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# Packaging Documentation

*Release 16.9.dev0*

**Donald Stufft**

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Core utilities for Python packages



# CHAPTER 1

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## Installation

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You can install packaging with pip:

```
$ pip install packaging
```





## Version Handling

A core requirement of dealing with packages is the ability to work with versions. [PEP 440](#) defines the standard version scheme for Python packages which has been implemented by this module.

### Usage

```
>>> from packaging.version import Version, parse
>>> v1 = parse("1.0a5")
>>> v2 = Version("1.0")
>>> v1
<Version('1.0a5')>
>>> v2
<Version('1.0')>
>>> v1 < v2
True
>>> v1.is_prerelease
True
>>> v2.is_prerelease
False
>>> Version("french toast")
Traceback (most recent call last):
...
InvalidVersion: Invalid version: 'french toast'
>>> Version("1.0").is_postrelease
False
>>> Version("1.0.post0").is_postrelease
True
```

## Reference

`packaging.version.parse(version)`

This function takes a version string and will parse it as a *Version* if the version is a valid PEP 440 version, otherwise it will parse it as a *LegacyVersion*.

**class** `packaging.version.Version(version)`

This class abstracts handling of a project's versions. It implements the scheme defined in PEP 440. A *Version* instance is comparison aware and can be compared and sorted using the standard Python interfaces.

**Parameters** `version (str)` – The string representation of a version which will be parsed and normalized before use.

**Raises** *InvalidVersion* – If the `version` does not conform to PEP 440 in any way then this exception will be raised.

**public**

A string representing the public version portion of this *Version()*.

**base\_version**

A string representing the base version of this *Version* instance. The base version is the public version of the project without any pre or post release markers.

**local**

A string representing the local version portion of this *Version()* if it has one, or *None* otherwise.

**is\_prerelease**

A boolean value indicating whether this *Version* instance represents a prerelease or a final release.

**is\_postrelease**

A boolean value indicating whether this *Version* instance represents a post-release.

**class** `packaging.version.LegacyVersion(version)`

This class abstracts handling of a project's versions if they are not compatible with the scheme defined in PEP 440. It implements a similar interface to that of *Version*.

This class implements the previous de facto sorting algorithm used by *setuptools*, however it will always sort as less than a *Version* instance.

**Parameters** `version (str)` – The string representation of a version which will be used as is.

**public**

A string representing the public version portion of this *LegacyVersion*. This will always be the entire version string.

**base\_version**

A string representing the base version portion of this *LegacyVersion* instance. This will always be the entire version string.

**local**

This will always be *None* since without PEP 440 we do not have the concept of a local version. It exists primarily to allow a *LegacyVersion* to be used as a stand in for a *Version*.

**is\_prerelease**

A boolean value indicating whether this *LegacyVersion* represents a prerelease or a final release. Since without PEP 440 there is no concept of pre or final releases this will always be *False* and exists for compatibility with *Version*.

**is\_postrelease**

A boolean value indicating whether this *LegacyVersion* represents a post-release. Since without PEP 440 there is no concept of post-releases this will always be *False* and exists for compatibility with *Version*.

**exception** `packaging.version.InvalidVersion`

Raised when attempting to create a `Version` with a version string that does not conform to [PEP 440](#).

`packaging.version.VERSION_PATTERN`

A string containing the regular expression used to match a valid version. The pattern is not anchored at either end, and is intended for embedding in larger expressions (for example, matching a version number as part of a file name). The regular expression should be compiled with the `re.VERBOSE` and `re.IGNORECASE` flags set.

## Specifiers

A core requirement of dealing with dependency is the ability to specify what versions of a dependency are acceptable for you. [PEP 440](#) defines the standard specifier scheme which has been implemented by this module.

