AFL-automation

NIST AFL Team

GETTING STARTED

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AFL-automation is a framework for instrument control and laboratory automation. It powers the NIST AFL (Autonomous Formulation Laboratory), but is designed to be versatile for many scientific instrumentation needs. It enables the easy conversion of Python classes - drivers - into robust HTTP microservices with authentication, task queueing, UI generation, data management, and more.

GETTING STARTED 1

2 GETTING STARTED

CHAPTER

ONE

INSTALLING AFL-AUTOMATION

This tutorial will guide you through the process of installing AFL-automation and its dependencies.

1.1 Basic Installation

AFL-automation can be installed using pip:

```
pip install AFL-automation
```

This will install the core dependencies needed for basic functionality.

1.2 Installation with Hardware Support

Depending on your specific hardware needs, you may want to install additional dependencies:

```
# For Ocean Insight spectrometers
pip install AFL-automation[seabreeze]

# For Opentrons liquid handling robots
pip install AFL-automation[opentrons]

# For multiple hardware types
pip install AFL-automation[seabreeze,opentrons]
```

For a complete list of available extras and what they provide, see the *Managing Dependencies* page.

1.3 Development Installation

For development, you might want to install in editable mode with additional tools:

```
git clone https://github.com/usnistgov/AFL-automation.git
cd AFL-automation
pip install -e .

# Install development tools
pip install -e ".[docs]"
```

CHAPTER

TWO

QUICK START GUIDE

This quick start guide will help you get up and running with AFL-automation quickly.

2.1 Creating Your First Driver

AFL-automation is built around the concept of *drivers* - Python classes that interact with hardware or provide services. Here's a simple example:

2.2 Running as a Microservice

Once you have a driver, you can turn it into a web service:

```
from AFL.automation.APIServer.APIServer import APIServer

# Create the driver instance
my_driver = SimpleDriver()

# Create the server
server = APIServer('my-service')

# Add your driver and run the server
server.create_queue(my_driver)
server.run(host='0.0.0.0', port=5000)
```

We usually run the server using a short-hand module called AFL.automation.shared.launcher. This requires two lines of boilerplate code at the end of your driver, like so. It also requires the module (i.e, the Python file your driver is

in) to be named the same as the Driver name.

Once you have these magic lines in your Driver, you can simply invoke the server as a Python module from the command line:

or for a built-in driver, for instance SeabreezeUVVis:

2.3 Accessing the Service (API)

You can now access your service via HTTP requests or use the built-in client:

```
from AFL.automation.APIServer.Client import Client

# Connect to the service
client = Client('http://localhost:5000')

# Call a method
response = client.enqueue(task_name='say_hello',interactive=True)
print(response) # Outputs: 'Hello, World!'

# Call a method asynchronously
response = client.enqueue(task_name='say_hello',interactive=False)
print(response) # Outputs a uuid

# Get the result of the task
result = client.get_result(response)
print(result) # Outputs: 'Hello, World!'
```

2.4 Accessing the Service (Browser)

You also get a browser-based user interface, accessible by simply pointing a browser to http://localhost:5000

Using this interface, you can view the driver status, call methods that are labeled as quickbar methods, pause/unpause the queue, and set configuration items.

2.5 Next Steps

For more detailed instructions, check out:

- AFL-automation Architecture Learn about AFL-automation's architecture
- Managing Dependencies Manage hardware-specific dependencies
- API Reference Explore the full API documentation

THREE

TUTORIALS

Tutorials are learning-oriented guides that help new users get started with AFL-automation.

CHAPTER

FOUR

HOW-TO GUIDES

How-to guides are problem-oriented instructions that help users accomplish specific tasks with AFL-automation.

4.1 Managing Dependencies

The AFL-automation package uses a modular dependency system to handle various hardware and specialized libraries. This allows you to install only the dependencies you need for your specific hardware configuration.

4.1.1 Core Dependencies

The core dependencies are installed automatically when you install the package. These include:

- Web framework components: Flask, Flask-CORS, Flask-JWT-Extended
- Data processing libraries: NumPy, pandas, SciPy, xarray, h5py
- Visualization tools: Matplotlib, Plotly, Bokeh, ipywidgets
- Scientific utilities: periodictable, scikit-learn, scikit-image

4.1.2 Optional Dependencies (Extras)

The package uses Python's "extras" mechanism to manage optional dependencies. You can install these using pip:

```
# Install with specific hardware support
pip install AFL-automation[seabreeze,opentrons]

# Install with scattering support
pip install AFL-automation[scattering-processing,sas-analysis]
```

4.1.3 Available Extras

Hardware Interfaces

Extra Name	Package(s)	Description
labjack	labjack-ljm	Support for LabJack data acquisition hardware
piplates	piplates	Support for Pi-Plates hardware add-ons
rpi-gpio	RPi.GPIO	Raspberry Pi GPIO interface libraries
serial	pyserial	Serial communication support for instruments
seabreeze	seabreeze	Support for Ocean Optics/Ocean Insight spectrometers
opentrons	opentrons	Support for Opentrons liquid handling robots
pyspec	certif-pyspec	Support for CHESS and other beamline control
remote-access	paramiko	SSH client for remote instrument connections

Scientific Processing

Extra Name	Package(s)	Description
scattering-proces	fabio, pyFAI	Scattering data processing and azimuthal integration
sas-analysis	sasmodels, sasdata	Small-Angle Scattering analysis tools
ml	tensorflow, gpflow	Machine learning utilities for data analysis
geometry	alphashape, shapely	Geometric analysis and manipulation tools

Neutron Scattering

Extra Name	Package(s)	Description
neutron-scatteri	epics, sans, mantid	Support for neutron scattering instrumentation
nice-neutron-sca	t nice	NIST NCNR NICE control system

Documentation

Extra Name	Package(s)	Description
docs	sphinx, sphinx-rtd-theme, sphinx-autodoc-typehints, sphinx-copybutton, myst-parser, nbsphinx	Tools for building documentation

4.1.4 Implementation Details

AFL-automation uses lazy loading for optional dependencies. This means that:

- 1. You can import the package without having all optional dependencies installed
- 2. Dependencies are only loaded when actually used (via the lazy_loader library)
- 3. Clear error messages will tell you which extra to install if you try to use a feature without its required dependency

Example of error when trying to use a feature without the required dependency:

```
>>> from AFL.automation.instrument import SeabreezeUVVis
>>> spectrometer = SeabreezeUVVis()
ImportError: This module requires the 'seabreeze' package.
Please install it: pip install AFL-automation[seabreeze]
```

4.1.5 Importing Multiple Hardware Packages

If you need support for multiple hardware types, you can specify multiple extras:

```
pip install AFL-automation[seabreeze,opentrons,scattering-processing]
```

Core packages that are not tied to specific hardware will be loaded normally without any special handling.

EXPLANATION

Explanation guides are understanding-oriented articles that provide background context and explain key concepts of AFL-automation.

5.1 AFL-automation Architecture

This page explains the core architecture of AFL-automation and how its components work together.

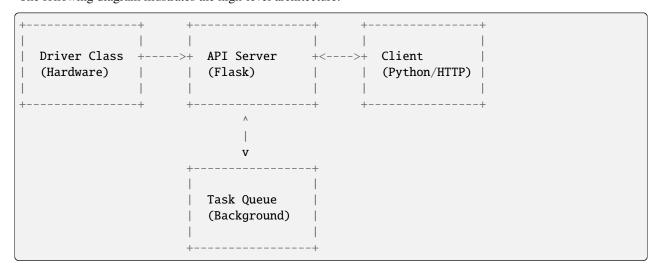
5.1.1 Core Concepts

AFL-automation is built around several key concepts:

- 1. Drivers: Python classes that interface with hardware or provide services
- 2. APIServer: A Flask-based web server that exposes drivers via HTTP
- 3. Task Queue: A system for managing asynchronous tasks
- 4. Client: A Python client for interacting with remote services

5.1.2 Architecture Diagram

The following diagram illustrates the high-level architecture:



5.1.3 Driver System

The driver system is the core of AFL-automation. Drivers:

- Encapsulate hardware control logic
- Define configuration parameters with defaults
- Provide methods for interacting with hardware
- · Support lazy loading of hardware-specific dependencies

5.1.4 API Server

The API server:

- Exposes driver methods via HTTP endpoints
- · Provides authentication and authorization
- Manages a task queue for asynchronous operations
- · Offers a web UI for monitoring and control

5.1.5 Dependency Management

AFL-automation uses a modular dependency system:

- · Core dependencies are always installed
- · Hardware-specific dependencies are optional
- Lazy loading ensures code works even without all dependencies
- · The extras system makes installation straightforward

For details on managing dependencies, see Managing Dependencies.

CHAPTER

SIX

REFERENCE

Reference documentation provides information-oriented technical descriptions of the AFL-automation API and code structure.

6.1 API Reference

This page provides detailed API documentation for all modules in the AFL-automation framework.

AFL.automation

AFL.automation.APIServer

AFL.automation.instrument

AFL.automation.loading

AFL.automation.prepare

AFL.automation.sample

AFL.automation.sample

AFL.automation.sample_env

AFL.automation.shared

6.1.1 AFL.automation

Functions

test() Run all tests using pytest.

AFL.automation.test()

Run all tests using pytest.

Modules

APIServer

EpicsADLiveProcess

instrument

loading

prepare

sample_env

shared

AFL.automation.APIServer

Modules

APIServer
Client
Driver
DummyDriver
DummyOT2Driver
LoggerFilter
QueueDaemon

AFL.automation.APIServer.APIServer

Functions

<pre>create_access_token(identity[, fresh,])</pre>	Create a new access token.
<pre>create_refresh_token(identity[,])</pre>	Create a new refresh token.
<pre>get_jwt_identity()</pre>	In a protected endpoint, this will return the identity of the JWT that is accessing the endpoint.
<pre>jsonify(*args, **kwargs)</pre>	Serialize the given arguments as JSON, and return a Response object with the application/json mimetype.
<pre>jwt_required([optional, fresh, refresh,])</pre>	A decorator to protect a Flask endpoint with JSON Web Tokens.
listify(obj)	
<pre>render_template(template_name_or_list, **context)</pre>	Render a template by name with the given context.
<pre>send_file(path_or_file[, mimetype,])</pre>	Send the contents of a file to the client.
set_access_cookies(response,[, max_age,])	Modifiy a Flask Response to set a cookie containing the access JWT.
set_refresh_cookies(response,[,])	Modifiy a Flask Response to set a cookie containing the refresh JWT.
strtobool(val)	Convert a string representation of truth to true (1) or false (0).
<pre>unset_jwt_cookies(response[, domain])</pre>	Modifiy a Flask Response to delete the cookies containing access or refresh JWTs.

Classes

APIServer(name[, data, experiment, contact,])	
CORS([app])	Initializes Cross Origin Resource sharing for the application.
FileHandler(filename[, mode, encoding,])	A handler class which writes formatted logging records to disk files.
Flask(import_name[, static_url_path,])	The flask object implements a WSGI application and acts as the central object.
<pre>IPVersion(value[, names, module, qualname,])</pre>	
<pre>JWTManager([app, add_context_processor])</pre>	An object used to hold JWT settings and callback functions for the Flask-JWT-Extended extension.
LoggerFilter(*filters)	
MutableQueue()	Thread-safe, mutable queue
QueueDaemon(app, driver, task_queue, history)	
SMTPHandler (mailhost, fromaddr, toaddrs, subject)	A handler class which sends an SMTP email for each logging event.
ServiceInfo	Service information.
Zeroconf([interfaces, unicast, ip_version,])	Implementation of Zeroconf Multicast DNS Service Discovery

```
class AFL.automation.APIServer.APIServer(name, data=None, experiment='Development',
                                                           contact='tbm@nist.gov',
                                                           index template='index.html',
                                                           new_index_template='index-new.html',
                                                          plot_template='simple-bokeh.html')
     __init__(name, data=None, experiment='Development', contact='tbm@nist.gov',
               index_template='index.html', new_index_template='index-new.html',
               plot_template='simple-bokeh.html')
     create_queue(driver, add_unqueued=True)
     reset_queue_daemon(driver=None)
     advertise_zeroconf(**kwargs)
     run(**kwargs)
     run_threaded(start_thread=True, **kwargs)
     add_standard_routes()
     get_info()
          Live, status page of the robot
     get_quickbar()
          Return the functions, params, and defaults to be shown in this server's quickbar
     is_server_live()
     get_unqueued_commands()
     get_queued_commands()
     add_unqueued_routes()
     query_driver()
     init_logging(toaddrs=None)
     index()
          Live, status page of the robot
     index_new()
          Live, status page of the robot
     webapp()
          Live, status page of the robot
     render_unqueued(func, kwargs_add, **kwargs)
          Convert an unqueued return item into web-suitable output
     send_1d_plot(result, multi=False, **kwargs)
     send_array_as_jpg(array, log_image=False, max_val=None, fillna=0.0, **kwargs)
     queue_state()
     driver_status()
```

Store an object named obj in the driver's dropbox If a uuid is provided, the object will be stored with that uuid Otherwise, a new uuid will be generated. In either case, the uuid will be returned to the client.

retrieve_obj()

Retrieve an object from the driver's dropbox unid specifies the object to retrieve delete specifies whether to delete the object after retrieval

```
set_driver_object()
get_driver_object()
enqueue()
reorder_queue()
remove_items()
remove_item()
move_item()
clear_queue()
clear_history()
debug()
pause()
halt()
init()
login()
get_server_time()
login_test()
```

AFL.automation.APIServer.Client

Classes

<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
ServerDiscovery()	ServerDiscovery class

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

```
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
logged_in()
login(username, populate_commands=True)
driver_status()
get_queue()
wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
get_unqueued_commands(inherit_commands=True)
get_queued_commands(inherit_commands=True)
enqueue(interactive=None, **kwargs)
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
halt()
queue_state()
remove_item(uuid)
move_item(uuid, pos)
set_driver_object(**kw)
get_driver_object(name)
deposit_obj(obj, uid=None)
```

Deposit an object in the dropbox obj : object, the object to deposit id : str, the uuid to deposit the object under if not specified, a new uuid will be generated

```
retrieve_obj(uid, delete=True)
```

Retrieve an object from the dropbox id : str, the uuid of the object to retrieve delete : bool, if True, delete the object after retrieving

```
set_object(serialize=True, **kw)
get_object(name, serialize=True)
```

AFL.automation.APIServer.Driver

Functions

```
 \begin{array}{c} ceil(x,/) & \text{Return the ceiling of x as an Integral.} \\ listify(obj) & \\ makeRegistrar() & \\ sqrt(x,/) & \text{Return the square root of x.} \\ \end{array}
```

Classes

unqueued()

```
Driver(name[, defaults, overrides])

PersistentConfig(path[, defaults, ...])

A dictionary-like class that serializes changes to disk
```

```
AFL.automation.APIServer.Driver.makeRegistrar()
```

class AFL.automation.APIServer.Driver.Driver(name, defaults=None, overrides=None)

```
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
    Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
```

```
pre_execute(**kwargs)
```

Executed before each call to execute

All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden by subclasses.

```
post_execute(**kwargs)
```

Executed after each call to execute

All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden by subclasses.

```
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
```

Set data in the DataPacket object

Parameters

- data (dict) Dictionary of data to store in the driver object
- variables (Note! if the keys in data are not system or sample)

:param : :param they will be erased at the end of this function call.:

```
retrieve_obj(uid, delete=True)
```

Retrieve an object from the dropbox

Parameters

uid (*str*) – The uuid of the file to retrieve

```
deposit_obj(obj, uid=None)
```

Store an object in the dropbox

Parameters

- **obj** (*object*) The object to store in the dropbox
- **uid** (*str*) The uuid to store the object under

AFL.automation.APIServer.DummyDriver

Functions

	he ceiling of x as an Integral.
listify(obj)	
sqrt(x, /) Return the	he square root of x.

Classes

```
Driver(name[, defaults, overrides])

DummyDriver([name, overrides])
```

```
class AFL.automation.APIServer.DummyDriver.DummyDriver(name=None, overrides=None)
     defaults = {'density of water': 1.0, 'speed of light': 300000000.0}
     __init__(name=None, overrides=None)
     status()
     test_command1(kwarg1=None, kwarg2=True)
          A test command with positional and keyword parameters
     test_command2(kwarg1=False, kwarg2=False, kwarg3=True)
          A test command with positional and keyword parameters
     test_command_sets_data(kwarg1=False, kwarg2=False, kwarg3=True)
          A test command with positional and keyword parameters
     how_many(**kwargs)
     test_plot(**kwargs)
     test_image(**kwargs)
     quickbar_test(text_field='Three', int_field=3, float_field=3.14, bool_field=True)
     quickbar_test2()
     dummy_reset_tank_levels(rinse1=950, rinse2=950, waste=0)
     loadSample(cellname='cell', sampleVolume=0)
```

AFL.automation.APIServer.DummyOT2Driver

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x, l)	Return the square root of x.

Classes

```
Driver(name[, defaults, overrides])

DummyDriver([name, overrides])

class AFL.automation.APIServer.DummyOT2Driver.DummyDriver(name=None, overrides=None)
    defaults = {'density of water': 1.0, 'speed of light': 300000000.0}

    __init__(name=None, overrides=None)
    status()
```

```
execute(**kwargs)
get_prep_target(**kwargs)

test_command1(kwarg1=None, kwarg2=True)
    A test command with positional and keyword parameters

test_command2(kwarg1=False, kwarg2=False, kwarg3=True)
    A test command with positional and keyword parameters

test_command_sets_data(kwarg1=False, kwarg2=False, kwarg3=True)
    A test command with positional and keyword parameters

how_many(**kwargs)

test_plot(**kwargs)

test_image(**kwargs)

quickbar_test(text_field='Three', int_field=3, float_field=3.14, bool_field=True)

quickbar_test2()

dummy_reset_tank_levels(rinse1=950, rinse2=950, waste=0)

loadSample(cellname='cell', sampleVolume=0)
```

AFL.automation.APIServer.LoggerFilter

Classes

```
LoggerFilter(*filters)
```

```
class AFL.automation.APIServer.LoggerFilter.LoggerFilter(*filters)
    __init__(*filters)
```

AFL.automation.APIServer.QueueDaemon

Functions

```
is_serialized(obj)
```

Classes

DataTrashcan()	A DataPacket implementation <i>for testing only</i> that takes all its data and simply throws it away.
<pre>QueueDaemon(app, driver, task_queue, history)</pre>	

```
__init__(app, driver, task_queue, history, debug=False, data=None)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

```
check_if_paused()
```

mask_serialized_objs(package)

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.EpicsADLiveProcess

Modules

AreaDetectorLive

Client

ReduceDaemon

AFL.automation.EpicsADLiveProcess.AreaDetectorLive

Classes

```
AreaDetectorLive([basepv, cam, filewriter, ...])
```

```
__init__(basepv='PIL5:', cam='cam1:', filewriter='TIFF1:', image='image1:')

cbfunc(pvname=None, value=None, char_value=None, **kwargs)

queuehandler()

status()
```

AFL.automation.EpicsADLiveProcess.Client

Classes

```
Client([ip, port])
```

Communicate with NistoRoboto server on OT-2

```
class AFL.automation.EpicsADLiveProcess.Client.Client(ip='10.42.0.30', port='5000')
    Communicate with NistoRoboto server on OT-2
    This class maps pipettor functions to HTTP REST requests that are sent to the NistoRoboto server
    __init__(ip='10.42.0.30', port='5000')
    logged_in()
    login(username)
    set_queue_mode(debug_mode=True)
```

transfer(source, dest, volume, source_loc=None, dest_loc=None)

Transfer fluid from one location to another

Parameters

- **source** (*str or list of str*) Source wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **dest** (*str or list of str*) Destination wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **volume** (*float*) volume of fluid to transfer in microliters

```
load_labware(name, slot)
load_instrument(name, mount, tip_rack_slots)
reset()
home()
halt()
```

AFL.automation.EpicsADLiveProcess.ReduceDaemon

Classes

```
ReduceDaemon(app, reduction_queue, ...[, ...])
```

__init__(app, reduction_queue, integrator, results, mask=None, npts=500)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.instrument

Modules

DummySAS

FileCamera

I22SAXS

NetworkCamera

SeabreezeUVVis

SpecScreen_Driver

AFL.automation.instrument.DummySAS

Classes

Driver(name[, defaults, overrides])

DummySAS([overrides])

```
class AFL.automation.instrument.DummySAS.DummySAS(overrides=None)

defaults = {}

__init__(overrides=None)

    connect to spec

expose(name=None, exposure=None, nexp=1, block=True, reduce_data=True, measure_transmission=True, save_nexus=True)

status()
```

AFL.automation.instrument.FileCamera

Classes

```
FileCamera()

class AFL.automation.instrument.FileCamera.FileCamera
    __init__()
    collect(fname)
```

AFL.automation.instrument.I22SAXS

Classes

```
Driver(name[, defaults, overrides])

I22SAXS([overrides])

class AFL.automation.instrument.I22SAXS.I22SAXS(overrides=None, **kwargs)

defaults = {'acq_time': 1, 'acq_timeout': 120, 'address': '',
    'data_read_cooldown': 5, 'empty_scan_id': '', 'file_read_timeout': 30,
    'nframes': 1, 'port': 2222, 'pos_list': [], 'processed_base_path':
    '/mnt/i22_processed/i22-', 'reduced_data_suffix':
    '_saxs_Transmission_Averaged_Subtracted_IvsQ_processed.nxs', 'ssh_key_path': '',
    'username': ''}
    __init__(overrides=None, **kwargs)

expose(name, empty=False, nframes=None, acq_time=None, set_empty=False)
    Perform a sequence of exposures at positions defined in self.config['pos_list'].
    Return the integrated data of the measurement with the lowest measured sample transmission.
    read_integrated(scanid)
    Scans the appropriate directory for the filename of the data collected with filename
```

AFL.automation.instrument.NetworkCamera

Classes

```
NetworkCamera(url)

class AFL.automation.instrument.NetworkCamera.NetworkCamera(url)
    __init__(url)
    camera_reset()
    collect()
```

AFL.automation.instrument.SeabreezeUVVis

Classes

```
      Driver(name[, defaults, overrides])

      Eq(key, value)
      Query equality of a given key's value to the specified value.

      Path(*args, **kwargs)
      PurePath subclass that can make system calls.

      SeabreezeUVVis([backend, device_serial, ...])
```

```
defaults = {'air_uuid': '', 'correctDarkCounts': False, 'correctNonlinearity':
False, 'exposure': 0.01, 'exposure_delay': 0, 'filename': 'test.h5', 'filepath':
'.', 'reference_uuid': '', 'saveSingleScan': False}
__init__(backend='cseabreeze', device_serial=None, overrides=None)
getExposure()
getExposureDelay()
getFilename()
getSaveSingleScan()
getFilepath()
setFilepath(filepath)
setFilename(filename)
setSaveSingleScan(saveSingleScan)
setExposureDelay(time)
```

AFL.automation.instrument.SpecScreen Driver

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x, l)	Return the square root of x.

Classes

```
Driver(name[, defaults, overrides])
SpecScreen_Driver([log_file])
```

```
class AFL.automation.instrument.SpecScreen_Driver.SpecScreen_Driver(log_file=None)
    __init__(log_file=None)
    status()
    execute(**kwargs)
```

AFL.automation.loading

Modules

CetoniMultiPosValve	
ChemyxSyringePump	This is largely duplicated from the reference code provided by Chemyx.
DigitalOutPressureController	vided by Chelliya.
DoubleViciMultiposSelector	
DummyPump	
FlowSelector	
LoadStopperDriver	
MultiChannelRelay	
NE1kSyringePump	
OneSelectorBlowoutSampleCell	
PneumaticPressureSampleCell	
PneumaticSampleCell	
PressureController	
PressureControllerAsPump	
PushPullSelectorSampleCell	
RSoXSSolutionSampleCell	
SainSmartRelay	
SampleCell	
Sensor	
SensorCallbackThread	
SensorPollingThread	
SerialDevice	
SyringePump	
Tubing	
TwoSelectorBlowoutSampleCell	
UltimusVPressureController	
ViciMultiposSelector	
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AFL.automation.loading.CetoniMultiPosValve

Classes

```
CetoniMultiPosValve(parentpump[, portlabels])
FlowSelector()
```

```
__init__(parentpump, portlabels={})
connect to valve and query the number of positions
```

Parameters

- to (port string describing the serial port the actuator is connected)
- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

selectPort(port, direction=None)

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

```
getPort(as_str=False)
```

query the current selected position

AFL.automation.loading.ChemyxSyringePump

This is largely duplicated from the reference code provided by Chemyx. Their package is a GUI and direct import of the module would be problematic.

Functions

<pre>getOpenPorts()</pre>	
parsePortName(portinfo)	On macOS and Linux, selects only usbserial options and parses the 8 character serial number.

Classes

```
ChemyxConnection(port, baudrate[, x, mode, ...])
 ChemyxSyringePump(port, syringe_id_mm, ...)
 SyringePump()
class AFL.automation.loading.ChemyxSyringePump.ChemyxSyringePump(port, syringe_id_mm,
                                                                             syringe volume, baud=9600,
                                                                             flow_delay=5)
     __init__(port, syringe_id_mm, syringe_volume, baud=9600, flow_delay=5)
          Initializes and verifies connection to a Chemyx syringe pump.
              port = serial port reference
              syringe_id_mm = syringe inner diameter in mm, used for absolute volume.
                  (will re-program the pump with this diameter on connection)
              syringe_volume = syringe volume in mL
              baud = baudrate for connection
     wait_dosage_finished(timeout seconds=60)
          The function waits until the last dosage command has finished until the timeout occurs.
     stop()
          Abort the current dispense/withdraw action.
     withdraw(volume, block=True, delay=True)
     dispense(volume, block=True, delay=True)
     setRate(rate)
     getRate()
     emptySyringe()
     getLevel()
     setLevel(level)
     blockUntilStatusStopped(pollingdelay=0.2)
          This is a deprecated function from old serial logic. It should work, but do not use.
     getStatus()
          query the pump status and return whether the pump is moving or not (true if moving, false if stopped)
     getValueFromParams(search_key)
AFL.automation.loading.ChemyxSyringePump.getOpenPorts()
AFL.automation.loading.ChemyxSyringePump.parsePortName(portinfo)
     On macOS and Linux, selects only usbserial options and parses the 8 character serial number.
```

```
__init__(port, baudrate, x=0, mode=0, verbose=False)
openConnection()
closeConnection()
sendCommand(command)
getResponse()
startPump()
stopPump()
pausePump()
restartPump()
setUnits(units)
setDiameter(diameter)
setRate(rate)
setVolume(volume)
setDelay(delay)
setTime(timer)
getParameterLimits()
getParameters()
getDisplacedVolume()
getElapsedTime()
getPumpStatus()
addMode(command)
addX(command)
```

AFL.automation.loading.DigitalOutPressureController

Classes

DigitalOutPressureController(digital_out,)	
PressureController()	Abstract superclass for pressure controllers that provides timed dispensing

```
class AFL.automation.loading.DigitalOutPressureController.DigitalOutPressureController(digital_out,
                                                                                                      pres-
                                                                                                      sure_to_v_conv)
     __init__(digital_out, pressure_to_v_conv)
          Initializes a DigitalOutPressureController
          Params:
              digital_out (AFL.automation.DigitalOut): pressure_to_v_conv (float): pressure units per volt
     set_P(pressure)
AFL.automation.loading.DoubleViciMultiposSelector
Classes
 DoubleViciMultiposSelector(port1, port2[, ...])
 FlowSelector()
 ViciMultiposSelector(port[, baudrate, ...])
class AFL.automation.loading.DoubleViciMultiposSelector.DoubleViciMultiposSelector(port1,
                                                                                                 port2,
                                                                                                 bau-
                                                                                                 drate=9600,
                                                                                                 portla-
                                                                                                 bels=None)
     __init__(port1, port2, baudrate=9600, portlabels=None)
          connect to valve and query the number of positions
              Parameters
                  • to
                                  (port - string describing the serial port the actuator is
                    connected)
                  • use (baud - baudrate to)
                  naming
                                    (portlabels - dict for smart port)
                                                                                            3,'instru-
                    ment':4,'rinse':5,'waste':6}
                  • {'sample' (of the form) - 3,'instrument':4,'rinse':5,'waste':6}
     selectPort(port, direction=None)
          moves the selector to portnum
          if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value,
          will move via most efficient route.
     getPort(as_str=False)
```

query the current selected position

AFL.automation.loading.DummyPump

Classes

```
DummyPump()
 SerialDevice(port[, baudrate, timeout, ...])
 SyringePump()
class AFL.automation.loading.DummyPump.DummyPump
     __init__()
          Dummy pump for testing - does nothing, but boy does it look good doing it.
     stop()
          Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.
     withdraw(volume, block=True, delay=True)
     dispense(volume, block=True, delay=True)
     setRate(rate)
     getRate()
     emptySyringe()
     blockUntilStatusStopped(pollingdelay=0.2)
     getStatus()
          query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
```

AFL.automation.loading.FlowSelector

Classes

```
rlowSelector()

class AFL.automation.loading.FlowSelector.FlowSelector
    getPort()
    selectPort()
```

AFL.automation.loading.LoadStopperDriver

```
Client([ip, port, username, interactive])
                                                   Communicate with APIServer
 Driver(name[, defaults, overrides])
 LoadStopperDriver(sensor[, load_client, ...])
                                                   Driver for stopping loads
 SensorPollingThread(sensor[, period, ...])
 StopLoadCBv1(poll, period, load_client[, ...])
 StopLoadCBv2(poll, period[, load_client, ...])
class AFL.automation.loading.LoadStopperDriver.LoadStopperDriver(sensor, load_client=None,
                                                                        load_object=None,
                                                                        auto initialize=True,
                                                                        overrides=None, data=None,
                                                                        sensorlabel=",
                                                                        name='LoadStopperDriver')
     Driver for stopping loads
     defaults = {'load_speed': 2, 'period': 0.05, 'poll_window': 1000, 'sensorlabel':
     '', 'stopper_baseline_duration': 2, 'stopper_filepath':
     '/github/home/.afl/loadstopper_data', 'stopper_loadstop_cooldown': 2,
     'stopper_min_load_time': 3, 'stopper_post_detection_sleep': 1,
     'stopper_threshold_npts': 50, 'stopper_threshold_std': 3.0,
     'stopper_threshold_v_step': 1, 'stopper_timeout': 120}
     __init__(sensor, load_client=None, load_object=None, auto_initialize=True, overrides=None, data=None,
               sensorlabel=", name='LoadStopperDriver')
     status()
     property app
     calibrate_sensor()
     read_sensor()
     read_poll()
     read_poll_load()
     reset()
     reset_poll()
     reset_stopper()
```

AFL.automation.loading.MultiChannelRelay

Classes

```
MultiChannelRelay()
```

```
class AFL.automation.loading.MultiChannelRelay.MultiChannelRelay
```

```
setChannels(channels)
getChannels(channels)
toggleChannels(channels)
```

AFL.automation.loading.NE1kSyringePump

Classes

```
NE1kSyringePump(port, syringe_id_mm, ...[, ...])
SerialDevice(port[, baudrate, timeout, ...])
SyringePump()
```

```
__init__(port, syringe_id_mm, syringe_volume, baud=9600, daisy_chain=None, pumpid=None, flow_delay=5)
```

Initializes and verifies connection to a New Era 1000 syringe pump.

port = serial port reference

syringe_id_mm = syringe inner diameter in mm, used for absolute volume.

(will re-program the pump with this diameter on connection)

syringe volume = syringe volume in mL

baud = baudrate for connection

daisy_chain = used for the 'party-line' mode on these pumps where a string of pumps is on one serial port.

when setting up daisy chaining:

connect to the first pump on a port with daisy_chain = False on subsequent pumps, set daisy_chain to the pump with a hardware connection (the first pump)

or any other pump on the string.

note: when daisy chaining you should probably set pumpid explicitly rather than autodiscovering

as most likely the autodiscovery will return the first pump id each time.

pumpid = the ID configured in the pump firmware. If not set, will attempt to auto-discover a pump. setting pumpid will save some time on connection and probably result in more reproducible behavior. Practically mandatory for daisy chain mode.

stop()

Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.

```
withdraw(volume, block=True, delay=True)
dispense(volume, block=True, delay=True)
setRate(rate)
getRate()
emptySyringe()
blockUntilStatusStopped(pollingdelay=0.2)
getStatus()
    query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
```

AFL.automation.loading.OneSelectorBlowoutSampleCell

Classes

Driver(name[, defaults, overrides])	
OneSelectorBlowoutSampleCell(pump, selector)	Class for a sample cell consisting of a pump and a one- to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a sepa- rate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
<pre>TwoSelectorBlowoutSampleCell(pump, selector,)</pre>	Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

 $\textbf{class} \ AFL. automation. loading. One Selector Blowout Sample Cell. \textbf{One Selector Blowout Sample Cell} (\textit{pump}, \textit{pump}, \textit$

```
se-
lec-
tor,
rinse_tank_level=950
waste_tank_level=0,
cell_waste_tank_leve
over-
rides=None)
```

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)

```
__init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0, overrides=None)
```

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

thickness = cell path length, to be incorporated into metadata, array with length = ncells

AFL.automation.loading.PneumaticPressureSampleCell

Classes

<pre>Driver(name[, defaults, overrides])</pre>	
PneumaticPressureSampleCell(pctrl, relayboard)	Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.
SampleCell()	
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

class AFL.automation.loading.PneumaticPressureSampleCell.PneumaticPressureSampleCell(pctrl,

relayboard,
digitalin=None,
rinse1_tank_level=950,
rinse2_tank_level=950,
waste_tank_level=0,
load_stopper=None,
robot_interlock_host=N
overrides=None)

Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.

Driven by a variable-pressure regulator.

```
pctrl: a pressurecontroller object supporting the set P method() and the optional p ramp() method.
         e.g. pctrl = DigitalOutPressureController(LabJackDigitalOut(...))
     relayboard: a relay board object supporting string-based setChannels() method
         required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample'
         e.g. selector = SainSmartRelay(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse1=950, rinse2=950, waste=0)
property app
property data
status()
loadSample(cellname='cell', sampleVolume=None, load_dest_label=")
     Load a sample into the cell
     Params cellname and sampleVolume are kept for backward compat, but are deprecated and unused.
advanceSample(load_dest_label=")
     Move a sample from one measurement cell to the next
     Params:
         load_dest_label (str, default "): a 'destination label' for this load.
             labeled sensors will only stop the load if their name is in this destination label. example:
               sensor 1 labeled 'afterSANS' sensor 2 labeled 'beforeSPEC' sensor 3 labeled '(default)
               advanceSample(load_dest_label='afterSANS') -> sensor 1 or sensor 3 can stop it advance-
               Sample(load_dest_label='beforeSPEC afterSANS') -> sensor 1, sensor 2, or sensor 3 can
               stop it advanceSample(load_dest_label=") -> only sensor 3 can stop it
stopLoad(**kwargs)
rinseCell(cellname='cell')
rinseAll()
setRinseLevel(vol)
setWasteLevel(vol)
primeRinse(waittime=10)
calibrate_sensor()
read_sensor()
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
set_sensor_config(**kwargs)
get_sensor_config(**kwargs)
sensor_reset(sensor_n=None)
```

AFL.automation.loading.PneumaticSampleCell

Classes

rinseAll()

setRinseLevel(vol)

```
      Driver(name[, defaults, overrides])

      PneumaticSampleCell(pump, relayboard[, ...])
      Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.

      SampleCell()
      defaultdict(default_factory=None, /, [...]) --> dict with default factory
```

```
class AFL.automation.loading.PneumaticSampleCell.PneumaticSampleCell(pump, relayboard,
                                                                               digitalin=None,
                                                                               rinse1_tank_level=950,
                                                                               rinse2_tank_level=950,
                                                                               waste\_tank\_level=0,
                                                                               load_stopper=None,
                                                                               overrides=None)
     Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.
     Driven by a syringe pump.
     defaults = {'air_speed': 30, 'arm_move_delay': 0.2, 'catch_to_cell_vol': 1.15,
     'external_load_complete_trigger': False, 'large_dispense_vol': 5, 'load_speed':
     2, 'rinse_program': [('rinse1', 5), (None, 2), ('rinse2', 5), ('blow', 5), (None,
     0.5), ('blow', 5)], 'vent_delay': 0.5, 'withdraw_vol': 1.5}
     __init__(pump, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950,
                waste_tank_level=0, load_stopper=None, overrides=None)
          pump: a pump object supporting withdraw() and dispense() methods
              e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
          relayboard: a relay board object supporting string-based setChannels() method
              required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample'
              e.g. selector = SainSmartRelay(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
     reset_pump(dispense=False)
     reset_tank_levels(rinse1=950, rinse2=950, waste=0)
     property app
     status()
     loadSample(cellname='cell', sampleVolume=0)
     stopLoad(**kwargs)
     rinseCell(cellname='cell')
```

```
setWasteLevel(vol)
primeRinse(waittime=10)
calibrate_sensor()
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
set_sensor_config(**kwargs)
get_sensor_config(**kwargs)
sensor_reset()
```

AFL.automation.loading.PressureController

Classes

PressureController()	Abstract superclass for pressure controllers that provides
	timed dispensing

class AFL.automation.loading.PressureController.PressureController

Abstract superclass for pressure controllers that provides timed dispensing

```
timed_dispense(dispense_pressure, dispense_time, block=True)
```

Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time. This dispense can be interrupted by calling self.stop().

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

AFL.automation.loading.PressureControllerAsPump

```
PressureControllerAsPump(pressure_controller)

SerialDevice(port[, baudrate, timeout, ...])

SyringePump()
```

```
class AFL.automation.loading.PressureControllerAsPump.PressureControllerAsPump(pressure_controller,
                                                                                              dis-
                                                                                              pense pressure=3.5,
                                                                                              im-
                                                                                              plied_flow_rate=50)
     __init__(pressure_controller, dispense_pressure=3.5, implied_flow_rate=50)
          Initialize a pressure controller as a syringe pump.
          pressure_controller: controller to connect to dispense_pressure: pressure at which dispense should run
          implied_flow_rate: flow rate which should be used to convert to dispense times, mL/min
     stop()
          Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.
     withdraw(volume, block=True, delay=True)
     dispense(volume, block=True, delay=True)
     setRate(rate)
     getRate()
     emptySyringe()
     blockUntilStatusStopped(pollingdelay=0.2)
     getStatus()
```

AFL.automation.loading.PushPullSelectorSampleCell

Classes

Driver(name[, defaults, overrides])	
PushPullSelectorSampleCell(pump, selector[,])	Class for a sample cell consisting of a pump and a one- to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a sepa- rate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
SampleCell()	
Tubing(specid, length)	
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)

class AFL.automation.loading.PushPullSelectorSampleCell.PushPullSelectorSampleCell(pump,

```
selec-
tor,
ncells=1,
thick-
ness=None,
catch to sel vol=None,
cell_to_sel_vol=None,
sv-
ringe_to_sel_vol=None,
selec-
tor_internal_vol=None,
cali-
brated_catch_to_syringe_v
cali-
brated_syringe_to_cell_vo
rinse_speed=50.0,
load speed=10.0,
rinse flow delay=3.0,
load flow delay=10.0)
```

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector) @TODO: figure out when/where to pull in air to the syringe to make up for extra_vol_to_empty_ml

```
__init__(pump, selector, ncells=1, thickness=None, catch to sel vol=None, cell to sel vol=None,
           syringe_to_sel_vol=None, selector_internal_vol=None, calibrated_catch_to_syringe_vol=None,
           calibrated_syringe_to_cell_vol=None, rinse_speed=50.0, load_speed=10.0,
           rinse_flow_delay=3.0, load_flow_delay=10.0)
     ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
     by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
     thickness = cell path length, to be incorporated into metadata, array with length = ncells
     cell state if not 'clean', array with length = ncells
     pump: a pump object supporting withdraw() and dispense() methods
         e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
     selector: a selector object supporting string-based selectPort() method with options
     'catch', 'cell', 'rinse', 'waste', 'air'
         e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
property app
status()
setParameter(parameter, value)
getParameters()
transfer(source, dest, vol source, vol dest=None)
catchToSyringe(sampleVolume=0)
```

loadSample(cellname='cell', sampleVolume=0)

```
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCell(cellname='cell')
blowOutCellForcedAir(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
```

AFL.automation.loading.RSoXSSolutionSampleCell

Classes

<pre>Driver(name[, defaults, overrides])</pre>	
RSoXSSolutionSampleCell(pump, selector[,])	Class for a sample cell consisting of a pump and a one-to- many flow selector for a flowrate-limited measurement cell (e.g., a liquid TEM sample holder for RSoXS).
SampleCell()	
Tubing(specid, length)	
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

```
\textbf{class} \ \texttt{AFL}. automation. loading. RSoXSSolution Sample Cell. \textbf{RSoXSSolution Sample Cell} (\textit{pump}, \textit{selector}, \textit{pump}, \textit
```

```
rinse_tank_level=950,
waste_tank_level=0,
cell_waste_tank_level=0,
over-
rides=None)
```

Class for a sample cell consisting of a pump and a one-to-many flow selector for a flowrate-limited measurement cell (e.g., a liquid TEM sample holder for RSoXS).

The pump draws from any of the sample ports and can quickly purge/rinse itself and the tubing between the loader and the cell. When the pump is connected to the cell, its max rate is limited to very slow (5 ul/min for RSoXS).

```
defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
__init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0,
          overrides=None)
    ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
    by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
    thickness = cell path length, to be incorporated into metadata, array with length = ncells
    cell state if not 'clean', array with length = ncells
    pump: a pump object supporting withdraw() and dispense() methods
        e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
    selector: a selector object supporting string-based selectPort() method with options
    'catch', 'cell', 'rinse', 'waste', 'air'
        e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse=950, waste=0, cell waste=0)
property app
status()
transfer(source, dest, vol source, vol dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
drySyringe(blow=True, waittime=1)
    transfer from air to waste, to push out any residual liquid.
    if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
```

```
rinseCatch()
rinseAll(cellname='cell')
setRinseLevel(vol)
setWasteLevel(vol)
```

AFL.automation.loading.SainSmartRelay

Module Attributes

```
usbrelay
```

Classes

```
MultiChannelRelay()
 SainSmartRelay(relaylabels, serial_port[, ...])
 SerialDevice(port[, baudrate, timeout, ...])
class AFL.automation.loading.SainSmartRelay.SainSmartRelay(relaylabels, serial_port, timeout=0.5)
     __init__(relaylabels, serial_port, timeout=0.5)
           Init connection to a SainSmart 16-channel USB relay module.
           Params: relaylabels (dict):
               mapping of port id to load name, e.g. {0:'arm_up',1:'arm_down'}
           serial_port (str):
               port to connect to
     setAllChannelsOff()
     setChannels(channels)
           Write a value (True, False) to the channels specified in channels
           Parameters: channels (dict):
               dict of channels, keys as either str (name) or int (id) to write to, vals as the value to write
     getChannels(asid=False)
           Read the current state of all channels
           Parameters: asid (bool,default false): Dict keys should simply be the id, not the name.
           Returns: (dict) key:value mappings of state.
     toggleChannels(channels)
```

```
AFL.automation.loading.SainSmartRelay.usbrelay = [[b':FE0100200000FF\r\n', b':FE0100000010F1\r\n'], [b':FE05000000000FD\r\n', b':FE050000FF00FE\r\n'], [b':FE0500010000FC\r\n', b':FE050001FF00FD\r\n'], [b':FE0500020000FB\r\n', b':FE050002FF00FC\r\n'], [b':FE0500030000FA\r\n', b':FE050003FF00FB\r\n'], [b':FE0500040000F9\r\n', b':FE050004FF00FA\r\n'], [b':FE0500050000F8\r\n', b':FE050005FF00F9\r\n'], [b':FE0500060000F7\r\n', b':FE050006FF00F8\r\n'], [b':FE050007F00F7\r\n'], [b':FE0500080000F5\r\n', b':FE050008FF00F6\r\n'], [b':FE050000FF00F7\r\n'], [b':FE050009FF00F5\r\n'], [b':FE05000A0000F3\r\n', b':FE05000AFF00F4\r\n'], [b':FE05000B0000F2\r\n', b':FE05000D0000F0\r\n'], [b':FE05000DFF00F1\r\n', b':FE05000E0000FF\r\n'], [b':FE05000EFF00F5\r\n'], [b':FE05000EFF00F5\r\n'], [b':FE05000EFF00FF\r\n'], [b':FE05000EFF00FF\r\n']]
```

"" Sainsmart 16-Channel 9-36v USB Relay Module (CH341 chip)(sku# 101-70-208) 1. Requires CH341 Windows driver installed (see http://wiki.sainsmart.com/index.php/101-70-208) 2. The hex table provided by Sainsmart requires converting to ASCII chars (see 'usbrelay' below) 3. Format of 'usbrelay' two-dimensional array is:

usbrelay = [row][ch-off, ch-on] so that the 2nd index selects ON/OFF value while the 1st index selects the array row.

Example...

```
status = usbrelay[0][1] \# row-0 (status) stat\_ret = usbrelay[0][0] \# row-0 (status return) ch\_1\_on = usbrelay[1][1] \# row-1 (chan-1 off) ch\_1\_off = usbrelay[1][0] \# row-1 (chan-1 off) ch\_16\_on = usbrelay[16][1] \# row-16 (chan-16 on) ch\_16\_off = usbrelay[16][0] \# row-16 (chan-16 off) all\_on = usbrelay[17][1] \# row-17 (all on) all\_off = usbrelay[17][0] \# row-17 (all off)
```

AFL.automation.loading.SampleCell

Classes

667777

```
SampleCell()
```

class AFL.automation.loading.SampleCell.SampleCell

loadSample()

AFL.automation.loading.Sensor

Classes

```
DummySensor1([period, minval, maxval])

DummySensor2([period, hi_value, lo_time, ...])

Sensor([address, channel])
```

class AFL.automation.loading.Sensor.**Sensor**(*address=1*, *channel=0*)

```
__init__(address=1, channel=0)
     calibrate()
     read()
class AFL.automation.loading.Sensor.DummySensor1(period=2, minval=-5, maxval=5)
      \_init\_(period=2, minval=-5, maxval=5)
           This constructor should always be called with keyword arguments. Arguments are:
           group should be None; reserved for future extension when a ThreadGroup class is implemented.
           target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
           name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
           small decimal number.
           args is a list or tuple of arguments for the target invocation. Defaults to ().
           kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
           If a subclass overrides the constructor, it must make sure to invoke the base class constructor
           (Thread.__init__()) before doing anything else to the thread.
     read()
     terminate()
     run()
           Method representing the thread's activity.
           You may override this method in a subclass. The standard run() method invokes the callable object passed
           to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from
           the args and kwargs arguments, respectively.
class AFL.automation.loading.Sensor.DummySensor2(period=0.1, hi_value=5, lo_time=15, hi_time=2)
     __init__(period=0.1, hi_value=5, lo_time=15, hi_time=2)
           This constructor should always be called with keyword arguments. Arguments are:
           group should be None; reserved for future extension when a ThreadGroup class is implemented.
           target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
           name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
           small decimal number.
           args is a list or tuple of arguments for the target invocation. Defaults to ().
           kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
           If a subclass overrides the constructor, it must make sure to invoke the base class constructor
           (Thread.__init__()) before doing anything else to the thread.
     driver_status()
     read()
     terminate()
```

```
run()
```

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.loading.SensorCallbackThread

Classes

```
LoaderCommunication([load_client, load_object])

SensorCallbackThread(poll[, period, daemon, ...])

SimpleThresholdCB(poll, period[, window, ...])

StopLoadCBv1(poll, period, load_client[, ...])

StopLoadCBv2(poll, period[, load_client, ...])
```

```
class AFL.automation.loading.SensorCallbackThread.SensorCallbackThread(poll, period = 0.1, daemon = True, filepath = None, data = None, sensorlabel = ")
```

__init__(poll, period=0.1, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread. $_$ init $_$ ()) before doing anything else to the thread.

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

```
class AFL.automation.loading.SensorCallbackThread.StopLoadCBv1(poll, period, load_client,
                                                                              threshold npts=20,
                                                                              threshold v step=1,
                                                                              threshold_std=2.5, timeout=120,
                                                                              loadstop cooldown=2,
                                                                              post detection sleep=0.2,
                                                                              baseline duration=2,
                                                                              daemon=True, filepath=None,
                                                                              data=None, sensorlabel=")
     __init__(poll, period, load_client, threshold_npts=20, threshold_v_step=1, threshold_std=2.5,
                timeout=120, loadstop cooldown=2, post detection sleep=0.2, baseline duration=2,
                daemon=True, filepath=None, data=None, sensorlabel=")
           This constructor should always be called with keyword arguments. Arguments are:
           group should be None; reserved for future extension when a ThreadGroup class is implemented.
           target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
           name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
           small decimal number.
           args is a list or tuple of arguments for the target invocation. Defaults to ().
           kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
           If a subclass overrides the constructor, it must make sure to invoke the base class constructor
           (Thread.__init__()) before doing anything else to the thread.
     process_signal()
class AFL.automation.loading.SensorCallbackThread.StopLoadCBv2(poll, period, load_client=None,
                                                                              load_object=None,
                                                                              threshold npts=20,
                                                                              threshold v step=1,
                                                                              threshold std=2.5, timeout=120,
                                                                              min\_load\_time=3,
                                                                              loadstop_cooldown=2,
                                                                              post detection sleep=0.2,
                                                                              baseline duration=2,
                                                                              trigger on end=False,
                                                                              instatrigger=True, daemon=True,
                                                                              filepath=None, data=None,
                                                                              sensorlabel=")
     __init__(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1,
                threshold std=2.5, timeout=120, min load time=3, loadstop cooldown=2,
                post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True,
                daemon=True, filepath=None, data=None, sensorlabel=")
           This constructor should always be called with keyword arguments. Arguments are:
           group should be None; reserved for future extension when a ThreadGroup class is implemented.
           target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
           name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
           small decimal number.
           args is a list or tuple of arguments for the target invocation. Defaults to ().
```

```
kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
          If a subclass overrides the constructor, it must make sure to invoke the base class constructor
          (Thread.__init__()) before doing anything else to the thread.
     process_signal()
class AFL.automation.loading.SensorCallbackThread.SimpleThresholdCB(poll, period, window=5,
                                                                                 threshold=1
     __init__(poll, period, window=5, threshold=1)
          This constructor should always be called with keyword arguments. Arguments are:
          group should be None; reserved for future extension when a ThreadGroup class is implemented.
          target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
          name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
          small decimal number.
          args is a list or tuple of arguments for the target invocation. Defaults to ().
          kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
          If a subclass overrides the constructor, it must make sure to invoke the base class constructor
          (Thread.__init__()) before doing anything else to the thread.
     process_signal()
class AFL.automation.loading.SensorCallbackThread.LoaderCommunication(load client=None,
                                                                                    load_object=None)
     __init__(load_client=None, load_object=None)
     getServerState()
     stopLoad()
AFL.automation.loading.SensorPollingThread
Classes
 SensorPollingThread(sensor[, period, ...])
class AFL.automation.loading.SensorPollingThread.SensorPollingThread(sensor, period=0.1,
                                                                                   callback=None,
                                                                                   hv pipe=None,
                                                                                   window=None,
                                                                                   filename=None,
                                                                                   daemon=True,
                                                                                   data=None)
     __init__(sensor, period=0.1, callback=None, hv_pipe=None, window=None, filename=None,
                daemon=True, data=None)
          This constructor should always be called with keyword arguments. Arguments are:
          group should be None; reserved for future extension when a ThreadGroup class is implemented.
```

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

```
read()
read_load_buffer()
reset_load_buffer()
terminate()
alive()
run()
```

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.loading.SerialDevice

Classes

```
SerialDevice(port[, baudrate, timeout, ...])
```

Exceptions

SerialCommsException	Raised when the system receives a serial response it can't
	parse, likely a garbled line

```
__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)
```

AFL.automation.loading.SyringePump

Classes

```
SyringePump()
```

```
class AFL.automation.loading.SyringePump.SyringePump
    stop()
    withdraw(volume, block=True)
    dispense(volume, block=True)
    setRate(rate)
    getRate(rate)
    emptySyringe()
```

AFL.automation.loading.Tubing

Classes

AFL.automation.loading.TwoSelectorBlowoutSampleCell

Classes

```
SampleCell()

Tubing(specid, length)

TwoSelectorBlowoutSampleCell(pump, ...)

Young and pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

defaultdict

defaultdict

defaultdicty
```

```
class AFL.automation.loading.TwoSelectorBlowoutSampleCell.TwoSelectorBlowoutSampleCell(pump,
                                                                                                     se-
                                                                                                     lec-
                                                                                                     tor,
                                                                                                     blows-
                                                                                                     e-
                                                                                                     lec-
                                                                                                     tor,
                                                                                                     rinse tank level=950
                                                                                                     waste_tank_level=0,
                                                                                                     cell_waste_tank_leve
                                                                                                     over-
                                                                                                     rides=None)
     Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample
     (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell
     where the cell is in the pump line).
     @TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)
     defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
     'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
      'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
     1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
     'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
     'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
     'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
     'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
     1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
     __init__(pump, selector, blowselector, rinse_tank_level=950, waste_tank_level=0,
                cell waste tank level=0, overrides=None)
          ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
          by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
          thickness = cell path length, to be incorporated into metadata, array with length = ncells
          cell state if not 'clean', array with length = ncells
          pump: a pump object supporting withdraw() and dispense() methods
              e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
          selector: a selector object supporting string-based selectPort() method with options
          'catch', 'cell', 'rinse', 'waste', 'air'
              e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
     reset_tank_levels(rinse=950, waste=0, cell_waste=0)
     property app
     status()
     transfer(source, dest, vol source, vol dest=None)
     catchToSyringe(sampleVolume=0)
     loadSample(cellname='cell', sampleVolume=0)
```

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catchToWaste(sampleVolume=0.0)

AFL.automation.loading.UltimusVPressureController

Classes

```
PressureController()
Abstract superclass for pressure controllers that provides timed dispensing
UltimusVPressureController(port[, baud])
```

class AFL.automation.loading.UltimusVPressureController.UltimusVPressureController(port, baud=115200)

```
__init__(port, baud=115200)
Initializes a DigitalOutPressureController
Params:
        port (str): serial port to use
compute_checksum(cmd)
char_count(cmd)
package_cmd(cmd)
send_command(cmd)
set_P(pressure)
        pressure: pressure to set in psi
```

AFL.automation.loading.ViciMultiposSelector

Classes

```
FlowSelector()

SerialDevice(port[, baudrate, timeout, ...])

ViciMultiposSelector(port[, baudrate, ...])
```

```
__init__(port, baudrate=9600, portlabels=None)
connect to valve and query the number of positions
```

Parameters

- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

selectPort(port, direction=None, block=True)

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

Parameters

- port (String or int) the name, or number, of the port to switch to
- **direction** (String, default=None) direction "CW" or "CCW" to perform the move in
- **block** (bool, default=True) block return until move completes

```
getPort(as_str=False)
```

query the current selected position

AFL.automation.prepare

Functions

```
#D20Factory(name[, phi_D2O, sld, properties]) Create a list of H2O/D2O solutions

compositionSweepFactory(name, components, ...)

make_locs(slot, nrows, ncols)

make_wellplate_locs(slot, size)
```

ComponentDB([path])	
Deck()	
MassBalance()	
<pre>PipetteAction(source, dest, volume[,])</pre>	
<pre>Sample(name, target[, target_check, balancer])</pre>	
SampleSeries()	
Solute(name[, description, density,])	Specialization class for solute components
Solution(name, components[, properties])	
Solvent(name, density[, description,])	Specialization class for solute components

Modules

Component
DeckBuilderWidget
Dummy_OT2_Driver
OT2Client
PrepType
PrepareWidget
SampleSeriesWidget
StockBuilderWidget
SweepBuilderWidget
factory
utilities

AFL.automation.prepare.Component

Functions

<pre>enforce_units(value, unit_type)</pre>	Ensure that a number has units and convert to the de-
	fault_units

```
Component(name, description)

PrepType(value[, names, module, qualname, ...])

Base class for all materials
```

Exceptions

```
ParseException(pstr[, loc, msg, elem]) Exception thrown when a parse expression doesn't match the input string
```

```
class AFL.automation.prepare.Component.Component(name, description)
     Base class for all materials
     This class defines all of the basic properties and methods to be shared across material objects
     __init__(name, description)
     emit()
     __hash__()
          Needed so Components can be dictionary keys
     copy()
     __iter__()
          Dummy iterator to mimic behavior of Mixture.
     property mass
     set_mass(value)
          Setter for inline mass changes
     property volume
     set_volume(value)
          Setter for inline volume changes
     property density
     property formula
     property moles
     property sld
     property is_solute
     property is_solvent
```

AFL.automation.prepare.DeckBuilderWidget

Functions

cart(v)	Datum the square root of v
Sqrt(X,I)	Return the square root of x.

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean <i>value</i> in the form of a checkbox.
<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
<pre>DeckBuilderWidget()</pre>	
<pre>DeckBuilderWidget_Model()</pre>	
<pre>DeckBuilderWidget_View()</pre>	
Dropdown(**kwargs)	Allows you to select a single item from a dropdown.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible
	box model.

class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget

```
__init__()
     build_deck_object()
     get_deck_config()
     set_deck_config(config)
     send_deck_cb(event)
     save_cb(event)
     load_cb(event)
     update_deck_graphic_cb(event)
     start()
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_Model
     __init__()
     \textbf{send\_deck\_config}(\textit{pi\_ip='piot2'}, \textit{align\_script='/home/nistoroboto/align.py'})
     build_deck_object(config)
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_View
     __init__()
     create_expanded_button(description, button_style)
     draw_deck()
     start()
```

AFL.automation.prepare.Dummy_OT2_Driver

Classes

```
Driver(name[, defaults, overrides])
 Dummy_OT2_Driver([overrides])
class AFL.automation.prepare.Dummy_OT2_Driver.Dummy_OT2_Driver(overrides=None)
     defaults = {'execute_delay': 1}
     __init__(overrides=None)
     reset_prep_targets()
     add_prep_targets(targets, reset=False)
     get_prep_target()
     status()
     reset_tipracks(mount='both')
     home(**kwargs)
     parse_well(loc)
     get_wells(locs)
     get_labware(slot)
     load_labware(name, slot, module=None, **kwargs)
     set_temp(slot, temp)
         Set the temperature of a tempdeck in slot slot
     get_temp(slot)
          Get the temperature of a tempdeck in slot slot
     deactivate_temp(slot)
         Disablea tempdeck in slot slot
     set_shake(rpm)
     stop_shake()
     set_shaker_temp(temp)
     unlatch_shaker()
     latch_shaker()
     get_shaker_temp()
     get_shake_rpm()
```

```
get_shake_latch_status()
load_instrument(name, mount, tip_rack_slots, **kwargs)
transfer(source, dest, volume, *args, **kwargs)
set_aspirate_rate(rate=150)
set_dispense_rate(rate=300)
set_gantry_speed(speed=400)
```

AFL.automation.prepare.OT2Client

Classes

```
Client([ip, port, username, interactive])
OT2Client([ip, port, username, interactive])
PipetteAction(source, dest, volume[, ...])
Communicate with APIServer
Communicate with AFL-automation server on OT-2
```

Communicate with AFL-automation server on OT-2

This class maps pipettor functions to HTTP REST requests that are sent to the AFL-automation server

transfer(source, dest, volume, interactive=None, **kwargs)

Transfer fluid from one location to another

Parameters

- source (str or list of str Source wells to transfer from. Wells should be specified as three) character strings with the first character being the slot number.
- **dest** (*str or list of str*) Destination wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **volume** (*float*) volume of fluid to transfer in microliters

```
reset_tipracks(mount='both')
load_labware(name, slot)
load_instrument(name, mount, tip_rack_slots)
aspirate_rate(rate)
dispense_rate(rate)
home()
```

AFL.automation.prepare.PrepType

Functions

```
makeRegistar()
prepRegistrar(prepType)
```

Classes

Enum(value[, names, module, qualname, type,])	Create a collection of name/value pairs.
<pre>PrepType(value[, names, module, qualname,])</pre>	
auto([value])	Instances are replaced with an appropriate value in Enum
	class suites.

```
BaseComponent = 1
BaseMixture = 2
Solute = 3
Solvent = 4
Solution = 5
```

AFL.automation.prepare.PrepareWidget

Functions

sqrt(x,/)	Return the square root of x.

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean <i>value</i> in the form of a checkbox.
DeckBuilderWidget()	
Dropdown(**kwargs)	Allows you to select a single item from a dropdown.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
PrepareWidget()	
PrepareWidget_Model()	
PrepareWidget_View()	
SampleSeriesWidget(deck)	
StockBuilderWidget(deck)	
SweepBuilderWidget(deck)	
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible box model.

class AFL.automation.prepare.PrepareWidget.PrepareWidget

AFL.automation.prepare.SampleSeriesWidget

Functions

sqrt(x,/)	Return the square root of x.
	*

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean value in the form of a checkbox.
<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
FloatText(**kwargs)	Displays a float value within a textbox.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible
	box model.
IntText(**kwargs)	Textbox widget that represents an integer.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
SampleSeriesWidget(deck)	
SampleSeriesWidget_Model(deck)	
SampleSeriesWidget_View()	
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible box model.

class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget(deck)

```
__init__(deck)
apply_protocol_order_cb(event)
apply_protocol_order()
update_protocol_order_preview_cb(event)
make_protocol()
make_catch_protocol()
submit_cb(event)
build_label(index)
example_label_cb(event)
make_all_labels_cb(event)
make_all_labels()
sync_to_prepare_cb(event)
reset_uuid_cb(event)
update_sort_order_cb(event, direction)
make_mixing_wells()
update_mixing_well_preview_cb(event)
submit_mixing_wells_cb(event)
```

```
start()
class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_Model(deck)
    __init__(deck)
    adjust_protocol_order(mix_order)
class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_View
    __init__()
    make_component_grid(components, nsamples)
    make_pipette_params(name)
    make_mixing_wells()
    start(components, nsamples, stock_names)
```

AFL.automation.prepare.StockBuilderWidget

Functions

sqrt(x, l) Return the square root of x.

Classes

```
StockBuilderWidget_Model(deck)
StockBuilderWidget_View()
```

class AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget(deck)

```
__init__(deck)
analyze_stocks_cb(event)
get_stock_objects()
add_stocks_to_deck()
get_stock_values()
save_cb(event, pkl=True)
load_cb(event)
update_location_check_cb(event)
make_stock_cb(event)
remove_stock_cb(event)
```

```
set_units_cb(event, units)
start()

class AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget_Model(deck)
    __init__(deck)
    add_stocks_to_deck(all_stocks_dict)
    to_stock_objects(all_stocks_dict)

class AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget_View
    __init__()
    make_stock_tab(stock_name, components)
    start()
```

AFL.automation.prepare.SweepBuilderWidget

Functions

sqrt(x,/)	Return the square root of x.

Classes

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean <i>value</i> in the form of a checkbox.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
SweepBuilderWidget(deck)	
SweepBuilderWidget_Model(deck)	
<pre>SweepBuilderWidget_View()</pre>	
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible box model.

```
class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget(deck)
    __init__(deck)
    plot_binary_cb(click)
    plot_ternary_cb(click)
    calc_sweep_cb(click)
```

```
validate_sweep_cb(click)
  get_sweep_data()
  get_deck()
  update_component_row_cb(event)
  start()

class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget_Model(deck)
    __init__(deck)
  validate_sweep(tolerance, progress=None)
  calc_sweep(sweep_dict, progress)

class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget_View
    __init__()
  make_stock_grid(component_names)
  make_ternary_plot(component_names)
  make_ternary_plot(component_names)
  start(component_names)
```

AFL.automation.prepare.factory

Functions

Classes

```
Solution(name, components[, properties])

product product(*iterables, repeat=1) --> product object
```

AFL.automation.prepare.factory.**HD20Factory**(name, phi_D2O=None, sld=None, properties=None) Create a list of H2O/D2O solutions

AFL.automation.prepare.factory.compositionSweepFactory(name, components, vary_components, lo, hi, num, logspace=False, properties=None, progress=None)

AFL.automation.prepare.utilities

Functions

```
make_locs(slot, nrows, ncols)
make_wellplate_locs(slot, size)
```

AFL.automation.prepare.utilities.make_locs(slot, nrows, ncols)

AFL.automation.prepare.utilities.make_wellplate_locs(slot, size)

AFL.automation.sample env

Modules

```
TemperatureDeck
```

AFL.automation.sample_env.TemperatureDeck

Classes

```
Driver(name[, defaults, overrides])

TemperatureDeck([overrides])
```

 ${\bf class} \ \, {\tt AFL.automation.sample_env.TemperatureDeck}. \\ {\bf TemperatureDeck} ({\it overrides=None}) \\$

```
defaults = {'serial_port': '/dev/ttyACM0', 'temperature_move_sleep': 0.2,
  'temperature_move_timeout': 900}

__init__(overrides=None)

set_temp(sp)

move_temp(temperature, wait=30, tolerance=0.1)

status()

read_temp()
```

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AFL.automation.shared

Modules

DataLabelerWidget

DatasetWidget

DiffractionLabeler

MutableQueue

PersistentConfig

ServerDiscovery

exceptions

serialization

units

utilities

widgetui

AFL.automation.shared.DataLabelerWidget

Functions

sqrt(x,/)	Return the square root of x.	
-----------	------------------------------	--

Classes

```
DataLabelerWodel(dataset)

DataLabelerView()

DataLabelerWidget(input_dataset, ...[, ...])

OrdinalEncoder(*[, categories, dtype, ...])

Encode categorical features as an integer array.
```

```
class AFL.automation.shared.DataLabelerWidget.DataLabelerWidget(input_dataset: Dataset,
```

```
sas_variable: str,
composition_variable: str |
List[str], sample_dim: str =
'sample', fit_variable: str | None
= None)
```

__init__(input_dataset: Dataset, sas_variable: str, composition_variable: str | List[str], sample_dim: str = 'sample', fit_variable: str | None = None)

Parameters

- dataset (xr.Dataset) Dataset from AFL
- **sas_variable** (*str*) Name of data variable in the *xarray.Dataset* that holds the scattering data
- **composition_variable** (*str | List[str]*) Name of data variable in the *xar-ray.Dataset* that holds the composition. If the composition is split across multiple variables, pass in a list of variables.
- **sample_dim** (*str*) The name of the *xarray* dimension corresponding to each sample or measurement. This is typically named 'sample' in much of the AFL agent codebase.
- **fit_variable** (*Optional[str]*) If not none, this data will be plotted along with the sas_variable data. This data variable should have the same shape as sas_variable.

```
next_button_callback(click)
     prev_button_callback(click)
     goto_callback(click)
     composition_click_callback(figure, location, click)
     update_plot()
     draw_peaks(peaks)
     change_qstar_callback(figure, location, click)
     change_model_callback(data)
     change_norder_callback(data)
     label(label)
     run()
class AFL.automation.shared.DataLabelerWidget.DataLabelerModel(dataset: Dataset)
     __init__(dataset: Dataset)
     ordinal_phase_labels()
     init_models()
     get_peaks(model, qstar=None, max_order=4)
class AFL.automation.shared.DataLabelerWidget.DataLabelerView
     __init__()
     update_plot(x, y, composition)
     remove_vertical_lines()
     add_vertical_line(x, y0=0, y1=128, row=1, col=1, line_kw=None)
     update_composition_colors(colors)
     run(x, y, all\ compositions, composition, models, ternary, components)
```

6.1. API Reference 71

AFL.automation.shared.DatasetWidget

Classes

```
class AFL.automation.shared.DatasetWidget.DatasetWidget(dataset: Dataset, sample_dim: str = sample', scatt\_variables: List[str] \mid None = None, comps\_variable: str \mid None = None, comps\_color\_variable: str \mid None = None, string: s
```

```
__init__(dataset: Dataset, sample_dim: str = 'sample', scatt_variables: List[str] | None = None, comps_variable: str | None = None, comps_color_variable: str | None = None, xmin: float = 0.001, xmax: float = 1.0)
```

Interactive widget for viewing compositionally varying scattering data

Parameters

- **dataset** (xr.Dataset) xarray.Dataset containing scattering data and compositions to be plotted.
- **sample_dim**(*str*) The name of the *xarray* dimension corresponding to sample variation, typically "sample"
- **comps_variable** (*Optional[str]*) The name of the *xarray* variable to plot as compositional data. Optional, if not specified, can be customized in the GUI.

Only the first two columns of the data will be used in the plot. If the compositions are in separate `xarray.DataArray`s, they should be grouped into single `xarray.DataArray`s like so:

```
`python ds['comps'] = ds[['A','B','C']].to_array('component').
transpose(...,'component') `
```

- **comps_color_variable** (*Optional[str]*) The name of the *xarray* variable to use as the colorscale of the compositional data scatter plot. Optional, if not specified, can be customized in the GUI.
- xmin (float) Set the default q-range of the scattering data. Can be customized in the GUI
- xmax (float) Set the default q-range of the scattering data. Can be customized in the GUI
- Usage
- ----
- ```python -
- DatasetWidget(ds) (widget =)

```
widget.run()
     next_button_callback(*args)
     prev_button_callback(*args)
     goto_callback(*args)
     composition_click_callback(figure, location, click)
     update_composition_plot()
     update_scattering_plot()
     update_plots()
     get_comps()
     initialize_plots(*args)
     update_colors(*args)
     apply_sel(*args)
     apply_isel(*args)
     extract_var(*args)
     combine_vars(*args)
     reset_dataset(*args)
     update_dropdowns(*args)
     update_sample_dim(*args)
     update_extract_coords(change)
     run()
class AFL.automation.shared.DatasetWidget.DatasetWidget_Model(dataset: Dataset, sample_dim: str)
     __init__(dataset: Dataset, sample_dim: str)
     property dataset
     reset_dataset()
     split_vars()
         Heuristically try to split vars into categories
     get_non_sample_dims(var: str)
     apply_sel(kw)
     apply_isel(kw)
     combine_vars(combined_var: str, to_combine_vars: List[str])
```

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```
extract_var(extract_from_var: str, extract_from_coord: str)
     get_composition(variable)
     get_scattering(variable, index)
class AFL.automation.shared.DatasetWidget.DatasetWidget_View(initial_scatt_variables: List[str] |
                                                                       None = None,
                                                                       initial_comps_variable: str | None =
                                                                       None, initial_comps_color_variable:
                                                                       str \mid None = None)
     __init__(initial_scatt_variables: List[str] | None = None, initial_comps_variable: str | None = None,
                initial\ comps\ color\ variable:\ str\mid None = None)
     update_colorscale(colors=None)
     update_selected(**kw)
     update_dropdowns(sample_vars=None, scatt_vars=None, comp_vars=None)
     plot_sas(x, y, name='SAS', append=False)
     plot\_comp(x, y, z=None, xname='x', yname='y', zname='z', colors=None)
     init_plots()
     init_buttons()
     init_checkboxes()
     init_dropdowns()
     init_inputs()
     run()
```

AFL.automation.shared.DiffractionLabeler

Functions

sqrt(x, l) Return the square root of x.

Classes

```
DiffractionLabeler(saxs_data, ...)

DiffractionLabelerModel(saxs_data, ...)

DiffractionLabelerView()

OrdinalEncoder(*[, categories, dtype, ...])

Encode categorical features as an integer array.
```

```
__init__(saxs_data, composition_data, possible_phase_labels)
     next_button_callback(click)
     prev_button_callback(click)
     goto_callback(click)
     ternary_click_callback(figure, location, click)
     update_plot()
     draw_peaks(peaks)
     change_qstar_callback(figure, location, click)
     change_model_callback(data)
     change_norder_callback(data)
     label(label)
     run()
class AFL.automation.shared.DiffractionLabeler.DiffractionLabelerModel(saxs_data,
                                                                               composition_data,
                                                                               possible phase labels)
     __init__(saxs_data, composition_data, possible_phase_labels)
     ordinal_phase_labels()
     init_models()
     get_peaks(model, qstar=None, max_order=4)
class AFL.automation.shared.DiffractionLabeler.DiffractionLabelerView
     __init__()
     update_plot(x, y, composition)
     remove_vertical_lines()
     add_vertical_line(x, y0=0, y1=128, row=1, col=1, line_kw=None)
     update_ternary_colors(colors)
     run(x, y, all_compositions, composition, models, possible_phase_labels)
```

AFL.automation.shared.MutableQueue

Classes

MutableQueue() Thread-safe, mutable queue

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Exceptions

Empty	Exception raised by Queue.get(block=0)/get_nowait().
Full	Exception raised by Queue.put(block=0)/put_nowait().

class AFL.automation.shared.MutableQueue.MutableQueue

Thread-safe, mutable queue

Unlike the standard library CPython queue, this class supportes positional inserts, deletions, and reordering. The tradeoff is performance for both reads and writes to the queue.

AFL.automation.shared.PersistentConfig

Classes

MutableMapping()	A MutableMapping is a generic container for associating key/value pairs.
<pre>PersistentConfig(path[, defaults,])</pre>	A dictionary-like class that serializes changes to disk

class AFL.automation.shared.PersistentConfig.PersistentConfig(path, defaults=None,

overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

A dictionary-like class that serializes changes to disk

This class provides dictionary-like setters and getters (e.g., [] and .update()) but, by default, all modifications are written into a file in json format with the root keys as timestamps. Modifications can be blocked by locking the config, and writing to disk can be disabled by setting the appropriate member attributes (see constructor). On instantiation, if provided with a previously saved configuration file, PersistentConfig will load the file's contents into memory and use the more recent configuration.

__init__(path, defaults=None, overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

Constructor

Parameters

- path (str or pathlib.Path) File path to file in which this config is or will be stored. This file will be created if it does not exist
- **defaults** (*dict*) Default values to use if no saved config is available or if parameters are missing from a saved config.
- **overrides** (*dict*) Values to use that override parameters in a saved config. These parameters can be changed after the PersistentConfig object is instantiated.
- **lock** (*bool*) If True, an AttributeError will be raised if the user attempts to modify the config
- write (bool) If False, all writing to the config file will be disabled and a warning will be emitted each time the config is modified.
- **datetime_key_format** (*str*) String defining the root level keys of the json-serialized file. See https://docs.python.org/3/library/datetime.html#strftime-strptime-behavior.

```
__getitem__(key)
```

Dictionary-like getter via config["param"]

```
__setitem__(key, value)
```

Dictionary-like setter via config["param"]=value

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

toJSON()

Serialize the config to json

update(update_dict)

Update several values in config at once

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

revert(nth=None, datetime_key=None)

Revert config to a historical config

Parameters

- **nth** (int, **optional***) Integer index of historical value to revert to. Can be negative to count from end of history. Note that -1 will correspond to the current config.
- datetime_key (str, optional) datetime formatted string as defined by date-time_key_format

get_historical_values(key, convert_to_datetime=False)

Convenience method for gathering historical values of a parameter

AFL.automation.shared.ServerDiscovery

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Classes

<pre>AsyncServiceBrowser(zeroconf, type_[,])</pre>	Used to browse for a service for specific type(s).
AsyncServiceInfo	An async version of ServiceInfo.
AsyncZeroconf([interfaces, unicast,])	Implementation of Zeroconf Multicast DNS Service
	Discovery
AsyncZeroconfServiceTypes()	An async version of ZeroconfServiceTypes.
<pre>IPVersion(value[, names, module, qualname,])</pre>	
RunThread(coro)	
ServerDiscovery()	ServerDiscovery class
ServiceBrowser(zc, type_[, handlers,])	Used to browse for a service of a specific type.
ServiceInfo	Service information.
ServiceStateChange(value[, names, module,])	
<pre>Zeroconf([interfaces, unicast, ip_version,])</pre>	Implementation of Zeroconf Multicast DNS Service
	Discovery

class AFL.automation.shared.ServerDiscovery.RunThread(coro)

__init__(coro)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

class AFL.automation.shared.ServerDiscovery.ServerDiscovery

ServerDiscovery class

This class is used to discover AFL servers on the network using zeroconf requests that match a particular specification.

