
Pytest-BDD Documentation

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BDD library for the pytest runner

pytest-bdd implements a subset of the Gherkin language to enable automating project requirements testing and to facilitate behavioral driven development.

Unlike many other BDD tools, it does not require a separate runner and benefits from the power and flexibility of pytest. It enables unifying unit and functional tests, reduces the burden of continuous integration server configuration and allows the reuse of test setups.

Pytest fixtures written for unit tests can be reused for setup and actions mentioned in feature steps with dependency injection. This allows a true BDD just-enough specification of the requirements without maintaining any context object containing the side effects of Gherkin imperative declarations.

1.1 Install pytest-bdd

```
pip install pytest-bdd
```

The minimum required version of pytest is 4.3.

1.2 Example

An example test for a blog hosting software could look like this. Note that `pytest-splinter` is used to get the browser fixture.

```
publish_article.feature:
```

```
Feature: Blog
  A site where you can publish your articles.

  Scenario: Publishing the article
    Given I'm an author user
    And I have an article

    When I go to the article page
    And I press the publish button

    Then I should not see the error message
    And the article should be published # Note: will query the database
```

Note that only one feature is allowed per feature file.

test_publish_article.py:

```
from pytest_bdd import scenario, given, when, then

@scenario('publish_article.feature', 'Publishing the article')
def test_publish():
    pass

@given("I'm an author user")
def author_user(auth, author):
    auth['user'] = author.user

@given("I have an article", target_fixture="article")
def article(author):
    return create_test_article(author=author)

@when("I go to the article page")
def go_to_article(article, browser):
    browser.visit(urljoin(browser.url, '/manage/articles/{0}/'.format(article.id)))

@when("I press the publish button")
def publish_article(browser):
    browser.find_by_css('button[name=publish]').first.click()

@then("I should not see the error message")
def no_error_message(browser):
    with pytest.raises(ElementDoesNotExist):
        browser.find_by_css('.message.error').first

@then("the article should be published")
def article_is_published(article):
    article.refresh() # Refresh the object in the SQLAlchemy session
    assert article.is_published
```

1.3 Scenario decorator

Functions decorated with the *scenario* decorator behave like a normal test function, and they will be executed after all scenario steps.

```
from pytest_bdd import scenario, given, when, then

@scenario('publish_article.feature', 'Publishing the article')
def test_publish(browser):
    assert article.title in browser.html
```

Note: It is however encouraged to try as much as possible to have your logic only inside the Given, When, Then steps.

1.4 Step aliases

Sometimes, one has to declare the same fixtures or steps with different names for better readability. In order to use the same step function with multiple step names simply decorate it multiple times:

```
@given("I have an article")
@given("there's an article")
def article(author, target_fixture="article"):
    return create_test_article(author=author)
```

Note that the given step aliases are independent and will be executed when mentioned.

For example if you associate your resource to some owner or not. Admin user can't be an author of the article, but articles should have a default author.

```
Feature: Resource owner
  Scenario: I'm the author
    Given I'm an author
    And I have an article

  Scenario: I'm the admin
    Given I'm the admin
    And there's an article
```

1.5 Step arguments

Often it's possible to reuse steps giving them a parameter(s). This allows to have single implementation and multiple use, so less code. Also opens the possibility to use same step twice in single scenario and with different arguments! And even more, there are several types of step parameter parsers at your disposal (idea taken from *behave* implementation):

string (the default) This is the default and can be considered as a *null* or *exact* parser. It parses no parameters and matches the step name by equality of strings.

parse (based on: *pypi_parse*) Provides a simple parser that replaces regular expressions for step parameters with a readable syntax like `{param:Type}`. The syntax is inspired by the Python builtin `string.format()`

function. Step parameters must use the named fields syntax of `pypi_parse` in step definitions. The named fields are extracted, optionally type converted and then used as step function arguments. Supports type conversions by using type converters passed via `extra_types`

cfparse (extends: `pypi_parse`, based on: `pypi_parse_type`) Provides an extended parser with “Cardinality Field” (CF) support. Automatically creates missing type converters for related cardinality as long as a type converter for cardinality=1 is provided. Supports parse expressions like: `* {values:Type+}` (cardinality=1..N, many) `* {values:Type*}` (cardinality=0..N, many0) `* {value:Type?}` (cardinality=0..1, optional) Supports type conversions (as above).

re This uses full regular expressions to parse the clause text. You will need to use named groups “(P<name>...)” to define the variables pulled from the text and passed to your `step()` function. Type conversion can only be done via `converters` step decorator argument (see example below).

The default parser is `string`, so just plain one-to-one match to the keyword definition. Parsers except `string`, as well as their optional arguments are specified like:

for `cfparse` parser

```
from pytest_bdd import parsers

@given(
    parsers.cfparse("there are {start:Number} cucumbers",
        extra_types=dict(Number=int)),
    target_fixture="start_cucumbers",
)
def start_cucumbers(start):
    return dict(start=start, eat=0)
```

for `re` parser

```
from pytest_bdd import parsers

@given(
    parsers.re(r"there are (?P<start>\d+) cucumbers"),
    converters=dict(start=int),
    target_fixture="start_cucumbers",
)
def start_cucumbers(start):
    return dict(start=start, eat=0)
```

Example:

```
Feature: Step arguments
  Scenario: Arguments for given, when, then
    Given there are 5 cucumbers

    When I eat 3 cucumbers
    And I eat 2 cucumbers

    Then I should have 0 cucumbers
```