## Usage

```
>>> from packaging.specifiers import SpecifierSet
>>> from packaging.version import Version
>>> spec1 = SpecifierSet("~=1.0")
>>> spec1
<SpecifierSet('~=1.0')>
>>> spec2 = SpecifierSet(">=1.0")
>>> spec2
<SpecifierSet('>=1.0')>
>>> # We can combine specifiers
>>> combined_spec = spec1 & spec2
>>> combined_spec
<SpecifierSet('>=1.0,~=1.0')>
>>> # We can also implicitly combine a string specifier
>>> combined_spec &= "!=1.1"
>>> combined_spec
<SpecifierSet('!=1.1,>=1.0,~=1.0')>
>>> # Create a few versions to check for contains.
>>> v1 = Version("1.0a5")
>>> v2 = Version("1.0")
>>> # We can check a version object to see if it falls within a specifier
>>> v1 in combined_spec
False
>>> v2 in combined_spec
True
>>> # We can even do the same with a string based version
>>> "1.4" in combined_spec
True
>>> # Finally we can filter a list of versions to get only those which are
>>> # contained within our specifier.
>>> list(combined_spec.filter([v1, v2, "1.4"]))
[<Version('1.0')>, '1.4']
```

## Reference

**class** `packaging.specifiers.SpecifierSet` (*specifiers, prereleases=None*)

This class abstracts handling specifying the dependencies of a project. It can be passed a single specifier (`>=3.0`), a comma-separated list of specifiers (`>=3.0, !=3.1`), or no specifier at all. Each individ-

ual specifier be attempted to be parsed as a PEP 440 specifier (*Specifier*) or as a legacy, setuptools style specifier (*LegacySpecifier*). You may combine *SpecifierSet* instances using the & operator (`SpecifierSet(">2") & SpecifierSet("<4")`).

Both the membership tests and the combination support using raw strings in place of already instantiated objects.

#### Parameters

- **specifiers** (*str*) – The string representation of a specifier or a comma-separated list of specifiers which will be parsed and normalized before use.
- **prereleases** (*bool*) – This tells the *SpecifierSet* if it should accept prerelease versions if applicable or not. The default of `None` will autodetect it from the given specifiers.

**Raises** *InvalidSpecifier* – If the given specifiers are not parseable than this exception will be raised.

#### **prereleases**

A boolean value indicating whether this *SpecifierSet* represents a specifier that includes a pre-release versions. This can be set to either `True` or `False` to explicitly enable or disable prereleases or it can be set to `None` (the default) to enable autodetection.

#### **\_\_contains\_\_** (*version*)

This is the more Pythonic version of *contains()*, but does not allow you to override the *prereleases* argument. If you need that, use *contains()*.

See *contains()*.

#### **contains** (*version*, *prereleases=None*)

Determines if *version*, which can be either a version string, a *Version*, or a *LegacyVersion* object, is contained within this set of specifiers.

This will either match or not match prereleases based on the *prereleases* parameter. When *prereleases* is set to `None` (the default) it will use the *Specifier().prereleases* attribute to determine if to allow them. Otherwise it will use the boolean value of the passed in value to determine if to allow them or not.

#### **\_\_len\_\_** ()

Returns the number of specifiers in this specifier set.

#### **\_\_iter\_\_** ()

Returns an iterator over all the underlying *Specifier* (or *LegacySpecifier*) instances in this specifier set.

#### **filter** (*iterable*, *prereleases=None*)

Takes an iterable that can contain version strings, *Version*, and *LegacyVersion* instances and will then filter it, returning an iterable that contains only items which match the rules of this specifier object.

This method is smarter than just `filter(Specifier().contains, [...])` because it implements the rule from PEP 440 where a prerelease item SHOULD be accepted if no other versions match the given specifier.

The *prereleases* parameter functions similarly to that of the same parameter in *contains*. If the value is `None` (the default) then it will intelligently decide if to allow prereleases based on the specifier, the *Specifier().prereleases* value, and the PEP 440 rules. Otherwise it will act as a boolean which will enable or disable all prerelease versions from being included.

**class** `packaging.specifiers.Specifier` (*specifier*, *prereleases=None*)

This class abstracts the handling of a single PEP 440 compatible specifier. It is generally not required to instantiate this manually, preferring instead to work with *SpecifierSet*.