```
__init__()
```

```
on_service_state_change(zeroconf: Zeroconf, service_type: str, name: str, state_change: ServiceStateChange) \rightarrow None
```

async manage_service_info_to_list(zeroconf, service_type, name, append_or_remove)

```
async get_service_info(zeroconf: Zeroconf, service\_type: str, name: str) \rightarrow None
```

async aio_find_server_by_name(service_name)

discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

async classmethod sa_aio_discover_server_by_name(service name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

classmethod sa_discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

find_server_by_name(service_name)

Disambiguator for either matching or discovering a specific server by name

match_server_by_name(service_name)

Looks through the registry of discovered services for an exact name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

find_server_by_partial_name(service_name)

Looks through the registry of discovered services for a partial name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

find_server_by_property_match(property_name, property_value)

Looks through the registry of discovered services for a partial match in a property string. Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

AFL.automation.shared.exceptions

Exceptions

EmptyException	Raised when a mixture runs out of mass or volume
MixingException	Raised when a mixture cannot be made
NoDeviceFoundException	Raised when no matching device can be found on the selected port
NotFoundError	
SerialCommsException	Raised when the system receives a serial response it can't parse, likely a garbled line

exception AFL.automation.shared.exceptions.EmptyException

Raised when a mixture runs out of mass or volume

$\textbf{exception} \hspace{0.2cm} \textbf{AFL.automation.shared.exceptions.} \textbf{Mixing} \textbf{Exception} \\$

Raised when a mixture cannot be made

exception AFL.automation.shared.exceptions.SerialCommsException

Raised when the system receives a serial response it can't parse, likely a garbled line

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exception AFL.automation.shared.exceptions.NoDeviceFoundException

Raised when no matching device can be found on the selected port

exception AFL.automation.shared.exceptions.NotFoundError

AFL.automation.shared.serialization

Functions

```
deserialize(pickled_str)
is_serialized(obj)
serialize(obj)
```

Exceptions

```
UnpicklingError
```

AFL.automation.shared.serialization.serialize(obj)

AFL.automation.shared.serialization.is_serialized(obj)

AFL.automation.shared.serialization.deserialize(pickled_str)

AFL.automation.shared.units

Functions

enforce_units(value, unit_type)	Ensure that a number has units and convert to the default_units
<pre>get_unit_type(value)</pre>	
has_units(value)	
is_concentration(value)	
is_density(value)	
is_mass(value)	
is_molarity(value)	
is_volume(value)	

AFL.automation.shared.units.has_units(value)

```
AFL.automation.shared.units.is_wolume(value)

AFL.automation.shared.units.is_molarity(value)

AFL.automation.shared.units.is_mass(value)

AFL.automation.shared.units.is_density(value)

AFL.automation.shared.units.is_concentration(value)

AFL.automation.shared.units.get_unit_type(value)

AFL.automation.shared.units.enforce_units(value, unit_type)

Ensure that a number has units and convert to the default_units
```

AFL.automation.shared.utilities

Functions

```
has_units(value)
listify(obj)

makeRegistar()

mpl_plot_to_bytes([fig, format])

tprint(in_str)

xarray_to_bytes(ds[, format])

AFL.automation.shared.utilities.listify(obj)

AFL.automation.shared.utilities.tprint(in_str)

AFL.automation.shared.utilities.makeRegistar()

AFL.automation.shared.utilities.mpl_plot_to_bytes(fig=None, format='svg')

AFL.automation.shared.utilities.xarray_to_bytes(ds, format='svg')
```

AFL.automation.shared.widgetui

Functions

clear_output([wait])	Clear the output of the current cell receiving output.
<pre>client_construct_ui(self[, return_ui,])</pre>	
<pre>display(*objs[, include, exclude, metadata,])</pre>	Display a Python object in all frontends.

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Classes

```
Markdown([data, url, filename, metadata])
```

AFL.automation.shared.widgetui.client_construct_ui(self, return_ui=False, display_ui=True)

6.1.2 AFL.automation.sample

Modules

CastingServer

AFL.automation.sample.CastingServer

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x, l)	Return the square root of x.

Classes

CastingServer(prep_url[, overrides])	
<pre>Client([ip, port, username, interactive]) Driver(name[, defaults, overrides])</pre>	Communicate with APIServer
<pre>OT2Client([ip, port, username, interactive])</pre>	Communicate with AFL-automation server on OT-2

class AFL.automation.sample.CastingServer.CastingServer(prep_url, overrides=None)

```
defaults = {'manifest': '/home/afl642/', 'manifest_cast': '/home/afl642/',
    'manifest_prep': '/home/afl642/'}
    __init__(prep_url, overrides=None)
    init_casting_manifest(attrs=None, overwrite=False)
    status()
    update_status(value)
    log_event(manifest_key, event, write=True)
    assign_targets(protocols, target_map)
    prepare_casting_stocks(**spec)
        Spec should contain sample_name and a protocol
```

6.2 Modules

This page provides an overview of the main modules in the AFL-automation framework.

6.2.1 API Server

The APIServer module provides HTTP microservices with authentication, task queueing, and UI generation.

AFL.automation.APIServer

AFL.automation.APIServer

Modules

APIServer

Client

Driver

DummyDriver

DummyOT2Driver

LoggerFilter

QueueDaemon

AFL.automation.APIServer.APIServer

Functions

Create a new access token.
Create a new refresh token.
In a protected endpoint, this will return the identity of
the JWT that is accessing the endpoint.
Serialize the given arguments as JSON, and return a
Response object with the application/json mime-
type.
• 1
A decorator to protect a Flask endpoint with JSON Web
Tokens.
Render a template by name with the given context.
Send the contents of a file to the client.
Modifiy a Flask Response to set a cookie containing the
access JWT.
Modifiy a Flask Response to set a cookie containing the
refresh JWT.
Convert a string representation of truth to true (1) or false
(0).
Modifiy a Flask Response to delete the cookies contain-
ing access or refresh JWTs.

AFL.automation.APIServer.APIServer.create_access_token

AFL.automation.APIServer.APIServer.create_access_token(identity: Any, fresh: bool | float | timedelta = False, expires_delta: Literal[False] | timedelta | None = None, additional_claims=None, additional_headers=None)

Create a new access token.

Parameters

- **identity** The identity of this token. This must either be a string, or you must have defined user_identity_loader() in order to convert the object you passed in into a string.
- **fresh** If this token should be marked as fresh, and can thus access endpoints protected with @jwt_required(fresh=True). Defaults to False.

This value can also be a datetime.timedelta, which indicate how long this token will be considered fresh.

- expires_delta A datetime.timedelta for how long this token should last before it expires. Set to False to disable expiration. If this is None, it will use the JWT_ACCESS_TOKEN_EXPIRES config value (see Configuration Options)
- additional_claims Optional. A hash of claims to include in the access token. These claims are merged into the default claims (exp, iat, etc) and claims returned from the additional_claims_loader() callback. On conflict, these claims take precedence.
- headers Optional. A hash of headers to include in the access token. These headers are merged into the default headers (alg, typ) and headers returned from the additional_headers_loader() callback. On conflict, these headers take precedence.

Returns

An encoded access token

AFL.automation.APIServer.APIServer.create_refresh_token

AFL.automation.APIServer.APIServer.create_refresh_token(identity: Any, expires_delta: Literal[False] | timedelta | None = None, additional_claims=None, additional_headers=None)

Create a new refresh token.

Parameters

- **identity** The identity of this token. This must either be a string, or you must have defined user_identity_loader() in order to convert the object you passed in into a string.
- expires_delta A datetime.timedelta for how long this token should last before it expires. Set to False to disable expiration. If this is None, it will use the JWT_REFRESH_TOKEN_EXPIRES config value (see Configuration Options)
- additional_claims Optional. A hash of claims to include in the refresh token. These claims are merged into the default claims (exp, iat, etc) and claims returned from the additional_claims_loader() callback. On conflict, these claims take precedence.
- headers Optional. A hash of headers to include in the refresh token. These headers are merged into the default headers (alg, typ) and headers returned from the additional_headers_loader() callback. On conflict, these headers take precedence.

Returns

An encoded refresh token

AFL.automation.APIServer.APIServer.get_jwt_identity

```
AFL.automation.APIServer.APIServer.get_jwt_identity() \rightarrow Any
```

In a protected endpoint, this will return the identity of the JWT that is accessing the endpoint. If no JWT is present due to jwt_required(optional=True), None is returned.

Returns

The identity of the JWT in the current request

AFL.automation.APIServer.APIServer.jsonify

AFL.automation.APIServer.APIServer.jsonify(*args: t.Any, **kwargs: t.Any) \rightarrow Response

Serialize the given arguments as JSON, and return a Response object with the application/json mimetype. A dict or list returned from a view will be converted to a JSON response automatically without needing to call this.

This requires an active request or application context, and calls app.json.response().

In debug mode, the output is formatted with indentation to make it easier to read. This may also be controlled by the provider.

Either positional or keyword arguments can be given, not both. If no arguments are given, None is serialized.

Parameters

- args A single value to serialize, or multiple values to treat as a list to serialize.
- **kwargs** Treat as a dict to serialize.

Changed in version 2.2: Calls current_app.json.response, allowing an app to override the behavior.

Changed in version 2.0.2: decimal.Decimal is supported by converting to a string.

Changed in version 0.11: Added support for serializing top-level arrays. This was a security risk in ancient browsers. See security-json.

Added in version 0.2.

AFL.automation.APIServer.APIServer.jwt_required

```
AFL.automation.APIServer.jwt_required(optional: bool = False, fresh: bool = False, refresh: bool = False, locations: str \mid Sequence \mid None = None, verify\_type: bool = True, skip\_revocation\_check: bool = False) <math>\rightarrow Any
```

A decorator to protect a Flask endpoint with JSON Web Tokens.

Any route decorated with this will require a valid JWT to be present in the request (unless optional=True, in which case no JWT is also valid) before the endpoint can be called.

Parameters

- **optional** If True, allow the decorated endpoint to be accessed if no JWT is present in the request. Defaults to False.
- fresh If True, require a JWT marked with fresh to be able to access this endpoint.
 Defaults to False.
- **refresh** If True, requires a refresh JWT to access this endpoint. If False, requires an access JWT to access this endpoint. Defaults to False.
- **locations** A location or list of locations to look for the JWT in this request, for example 'headers' or ['headers', 'cookies']. Defaults to None which indicates that JWTs will be looked for in the locations defined by the JWT_TOKEN_LOCATION configuration option.
- **verify_type** If True, the token type (access or refresh) will be checked according to the refresh argument. If False, type will not be checked and both access and refresh tokens will be accepted.
- **skip_revocation_check** If True, revocation status of the token will be *not* checked. If False, revocation status of the token will be checked.

AFL.automation.APIServer.APIServer.listify

AFL.automation.APIServer.APIServer.listify(obj)

AFL.automation.APIServer.APIServer.render_template

```
AFL.automation.APIServer.APIServer.render_template(template_name_or_list: str | Template | List[str | Template], **context: Any) \rightarrow str
```

Render a template by name with the given context.

Parameters

- **template_name_or_list** The name of the template to render. If a list is given, the first name to exist will be rendered.
- **context** The variables to make available in the template.

AFL.automation.APIServer.APIServer.send_file

```
AFL.automation.APIServer.APIServer.send_file(path\_or\_file: PathLike \mid str \mid BinaryIO, mimetype: str \mid None = None, as\_attachment: bool = False, download\_name: str \mid None = None, conditional: bool = True, etag: bool | str = True, last\_modified: datetime | int | float | None = None, max\_age: int | Callable[[str | None], int | None] | None = None) <math>\rightarrow Response
```

Send the contents of a file to the client.

The first argument can be a file path or a file-like object. Paths are preferred in most cases because Werkzeug can manage the file and get extra information from the path. Passing a file-like object requires that the file is opened in binary mode, and is mostly useful when building a file in memory with io.BytesIO.

Never pass file paths provided by a user. The path is assumed to be trusted, so a user could craft a path to access a file you didn't intend. Use send_from_directory() to safely serve user-requested paths from within a directory.

If the WSGI server sets a file_wrapper in environ, it is used, otherwise Werkzeug's built-in wrapper is used. Alternatively, if the HTTP server supports X-Sendfile, configuring Flask with USE_X_SENDFILE = True will tell the server to send the given path, which is much more efficient than reading it in Python.

Parameters

- path_or_file The path to the file to send, relative to the current working directory if a relative path is given. Alternatively, a file-like object opened in binary mode. Make sure the file pointer is seeked to the start of the data.
- **mimetype** The MIME type to send for the file. If not provided, it will try to detect it from the file name.
- **as_attachment** Indicate to a browser that it should offer to save the file instead of displaying it.
- **download_name** The default name browsers will use when saving the file. Defaults to the passed file name.
- **conditional** Enable conditional and range responses based on request headers. Requires passing a file path and environ.
- **etag** Calculate an ETag for the file, which requires passing a file path. Can also be a string to use instead.
- last_modified The last modified time to send for the file, in seconds. If not provided, it will try to detect it from the file path.
- max_age How long the client should cache the file, in seconds. If set, Cache-Control will be public, otherwise it will be no-cache to prefer conditional caching.

Changed in version 2.0: download_name replaces the attachment_filename parameter. If as_attachment=False, it is passed with Content-Disposition: inline instead.

Changed in version 2.0: max_age replaces the cache_timeout parameter. conditional is enabled and max_age is not set by default.

Changed in version 2.0: etag replaces the add_etags parameter. It can be a string to use instead of generating one.

Changed in version 2.0: Passing a file-like object that inherits from TextIOBase will raise a ValueError rather than sending an empty file.

Added in version 2.0: Moved the implementation to Werkzeug. This is now a wrapper to pass some Flask-specific arguments.

Changed in version 1.1: filename may be a PathLike object.

Changed in version 1.1: Passing a BytesIO object supports range requests.

Changed in version 1.0.3: Filenames are encoded with ASCII instead of Latin-1 for broader compatibility with WSGI servers.

Changed in version 1.0: UTF-8 filenames as specified in RFC 2231 are supported.

Changed in version 0.12: The filename is no longer automatically inferred from file objects. If you want to use automatic MIME and etag support, pass a filename via filename_or_fp or attachment_filename.

Changed in version 0.12: attachment_filename is preferred over filename for MIME detection.

Changed in version 0.9: cache_timeout defaults to Flask.get_send_file_max_age().

Changed in version 0.7: MIME guessing and etag support for file-like objects was deprecated because it was unreliable. Pass a filename if you are able to, otherwise attach an etag yourself.

Changed in version 0.5: The add_etags, cache_timeout and conditional parameters were added. The default behavior is to add etags.

Added in version 0.2.

AFL.automation.APIServer.APIServer.set_access_cookies

AFL.automation.APIServer.APIServer.set_access_cookies(response: Response, encoded_access_token: $str, max age=None, domain=None) \rightarrow None$

Modifiy a Flask Response to set a cookie containing the access JWT. Also sets the corresponding CSRF cookies if JWT_CSRF_IN_COOKIES is True (see Configuration Options)

Parameters

- **response** A Flask Response object.
- **encoded_access_token** The encoded access token to set in the cookies.
- max_age The max age of the cookie. If this is None, it will use the JWT_SESSION_COOKIE option (see Configuration Options). Otherwise, it will use this as the cookies max-age and the JWT_SESSION_COOKIE option will be ignored. Values should be the number of seconds (as an integer).
- **domain** The domain of the cookie. If this is None, it will use the JWT_COOKIE_DOMAIN option (see Configuration Options). Otherwise, it will use this as the cookies domain and the JWT_COOKIE_DOMAIN option will be ignored.

AFL.automation.APIServer.APIServer.set_refresh_cookies

```
AFL.automation.APIServer.APIServer.set_refresh_cookies(response: Response, encoded_refresh_token: str, max\_age: int \mid None = None, domain: str \mid None = None) \rightarrow None
```

Modifiy a Flask Response to set a cookie containing the refresh JWT. Also sets the corresponding CSRF cookies if JWT_CSRF_IN_COOKIES is True (see Configuration Options)

Parameters

- **response** A Flask Response object.
- **encoded_refresh_token** The encoded refresh token to set in the cookies.

- max_age The max age of the cookie. If this is None, it will use the JWT_SESSION_COOKIE option (see Configuration Options). Otherwise, it will use this as the cookies max-age and the JWT_SESSION_COOKIE option will be ignored. Values should be the number of seconds (as an integer).
- **domain** The domain of the cookie. If this is None, it will use the JWT_COOKIE_DOMAIN option (see Configuration Options). Otherwise, it will use this as the cookies domain and the JWT_COOKIE_DOMAIN option will be ignored.

AFL.automation.APIServer.APIServer.strtobool

AFL.automation.APIServer.APIServer.strtobool(val)

Convert a string representation of truth to true (1) or false (0).

True values are 'y', 'yes', 't', 'true', 'on', and '1'; false values are 'n', 'no', 'f', 'false', 'off', and '0'. Raises ValueError if 'val' is anything else.

AFL.automation.APIServer.APIServer.unset_jwt_cookies

AFL.automation.APIServer.APIServer.unset_jwt_cookies(response: Response, domain: $str \mid None = None \rightarrow None$

Modifiy a Flask Response to delete the cookies containing access or refresh JWTs. Also deletes the corresponding CSRF cookies if applicable.

Parameters

response – A Flask Response object

Classes

APIServer(name[, data, experiment, contact,])	
CORS([app])	Initializes Cross Origin Resource sharing for the application.
FileHandler(filename[, mode, encoding,])	A handler class which writes formatted logging records to disk files.
Flask(import_name[, static_url_path,])	The flask object implements a WSGI application and acts as the central object.
IPVersion(value[, names, module, qualname,])	
<pre>JWTManager([app, add_context_processor])</pre>	An object used to hold JWT settings and callback functions for the Flask-JWT-Extended extension.
LoggerFilter(*filters)	
MutableQueue()	Thread-safe, mutable queue
QueueDaemon(app, driver, task_queue, history)	
SMTPHandler(mailhost, fromaddr, toaddrs, subject)	A handler class which sends an SMTP email for each logging event.
ServiceInfo	Service information.
Zeroconf([interfaces, unicast, ip_version,])	Implementation of Zeroconf Multicast DNS Service Discovery

AFL.automation.APIServer.APIServer.APIServer

Methods

```
__init__(name[, data, experiment, contact, ...])
add_standard_routes()
add_unqueued_routes()
advertise_zeroconf(**kwargs)
clear_history()
clear_queue()
create_queue(driver[, add_unqueued])
debug()
deposit_obj()
                                                  Store an object named obj in the driver's dropbox If
                                                  a uuid is provided, the object will be stored with that
                                                  uuid Otherwise, a new uuid will be generated.
driver_status()
enqueue()
get_driver_object()
get_info()
                                                  Live, status page of the robot
get_queue()
get_queue_iteration()
get_queued_commands()
                                                  Return the functions, params, and defaults to be
get_quickbar()
                                                  shown in this server's quickbar
get_server_time()
get_unqueued_commands()
```

continues on next page

Table 1 – continued from previous page

	a from previous page
halt()	
index()	Live, status page of the robot
<pre>index_new()</pre>	Live, status page of the robot
init()	
<pre>init_logging([toaddrs])</pre>	
is_server_live()	
login()	
<pre>login_test()</pre>	
<pre>move_item()</pre>	
pause()	
<pre>query_driver()</pre>	
<pre>queue_state()</pre>	
remove_item()	
remove_items()	
<pre>render_unqueued(func, kwargs_add, **kwargs)</pre>	Convert an unqueued return item into web-suitable output
reorder_queue()	
<pre>reset_queue_daemon([driver])</pre>	
retrieve_obj()	Retrieve an object from the driver's dropbox uuid specifies the object to retrieve delete specifies whether to delete the object after retrieval
run(**kwargs)	
<pre>run_threaded([start_thread])</pre>	
<pre>send_1d_plot(result[, multi])</pre>	
send_array_as_jpg(array[, log_image,])	
<pre>set_driver_object()</pre>	
webapp()	Live, status page of the robot

create_queue(driver, add_unqueued=True)

```
reset_queue_daemon(driver=None)
advertise_zeroconf(**kwargs)
run(**kwargs)
run_threaded(start_thread=True, **kwargs)
add_standard_routes()
get_info()
    Live, status page of the robot
get_quickbar()
     Return the functions, params, and defaults to be shown in this server's quickbar
is_server_live()
get_unqueued_commands()
get_queued_commands()
add_unqueued_routes()
query_driver()
init_logging(toaddrs=None)
index()
    Live, status page of the robot
index_new()
    Live, status page of the robot
webapp()
    Live, status page of the robot
render_unqueued(func, kwargs_add, **kwargs)
     Convert an unqueued return item into web-suitable output
send_1d_plot(result, multi=False, **kwargs)
send_array_as_jpg(array, log_image=False, max_val=None, fillna=0.0, **kwargs)
queue_state()
driver_status()
get_queue()
get_queue_iteration()
deposit_obj()
     Store an object named obj in the driver's dropbox If a uuid is provided, the object will be stored with that
     uuid Otherwise, a new uuid will be generated. In either case, the uuid will be returned to the client.
```

Retrieve an object from the driver's dropbox unid specifies the object to retrieve delete specifies whether to delete the object after retrieval

retrieve_obj()

```
set_driver_object()
get_driver_object()
enqueue()
reorder_queue()
remove_items()
remove_item()
move_item()
clear_queue()
clear_history()
debug()
pause()
halt()
init()
login()
get_server_time()
login_test()
```

AFL.automation.APIServer.APIServer.CORS

```
class AFL.automation.APIServer.APIServer.CORS(app=None, **kwargs)
```

Bases: object

Initializes Cross Origin Resource sharing for the application. The arguments are identical to *cross_origin*, with the addition of a *resources* parameter. The resources parameter defines a series of regular expressions for resource paths to match and optionally, the associated options to be applied to the particular resource. These options are identical to the arguments to *cross_origin*.

The settings for CORS are determined in the following order

- 1. Resource level settings (e.g when passed as a dictionary)
- 2. Keyword argument settings
- 3. App level configuration settings (e.g. $CORS_*$)
- 4. Default settings

Note: as it is possible for multiple regular expressions to match a resource path, the regular expressions are first sorted by length, from longest to shortest, in order to attempt to match the most specific regular expression. This allows the definition of a number of specific resource options, with a wildcard fallback for all other resources.

Parameters

• **resources** (*dict*, *iterable or string*) – The series of regular expression and (optionally) associated CORS options to be applied to the given resource path.

If the argument is a dictionary, it's keys must be regular expressions, and the values must be a dictionary of kwargs, identical to the kwargs of this function.

If the argument is a list, it is expected to be a list of regular expressions, for which the appwide configured options are applied.

If the argument is a string, it is expected to be a regular expression for which the app-wide configured options are applied.

Default: Match all and apply app-level configuration

• **origins** (*list*, *string or regex*) – The origin, or list of origins to allow requests from. The origin(s) may be regular expressions, case-sensitive strings, or else an asterisk.

1 Note

origins must include the schema and the port (if not port 80), e.g., CORS(app, origins=["http://localhost:8000", "https://example.com"]).

Default: '*'

• **methods** (list or string) – The method or list of methods which the allowed origins are allowed to access for non-simple requests.

Default: [GET, HEAD, POST, OPTIONS, PUT, PATCH, DELETE]

 expose_headers (list or string) – The header or list which are safe to expose to the API of a CORS API specification.

Default: None

• allow_headers (list, string or regex) - The header or list of header field names which can be used when this resource is accessed by allowed origins. The header(s) may be regular expressions, case-sensitive strings, or else an asterisk.

Default: '*', allow all headers

• supports_credentials (bool) – Allows users to make authenticated requests. If true, injects the Access-Control-Allow-Credentials header in responses. This allows cookies and credentials to be submitted across domains.

note

This option cannot be used in conjunction with a '*' origin

Default : False

• max_age (timedelta, integer, string or None) - The maximum time for which this CORS request maybe cached. This value is set as the Access-Control-Max-Age header.

Default: None

• send_wildcard (bool) – If True, and the origins parameter is *, a wildcard Access-Control-Allow-Origin header is sent, rather than the request's Origin header.

Default: False

• vary_header (bool) – If True, the header Vary: Origin will be returned as per the W3 implementation guidelines.

Setting this header when the Access-Control-Allow-Origin is dynamically generated (e.g. when there is more than one allowed origin, and an Origin than '*' is returned) informs CDNs and other caches that the CORS headers are dynamic, and cannot be cached.

If False, the Vary header will never be injected or altered.

Default: True

• allow_private_network (bool) — If True, the response header Access-Control-Allow-Private-Network will be set with the value 'true' whenever the request header Access-Control-Request-Private-Network has a value 'true'.

If False, the response header *Access-Control-Allow-Private-Network* will be set with the value 'false' whenever the request header *Access-Control-Request-Private-Network* has a value of 'true'.

If the request header *Access-Control-Request-Private-Network* is not present or has a value other than 'true', the response header *Access-Control-Allow-Private-Network* will not be set.

```
Default : True
__init__(app=None, **kwargs)
```

Methods

```
__init__([app])
init_app(app, **kwargs)

__init__(app=None, **kwargs)
init_app(app, **kwargs)
```

AFL.automation.APIServer.APIServer.FileHandler

Bases: StreamHandler

A handler class which writes formatted logging records to disk files.

__init__(filename, mode='a', encoding=None, delay=False, errors=None)

Open the specified file and use it as the stream for logging.

Methods

init(filename[, mode, encoding, delay,])	Open the specified file and use it as the stream for logging.
acquire()	Acquire the I/O thread lock.
addFilter(filter)	Add the specified filter to this handler.
close()	Closes the stream.
createLock()	Acquire a thread lock for serializing access to the underlying I/O.
emit(record)	Emit a record.
filter(record)	Determine if a record is loggable by consulting all the filters.
flush()	Flushes the stream.
<pre>format(record)</pre>	Format the specified record.
<pre>get_name()</pre>	
handle(record)	Conditionally emit the specified logging record.
handleError(record)	Handle errors which occur during an emit() call.
release()	Release the I/O thread lock.
removeFilter(filter)	Remove the specified filter from this handler.
setFormatter(fmt)	Set the formatter for this handler.
setLevel(level)	Set the logging level of this handler.
setStream(stream)	Sets the StreamHandler's stream to the specified value, if it is different.
set_name(name)	

Attributes

name terminator

__init__(filename, mode='a', encoding=None, delay=False, errors=None)

Open the specified file and use it as the stream for logging.

close()

Closes the stream.

emit(record)

Emit a record.

If the stream was not opened because 'delay' was specified in the constructor, open it before calling the superclass's emit.

If stream is not open, current mode is 'w' and _closed=True, record will not be emitted (see Issue #42378).

acquire()

Acquire the I/O thread lock.

addFilter(filter)

Add the specified filter to this handler.

createLock()

Acquire a thread lock for serializing access to the underlying I/O.

filter(record)

Determine if a record is loggable by consulting all the filters.

The default is to allow the record to be logged; any filter can veto this and the record is then dropped. Returns a zero value if a record is to be dropped, else non-zero.

Changed in version 3.2: Allow filters to be just callables.

flush()

Flushes the stream.

format(record)

Format the specified record.

If a formatter is set, use it. Otherwise, use the default formatter for the module.

get_name()

handle(record)

Conditionally emit the specified logging record.

Emission depends on filters which may have been added to the handler. Wrap the actual emission of the record with acquisition/release of the I/O thread lock. Returns whether the filter passed the record for emission.

handleError(record)

Handle errors which occur during an emit() call.

This method should be called from handlers when an exception is encountered during an emit() call. If raiseExceptions is false, exceptions get silently ignored. This is what is mostly wanted for a logging system - most users will not care about errors in the logging system, they are more interested in application errors. You could, however, replace this with a custom handler if you wish. The record which was being processed is passed in to this method.

property name

release()

Release the I/O thread lock.

removeFilter(filter)

Remove the specified filter from this handler.

setFormatter(fmt)

Set the formatter for this handler.

setLevel(level)

Set the logging level of this handler. level must be an int or a str.

setStream(stream)

Sets the StreamHandler's stream to the specified value, if it is different.

Returns the old stream, if the stream was changed, or None if it wasn't.

set_name(name)

terminator = '\n'

AFL.automation.APIServer.APIServer.Flask

```
class AFL.automation.APIServer.APIServer.Flask(import_name: str, static_url_path: str | None = None, static_folder: str | PathLike | None = 'static', static_host: str | None = None, host_matching: bool = False, subdomain_matching: bool = False, template_folder: str | PathLike | None = 'templates', instance_path: str | None = None, instance_relative_config: bool = False, root_path: str | None = None)
```

Bases: Scaffold

The flask object implements a WSGI application and acts as the central object. It is passed the name of the module or package of the application. Once it is created it will act as a central registry for the view functions, the URL rules, template configuration and much more.

The name of the package is used to resolve resources from inside the package or the folder the module is contained in depending on if the package parameter resolves to an actual python package (a folder with an __init__.py file inside) or a standard module (just a .py file).

For more information about resource loading, see open_resource().

Usually you create a *Flask* instance in your main module or in the __init__.py file of your package like this:

```
from flask import Flask
app = Flask(__name__)
```

1 About the First Parameter

The idea of the first parameter is to give Flask an idea of what belongs to your application. This name is used to find resources on the filesystem, can be used by extensions to improve debugging information and a lot more.

So it's important what you provide there. If you are using a single module, __name__ is always the correct value. If you however are using a package, it's usually recommended to hardcode the name of your package there.

For example if your application is defined in yourapplication/app.py you should create it with one of the two versions below:

```
app = Flask('yourapplication')
app = Flask(__name__.split('.')[0])
```

Why is that? The application will work even with __name__, thanks to how resources are looked up. However it will make debugging more painful. Certain extensions can make assumptions based on the import name of your application. For example the Flask-SQLAlchemy extension will look for the code in your application that triggered an SQL query in debug mode. If the import name is not properly set up, that debugging information is lost. (For example it would only pick up SQL queries in *yourapplication.app* and not *yourapplication.views.frontend*)

Added in version 0.7: The *static_url_path*, *static_folder*, and *template_folder* parameters were added.

Added in version 0.8: The instance_path and instance_relative_config parameters were added.

Added in version 0.11: The *root_path* parameter was added.

Added in version 1.0: The host_matching and static_host parameters were added.

Added in version 1.0: The subdomain_matching parameter was added. Subdomain matching needs to be enabled manually now. Setting SERVER_NAME does not implicitly enable it.

Parameters

- **import_name** the name of the application package
- **static_url_path** can be used to specify a different path for the static files on the web. Defaults to the name of the *static_folder* folder.
- **static_folder** The folder with static files that is served at **static_url_path**. Relative to the application **root_path** or an absolute path. Defaults to 'static'.
- **static_host** the host to use when adding the static route. Defaults to None. Required when using host_matching=True with a static_folder configured.
- host_matching set url_map.host_matching attribute. Defaults to False.
- **subdomain_matching** consider the subdomain relative to SERVER_NAME when matching routes. Defaults to False.
- **template_folder** the folder that contains the templates that should be used by the application. Defaults to 'templates' folder in the root path of the application.
- **instance_path** An alternative instance path for the application. By default the folder 'instance' next to the package or module is assumed to be the instance path.
- **instance_relative_config** if set to True relative filenames for loading the config are assumed to be relative to the instance path instead of the application root.
- **root_path** The path to the root of the application files. This should only be set manually when it can't be detected automatically, such as for namespace packages.

__init__(import_name: str, static_url_path: str | None = None, static_folder: str | PathLike | None = 'static', static_host: str | None = None, host_matching: bool = False, subdomain_matching: bool = False, template_folder: str | PathLike | None = 'templates', instance_path: str | None = None, instance_relative_config: bool = False, root_path: str | None = None)

Methods

init(import_name[, static_url_path,])	
<pre>add_template_filter(f[, name])</pre>	Register a custom template filter.
<pre>add_template_global(f[, name])</pre>	Register a custom template global function.
<pre>add_template_test(f[, name])</pre>	Register a custom template test.
<pre>add_url_rule(rule[, endpoint, view_func,])</pre>	Register a rule for routing incoming requests and building URLs.
<pre>after_request(f)</pre>	Register a function to run after each request to this object.
app_context()	Create an AppContext.
async_to_sync(func)	Return a sync function that will run the coroutine function.
<pre>auto_find_instance_path()</pre>	Tries to locate the instance path if it was not provided to the constructor of the application class.
before_first_request(f)	Registers a function to be run before the first request to this instance of the application.
before_request(f)	Register a function to run before each request.
context_processor(f)	Registers a template context processor function.

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Table 2 – continued from previous page

Table 2 – continued	from previous page
<pre>create_global_jinja_loader()</pre>	Creates the loader for the Jinja2 environment.
<pre>create_jinja_environment()</pre>	Create the Jinja environment based on
	jinja_options and the various Jinja-related
	methods of the app.
<pre>create_url_adapter(request)</pre>	Creates a URL adapter for the given request.
delete(rule, **options)	Shortcut for <i>route()</i> with methods=["DELETE"].
dispatch_request()	Does the request dispatching.
do_teardown_appcontext([exc])	Called right before the application context is popped.
do_teardown_request([exc])	Called after the request is dispatched and the response
do_teardown_request([exc])	is returned, right before the request context is popped.
and a start (and a start)	1 11
endpoint(endpoint)	Decorate a view function to register it for the given
(6	endpoint.
ensure_sync(func)	Ensure that the function is synchronous for WSGI
	workers.
<pre>errorhandler(code_or_exception)</pre>	Register a function to handle errors by code or excep-
	tion class.
<pre>finalize_request(rv[, from_error_handler])</pre>	Given the return value from a view function this final-
	izes the request by converting it into a response and
	invoking the postprocessing functions.
<pre>full_dispatch_request()</pre>	Dispatches the request and on top of that performs
	request pre and postprocessing as well as HTTP ex-
	ception catching and error handling.
<pre>get(rule, **options)</pre>	Shortcut for <i>route()</i> with methods=["GET"].
<pre>get_send_file_max_age(filename)</pre>	Used by send_file() to determine the max_age
	cache value for a given file path if it wasn't passed.
handle_exception(e)	Handle an exception that did not have an error handler
	associated with it, or that was raised from an error
	handler.
handle_http_exception(e)	Handles an HTTP exception.
handle_url_build_error(error, endpoint, val-	Called by <i>url_for()</i> if a BuildError was raised.
ues)	•
handle_user_exception(e)	This method is called whenever an exception occurs
* ()	that should be handled.
<pre>inject_url_defaults(endpoint, values)</pre>	Injects the URL defaults for the given endpoint di-
	rectly into the values dictionary passed.
<pre>iter_blueprints()</pre>	Iterates over all blueprints by the order they were reg-
	istered.
log_exception(exc_info)	Logs an exception.
make_aborter()	Create the object to assign to aborter.
make_config([instance_relative])	Used to create the config attribute by the Flask con-
make_confrag([motanee_relative])	structor.
<pre>make_default_options_response()</pre>	This method is called to create the default OPTIONS
make_defauft_options_fesponse()	
make waspense(m)	response.
make_response(rv)	Convert the return value from a view function to an
wales shall someone	instance of response_class.
<pre>make_shell_context()</pre>	Returns the shell context for an interactive shell for
	this application.
<pre>open_instance_resource(resource[, mode])</pre>	Opens a resource from the application's instance
	folder (instance_path).
<pre>open_resource(resource[, mode])</pre>	Open a resource file relative to <i>root_path</i> for read-
	ing.
<pre>patch(rule, **options)</pre>	Shortcut for <i>route()</i> with methods=["PATCH"].
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Table 2 – continued from previous page

Table 2 – Continued	
post(rule, **options)	Shortcut for route() with methods=["POST"].
<pre>preprocess_request()</pre>	Called before the request is dispatched.
process_response(response)	Can be overridden in order to modify the response object before it's sent to the WSGI server.
<pre>put(rule, **options)</pre>	Shortcut for <i>route()</i> with methods=["PUT"].
<pre>raise_routing_exception(request)</pre>	Intercept routing exceptions and possibly do something else.
<pre>redirect(location[, code])</pre>	Create a redirect response object.
<pre>register_blueprint(blueprint, **options)</pre>	Register a Blueprint on the application.
register_error_handler(code_or_exception, f)	Alternative error attach function to the <i>errorhandler()</i> decorator that is more straightforward to use for non decorator usage.
request_context(environ)	Create a RequestContext representing a WSGI environment.
route(rule, **options)	Decorate a view function to register it with the given URL rule and options.
<pre>run([host, port, debug, load_dotenv])</pre>	Runs the application on a local development server.
select_jinja_autoescape(filename)	Returns True if autoescaping should be active for the given template name.
<pre>send_static_file(filename)</pre>	The view function used to serve files from static_folder.
shell_context_processor(f)	Registers a shell context processor function.
should_ignore_error(error)	This is called to figure out if an error should be ignored or not as far as the teardown system is concerned.
teardown_appcontext(f)	Registers a function to be called when the application context is popped.
teardown_request(f)	Register a function to be called when the request context is popped.
<pre>template_filter([name])</pre>	A decorator that is used to register custom template filter. You can specify a name for the filter, otherwise the function name will be used. Example::.
<pre>template_global([name])</pre>	A decorator that is used to register a custom template global function. You can specify a name for the global function, otherwise the function name will be used. Example::.
<pre>template_test([name])</pre>	A decorator that is used to register custom template test. You can specify a name for the test, otherwise the function name will be used. Example::.
test_cli_runner(**kwargs)	Create a CLI runner for testing CLI commands.
<pre>test_client([use_cookies])</pre>	Creates a test client for this application.
test_request_context(*args, **kwargs)	Create a RequestContext for a WSGI environment created from the given values.
<pre>trap_http_exception(e)</pre>	Checks if an HTTP exception should be trapped or not.
<pre>update_template_context(context)</pre>	Update the template context with some commonly used variables.
url_defaults(f)	Callback function for URL defaults for all view functions of the application.
<pre>url_for(endpoint, *[, _anchor, _method,])</pre>	Generate a URL to the given endpoint with the given values.
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Table 2 – continued from previous page

url_value_preprocessor(f)	Register a URL value preprocessor function for all view functions in the application.
wsgi_app(environ, start_response)	The actual WSGI application. This is not implemented incall() so that middlewares can be applied without losing a reference to the app object. Instead of doing this::.

Attributes

debug	Whether debug mode is enabled.
default_config	Default configuration parameters.
env	What environment the app is running in.
<pre>got_first_request</pre>	This attribute is set to True if the application started
	handling the first request.
has_static_folder	True if static_folder is set.
jinja_env	The Jinja environment used to load templates.
jinja_loader	The Jinja loader for this object's templates.
jinja_options	Options that are passed to the Jinja environment in
	<pre>create_jinja_environment().</pre>
json_decoder	The JSON decoder class to use.
json_encoder	The JSON encoder class to use.
logger	A standard Python Logger for the app, with the same
	name as name.
name	The name of the application.
permanent_session_lifetime	A timedelta which is used to set the expiration date
	of a permanent session.
propagate_exceptions	Returns the value of the PROPAGATE_EXCEPTIONS
	configuration value in case it's set, otherwise a sen-
	sible default is returned.
secret_key	If a secret key is set, cryptographic components can
_ ,	use this to sign cookies and other things.
send_file_max_age_default	The default value for max_age for send_file().
session_cookie_name	The name of the cookie set by the session interface.
session_interface	the session interface to use.
static_folder	The absolute path to the configured static folder.
static_url_path	The URL prefix that the static route will be accessible
•	from.
templates_auto_reload	Reload templates when they are changed.
test_cli_runner_class	The CliRunner subclass, by de-
	fault FlaskCliRunner that is used by
	test_cli_runner().
test_client_class	The test_client() method creates an instance of
	this test client class.
testing	The testing flag.
use_x_sendfile	Enable this to use the X-Sendfile feature, assuming
	the server supports it, from send_file().
instance_path	Holds the path to the instance folder.
config	The configuration dictionary as Config.
aborter	An instance of aborter_class created by
	make_aborter().
json	Provides access to JSON methods.
json	Provides access to JSON methods. continues on next page

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Table 3 – continued from previous page

url_build_error_handlers A list of functions that are called handle_url_build_error() when url_f raises a BuildError. before_first_request_funcs A list of functions that will be called at the beging of the first request to this instance. teardown_appcontext_funcs A list of functions that are called when the application context is destroyed. shell_context_processors A list of shell context processor functions that she run when a shell context is created. blueprints Maps registered blueprint names to blueprint object attered. extensions a place where extensions can store application cific state. url_map The Map for this instance. You can use this to chapter the routing converters after the class was created before any routes are connected. Example::. import_name The name of the package or module that this complete that the package or module that this complete that this complete that the package or module that this	ation and jects. spe-
of the first request to this instance. **Leardown_appcontext_funcs** **A list of functions that are called when the application context is destroyed. **shell_context_processors** A list of shell context processor functions that she run when a shell context is created. **Blueprints** **Maps registered blueprint names to blueprint object a place where extensions can store application cific state. **url_map** **The Map for this instance. You can use this to che the routing converters after the class was created before any routes are connected. Example::. **import_name** **The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created before any routes are connected. The name of the package or module that this context is created.	ation nould jects.
context is destroyed. Shell_context_processors A list of shell context processor functions that sl be run when a shell context is created. Maps registered blueprint names to blueprint ob a place where extensions can store application cific state. Url_map The Map for this instance. You can use this to che routing converters after the class was created before any routes are connected. Example::. import_name The name of the package or module that this context.	jects. spe-
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the routing converters after the class was create before any routes are connected. Example::. import_name The name of the package or module that this content is a second of the package or module.	
	·
template_folder The path to the templates folder, relative root_path, to add to the template loader.	e to
root_pathAbsolute path to the package on the filesystem.cliThe Click command group for registering CLI mands for this object.	
view_functions A dictionary mapping endpoint names to view tions.	func-
error_handler_spec A data structure of registered error hand in the format {scope: {code: {cl handler}}}.	ilers, ass:
before_request_funcs A data structure of functions to call at the ginning of each request, in the format {sc [functions]}.	
after_request_funcsA data structure of functions to call at the end ofrequest, in the format {scope: [functions]	
teardown_request_funcs A data structure of functions to call at the end of request even if an exception is raised, in the forest even [functions].	rmat
template_context_processors A data structure of functions to call to pass extra text values when rendering templates, in the form {scope: [functions]}.	rmat
url_value_preprocessorsA data structure of functions to call to modify the word arguments passed to the view function, i format {scope: [functions]}.	-
url_default_functionsA data structure of functions to call to modify the word arguments when generating URLs, in the for {scope: [functions]}.	

request_class

alias of Request

${\tt response_class}$

alias of Response

aborter_class

alias of Aborter

jinja_environment

alias of Environment

app_ctx_globals_class

alias of _AppCtxGlobals

config_class

alias of Config

testing

The testing flag. Set this to True to enable the test mode of Flask extensions (and in the future probably also Flask itself). For example this might activate test helpers that have an additional runtime cost which should not be enabled by default.

If this is enabled and PROPAGATE_EXCEPTIONS is not changed from the default it's implicitly enabled.

This attribute can also be configured from the config with the TESTING configuration key. Defaults to False.

secret_key

If a secret key is set, cryptographic components can use this to sign cookies and other things. Set this to a complex random value when you want to use the secure cookie for instance.

This attribute can also be configured from the config with the SECRET_KEY configuration key. Defaults to None.

property session_cookie_name: str

The name of the cookie set by the session interface.

Deprecated since version 2.2: Will be removed in Flask 2.3. Use app. config["SESSION_COOKIE_NAME"] instead.

permanent_session_lifetime

A timedelta which is used to set the expiration date of a permanent session. The default is 31 days which makes a permanent session survive for roughly one month.

This attribute can also be configured from the config with the PERMANENT_SESSION_LIFETIME configuration key. Defaults to timedelta(days=31)

property send_file_max_age_default: timedelta | None

The default value for max_age for send_file(). The default is None, which tells the browser to use conditional requests instead of a timed cache.

Deprecated since version 2.2: Will be removed in Flask 2.3. Use app. config["SEND_FILE_MAX_AGE_DEFAULT"] instead.

Changed in version 2.0: Defaults to None instead of 12 hours.

property use_x_sendfile: bool

Enable this to use the X-Sendfile feature, assuming the server supports it, from send_file().

Deprecated since version 2.2: Will be removed in Flask 2.3. Use app.config["USE_X_SENDFILE"] instead.

property json_encoder: Type[JSONEncoder]

The JSON encoder class to use. Defaults to JSONEncoder.

Deprecated since version 2.2: Will be removed in Flask 2.3. Customize *json_provider_class* instead. Added in version 0.10.

property json_decoder: Type[JSONDecoder] The JSON decoder class to use. Defaults to JSONDecoder. Deprecated since version 2.2: Will be removed in Flask 2.3. Customize *json_provider_class* instead. Added in version 0.10. json_provider_class alias of DefaultJSONProvider jinja_options: dict = {} Options that are passed to the Jinja environment in create_jinja_environment(). Changing these options after the environment is created (accessing jinja_env) will have no effect. Changed in version 1.1.0: This is a dict instead of an ImmutableDict to allow easier configuration. default_config = {'APPLICATION_ROOT': '/', 'DEBUG': None, 'ENV': None, 'EXPLAIN_TEMPLATE_LOADING': False, 'JSONIFY_MIMETYPE': None, 'JSONIFY_PRETTYPRINT_REGULAR': None, 'JSON_AS_ASCII': None, 'JSON_SORT_KEYS': None, 'MAX_CONTENT_LENGTH': None, 'MAX_COOKIE_SIZE': 4093, 'PERMANENT_SESSION_LIFETIME': datetime.timedelta(days=31), 'PREFERRED_URL_SCHEME': 'http', 'PROPAGATE_EXCEPTIONS': None, 'SECRET_KEY': None, 'SEND_FILE_MAX_AGE_DEFAULT': None, 'SERVER_NAME': None, 'SESSION_COOKIE_DOMAIN': None, 'SESSION_COOKIE_HTTPONLY': True, 'SESSION_COOKIE_NAME': 'session', 'SESSION_COOKIE_PATH': None, 'SESSION_COOKIE_SAMESITE': None, 'SESSION_COOKIE_SECURE': False, 'SESSION_REFRESH_EACH_REQUEST': True, 'TEMPLATES_AUTO_RELOAD': None, 'TESTING': False, 'TRAP_BAD_REQUEST_ERRORS': None, 'TRAP_HTTP_EXCEPTIONS': False, 'USE_X_SENDFILE': False} Default configuration parameters. url_rule_class alias of Rule url_map_class alias of Map test_client_class: Type[FlaskClient] | None = None The test_client() method creates an instance of this test client class. Defaults to FlaskClient. Added in version 0.7. test_cli_runner_class: Type[FlaskCliRunner] | None = None The CliRunner subclass, by default FlaskCliRunner that is used by test_cli_runner(). Its __init__ method should take a Flask app object as the first argument. Added in version 1.0. session_interface: SessionInterface = <flask.sessions.SecureCookieSessionInterface</pre> object> the session interface to use. By default an instance of SecureCookieSessionInterface is used here.

static_host: str | None = None, host_matching: bool = False, subdomain_matching: bool = False, template_folder: str | PathLike | None = 'templates', instance_path: str | None = None, instance_relative_config: bool = False, root_path: str | None = None)

__init__(import name: str, static url path: str | None = None, static folder: str | PathLike | None = 'static',

Added in version 0.8.

instance_path

Holds the path to the instance folder.

Added in version 0.8.

config

The configuration dictionary as Config. This behaves exactly like a regular dictionary but supports additional methods to load a config from files.

aborter

An instance of *aborter_class* created by *make_aborter()*. This is called by **flask.abort()** to raise HTTP errors, and can be called directly as well.

Added in version 2.2: Moved from flask.abort, which calls this object.

json: JSONProvider

Provides access to JSON methods. Functions in flask.json will call methods on this provider when the application context is active. Used for handling JSON requests and responses.

An instance of *json_provider_class*. Can be customized by changing that attribute on a subclass, or by assigning to this attribute afterwards.

The default, DefaultJSONProvider, uses Python's built-in json library. A different provider can use a different JSON library.

Added in version 2.2.

url_build_error_handlers: t.List[t.Callable[[Exception, str, t.Dict[str, t.Any]], str]]

A list of functions that are called by <code>handle_url_build_error()</code> when <code>url_for()</code> raises a BuildError. Each function is called with error, endpoint and values. If a function returns None or raises a BuildError, it is skipped. Otherwise, its return value is returned by <code>url_for</code>.

Added in version 0.9.

before_first_request_funcs: t.List[ft.BeforeFirstRequestCallable]

A list of functions that will be called at the beginning of the first request to this instance. To register a function, use the *before_first_request()* decorator.

Deprecated since version 2.2: Will be removed in Flask 2.3. Run setup code when creating the application instead.

Added in version 0.8.

teardown_appcontext_funcs: t.List[ft.TeardownCallable]

A list of functions that are called when the application context is destroyed. Since the application context is also torn down if the request ends this is the place to store code that disconnects from databases.

Added in version 0.9.

shell_context_processors: t.List[ft.ShellContextProcessorCallable]

A list of shell context processor functions that should be run when a shell context is created.

Added in version 0.11.

blueprints: t.Dict[str, 'Blueprint']

Maps registered blueprint names to blueprint objects. The dict retains the order the blueprints were registered in. Blueprints can be registered multiple times, this dict does not track how often they were attached.

Added in version 0.7.

extensions: dict

a place where extensions can store application specific state. For example this is where an extension could store database engines and similar things.

The key must match the name of the extension module. For example in case of a "Flask-Foo" extension in *flask foo*, the key would be 'foo'.

Added in version 0.7.

url_map

The Map for this instance. You can use this to change the routing converters after the class was created but before any routes are connected. Example:

property name: str

The name of the application. This is usually the import name with the difference that it's guessed from the run file if the import name is main. This name is used as a display name when Flask needs the name of the application. It can be set and overridden to change the value.

Added in version 0.8.

property propagate_exceptions: bool

Returns the value of the PROPAGATE_EXCEPTIONS configuration value in case it's set, otherwise a sensible default is returned.

Deprecated since version 2.2: Will be removed in Flask 2.3.

Added in version 0.7.

property logger: Logger

A standard Python Logger for the app, with the same name as *name*.

In debug mode, the logger's level will be set to DEBUG.

If there are no handlers configured, a default handler will be added. See /logging for more information.

Changed in version 1.1.0: The logger takes the same name as *name* rather than hard-coding "flask.app".

Changed in version 1.0.0: Behavior was simplified. The logger is always named "flask.app". The level is only set during configuration, it doesn't check app.debug each time. Only one format is used, not different ones depending on app.debug. No handlers are removed, and a handler is only added if no handlers are already configured.

Added in version 0.3.

property jinja_env: Environment

The Jinja environment used to load templates.

The environment is created the first time this property is accessed. Changing *jinja_options* after that will have no effect.

property got_first_request: bool

This attribute is set to True if the application started handling the first request.

Added in version 0.8.

make_config(instance relative: bool = False) \rightarrow Config

Used to create the config attribute by the Flask constructor. The *instance_relative* parameter is passed in from the constructor of Flask (there named *instance_relative_config*) and indicates if the config should be relative to the instance path or the root path of the application.

Added in version 0.8.

make_aborter() → Aborter

Create the object to assign to *aborter*. That object is called by flask.abort() to raise HTTP errors, and can be called directly as well.

By default, this creates an instance of *aborter_class*, which defaults to werkzeug.exceptions. Aborter.

Added in version 2.2.

auto_find_instance_path() \rightarrow str

Tries to locate the instance path if it was not provided to the constructor of the application class. It will basically calculate the path to a folder named instance next to your main file or the package.

Added in version 0.8.

open_instance_resource(resource: str, mode: str = 'rb') \rightarrow IO

Opens a resource from the application's instance folder (*instance_path*). Otherwise works like *open_resource(*). Instance resources can also be opened for writing.

Parameters

- **resource** the name of the resource. To access resources within subfolders use forward slashes as separator.
- mode resource file opening mode, default is 'rb'.

property templates_auto_reload: bool

Reload templates when they are changed. Used by *create_jinja_environment()*. It is enabled by default in debug mode.

Deprecated since version 2.2: Will be removed in Flask 2.3. Use app. config["TEMPLATES_AUTO_RELOAD"] instead.

Added in version 1.0: This property was added but the underlying config and behavior already existed.

create_jinja_environment() → Environment

Create the Jinja environment based on <code>jinja_options</code> and the various Jinja-related methods of the app. Changing <code>jinja_options</code> after this will have no effect. Also adds Flask-related globals and filters to the environment.

Changed in version 0.11: Environment.auto_reload set in accordance with TEMPLATES_AUTO_RELOAD configuration option.

Added in version 0.5.

create_global_jinja_loader() → DispatchingJinjaLoader

Creates the loader for the Jinja2 environment. Can be used to override just the loader and keeping the rest unchanged. It's discouraged to override this function. Instead one should override the <code>jinja_loader()</code> function instead.

The global loader dispatches between the loaders of the application and the individual blueprints.

Added in version 0.7.

$select_jinja_autoescape(filename: str) \rightarrow bool$

Returns True if autoescaping should be active for the given template name. If no template name is given, returns *True*.

Changed in version 2.2: Autoescaping is now enabled by default for .svg files.

Added in version 0.5.

$update_template_context(context: dict) \rightarrow None$

Update the template context with some commonly used variables. This injects request, session, config and g into the template context as well as everything template context processors want to inject. Note that the as of Flask 0.6, the original values in the context will not be overridden if a context processor decides to return a value with the same key.

Parameters

context – the context as a dictionary that is updated in place to add extra variables.

$make_shell_context() \rightarrow dict$

Returns the shell context for an interactive shell for this application. This runs all the registered shell context processors.

Added in version 0.11.

property env: str

What environment the app is running in. This maps to the ENV config key.

Do not enable development when deploying in production.

Default: 'production'

Deprecated since version 2.2: Will be removed in Flask 2.3.

property debug: bool

Whether debug mode is enabled. When using flask run to start the development server, an interactive debugger will be shown for unhandled exceptions, and the server will be reloaded when code changes. This maps to the DEBUG config key. It may not behave as expected if set late.

Do not enable debug mode when deploying in production.

Default: False

```
run (host: str \mid None = None, port: int \mid None = None, debug: bool \mid None = None, load\_dotenv: bool = True, **options: Any) \rightarrow None
```

Runs the application on a local development server.

Do not use run() in a production setting. It is not intended to meet security and performance requirements for a production server. Instead, see /deploying/index for WSGI server recommendations.

If the *debug* flag is set the server will automatically reload for code changes and show a debugger in case an exception happened.

If you want to run the application in debug mode, but disable the code execution on the interactive debugger, you can pass use_evalex=False as parameter. This will keep the debugger's traceback screen active, but disable code execution.

It is not recommended to use this function for development with automatic reloading as this is badly supported. Instead you should be using the **flask** command line script's **run** support.

Keep in Mind

Flask will suppress any server error with a generic error page unless it is in debug mode. As such to enable just the interactive debugger without the code reloading, you have to invoke run() with debug=True and use_reloader=False. Setting use_debugger to True without being in debug mode won't catch any exceptions because there won't be any to catch.

Parameters

- host the hostname to listen on. Set this to '0.0.0.0' to have the server available externally as well. Defaults to '127.0.0.1' or the host in the SERVER_NAME config variable if present.
- port the port of the webserver. Defaults to 5000 or the port defined in the SERVER_NAME config variable if present.
- **debug** if given, enable or disable debug mode. See *debug*.
- load_dotenv Load the nearest .env and .flaskenv files to set environment variables. Will also change the working directory to the directory containing the first file found.
- options the options to be forwarded to the underlying Werkzeug server. See werkzeug. serving.run_simple() for more information.

Changed in version 1.0: If installed, python-dotenv will be used to load environment variables from .env and .flaskenv files.

The FLASK_DEBUG environment variable will override debug.

Threaded mode is enabled by default.

Changed in version 0.10: The default port is now picked from the SERVER_NAME variable.

```
test_client(use cookies: bool = True, **kwargs: Any) \rightarrow FlaskClient
```

Creates a test client for this application. For information about unit testing head over to /testing.

Note that if you are testing for assertions or exceptions in your application code, you must set app.testing = True in order for the exceptions to propagate to the test client. Otherwise, the exception will be handled by the application (not visible to the test client) and the only indication of an AssertionError or other exception will be a 500 status code response to the test client. See the testing attribute. For example:

```
app.testing = True
client = app.test_client()
```

The test client can be used in a with block to defer the closing down of the context until the end of the with block. This is useful if you want to access the context locals for testing:

```
with app.test_client() as c:
   rv = c.get('/?vodka=42')
   assert request.args['vodka'] == '42'
```

Additionally, you may pass optional keyword arguments that will then be passed to the application's test_client_class constructor. For example:

```
from flask.testing import FlaskClient
class CustomClient(FlaskClient):
```

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```
def __init__(self, *args, **kwargs):
    self._authentication = kwargs.pop("authentication")
    super(CustomClient,self).__init__( *args, **kwargs)

app.test_client_class = CustomClient
    client = app.test_client(authentication='Basic ....')
```

See FlaskClient for more information.

Changed in version 0.4: added support for with block usage for the client.

Added in version 0.7: The *use_cookies* parameter was added as well as the ability to override the client to be used by setting the *test_client_class* attribute.

Changed in version 0.11: Added **kwargs to support passing additional keyword arguments to the constructor of test_client_class.

```
test_cli_runner(**kwargs: Any) → FlaskCliRunner
```

Create a CLI runner for testing CLI commands. See testing-cli.

Returns an instance of test_cli_runner_class, by default FlaskCliRunner. The Flask app object is passed as the first argument.

Added in version 1.0.

```
register_blueprint(blueprint: Blueprint, **options: Any) \rightarrow None
```

Register a Blueprint on the application. Keyword arguments passed to this method will override the defaults set on the blueprint.

Calls the blueprint's register() method after recording the blueprint in the application's *blueprints*.

Parameters

- **blueprint** The blueprint to register.
- **url_prefix** Blueprint routes will be prefixed with this.
- **subdomain** Blueprint routes will match on this subdomain.
- **url_defaults** Blueprint routes will use these default values for view arguments.
- **options** Additional keyword arguments are passed to BlueprintSetupState. They can be accessed in record() callbacks.

Changed in version 2.0.1: The name option can be used to change the (pre-dotted) name the blueprint is registered with. This allows the same blueprint to be registered multiple times with unique names for url_for.

Added in version 0.7.

iter_blueprints() → ValuesView[Blueprint]

Iterates over all blueprints by the order they were registered.

Added in version 0.11.

add_url_rule(rule: str, endpoint: str | None = None, view func: Callable[[...], Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | WSGIApplication] | Callable[[...], Awaitable[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | WSGIApplication]] | None = None, $provide_automatic_options: bool \mid None = None, **options: Any) \rightarrow None$

Register a rule for routing incoming requests and building URLs. The *route()* decorator is a shortcut to call this with the view_func argument. These are equivalent:

```
@app.route("/")
def index():
    ...
```

```
def index():
    ...
app.add_url_rule("/", view_func=index)
```

See url-route-registrations.

The endpoint name for the route defaults to the name of the view function if the endpoint parameter isn't passed. An error will be raised if a function has already been registered for the endpoint.

The methods parameter defaults to ["GET"]. HEAD is always added automatically, and OPTIONS is added automatically by default.

view_func does not necessarily need to be passed, but if the rule should participate in routing an endpoint name must be associated with a view function at some point with the endpoint() decorator.

```
app.add_url_rule("/", endpoint="index")
@app.endpoint("index")
def index():
...
```

If view_func has a required_methods attribute, those methods are added to the passed and automatic methods. If it has a provide_automatic_methods attribute, it is used as the default if the parameter is not passed.

Parameters

- **rule** The URL rule string.
- **endpoint** The endpoint name to associate with the rule and view function. Used when routing and building URLs. Defaults to view_func.__name__.
- **view_func** The view function to associate with the endpoint name.

- **provide_automatic_options** Add the OPTIONS method and respond to OPTIONS requests automatically.
- **options** Extra options passed to the Rule object.

```
template_filter(name: str | None = None) \rightarrow Callable[[T_template_filter], T_template_filter]
```

A decorator that is used to register custom template filter. You can specify a name for the filter, otherwise the function name will be used. Example:

```
@app.template_filter()
def reverse(s):
   return s[::-1]
```

Parameters

name – the optional name of the filter, otherwise the function name will be used.

```
add_template_filter(f: Callable[[...], Any], name: str | None = None) \rightarrow None
```

Register a custom template filter. Works exactly like the template_filter() decorator.

Parameters

name – the optional name of the filter, otherwise the function name will be used.

```
template\_test(name: str \mid None = None) \rightarrow Callable[[T\_template\_test], T\_template\_test]
```

A decorator that is used to register custom template test. You can specify a name for the test, otherwise the function name will be used. Example:

```
@app.template_test()
def is_prime(n):
    if n == 2:
        return True
    for i in range(2, int(math.ceil(math.sqrt(n))) + 1):
        if n % i == 0:
            return False
    return True
```

Added in version 0.10.

Parameters

name – the optional name of the test, otherwise the function name will be used.

```
add_template_test(f: Callable[[...], bool], name: str | None = None) \rightarrow None
```

Register a custom template test. Works exactly like the template_test() decorator.

Added in version 0.10.

Parameters

name – the optional name of the test, otherwise the function name will be used.

```
template\_global(name: str | None = None) \rightarrow Callable[[T_template\_global], T_template\_global]
```

A decorator that is used to register a custom template global function. You can specify a name for the global function, otherwise the function name will be used. Example:

```
@app.template_global()
def double(n):
   return 2 * n
```

Added in version 0.10.

Parameters

name – the optional name of the global function, otherwise the function name will be used.

```
add_template_global(f: Callable[[...], Any], name: str | None = None) \rightarrow None
```

Register a custom template global function. Works exactly like the template_global() decorator.

Added in version 0.10.

Parameters

name – the optional name of the global function, otherwise the function name will be used.

```
before_first_request(f: T\_before\_first\_request) \rightarrow T_before_first_request
```

Registers a function to be run before the first request to this instance of the application.

The function will be called without any arguments and its return value is ignored.

Deprecated since version 2.2: Will be removed in Flask 2.3. Run setup code when creating the application instead.

Added in version 0.8.

```
teardown\_appcontext(f: T\_teardown) \rightarrow T\_teardown
```

Registers a function to be called when the application context is popped. The application context is typically popped after the request context for each request, at the end of CLI commands, or after a manually pushed context ends.

```
with app.app_context():
...
```

When the with block exits (or ctx.pop() is called), the teardown functions are called just before the app context is made inactive. Since a request context typically also manages an application context it would also be called when you pop a request context.

When a teardown function was called because of an unhandled exception it will be passed an error object. If an *errorhandler()* is registered, it will handle the exception and the teardown will not receive it.

Teardown functions must avoid raising exceptions. If they execute code that might fail they must surround that code with a try/except block and log any errors.

The return values of teardown functions are ignored.

Added in version 0.9.

```
shell\_context\_processor(f: T\_shell\_context\_processor) \rightarrow T\_shell\_context\_processor
```

Registers a shell context processor function.

Added in version 0.11.

```
handle_http_exception(e: HTTPException) → HTTPException | Response | str | bytes | List[Any] |

Mapping[str, Any] | Iterator[str] | Iterator[bytes] | Tuple[Response | str | bytes |

List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], Headers |

Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] |

Tuple[str, ...]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] |

Iterator[str] | Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] |

Mapping[str, Any] | Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str |

List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] |
```

WSGIApplication

Handles an HTTP exception. By default this will invoke the registered error handlers and fall back to returning the exception as response.

Changed in version 1.0.3: RoutingException, used internally for actions such as slash redirects during routing, is not passed to error handlers.

Changed in version 1.0: Exceptions are looked up by code *and* by MRO, so HTTPException subclasses can be handled with a catch-all handler for the base HTTPException.

Added in version 0.3.

$trap_http_exception(e: Exception) \rightarrow bool$

Checks if an HTTP exception should be trapped or not. By default this will return False for all exceptions except for a bad request key error if TRAP_BAD_REQUEST_ERRORS is set to True. It also returns True if TRAP_HTTP_EXCEPTIONS is set to True.

This is called for all HTTP exceptions raised by a view function. If it returns True for any exception the error handler for this exception is not called and it shows up as regular exception in the traceback. This is helpful for debugging implicitly raised HTTP exceptions.

Changed in version 1.0: Bad request errors are not trapped by default in debug mode.

Added in version 0.8.

handle_user_exception(e: Exception) → HTTPException | Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str, ...]]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | WSGIApplication

This method is called whenever an exception occurs that should be handled. A special case is HTTPException which is forwarded to the <code>handle_http_exception()</code> method. This function will either return a response value or reraise the exception with the same traceback.

Changed in version 1.0: Key errors raised from request data like form show the bad key in debug mode rather than a generic bad request message.

Added in version 0.7.

handle_exception(e: Exception) \rightarrow Response

Handle an exception that did not have an error handler associated with it, or that was raised from an error handler. This always causes a 500 InternalServerError.

Always sends the got_request_exception signal.

If *propagate_exceptions* is True, such as in debug mode, the error will be re-raised so that the debugger can display it. Otherwise, the original exception is logged, and an InternalServerError is returned.

If an error handler is registered for InternalServerError or 500, it will be used. For consistency, the handler will always receive the InternalServerError. The original unhandled exception is available as e.original_exception.

Changed in version 1.1.0: Always passes the InternalServerError instance to the handler, setting original_exception to the unhandled error.

Changed in version 1.1.0: after_request functions and other finalization is done even for the default 500 response when there is no handler.

Added in version 0.3.

log_exception(*exc_info: Tuple[type, BaseException, TracebackType]* | *Tuple[None, None, None]*) → None Logs an exception. This is called by *handle_exception()* if debugging is disabled and right before the handler is called. The default implementation logs the exception as error on the *logger*.

Added in version 0.8.

dispatch_request() → Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] |

Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes],

Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] |

Tuple[str, ...]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] |

Iterator[str] | Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] | Mapping[str,

Any] | Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str,

...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | WSGIApplication

Does the request dispatching. Matches the URL and returns the return value of the view or error handler. This does not have to be a response object. In order to convert the return value to a proper response object, call <code>make_response()</code>.

Changed in version 0.7: This no longer does the exception handling, this code was moved to the new full_dispatch_request().

$full_dispatch_request() \rightarrow Response$

Dispatches the request and on top of that performs request pre and postprocessing as well as HTTP exception catching and error handling.

Added in version 0.7.

finalize_request(rv: Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] |

Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] |

Iterator[bytes], Headers | Mapping[str, str | List[str] | Tuple[str, ...]] |

Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] | Tuple[Response | str | bytes |

List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int] | Tuple[Response | str |

bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int, Headers |

Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] |

Tuple[str, ...]]] | WSGIApplication | HTTPException, from_error_handler: bool =

False) → Response

Given the return value from a view function this finalizes the request by converting it into a response and invoking the postprocessing functions. This is invoked for both normal request dispatching as well as error handlers.

Because this means that it might be called as a result of a failure a special safe mode is available which can be enabled with the *from_error_handler* flag. If enabled, failures in response processing will be logged and otherwise ignored.

Internal

$\textbf{make_default_options_response()} \rightarrow Response$

This method is called to create the default OPTIONS response. This can be changed through subclassing to change the default behavior of OPTIONS responses.

Added in version 0.7.

should_ignore_error($error: BaseException \mid None$) \rightarrow bool

This is called to figure out if an error should be ignored or not as far as the teardown system is concerned. If this function returns True then the teardown handlers will not be passed the error.

Added in version 0.10.

```
ensure_sync(func: Callable) \rightarrow Callable
```

Ensure that the function is synchronous for WSGI workers. Plain def functions are returned as-is. async def functions are wrapped to run and wait for the response.

Override this method to change how the app runs async views.

Added in version 2.0.

```
async_{to\_sync}(func: Callable[[...], Coroutine]) \rightarrow Callable[[...], Any]
```

Return a sync function that will run the coroutine function.

```
result = app.async_to_sync(func)(*args, **kwargs)
```

Override this method to change how the app converts async code to be synchronously callable.

Added in version 2.0.

```
url_for(endpoint: str, *, _anchor: str \mid None = None, _method: str \mid None = None, _scheme: str \mid None = None, _external: str \mid None = None, **values: str \mid None = None, _scheme: str \mid None = None, _s
```

Generate a URL to the given endpoint with the given values.

This is called by flask.url_for(), and can be called directly as well.

An *endpoint* is the name of a URL rule, usually added with <code>@app.route()</code>, and usually the same name as the view function. A route defined in a <code>Blueprint</code> will prepend the blueprint's name separated by a . to the endpoint.

In some cases, such as email messages, you want URLs to include the scheme and domain, like https://example.com/hello. When not in an active request, URLs will be external by default, but this requires setting SERVER_NAME so Flask knows what domain to use. APPLICATION_ROOT and PREFERRED_URL_SCHEME should also be configured as needed. This config is only used when not in an active request.

Functions can be decorated with url_defaults() to modify keyword arguments before the URL is built.

If building fails for some reason, such as an unknown endpoint or incorrect values, the app's <code>handle_url_build_error()</code> method is called. If that returns a string, that is returned, otherwise a <code>BuildError</code> is raised.

Parameters

- **endpoint** The endpoint name associated with the URL to generate. If this starts with a ., the current blueprint name (if any) will be used.
- **_anchor** If given, append this as #anchor to the URL.
- **_method** If given, generate the URL associated with this method for the endpoint.
- _scheme If given, the URL will have this scheme if it is external.
- **_external** If given, prefer the URL to be internal (False) or require it to be external (True). External URLs include the scheme and domain. When not in an active request, URLs are external by default.
- **values** Values to use for the variable parts of the URL rule. Unknown keys are appended as query string arguments, like ?a=b&c=d.

Added in version 2.2: Moved from flask.url_for, which calls this method.

```
redirect(location: str, code: int = 302) \rightarrow Response
```

Create a redirect response object.

This is called by flask.redirect(), and can be called directly as well.

Parameters

- location The URL to redirect to.
- code The status code for the redirect.

Added in version 2.2: Moved from flask.redirect, which calls this method.

make_response(rv: Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] |

Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes],

Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] |

Tuple[str, ...]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] |

Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] |

Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str, ...]] |

Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] | WSGIApplication) → Response

Convert the return value from a view function to an instance of *response_class*.

Parameters

rv - the return value from the view function. The view function must return a response.
Returning None, or the view ending without returning, is not allowed. The following types are allowed for view_rv:

str

A response object is created with the string encoded to UTF-8 as the body.

bytes

A response object is created with the bytes as the body.

dict

A dictionary that will be isonify'd before being returned.

list

A list that will be jsonify'd before being returned.

generator or iterator

A generator that returns str or bytes to be streamed as the response.

tuple

Either (body, status, headers), (body, status), or (body, headers), where body is any of the other types allowed here, status is a string or an integer, and headers is a dictionary or a list of (key, value) tuples. If body is a *response_class* instance, status overwrites the exiting value and headers are extended.

response_class

The object is returned unchanged.

other Response class

The object is coerced to response_class.

callable()

The function is called as a WSGI application. The result is used to create a response object.

Changed in version 2.2: A generator will be converted to a streaming response. A list will be converted to a JSON response.

Changed in version 1.1: A dict will be converted to a JSON response.

Changed in version 0.9: Previously a tuple was interpreted as the arguments for the response object.

create_url_adapter(request: Request | None) → MapAdapter | None

Creates a URL adapter for the given request. The URL adapter is created at a point where the request context is not yet set up so the request is passed explicitly.

Added in version 0.6.

Changed in version 0.9: This can now also be called without a request object when the URL adapter is created for the application context.

Changed in version 1.0: SERVER_NAME no longer implicitly enables subdomain matching. Use subdomain_matching instead.

```
after_request(f: T\_after\_request) \rightarrow T_after_request
```

Register a function to run after each request to this object.

The function is called with the response object, and must return a response object. This allows the functions to modify or replace the response before it is sent.

If a function raises an exception, any remaining after_request functions will not be called. Therefore, this should not be used for actions that must execute, such as to close resources. Use teardown_request() for that.

This is available on both app and blueprint objects. When used on an app, this executes after every request. When used on a blueprint, this executes after every request that the blueprint handles. To register with a blueprint and execute after every request, use Blueprint.after_app_request().

```
before_request(f: T\_before\_request) \rightarrow T_before_request
```

Register a function to run before each request.

For example, this can be used to open a database connection, or to load the logged in user from the session.

```
@app.before_request
def load_user():
    if "user_id" in session:
        g.user = db.session.get(session["user_id"])
```

The function will be called without any arguments. If it returns a non-None value, the value is handled as if it was the return value from the view, and further request handling is stopped.

This is available on both app and blueprint objects. When used on an app, this executes before every request. When used on a blueprint, this executes before every request that the blueprint handles. To register with a blueprint and execute before every request, use Blueprint.before_app_request().

```
context\_processor(f: T\_template\_context\_processor) \rightarrow T\_template\_context\_processor
```

Registers a template context processor function. These functions run before rendering a template. The keys of the returned dict are added as variables available in the template.

This is available on both app and blueprint objects. When used on an app, this is called for every rendered template. When used on a blueprint, this is called for templates rendered from the blueprint's views. To register with a blueprint and affect every template, use Blueprint.app_context_processor().

```
\begin{tabular}{ll} \textbf{delete}(\textit{rule: str}, **options: Any) \rightarrow Callable[[T\_route], T\_route] \\ Shortcut for \textit{route()} with methods=["DELETE"]. \\ \end{tabular}
```

Added in version 2.0.

```
endpoint(endpoint: str) \rightarrow Callable[[F], F]
```

Decorate a view function to register it for the given endpoint. Used if a rule is added without a view_func with add_url_rule().

```
app.add_url_rule("/ex", endpoint="example")
@app.endpoint("example")
```

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```
def example():
    ...
```

Parameters

endpoint – The endpoint name to associate with the view function.

```
errorhandler(code\_or\_exception: Type[Exception] \mid int) \rightarrow Callable[[T\_error\_handler], T\_error\_handler] Register a function to handle errors by code or exception class.
```

A decorator that is used to register a function given an error code. Example:

```
@app.errorhandler(404)
def page_not_found(error):
    return 'This page does not exist', 404
```

You can also register handlers for arbitrary exceptions:

```
@app.errorhandler(DatabaseError)
def special_exception_handler(error):
    return 'Database connection failed', 500
```

This is available on both app and blueprint objects. When used on an app, this can handle errors from every request. When used on a blueprint, this can handle errors from requests that the blueprint handles. To register with a blueprint and affect every request, use Blueprint.app_errorhandler().

Added in version 0.7: Use register_error_handler() instead of modifying error_handler_spec directly, for application wide error handlers.

Added in version 0.7: One can now additionally also register custom exception types that do not necessarily have to be a subclass of the HTTPException class.

Parameters

code_or_exception – the code as integer for the handler, or an arbitrary exception

```
\label{eq:content} \begin{split} \textbf{get}(\textit{rule: str}, **options: Any}) \rightarrow & \text{Callable}[[T\_route], T\_route] \\ & \text{Shortcut for } \textit{route()} \text{ with methods=["GET"]}. \end{split}
```

Added in version 2.0.

```
get\_send\_file\_max\_age(filename: str \mid None) \rightarrow int \mid None
```

Used by send_file() to determine the max_age cache value for a given file path if it wasn't passed.

By default, this returns SEND_FILE_MAX_AGE_DEFAULT from the configuration of current_app. This defaults to None, which tells the browser to use conditional requests instead of a timed cache, which is usually preferable.

Changed in version 2.0: The default configuration is None instead of 12 hours.

Added in version 0.9.

```
property has_static_folder: bool
```

True if static folder is set.

Added in version 0.5.

```
inject\_url\_defaults(endpoint: str, values: dict) \rightarrow None
```

Injects the URL defaults for the given endpoint directly into the values dictionary passed. This is used internally and automatically called on URL building.

Added in version 0.7.

```
property jinja_loader: FileSystemLoader | None
```

The Jinja loader for this object's templates. By default this is a class jinja2.loaders. FileSystemLoader to template_folder if it is set.

Added in version 0.5.

```
open_resource(resource: str, mode: str = 'rb') \rightarrow IO
```

Open a resource file relative to *root_path* for reading.

For example, if the file schema.sql is next to the file app.py where the Flask app is defined, it can be opened with:

```
with app.open_resource("schema.sql") as f:
    conn.executescript(f.read())
```

Parameters

- **resource** Path to the resource relative to *root_path*.
- **mode** Open the file in this mode. Only reading is supported, valid values are "r" (or "rt") and "rb".

Shortcut for *route()* with methods=["POST"].

Added in version 2.0.

$$\label{eq:content} \begin{split} \text{put}(\textit{rule: str}, **options: Any}) \rightarrow \text{Callable}[[T_route], T_route] \\ \text{Shortcut for } \textit{route()} \text{ with methods=["PUT"]}. \end{split}$$

Added in version 2.0.

register_error_handler(code_or_exception: Type[Exception] | int, f: Callable[[Any], Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] |

Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] |

Iterator[bytes], Headers | Mapping[str, str | List[str] | Tuple[str, ...]] |

Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[bytes], int] |

Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] |

Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str, ...]] |

Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] | WSGIApplication]) →

None

Alternative error attach function to the *errorhandler()* decorator that is more straightforward to use for non decorator usage.

Added in version 0.7.

```
route(rule: str, **options: Any) \rightarrow Callable[[T_route], T_route]
```

Decorate a view function to register it with the given URL rule and options. Calls add_url_rule(), which has more details about the implementation.

```
@app.route("/")
def index():
    return "Hello, World!"
```

See url-route-registrations.

The endpoint name for the route defaults to the name of the view function if the endpoint parameter isn't passed.

The methods parameter defaults to ["GET"]. HEAD and OPTIONS are added automatically.

Parameters

- **rule** The URL rule string.
- **options** Extra options passed to the Rule object.

```
send_static_file(filename: str) \rightarrow Response
```

The view function used to serve files from $static_folder$. A route is automatically registered for this view at $static_url_path$ if $static_folder$ is set.

Added in version 0.5.

```
property static_folder: str | None
```

The absolute path to the configured static folder. None if no static folder is set.

```
property static_url_path: str | None
```

The URL prefix that the static route will be accessible from.

If it was not configured during init, it is derived from static_folder.

```
teardown\_request(f: T\_teardown) \rightarrow T\_teardown
```

Register a function to be called when the request context is popped. Typically this happens at the end of each request, but contexts may be pushed manually as well during testing.

```
with app.test_request_context():
...
```

When the with block exits (or ctx.pop() is called), the teardown functions are called just before the request context is made inactive.

When a teardown function was called because of an unhandled exception it will be passed an error object. If an *errorhandler()* is registered, it will handle the exception and the teardown will not receive it.

Teardown functions must avoid raising exceptions. If they execute code that might fail they must surround that code with a try/except block and log any errors.

The return values of teardown functions are ignored.

This is available on both app and blueprint objects. When used on an app, this executes after every request. When used on a blueprint, this executes after every request that the blueprint handles. To register with a blueprint and execute after every request, use Blueprint.teardown_app_request().