The code will look like:

```
import re
from pytest_bdd import scenario, given, when, then, parsers

@scenario("arguments.feature", "Arguments for given, when, then")
```

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```

def test_arguments():
    pass

@given(parsers.parse("there are {start:d} cucumbers"), target_fixture="start_cucumbers
↪")
def start_cucumbers(start):
    return dict(start=start, eat=0)

@when(parsers.parse("I eat {eat:d} cucumbers"))
def eat_cucumbers(start_cucumbers, eat):
    start_cucumbers["eat"] += eat

@then(parsers.parse("I should have {left:d} cucumbers"))
def should_have_left_cucumbers(start_cucumbers, start, left):
    assert start_cucumbers['start'] == start
    assert start - start_cucumbers['eat'] == left

```

Example code also shows possibility to pass argument converters which may be useful if you need to postprocess step arguments after the parser.

You can implement your own step parser. It's interface is quite simple. The code can look like:

```

import re
from pytest_bdd import given, parsers

class MyParser(parsers.StepParser):
    """Custom parser."""

    def __init__(self, name, **kwargs):
        """Compile regex."""
        super().__init__(name)
        self.regex = re.compile(re.sub("%(.+)%", "(?P<\1>.+)", self.name), **kwargs)

    def parse_arguments(self, name):
        """Get step arguments.

        :return: `dict` of step arguments
        """
        return self.regex.match(name).groupdict()

    def is_matching(self, name):
        """Match given name with the step name."""
        return bool(self.regex.match(name))

@given(parsers.parse("there are %start% cucumbers"), target_fixture="start_cucumbers")
def start_cucumbers(start):
    return dict(start=start, eat=0)

```

1.5.1 Step arguments are fixtures as well!

Step arguments are injected into pytest *request* context as normal fixtures with the names equal to the names of the arguments. This opens a number of possibilities:

- you can access step's argument as a fixture in other step function just by mentioning it as an argument (just like any other pytest fixture)
- if the name of the step argument clashes with existing fixture, it will be overridden by step's argument value; this way you can set/override the value for some fixture deeply inside of the fixture tree in a ad-hoc way by just choosing the proper name for the step argument.

1.6 Override fixtures via given steps

Dependency injection is not a panacea if you have complex structure of your test setup data. Sometimes there's a need such a given step which would imperatively change the fixture only for certain test (scenario), while for other tests it will stay untouched. To allow this, special parameter *target_fixture* exists in the *given* decorator:

```
from pytest_bdd import given

@pytest.fixture
def foo():
    return "foo"

@given("I have injecting given", target_fixture="foo")
def injecting_given():
    return "injected foo"

@then('foo should be "injected foo"')
def foo_is_foo(foo):
    assert foo == 'injected foo'
```

```
Feature: Target fixture
  Scenario: Test given fixture injection
    Given I have injecting given
    Then foo should be "injected foo"
```

In this example existing fixture *foo* will be overridden by given step *I have injecting given* only for scenario it's used in.

Sometimes it is also useful to let *when* and *then* steps to provide a fixture as well. A common use case is when we have to assert the outcome of an HTTP request:

```
# test_blog.py

from pytest_bdd import scenarios, given, when, then

from my_app.models import Article

scenarios("blog.feature")

@given("there is an article", target_fixture="article")
```

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```
def there_is_an_article():
    return Article()

@when("I request the deletion of the article", target_fixture="request_result")
def there_should_be_a_new_article(article, http_client):
    return http_client.delete(f"/articles/{article.uid}")

@then("the request should be successful")
def article_is_published(request_result):
    assert request_result.status_code == 200
```

```
# blog.feature

Feature: Blog
  Scenario: Deleting the article
    Given there is an article

    When I request the deletion of the article

    Then the request should be successful
```

1.7 Multiline steps

As Gherkin, pytest-bdd supports multiline steps (aka [PyStrings](#)). But in much cleaner and powerful way:

```
Feature: Multiline steps
  Scenario: Multiline step using sub indentation
    Given I have a step with:
      Some
      Extra
      Lines
    Then the text should be parsed with correct indentation
```

Step is considered as multiline one, if the **next** line(s) after it's first line, is indented relatively to the first line. The step name is then simply extended by adding further lines with newlines. In the example above, the Given step name will be:

```
'I have a step with:\nSome\nExtra\nLines'
```

You can of course register step using full name (including the newlines), but it seems more practical to use step arguments and capture lines after first line (or some subset of them) into the argument:

```
import re

from pytest_bdd import given, then, scenario, parsers

@scenario(
    'multiline.feature',
    'Multiline step using sub indentation',
)
```

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```
def test_multiline():
    pass

@given(parsers.parse("I have a step with:\n{text}"), target_fixture="i_have_text")
def i_have_text(text):
    return text

@then("the text should be parsed with correct indentation")
def text_should_be_correct(i_have_text, text):
    assert i_have_text == text == 'Some\nExtra\nLines'
```

Note that *then* step definition (*text_should_be_correct*) in this example uses *text* fixture which is provided by a *given* step (*i_have_text*) argument with the same name (*text*). This possibility is described in the *Step arguments are fixtures as well!* section.

1.8 Scenarios shortcut

If you have relatively large set of feature files, it's boring to manually bind scenarios to the tests using the scenario decorator. Of course with the manual approach you get all the power to be able to additionally parametrize the test, give the test function a nice name, document it, etc, but in the majority of the cases you don't need that. Instead you want to bind *all* scenarios found in the *feature* folder(s) recursively automatically. For this - there's a *scenarios* helper.

