Python Device server for SCPI instruments

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What's SCPI?

Standard Commands for Programmable Instruments

From the wikipedia's definition

The *Standard Commands for Programmable Instruments* (SCPI; often pronounced "skippy") defines a standard for syntax and commands to use in controlling programmable test and measurement devices, such as automatic test equipment and electronic test equipment.

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Standard definition

- SCPI-99
- IEEE 488.2-2004

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How it looks like:

```
*IDN?,                  SOURce:FREQuency:STARt?,
*RST,...                SYSTem:COMMunicate:SERial:BAUD 2400
```

Tango Device Servers

What we (all) did with SCPI, or at least what I've seen:

- At least 49 Device Servers identified in the Catalogue

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by Family

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Instrumentation	19
Measurement Instruments	20
Other Instruments	1
Standard Interfaces	1

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alba	7
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[a] ScpiDS multiple instruments

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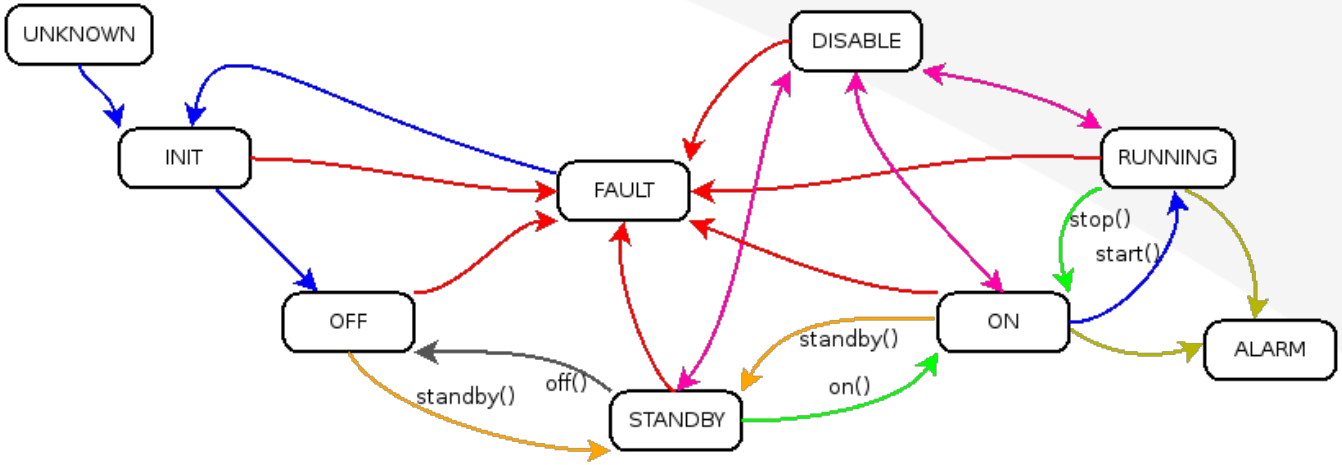
Skippy:

