31.4. runpy — Locating and executing Python modules

Source code: Lib/runpy.py

The runpy module is used to locate and run Python modules without importing them first. Its main use is to implement the -m command line switch that allows scripts to be located using the Python module namespace rather than the filesystem.

Note that this is *not* a sandbox module - all code is executed in the current process, and any side effects (such as cached imports of other modules) will remain in place after the functions have returned.

Furthermore, any functions and classes defined by the executed code are not guaranteed to work correctly after a runpy function has returned. If that limitation is not acceptable for a given use case, importlib is likely to be a more suitable choice than this module.

The runpy module provides two functions:

runpy.**run_module**(*mod_name*, *init_globals=None*, *run_name=None*, *alter_sys=False*)

Execute the code of the specified module and return the resulting module globals dictionary. The module's code is first located using the standard import mechanism (refer to **PEP 302** for details) and then executed in a fresh module namespace.

The *mod_name* argument should be an absolute module name. If the module name refers to a package rather than a normal module, then that package is imported and the `__main__` submodule within that package is then executed and the resulting module globals dictionary returned.

The optional dictionary argument *init_globals* may be used to pre-populate the module's globals dictionary before the code is executed. The supplied dictionary will not be modified. If any of the special global variables below are defined in the supplied dictionary, those definitions are overridden by `run_module()`.

The special global variables `__name__`, `__spec__`, `__file__`, `__cached__`, `__loader__` and `__package__` are set in the globals dictionary before the module code is executed (Note that this is a minimal set of variables - other variables may be set implicitly as an interpreter implementation detail).

`__name__` is set to *run_name* if this optional argument is not `None`, to `mod_name + '.__main__'` if the named module is a package and to the *mod_name* argument otherwise.

`__spec__` will be set appropriately for the *actually* imported module (that is, `__spec__.name` will always be *mod_name* or `mod_name + '.__main__`, never *run_name*).

`__file__`, `__cached__`, `__loader__` and `__package__` are set as normal based on the module spec.

If the argument *alter_sys* is supplied and evaluates to `True`, then `sys.argv[0]` is updated with the value of `__file__` and `sys.modules[__name__]` is updated with a temporary module object for the module being executed. Both `sys.argv[0]` and `sys.modules[__name__]` are restored to their original values before the function returns.

Note that this manipulation of `sys` is not thread-safe. Other threads may see the partially initialised module, as well as the altered list of arguments. It is recommended that the `sys` module be left alone when invoking this function from threaded code.

> **See also:** The `-m` option offering equivalent functionality from the command line.

Changed in version 3.1: Added ability to execute packages by looking for a `__main__` submodule.

Changed in version 3.2: Added `__cached__` global variable (see **PEP 3147**).

Changed in version 3.4: Updated to take advantage of the module spec feature added by **PEP 451**. This allows `__cached__` to be set correctly for modules run this way, as well as ensuring the real module name is always accessible as `__spec__.name`.

`runpy.`**`run_path`**(*file_path*, *init_globals=None*, *run_name=None*)

Execute the code at the named filesystem location and return the resulting module globals dictionary. As with a script name supplied to the CPython command line, the supplied path may refer to a Python source file, a compiled bytecode file or a valid sys.path entry containing a `__main__` module (e.g. a zipfile containing a top-level `__main__.py` file).

For a simple script, the specified code is simply executed in a fresh module namespace. For a valid sys.path entry (typically a zipfile or directory), the entry is first added to the beginning of `sys.path`. The function then looks for and executes a `__main__` module using the updated path. Note that there is no special protection against invoking an existing `__main__` entry located elsewhere on `sys.path` if there is no such module at the specified location.

The optional dictionary argument *init_globals* may be used to pre-populate the module's globals dictionary before the code is executed. The supplied dictionary will not be modified. If any of the special global variables below are defined in the supplied dictionary, those definitions are overridden by `run_path()`.

The special global variables `__name__`, `__spec__`, `__file__`, `__cached__`, `__loader__` and `__package__` are set in the globals dictionary before the module code is executed (Note that this is a minimal set of variables - other variables may be set implicitly as an interpreter implementation detail).

`__name__` is set to *run_name* if this optional argument is not `None` and to `'<run_path>'` otherwise.

If the supplied path directly references a script file (whether as source or as precompiled byte code), then `__file__` will be set to the supplied path, and `__spec__`, `__cached__`, `__loader__` and `__package__` will all be set to `None`.

If the supplied path is a reference to a valid sys.path entry, then `__spec__` will be set appropriately for the imported `__main__` module (that is, `__spec__.name` will always be `__main__`). `__file__`, `__cached__`, `__loader__` and `__package__` will be set as normal based on the module spec.

A number of alterations are also made to the `sys` module. Firstly, `sys.path` may be altered as described above. `sys.argv[0]` is updated with the value of `file_path` and `sys.modules[__name__]` is updated with a temporary module object for the module being executed. All modifications to items in `sys` are reverted before the function returns.

Note that, unlike `run_module()`, the alterations made to `sys` are not optional in this function as these adjustments are essential to allowing the execution of sys.path entries. As the thread-safety limitations still apply, use of this function in threaded code should be either serialised with the import lock or delegated to a separate process.

See also: Interface options for equivalent functionality on the command line (`python path/to/script`).

New in version 3.2.

Changed in version 3.4: Updated to take advantage of the module spec feature added by **PEP 451**. This allows `__cached__` to be set correctly in the case where `__main__` is imported from a valid sys.path entry rather than being executed directly.

See also:

PEP 338 – Executing modules as scripts
PEP written and implemented by Nick Coghlan.

PEP 366 – Main module explicit relative imports
PEP written and implemented by Nick Coghlan.

PEP 451 – A ModuleSpec Type for the Import System
PEP written and implemented by Eric Snow

Command line and environment - CPython command line details

The `importlib.import_module()` function