```
from pytest_bdd import scenarios

# assume 'features' subfolder is in this file's directory
scenarios('features')
```

That's all you need to do to bind all scenarios found in the *features* folder! Note that you can pass multiple paths, and those paths can be either feature files or feature folders.

```
from pytest_bdd import scenarios

# pass multiple paths/files
scenarios('features', 'other_features/some.feature', 'some_other_features')
```

But what if you need to manually bind certain scenario, leaving others to be automatically bound? Just write your scenario in a *normal* way, but ensure you do it *BEFORE* the call of *scenarios* helper.

```
from pytest_bdd import scenario, scenarios

@scenario('features/some.feature', 'Test something')
def test_something():
    pass

# assume 'features' subfolder is in this file's directory
scenarios('features')
```

In the example above *test_something* scenario binding will be kept manual, other scenarios found in the *features* folder will be bound automatically.

1.9 Scenario outlines

Scenarios can be parametrized to cover few cases. In Gherkin the variable templates are written using corner braces as <somevalue>. Gherkin scenario outlines are supported by pytest-bdd exactly as it's described in [be behave docs](#).

Example:

```
Feature: Scenario outlines
  Scenario Outline: Outlined given, when, then
    Given there are <start> cucumbers
    When I eat <eat> cucumbers
    Then I should have <left> cucumbers

    Examples:
    | start | eat | left |
    | 12   | 5  | 7   |
```

pytest-bdd feature file format also supports example tables in different way:

```
Feature: Scenario outlines
  Scenario Outline: Outlined given, when, then
    Given there are <start> cucumbers
    When I eat <eat> cucumbers
    Then I should have <left> cucumbers

    Examples: Vertical
    | start | 12 | 2 |
    | eat   | 5  | 1 |
    | left  | 7  | 1 |
```

This form allows to have tables with lots of columns keeping the maximum text width predictable without significant readability change.

The code will look like:

```
from pytest_bdd import given, when, then, scenario, parsers

@scenario(
    "outline.feature",
    "Outlined given, when, then",
)
def test_outlined():
    pass

@given(parsers.parse("there are {start:d} cucumbers", target_fixture="start_cucumbers
↪"))
def start_cucumbers(start):
    assert isinstance(start, int)
    return dict(start=start)

@when(parsers.parse("I eat {eat:g} cucumbers"))
def eat_cucumbers(start_cucumbers, eat):
    assert isinstance(eat, float)
    start_cucumbers["eat"] = eat
```

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```
@then(parsers.parse("I should have {left} cucumbers"))
def should_have_left_cucumbers(start_cucumbers, start, eat, left):
    assert isinstance(left, str)
    assert start - eat == int(left)
    assert start_cucumbers["start"] == start
    assert start_cucumbers["eat"] == eat
```

Example code also shows possibility to pass example converters which may be useful if you need parameter types different than strings.

1.9.1 Feature examples

It's possible to declare example table once for the whole feature, and it will be shared among all the scenarios of that feature:

```
Feature: Outline

Examples:
| start | eat | left |
| 12    | 5   | 7    |
| 5     | 4   | 1    |

Scenario Outline: Eat cucumbers
  Given there are <start> cucumbers
  When I eat <eat> cucumbers
  Then I should have <left> cucumbers

Scenario Outline: Eat apples
  Given there are <start> apples
  When I eat <eat> apples
  Then I should have <left> apples
```

For some more complex case, you might want to parametrize on both levels: feature and scenario. This is allowed as long as parameter names do not clash:

```
Feature: Outline

Examples:
| start | eat | left |
| 12    | 5   | 7    |
| 5     | 4   | 1    |

Scenario Outline: Eat fruits
  Given there are <start> <fruits>
  When I eat <eat> <fruits>
  Then I should have <left> <fruits>

  Examples:
  | fruits |
  | oranges |
  | apples |

Scenario Outline: Eat vegetables
  Given there are <start> <vegetables>
```

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```

When I eat <eat> <vegetables>
Then I should have <left> <vegetables>

Examples:
| vegetables |
| carrots   |
| tomatoes  |

```

1.9.2 Combine scenario outline and pytest parametrization

It's also possible to parametrize the scenario on the python side. The reason for this is that it is sometimes not needed to mention example table for every scenario.

The code will look like:

```

import pytest
from pytest_bdd import scenario, given, when, then, parsers

# Here we use pytest to parametrize the test with the parameters table
@pytest.mark.parametrize(
    ["start", "eat", "left"],
    [(12, 5, 7)],
)
@scenario(
    "parametrized.feature",
    "Parametrized given, when, then",
)
# Note that we should take the same arguments in the test function that we use
# for the test parametrization either directly or indirectly (fixtures depend on
↳them).
def test_parametrized(start, eat, left):
    """We don't need to do anything here, everything will be managed by the scenario
↳decorator."""