13 instruments
9 manufacturers
4 in progress

[a] ScpiDS multiple instruments

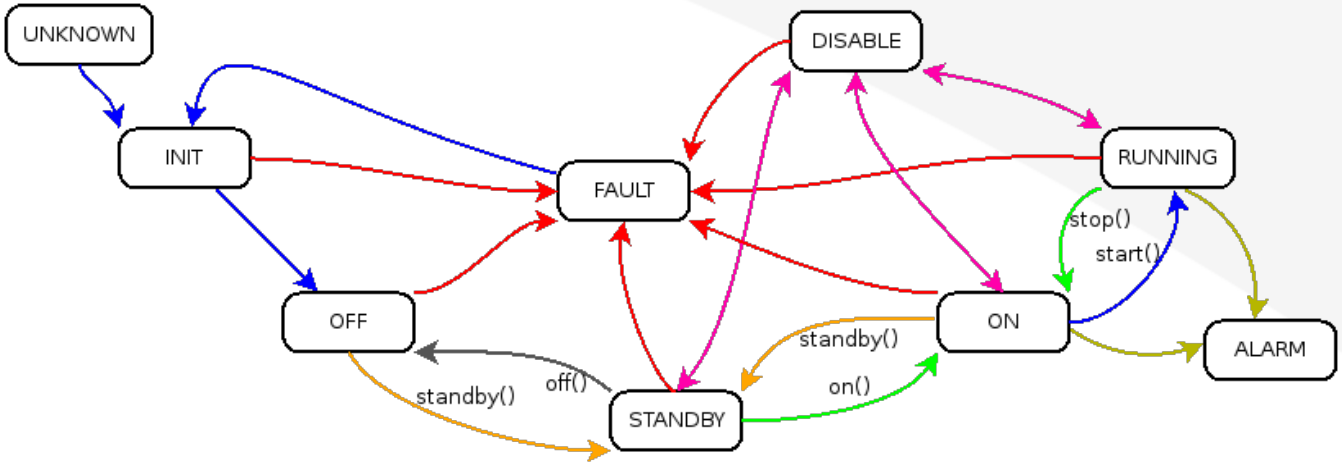
SkippyDS

State machine and tango description



SkippyDS

State machine and tango description



commands

- `IDN()`
- `Off(), Standby(), On()`
- `Start(), Stop()`
- `{Add,Remove}Monitoring()`
- `{Get,Set}MonitoringPeriod()`
- `CMD()`

SkippyDS

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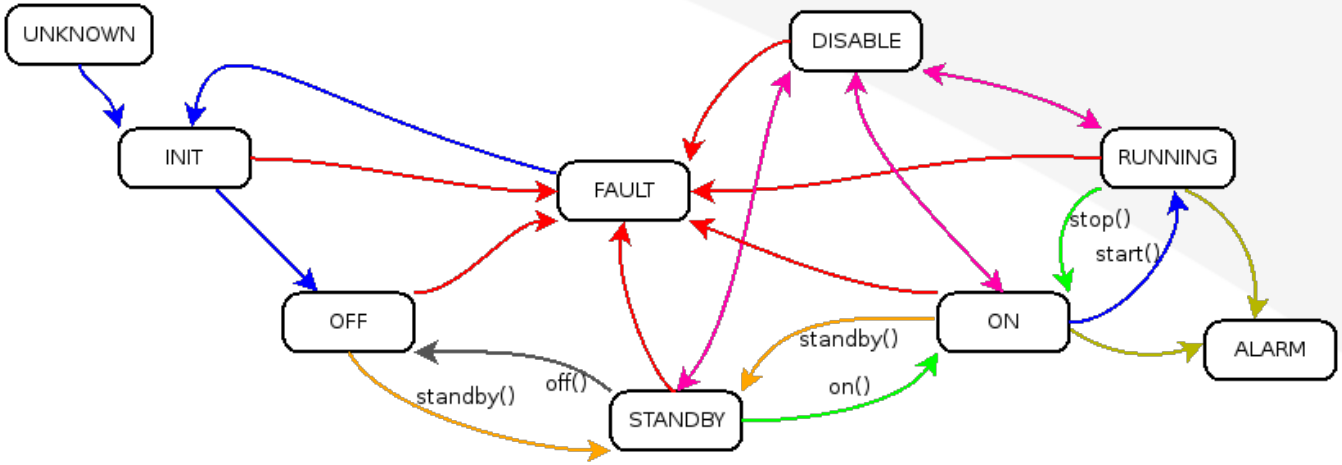

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attributes

- `QueryWindow`
- `TimeStampsThreshold`

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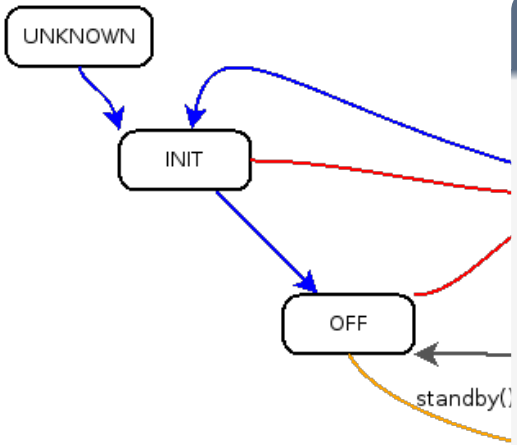