```
url_defaults(f: T_url_defaults) \rightarrow T_url_defaults
```

Callback function for URL defaults for all view functions of the application. It's called with the endpoint and values and should update the values passed in place.

This is available on both app and blueprint objects. When used on an app, this is called for every request. When used on a blueprint, this is called for requests that the blueprint handles. To register with a blueprint and affect every request, use Blueprint.app_url_defaults().

$url_value_preprocessor(f: T_url_value_preprocessor) \rightarrow T_url_value_preprocessor$

Register a URL value preprocessor function for all view functions in the application. These functions will be called before the *before_request()* functions.

The function can modify the values captured from the matched url before they are passed to the view. For example, this can be used to pop a common language code value and place it in g rather than pass it to every view.

The function is passed the endpoint name and values dict. The return value is ignored.

This is available on both app and blueprint objects. When used on an app, this is called for every request. When used on a blueprint, this is called for requests that the blueprint handles. To register with a blueprint and affect every request, use Blueprint.app_url_value_preprocessor().

import_name

The name of the package or module that this object belongs to. Do not change this once it is set by the constructor.

template folder

The path to the templates folder, relative to *root_path*, to add to the template loader. None if templates should not be added.

root_path

Absolute path to the package on the filesystem. Used to look up resources contained in the package.

cli

The Click command group for registering CLI commands for this object. The commands are available from the flask command once the application has been discovered and blueprints have been registered.

view_functions: t.Dict[str, t.Callable]

A dictionary mapping endpoint names to view functions.

To register a view function, use the *route()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

error_handler_spec: t.Dict[ft.AppOrBlueprintKey, t.Dict[t.Optional[int], t.Dict[t.Type[Exception], ft.ErrorHandlerCallable]]]

A data structure of registered error handlers, in the format {scope: {code: {class: handler}}}. The scope key is the name of a blueprint the handlers are active for, or None for all requests. The code key is the HTTP status code for HTTPException, or None for other exceptions. The innermost dictionary maps exception classes to handler functions.

To register an error handler, use the *errorhandler()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

before_request_funcs: t.Dict[ft.AppOrBlueprintKey, t.List[ft.BeforeRequestCallable]]

A data structure of functions to call at the beginning of each request, in the format {scope: [functions]}. The scope key is the name of a blueprint the functions are active for, or None for all requests.

To register a function, use the *before_request()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

after_request_funcs: t.Dict[ft.App0rBlueprintKey, t.List[ft.AfterRequestCallable]]

A data structure of functions to call at the end of each request, in the format {scope: [functions]}. The scope key is the name of a blueprint the functions are active for, or None for all requests.

To register a function, use the *after_request()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

teardown_request_funcs: t.Dict[ft.AppOrBlueprintKey, t.List[ft.TeardownCallable]]

A data structure of functions to call at the end of each request even if an exception is raised, in the format {scope: [functions]}. The scope key is the name of a blueprint the functions are active for, or None for all requests.

To register a function, use the teardown_request() decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

template_context_processors: t.Dict[ft.AppOrBlueprintKey, t.List[ft.TemplateContextProcessorCallable]]

A data structure of functions to call to pass extra context values when rendering templates, in the format {scope: [functions]}. The scope key is the name of a blueprint the functions are active for, or None for all requests.

To register a function, use the *context_processor()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

url_value_preprocessors: t.Dict[ft.AppOrBlueprintKey, t.List[ft.URLValuePreprocessorCallable]]

A data structure of functions to call to modify the keyword arguments passed to the view function, in the format {scope: [functions]}. The scope key is the name of a blueprint the functions are active for, or None for all requests.

To register a function, use the *url_value_preprocessor()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

url_default_functions: t.Dict[ft.AppOrBlueprintKey, t.List[ft.URLDefaultCallable]]

A data structure of functions to call to modify the keyword arguments when generating URLs, in the format {scope: [functions]}. The scope key is the name of a blueprint the functions are active for, or None for all requests.

To register a function, use the *url_defaults()* decorator.

This data structure is internal. It should not be modified directly and its format may change at any time.

handle_url_build_error(error: BuildError, endpoint: str, values: Dict[str, Any]) \rightarrow str

Called by *url_for()* if a BuildError was raised. If this returns a value, it will be returned by url_for, otherwise the error will be re-raised.

Each function in *url_build_error_handlers* is called with error, endpoint and values. If a function returns None or raises a BuildError, it is skipped. Otherwise, its return value is returned by url_for.

Parameters

- **error** The active BuildError being handled.
- **endpoint** The endpoint being built.
- **values** The keyword arguments passed to url_for.

preprocess_request() → Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]]] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int] | Tuple[Response | str | bytes | List[Any] | Mapping[str, Any] | Iterator[str] | Iterator[bytes], int, Headers | Mapping[str, str | List[str] | Tuple[str, ...]] | Sequence[Tuple[str, str | List[str] | Tuple[str, ...]]] | WSGIApplication | None

Called before the request is dispatched. Calls *url_value_preprocessors* registered with the app and the current blueprint (if any). Then calls *before_request_funcs* registered with the app and the blueprint.

If any before_request() handler returns a non-None value, the value is handled as if it was the return value from the view, and further request handling is stopped.

$process_response(response: Response) \rightarrow Response$

Can be overridden in order to modify the response object before it's sent to the WSGI server. By default this will call all the *after_request()* decorated functions.

Changed in version 0.5: As of Flask 0.5 the functions registered for after request execution are called in reverse order of registration.

Parameters

response – a response_class object.

Returns

a new response object or the same, has to be an instance of response_class.

$do_teardown_request(exc: BaseException | None = < object object>) \rightarrow None$

Called after the request is dispatched and the response is returned, right before the request context is popped.

This calls all functions decorated with teardown_request(), and Blueprint.teardown_request() if a blueprint handled the request. Finally, the request_tearing_down signal is sent.

This is called by RequestContext.pop(), which may be delayed during testing to maintain access to resources.

Parameters

exc – An unhandled exception raised while dispatching the request. Detected from the current exception information if not passed. Passed to each teardown function.

Changed in version 0.9: Added the exc argument.

$do_{teardown_appcontext(exc: BaseException | None = <object object>) \rightarrow None$

Called right before the application context is popped.

When handling a request, the application context is popped after the request context. See do_teardown_request().

This calls all functions decorated with teardown_appcontext(). Then the appcontext_tearing_down signal is sent.

This is called by AppContext.pop().

Added in version 0.9.

$app_context() \rightarrow AppContext$

Create an AppContext. Use as a with block to push the context, which will make current_app point at this application.

An application context is automatically pushed by RequestContext.push() when handling a request, and when running a CLI command. Use this to manually create a context outside of these situations.

```
with app.app_context():
  init_db()
```

See /appcontext.

Added in version 0.9.

```
request_context(environ: dict) \rightarrow RequestContext
```

Create a RequestContext representing a WSGI environment. Use a with block to push the context, which will make request point at this request.

See /reqcontext.

Typically you should not call this from your own code. A request context is automatically pushed by the $wsgi_app()$ when handling a request. Use $test_request_context()$ to create an environment and context instead of this method.

Parameters

environ - a WSGI environment

```
test_request_context(*args: Any, **kwargs: Any) → RequestContext
```

Create a RequestContext for a WSGI environment created from the given values. This is mostly useful during testing, where you may want to run a function that uses request data without dispatching a full request.

See /reqcontext.

Use a with block to push the context, which will make request point at the request for the created environment.

```
with test_request_context(...):
    generate_report()
```

When using the shell, it may be easier to push and pop the context manually to avoid indentation.

```
ctx = app.test_request_context(...)
ctx.push()
...
ctx.pop()
```

Takes the same arguments as Werkzeug's EnvironBuilder, with some defaults from the application. See the linked Werkzeug docs for most of the available arguments. Flask-specific behavior is listed here.

Parameters

- path URL path being requested.
- base_url Base URL where the app is being served, which path is relative to. If not given, built from PREFERRED_URL_SCHEME, subdomain, SERVER_NAME, and APPLICATION_ROOT.
- **subdomain** Subdomain name to append to SERVER_NAME.
- url_scheme Scheme to use instead of PREFERRED_URL_SCHEME.
- data The request body, either as a string or a dict of form keys and values.
- **json** If given, this is serialized as JSON and passed as data. Also defaults content_type to application/json.
- args other positional arguments passed to EnvironBuilder.

• kwargs – other keyword arguments passed to EnvironBuilder.

```
wsgi_app(environ: dict, start_response: Callable) \rightarrow Any
```

The actual WSGI application. This is not implemented in __call__() so that middlewares can be applied without losing a reference to the app object. Instead of doing this:

```
app = MyMiddleware(app)
```

It's a better idea to do this instead:

```
app.wsgi_app = MyMiddleware(app.wsgi_app)
```

Then you still have the original application object around and can continue to call methods on it.

Changed in version 0.7: Teardown events for the request and app contexts are called even if an unhandled error occurs. Other events may not be called depending on when an error occurs during dispatch. See callbacks-and-errors.

Parameters

- environ A WSGI environment.
- **start_response** A callable accepting a status code, a list of headers, and an optional exception context to start the response.

```
__call__(environ: dict, start_response: Callable) \rightarrow Any
```

The WSGI server calls the Flask application object as the WSGI application. This calls wsgi_app(), which can be wrapped to apply middleware.

AFL.automation.APIServer.APIServer.IPVersion

```
Bases: Enum
__init__(*args, **kwds)
```

Attributes

```
V40nly
V60nly
All
```

```
V4Only = 1
V6Only = 2
All = 3
```

classmethod __contains__(member)

Return True if member is a member of this enum raises TypeError if member is not an enum member

note: in 3.12 TypeError will no longer be raised, and True will also be returned if member is the value of a member in this enum

```
classmethod __getitem__(name)
```

Return the member matching name.

```
classmethod __iter__()
```

Return members in definition order.

```
classmethod __len__()
```

Return the number of members (no aliases)

AFL.automation.APIServer.APIServer.JWTManager

Bases: object

An object used to hold JWT settings and callback functions for the Flask-JWT-Extended extension.

Instances of JWTManager are not bound to specific apps, so you can create one in the main body of your code and then bind it to your app in a factory function.

```
__init__(app: Flask | None = None, add_context_processor: bool = False) \rightarrow None
```

Create the JWTManager instance. You can either pass a flask application in directly here to register this extension with the flask app, or call init_app after creating this object (in a factory pattern).

Parameters

- app The Flask Application object
- **add_context_processor** Controls if *current_user* is should be added to flasks template context (and thus be available for use in Jinja templates). Defaults to False.

Methods

<pre>init([app, add_context_processor])</pre>	Create the JWTManager instance.
additional_claims_loader(callback)	This decorator sets the callback function used to add additional claims when creating a JWT.
<pre>additional_headers_loader(callback)</pre>	This decorator sets the callback function used to add
	additional headers when creating a JWT.
decode_key_loader(callback)	This decorator sets the callback function for dynamically setting the JWT decode key based on the UN-
	VERIFIED contents of the token.
encode_key_loader(callback)	This decorator sets the callback function for dynamically setting the JWT encode key based on the tokens identity.
<pre>expired_token_loader(callback)</pre>	This decorator sets the callback function for returning
	a custom response when an expired JWT is encountered.
<pre>init_app(app[, add_context_processor])</pre>	Register this extension with the flask app.
<pre>invalid_token_loader(callback)</pre>	This decorator sets the callback function for returning a custom response when an invalid JWT is encoun-
manda Carab talam I andam(anliberta)	tered.
needs_fresh_token_loader(callback)	This decorator sets the callback function for returning a custom response when a valid and non-fresh token
	is used on an endpoint that is marked as fresh=True.
revoked_token_loader(callback)	This decorator sets the callback function for returning
- 0. 0.101 _ 00.101 00.101 _ (0.1110 . 1011)	a custom response when a revoked token is encountered.
token_in_blocklist_loader(callback)	This decorator sets the callback function used to check if a JWT has been revoked.
<pre>token_verification_failed_loader(callback)</pre>	This decorator sets the callback function used to re-
	turn a custom response when the claims verification check fails.
token_verification_loader(callback)	This decorator sets the callback function used for custom verification of a valid JWT.
unauthorized_loader(callback)	This decorator sets the callback function used to return a custom response when no JWT is present.
user_identity_loader(callback)	This decorator sets the callback function used to convert an identity to a string when creating JWTs.
user_lookup_error_loader(callback)	This decorator sets the callback function used to
	return a custom response when loading a user via user_lookup_loader() fails.
user_lookup_loader(callback)	This decorator sets the callback function used to con-
	vert a JWT into a python object that can be used in a protected endpoint.
	i i

__init__(app: Flask | None = None, $add_context_processor$: bool = False) \rightarrow None

Create the JWTManager instance. You can either pass a flask application in directly here to register this extension with the flask app, or call init_app after creating this object (in a factory pattern).

Parameters

- app The Flask Application object
- **add_context_processor** Controls if *current_user* is should be added to flasks template context (and thus be available for use in Jinja templates). Defaults to False.

 $init_app(app: Flask, add_context_processor: bool = False) \rightarrow None$

Register this extension with the flask app.

Parameters

- app The Flask Application object
- **add_context_processor** Controls if *current_user* is should be added to flasks template context (and thus be available for use in Jinja templates). Defaults to False.

additional_claims_loader(*callback: Callable*) → Callable

This decorator sets the callback function used to add additional claims when creating a JWT. The claims returned by this function will be merged with any claims passed in via the additional_claims argument to create_access_token() or create_refresh_token().

The decorated function must take one argument.

The argument is the identity that was used when creating a JWT.

The decorated function must return a dictionary of claims to add to the JWT.

additional_headers_loader(callback: Callable) → Callable

This decorator sets the callback function used to add additional headers when creating a JWT. The headers returned by this function will be merged with any headers passed in via the additional_headers argument to create_access_token() or create_refresh_token().

The decorated function must take one argument.

The argument is the identity that was used when creating a JWT.

The decorated function must return a dictionary of headers to add to the JWT.

decode_key_loader(*callback: Callable*) → Callable

This decorator sets the callback function for dynamically setting the JWT decode key based on the **UNVER-IFIED** contents of the token. Think carefully before using this functionality, in most cases you probably don't need it.

The decorated function must take two arguments.

The first argument is a dictionary containing the header data of the unverified JWT.

The second argument is a dictionary containing the payload data of the unverified JWT.

The decorated function must return a *string* that is used to decode and verify the token.

encode_key_loader(*callback: Callable*) → Callable

This decorator sets the callback function for dynamically setting the JWT encode key based on the tokens identity. Think carefully before using this functionality, in most cases you probably don't need it.

The decorated function must take **one** argument.

The argument is the identity used to create this JWT.

The decorated function must return a string which is the secrete key used to encode the JWT.

expired_token_loader(*callback: Callable*) → Callable

This decorator sets the callback function for returning a custom response when an expired JWT is encountered.

The decorated function must take two arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must return a Flask Response.

invalid_token_loader(callback: Callable) → Callable

This decorator sets the callback function for returning a custom response when an invalid JWT is encountered.

This decorator sets the callback function that will be used if an invalid JWT attempts to access a protected endpoint.

The decorated function must take one argument.

The argument is a string which contains the reason why a token is invalid.

The decorated function must return a Flask Response.

$needs_fresh_token_loader(callback: Callable) \rightarrow Callable$

This decorator sets the callback function for returning a custom response when a valid and non-fresh token is used on an endpoint that is marked as fresh=True.

The decorated function must take **two** arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must return a Flask Response.

$revoked_token_loader(callback: Callable) \rightarrow Callable$

This decorator sets the callback function for returning a custom response when a revoked token is encountered.

The decorated function must take **two** arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must return a Flask Response.

token_in_blocklist_loader(callback: Callable) → Callable

This decorator sets the callback function used to check if a JWT has been revoked.

The decorated function must take **two** arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must be return True if the token has been revoked, False otherwise.

token_verification_failed_loader(callback: Callable) → Callable

This decorator sets the callback function used to return a custom response when the claims verification check fails.

The decorated function must take **two** arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must return a Flask Response.

token_verification_loader(callback: Callable) → Callable

This decorator sets the callback function used for custom verification of a valid JWT.

The decorated function must take two arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must return True if the token is valid, or False otherwise.

unauthorized loader(callback: Callable) → Callable

This decorator sets the callback function used to return a custom response when no JWT is present.

The decorated function must take **one** argument.

The argument is a string that explains why the JWT could not be found.

The decorated function must return a Flask Response.

$user_identity_loader(callback: Callable) \rightarrow Callable$

This decorator sets the callback function used to convert an identity to a string when creating JWTs. This is useful for using objects (such as SQLAlchemy instances) as the identity when creating your tokens.

The decorated function must take one argument.

The argument is the identity that was used when creating a JWT.

The decorated function must return a string.

user_lookup_loader(callback: Callable) → Callable

This decorator sets the callback function used to convert a JWT into a python object that can be used in a protected endpoint. This is useful for automatically loading a SQLAlchemy instance based on the contents of the JWT.

The object returned from this function can be accessed via current_user or get_current_user()

The decorated function must take two arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function can return any python object, which can then be accessed in a protected endpoint. If an object cannot be loaded, for example if a user has been deleted from your database, None must be returned to indicate that an error occurred loading the user.

user_lookup_error_loader(callback: Callable) → Callable

This decorator sets the callback function used to return a custom response when loading a user via user_loader() fails.

The decorated function must take **two** arguments.

The first argument is a dictionary containing the header data of the JWT.

The second argument is a dictionary containing the payload data of the JWT.

The decorated function must return a Flask Response.

AFL.automation.APIServer.APIServer.LoggerFilter

class AFL.automation.APIServer.APIServer.LoggerFilter(*filters)

Bases: object

```
__init__(*filters)
```

Methods

```
__init__(*filters)
```

```
__init__(*filters)
```

AFL.automation.APIServer.APIServer.MutableQueue

class AFL.automation.APIServer.APIServer.MutableQueue

Bases: object

Thread-safe, mutable queue

Unlike the standard library CPython queue, this class supportes positional inserts, deletions, and reordering. The tradeoff is performance for both reads and writes to the queue.

Methods

init()	
empty()	
<pre>get([loc, block, timeout])</pre>	Get next item from queue
<pre>iterationid()</pre>	
<pre>move(old_index[, new_index])</pre>	Move item in queue
put(item, loc)	Insert an item at the top of the queue
qsize()	
remove(loc)	Remove an item from the queue

AFL.automation.APIServer.APIServer.QueueDaemon

Bases: Thread

__init__(app, driver, task_queue, history, debug=False, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(app, driver, task_queue, history[,])	This constructor should always be called with keyword arguments.
<pre>check_if_paused()</pre>	
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>mask_serialized_objs(package)</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(app, driver, task_queue, history, debug=False, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

check_if_paused()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

mask_serialized_objs(package)

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.APIServer.APIServer.SMTPHandler

Bases: Handler

A handler class which sends an SMTP email for each logging event.

__init__(mailhost, fromaddr, toaddrs, subject, credentials=None, secure=None, timeout=5.0)
Initialize the handler.

Initialize the instance with the from and to addresses and subject line of the email. To specify a non-standard SMTP port, use the (host, port) tuple format for the mailhost argument. To specify authentication credentials, supply a (username, password) tuple for the credentials argument. To specify the use of a secure protocol (TLS), pass in a tuple for the secure argument. This will only be used when authentication credentials are supplied. The tuple will be either an empty tuple, or a single-value tuple with the name of a keyfile, or a 2-value tuple with the names of the keyfile and certificate file. (This tuple is passed to the *starttls* method). A timeout in seconds can be specified for the SMTP connection (the default is one second).

Methods

init(mailhost, fromaddr, toaddrs, subject)	Initialize the handler.
acquire()	Acquire the I/O thread lock.
addFilter(filter)	Add the specified filter to this handler.
close()	Tidy up any resources used by the handler.
createLock()	Acquire a thread lock for serializing access to the underlying I/O.
emit(record)	Emit a record.
filter(record)	Determine if a record is loggable by consulting all the filters.
flush()	Ensure all logging output has been flushed.
format(record)	Format the specified record.
<pre>getSubject(record)</pre>	Determine the subject for the email.
<pre>get_name()</pre>	
handle(record)	Conditionally emit the specified logging record.
handleError(record)	Handle errors which occur during an emit() call.
release()	Release the I/O thread lock.
removeFilter(filter)	Remove the specified filter from this handler.
setFormatter(fmt)	Set the formatter for this handler.
setLevel(level)	Set the logging level of this handler.
set_name(name)	

Attributes

name

__init__(mailhost, fromaddr, toaddrs, subject, credentials=None, secure=None, timeout=5.0)

Initialize the handler.

Initialize the instance with the from and to addresses and subject line of the email. To specify a non-standard SMTP port, use the (host, port) tuple format for the mailhost argument. To specify authentication credentials, supply a (username, password) tuple for the credentials argument. To specify the use of a secure protocol (TLS), pass in a tuple for the secure argument. This will only be used when authentication credentials are supplied. The tuple will be either an empty tuple, or a single-value tuple with the name of a keyfile, or a 2-value tuple with the names of the keyfile and certificate file. (This tuple is passed to the *starttls* method). A timeout in seconds can be specified for the SMTP connection (the default is one second).

getSubject(record)

Determine the subject for the email.

If you want to specify a subject line which is record-dependent, override this method.

emit(record)

Emit a record.

Format the record and send it to the specified addressees.

acquire()

Acquire the I/O thread lock.

addFilter(filter)

Add the specified filter to this handler.

close()

Tidy up any resources used by the handler.

This version removes the handler from an internal map of handlers, _handlers, which is used for handler lookup by name. Subclasses should ensure that this gets called from overridden close() methods.

createLock()

Acquire a thread lock for serializing access to the underlying I/O.

filter(record)

Determine if a record is loggable by consulting all the filters.

The default is to allow the record to be logged; any filter can veto this and the record is then dropped. Returns a zero value if a record is to be dropped, else non-zero.

Changed in version 3.2: Allow filters to be just callables.

flush()

Ensure all logging output has been flushed.

This version does nothing and is intended to be implemented by subclasses.

format(record)

Format the specified record.

If a formatter is set, use it. Otherwise, use the default formatter for the module.

get_name()

handle(record)

Conditionally emit the specified logging record.

Emission depends on filters which may have been added to the handler. Wrap the actual emission of the record with acquisition/release of the I/O thread lock. Returns whether the filter passed the record for emission.

handleError(record)

Handle errors which occur during an emit() call.

This method should be called from handlers when an exception is encountered during an emit() call. If raiseExceptions is false, exceptions get silently ignored. This is what is mostly wanted for a logging system - most users will not care about errors in the logging system, they are more interested in application errors. You could, however, replace this with a custom handler if you wish. The record which was being processed is passed in to this method.

property name

release()

Release the I/O thread lock.

removeFilter(filter)

Remove the specified filter from this handler.

setFormatter(fmt)

Set the formatter for this handler.

```
setLevel(level)
```

Set the logging level of this handler. level must be an int or a str.

```
set_name(name)
```

AFL.automation.APIServer.APIServer.ServiceInfo

class AFL.automation.APIServer.APIServer.ServiceInfo

Bases: RecordUpdateListener

Service information.

Constructor parameters are as follows:

- type_: fully qualified service type name
- name: fully qualified service name
- port: port that the service runs on
- weight: weight of the service
- priority: priority of the service
- *properties*: dictionary of properties (or a bytes object holding the contents of the *text* field). converted to str and then encoded to bytes using UTF-8. Keys with *None* values are converted to value-less attributes.
- *server*: fully qualified name for service host (defaults to name)
- host_ttl: ttl used for A/SRV records
- other_ttl: ttl used for PTR/TXT records
- addresses and parsed_addresses: List of IP addresses (either as bytes, network byte order, or in parsed form as text; at most one of those parameters can be provided)
- interface_index: scope_id or zone_id for IPv6 link-local addresses i.e. an identifier of the interface where the peer is connected to

__init__(*args, **kwargs)

Methods

init(*args, **kwargs)	
addresses_by_version(version)	List addresses matching IP version.
async_clear_cache()	Clear the cache for this service info.
<pre>async_request(zc, timeout[, question_type,])</pre>	Returns true if the service could be discovered on the network, and updates this object with details discovered.
<pre>async_update_records(zc, now, records)</pre>	Updates service information from a DNS record.
<pre>async_update_records_complete()</pre>	Called when a record update has completed for all handlers.
<pre>async_wait(timeout[, loop])</pre>	Calling task waits for a given number of milliseconds or until notified.
<pre>dns_addresses([override_ttl, version])</pre>	Return matching DNSAddress from ServiceInfo.
<pre>dns_nsec(missing_types[, override_ttl])</pre>	Return DNSNsec from ServiceInfo.
<pre>dns_pointer([override_ttl])</pre>	Return DNSPointer from ServiceInfo.
<pre>dns_service([override_ttl])</pre>	Return DNSService from ServiceInfo.
<pre>dns_text([override_ttl])</pre>	Return DNSText from ServiceInfo.
<pre>get_address_and_nsec_records([override_ttl])</pre>	Build a set of address records and NSEC records for non-present record types.
<pre>get_name()</pre>	Name accessor
<pre>ip_addresses_by_version(version)</pre>	List ip_address objects matching IP version.
<pre>load_from_cache(zc[, now])</pre>	Populate the service info from the cache.
<pre>parsed_addresses([version])</pre>	List addresses in their parsed string form.
<pre>parsed_scoped_addresses([version])</pre>	Equivalent to parsed_addresses, with the exception that IPv6 Link-Local addresses are qualified with % <interface_index> when available</interface_index>
<pre>request(zc, timeout[, question_type, addr, port])</pre>	Returns true if the service could be discovered on the network, and updates this object with details discovered.
<pre>set_server_if_missing()</pre>	Set the server if it is missing.
<pre>update_record(zc, now, record)</pre>	Update a single record.

Attributes

```
host\_ttl
interface_index
key
other_ttl
port
priority
server
server_key
text
type
weight
addresses
                                                 IPv4 addresses of this service.
decoded_properties
                                                 Return properties as strings.
name
                                                 The name of the service.
                                                 Return properties as bytes.
properties
```

host_ttl

interface_index

key

other_ttl

port

priority

server

server_key

text

type

weight

__init__(*args, **kwargs)

addresses

IPv4 addresses of this service.

Only IPv4 addresses are returned for backward compatibility. Use addresses_by_version() or parsed_addresses() to include IPv6 addresses as well.

addresses_by_version(version: IPVersion)

List addresses matching IP version.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

async_clear_cache()

Clear the cache for this service info.

```
async_request(zc: Zeroconf, timeout: float, question\_type: DNSQuestionType | None = None, addr: str | None = None, port: int = 5353) \rightarrow bool
```

Returns true if the service could be discovered on the network, and updates this object with details discovered.

This method will be run in the event loop.

Passing addr and port is optional, and will default to the mDNS multicast address and port. This is useful for directing requests to a specific host that may be able to respond across subnets.

Parameters

- **zc** Zeroconf instance
- timeout time in milliseconds to wait for a response
- question_type question type to ask
- addr address to send the request to
- port port to send the request to

```
async_update_records(zc: Zeroconf, now: float_, records: list[RecordUpdate])
```

Updates service information from a DNS record.

This method will be run in the event loop.

async_update_records_complete()

Called when a record update has completed for all handlers.

At this point the cache will have the new records.

This method will be run in the event loop.

```
async_wait(timeout: float, loop: AbstractEventLoop | None = None) <math>\rightarrow None
```

Calling task waits for a given number of milliseconds or until notified.

decoded_properties

Return properties as strings.

```
dns\_addresses(override\_ttl: int\_ | None = None, version: IPVersion = IPVersion.All) \rightarrow list[DNSAddress]
Return matching DNSAddress from ServiceInfo.
```

```
dns\_nsec(missing\_types: list[int], override\_ttl: int\_ | None = None) \rightarrow DNSNsec
```

Return DNSNsec from ServiceInfo.

```
dns_pointer(override\_ttl: int_ | None = None) \rightarrow DNSPointer
```

Return DNSPointer from ServiceInfo.

$dns_service(override_ttl: int_| None = None) \rightarrow DNSService$

Return DNSService from ServiceInfo.

```
dns_text(override_ttl: int_| None = None) \rightarrow DNSText
```

Return DNSText from ServiceInfo.

$get_address_and_nsec_records(override_ttl: int_ | None = None) \rightarrow set[DNSRecord]$

Build a set of address records and NSEC records for non-present record types.

```
get_name() \rightarrow str
```

Name accessor

ip_addresses_by_version(version: IPVersion)

List ip_address objects matching IP version.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

```
load_from_cache(zc: Zeroconf, now: float_ | None = None) \rightarrow bool
```

Populate the service info from the cache.

This method is designed to be threadsafe.

name

The name of the service.

```
parsed\_addresses(version: IPVersion = IPVersion.All) \rightarrow list[str]
```

List addresses in their parsed string form.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

```
parsed\_scoped\_addresses(version: IPVersion = IPVersion.All) \rightarrow list[str]
```

Equivalent to parsed_addresses, with the exception that IPv6 Link-Local addresses are qualified with %<interface_index> when available

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

properties

Return properties as bytes.

```
request(zc: Zeroconf, timeout: float, question_type: DNSQuestionType | None = None, addr: str | None = None, port: int = 5353) \rightarrow bool
```

Returns true if the service could be discovered on the network, and updates this object with details discovered.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_request* cannot be completed.

Parameters

• **zc** – Zeroconf instance

- timeout time in milliseconds to wait for a response
- question_type question type to ask
- addr address to send the request to
- port port to send the request to

```
set_server_if_missing() → None
```

Set the server if it is missing.

This function is for backwards compatibility.

```
\textbf{update\_record}(\textit{zc: Zeroconf}, \textit{now: float, record: DNSRecord}) \rightarrow \texttt{None}
```

Update a single record.

This method is deprecated and will be removed in a future version. update_records should be implemented instead.

AFL.automation.APIServer.APIServer.Zeroconf

```
class AFL.automation.APIServer.APIServer.Zeroconf(interfaces: Sequence[str | int | tuple[str, int, int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False)
```

Bases: QuietLogger

Implementation of Zeroconf Multicast DNS Service Discovery

Supports registration, unregistration, queries and browsing.

```
__init__(interfaces: Sequence[str | int | tuple[tuple[str, int, int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False) \rightarrow None
```

Creates an instance of the Zeroconf class, establishing multicast communications, listening and reaping threads.

Parameters

• **interfaces** – InterfaceChoice or a list of IP addresses (IPv4 and IPv6) and interface indexes (IPv6 only).

IPv6 notes for non-POSIX systems: * InterfaceChoice.All is an alias for Interface-Choice.Default

on Python versions before 3.8.

Also listening on loopback (::1) doesn't work, use a real address.

- **ip_version** IP versions to support. If *choice* is a list, the default is detected from it. Otherwise defaults to V4 only for backward compatibility.
- apple_p2p use AWDL interface (only macOS)

Methods

init([interfaces, unicast, ip_version,])	Creates an instance of the Zeroconf class, establishing multicast communications, listening and reaping threads.
add_listener(listener, question)	Adds a listener for a given question.

continues on next page

Table 4 – continued from previous page

add service_listener(typelistener) Adds a listener for a particular service type. async_check_service(info, allow_name_change) Adds a listener for a given question. async_get_service_info(type_, name ,) Checks the network for a unique service name, modifying the ServiceInfo passed in if it is not unique. async_notify_all() Returns network service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds. async_remove_listener(listener) Schedule an async_notify_all. async_wair_tore(info) Removes a listener. async_wair_tore(info) Secnds an outgoing packet. unregister aservice(info) Unregister aservice. async_wait_for_start([timeout]) Calling task waits for a given number of milliseconds or until notified. async_wait_for_start([timeout]) Wait for start up for actions that require a running Zeroconf instance. close() Ends the background threads, and prevent this instance from servicing further queries. generate_service_upery(info) Generate a pury to lookup a service. get_service_info(type_, name[, timeout,]) Resisters servicing further queries. get_service_info(type_, name[, timeout,]) Notifies all waiting threads and notify listeners. get_service_info(type_, name[, timeout,]) Notifies all waiting threads and notify lis	Table 4 – Continued	
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update_service(info) Registers service information to the network with a		
default TTL.	<pre>update_service(info)</pre>	

Attributes

listeners

started

Check if the instance has started.

```
__init__(interfaces: Sequence[str | int | tuple[tuple[str, int, int], int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False) \rightarrow None
```

Creates an instance of the Zeroconf class, establishing multicast communications, listening and reaping threads.

Parameters

• **interfaces** – **InterfaceChoice** or a list of IP addresses (IPv4 and IPv6) and interface indexes (IPv6 only).

IPv6 notes for non-POSIX systems: * InterfaceChoice.All is an alias for Interface-Choice.Default

on Python versions before 3.8.

Also listening on loopback (::1) doesn't work, use a real address.

- **ip_version** IP versions to support. If *choice* is a list, the default is detected from it. Otherwise defaults to V4 only for backward compatibility.
- apple_p2p use AWDL interface (only macOS)

property started: bool

Check if the instance has started.

```
start() \rightarrow None
```

Start Zeroconf.

```
async async_wait_for_start(timeout: float = 9) \rightarrow None
```

Wait for start up for actions that require a running Zeroconf instance.

Throws NotRunningException if the instance is not running or could not be started.

```
property listeners: set[RecordUpdateListener]
```

```
async async_wait(timeout: float) \rightarrow None
```

Calling task waits for a given number of milliseconds or until notified.

```
notify_all() \rightarrow None
```

Notifies all waiting threads and notify listeners.

```
async\_notify\_all() \rightarrow None
```

Schedule an async_notify_all.

```
get_service_info(type_: str, name: str, timeout: int = 3000, question_type: DNSQuestionType | None = None) \rightarrow ServiceInfo | None
```

Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.

Parameters

• type – fully qualified service type name

- name the name of the service
- timeout milliseconds to wait for a response
- question_type The type of questions to ask (DNSQuestionType.QM or DNSQuestionType.QU)

```
add\_service\_listener(type:str, listener: ServiceListener) \rightarrow None
```

Adds a listener for a particular service type. This object will then have its add_service and remove_service methods called when services of that type become available and unavailable.

```
remove\_service\_listener(listener: ServiceListener) \rightarrow None
```

Removes a listener from the set that is currently listening.

```
remove_all_service_listeners() → None
```

Removes a listener from the set that is currently listening.

```
register_service(info: ServiceInfo, ttl: int | None = None, allow_name_change: bool = False, cooperating responders: bool = False, strict: bool = True) \rightarrow None
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service. The name of the service may be changed if needed to make it unique on the network. Additionally multiple cooperating responders can register the same service on the network for resilience (if you want this behavior set *cooperating_responders* to *True*).

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *register_service* cannot be completed.

```
async async_register_service(info: ServiceInfo, ttl: int | None = None, allow_name_change: bool = False, cooperating\_responders: bool = False, strict: bool = True) \rightarrow Awaitable
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service. The name of the service may be changed if needed to make it unique on the network. Additionally multiple cooperating responders can register the same service on the network for resilience (if you want this behavior set *cooperating_responders* to *True*).

```
update\_service(info: ServiceInfo) \rightarrow None
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_update_service* cannot be completed.

```
async async_update_service(info: ServiceInfo) → Awaitable
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service.

```
async async_get_service_info(type_: str, name: str, timeout: int = 3000, question_type: DNSQuestionType | None = None) <math>\rightarrow AsyncServiceInfo | None
```

Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.

Parameters

- type fully qualified service type name
- name the name of the service
- timeout milliseconds to wait for a response
- question_type The type of questions to ask (DNSQuestionType.QM or DNSQuestion-Type.QU)

 $\begin{tabular}{ll} \begin{tabular}{ll} \beg$

Generate a broadcast to announce a service.

generate_service_query(*info:* ServiceInfo) → DNSOutgoing

Generate a query to lookup a service.

 $unregister_service(info: ServiceInfo) \rightarrow None$

Unregister a service.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_unregister_service* cannot be completed.

async async_unregister_service(*info*: ServiceInfo) → Awaitable

Unregister a service.

 $generate_unregister_all_services() \rightarrow DNSOutgoing | None$

Generate a DNSOutgoing goodbye for all services and remove them from the registry.

async async_unregister_all_services() \rightarrow None

Unregister all registered services.

Unlike async_register_service and async_unregister_service, this method does not return a future and is always expected to be awaited since its only called at shutdown.

 $unregister_all_services() \rightarrow None$

Unregister all registered services.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_unregister_all_services* cannot be completed.

async_check_service(info: ServiceInfo, allow_name_change: bool, cooperating_responders: bool = False, strict: bool = True) \rightarrow None

Checks the network for a unique service name, modifying the ServiceInfo passed in if it is not unique.

 $\textbf{add_listener}(\textit{listener: RecordUpdateListener, question: DNSQuestion} \mid \textit{list[DNSQuestion]} \mid \textit{None}) \rightarrow \\ \text{None}$

Adds a listener for a given question. The listener will have its update_record method called when information is available to answer the question(s).

This function is threadsafe

 $remove_listener(listener: RecordUpdateListener) \rightarrow None$

Removes a listener.

This function is threadsafe

 $\textbf{async_add_listener}(\textit{listener}: \textit{RecordUpdateListener}, \textit{question}: \textit{DNSQuestion} \mid \textit{list[DNSQuestion]} \mid \textit{None}) \\ \rightarrow \textit{None}$

Adds a listener for a given question. The listener will have its update_record method called when information is available to answer the question(s).

This function is not threadsafe and must be called in the eventloop.

 $async_remove_listener(listener: RecordUpdateListener) \rightarrow None$

Removes a listener.

This function is not threadsafe and must be called in the eventloop.

```
send(out: DNSOutgoing, addr: str | None = None, port: int = 5353, v6_flow_scope: tuple[()] | tuple[int, int]
            = (), transport: \_WrappedTransport \mid None = None) \rightarrow None
           Sends an outgoing packet threadsafe.
     async_send(out: DNSOutgoing, addr: str | None = None, port: int = 5353, v6_flow_scope: tuple[()] |
                   tuple[int, int] = (), transport: \_WrappedTransport | None = None) \rightarrow None
           Sends an outgoing packet.
     close() \rightarrow None
           Ends the background threads, and prevent this instance from servicing further queries.
           This method is idempotent and irreversible.
     classmethod log_exception_debug(*logger data: Any) \rightarrow None
     classmethod log_exception_once(exc: Exception, *args: Any) \rightarrow None
     classmethod log_exception_warning(*logger\_data: Any) \rightarrow None
     classmethod log_warning_once(*args: Any) \rightarrow None
class AFL.automation.APIServer.APIServer.APIServer(name, data=None, experiment='Development',
                                                              contact='tbm@nist.gov',
                                                              index_template='index.html',
                                                              new_index_template='index-new.html',
                                                              plot_template='simple-bokeh.html')
     __init__(name, data=None, experiment='Development', contact='tbm@nist.gov',
                index_template='index.html', new_index_template='index-new.html',
                plot_template='simple-bokeh.html')
     create_queue(driver, add_unqueued=True)
     reset_queue_daemon(driver=None)
     advertise_zeroconf(**kwargs)
     run(**kwargs)
     run_threaded(start_thread=True, **kwargs)
     add_standard_routes()
     get_info()
          Live, status page of the robot
     get_quickbar()
           Return the functions, params, and defaults to be shown in this server's quickbar
     is_server_live()
     get_unqueued_commands()
     get_queued_commands()
     add_unqueued_routes()
     query_driver()
```

```
init_logging(toaddrs=None)
index()
     Live, status page of the robot
index_new()
     Live, status page of the robot
webapp()
     Live, status page of the robot
render_unqueued(func, kwargs_add, **kwargs)
     Convert an unqueued return item into web-suitable output
send_1d_plot(result, multi=False, **kwargs)
send_array_as_jpg(array, log_image=False, max_val=None, fillna=0.0, **kwargs)
queue_state()
driver_status()
get_queue()
get_queue_iteration()
deposit_obj()
     Store an object named obj in the driver's dropbox If a uuid is provided, the object will be stored with that
     uuid Otherwise, a new uuid will be generated. In either case, the uuid will be returned to the client.
retrieve_obj()
     Retrieve an object from the driver's dropbox uuid specifies the object to retrieve delete specifies whether
     to delete the object after retrieval
set_driver_object()
get_driver_object()
enqueue()
reorder_queue()
remove_items()
remove_item()
move_item()
clear_queue()
clear_history()
debug()
pause()
halt()
init()
```

```
login()
get_server_time()
login_test()
```

AFL.automation.APIServer.Client

Classes

<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
ServerDiscovery()	ServerDiscovery class

AFL.automation.APIServer.Client.Client

Bases: object

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

__init__(*ip=None*, *port='5000'*, *username=None*, *interactive=False*)

Methods

```
__init__([ip, port, username, interactive])

clear_history()

clear_queue()

debug(state)

deposit_obj(obj[, uid])

Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object under if not specified, a new uuid will be generated driver_status()

enqueue([interactive])

enqueued_base(**kwargs)

from_server_name(server_name, **kwargs)

get_config(name[, print_console, interactive])

get_driver_object(name)

continues on next page
```

Table 5 – continued from previous page

```
get_object(name[, serialize])
 get_queue()
 get_queued_commands([inherit_commands])
 get_quickbar()
 get_server_time()
 get_unqueued_commands([inherit_commands])
 halt()
 logged_in()
 login(username[, populate_commands])
 move_item(uuid, pos)
 pause(state)
 query_driver(**kwargs)
 queue_state()
 remove_item(uuid)
 reset_queue_daemon()
 retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox id: str, the uuid
                                                   of the object to retrieve delete: bool, if True, delete
                                                   the object after retrieving
 server_cmd(cmd, **kwargs)
 set_config([interactive])
 set_driver_object(**kw)
 set_object([serialize])
 unqueued_base(**kwargs)
 wait([target_uuid, interval, for_history, ...])
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
logged_in()
login(username, populate_commands=True)
```

```
driver_status()
get_queue()
wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
get_unqueued_commands(inherit_commands=True)
get_queued_commands(inherit_commands=True)
enqueue(interactive=None, **kwargs)
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
halt()
queue_state()
remove_item(uuid)
move_item(uuid, pos)
set_driver_object(**kw)
get_driver_object(name)
deposit_obj(obj, uid=None)
     Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
     under if not specified, a new uuid will be generated
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
     the object after retrieving
set_object(serialize=True, **kw)
get_object(name, serialize=True)
```

AFL.automation.APIServer.Client.ServerDiscovery

class AFL.automation.APIServer.Client.ServerDiscovery

Bases: object

ServerDiscovery class

This class is used to discover AFL servers on the network using zeroconf requests that match a particular specification.

__init__()

Methods

init()	
<pre>aio_find_server_by_name(service_name)</pre>	
discover_server_by_name(service_name)	Does a zeroconf request to find a named AFL-automation server on the network.
<pre>find_server_by_name(service_name)</pre>	Disambiguator for either matching or discovering a specific server by name
<pre>find_server_by_partial_name(service_name)</pre>	Looks through the registry of discovered services for a partial name match.
<pre>find_server_by_property_match(property_name)</pre>	Looks through the registry of discovered services for a partial match in a property string.
<pre>get_service_info(zeroconf, service_type, name)</pre>	
<pre>manage_service_info_to_list(zeroconf,)</pre>	
<pre>match_server_by_name(service_name)</pre>	Looks through the registry of discovered services for an exact name match.
<pre>on_service_state_change(zeroconf,)</pre>	
sa_aio_discover_server_by_name(service_name	Does a zeroconf request to find a named AFL-automation server on the network.
sa_discover_server_by_name(service_name)	Does a zeroconf request to find a named AFL-automation server on the network.

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

async classmethod sa_aio_discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

classmethod sa_discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

```
find_server_by_name(service_name)
```

Disambiguator for either matching or discovering a specific server by name

```
match_server_by_name(service_name)
```

Looks through the registry of discovered services for an exact name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

```
find_server_by_partial_name(service_name)
```

Looks through the registry of discovered services for a partial name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

```
find_server_by_property_match(property_name, property_value)
```

Looks through the registry of discovered services for a partial match in a property string. Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

```
__init__(ip=None, port='5000', username=None, interactive=False)

classmethod from_server_name(server_name, **kwargs)

logged_in()

login(username, populate_commands=True)

driver_status()

get_queue()

wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)

get_quickbar()

server_cmd(cmd, **kwargs)

enqueued_base(**kwargs)

unqueued_base(**kwargs)

get_unqueued_commands(inherit_commands=True)

get_queued_commands(inherit_commands=True)

enqueue(interactive=None, **kwargs)
```

```
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
halt()
queue_state()
remove_item(uuid)
move_item(uuid, pos)
set_driver_object(**kw)
get_driver_object(name)
deposit_obj(obj, uid=None)
     Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
     under if not specified, a new uuid will be generated
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
     the object after retrieving
set_object(serialize=True, **kw)
get_object(name, serialize=True)
```

AFL.automation.APIServer.Driver

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
<pre>makeRegistrar()</pre>	
sqrt(x, l)	Return the square root of x.

AFL.automation.APIServer.Driver.ceil

```
AFL.automation.APIServer.Driver.ceil(x,/)
Return the ceiling of x as an Integral.
This is the smallest integer >= x.
```

AFL.automation.APIServer.Driver.listify

AFL.automation.APIServer.Driver.listify(obj)

AFL.automation.APIServer.Driver.makeRegistrar

AFL.automation.APIServer.Driver.makeRegistrar()

AFL.automation.APIServer.Driver.sqrt

```
AFL.automation.APIServer.Driver.\mathbf{sqrt}(x,/)
Return the square root of x.
```

Classes

```
      Driver(name[, defaults, overrides])

      PersistentConfig(path[, defaults, ...])
      A dictionary-like class that serializes changes to disk
```

AFL.automation.APIServer.Driver.Driver

```
class AFL.automation.APIServer.Driver.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
           Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
           :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
           Retrieve an object from the dropbox
               Parameters
                   uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
           Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.APIServer.Driver.PersistentConfig
class AFL.automation.APIServer.Driver.PersistentConfig(path, defaults=None, overrides=None,
                                                                   lock=False, write=True,
                                                                   max_history=10000,
                                                                   datetime_key_format='%y/%d/%m
                                                                   %H:%M:%S.%f')
```

Bases: MutableMapping

A dictionary-like class that serializes changes to disk

This class provides dictionary-like setters and getters (e.g., [] and .update()) but, by default, all modifications are written into a file in json format with the root keys as timestamps. Modifications can be blocked by locking the config, and writing to disk can be disabled by setting the appropriate member attributes (see constructor). On instantiation, if provided with a previously saved configuration file, PersistentConfig will load the file's contents into memory and use the more recent configuration.

__init__(path, defaults=None, overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

Constructor

Parameters

- path (str or pathlib.Path) File path to file in which this config is or will be stored. This file will be created if it does not exist
- **defaults** (*dict*) Default values to use if no saved config is available or if parameters are missing from a saved config.
- **overrides** (*dict*) Values to use that override parameters in a saved config. These parameters can be changed after the PersistentConfig object is instantiated.
- **lock** (*bool*) If True, an AttributeError will be raised if the user attempts to modify the config
- write (bool) If False, all writing to the config file will be disabled and a warning will be emitted each time the config is modified.
- **datetime_key_format** (*str*) String defining the root level keys of the json-serialized file. See https://docs.python.org/3/library/datetime.html#strftime-strptime-behavior.

Methods

init(path[, defaults, overrides, lock,])		Constructor
clear()		
<pre>get(k[,d])</pre>		
<pre>get_historical_values(key[, vert_to_datetime])</pre>	con-	Convenience method for gathering historical values of a parameter
items()		
keys()		
<i>pop</i> (k[,d])		If key is not found, d is returned if given, otherwise KeyError is raised.
<pre>popitem()</pre>		as a 2-tuple; but raise KeyError if D is empty.
<pre>revert([nth, datetime_key])</pre>		Revert config to a historical config
setdefault(k[,d])		
toJSON()		Serialize the config to json
<pre>update(update_dict)</pre>		Update several values in config at once
values()		

__init__(path, defaults=None, overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

Constructor

Parameters

- path (str or pathlib.Path) File path to file in which this config is or will be stored. This file will be created if it does not exist
- **defaults** (*dict*) Default values to use if no saved config is available or if parameters are missing from a saved config.
- **overrides** (*dict*) Values to use that override parameters in a saved config. These parameters can be changed after the PersistentConfig object is instantiated.
- **lock** (*bool*) If True, an AttributeError will be raised if the user attempts to modify the config
- write (bool) If False, all writing to the config file will be disabled and a warning will be emitted each time the config is modified.
- **datetime_key_format** (*str*) String defining the root level keys of the json-serialized file. See https://docs.python.org/3/library/datetime.html#strftime-strptime-behavior.

```
__getitem__(key)
```

Dictionary-like getter via config["param"]

```
__setitem__(key, value)
```

Dictionary-like setter via config["param"]=value

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

toJSON()

Serialize the config to json

update(update_dict)

Update several values in config at once

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

revert(nth=None, datetime_key=None)

Revert config to a historical config

Parameters

- **nth** (int, **optional***) Integer index of historical value to revert to. Can be negative to count from end of history. Note that -1 will correspond to the current config.
- $\hbox{\bf \bullet datetime_key} \ (str, \ optional) datetime \ formatted \ string \ as \ defined \ by \ datetime_key_format \\$

get_historical_values(key, convert_to_datetime=False)

Convenience method for gathering historical values of a parameter

clear() \rightarrow None. Remove all items from D.

 $get(k[,d]) \rightarrow D[k]$ if k in D, else d. d defaults to None.

items() \rightarrow a set-like object providing a view on D's items

keys() \rightarrow a set-like object providing a view on D's keys

```
pop(k[,d]) \rightarrow v, remove specified key and return the corresponding value.
           If key is not found, d is returned if given, otherwise KeyError is raised.
     popitem() \rightarrow (k, v), remove and return some (key, value) pair
           as a 2-tuple; but raise KeyError if D is empty.
     setdefault(k[,d]) \rightarrow D.get(k,d), also set D[k]=d if k not in D
     values() \rightarrow an object providing a view on D's values
AFL.automation.APIServer.Driver.makeRegistrar()
class AFL.automation.APIServer.Driver.Driver(name, defaults=None, overrides=None)
     unqueued()
     queued()
     quickbar()
     __init__(name, defaults=None, overrides=None)
     classmethod gather_defaults()
           Gather all inherited static class-level dictionaries called default.
     set_config(**kwargs)
     get_config(name, print_console=False)
     get_configs(print_console=False)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
```

set_data(data: dict)

Set data in the DataPacket object

Parameters

- data (dict) Dictionary of data to store in the driver object
- variables (Note! if the keys in data are not system or sample)

:param : :param they will be erased at the end of this function call.:

```
retrieve_obj(uid, delete=True)
```

Retrieve an object from the dropbox

Parameters

uid (*str*) – The uuid of the file to retrieve

deposit_obj(obj, uid=None)

Store an object in the dropbox

Parameters

- **obj** (*object*) The object to store in the dropbox
- **uid** (*str*) The uuid to store the object under

AFL.automation.APIServer.DummyDriver

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x, l)	Return the square root of x.

AFL.automation.APIServer.DummyDriver.ceil

```
AFL.automation.APIServer.DummyDriver.ceil(x,/)
```

Return the ceiling of x as an Integral.

This is the smallest integer $\geq x$.

AFL.automation.APIServer.DummyDriver.listify

AFL.automation.APIServer.DummyDriver.listify(obj)

AFL.automation.APIServer.DummyDriver.sqrt

```
AFL.automation.APIServer.DummyDriver.\mathbf{sqrt}(x,/)
Return the square root of x.
```

Classes

```
Driver(name[, defaults, overrides])

DummyDriver([name, overrides])
```

AFL.automation.APIServer.DummyDriver.Driver

```
class AFL.automation.APIServer.DummyDriver.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
                                                   Gather all inherited static class-level dictionaries
gather_defaults()
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
                                                   Executed after each call to execute
post_execute(**kwargs)
pre_execute(**kwargs)
                                                   Executed before each call to execute
queued()
quickbar()
reset_sample()
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

```
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
```

```
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.APIServer.DummyDriver.DummyDriver

class AFL.automation.APIServer.DummyDriver.DummyDriver(name=None, overrides=None)
 Bases: Driver
 __init__(name=None, overrides=None)

Methods

```
__init__([name, overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
dummy_reset_tank_levels([rinsel,
                                          rinse2,
waste])
execute(**kwargs)
gather_defaults()
                                                   Gather all inherited static class-level dictionaries
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
how_many(**kwargs)
loadSample([cellname, sampleVolume])
post_execute(**kwargs)
                                                   Executed after each call to execute
pre_execute(**kwargs)
                                                   Executed before each call to execute
queued()
quickbar()
quickbar_test([text_field, int_field, ...])
quickbar_test2()
reset_sample()
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
test_command1([kwarg1, kwarg2])
                                                   A test command with positional and keyword param-
test_command2([kwarg1, kwarg2, kwarg3])
                                                   A test command with positional and keyword param-
test_command_sets_data([kwarg1,
                                         kwarg2,
                                                   A test command with positional and keyword param-
kwarg3])
test_image(**kwargs)
test_plot(**kwargs)
```

6.2. Modules^{ed()}

Attributes

```
defaults
```

```
defaults = {'density of water': 1.0, 'speed of light': 300000000.0}
__init__(name=None, overrides=None)
status()
test_command1(kwarg1=None, kwarg2=True)
    A test command with positional and keyword parameters
test_command2(kwarg1=False, kwarg2=False, kwarg3=True)
    A test command with positional and keyword parameters
test_command_sets_data(kwarg1=False, kwarg2=False, kwarg3=True)
    A test command with positional and keyword parameters
how_many(**kwargs)
test_plot(**kwargs)
test_image(**kwargs)
quickbar_test(text_field='Three', int_field=3, float_field=3.14, bool_field=True)
quickbar_test2()
dummy_reset_tank_levels(rinse1=950, rinse2=950, waste=0)
loadSample(cellname='cell', sampleVolume=0)
deposit_obj(obj, uid=None)
    Store an object in the dropbox
        Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
    Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
```

```
post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
              Parameters
                  uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
class AFL.automation.APIServer.DummyDriver.DummyDriver(name=None, overrides=None)
     defaults = {'density of water': 1.0, 'speed of light': 300000000.0}
     __init__(name=None, overrides=None)
     status()
     test_command1(kwarg1=None, kwarg2=True)
          A test command with positional and keyword parameters
     test_command2(kwarg1=False, kwarg2=False, kwarg3=True)
          A test command with positional and keyword parameters
     test_command_sets_data(kwarg1=False, kwarg2=False, kwarg3=True)
          A test command with positional and keyword parameters
     how_many(**kwargs)
```

```
test_plot(**kwargs)
test_image(**kwargs)
quickbar_test(text_field='Three', int_field=3, float_field=3.14, bool_field=True)
quickbar_test2()
dummy_reset_tank_levels(rinsel=950, rinse2=950, waste=0)
loadSample(cellname='cell', sampleVolume=0)
```

AFL.automation.APIServer.DummyOT2Driver

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x,/)	Return the square root of x.

AFL.automation.APIServer.DummyOT2Driver.ceil

```
AFL.automation.APIServer.DummyOT2Driver.ceil(x,/)
Return the ceiling of x as an Integral.
This is the smallest integer >= x.
```

AFL.automation.APIServer.DummyOT2Driver.listify

AFL.automation.APIServer.DummyOT2Driver.listify(obj)

AFL.automation.APIServer.DummyOT2Driver.sqrt

```
AFL.automation.APIServer.DummyOT2Driver.sqrt(x,/)
Return the square root of x.
```

Classes

```
Driver(name[, defaults, overrides])

DummyDriver([name, overrides])
```

AFL.automation.APIServer.DummyOT2Driver.Driver

```
class AFL.automation.APIServer.DummyOT2Driver.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                  uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
          Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.APIServer.DummyOT2Driver.DummyDriver
class AFL.automation.APIServer.DummyOT2Driver.DummyDriver(name=None, overrides=None)
     Bases: Driver
     __init__(name=None, overrides=None)
```

Methods

init([name, overrides])	
<pre>deposit_obj(obj[, uid]) dummy_reset_tank_levels([rinse1, rinse waste])</pre>	Store an object in the dropbox 2,
execute(**kwargs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_prep_target(**kwargs)</pre>	
<pre>get_sample()</pre>	
how_many(**kwargs)	
<pre>loadSample([cellname, sampleVolume])</pre>	
<pre>post_execute(**kwargs) pre_execute(**kwargs) queued()</pre>	Executed after each call to execute Executed before each call to execute
quickbar()	
<pre>quickbar_test([text_field, int_field,])</pre>	
quickbar_test2()	
reset_sample()	
<pre>retrieve_obj(uid[, delete]) set_config(**kwargs)</pre>	Retrieve an object from the dropbox
set_data(data)	Set data in the DataPacket object
<pre>set_object([serialized])</pre>	
<pre>set_sample(sample_name[, sample_uuid])</pre>	
status()	
test_command1([kwarg1, kwarg2])	A test command with positional and keyword parameters
test_command2([kwarg1, kwarg2, kwarg3])	A test command with positional and keyword parameters
test_command_sets_data([kwarg1, kwarg3])	2, A test command with positional and keyword parameters continues on next page

Table 6 – continued from previous page

```
test_image(**kwargs)

test_plot(**kwargs)

unqueued()
```

Attributes

```
defaults
```

```
defaults = {'density of water': 1.0, 'speed of light': 300000000.0}
__init__(name=None, overrides=None)
status()
execute(**kwargs)
get_prep_target(**kwargs)
test_command1(kwarg1=None, kwarg2=True)
    A test command with positional and keyword parameters
test_command2(kwarg1=False, kwarg2=False, kwarg3=True)
    A test command with positional and keyword parameters
test_command_sets_data(kwarg1=False, kwarg2=False, kwarg3=True)
    A test command with positional and keyword parameters
how_many(**kwargs)
test_plot(**kwargs)
test_image(**kwargs)
quickbar_test(text_field='Three', int_field=3, float_field=3.14, bool_field=True)
quickbar_test2()
dummy_reset_tank_levels(rinse1=950, rinse2=950, waste=0)
loadSample(cellname='cell', sampleVolume=0)
deposit_obj(obj, uid=None)
    Store an object in the dropbox
        Parameters
            • obj (object) – The object to store in the dropbox
            • uid (str) – The uuid to store the object under
classmethod gather_defaults()
```

Gather all inherited static class-level dictionaries called default.

```
get_config(name, print_console=False)
     get_configs(print_console=False)
     get_object(name, serialize=True)
     get_sample()
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
              Parameters
                  uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
              Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
class AFL.automation.APIServer.DummyOT2Driver.DummyDriver(name=None, overrides=None)
     defaults = {'density of water': 1.0, 'speed of light': 300000000.0}
     __init__(name=None, overrides=None)
     status()
     execute(**kwargs)
     get_prep_target(**kwargs)
```

```
test_command1(kwarg1=None, kwarg2=True)
          A test command with positional and keyword parameters
     test_command2(kwarg1=False, kwarg2=False, kwarg3=True)
          A test command with positional and keyword parameters
     test_command_sets_data(kwarg1=False, kwarg2=False, kwarg3=True)
          A test command with positional and keyword parameters
     how_many(**kwargs)
     test_plot(**kwargs)
     test_image(**kwargs)
     quickbar_test(text_field='Three', int_field=3, float_field=3.14, bool_field=True)
     quickbar_test2()
     dummy_reset_tank_levels(rinse1=950, rinse2=950, waste=0)
     loadSample(cellname='cell', sampleVolume=0)
AFL.automation.APIServer.LoggerFilter
Classes
 LoggerFilter(*filters)
AFL.automation.APIServer.LoggerFilter.LoggerFilter
class AFL.automation.APIServer.LoggerFilter.LoggerFilter(*filters)
     Bases: object
     __init__(*filters)
     Methods
       __init__(*filters)
     __init__(*filters)
class AFL.automation.APIServer.LoggerFilter.LoggerFilter(*filters)
     __init__(*filters)
AFL.automation.APIServer.QueueDaemon
Functions
 is_serialized(obj)
```

AFL.automation.APIServer.QueueDaemon.is_serialized

AFL.automation.APIServer.QueueDaemon.is_serialized(obj)

Classes

DataTrashcan()	A DataPacket implementation <i>for testing only</i> that takes all its data and simply throws it away.
<pre>QueueDaemon(app, driver, task_queue, history)</pre>	

AFL.automation.APIServer.QueueDaemon.DataTrashcan

class AFL.automation.APIServer.QueueDaemon.DataTrashcan

Bases: DataPacket

A DataPacket implementation for testing only that takes all its data and simply throws it away.

__init__()

init()	
add_array(*args, **kwargs)	Abstract method adding arrays that need special handling
clear()	
finalize()	
<pre>get(k[,d])</pre>	
<pre>items()</pre>	
keys()	
<i>pop</i> (k[,d])	If key is not found, d is returned if given, otherwise KeyError is raised.
<pre>popitem()</pre>	as a 2-tuple; but raise KeyError if D is empty.
reset()	Clears all transient data.
reset_sample()	
setdefault(k[,d])	
setupDefaults()	
transmit()	
update([E,]**F)	If E present and has a .keys() method, does: for k in E: $D[k] = E[k]$ If E present and lacks .keys() method, does: for (k, v) in E: $D[k] = v$ In either case, this is followed by: for k, v in F.items(): $D[k] = v$
values()	

Attributes

```
PROTECTED_SYSTEM_KEYS

transmit()
add_array(*args, **kwargs)
    Abstract method adding arrays that need special handling
PROTECTED_SAMPLE_KEYS = ['sample_name', 'sample_uuid', 'sample_composition', 'AL_components', 'AL_campaign_name', 'AL_uuid']

PROTECTED_SYSTEM_KEYS = ['driver_name', 'driver_config', 'platform_serial']
```

```
__init__()
      clear() \rightarrow None. Remove all items from D.
      finalize()
      get(k[,d]) \rightarrow D[k] if k in D, else d. d defaults to None.
      items() \rightarrow a set-like object providing a view on D's items
      keys() \rightarrow a set-like object providing a view on D's keys
      pop(k[,d]) \rightarrow v, remove specified key and return the corresponding value.
            If key is not found, d is returned if given, otherwise KeyError is raised.
      popitem() \rightarrow (k, v), remove and return some (key, value) pair
            as a 2-tuple; but raise KeyError if D is empty.
      reset()
            Clears all transient data.
      reset_sample()
      setdefault(k[, d]) \rightarrow D.get(k,d), also set D[k]=d if k not in D
      setupDefaults()
      update([E, ]^{**F}) \rightarrow None. Update D from mapping/iterable E and F.
            If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method,
            does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
      values() \rightarrow an object providing a view on D's values
AFL.automation.APIServer.QueueDaemon.QueueDaemon
                                                                           debug=False, data=None)
```

class AFL.automation.APIServer.QueueDaemon.**QueueDaemon**(app, driver, task_queue, history,

Bases: Thread

__init__(app, driver, task_queue, history, debug=False, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

init(app, driver, task_queue, history[,])	This constructor should always be called with keyword arguments.
<pre>check_if_paused()</pre>	
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>mask_serialized_objs(package)</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(app, driver, task_queue, history, debug=False, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

check_if_paused()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

mask_serialized_objs(package)

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

__init__(app, driver, task_queue, history, debug=False, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

check_if_paused()

mask_serialized_objs(package)

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

6.2.2 Instrument

The Instrument module contains drivers and interfaces for various scientific instruments.

AFL.automation.instrument

AFL.automation.instrument

Modules

DummySAS

FileCamera

I22SAXS

NetworkCamera

SeabreezeUVVis

SpecScreen_Driver

AFL.automation.instrument.DummySAS

Classes

Driver(name[, defaults, overrides])

DummySAS([overrides])

AFL.automation.instrument.DummySAS.Driver

class AFL.automation.instrument.DummySAS.Driver(name, defaults=None, overrides=None)

Bases: object

__init__(name, defaults=None, overrides=None)

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                   uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
          Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.instrument.DummySAS.DummySAS
class AFL.automation.instrument.DummySAS.DummySAS(overrides=None)
     Bases: Driver
      __init__(overrides=None)
          connect to spec
```

init([overrides])	connect to spec
deposit_obj(obj[, uid])	Store an object in the dropbox
execute(**kwargs)	·
expose([name, exposure, nexp, block,])	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>post_execute(**kwargs)</pre>	Executed after each call to execute
<pre>pre_execute(**kwargs)</pre>	Executed before each call to execute
queued()	
quickbar()	
reset_sample()	
<pre>retrieve_obj(uid[, delete])</pre>	Retrieve an object from the dropbox
set_config(**kwargs)	
set_data(data)	Set data in the DataPacket object
set_object([serialized])	
<pre>set_sample(sample_name[, sample_uuid])</pre>	
status()	
unqueued()	

Attributes

```
status()
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
reset_sample()
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
set_config(**kwargs)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
set_object(serialized=True, **kw)
```

AFL.automation.instrument.FileCamera

Classes

```
FileCamera()
```

AFL.automation.instrument.FileCamera.FileCamera

```
class AFL.automation.instrument.FileCamera.FileCamera
Bases: object
__init__()
```

Methods

```
__init__()
collect(fname)

__init__()
collect(fname)

class AFL.automation.instrument.FileCamera.FileCamera
__init__()
collect(fname)
```

AFL.automation.instrument.l22SAXS

Classes

```
Driver(name[, defaults, overrides])

I22SAXS([overrides])
```

AFL.automation.instrument.l22SAXS.Driver

```
class AFL.automation.instrument.I22SAXS.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
                                                   Gather all inherited static class-level dictionaries
gather_defaults()
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
                                                   Executed after each call to execute
post_execute(**kwargs)
                                                   Executed before each call to execute
pre_execute(**kwargs)
queued()
quickbar()
reset_sample()
                                                   Retrieve an object from the dropbox
retrieve_obj(uid[, delete])
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

```
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
```

```
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.instrument.I22SAXS.I22SAXS

```
class AFL.automation.instrument.I22SAXS.I22SAXS(overrides=None, **kwargs)
    Bases: Driver
    __init__(overrides=None, **kwargs)
```

Methods

init([overrides])	
deposit_obj(obj[, uid])	Store an object in the dropbox
execute(**kwargs)	
expose(name[, empty, nframes, acq_time,])	Perform a sequence of exposures at positions defined in self.config['pos_list'].
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>post_execute(**kwargs)</pre>	Executed after each call to execute
<pre>pre_execute(**kwargs)</pre>	Executed before each call to execute
queued()	
quickbar()	
<pre>read_integrated(scanid)</pre>	Scans the appropriate directory for the filename of the data collected with filename
reset_sample()	
<pre>retrieve_obj(uid[, delete])</pre>	Retrieve an object from the dropbox
set_config(**kwargs)	
set_data(data)	Set data in the DataPacket object
<pre>set_object([serialized])</pre>	
<pre>set_sample(sample_name[, sample_uuid])</pre>	
status()	
unqueued()	

Attributes

```
defaults
defaults = {'acq_time': 1, 'acq_timeout': 120, 'address':
'data_read_cooldown': 5, 'empty_scan_id': '', 'file_read_timeout':
'nframes': 1, 'port': 2222, 'pos_list': [], 'processed_base_path':
'/mnt/i22_processed/i22-', 'reduced_data_suffix':
'_saxs_Transmission_Averaged_Subtracted_IvsQ_processed.nxs', 'ssh_key_path': '',
'username': ''}
__init__(overrides=None, **kwargs)
expose(name, empty=False, nframes=None, acq_time=None, set_empty=False)
     Perform a sequence of exposures at positions defined in self.config['pos_list'].
     Return the integrated data of the measurement with the lowest measured sample transmission.
read_integrated(scanid)
     Scans the appropriate directory for the filename of the data collected with filename
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
    by subclasses.
queued()
quickbar()
```

```
reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
              Parameters
                 uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
              Parameters
                  • data (dict) – Dictionary of data to store in the driver object
                  • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     status()
     unqueued()
class AFL.automation.instrument.I22SAXS.I22SAXS(overrides=None, **kwargs)
     defaults = {'acq_time': 1, 'acq_timeout': 120, 'address': '',
     'data_read_cooldown': 5, 'empty_scan_id': '', 'file_read_timeout': 30,
     'nframes': 1, 'port': 2222, 'pos_list': [], 'processed_base_path':
     '/mnt/i22_processed/i22-', 'reduced_data_suffix':
     '_saxs_Transmission_Averaged_Subtracted_IvsQ_processed.nxs', 'ssh_key_path': '',
     'username': ''}
     __init__(overrides=None, **kwargs)
     expose(name, empty=False, nframes=None, acq_time=None, set_empty=False)
          Perform a sequence of exposures at positions defined in self.config['pos_list'].
          Return the integrated data of the measurement with the lowest measured sample transmission.
     read_integrated(scanid)
          Scans the appropriate directory for the filename of the data collected with filename
```

AFL.automation.instrument.NetworkCamera

Classes

NetworkCamera(url)

AFL.automation.instrument.NetworkCamera.NetworkCamera

```
class AFL.automation.instrument.NetworkCamera.NetworkCamera(url)
Bases: object
__init__(url)

Methods

__init__(url)

camera_reset()

collect()

__init__(url)

camera_reset()

collect()

class AFL.automation.instrument.NetworkCamera.NetworkCamera(url)
```

AFL.automation.instrument.SeabreezeUVVis

Classes

__init__(*url*)

collect()

camera_reset()

Driver(name[, defaults, overrides])	
Eq(key, value)	Query equality of a given key's value to the specified value.
Path(*args, **kwargs)	PurePath subclass that can make system calls.
SeabreezeUVVis([backend, device_serial,])	

AFL.automation.instrument.SeabreezeUVVis.Driver

```
class AFL.automation.instrument.SeabreezeUVVis.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
           Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
           :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
           Retrieve an object from the dropbox
               Parameters
                   uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
           Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.instrument.SeabreezeUVVis.Eq
class AFL.automation.instrument.SeabreezeUVVis.Eq(key: str, value: Any)
     Bases: NoBool
     Query equality of a given key's value to the specified value.
     See Key in this module for a more intuitive interface for equality.
```

Parameters

- **key** (*str*) e.g. "color", "sample.name"
- **value** (*JSONSerializable*) May be a string, number, list, or dict.

Examples

Search for color == "red"

```
>>> c.search(Eq("color", "red"))
```

```
__init__(key: str, value: Any) \rightarrow None
```

Methods

```
__init__(key, value)

decode(*, key, value)

encode()
```

Attributes

```
key value
```

```
key: str
value: Any
encode()
classmethod decode(*, key, value)
__init__(key: str, value: Any) → None
```

AFL.automation.instrument.SeabreezeUVVis.Path

```
class AFL.automation.instrument.SeabreezeUVVis.Path(*args, **kwargs)
```

Bases: PurePath

PurePath subclass that can make system calls.

Path represents a filesystem path but unlike PurePath, also offers methods to do system calls on path objects. Depending on your system, instantiating a Path will return either a PosixPath or a WindowsPath object. You can also instantiate a PosixPath or WindowsPath directly, but cannot instantiate a WindowsPath on a POSIX system or vice versa.

```
__init__()
```

init()	
absolute()	Return an absolute version of this path by prepending
. 0	the current working directory.
as_posix()	Return the string representation of the path with forward (/) slashes.
as_uri()	Return the path as a 'file' URI.
<pre>chmod(mode, *[, follow_symlinks])</pre>	Change the permissions of the path, like os.chmod().
cwd()	Return a new path pointing to the current working directory (as returned by os.getcwd()).
exists()	Whether this path exists.
expanduser()	Return a new path with expanded ~ and ~user con-
	structs (as returned by os.path.expanduser)
glob(pattern)	Iterate over this subtree and yield all existing files (of any kind, including directories) matching the given relative pattern.
group()	Return the group name of the file gid.
hardlink_to(target)	Make this path a hard link pointing to the same file as
, ,	target.
home()	Return a new path pointing to the user's home direc-
	tory (as returned by os.path.expanduser('~')).
is_absolute()	True if the path is absolute (has both a root and, it
	applicable, a drive).
is_block_device()	Whether this path is a block device.
is_char_device()	Whether this path is a character device.
is_dir()	Whether this path is a directory.
is_fifo()	Whether this path is a FIFO.
is_file()	Whether this path is a regular file (also True for symlinks pointing to regular files).
is_mount()	Check if this path is a POSIX mount point
is_relative_to(*other)	Return True if the path is relative to another path or False.
is_reserved()	Return True if the path contains one of the special
	names reserved by the system, if any.
is_socket()	Whether this path is a socket.
is_symlink()	Whether this path is a symbolic link.
iterdir()	Iterate over the files in this directory.
joinpath(*args)	Combine this path with one or several arguments, and
	return a new path representing either a subpath (if al
	arguments are relative paths) or a totally different path
	(if one of the arguments is anchored).
1chmod(mode)	Like chmod(), except if the path points to a symlink
	the symlink's permissions are changed, rather than its
1:-1- +-(44)	target's.
link_to(target)	Make the target path a hard link pointing to this path
lstat()	Like stat(), except if the path points to a symlink, the
	symlink's status information is returned, rather than
<pre>match(path_pattern)</pre>	its target's. Return True if this path matches the given pattern.
mkdir([mode, parents, exist_ok])	Create a new directory at this given path.
miserr ([mode, parents, exist_ok])	continues on next page

continues on next page

Table 7 – continued from previous page

open([mode, buffering, encoding, errors,]) Open the file pointed by this path and return a file object, as the built-in open() function does. owner() Return the login name of the file owner. read_bytes() Open the file in bytes mode, read it, and close the file. read_tink() Return the path to which the symbolic link points. relative_to(*other) Return the relative path to another path identified by the passed arguments. rename(target) Rename this path to the target path. replace(target) Make the path absolute, resolving all symlinks on the way and also normalizing it. resolve([strict]) Make the path absolute, resolving all symlinks on the way and also normalizing it. rglob(pattern) Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree. rmdir() Remove this directory. samefile(other_path) Return whether other_path is the same or not as this file (as returned by os.path.samefile()). stat(*[, follow_symlinks]) Return the result of the stat() system call on this path, like os.stat() does. symlink_to(target[, target_is_directory]) Make this path a symlink pointing to the target path. touch([mode, exist_ok]) Create this file with the given access mode, if it doesn't exist. unlink([miss		- 1 1 3 -
owner()Return the login name of the file owner.read_bytes()Open the file in bytes mode, read it, and close the file.read_text([encoding, errors])Open the file in text mode, read it, and close the file.readlink()Return the path to which the symbolic link points.relative_to(*other)Return the relative path to another path identified by the passed arguments.rename(target)Rename this path to the target path, overwriting if that path exists.resolve([strict])Make the path absolute, resolving all symlinks on the way and also normalizing it.rglob(pattern)Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.rmdir()Remove this directory.samefile(other_path)Return whether other_path is the same or not as this file (as returned by os.path.samefile()).stat(*[, follow_symlinks])Return the result of the stat() system call on this path, like os.stat() does.symlink_to(target[, target_is_directory])Make this path a symlink pointing to the target path.touch([mode, exist_ok])Create this file with the given access mode, if it doesn't exist.unlink([missing_ok])Remove this file or link.with_name(name)Return a new path with the file name changed.with_stem(stem)Return a new path with the file suffix changed.with_stem(stem)Return a new path with the file suffix changed.write_bytes(data)Open the file in bytes mode, write to it, and close the file.	<pre>open([mode, buffering, encoding, errors,])</pre>	• • • • • • • • • • • • • • • • • • • •
read_bytes()Open the file in bytes mode, read it, and close the file.read_text([encoding, errors])Open the file in text mode, read it, and close the file.readlink()Return the path to which the symbolic link points.relative_to(*other)Return the relative path to another path identified by the passed arguments.rename(target)Rename this path to the target path.replace(target)Rename this path to the target path, overwriting if that path exists.resolve([strict])Make the path absolute, resolving all symlinks on the way and also normalizing it.rglob(pattern)Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.rmdir()Remove this directory.samefile(other_path)Return whether other_path is the same or not as this file (as returned by os.path.samefile()).stat(*[, follow_symlinks])Return the result of the stat() system call on this path, like os.stat() does.symlink_to(target[, target_is_directory])Make this path a symlink pointing to the target path.touch([mode, exist_ok])Create this file with the given access mode, if it doesn't exist.unlink([missing_ok])Remove this file or link.with_name(name)Return a new path with the file name changed.with_stem(stem)Return a new path with the file suffix changed.write_bytes(data)Open the file in bytes mode, write to it, and close the file.write_text(data[, encoding, errors, newline])Open the file in text mode, write to it, and close the		1
read_text([encoding, errors])Open the file in text mode, read it, and close the file.readlink()Return the path to which the symbolic link points.relative_to(*other)Return the relative path to another path identified by the passed arguments.rename(target)Rename this path to the target path.replace(target)Rename this path to the target path, overwriting if that path exists.resolve([strict])Make the path absolute, resolving all symlinks on the way and also normalizing it.rglob(pattern)Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.rmdir()Remove this directory.samefile(other_path)Return whether other_path is the same or not as this file (as returned by os.path.samefile()).stat(*[, follow_symlinks])Return the result of the stat() system call on this path, like os.stat() does.symlink_to(target[, target_is_directory])Make this path a symlink pointing to the target path.touch([mode, exist_ok])Create this file with the given access mode, if it doesn't exist.unlink([missing_ok])Remove this file or link.with_name(name)Return a new path with the file name changed.with_stem(stem)Return a new path with the stem changed.write_bytes(data)Open the file in bytes mode, write to it, and close the file.write_text(data[, encoding, errors, newline])Open the file in text mode, write to it, and close the file.	owner()	Return the login name of the file owner.
readlink()Return the path to which the symbolic link points.relative_to(*other)Return the relative path to another path identified by the passed arguments.rename(target)Rename this path to the target path.replace(target)Rename this path to the target path, overwriting if that path exists.resolve([strict])Make the path absolute, resolving all symlinks on the way and also normalizing it.rglob(pattern)Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.rmdir()Remove this directory.samefile(other_path)Return whether other_path is the same or not as this file (as returned by os.path.samefile()).stat(*[, follow_symlinks])Return the result of the stat() system call on this path, like os.stat() does.symlink_to(target[, target_is_directory])Make this path a symlink pointing to the target path.touch([mode, exist_ok])Create this file with the given access mode, if it doesn't exist.unlink([missing_ok])Remove this file or link.with_name(name)Return a new path with the file name changed.with_stem(stem)Return a new path with the stem changed.with_stefix(suffix)Return a new path with the file suffix changed.write_bytes(data)Open the file in bytes mode, write to it, and close the file.write_text(data[, encoding, errors, newline])Open the file in text mode, write to it, and close the	read_bytes()	Open the file in bytes mode, read it, and close the file.
relative_to(*other)Return the relative path to another path identified by the passed arguments.rename(target)Rename this path to the target path.replace(target)Rename this path to the target path, overwriting if that path exists.resolve([strict])Make the path absolute, resolving all symlinks on the way and also normalizing it.rglob(pattern)Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.rmdir()Remove this directory.samefile(other_path)Return whether other_path is the same or not as this file (as returned by os.path.samefile()).stat(*[, follow_symlinks])Return the result of the stat() system call on this path, like os.stat() does.symlink_to(target[, target_is_directory])Make this path a symlink pointing to the target path.touch([mode, exist_ok])Create this file with the given access mode, if it doesn't exist.unlink([missing_ok])Remove this file or link.with_name(name)Return a new path with the file name changed.with_stem(stem)Return a new path with the file suffix changed.with_suffix(suffix)Return a new path with the file suffix changed.write_bytes(data)Open the file in bytes mode, write to it, and close the file.write_text(data[, encoding, errors, newline])Open the file in text mode, write to it, and close the	<pre>read_text([encoding, errors])</pre>	Open the file in text mode, read it, and close the file.
the passed arguments. rename(target) Rename this path to the target path. Rename this path to the target path, overwriting if that path exists. resolve([strict]) Make the path absolute, resolving all symlinks on the way and also normalizing it. Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree. rmdir() Remove this directory. samefile(other_path) Return whether other_path is the same or not as this file (as returned by os.path.samefile()). stat(*[, follow_symlinks]) Return the result of the stat() system call on this path, like os.stat() does. symlink_to(target[, target_is_directory]) Make this path a symlink pointing to the target path. touch([mode, exist_ok]) Create this file with the given access mode, if it doesn't exist. unlink([missing_ok]) Remove this file or link. with_name(name) Return a new path with the file name changed. with_stem(stem) with_suffix(suffix) Return a new path with the file suffix changed. write_bytes(data) Open the file in bytes mode, write to it, and close the file. write_text(data[, encoding, errors, newline])	readlink()	Return the path to which the symbolic link points.
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replace(target)Rename this path to the target path, overwriting if that path exists.resolve([strict])Make the path absolute, resolving all symlinks on the way and also normalizing it.rglob(pattern)Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.rmdir()Remove this directory.samefile(other_path)Return whether other_path is the same or not as this file (as returned by os.path.samefile()).stat(*[, follow_symlinks])Return the result of the stat() system call on this path, like os.stat() does.symlink_to(target[, target_is_directory])Make this path a symlink pointing to the target path.touch([mode, exist_ok])Create this file with the given access mode, if it doesn't exist.unlink([missing_ok])Remove this file or link.with_name(name)Return a new path with the file name changed.with_stem(stem)Return a new path with the stem changed.with_suffix(suffix)Return a new path with the file suffix changed.write_bytes(data)Open the file in bytes mode, write to it, and close the file.write_text(data[, encoding, errors, newline])Open the file in text mode, write to it, and close the		the passed arguments.
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file. write_text(data[, encoding, errors, newline]) file. Open the file in text mode, write to it, and close the	<pre>with_suffix(suffix)</pre>	Return a new path with the file suffix changed.
write_text(data[, encoding, errors, newline]) Open the file in text mode, write to it, and close the	<pre>write_bytes(data)</pre>	Open the file in bytes mode, write to it, and close the
		file.
file.	<pre>write_text(data[, encoding, errors, newline])</pre>	Open the file in text mode, write to it, and close the
		file.