@given(parsers.parse("there are {start:d} cucumbers"), target_fixture="start_cucumbers
↳")
def start_cucumbers(start):
    return dict(start=start)

@when(parsers.parse("I eat {eat:d} cucumbers"))
def eat_cucumbers(start_cucumbers, start, eat):
    start_cucumbers["eat"] = eat

@then(parsers.parse("I should have {left:d} cucumbers"))
def should_have_left_cucumbers(start_cucumbers, start, eat, left):
    assert start - eat == left
    assert start_cucumbers["start"] == start
    assert start_cucumbers["eat"] == eat

```

With a parametrized.feature file:

```

Feature: parametrized
  Scenario: Parametrized given, when, then
    Given there are <start> cucumbers
    When I eat <eat> cucumbers
    Then I should have <left> cucumbers
    
```

The significant downside of this approach is inability to see the test table from the feature file.

1.10 Organizing your scenarios

The more features and scenarios you have, the more important becomes the question about their organization. The things you can do (and that is also a recommended way):

- organize your feature files in the folders by semantic groups:

```

features
├── frontend
│   └── auth
│       └── login.feature
└── backend
    └── auth
        └── login.feature
    
```

This looks fine, but how do you run tests only for certain feature? As pytest-bdd uses pytest, and bdd scenarios are actually normal tests. But test files are separate from the feature files, the mapping is up to developers, so the test files structure can look completely different:

```

tests
├── functional
│   └── test_auth.py
│       ├── """Authentication tests."""
│       ├── from pytest_bdd import scenario
│       ├──
│       ├── @scenario('frontend/auth/login.feature')
│       ├── def test_logging_in_frontend():
│       │   pass
│       ├──
│       ├── @scenario('backend/auth/login.feature')
│       ├── def test_logging_in_backend():
│       │   pass
    
```

For picking up tests to run we can use [tests selection](#) technique. The problem is that you have to know how your tests are organized, knowing only the feature files organization is not enough. [cucumber tags](#) introduce standard way of categorizing your features and scenarios, which pytest-bdd supports. For example, we could have:

```

@login @backend
Feature: Login
    
```

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```
@successful
Scenario: Successful login
```

pytest-bdd uses `pytest` markers as a *storage* of the tags for the given scenario test, so we can use standard test selection:

```
pytest -m "backend and login and successful"
```

The feature and scenario markers are not different from standard `pytest` markers, and the `@` symbol is stripped out automatically to allow test selector expressions. If you want to have bdd-related tags to be distinguishable from the other test markers, use prefix like `bdd`. Note that if you use `pytest -strict` option, all bdd tags mentioned in the feature files should be also in the `markers` setting of the `pytest.ini` config. Also for tags please use names which are python-compatible variable names, eg starts with a non-number, underscore alphanumeric, etc. That way you can safely use tags for tests filtering.

You can customize how tags are converted to `pytest` marks by implementing the `pytest_bdd_apply_tag` hook and returning `True` from it:

```
def pytest_bdd_apply_tag(tag, function):
    if tag == 'todo':
        marker = pytest.mark.skip(reason="Not implemented yet")
        marker(function)
        return True
    else:
        # Fall back to the default behavior of pytest-bdd
        return None
```

1.11 Test setup

Test setup is implemented within the Given section. Even though these steps are executed imperatively to apply possible side-effects, `pytest-bdd` is trying to benefit of the `PyTest` fixtures which is based on the dependency injection and makes the setup more declarative style.

```
@given("I have a beautiful article", target_fixture="article")
def article():
    return Article(is_beautiful=True)
```

The target `PyTest` fixture “article” gets the return value and any other step can depend on it.

```
Feature: The power of PyTest
  Scenario: Symbolic name across steps
    Given I have a beautiful article
    When I publish this article
```

When step is referring the article to publish it.

```
@when("I publish this article")
def publish_article(article):
    article.publish()
```

Many other BDD toolkits operate a global context and put the side effects there. This makes it very difficult to implement the steps, because the dependencies appear only as the side-effects in the run-time and not declared in the code. The publish article step has to trust that the article is already in the context, has to know the name of the attribute it is stored there, the type etc.

In pytest-bdd you just declare an argument of the step function that it depends on and the PyTest will make sure to provide it.

Still side effects can be applied in the imperative style by design of the BDD.

```
Feature: News website
  Scenario: Publishing an article
    Given I have a beautiful article
    And my article is published
```

Functional tests can reuse your fixture libraries created for the unit-tests and upgrade them by applying the side effects.

```
@pytest.fixture
def article():
    return Article(is_beautiful=True)

@given("I have a beautiful article")
def i_have_a_beautiful_article(article):
    pass

@given("my article is published")
def published_article(article):
    article.publish()
    return article
```

This way side-effects were applied to our article and PyTest makes sure that all steps that require the “article” fixture will receive the same object. The value of the “published_article” and the “article” fixtures is the same object.

Fixtures are evaluated only once within the PyTest scope and their values are cached.

1.12 Backgrounds

It’s often the case that to cover certain feature, you’ll need multiple scenarios. And it’s logical that the setup for those scenarios will have some common parts (if not equal). For this, there are *backgrounds*. pytest-bdd implements [Gherkin backgrounds](#) for features.

```
Feature: Multiple site support

Background:
  Given a global administrator named "Greg"
  And a blog named "Greg's anti-tax rants"
  And a customer named "Wilson"
  And a blog named "Expensive Therapy" owned by "Wilson"

Scenario: Wilson posts to his own blog
  Given I am logged in as Wilson
  When I try to post to "Expensive Therapy"
  Then I should see "Your article was published."

Scenario: Greg posts to a client's blog
  Given I am logged in as Greg
  When I try to post to "Expensive Therapy"
  Then I should see "Your article was published."
```

In this example, all steps from the background will be executed before all the scenario's own given steps, adding possibility to prepare some common setup for multiple scenarios in a single feature. About background best practices, please read [here](#).