#### Parameters

- **specifier** (*str*) – The string representation of a specifier which will be parsed and normalized before use.
- **prereleases** (*bool*) – This tells the specifier if it should accept prerelease versions if applicable or not. The default of `None` will autodetect it from the given specifiers.

**Raises** *InvalidSpecifier* – If the `specifier` does not conform to PEP 440 in any way then this exception will be raised.

**operator**

The string value of the operator part of this specifier.

**version**

The string version of the version part of this specifier.

**prereleases**

See `SpecifierSet.prereleases`.

**\_\_contains\_\_** (*version*)

See `SpecifierSet.__contains__()`.

**contains** (*version, prereleases=None*)

See `SpecifierSet.contains()`.

**filter** (*iterable, prereleases=None*)

See `SpecifierSet.filter()`.

**class** `packaging.specifiers.LegacySpecifier` (*specifier, prereleases=None*)

This class abstracts the handling of a single legacy, `setuptools` style specifier. It is generally not required to instantiate this manually, preferring instead to work with `SpecifierSet`.

**Parameters**

- **specifier** (*str*) – The string representation of a specifier which will be parsed and normalized before use.
- **prereleases** (*bool*) – This tells the specifier if it should accept prerelease versions if applicable or not. The default of `None` will autodetect it from the given specifiers.

**Raises** *InvalidSpecifier* – If the `specifier` is not parseable then this will be raised.

**operator**

The string value of the operator part of this specifier.

**version**

The string version of the version part of this specifier.

**prereleases**

See `SpecifierSet.prereleases`.

**\_\_contains\_\_** (*version*)

See `SpecifierSet.__contains__()`.

**contains** (*version, prereleases=None*)

See `SpecifierSet.contains()`.

**filter** (*iterable, prereleases=None*)

See `SpecifierSet.filter()`.

**exception** `packaging.specifiers.InvalidSpecifier`

Raised when attempting to create a `Specifier` with a specifier string that does not conform to PEP 440.

## Markers

One extra requirement of dealing with dependencies is the ability to specify if it is required depending on the operating system or Python version in use. PEP 508 defines the scheme which has been implemented by this module.

## Usage

```
>>> from packaging.markers import Marker, UndefinedEnvironmentName
>>> marker = Marker("python_version>'2'")
>>> marker
<Marker('python_version > "2"')>
>>> # We can evaluate a marker to see if the dependency is required
>>> marker.evaluate()
True
>>> # We can also override the environment
>>> env = {'python_version': '1.5.4'}
>>> marker.evaluate(environment=env)
False
>>> # Multiple markers can be ANDed
>>> and_marker = Marker("os_name=='a' and os_name=='b'")
>>> and_marker
<Marker('os_name == "a" and os_name == "b"')>
>>> # Multiple markers can be ORed
>>> or_marker = Marker("os_name=='a' or os_name=='b'")
>>> or_marker
<Marker('os_name == "a" or os_name == "b"')>
>>> # Markers can be also used with extras, to pull in dependencies if
>>> # a certain extra is being installed
>>> extra = Marker('extra == "bar"')
>>> # Evaluating an extra marker with no environment is an error
>>> try:
...     extra.evaluate()
... except UndefinedEnvironmentName:
...     pass
>>> extra_environment = {'extra': ''}
>>> extra.evaluate(environment=extra_environment)
False
>>> extra_environment['extra'] = 'bar'
>>> extra.evaluate(environment=extra_environment)
True
```

## Reference

**class** `packaging.markers.Marker` (*markers*)

This class abstracts handling markers for dependencies of a project. It can be passed a single marker or multiple markers that are ANDed or ORed together. Each marker will be parsed according to PEP 508.

**Parameters** `markers` (*str*) – The string representation of a marker or markers.

**Raises** `InvalidMarker` – If the given `markers` are not parseable, then this exception will be raised.

**evaluate** (*environment=None*)

Evaluate the marker given the context of the current Python process.