Attributes

anchor	The concatenation of the drive and root, or ".
drive	The drive prefix (letter or UNC path), if any.
name	The final path component, if any.
parent	The logical parent of the path.
parents	A sequence of this path's logical parents.
parts	An object providing sequence-like access to the com-
	ponents in the filesystem path.
root	The root of the path, if any.
stem	The final path component, minus its last suffix.
suffix	The final component's last suffix, if any.
suffixes	A list of the final component's suffixes, if any.

classmethod cwd()

Return a new path pointing to the current working directory (as returned by os.getcwd()).

classmethod home()

Return a new path pointing to the user's home directory (as returned by os.path.expanduser('~')).

samefile(other path)

Return whether other_path is the same or not as this file (as returned by os.path.samefile()).

iterdir()

Iterate over the files in this directory. Does not yield any result for the special paths '.' and '..'.

glob(pattern)

Iterate over this subtree and yield all existing files (of any kind, including directories) matching the given relative pattern.

rglob(pattern)

Recursively yield all existing files (of any kind, including directories) matching the given relative pattern, anywhere in this subtree.

absolute()

Return an absolute version of this path by prepending the current working directory. No normalization or symlink resolution is performed.

Use resolve() to get the canonical path to a file.

resolve(strict=False)

Make the path absolute, resolving all symlinks on the way and also normalizing it.

stat(*, follow_symlinks=True)

Return the result of the stat() system call on this path, like os.stat() does.

owner()

Return the login name of the file owner.

group()

Return the group name of the file gid.

```
open(mode='r', buffering=-1, encoding=None, errors=None, newline=None)
```

Open the file pointed by this path and return a file object, as the built-in open() function does.

read_bytes()

Open the file in bytes mode, read it, and close the file.

read_text(encoding=None, errors=None)

Open the file in text mode, read it, and close the file.

write_bytes(data)

Open the file in bytes mode, write to it, and close the file.

write_text(data, encoding=None, errors=None, newline=None)

Open the file in text mode, write to it, and close the file.

readlink()

Return the path to which the symbolic link points.

touch(mode=438, exist_ok=True)

Create this file with the given access mode, if it doesn't exist.

mkdir(mode=511, parents=False, exist_ok=False)

Create a new directory at this given path.

chmod(mode, *, follow_symlinks=True)

Change the permissions of the path, like os.chmod().

lchmod(mode)

Like chmod(), except if the path points to a symlink, the symlink's permissions are changed, rather than its target's.

unlink(missing_ok=False)

Remove this file or link. If the path is a directory, use rmdir() instead.

rmdir()

Remove this directory. The directory must be empty.

lstat()

Like stat(), except if the path points to a symlink, the symlink's status information is returned, rather than its target's.

rename(target)

Rename this path to the target path.

The target path may be absolute or relative. Relative paths are interpreted relative to the current working directory, *not* the directory of the Path object.

Returns the new Path instance pointing to the target path.

replace(target)

Rename this path to the target path, overwriting if that path exists.

The target path may be absolute or relative. Relative paths are interpreted relative to the current working directory, *not* the directory of the Path object.

Returns the new Path instance pointing to the target path.

symlink_to(target, target_is_directory=False)

Make this path a symlink pointing to the target path. Note the order of arguments (link, target) is the reverse of os.symlink.

hardlink_to(target)

Make this path a hard link pointing to the same file as target.

Note the order of arguments (self, target) is the reverse of os.link's.

link_to(target)

Make the target path a hard link pointing to this path.

Note this function does not make this path a hard link to *target*, despite the implication of the function and argument names. The order of arguments (target, link) is the reverse of Path.symlink_to, but matches that of os.link.

Deprecated since Python 3.10 and scheduled for removal in Python 3.12. Use *hardlink_to()* instead.

exists()

Whether this path exists.

is_dir()

Whether this path is a directory.

is_file()

Whether this path is a regular file (also True for symlinks pointing to regular files).

is_mount()

Check if this path is a POSIX mount point

is_symlink()

Whether this path is a symbolic link.

is_block_device()

Whether this path is a block device.

is_char_device()

Whether this path is a character device.

is_fifo()

Whether this path is a FIFO.

is_socket()

Whether this path is a socket.

expanduser()

Return a new path with expanded ~ and ~user constructs (as returned by os.path.expanduser)

__bytes__()

Return the bytes representation of the path. This is only recommended to use under Unix.

__str__()

Return the string representation of the path, suitable for passing to system calls.

property anchor

The concatenation of the drive and root, or ".

as_posix()

Return the string representation of the path with forward (/) slashes.

as_uri()

Return the path as a 'file' URI.

property drive

The drive prefix (letter or UNC path), if any.

is_absolute()

True if the path is absolute (has both a root and, if applicable, a drive).

is_relative_to(*other)

Return True if the path is relative to another path or False.

is_reserved()

Return True if the path contains one of the special names reserved by the system, if any.

joinpath(*args)

Combine this path with one or several arguments, and return a new path representing either a subpath (if all arguments are relative paths) or a totally different path (if one of the arguments is anchored).

match(path_pattern)

Return True if this path matches the given pattern.

property name

The final path component, if any.

property parent

The logical parent of the path.

property parents

A sequence of this path's logical parents.

property parts

An object providing sequence-like access to the components in the filesystem path.

relative_to(*other)

Return the relative path to another path identified by the passed arguments. If the operation is not possible (because this is not a subpath of the other path), raise ValueError.

property root

The root of the path, if any.

property stem

The final path component, minus its last suffix.

property suffix

The final component's last suffix, if any.

This includes the leading period. For example: '.txt'

property suffixes

A list of the final component's suffixes, if any.

These include the leading periods. For example: ['.tar', '.gz']

with_name(name)

Return a new path with the file name changed.

with_stem(stem)

Return a new path with the stem changed.

with_suffix(suffix)

Return a new path with the file suffix changed. If the path has no suffix, add given suffix. If the given suffix is an empty string, remove the suffix from the path.

AFL.automation.instrument.SeabreezeUVVis.SeabreezeUVVis

```
\begin{tabular}{ll} \textbf{class} & \textbf{AFL}. \textbf{automation.instrument.SeabreezeUVVis.SeabreezeUVVis} (backend='cseabreeze', \\ & device\_serial=None, \\ & overrides=None) \end{tabular}
```

```
Bases: Driver
```

```
__init__(backend='cseabreeze', device_serial=None, overrides=None)
```

Methods

```
__init__([backend, device_serial, overrides])

collect(nframes[, reduced, absorbance, ...])

collectContinuous(duration[, start, return_data])
```

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Table 8 – continued from previous page

Table 8 – continued	from previous page
<pre>collectSingleSpectrum([set_reference, set_air])</pre>	
<pre>deposit_obj(obj[, uid])</pre>	Store an object in the dropbox
execute(**kwargs)	2.000 m. 00,000 m. 000 p. 000
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>getExposure()</pre>	
<pre>getExposureDelay()</pre>	
<pre>getFilename()</pre>	
<pre>getFilepath()</pre>	
<pre>getSaveSingleScan()</pre>	
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
post_execute(**kwargs)	Executed after each call to execute
pre_execute(**kwargs)	Executed before each call to execute
queued()	
quickbar()	
reduced(data_raw_mean, data_raw_std[,])	
reset_sample()	
<pre>retrieve_obj(uid[, delete])</pre>	Retrieve an object from the dropbox
setExposure(time)	ı
setExposureDelay(time)	
setFilename(filename)	
setFilepath(filepath)	
setSaveSingleScan(saveSingleScan)	
<pre>set_config(**kwargs)</pre>	
set_data(data)	Set data in the DataPacket object
set_object([serialized])	
	continues on next page

continues on next page

Table 8 – continued from previous page

```
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

Attributes

```
defaults
```

```
defaults = {'air_uuid': '', 'correctDarkCounts': False, 'correctNonlinearity':
False, 'exposure': 0.01, 'exposure_delay': 0, 'filename': 'test.h5', 'filepath':
'.', 'reference_uuid': '', 'saveSingleScan': False}
__init__(backend='cseabreeze', device_serial=None, overrides=None)
getExposure()
getExposureDelay()
getFilename()
getSaveSingleScan()
getFilepath()
setFilepath(filepath)
setFilename(filename)
setSaveSingleScan(saveSingleScan)
setExposureDelay(time)
setExposure(time)
collectContinuous(duration, start=None, return_data=False, **kwargs)
collectSingleSpectrum(set_reference=False, set_air=False, **kwargs)
collect(nframes: int, reduced: bool = False, absorbance: bool = True, set\_reference: bool = False, set\_air:
         bool = False, exposure: float | None = None, return_data: bool = False, **kwargs)
reduced(data_raw_mean, data_raw_std, absorbance=True, reference_uuid='reference_uuid')
deposit_obj(obj, uid=None)
    Store an object in the dropbox
```

Parameters

- **obj** (*object*) The object to store in the dropbox
- **uid** (*str*) The uuid to store the object under

```
execute(**kwargs)
     classmethod gather_defaults()
           Gather all inherited static class-level dictionaries called default.
     get_config(name, print_console=False)
     get_configs(print_console=False)
     get_object(name, serialize=True)
     get_sample()
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     retrieve_obj(uid, delete=True)
           Retrieve an object from the dropbox
               Parameters
                   uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
           Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
           :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     status()
     unqueued()
class AFL.automation.instrument.SeabreezeUVVis.SeabreezeUVVis(backend='cseabreeze',
                                                                           device serial=None,
                                                                           overrides=None)
```

```
defaults = {'air_uuid': '', 'correctDarkCounts': False, 'correctNonlinearity':
False, 'exposure': 0.01, 'exposure_delay': 0, 'filename': 'test.h5', 'filepath':
'.', 'reference_uuid': '', 'saveSingleScan': False}
__init__(backend='cseabreeze', device_serial=None, overrides=None)
getExposure()
getExposureDelay()
getFilename()
getSaveSingleScan()
getFilepath()
setFilepath(filepath)
setFilename(filename)
setSaveSingleScan(saveSingleScan)
setExposureDelay(time)
setExposure(time)
collectContinuous(duration, start=None, return_data=False, **kwargs)
collectSingleSpectrum(set_reference=False, set_air=False, **kwargs)
collect(nframes: int, reduced: bool = False, absorbance: bool = True, set\_reference: bool = False, set\_air:
        bool = False, exposure: float | None = None, return data: bool = False, **kwargs)
reduced(data raw mean, data raw std, absorbance=True, reference uuid='reference uuid')
```

AFL.automation.instrument.SpecScreen Driver

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x, l)	Return the square root of x.

AFL.automation.instrument.SpecScreen Driver.ceil

```
AFL.automation.instrument.SpecScreen_Driver.ceil(x,/)
Return the ceiling of x as an Integral.

This is the smallest integer >= x.
```

AFL.automation.instrument.SpecScreen Driver.listify

AFL.automation.instrument.SpecScreen_Driver.listify(obj)

AFL.automation.instrument.SpecScreen_Driver.sqrt

AFL.automation.instrument.SpecScreen_Driver. $\mathbf{sqrt}(x,/)$ Return the square root of x.

Classes

```
Driver(name[, defaults, overrides])
SpecScreen_Driver([log_file])
```

AFL.automation.instrument.SpecScreen_Driver.Driver

```
class AFL.automation.instrument.SpecScreen_Driver.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
                                                    Executed before each call to execute
 pre_execute(**kwargs)
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                  uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
          Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.instrument.SpecScreen Driver.SpecScreen Driver
class AFL.automation.instrument.SpecScreen_Driver.SpecScreen_Driver(log_file=None)
     Bases: Driver
     __init__(log_file=None)
```

```
__init__([log_file])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
                                                    Executed before each call to execute
 pre_execute(**kwargs)
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
__init__(log_file=None)
status()
execute(**kwargs)
```

deposit_obj(obj, uid=None)

Store an object in the dropbox

Parameters

- **obj** (*object*) The object to store in the dropbox
- **uid** (*str*) The uuid to store the object under

classmethod gather_defaults()

Gather all inherited static class-level dictionaries called default.

```
get_config(name, print_console=False)
     get_configs(print_console=False)
     get_object(name, serialize=True)
     get_sample()
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                  uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
class AFL.automation.instrument.SpecScreen_Driver.SpecScreen_Driver(log_file=None)
     __init__(log_file=None)
     status()
     execute(**kwargs)
```

6.2.3 Loading

The Loading module provides functionality for loading and handling samples.

AFL.automation.loading

AFL.automation.loading

Modules

CetoniMultiPosValve	
ChemyxSyringePump	This is largely duplicated from the reference code provided by Chemyx.
DigitalOutPressureController	vided by Chemyx.
DoubleViciMultiposSelector	
DummyPump	
FlowSelector	
LoadStopperDriver	
MultiChannelRelay	
NE1kSyringePump	
OneSelectorBlowoutSampleCell	
PneumaticPressureSampleCell	
PneumaticSampleCell	
PressureController	
PressureControllerAsPump	
PushPullSelectorSampleCell	
RSoXSSolutionSampleCell	
SainSmartRelay	
SampleCell	
Sensor	
SensorCallbackThread	
SensorPollingThread	
SerialDevice	
SyringePump	
Tubing	
TwoSelectorBlowoutSampleCell	
UltimusVPressureController	
ViciMultiposSelector	
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AFL.automation.loading.CetoniMultiPosValve

Classes

```
CetoniMultiPosValve(parentpump[, portlabels])

FlowSelector()
```

AFL.automation.loading.CetoniMultiPosValve.CetoniMultiPosValve

Bases: FlowSelector

__init__(parentpump, portlabels={})

connect to valve and query the number of positions

Parameters

- to (port string describing the serial port the actuator is connected)
- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

Methods

init(parentpump[, portlabels])	connect to valve and query the number of positions
<pre>getPort([as_str])</pre>	query the current selected position
<pre>selectPort(port[, direction])</pre>	moves the selector to portnum

__init__(parentpump, portlabels={})

connect to valve and query the number of positions

Parameters

- to (port string describing the serial port the actuator is connected)
- **use** (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

selectPort(port, direction=None)

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

```
getPort(as_str=False)
          query the current selected position
AFL.automation.loading.CetoniMultiPosValve.FlowSelector
class AFL.automation.loading.CetoniMultiPosValve.FlowSelector
     Bases: object
     __init__()
     Methods
       __init__()
       getPort()
       selectPort()
     getPort()
     selectPort()
class AFL.automation.loading.CetoniMultiPosValve.CetoniMultiPosValve(parentpump,
                                                                                portlabels={})
     __init__(parentpump, portlabels={})
          connect to valve and query the number of positions
              Parameters
                  • to
                                  (port - string describing the serial port the actuator is
                    connected)
                  • use (baud - baudrate to)

    naming

                                   (portlabels - dict for smart port)
                                                                                           3.'instru-
                    ment':4,'rinse':5,'waste':6}
                  • {'sample' (of the form) - 3,'instrument':4,'rinse':5,'waste':6}
     selectPort(port, direction=None)
          moves the selector to portnum
          if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value,
          will move via most efficient route.
```

AFL.automation.loading.ChemyxSyringePump

query the current selected position

getPort(as_str=False)

This is largely duplicated from the reference code provided by Chemyx. Their package is a GUI and direct import of the module would be problematic.

Functions

<pre>getOpenPorts()</pre>	
<pre>parsePortName(portinfo)</pre>	On macOS and Linux, selects only usbserial options and parses the 8 character serial number.

AFL.automation.loading.ChemyxSyringePump.getOpenPorts

AFL.automation.loading.ChemyxSyringePump.getOpenPorts()

AFL.automation.loading.ChemyxSyringePump.parsePortName

AFL.automation.loading.ChemyxSyringePump.parsePortName(portinfo)

On macOS and Linux, selects only usbserial options and parses the 8 character serial number.

Classes

```
ChemyxConnection(port, baudrate[, x, mode, ...])

ChemyxSyringePump(port, syringe_id_mm, ...)

SyringePump()
```

AFL.automation.loading.ChemyxSyringePump.ChemyxConnection

Bases: object
__init__(port, baudrate, x=0, mode=0, verbose=False)

```
__init__(port, baudrate[, x, mode, verbose])
 addMode(command)
 addX(command)
 closeConnection()
 getDisplacedVolume()
 getElapsedTime()
 getParameterLimits()
 getParameters()
 getPumpStatus()
 getResponse()
 openConnection()
 pausePump()
 restartPump()
 sendCommand(command)
 setDelay(delay)
 setDiameter(diameter)
 setRate(rate)
 setTime(timer)
 setUnits(units)
 setVolume(volume)
 startPump()
 stopPump()
__init__(port, baudrate, x=0, mode=0, verbose=False)
openConnection()
closeConnection()
```

```
sendCommand(command)
     getResponse()
     startPump()
     stopPump()
     pausePump()
     restartPump()
     setUnits(units)
     setDiameter(diameter)
     setRate(rate)
     setVolume(volume)
     setDelay(delay)
     setTime(timer)
     getParameterLimits()
     getParameters()
     getDisplacedVolume()
     getElapsedTime()
     getPumpStatus()
     addMode(command)
     addX(command)
AFL.automation.loading.ChemyxSyringePump.ChemyxSyringePump
class AFL.automation.loading.ChemyxSyringePump.ChemyxSyringePump(port, syringe_id_mm,
                                                                        syringe_volume, baud=9600,
                                                                        flow delay=5)
     Bases: SyringePump
     __init__(port, syringe_id_mm, syringe_volume, baud=9600, flow_delay=5)
          Initializes and verifies connection to a Chemyx syringe pump.
              port = serial port reference
              syringe_id_mm = syringe inner diameter in mm, used for absolute volume.
                 (will re-program the pump with this diameter on connection)
              syringe_volume = syringe volume in mL
              baud = baudrate for connection
```

```
__init__(port, syringe_id_mm, syringe_volume)
                                                    Initializes and verifies connection to a Chemyx sy-
                                                    ringe pump.
blockUntilStatusStopped([pollingdelay])
                                                    This is a deprecated function from old serial logic.
dispense(volume[, block, delay])
emptySyringe()
getLevel()
getRate()
getStatus()
                                                    query the pump status and return whether the pump
                                                    is moving or not (true if moving, false if stopped)
getValueFromParams(search_key)
setLevel(level)
setRate(rate)
                                                    Abort the current dispense/withdraw action.
stop()
wait_dosage_finished([timeout_seconds])
                                                    The function waits until the last dosage command has
                                                    finished until the timeout occurs.
withdraw(volume[, block, delay])
```

```
__init__(port, syringe_id_mm, syringe_volume, baud=9600, flow_delay=5)
     Initializes and verifies connection to a Chemyx syringe pump.
         port = serial port reference
         syringe id mm = syringe inner diameter in mm, used for absolute volume.
             (will re-program the pump with this diameter on connection)
         syringe_volume = syringe volume in mL
         baud = baudrate for connection
wait_dosage_finished(timeout seconds=60)
     The function waits until the last dosage command has finished until the timeout occurs.
stop()
     Abort the current dispense/withdraw action.
withdraw(volume, block=True, delay=True)
dispense(volume, block=True, delay=True)
setRate(rate)
getRate()
emptySyringe()
```

getLevel()

```
setLevel(level)
     blockUntilStatusStopped(pollingdelay=0.2)
          This is a deprecated function from old serial logic. It should work, but do not use.
     getStatus()
          query the pump status and return whether the pump is moving or not (true if moving, false if stopped)
     getValueFromParams(search_key)
AFL.automation.loading.ChemyxSyringePump.SyringePump
class AFL.automation.loading.ChemyxSyringePump.SyringePump
     Bases: object
     __init__()
     Methods
      __init__()
      dispense(volume[, block])
      emptySyringe()
      getRate(rate)
      setRate(rate)
      stop()
      withdraw(volume[, block])
     stop()
     withdraw(volume, block=True)
     dispense(volume, block=True)
     setRate(rate)
     getRate(rate)
     emptySyringe()
class AFL.automation.loading.ChemyxSyringePump.ChemyxSyringePump(port, syringe_id_mm,
                                                                          syringe_volume, baud=9600,
                                                                          flow_delay=5)
     __init__(port, syringe_id_mm, syringe_volume, baud=9600, flow_delay=5)
          Initializes and verifies connection to a Chemyx syringe pump.
              port = serial port reference
```

```
syringe id mm = syringe inner diameter in mm, used for absolute volume.
                                              (will re-program the pump with this diameter on connection)
                                    syringe_volume = syringe volume in mL
                                    baud = baudrate for connection
             wait_dosage_finished(timeout seconds=60)
                          The function waits until the last dosage command has finished until the timeout occurs.
             stop()
                          Abort the current dispense/withdraw action.
             withdraw(volume, block=True, delay=True)
             dispense(volume, block=True, delay=True)
             setRate(rate)
             getRate()
             emptySyringe()
             getLevel()
             setLevel(level)
             blockUntilStatusStopped(pollingdelay=0.2)
                          This is a deprecated function from old serial logic. It should work, but do not use.
             getStatus()
                          query the pump status and return whether the pump is moving or not (true if moving, false if stopped)
             getValueFromParams(search_key)
AFL.automation.loading.ChemyxSyringePump.getOpenPorts()
AFL.automation.loading.ChemyxSyringePump.parsePortName(portinfo)
             On macOS and Linux, selects only usbserial options and parses the 8 character serial number.
\textbf{class} \  \, \textbf{AFL}. automation.loading. ChemyxSyringePump. \textbf{ChemyxConnection} (port, baudrate, x=0, mode=0, mode=
                                                                                                                                                                                             verbose=False)
             __init__(port, baudrate, x=0, mode=0, verbose=False)
             openConnection()
             closeConnection()
             sendCommand(command)
             getResponse()
             startPump()
             stopPump()
             pausePump()
             restartPump()
```

```
setUnits(units)
setDiameter(diameter)
setRate(rate)
setVolume(volume)
setDelay(delay)
setTime(timer)
getParameterLimits()
getParameters()
getDisplacedVolume()
getElapsedTime()
getPumpStatus()
addMode(command)
addX(command)
```

AFL.automation.loading.DigitalOutPressureController

Classes

```
DigitalOutPressureController(digital_out, ...)

PressureController()

Abstract superclass for pressure controllers that provides timed dispensing
```

AFL.automation.loading.DigitalOutPressureController.DigitalOutPressureController

 $\textbf{class AFL}. automation. loading. Digital OutPressureController. \textbf{DigitalOutPressureController} (digital_out, pressure_to_v_conv)$

init(digital_out, pressure_to_v_conv)		Initializes a DigitalOutPressureController
<pre>blockUntilStatusStopped([pollingdelay])</pre>		block execution until the controller finishes a dis-
		pense
dispenseRunning()		Returns true if a timed dispense is running, false oth-
		erwise.
<pre>ramp_dispense(dispense_start_pressure,)</pre>		Perform a pressure dispense with a linear ramp in
		pressure between dispense_start_pressure and dis-
		pense_stop_pressure, stopping after dispense_time.
<pre>set_P(pressure)</pre>		
stop()		Abort the current timed dispense action.
timed_dispense(dispense_pressure,	dis-	Perform a pressure dispense at pressure dis-
pense_time)		pense_pressure, stopping after dispense_time.

__init__(digital_out, pressure_to_v_conv)

Initializes a DigitalOutPressureController

Params:

digital_out (AFL.automation.DigitalOut): pressure_to_v_conv (float): pressure units per volt

set_P(pressure)

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

timed_dispense(dispense_pressure, dispense_time, block=True)

Perform a pressure dispense at pressure *dispense_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop().

AFL.automation.loading.DigitalOutPressureController.PressureController

class AFL.automation.loading.DigitalOutPressureController.PressureController

Bases: object

Abstract superclass for pressure controllers that provides timed dispensing

__init__()

init()	
<pre>blockUntilStatusStopped([pollingdelay])</pre>	block execution until the controller finishes a dispense
dispenseRunning()	Returns true if a timed dispense is running, false otherwise.
<pre>ramp_dispense(dispense_start_pressure,)</pre>	Perform a pressure dispense with a linear ramp in pressure between <i>dispense_start_pressure</i> and <i>dispense_stop_pressure</i> , stopping after <i>dispense_time</i> .
stop()	Abort the current timed dispense action.
<pre>timed_dispense(dispense_pressure,</pre>	Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time.

timed_dispense(dispense pressure, dispense time, block=True)

Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time. This dispense can be interrupted by calling self.stop().

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

 $\textbf{class AFL}. \textbf{automation.} loading. \textbf{DigitalOutPressureController.} \textbf{DigitalOutPressureController}. \textbf{DigitalOutPressureContro$

sure_to_v_conv)

```
__init__(digital_out, pressure_to_v_conv)
Initializes a DigitalOutPressureController
```

Params:

 $digital_out \ (AFL.automation. DigitalOut): \ pressure_to_v_conv \ (float): \ pressure_units \ per \ volt$

set_P(pressure)

AFL.automation.loading.DoubleViciMultiposSelector

Classes

```
DoubleViciMultiposSelector(port1, port2[, ...])

FlowSelector()

ViciMultiposSelector(port[, baudrate, ...])
```

AFL.automation.loading.DoubleViciMultiposSelector.DoubleViciMultiposSelector

class AFL.automation.loading.DoubleViciMultiposSelector.DoubleViciMultiposSelector(port1,

port2, baudrate=9600, portlabels=None)

Bases: FlowSelector

__init__(port1, port2, baudrate=9600, portlabels=None) connect to valve and query the number of positions

Parameters

- to (port string describing the serial port the actuator is connected)
- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

Methods

init(port1, port2[, baudrate, portlabels])	connect to valve and query the number of positions
<pre>getPort([as_str])</pre>	query the current selected position
<pre>selectPort(port[, direction])</pre>	moves the selector to portnum

__init__(port1, port2, baudrate=9600, portlabels=None) connect to valve and query the number of positions

Parameters

- to (port string describing the serial port the actuator is connected)
- **use** (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

```
AFL-automation
     selectPort(port, direction=None)
          moves the selector to portnum
          if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value,
          will move via most efficient route.
     getPort(as_str=False)
          query the current selected position
AFL.automation.loading.DoubleViciMultiposSelector.FlowSelector
class AFL.automation.loading.DoubleViciMultiposSelector.FlowSelector
     Bases: object
     __init__()
     Methods
       __init__()
      getPort()
      selectPort()
     getPort()
     selectPort()
AFL.automation.loading.DoubleViciMultiposSelector.ViciMultiposSelector
```

class AFL.automation.loading.DoubleViciMultiposSelector.ViciMultiposSelector(port, baudrate=9600, portlabels=None)

```
Bases: SerialDevice, FlowSelector
__init__(port, baudrate=9600, portlabels=None)
     connect to valve and query the number of positions
```

Parameters

- to (port - string describing the serial port the actuator is connected)
- use (baud baudrate to)
- naming (portlabels - dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

```
__init__(port[, baudrate, portlabels]) connect to valve and query the number of positions

getPort([as_str]) query the current selected position

selectPort(port[, direction, block]) moves the selector to portnum

sendCommand(cmd[, response, questionmarkOK, ...])
```

__init__(port, baudrate=9600, portlabels=None)

connect to valve and query the number of positions

Parameters

- to (port string describing the serial port the actuator is connected)
- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

selectPort(port, direction=None, block=True)

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

Parameters

- port (String or int) the name, or number, of the port to switch to
- **direction** (String, default=None) direction "CW" or "CCW" to perform the move in
- block (bool, default=True) block return until move completes

getPort(as str=False)

query the current selected position

sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)

class AFL.automation.loading.DoubleViciMultiposSelector.DoubleViciMultiposSelector(port1,

port2, baudrate=9600, portla-

bels=None)

__init__(port1, port2, baudrate=9600, portlabels=None) connect to valve and query the number of positions

Parameters

- use (baud baudrate to)

```
• naming (portlabels - dict for smart port) - 3,'instrument':4,'rinse':5,'waste':6}
```

• {'sample' (of the form) - 3,'instrument':4,'rinse':5,'waste':6}

```
selectPort(port, direction=None)
```

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

```
getPort(as_str=False)
```

query the current selected position

AFL.automation.loading.DummyPump

Classes

```
DummyPump()

SerialDevice(port[, baudrate, timeout, ...])

SyringePump()
```

AFL.automation.loading.DummyPump.DummyPump

class AFL.automation.loading.DummyPump.DummyPump

Bases: SyringePump

__init__()

Dummy pump for testing - does nothing, but boy does it look good doing it.

Methods

init()	Dummy pump for testing - does nothing, but boy does it look good doing it.
<pre>blockUntilStatusStopped([pollingdelay])</pre>	
dispense(volume[, block, delay])	
<pre>emptySyringe()</pre>	
<pre>getRate()</pre>	
<pre>getStatus()</pre>	query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
setRate(rate)	
stop()	Abort the current dispense/withdraw action.
<pre>withdraw(volume[, block, delay])</pre>	

```
__init__()
          Dummy pump for testing - does nothing, but boy does it look good doing it.
     stop()
          Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.
     withdraw(volume, block=True, delay=True)
     dispense(volume, block=True, delay=True)
     setRate(rate)
     getRate()
     emptySyringe()
     blockUntilStatusStopped(pollingdelay=0.2)
     getStatus()
          query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
AFL.automation.loading.DummyPump.SerialDevice
class AFL.automation.loading.DummyPump.SerialDevice(port, baudrate=19200, timeout=0.5,
                                                           raw_writes=False)
     Bases: object
     __init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
     Methods
      __init__(port[, baudrate, timeout, raw_writes])
      sendCommand(cmd[, response, questionmarkOK,
     __init__(port, baudrate=19200, timeout=0.5, raw writes=False)
     sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)
AFL.automation.loading.DummyPump.SyringePump
class AFL.automation.loading.DummyPump.SyringePump
     Bases: object
     __init__()
```

```
__init__()
       dispense(volume[, block])
       emptySyringe()
       getRate(rate)
       setRate(rate)
       stop()
       withdraw(volume[, block])
     stop()
     withdraw(volume, block=True)
     dispense(volume, block=True)
     setRate(rate)
     getRate(rate)
     emptySyringe()
class AFL.automation.loading.DummyPump.DummyPump
     __init__()
          Dummy pump for testing - does nothing, but boy does it look good doing it.
     stop()
          Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.
     withdraw(volume, block=True, delay=True)
     dispense(volume, block=True, delay=True)
     setRate(rate)
     getRate()
     emptySyringe()
     blockUntilStatusStopped(pollingdelay=0.2)
     getStatus()
          query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
```

AFL.automation.loading.FlowSelector

Classes

```
FlowSelector()
```

${\bf AFL}. automation. Io ading. Flow Selector. Flow Selector$

```
class AFL.automation.loading.FlowSelector.FlowSelector
    Bases: object
    __init__()
```

Methods

```
__init__()

getPort()

selectPort()
```

```
getPort()
selectPort()
class AFL.automation.loading.FlowSelector.FlowSelector
    getPort()
```

AFL.automation.loading.LoadStopperDriver

Classes

selectPort()

Client([ip, port, username, interactive])	Communicate with APIServer
Driver(name[, defaults, overrides])	
<pre>LoadStopperDriver(sensor[, load_client,])</pre>	Driver for stopping loads
SensorPollingThread(sensor[, period,])	
StopLoadCBv1(poll, period, load_client[,])	
StopLoadCBv2(poll, period[, load_client,])	

AFL.automation.loading.LoadStopperDriver.Client

Bases: object

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

__init__(ip=None, port='5000', username=None, interactive=False)

Methods

```
__init__([ip, port, username, interactive])
clear_history()
clear_queue()
debug(state)
deposit_obj(obj[, uid])
                                                   Deposit an object in the dropbox obj: object, the ob-
                                                  ject to deposit id: str, the uuid to deposit the object
                                                   under if not specified, a new uuid will be generated
driver_status()
enqueue([interactive])
enqueued_base(**kwargs)
from_server_name(server_name, **kwargs)
get_config(name[, print_console, interactive])
get_driver_object(name)
get_object(name[, serialize])
get_queue()
get_queued_commands([inherit_commands])
get_quickbar()
get_server_time()
get_unqueued_commmands([inherit_commands])
halt()
```

continues on next page

Table 9 – continued from previous page

```
logged_in()
 login(username[, populate_commands])
 move_item(uuid, pos)
 pause(state)
 query_driver(**kwargs)
 queue_state()
 remove_item(uuid)
 reset_queue_daemon()
 retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox id: str, the uuid
                                                   of the object to retrieve delete: bool, if True, delete
                                                   the object after retrieving
 server_cmd(cmd, **kwargs)
 set_config([interactive])
 set_driver_object(**kw)
 set_object([serialize])
 unqueued_base(**kwargs)
 wait([target_uuid, interval, for_history, ...])
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
logged_in()
login(username, populate_commands=True)
driver_status()
get_queue()
wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
```

```
get_unqueued_commands(inherit_commands=True)
     get_queued_commands(inherit_commands=True)
     enqueue(interactive=None, **kwargs)
     set_config(interactive=None, **kwargs)
     get_config(name, print_console=True, interactive=None)
     get_server_time()
     query_driver(**kwargs)
     reset_queue_daemon()
     pause(state)
     clear_queue()
     clear_history()
     debug(state)
     halt()
     queue_state()
     remove_item(uuid)
     move_item(uuid, pos)
     set_driver_object(**kw)
     get_driver_object(name)
     deposit_obj(obj, uid=None)
          Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
          under if not specified, a new uuid will be generated
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
          the object after retrieving
     set_object(serialize=True, **kw)
     get_object(name, serialize=True)
AFL.automation.loading.LoadStopperDriver.Driver
class AFL.automation.loading.LoadStopperDriver.Driver(name, defaults=None, overrides=None)
     Bases: object
     __init__(name, defaults=None, overrides=None)
```

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

overrides=None, data=None,

name='LoadStopperDriver')

sensorlabel=",

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
           Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
           :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
           Retrieve an object from the dropbox
               Parameters
                   uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
           Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.loading.LoadStopperDriver.LoadStopperDriver
class AFL.automation.loading.LoadStopperDriver.LoadStopperDriver(sensor, load_client=None,
                                                                               load object=None,
                                                                               auto_initialize=True,
```

Bases: Driver

Driver for stopping loads

__init__(sensor, load_client=None, load_object=None, auto_initialize=True, overrides=None, data=None, sensorlabel=", name='LoadStopperDriver')

```
__init__(sensor[, load_client, load_object, ...])
calibrate_sensor()
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
                                                   Gather all inherited static class-level dictionaries
gather_defaults()
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
post_execute(**kwargs)
                                                   Executed after each call to execute
                                                   Executed before each call to execute
pre_execute(**kwargs)
queued()
quickbar()
read_pol1()
read_poll_load()
read_sensor()
reset()
reset_poll()
reset_sample()
reset_stopper()
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

Attributes

```
app
 defaults
defaults = {'load_speed': 2, 'period': 0.05, 'poll_window': 1000, 'sensorlabel':
'', 'stopper_baseline_duration': 2, 'stopper_filepath':
'/github/home/.afl/loadstopper_data', 'stopper_loadstop_cooldown': 2,
'stopper_min_load_time': 3, 'stopper_post_detection_sleep': 1,
'stopper_threshold_npts': 50, 'stopper_threshold_std': 3.0,
'stopper_threshold_v_step': 1, 'stopper_timeout': 120}
__init__(sensor, load_client=None, load_object=None, auto_initialize=True, overrides=None, data=None,
         sensorlabel=", name='LoadStopperDriver')
status()
property app
calibrate_sensor()
read_sensor()
read_poll()
read_poll_load()
reset()
reset_poll()
deposit_obj(obj, uid=None)
    Store an object in the dropbox
        Parameters
            • obj (object) – The object to store in the dropbox
            • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
    Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
```

```
post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     reset_stopper()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                   uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
AFL.automation.loading.LoadStopperDriver.SensorPollingThread
class AFL.automation.loading.LoadStopperDriver.SensorPollingThread(sensor, period=0.1,
                                                                                 callback=None,
                                                                                hv_pipe=None,
                                                                                 window=None,
                                                                                filename=None,
                                                                                daemon=True, data=None)
     Bases: Thread
     __init__(sensor, period=0.1, callback=None, hv_pipe=None, window=None, filename=None,
                daemon=True, data=None)
          This constructor should always be called with keyword arguments. Arguments are:
          group should be None; reserved for future extension when a ThreadGroup class is implemented.
```

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(sensor[, period, callback,])	This constructor should always be called with keyword arguments.
alive()	
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
read()	
read_load_buffer()	
reset_load_buffer()	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(sensor, period=0.1, callback=None, hv_pipe=None, window=None, filename=None, daemon=True, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

read()

read_load_buffer()

reset_load_buffer()

terminate()

alive()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call

is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

AFL.automation.loading.LoadStopperDriver.StopLoadCBv1

```
class AFL.automation.loading.LoadStopperDriver.StopLoadCBv1(poll, period, load\_client, threshold\_npts=20, threshold\_v\_step=1, threshold\_std=2.5, timeout=120, loadstop\_cooldown=2, post\_detection\_sleep=0.2, baseline\_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")
```

Bases: SensorCallbackThread

```
__init__(poll, period, load_client, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(poll, period, load_client[,])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>process_signal()</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	·
update_status(value)	

Attributes

-	
daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(poll, period, load_client, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

terminate()

update_status(value)

AFL.automation.loading.LoadStopperDriver.StopLoadCBv2

```
class AFL.automation.loading.LoadStopperDriver.StopLoadCBv2(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")
```

Bases: SensorCallbackThread

```
__init__(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(poll, period[, load_client,])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>process_signal()</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	
update_status(value)	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

```
terminate()
```

```
update_status(value)
```

Driver for stopping loads

calibrate_sensor()

```
read_sensor()
    read_poll()
    read_poll_load()
    reset()
    reset_poll()
    reset_stopper()
AFL.automation.loading.MultiChannelRelay
Classes
 MultiChannelRelay()
AFL.automation.loading.MultiChannelRelay.MultiChannelRelay
class AFL.automation.loading.MultiChannelRelay.MultiChannelRelay
     Bases: object
     __init__()
     Methods
      __init__()
      getChannels(channels)
      setChannels(channels)
      toggleChannels(channels)
```

```
setChannels(channels)

getChannels(channels)

toggleChannels(channels)

class AFL.automation.loading.MultiChannelRelay.MultiChannelRelay

setChannels(channels)

getChannels(channels)

toggleChannels(channels)
```

AFL.automation.loading.NE1kSyringePump

Classes

```
NE1kSyringePump(port, syringe_id_mm, ...[, ...])
SerialDevice(port[, baudrate, timeout, ...])
SyringePump()
```

AFL.automation.loading.NE1kSyringePump.NE1kSyringePump

```
Bases: SyringePump
__init__(port, syringe_id_mm, syringe_volume, baud=9600, daisy_chain=None, pumpid=None, flow_delay=5)
```

Initializes and verifies connection to a New Era 1000 syringe pump.

port = serial port reference

syringe_id_mm = syringe inner diameter in mm, used for absolute volume.

(will re-program the pump with this diameter on connection)

syringe_volume = syringe volume in mL

baud = baudrate for connection

daisy_chain = used for the 'party-line' mode on these pumps where a string of pumps is on one serial port.

when setting up daisy chaining:

connect to the first pump on a port with daisy_chain = False on subsequent pumps, set daisy_chain to the pump with a hardware connection (the first pump)

or any other pump on the string.

note: when daisy chaining you should probably set pumpid explicitly rather than autodiscovering

as most likely the autodiscovery will return the first pump id each time.

pumpid = the ID configured in the pump firmware. If not set, will attempt to auto-discover a pump.

setting pumpid will save some time on connection and probably result in more reproducible behavior. Practically mandatory for daisy chain mode.

Methods

init(port, syringe_id_mm, syringe_volume)	Initializes and verifies connection to a New Era 1000 syringe pump.
<pre>blockUntilStatusStopped([pollingdelay])</pre>	
dispense(volume[, block, delay])	
<pre>emptySyringe()</pre>	
<pre>getRate()</pre>	
<pre>getStatus()</pre>	query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
setRate(rate)	
stop()	Abort the current dispense/withdraw action.
withdraw(volume[, block, delay])	

Initializes and verifies connection to a New Era 1000 syringe pump.

port = serial port reference

syringe_id_mm = syringe inner diameter in mm, used for absolute volume.

(will re-program the pump with this diameter on connection)

syringe_volume = syringe volume in mL

baud = baudrate for connection

daisy_chain = used for the 'party-line' mode on these pumps where a string of pumps is on one serial port.

when setting up daisy chaining:

connect to the first pump on a port with daisy_chain = False on subsequent pumps, set daisy_chain to the pump with a hardware connection (the first pump)

or any other pump on the string.

note: when daisy chaining you should probably set pumpid explicitly rather than autodiscovering

as most likely the autodiscovery will return the first pump id each time.

pumpid = the ID configured in the pump firmware. If not set, will attempt to auto-discover a pump. setting pumpid will save some time on connection and probably result in more reproducible behavior. Practically mandatory for daisy chain mode.

stop()

Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.

withdraw(volume, block=True, delay=True)

dispense(*volume*, *block=True*, *delay=True*)

```
setRate(rate)
     getRate()
     emptySyringe()
     blockUntilStatusStopped(pollingdelay=0.2)
     getStatus()
           query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
AFL.automation.loading.NE1kSyringePump.SerialDevice
class AFL.automation.loading.NE1kSyringePump.SerialDevice(port, baudrate=19200, timeout=0.5,
                                                                       raw_writes=False)
     Bases: object
     __init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
     Methods
       __init__(port[, baudrate, timeout, raw_writes])
       sendCommand(cmd[, response, questionmarkOK,
       ...])
     __init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
     \textbf{sendCommand}(\textit{cmd}, \textit{response} = \textit{True}, \textit{questionmarkOK} = \textit{False}, \textit{timeout} = -1, \textit{debug} = \textit{False})
AFL.automation.loading.NE1kSyringePump.SyringePump
class AFL.automation.loading.NE1kSyringePump.SyringePump
     Bases: object
     __init__()
     Methods
        __init__()
       dispense(volume[, block])
       emptySyringe()
       getRate(rate)
       setRate(rate)
       stop()
```

withdraw(volume[, block])

```
stop()
     withdraw(volume, block=True)
     dispense(volume, block=True)
     setRate(rate)
     getRate(rate)
     emptySyringe()
class AFL.automation.loading.NE1kSyringePump.NE1kSyringePump(port, syringe_id_mm,
                                                                          syringe volume, baud=9600,
                                                                          daisy_chain=None, pumpid=None,
                                                                          flow_delay=5)
     __init__(port, syringe_id_mm, syringe_volume, baud=9600, daisy_chain=None, pumpid=None,
                flow_delay=5)
           Initializes and verifies connection to a New Era 1000 syringe pump.
           port = serial port reference
           syringe_id_mm = syringe inner diameter in mm, used for absolute volume.
               (will re-program the pump with this diameter on connection)
           syringe_volume = syringe volume in mL
           baud = baudrate for connection
           daisy_chain = used for the 'party-line' mode on these pumps where a string of pumps is on one
           serial port.
               when setting up daisy chaining:
                   connect to the first pump on a port with daisy_chain = False on subsequent pumps, set daisy_chain
                   to the pump with a hardware connection (the first pump)
                     or any other pump on the string.
                   note: when daisy chaining you should probably set pumpid explicitly rather than
                   autodiscovering
                     as most likely the autodiscovery will return the first pump id each time.
           pumpid = the ID configured in the pump firmware. If not set, will attempt to auto-discover a pump.
               setting pumpid will save some time on connection and probably result in more reproducible behavior.
               Practically mandatory for daisy chain mode.
     stop()
           Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.
     withdraw(volume, block=True, delay=True)
     dispense(volume, block=True, delay=True)
     setRate(rate)
     getRate()
     emptySyringe()
```

blockUntilStatusStopped(pollingdelay=0.2)

getStatus()

query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)

AFL.automation.loading.OneSelectorBlowoutSampleCell

Classes

Driver(name[, defaults, overrides])	
OneSelectorBlowoutSampleCell(pump, selector)	Class for a sample cell consisting of a pump and a one- to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a sepa- rate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
<pre>TwoSelectorBlowoutSampleCell(pump, selector,)</pre>	Class for a sample cell consisting of a pump and a one- to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a sepa- rate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

AFL.automation.loading.OneSelectorBlowoutSampleCell.Driver

Bases: object

__init__(name, defaults=None, overrides=None)

Methods

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
           Set data in the DataPacket object
               Parameters
                   • data (dict) - Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
           :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
           Retrieve an object from the dropbox
               Parameters
                   uid (str) – The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
           Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.loading.OneSelectorBlowoutSampleCell.OneSelectorBlowoutSampleCell
```

class AFL.automation.loading.OneSelectorBlowoutSampleCell.OneSelectorBlowoutSampleCell(pump,

```
se-
lec-
tor,
rinse_tank_level=950
waste tank level=0,
cell_waste_tank_leve
over-
rides=None)
```

Bases: TwoSelectorBlowoutSampleCell

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

```
@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)
```

```
__init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0, overrides=None)
```

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

thickness = cell path length, to be incorporated into metadata, array with length = ncells

cell state if not 'clean', array with length = ncells

pump: a pump object supporting withdraw() and dispense() methods

e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)

selector: a selector object supporting string-based selectPort() method with options 'catch','cell','rinse','waste','air'

e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})

Methods

init(pump, selector[, rinse_tank_level,])	ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
<pre>blowOutCell([cellname, waittime])</pre>	
blowOutCellLegacy([cellname])	
<pre>catchToSyringe([sampleVolume])</pre>	
<pre>catchToWaste([sampleVolume])</pre>	
cellToWaste([cellname])	
<pre>deposit_obj(obj[, uid])</pre>	Store an object in the dropbox
drySyringe([blow, waittime])	transfer from air to waste, to push out any residual liquid.
execute(**kwargs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
	continues on next page

Table 10 – continued from previous page

```
loadSample([cellname, sampleVolume])
post_execute(**kwargs)
                                                  Executed after each call to execute
pre_execute(**kwargs)
                                                  Executed before each call to execute
queued()
quickbar()
reset_sample()
reset_tank_levels([rinse, waste, cell_waste])
retrieve_obj(uid[, delete])
                                                  Retrieve an object from the dropbox
rinseAll([cellname])
rinseCatch()
rinseCell([cellname])
rinseCellFlood([cellname])
rinseCellPull([cellname])
rinseSyringe()
setRinseLevel(vol)
setWasteLevel(vol)
set_config(**kwargs)
set_data(data)
                                                  Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
swish(vol)
transfer(source, dest, vol_source[, vol_dest])
unqueued()
```

Attributes

```
app
defaults
```

```
__init__(pump, selector, rinse tank level=950, waste tank level=0, cell waste tank level=0,
          overrides=None)
     ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
     by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
     thickness = cell path length, to be incorporated into metadata, array with length = ncells
     cell state if not 'clean', array with length = ncells
     pump: a pump object supporting withdraw() and dispense() methods
         e.g. pump = NE1KSyringePump(port,syringe id mm,syringe volume)
     selector: a selector object supporting string-based selectPort() method with options
     'catch', 'cell', 'rinse', 'waste', 'air'
         e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
drySyringe(blow=True, waittime=1)
     transfer from air to waste, to push out any residual liquid.
     if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
property app
catchToSyringe(sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
get_object(name, serialize=True)
get_sample()
loadSample(cellname='cell', sampleVolume=0)
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
reset_sample()
reset_tank_levels(rinse=950, waste=0, cell_waste=0)
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
rinseAll(cellname='cell')
rinseCatch()
rinseCell(cellname='cell')
rinseCellFlood(cellname='cell')
rinseCellPull(cellname='cell')
rinseSyringe()
setRinseLevel(vol)
setWasteLevel(vol)
set_config(**kwargs)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
             • data (dict) – Dictionary of data to store in the driver object
             • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
set_object(serialized=True, **kw)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
status()
swish(vol)
transfer(source, dest, vol_source, vol_dest=None)
unqueued()
```

AFL.automation.loading.OneSelectorBlowoutSampleCell.TwoSelectorBlowoutSampleCell

```
class AFL.automation.loading.OneSelectorBlowoutSampleCell.TwoSelectorBlowoutSampleCell(pump,
```

selector, blowselector, rinse_tank_level=950 waste_tank_level=0, cell_waste_tank_leve overrides=None)

Bases: Driver, SampleCell

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)

```
__init__(pump, selector, blowselector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0, overrides=None)
```

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

thickness = cell path length, to be incorporated into metadata, array with length = ncells

cell state if not 'clean', array with length = ncells

pump: a pump object supporting withdraw() and dispense() methods

```
e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
```

selector: a selector object supporting string-based selectPort() method with options 'catch','cell','rinse','waste','air'

```
e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
```

Methods

```
__init__(pump, selector, blowselector[, ...])

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

blowOutCell([cellname, waittime])

continues on next page
```

Table 11 – continued from previous page

lable 11 – continue	ed from previous page
<pre>blowOutCellLegacy([cellname])</pre>	
<pre>catchToSyringe([sampleVolume])</pre>	
<pre>catchToWaste([sampleVolume])</pre>	
cellToWaste([cellname])	
deposit_obj(obj[, uid])	Store an object in the dropbox
drySyringe([blow, waittime])	transfer from air to waste, to push out any residual liquid.
execute(**kwargs)	1
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>loadSample([cellname, sampleVolume])</pre>	
post_execute(**kwargs)	Executed after each call to execute
pre_execute(**kwargs)	Executed before each call to execute
queued()	Executed before each earl to execute
quickbar()	
reset_sample()	
<pre>reset_tank_levels([rinse, waste, cell_waste])</pre>	
<pre>retrieve_obj(uid[, delete])</pre>	Retrieve an object from the dropbox
rinseAll([cellname])	remere un coject nom the dropoon
rinseCatch()	
rinseCell([cellname])	
rinseCellFlood([cellname])	
rinseCellPull([cellname])	
rinseSyringe()	
setRinseLevel(vol)	
setWasteLevel(vol)	
	continues on next page

continues on next page

Table 11 – continued from previous page

Attributes

```
app
 defaults
defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
__init__(pump, selector, blowselector, rinse_tank_level=950, waste_tank_level=0,
          cell_waste_tank_level=0, overrides=None)
    ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
    by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
    thickness = cell path length, to be incorporated into metadata, array with length = ncells
    cell state if not 'clean', array with length = ncells
    pump: a pump object supporting withdraw() and dispense() methods
        e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
    selector: a selector object supporting string-based selectPort() method with options
    'catch', 'cell', 'rinse', 'waste', 'air'
        e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse=950, waste=0, cell_waste=0)
property app
```

```
status()
transfer(source, dest, vol_source, vol_dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
drySyringe(blow=True, waittime=1)
     transfer from air to waste, to push out any residual liquid.
    if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
setRinseLevel(vol)
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
```

```
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
reset_sample()
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
setWasteLevel(vol)
set_config(**kwargs)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
set_object(serialized=True, **kw)
set_sample(sample_name, sample_uuid=None, **kwargs)
```

AFL.automation.loading.OneSelectorBlowoutSampleCell.defaultdict

${\bf class} \ {\tt AFL.} automation. loading. One Selector {\tt BlowoutSampleCell.} {\bf default dict}$

```
Bases: dict
defaultdict(default_factory=None, /, [...]) -> dict with default factory
```

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

```
__init__(*args, **kwargs)
```

unqueued()

Methods

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
<i>pop</i> (k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
<pre>setdefault(key[, default])</pre>	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

default_factory	Factory for default value called bymissing().
ini. (*	
init(*args, **kwargs)	
$\textbf{clear()} \rightarrow None. \ Remove \ all \ items \ from \ D.$	
$copy() \rightarrow a$ shallow copy of D.	
default_factory	
Factory for default value called bymissing().	
<pre>fromkeys(value=None,/)</pre>	
Create a new dictionary with keys from iterable at	nd values set to value.
<pre>get(key, default=None, /)</pre>	
Return the value for key if key is in the dictionary.	else default.
$items() \rightarrow a$ set-like object providing a view on D's it	ems
$\mathbf{keys}() \to a$ set-like object providing a view on D's key	VS
$pop(k[,d]) \rightarrow v$, remove specified key and return the If the key is not found, return the default if given;	

```
Remove and return a (key, value) pair as a 2-tuple.
           Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
      setdefault(key, default=None, /)
           Insert key with a value of default if key is not in the dictionary.
           Return the value for key if key is in the dictionary, else default.
      update(E, **F) \rightarrow None. Update D from dict/iterable E and F.
           If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
           method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
      values() \rightarrow an object providing a view on D's values
class AFL.automation.loading.OneSelectorBlowoutSampleCell.OneSelectorBlowoutSampleCell(pump,
                                                                                                                  se-
                                                                                                                  lec-
                                                                                                                  tor,
                                                                                                                  rinse tank level=950
                                                                                                                  waste tank level=0,
                                                                                                                  cell_waste_tank_leve
                                                                                                                  rides=None)
      Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample
      (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell
      where the cell is in the pump line).
      @TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)
      __init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0,
                 overrides=None)
           ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
           by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
           thickness = cell path length, to be incorporated into metadata, array with length = ncells
           cell state if not 'clean', array with length = ncells
           pump: a pump object supporting withdraw() and dispense() methods
                e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
           selector: a selector object supporting string-based selectPort() method with options
           'catch', 'cell', 'rinse', 'waste', 'air'
                e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1, 'cell':2, 'rinse':3, 'waste':4, 'air':5})
      drySyringe(blow=True, waittime=1)
           transfer from air to waste, to push out any residual liquid.
           if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
      blowOutCellLegacy(cellname='cell')
      blowOutCell(cellname='cell', waittime=20)
```

popitem()

AFL.automation.loading.PneumaticPressureSampleCell

Classes

Driver(name[, defaults, overrides])	
<pre>PneumaticPressureSampleCell(pctrl, relayboard)</pre>	Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.
SampleCell()	
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

AFL.automation.loading.PneumaticPressureSampleCell.Driver

 ${\bf class} \ \, {\tt AFL.automation.loading.PneumaticPressureSampleCell.Driver} (name, defaults=None, overrides=None)$

Bases: object

__init__(name, defaults=None, overrides=None)

Methods

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) - The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.loading.PneumaticPressureSampleCell.PneumaticPressureSampleCell

```
class AFL.automation.loading.PneumaticPressureSampleCell.PneumaticPressureSampleCell(pctrl,
```

relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950, waste_tank_level=0, load_stopper=None, robot_interlock_host=Noverrides=None)

Bases: Driver, SampleCell

Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.

Driven by a variable-pressure regulator.

```
__init__(pctrl, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950, waste_tank_level=0, load_stopper=None, robot_interlock_host=None, overrides=None)
```

pctrl: a pressurecontroller object supporting the set_P method() and the optional p_ramp() method.
e.g. pctrl = DigitalOutPressureController(LabJackDigitalOut(...))

relayboard: a relay board object supporting string-based setChannels() method

required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample' e.g. selector = SainSmartRelay(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})

Methods

init(pctrl, relayboard[, digitalin,])	pctrl: a pressurecontroller object supporting the set_P method() and the optional p_ramp() method.
<pre>advanceSample([load_dest_label])</pre>	Move a sample from one measurement cell to the next
calibrate_sensor()	·
<pre>deposit_obj(obj[, uid])</pre>	Store an object in the dropbox
execute(**kwargs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>get_sensor_config(**kwargs)</pre>	
<pre>loadSample([cellname, sampleVolume,])</pre>	Load a sample into the cell
<pre>post_execute(**kwargs)</pre>	Executed after each call to execute
<pre>pre_execute(**kwargs)</pre>	Executed before each call to execute

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Table 12 – continued from previous page

```
primeRinse([waittime])
queued()
quickbar()
read_sensor()
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
reset_sample()
reset_tank_levels([rinse1, rinse2, waste])
                                                 Retrieve an object from the dropbox
retrieve_obj(uid[, delete])
rinseAll()
rinseCell([cellname])
sensor_reset([sensor_n])
setRinseLevel(vol)
setWasteLevel(vol)
set_config(**kwargs)
set_data(data)
                                                 Set data in the DataPacket object
set_object([serialized])
\verb|set_sample| (sample_name[, sample_uuid])|
set_sensor_config(**kwargs)
status()
stopLoad(**kwargs)
unqueued()
```

Attributes

```
app
data
defaults
```

```
defaults = {'arm_move_delay': 0.2, 'blowout_pressure': 20,
'external_load_complete_trigger': False, 'load_mode': 'static', 'load_pressure':
2, 'load_timeout': 60, 'ramp_load_duration': 20, 'ramp_load_stop_pressure': 7,
'rinse_program': [('rinse1', 5), (None, 2), ('rinse2', 5), ('blow', 5), (None,
0.5), ('blow', 5)], 'vent_delay': 0.5}
__init__(pctrl, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950,
          waste_tank_level=0, load_stopper=None, robot_interlock_host=None, overrides=None)
     pctrl: a pressurecontroller object supporting the set_P method() and the optional p_ramp() method.
         e.g. pctrl = DigitalOutPressureController(LabJackDigitalOut(...))
     relayboard: a relay board object supporting string-based setChannels() method
         required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample'
         e.g. selector = SainSmartRelay(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse1=950, rinse2=950, waste=0)
property app
property data
status()
loadSample(cellname='cell', sampleVolume=None, load_dest_label=")
     Load a sample into the cell
     Params cellname and sampleVolume are kept for backward compat, but are deprecated and unused.
advanceSample(load_dest_label=")
     Move a sample from one measurement cell to the next
     Params:
         load_dest_label (str, default "): a 'destination label' for this load.
             labeled sensors will only stop the load if their name is in this destination label. example:
               sensor 1 labeled 'afterSANS' sensor 2 labeled 'beforeSPEC' sensor 3 labeled '(default)
               advanceSample(load_dest_label='afterSANS') -> sensor 1 or sensor 3 can stop it advance-
               Sample(load dest label='beforeSPEC afterSANS') -> sensor 1, sensor 2, or sensor 3 can
               stop it advanceSample(load_dest_label=") -> only sensor 3 can stop it
stopLoad(**kwargs)
rinseCell(cellname='cell')
rinseAll()
setRinseLevel(vol)
setWasteLevel(vol)
primeRinse(waittime=10)
calibrate_sensor()
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
```

```
• obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
read_sensor()
reset_sample()
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
set_config(**kwargs)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
             • data (dict) – Dictionary of data to store in the driver object
             • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
set_object(serialized=True, **kw)
set_sample(sample_name, sample_uuid=None, **kwargs)
unqueued()
```

```
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
set_sensor_config(**kwargs)
get_sensor_config(**kwargs)
sensor_reset(sensor_n=None)
```

AFL.automation.loading.PneumaticPressureSampleCell.SampleCell

```
\textbf{class} \ \texttt{AFL}. automation. loading. Pneumatic Pressure Sample Cell. \textbf{Sample Cell}
```

```
Bases: object
__init__()
```

Methods

```
__init__()
loadSample()
```

loadSample()

AFL.automation.loading.PneumaticPressureSampleCell.defaultdict

class AFL.automation.loading.PneumaticPressureSampleCell.defaultdict

```
Bases: dict
```

defaultdict(default_factory=None, /, [...]) -> dict with default factory

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

```
__init__(*args, **kwargs)
```

Methods

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
pop(k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
setdefault(key[, default])	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

default_factory	Factory for default value called bymissing().
init(*args, **kwargs)	
${f clear}() ightarrow {f N}{f one}.$ Remove all items from D.	
$copy() \rightarrow a \text{ shallow copy of D.}$	
default_factory	
Factory for default value called bymissing().
fromkeys (value=None, /) Create a new dictionary with keys from iterable a	and values set to value.
<pre>get(key, default=None, /)</pre>	
Return the value for key if key is in the dictionary	y, else default.
$\textbf{items()} \rightarrow a \text{ set-like object providing a view on D's i}$	tems
$\textbf{keys}(\textbf{)} \rightarrow \textbf{a}$ set-like object providing a view on D's ke	eys
$pop(k[,d]) \rightarrow v$, remove specified key and return the If the key is not found, return the default if given	

```
Remove and return a (key, value) pair as a 2-tuple.
           Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
     setdefault(key, default=None, /)
           Insert key with a value of default if key is not in the dictionary.
           Return the value for key if key is in the dictionary, else default.
     update([E, ]^{**F}) \rightarrow None. Update D from dict/iterable E and F.
           If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
           method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
     values() \rightarrow an object providing a view on D's values
class AFL.automation.loading.PneumaticPressureSampleCell.PneumaticPressureSampleCell(pctrl,
                                                                                                        re-
                                                                                                        lay-
                                                                                                        board,
                                                                                                        digi-
                                                                                                        talin=None,
                                                                                                        rinse1_tank_level=950,
                                                                                                        rinse2 tank level=950,
                                                                                                        waste\_tank\_level=0,
                                                                                                        load stopper=None,
                                                                                                        robot interlock host=N
                                                                                                        over-
                                                                                                        rides=None)
     Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.
     Driven by a variable-pressure regulator.
     defaults = {'arm_move_delay': 0.2, 'blowout_pressure': 20,
      'external_load_complete_trigger': False, 'load_mode': 'static', 'load_pressure':
     2, 'load_timeout': 60, 'ramp_load_duration': 20, 'ramp_load_stop_pressure': 7,
      'rinse_program': [('rinse1', 5), (None, 2), ('rinse2', 5), ('blow', 5), (None,
     0.5), ('blow', 5)], 'vent_delay': 0.5}
     __init__(pctrl, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950,
                waste_tank_level=0, load_stopper=None, robot_interlock_host=None, overrides=None)
           pctrl: a pressurecontroller object supporting the set_P method() and the optional p_ramp() method.
               e.g. pctrl = DigitalOutPressureController(LabJackDigitalOut(...))
           relayboard: a relay board object supporting string-based setChannels() method
               required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample'
               e.g. selector = SainSmartRelay(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
     reset_tank_levels(rinse1=950, rinse2=950, waste=0)
     property app
     property data
     status()
```

popitem()

```
{\bf loadSample} ({\it cellname='cell', sampleVolume=None, load\_dest\_label=''})
```

Load a sample into the cell

Params cellname and sampleVolume are kept for backward compat, but are deprecated and unused.

```
advanceSample(load dest label=")
```

Move a sample from one measurement cell to the next

Params:

load_dest_label (str, default ''): a 'destination label' for this load.

labeled sensors will only stop the load if their name is in this destination label. example:

```
sensor 1 labeled 'afterSANS' sensor 2 labeled 'beforeSPEC' sensor 3 labeled '' (default)
```

advanceSample(load_dest_label='afterSANS') -> sensor 1 or sensor 3 can stop it advance-Sample(load_dest_label='beforeSPEC afterSANS') -> sensor 1, sensor 2, or sensor 3 can stop it advanceSample(load_dest_label=") -> only sensor 3 can stop it

```
stopLoad(**kwargs)
rinseCell(cellname='cell')
rinseAll()
setRinseLevel(vol)
setWasteLevel(vol)
primeRinse(waittime=10)
calibrate_sensor()
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
set_sensor_config(**kwargs)
get_sensor_config(**kwargs)
sensor_reset(sensor_n=None)
```

AFL.automation.loading.PneumaticSampleCell

Classes

Driver(name[, defaults, overrides])	
<pre>PneumaticSampleCell(pump, relayboard[,])</pre>	Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.
SampleCell()	
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

AFL.automation.loading.PneumaticSampleCell.Driver

```
class AFL.automation.loading.PneumaticSampleCell.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
                                                   Gather all inherited static class-level dictionaries
gather_defaults()
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
                                                   Executed after each call to execute
post_execute(**kwargs)
pre_execute(**kwargs)
                                                   Executed before each call to execute
queued()
quickbar()
reset_sample()
                                                   Retrieve an object from the dropbox
retrieve_obj(uid[, delete])
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

```
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
```

```
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.loading.PneumaticSampleCell.PneumaticSampleCell

Bases: Driver, SampleCell

Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.

Driven by a syringe pump.

__init__(pump, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950, waste_tank_level=0, load_stopper=None, overrides=None)

pump: a pump object supporting withdraw() and dispense() methods

e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)

relayboard: a relay board object supporting string-based setChannels() method

required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample' e.g. selector = SainSmartRelay(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})

Methods

init(pump, relayboard[, digitalin,])	pump: a pump object supporting withdraw() and dispense() methods
<pre>calibrate_sensor()</pre>	
<pre>deposit_obj(obj[, uid])</pre>	Store an object in the dropbox
execute(**kwargs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>get_sensor_config(**kwargs)</pre>	
<pre>loadSample([cellname, sampleVolume])</pre>	
<pre>post_execute(**kwargs)</pre>	Executed after each call to execute
<pre>pre_execute(**kwargs)</pre>	Executed before each call to execute
<pre>primeRinse([waittime])</pre>	
queued()	

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Table 13 – continued from previous page

```
quickbar()
read_sensor()
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
reset_pump([dispense])
reset_sample()
reset\_tank\_levels([rinse1, rinse2, waste])
retrieve_obj(uid[, delete])
                                                 Retrieve an object from the dropbox
rinseAll()
rinseCell([cellname])
sensor_reset()
setRinseLevel(vol)
setWasteLevel(vol)
set_config(**kwargs)
set_data(data)
                                                 Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
set_sensor_config(**kwargs)
status()
stopLoad(**kwargs)
unqueued()
```

Attributes

```
defaults

defaults = {'air_speed': 30, 'arm_move_delay': 0.2, 'catch_to_cell_vol': 1.15,
'external_load_complete_trigger': False, 'large_dispense_vol': 5, 'load_speed':
```

2, 'rinse_program': [('rinse1', 5), (None, 2), ('rinse2', 5), ('blow', 5), (None,

0.5), ('blow', 5)], 'vent_delay': 0.5, 'withdraw_vol': 1.5}

```
__init__(pump, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950,
          waste_tank_level=0, load_stopper=None, overrides=None)
     pump: a pump object supporting withdraw() and dispense() methods
         e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
     relayboard: a relay board object supporting string-based setChannels() method
         required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample'
         e.g. selector = SainSmartRelay(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_pump(dispense=False)
reset_tank_levels(rinse1=950, rinse2=950, waste=0)
property app
status()
loadSample(cellname='cell', sampleVolume=0)
stopLoad(**kwargs)
rinseCell(cellname='cell')
rinseAll()
setRinseLevel(vol)
setWasteLevel(vol)
primeRinse(waittime=10)
calibrate_sensor()
read_sensor()
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
```

```
post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     read_sensor_poll(**kwargs)
     reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
              Parameters
                  uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
              Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
     read_sensor_poll_load(**kwargs)
     set_sensor_config(**kwargs)
     get_sensor_config(**kwargs)
     sensor_reset()
AFL.automation.loading.PneumaticSampleCell.SampleCell
class AFL.automation.loading.PneumaticSampleCell.SampleCell
     Bases: object
     __init__()
```

```
__init__()
loadSample()
```

loadSample()

AFL.automation.loading.PneumaticSampleCell.defaultdict

class AFL.automation.loading.PneumaticSampleCell.defaultdict

Bases: dict

defaultdict(default_factory=None, /, [...]) -> dict with default factory

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

Methods

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
pop(k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
<pre>setdefault(key[, default])</pre>	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

```
default_factory
                                                             Factory for default value called by __missing__().
      __init__(*args, **kwargs)
      clear() \rightarrow None. Remove all items from D.
      copy() \rightarrow a shallow copy of D.
      default_factory
           Factory for default value called by __missing__().
      fromkeys(value=None,/)
           Create a new dictionary with keys from iterable and values set to value.
      get(key, default=None, /)
           Return the value for key if key is in the dictionary, else default.
      items() \rightarrow a set-like object providing a view on D's items
      keys() \rightarrow a set-like object providing a view on D's keys
      pop(k[,d]) \rightarrow v, remove specified key and return the corresponding value.
           If the key is not found, return the default if given; otherwise, raise a KeyError.
      popitem()
           Remove and return a (key, value) pair as a 2-tuple.
           Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
      setdefault(key, default=None, /)
           Insert key with a value of default if key is not in the dictionary.
           Return the value for key if key is in the dictionary, else default.
      update([E, ]^{**F}) \rightarrow None. Update D from dict/iterable E and F.
           If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
           method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
      values() \rightarrow an object providing a view on D's values
class AFL.automation.loading.PneumaticSampleCell.PneumaticSampleCell(pump, relayboard,
                                                                                       digitalin=None,
                                                                                       rinse1 tank level=950,
                                                                                       rinse2_tank_level=950,
                                                                                       waste\_tank\_level=0,
                                                                                       load_stopper=None,
                                                                                       overrides=None)
      Class for a sample cell consisting of a push-through, pneumatically-closed sample loader.
      Driven by a syringe pump.
      defaults = {'air_speed': 30, 'arm_move_delay': 0.2, 'catch_to_cell_vol': 1.15,
      'external_load_complete_trigger': False, 'large_dispense_vol': 5, 'load_speed':
      2, 'rinse_program': [('rinse1', 5), (None, 2), ('rinse2', 5), ('blow', 5), (None,
      0.5), ('blow', 5)], 'vent_delay': 0.5, 'withdraw_vol': 1.5}
```

```
__init__(pump, relayboard, digitalin=None, rinse1_tank_level=950, rinse2_tank_level=950,
          waste_tank_level=0, load_stopper=None, overrides=None)
     pump: a pump object supporting withdraw() and dispense() methods
         e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
     relayboard: a relay board object supporting string-based setChannels() method
         required channels are 'arm-up', 'arm-down', 'rinse1', 'rinse2', 'blow', 'enable', 'piston-vent', 'postsample'
         e.g. selector = SainSmartRelay(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_pump(dispense=False)
reset_tank_levels(rinse1=950, rinse2=950, waste=0)
property app
status()
loadSample(cellname='cell', sampleVolume=0)
stopLoad(**kwargs)
rinseCell(cellname='cell')
rinseAll()
setRinseLevel(vol)
setWasteLevel(vol)
primeRinse(waittime=10)
calibrate_sensor()
read_sensor()
read_sensor_poll(**kwargs)
read_sensor_poll_load(**kwargs)
set_sensor_config(**kwargs)
get_sensor_config(**kwargs)
sensor_reset()
```

AFL.automation.loading.PressureController

Classes

PressureController()

Abstract superclass for pressure controllers that provides timed dispensing

AFL.automation.loading.PressureController.PressureController

class AFL.automation.loading.PressureController.PressureController

Bases: object

Abstract superclass for pressure controllers that provides timed dispensing

__init__()

Methods

init()	
<pre>blockUntilStatusStopped([pollingdelay])</pre>	block execution until the controller finishes a dispense
dispenseRunning()	Returns true if a timed dispense is running, false otherwise.
<pre>ramp_dispense(dispense_start_pressure,)</pre>	Perform a pressure dispense with a linear ramp in pressure between <i>dispense_start_pressure</i> and <i>dispense_stop_pressure</i> , stopping after <i>dispense_time</i> .
stop()	Abort the current timed dispense action.
<pre>timed_dispense(dispense_pressure,</pre>	Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time.

timed_dispense(dispense_pressure, dispense_time, block=True)

Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time. This dispense can be interrupted by calling self.stop().

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

class AFL.automation.loading.PressureController.PressureController

Abstract superclass for pressure controllers that provides timed dispensing

timed_dispense(dispense_pressure, dispense_time, block=True)

Perform a pressure dispense at pressure *dispense_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop().