Note: There is only step “Given” should be used in “Background” section, steps “When” and “Then” are prohibited, because their purpose are related to actions and consuming outcomes, that is conflict with “Background” aim - prepare system for tests or “put the system in a known state” as “Given” does it. The statement above is applied for strict Gherkin mode, which is enabled by default.

1.13 Reusing fixtures

Sometimes scenarios define new names for the existing fixture that can be inherited (reused). For example, if we have pytest fixture:

```
@pytest.fixture
def article():
    """Test article."""
    return Article()
```

Then this fixture can be reused with other names using given():

```
@given('I have beautiful article')
def i_have_an_article(article):
    """I have an article."""
```

1.14 Reusing steps

It is possible to define some common steps in the parent confstest.py and simply expect them in the child test file.

common_steps.feature:

```
Scenario: All steps are declared in the confstest
  Given I have a bar
  Then bar should have value "bar"
```

confstest.py:

```
from pytest_bdd import given, then

@given("I have a bar", target_fixture="bar")
def bar():
    return "bar"

@then('bar should have value "bar"')
def bar_is_bar(bar):
    assert bar == "bar"
```

test_common.py:

```
@scenario("common_steps.feature", "All steps are declared in the conftest")
def test_conftest():
    pass
```

There are no definitions of the steps in the test file. They were collected from the parent `conftest.py`.

1.15 Default steps

Here is the list of steps that are implemented inside of the `pytest-bdd`:

given

- trace - enters the `pdb` debugger via `pytest.set_trace()`

when

- trace - enters the `pdb` debugger via `pytest.set_trace()`

then

- trace - enters the `pdb` debugger via `pytest.set_trace()`

1.16 Feature file paths

By default, `pytest-bdd` will use current module's path as base path for finding feature files, but this behaviour can be changed in the `pytest` configuration file (i.e. `pytest.ini`, `tox.ini` or `setup.cfg`) by declaring the new base path in the `bdd_features_base_dir` key. The path is interpreted as relative to the working directory when starting `pytest`. You can also override features base path on a per-scenario basis, in order to override the path for specific tests.

`pytest.ini`:

```
[pytest]
bdd_features_base_dir = features/
```

`tests/test_publish_article.py`:

```
from pytest_bdd import scenario

@scenario("foo.feature", "Foo feature in features/foo.feature")
def test_foo():
    pass

@scenario(
    "foo.feature",
    "Foo feature in tests/local-features/foo.feature",
    features_base_dir="./local-features/",
)
def test_foo_local():
    pass
```

The `features_base_dir` parameter can also be passed to the `@scenario` decorator.

1.17 Avoid retyping the feature file name

If you want to avoid retyping the feature file name when defining your scenarios in a test file, use `functools.partial`. This will make your life much easier when defining multiple scenarios in a test file. For example:

test_publish_article.py:

```
from functools import partial

import pytest_bdd

scenario = partial(pytest_bdd.scenario, "/path/to/publish_article.feature")

@scenario("Publishing the article")
def test_publish():
    pass

@scenario("Publishing the article as unprivileged user")
def test_publish_unprivileged():
    pass
```

You can learn more about `functools.partial` in the Python docs.

1.18 Hooks

pytest-bdd exposes several `pytest hooks` which might be helpful building useful reporting, visualization, etc on top of it:

- `pytest_bdd_before_scenario(request, feature, scenario)` - Called before scenario is executed
- `pytest_bdd_after_scenario(request, feature, scenario)` - Called after scenario is executed (even if one of steps has failed)
- `pytest_bdd_before_step(request, feature, scenario, step, step_func)` - Called before step function is executed and it's arguments evaluated
- `pytest_bdd_before_step_call(request, feature, scenario, step, step_func, step_func_args)` - Called before step function is executed with evaluated arguments
- `pytest_bdd_after_step(request, feature, scenario, step, step_func, step_func_args)` - Called after step function is successfully executed
- `pytest_bdd_step_error(request, feature, scenario, step, step_func, step_func_args, exception)` - Called when step function failed to execute
- `pytest_bdd_step_func_lookup_error(request, feature, scenario, step, exception)` - Called when step lookup failed

1.19 Browser testing

Tools recommended to use for browser testing:

- `pytest-splinter` - pytest `splinter` integration for the real browser testing

1.20 Reporting

It's important to have nice reporting out of your bdd tests. Cucumber introduced some kind of standard for `json` format which can be used for, for example, by [this Jenkins plugin](#).

To have an output in json format:

```
pytest --cucumberjson=<path to json report>
```

This will output an expanded (meaning scenario outlines will be expanded to several scenarios) cucumber format.