**Parameters** `environment` (*dict*) – A dictionary containing keys and values to override the detected environment.

**Raises** `UndefinedComparison`: If the marker uses a PEP 440 comparison on strings which are not valid PEP 440 versions.

**Raises** `UndefinedEnvironmentName`: If the marker accesses a value that isn't present inside of the environment dictionary.

**exception** `packaging.markers.InvalidMarker`

Raised when attempting to create a `Marker` with a string that does not conform to PEP 508.

**exception** `packaging.markers.UndefinedComparison`

Raised when attempting to evaluate a `Marker` with a PEP 440 comparison operator against values that are not valid PEP 440 versions.

**exception** `packaging.markers.UndefinedEnvironmentName`

Raised when attempting to evaluate a `Marker` with a value that is missing from the evaluation environment.

## Requirements

Parse a given requirements line for specifying dependencies of a Python project, using [PEP 508](#) which defines the scheme that has been implemented by this module.

## Usage

```
>>> from packaging.requirements import Requirement
>>> simple_req = Requirement("name")
>>> simple_req
<Requirement('name')>
>>> simple_req.name
'name'
>>> simple_req.url is None
True
>>> simple_req.extras
set()
>>> simple_req.specifier
<SpecifierSet('')>
>>> simple_req.marker is None
True
>>> # Requirements can be specified with extras, specifiers and markers
>>> req = Requirement('name[foo]>=2,<3; python_version>"2.0"')
>>> req.name
'name'
>>> req.extras
{'foo'}
>>> req.specifier
<SpecifierSet('<3,>=2')>
>>> req.marker
<Marker('python_version > "2.0"')>
>>> # Requirements can also be specified with a URL, but may not specify
>>> # a version.
>>> url_req = Requirement('name @ https://github.com/pypa ;os_name=="a"')
>>> url_req.name
'name'
>>> url_req.url
```

```
'https://github.com/pypa'  
>>> url_req.extras  
set()  
>>> url_req.marker  
<Marker('os_name == "a"')>
```

## Reference

**class** `packaging.requirements.Requirement` (*requirement*)

This class abstracts handling the details of a requirement for a project. Each requirement will be parsed according to PEP 508.

**Parameters** `requirement` (*str*) – The string representation of a requirement.

**Raises** `InvalidRequirement` – If the given `requirement` is not parseable, then this exception will be raised.

**name**

The name of the requirement.

**url**

The URL, if any where to download the requirement from. Can be None.

**extras**

A set of extras that the requirement specifies.

**specifier**

A `SpecifierSet` of the version specified by the requirement.

**marker**

A `Marker` of the marker for the requirement. Can be None.

**exception** `packaging.requirements.InvalidRequirement`

Raised when attempting to create a `Requirement` with a string that does not conform to PEP 508.

## Utilities

A set of small, helper utilities for dealing with Python packages.

## Reference

`packaging.utils.canonicalize_name` (*name*)

This function takes a valid Python package name, and returns the normalized form of it.

**Parameters** `name` (*str*) – The name to normalize.

```
>>> from packaging.utils import canonicalize_name  
>>> canonicalize_name("Django")  
'django'  
>>> canonicalize_name("oslo.concurrency")  
'oslo-concurrency'  
>>> canonicalize_name("requests")  
'requests'
```



## Development

As an open source project, packaging welcomes contributions of all forms. The sections below will help you get started.

File bugs and feature requests on our issue tracker on [GitHub](#). If it is a bug check out [what to put in your bug report](#).

### Getting started

Working on packaging requires the installation of a small number of development dependencies. These are listed in `dev-requirements.txt` and they can be installed in a [virtualenv](#) using `pip`. Once you've installed the dependencies, install packaging in `editable` mode. For example:

```
$ # Create a virtualenv and activate it
$ pip install --requirement dev-requirements.txt
$ pip install --editable .
```

You are now ready to run the tests and build the documentation.