Properties

- Instrument
- Port
- Serial{Baudrate,Bytesize,...}
- Num{Channels,Functions,Multiple}
- MonitoredAttributes
- Auto{Standby,On,Start}
- TxTerminator

commands

- IDN()
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attributes

- QueryWindow
- TimeStampsThreshold

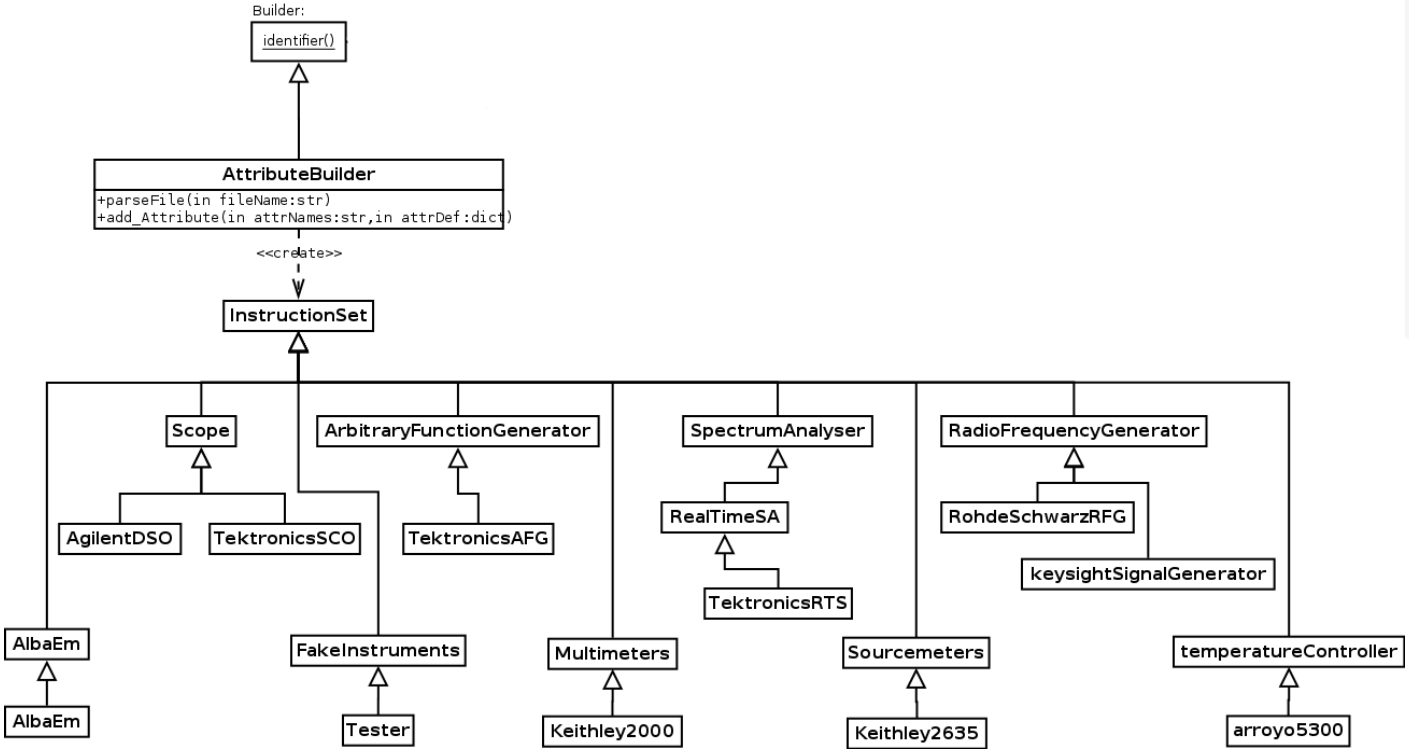
Attribute builder

```
Attribute('IO',
          {'type': PyTango.CmdArgType.DevString,
           'dim': [0],
           'readCmd': lambda mult, num: "%s%.2d:VALU?" % (mult, num),
           'writeCmd': lambda mult, num: (
               lambda value: "%s%.2d:VALU␣%s" % (mult, num, value)),
           'multiple': {'scpiPrefix': 'IOPOrt', 'attrSuffix': 'Port'}
           })
```