To enable gherkin-formatted output on terminal, use

```
pytest --gherkin-terminal-reporter
```

1.21 Test code generation helpers

For newcomers it's sometimes hard to write all needed test code without being frustrated. To simplify their life, simple code generator was implemented. It allows to create fully functional but of course empty tests and step definitions for given a feature file. It's done as a separate console script provided by `pytest-bdd` package:

```
pytest-bdd generate <feature file name> .. <feature file nameN>
```

It will print the generated code to the standard output so you can easily redirect it to the file:

```
pytest-bdd generate features/some.feature > tests/functional/test_some.py
```

1.22 Advanced code generation

For more experienced users, there's smart code generation/suggestion feature. It will only generate the test code which is not yet there, checking existing tests and step definitions the same way it's done during the test execution. The code suggestion tool is called via passing additional `pytest` arguments:

```
pytest --generate-missing --feature features tests/functional
```

The output will be like:

```
===== test session starts =====
platform linux2 -- Python 2.7.6 -- py-1.4.24 -- pytest-2.6.2
plugins: xdist, pep8, cov, cache, bdd, bdd, bdd
collected 2 items

Scenario is not bound to any test: "Code is generated for scenarios which are not_
↳bound to any tests" in feature "Missing code generation" in /tmp/pytest-552/testdir/
↳test_generate_missing0/tests/generation.feature
-----

Step is not defined: "I have a custom bar" in scenario: "Code is generated for_
↳scenario steps which are not yet defined(implemented)" in feature "Missing code_
↳generation" in /tmp/pytest-552/testdir/test_generate_missing0/tests/generation.
↳feature
-----
```

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Please place the code above to the test file(s):

```
@scenario('tests/generation.feature', 'Code is generated for scenarios which are not_
↳bound to any tests')
def test_Code_is_generated_for_scenarios_which_are_not_bound_to_any_tests():
    """Code is generated for scenarios which are not bound to any tests."""

@given("I have a custom bar")
def I_have_a_custom_bar():
    """I have a custom bar."""
```

As a side effect, the tool will validate the files for format errors, also some of the logic bugs, for example the ordering of the types of the steps.

1.23 Migration of your tests from versions 4.x.x

Templated steps (e.g. `@given("there are <start> cucumbers")`) should now use step argument parsers in order to match the scenario outlines and get the values from the example tables. The values from the example tables are no longer passed as fixtures, although if you define your step to use a parser, the parameters will be still provided as fixtures.

```
# Old step definition:
@given("there are <start> cucumbers")
def given_cucumbers(start):
    pass

# New step definition:
@given(parsers.parse("there are {start} cucumbers"))
def given_cucumbers(start):
    pass
```

Scenario `example_converters` are removed in favor of the converters provided on the step level:

```
# Old code:
@given("there are <start> cucumbers")
def given_cucumbers(start):
    return {"start": start}

@scenario("outline.feature", "Outlined", example_converters={"start": float})
def test_outline():
    pass

# New code:
@given(parsers.parse("there are {start} cucumbers"), converters={"start": float})
def given_cucumbers(start):
    return {"start": start}

@scenario("outline.feature", "Outlined")
def test_outline():
    pass
```

1.24 Migration of your tests from versions 3.x.x

Given steps are no longer fixtures. In case it is needed to make given step setup a fixture the `target_fixture` parameter should be used.

```
@given("there's an article", target_fixture="article")
def there_is_an_article():
    return Article()
```

Given steps no longer have fixture parameter. In fact the step may depend on multiple fixtures. Just normal step declaration with the dependency injection should be used.

```
@given("there's an article")
def there_is_an_article(article):
    pass
```

Strict gherkin option is removed, so the `strict_gherkin` parameter can be removed from the scenario decorators as well as `bdd_strict_gherkin` from the ini files.

Step validation handlers for the hook `pytest_bdd_step_validation_error` should be removed.

1.25 License

This software is licensed under the [MIT license](#).

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Oleg Pidsadnyi original idea, initial implementation and further improvements

Anatoly Bubenkov key implementation idea and realization, many new features and improvements

These people have contributed to *pytest-bdd*, in alphabetical order:

- Adam Coddington
- Albert-Jan Nijburg
- Alessio Bogon
- Andrey Makhnach
- Aron Curzon
- Dmitrijs Milajevs
- Dmitry Kolyagin
- Florian Bruhin
- Floris Bruynooghe
- Harro van der Klauw
- Hugo van Kemenade
- Laurence Rowe
- Leonardo Santagada
- Milosz Sliwinski
- Michiel Holtkamp
- Robin Pedersen
- Sergey Kraynev

3.1 5.0.0

This release introduces breaking changes, please refer to the *Migration of your tests from versions 4.x.x*.

- Rewrite the logic to parse Examples for Scenario Outlines. Now the substitution of the examples is done during the parsing of Gherkin feature files. You won't need to define the steps twice like `@given("there are <start> cucumbers")` and `@given(parsers.parse("there are {start} cucumbers"))`. The latter will be enough.
- Removed `example_converters` from `scenario(...)` signature. You should now use just the `converters` parameter for `given`, `when`, `then`.
- Removed `--cucumberjson-expanded` and `--cucumber-json-expanded` options. Now the JSON report is always expanded.
- Removed `--gherkin-terminal-reporter-expanded` option. Now the terminal report is always expanded.

3.2 4.1.0

- `when` and `then` steps now can provide a `target_fixture`, just like `given` does. Discussion at <https://github.com/pytest-dev/pytest-bdd/issues/402>.
- Drop compatibility for python 2 and officially support only python `>= 3.6`.
- Fix error when using `-cucumber-json-expanded` in combination with `example_converters` (marcbrossaissogeti).
- Fix `-generate-missing` not correctly recognizing steps with parsers

3.3 4.0.2

- Fix a bug that prevents using comments in the `Examples:` section. (youtux)

3.4 4.0.1

- Fixed performance regression introduced in 4.0.0 where collection time of tests would take way longer than before. (youtux)

3.5 4.0.0

This release introduces breaking changes, please refer to the *Migration of your tests from versions 3.x.x*.