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

AFL.automation.loading.PressureControllerAsPump

Classes

```
PressureControllerAsPump(pressure_controller)

SerialDevice(port[, baudrate, timeout, ...])

SyringePump()
```

AFL.automation.loading.PressureControllerAsPump.PressureControllerAsPump

```
 \begin{tabular}{ll} {\bf class} & {\tt AFL.automation.loading.PressureControllerAsPump.PressureControllerAsPump}(pressure\_controller, \\ & dispense\_pressure=3.5, \\ & im-plied\_flow\_rate=50) \end{tabular}
```

```
Bases: SyringePump
__init__(pressure_controller, dispense_pressure=3.5, implied_flow_rate=50)
Initialize a pressure controller as a syringe pump.
```

 $pressure_controller: controller to connect to dispense_pressure: pressure at which dispense should run implied_flow_rate: flow rate which should be used to convert to dispense times, mL/min$

```
_init__(pressure_controller[, ...])
                                                       Initialize a pressure controller as a syringe pump.
 blockUntilStatusStopped([pollingdelay])
 dispense(volume[, block, delay])
 emptySyringe()
 getRate()
 getStatus()
                                                       query the pump status and return a tuple of the status
                                                       character, infused volume, and withdrawn volume)
 setRate(rate)
                                                       Abort the current dispense/withdraw action.
 stop()
 withdraw(volume[, block, delay])
__init__(pressure_controller, dispense_pressure=3.5, implied_flow_rate=50)
     Initialize a pressure controller as a syringe pump.
     pressure_controller: controller to connect to dispense_pressure: pressure at which dispense should run
     implied_flow_rate: flow rate which should be used to convert to dispense times, mL/min
stop()
```

Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel. withdraw(volume, block=True, delay=True)

dispense(volume, block=True, delay=True)

setRate(rate)

getRate()

emptySyringe()

blockUntilStatusStopped(pollingdelay=0.2)

getStatus()

query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)

AFL.automation.loading.PressureControllerAsPump.SerialDevice

Bases: object

__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)

```
__init__(port[, baudrate, timeout, raw_writes])

sendCommand(cmd[, response, questionmarkOK,
...])

__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)

sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)
```

AFL.automation.loading.PressureControllerAsPump.SyringePump

```
class AFL.automation.loading.PressureControllerAsPump.SyringePump
    Bases: object
    __init__()
```

Methods

```
__init__()

dispense(volume[, block])

emptySyringe()

getRate(rate)

setRate(rate)

stop()

withdraw(volume[, block])
```

```
stop()
withdraw(volume, block=True)
dispense(volume, block=True)
setRate(rate)
getRate(rate)
emptySyringe()
```

 $\textbf{class} \ \, \textbf{AFL}. \textbf{automation.} loading. \textbf{PressureControllerAsPump.} \textbf{\textit{PressureControllerAsPump.} PressureControllerAsPump.} \\ \textbf{\textit{dis-}}$

pense_pressure=3.5,
im-

plied_flow_rate=50)

```
__init__(pressure_controller, dispense_pressure=3.5, implied_flow_rate=50)

Initialize a pressure controller as a syringe pump.

pressure_controller: controller to connect to dispense_pressure: pressure at which dispense should run implied_flow_rate: flow rate which should be used to convert to dispense times, mL/min

stop()

Abort the current dispense/withdraw action. Equivalent to pressing stop button on panel.

withdraw(volume, block=True, delay=True)

dispense(volume, block=True, delay=True)

setRate(rate)

getRate()

emptySyringe()

blockUntilStatusStopped(pollingdelay=0.2)

getStatus()

query the pump status and return a tuple of the status character, infused volume, and withdrawn volume)
```

AFL.automation.loading.PushPullSelectorSampleCell

Classes

Driver(name[, defaults, overrides])	
PushPullSelectorSampleCell(pump, selector[,])	Class for a sample cell consisting of a pump and a one- to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a sepa- rate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
SampleCell()	
Tubing(specid, length)	
defaultdict	defaultdict(default_factory=None, /, [])> dict with default factory

AFL.automation.loading.PushPullSelectorSampleCell.Driver

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) - The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.loading.PushPullSelectorSampleCell.PushPullSelectorSampleCell

```
class AFL.automation.loading.PushPullSelectorSampleCell.PushPullSelectorSampleCell(pump,
```

```
selec-
tor,
ncells=1,
thick-
ness=None,
catch to sel vol=None,
cell_to_sel_vol=None,
sv-
ringe_to_sel_vol=None,
selec-
tor_internal_vol=None,
cali-
brated_catch_to_syringe_v
cali-
brated_syringe_to_cell_vo
rinse\_speed=50.0,
load speed=10.0,
rinse flow delay=3.0,
load flow delay=10.0)
```

Bases: Driver, SampleCell

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector) @TODO: figure out when/where to pull in air to the syringe to make up for extra vol to empty ml

```
__init__(pump, selector, ncells=1, thickness=None, catch to sel vol=None, cell to sel vol=None,
          syringe_to_sel_vol=None, selector_internal_vol=None, calibrated_catch_to_syringe_vol=None,
          calibrated syringe to cell vol=None, rinse speed=50.0, load speed=10.0,
          rinse flow delay=3.0, load flow delay=10.0)
```

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

thickness = cell path length, to be incorporated into metadata, array with length = ncells

cell state if not 'clean', array with length = ncells

pump: a pump object supporting withdraw() and dispense() methods

e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)

selector: a selector object supporting string-based selectPort() method with options 'catch', 'cell', 'rinse', 'waste', 'air'

e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})

Methods

```
__init__(pump, selector[, ncells, ...])
                                                       ncells = number of connected cells (up to 6 cells with
                                                       a 10-position flow selector, with four positions taken
                                                       by load port, rinse, waste, and air) Name = the cell
                                                       name, array with length = ncells
blowOutCell([cellname])
```

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Table 14 – continued from previous page

Table 14 – Continue	d from previous page
<pre>blowOutCellForcedAir([cellname, waittime])</pre>	
<pre>catchToSyringe([sampleVolume])</pre>	
<pre>catchToWaste([sampleVolume])</pre>	
cellToWaste([cellname])	
deposit_obj(obj[, uid])	Store an object in the dropbox
execute(**kwargs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>getParameters()</pre>	
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>loadSample([cellname, sampleVolume])</pre>	
post_execute(**kwargs)	Executed after each call to execute
pre_execute(**kwargs)	Executed before each call to execute
queued()	
quickbar()	
reset_sample()	
<pre>retrieve_obj(uid[, delete])</pre>	Retrieve an object from the dropbox
rinseAll([cellname])	·
rinseCatch()	
rinseCell([cellname])	
rinseCellFlood([cellname])	
rinseCellPull([cellname])	
rinseSyringe()	
setParameter(parameter, value)	
set_config(**kwargs)	
set_data(data)	Set data in the DataPacket object

continues on next page

Table 14 - continued from previous page

```
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
swish(vol)
transfer(source, dest, vol_source[, vol_dest])
unqueued()
```

Attributes

```
app
__init__(pump, selector, ncells=1, thickness=None, catch_to_sel_vol=None, cell_to_sel_vol=None,
           syringe_to_sel_vol=None, selector_internal_vol=None, calibrated_catch_to_syringe_vol=None,
           calibrated_syringe_to_cell_vol=None, rinse_speed=50.0, load_speed=10.0,
           rinse flow delay=3.0, load flow delay=10.0)
     ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
     by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
     thickness = cell path length, to be incorporated into metadata, array with length = ncells
     cell state if not 'clean', array with length = ncells
     pump: a pump object supporting withdraw() and dispense() methods
         e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
     selector: a selector object supporting string-based selectPort() method with options
     'catch', 'cell', 'rinse', 'waste', 'air'
         e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1, 'cell':2, 'rinse':3, 'waste':4, 'air':5})
property app
status()
setParameter(parameter, value)
getParameters()
transfer(source, dest, vol_source, vol_dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
```

```
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
reset_sample()
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
set_config(**kwargs)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
             • data (dict) – Dictionary of data to store in the driver object
             • variables (Note! if the keys in data are not system or sample)
```

```
:param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     swish(vol)
     unqueued()
     blowOutCell(cellname='cell')
     blowOutCellForcedAir(cellname='cell', waittime=20)
     rinseCatch()
     rinseAll(cellname='cell')
AFL.automation.loading.PushPullSelectorSampleCell.SampleCell
class AFL.automation.loading.PushPullSelectorSampleCell.SampleCell
     Bases: object
     __init__()
     Methods
       __init__()
      loadSample()
     loadSample()
AFL.automation.loading.PushPullSelectorSampleCell.Tubing
class AFL.automation.loading.PushPullSelectorSampleCell.Tubing(specid, length)
     Bases: object
     __init__(specid, length)
          length is in cm?
     Methods
        _init__(specid, length)
                                                      length is in cm?
       volume()
                                                      returns volume in mL
     Attributes
       tubing
```

```
tubing = [{'IDEXpart': 1530, 'ID_mm': 1.575, 'OD_in': 0.125, 'material':
'Tefzel', 'typeid': 1530}, {'IDEXpart': 1529, 'ID_mm': 0.254, 'OD_in': 0.075,
'material': 'Tefzel', 'typeid': 1529}, {'IDEXpart': 0, 'ID_mm': 2.92, 'OD_in':
0.1875, 'material': 'PVC', 'typeid': 1}, {'IDEXpart': 1517, 'ID_mm': 1, 'OD_in':
0.075, 'material': 'Tefzel', 'typeid': 1517}]
__init__(specid, length)
    length is in cm?

volume()
    returns volume in mL
```

AFL.automation.loading.PushPullSelectorSampleCell.defaultdict

class AFL.automation.loading.PushPullSelectorSampleCell.defaultdict

Bases: dict

defaultdict(default_factory=None, /, [...]) -> dict with default factory

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

Methods

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
pop(k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
setdefault(key[, default])	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

```
default_factory
                                                           Factory for default value called by __missing__().
__init__(*args, **kwargs)
clear() \rightarrow None. Remove all items from D.
copy() \rightarrow a shallow copy of D.
default_factory
     Factory for default value called by __missing__().
fromkeys(value=None,/)
     Create a new dictionary with keys from iterable and values set to value.
get(key, default=None, /)
     Return the value for key if key is in the dictionary, else default.
items() \rightarrow a set-like object providing a view on D's items
keys() \rightarrow a set-like object providing a view on D's keys
pop(k[,d]) \rightarrow v, remove specified key and return the corresponding value.
     If the key is not found, return the default if given; otherwise, raise a KeyError.
popitem()
     Remove and return a (key, value) pair as a 2-tuple.
     Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
setdefault(key, default=None, /)
     Insert key with a value of default if key is not in the dictionary.
     Return the value for key if key is in the dictionary, else default.
update([E, ]^{**F}) \rightarrow None. Update D from dict/iterable E and F.
     If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
     method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
values() \rightarrow an object providing a view on D's values
```

```
class AFL.automation.loading.PushPullSelectorSampleCell.PushPullSelectorSampleCell(pump,
```

```
selec-
tor,
ncells=1,
thick-
ness=None,
catch to sel vol=None,
cell_to_sel_vol=None,
sv-
ringe_to_sel_vol=None,
selec-
tor_internal_vol=None,
cali-
brated_catch_to_syringe_v
cali-
brated_syringe_to_cell_vo
rinse_speed=50.0,
load speed=10.0,
rinse flow delay=3.0,
load flow delay=10.0)
```

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector) @TODO: figure out when/where to pull in air to the syringe to make up for extra_vol_to_empty_ml

```
__init__(pump, selector, ncells=1, thickness=None, catch to sel vol=None, cell to sel vol=None,
           syringe_to_sel_vol=None, selector_internal_vol=None, calibrated_catch_to_syringe_vol=None,
           calibrated_syringe_to_cell_vol=None, rinse_speed=50.0, load_speed=10.0,
           rinse_flow_delay=3.0, load_flow_delay=10.0)
     ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
     by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
     thickness = cell path length, to be incorporated into metadata, array with length = ncells
     cell state if not 'clean', array with length = ncells
     pump: a pump object supporting withdraw() and dispense() methods
         e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
     selector: a selector object supporting string-based selectPort() method with options
     'catch', 'cell', 'rinse', 'waste', 'air'
         e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
property app
status()
setParameter(parameter, value)
getParameters()
transfer(source, dest, vol source, vol dest=None)
catchToSyringe(sampleVolume=0)
```

loadSample(cellname='cell', sampleVolume=0)

```
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCell(cellname='cell')
blowOutCellForcedAir(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
```

AFL.automation.loading.RSoXSSolutionSampleCell

Classes

```
### Driver(name[, defaults, overrides])

#### RSoXSSolutionSampleCell(pump, selector[, ...])

#### Class for a sample cell consisting of a pump and a one-to-many flow selector for a flowrate-limited measurement cell (e.g., a liquid TEM sample holder for RSoXS).

### SampleCell()

#### Tubing(specid, length)

#### defaultdict(default_factory=None, /, [...]) --> dict with default factory
```

AFL.automation.loading.RSoXSSolutionSampleCell.Driver

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

cell_waste_tank_level=0,

over-

rides=None)

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                   uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
          Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.loading.RSoXSSolutionSampleCell.RSoXSSolutionSampleCell
class AFL.automation.loading.RSoXSSolutionSampleCell.RSoXSSolutionSampleCell(pump, selector,
                                                                                             rinse tank level=950,
                                                                                             waste\_tank\_level=0,
```

```
Bases: Driver, SampleCell
```

Class for a sample cell consisting of a pump and a one-to-many flow selector for a flowrate-limited measurement cell (e.g., a liquid TEM sample holder for RSoXS).

The pump draws from any of the sample ports and can quickly purge/rinse itself and the tubing between the loader and the cell. When the pump is connected to the cell, its max rate is limited to very slow (5 ul/min for RSoXS).

```
__init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0, overrides=None)

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

thickness = cell path length, to be incorporated into metadata, array with length = ncells

cell state if not 'clean', array with length = ncells

pump: a pump object supporting withdraw() and dispense() methods

e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)

selector: a selector object supporting string-based selectPort() method with options

'catch','cell','rinse','waste','air'

e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
```

Methods

init(pump, selector[, rinse_tank_level,])	ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
<pre>blowOutCell([cellname, waittime])</pre>	
<pre>blowOutCellLegacy([cellname])</pre>	
<pre>catchToSyringe([sampleVolume])</pre>	
<pre>catchToWaste([sampleVolume])</pre>	
cellToWaste([cellname])	
<pre>deposit_obj(obj[, uid])</pre>	Store an object in the dropbox
drySyringe([blow, waittime])	transfer from air to waste, to push out any residual liquid.
execute(**kwargs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	

continues on next page

Table 15 – continued from previous page

```
get_sample()
loadSample([cellname, sampleVolume])
post_execute(**kwargs)
                                                  Executed after each call to execute
                                                  Executed before each call to execute
pre_execute(**kwargs)
queued()
quickbar()
reset_sample()
reset_tank_levels([rinse, waste, cell_waste])
retrieve_obj(uid[, delete])
                                                  Retrieve an object from the dropbox
rinseAll([cellname])
rinseCatch()
rinseCell([cellname])
rinseCellFlood([cellname])
rinseCellPull([cellname])
rinseSyringe()
setRinseLevel(vol)
setWasteLevel(vol)
set_config(**kwargs)
set_data(data)
                                                  Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
swish(vol)
transfer(source, dest, vol_source[, vol_dest])
unqueued()
```

Attributes

```
app
 defaults
defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
__init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0,
          overrides=None)
    ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
    by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
    thickness = cell path length, to be incorporated into metadata, array with length = ncells
    cell state if not 'clean', array with length = ncells
    pump: a pump object supporting withdraw() and dispense() methods
        e.g. pump = NE1KSyringePump(port,syringe id mm,syringe volume)
    selector: a selector object supporting string-based selectPort() method with options
    'catch', 'cell', 'rinse', 'waste', 'air'
         e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse=950, waste=0, cell_waste=0)
property app
status()
transfer(source, dest, vol_source, vol_dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
drySyringe(blow=True, waittime=1)
    transfer from air to waste, to push out any residual liquid.
    if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
rinseCell(cellname='cell')
```

```
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
setRinseLevel(vol)
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
reset_sample()
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
```

```
setWasteLevel(vol)
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
              Parameters
                  • data (dict) – Dictionary of data to store in the driver object
                  • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
AFL.automation.loading.RSoXSSolutionSampleCell.SampleCell
class AFL.automation.loading.RSoXSSolutionSampleCell.SampleCell
     Bases: object
     __init__()
     Methods
       _init__()
      loadSample()
     loadSample()
AFL.automation.loading.RSoXSSolutionSampleCell.Tubing
class AFL.automation.loading.RSoXSSolutionSampleCell.Tubing(specid, length)
     Bases: object
     __init__(specid, length)
          length is in cm?
     Methods
       __init__(specid, length)
                                                      length is in cm?
                                                      returns volume in mL
      volume()
```

Attributes

```
tubing

tubing = [{'IDEXpart': 1530, 'ID_mm': 1.575, 'OD_in': 0.125, 'material':
'Tefzel', 'typeid': 1530}, {'IDEXpart': 1529, 'ID_mm': 0.254, 'OD_in': 0.075,
'material': 'Tefzel', 'typeid': 1529}, {'IDEXpart': 0, 'ID_mm': 2.92, 'OD_in':
0.1875, 'material': 'PVC', 'typeid': 1}, {'IDEXpart': 1517, 'ID_mm': 1, 'OD_in':
0.075, 'material': 'Tefzel', 'typeid': 1517}]
__init__(specid, length)
    length is in cm?

volume()
    returns volume in mL
```

AFL.automation.loading.RSoXSSolutionSampleCell.defaultdict

class AFL.automation.loading.RSoXSSolutionSampleCell.defaultdict

Bases: dict

defaultdict(default_factory=None, /, [...]) -> dict with default factory

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

```
__init__(*args, **kwargs)
```

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
pop(k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
<pre>setdefault(key[, default])</pre>	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

default_factory	Factory for default value called bymissing().
ini. (*	
init(*args, **kwargs)	
$\textbf{clear()} \rightarrow None. \ Remove \ all \ items \ from \ D.$	
$copy() \rightarrow a$ shallow copy of D.	
default_factory	
Factory for default value called bymissing().	
<pre>fromkeys(value=None,/)</pre>	
Create a new dictionary with keys from iterable at	nd values set to value.
<pre>get(key, default=None, /)</pre>	
Return the value for key if key is in the dictionary.	else default.
$items() \rightarrow a$ set-like object providing a view on D's it	ems
$\textbf{keys}() \rightarrow a \text{ set-like object providing a view on D's keys}$	
$pop(k[,d]) \rightarrow v$, remove specified key and return the corresponding value. If the key is not found, return the default if given; otherwise, raise a KeyError.	

```
popitem()
          Remove and return a (key, value) pair as a 2-tuple.
          Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
     setdefault(key, default=None, /)
          Insert key with a value of default if key is not in the dictionary.
          Return the value for key if key is in the dictionary, else default.
     update([E, *F] \rightarrow None. Update D from dict/iterable E and F.
          If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
          method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
     values() \rightarrow an object providing a view on D's values
class AFL.automation.loading.RSoXSSolutionSampleCell.RSoXSSolutionSampleCell(pump, selector,
                                                                                             rinse_tank_level=950,
                                                                                             waste\_tank\_level=0,
                                                                                             cell waste tank level=0,
                                                                                             over-
                                                                                             rides=None)
     Class for a sample cell consisting of a pump and a one-to-many flow selector for a flowrate-limited measurement
     cell (e.g., a liquid TEM sample holder for RSoXS).
     The pump draws from any of the sample ports and can quickly purge/rinse itself and the tubing between the
     loader and the cell. When the pump is connected to the cell, its max rate is limited to very slow (5 ul/min for
     RSoXS).
     defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
      'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
      'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
     1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
      'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
      'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
      'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
      'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
     1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
     __init__(pump, selector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0,
                overrides=None)
          ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
          by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
          thickness = cell path length, to be incorporated into metadata, array with length = ncells
          cell state if not 'clean', array with length = ncells
          pump: a pump object supporting withdraw() and dispense() methods
               e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
          selector: a selector object supporting string-based selectPort() method with options
          'catch'.'cell'.'rinse'.'waste'.'air'
               e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
     reset_tank_levels(rinse=950, waste=0, cell waste=0)
     property app
```

```
status()
transfer(source, dest, vol_source, vol_dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
drySyringe(blow=True, waittime=1)
     transfer from air to waste, to push out any residual liquid.
    if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
setRinseLevel(vol)
setWasteLevel(vol)
```

AFL.automation.loading.SainSmartRelay

Module Attributes

usbrelay

AFL.automation.loading.SainSmartRelay.usbrelay

```
AFL.automation.loading.SainSmartRelay.usbrelay = [[b':FE0100200000FF\r\n',
b':FE0100000010F1\r\n'], [b':FE050000000FD\r\n', b':FE050000FF00FE\r\n'],
[b':FE0500010000FC\r\n', b':FE050001FF00FD\r\n'], [b':FE0500020000FB\r\n',
b':FE050002FF00FC\r\n'], [b':FE0500030000FA\r\n', b':FE050003FF00FB\r\n'],
[b':FE0500040000F9\r\n', b':FE050004FF00FA\r\n'], [b':FE0500050000F8\r\n',
b':FE050005FF00F9\r\n'], [b':FE0500060000F7\r\n', b':FE050006FF00F8\r\n'],
[b':FE0500070000F6\r\n', b':FE050007FF00F7\r\n'], [b':FE0500080000F5\r\n',
b':FE050008FF00F6\r\n'], [b':FE0500090000F4\r\n', b':FE050009FF00F5\r\n'],
[b':FE05000A0000F3\r\n', b':FE05000AFF00F4\r\n'], [b':FE05000B0000F2\r\n',
b':FE05000BFF00F3\r\n'], [b':FE05000C0000F1\r\n', b':FE05000CFF00F2\r\n'],
[b':FE05000D0000F0\r\n', b':FE05000DFF00F1\r\n'], [b':FE05000E0000FF\r\n',
b':FE05000EFF00F0\r\n'], [b':FE05000F0000FE\r\n', b':FE05000FF00FF\r\n'],
[b':FE0F00000010020000E1\r\n', b':FE0F0000001002FFFFE3\r\n']]
     "" Sainsmart 16-Channel 9-36v USB Relay Module (CH341 chip)(sku# 101-70-208) 1. Requires CH341 Win-
     dows driver installed (see http://wiki.sainsmart.com/index.php/101-70-208) 2. The hex table provided by Sains-
     mart requires converting to ASCII chars (see 'usbrelay' below) 3. Format of 'usbrelay' two-dimensional array
```

is: usbrelay = [row][ch-off, ch-on] so that the 2nd index selects ON/OFF value

Example...

```
status = usbrelay[0][1] \# row-0 (status) stat\_ret = usbrelay[0][0] \# row-0 (status return) ch\_1\_on = usbrelay[1][1] \# row-1 (chan-1 off) ch\_1\_off = usbrelay[1][0] \# row-1 (chan-1 off) ch\_16\_on = usbrelay[16][1] \# row-16 (chan-16 on) ch\_16\_off = usbrelay[16][0] \# row-16 (chan-16 off) all\_on = usbrelay[17][1] \# row-17 (all on) all\_off = usbrelay[17][0] \# row-17 (all off)
```

"

Classes

```
MultiChannelRelay()

SainSmartRelay(relaylabels, serial_port[, ...])

SerialDevice(port[, baudrate, timeout, ...])
```

AFL.automation.loading.SainSmartRelay.MultiChannelRelay

while the 1st index selects the array row.

```
__init__()

getChannels(channels)

setChannels(channels)

toggleChannels(channels)

setChannels(channels)

getChannels(channels)

toggleChannels(channels)
```

AFL.automation.loading.SainSmartRelay.SainSmartRelay

```
class AFL.automation.loading.SainSmartRelay.SainSmartRelay(relaylabels, serial_port, timeout=0.5)
    Bases: MultiChannelRelay, SerialDevice
    __init__(relaylabels, serial_port, timeout=0.5)
    Init connection to a SainSmart 16-channel USB relay module.
    Params: relaylabels (dict):
        mapping of port id to load name, e.g. {0:'arm_up',1:'arm_down'}
    serial_port (str):
        port to connect to
```

Methods

```
__init__(relaylabels, serial_port, timeout=0.5)
Init connection to a SainSmart 16-channel USB relay module.

Params: relaylabels (dict):

mapping of port id to load name, e.g. {0:'arm_up',1:'arm_down'}
```

```
serial_port (str):
               port to connect to
     setAllChannelsOff()
     setChannels(channels)
          Write a value (True, False) to the channels specified in channels
          Parameters: channels (dict):
               dict of channels, keys as either str (name) or int (id) to write to, vals as the value to write
     getChannels(asid=False)
          Read the current state of all channels
          Parameters: asid (bool,default false): Dict keys should simply be the id, not the name.
          Returns: (dict) key:value mappings of state.
     toggleChannels(channels)
     sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)
AFL.automation.loading.SainSmartRelay.SerialDevice
class AFL.automation.loading.SainSmartRelay.SerialDevice(port, baudrate=19200, timeout=0.5,
                                                                    raw_writes=False)
     Bases: object
     __init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
     Methods
       __init__(port[, baudrate, timeout, raw_writes])
       sendCommand(cmd[, response, questionmarkOK,
       ...])
     __init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
     sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)
class AFL.automation.loading.SainSmartRelay.SainSmartRelay(relaylabels, serial_port, timeout=0.5)
     __init__(relaylabels, serial_port, timeout=0.5)
          Init connection to a SainSmart 16-channel USB relay module.
          Params: relaylabels (dict):
               mapping of port id to load name, e.g. {0:'arm_up',1:'arm_down'}
          serial_port (str):
               port to connect to
     setAllChannelsOff()
```

```
setChannels(channels)
          Write a value (True, False) to the channels specified in channels
          Parameters: channels (dict):
              dict of channels, keys as either str (name) or int (id) to write to, vals as the value to write
     getChannels(asid=False)
          Read the current state of all channels
          Parameters: asid (bool,default false): Dict keys should simply be the id, not the name.
          Returns: (dict) key:value mappings of state.
     toggleChannels(channels)
AFL.automation.loading.SainSmartRelay.usbrelay = [[b':FE0100200000FF\r\n',
b':FE0100000010F1\r\n'], [b':FE050000000FD\r\n', b':FE050000FF00FE\r\n'],
[b':FE0500010000FC\r\n', b':FE050001FF00FD\r\n'], [b':FE0500020000FB\r\n',
b':FE050002FF00FC\r\n'], [b':FE0500030000FA\r\n', b':FE050003FF00FB\r\n'],
[b':FE0500040000F9\r\n', b':FE050004FF00FA\r\n'], [b':FE0500050000F8\r\n',
b':FE050005FF00F9\r\n'], [b':FE0500060000F7\r\n', b':FE050006FF00F8\r\n'],
[b':FE0500070000F6\r\n', b':FE050007FF00F7\r\n'], [b':FE0500080000F5\r\n',
b':FE050008FF00F6\r\n'], [b':FE0500090000F4\r\n', b':FE050009FF00F5\r\n'],
[b':FE05000A0000F3\r\n', b':FE05000AFF00F4\r\n'], [b':FE05000B0000F2\r\n',
b':FE05000BFF00F3\r\n'], [b':FE05000C0000F1\r\n', b':FE05000CFF00F2\r\n'],
[b':FE05000D0000F0\r\n', b':FE05000DFF00F1\r\n'], [b':FE05000E0000FF\r\n',
b':FE05000EFF00F0\r\n'], [b':FE05000F0000FE\r\n', b':FE05000FFF00FF\r\n'],
[b':FE0F00000010020000E1\r\n', b':FE0F0000001002FFFFE3\r\n']]
     "" Sainsmart 16-Channel 9-36v USB Relay Module (CH341 chip)(sku# 101-70-208) 1. Requires CH341 Win-
     dows driver installed (see http://wiki.sainsmart.com/index.php/101-70-208) 2. The hex table provided by Sains-
     mart requires converting to ASCII chars (see 'usbrelay' below) 3. Format of 'usbrelay' two-dimensional array
          usbrelay = [row][ch-off, ch-on] so that the 2nd index selects ON/OFF value
              while the 1st index selects the array row.
          Example...
              status = usbrelay[0][1] # row-0 (status) stat_ret = usbrelay[0][0] # row-0 (status return) ch_1_on
              = usbrelay[1][1] # row-1 (chan-1 off) ch_1_off = usbrelay[1][0] # row-1 (chan-1 off) ch_16_on =
              usbrelay[16][1] # row-16 (chan-16 on) ch_16_off = usbrelay[16][0] # row-16 (chan-16 off) all_on
              = usbrelay[17][1] # row-17 (all on) all_off = usbrelay[17][0] # row-17 (all off)
     667777
```

AFL.automation.loading.SampleCell

Classes

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```
SampleCell()
```

AFL.automation.loading.SampleCell.SampleCell

```
class AFL.automation.loading.SampleCell.SampleCell
    Bases: object
```

```
__init__()
```

```
__init__()
loadSample()
```

loadSample()

class AFL.automation.loading.SampleCell.SampleCell

loadSample()

AFL.automation.loading.Sensor

Classes

```
DummySensor1([period, minval, maxval])

DummySensor2([period, hi_value, lo_time, ...])

Sensor([address, channel])
```

AFL.automation.loading.Sensor.DummySensor1

```
\textbf{class} \ \texttt{AFL.automation.loading.Sensor.DummySensor1} (\textit{period} = 2, \textit{minval} = -5, \textit{maxval} = 5)
```

Bases: Thread

```
__init__(period=2, minval=-5, maxval=5)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

init([period, minval, maxval])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
read()	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(*period*=2, *minval*=-5, *maxval*=5)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

 ${\it args}$ is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

read()

terminate()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

AFL.automation.loading.Sensor.DummySensor2

class AFL.automation.loading.Sensor.DummySensor2(period=0.1, hi_value=5, lo_time=15, hi_time=2)

Bases: Thread

```
__init__(period=0.1, hi_value=5, lo_time=15, hi_time=2)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init([period, hi_value, lo_time, hi_time])	This constructor should always be called with keyword arguments.
<pre>driver_status()</pre>	
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
read()	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(period=0.1, hi_value=5, lo_time=15, hi_time=2)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

driver_status()

read()

terminate()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

AFL.automation.loading.Sensor.Sensor

```
class AFL.automation.loading.Sensor.Sensor(address=1, channel=0)
     Bases: object
     __init__(address=1, channel=0)
     Methods
       __init__([address, channel])
       calibrate()
       read()
     __init__(address=1, channel=0)
     calibrate()
     read()
class AFL.automation.loading.Sensor.Sensor(address=1, channel=0)
     __init__(address=1, channel=0)
     calibrate()
     read()
class AFL.automation.loading.Sensor.DummySensor1(period=2, minval=-5, maxval=5)
     __init__(period=2, minval=-5, maxval=5)
           This constructor should always be called with keyword arguments. Arguments are:
           group should be None; reserved for future extension when a ThreadGroup class is implemented.
           target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
           name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
           small decimal number.
           args is a list or tuple of arguments for the target invocation. Defaults to ().
           kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
           If a subclass overrides the constructor, it must make sure to invoke the base class constructor
           (Thread.__init__()) before doing anything else to the thread.
     read()
     terminate()
     run()
           Method representing the thread's activity.
           You may override this method in a subclass. The standard run() method invokes the callable object passed
```

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the args and kwargs arguments, respectively.

to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from

class AFL.automation.loading.Sensor.DummySensor2(period=0.1, hi_value=5, lo_time=15, hi_time=2)

```
__init__(period=0.1, hi_value=5, lo_time=15, hi_time=2)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

```
driver_status()
read()
terminate()
run()
```

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.loading.SensorCallbackThread

Classes

```
LoaderCommunication([load_client, load_object])

SensorCallbackThread(poll[, period, daemon, ...])

SimpleThresholdCB(poll, period[, window, ...])

StopLoadCBv1(poll, period, load_client[, ...])

StopLoadCBv2(poll, period[, load_client, ...])
```

AFL.automation.loading.SensorCallbackThread.LoaderCommunication

```
\textbf{class} \  \, \textbf{AFL}. \textbf{automation.loading.SensorCallbackThread.} \\ \textbf{LoaderCommunication} (load\_client=None, \\ load\_object=None)
```

```
Bases: object
__init__(load_client=None, load_object=None)
```

```
__init__([load_client, load_object])

getServerState()

stopLoad()

__init__(load_client=None, load_object=None)

getServerState()

stopLoad()
```

AFL.automation.loading.SensorCallbackThread.SensorCallbackThread

```
 \textbf{class} \  \, \textbf{AFL}. \textbf{automation.} 1 \textbf{o} \textbf{a} \textbf{d} \textbf{i} \textbf{g}. \textbf{SensorCallbackThread}. \textbf{SensorCallbackThread} (\textit{poll}, \textit{period} = 0.1, \\ \textit{d} \textbf{a} \textbf{e} \textit{mon} = \textit{True}, \\ \textit{filepath} = \textit{None}, \\ \textit{d} \textbf{a} \textbf{t} \textbf{a} = \textit{None}, \\ \textit{sensorlabel} = ")
```

Bases: Thread

 $\verb|__init__(poll, period=0.1, daemon=True, filepath=None, data=None, sensor label=")|$

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

init(poll[, period, daemon, filepath,])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>process_signal(signal)</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	
update_status(value)	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(poll, period=0.1, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

```
update_status(value)

terminate()

process_signal(signal)

run()
```

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

AFL.automation.loading.SensorCallbackThread.SimpleThresholdCB

Bases: SensorCallbackThread

__init__(poll, period, window=5, threshold=1)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread. init ()) before doing anything else to the thread.

Methods

init(poll, period[, window, threshold])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>process_signal()</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	
update_status(value)	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(poll, period, window=5, threshold=1)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

terminate()

update_status(value)

AFL.automation.loading.SensorCallbackThread.StopLoadCBv1

class AFL.automation.loading.SensorCallbackThread.StopLoadCBv1(poll, period, load_client,

threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")

Bases: SensorCallbackThread

__init__(poll, period, load_client, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(poll, period, load_client[,])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>process_signal()</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	
update_status(value)	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(poll, period, load_client, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

terminate()

update_status(value)

AFL.automation.loading.SensorCallbackThread.StopLoadCBv2

class AFL.automation.loading.SensorCallbackThread.StopLoadCBv2(poll, period, load_client=None,

load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")

Bases: SensorCallbackThread

__init__(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(poll, period[, load_client,])	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
<pre>process_signal()</pre>	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	
update_status(value)	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

terminate()

```
update_status(value)
```

 $\textbf{class AFL.automation.loading.SensorCallbackThread.SensorCallbackThread} (poll, period = 0.1, \\ daemon = True, \\ filepath = None, \\ data = None, \\ sensorlabel = ")$

__init__(poll, period=0.1, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

```
update_status(value)
```

terminate()

process_signal(signal)

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

class AFL.automation.loading.SensorCallbackThread.StopLoadCBv1(poll, period, load_client,

threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")

__init__(poll, period, load_client, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

class AFL.automation.loading.SensorCallbackThread.StopLoadCBv2(poll, period, load_client=None,

load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")

__init__(poll, period, load_client=None, load_object=None, threshold_npts=20, threshold_v_step=1, threshold_std=2.5, timeout=120, min_load_time=3, loadstop_cooldown=2, post_detection_sleep=0.2, baseline_duration=2, trigger_on_end=False, instatrigger=True, daemon=True, filepath=None, data=None, sensorlabel=")

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

process_signal()

```
__init__(poll, period, window=5, threshold=1)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

```
process_signal()
```

```
__init__(load_client=None, load_object=None)
getServerState()
stopLoad()
```

AFL.automation.loading.SensorPollingThread

Classes

```
SensorPollingThread(sensor[, period, ...])
```

AFL.automation.loading.SensorPollingThread.SensorPollingThread

 $\textbf{class} \ \texttt{AFL}. automation. loading. Sensor Polling Thread. \textbf{Sensor Polling Thread} (\textit{sensor}, \textit{period} = 0.1, \texttt{automation}) and the property of the$

callback=None, hv_pipe=None, window=None, filename=None, daemon=True, data=None)

Bases: Thread

```
__init__(sensor, period=0.1, callback=None, hv_pipe=None, window=None, filename=None, daemon=True, data=None)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

 $\ensuremath{\mathit{args}}$ is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

init(sensor[, period, callback,])	This constructor should always be called with keyword arguments.
alive()	
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
read()	
read_load_buffer()	
reset_load_buffer()	
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(sensor, period=0.1, callback=None, hv_pipe=None, window=None, filename=None, daemon=True, data=None)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor $(Thread._init_())$ before doing anything else to the thread.

read()

read_load_buffer()

reset_load_buffer()

terminate()

alive()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

ioin(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

```
\textbf{class} \  \, \textbf{AFL.automation.loading.SensorPollingThread}. \textbf{SensorPollingThread} (\textit{sensor}, \textit{period} = 0.1, \\ \textbf{sensorPollingThread}). \\ \textbf{sensorPollingThread} (\textit{sensor}, \textit{period} = 0.1, \\ \textbf{sensor}, \textit{period}
```

callback=None, hv_pipe=None, window=None, filename=None, daemon=True, data=None)

```
__init__(sensor, period=0.1, callback=None, hv_pipe=None, window=None, filename=None, daemon=True, data=None)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

read()

read_load_buffer()

reset_load_buffer()

```
terminate()
```

alive()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

AFL.automation.loading.SerialDevice

Classes

```
SerialDevice(port[, baudrate, timeout, ...])
```

AFL.automation.loading.SerialDevice.SerialDevice

```
Bases: object
```

```
__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
```

Methods

```
__init__(port[, baudrate, timeout, raw_writes])

sendCommand(cmd[, response, questionmarkOK,
...])
```

```
__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
```

sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)

Exceptions

SerialCommsException	Raised when the system receives a serial response it can't
	parse, likely a garbled line

AFL.automation.loading.SerialDevice.SerialCommsException

exception AFL.automation.loading.SerialDevice.SerialCommsException

Raised when the system receives a serial response it can't parse, likely a garbled line

```
__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
```

sendCommand(*cmd*, *response=True*, *questionmarkOK=False*, *timeout=-1*, *debug=False*)

AFL.automation.loading.SyringePump

Classes

```
SyringePump()
```

AFL.automation.loading.SyringePump.SyringePump

```
class AFL.automation.loading.SyringePump.SyringePump
    Bases: object
    __init__()
```

Methods

```
__init__()

dispense(volume[, block])

emptySyringe()

getRate(rate)

setRate(rate)

stop()

withdraw(volume[, block])
```

```
stop()
withdraw(volume, block=True)
dispense(volume, block=True)
setRate(rate)
getRate(rate)
emptySyringe()
class AFL.automation.loading.SyringePump.SyringePump
stop()
withdraw(volume, block=True)
dispense(volume, block=True)
setRate(rate)
getRate(rate)
emptySyringe()
```

AFL.automation.loading.Tubing

Classes

```
Tubing(specid, length)
```

AFL.automation.loading.Tubing.Tubing

```
class AFL.automation.loading.Tubing.Tubing(specid, length)
    Bases: object
    __init__(specid, length)
    length is in cm?
```

Methods

```
__init__(specid, length) length is in cm?
volume() returns volume in mL
```

Attributes

```
tubing
```

```
tubing = [{'IDEXpart': 1530, 'ID_mm': 1.575, 'OD_in': 0.125, 'material':
     'Tefzel', 'typeid': 1530}, {'IDEXpart': 1529, 'ID_mm': 0.254, 'OD_in': 0.075,
     'material': 'Tefzel', 'typeid': 1529}, {'IDEXpart': 0, 'ID_mm': 2.92, 'OD_in':
    0.1875, 'material': 'PVC', 'typeid': 1}, {'IDEXpart': 1517, 'ID_mm': 1, 'OD_in':
    0.075, 'material': 'Tefzel', 'typeid': 1517}]
    __init__(specid, length)
        length is in cm?
    volume()
         returns volume in mL
class AFL.automation.loading.Tubing.Tubing(specid, length)
    tubing = [{'IDEXpart': 1530, 'ID_mm': 1.575, 'OD_in': 0.125, 'material':
     'Tefzel', 'typeid': 1530}, {'IDEXpart': 1529, 'ID_mm': 0.254, 'OD_in': 0.075,
     'material': 'Tefzel', 'typeid': 1529}, {'IDEXpart': 0, 'ID_mm': 2.92, 'OD_in':
    0.1875, 'material': 'PVC', 'typeid': 1}, {'IDEXpart': 1517, 'ID_mm': 1, 'OD_in':
    0.075, 'material': 'Tefzel', 'typeid': 1517}]
    __init__(specid, length)
        length is in cm?
    volume()
         returns volume in mL
```

AFL.automation.loading.TwoSelectorBlowoutSampleCell

Classes

Driver(name[, defaults, overrides])		
SampleCell()		
Tubing(specid, length)		
TwoSelectorBlowoutSampleCell(pump,)	selector,	Class for a sample cell consisting of a pump and a one- to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a sepa- rate selector channel (in contrast to an inline selector cell where the cell is in the pump line).
defaultdict		defaultdict(default_factory=None, /, [])> dict with default factory

${\bf AFL}. automation. loading. Two Selector Blowout Sample Cell. Driver$

Bases: object
__init__(name, defaults=None, overrides=None)

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                  uid (str) - The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
          Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.loading.TwoSelectorBlowoutSampleCell.SampleCell
class AFL.automation.loading.TwoSelectorBlowoutSampleCell.SampleCell
     Bases: object
     __init__()
```

```
__init__()
loadSample()
```

loadSample()

AFL.automation.loading.TwoSelectorBlowoutSampleCell.Tubing

```
class AFL.automation.loading.TwoSelectorBlowoutSampleCell.Tubing(specid, length)
    Bases: object
    __init__(specid, length)
    length is in cm?
```

Methods

init(specid, length)	length is in cm?
volume()	returns volume in mL

Attributes

```
tubing = [{'IDEXpart': 1530, 'ID_mm': 1.575, 'OD_in': 0.125, 'material':
'Tefzel', 'typeid': 1530}, {'IDEXpart': 1529, 'ID_mm': 0.254, 'OD_in': 0.075,
'material': 'Tefzel', 'typeid': 1529}, {'IDEXpart': 0, 'ID_mm': 2.92, 'OD_in':
0.1875, 'material': 'PVC', 'typeid': 1}, {'IDEXpart': 1517, 'ID_mm': 1, 'OD_in':
0.075, 'material': 'Tefzel', 'typeid': 1517}]
__init__(specid, length)
    length is in cm?
volume()
    returns volume in mL
```

AFL. automation. Ioading. Two Selector Blowout Sample Cell. Two Selector Blow Sele

```
class AFL.automation.loading.TwoSelectorBlowoutSampleCell.TwoSelectorBlowoutSampleCell(pump,
```

```
se-
lec-
tor,
blows-
e-
lec-
tor,
rinse_tank_level=950
waste_tank_level=0,
cell_waste_tank_leve
over-
rides=None)
```

Bases: Driver, SampleCell

Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell where the cell is in the pump line).

@TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)

```
__init__(pump, selector, blowselector, rinse_tank_level=950, waste_tank_level=0, cell_waste_tank_level=0, overrides=None)
```

ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells

thickness = cell path length, to be incorporated into metadata, array with length = ncells

cell state if not 'clean', array with length = ncells

```
pump: a pump object supporting withdraw() and dispense() methods
    e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)
```

selector: a selector object supporting string-based selectPort() method with options 'catch','cell','rinse','waste','air'

e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})

Methods

init(pump, selector, blowselector[,])	ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
<pre>blowOutCell([cellname, waittime])</pre>	
blowOutCellLegacy([cellname])	
<pre>catchToSyringe([sampleVolume])</pre>	
catchToWaste([sampleVolume])	
cellToWaste([cellname])	
<pre>deposit_obj(obj[, uid])</pre>	Store an object in the dropbox
drySyringe([blow, waittime])	transfer from air to waste, to push out any residual liquid.
	continues on next page

continues on next page

Table 16 – continued from previous page

```
execute(**kwargs)
gather_defaults()
                                                  Gather all inherited static class-level dictionaries
                                                  called default.
get_config(name[, print_console])
get\_configs([print\_console])
get_object(name[, serialize])
get_sample()
loadSample([cellname, sampleVolume])
post_execute(**kwargs)
                                                  Executed after each call to execute
pre_execute(**kwargs)
                                                  Executed before each call to execute
queued()
quickbar()
reset_sample()
reset_tank_levels([rinse, waste, cell_waste])
retrieve_obj(uid[, delete])
                                                  Retrieve an object from the dropbox
rinseAll([cellname])
rinseCatch()
rinseCell([cellname])
rinseCellFlood([cellname])
rinseCellPull([cellname])
rinseSyringe()
setRinseLevel(vol)
setWasteLevel(vol)
set_config(**kwargs)
set_data(data)
                                                  Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
swish(vol)
```

continues on next page

Table 16 - continued from previous page

```
transfer(source, dest, vol_source[, vol_dest])
unqueued()
```

Attributes

```
app
 defaults
defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
__init__(pump, selector, blowselector, rinse_tank_level=950, waste_tank_level=0,
          cell waste tank level=0, overrides=None)
    ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
    by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
    thickness = cell path length, to be incorporated into metadata, array with length = ncells
    cell state if not 'clean', array with length = ncells
    pump: a pump object supporting withdraw() and dispense() methods
        e.g. pump = NE1KSyringePump(port,syringe id mm,syringe volume)
    selector: a selector object supporting string-based selectPort() method with options
    'catch', 'cell', 'rinse', 'waste', 'air'
        e.g. selector = ViciMultiposSelector(port,portlabels={'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse=950, waste=0, cell_waste=0)
property app
status()
transfer(source, dest, vol_source, vol_dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
```

```
drySyringe(blow=True, waittime=1)
     transfer from air to waste, to push out any residual liquid.
     if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
setRinseLevel(vol)
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
quickbar()
reset_sample()
```

AFL.automation.loading.TwoSelectorBlowoutSampleCell.defaultdict

class AFL.automation.loading.TwoSelectorBlowoutSampleCell.defaultdict

```
Bases: dict
```

defaultdict(default_factory=None, /, [...]) -> dict with default factory

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

```
__init__(*args, **kwargs)
```

Methods

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
<i>pop</i> (k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
setdefault(key[, default])	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

default_factory	Factory for default value called bymissing().	
init(*args, **kwargs)		
$clear() \rightarrow None$. Remove all items from D.		
$copy() \rightarrow a$ shallow copy of D.		
default_factory		
Factory for default value called bymissin	g().	
<pre>fromkeys(value=None,/)</pre>		
Create a new dictionary with keys from itera	able and values set to value.	
<pre>get(key, default=None, /)</pre>	1 16 1	
Return the value for key if key is in the dictionary, else default.		
items () \rightarrow a set-like object providing a view on	D's items	
keys () \rightarrow a set-like object providing a view on I	D's keys	
$\mathtt{pop}(k \llbracket, d \rrbracket) \to \mathrm{v}$, remove specified key and return	rn the corresponding value.	
If the key is not found, return the default if g	given; otherwise, raise a KeyError.	

popitem()

```
Remove and return a (key, value) pair as a 2-tuple.
          Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
     setdefault(key, default=None, /)
          Insert key with a value of default if key is not in the dictionary.
          Return the value for key if key is in the dictionary, else default.
     update([E, *F] \rightarrow None. Update D from dict/iterable E and F.
          If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
          method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
     values() \rightarrow an object providing a view on D's values
class AFL.automation.loading.TwoSelectorBlowoutSampleCell.TwoSelectorBlowoutSampleCell(pump,
                                                                                                         se-
                                                                                                         lec-
                                                                                                         tor,
                                                                                                         blows-
                                                                                                         lec-
                                                                                                         tor,
                                                                                                         rinse_tank_level=950
                                                                                                         waste tank level=0.
                                                                                                         cell_waste_tank_leve
                                                                                                         over-
                                                                                                         rides=None)
     Class for a sample cell consisting of a pump and a one-to-many flow selector where the pump line holds sample
     (pulling and pushing as necessary) with a cell on a separate selector channel (in contrast to an inline selector cell
     where the cell is in the pump line).
      @TODO: write support for multiple cells on separate channels (up to 6 cells on a 10-position selector)
     defaults = {'blow_out_vol': 6, 'calibrated_catch_to_syringe_vol': 1.1,
      'calibrated_syringe_to_cell_vol': 3.2, 'catch_empty_ffvol': 2,
      'catch_to_selector_vol': 0.8796459430051422, 'cell_to_selector_vol':
      1.9351768777756622, 'dry_vol_ml': 5, 'load_flow_delay': 10.0, 'load_speed': 10.0,
      'ncells': 1, 'nrinses_catch': 2, 'nrinses_cell': 1, 'nrinses_cell_flood': 2,
      'nrinses_syringe': 2, 'rinse_flow_delay': 3.0, 'rinse_prime_vol': 3,
      'rinse_speed': 50.0, 'rinse_vol_catch_ml': 2, 'rinse_vol_ml': 3,
      'selector_internal_vol': 0.0005067074790974977, 'syringe_to_selector_vol':
     1.1625376729937205, 'thickness': None, 'to_waste_vol': 1}
     __init__(pump, selector, blowselector, rinse_tank_level=950, waste_tank_level=0,
                cell_waste_tank_level=0, overrides=None)
          ncells = number of connected cells (up to 6 cells with a 10-position flow selector, with four positions taken
          by load port, rinse, waste, and air) Name = the cell name, array with length = ncells
          thickness = cell path length, to be incorporated into metadata, array with length = ncells
          cell state if not 'clean', array with length = ncells
          pump: a pump object supporting withdraw() and dispense() methods
```

e.g. pump = NE1KSyringePump(port,syringe_id_mm,syringe_volume)

```
selector: a selector object supporting string-based selectPort() method with options
     'catch','cell','rinse','waste','air'
         e.g. selector = ViciMultiposSelector(port,portlabels={ 'catch':1,'cell':2,'rinse':3,'waste':4,'air':5})
reset_tank_levels(rinse=950, waste=0, cell waste=0)
property app
status()
transfer(source, dest, vol_source, vol_dest=None)
catchToSyringe(sampleVolume=0)
loadSample(cellname='cell', sampleVolume=0)
catchToWaste(sampleVolume=0.0)
cellToWaste(cellname='cell')
rinseSyringe()
drySyringe(blow=True, waittime=1)
     transfer from air to waste, to push out any residual liquid.
     if blow is True, additionally use a 1 s pulse of nitrogen to clear the syringe transfer line.
rinseCell(cellname='cell')
rinseCellPull(cellname='cell')
rinseCellFlood(cellname='cell')
swish(vol)
blowOutCellLegacy(cellname='cell')
blowOutCell(cellname='cell', waittime=20)
rinseCatch()
rinseAll(cellname='cell')
setRinseLevel(vol)
setWasteLevel(vol)
```

AFL.automation.loading.UltimusVPressureController

Classes

PressureController()	Abstract superclass for pressure controllers that provides timed dispensing
<pre>UltimusVPressureController(port[, baud])</pre>	

AFL.automation.loading.UltimusVPressureController.PressureController

class AFL.automation.loading.UltimusVPressureController.PressureController

Bases: object

Abstract superclass for pressure controllers that provides timed dispensing

__init__()

Methods

init()	
<pre>blockUntilStatusStopped([pollingdelay])</pre>	block execution until the controller finishes a dispense
dispenseRunning()	Returns true if a timed dispense is running, false otherwise.
<pre>ramp_dispense(dispense_start_pressure,)</pre>	Perform a pressure dispense with a linear ramp in pressure between <i>dispense_start_pressure</i> and <i>dispense_stop_pressure</i> , stopping after <i>dispense_time</i> .
stop()	Abort the current timed dispense action.
<pre>timed_dispense(dispense_pressure, pense_time)</pre>	Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time.

timed_dispense(dispense_pressure, dispense_time, block=True)

Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time. This dispense can be interrupted by calling self.stop().

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

AFL.automation.loading.UltimusVPressureController.UltimusVPressureController

class AFL.automation.loading.UltimusVPressureController.UltimusVPressureController(port,

baud=115200)

Methods

init(port[, baud]) blockUntilStatusStopped([pollingdelay])		Initializes a DigitalOutPressureController block execution until the controller finishes a dispense
char_count(cmd)		
<pre>compute_checksum(cmd)</pre>		
dispenseRunning()		Returns true if a timed dispense is running, false otherwise.
<pre>package_cmd(cmd)</pre>		
<pre>ramp_dispense(dispense_start_pressure,)</pre>		Perform a pressure dispense with a linear ramp in pressure between <i>dispense_start_pressure</i> and <i>dispense_stop_pressure</i> , stopping after <i>dispense_time</i> .
send_command(cmd)		
<pre>set_P(pressure)</pre>		pressure: pressure to set in psi
stop()		Abort the current timed dispense action.
<pre>timed_dispense(dispense_pressure, pense_time)</pre>	dis-	Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time.

```
__init__(port, baud=115200)
```

Initializes a DigitalOutPressureController

Params:

port (str): serial port to use

 ${\tt compute_checksum}(cmd)$

char_count(cmd)

package_cmd(cmd)

send_command(cmd)

set_P(pressure)

pressure: pressure to set in psi

blockUntilStatusStopped(pollingdelay=0.2)

block execution until the controller finishes a dispense

dispenseRunning()

Returns true if a timed dispense is running, false otherwise.

Perform a pressure dispense with a linear ramp in pressure between *dispense_start_pressure* and *dispense_stop_pressure*, stopping after *dispense_time*. This dispense can be interrupted by calling self.stop(). If const_time is set, the last *const_time* seconds of the dispense will be at constant pressure, with the ramp occurring in the remaining time.

stop()

Abort the current timed dispense action.

```
timed_dispense(dispense_pressure, dispense_time, block=True)
```

Perform a pressure dispense at pressure dispense_pressure, stopping after dispense_time. This dispense can be interrupted by calling self.stop().

 $\textbf{class} \ \texttt{AFL}. automation. loading. Ultimus VP ressure \texttt{Controller}. \textbf{Ultimus VP ressure \texttt{Controller}} (port, port, p$

baud=115200)

```
__init__(port, baud=115200)
Initializes a DigitalOutPressureController
Params:
        port (str): serial port to use

compute_checksum(cmd)

char_count(cmd)

package_cmd(cmd)

send_command(cmd)

set_P(pressure)
        pressure: pressure to set in psi
```

AFL.automation.loading.ViciMultiposSelector

Classes

```
FlowSelector()

SerialDevice(port[, baudrate, timeout, ...])

ViciMultiposSelector(port[, baudrate, ...])
```

AFL.automation.loading.ViciMultiposSelector.FlowSelector

```
{\bf class} \ {\tt AFL.automation.loading.ViciMultiposSelector.} {\bf FlowSelector}
```

```
Bases: object
__init__()
```

Methods

```
__init__()

getPort()

selectPort()
```

```
getPort()
selectPort()
```

AFL.automation.loading.ViciMultiposSelector.SerialDevice

```
Bases: object
__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
```

Methods

```
__init__(port[, baudrate, timeout, raw_writes])

sendCommand(cmd[, response, questionmarkOK,
...])
```

```
__init__(port, baudrate=19200, timeout=0.5, raw_writes=False)
sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)
```

AFL.automation.loading.ViciMultiposSelector.ViciMultiposSelector

```
Bases: SerialDevice, FlowSelector
__init__(port, baudrate=9600, portlabels=None)
connect to valve and query the number of positions
```

Parameters

- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

Methods

```
__init__(port[, baudrate, portlabels]) connect to valve and query the number of positions

getPort([as_str]) query the current selected position

selectPort(port[, direction, block]) moves the selector to portnum

sendCommand(cmd[, response, questionmarkOK, ...])
```

```
__init__(port, baudrate=9600, portlabels=None)
connect to valve and query the number of positions
```

Parameters

- use (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

selectPort(port, direction=None, block=True)

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

Parameters

- port (String or int) the name, or number, of the port to switch to
- **direction** (*String*, *default=None*) direction "CW" or "CCW" to perform the move in
- **block** (*bool*, *default=True*) block return until move completes

getPort(as_str=False)

query the current selected position

sendCommand(cmd, response=True, questionmarkOK=False, timeout=-1, debug=False)

__init__(port, baudrate=9600, portlabels=None)

connect to valve and query the number of positions

Parameters

- to (port string describing the serial port the actuator is connected)
- **use** (baud baudrate to)
- naming (portlabels dict for smart port) 3,'instrument':4,'rinse':5,'waste':6}
- {'sample' (of the form) 3,'instrument':4,'rinse':5,'waste':6}

selectPort(port, direction=None, block=True)

moves the selector to portnum

if direction is set to either "CW" or "CCW" it moves the actuator in that direction. if unset or other value, will move via most efficient route.

Parameters

- port (String or int) the name, or number, of the port to switch to
- **direction** (*String*, *default=None*) direction "CW" or "CCW" to perform the move in
- block (bool, default=True) block return until move completes

getPort(as_str=False)

query the current selected position

6.2.4 Prepare

The Prepare module provides functionality for sample preparation and processing.

AFL.automation.prepare

AFL.automation.prepare

Functions

```
##D20Factory(name[, phi_D2O, sld, properties]) Create a list of H2O/D2O solutions

compositionSweepFactory(name, components, ...)

make_locs(slot, nrows, ncols)

make_wellplate_locs(slot, size)
```

AFL.automation.prepare.HD2OFactory

AFL.automation.prepare.HD20Factory(name, phi_D2O=None, sld=None, properties=None)
Create a list of H2O/D2O solutions

AFL.automation.prepare.compositionSweepFactory

AFL.automation.prepare.compositionSweepFactory(name, components, vary_components, lo, hi, num, logspace=False, properties=None, progress=None)

AFL.automation.prepare.make_locs

AFL.automation.prepare.make_locs(slot, nrows, ncols)

AFL.automation.prepare.make_wellplate_locs

AFL.automation.prepare.make_wellplate_locs(slot, size)

Classes

```
ComponentDB([path])

Deck()

MassBalance()

PipetteAction(source, dest, volume[, ...])

Sample(name, target[, target_check, balancer])

SampleSeries()

Solute(name[, description, density, ...]) Specialization class for solute components

Solution(name, components[, properties])

Solvent(name, density[, description, ...]) Specialization class for solute components
```

AFL.automation.prepare.ComponentDB

```
class AFL.automation.prepare.ComponentDB(path='.afl/component.db.json')
    Bases: object
    __init__(path='.afl/component.db.json')
```

Methods

```
__init__([path])
add(name, preptype[, formula, density, sld, ...])
add_interactive(name)
read([path])
remove(name[, write])
write([path])

__init__(path='.afl/component.db.json')
read(path=None)
write(path=None)
add(name, preptype, formula=None, density=None, sld=None, write=False, description=None, overwrite=False)
add_interactive(name)
remove(name, write=False)
```

AFL.automation.prepare.Deck

```
class AFL.automation.prepare.Deck
    Bases: object
    __init__()
```

Methods

__init__()

```
__init__()
add_catch(name, slot)
add_container(name, slot)
add_pipette(name, mount, tipracks)
add_stock(stock, location)
add_target(target[, location, name])
catch_sample(volume, source, dest[, ...])
get_components()
get_stock(name)
init_remote_connection(url[, home])
iterate_protocols()
make_align_script(filename[,
load_last_sample])
make_mass_balance()
make_protocol([only_validated, flatten, ...])
make_sample_series([reset_sample_series])
make_script(filename[, load_last_sample])
reset_stocks()
reset_targets()
send_deck_config([debug_mode])
send_protocol([send_deck_config, debug_mode])
validate_sample_series([tolerance, ...])
```

```
init_remote_connection(url, home=False)
     catch_sample(volume, source, dest, mix_before=None, debug_mode=False)
     send_deck_config(debug_mode=False)
     send_protocol(send_deck_config=True, debug_mode=False)
     add_pipette(name, mount, tipracks)
     add_catch(name, slot)
     add_container(name, slot)
     add_stock(stock, location)
     get_stock(name)
     add_target(target, location='target', name=None)
     make_mass_balance()
     reset_targets()
     reset_stocks()
     get_components()
     make_sample_series(reset_sample_series=False)
     validate_sample_series(tolerance=0.0, print_report=True, progress=None)
     make_protocol(only_validated=False, flatten=False, pipette_kw=None)
     iterate_protocols()
     make_align_script(filename, load_last_sample=True)
     make_script(filename, load_last_sample=True)
AFL.automation.prepare.MassBalance
class AFL.automation.prepare.MassBalance
     Bases: object
     __init__()
```

Methods

```
__init__()
 add_stock(stock, location)
 balance_mass()
 {\tt calculate\_bounds}([components, ...])
 constrain_samples_conc(constraints[, rtol])
 copy()
 in_bounds(points[, ternary])
 make_grid_mask([pts_per_row, ternary])
 make_mass_fraction_matrix()
 make_target_component_masses()
 plot_bounds([include_points])
 plot_grid_mask()
 process_components()
 reset()
 reset_stocks()
 reset_targets()
 sample_composition_space([pipette_min, ...])
                                                   Combine stock solutions to generate samples of pos-
                                                   sible target compositions
 set_target(target, location)
__init__()
copy()
add_stock(stock, location)
set_target(target, location)
reset_targets()
reset_stocks()
reset()
process_components()
```

```
make_mass_fraction_matrix()
     make_target_component_masses()
     balance_mass()
     sample_composition_space(pipette_min=<Quantity(5, 'microliter')>,
                                   stock_transfer_max=<Quantity(3500, 'microliter')>, grid_density=5,
                                   composition_data='frac')
          Combine stock solutions to generate samples of possible target compositions
     constrain_samples_conc(constraints, rtol=0.05)
     calculate_bounds(components=None, exclude_comps_below=None, fixed_comps=None,
                         composition_data='samples_frac', ternary=True)
     in_bounds(points, ternary=True)
     make_grid_mask(pts_per_row=100, ternary=True)
     plot_grid_mask()
     plot_bounds(include_points=True)
AFL.automation.prepare.PipetteAction
class AFL.automation.prepare.PipetteAction(source, dest, volume, source_loc=None, dest_loc=None,
                                                  aspirate_rate=None, dispense_rate=None,
                                                  mix aspirate rate=None, mix dispense rate=None,
                                                  mix_before=None, mix_after=None, blow_out=False,
                                                  post aspirate delay=0.0, post dispense delay=0.0,
                                                  aspirate_equilibration_delay=0.0, drop_tip=True,
                                                  force new tip=False, to top=True, to center=False,
                                                  to_top_z_offset=0, fast_mixing=False)
     Bases: object
     __init__(source, dest, volume, source_loc=None, dest_loc=None, aspirate_rate=None,
                dispense_rate=None, mix_aspirate_rate=None, mix_dispense_rate=None, mix_before=None,
                mix_after=None, blow_out=False, post_aspirate_delay=0.0, post_dispense_delay=0.0,
                aspirate_equilibration_delay=0.0, drop_tip=True, force_new_tip=False, to_top=True,
                to_center=False, to_top_z_offset=0, fast_mixing=False)
     Methods
       __init__(source, dest, volume[, source_loc, ...])
       emit_protocol()
       get_kwargs()
```

__init__(source, dest, volume, source_loc=None, dest_loc=None, aspirate_rate=None, dispense_rate=None, mix_aspirate_rate=None, mix_dispense_rate=None, mix_before=None, mix_after=None, blow_out=False, post_aspirate_delay=0.0, post_dispense_delay=0.0, aspirate_equilibration_delay=0.0, drop_tip=True, force_new_tip=False, to_top=True, to_center=False, to_top_z_offset=0, fast_mixing=False)

```
emit_protocol()
     get_kwargs()
AFL.automation.prepare.Sample
class AFL.automation.prepare.Sample(name, target, target_check=None, balancer=None)
     Bases: object
     __init__(name, target, target_check=None, balancer=None)
     Methods
      __init__(name, target[, target_check, balancer])
      emit_protocol()
     Attributes
      balancer
      target
      target_check
      target_loc
     __init__(name, target, target_check=None, balancer=None)
     emit_protocol()
     property target
     property target_check
     property balancer
     property target_loc
AFL.automation.prepare.SampleSeries
class AFL.automation.prepare.SampleSeries
     Bases: object
```

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__init__()

Methods

```
__init__()
add_sample(sample)

mass_totals_component([only_validated])

reset()
shuffle()

__init__()
reset()
shuffle()

add_sample(sample)
mass_totals_stock(only_validated=True)

mass_totals_component(only_validated=True)
```

AFL.automation.prepare.Solute

```
class AFL.automation.prepare.Solute(name, description=None, density=None, formula=None, sld=None)
    Bases: Component
    Specialization class for solute components
    __init__(name, description=None, density=None, formula=None, sld=None)
```

Methods

```
__init__(name[, description, density, ...])

copy()

emit()

set_mass(value) Setter for inline mass changes
set_volume(volume) Setter for inline volume changes
```

Attributes

```
density
 formula
 is_solute
 is_solvent
 mass
 moles
 sld
 volume
__init__(name, description=None, density=None, formula=None, sld=None)
property density
property formula
property sld
property volume
__hash__()
    Needed so Components can be dictionary keys
__iter__()
    Dummy iterator to mimic behavior of Mixture.
copy()
emit()
property is_solute
property is_solvent
property mass
property moles
set_mass(value)
    Setter for inline mass changes
set_volume(volume)
    Setter for inline volume changes
```

AFL.automation.prepare.Solution

```
class AFL.automation.prepare.Solution(name, components, properties=None)
    Bases: object
    __init__(name, components, properties=None)
```

Methods

```
__init__(name, components[, properties])
add_component_from_name(name[,
                                      properties,
...])
contains(name)
copy([name])
from_dict(in_dict)
measure_out(amount[, deplete])
                                                  Create solution with identical composition at new to-
                                                  tal mass/volume
rename_component(old_name, new_name[, in-
place])
set_mass(value)
                                                  Setter for inline mass changes
set_properties_from_dict([properties,
                                             in-
place])
set_volume(value)
                                                  Setter for inline volume changes
to_dict()
```

Attributes

```
concentration
                                                Total mass of mixture.
mass
                                                Mass fraction of components in mixture
mass_fraction
molarity
size
solutes
solvent_density
solvent_mass
solvent_sld
solvent_volume
solvents
                                                Total volume of mixture.
volume
volume_fraction
                                                Volume fraction of solvents in mixture
```

```
__init__(name, components, properties=None)
__hash__()
    Needed so Solutions can be dictionary keys
to_dict()
classmethod from_dict(in_dict)
add_component_from_name(name, properties=None, inplace=False)
set_properties_from_dict(properties=None, inplace=False)
rename_component(old_name, new_name, inplace=False)
copy(name=None)
contains(name)
property size
property solutes
property solvents
__eq__(other)
     'Compare the mass, volume, and composition of two mixtures
property mass
     Total mass of mixture.
```

```
set_mass(value)
          Setter for inline mass changes
     property volume
          Total volume of mixture. Only solvents are included in volume calculation
     set_volume(value)
          Setter for inline volume changes
     property solvent_sld
     property solvent_density
     property solvent_volume
     property solvent_mass
     property mass_fraction
          Mass fraction of components in mixture
              Returns
                  • mass_fraction (dict)
                  • Component mass fractions
     property volume_fraction
          Volume fraction of solvents in mixture
              Returns
                  • solvent_fraction (dict)
                  • Component mass fractions
     property concentration
     property molarity
     measure_out(amount, deplete=False)
          Create solution with identical composition at new total mass/volume
AFL.automation.prepare.Solvent
class AFL.automation.prepare.Solvent(name, density, description=None, formula=None, sld=None)
     Bases: Component
     Specialization class for solute components
     __init__(name, density, description=None, formula=None, sld=None)
```

Methods

```
__init__(name, density[, description, ...])

copy()

emit()

set_mass(value) Setter for inline mass changes
set_volume(value) Setter for inline volume changes
```

Attributes

```
density

formula

is_solute

is_solvent

mass

moles

sld

volume
```

```
__init__(name, density, description=None, formula=None, sld=None)

property density

property formula

property sld

__hash__()

    Needed so Components can be dictionary keys

__iter__()

    Dummy iterator to mimic behavior of Mixture.

copy()

emit()

property is_solute

property is_solvent

property mass
```

```
property moles

set_mass(value)

Setter for inline mass changes

set_volume(value)

Setter for inline volume changes

property volume
```

Modules

Component

DeckBuilderWidget

Dummy_OT2_Driver

OT2Client

PrepType

PrepareWidget

SampleSeriesWidget

StockBuilderWidget

SweepBuilderWidget

factory

utilities

AFL.automation.prepare.Component

Functions

fault_units	<pre>enforce_units(value, unit_type)</pre>	Ensure that a number has units and convert to the default_units
-------------	--	---

AFL.automation.prepare.Component.enforce_units

AFL.automation.prepare.Component.enforce_units(value, unit_type)

Ensure that a number has units and convert to the default_units

Classes

Component(name, description)	Base class for all materials
<pre>PrepType(value[, names, module, qualname,])</pre>	

AFL.automation.prepare.Component.Component

```
class AFL.automation.prepare.Component.Component(name, description)
```

Bases: object

Base class for all materials

This class defines all of the basic properties and methods to be shared across material objects

```
__init__(name, description)
```

Methods

```
__init__(name, description)

copy()

emit()

set_mass(value) Setter for inline mass changes

set_volume(value) Setter for inline volume changes
```

Attributes

```
density

formula

is_solute

is_solvent

mass

moles

sld

volume

__init__(name, description)

emit()
__hash__()
    Needed so Components can be dictionary keys

copy()
__iter__()
```

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Dummy iterator to mimic behavior of Mixture.

```
property mass
     set_mass(value)
         Setter for inline mass changes
     property volume
     set_volume(value)
         Setter for inline volume changes
     property density
     property formula
     property moles
     property sld
     property is_solute
     property is_solvent
AFL.automation.prepare.Component.PrepType
class AFL.automation.prepare.Component.PrepType(value, names=None, *, module=None,
                                                   qualname=None, type=None, start=1,
                                                   boundary=None)
     Bases: Enum
     __init__(*args, **kwds)
     Attributes
      BaseComponent
      BaseMixture
      Solute
      Solvent
      Solution
     BaseComponent = 1
     BaseMixture = 2
     Solute = 3
     Solvent = 4
     Solution = 5
```

```
classmethod __contains__(member)
```

Return True if member is a member of this enum raises TypeError if member is not an enum member note: in 3.12 TypeError will no longer be raised, and True will also be returned if member is the value of a member in this enum

```
classmethod __getitem__(name)
```

Return the member matching *name*.

```
classmethod __iter__()
```

Return members in definition order.

```
classmethod __len__()
```

Return the number of members (no aliases)

Exceptions

```
ParseException(pstr[, loc, msg, elem]) Exception thrown when a parse expression doesn't match the input string
```

AFL.automation.prepare.Component.ParseException

exception AFL.automation.prepare.Component.ParseException($pstr: str, loc: int = 0, msg: str \mid None = None, elem=None)$

Exception thrown when a parse expression doesn't match the input string

Example:

```
integer = Word(nums).set_name("integer")
try:
    integer.parse_string("ABC")
except ParseException as pe:
    print(pe, f"column: {pe.column}")
```

prints:

emit()

```
Expected integer, found 'ABC' (at char 0), (line:1, col:1) column: 1

loc: int

msg: str

pstr: str

parser_element: Any

args: tuple[str, int, str | None]

class AFL.automation.prepare.Component.Component(name, description)

Base class for all materials

This class defines all of the basic properties and methods to be shared across material objects

__init__(name, description)
```

```
__hash__()
    Needed so Components can be dictionary keys
copy()
__iter__()
    Dummy iterator to mimic behavior of Mixture.
property mass
set_mass(value)
    Setter for inline mass changes
property volume
set_volume(value)
    Setter for inline volume changes
property density
property formula
property moles
property sld
property is_solute
property is_solvent
```

AFL.automation.prepare.DeckBuilderWidget

Functions

sqrt(x, /)

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Return the square root of x.

AFL.automation.prepare.DeckBuilderWidget.sqrt

AFL.automation.prepare.DeckBuilderWidget. $\mathbf{sqrt}(x,/)$ Return the square root of x.

Classes

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean <i>value</i> in the form of a checkbox.
<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
DeckBuilderWidget()	
DeckBuilderWidget_Model()	
<pre>DeckBuilderWidget_View()</pre>	
Dropdown(**kwargs)	Allows you to select a single item from a dropdown.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
7 1 7/441	
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible
	box model.

AFL.automation.prepare.DeckBuilderWidget.Button

class AFL.automation.prepare.DeckBuilderWidget.Button(**kwargs: Any)

Bases: DOMWidget, CoreWidget

Button widget.

This widget has an on_click method that allows you to listen for the user clicking on the button. The click event itself is stateless.

Parameters

- **description** (*str*) description displayed on the button
- icon (str) font-awesome icon names, without the 'fa-' prefix
- **disabled** (bool) whether user interaction is enabled

__init__(**kwargs)

Public constructor

Methods

init(**kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not
	a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
click()	Programmatically trigger a click event.
	continues on post page

continues on next page

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close()	
	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_click(callback[, remove])	Register a callback to execute when the button is clicked.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

button_style	Use a predefined styling for the button.
COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Button label.
disabled	Enable or disable user changes.
icon	Font-awesome icon names, without the 'fa-' prefix.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

description

Button label.

disabled

Enable or disable user changes.

icon

Font-awesome icon names, without the 'fa-' prefix.

button_style

Use a predefined styling for the button.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

__init__(**kwargs)

Public constructor

on_click(callback, remove=False)

Register a callback to execute when the button is clicked.

The callback will be called with one argument, the clicked button widget instance.

Parameters

remove (bool (optional)) – Set to true to remove the callback from the list of callbacks.

click()

Programmatically trigger a click event.

This will call the callbacks registered to the clicked button widget instance.

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata:* Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

```
notify_change(change)
```

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• remove (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• **handler** (*callable*) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change'*)) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.Checkbox

```
class AFL.automation.prepare.DeckBuilderWidget.Checkbox(**kwargs: Any)
```

Bases: _Bool

Displays a boolean value in the form of a checkbox.

Parameters

- value ({True, False}) value of the checkbox: True-checked, False-unchecked
- **description** (*str*) description displayed next to the checkbox
- **indent** ({*True*, *False*}) indent the control to align with other controls with a description. The style.description_width attribute controls this width for consistence with other controls.

```
__init__(value=None, **kwargs)
Public constructor
```

Methods

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.

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Table 18 – continued from previous page

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<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes.
indent	Indent the control to align with other controls with a
	description.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Bool value
widget_types	
widgets	

indent

Indent the control to align with other controls with a description.

style

Styling customizations

__del__()

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(***metadata: Any*) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated:: 8.0.0

Use tooltip attribute instead.

disabled

Enable or disable user changes.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

```
notify_change(change)
```

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- **name** (*list*, *str*, *None*) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• **remove** (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = traitlets.All, type: traitlets.All, type:
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• **handler** (*callable*) – The callable called when a trait attribute changes.

continues on next page

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Bool value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.Client

Bases: object

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

```
__init__(ip=None, port='5000', username=None, interactive=False)
```

Methods

```
__init__([ip, port, username, interactive])

clear_history()

clear_queue()

debug(state)

deposit_obj(obj[, uid])

Deposit an object in the dropbox obj : object, the object to deposit id : str, the uuid to deposit the object under if not specified, a new uuid will be generated

driver_status()

enqueue([interactive])

enqueued_base(**kwargs)

from_server_name(server_name, **kwargs)

get_config(name[, print_console, interactive])
```

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```
get_driver_object(name)
 get_object(name[, serialize])
 get_queue()
 get_queued_commands([inherit_commands])
 get_quickbar()
 get_server_time()
 get_unqueued_commands([inherit_commands])
 halt()
 logged_in()
 login(username[, populate_commands])
 move_item(uuid, pos)
 pause(state)
 query_driver(**kwargs)
 queue_state()
 remove_item(uuid)
 reset_queue_daemon()
 retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox id: str, the uuid
                                                   of the object to retrieve delete: bool, if True, delete
                                                   the object after retrieving
 server_cmd(cmd, **kwargs)
 set_config([interactive])
 set_driver_object(**kw)
 set_object([serialize])
 unqueued_base(**kwargs)
 wait([target_uuid, interval, for_history, ...])
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
logged_in()
```

```
login(username, populate_commands=True)
driver_status()
get_queue()
wait(target uuid=None, interval=0.1, for history=True, first check delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
get_unqueued_commands(inherit_commands=True)
get_queued_commands(inherit_commands=True)
enqueue(interactive=None, **kwargs)
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
halt()
queue_state()
remove_item(uuid)
move_item(uuid, pos)
set_driver_object(**kw)
get_driver_object(name)
deposit_obj(obj, uid=None)
     Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
     under if not specified, a new uuid will be generated
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
     the object after retrieving
set_object(serialize=True, **kw)
get_object(name, serialize=True)
```

AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget

Methods

```
__init__()

build_deck_object()

get_deck_config()

load_cb(event)

save_cb(event)

send_deck_cb(event)

set_deck_config(config)

start()

update_deck_graphic_cb(event)
```

```
__init__()
build_deck_object()
get_deck_config()
set_deck_config(config)
send_deck_cb(event)
save_cb(event)
load_cb(event)
update_deck_graphic_cb(event)
start()
```

AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_Model

```
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_Model
    Bases: object
    __init__()
```

Methods

```
__init__()
      build_deck_object(config)
      send_deck_config([pi_ip, align_script])
     __init__()
     send_deck_config(pi_ip='piot2', align_script='/home/nistoroboto/align.py')
     build_deck_object(config)
AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_View
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_View
     Bases: object
     __init__()
     Methods
      __init__()
      create_expanded_button(description,
                                               but-
      ton style)
      draw_deck()
      start()
     __init__()
     create_expanded_button(description, button_style)
     draw_deck()
     start()
AFL.automation.prepare.DeckBuilderWidget.Dropdown
class AFL.automation.prepare.DeckBuilderWidget.Dropdown(**kwargs: Any)
     Bases: _Selection
     Allows you to select a single item from a dropdown.
         Parameters
```

[('Galileo', 0), ('Brahe', 1), ('Hubble', 2)], or a Mapping between labels and values, e.g., {'Galileo': 0, 'Brahe': 1, 'Hubble': 2}.

• **options** (*list*) - The options for the dropdown. This can either be a list of values, e.g. ['Galileo', 'Brahe', 'Hubble'] or [0, 1, 2], a list of (label, value) pairs, e.g.

- index (int) The index of the current selection.
- **value** (*any*) The value of the current selection. When programmatically setting the value, a reverse lookup is performed among the options to check that the value is valid. The reverse lookup uses the equality operator by default, but another predicate may be provided via the equals keyword argument. For example, when dealing with numpy arrays, one may set equals=np.array_equal.
- label (str) The label corresponding to the selected value.
- **disabled** (*bool*) Whether to disable user changes.
- **description** (*str*) Label for this input group. This should be a string describing the widget.

__init__(*args, **kwargs)
Public constructor

Methods

init(*args, **kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be
· ·	passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
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Table 20 – continued from previous page

on_trait_change([handler, name, remove])	DEPRECATED: Setup a handler to be called when a
on_ on the first of the first o	trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
<pre>trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
index	Selected index
keys	The traits which are synced.
label	Selected label
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
options	Iterable of values, (label, value) pairs, or Mapping be-
	tween labels and values that the user can select.
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Selected value
widget_types	
widgets	

__del__()

Object disposal

__init__(*args, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

$\textbf{classmethod class_own_traits(**metadata: Any)} \rightarrow \text{dict[str, TraitType[Any, Any]]}$

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the *trait_names()* method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

disabled

Enable or disable user changes

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- state (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

index

Selected index

keys

The traits which are synced.

label

Selected label

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

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A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

```
notify_change(change)
```

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• **remove** (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

options

Iterable of values, (label, value) pairs, or Mapping between labels and values that the user can select.