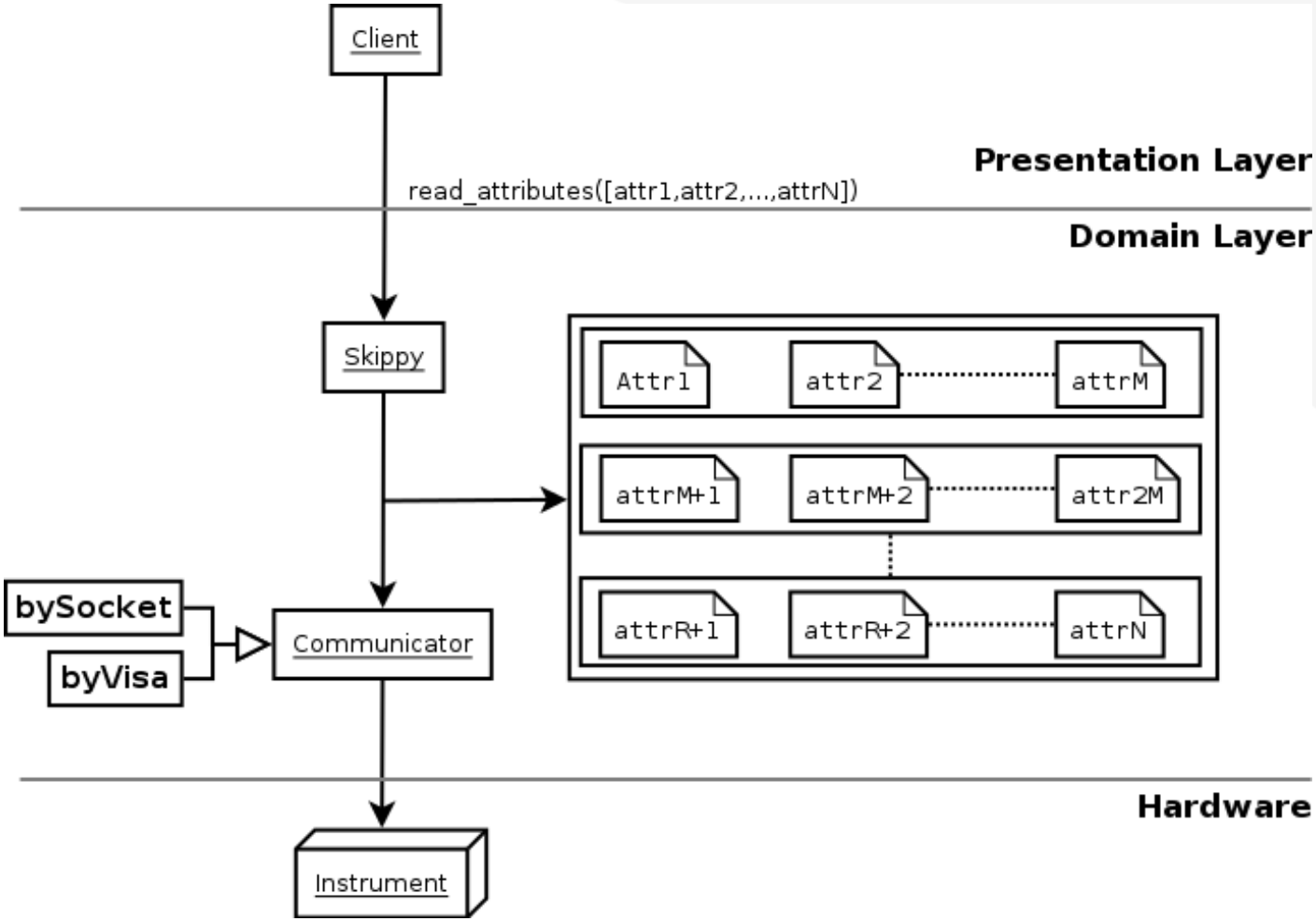
keywords

- type, dim
- label, description,
- format, unit,
- memorized
- min/max
- readCmd, writeCmd
- channels, functions, multiple
- delayAfterWrite
- readFormula