### Running tests

packaging unit tests are found in the `tests/` directory and are designed to be run using `pytest`. `pytest` will discover the tests automatically, so all you have to do is:

```
$ py.test
...
62746 passed in 220.43 seconds
```

This runs the tests with the default Python interpreter.

You can also verify that the tests pass on other supported Python interpreters. For this we use `tox`, which will automatically create a `virtualenv` for each supported Python version and run the tests. For example:

```
$ tox
...
ERROR: py26: InterpreterNotFound: python2.6
py27: commands succeeded
ERROR: pypy: InterpreterNotFound: pypy
ERROR: py32: InterpreterNotFound: python3.2
py33: commands succeeded
docs: commands succeeded
pep8: commands succeeded
```

You may not have all the required Python versions installed, in which case you will see one or more `InterpreterNotFound` errors.

### Building documentation

packaging documentation is stored in the `docs/` directory. It is written in [reStructured Text](#) and rendered using [Sphinx](#).

Use `tox` to build the documentation. For example:

```
$ tox -e docs
...
docs: commands succeeded
congratulations :)
```

The HTML documentation index can now be found at `docs/_build/html/index.html`.

### Submitting patches

- Always make a new branch for your work.
- Patches should be small to facilitate easier review. [Studies have shown](#) that review quality falls off as patch size grows. Sometimes this will result in many small PRs to land a single large feature.
- Larger changes should be discussed in a ticket before submission.
- New features and significant bug fixes should be documented in the *Changelog*.
- You must have legal permission to distribute any code you contribute and it must be available under both the BSD and Apache Software License Version 2.0 licenses.

If you believe you've identified a security issue in packaging, please follow the directions on the [security page](#).

### Code

When in doubt, refer to [PEP 8](#) for Python code. You can check if your code meets our automated requirements by running `flake8` against it. If you've installed the development requirements this will automatically use our configuration. You can also run the `tox` job with `tox -e pep8`.

Write comments as complete sentences.

Every code file must start with the boilerplate licensing notice:

```
# This file is dual licensed under the terms of the Apache License, Version
# 2.0, and the BSD License. See the LICENSE file in the root of this repository
# for complete details.
```

Additionally, every Python code file must contain

```
from __future__ import absolute_import, division, print_function
```

## Tests

All code changes must be accompanied by unit tests with 100% code coverage (as measured by the combined metrics across our build matrix).

## Documentation

All features should be documented with prose in the `docs` section.

When referring to a hypothetical individual (such as “a person receiving an encrypted message”) use gender neutral pronouns (they/them/their).

Docstrings are typically only used when writing abstract classes, but should be written like this if required:

```
def some_function(some_arg):
    """
    Does some things.

    :param some_arg: Some argument.
    """
```

So, specifically:

- Always use three double quotes.
- Put the three double quotes on their own line.
- No blank line at the end.
- Use Sphinx parameter/attribute documentation [syntax](#).

## Reviewing and merging patches

Everyone is encouraged to review open pull requests. We only ask that you try and think carefully, ask questions and are [excellent to one another](#). Code review is our opportunity to share knowledge, design ideas and make friends.

When reviewing a patch try to keep each of these concepts in mind:

### Architecture

- Is the proposed change being made in the correct place?

### Intent

- What is the change being proposed?
- Do we want this feature or is the bug they’re fixing really a bug?

### Implementation

- Does the change do what the author claims?
- Are there sufficient tests?
- Has it been documented?
- Will this change introduce new bugs?

### Grammar and style

These are small things that are not caught by the automated style checkers.

- Does a variable need a better name?
- Should this be a keyword argument?

## Security

We take the security of packaging seriously. If you believe you've identified a security issue in it, please report it to [donald@stufft.io](mailto:donald@stufft.io). Message may be encrypted with PGP using key fingerprint 7C6B 7C5D 5E2B 6356 A926 F04F 6E3C BCE9 3372 DCFA (this public key is available from most commonly-used key servers).