The labels are the strings that will be displayed in the UI, representing the actual Python choices, and should be unique.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (unicode, or iterable (optional)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

style

Styling customizations

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

$trait_defaults(*names: str, **metadata: Any) \rightarrow dict[str, Any] | Sentinel$

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Selected value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.HBox

```
class AFL.automation.prepare.DeckBuilderWidget.HBox(**kwargs: Any)
```

Bases: Box

Displays multiple widgets horizontally using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to ', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Horizontal Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.HBox([title_widget, slider])

__init__(children=(), **kwargs)
```

Public constructor

Methods

	D 11:
init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
class_traits(**metadata)	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
<pre>has_trait(name)</pre>	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the frontend, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
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Table 21 – continued from previous page

<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

__del__()

Object disposal

__init__(children=(), **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(***metadata: Any*) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

$\verb|static get_manager_state|| \textit{drop_defaults} = False, \textit{widgets} = None||$

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

• handler (callable) – A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys:

- \ast owner: the HasTraits instance \ast old: the old value of the modified trait attribute \ast new: the new value of the modified trait attribute \ast name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

```
send_state(key=None)
```

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | <math>str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.Label

```
class AFL.automation.prepare.DeckBuilderWidget.Label(**kwargs: Any)
```

Bases: _String

Label widget.

It also renders math inside the string *value* as Latex (requires \$ \$ or \$\$ \$\$ and similar latex tags).

__init__(value=None, **kwargs)

Public constructor

Methods

(5.1.1)	D 111
init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be
	passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
on_trait_change([handler, name, remove])	DEPRECATED: Setup a handler to be called when a
	trait changes.
<pre>on_widget_constructed(callback)</pre>	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
	continues on next page

continues on next page

Table 22 – continued from previous page

remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
<pre>set_trait(name, value)</pre>	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use tooltip attribute instead.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

```
__del__()
```

Object disposal

```
__init__(value=None, **kwargs)
```

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) $\rightarrow list[str]$

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata:* Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated:: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default:* '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) $\rightarrow None$

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

$set_trait(name: str, value: Any) \rightarrow None$

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) \rightarrow dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.Layout

```
class AFL.automation.prepare.DeckBuilderWidget.Layout(**kwargs: Any)
```

Layout specification

Bases: Widget

Defines a layout that can be expressed using CSS. Supports a subset of https://developer.mozilla.org/en-US/docs/Web/CSS/Reference

When a property is also accessible via a shorthand property, we only expose the shorthand.

For example: - flex-grow, flex-shrink and flex-basis are bound to flex. - flex-wrap and flex-direction are bound to flex-flow. - margin-[top/bottom/left/right] values are bound to margin, etc.

__init__(**kwargs)

Public constructor

Methods

L L Child	D 11
init(**kwargs)	Public constructor
add_traits(**traits)	Dynamically add trait attributes to the Widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
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continues on next page

Table 23 – continued from previous page

trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

align_content	The align-content CSS attribute.
align_items	The align-items CSS attribute.
align_self	The align-self CSS attribute.
border	border property getter.
border_bottom	The border bottom CSS attribute.
border_left	The border left CSS attribute.
border_right	The border right CSS attribute.
border_top	The border top CSS attribute.
bottom	The bottom CSS attribute.
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
display	The display CSS attribute.
flex	The flex CSS attribute.
flex_flow	The flex-flow CSS attribute.
grid_area	The grid-area CSS attribute.
grid_auto_columns	The grid-auto-columns CSS attribute.
grid_auto_flow	The grid-auto-flow CSS attribute.
grid_auto_rows	The grid-auto-rows CSS attribute.
grid_column	The grid-column CSS attribute.
grid_gap	The grid-gap CSS attribute.
grid_row	The grid-row CSS attribute.
<pre>grid_template_areas</pre>	The grid-template-areas CSS attribute.
<pre>grid_template_columns</pre>	The grid-template-columns CSS attribute.
<pre>grid_template_rows</pre>	The grid-template-rows CSS attribute.
height	The height CSS attribute.
justify_content	The justify-content CSS attribute.
justify_items	The justify-items CSS attribute.
keys	The traits which are synced.
left	The left CSS attribute.
log	A trait whose value must be an instance of a specified
	class.
margin	The margin CSS attribute.
max_height	The max-height CSS attribute.
max_width	The max-width CSS attribute.
min_height	The min-height CSS attribute.
min_width	The min-width CSS attribute.
model_id	Gets the model id of this widget.
object_fit	The object-fit CSS attribute.
object_position	The object-position CSS attribute.
order	The order CSS attribute.
overflow	The overflow CSS attribute.
padding	The padding CSS attribute.

continues on next page

Table 24 – continued from previous page

right	The right CSS attribute.
top	The top CSS attribute.
visibility	The visibility CSS attribute.
widget_types	
widgets	
width	The width CSS attribute.

align_content

The align-content CSS attribute.

align_items

The align-items CSS attribute.

align_self

The align-self CSS attribute.

border_top

The border top CSS attribute.

border_right

The border right CSS attribute.

border_bottom

The border bottom CSS attribute.

border_left

The border left CSS attribute.

bottom

The bottom CSS attribute.

display

The display CSS attribute.

flex

The flex CSS attribute.

flex_flow

The flex-flow CSS attribute.

height

The height CSS attribute.

justify_content

The justify-content CSS attribute.

justify_items

The justify-items CSS attribute.

left

The left CSS attribute.

margin

The margin CSS attribute.

max_height

The max-height CSS attribute.

max_width

The max-width CSS attribute.

min_height

The min-height CSS attribute.

min_width

The min-width CSS attribute.

overflow

The overflow CSS attribute.

order

The order CSS attribute.

padding

The padding CSS attribute.

right

The right CSS attribute.

top

The top CSS attribute.

visibility

The visibility CSS attribute.

width

The width CSS attribute.

object_fit

The object-fit CSS attribute.

object_position

The object-position CSS attribute.

grid_auto_columns

The grid-auto-columns CSS attribute.

grid_auto_flow

The grid-auto-flow CSS attribute.

grid_auto_rows

The grid-auto-rows CSS attribute.

grid_gap

The grid-gap CSS attribute.

grid_template_rows

The grid-template-rows CSS attribute.

grid_template_columns

The grid-template-columns CSS attribute.

grid_template_areas

The grid-template-areas CSS attribute.

grid_row

The grid-row CSS attribute.

grid_column

The grid-column CSS attribute.

grid_area

The grid-area CSS attribute.

```
__init__(**kwargs)
```

Public constructor

property border

border property getter. Return the common value of all side borders if they are identical. Otherwise return None.

```
__del__()
```

Object disposal

```
add_traits(**traits)
```

Dynamically add trait attributes to the Widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

```
classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default:* '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str \mid None = None) \rightarrow dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = traitlets.All, type:
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• **handler** (*callable*) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.Text

```
class AFL.automation.prepare.DeckBuilderWidget.Text(**kwargs: Any)
    Bases: _String
    Single line textbox widget.
    __init__(*args, **kwargs)
    Public constructor
```

Methods

init(*args, **kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.

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Table 25 – continued from previous page

	, , ,
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifica-
nord_trart_notrifications()	tions and cross validation.
notify_change(change)	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_submit(callback[, remove])</pre>	(Un)Register a callback to handle text submission.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
<pre>send_state([key])</pre>	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
continuous_update	Update the value as the user types.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

disabled

Enable or disable user changes

continuous_update

Update the value as the user types. If False, update on submission, e.g., pressing Enter or navigating away.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

```
__init__(*args, **kwargs)
```

Public constructor

on_submit(callback, remove=False)

(Un)Register a callback to handle text submission.

Triggered when the user clicks enter.

Parameters

- callback (callable) Will be called with exactly one argument: the Widget instance
- **remove** (bool (optional)) Whether to unregister the callback

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

```
get_state(key=None, drop_defaults=False)
```

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- metadata (dict) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

setup_instance(**kwargs: Any) \rightarrow None

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.DeckBuilderWidget.VBox

Displays multiple widgets vertically using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to '', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Vertical Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.VBox([title_widget, slider])
```

```
__init__(children=(), **kwargs)
Public constructor
```

Methods

init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
class_own_trait_events(name)	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.

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send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

```
__del__()
   Object disposal
__init__(children=(), **kwargs)
   Public constructor

add_class(className)
   Adds a class to the top level element of the widget.
   Doesn't add the class if it already exists.

add_traits(**traits)
   Dynamically add trait attributes to the Widget.

blur()
```

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, $type: Sentinel | str = 'change') \rightarrow None$

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- **name** (*list*, *str*, *None*) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

$trait_has_value(name: str) \rightarrow bool$

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.

```
• type (str or All (default: 'change')) - The type of notification to filter by. If
                    All, the specified handler is uninstalled from the list of notifiers corresponding to all types.
     unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
          Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait
          notifiers.
     widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
     widgets = {}
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget
     __init__()
     build_deck_object()
     get_deck_config()
     set_deck_config(config)
     send_deck_cb(event)
     save_cb(event)
     load_cb(event)
     update_deck_graphic_cb(event)
     start()
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_Model
     __init__()
     send_deck_config(pi_ip='piot2', align_script='/home/nistoroboto/align.py')
     build_deck_object(config)
class AFL.automation.prepare.DeckBuilderWidget.DeckBuilderWidget_View
     __init__()
     create_expanded_button(description, button style)
     draw_deck()
     start()
AFL.automation.prepare.Dummy OT2 Driver
Classes
 Driver(name[, defaults, overrides])
 Dummy_OT2_Driver([overrides])
```

AFL.automation.prepare.Dummy_OT2_Driver.Driver

```
class AFL.automation.prepare.Dummy_OT2_Driver.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
                                                   Gather all inherited static class-level dictionaries
gather_defaults()
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
                                                   Executed after each call to execute
post_execute(**kwargs)
                                                   Executed before each call to execute
pre_execute(**kwargs)
queued()
quickbar()
reset_sample()
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

```
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
```

```
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.prepare.Dummy_OT2_Driver.Dummy_OT2_Driver

```
class AFL.automation.prepare.Dummy_OT2_Driver.Dummy_OT2_Driver(overrides=None)
    Bases: Driver
    __init__(overrides=None)
```

Methods

init([overrides])	
<pre>add_prep_targets(targets[, reset])</pre>	
<pre>deactivate_temp(slot)</pre>	Disablea tempdeck in slot slot
deposit_obj(obj[, uid])	Store an object in the dropbox
execute(**kwargs)	Store an object in the dropoox
execute(~kwaigs)	
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries
	called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
get_conrigo([print_console])	
<pre>get_labware(slot)</pre>	
get_labware(slot)	
. 1 / [1 .])	
<pre>get_object(name[, serialize])</pre>	
<pre>get_prep_target()</pre>	
<pre>get_sample()</pre>	
<pre>get_shake_latch_status()</pre>	
<pre>get_shake_rpm()</pre>	
<pre>get_shaker_temp()</pre>	
ge e_brianci _ temp()	
<pre>get_temp(slot)</pre>	Get the temperature of a tempdeck in slot slot
	Get the temperature of a tempacek in slot slot
<pre>get_wells(locs)</pre>	
I doubt	
home(**kwargs)	
latch_shaker()	
<pre>load_instrument(name, mount, tip_rack_slots,)</pre>	
<pre>load_labware(name, slot[, module])</pre>	
parse_well(loc)	
par be_werr(ioc)	
post_execute(**kwargs)	Executed after each call to execute
- · · · · · · · · · · · · · · · · · · ·	Executed after each call to execute
pre_execute(**kwargs)	
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```
queued()
quickbar()
reset_prep_targets()
reset_sample()
reset_tipracks([mount])
retrieve_obj(uid[, delete])
                                                  Retrieve an object from the dropbox
set_aspirate_rate([rate])
set_config(**kwargs)
set_data(data)
                                                  Set data in the DataPacket object
set_dispense_rate([rate])
set_gantry_speed([speed])
set_object([serialized])
set_sample(sample_name[, sample_uuid])
set_shake(rpm)
set_shaker_temp(temp)
set_temp(slot, temp)
                                                  Set the temperature of a tempdeck in slot slot
status()
stop_shake()
transfer(source, dest, volume, *args, **kwargs)
unlatch_shaker()
unqueued()
```

Attributes

```
defaults

defaults = {'execute_delay': 1}
__init__(overrides=None)
reset_prep_targets()
```

```
add_prep_targets(targets, reset=False)
get_prep_target()
status()
reset_tipracks(mount='both')
home(**kwargs)
parse_well(loc)
get_wells(locs)
get_labware(slot)
load_labware(name, slot, module=None, **kwargs)
set_temp(slot, temp)
     Set the temperature of a tempdeck in slot slot
get_temp(slot)
     Get the temperature of a tempdeck in slot slot
deactivate_temp(slot)
     Disablea tempdeck in slot slot
set_shake(rpm)
stop_shake()
set_shaker_temp(temp)
unlatch_shaker()
latch_shaker()
get_shaker_temp()
get_shake_rpm()
get_shake_latch_status()
load_instrument(name, mount, tip_rack_slots, **kwargs)
transfer(source, dest, volume, *args, **kwargs)
set_aspirate_rate(rate=150)
set_dispense_rate(rate=300)
set_gantry_speed(speed=400)
deposit_obj(obj, uid=None)
     Store an object in the dropbox
        Parameters
```

- **obj** (*object*) The object to store in the dropbox
- **uid** (*str*) The uuid to store the object under

```
execute(**kwargs)
     classmethod gather_defaults()
          Gather all inherited static class-level dictionaries called default.
     get_config(name, print_console=False)
     get_configs(print_console=False)
     get_object(name, serialize=True)
     get_sample()
     post_execute(**kwargs)
          Executed after each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                  uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
class AFL.automation.prepare.Dummy_OT2_Driver.Dummy_OT2_Driver(overrides=None)
     defaults = {'execute_delay': 1}
     __init__(overrides=None)
```

```
reset_prep_targets()
add_prep_targets(targets, reset=False)
get_prep_target()
status()
reset_tipracks(mount='both')
home(**kwargs)
parse_well(loc)
get_wells(locs)
get_labware(slot)
load_labware(name, slot, module=None, **kwargs)
set_temp(slot, temp)
     Set the temperature of a tempdeck in slot slot
get_temp(slot)
    Get the temperature of a tempdeck in slot slot
deactivate_temp(slot)
    Disablea tempdeck in slot slot
set_shake(rpm)
stop_shake()
set_shaker_temp(temp)
unlatch_shaker()
latch_shaker()
get_shaker_temp()
get_shake_rpm()
get_shake_latch_status()
load_instrument(name, mount, tip_rack_slots, **kwargs)
transfer(source, dest, volume, *args, **kwargs)
set_aspirate_rate(rate=150)
set_dispense_rate(rate=300)
set_gantry_speed(speed=400)
```

AFL.automation.prepare.OT2Client

Classes

<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
<pre>OT2Client([ip, port, username, interactive])</pre>	Communicate with AFL-automation server on OT-2
<pre>PipetteAction(source, dest, volume[,])</pre>	

AFL.automation.prepare.OT2Client.Client

Bases: object

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

__init__(ip=None, port='5000', username=None, interactive=False)

Methods

```
__init__([ip, port, username, interactive])
clear_history()
clear_queue()
debug(state)
deposit_obj(obj[, uid])
                                                    Deposit an object in the dropbox obj: object, the ob-
                                                    ject to deposit id: str, the uuid to deposit the object
                                                    under if not specified, a new uuid will be generated
driver_status()
enqueue([interactive])
enqueued_base(**kwargs)
from_server_name(server_name, **kwargs)
get_config(name[, print_console, interactive])
get_driver_object(name)
get_object(name[, serialize])
get_queue()
```

continues on next page

Table 28 – continued from previous page

```
get_queued_commands([inherit_commands])
 get_quickbar()
 get_server_time()
 get_unqueued_commmands([inherit_commands])
 halt()
 logged_in()
 login(username[, populate_commands])
 move_item(uuid, pos)
 pause(state)
 query_driver(**kwargs)
 queue_state()
 remove_item(uuid)
 reset_queue_daemon()
 retrieve_obj(uid[, delete])
                                                  Retrieve an object from the dropbox id: str, the uuid
                                                  of the object to retrieve delete: bool, if True, delete
                                                  the object after retrieving
 server_cmd(cmd, **kwargs)
 set_config([interactive])
 set_driver_object(**kw)
 set_object([serialize])
 unqueued_base(**kwargs)
 wait([target_uuid, interval, for_history, ...])
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
logged_in()
login(username, populate_commands=True)
driver_status()
get_queue()
```

```
wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
get_unqueued_commands(inherit_commands=True)
get_queued_commands(inherit_commands=True)
enqueue(interactive=None, **kwargs)
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
halt()
queue_state()
remove_item(uuid)
move_item(uuid, pos)
set_driver_object(**kw)
get_driver_object(name)
deposit_obj(obj, uid=None)
     Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
     under if not specified, a new uuid will be generated
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
     the object after retrieving
set_object(serialize=True, **kw)
get_object(name, serialize=True)
```

AFL.automation.prepare.OT2Client.OT2Client

Bases: Client

Communicate with AFL-automation server on OT-2

This class maps pipettor functions to HTTP REST requests that are sent to the AFL-automation server

__init__(*ip=None*, *port='5000'*, *username=None*, *interactive=False*)

Methods

```
_init__([ip, port, username, interactive])
aspirate_rate(rate)
clear_history()
clear_queue()
debug(state)
deposit_obj(obj[, uid])
                                                  Deposit an object in the dropbox obj: object, the ob-
                                                  ject to deposit id: str, the uuid to deposit the object
                                                  under if not specified, a new uuid will be generated
dispense_rate(rate)
driver_status()
enqueue([interactive])
enqueued_base(**kwargs)
from_server_name(server_name, **kwargs)
get_config(name[, print_console, interactive])
get_driver_object(name)
get_object(name[, serialize])
get_queue()
get_queued_commands([inherit_commands])
get_quickbar()
get_server_time()
get_unqueued_commands([inherit_commands])
```

continues on next page

Table 29 - continued from previous page

```
halt()
home()
load_instrument(name, mount, tip_rack_slots)
load_labware(name, slot)
logged_in()
login(username[, populate_commands])
move_item(uuid, pos)
pause(state)
query_driver(**kwargs)
queue_state()
remove_item(uuid)
reset_queue_daemon()
reset_tipracks([mount])
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox id: str, the uuid
                                                   of the object to retrieve delete: bool, if True, delete
                                                   the object after retrieving
server_cmd(cmd, **kwargs)
set_config([interactive])
set_driver_object(**kw)
set_object([serialize])
                                                   Transfer fluid from one location to another
transfer(source, dest, volume[, interactive])
unqueued_base(**kwargs)
wait([target_uuid, interval, for_history, ...])
```

transfer(source, dest, volume, interactive=None, **kwargs)

Transfer fluid from one location to another

Parameters

- source (str or list of str Source wells to transfer from. Wells should be specified as three) character strings with the first character being the slot number.
- **dest** (*str or list of str*) Destination wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.

```
• volume (float) – volume of fluid to transfer in microliters
reset_tipracks(mount='both')
load_labware(name, slot)
load_instrument(name, mount, tip_rack_slots)
aspirate_rate(rate)
dispense_rate(rate)
home()
__init__(ip=None, port='5000', username=None, interactive=False)
clear_history()
clear_queue()
debug(state)
deposit_obj(obj, uid=None)
    Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
    under if not specified, a new uuid will be generated
driver_status()
enqueue(interactive=None, **kwargs)
enqueued_base(**kwargs)
classmethod from_server_name(server_name, **kwargs)
get_config(name, print_console=True, interactive=None)
get_driver_object(name)
get_object(name, serialize=True)
get_queue()
get_queued_commands(inherit_commands=True)
get_quickbar()
get_server_time()
get_unqueued_commands(inherit_commands=True)
halt()
logged_in()
login(username, populate_commands=True)
move_item(uuid, pos)
pause(state)
query_driver(**kwargs)
```

```
queue_state()
remove_item(uuid)
reset_queue_daemon()
retrieve_obj(uid, delete=True)
    Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete the object after retrieving
server_cmd(cmd, **kwargs)
set_config(interactive=None, **kwargs)
set_driver_object(**kw)
set_object(serialize=True, **kw)
unqueued_base(**kwargs)
wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
```

AFL.automation.prepare.OT2Client.PipetteAction

class AFL.automation.prepare.OT2Client.PipetteAction(source, dest, volume, source_loc=None,

dest_loc=None, aspirate_rate=None, dispense_rate=None, mix_aspirate_rate=None, mix_dispense_rate=None, mix_before=None, mix_after=None, blow_out=False, post_aspirate_delay=0.0, post_dispense_delay=0.0, aspirate_equilibration_delay=0.0, drop_tip=True, force_new_tip=False, to_top=True, to_center=False, to_top_z_offset=0, fast_mixing=False)

Bases: object

__init__(source, dest, volume, source_loc=None, dest_loc=None, aspirate_rate=None, dispense_rate=None, mix_aspirate_rate=None, mix_dispense_rate=None, mix_before=None, mix_after=None, blow_out=False, post_aspirate_delay=0.0, post_dispense_delay=0.0, aspirate_equilibration_delay=0.0, drop_tip=True, force_new_tip=False, to_top=True, to_center=False, to_top_z_offset=0, fast_mixing=False)

Methods

```
__init__(source, dest, volume[, source_loc, ...])
emit_protocol()
get_kwargs()
```

```
__init__(source, dest, volume, source_loc=None, dest_loc=None, aspirate_rate=None, dispense_rate=None, mix_aspirate_rate=None, mix_dispense_rate=None, mix_before=None, mix_after=None, blow_out=False, post_aspirate_delay=0.0, post_dispense_delay=0.0, aspirate_equilibration_delay=0.0, drop_tip=True, force_new_tip=False, to_top=True, to_center=False, to_top_z_offset=0, fast_mixing=False)
```

```
emit_protocol()
get_kwargs()
```

Communicate with AFL-automation server on OT-2

This class maps pipettor functions to HTTP REST requests that are sent to the AFL-automation server

transfer(source, dest, volume, interactive=None, **kwargs)

Transfer fluid from one location to another

Parameters

- source (str or list of str Source wells to transfer from. Wells should be specified as three) character strings with the first character being the slot number.
- **dest** (*str or list of str*) Destination wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **volume** (*float*) volume of fluid to transfer in microliters

```
reset_tipracks(mount='both')
load_labware(name, slot)
load_instrument(name, mount, tip_rack_slots)
aspirate_rate(rate)
dispense_rate(rate)
home()
```

AFL.automation.prepare.PrepType

Functions

```
makeRegistar()
prepRegistrar(prepType)
```

AFL.automation.prepare.PrepType.makeRegistar

AFL.automation.prepare.PrepType.makeRegistar()

AFL.automation.prepare.PrepType.prepRegistrar

AFL.automation.prepare.PrepType.prepRegistrar(prepType)

Classes

```
      Enum(value[, names, module, qualname, type, ...])
      Create a collection of name/value pairs.

      PrepType(value[, names, module, qualname, ...])
      Instances are replaced with an appropriate value in Enum class suites.
```

AFL.automation.prepare.PrepType.Enum

class AFL.automation.prepare.PrepType.**Enum**(*value*, *names=None*, *, *module=None*, *qualname=None*, type=None, start=1, boundary=None)

Bases: object

Create a collection of name/value pairs.

Example enumeration:

Access them by:

· attribute access:

```
>>> Color.RED <Color.RED: 1>
```

• value lookup:

```
>>> Color(1)
<Color.RED: 1>
```

• name lookup:

```
>>> Color['RED']
<Color.RED: 1>
```

Enumerations can be iterated over, and know how many members they have:

```
>>> len(Color)
3
```

```
>>> list(Color)
[<Color.RED: 1>, <Color.BLUE: 2>, <Color.GREEN: 3>]
```

Methods can be added to enumerations, and members can have their own attributes – see the documentation for details.

```
__init__(*args, **kwds)
```

classmethod __contains__(member)

Return True if member is a member of this enum raises TypeError if member is not an enum member note: in 3.12 TypeError will no longer be raised, and True will also be returned if member is the value of a member in this enum

classmethod __getitem__(name)

Return the member matching name.

classmethod __iter__()

Return members in definition order.

classmethod __len__()

Return the number of members (no aliases)

AFL.automation.prepare.PrepType.PrepType

```
\begin{tabular}{ll} \textbf{class} & \textbf{AFL}. \textbf{automation.prepare.PrepType}. \textbf{PrepType}(value, names=None, *, module=None, qualname=None, type=None, start=1, boundary=None) \end{tabular}
```

```
Bases: Enum
__init__(*args, **kwds)
```

Attributes

```
BaseComponent

BaseMixture

Solute

Solvent

Solution
```

```
BaseMixture = 2
Solute = 3
Solvent = 4
Solution = 5
```

BaseComponent = 1

```
classmethod __contains__(member)
```

Return True if member is a member of this enum raises TypeError if member is not an enum member note: in 3.12 TypeError will no longer be raised, and True will also be returned if member is the value of a member in this enum

```
classmethod __getitem__(name)
          Return the member matching name.
     classmethod __iter__()
          Return members in definition order.
     classmethod __len__()
          Return the number of members (no aliases)
AFL.automation.prepare.PrepType.auto
class AFL.automation.prepare.PrepType.auto(value=_auto_null)
     Bases: object
     Instances are replaced with an appropriate value in Enum class suites.
     __init__(value=_auto_null)
     Methods
      __init__([value])
     __init__(value=_auto_null)
class AFL.automation.prepare.PrepType.PrepType(value, names=None, *, module=None,
                                                    qualname=None, type=None, start=1,
                                                    boundary=None)
     BaseComponent = 1
     BaseMixture = 2
     Solute = 3
     Solvent = 4
     Solution = 5
AFL.automation.prepare.PrepareWidget
Functions
```

sqrt(x, l) Return the square root of x.

AFL.automation.prepare.PrepareWidget.sqrt

AFL.automation.prepare.PrepareWidget. $\mathbf{sqrt}(x,/)$ Return the square root of x.

Classes

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean <i>value</i> in the form of a checkbox.
DeckBuilderWidget()	1 0
Dropdown(**kwargs)	Allows you to select a single item from a dropdown.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
PrepareWidget()	
PrepareWidget_Model()	
PrepareWidget_View()	
SampleSeriesWidget(deck)	
StockBuilderWidget(deck)	
SweepBuilderWidget(deck)	
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible box model.

AFL.automation.prepare.PrepareWidget.Button

class AFL.automation.prepare.PrepareWidget.Button(**kwargs: Any)

Bases: DOMWidget, CoreWidget

Button widget.

This widget has an on_click method that allows you to listen for the user clicking on the button. The click event itself is stateless.

Parameters

- **description** (*str*) description displayed on the button
- icon (str) font-awesome icon names, without the 'fa-' prefix
- **disabled** (bool) whether user interaction is enabled

__init__(**kwargs)

Public constructor

Methods

add_class(className)Adds a class to the top level element ofadd_traits(**traits)Dynamically add trait attributes to the V	
add_traits(**traits) Dynamically add trait attributes to the V	he widget.
	/idget.
blur() Blur the widget.	

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Table 30 – continued from previous page

Table 30 – continu	ed from previous page
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
class_own_traits(**metadata)	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
click()	Programmatically trigger a click event.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_click(callback[, remove])</pre>	Register a callback to execute when the button is clicked.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
<pre>on_widget_constructed(callback)</pre>	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
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Table 30 – continued from previous page

traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

button_style	Use a predefined styling for the button.
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
description	Button label.
disabled	Enable or disable user changes.
icon	Font-awesome icon names, without the 'fa-' prefix.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified class.
model_id	Gets the model id of this widget.
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

description

Button label.

disabled

Enable or disable user changes.

icon

Font-awesome icon names, without the 'fa-' prefix.

button_style

Use a predefined styling for the button.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

__init__(**kwargs)

Public constructor

on_click(callback, remove=False)

Register a callback to execute when the button is clicked.

The callback will be called with one argument, the clicked button widget instance.

Parameters

remove (bool (optional)) – Set to true to remove the callback from the list of callbacks.

click()

Programmatically trigger a click event.

This will call the callbacks registered to the clicked button widget instance.

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode or iterable (optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | str
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False,

then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.Checkbox

```
class AFL.automation.prepare.PrepareWidget.Checkbox(**kwargs: Any)
```

Bases: _Bool

Displays a boolean value in the form of a checkbox.

Parameters

- $\bullet \ \ \textbf{value} \ (\{\textit{True}, \textit{False}\}) \text{value of the checkbox: True-checked}, \\ \text{False-unchecked}$
- **description** (*str*) description displayed next to the checkbox
- **indent** ({True, False}) indent the control to align with other controls with a description. The style.description_width attribute controls this width for consistence with other controls.

```
__init__(value=None, **kwargs)
```

Public constructor

Methods

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not
	a parent.
class_trait_names(**metadata)	Get a list of all the names of this class' traits.

continues on next page

Table 31 – continued from previous page

Table 31 – continue	1 1 0
class_traits(**metadata)	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
5	-
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be
	passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embed-
and add (flow days defaulted)	ding
<pre>get_state([key, drop_defaults]) get_view_spec()</pre>	Gets the widget state, or a piece of it.
get_view_spec()	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is re-
	ceived
has_trait(name)	Returns True if the object has a trait with the specified
	name.
hold_sync()	Hold syncing any state until the outermost context
	manager exits
<pre>hold_trait_notifications()</pre>	Context manager for bundling trait change notifica-
	tions and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
<pre>send(content[, buffers])</pre>	Sends a custom msg to the widget model in the front-
	end.
send_state([key])	Sends the widget state, or a piece of it, to the front-
	end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
<pre>set_trait(name, value)</pre>	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
unobserve(handler[, names, type])	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the spec-
	ified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes.
indent	Indent the control to align with other controls with a
	description.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Bool value
widget_types	
widgets	

indent

Indent the control to align with other controls with a description.

style

Styling customizations

__del__()

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(***metadata: Any*) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated:: 8.0.0

Use tooltip attribute instead.

disabled

Enable or disable user changes.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode or iterable (optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

```
notify_change(change)
```

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• **remove** (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• handler (callable) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change'*)) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Bool value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.DeckBuilderWidget

```
class AFL.automation.prepare.PrepareWidget.DeckBuilderWidget
```

```
Bases: object
__init__()
```

Methods

```
__init__()

build_deck_object()

get_deck_config()

load_cb(event)

save_cb(event)

send_deck_cb(event)

set_deck_config(config)

start()

update_deck_graphic_cb(event)
```

```
__init__()
build_deck_object()
get_deck_config()
set_deck_config(config)
send_deck_cb(event)
```

```
save_cb(event)
load_cb(event)
update_deck_graphic_cb(event)
start()
```

AFL.automation.prepare.PrepareWidget.Dropdown

```
class AFL.automation.prepare.PrepareWidget.Dropdown(**kwargs: Any)
```

Bases: _Selection

Allows you to select a single item from a dropdown.

Parameters

- **options** (*list*) The options for the dropdown. This can either be a list of values, e.g. ['Galileo', 'Brahe', 'Hubble'] or [0, 1, 2], a list of (label, value) pairs, e.g. [('Galileo', 0), ('Brahe', 1), ('Hubble', 2)], or a Mapping between labels and values, e.g., {'Galileo': 0, 'Brahe': 1, 'Hubble': 2}.
- **index** (*int*) The index of the current selection.
- **value** (*any*) The value of the current selection. When programmatically setting the value, a reverse lookup is performed among the options to check that the value is valid. The reverse lookup uses the equality operator by default, but another predicate may be provided via the equals keyword argument. For example, when dealing with numpy arrays, one may set equals=np.array_equal.
- **label** (*str*) The label corresponding to the selected value.
- **disabled** (*bool*) Whether to disable user changes.
- **description** (*str*) Label for this input group. This should be a string describing the widget.

```
__init__(*args, **kwargs)
Public constructor
```

Methods

	w 11.
init(*args, **kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not
	a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.

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Table 32 – continued from previous page

get_interact_value() Return the value for this widget which should be passed to interactive functions. get_manager_state([drop_defaults, widgets]) Returns the full state for a widget manager for embedding. get_state([key, drop_defaults]) Gets the widget state, or a piece of it. get_view_spec() Static method, called when a widget is constructed. handle_control_comm_opened(comm, msg) Static method, called when a widget is constructed. handle_control_comm_opened(comm, msg) Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received has_trait(name) Returns True if the object has a trait with the specified name. hold_sync() Hold syncing any state until the outermost context manager exits hold_trait_notifications() Context manager for bundling trait change notifications and cross validation. notify_change(change) Called when a property has changed. observe(handler[, names, type]) Called when a property has changed. on_msg(callback], remove) Called when a property has changed. on_msidget_constructed(callback) DEPRECATED: Setup a handler to be called when a trait changes. on_widget_constructed(callback) Registers a custom msg receive callback. open() Depart of the constructed.	Table 32 – continue	d Iron previous page
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	<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name]) Remove trait change handlers of any type for the spec-	unobserve_all([name])	• • • • • • • • • • • • • • • • • • • •
ified name.		ified name.

Attributes

COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
index	Selected index
keys	The traits which are synced.
label	Selected label
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
options	Iterable of values, (label, value) pairs, or Mapping be-
	tween labels and values that the user can select.
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Selected value
widget_types	
widgets	

```
__del__()
```

Object disposal

__init__(*args, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

$\textbf{classmethod class_own_traits(**metadata: Any)} \rightarrow \text{dict[str, TraitType[Any, Any]]}$

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

disabled

Enable or disable user changes

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- state (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

index

Selected index

kevs

The traits which are synced.

label

Selected label

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

```
notify_change(change)
```

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• remove (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

options

Iterable of values, (label, value) pairs, or Mapping between labels and values that the user can select.

The labels are the strings that will be displayed in the UI, representing the actual Python choices, and should be unique.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

```
send_state(key=None)
```

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

style

Styling customizations

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

$trait_defaults(*names: str, **metadata: Any) \rightarrow dict[str, Any] | Sentinel$

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Selected value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.HBox

Displays multiple widgets horizontally using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to ', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Horizontal Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.HBox([title_widget, slider])

__init__(children=(), **kwargs)
Public constructor
```

Methods

	7.11
init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
<pre>send(content[, buffers])</pre>	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the frontend, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only at-
	tributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
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continues on next page

Table 33 – continued from previous page

<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
$model_id$	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

__del__()

Object disposal

__init__(children=(), **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(***metadata: Any*) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

$\verb|static get_manager_state|| \textit{drop_defaults} = False, \textit{widgets} = None||$

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

 $\textbf{key} \, (unicode \ or \ iterable \ (optional)) - A \ single \ property's \ name \ or \ iterable \ of \ property \ names \ to \ get.$

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

• handler (callable) – A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys:

- \ast owner: the HasTraits instance \ast old: the old value of the modified trait attribute \ast new: the new value of the modified trait attribute \ast name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

```
send_state(key=None)
```

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | <math>str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.Label

class AFL.automation.prepare.PrepareWidget.Label(**kwargs: Any)

Bases: _String

Label widget.

It also renders math inside the string *value* as Latex (requires \$ \$ or \$\$ \$\$ and similar latex tags).

__init__(value=None, **kwargs)

Public constructor

Methods

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
on_trait_change([handler, name, remove])	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
- "	continues on next page

continues on next page

Table 34 – continued from previous page

7 (1)	
remove_class(className)	Removes a class from the top level element of the
	widget.
<pre>send(content[, buffers])</pre>	Sends a custom msg to the widget model in the front-
	end.
send_state([key])	Sends the widget state, or a piece of it, to the front-
· · · ·	end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only at-
	tributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
, , , , , , , , , , , , , , , , , , , ,	•
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the spec-
	ified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

```
__del__()
```

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the *trait_names()* method, but is unbound.

classmethod class_traits(***metadata:* Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) $\rightarrow None$

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

$set_trait(name: str, value: Any) \rightarrow None$

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) \rightarrow dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.Layout

```
class AFL.automation.prepare.PrepareWidget.Layout(**kwargs: Any)
```

Bases: Widget

Layout specification

Defines a layout that can be expressed using CSS. Supports a subset of https://developer.mozilla.org/en-US/docs/Web/CSS/Reference

When a property is also accessible via a shorthand property, we only expose the shorthand.

For example: - flex-grow, flex-shrink and flex-basis are bound to flex. - flex-wrap and flex-direction are bound to flex-flow. - margin-[top/bottom/left/right] values are bound to margin, etc.

__init__(**kwargs)

Public constructor

Methods

init(**kwargs)	Public constructor
add_traits(**traits)	Dynamically add trait attributes to the Widget.
class_own_trait_events(name)	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not
	a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embed-
	ding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
<pre>handle_control_comm_opened(comm, msg)</pre>	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is re-
	ceived
<pre>has_trait(name)</pre>	Returns True if the object has a trait with the specified
	name.
hold_sync()	Hold syncing any state until the outermost context
	manager exits
<pre>hold_trait_notifications()</pre>	Context manager for bundling trait change notifica-
	tions and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is con-
` ,	structed.
open()	Open a comm to the frontend if one isn't already open.
send(content[, buffers])	Sends a custom msg to the widget model in the front-
	end.
send_state([key])	Sends the widget state, or a piece of it, to the front-
- •	end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
<pre>set_trait(name, value)</pre>	Forcibly sets trait attribute, including read-only at-
	tributes.
setup_instance(**kwargs)	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
<pre>trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
	continues on next name

continues on next page

Table 35 – continued from previous page

trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the spec-
	ified name.

Attributes

alian content	The clien content CCC ettribute
align_content	The align-content CSS attribute.
align_items	The align-items CSS attribute.
align_self	The align-self CSS attribute.
border	border property getter.
border_bottom	The border bottom CSS attribute.
border_left	The border left CSS attribute.
border_right	The border right CSS attribute.
border_top	The border top CSS attribute.
bottom	The bottom CSS attribute.
COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
display	The display CSS attribute.
flex	The flex CSS attribute.
flex_flow	The flex-flow CSS attribute.
grid_area	The grid-area CSS attribute.
grid_auto_columns	The grid-auto-columns CSS attribute.
grid_auto_flow	The grid-auto-flow CSS attribute.
grid_auto_rows	The grid-auto-rows CSS attribute.
grid_column	The grid-column CSS attribute.
grid_gap	The grid-gap CSS attribute.
grid_row	The grid-row CSS attribute.
grid_template_areas	The grid-template-areas CSS attribute.
grid_template_columns	The grid-template-columns CSS attribute.
grid_template_rows	The grid-template-rows CSS attribute.
height	The height CSS attribute.
justify_content	The justify-content CSS attribute.
justify_items	The justify-items CSS attribute.
keys	The traits which are synced.
left	The left CSS attribute.
log	A trait whose value must be an instance of a specified
109	class.
margin	The margin CSS attribute.
max_height	The max-height CSS attribute.
max_width	The max-width CSS attribute.
min_height	The min-height CSS attribute.
min_width	The min-width CSS attribute.
model_id	Gets the model id of this widget.
object_fit	The object-fit CSS attribute.
object_position	The object-position CSS attribute.
order	The order CSS attribute.
overflow	The overflow CSS attribute.
padding	The padding CSS attribute.
padding	continues on port page

continues on next page

Table 36 – continued from previous page

right	The right CSS attribute.
top	The top CSS attribute.
visibility	The visibility CSS attribute.
widget_types	
widgets	
width	The width CSS attribute.

align_content

The align-content CSS attribute.

align_items

The align-items CSS attribute.

align_self

The align-self CSS attribute.

border_top

The border top CSS attribute.

border_right

The border right CSS attribute.

border_bottom

The border bottom CSS attribute.

border_left

The border left CSS attribute.

bottom

The bottom CSS attribute.

display

The display CSS attribute.

flex

The flex CSS attribute.

flex_flow

The flex-flow CSS attribute.

height

The height CSS attribute.

justify_content

The justify-content CSS attribute.

justify_items

The justify-items CSS attribute.

left

The left CSS attribute.

margin

The margin CSS attribute.

max_height

The max-height CSS attribute.

max_width

The max-width CSS attribute.

min_height

The min-height CSS attribute.

min_width

The min-width CSS attribute.

overflow

The overflow CSS attribute.

order

The order CSS attribute.

padding

The padding CSS attribute.

right

The right CSS attribute.

top

The top CSS attribute.

visibility

The visibility CSS attribute.

width

The width CSS attribute.

object_fit

The object-fit CSS attribute.

object_position

The object-position CSS attribute.

grid_auto_columns

The grid-auto-columns CSS attribute.

grid_auto_flow

The grid-auto-flow CSS attribute.

grid_auto_rows

The grid-auto-rows CSS attribute.

grid_gap

The grid-gap CSS attribute.

grid_template_rows

The grid-template-rows CSS attribute.

grid_template_columns

The grid-template-columns CSS attribute.

grid_template_areas

The grid-template-areas CSS attribute.

grid_row

The grid-row CSS attribute.

grid_column

The grid-column CSS attribute.

grid_area

The grid-area CSS attribute.

```
__init__(**kwargs)
```

Public constructor

property border

border property getter. Return the common value of all side borders if they are identical. Otherwise return None.

```
__del__()
```

Object disposal

add_traits(**traits)

Dynamically add trait attributes to the Widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

```
classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
\begin{tabular}{ll} \textbf{on\_trait\_change}(handler: EventHandler \mid None = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, name: Sentinel \mid str \mid None = None, remove: bool \\ = False) \rightarrow \begin{tabular}{ll} \textbf{None} = None, remove:
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str \mid None = None) \rightarrow dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = traitlets.All, type:
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• handler (callable) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.PrepareWidget

```
class AFL.automation.prepare.PrepareWidget.PrepareWidget
    Bases: object
    __init__()
```

Methods

```
SampleSeriesTool_reset_cb(event)

StockBuilder_reset_cb(event)

SweepBuilder_reset_cb(event)

__init__()

start()
```

```
__init__()
SweepBuilder_reset_cb(event)
StockBuilder_reset_cb(event)
SampleSeriesTool_reset_cb(event)
start()
```

AFL.automation.prepare.PrepareWidget.PrepareWidget Model

```
class AFL.automation.prepare.PrepareWidget.PrepareWidget_Model
     Bases: object
    __init__()
```

Methods

```
__init__()
```

AFL.automation.prepare.PrepareWidget_PrepareWidget_View

Methods

```
__init__()
start(deck_builder_widget)
```

start(deck_builder_widget)

AFL.automation.prepare.PrepareWidget.SampleSeriesWidget

Methods

```
__init__(deck)
 apply_protocol_order()
 apply_protocol_order_cb(event)
 build_label(index)
 example_label_cb(event)
 make_all_labels()
 make_all_labels_cb(event)
 make_catch_protocol()
 make_mixing_wells()
 make_protocol()
 reset_uuid_cb(event)
 start()
 submit_cb(event)
 submit_mixing_wells_cb(event)
 sync_to_prepare_cb(event)
 update_mixing_well_preview_cb(event)
 update_protocol_order_preview_cb(event)
 update_sort_order_cb(event, direction)
__init__(deck)
apply_protocol_order_cb(event)
apply_protocol_order()
update_protocol_order_preview_cb(event)
make_protocol()
make_catch_protocol()
submit_cb(event)
build_label(index)
```

```
example_label_cb(event)
    make_all_labels_cb(event)
    make_all_labels()
     sync_to_prepare_cb(event)
    reset_uuid_cb(event)
     update_sort_order_cb(event, direction)
    make_mixing_wells()
     update_mixing_well_preview_cb(event)
     submit_mixing_wells_cb(event)
     start()
AFL.automation.prepare.PrepareWidget.StockBuilderWidget
class AFL.automation.prepare.PrepareWidget.StockBuilderWidget(deck)
     Bases: object
     __init__(deck)
     Methods
       _init__(deck)
      add_stocks_to_deck()
      analyze_stocks_cb(event)
      get_stock_objects()
      get_stock_values()
      load_cb(event)
      make_stock_cb(event)
      remove_stock_cb(event)
      save_cb(event[, pkl])
```

6.2. Modules 527

set_units_cb(event, units)

update_location_check_cb(event)

start()

```
__init__(deck)
     analyze_stocks_cb(event)
     get_stock_objects()
     add_stocks_to_deck()
     get_stock_values()
     save_cb(event, pkl=True)
     load_cb(event)
     update_location_check_cb(event)
    make_stock_cb(event)
     remove_stock_cb(event)
     set_units_cb(event, units)
     start()
AFL.automation.prepare.PrepareWidget.SweepBuilderWidget
class AFL.automation.prepare.PrepareWidget.SweepBuilderWidget(deck)
     Bases: object
     __init__(deck)
     Methods
      __init__(deck)
      calc_sweep_cb(click)
      get_deck()
      get_sweep_data()
      plot_binary_cb(click)
      plot_ternary_cb(click)
      start()
      update_component_row_cb(event)
      validate_sweep_cb(click)
     __init__(deck)
     plot_binary_cb(click)
```

```
plot_ternary_cb(click)
calc_sweep_cb(click)
validate_sweep_cb(click)
get_sweep_data()
get_deck()
update_component_row_cb(event)
start()
```

AFL.automation.prepare.PrepareWidget.Text

```
class AFL.automation.prepare.PrepareWidget.Text(**kwargs: Any)
    Bases: _String
    Single line textbox widget.
    __init__(*args, **kwargs)
    Public constructor
```

Methods

init(*args, **kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
	continues on next page

Table 37 – continued from previous page

hold_trait_notifications()	Context manager for bundling trait change notifica-
	tions and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_submit(callback[, remove])</pre>	(Un)Register a callback to handle text submission.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
<pre>set_trait(name, value)</pre>	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
continuous_update	Update the value as the user types.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

disabled

Enable or disable user changes

continuous_update

Update the value as the user types. If False, update on submission, e.g., pressing Enter or navigating away.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

```
__init__(*args, **kwargs)
```

Public constructor

on_submit(callback, remove=False)

(Un)Register a callback to handle text submission.

Triggered when the user clicks enter.

Parameters

- callback (callable) Will be called with exactly one argument: the Widget instance
- **remove** (bool (optional)) Whether to unregister the callback

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

```
get_state(key=None, drop_defaults=False)
```

Gets the widget state, or a piece of it.

Parameters

 $\ensuremath{\textit{key}}\xspace(unicode\ or\ iterable\ (optional))$ — A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- metadata (dict) metadata for each field: {key: metadata}

```
get_view_spec()
```

```
static handle_comm_opened(comm, msg)
```

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

setup_instance(**kwargs: Any) \rightarrow None

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.PrepareWidget.VBox

Displays multiple widgets vertically using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to ', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Vertical Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.VBox([title_widget, slider])
```

```
__init__(children=(), **kwargs)
Public constructor
```

Methods

init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
class_own_trait_events(name)	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.

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send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

```
__del__()
    Object disposal
__init__(children=(), **kwargs)
    Public constructor

add_class(className)
    Adds a class to the top level element of the widget.
    Doesn't add the class if it already exists.

add_traits(**traits)
    Dynamically add trait attributes to the Widget.

blur()
```

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata:* Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, $type: Sentinel | str = 'change') \rightarrow None$

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (*list*, *str*, *None*) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

$trait_has_value(name: str) \rightarrow bool$

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | str |
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.

• **type** (*str or All (default: 'change')*) – The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}

class AFL.automation.prepare.PrepareWidget.PrepareWidget
    __init__()
    SweepBuilder_reset_cb(event)
    StockBuilder_reset_cb(event)
    SampleSeriesTool_reset_cb(event)
```

class AFL.automation.prepare.PrepareWidget.PrepareWidget_Model

class AFL.automation.prepare.PrepareWidget.PrepareWidget_View

start(deck_builder_widget)

AFL.automation.prepare.SampleSeriesWidget

Functions

start()

sqrt(x, /)

Return the square root of x.

AFL.automation.prepare.SampleSeriesWidget.sqrt

AFL.automation.prepare.SampleSeriesWidget. $\mathbf{sqrt}(x,/)$ Return the square root of x.

Classes

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean value in the form of a checkbox.
<pre>Client([ip, port, username, interactive])</pre>	Communicate with APIServer
FloatText(**kwargs)	Displays a float value within a textbox.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
IntText(**kwargs)	Textbox widget that represents an integer.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
SampleSeriesWidget(deck)	
SampleSeriesWidget_Model(deck)	
SampleSeriesWidget_View()	
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible box model.

AFL.automation.prepare.SampleSeriesWidget.Button

class AFL.automation.prepare.SampleSeriesWidget.Button(**kwargs: Any)

Bases: DOMWidget, CoreWidget

Button widget.

This widget has an on_click method that allows you to listen for the user clicking on the button. The click event itself is stateless.

Parameters

- **description** (*str*) description displayed on the button
- icon (str) font-awesome icon names, without the 'fa-' prefix
- **disabled** (*bool*) whether user interaction is enabled

```
__init__(**kwargs)
```

Public constructor

Methods

init(**kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not
	a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.

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	d from previous page
click()	Programmatically trigger a click event.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embed-
	ding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
<pre>handle_control_comm_opened(comm, msg)</pre>	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified
	name.
hold_sync()	Hold syncing any state until the outermost context manager exits
<pre>hold_trait_notifications()</pre>	Context manager for bundling trait change notifica-
	tions and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_click(callback[, remove])	Register a callback to execute when the button is clicked.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the front-
	end.
<pre>send_state([key])</pre>	Sends the widget state, or a piece of it, to the front-
	end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
unobserve(handler[, names, type])	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

button_style	Use a predefined styling for the button.
COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Button label.
disabled	Enable or disable user changes.
icon	Font-awesome icon names, without the 'fa-' prefix.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

description

Button label.

disabled

Enable or disable user changes.

icon

Font-awesome icon names, without the 'fa-' prefix.

button_style

Use a predefined styling for the button.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

__init__(**kwargs)

Public constructor

on_click(callback, remove=False)

Register a callback to execute when the button is clicked.

The callback will be called with one argument, the clicked button widget instance.

Parameters

remove (bool (optional)) – Set to true to remove the callback from the list of callbacks.

click()

Programmatically trigger a click event.

This will call the callbacks registered to the clicked button widget instance.

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata:* Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• **remove** (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = traitlets.All, type:
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• handler (callable) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change'*)) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.Checkbox

```
class AFL.automation.prepare.SampleSeriesWidget.Checkbox(**kwargs: Any)
```

Bases: _Bool

Displays a boolean value in the form of a checkbox.

Parameters

- value ({True, False}) value of the checkbox: True-checked, False-unchecked
- **description** (*str*) description displayed next to the checkbox
- **indent** ({*True*, *False*}) indent the control to align with other controls with a description. The style.description_width attribute controls this width for consistence with other controls.

```
__init__(value=None, **kwargs)
Public constructor
```

Methods

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
class_own_traits(**metadata)	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.

continues on next page

Table 40 – continued from previous page

<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
<pre>handle_control_comm_opened(comm, msg)</pre>	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is re-
	ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifica-
	tions and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a
	trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
<pre>send(content[, buffers])</pre>	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the frontend, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use tooltip attribute instead.
disabled	Enable or disable user changes.
indent	Indent the control to align with other controls with a description.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
1-1 -2 1	class.
model_id	Gets the model id of this widget.
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Bool value
widget_types	
widgets	

indent

Indent the control to align with other controls with a description.

style

Styling customizations

__del__()

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(***metadata: Any*) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated:: 8.0.0

Use tooltip attribute instead.

disabled

Enable or disable user changes.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

```
notify_change(change)
```

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• **remove** (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = traitlets.All, type:
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• **handler** (*callable*) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Bool value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.Client

Bases: object

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

```
__init__(ip=None, port='5000', username=None, interactive=False)
```

Methods

```
__init__([ip, port, username, interactive])

clear_history()

clear_queue()

debug(state)

deposit_obj(obj[, uid])

Deposit an object in the dropbox obj : object, the object to deposit id : str, the uuid to deposit the object under if not specified, a new uuid will be generated

driver_status()

enqueue([interactive])

enqueued_base(**kwargs)

from_server_name(server_name, **kwargs)

get_config(name[, print_console, interactive])
```

continues on next page

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```
get_driver_object(name)
 get_object(name[, serialize])
 get_queue()
 get_queued_commands([inherit_commands])
 get_quickbar()
 get_server_time()
 get_unqueued_commands([inherit_commands])
 halt()
 logged_in()
 login(username[, populate_commands])
 move_item(uuid, pos)
 pause(state)
 query_driver(**kwargs)
 queue_state()
 remove_item(uuid)
 reset_queue_daemon()
 retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox id: str, the uuid
                                                   of the object to retrieve delete: bool, if True, delete
                                                   the object after retrieving
 server_cmd(cmd, **kwargs)
 set_config([interactive])
 set_driver_object(**kw)
 set_object([serialize])
 unqueued_base(**kwargs)
 wait([target_uuid, interval, for_history, ...])
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
```

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logged_in()

```
login(username, populate_commands=True)
driver_status()
get_queue()
wait(target uuid=None, interval=0.1, for history=True, first check delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
get_unqueued_commands(inherit_commands=True)
get_queued_commands(inherit_commands=True)
enqueue(interactive=None, **kwargs)
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
halt()
queue_state()
remove_item(uuid)
move_item(uuid, pos)
set_driver_object(**kw)
get_driver_object(name)
deposit_obj(obj, uid=None)
     Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
     under if not specified, a new uuid will be generated
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
     the object after retrieving
set_object(serialize=True, **kw)
get_object(name, serialize=True)
```

AFL.automation.prepare.SampleSeriesWidget.FloatText

class AFL.automation.prepare.SampleSeriesWidget.FloatText(**kwargs: Any)

Bases: _Float

Displays a float value within a textbox. For a textbox in which the value must be within a specific range, use BoundedFloatText.

Parameters

- value (float) value displayed
- **step** (*float*) step of the increment (if None, any step is allowed)
- **description** (*str*) description displayed next to the text box

__init__(value=None, **kwargs)

Public constructor

Methods

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
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Table 42 – continued from previous page

	1 1 0
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
<pre>on_widget_constructed(callback)</pre>	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
continuous_update	Update the value as the user types.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
step	Minimum step to increment the value
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Float value
widget_types	
widgets	

disabled

Enable or disable user changes

continuous_update

Update the value as the user types. If False, update on submission, e.g., pressing Enter or navigating away.

step

Minimum step to increment the value

__del__()

Object disposal

```
__init__(value=None, **kwargs)
```

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

```
classmethod class_own_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

```
classmethod class_trait_names(**metadata: Any) → list[str]
```

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

```
classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

 $\begin{tabular}{ll} \textbf{key} (unicode \ or \ iterable \ (optional)) - A single property's name or iterable of property names to get. \\ \end{tabular}$

Returns

- **state** (dict of states)
- metadata (dict) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

$has_trait(name: str) \rightarrow bool$

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | $str | None = None, remove: bool = False) \rightarrow None$

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (*list of binary buffers*) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

style

Styling customizations

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str \mid None = None) \rightarrow dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

 $trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any$

Get metadata values for trait by key.

```
trait_names(**metadata: Any) → list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) \rightarrow dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Float value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.HBox

class AFL.automation.prepare.SampleSeriesWidget.HBox(**kwargs: Any)

Bases: Box

Displays multiple widgets horizontally using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to ', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Horizontal Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.HBox([title_widget, slider])
```

```
__init__(children=(), **kwargs)
```

Public constructor

Methods

init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	•
· · · · · · · · · · · · · · · · · · ·	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits

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	1 0
<pre>hold_trait_notifications()</pre>	Context manager for bundling trait change notifica-
	tions and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
<pre>on_widget_constructed(callback)</pre>	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
unobserve(handler[, names, type])	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

__del__()

Object disposal

__init__(children=(), **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode or iterable (optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False,

then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.IntText

```
class AFL.automation.prepare.SampleSeriesWidget.IntText(**kwargs: Any)
    Bases: _Int
```

Textbox widget that represents an integer.

```
__init__(value=None, **kwargs)
```

Parameters

value (*integer*) – The initial value.

Methods

init([value])	
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
class_traits(**metadata)	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.

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ed from previous page
Return the value for this widget which should be passed to interactive functions.
Returns the full state for a widget manager for embedding
Gets the widget state, or a piece of it.
Static method, called when a widget is constructed.
Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
Returns True if the object has a trait with the specified name.
Hold syncing any state until the outermost context manager exits
Context manager for bundling trait change notifications and cross validation.
Called when a property has changed.
Setup a handler to be called when a trait changes.
(Un)Register a custom msg receive callback.
DEPRECATED: Setup a handler to be called when a trait changes.
Registers a callback to be called when a widget is constructed.
Open a comm to the frontend if one isn't already open.
Removes a class from the top level element of the widget.
Sends a custom msg to the widget model in the frontend.
Sends the widget state, or a piece of it, to the frontend, if it exists.
Called when a state is received from the front-end.
Forcibly sets trait attribute, including read-only attributes.
This is called before selfinit is called.
Return a trait's default value or a dictionary of them
Get a dict of all the event handlers of this class.
Returns True if the specified trait has a value.
Get metadata values for trait by key.
Get a list of all the names of this class' traits.
A dict of trait names and their values.
Get a dict of all the traits of this class.
Remove a trait change handler.
Remove trait change handlers of any type for the specified name.

Attributes

COMM	A trait which allows any value.
continuous_update	Update the value as the user types.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use tooltip attribute instead.
disabled	Enable or disable user changes
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified class.
model_id	Gets the model id of this widget.
step	Minimum step to increment the value
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Int value
widget_types	
widgets	

disabled

Enable or disable user changes

continuous_update

Update the value as the user types. If False, update on submission, e.g., pressing Enter or navigating away.

step

Minimum step to increment the value

```
__del__()
```

Object disposal

__init__(value=None, **kwargs)

Parameters

value (*integer*) – The initial value.

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) $\rightarrow list[str]$

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

$\textbf{classmethod class_traits(**metadata: Any)} \rightarrow \text{dict[str, TraitType[Any, Any]]}$

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

```
get_state(key=None, drop_defaults=False)
```

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (*dict of states*)
- **metadata** (*dict*) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

style

Styling customizations

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Int value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.Label

```
class AFL.automation.prepare.SampleSeriesWidget.Label(**kwargs: Any)
    Bases: _String
    Label widget.

It also renders math inside the string value as Latex (requires $ $ or $$ $$ and similar latex tags).
    __init__(value=None, **kwargs)
```

Methods

Public constructor

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not
	a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
class_traits(**metadata)	Get a dict of all the traits of this class.

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Table 40 Continue	ed from previous page
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be
	passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embed-
	ding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
<pre>handle_control_comm_opened(comm, msg)</pre>	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is re-
	ceived
has_trait(name)	Returns True if the object has a trait with the specified
	name.
hold_sync()	Hold syncing any state until the outermost context
	manager exits
<pre>hold_trait_notifications()</pre>	Context manager for bundling trait change notifica-
	tions and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a
	trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is con-
	structed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the
and (content [1 (Cont)	widget.
send(content[, buffers])	Sends a custom msg to the widget model in the front-
	end.
send_state([key])	Sends the widget state, or a piece of it, to the front-
ant atata(aura data)	end, if it exists. Called when a state is received from the front-end.
set_state(sync_data)	
set_trait(name, value)	Forcibly sets trait attribute, including read-only at-
cotun instance(**kweese)	tributes. This is called before calf init is called
<pre>setup_instance(**kwargs) trait_defaults(*names, **metadata)</pre>	This is called before selfinit is called.
trait_defaults(*names, **metadata) trait_events([name])	Return a trait's default value or a dictionary of them Get a dict of all the event handlers of this class.
trait_events([name]) trait_has_value(name)	Returns True if the specified trait has a value.
trait_nas_value(name) trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
unobserve(handler[, names, type])	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the spec-
anobserve_arr([name])	ified name.
	med name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use tooltip attribute instead.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

__del__()

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the *trait_names()* method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default: None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = traitlets.All, type:
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• handler (callable) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.Layout

```
class AFL.automation.prepare.SampleSeriesWidget.Layout(**kwargs: Any)
```

Bases: Widget

Layout specification

Defines a layout that can be expressed using CSS. Supports a subset of https://developer.mozilla.org/en-US/docs/Web/CSS/Reference

When a property is also accessible via a shorthand property, we only expose the shorthand.

For example: - flex-grow, flex-shrink and flex-basis are bound to flex. - flex-wrap and flex-direction are bound to flex-flow. - margin-[top/bottom/left/right] values are bound to margin, etc.

```
__init__(**kwargs)

Public constructor
```

Methods

init(**kwargs)	Public constructor
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
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Table 46 – continued from previous page

	ou nom promote page
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
<pre>has_trait(name)</pre>	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the frontend, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
<pre>unobserve_all([name])</pre>	Remove trait change handlers of any type for the specified name.

Attributes

align_content	The align-content CSS attribute.
align_items	The align-items CSS attribute.
align_self	The align-self CSS attribute.
border	border property getter.
border_bottom	The border bottom CSS attribute.
border_left	The border left CSS attribute.
border_right	The border right CSS attribute.
border_top	The border top CSS attribute.
bottom	The bottom CSS attribute.
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
display	The display CSS attribute.

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Table 47 – continued from previous page

The flex CSS attribute.
The flex-flow CSS attribute.
The grid-area CSS attribute.
The grid-auto-columns CSS attribute.
The grid-auto-flow CSS attribute.
The grid-auto-rows CSS attribute.
The grid-column CSS attribute.
The grid-gap CSS attribute.
The grid-row CSS attribute.
The grid-template-areas CSS attribute.
The grid-template-columns CSS attribute.
The grid-template-rows CSS attribute.
The height CSS attribute.
The justify-content CSS attribute.
The justify-items CSS attribute.
The traits which are synced.
The left CSS attribute.
A trait whose value must be an instance of a specified
class.
The margin CSS attribute.
The max-height CSS attribute.
The max-width CSS attribute.
The min-height CSS attribute.
The min-width CSS attribute.
Gets the model id of this widget.
The object-fit CSS attribute.
The object-position CSS attribute.
The order CSS attribute.
The overflow CSS attribute.
The padding CSS attribute.
The right CSS attribute.
The top CSS attribute.
The visibility CSS attribute.
The width CSS attribute.

align_content

The align-content CSS attribute.

align_items

The align-items CSS attribute.

align_self

The align-self CSS attribute.

border_top

The border top CSS attribute.

border_right

The border right CSS attribute.

border_bottom

The border bottom CSS attribute.

border_left

The border left CSS attribute.

bottom

The bottom CSS attribute.

display

The display CSS attribute.

flex

The flex CSS attribute.

flex_flow

The flex-flow CSS attribute.

height

The height CSS attribute.

justify_content

The justify-content CSS attribute.

justify_items

The justify-items CSS attribute.

left

The left CSS attribute.

margin

The margin CSS attribute.

max_height

The max-height CSS attribute.

max_width

The max-width CSS attribute.

min_height

The min-height CSS attribute.

min_width

The min-width CSS attribute.

overflow

The overflow CSS attribute.

order

The order CSS attribute.

padding

The padding CSS attribute.

right

The right CSS attribute.

```
top
     The top CSS attribute.
visibility
     The visibility CSS attribute.
width
     The width CSS attribute.
object_fit
     The object-fit CSS attribute.
object_position
     The object-position CSS attribute.
grid_auto_columns
     The grid-auto-columns CSS attribute.
grid_auto_flow
     The grid-auto-flow CSS attribute.
grid_auto_rows
     The grid-auto-rows CSS attribute.
grid_gap
     The grid-gap CSS attribute.
grid_template_rows
     The grid-template-rows CSS attribute.
grid_template_columns
     The grid-template-columns CSS attribute.
grid_template_areas
     The grid-template-areas CSS attribute.
grid_row
     The grid-row CSS attribute.
grid_column
     The grid-column CSS attribute.
grid_area
     The grid-area CSS attribute.
__init__(**kwargs)
     Public constructor
property border
     border property getter. Return the common value of all side borders if they are identical. Otherwise return
     None.
__del__()
     Object disposal
```

add_traits(**traits)

Dynamically add trait attributes to the Widget.

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) $\rightarrow list[str]$

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

 $\begin{tabular}{ll} \textbf{key} (unicode \ or \ iterable \ (optional)) - A single property's name or iterable of property names to get. \\ \end{tabular}$

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

```
static handle_comm_opened(comm, msg)
```

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

• handler (callable) – A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.

- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (*bool*) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False,

then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change'*)) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget

```
class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget(deck)
    Bases: object
    __init__(deck)
```

Methods

```
__init__(deck)
 apply_protocol_order()
 apply_protocol_order_cb(event)
 build_label(index)
 example_label_cb(event)
 make_all_labels()
 make_all_labels_cb(event)
 make_catch_protocol()
 make_mixing_wells()
 make_protocol()
 reset_uuid_cb(event)
 start()
 submit_cb(event)
 submit_mixing_wells_cb(event)
 sync_to_prepare_cb(event)
 update_mixing_well_preview_cb(event)
 update_protocol_order_preview_cb(event)
 update_sort_order_cb(event, direction)
__init__(deck)
apply_protocol_order_cb(event)
apply_protocol_order()
update_protocol_order_preview_cb(event)
make_protocol()
make_catch_protocol()
submit_cb(event)
build_label(index)
```

```
example_label_cb(event)
     make_all_labels_cb(event)
     make_all_labels()
     sync_to_prepare_cb(event)
     reset_uuid_cb(event)
     update_sort_order_cb(event, direction)
     make_mixing_wells()
     update_mixing_well_preview_cb(event)
     submit_mixing_wells_cb(event)
     start()
AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_Model
\textbf{class} \ AFL. automation. prepare. Sample Series \texttt{Widget}. \textbf{Sample Series} \textbf{Widget}\_\textbf{Model} (\textit{deck})
     Bases: object
     __init__(deck)
     Methods
       __init__(deck)
       adjust_protocol_order(mix_order)
     __init__(deck)
     adjust_protocol_order(mix_order)
AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_View
class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_View
     Bases: object
     __init__()
```

Methods

```
__init__()

make_component_grid(components, nsamples)

make_mixing_wells()

make_pipette_params(name)

start(components, nsamples, stock_names)
```

```
__init__()
make_component_grid(components, nsamples)
make_pipette_params(name)
make_mixing_wells()
start(components, nsamples, stock_names)
```

AFL.automation.prepare.SampleSeriesWidget.Text

Methods

init(*args, **kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding

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	a nom previous page
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
<pre>handle_control_comm_opened(comm, msg)</pre>	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is re-
	ceived
<pre>has_trait(name)</pre>	Returns True if the object has a trait with the specified
	name.
hold_sync()	Hold syncing any state until the outermost context
	manager exits
<pre>hold_trait_notifications()</pre>	Context manager for bundling trait change notifica-
	tions and cross validation.
notify_change(change)	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_submit(callback[, remove])</pre>	(Un)Register a callback to handle text submission.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a
	trait changes.
<pre>on_widget_constructed(callback)</pre>	Registers a callback to be called when a widget is con-
	structed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the
1/	widget.
send(content[, buffers])	Sends a custom msg to the widget model in the front-
(7)	end.
send_state([key])	Sends the widget state, or a piece of it, to the front-
1.1	end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only at-
	tributes.
setup_instance(**kwargs)	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata) trait_events([name])</pre>	Return a trait's default value or a dictionary of them Get a dict of all the event handlers of this class.
trait_events([name]) trait_has_value(name)	
	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default]) trait_names(**metadata)</pre>	Get metadata values for trait by key. Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
unobserve(handler[, names, type])	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the spec-
anobserve_arr([name])	ified name.
	med name.

Attributes

comm	A trait which allows any value.
continuous_update	Update the value as the user types.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

disabled

Enable or disable user changes

continuous_update

Update the value as the user types. If False, update on submission, e.g., pressing Enter or navigating away.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

```
__init__(*args, **kwargs)
```

Public constructor

on_submit(callback, remove=False)

(Un)Register a callback to handle text submission.

Triggered when the user clicks enter.

Parameters

- callback (callable) Will be called with exactly one argument: the Widget instance
- remove (bool (optional)) Whether to unregister the callback

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

```
get_state(key=None, drop_defaults=False)
```

Gets the widget state, or a piece of it.

Parameters

 $\textbf{key} \, (unicode \ or \ iterable \ (optional)) - A \ single \ property's \ name \ or \ iterable \ of \ property \ names \ to \ get.$

Returns

- **state** (dict of states)
- metadata (dict) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

setup_instance(**kwargs: Any) \rightarrow None

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str \mid None = None) \rightarrow dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) \rightarrow dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SampleSeriesWidget.VBox

Displays multiple widgets vertically using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to '', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Vertical Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.VBox([title_widget, slider])
```

```
__init__(children=(), **kwargs)
Public constructor
```

Methods

init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
class_own_trait_events(name)	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.

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send_state([key])	Sends the widget state, or a piece of it, to the frontend, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

```
__del__()
    Object disposal
__init__(children=(), **kwargs)
    Public constructor
add_class(className)
    Adds a class to the top level el
```

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

$trait_has_value(name: str) \rightarrow bool$

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.

• type (str or All (default: 'change')) - The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types. **unobserve_all**($name: str \mid Any = traitlets.All$) \rightarrow None Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers. widget_types = <ipywidgets.widgets.widget.WidgetRegistry object> widgets = {} class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget(deck) __init__(deck) apply_protocol_order_cb(event) apply_protocol_order() update_protocol_order_preview_cb(event) make_protocol() make_catch_protocol() submit_cb(event) build_label(index) example_label_cb(event) make_all_labels_cb(event) make_all_labels() sync_to_prepare_cb(event) reset_uuid_cb(event) update_sort_order_cb(event, direction) make_mixing_wells() update_mixing_well_preview_cb(event) submit_mixing_wells_cb(event) start() class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_Model(deck) __init__(deck) adjust_protocol_order(mix_order) class AFL.automation.prepare.SampleSeriesWidget.SampleSeriesWidget_View __init__()

make_component_grid(components, nsamples)

```
make_pipette_params(name)
make_mixing_wells()
start(components, nsamples, stock_names)
```

AFL.automation.prepare.StockBuilderWidget

Functions

sqrt(x, /)

Return the square root of x.

AFL.automation.prepare.StockBuilderWidget.sqrt

AFL.automation.prepare.StockBuilderWidget. $\mathbf{sqrt}(x,/)$ Return the square root of x.

Classes

```
StockBuilderWidget(deck)
StockBuilderWidget_Model(deck)
StockBuilderWidget_View()
```

AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget

Methods

```
__init__(deck)
 add_stocks_to_deck()
 analyze_stocks_cb(event)
 get_stock_objects()
 get_stock_values()
 load_cb(event)
 make_stock_cb(event)
 remove_stock_cb(event)
 save_cb(event[, pkl])
 set_units_cb(event, units)
 start()
 update_location_check_cb(event)
__init__(deck)
analyze_stocks_cb(event)
get_stock_objects()
add_stocks_to_deck()
get_stock_values()
save_cb(event, pkl=True)
load_cb(event)
update_location_check_cb(event)
make_stock_cb(event)
remove_stock_cb(event)
set_units_cb(event, units)
start()
```

AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget_Model

```
__init__(deck)
```

Methods

```
__init__(deck)

add_stocks_to_deck(all_stocks_dict)

to_stock_objects(all_stocks_dict)

__init__(deck)
```

```
add_stocks_to_deck(all_stocks_dict)
to_stock_objects(all_stocks_dict)
```

AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget_View

Methods

```
__init__()
make_stock_tab(stock_name, components)

start()

__init__()
make_stock_tab(stock_name, components)

start()

class AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget(deck)
    __init__(deck)
    analyze_stocks_cb(event)

get_stock_objects()
add_stocks_to_deck()
get_stock_values()
save_cb(event, pkl=True)
```

```
load_cb(event)
update_location_check_cb(event)
make_stock_cb(event)
remove_stock_cb(event)
set_units_cb(event, units)
start()
class AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget_Model(deck)
    __init__(deck)
add_stocks_to_deck(all_stocks_dict)
to_stock_objects(all_stocks_dict)
class AFL.automation.prepare.StockBuilderWidget.StockBuilderWidget_View
    __init__()
make_stock_tab(stock_name, components)
start()
```

AFL.automation.prepare.SweepBuilderWidget

Functions

sqrt(x, l)	Return the square root of x.
------------	------------------------------

AFL.automation.prepare.SweepBuilderWidget.sqrt

AFL.automation.prepare.SweepBuilderWidget.sqrt(x,/)Return the square root of x.

Classes

Button(**kwargs)	Button widget.
Checkbox(**kwargs)	Displays a boolean <i>value</i> in the form of a checkbox.
HBox(**kwargs)	Displays multiple widgets horizontally using the flexible box model.
Label(**kwargs)	Label widget.
Layout(**kwargs)	Layout specification
SweepBuilderWidget(deck)	
SweepBuilderWidget_Model(deck)	
<pre>SweepBuilderWidget_View()</pre>	
Text(**kwargs)	Single line textbox widget.
VBox(**kwargs)	Displays multiple widgets vertically using the flexible box model.

AFL.automation.prepare.SweepBuilderWidget.Button

class AFL.automation.prepare.SweepBuilderWidget.Button(**kwargs: Any)

Bases: DOMWidget, CoreWidget

Button widget.

This widget has an on_click method that allows you to listen for the user clicking on the button. The click event itself is stateless.

Parameters

- **description** (*str*) description displayed on the button
- icon (str) font-awesome icon names, without the 'fa-' prefix
- **disabled** (bool) whether user interaction is enabled

```
__init__(**kwargs)
```

Public constructor

Methods

init(**kwargs)	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
click()	Programmatically trigger a click event.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
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Table 50 – continued from previous page

	a nom providuo pago
<pre>on_click(callback[, remove])</pre>	Register a callback to execute when the button is clicked.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
<pre>on_widget_constructed(callback)</pre>	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
<pre>trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

button_style	Use a predefined styling for the button.
COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
description	Button label.
disabled	Enable or disable user changes.
icon	Font-awesome icon names, without the 'fa-' prefix.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified class.
model_id	Gets the model id of this widget.
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

description

Button label.

disabled

Enable or disable user changes.

icon

Font-awesome icon names, without the 'fa-' prefix.

button_style

Use a predefined styling for the button.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

```
__init__(**kwargs)
```

Public constructor

on_click(callback, remove=False)

Register a callback to execute when the button is clicked.

The callback will be called with one argument, the clicked button widget instance.

Parameters

remove (bool (optional)) – Set to true to remove the callback from the list of callbacks.

click()

Programmatically trigger a click event.

This will call the callbacks registered to the clicked button widget instance.

```
__del__()
```

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

 $\begin{tabular}{ll} \textbf{key} (unicode \ or \ iterable \ (optional)) - A single property's name or iterable of property names to get. \\ \end{tabular}$

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

• handler (callable) – A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.

- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | $str | None = None, remove: bool = False) \rightarrow None$

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (list of binary buffers) Binary buffers to send with message

```
send_state(key=None)
```

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str \mid None = None) \rightarrow dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

 $trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any$

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SweepBuilderWidget.Checkbox

class AFL.automation.prepare.SweepBuilderWidget.Checkbox(**kwargs: Any)

Bases: _Bool

Displays a boolean value in the form of a checkbox.

Parameters

- $value({True, False})$ value of the checkbox: True-checked, False-unchecked
- **description** (*str*) description displayed next to the checkbox
- **indent** ({*True*, *False*}) indent the control to align with other controls with a description. The style.description_width attribute controls this width for consistence with other controls.

__init__(value=None, **kwargs)

Public constructor

Methods

init ([valua])	Public constructor
init([value]) add_class(className)	Adds a class to the top level element of the widget.
	1
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
class_traits(**metadata)	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be
	passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifica-
	tions and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
	continues on next page

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Table 51 – continued from previous page

	a nom providuo pago
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
<pre>send(content[, buffers])</pre>	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes.
indent	Indent the control to align with other controls with a
	description.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
style	Styling customizations
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	Bool value
widget_types	
widgets	

indent

Indent the control to align with other controls with a description.

style

Styling customizations

```
__del__()
```

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

disabled

Enable or disable user changes.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode or iterable (optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- metadata (dict) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

$has_trait(name: str) \rightarrow bool$

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- **buffers** (*list of binary buffers*) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
Called when a state
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

 $trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any$

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

trait_values(**metadata: Any) → dict[str, Any]

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

Bool value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SweepBuilderWidget.HBox

```
class AFL.automation.prepare.SweepBuilderWidget.HBox(**kwargs: Any)
```

Bases: Box

Displays multiple widgets horizontally using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or ''. Applies a predefined style to the box. Defaults to '', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Horizontal Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.HBox([title_widget, slider])
```

```
\_\_init\_\_(\mathit{children} = (), **kwargs)
```

Public constructor

Methods

init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
notify_change(change)	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
on_msg(callback[, remove])	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.

continues on next page

Table 52 – continued from previous page

open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
<pre>set_trait(name, value)</pre>	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
COMM	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

```
__del__()
    Object disposal
__init__(children=(), **kwargs)
    Public constructor
add_class(className)
```

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

```
classmethod class_own_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

```
classmethod class_trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

This method is just like the *trait_names()* method, but is unbound.

```
classmethod class_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode or iterable (optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.

• **remove** (bool) – If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• handler (callable) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SweepBuilderWidget.Label

```
class AFL.automation.prepare.SweepBuilderWidget.Label(**kwargs: Any)
    Bases: _String
    Label widget.

It also renders math inside the string value as Latex (requires $ $ or $$ $$ and similar latex tags).
    __init__(value=None, **kwargs)
    Public constructor
```

Methods

init([value])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
· /	Blur the widget.
blur()	ē
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_interact_value()</pre>	Return the value for this widget which should be
	passed to interactive functions.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embed-
	ding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	<i>y</i> 1
• •	
handle_comm_opened(comm, msg)	Static method, called when a widget is constructed.
<pre>handle_control_comm_opened(comm, msg)</pre>	Class method, called when the comm-open message
	on the "jupyter.widget.control" comm channel is re-
	ceived
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Table 53 – continued from previous page

has_trait(name)	Returns True if the object has a trait with the specified
	name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
<pre>observe(handler[, names, type])</pre>	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
<pre>send(content[, buffers])</pre>	Sends a custom msg to the widget model in the frontend.
<pre>send_state([key])</pre>	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
setup_instance(**kwargs)	This is called before selfinit is called.
trait_defaults(*names, **metadata)	Return a trait's default value or a dictionary of them
trait_events([name])	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use tooltip attribute instead.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

__del__()

Object disposal

__init__(value=None, **kwargs)

Public constructor

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) \rightarrow list[str]

Get a list of all the names of this class' traits.

This method is just like the *trait_names()* method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- drop_defaults when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup\_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) \rightarrow dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default: None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

• handler (callable) – The callable called when a trait attribute changes.

- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SweepBuilderWidget.Layout

class AFL.automation.prepare.SweepBuilderWidget.Layout(**kwargs: Any)

Bases: Widget

Layout specification

Defines a layout that can be expressed using CSS. Supports a subset of https://developer.mozilla.org/en-US/docs/Web/CSS/Reference

When a property is also accessible via a shorthand property, we only expose the shorthand.

For example: - flex-grow, flex-shrink and flex-basis are bound to flex. - flex-wrap and flex-direction are bound to flex-flow. - margin-[top/bottom/left/right] values are bound to margin, etc.

```
__init__(**kwargs)

Public constructor
```

Methods

init(**kwargs)	Public constructor
add_traits(**traits)	Dynamically add trait attributes to the Widget.
<pre>class_own_trait_events(name)</pre>	Get a dict of all event handlers defined on this class, not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
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Table 54 – continued from previous page

handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is re- ceived
<pre>has_trait(name)</pre>	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.
send_state([key])	Sends the widget state, or a piece of it, to the frontend, if it exists.
set_state(sync_data)	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
<pre>unobserve_all([name])</pre>	Remove trait change handlers of any type for the specified name.