Instrument builder



Instrument requests



Sardana Controller

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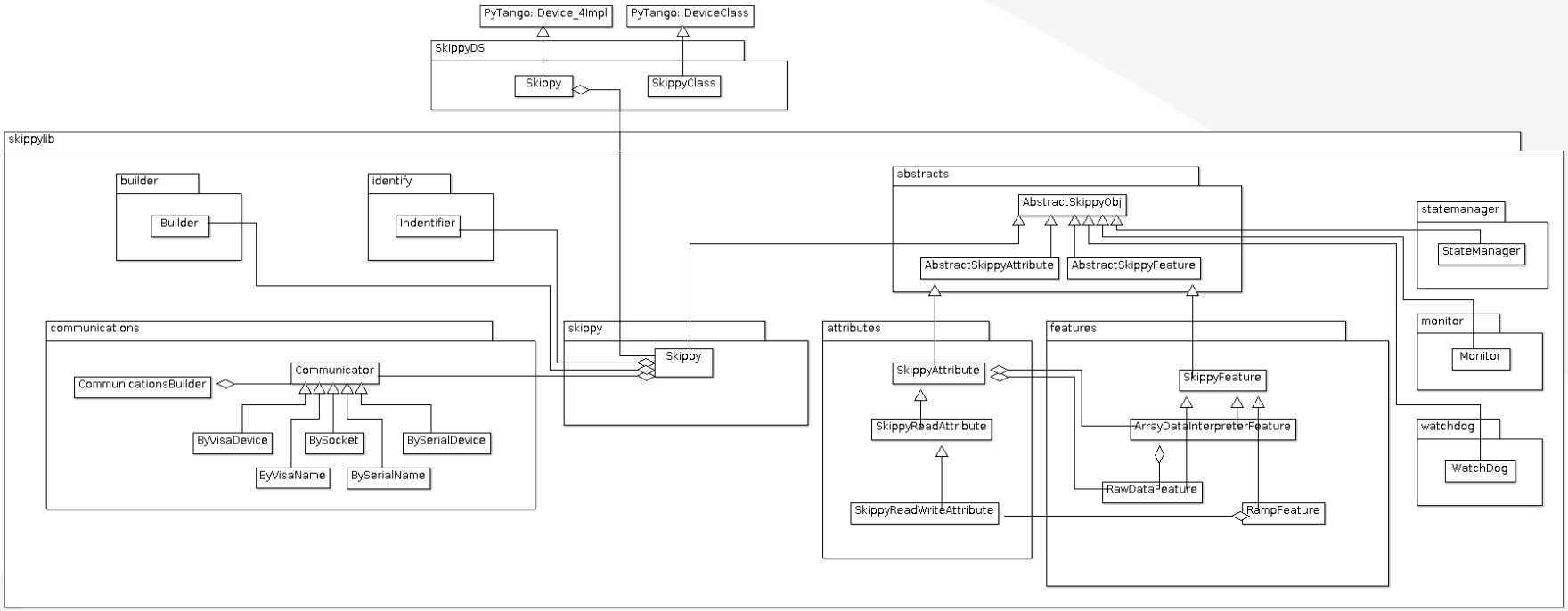
- Again, one specific controller per instrument?
- Reimplement generic features?
- Encapsulate and share the features: a python module

python-skippy module



Software patterns

Strategy pattern on the communications
Singleton on statemanager, monitor and watchdog
Composite in the attributes

python-skippy module

Python console example

```
>>> from skippylib import Skippy
>>> skippyObj = Skippy(name='scodilt0401', port=5025, nChannels=4)
>>> skippyObj.idn
'KEYSIGHT␣TECHNOLOGIES,DSOS204A,MY58150181,06.30.00701'
>>> stateCh1 = skippyObj.attributes['StateCh1']
>>> print("{!r}".format(StateCh1))
StateCh1 (SkippyReadWriteAttribute):
    rvalue: True
    wvalue: None
    timestamp: 1559207397.3
    quality: ATTR_VALID
    type: DevBoolean
    dim: 0
    readCmd: ':CHAN1:DISPlay?'
    readFormula: None
    writeCmd: ':%s%d:DISPlay␣%s'
>>> stateCh1.isRampeable()
False
```

Software patterns

Strategy
Singleton
Composite in the attributes

In practice @ ALBA

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- Master oscillator
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- Beamline & Laboratory instruments
  - Source & Multimeters
  - Pump controller [1]
  - Temperature controller [2]

[1] LN2 pump where J.Andreu has had to write the server side scpi in C#

[2] It doesn't work as scpi but string-like protocol

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- Alba #Em & Music SiPM
  - We close the circle with the scpilib