Once you've submitted an issue via email, you should receive an acknowledgment within 48 hours, and depending on the action to be taken, you may receive further follow-up emails.

## Changelog

### 16.9 - master

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**Note:** This version is not yet released and is under active development.

---

- Drop support for python 2.6 and 3.2
- Define minimal pyparsing version to 2.0.2 (#91).

### 16.8 - 2016-10-29

- Fix markers that utilize `in` so that they render correctly.
- Fix an erroneous test on Python RC releases.

### 16.7 - 2016-04-23

- Add support for the deprecated `python_implementation` marker which was an undocumented `setuptools` marker in addition to the newer markers.

## 16.6 - 2016-03-29

- Add support for the deprecated, PEP 345 environment markers in addition to the newer markers.

## 16.5 - 2016-02-26

- Fix a regression in parsing requirements with whitespaces between the comma separators.

## 16.4 - 2016-02-22

- Fix a regression in parsing requirements like `foo (==4)`.

## 16.3 - 2016-02-21

- Fix a bug where `packaging.requirements.Requirement` was overly strict when matching legacy requirements.

## 16.2 - 2016-02-09

- Add a function that implements the name canonicalization from PEP 503.

## 16.1 - 2016-02-07

- Implement requirement specifiers from PEP 508.

## 16.0 - 2016-01-19

- Relicense so that `packaging` is available under *either* the Apache License, Version 2.0 or a 2 Clause BSD license.
- Support installation of `packaging` when only `distutils` is available.
- Fix `==` comparison when there is a prefix and a local version in play. (#41).
- Implement environment markers from PEP 508.

## 15.3 - 2015-08-01

- Normalize post-release spellings for `rev/r` prefixes. #35

## 15.2 - 2015-05-13

- Fix an error where the arbitrary specifier (`===`) was not correctly allowing pre-releases when it was being used.
- Expose the specifier and version parts through properties on the `Specifier` classes.
- Allow iterating over the `SpecifierSet` to get access to all of the `Specifier` instances.
- Allow testing if a version is contained within a specifier via the `in` operator.

## 15.1 - 2015-04-13

- Fix a logic error that was causing inconsistent answers about whether or not a pre-release was contained within a `SpecifierSet` or not.

## 15.0 - 2015-01-02

- Add `Version().is_postrelease` and `LegacyVersion().is_postrelease` to make it easy to determine if a release is a post release.
- Add `Version().base_version` and `LegacyVersion().base_version` to make it easy to get the public version without any pre or post release markers.
- Support the update to PEP 440 which removed the implied `!=V.*` when using either `>V` or `<V` and which instead special cased the handling of pre-releases, post-releases, and local versions when using `>V` or `<V`.

## 14.5 - 2014-12-17

- Normalize release candidates as `rc` instead of `c`.
- Expose the `VERSION_PATTERN` constant, a regular expression matching a valid version.

## 14.4 - 2014-12-15

- Ensure that versions are normalized before comparison when used in a specifier with a less than (`<`) or greater than (`>`) operator.

## 14.3 - 2014-11-19

- **BACKWARDS INCOMPATIBLE** Refactor specifier support so that it can sanely handle legacy specifiers as well as PEP 440 specifiers.
- **BACKWARDS INCOMPATIBLE** Move the specifier support out of `packaging.version` into `packaging.specifiers`.

## 14.2 - 2014-09-10

- Add prerelease support to `Specifier`.
- Remove the ability to do `item in Specifier()` and replace it with `Specifier().contains(item)` in order to allow flags that signal if a prerelease should be accepted or not.
- Add a method `Specifier().filter()` which will take an iterable and returns an iterable with items that do not match the specifier filtered out.

## 14.1 - 2014-09-08

- Allow `LegacyVersion` and `Version` to be sorted together.
- Add `packaging.version.parse()` to enable easily parsing a version string as either a `Version` or a `LegacyVersion` depending on it's PEP 440 validity.

## 14.0 - 2014-09-05

- Initial release.





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