Attributes

align_content	The align-content CSS attribute.
align_items	The align-items CSS attribute.
align_self	The align-self CSS attribute.
border	border property getter.
border_bottom	The border bottom CSS attribute.
border_left	The border left CSS attribute.
border_right	The border right CSS attribute.
border_top	The border top CSS attribute.
bottom	The bottom CSS attribute.
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
display	The display CSS attribute.

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Table 55 – continued from previous page

	Table 55 – continued from previous page
flex	The flex CSS attribute.
flex_flow	The flex-flow CSS attribute.
grid_area	The grid-area CSS attribute.
grid_auto_columns	The grid-auto-columns CSS attribute.
grid_auto_flow	The grid-auto-flow CSS attribute.
grid_auto_rows	The grid-auto-rows CSS attribute.
grid_column	The grid-column CSS attribute.
grid_gap	The grid-gap CSS attribute.
grid_row	The grid-row CSS attribute.
<pre>grid_template_areas</pre>	The grid-template-areas CSS attribute.
<pre>grid_template_columns</pre>	The grid-template-columns CSS attribute.
grid_template_rows	The grid-template-rows CSS attribute.
height	The height CSS attribute.
justify_content	The justify-content CSS attribute.
justify_items	The justify-items CSS attribute.
keys	The traits which are synced.
left	The left CSS attribute.
log	A trait whose value must be an instance of a specified
-	class.
margin	The margin CSS attribute.
max_height	The max-height CSS attribute.
max_width	The max-width CSS attribute.
min_height	The min-height CSS attribute.
min_width	The min-width CSS attribute.
model_id	Gets the model id of this widget.
object_fit	The object-fit CSS attribute.
object_position	The object-position CSS attribute.
order	The order CSS attribute.
overflow	The overflow CSS attribute.
padding	The padding CSS attribute.
right	The right CSS attribute.
top	The top CSS attribute.
visibility	The visibility CSS attribute.
widget_types	
widgets	
width	The width CSS attribute.

align_content

The align-content CSS attribute.

align_items

The align-items CSS attribute.

align_self

The align-self CSS attribute.

border_top

The border top CSS attribute.

border_right

The border right CSS attribute.

border_bottom

The border bottom CSS attribute.

border_left

The border left CSS attribute.

bottom

The bottom CSS attribute.

display

The display CSS attribute.

flex

The flex CSS attribute.

flex_flow

The flex-flow CSS attribute.

height

The height CSS attribute.

justify_content

The justify-content CSS attribute.

justify_items

The justify-items CSS attribute.

left

The left CSS attribute.

margin

The margin CSS attribute.

max_height

The max-height CSS attribute.

max_width

The max-width CSS attribute.

min_height

The min-height CSS attribute.

min_width

The min-width CSS attribute.

overflow

The overflow CSS attribute.

order

The order CSS attribute.

padding

The padding CSS attribute.

right

The right CSS attribute.

top The top CSS attribute. visibility The visibility CSS attribute. width The width CSS attribute. object_fit The object-fit CSS attribute. object_position The object-position CSS attribute. grid_auto_columns The grid-auto-columns CSS attribute. grid_auto_flow The grid-auto-flow CSS attribute. grid_auto_rows The grid-auto-rows CSS attribute. grid_gap The grid-gap CSS attribute. grid_template_rows The grid-template-rows CSS attribute. grid_template_columns The grid-template-columns CSS attribute. grid_template_areas The grid-template-areas CSS attribute. grid_row The grid-row CSS attribute. grid_column The grid-column CSS attribute. grid_area The grid-area CSS attribute. __init__(**kwargs) Public constructor property border border property getter. Return the common value of all side borders if they are identical. Otherwise return None. __del__()

Object disposal add_traits(**traits)

Dynamically add trait attributes to the Widget.

classmethod class_own_trait_events(name: str) \rightarrow dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(**metadata: Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the *traits()* method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode* or *iterable* (*optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

```
static handle_comm_opened(comm, msg)
```

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

• handler (callable) – A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.

- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | $str | None = None, remove: bool = False) \rightarrow None$

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (*bool*) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

```
send(content, buffers=None)
```

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

```
set_state(sync_data)
```

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default: None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
\textbf{trait\_names(}**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False,

then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) \rightarrow dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | str |
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change'*)) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

```
widget_types = <ipywidgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget

```
class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget(deck)
    Bases: object
    __init__(deck)
```

Methods

```
__init__(deck)
      calc_sweep_cb(click)
      get_deck()
      get_sweep_data()
      plot_binary_cb(click)
      plot_ternary_cb(click)
      start()
      update_component_row_cb(event)
      validate_sweep_cb(click)
     __init__(deck)
     plot_binary_cb(click)
     plot_ternary_cb(click)
     calc_sweep_cb(click)
     validate_sweep_cb(click)
     get_sweep_data()
     get_deck()
     update_component_row_cb(event)
     start()
AFL. automation. prepare. Sweep Builder Widget. Sweep Builder Widget\_Model
class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget_Model(deck)
     Bases: object
     __init__(deck)
     Methods
       __init__(deck)
      calc_sweep(sweep_dict, progress)
      validate_sweep(tolerance[, progress])
```

```
__init__(deck)
validate_sweep(tolerance, progress=None)
calc_sweep(sweep_dict, progress)
```

AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget_View

Methods

```
__init__()

make_binary_plot(component_names)

make_stock_grid(component_names)

make_ternary_plot(component_names)

start(component_names)
```

```
__init__()
make_stock_grid(component_names)
make_ternary_plot(component_names)
make_binary_plot(component_names)
start(component_names)
```

AFL.automation.prepare.SweepBuilderWidget.Text

```
class AFL.automation.prepare.SweepBuilderWidget.Text(**kwargs: Any)
    Bases: _String
    Single line textbox widget.
    __init__(*args, **kwargs)
    Public constructor
```

Methods

init(*args, **kwargs)	Public constructor
<pre>add_class(className)</pre>	Adds a class to the top level element of the widget.
<pre>add_traits(**traits)</pre>	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.

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Table 56 – continued from previous page

Table 56 – continued from previous page		
class_own_trait_events(name)	Get a dict of all event handlers defined on this class, not a parent.	
class_own_traits(**metadata)	Get a dict of all the traitlets defined on this class, not a parent.	
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.	
class_traits(**metadata)	Get a dict of all the traits of this class.	
close()	Close method.	
close_all()		
focus()	Focus on the widget.	
<pre>get_interact_value()</pre>	Return the value for this widget which should be passed to interactive functions.	
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding	
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.	
<pre>get_view_spec()</pre>		
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.	
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received	
has_trait(name)	Returns True if the object has a trait with the specified name.	
hold_sync()	Hold syncing any state until the outermost context manager exits	
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.	
notify_change(change)	Called when a property has changed.	
observe(handler[, names, type])	Setup a handler to be called when a trait changes.	
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.	
<pre>on_submit(callback[, remove])</pre>	(Un)Register a callback to handle text submission.	
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.	
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.	
open()	Open a comm to the frontend if one isn't already open.	
remove_class(className)	Removes a class from the top level element of the widget.	
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.	
send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.	
set_state(sync_data)	Called when a state is received from the front-end.	
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.	
setup_instance(**kwargs)	This is called before selfinit is called.	
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them	
trait_events([name])	Get a dict of all the event handlers of this class.	
trait_has_value(name)	Returns True if the specified trait has a value.	
<pre>trait_metadata(traitname, key[, default])</pre>	Get metadata values for trait by key.	
trait_names(**metadata)	Get a list of all the names of this class' traits.	
trait_values(**metadata)	A dict of trait names and their values.	
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Table 56 – continued from previous page

traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

comm	A trait which allows any value.
continuous_update	Update the value as the user types.
cross_validation_lock	A contextmanager for running a block with our cross
	validation lock set to True.
description	Description of the control.
description_allow_html	Accept HTML in the description.
description_tooltip	The tooltip information deprecated :: 8.0.0 Use
	tooltip attribute instead.
disabled	Enable or disable user changes
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
placeholder	Placeholder text to display when nothing has been
	typed
style	An instance trait which coerces a dict to an instance.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
value	String value
widget_types	
widgets	

disabled

Enable or disable user changes

continuous_update

Update the value as the user types. If False, update on submission, e.g., pressing Enter or navigating away.

style

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

__init__(*args, **kwargs)

Public constructor

on_submit(callback, remove=False)

(Un)Register a callback to handle text submission.

Triggered when the user clicks enter.

Parameters

- callback (callable) Will be called with exactly one argument: the Widget instance
- remove (bool (optional)) Whether to unregister the callback

__del__()

Object disposal

add_class(className)

Adds a class to the top level element of the widget.

Doesn't add the class if it already exists.

add_traits(**traits)

Dynamically add trait attributes to the Widget.

blur()

Blur the widget.

classmethod class_own_trait_events(name: str) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata*: *Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

description

Description of the control.

description_allow_html

Accept HTML in the description.

property description_tooltip

The tooltip information. .. deprecated :: 8.0.0

Use tooltip attribute instead.

focus()

Focus on the widget.

get_interact_value()

Return the value for this widget which should be passed to interactive functions. Custom widgets can change this method to process the raw value self.value.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (unicode or iterable (optional)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

```
get_view_spec()
```

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

$hold_trait_notifications() \rightarrow Any$

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

```
observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

```
on_msg(callback, remove=False)
```

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

on_trait_change(handler: EventHandler | None = None, name: Sentinel | $str | None = None, remove: bool = False) \rightarrow None$

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **remove** (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

placeholder

Placeholder text to display when nothing has been typed

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

$set_trait(name: str, value: Any) \rightarrow None$

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (str (default: None)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

```
trait_has_value(name: str) \rightarrow bool
```

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) \rightarrow dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = 'change') \rightarrow None
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.
- **type** (*str or All (default: 'change')*) The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types.

```
unobserve_all(name: str \mid Any = traitlets.All) \rightarrow None
```

Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers.

value

String value

```
widget_types = <ipywidgets.widgets.widget.WidgetRegistry object>
widgets = {}
```

AFL.automation.prepare.SweepBuilderWidget.VBox

```
class AFL.automation.prepare.SweepBuilderWidget.VBox(**kwargs: Any)
    Bases: Box
```

Displays multiple widgets vertically using the flexible box model.

Parameters

- children (iterable of Widget instances) list of widgets to display
- **box_style** (*str*) one of 'success', 'info', 'warning' or 'danger', or '. Applies a predefined style to the box. Defaults to '', which applies no pre-defined style.

Examples

```
>>> import ipywidgets as widgets
>>> title_widget = widgets.HTML('<em>Vertical Box Example</em>')
>>> slider = widgets.IntSlider()
>>> widgets.VBox([title_widget, slider])
```

```
__init__(children=(), **kwargs)
Public constructor
```

Methods

init([children])	Public constructor
add_class(className)	Adds a class to the top level element of the widget.
add_traits(**traits)	Dynamically add trait attributes to the Widget.
blur()	Blur the widget.
class_own_trait_events(name)	Get a dict of all event handlers defined on this class,
	not a parent.
<pre>class_own_traits(**metadata)</pre>	Get a dict of all the traitlets defined on this class, not a parent.
<pre>class_trait_names(**metadata)</pre>	Get a list of all the names of this class' traits.
<pre>class_traits(**metadata)</pre>	Get a dict of all the traits of this class.
close()	Close method.
close_all()	
focus()	Focus on the widget.
<pre>get_manager_state([drop_defaults, widgets])</pre>	Returns the full state for a widget manager for embedding
<pre>get_state([key, drop_defaults])</pre>	Gets the widget state, or a piece of it.
<pre>get_view_spec()</pre>	
<pre>handle_comm_opened(comm, msg)</pre>	Static method, called when a widget is constructed.
handle_control_comm_opened(comm, msg)	Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received
has_trait(name)	Returns True if the object has a trait with the specified name.
hold_sync()	Hold syncing any state until the outermost context manager exits
hold_trait_notifications()	Context manager for bundling trait change notifications and cross validation.
<pre>notify_change(change)</pre>	Called when a property has changed.
observe(handler[, names, type])	Setup a handler to be called when a trait changes.
<pre>on_msg(callback[, remove])</pre>	(Un)Register a custom msg receive callback.
<pre>on_trait_change([handler, name, remove])</pre>	DEPRECATED: Setup a handler to be called when a trait changes.
on_widget_constructed(callback)	Registers a callback to be called when a widget is constructed.
open()	Open a comm to the frontend if one isn't already open.
remove_class(className)	Removes a class from the top level element of the widget.
send(content[, buffers])	Sends a custom msg to the widget model in the frontend.

continues on next page

Table 57 – continued from previous page

send_state([key])	Sends the widget state, or a piece of it, to the front- end, if it exists.
<pre>set_state(sync_data)</pre>	Called when a state is received from the front-end.
set_trait(name, value)	Forcibly sets trait attribute, including read-only attributes.
<pre>setup_instance(**kwargs)</pre>	This is called before selfinit is called.
<pre>trait_defaults(*names, **metadata)</pre>	Return a trait's default value or a dictionary of them
<pre>trait_events([name])</pre>	Get a dict of all the event handlers of this class.
trait_has_value(name)	Returns True if the specified trait has a value.
trait_metadata(traitname, key[, default])	Get metadata values for trait by key.
trait_names(**metadata)	Get a list of all the names of this class' traits.
trait_values(**metadata)	A dict of trait names and their values.
traits(**metadata)	Get a dict of all the traits of this class.
<pre>unobserve(handler[, names, type])</pre>	Remove a trait change handler.
unobserve_all([name])	Remove trait change handlers of any type for the specified name.

Attributes

box_style	Use a predefined styling for the box.
children	List of widget children
comm	A trait which allows any value.
cross_validation_lock	A contextmanager for running a block with our cross validation lock set to True.
keys	The traits which are synced.
layout	An instance trait which coerces a dict to an instance.
log	A trait whose value must be an instance of a specified
	class.
model_id	Gets the model id of this widget.
tabbable	Is widget tabbable?
tooltip	A tooltip caption.
widget_types	
widgets	

```
__del__()
    Object disposal
__init__(children=(), **kwargs)
    Public constructor

add_class(className)
    Adds a class to the top level element of the widget.
    Doesn't add the class if it already exists.

add_traits(**traits)
    Dynamically add trait attributes to the Widget.

blur()
```

Blur the widget.

box_style

Use a predefined styling for the box.

children

List of widget children

classmethod class_own_trait_events(*name: str*) → dict[str, EventHandler]

Get a dict of all event handlers defined on this class, not a parent.

Works like event_handlers, except for excluding traits from parents.

classmethod class_own_traits(***metadata: Any*) → dict[str, TraitType[Any, Any]]

Get a dict of all the traitlets defined on this class, not a parent.

Works like *class_traits*, except for excluding traits from parents.

classmethod class_trait_names(**metadata: Any) → list[str]

Get a list of all the names of this class' traits.

This method is just like the trait_names() method, but is unbound.

classmethod class_traits(***metadata:* Any) → dict[str, TraitType[Any, Any]]

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

This method is just like the traits() method, but is unbound.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

close()

Close method.

Closes the underlying comm. When the comm is closed, all of the widget views are automatically removed from the front-end.

classmethod close_all()

comm

A trait which allows any value.

property cross_validation_lock: Any

A contextmanager for running a block with our cross validation lock set to True.

At the end of the block, the lock's value is restored to its value prior to entering the block.

focus()

Focus on the widget.

static get_manager_state(drop_defaults=False, widgets=None)

Returns the full state for a widget manager for embedding

Parameters

- **drop_defaults** when True, it will not include default value
- widgets list with widgets to include in the state (or all widgets when None)

Returns

get_state(key=None, drop_defaults=False)

Gets the widget state, or a piece of it.

Parameters

key (*unicode or iterable (optional*)) – A single property's name or iterable of property names to get.

Returns

- **state** (dict of states)
- **metadata** (*dict*) metadata for each field: {key: metadata}

get_view_spec()

static handle_comm_opened(comm, msg)

Static method, called when a widget is constructed.

classmethod handle_control_comm_opened(comm, msg)

Class method, called when the comm-open message on the "jupyter.widget.control" comm channel is received

```
has\_trait(name: str) \rightarrow bool
```

Returns True if the object has a trait with the specified name.

hold_sync()

Hold syncing any state until the outermost context manager exits

hold_trait_notifications() → Any

Context manager for bundling trait change notifications and cross validation.

Use this when doing multiple trait assignments (init, config), to avoid race conditions in trait notifiers requesting other trait values. All trait notifications will fire after all values have been assigned.

keys

The traits which are synced.

layout

An instance trait which coerces a dict to an instance.

This lets the instance be specified as a dict, which is used to initialize the instance.

Also, we default to a trivial instance, even if args and kwargs is not specified.

log

A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

property model_id

Gets the model id of this widget.

If a Comm doesn't exist yet, a Comm will be created automagically.

notify_change(change)

Called when a property has changed.

observe(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, $type: Sentinel | str = 'change') \rightarrow None$

Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Parameters

- handler (callable) A callable that is called when a trait changes. Its signature should be handler(change), where change is a dictionary. The change dictionary at least holds a 'type' key. * type: the type of notification. Other keys may be passed depending on the value of 'type'. In the case where type is 'change', we also have the following keys: * owner: the HasTraits instance * old: the old value of the modified trait attribute * new: the new value of the modified trait attribute * name: the name of the modified trait attribute.
- names (list, str, All) If names is All, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- **type** (*str*, *All* (*default*: '*change*')) The type of notification to filter by. If equal to All, then all notifications are passed to the observe handler.

on_msg(callback, remove=False)

(Un)Register a custom msg receive callback.

Parameters

• callback (callable) – callback will be passed three arguments when a message arrives:

```
callback(widget, content, buffers)
```

• **remove** (*bool*) – True if the callback should be unregistered.

```
on_trait_change(handler: EventHandler | None = None, name: Sentinel | str | None = None, remove: bool = False) \rightarrow None
```

DEPRECATED: Setup a handler to be called when a trait changes.

This is used to setup dynamic notifications of trait changes.

Static handlers can be created by creating methods on a HasTraits subclass with the naming convention '_[traitname]_changed'. Thus, to create static handler for the trait 'a', create the method _a_changed(self, name, old, new) (fewer arguments can be used, see below).

If remove is True and handler is not specified, all change handlers for the specified name are uninstalled.

Parameters

- handler (callable, None) A callable that is called when a trait changes. Its signature can be handler(), handler(name), handler(name, new), handler(name, old, new), or handler(name, old, new, self).
- name (list, str, None) If None, the handler will apply to all traits. If a list of str, handler will apply to all names in the list. If a str, the handler will apply just to that name.
- remove (bool) If False (the default), then install the handler. If True then unintall it.

static on_widget_constructed(callback)

Registers a callback to be called when a widget is constructed.

The callback must have the following signature: callback(widget)

open()

Open a comm to the frontend if one isn't already open.

remove_class(className)

Removes a class from the top level element of the widget.

Doesn't remove the class if it doesn't exist.

send(content, buffers=None)

Sends a custom msg to the widget model in the front-end.

Parameters

- **content** (*dict*) Content of the message to send.
- buffers (list of binary buffers) Binary buffers to send with message

send_state(key=None)

Sends the widget state, or a piece of it, to the front-end, if it exists.

Parameters

key (*unicode*, *or iterable* (*optional*)) – A single property's name or iterable of property names to sync with the front-end.

set_state(sync_data)

Called when a state is received from the front-end.

```
set\_trait(name: str, value: Any) \rightarrow None
```

Forcibly sets trait attribute, including read-only attributes.

```
setup_instance(**kwargs: Any) \rightarrow None
```

This is called **before** self.__init__ is called.

tabbable

Is widget tabbable?

tooltip

A tooltip caption.

```
trait_defaults(*names: str, **metadata: Any) → dict[str, Any] | Sentinel
```

Return a trait's default value or a dictionary of them

Notes

Dynamically generated default values may depend on the current state of the object.

```
classmethod trait_events(name: str | None = None) → dict[str, EventHandler]
```

Get a dict of all the event handlers of this class.

Parameters

name (*str* (*default*: *None*)) – The name of a trait of this class. If name is None then all the event handlers of this class will be returned instead.

Return type

The event handlers associated with a trait name, or all event handlers.

$trait_has_value(name: str) \rightarrow bool$

Returns True if the specified trait has a value.

This will return false even if getattr would return a dynamically generated default value. These default values will be recognized as existing only after they have been generated.

Example

```
class MyClass(HasTraits):
    i = Int()

mc = MyClass()
assert not mc.trait_has_value("i")
mc.i # generates a default value
assert mc.trait_has_value("i")
```

```
trait_metadata(traitname: str, key: str, default: Any = None) \rightarrow Any
```

Get metadata values for trait by key.

```
trait_names(**metadata: Any) \rightarrow list[str]
```

Get a list of all the names of this class' traits.

```
trait_values(**metadata: Any) → dict[str, Any]
```

A dict of trait names and their values.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

Return type

A dict of trait names and their values.

Notes

Trait values are retrieved via getattr, any exceptions raised by traits or the operations they may trigger will result in the absence of a trait value in the result dict.

```
traits(**metadata: Any) → dict[str, TraitType[Any, Any]]
```

Get a dict of all the traits of this class. The dictionary is keyed on the name and the values are the TraitType objects.

The TraitTypes returned don't know anything about the values that the various HasTrait's instances are holding.

The metadata kwargs allow functions to be passed in which filter traits based on metadata values. The functions should take a single value as an argument and return a boolean. If any function returns False, then the trait is not included in the output. If a metadata key doesn't exist, None will be passed to the function.

```
unobserve(handler: Callable[[...], Any], names: Sentinel | str | Iterable[Sentinel | str] = traitlets.All, type: Sentinel | str = str | st
```

Remove a trait change handler.

This is used to unregister handlers to trait change notifications.

Parameters

- handler (callable) The callable called when a trait attribute changes.
- names (list, str, All (default: All)) The names of the traits for which the specified handler should be uninstalled. If names is All, the specified handler is uninstalled from the list of notifiers corresponding to all changes.

• type (str or All (default: 'change')) - The type of notification to filter by. If All, the specified handler is uninstalled from the list of notifiers corresponding to all types. **unobserve_all**($name: str \mid Any = traitlets.All$) \rightarrow None Remove trait change handlers of any type for the specified name. If name is not specified, removes all trait notifiers. widget_types = <ipywidgets.widgets.widget.WidgetRegistry object> widgets = {} class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget(deck) __init__(deck) plot_binary_cb(click) plot_ternary_cb(click) calc_sweep_cb(click) validate_sweep_cb(click) get_sweep_data() get_deck() update_component_row_cb(event) start() class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget_Model(deck) __init__(deck) validate_sweep(tolerance, progress=None) calc_sweep_dict, progress) class AFL.automation.prepare.SweepBuilderWidget.SweepBuilderWidget_View __init__() make_stock_grid(component names) make_ternary_plot(component names) make_binary_plot(component_names) start(component_names)

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AFL.automation.prepare.factory

Functions

AFL.automation.prepare.factory.HD2OFactory

AFL.automation.prepare.factory.**HD20Factory**(name, phi_D2O=None, sld=None, properties=None) Create a list of H2O/D2O solutions

AFL.automation.prepare.factory.compositionSweepFactory

AFL.automation.prepare.factory.compositionSweepFactory(name, components, vary_components, lo, hi, num, logspace=False, properties=None, progress=None)

AFL.automation.prepare.factory.has units

AFL.automation.prepare.factory.has_units(value)

AFL.automation.prepare.factory.is_concentration

AFL.automation.prepare.factory.is_concentration(value)

AFL.automation.prepare.factory.is mass

AFL.automation.prepare.factory.is_mass(value)

AFL.automation.prepare.factory.is_molarity

AFL.automation.prepare.factory.is_molarity(value)

AFL.automation.prepare.factory.is volume

AFL.automation.prepare.factory.is_volume(value)

AFL.automation.prepare.factory.listify

AFL.automation.prepare.factory.listify(obj)

Classes

```
Solution(name, components[, properties])

product product(*iterables, repeat=1) --> product object
```

AFL.automation.prepare.factory.Solution

```
class AFL.automation.prepare.factory.Solution(name, components, properties=None)
    Bases: object
    __init__(name, components, properties=None)
```

Methods

```
__init__(name, components[, properties])
add_component_from_name(name[,
                                      properties,
...])
contains(name)
copy([name])
from_dict(in_dict)
measure_out(amount[, deplete])
                                                  Create solution with identical composition at new to-
                                                  tal mass/volume
rename_component(old_name, new_name[,
place])
set_mass(value)
                                                  Setter for inline mass changes
set_properties_from_dict([properties,
                                             in-
place])
set_volume(value)
                                                  Setter for inline volume changes
to_dict()
```

Attributes

```
concentration
                                                 Total mass of mixture.
mass
                                                 Mass fraction of components in mixture
mass_fraction
molarity
size
solutes
solvent_density
solvent_mass
solvent_sld
solvent_volume
solvents
                                                 Total volume of mixture.
volume
volume_fraction
                                                 Volume fraction of solvents in mixture
```

```
__init__(name, components, properties=None)
__hash__()
    Needed so Solutions can be dictionary keys
to_dict()
classmethod from_dict(in_dict)
add_component_from_name(name, properties=None, inplace=False)
set_properties_from_dict(properties=None, inplace=False)
rename_component(old_name, new_name, inplace=False)
copy(name=None)
contains(name)
property size
property solutes
property solvents
__eq__(other)
     'Compare the mass, volume, and composition of two mixtures
property mass
     Total mass of mixture.
```

Chapter 6. Reference

```
set_mass(value)
     Setter for inline mass changes
property volume
     Total volume of mixture. Only solvents are included in volume calculation
set_volume(value)
     Setter for inline volume changes
property solvent_sld
property solvent_density
property solvent_volume
property solvent_mass
property mass_fraction
     Mass fraction of components in mixture
         Returns
             • mass fraction (dict)
             • Component mass fractions
```

property volume_fraction

Volume fraction of solvents in mixture

Returns

- solvent fraction (dict)
- Component mass fractions

```
property concentration
property molarity
measure_out(amount, deplete=False)
```

Create solution with identical composition at new total mass/volume

AFL.automation.prepare.factory.product

class AFL.automation.prepare.factory.product

```
Bases: object
product(*iterables, repeat=1) -> product object
```

Cartesian product of input iterables. Equivalent to nested for-loops.

For example, product(A, B) returns the same as: ((x,y) for x in A for y in B). The leftmost iterators are in the outermost for-loop, so the output tuples cycle in a manner similar to an odometer (with the rightmost element changing on every iteration).

To compute the product of an iterable with itself, specify the number of repetitions with the optional repeat keyword argument. For example, product(A, repeat=4) means the same as product(A, A, A, A).

```
product(`ab', range(3)) \rightarrow (`a',0) \ (`a',1) \ (`a',2) \ (`b',0) \ (`b',1) \ (`b',2) \ product((0,1), (0,1), (0,1)) \rightarrow (0,0,0) \ (0,0,1)
(0,1,0)(0,1,1)(1,0,0)\dots
```

__init__()

Methods

```
__init__()
```

AFL.automation.prepare.factory.**HD20Factory**(name, phi_D2O=None, sld=None, properties=None) Create a list of H2O/D2O solutions

AFL.automation.prepare.factory.compositionSweepFactory(name, components, vary_components, lo, hi, num, logspace=False, properties=None, progress=None)

AFL.automation.prepare.utilities

Functions

```
make_locs(slot, nrows, ncols)
make_wellplate_locs(slot, size)
```

AFL.automation.prepare.utilities.make locs

AFL.automation.prepare.utilities.make_locs(slot, nrows, ncols)

AFL.automation.prepare.utilities.make wellplate locs

AFL.automation.prepare.utilities.make_wellplate_locs(slot, size)

AFL.automation.prepare.utilities.make_locs(slot, nrows, ncols)

AFL.automation.prepare.utilities.make_wellplate_locs(slot, size)

6.2.5 Sample

The Sample module provides functionality for experiment orchestration 'Sample Servers'

```
AFL.automation.sample
AFL.automation.sample_env
```

AFL.automation.sample

Modules

CastingServer

AFL.automation.sample.CastingServer

Functions

ceil(x,/)	Return the ceiling of x as an Integral.
listify(obj)	
sqrt(x, /)	Return the square root of x.

AFL.automation.sample.CastingServer.ceil

```
AFL.automation.sample.CastingServer.ceil(x,/)
Return the ceiling of x as an Integral.
This is the smallest integer >= x.
```

AFL.automation.sample.CastingServer.listify

AFL.automation.sample.CastingServer.listify(obj)

AFL.automation.sample.CastingServer.sqrt

```
AFL.automation.sample.CastingServer.\mathbf{sqrt}(x,/)
Return the square root of x.
```

Classes

CastingServer(prep_url[, overrides])	
<pre>Client([ip, port, username, interactive]) Driver(name[, defaults, overrides])</pre>	Communicate with APIServer
<pre>0T2Client([ip, port, username, interactive])</pre>	Communicate with AFL-automation server on OT-2

AFL.automation.sample.CastingServer.CastingServer

```
class AFL.automation.sample.CastingServer.CastingServer(prep_url, overrides=None)
    Bases: Driver
    __init__(prep_url, overrides=None)
```

Methods

init(prep_url[, overrides])	
<pre>assign_targets(protocols, target_map)</pre>	
<pre>bulk_cast_films(**spec) deposit_obj(obj[, uid]) execute(**kwargs)</pre>	Spec should contain sample_name and a protocol Store an object in the dropbox
<pre>gather_defaults()</pre>	Gather all inherited static class-level dictionaries called default.
<pre>get_config(name[, print_console])</pre>	
<pre>get_configs([print_console])</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_sample()</pre>	
<pre>init_casting_manifest([attrs, overwrite])</pre>	
<pre>log_event(manifest_key, event[, write])</pre>	
<pre>post_execute(**kwargs) pre_execute(**kwargs) prepare_and_cast(**sample)</pre>	Executed after each call to execute Executed before each call to execute
<pre>prepare_casting_stocks(**spec) queued()</pre>	Spec should contain sample_name and a protocol
quickbar()	
reset_sample()	
<pre>retrieve_obj(uid[, delete]) set_config(**kwargs)</pre>	Retrieve an object from the dropbox
set_data(data)	Set data in the DataPacket object
set_object([serialized])	Set data in the Datai acket object
<pre>set_sample(sample_name[, sample_uuid])</pre>	
status()	
unqueued()	
update_status(value)	

Attributes

```
defaults
```

```
defaults = {'manifest': '/home/afl642/', 'manifest_cast': '/home/afl642/',
'manifest_prep': '/home/afl642/'}
__init__(prep_url, overrides=None)
init_casting_manifest(attrs=None, overwrite=False)
status()
update_status(value)
log_event(manifest_key, event, write=True)
assign_targets(protocols, target_map)
prepare_casting_stocks(**spec)
    Spec should contain sample_name and a protocol
bulk_cast_films(**spec)
    Spec should contain sample name and a protocol
prepare_and_cast(**sample)
deposit_obj(obj, uid=None)
    Store an object in the dropbox
        Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
    Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
    Executed after each call to execute
```

All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden by subclasses.

```
pre_execute(**kwargs)
          Executed before each call to execute
          All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
          by subclasses.
     queued()
     quickbar()
     reset_sample()
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
               Parameters
                   uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
AFL.automation.sample.CastingServer.Client
                                                           interactive=False)
```

class AFL.automation.sample.CastingServer.**Client**(*ip=None*, *port='5000'*, *username=None*,

Bases: object

Communicate with APIServer

This class provides an interface to generate HTTP REST requests that are sent to an APIServer, monitor the status of those requests, and retrieve the results of those requests. It is intended to be used as a client to the APIServer class.

```
__init__(ip=None, port='5000', username=None, interactive=False)
```

Methods

```
__init__([ip, port, username, interactive])
clear_history()
clear_queue()
```

continues on next page

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debug(state)	
<pre>deposit_obj(obj[, uid])</pre>	Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object under if not specified, a new uuid will be generated
driver_status()	1
enqueue([interactive])	
enqueued_base(**kwargs)	
<pre>from_server_name(server_name, **kwargs)</pre>	
<pre>get_config(name[, print_console, interactive])</pre>	
<pre>get_driver_object(name)</pre>	
<pre>get_object(name[, serialize])</pre>	
<pre>get_queue()</pre>	
<pre>get_queued_commands([inherit_commands])</pre>	
<pre>get_quickbar()</pre>	
<pre>get_server_time()</pre>	
<pre>get_unqueued_commands([inherit_commands])</pre>	
halt()	
logged_in()	
<pre>login(username[, populate_commands])</pre>	
<pre>move_item(uuid, pos)</pre>	
pause(state)	
query_driver(**kwargs)	
<pre>queue_state()</pre>	
remove_item(uuid)	
reset_queue_daemon()	
<pre>retrieve_obj(uid[, delete])</pre>	Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete the object after retrieving
<pre>server_cmd(cmd, **kwargs)</pre>	, c
	continues on next page

continues on next page

Table 58 – continued from previous page

```
set_config([interactive])
 set_driver_object(**kw)
 set_object([serialize])
 unqueued_base(**kwargs)
 wait([target_uuid, interval, for_history, ...])
__init__(ip=None, port='5000', username=None, interactive=False)
classmethod from_server_name(server_name, **kwargs)
logged_in()
login(username, populate_commands=True)
driver_status()
get_queue()
wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
get_quickbar()
server_cmd(cmd, **kwargs)
enqueued_base(**kwargs)
unqueued_base(**kwargs)
get_unqueued_commands(inherit_commands=True)
get_queued_commands(inherit_commands=True)
enqueue(interactive=None, **kwargs)
set_config(interactive=None, **kwargs)
get_config(name, print_console=True, interactive=None)
get_server_time()
query_driver(**kwargs)
reset_queue_daemon()
pause(state)
clear_queue()
clear_history()
debug(state)
```

```
halt()
     queue_state()
     remove_item(uuid)
     move_item(uuid, pos)
     set_driver_object(**kw)
     get_driver_object(name)
     deposit_obj(obj, uid=None)
          Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
          under if not specified, a new uuid will be generated
     retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
          the object after retrieving
     set_object(serialize=True, **kw)
     get_object(name, serialize=True)
AFL.automation.sample.CastingServer.Driver
```

```
class AFL.automation.sample.CastingServer.Driver(name, defaults=None, overrides=None)
     Bases: object
     __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
 deposit_obj(obj[, uid])
                                                    Store an object in the dropbox
 execute(**kwargs)
 gather_defaults()
                                                    Gather all inherited static class-level dictionaries
                                                    called default.
 get_config(name[, print_console])
 get_configs([print_console])
 get_object(name[, serialize])
 get_sample()
 post_execute(**kwargs)
                                                    Executed after each call to execute
 pre_execute(**kwargs)
                                                    Executed before each call to execute
 queued()
 quickbar()
 reset_sample()
 retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox
 set_config(**kwargs)
 set_data(data)
                                                    Set data in the DataPacket object
 set_object([serialized])
 set_sample(sample_name[, sample_uuid])
 status()
 unqueued()
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
```

```
set_sample(sample_name, sample_uuid=None, **kwargs)
     get_sample()
     reset_sample()
     status()
     pre_execute(**kwargs)
           Executed before each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     post_execute(**kwargs)
           Executed after each call to execute
           All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
           by subclasses.
     execute(**kwargs)
     set_object(serialized=True, **kw)
     get_object(name, serialize=True)
     set_data(data: dict)
           Set data in the DataPacket object
               Parameters
                   • data (dict) – Dictionary of data to store in the driver object
                   • variables (Note! if the keys in data are not system or sample)
           :param : :param they will be erased at the end of this function call.:
     retrieve_obj(uid, delete=True)
           Retrieve an object from the dropbox
               Parameters
                   uid (str) – The uuid of the file to retrieve
     deposit_obj(obj, uid=None)
           Store an object in the dropbox
               Parameters
                   • obj (object) – The object to store in the dropbox
                   • uid (str) – The uuid to store the object under
AFL.automation.sample.CastingServer.OT2Client
class AFL.automation.sample.CastingServer.0T2Client(ip=None, port='5000', username=None,
                                                               interactive=False)
     Bases: Client
     Communicate with AFL-automation server on OT-2
     This class maps pipettor functions to HTTP REST requests that are sent to the AFL-automation server
     __init__(ip=None, port='5000', username=None, interactive=False)
```

Methods

```
__init__([ip, port, username, interactive])
aspirate_rate(rate)
clear_history()
clear_queue()
debug(state)
deposit_obj(obj[, uid])
                                                  Deposit an object in the dropbox obj: object, the ob-
                                                  ject to deposit id: str, the uuid to deposit the object
                                                  under if not specified, a new uuid will be generated
dispense_rate(rate)
driver_status()
enqueue([interactive])
enqueued_base(**kwargs)
from_server_name(server_name, **kwargs)
get_config(name[, print_console, interactive])
get_driver_object(name)
get_object(name[, serialize])
get_queue()
get_queued_commands([inherit_commands])
get_quickbar()
get_server_time()
get_unqueued_commands([inherit_commands])
halt()
home()
load_instrument(name, mount, tip_rack_slots)
load_labware(name, slot)
logged_in()
login(username[, populate_commands])
```

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```
move_item(uuid, pos)
pause(state)
query_driver(**kwargs)
queue_state()
remove_item(uuid)
reset_queue_daemon()
reset_tipracks([mount])
retrieve_obj(uid[, delete])
                                                    Retrieve an object from the dropbox id: str, the uuid
                                                    of the object to retrieve delete: bool, if True, delete
                                                    the object after retrieving
server_cmd(cmd, **kwargs)
set_config([interactive])
set_driver_object(**kw)
set_object([serialize])
                                                    Transfer fluid from one location to another
transfer(source, dest, volume[, interactive])
unqueued_base(**kwargs)
wait([target_uuid, interval, for_history, ...])
```

transfer(source, dest, volume, interactive=None, **kwargs)

Transfer fluid from one location to another

Parameters

- source (str or list of str Source wells to transfer from. Wells should be specified as three) character strings with the first character being the slot number.
- **dest**(*str* or *list* of *str*) Destination wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **volume** (*float*) volume of fluid to transfer in microliters

```
reset_tipracks(mount='both')
load_labware(name, slot)
load_instrument(name, mount, tip_rack_slots)
aspirate_rate(rate)
dispense_rate(rate)
```

```
home()
__init__(ip=None, port='5000', username=None, interactive=False)
clear_history()
clear_queue()
debug(state)
deposit_obj(obj, uid=None)
    Deposit an object in the dropbox obj: object, the object to deposit id: str, the uuid to deposit the object
    under if not specified, a new uuid will be generated
driver_status()
enqueue(interactive=None, **kwargs)
enqueued_base(**kwargs)
classmethod from_server_name(server_name, **kwargs)
get_config(name, print_console=True, interactive=None)
get_driver_object(name)
get_object(name, serialize=True)
get_queue()
get_queued_commands(inherit_commands=True)
get_quickbar()
get_server_time()
get_unqueued_commands(inherit_commands=True)
halt()
logged_in()
login(username, populate_commands=True)
move_item(uuid, pos)
pause(state)
query_driver(**kwargs)
queue_state()
remove_item(uuid)
reset_queue_daemon()
retrieve_obj(uid, delete=True)
    Retrieve an object from the dropbox id: str, the uuid of the object to retrieve delete: bool, if True, delete
```

the object after retrieving

```
server_cmd(cmd, **kwargs)
     set_config(interactive=None, **kwargs)
     set_driver_object(**kw)
     set_object(serialize=True, **kw)
     unqueued_base(**kwargs)
     wait(target_uuid=None, interval=0.1, for_history=True, first_check_delay=5.0)
class AFL.automation.sample.CastingServer.CastingServer(prep_url, overrides=None)
     defaults = {'manifest': '/home/af1642/', 'manifest_cast': '/home/af1642/',
     'manifest_prep': '/home/afl642/'}
     __init__(prep_url, overrides=None)
     init_casting_manifest(attrs=None, overwrite=False)
     status()
     update_status(value)
     log_event(manifest_key, event, write=True)
     assign_targets(protocols, target_map)
     prepare_casting_stocks(**spec)
          Spec should contain sample_name and a protocol
     bulk_cast_films(**spec)
         Spec should contain sample_name and a protocol
     prepare_and_cast(**sample)
```

AFL.automation.sample env

Modules

TemperatureDeck

AFL.automation.sample_env.TemperatureDeck

Classes

```
Driver(name[, defaults, overrides])
TemperatureDeck([overrides])
```

AFL.automation.sample_env.TemperatureDeck.Driver

```
class AFL.automation.sample_env.TemperatureDeck.Driver(name, defaults=None, overrides=None)
    Bases: object
    __init__(name, defaults=None, overrides=None)
```

Methods

```
__init__(name[, defaults, overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
                                                   Gather all inherited static class-level dictionaries
gather_defaults()
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
                                                   Executed after each call to execute
post_execute(**kwargs)
pre_execute(**kwargs)
                                                   Executed before each call to execute
queued()
quickbar()
reset_sample()
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox
set_config(**kwargs)
set_data(data)
                                                   Set data in the DataPacket object
set_object([serialized])
set_sample(sample_name[, sample_uuid])
status()
unqueued()
```

```
unqueued()
queued()
quickbar()
__init__(name, defaults=None, overrides=None)
```

```
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
set_config(**kwargs)
get_config(name, print_console=False)
get_configs(print_console=False)
set_sample(sample_name, sample_uuid=None, **kwargs)
get_sample()
reset_sample()
status()
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
execute(**kwargs)
set_object(serialized=True, **kw)
get_object(name, serialize=True)
set_data(data: dict)
     Set data in the DataPacket object
         Parameters
              • data (dict) – Dictionary of data to store in the driver object
              • variables (Note! if the keys in data are not system or sample)
     :param : :param they will be erased at the end of this function call.:
retrieve_obj(uid, delete=True)
     Retrieve an object from the dropbox
         Parameters
             uid (str) – The uuid of the file to retrieve
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
              • obj (object) – The object to store in the dropbox
              • uid (str) – The uuid to store the object under
```

AFL.automation.sample_env.TemperatureDeck.TemperatureDeck

```
class AFL.automation.sample_env.TemperatureDeck.TemperatureDeck(overrides=None)
    Bases: Driver
    __init__(overrides=None)
```

Methods

```
__init__([overrides])
deposit_obj(obj[, uid])
                                                   Store an object in the dropbox
execute(**kwargs)
gather_defaults()
                                                   Gather all inherited static class-level dictionaries
                                                   called default.
get_config(name[, print_console])
get_configs([print_console])
get_object(name[, serialize])
get_sample()
move_temp(temperature[, wait, tolerance])
post_execute(**kwargs)
                                                   Executed after each call to execute
pre_execute(**kwargs)
                                                   Executed before each call to execute
queued()
quickbar()
read_temp()
reset_sample()
retrieve_obj(uid[, delete])
                                                   Retrieve an object from the dropbox
set_config(**kwargs)
                                                   Set data in the DataPacket object
set_data(data)
set_object([serialized])
set_sample(sample_name[, sample_uuid])
set_temp(sp)
status()
unqueued()
```

Attributes

quickbar()

reset_sample()

```
defaults
defaults = {'serial_port': '/dev/ttyACMO', 'temperature_move_sleep': 0.2,
'temperature_move_timeout':
__init__(overrides=None)
set_temp(sp)
move_temp(temperature, wait=30, tolerance=0.1)
status()
read_temp()
deposit_obj(obj, uid=None)
     Store an object in the dropbox
         Parameters
             • obj (object) – The object to store in the dropbox
             • uid (str) – The uuid to store the object under
execute(**kwargs)
classmethod gather_defaults()
     Gather all inherited static class-level dictionaries called default.
get_config(name, print_console=False)
get_configs(print_console=False)
get_object(name, serialize=True)
get_sample()
post_execute(**kwargs)
     Executed after each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
pre_execute(**kwargs)
     Executed before each call to execute
     All of the kwargs passed to execute are also pass to this method. It is expected that this method be overridden
     by subclasses.
queued()
```

```
retrieve_obj(uid, delete=True)
          Retrieve an object from the dropbox
              Parameters
                 uid (str) – The uuid of the file to retrieve
     set_config(**kwargs)
     set_data(data: dict)
          Set data in the DataPacket object
              Parameters
                  • data (dict) – Dictionary of data to store in the driver object
                  • variables (Note! if the keys in data are not system or sample)
          :param : :param they will be erased at the end of this function call.:
     set_object(serialized=True, **kw)
     set_sample(sample_name, sample_uuid=None, **kwargs)
     unqueued()
class AFL.automation.sample_env.TemperatureDeck.TemperatureDeck(overrides=None)
     defaults = {'serial_port': '/dev/ttyACMO', 'temperature_move_sleep': 0.2,
     'temperature_move_timeout': 900}
     __init__(overrides=None)
     set_temp(sp)
     move_temp(temperature, wait=30, tolerance=0.1)
     status()
     read_temp()
```

6.2.6 Shared

The Shared module provides common utilities and functionality used across the AFL-automation framework.

AFL.automation.shared

AFL.automation.shared

Modules

DataLabelerWidget

DatasetWidget

DiffractionLabeler

MutableQueue

PersistentConfig

ServerDiscovery

exceptions

serialization

units

utilities

widgetui

AFL.automation.shared.DataLabelerWidget

Functions

sqrt(x, l) Return the square root of x.

AFL.automation.shared.DataLabelerWidget.sqrt

AFL.automation.shared.DataLabelerWidget. $\mathbf{sqrt}(x,/)$ Return the square root of x.

Classes

```
DataLabelerWodel(dataset)

DataLabelerView()

DataLabelerWidget(input_dataset, ...[, ...])

OrdinalEncoder(*[, categories, dtype, ...])

Encode categorical features as an integer array.
```

AFL.automation.shared.DataLabelerWidget.DataLabelerModel

```
class AFL.automation.shared.DataLabelerWidget.DataLabelerModel(dataset: Dataset)
    Bases: object
    __init__(dataset: Dataset)
```

Methods

```
__init__(dataset)

get_peaks(model[, qstar, max_order])

init_models()

ordinal_phase_labels()

__init__(dataset: Dataset)

ordinal_phase_labels()

init_models()
```

AFL.automation.shared.DataLabelerWidget.DataLabelerView

get_peaks(model, qstar=None, max_order=4)

Methods

```
__init__()

add_vertical_line(x[, y0, y1, row, col, line_kw])

remove_vertical_lines()

run(x, y, all_compositions, composition, ...)

update_composition_colors(colors)

update_plot(x, y, composition)
```

```
remove_vertical_lines()
add_vertical_line(x, y0=0, y1=128, row=1, col=1, line_kw=None)
update_composition_colors(colors)
run(x, y, all_compositions, composition, models, ternary, components)
```

AFL.automation.shared.DataLabelerWidget.DataLabelerWidget

Bases: object

__init__(input_dataset: Dataset, sas_variable: str, composition_variable: str | List[str], sample_dim: str = 'sample', fit_variable: str | None = None)

Parameters

- **dataset** (xr.Dataset) Dataset from AFL
- **sas_variable** (*str*) Name of data variable in the *xarray.Dataset* that holds the scattering data
- **composition_variable** (*str | List[str]*) Name of data variable in the *xar-ray.Dataset* that holds the composition. If the composition is split across multiple variables, pass in a list of variables.
- **sample_dim** (*str*) The name of the *xarray* dimension corresponding to each sample or measurement. This is typically named 'sample' in much of the AFL agent codebase.
- **fit_variable** (*Optional[str]*) If not none, this data will be plotted along with the sas_variable data. This data variable should have the same shape as sas_variable.

Methods

```
__init__(input_dataset, sas_variable, ...[, ...])

change_model_callback(data)

change_norder_callback(data)

change_qstar_callback(figure, location, click)

composition_click_callback(figure, location, ...)

draw_peaks(peaks)

goto_callback(click)

label(label)

next_button_callback(click)

prev_button_callback(click)

run()

update_plot()
```

__init__(input_dataset: Dataset, sas_variable: str, composition_variable: str | List[str], sample_dim: str = 'sample', fit_variable: str | None = None')

Parameters

- **dataset** (*xr.Dataset*) Dataset from AFL
- **sas_variable** (*str*) Name of data variable in the *xarray.Dataset* that holds the scattering data
- **composition_variable** (str | List[str]) Name of data variable in the *xar-ray.Dataset* that holds the composition. If the composition is split across multiple variables, pass in a list of variables.
- **sample_dim** (*str*) The name of the *xarray* dimension corresponding to each sample or measurement. This is typically named 'sample' in much of the AFL agent codebase.
- **fit_variable** (*Optional[str]*) If not none, this data will be plotted along with the sas_variable data. This data variable should have the same shape as sas_variable.

```
next_button_callback(click)
prev_button_callback(click)
goto_callback(click)
composition_click_callback(figure, location, click)
update_plot()
```

```
draw_peaks(peaks)
change_qstar_callback(figure, location, click)
change_model_callback(data)
change_norder_callback(data)
label(label)
run()
```

AFL.automation.shared.DataLabelerWidget.OrdinalEncoder

Bases: OneToOneFeatureMixin, _BaseEncoder

Encode categorical features as an integer array.

The input to this transformer should be an array-like of integers or strings, denoting the values taken on by categorical (discrete) features. The features are converted to ordinal integers. This results in a single column of integers (0 to n_categories - 1) per feature.

Read more in the User Guide. For a comparison of different encoders, refer to: sphx_glr_auto_examples_preprocessing_plot_target_encoder.py.

Added in version 0.20.

Parameters

- categories ('auto' or a list of array-like, default='auto') Categories (unique values) per feature:
 - 'auto': Determine categories automatically from the training data.
 - list: categories[i] holds the categories expected in the ith column. The passed categories should not mix strings and numeric values, and should be sorted in case of numeric values.

The used categories can be found in the categories_ attribute.

- **dtype** (number type, default=np.float64) Desired dtype of output.
- handle_unknown ({'error', 'use_encoded_value'}, default='error') When set to 'error' an error will be raised in case an unknown categorical feature is present during transform. When set to 'use_encoded_value', the encoded value of unknown categories will be set to the value given for the parameter unknown_value. In inverse_transform(), an unknown category will be denoted as None.

Added in version 0.24.

• unknown_value (int or np.nan, default=None) — When the parameter handle_unknown is set to 'use_encoded_value', this parameter is required and will set the encoded value of unknown categories. It has to be distinct from the values used to encode any of the categories in fit. If set to np.nan, the dtype parameter must be a float dtype.

Added in version 0.24.

• **encoded_missing_value** (*int or np.nan*, *default=np.nan*) – Encoded value of missing categories. If set to *np.nan*, then the *dtype* parameter must be a float dtype.

Added in version 1.1.

- min_frequency (int or float, default=None) Specifies the minimum frequency below which a category will be considered infrequent.
 - If *int*, categories with a smaller cardinality will be considered infrequent.
 - If float, categories with a smaller cardinality than min_frequency * n_samples will be considered infrequent.

Added in version 1.3: Read more in the User Guide.

max_categories (int, default=None) – Specifies an upper limit to the number of output categories for each input feature when considering infrequent categories. If there are infrequent categories, max_categories includes the category representing the infrequent categories along with the frequent categories. If None, there is no limit to the number of output features.

 $max_categories$ do **not** take into account missing or unknown categories. Setting $un-known_value$ or $encoded_missing_value$ to an integer will increase the number of unique integer codes by one each. This can result in up to $max_categories + 2$ integer codes.

Added in version 1.3: Read more in the User Guide.

categories_

The categories of each feature determined during fit (in order of the features in X and corresponding with the output of transform). This does not include categories that weren't seen during fit.

Type

list of arrays

n_features_in_

Number of features seen during fit.

Added in version 1.0.

Type

int

feature_names_in_

Names of features seen during fit. Defined only when X has feature names that are all strings.

Added in version 1.0.

Type

ndarray of shape (n_features_in_,)

infrequent_categories_

Defined only if infrequent categories are enabled by setting $min_frequency$ or $max_categories$ to a non-default value. $infrequent_categories_[i]$ are the infrequent categories for feature i. If the feature i has no infrequent categories $infrequent_categories_[i]$ is None.

Added in version 1.3.

Type

list of ndarray

→ See also

OneHotEncoder

Performs a one-hot encoding of categorical features. This encoding is suitable for low to medium cardinality categorical variables, both in supervised and unsupervised settings.

TargetEncoder

Encodes categorical features using supervised signal in a classification or regression pipeline. This encoding is typically suitable for high cardinality categorical variables.

LabelEncoder

Encodes target labels with values between 0 and n_classes-1.

Notes

With a high proportion of *nan* values, inferring categories becomes slow with Python versions before 3.10. The handling of *nan* values was improved from Python 3.10 onwards, (c.f. bpo-43475).

Examples

Given a dataset with two features, we let the encoder find the unique values per feature and transform the data to an ordinal encoding.

By default, OrdinalEncoder is lenient towards missing values by propagating them.

You can use the parameter *encoded_missing_value* to encode missing values.

Infrequent categories are enabled by setting *max_categories* or *min_frequency*. In the following example, "a" and "d" are considered infrequent and grouped together into a single category, "b" and "c" are their own categories, unknown values are encoded as 3 and missing values are encoded as 4.

```
>>> X_train = np.array(
        [["a"] * 5 + ["b"] * 20 + ["c"] * 10 + ["d"] * 3 + [np.nan]],
        dtype=object).T
>>> enc = OrdinalEncoder(
        handle_unknown="use_encoded_value", unknown_value=3,
        max_categories=3, encoded_missing_value=4)
. . .
>>> _ = enc.fit(X_train)
>>> X_test = np.array([["a"], ["b"], ["c"], ["d"], ["e"], [np.nan]], dtype=object)
>>> enc.transform(X_test)
array([[2.],
       [0.],
       [1.],
       [2.],
       [3.],
       [4.]])
```

__init__(*, categories='auto', dtype=<class 'numpy.float64'>, handle_unknown='error', unknown_value=None, encoded_missing_value=nan, min_frequency=None, max_categories=None)

Methods

init(*[, categories, dtype,])	
fit(X[,y])	Fit the OrdinalEncoder to X.
$fit_transform(X[,y])$	Fit to data, then transform it.
<pre>get_feature_names_out([input_features])</pre>	Get output feature names for transformation.
<pre>get_metadata_routing()</pre>	Get metadata routing of this object.
<pre>get_params([deep])</pre>	Get parameters for this estimator.
inverse_transform(X)	Convert the data back to the original representation.
<pre>set_output(*[, transform])</pre>	Set output container.
set_params(**params)	Set the parameters of this estimator.
transform(X)	Transform X to ordinal codes.

Attributes

```
infrequent_categories_ Infrequent categories for each feature.
```

```
__init__(*, categories='auto', dtype=<class 'numpy.float64'>, handle_unknown='error', unknown_value=None, encoded_missing_value=nan, min_frequency=None, max_categories=None)
```

```
fit(X, y=None)
```

Fit the OrdinalEncoder to X.

Parameters

• **X** (array-like of shape (n_samples, n_features)) — The data to determine the categories of each feature.

• y (None) – Ignored. This parameter exists only for compatibility with Pipeline.

Returns

self - Fitted encoder.

Return type

object

transform(X)

Transform X to ordinal codes.

Parameters

X(array-like of shape (n_samples, n_features)) − The data to encode.

Returns

X_out – Transformed input.

Return type

ndarray of shape (n_samples, n_features)

inverse_transform(X)

Convert the data back to the original representation.

Parameters

 \mathbf{X} (array-like of shape (n_samples, n_encoded_features)) — The transformed data.

Returns

X_tr – Inverse transformed array.

Return type

ndarray of shape (n_samples, n_features)

fit_transform(X, y=None, **fit_params)

Fit to data, then transform it.

Fits transformer to X and y with optional parameters fit_params and returns a transformed version of X.

Parameters

- **X**(array-like of shape (n_samples, n_features)) Input samples.
- y (array-like of shape (n_samples,) or (n_samples, n_outputs), default=None) Target values (None for unsupervised transformations).
- ****fit_params** (*dict*) Additional fit parameters.

Returns

X_new – Transformed array.

Return type

ndarray array of shape (n_samples, n_features_new)

get_feature_names_out(input_features=None)

Get output feature names for transformation.

Parameters

input_features (array-like of str or None, default=None) - Input features.

• If *input_features* is *None*, then *feature_names_in_* is used as feature names in. If *feature_names_in_* is not defined, then the following input feature names are generated: ["x0", "x1", ..., "x(n_features_in_ - 1)"].

• If *input_features* is an array-like, then *input_features* must match *feature_names_in_* if *feature_names_in_* is defined.

Returns

feature_names_out – Same as input features.

Return type

ndarray of str objects

get_metadata_routing()

Get metadata routing of this object.

Please check User Guide on how the routing mechanism works.

Returns

routing – A MetadataRequest encapsulating routing information.

Return type

MetadataRequest

get_params(deep=True)

Get parameters for this estimator.

Parameters

deep (*bool*, *default=True*) – If True, will return the parameters for this estimator and contained subobjects that are estimators.

Daturna

params – Parameter names mapped to their values.

Return type

dict

property infrequent_categories_

Infrequent categories for each feature.

```
set_output(*, transform=None)
```

Set output container.

See sphx_glr_auto_examples_miscellaneous_plot_set_output.py for an example on how to use the API.

Parameters

transform ({"default", "pandas", "polars"}, default=None) - Configure output of transform and $fit_transform$.

- "default": Default output format of a transformer
- "pandas": DataFrame output
- "polars": Polars output
- None: Transform configuration is unchanged

Added in version 1.4: "polars" option was added.

Returns

self – Estimator instance.

Return type

estimator instance

```
set_params(**params)
```

Set the parameters of this estimator.

The method works on simple estimators as well as on nested objects (such as Pipeline). The latter have parameters of the form <component>__<parameter> so that it's possible to update each component of a nested object.

Parameters

```
**params (dict) – Estimator parameters.
```

Returns

self – Estimator instance.

Return type

estimator instance

```
class AFL.automation.shared.DataLabelerWidget.DataLabelerWidget(input_dataset: Dataset,
```

```
sas_variable: str,

composition_variable: str |

List[str], sample_dim: str =

'sample', fit_variable: str | None

= None)
```

__init__(input_dataset: Dataset, sas_variable: str, composition_variable: str | List[str], sample_dim: str = 'sample', fit_variable: str | None = None)

Parameters

- **dataset** (xr.Dataset) Dataset from AFL
- **sas_variable** (*str*) Name of data variable in the *xarray.Dataset* that holds the scattering data
- **composition_variable** (*str | List[str]*) Name of data variable in the *xar-ray.Dataset* that holds the composition. If the composition is split across multiple variables, pass in a list of variables.
- **sample_dim** (*str*) The name of the *xarray* dimension corresponding to each sample or measurement. This is typically named 'sample' in much of the AFL agent codebase.
- **fit_variable** (*Optional[str]*) If not none, this data will be plotted along with the sas_variable data. This data variable should have the same shape as sas_variable.

```
next_button_callback(click)
prev_button_callback(click)
goto_callback(click)
composition_click_callback(figure, location, click)
update_plot()
draw_peaks(peaks)
change_qstar_callback(figure, location, click)
change_model_callback(data)
change_norder_callback(data)
```

```
label(label)
rum()

class AFL.automation.shared.DataLabelerWidget.DataLabelerModel(dataset: Dataset)
    __init__(dataset: Dataset)
    ordinal_phase_labels()
    init_models()
    get_peaks(model, qstar=None, max_order=4)

class AFL.automation.shared.DataLabelerWidget.DataLabelerView
    __init__()
    update_plot(x, y, composition)
    remove_vertical_lines()
    add_vertical_line(x, y0=0, y1=128, row=1, col=1, line_kw=None)
    update_composition_colors(colors)
    run(x, y, all_compositions, composition, models, ternary, components)
```

AFL.automation.shared.DatasetWidget

Classes

722

AFL.automation.shared.DatasetWidget.DatasetWidget

- **dataset** (xr.Dataset) xarray.Dataset containing scattering data and compositions to be plotted.
- **sample_dim**(*str*) The name of the *xarray* dimension corresponding to sample variation, typically "sample"
- **comps_variable** (*Optional[str]*) The name of the *xarray* variable to plot as compositional data. Optional, if not specified, can be customized in the GUI.

Only the first two columns of the data will be used in the plot. If the compositions are in separate `xarray.DataArray`s, they should be grouped into single `xarray.DataArray`s like so:

```
`python ds['comps'] = ds[['A','B','C']].to_array('component').
transpose(...,'component') `
```

- **comps_color_variable** (*Optional[str]*) The name of the *xarray* variable to use as the colorscale of the compositional data scatter plot. Optional, if not specified, can be customized in the GUI.
- **xmin** (*float*) Set the default q-range of the scattering data. Can be customized in the GUI
- xmax (float) Set the default q-range of the scattering data. Can be customized in the GUI
- Usage
- ----
- ```python -
- DatasetWidget(ds) (widget =)
- widget.run()
- ``` –

Methods

```
__init__(dataset[, sample_dim, ...])
                                                Interactive widget for viewing compositionally vary-
                                                ing scattering data
apply_isel(*args)
apply_sel(*args)
combine_vars(*args)
composition_click_callback(figure, location,
...)
extract_var(*args)
get_comps()
goto_callback(*args)
initialize_plots(*args)
next_button_callback(*args)
prev_button_callback(*args)
reset_dataset(*args)
run()
update_colors(*args)
update_composition_plot()
update_dropdowns(*args)
update_extract_coords(change)
update_plots()
update_sample_dim(*args)
update_scattering_plot()
```

```
__init__(dataset: Dataset, sample_dim: str = 'sample', scatt_variables: List[str] | None = None, comps_variable: str | None = None, comps_color_variable: str | None = None, xmin: float = 0.001, xmax: float = 1.0)
```

Interactive widget for viewing compositionally varying scattering data

Parameters

- **dataset** (*xr.Dataset*) *xarray.Dataset* containing scattering data and compositions to be plotted.
- sample_dim(str) The name of the xarray dimension corresponding to sample variation,

```
typically "sample"
```

• comps_variable (Optional[str]) - The name of the xarray variable to plot as compositional data. Optional, if not specified, can be customized in the GUI.

Only the first two columns of the data will be used in the plot. If the compositions are in separate `xarray.DataArray`s, they should be grouped into single `xarray.DataArray`s like so:

```
`python ds['comps'] = ds[['A','B','C']].to_array('component').
transpose(...,'component')
```

- comps_color_variable (Optional[str]) The name of the xarray variable to use as the colorscale of the compositional data scatter plot. Optional, if not specified, can be customized in the GUI.
- **xmin** (*float*) Set the default q-range of the scattering data. Can be customized in the
- xmax (float) Set the default q-range of the scattering data. Can be customized in the **GUI**
- Usage
- ```python -
- DatasetWidget(ds) (widget =)
- widget.run()
- ``` _

```
next_button_callback(*args)
prev_button_callback(*args)
goto_callback(*args)
composition_click_callback(figure, location, click)
update_composition_plot()
update_scattering_plot()
update_plots()
get_comps()
initialize_plots(*args)
update_colors(*args)
apply_sel(*args)
apply_isel(*args)
extract_var(*args)
combine_vars(*args)
reset_dataset(*args)
```

```
update_dropdowns(*args)
update_sample_dim(*args)
update_extract_coords(change)
run()
```

AFL.automation.shared.DatasetWidget_DatasetWidget_Model

```
class AFL.automation.shared.DatasetWidget.DatasetWidget_Model(dataset: Dataset, sample_dim: str)
    Bases: object
    __init__(dataset: Dataset, sample_dim: str)
```

Methods

```
__init__(dataset, sample_dim)

apply_isel(kw)

apply_sel(kw)

combine_vars(combined_var, to_combine_vars)

extract_var(extract_from_var, ex-
tract_from_coord)

get_composition(variable)

get_non_sample_dims(var)

get_scattering(variable, index)

reset_dataset()

split_vars()

Heuristically try to split vars into categories
```

Attributes

```
__init__(dataset: Dataset, sample_dim: str)

property dataset

reset_dataset()

split_vars()

Heuristically try to split vars into categories

get_non_sample_dims(var: str)
```

```
apply_sel(kw)
apply_isel(kw)
combine_vars(combined_var: str, to_combine_vars: List[str])
extract_var(extract_from_var: str, extract_from_coord: str)
get_composition(variable)
get_scattering(variable, index)
```

AFL.automation.shared.DatasetWidget.DatasetWidget View

```
class AFL.automation.shared.DatasetWidget.DatasetWidget_View(initial_scatt_variables: List[str] |
                                                                         None = None,
                                                                         initial_comps_variable: str | None =
                                                                         None, initial_comps_color_variable:
                                                                         str \mid None = None)
     Bases: object
```

__init__(initial_scatt_variables: List[str] | None = None, initial_comps_variable: str | None = None, initial_comps_color_variable: str | None = None)

Methods

```
__init__([initial_scatt_variables, ...])
init_buttons()
init_checkboxes()
init_dropdowns()
init_inputs()
init_plots()
plot_comp(x, y[, z, xname, yname, zname, colors])
plot_sas(x, y[, name, append])
run()
update_colorscale([colors])
update_dropdowns([sample_vars, scatt_vars, ...])
update_selected(**kw)
```

__init__(initial_scatt_variables: List[str] | None = None, initial_comps_variable: str | None = None, initial_comps_color_variable: str | None = None)

```
update_colorscale(colors=None)
update_selected(**kw)

update_dropdowns(sample_vars=None, scatt_vars=None, comp_vars=None)
plot_sas(x, y, name='SAS', append=False)
plot_comp(x, y, z=None, xname='x', yname='y', zname='z', colors=None)
init_plots()
init_buttons()
init_checkboxes()
init_dropdowns()
init_inputs()
run()
```

AFL.automation.shared.DatasetWidget.defaultdict

class AFL.automation.shared.DatasetWidget.defaultdict

```
Bases: dict
```

defaultdict(default_factory=None, /, [...]) -> dict with default factory

The default factory is called without arguments to produce a new value when a key is not present, in __getitem__ only. A defaultdict compares equal to a dict with the same items. All remaining arguments are treated the same as if they were passed to the dict constructor, including keyword arguments.

```
__init__(*args, **kwargs)
```

Methods

init(*args, **kwargs)	
clear()	
copy()	
<pre>fromkeys([value])</pre>	Create a new dictionary with keys from iterable and values set to value.
<pre>get(key[, default])</pre>	Return the value for key if key is in the dictionary, else default.
<pre>items()</pre>	
keys()	
<i>pop</i> (k[,d])	If the key is not found, return the default if given; otherwise, raise a KeyError.
<pre>popitem()</pre>	Remove and return a (key, value) pair as a 2-tuple.
<pre>setdefault(key[, default])</pre>	Insert key with a value of default if key is not in the dictionary.
update([E,]**F)	If E is present and has a .keys() method, then does: for k in E: $D[k] = E[k]$ If E is present and lacks a .keys() method, then does: for k, v in E: $D[k] = v$ In either case, this is followed by: for k in F: $D[k] = F[k]$
values()	

Attributes

default_factory	Factory for default value called bymissing().
ini. (*	
init(*args, **kwargs)	
$\textbf{clear()} \rightarrow None. \ Remove \ all \ items \ from \ D.$	
$copy() \rightarrow a$ shallow copy of D.	
default_factory	
Factory for default value called bymissing().	
<pre>fromkeys(value=None,/)</pre>	
Create a new dictionary with keys from iterable at	nd values set to value.
<pre>get(key, default=None, /)</pre>	
Return the value for key if key is in the dictionary.	else default.
$items() \rightarrow a$ set-like object providing a view on D's it	ems
$\mathbf{keys}() \to a$ set-like object providing a view on D's key	VS
$pop(k[,d]) \rightarrow v$, remove specified key and return the If the key is not found, return the default if given;	

```
popitem()
```

Remove and return a (key, value) pair as a 2-tuple.

Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.

```
setdefault(key, default=None, /)
```

Insert key with a value of default if key is not in the dictionary.

Return the value for key if key is in the dictionary, else default.

```
update([E, ]^{**F}) \rightarrow None. Update D from dict/iterable E and F.
```

If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys() method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]

values() \rightarrow an object providing a view on D's values

```
__init__(dataset: Dataset, sample_dim: str = 'sample', scatt_variables: List[str] | None = None, comps_variable: str | None = None, comps_color_variable: str | None = None, xmin: float = 0.001, xmax: float = 1.0)
```

Interactive widget for viewing compositionally varying scattering data

Parameters

• **dataset** (*xr.Dataset*) – *xarray.Dataset* containing scattering data and compositions to be plotted.

xmin: float = 0.001, xmax: float = 1.0)

- **sample_dim**(*str*) The name of the *xarray* dimension corresponding to sample variation, typically "sample"
- **comps_variable** (*Optional[str]*) The name of the *xarray* variable to plot as compositional data. Optional, if not specified, can be customized in the GUI.

Only the first two columns of the data will be used in the plot. If the compositions are in separate `xarray.DataArray`s, they should be grouped into single `xarray.DataArray`s like so:

```
`python ds['comps'] = ds[['A','B','C']].to_array('component').
transpose(...,'component') `
```

- **comps_color_variable** (*Optional[str]*) The name of the *xarray* variable to use as the colorscale of the compositional data scatter plot. Optional, if not specified, can be customized in the GUI.
- xmin (float) Set the default q-range of the scattering data. Can be customized in the GUI
- xmax (float) Set the default q-range of the scattering data. Can be customized in the GUI
- Usage
- ----
- ```python -
- DatasetWidget(ds) (widget =)

```
widget.run()
     next_button_callback(*args)
     prev_button_callback(*args)
     goto_callback(*args)
     composition_click_callback(figure, location, click)
     update_composition_plot()
     update_scattering_plot()
     update_plots()
     get_comps()
     initialize_plots(*args)
     update_colors(*args)
     apply_sel(*args)
     apply_isel(*args)
     extract_var(*args)
     combine_vars(*args)
     reset_dataset(*args)
     update_dropdowns(*args)
     update_sample_dim(*args)
     update_extract_coords(change)
     run()
class AFL.automation.shared.DatasetWidget.DatasetWidget_Model(dataset: Dataset, sample_dim: str)
     __init__(dataset: Dataset, sample_dim: str)
     property dataset
     reset_dataset()
     split_vars()
         Heuristically try to split vars into categories
     get_non_sample_dims(var: str)
     apply_sel(kw)
     apply_isel(kw)
     combine_vars(combined_var: str, to_combine_vars: List[str])
```

```
extract_var(extract_from_var: str, extract_from_coord: str)
     get_composition(variable)
     get_scattering(variable, index)
class AFL.automation.shared.DatasetWidget.DatasetWidget_View(initial_scatt_variables: List[str] |
                                                                       None = None,
                                                                       initial_comps_variable: str | None =
                                                                       None, initial_comps_color_variable:
                                                                       str \mid None = None)
     __init__(initial_scatt_variables: List[str] | None = None, initial_comps_variable: str | None = None,
               initial_comps_color_variable: str | None = None)
     update_colorscale(colors=None)
     update_selected(**kw)
     update_dropdowns(sample_vars=None, scatt_vars=None, comp_vars=None)
     plot_sas(x, y, name='SAS', append=False)
     plot\_comp(x, y, z=None, xname='x', yname='y', zname='z', colors=None)
     init_plots()
     init_buttons()
     init_checkboxes()
     init_dropdowns()
     init_inputs()
     run()
```

AFL.automation.shared.DiffractionLabeler

Functions

sqrt(x, l) Return the square root of x.

AFL.automation.shared.DiffractionLabeler.sqrt

AFL.automation.shared.DiffractionLabeler.sqrt(x,/)Return the square root of x.

Classes

```
DiffractionLabeler(saxs_data, ...)

DiffractionLabelerModel(saxs_data, ...)

DiffractionLabelerView()

OrdinalEncoder(*[, categories, dtype, ...])

Encode categorical features as an integer array.
```

AFL.automation.shared.DiffractionLabeler.DiffractionLabeler

```
Bases: object
__init__(saxs_data, composition_data, possible_phase_labels)
```

Methods

```
__init__(saxs_data, composition_data, ...)

change_model_callback(data)

change_norder_callback(figure, location, click)

draw_peaks(peaks)

goto_callback(click)

label(label)

next_button_callback(click)

run()

ternary_click_callback(figure, location, click)

update_plot()

__init__(saxs_data, composition_data, possible_phase_labels)

next_button_callback(click)
```

```
__init__(saxs_data, composition_data, possible_phase_labels)

next_button_callback(click)

prev_button_callback(click)

goto_callback(click)

ternary_click_callback(figure, location, click)

update_plot()

draw_peaks(peaks)

change_qstar_callback(figure, location, click)

change_model_callback(data)

change_norder_callback(data)
```

```
label(label)
run()
```

AFL.automation.shared.DiffractionLabeler.DiffractionLabelerModel

 ${\bf class} \ \, {\tt AFL.automation.shared.DiffractionLabeler.DiffractionLabelerModel} (saxs_data, \\ composition_data, \\ possible_phase_labels)$

```
Bases: object __init__(saxs_data, composition_data, possible_phase_labels)
```

Methods

```
__init__(saxs_data, composition_data, ...)

get_peaks(model[, qstar, max_order])

init_models()

ordinal_phase_labels()

__init__(saxs_data, composition_data, possible_phase_labels)

ordinal_phase_labels()
```

```
ordinal_phase_labels()
init_models()
```

get_peaks(model, qstar=None, max_order=4)

AFL.automation.shared.DiffractionLabeler.DiffractionLabelerView

class AFL.automation.shared.DiffractionLabeler.DiffractionLabelerView
 Bases: object

__init__()

Methods

```
__init__()
add_vertical_line(x[, y0, y1, row, col, line_kw])

remove_vertical_lines()

run(x, y, all_compositions, composition, ...)

update_plot(x, y, composition)

update_ternary_colors(colors)
```

```
__init__()
update_plot(x, y, composition)
remove_vertical_lines()
add_vertical_line(x, y0=0, y1=128, row=1, col=1, line_kw=None)
update_ternary_colors(colors)
run(x, y, all compositions, composition, models, possible phase labels)
```

AFL.automation.shared.DiffractionLabeler.OrdinalEncoder

Bases: OneToOneFeatureMixin, _BaseEncoder

Encode categorical features as an integer array.

The input to this transformer should be an array-like of integers or strings, denoting the values taken on by categorical (discrete) features. The features are converted to ordinal integers. This results in a single column of integers (0 to n_categories - 1) per feature.

Read more in the User Guide. For a comparison of different encoders, refer to: sphx_glr_auto_examples_preprocessing_plot_target_encoder.py.

Added in version 0.20.

Parameters

- categories ('auto' or a list of array-like, default='auto') Categories (unique values) per feature:
 - 'auto': Determine categories automatically from the training data.
 - list: categories[i] holds the categories expected in the ith column. The passed categories should not mix strings and numeric values, and should be sorted in case of numeric values.

The used categories can be found in the categories_ attribute.

- **dtype** (number type, default=np.float64) Desired dtype of output.
- handle_unknown ({'error', 'use_encoded_value'}, default='error') When set to 'error' an error will be raised in case an unknown categorical feature is present during transform. When set to 'use_encoded_value', the encoded value of unknown categories will be set to the value given for the parameter unknown_value. In inverse_transform(), an unknown category will be denoted as None.

Added in version 0.24.

• unknown_value (int or np.nan, default=None) — When the parameter handle_unknown is set to 'use_encoded_value', this parameter is required and will set the encoded value of unknown categories. It has to be distinct from the values used to encode any of the categories in fit. If set to np.nan, the dtype parameter must be a float dtype.

Added in version 0.24.

• **encoded_missing_value** (*int or np.nan*, *default=np.nan*) – Encoded value of missing categories. If set to *np.nan*, then the *dtype* parameter must be a float dtype.

Added in version 1.1.

- min_frequency (int or float, default=None) Specifies the minimum frequency below which a category will be considered infrequent.
 - If *int*, categories with a smaller cardinality will be considered infrequent.
 - If float, categories with a smaller cardinality than min_frequency * n_samples will be considered infrequent.

Added in version 1.3: Read more in the User Guide.

• max_categories (int, default=None) – Specifies an upper limit to the number of output categories for each input feature when considering infrequent categories. If there are infrequent categories, max_categories includes the category representing the infrequent categories along with the frequent categories. If None, there is no limit to the number of output features.

 $max_categories$ do **not** take into account missing or unknown categories. Setting $un-known_value$ or $encoded_missing_value$ to an integer will increase the number of unique integer codes by one each. This can result in up to $max_categories + 2$ integer codes.

Added in version 1.3: Read more in the User Guide.

categories_

The categories of each feature determined during fit (in order of the features in X and corresponding with the output of transform). This does not include categories that weren't seen during fit.

Type

list of arrays

n_features_in_

Number of features seen during fit.

Added in version 1.0.

Type

int

feature_names_in_

Names of features seen during fit. Defined only when X has feature names that are all strings.

Added in version 1.0.

Type

ndarray of shape (n_features_in_,)

infrequent_categories_

Defined only if infrequent categories are enabled by setting $min_frequency$ or $max_categories$ to a non-default value. $infrequent_categories_[i]$ are the infrequent categories for feature i. If the feature i has no infrequent categories $infrequent_categories_[i]$ is None.

Added in version 1.3.

Type

list of ndarray

See also

OneHotEncoder

Performs a one-hot encoding of categorical features. This encoding is suitable for low to medium cardinality categorical variables, both in supervised and unsupervised settings.

TargetEncoder

Encodes categorical features using supervised signal in a classification or regression pipeline. This encoding is typically suitable for high cardinality categorical variables.

LabelEncoder

Encodes target labels with values between 0 and n_classes-1.

Notes

With a high proportion of *nan* values, inferring categories becomes slow with Python versions before 3.10. The handling of *nan* values was improved from Python 3.10 onwards, (c.f. bpo-43475).