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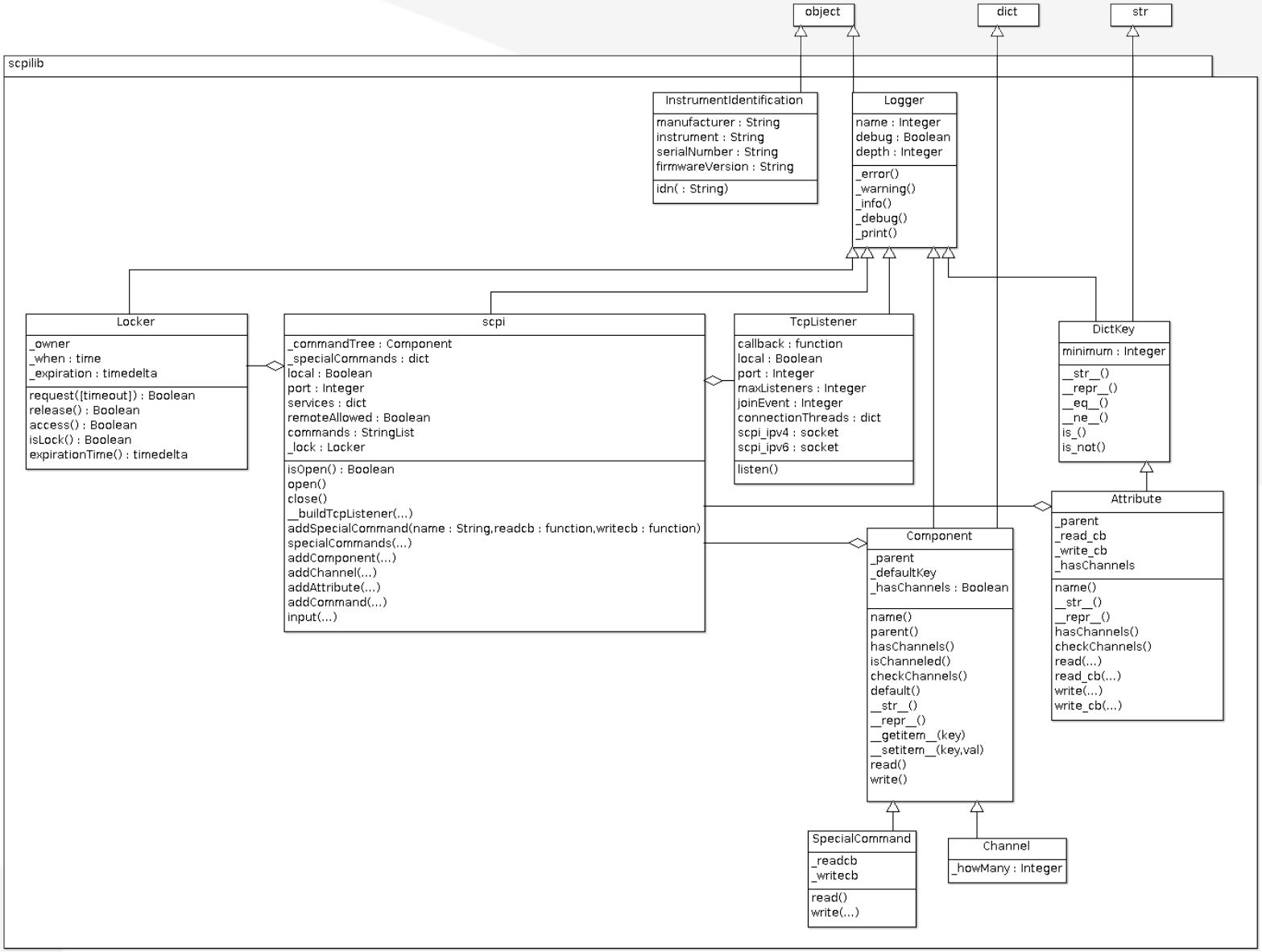
python-scpilib module



Wish & ToDo Lists

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skippylib

- Improve new instrument insertion
- Improve the watchdog
- Dynamic attributes as property
- Dynamic commands
- Generalize *TxTerminator*
- Different ramp strategies
- `WriteFormula`
- input validation
- dependencies with state-like

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- *autodoc* scpi tree
- python3
- Set of *minimal* commands
- Write lock (current is RW)
- Report locker owner
- Extend *lock* feature to subtrees
- Listen more channels than network
- SSL and ACLs
- Event subscription
- multidimensional data

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gui

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