- Strict Gherkin option is removed (`@scenario()` does not accept the `strict_gherkin` parameter). (olegpidsadnyi)
- `@scenario()` does not accept the undocumented parameter `caller_module` anymore. (youtux)
- Given step is no longer a fixture. The scope parameter is also removed. (olegpidsadnyi)
- Fixture parameter is removed from the given step declaration. (olegpidsadnyi)
- `pytest_bdd_step_validation_error` hook is removed. (olegpidsadnyi)
- Fix an error with pytest-pylint plugin #374. (toracle)
- Fix pytest-xdist 2.0 compatibility #369. (olegpidsadnyi)
- Fix compatibility with pytest 6 `--import-mode=importlib` option. (youtux)

3.6 3.4.0

- Parse multiline steps according to the gherkin specification #365.

3.7 3.3.0

- Drop support for pytest < 4.3.
- Fix a Python 4.0 bug.
- Fix `pytest --generate-missing` functionality being broken.
- Fix problematic missing step definition from strings containing quotes.
- Implement parsing escaped pipe characters in outline parameters (Mark90) #337.
- Disable the strict Gherkin validation in the steps generation (v-buriak) #356.

3.8 3.2.1

- Fix regression introduced in 3.2.0 where `pytest-bdd` would break in presence of test items that are not functions.

3.9 3.2.0

- Fix Python 3.8 support
- Remove code that rewrites code. This should help with the maintenance of this project and make debugging easier.

3.10 3.1.1

- Allow unicode string in `@given()` step names when using python2. This makes the transition of projects from python 2 to 3 easier.

3.11 3.1.0

- Drop support for `pytest < 3.3.2`.
- Step definitions generated by `$ pytest-bdd generate` will now raise `NotImplementedError` by default.
- `@given(...)` no longer accepts regex objects. It was deprecated long ago.
- Improve project testing by treating warnings as exceptions.
- `pytest_bdd_step_validation_error` will now always receive `step_func_args` as defined in the signature.

3.12 3.0.2

- Add compatibility with `pytest 4.2` (sliwinski-milosz) #288.

3.13 3.0.1

- Minimal supported version of `pytest` is now 2.9.0 as lower versions do not support `bool` type ini options (sliwinski-milosz) #260
- Fix `RemovedInPytest4Warning` warnings (sliwinski-milosz) #261.

3.14 3.0.0

- Fixtures `pytestbdd_feature_base_dir` and `pytestbdd_strict_gherkin` have been removed. Check the [Migration of your tests from versions 2.x.x](#) for more information (sliwinski-milosz) #255
- Fix step definitions not being found when using parsers or converters after a change in `pytest` (youtux) #257

3.15 2.21.0

- Gherkin terminal reporter expanded format (pauk-slon)

3.16 2.20.0

- Added support for But steps (olegpidsadnyi)
- Fixed compatibility with pytest 3.3.2 (olegpidsadnyi)
- Minimal required version of pytest is now 2.8.1 since it doesn't support earlier versions (olegpidsadnyi)

3.17 2.19.0

- Added `-cucumber-json-expanded` option for explicit selection of expanded format (mjholtkamp)
- Step names are filled in when `-cucumber-json-expanded` is used (mjholtkamp)

3.18 2.18.2

- Fix check for out section steps definitions for no strict gherkin feature

3.19 2.18.1

- Relay fixture results to recursive call of `'get_features'` (coddingtonbear)

3.20 2.18.0

- Add gherkin terminal reporter (spinus + thedraw)

3.21 2.17.2

- Fix scenario lines containing an `@` being parsed as a tag. (The-Compiler)

3.22 2.17.1

- Add support for pytest 3.0

3.23 2.17.0

- Fix `FixtureDef` signature for newer pytest versions (The-Compiler)
- Better error explanation for the steps defined outside of scenarios (olegpidsadnyi)
- Add a `pytest_bdd_apply_tag` hook to customize handling of tags (The-Compiler)
- Allow spaces in tag names. This can be useful when using the `pytest_bdd_apply_tag` hook with tags like `@xfail: Some reason`.

3.24 2.16.1

- Cleaned up hooks of the plugin (olegpidsadnyi)
- Fixed report serialization (olegpidsadnyi)

3.25 2.16.0

- Fixed deprecation warnings with pytest 2.8 (The-Compiler)
- Fixed deprecation warnings with Python 3.5 (The-Compiler)

3.26 2.15.0

- Add examples data in the scenario report (bubenkoff)

3.27 2.14.5

- Properly parse feature description (bubenkoff)

3.28 2.14.3

- Avoid potentially random collection order for xdist compatibility (bubenkoff)

3.29 2.14.1

- Pass additional arguments to parsers (bubenkoff)

3.30 2.14.0

- Add validation check which prevents having multiple features in a single feature file (bubenkoff)

3.31 2.13.1

- Allow mixing feature example table with scenario example table (bubenkoff, olegpidsadnyi)

3.32 2.13.0

- Feature example table (bubenkoff, sureshvv)