Examples

Given a dataset with two features, we let the encoder find the unique values per feature and transform the data to an ordinal encoding.

By default, OrdinalEncoder is lenient towards missing values by propagating them.

You can use the parameter *encoded_missing_value* to encode missing values.

Infrequent categories are enabled by setting *max_categories* or *min_frequency*. In the following example, "a" and "d" are considered infrequent and grouped together into a single category, "b" and "c" are their own categories, unknown values are encoded as 3 and missing values are encoded as 4.

```
>>> X_train = np.array(
        [["a"] * 5 + ["b"] * 20 + ["c"] * 10 + ["d"] * 3 + [np.nan]],
        dtype=object).T
>>> enc = OrdinalEncoder(
        handle_unknown="use_encoded_value", unknown_value=3,
        max_categories=3, encoded_missing_value=4)
. . .
>>> _ = enc.fit(X_train)
>>> X_test = np.array([["a"], ["b"], ["c"], ["d"], ["e"], [np.nan]], dtype=object)
>>> enc.transform(X_test)
array([[2.],
       [0.],
       [1.],
       [2.],
       [3.],
       [4.]])
```

__init__(*, categories='auto', dtype=<class 'numpy.float64'>, handle_unknown='error', unknown_value=None, encoded_missing_value=nan, min_frequency=None, max_categories=None)

Methods

init(*[, categories, dtype,])	
fit(X[,y])	Fit the OrdinalEncoder to X.
$fit_transform(X[,y])$	Fit to data, then transform it.
<pre>get_feature_names_out([input_features])</pre>	Get output feature names for transformation.
<pre>get_metadata_routing()</pre>	Get metadata routing of this object.
<pre>get_params([deep])</pre>	Get parameters for this estimator.
inverse_transform(X)	Convert the data back to the original representation.
<pre>set_output(*[, transform])</pre>	Set output container.
<pre>set_params(**params)</pre>	Set the parameters of this estimator.
transform(X)	Transform X to ordinal codes.

Attributes

```
infrequent_categories_ Infrequent categories for each feature.
```

```
__init__(*, categories='auto', dtype=<class 'numpy.float64'>, handle_unknown='error', unknown_value=None, encoded_missing_value=nan, min_frequency=None, max_categories=None)
```

```
fit(X, y=None)
```

Fit the OrdinalEncoder to X.

Parameters

• **X** (array-like of shape (n_samples, n_features)) — The data to determine the categories of each feature.

• y (None) – Ignored. This parameter exists only for compatibility with Pipeline.

Returns

self - Fitted encoder.

Return type

object

transform(X)

Transform X to ordinal codes.

Parameters

X(array-like of shape (n_samples, n_features)) − The data to encode.

Returns

X_out – Transformed input.

Return type

ndarray of shape (n_samples, n_features)

$inverse_transform(X)$

Convert the data back to the original representation.

Parameters

 \mathbf{X} (array-like of shape (n_samples, n_encoded_features)) — The transformed data.

Returns

X_tr – Inverse transformed array.

Return type

ndarray of shape (n_samples, n_features)

fit_transform(X, y=None, **fit_params)

Fit to data, then transform it.

Fits transformer to X and y with optional parameters fit_params and returns a transformed version of X.

Parameters

- **X**(array-like of shape (n_samples, n_features)) Input samples.
- y (array-like of shape (n_samples,) or (n_samples, n_outputs), default=None) Target values (None for unsupervised transformations).
- ****fit_params** (*dict*) Additional fit parameters.

Returns

X_new – Transformed array.

Return type

ndarray array of shape (n_samples, n_features_new)

get_feature_names_out(input_features=None)

Get output feature names for transformation.

Parameters

input_features (array-like of str or None, default=None) - Input features.

• If *input_features* is *None*, then *feature_names_in_* is used as feature names in. If *feature_names_in_* is not defined, then the following input feature names are generated: ["x0", "x1", ..., "x(n_features_in_ - 1)"].

• If *input_features* is an array-like, then *input_features* must match *feature_names_in_* if *feature_names_in_* is defined.

Returns

feature_names_out – Same as input features.

Return type

ndarray of str objects

get_metadata_routing()

Get metadata routing of this object.

Please check User Guide on how the routing mechanism works.

Returns

routing – A MetadataRequest encapsulating routing information.

Return type

MetadataRequest

get_params(deep=True)

Get parameters for this estimator.

Parameters

deep (*bool*, *default=True*) – If True, will return the parameters for this estimator and contained subobjects that are estimators.

Returns

params – Parameter names mapped to their values.

Return type

dict

property infrequent_categories_

Infrequent categories for each feature.

```
set_output(*, transform=None)
```

Set output container.

See sphx_glr_auto_examples_miscellaneous_plot_set_output.py for an example on how to use the API.

Parameters

transform ({"default", "pandas", "polars"}, default=None) - Configure output of transform and $fit_transform$.

- "default": Default output format of a transformer
- "pandas": DataFrame output
- "polars": Polars output
- None: Transform configuration is unchanged

Added in version 1.4: "polars" option was added.

Returns

self – Estimator instance.

Return type

estimator instance

```
set_params(**params)
          Set the parameters of this estimator.
          The method works on simple estimators as well as on nested objects (such as Pipeline). The latter have
          parameters of the form <component>__<parameter> so that it's possible to update each component of a
          nested object.
              Parameters
                 **params (dict) – Estimator parameters.
                 self – Estimator instance.
              Return type
                  estimator instance
class AFL.automation.shared.DiffractionLabeler.DiffractionLabeler(saxs_data, composition_data,
                                                                           possible_phase_labels)
     __init__(saxs_data, composition_data, possible_phase_labels)
     next_button_callback(click)
     prev_button_callback(click)
     goto_callback(click)
     ternary_click_callback(figure, location, click)
     update_plot()
     draw_peaks(peaks)
     change_qstar_callback(figure, location, click)
     change_model_callback(data)
     change_norder_callback(data)
     label(label)
     run()
class AFL.automation.shared.DiffractionLabeler.DiffractionLabelerModel(saxs_data,
                                                                                 composition_data,
                                                                                 possible_phase_labels)
     __init__(saxs_data, composition_data, possible_phase_labels)
     ordinal_phase_labels()
     init_models()
     get_peaks(model, qstar=None, max_order=4)
class AFL.automation.shared.DiffractionLabeler.DiffractionLabelerView
     init ()
     update_plot(x, y, composition)
```

```
remove_vertical_lines()

add_vertical_line(x, y0=0, y1=128, row=1, col=1, line\_kw=None)

update_ternary_colors(colors)

run(x, y, all\_compositions, composition, models, possible\_phase\_labels)
```

AFL.automation.shared.MutableQueue

Classes

AFL.automation.shared.MutableQueue.MutableQueue

class AFL.automation.shared.MutableQueue.MutableQueue

Bases: object

Thread-safe, mutable queue

Unlike the standard library CPython queue, this class supportes positional inserts, deletions, and reordering. The tradeoff is performance for both reads and writes to the queue.

__init__()

Methods

init()	
empty()	
<pre>get([loc, block, timeout])</pre>	Get next item from queue
<pre>iterationid()</pre>	
<pre>move(old_index[, new_index])</pre>	Move item in queue
put(item, loc)	Insert an item at the top of the queue
qsize()	
remove(loc)	Remove an item from the queue

```
get(loc=0, block=True, timeout=None)
   Get next item from queue
move(old_index, new_index=None)
   Move item in queue
```

Exceptions

Empty	Exception raised by Queue.get(block=0)/get_nowait().
Full	Exception raised by Queue.put(block=0)/put_nowait().

AFL.automation.shared.MutableQueue.Empty

AFL.automation.shared.MutableQueue.Full

exception AFL.automation.shared.MutableQueue.Full

Exception raised by Queue.put(block=0)/put_nowait().

class AFL.automation.shared.MutableQueue.MutableQueue

Thread-safe, mutable queue

Unlike the standard library CPython queue, this class supportes positional inserts, deletions, and reordering. The tradeoff is performance for both reads and writes to the queue.

AFL.automation.shared.PersistentConfig

Classes

MutableMapping()	A MutableMapping is a generic container for associating key/value pairs.
<pre>PersistentConfig(path[, defaults,])</pre>	A dictionary-like class that serializes changes to disk

AFL.automation.shared.PersistentConfig.MutableMapping

class AFL.automation.shared.PersistentConfig.MutableMapping

Bases: Mapping

A MutableMapping is a generic container for associating key/value pairs.

This class provides concrete generic implementations of all methods except for __getitem__, __setitem__, __delitem__, __iter__, and __len__.

__init__()

Methods

init()	
clear()	
<pre>get(k[,d])</pre>	
items()	
keys()	
pop(k[,d])	If key is not found, d is returned if given, otherwise KeyError is raised.
<pre>popitem()</pre>	as a 2-tuple; but raise KeyError if D is empty.
setdefault(k[,d])	
update([E,]**F)	If E present and has a .keys() method, does: for k in E: $D[k] = E[k]$ If E present and lacks .keys() method, does: for (k, v) in E: $D[k] = v$ In either case, this is followed by: for k , v in F.items(): $D[k] = v$
values()	

clear() \rightarrow None. Remove all items from D.

 $get(k[,d]) \rightarrow D[k]$ if k in D, else d. d defaults to None.

items() \rightarrow a set-like object providing a view on D's items

keys() \rightarrow a set-like object providing a view on D's keys

 $pop(k[,d]) \rightarrow v$, remove specified key and return the corresponding value.

If key is not found, d is returned if given, otherwise KeyError is raised.

 $extbf{popitem}() o (k, v)$, remove and return some (key, value) pair

as a 2-tuple; but raise KeyError if \boldsymbol{D} is empty.

 ${\tt setdefault}(k\big[,d\,\big]) \to {\rm D.get(k,d)}, \text{ also set D[k]=d if k not in D}$

update($[E,]^{**}F$) \rightarrow None. Update D from mapping/iterable E and F.

If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v

values() \rightarrow an object providing a view on D's values

AFL.automation.shared.PersistentConfig.PersistentConfig

class AFL.automation.shared.PersistentConfig.**PersistentConfig**(path, defaults=None,

overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

Bases: MutableMapping

A dictionary-like class that serializes changes to disk

This class provides dictionary-like setters and getters (e.g., [] and .update()) but, by default, all modifications are written into a file in json format with the root keys as timestamps. Modifications can be blocked by locking the config, and writing to disk can be disabled by setting the appropriate member attributes (see constructor). On instantiation, if provided with a previously saved configuration file, PersistentConfig will load the file's contents into memory and use the more recent configuration.

__init__(path, defaults=None, overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

Constructor

Parameters

- path (str or pathlib.Path) File path to file in which this config is or will be stored. This file will be created if it does not exist
- **defaults** (*dict*) Default values to use if no saved config is available or if parameters are missing from a saved config.
- **overrides** (*dict*) Values to use that override parameters in a saved config. These parameters can be changed after the PersistentConfig object is instantiated.
- **lock** (*boo1*) If True, an AttributeError will be raised if the user attempts to modify the config
- write (bool) If False, all writing to the config file will be disabled and a warning will be emitted each time the config is modified.
- $datetime_{key_format}(str)$ String defining the root level keys of the json-serialized file. See https://docs.python.org/3/library/datetime.html#strftime-strptime-behavior.

Methods

init(path[, defaults, overrides, lock,])		Constructor
clear()		
<pre>get(k[,d])</pre>		
<pre>get_historical_values(key[, vert_to_datetime])</pre>	con-	Convenience method for gathering historical values of a parameter
items()		
keys()		
<i>pop</i> (k[,d])		If key is not found, d is returned if given, otherwise KeyError is raised.
<pre>popitem()</pre>		as a 2-tuple; but raise KeyError if D is empty.
<pre>revert([nth, datetime_key])</pre>		Revert config to a historical config
setdefault(k[,d])		
toJSON()		Serialize the config to json
<pre>update(update_dict)</pre>		Update several values in config at once
values()		

__init__(path, defaults=None, overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

Constructor

Parameters

- path (str or pathlib.Path) File path to file in which this config is or will be stored. This file will be created if it does not exist
- **defaults** (*dict*) Default values to use if no saved config is available or if parameters are missing from a saved config.
- **overrides** (*dict*) Values to use that override parameters in a saved config. These parameters can be changed after the PersistentConfig object is instantiated.
- **lock** (*bool*) If True, an AttributeError will be raised if the user attempts to modify the config
- write (bool) If False, all writing to the config file will be disabled and a warning will be emitted each time the config is modified.
- $datetime_key_format(str)$ String defining the root level keys of the json-serialized file. See https://docs.python.org/3/library/datetime.html#strftime-strptime-behavior.

```
__getitem__(key)
```

Dictionary-like getter via config["param"]

```
__setitem__(key, value)
```

Dictionary-like setter via config["param"]=value

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

```
toJSON()
```

Serialize the config to json

```
update(update dict)
```

Update several values in config at once

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

```
revert(nth=None, datetime key=None)
```

Revert config to a historical config

Parameters

- **nth** (int, **optional***) Integer index of historical value to revert to. Can be negative to count from end of history. Note that -1 will correspond to the current config.
- datetime_key (str, optional) datetime formatted string as defined by date-time_key_format

```
get_historical_values(key, convert_to_datetime=False)
```

Convenience method for gathering historical values of a parameter

clear() \rightarrow None. Remove all items from D.

 $get(k[,d]) \rightarrow D[k]$ if k in D, else d. d defaults to None.

items() \rightarrow a set-like object providing a view on D's items

keys() \rightarrow a set-like object providing a view on D's keys

 $pop(k[,d]) \rightarrow v$, remove specified key and return the corresponding value.

If key is not found, d is returned if given, otherwise KeyError is raised.

```
popitem() \rightarrow (k, v), remove and return some (key, value) pair
```

as a 2-tuple; but raise KeyError if D is empty.

setdefault $(k[,d]) \rightarrow D.get(k,d)$, also set D[k]=d if k not in D

values() \rightarrow an object providing a view on D's values

class AFL.automation.shared.PersistentConfig.PersistentConfig(path, defaults=None,

overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')

A dictionary-like class that serializes changes to disk

This class provides dictionary-like setters and getters (e.g., [] and .update()) but, by default, all modifications are written into a file in json format with the root keys as timestamps. Modifications can be blocked by locking the config, and writing to disk can be disabled by setting the appropriate member attributes (see constructor). On instantiation, if provided with a previously saved configuration file, PersistentConfig will load the file's contents into memory and use the more recent configuration.

```
__init__(path, defaults=None, overrides=None, lock=False, write=True, max_history=10000, datetime_key_format='%y/%d/%m %H:%M:%S.%f')
```

Constructor

Parameters

- path (str or pathlib.Path) File path to file in which this config is or will be stored. This file will be created if it does not exist
- **defaults** (*dict*) Default values to use if no saved config is available or if parameters are missing from a saved config.
- **overrides** (*dict*) Values to use that override parameters in a saved config. These parameters can be changed after the PersistentConfig object is instantiated.
- **lock** (*bool*) If True, an AttributeError will be raised if the user attempts to modify the config
- write (bool) If False, all writing to the config file will be disabled and a warning will be emitted each time the config is modified.
- **datetime_key_format** (*str*) String defining the root level keys of the json-serialized file. See https://docs.python.org/3/library/datetime.html#strftime-strptime-behavior.

```
__getitem__(key)
```

Dictionary-like getter via config["param"]

```
__setitem__(key, value)
```

Dictionary-like setter via config["param"]=value

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

toJSON()

Serialize the config to json

update(update_dict)

Update several values in config at once

Changes will be written to PersistentConfig.path if PersistentConfig.write is True (default).

revert(nth=None, datetime_key=None)

Revert config to a historical config

Parameters

- **nth** (int, **optional***) Integer index of historical value to revert to. Can be negative to count from end of history. Note that -1 will correspond to the current config.
- datetime_key (str, optional) datetime formatted string as defined by date-time key format

```
get_historical_values(key, convert_to_datetime=False)
```

Convenience method for gathering historical values of a parameter

AFL.automation.shared.ServerDiscovery

Classes

AsyncServiceBrowser(zeroconf, type_[,])	Used to browse for a service for specific type(s).
AsyncServiceInfo	An async version of ServiceInfo.
AsyncZeroconf([interfaces, unicast,])	Implementation of Zeroconf Multicast DNS Service Discovery
AsyncZeroconfServiceTypes()	An async version of ZeroconfServiceTypes.
<pre>IPVersion(value[, names, module, qualname,])</pre>	
RunThread(coro)	
ServerDiscovery()	ServerDiscovery class
ServiceBrowser(zc, type_[, handlers,])	Used to browse for a service of a specific type.
ServiceInfo	Service information.
ServiceStateChange(value[, names, module,])	
<pre>Zeroconf([interfaces, unicast, ip_version,])</pre>	Implementation of Zeroconf Multicast DNS Service Discovery

AFL.automation.shared.ServerDiscovery.AsyncServiceBrowser

 $\textbf{class} \ \, \textbf{AFL.automation.shared.ServerDiscovery.} \\ \textbf{AsyncServiceBrowser}(\textit{zeroconf}; \ \textit{Zeroconf}, \textit{type_: str} \ | \ \textit{type_: str} \$

list, handlers: ServiceListener |
list[Callable[[...], None]] | None
= None, listener: ServiceListener
| None = None, addr: str | None
= None, port: int = 5353, delay:
int = 10000, question_type:
DNSQuestionType | None =
None)

Bases: _ServiceBrowserBase

Used to browse for a service for specific type(s).

Constructor parameters are as follows:

- zc: A Zeroconf instance
- type_: fully qualified service type name
- handler: ServiceListener or Callable that knows how to process ServiceStateChange events
- listener: ServiceListener
- addr: address to send queries (will default to multicast)
- port: port to send queries (will default to mdns 5353)
- delay: The initial delay between answering questions
- question_type: The type of questions to ask (DNSQuestionType.QM or DNSQuestionType.QU)

The listener object will have its add_service() and remove_service() methods called when this browser discovers changes in the services availability.

__init__(zeroconf: Zeroconf, type_: str | list, handlers: ServiceListener | list[Callable[[...], None]] | None = None, listener: ServiceListener | None = None, addr: str | None = None, port: int = 5353, delay: int = 10000, question_type: DNSQuestionType | None = None) → None

Used to browse for a service for specific type(s).

Constructor parameters are as follows:

- zc: A Zeroconf instance
- type_: fully qualified service type name
- handler: ServiceListener or Callable that knows how to process ServiceStateChange events
- listener: ServiceListener
- addr: address to send queries (will default to multicast)
- port: port to send queries (will default to mdns 5353)
- delay: The initial delay between answering questions
- question_type: The type of questions to ask (DNSQuestionType.QM or DNSQuestionType.QU)

The listener object will have its add_service() and remove_service() methods called when this browser discovers changes in the services availability.

Methods

init(zeroconf, type_[, handlers,])	Used to browse for a service for specific type(s).
<pre>async_cancel()</pre>	Cancel the browser.
<pre>async_update_records(zc, now, records)</pre>	Callback invoked by Zeroconf when new information
	arrives.
<pre>async_update_records_complete()</pre>	Called when a record update has completed for all
	handlers.
<pre>update_record(zc, now, record)</pre>	Update a single record.

Attributes

```
done
query_scheduler
types
zc
service_state_changed
```

__init__(zeroconf: Zeroconf, type_: str | list, handlers: ServiceListener | list[Callable[[...], None]] | None = None, listener: ServiceListener | None = None, addr: str | None = None, port: int = 5353, delay: int = 10000, question_type: DNSQuestionType | None = None) → None

Used to browse for a service for specific type(s).

Constructor parameters are as follows:

- zc: A Zeroconf instance
- type_: fully qualified service type name

- handler: ServiceListener or Callable that knows how to process ServiceStateChange events
- listener: ServiceListener
- addr: address to send queries (will default to multicast)
- port: port to send queries (will default to mdns 5353)
- delay: The initial delay between answering questions
- question_type: The type of questions to ask (DNSQuestionType.QM or DNSQuestionType.QU)

The listener object will have its add_service() and remove_service() methods called when this browser discovers changes in the services availability.

```
async async_cancel() \rightarrow None
```

Cancel the browser.

done

query_scheduler

types

zc

async_update_records(zc: Zeroconf, now: float_, records: list[RecordUpdate])

Callback invoked by Zeroconf when new information arrives.

Updates information required by browser in the Zeroconf cache.

Ensures that there is are no unnecessary duplicates in the list.

This method will be run in the event loop.

async_update_records_complete()

Called when a record update has completed for all handlers.

At this point the cache will have the new records.

This method will be run in the event loop.

This method is expected to be overridden by subclasses.

service_state_changed

```
update\_record(zc: Zeroconf, now: float, record: DNSRecord) \rightarrow None
```

Update a single record.

This method is deprecated and will be removed in a future version. update_records should be implemented instead.

AFL.automation.shared.ServerDiscovery.AsyncServiceInfo

class AFL.automation.shared.ServerDiscovery.AsyncServiceInfo

Bases: ServiceInfo

An async version of ServiceInfo.

```
__init__(*args, **kwargs)
```

Methods

init(*args, **kwargs)	
addresses_by_version(version)	List addresses matching IP version.
async_clear_cache()	Clear the cache for this service info.
<pre>async_request(zc, timeout[, question_type,])</pre>	Returns true if the service could be discovered on the network, and updates this object with details discovered.
<pre>async_update_records(zc, now, records)</pre>	Updates service information from a DNS record.
<pre>async_update_records_complete()</pre>	Called when a record update has completed for all handlers.
<pre>async_wait(timeout[, loop])</pre>	Calling task waits for a given number of milliseconds or until notified.
<pre>dns_addresses([override_ttl, version])</pre>	Return matching DNSAddress from ServiceInfo.
<pre>dns_nsec(missing_types[, override_ttl])</pre>	Return DNSNsec from ServiceInfo.
<pre>dns_pointer([override_ttl])</pre>	Return DNSPointer from ServiceInfo.
<pre>dns_service([override_ttl])</pre>	Return DNSService from ServiceInfo.
<pre>dns_text([override_ttl])</pre>	Return DNSText from ServiceInfo.
<pre>get_address_and_nsec_records([override_ttl])</pre>	Build a set of address records and NSEC records for non-present record types.
<pre>get_name()</pre>	Name accessor
<pre>ip_addresses_by_version(version)</pre>	List ip_address objects matching IP version.
<pre>load_from_cache(zc[, now])</pre>	Populate the service info from the cache.
<pre>parsed_addresses([version])</pre>	List addresses in their parsed string form.
<pre>parsed_scoped_addresses([version])</pre>	Equivalent to parsed_addresses, with the exception that IPv6 Link-Local addresses are qualified with % <interface_index> when available</interface_index>
<pre>request(zc, timeout[, question_type, addr, port])</pre>	Returns true if the service could be discovered on the network, and updates this object with details discovered.
<pre>set_server_if_missing()</pre>	Set the server if it is missing.
<pre>update_record(zc, now, record)</pre>	Update a single record.

Attributes

```
host\_ttl
interface_index
key
other_ttl
port
priority
server
server_key
text
type
weight
addresses
                                                 IPv4 addresses of this service.
decoded_properties
                                                 Return properties as strings.
name
                                                 The name of the service.
                                                 Return properties as bytes.
properties
```

host_ttl

interface_index

key

other_ttl

port

priority

server

server_key

text

type

weight

__init__(*args, **kwargs)

addresses

IPv4 addresses of this service.

Only IPv4 addresses are returned for backward compatibility. Use addresses_by_version() or parsed_addresses() to include IPv6 addresses as well.

addresses_by_version(version: IPVersion)

List addresses matching IP version.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

async_clear_cache()

Clear the cache for this service info.

```
async_request(zc: Zeroconf, timeout: float, question\_type: DNSQuestionType | None = None, addr: str | None = None, port: int = 5353) \rightarrow bool
```

Returns true if the service could be discovered on the network, and updates this object with details discovered.

This method will be run in the event loop.

Passing addr and port is optional, and will default to the mDNS multicast address and port. This is useful for directing requests to a specific host that may be able to respond across subnets.

Parameters

- **zc** Zeroconf instance
- timeout time in milliseconds to wait for a response
- question_type question type to ask
- addr address to send the request to
- port port to send the request to

```
async_update_records(zc: Zeroconf, now: float_, records: list[RecordUpdate])
```

Updates service information from a DNS record.

This method will be run in the event loop.

async_update_records_complete()

Called when a record update has completed for all handlers.

At this point the cache will have the new records.

This method will be run in the event loop.

```
async_wait(timeout: float, loop: AbstractEventLoop | None = None) <math>\rightarrow None
```

Calling task waits for a given number of milliseconds or until notified.

decoded_properties

Return properties as strings.

```
dns\_addresses(override\_ttl: int\_ | None = None, version: IPVersion = IPVersion.All) \rightarrow list[DNSAddress]
Return matching DNSAddress from ServiceInfo.
```

```
dns\_nsec(missing\_types: list[int], override\_ttl: int\_ | None = None) \rightarrow DNSNsec
```

Return DNSNsec from ServiceInfo.

```
dns_pointer(override\_ttl: int_ | None = None) \rightarrow DNSPointer
```

Return DNSPointer from ServiceInfo.

$dns_service(override_ttl: int_ | None = None) \rightarrow DNSService$

Return DNSService from ServiceInfo.

```
dns_text(override_ttl: int_| None = None) \rightarrow DNSText
```

Return DNSText from ServiceInfo.

get_address_and_nsec_records($override_ttl: int_ \mid None = None$) $\rightarrow set[DNSRecord]$

Build a set of address records and NSEC records for non-present record types.

```
get_name() \rightarrow str
```

Name accessor

ip_addresses_by_version(version: IPVersion)

List ip_address objects matching IP version.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

```
load_from_cache(zc: Zeroconf, now: float_| None = None) \rightarrow bool
```

Populate the service info from the cache.

This method is designed to be threadsafe.

name

The name of the service.

```
parsed\_addresses(version: IPVersion = IPVersion.All) \rightarrow list[str]
```

List addresses in their parsed string form.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

```
parsed\_scoped\_addresses(version: IPVersion = IPVersion.All) \rightarrow list[str]
```

Equivalent to parsed_addresses, with the exception that IPv6 Link-Local addresses are qualified with %<interface_index> when available

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

properties

Return properties as bytes.

```
request(zc: Zeroconf, timeout: float, question_type: DNSQuestionType | None = None, addr: str \mid None = None, port: int = 5353) \rightarrow bool
```

Returns true if the service could be discovered on the network, and updates this object with details discovered.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_request* cannot be completed.

Parameters

• **zc** – Zeroconf instance

- timeout time in milliseconds to wait for a response
- question_type question type to ask
- addr address to send the request to
- port port to send the request to

```
set_server_if_missing() → None
```

Set the server if it is missing.

This function is for backwards compatibility.

```
\mathbf{update\_record}(\mathit{zc} \colon \mathsf{Zeroconf}, \mathit{now} \colon \mathit{float}, \mathit{record} \colon \mathit{DNSRecord}) \to \mathsf{None}
```

Update a single record.

This method is deprecated and will be removed in a future version. update_records should be implemented instead.

AFL.automation.shared.ServerDiscovery.AsyncZeroconf

Bases: object

Implementation of Zeroconf Multicast DNS Service Discovery

Supports registration, unregistration, queries and browsing.

The async version is currently a wrapper around Zeroconf which is now also async. It is expected that an asyncio event loop is already running before creating the AsyncZeroconf object.

```
__init__(interfaces: Sequence[str | int | tuple[tuple[str, int, int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False, zc: Zeroconf | None = None) \rightarrow None
```

Creates an instance of the Zeroconf class, establishing multicast communications, and listening.

Parameters

• **interfaces** – **InterfaceChoice** or a list of IP addresses (IPv4 and IPv6) and interface indexes (IPv6 only).

IPv6 notes for non-POSIX systems: * InterfaceChoice.All is an alias for InterfaceChoice.Default

on Python versions before 3.8.

Also listening on loopback (::1) doesn't work, use a real address.

- **ip_version** IP versions to support. If *choice* is a list, the default is detected from it. Otherwise defaults to V4 only for backward compatibility.
- apple_p2p use AWDL interface (only macOS)

Methods

init([interfaces, unicast, ip_version,])	Creates an instance of the Zeroconf class, establishing multicast communications, and listening.
<pre>async_add_service_listener(type_, listener)</pre>	Adds a listener for a particular service type.
async_close()	Ends the background threads, and prevent this instance from servicing further queries.
<pre>async_get_service_info(type_, name[,])</pre>	Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.
<pre>async_register_service(info[, ttl,])</pre>	Registers service information to the network with a default TTL.
<pre>async_remove_all_service_listeners()</pre>	Removes a listener from the set that is currently listening.
async_remove_service_listener(listener)	Removes a listener from the set that is currently listening.
<pre>async_unregister_all_services()</pre>	Unregister all registered services.
<pre>async_unregister_service(info)</pre>	Unregister a service.
async_update_service(info)	Registers service information to the network with a default TTL.

__init__(interfaces: Sequence[str | int | tuple[tuple[str, int, int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False, zc: Zeroconf | None = None) \rightarrow None

Creates an instance of the Zeroconf class, establishing multicast communications, and listening.

Parameters

• **interfaces** – **InterfaceChoice** or a list of IP addresses (IPv4 and IPv6) and interface indexes (IPv6 only).

IPv6 notes for non-POSIX systems: * InterfaceChoice.All is an alias for InterfaceChoice.Default

on Python versions before 3.8.

Also listening on loopback (::1) doesn't work, use a real address.

- **ip_version** IP versions to support. If *choice* is a list, the default is detected from it. Otherwise defaults to V4 only for backward compatibility.
- apple_p2p use AWDL interface (only macOS)

async async_register_service(info: ServiceInfo, ttl: int | None = None, allow_name_change: bool = False, cooperating_responders: bool = False, strict: bool = True) \rightarrow Awaitable

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service. The name of the service may be changed if needed to make it unique on the network. Additionally multiple cooperating responders can register the same service on the network for resilience (if you want this behavior set *cooperating_responders* to *True*).

The service will be broadcast in a task. This task is returned and therefore can be awaited if necessary.

async async_unregister_all_services() \rightarrow None

Unregister all registered services.

Unlike async_register_service and async_unregister_service, this method does not return a future and is always expected to be awaited since its only called at shutdown.

```
async async_unregister_service(info: ServiceInfo) → Awaitable
```

Unregister a service.

The service will be broadcast in a task. This task is returned and therefore can be awaited if necessary.

```
async async_update_service(info: ServiceInfo) → Awaitable
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service.

The service will be broadcast in a task. This task is returned and therefore can be awaited if necessary.

```
async async_close() \rightarrow None
```

Ends the background threads, and prevent this instance from servicing further queries.

```
async async_get_service_info(type_: str, name: str, timeout: int = 3000, question_type: DNSQuestionType \mid None = None) \rightarrow AsyncServiceInfo \mid None
```

Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.

Parameters

- **type** fully qualified service type name
- name the name of the service
- **timeout** milliseconds to wait for a response
- question_type The type of questions to ask (DNSQuestionType.QM or DNSQuestion-Type.QU)

```
async async_add_service_listener(type_{-}: str, listener: ServiceListener) \rightarrow None
```

Adds a listener for a particular service type. This object will then have its add_service and remove_service methods called when services of that type become available and unavailable.

```
async async_remove_service_listener(listener: ServiceListener) \rightarrow None
```

Removes a listener from the set that is currently listening.

```
{\tt async\_remove\_all\_service\_listeners()} \rightarrow {\tt None}
```

Removes a listener from the set that is currently listening.

AFL.automation.shared.ServerDiscovery.AsyncZeroconfServiceTypes

class AFL.automation.shared.ServerDiscovery.AsyncZeroconfServiceTypes

Bases: ZeroconfServiceTypes

An async version of ZeroconfServiceTypes.

```
__init__() \rightarrow None
```

Keep track of found services in a set.

Methods

init()	Keep track of found services in a set.
<pre>add_service(zc, type_, name)</pre>	Service added.
<pre>async_find([aiozc, timeout, interfaces,])</pre>	Return all of the advertised services on any local networks.
<pre>find([zc, timeout, interfaces, ip_version])</pre>	Return all of the advertised services on any local networks.
<pre>remove_service(zc, type_, name)</pre>	Service removed.
<pre>update_service(zc, type_, name)</pre>	Service updated.

```
async classmethod async_find(aiozc: AsyncZeroconf | None = None, timeout: int | float = 5, interfaces: Sequence[str | int | tuple[tuple[str, int, int], int]] | InterfaceChoice = InterfaceChoice.All, ip_version: IPVersion | None = None) \rightarrow tuple[str, ...]
```

Return all of the advertised services on any local networks.

Parameters

- aiozc AsyncZeroconf() instance. Pass in if already have an instance running or if nondefault interfaces are needed
- timeout seconds to wait for any responses
- interfaces interfaces to listen on.
- **ip_version** IP protocol version to use.

Returns

tuple of service type strings

```
__init__() \rightarrow None
```

Keep track of found services in a set.

```
add_service(zc: Zeroconf, type_-: str, name: str) \rightarrow None Service added.
```

```
classmethod find(zc: Zeroconf | None = None, timeout: int | float = 5, interfaces: Sequence[str | int | tuple[tuple[str, int, int], int]] | InterfaceChoice = InterfaceChoice.All, ip_version: IPVersion | None = None) \rightarrow tuple[str, ...]
```

Return all of the advertised services on any local networks.

Parameters

- **zc** Zeroconf() instance. Pass in if already have an instance running or if non-default interfaces are needed
- **timeout** seconds to wait for any responses
- interfaces interfaces to listen on.
- **ip_version** IP protocol version to use.

Returns

tuple of service type strings

```
remove_service(zc: Zeroconf, type_-: str, name: str) \rightarrow None Service removed.
```

```
update_service(zc: Zeroconf, type_-: str, name: str) \rightarrow None Service updated.
```

AFL.automation.shared.ServerDiscovery.IPVersion

```
Bases: Enum
__init__(*args, **kwds)
```

Attributes

```
V40nly
V60nly
All
```

```
V4Only = 1
V6Only = 2
All = 3
classmethod __contains__(member)
```

 $Return\ True\ if\ member\ is\ a\ member\ of\ this\ enum\ raises\ Type Error\ if\ member\ is\ not\ an\ enum\ member$

note: in 3.12 TypeError will no longer be raised, and True will also be returned if member is the value of a member in this enum

```
classmethod __getitem__(name)
```

Return the member matching *name*.

```
classmethod __iter__()
```

Return members in definition order.

```
classmethod __len__()
```

Return the number of members (no aliases)

AFL.automation.shared.ServerDiscovery.RunThread

```
class AFL.automation.shared.ServerDiscovery.RunThread(coro)
```

```
Bases: Thread
__init__(coro)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

Methods

init(coro)	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(coro)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

AFL.automation.shared.ServerDiscovery.ServerDiscovery

class AFL.automation.shared.ServerDiscovery.ServerDiscovery

Bases: object

ServerDiscovery class

This class is used to discover AFL servers on the network using zeroconf requests that match a particular specification.

__init__()

Methods

init()	
<pre>aio_find_server_by_name(service_name)</pre>	
<pre>discover_server_by_name(service_name)</pre>	Does a zeroconf request to find a named AFL-automation server on the network.
<pre>find_server_by_name(service_name)</pre>	Disambiguator for either matching or discovering a specific server by name
<pre>find_server_by_partial_name(service_name)</pre>	Looks through the registry of discovered services for a partial name match.
<pre>find_server_by_property_match(property_name)</pre>	Looks through the registry of discovered services for a partial match in a property string.
<pre>get_service_info(zeroconf, service_type, name)</pre>	
<pre>manage_service_info_to_list(zeroconf,)</pre>	
<pre>match_server_by_name(service_name)</pre>	Looks through the registry of discovered services for an exact name match.
on_service_state_change(zeroconf,)	
sa_aio_discover_server_by_name(service_name	automation server on the network.
<pre>sa_discover_server_by_name(service_name)</pre>	Does a zeroconf request to find a named AFL-automation server on the network.

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

async classmethod sa_aio_discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

classmethod sa_discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

find_server_by_name(service_name)

Disambiguator for either matching or discovering a specific server by name

```
match_server_by_name(service_name)
```

Looks through the registry of discovered services for an exact name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

find_server_by_partial_name(service_name)

Looks through the registry of discovered services for a partial name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

find_server_by_property_match(property_name, property_value)

Looks through the registry of discovered services for a partial match in a property string. Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

AFL.automation.shared.ServerDiscovery.ServiceBrowser

```
class AFL.automation.shared.ServerDiscovery.ServiceBrowser(zc: Zeroconf, type\_: str \mid list, handlers: ServiceListener \mid list[Callable[..., None]] \mid None = None, listener: ServiceListener \mid None = None, addr: <math>str \mid None = None, port: int = 5353, delay: int = 10000, question\_type: DNSQuestionType \mid None = None)
```

Bases: _ServiceBrowserBase, Thread

Used to browse for a service of a specific type.

The listener object will have its add_service() and remove_service() methods called when this browser discovers changes in the services availability.

__init__(zc: Zeroconf, type_: str | list, handlers: ServiceListener | list[Callable[..., None]] | None = None, listener: ServiceListener | None = None, addr: str | None = None, port: int = 5353, delay: int = 10000, question_type: DNSQuestionType | None = None) → None

Used to browse for a service for specific type(s).

Constructor parameters are as follows:

- zc: A Zeroconf instance
- type_: fully qualified service type name
- handler: ServiceListener or Callable that knows how to process ServiceStateChange events
- listener: ServiceListener
- addr: address to send queries (will default to multicast)
- port: port to send queries (will default to mdns 5353)
- delay: The initial delay between answering questions
- *question_type*: The type of questions to ask (DNSQuestionType.QM or DNSQuestionType.QU)

The listener object will have its add_service() and remove_service() methods called when this browser discovers changes in the services availability.

Methods

init(zc, type_[, handlers, listener,])	Used to browse for a service for specific type(s).
<pre>async_update_records(zc, now, records)</pre>	Callback invoked by Zeroconf when new information arrives.
<pre>async_update_records_complete()</pre>	Called when a record update has completed for all handlers.
cancel()	Cancel the browser.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
run()	Run the browser thread.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
<pre>update_record(zc, now, record)</pre>	Update a single record.

Attributes

done	
query_scheduler	
types	
ZC	
daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.
service_state_changed	

done

query_scheduler

types

zc

__init__(zc: Zeroconf, type_: str | list, handlers: ServiceListener | list[Callable[..., None]] | None = None, listener: ServiceListener | None = None, addr: str | None = None, port: int = 5353, delay: int = 10000, question_type: DNSQuestionType | None = None) → None

Used to browse for a service for specific type(s).

Constructor parameters are as follows:

- zc: A Zeroconf instance
- type_: fully qualified service type name
- handler: ServiceListener or Callable that knows how to process ServiceStateChange events
- listener: ServiceListener
- addr: address to send queries (will default to multicast)
- port: port to send queries (will default to mdns 5353)
- delay: The initial delay between answering questions
- question_type: The type of questions to ask (DNSQuestionType.QM or DNSQuestionType.QU)

The listener object will have its add_service() and remove_service() methods called when this browser discovers changes in the services availability.

```
async_update_records(zc: Zeroconf, now: float_, records: list[RecordUpdate])
```

Callback invoked by Zeroconf when new information arrives.

Updates information required by browser in the Zeroconf cache.

Ensures that there is are no unnecessary duplicates in the list.

This method will be run in the event loop.

$async_update_records_complete() \rightarrow None$

Called when a record update has completed for all handlers.

At this point the cache will have the new records.

This method will be run in the event loop.

$cancel() \rightarrow None$

Cancel the browser.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

$run() \rightarrow None$

Run the browser thread.

service_state_changed

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

$update_record(zc: Zeroconf, now: float, record: DNSRecord) \rightarrow None$

Update a single record.

This method is deprecated and will be removed in a future version. update_records should be implemented instead.

AFL.automation.shared.ServerDiscovery.ServiceInfo

class AFL.automation.shared.ServerDiscovery.ServiceInfo

Bases: RecordUpdateListener

Service information.

Constructor parameters are as follows:

- *type_*: fully qualified service type name
- name: fully qualified service name
- port: port that the service runs on
- weight: weight of the service
- priority: priority of the service
- *properties*: dictionary of properties (or a bytes object holding the contents of the *text* field). converted to str and then encoded to bytes using UTF-8. Keys with *None* values are converted to value-less attributes.
- server: fully qualified name for service host (defaults to name)

- host_ttl: ttl used for A/SRV records
- other_ttl: ttl used for PTR/TXT records
- addresses and parsed_addresses: List of IP addresses (either as bytes, network byte order, or in parsed form as text; at most one of those parameters can be provided)
- interface_index: scope_id or zone_id for IPv6 link-local addresses i.e. an identifier of the interface where the peer is connected to

__init__(*args, **kwargs)

Methods

init(*args, **kwargs)	
addresses_by_version(version)	List addresses matching IP version.
async_clear_cache()	Clear the cache for this service info.
	Returns true if the service could be discovered on the
<pre>async_request(zc, timeout[, question_type,])</pre>	network, and updates this object with details discovered.
<pre>async_update_records(zc, now, records)</pre>	Updates service information from a DNS record.
<pre>async_update_records_complete()</pre>	Called when a record update has completed for all handlers.
<pre>async_wait(timeout[, loop])</pre>	Calling task waits for a given number of milliseconds or until notified.
<pre>dns_addresses([override_ttl, version])</pre>	Return matching DNSAddress from ServiceInfo.
<pre>dns_nsec(missing_types[, override_ttl])</pre>	Return DNSNsec from ServiceInfo.
<pre>dns_pointer([override_ttl])</pre>	Return DNSPointer from ServiceInfo.
<pre>dns_service([override_ttl])</pre>	Return DNSService from ServiceInfo.
<pre>dns_text([override_ttl])</pre>	Return DNSText from ServiceInfo.
<pre>get_address_and_nsec_records([override_ttl])</pre>	Build a set of address records and NSEC records for non-present record types.
<pre>get_name()</pre>	Name accessor
<pre>ip_addresses_by_version(version)</pre>	List ip_address objects matching IP version.
<pre>load_from_cache(zc[, now])</pre>	Populate the service info from the cache.
<pre>parsed_addresses([version])</pre>	List addresses in their parsed string form.
<pre>parsed_scoped_addresses([version])</pre>	Equivalent to parsed_addresses, with the exception that IPv6 Link-Local addresses are qualified with % <interface_index> when available</interface_index>
<pre>request(zc, timeout[, question_type, addr, port])</pre>	Returns true if the service could be discovered on the network, and updates this object with details discovered.
<pre>set_server_if_missing()</pre>	Set the server if it is missing.
update_record(zc, now, record)	Update a single record.

Attributes

```
host\_ttl
interface_index
key
other_ttl
port
priority
server
server_key
text
type
weight
addresses
                                                 IPv4 addresses of this service.
decoded\_properties
                                                 Return properties as strings.
                                                 The name of the service.
name
                                                 Return properties as bytes.
properties
```

host_ttl

interface_index

key

other_ttl

port

priority

server

server_key

text

type

weight

__init__(*args, **kwargs)

addresses

IPv4 addresses of this service.

Only IPv4 addresses are returned for backward compatibility. Use addresses_by_version() or parsed_addresses() to include IPv6 addresses as well.

addresses_by_version(version: IPVersion)

List addresses matching IP version.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

async_clear_cache()

Clear the cache for this service info.

```
async_request(zc: Zeroconf, timeout: float, question\_type: DNSQuestionType | None = None, addr: str | None = None, port: int = 5353) \rightarrow bool
```

Returns true if the service could be discovered on the network, and updates this object with details discovered.

This method will be run in the event loop.

Passing addr and port is optional, and will default to the mDNS multicast address and port. This is useful for directing requests to a specific host that may be able to respond across subnets.

Parameters

- **zc** Zeroconf instance
- timeout time in milliseconds to wait for a response
- question_type question type to ask
- addr address to send the request to
- port port to send the request to

```
async_update_records(zc: Zeroconf, now: float_, records: list[RecordUpdate])
```

Updates service information from a DNS record.

This method will be run in the event loop.

async_update_records_complete()

Called when a record update has completed for all handlers.

At this point the cache will have the new records.

This method will be run in the event loop.

```
async_wait(timeout: float, loop: AbstractEventLoop | None = None) <math>\rightarrow None
```

Calling task waits for a given number of milliseconds or until notified.

decoded_properties

Return properties as strings.

```
dns\_addresses(override\_ttl: int\_ | None = None, version: IPVersion = IPVersion.All) \rightarrow list[DNSAddress]
Return matching DNSAddress from ServiceInfo.
```

```
dns_nsec(missing_types: list[int], override_ttl: int_ | None = None) → DNSNsec Return DNSNsec from ServiceInfo.
```

 $dns_pointer(override_ttl: int_ | None = None) \rightarrow DNSPointer$

Return DNSPointer from ServiceInfo.

 $dns_service(override_ttl: int_| None = None) \rightarrow DNSService$

Return DNSService from ServiceInfo.

 $dns_text(override_ttl: int_| None = None) \rightarrow DNSText$

Return DNSText from ServiceInfo.

get_address_and_nsec_records($override_ttl: int_ \mid None = None$) $\rightarrow set[DNSRecord]$

Build a set of address records and NSEC records for non-present record types.

```
get_name() \rightarrow str
```

Name accessor

ip_addresses_by_version(version: IPVersion)

List ip_address objects matching IP version.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

```
load_from_cache(zc: Zeroconf, now: float_ | None = None) \rightarrow bool
```

Populate the service info from the cache.

This method is designed to be threadsafe.

name

The name of the service.

```
parsed\_addresses(version: IPVersion = IPVersion.All) \rightarrow list[str]
```

List addresses in their parsed string form.

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

```
parsed\_scoped\_addresses(version: IPVersion = IPVersion.All) \rightarrow list[str]
```

Equivalent to parsed_addresses, with the exception that IPv6 Link-Local addresses are qualified with %<interface_index> when available

Addresses are guaranteed to be returned in LIFO (last in, first out) order with IPv4 addresses first and IPv6 addresses second.

This means the first address will always be the most recently added address of the given IP version.

properties

Return properties as bytes.

```
request(zc: Zeroconf, timeout: float, question_type: DNSQuestionType | None = None, addr: str \mid None = None, port: int = 5353) \rightarrow bool
```

Returns true if the service could be discovered on the network, and updates this object with details discovered.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_request* cannot be completed.

Parameters

• zc – Zeroconf instance

```
• timeout – time in milliseconds to wait for a response
```

```
• question_type – question type to ask
```

- addr address to send the request to
- port port to send the request to

```
set\_server\_if\_missing() \rightarrow None
```

Set the server if it is missing.

This function is for backwards compatibility.

```
update\_record(zc: Zeroconf, now: float, record: DNSRecord) \rightarrow None
```

Update a single record.

This method is deprecated and will be removed in a future version. update_records should be implemented instead

AFL.automation.shared.ServerDiscovery.ServiceStateChange

```
Bases: Enum
__init__(*args, **kwds)
```

Attributes

```
Added
Removed
Updated
```

```
Added = 1
```

Removed = 2

Updated = 3

classmethod __contains__(member)

Return True if member is a member of this enum raises TypeError if member is not an enum member

note: in 3.12 TypeError will no longer be raised, and True will also be returned if member is the value of a member in this enum

classmethod __getitem__(name)

Return the member matching *name*.

classmethod __iter__()

Return members in definition order.

classmethod __len__()

Return the number of members (no aliases)

AFL.automation.shared.ServerDiscovery.Zeroconf

class AFL.automation.shared.ServerDiscovery.Zeroconf(interfaces: Sequence[str | int | tuple[tuple[str,

int, int], int]] | InterfaceChoice =
InterfaceChoice.All, unicast: bool = False,
ip_version: IPVersion | None = None,
apple_p2p: bool = False)

Bases: QuietLogger

Implementation of Zeroconf Multicast DNS Service Discovery

Supports registration, unregistration, queries and browsing.

```
__init__(interfaces: Sequence[str | int | tuple[tuple[str, int, int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False) \rightarrow None
```

Creates an instance of the Zeroconf class, establishing multicast communications, listening and reaping threads.

Parameters

• **interfaces** – InterfaceChoice or a list of IP addresses (IPv4 and IPv6) and interface indexes (IPv6 only).

IPv6 notes for non-POSIX systems: * InterfaceChoice.All is an alias for Interface-Choice.Default

on Python versions before 3.8.

Also listening on loopback (::1) doesn't work, use a real address.

- **ip_version** IP versions to support. If *choice* is a list, the default is detected from it. Otherwise defaults to V4 only for backward compatibility.
- apple_p2p use AWDL interface (only macOS)

Methods

init([interfaces, unicast, ip_version,])	Creates an instance of the Zeroconf class, establishing multicast communications, listening and reaping threads.
<pre>add_listener(listener, question)</pre>	Adds a listener for a given question.
<pre>add_service_listener(type_, listener)</pre>	Adds a listener for a particular service type.
<pre>async_add_listener(listener, question)</pre>	Adds a listener for a given question.
<pre>async_check_service(info, allow_name_change)</pre>	Checks the network for a unique service name, modifying the ServiceInfo passed in if it is not unique.
<pre>async_get_service_info(type_, name[,])</pre>	Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.
<pre>async_notify_all()</pre>	Schedule an async_notify_all.
<pre>async_register_service(info[, ttl,])</pre>	Registers service information to the network with a default TTL.
<pre>async_remove_listener(listener)</pre>	Removes a listener.
<pre>async_send(out[, addr, port, v6_flow_scope,])</pre>	Sends an outgoing packet.
<pre>async_unregister_all_services()</pre>	Unregister all registered services.
async_unregister_service(info)	Unregister a service.

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async_update_service(info)	Registers service information to the network with a default TTL.
async_wait(timeout)	Calling task waits for a given number of milliseconds or until notified.
<pre>async_wait_for_start([timeout])</pre>	Wait for start up for actions that require a running Zeroconf instance.
close()	Ends the background threads, and prevent this instance from servicing further queries.
<pre>generate_service_broadcast(info, ttl[,])</pre>	Generate a broadcast to announce a service.
<pre>generate_service_query(info)</pre>	Generate a query to lookup a service.
<pre>generate_unregister_all_services()</pre>	Generate a DNSOutgoing goodbye for all services and remove them from the registry.
<pre>get_service_info(type_, name[, timeout,])</pre>	Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.
log_exception_debug(*logger_data)	
<pre>log_exception_once(exc, *args)</pre>	
<pre>log_exception_warning(*logger_data)</pre>	
log_warning_once(*args)	
notify_all()	Notifies all waiting threads and notify listeners.
register_service(info[, ttl,])	Registers service information to the network with a default TTL.
remove_all_service_listeners()	Removes a listener from the set that is currently listening.
remove_listener(listener)	Removes a listener.
remove_service_listener(listener)	Removes a listener from the set that is currently listening.
<pre>send(out[, addr, port, v6_flow_scope, transport])</pre>	Sends an outgoing packet threadsafe.
start()	Start Zeroconf.
<pre>unregister_all_services()</pre>	Unregister all registered services.
unregister_service(info)	Unregister a service.
update_service(info)	Registers service information to the network with a default TTL.

Attributes

listeners	
started	Check if the instance has started.

__init__(interfaces: Sequence[str | int | tuple[tuple[str, int, int]] | InterfaceChoice = InterfaceChoice.All, unicast: bool = False, ip_version: IPVersion | None = None, apple_p2p: bool = False) \rightarrow None

Creates an instance of the Zeroconf class, establishing multicast communications, listening and reaping threads.

Parameters

• **interfaces** – InterfaceChoice or a list of IP addresses (IPv4 and IPv6) and interface indexes (IPv6 only).

IPv6 notes for non-POSIX systems: * InterfaceChoice.All is an alias for Interface-Choice.Default

on Python versions before 3.8.

Also listening on loopback (::1) doesn't work, use a real address.

- **ip_version** IP versions to support. If *choice* is a list, the default is detected from it. Otherwise defaults to V4 only for backward compatibility.
- apple_p2p use AWDL interface (only macOS)

property started: bool

Check if the instance has started.

```
start() \rightarrow None
```

Start Zeroconf.

```
async async_wait_for_start(timeout: float = 9) \rightarrow None
```

Wait for start up for actions that require a running Zeroconf instance.

Throws NotRunningException if the instance is not running or could not be started.

```
property listeners: set[RecordUpdateListener]
```

```
async async_wait(timeout: float) \rightarrow None
```

Calling task waits for a given number of milliseconds or until notified.

```
notify_all() \rightarrow None
```

Notifies all waiting threads and notify listeners.

```
async_notify_all() \rightarrow None
```

Schedule an async_notify_all.

```
get_service_info(type_: str, name: str, timeout: int = 3000, question_type: DNSQuestionType | None = None) \rightarrow ServiceInfo | None
```

Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.

Parameters

- type fully qualified service type name
- name the name of the service
- timeout milliseconds to wait for a response
- question_type The type of questions to ask (DNSQuestionType.QM or DNSQuestion-Type.QU)

```
add\_service\_listener(type\_: str, listener: ServiceListener) \rightarrow None
```

Adds a listener for a particular service type. This object will then have its add_service and remove_service methods called when services of that type become available and unavailable.

```
remove_service_listener(listener: ServiceListener) → None
```

Removes a listener from the set that is currently listening.

```
remove\_all\_service\_listeners() \rightarrow None
```

Removes a listener from the set that is currently listening.

```
register_service(info: ServiceInfo, ttl: int | None = None, allow_name_change: bool = False, cooperating responders: bool = False, strict: bool = True) \rightarrow None
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service. The name of the service may be changed if needed to make it unique on the network. Additionally multiple cooperating responders can register the same service on the network for resilience (if you want this behavior set *cooperating_responders* to *True*).

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *register service* cannot be completed.

```
async async_register_service(info: ServiceInfo, ttl: int | None = None, allow_name_change: bool = False, cooperating_responders: bool = False, strict: bool = True) \rightarrow Awaitable
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service. The name of the service may be changed if needed to make it unique on the network. Additionally multiple cooperating responders can register the same service on the network for resilience (if you want this behavior set *cooperating responders* to *True*).

```
update_service(info: ServiceInfo) \rightarrow None
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to <code>async_update_service</code> cannot be completed.

```
async async_update_service(info: ServiceInfo) → Awaitable
```

Registers service information to the network with a default TTL. Zeroconf will then respond to requests for information for that service.

```
async async_get_service_info(type_: str, name: str, timeout: int = 3000, question_type: DNSQuestionType \mid None = None) \rightarrow AsyncServiceInfo \mid None
```

Returns network's service information for a particular name and type, or None if no service matches by the timeout, which defaults to 3 seconds.

Parameters

- **type** fully qualified service type name
- name the name of the service
- timeout milliseconds to wait for a response
- question_type The type of questions to ask (DNSQuestionType.QM or DNSQuestion-Type.QU)

```
\begin{tabular}{ll} \begin{tabular}{ll} \textbf{generate\_service\_broadcast}(info: ServiceInfo, ttl: int \mid None, broadcast\_addresses: bool = True) \rightarrow \\ DNSOutgoing \end{tabular}
```

Generate a broadcast to announce a service.

```
generate\_service\_query(info: ServiceInfo) \rightarrow DNSOutgoing
```

Generate a query to lookup a service.

```
unregister\_service(info: ServiceInfo) \rightarrow None
```

Unregister a service.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_unregister_service* cannot be completed.

```
async async_unregister_service(info: ServiceInfo) → Awaitable
```

Unregister a service.

```
generate\_unregister\_all\_services() \rightarrow DNSOutgoing | None
```

Generate a DNSOutgoing goodbye for all services and remove them from the registry.

```
async async_unregister_all_services() \rightarrow None
```

Unregister all registered services.

Unlike async_register_service and async_unregister_service, this method does not return a future and is always expected to be awaited since its only called at shutdown.

```
unregister_all_services() \rightarrow None
```

Unregister all registered services.

While it is not expected during normal operation, this function may raise EventLoopBlocked if the underlying call to *async_unregister_all_services* cannot be completed.

```
async async_check_service(info: ServiceInfo, allow_name_change: bool, cooperating_responders: bool = False, strict: bool = True) \rightarrow None
```

Checks the network for a unique service name, modifying the ServiceInfo passed in if it is not unique.

```
\textbf{add\_listener}(\textit{listener: RecordUpdateListener, question: DNSQuestion} \mid \textit{list[DNSQuestion]} \mid \textit{None}) \rightarrow \\ \textbf{None}
```

Adds a listener for a given question. The listener will have its update_record method called when information is available to answer the question(s).

This function is threadsafe

```
remove\_listener(listener: RecordUpdateListener) \rightarrow None
```

Removes a listener.

This function is threadsafe

```
 \textbf{async\_add\_listener}. \ \textit{RecordUpdateListener}, \ \textit{question: DNSQuestion} \ | \ \textit{list[DNSQuestion]} \ | \ \textit{None} ) \\ \rightarrow \text{None}
```

Adds a listener for a given question. The listener will have its update_record method called when information is available to answer the question(s).

This function is not threadsafe and must be called in the eventloop.

```
async\_remove\_listener(listener: RecordUpdateListener) \rightarrow None
```

Removes a listener.

This function is not threadsafe and must be called in the eventloop.

```
send(out: DNSOutgoing, addr: str \mid None = None, port: int = 5353, v6_flow_scope: tuple[()] \mid tuple[int, int] = (), transport: _WrappedTransport | None = None) <math>\rightarrow None
```

Sends an outgoing packet threadsafe.

```
async_send(out: DNSOutgoing, addr: str \mid None = None, port: int = 5353, v6_flow_scope: tuple[()] \mid tuple[int, int] = (), transport: _WrappedTransport | None = None) <math>\rightarrow None
```

Sends an outgoing packet.

```
close() \rightarrow None
```

Ends the background threads, and prevent this instance from servicing further queries.

This method is idempotent and irreversible.

```
classmethod log_exception_debug(*logger\_data: Any) \rightarrow None
     classmethod log_exception_once(exc: Exception, *args: Any) \rightarrow None
     classmethod log_exception_warning(*logger\_data: Any) \rightarrow None
     classmethod log_warning_once(*args: Any) \rightarrow None
class AFL.automation.shared.ServerDiscovery.RunThread(coro)
      __init__(coro)
           This constructor should always be called with keyword arguments. Arguments are:
           group should be None; reserved for future extension when a ThreadGroup class is implemented.
           target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.
           name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a
           small decimal number.
           args is a list or tuple of arguments for the target invocation. Defaults to ().
           kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.
           If a subclass overrides the constructor, it must make sure to invoke the base class constructor
           (Thread.__init__()) before doing anything else to the thread.
     run()
           Method representing the thread's activity.
           You may override this method in a subclass. The standard run() method invokes the callable object passed
           to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from
           the args and kwargs arguments, respectively.
class AFL.automation.shared.ServerDiscovery.ServerDiscovery
     ServerDiscovery class
     This class is used to discover AFL servers on the network using zeroconf requests that match a particular speci-
     fication.
     __init__()
     on_service_state_change(zeroconf: Zeroconf, service_type: str, name: str, state_change:
                                    ServiceStateChange) \rightarrow None
     async manage_service_info_to_list(zeroconf, service_type, name, append_or_remove)
     async get_service_info(zeroconf: Zeroconf, service_type: str, name: str) \rightarrow None
     async aio_find_server_by_name(service_name)
     discover_server_by_name(service name)
           Does a zeroconf request to find a named AFL-automation server on the network.
```

Returns a tuple of (hostname:port string,ServiceInfo object) if found, None if not found.

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

async classmethod sa_aio_discover_server_by_name(service_name)

classmethod sa_discover_server_by_name(service_name)

Does a zeroconf request to find a named AFL-automation server on the network.

Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

find_server_by_name(service name)

Disambiguator for either matching or discovering a specific server by name

match_server_by_name(service name)

Looks through the registry of discovered services for an exact name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

find_server_by_partial_name(service_name)

Looks through the registry of discovered services for a partial name match. Returns a tuple of (host-name:port string, ServiceInfo object) if found, None if not found.

find_server_by_property_match(property_name, property_value)

Looks through the registry of discovered services for a partial match in a property string. Returns a tuple of (hostname:port string, ServiceInfo object) if found, None if not found.

AFL.automation.shared.exceptions

Exceptions

EmptyException	Raised when a mixture runs out of mass or volume
MixingException	Raised when a mixture cannot be made
NoDeviceFoundException	Raised when no matching device can be found on the selected port
NotFoundError	
SerialCommsException	Raised when the system receives a serial response it can't parse, likely a garbled line

AFL.automation.shared.exceptions.EmptyException

exception AFL.automation.shared.exceptions.EmptyException

Raised when a mixture runs out of mass or volume

AFL.automation.shared.exceptions.MixingException

exception AFL.automation.shared.exceptions.MixingException

Raised when a mixture cannot be made

AFL.automation.shared.exceptions.NoDeviceFoundException

 $\textbf{exception} \hspace{0.1cm} \textbf{AFL.automation.shared.exceptions.} \textbf{NoDeviceFoundException} \\$

Raised when no matching device can be found on the selected port

AFL.automation.shared.exceptions.NotFoundError

exception AFL.automation.shared.exceptions.NotFoundError

AFL.automation.shared.exceptions.SerialCommsException

exception AFL.automation.shared.exceptions.SerialCommsException

Raised when the system receives a serial response it can't parse, likely a garbled line

exception AFL.automation.shared.exceptions.EmptyException

Raised when a mixture runs out of mass or volume

exception AFL.automation.shared.exceptions.MixingException

Raised when a mixture cannot be made

exception AFL.automation.shared.exceptions.SerialCommsException

Raised when the system receives a serial response it can't parse, likely a garbled line

exception AFL.automation.shared.exceptions.NoDeviceFoundException

Raised when no matching device can be found on the selected port

exception AFL.automation.shared.exceptions.NotFoundError

AFL.automation.shared.serialization

Functions

deserialize(pickled_str)

is_serialized(obj)

serialize(obj)

AFL.automation.shared.serialization.deserialize

AFL.automation.shared.serialization.deserialize(pickled_str)

AFL.automation.shared.serialization.is serialized

AFL.automation.shared.serialization.is_serialized(obj)

AFL.automation.shared.serialization.serialize

AFL.automation.shared.serialization.serialize(obj)

Exceptions

UnpicklingError

AFL.automation.shared.serialization.UnpicklingError

exception AFL.automation.shared.serialization.UnpicklingError

AFL.automation.shared.serialization.serialize(obj)

AFL.automation.shared.serialization.is_serialized(obj)

AFL.automation.shared.serialization.deserialize(pickled_str)

AFL.automation.shared.units

Functions

enforce_units(value, unit_type)	Ensure that a number has units and convert to the default_units
<pre>get_unit_type(value)</pre>	
has_units(value)	
is_concentration(value)	
is_density(value)	
is_mass(value)	
is_molarity(value)	
is_volume(value)	

AFL.automation.shared.units.enforce_units

AFL.automation.shared.units.enforce_units(value, unit_type)

Ensure that a number has units and convert to the default_units

AFL.automation.shared.units.get_unit_type

AFL.automation.shared.units.get_unit_type(value)

AFL.automation.shared.units.has_units

AFL.automation.shared.units.has_units(value)

AFL.automation.shared.units.is_concentration

AFL.automation.shared.units.is_concentration(value)

AFL.automation.shared.units.is_density

AFL.automation.shared.units.is_density(value)

AFL.automation.shared.units.is_mass

AFL.automation.shared.units.is_mass(value)

AFL.automation.shared.units.is_molarity

```
AFL.automation.shared.units.is_molarity(value)
```

AFL.automation.shared.units.is_volume

```
AFL.automation.shared.units.is_volume(value)
```

AFL.automation.shared.units.has_units(value)

AFL.automation.shared.units.is_volume(value)

AFL.automation.shared.units.is_molarity(value)

AFL.automation.shared.units.is_mass(value)

AFL.automation.shared.units.is_density(value)

AFL.automation.shared.units.is_concentration(value)

AFL.automation.shared.units.get_unit_type(value)

AFL.automation.shared.units.enforce_units(value, unit_type)

Ensure that a number has units and convert to the default_units

AFL.automation.shared.utilities

Functions

```
has_units(value)

listify(obj)

makeRegistar()

mpl_plot_to_bytes([fig, format])

tprint(in_str)

xarray_to_bytes(ds[, format])
```

AFL.automation.shared.utilities.has units

AFL.automation.shared.utilities.has_units(value)

AFL.automation.shared.utilities.listify

AFL.automation.shared.utilities.listify(obj)

AFL.automation.shared.utilities.makeRegistar

AFL.automation.shared.utilities.makeRegistar()

AFL.automation.shared.utilities.mpl_plot_to_bytes

AFL.automation.shared.utilities.mpl_plot_to_bytes(fig=None, format='svg')

AFL.automation.shared.utilities.tprint

AFL.automation.shared.utilities.tprint(in_str)

AFL.automation.shared.utilities.xarray_to_bytes

```
AFL.automation.shared.utilities.xarray_to_bytes(ds, format='svg')
```

AFL.automation.shared.utilities.listify(obj)

AFL.automation.shared.utilities.tprint(in_str)

AFL.automation.shared.utilities.makeRegistar()

AFL.automation.shared.utilities.mpl_plot_to_bytes(fig=None, format='svg')

AFL.automation.shared.utilities.xarray_to_bytes(ds, format='svg')

AFL.automation.shared.widgetui

Functions

clear_output([wait])	Clear the output of the current cell receiving output.
<pre>client_construct_ui(self[, return_ui,])</pre>	
<pre>display(*objs[, include, exclude, metadata,])</pre>	Display a Python object in all frontends.

AFL.automation.shared.widgetui.clear_output

AFL.automation.shared.widgetui.clear_output(wait=False)

Clear the output of the current cell receiving output.

Parameters

wait (bool [default: false]) — Wait to clear the output until new output is available to replace it.

AFL.automation.shared.widgetui.client_construct_ui

AFL.automation.shared.widgetui.client_construct_ui(self, return_ui=False, display_ui=True)

AFL.automation.shared.widgetui.display

AFL.automation.shared.widgetui.display(*objs, include=None, exclude=None, metadata=None, transient=None, display_id=None, raw=False, clear=False, **kwargs)

Display a Python object in all frontends.

By default all representations will be computed and sent to the frontends. Frontends can decide which representation is used and how.

In terminal IPython this will be similar to using print(), for use in richer frontends see Jupyter notebook examples with rich display logic.

Parameters

- *objs (object) The Python objects to display.
- raw (bool, optional) Are the objects to be displayed already mimetype-keyed dicts of raw display data, or Python objects that need to be formatted before display? [default: False]
- **include** (*list*, *tuple or set*, *optional*) A list of format type strings (MIME types) to include in the format data dict. If this is set *only* the format types included in this list will be computed.
- **exclude** (*list*, *tuple or set*, *optional*) A list of format type strings (MIME types) to exclude in the format data dict. If this is set all format types will be computed, except for those included in this argument.
- metadata (dict, optional) A dictionary of metadata to associate with the output.
 mime-type keys in this dictionary will be associated with the individual representation formats, if they exist.
- **transient** (*dict*, *optional*) A dictionary of transient data to associate with the output. Data in this dict should not be persisted to files (e.g. notebooks).
- **display_id**(*str*, *bool optional*) Set an id for the display. This id can be used for updating this display area later via update_display. If given as *True*, generate a new *display_id*
- **clear** (*bool*, *optional*) Should the output area be cleared before displaying anything? If True, this will wait for additional output before clearing. [default: False]
- **kwargs (additional keyword-args, optional) Additional keyword-arguments are passed through to the display publisher.

Returns

handle – Returns a handle on updatable displays for use with update_display(), if *display_id* is given. Returns None if no *display_id* is given (default).

Return type

DisplayHandle

Examples

```
>>> class Json(object):
...     def __init__(self, json):
...         self.json = json
...     def _repr_pretty_(self, pp, cycle):
...         import json
...         pp.text(json.dumps(self.json, indent=2))
...         def __repr__(self):
...         return str(self.json)
```

```
>>> d = Json({1:2, 3: {4:5}})
```

```
>>> print(d)
{1: 2, 3: {4: 5}}
```

```
>>> display(d)
{
    "1": 2,
    "3": {
        "4": 5
    }
}
```

```
>>> def int_formatter(integer, pp, cycle):
... pp.text('I'*integer)
```

```
>>> plain = get_ipython().display_formatter.formatters['text/plain']
>>> plain.for_type(int, int_formatter)
<function _repr_pprint at 0x...>
>>> display(7-5)
II
```

```
>>> del plain.type_printers[int]
>>> display(7-5)
2
```

```
See also
update_display()
```

Notes

In Python, objects can declare their textual representation using the <u>__repr__</u> method. IPython expands on this idea and allows objects to declare other, rich representations including:

- HTML
- JSON
- PNG
- JPEG
- SVG
- LaTeX

A single object can declare some or all of these representations; all are handled by IPython's display system.

The main idea of the first approach is that you have to implement special display methods when you define your class, one for each representation you want to use. Here is a list of the names of the special methods and the values they must return:

- _repr_html_: return raw HTML as a string, or a tuple (see below).
- _repr_json_: return a JSONable dict, or a tuple (see below).

- _repr_jpeg_: return raw JPEG data, or a tuple (see below).
- _repr_png_: return raw PNG data, or a tuple (see below).
- _repr_svg_: return raw SVG data as a string, or a tuple (see below).
- _repr_latex_: return LaTeX commands in a string surrounded by "\$", or a tuple (see below).
- _repr_mimebundle_: return a full mimebundle containing the mapping from all mimetypes to data. Use this for any mime-type not listed above.

The above functions may also return the object's metadata alonside the data. If the metadata is available, the functions will return a tuple containing the data and metadata, in that order. If there is no metadata available, then the functions will return the data only.

When you are directly writing your own classes, you can adapt them for display in IPython by following the above approach. But in practice, you often need to work with existing classes that you can't easily modify.

You can refer to the documentation on integrating with the display system in order to register custom formatters for already existing types (integrating_rich_display).

Added in version 5.4: display available without import

Added in version 6.1: display available without import

Since IPython 5.4 and 6.1 *display()* is automatically made available to the user without import. If you are using display in a document that might be used in a pure python context or with older version of IPython, use the following import at the top of your file:

```
from IPython.display import display
```

Classes

Markdown([data, url, filename, metadata])

AFL.automation.shared.widgetui.Markdown

Bases: TextDisplayObject

__init__(data=None, url=None, filename=None, metadata=None)

Create a display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. The MIME type of the data should match the subclasses used, so the Png subclass should be used for 'image/png' data. If the data is a URL, the data will first be downloaded and then displayed.

Parameters

- data (unicode, str or bytes) The raw data or a URL or file to load the data from
- **url** (*unicode*) A URL to download the data from.
- **filename** (*unicode*) Path to a local file to load the data from.
- **metadata** (*dict*) Dict of metadata associated to be the object when displayed

Methods

init([data, url, filename, metadata])	Create a display object given raw data.
reload()	Reload the raw data from file or URL.

Attributes

metadata

__init__(data=None, url=None, filename=None, metadata=None)

Create a display object given raw data.

When this object is returned by an expression or passed to the display function, it will result in the data being displayed in the frontend. The MIME type of the data should match the subclasses used, so the Png subclass should be used for 'image/png' data. If the data is a URL, the data will first be downloaded and then displayed.

Parameters

- data (unicode, str or bytes) The raw data or a URL or file to load the data from
- url (unicode) A URL to download the data from.
- **filename** (*unicode*) Path to a local file to load the data from.
- **metadata** (*dict*) Dict of metadata associated to be the object when displayed

metadata = None

reload()

Reload the raw data from file or URL.

 ${\tt AFL.automation.shared.widgetui.client_construct_ui} (\textit{self}, \textit{return_ui} = \textit{False}, \textit{display_ui} = \textit{True})$

CHAPTER

SEVEN

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AFL.automation.instrument

AFL.automation.loading

AFL.automation.prepare

AFL.automation.sample

AFL.automation.sample

7.1 AFL.automation

Functions

test() Run all tests using pytest.

7.1.1 AFL.automation.test

AFL.automation.test()

AFL.automation.test()

Run all tests using pytest.

Run all tests using pytest.

Modules

APIServer

EpicsADLiveProcess

instrument

loading

prepare

sample_env

shared

7.1.2 AFL.automation.EpicsADLiveProcess

Modules

AreaDetectorLive

Client

ReduceDaemon

AFL.automation.EpicsADLiveProcess.AreaDetectorLive

Classes

AreaDetectorLive([basepv, cam, filewriter, ...])

AFL.automation.EpicsADLiveProcess.AreaDetectorLive.AreaDetectorLive

```
Bases: object
__init__(basepv='PIL5:', cam='cam1:', filewriter='TIFF1:', image='image1:')
```

Methods

```
__init__([basepv, cam, filewriter, image])
      cbfunc([pvname, value, char_value])
      queuehandler()
      status()
     __init__(basepv='PIL5:', cam='cam1:', filewriter='TIFF1:', image='image1:')
     cbfunc(pvname=None, value=None, char_value=None, **kwargs)
     queuehandler()
     status()
class AFL.automation.EpicsADLiveProcess.AreaDetectorLive.AreaDetectorLive(basepv='PIL5:',
                                                                                     cam='cam1:',
                                                                                    filewriter='TIFF1:',
                                                                                     image='image1:')
     __init__(basepv='PIL5:', cam='cam1:', filewriter='TIFF1:', image='image1:')
     cbfunc(pvname=None, value=None, char_value=None, **kwargs)
     queuehandler()
     status()
```

AFL.automation.EpicsADLiveProcess.Client

Classes

```
Client([ip, port])
```

Communicate with NistoRoboto server on OT-2

AFL.automation.EpicsADLiveProcess.Client.Client

```
class AFL.automation.EpicsADLiveProcess.Client.Client(ip='10.42.0.30', port='5000')
    Bases: object
    Communicate with NistoRoboto server on OT-2
    This class maps pipettor functions to HTTP REST requests that are sent to the NistoRoboto server
    __init__(ip='10.42.0.30', port='5000')
```

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Methods

```
__init__([ip, port])
       halt()
       home()
       load_instrument(name, mount, tip_rack_slots)
       load_labware(name, slot)
       logged_in()
       login(username)
       reset()
       set_queue_mode([debug_mode])
       transfer(source, dest, volume[, source_loc, ...])
                                                          Transfer fluid from one location to another
     __init__(ip='10.42.0.30', port='5000')
     logged_in()
     login(username)
     set_queue_mode(debug_mode=True)
     transfer(source, dest, volume, source_loc=None, dest_loc=None)
           Transfer fluid from one location to another
               Parameters
                   • source (str or list of str) - Source wells to transfer from. Wells should be spec-
                     ified as three character strings with the first character being the slot number.
                   • dest (str or list of str) - Destination wells to transfer from. Wells should be spec-
                     ified as three character strings with the first character being the slot number.
                   • volume (float) – volume of fluid to transfer in microliters
     load_labware(name, slot)
     load_instrument(name, mount, tip_rack_slots)
     reset()
     home()
     halt()
class AFL.automation.EpicsADLiveProcess.Client.Client(ip='10.42.0.30', port='5000')
```

This class maps pipettor functions to HTTP REST requests that are sent to the NistoRoboto server

Communicate with NistoRoboto server on OT-2

```
__init__(ip='10.42.0.30', port='5000')
logged_in()
login(username)
set_queue_mode(debug_mode=True)
transfer(source, dest, volume, source_loc=None, dest_loc=None)
    Transfer fluid from one location to another
```

Parameters

- **source** (*str or list of str*) Source wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **dest**(str or list of str) Destination wells to transfer from. Wells should be specified as three character strings with the first character being the slot number.
- **volume** (*float*) volume of fluid to transfer in microliters

```
load_labware(name, slot)
load_instrument(name, mount, tip_rack_slots)
reset()
home()
halt()
```

AFL.automation.EpicsADLiveProcess.ReduceDaemon

Classes

```
ReduceDaemon(app, reduction_queue, ...[, ...])
```

AFL.automation.EpicsADLiveProcess.ReduceDaemon.ReduceDaemon

```
Bases: Thread
```

```
__init__(app, reduction_queue, integrator, results, mask=None, npts=500)
```

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

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Methods

init(app, reduction_queue, integrator,)	This constructor should always be called with keyword arguments.
<pre>getName()</pre>	Return a string used for identification purposes only.
isDaemon()	Return whether this thread is a daemon.
is_alive()	Return whether the thread is alive.
<pre>join([timeout])</pre>	Wait until the thread terminates.
run()	Method representing the thread's activity.
setDaemon(daemonic)	Set whether this thread is a daemon.
setName(name)	Set the name string for this thread.
start()	Start the thread's activity.
terminate()	

Attributes

daemon	A boolean value indicating whether this thread is a daemon thread.
ident	Thread identifier of this thread or None if it has not been started.
name	A string used for identification purposes only.
native_id	Native integral thread ID of this thread, or None if it has not been started.

__init__(app, reduction_queue, integrator, results, mask=None, npts=500)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

setDaemon(daemonic)

Set whether this thread is a daemon.

This method is deprecated, use the .daemon property instead.

setName(name)

Set the name string for this thread.

This method is deprecated, use the name attribute instead.

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start()

Start the thread's activity.

It must be called at most once per thread object. It arranges for the object's run() method to be invoked in a separate thread of control.

This method will raise a RuntimeError if called more than once on the same thread object.

__init__(app, reduction_queue, integrator, results, mask=None, npts=500)

This constructor should always be called with keyword arguments. Arguments are:

group should be None; reserved for future extension when a ThreadGroup class is implemented.

target is the callable object to be invoked by the run() method. Defaults to None, meaning nothing is called.

name is the thread name. By default, a unique name is constructed of the form "Thread-N" where N is a small decimal number.

args is a list or tuple of arguments for the target invocation. Defaults to ().

kwargs is a dictionary of keyword arguments for the target invocation. Defaults to {}.

If a subclass overrides the constructor, it must make sure to invoke the base class constructor (Thread.__init__()) before doing anything else to the thread.

terminate()

run()

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

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