3.33 2.12.2

- Make it possible to relax strict Gherkin scenario validation (bubenkoff)

3.34 2.11.3

- Fix minimal *six* version (bubenkoff, dustinfarris)

3.35 2.11.1

- Mention step type on step definition not found errors and in code generation (bubenkoff, lrowe)

3.36 2.11.0

- Prefix step definition fixture names to avoid name collisions (bubenkoff, lrowe)

3.37 2.10.0

- Make feature and scenario tags to be fully compatible with pytest markers (bubenkoff, kevinastone)

3.38 2.9.1

- Fixed FeatureError string representation to correctly support python3 (bubenkoff, lrowe)

3.39 2.9.0

- Added possibility to inject fixtures from given keywords (bubenkoff)

3.40 2.8.0

- Added hook before the step is executed with evaluated parameters (olegpidsadnyi)

3.41 2.7.2

- Correct base feature path lookup for python3 (bubenkoff)

3.42 2.7.1

- Allow to pass `scope` for `given` steps (bubenkoff, sureshvv)

3.43 2.7.0

- Implemented *scenarios* shortcut to automatically bind scenarios to tests (bubenkoff)

3.44 2.6.2

- Parse comments only in the beginning of words (santagada)

3.45 2.6.1

- Correctly handle *pytest-bdd* command called without the subcommand under python3 (bubenkoff, spinus)
- Pluggable parsers for step definitions (bubenkoff, spinus)

3.46 2.5.3

- Add after scenario hook, document both before and after scenario hooks (bubenkoff)

3.47 2.5.2

- Fix code generation steps ordering (bubenkoff)

3.48 2.5.1

- Fix error report serialization (olegpidsadnyi)

3.49 2.5.0

- Fix multiline steps in the Background section (bubenkoff, arpe)
- Code cleanup (olegpidsadnyi)

3.50 2.4.5

- Fix unicode issue with scenario name (bubenkoff, aohontsev)

3.51 2.4.3

- Fix unicode regex argumented steps issue (bubenkoff, aohontsev)
- Fix steps timings in the json reporting (bubenkoff)

3.52 2.4.2

- Recursion is fixed for the `-generate-missing` and the `-feature` parameters (bubenkoff)

3.53 2.4.1

- Better reporting of a not found scenario (bubenkoff)
- Simple test code generation implemented (bubenkoff)
- Correct timing values for cucumber json reporting (bubenkoff)
- Validation/generation helpers (bubenkoff)

3.54 2.4.0

- Background support added (bubenkoff)
- Fixed double collection of the conftest files if scenario decorator is used (ropez, bubenkoff)

3.55 2.3.3

- Added timings to the cucumber json report (bubenkoff)

3.56 2.3.2

- Fixed incorrect error message using `e.argsname` instead of `step.name` (hvdklauw)

3.57 2.3.1

- Implemented cucumber tags support (bubenkoff)
- Implemented cucumber json formatter (bubenkoff, albertjan)
- Added `'trace'` keyword (bubenkoff)

3.58 2.1.2

- Latest pytest compatibility fixes (bubenkoff)

3.59 2.1.1

- Bugfixes (bubenkoff)

3.60 2.1.0

- Implemented multiline steps (bubenkoff)

3.61 2.0.1

- Allow more than one parameter per step (bubenkoff)
- Allow empty example values (bubenkoff)

3.62 2.0.0

- Pure pytest parametrization for scenario outlines (bubenkoff)
- Argumented steps now support converters (transformations) (bubenkoff)
- scenario supports only decorator form (bubenkoff)
- Code generation refactoring and cleanup (bubenkoff)

3.63 1.0.0

- Implemented scenario outlines (bubenkoff)

3.64 0.6.11

- Fixed step arguments conflict with the fixtures having the same name (olegpidsadnyi)

3.65 0.6.9

- Implemented support of Gherkin “Feature:” (olegpidsadnyi)

3.66 0.6.8

- Implemented several hooks to allow reporting/error handling (bubenkoff)

3.67 0.6.6

- Fixes to unnecessary mentioning of pytest-bdd package files in py.test log with -v (bubenkoff)

3.68 0.6.5

- Compatibility with recent pytest (bubenkoff)

3.69 0.6.4

- More unicode fixes (amakhnach)

3.70 0.6.3

- Added unicode support for feature files. Removed buggy module replacement for scenario. (amakhnach)

3.71 0.6.2

- Removed unnecessary mention of pytest-bdd package files in py.test log with -v (bubenkoff)

3.72 0.6.1

- Step arguments in whens when there are no given arguments used. (amakhnach, bubenkoff)

3.73 0.6.0

- Added step arguments support. (curzona, olegpidsadnyi, bubenkoff)
- Added checking of the step type order. (markon, olegpidsadnyi)

3.74 0.5.2

- Added extra info into output when FeatureError exception raises. (amakhnach)

3.75 0.5.0

- Added parametrization to scenarios
- Coveralls.io integration
- Test coverage improvement/fixes

- Correct wrapping of step functions to preserve function docstring

3.76 0.4.7

- Fixed Python 3.3 support

3.77 0.4.6

- Fixed a bug when `py.test --fixtures` showed incorrect filenames for the steps.

3.78 0.4.5

- Fixed a bug with the reuse of the fixture by given steps being evaluated multiple times.

3.79 0.4.3

- Update the license file and PYPI related documentation.