

A close-up, low-angle shot of a golden wheat field. The wheat stalks are in sharp focus in the foreground, with a soft, warm glow from the sun in the background, creating a bokeh effect. The overall color palette is warm, dominated by yellows, oranges, and browns.

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Tox jobs parallelization

in OpenDaylight CI

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Tox panorama / reminder

Tox panorama / reminder: what is Tox ?

- a Python virtual environment
 - based on venv (formerly virtualenv)
 - it does not affect host system packages
- a simple configuration file (tox.ini) usually at the root of the (Git) project folder
- main 1st goal: ease tests automation
 - unify Continuous Integration and command line based testing
- main 2nd goal: ease dependencies management

<https://docs.python.org/3/glossary.html#term-virtual-environment>

<https://github.com/tox-dev/tox>

Tox panorama: tox.ini configuration

- the envlist parameter specifies profiles to be run by default
 - be careful of conventions that correspond to a python version (py3, py37, etc)
 - it can be overridden by –e option at run time
 - all profiles are not necessarily declared in envlist

<https://git.opendaylight.org/gerrit/c/transportpce/+/99063/1/tox.ini>

<https://tox.wiki/en/latest/example/basic.html#a-simple-tox-ini-default-environments>

<https://github.com/tox-dev/tox>

```
[tox]
envlist = py37,py38
```

```
[testenv]
deps = pytest
commands = pytest
```

```
$ tox
[lots of output from what tox does]
[lots of output from commands that were run]
_____ summary _____
py37: commands succeeded
py38: commands succeeded congratulations :)
```

```
$ tox -e py38
[lots of output from what tox does]
[lots of output from commands that were run]
_____ summary _____
py38: commands succeeded congratulations :)
```

Tox panorama: requirements & constraints

- Requirements & constraints in Tox are derived from pip
 - automatic dependencies resolution
 - same syntax but 2 different options `-r` and `-c`
- can be either specified in `requirements.txt` and `constraints.txt` files or directly in `tox.ini` configuration
- Requirements usually indicate the range of dependencies versions where the tests are **believed** to work.
Constraints usually indicate some tested/pinned/fixed versions where the tests are **known** to work. Typically in a CI / integration environment.

<https://tox.wiki/en/latest/example/basic.html#depending-on-requirements-txt-or-defining-constraints>
<https://pip.pypa.io/en/stable/reference/requirements-file-format/#requirements-file-format>

Tox panorama: requirements & constraints

Example

```
##### Requirements without Version Specifiers #####
pytest
pytest-cov
beautifulsoup4

##### Requirements with Version Specifiers #####
# See https://www.python.org/dev/peps/pep-0440/#version-specifiers
docopt == 0.6.1          # Version Matching. Must be version 0.6.1
keyring >= 4.1.1        # Minimum version 4.1.1
coverage != 3.5         # Version Exclusion. Anything except version 3.5
Mopidy-Dirble ~ 1.1     # Compatible release. Same as >= 1.1, == 1.*

##### Refer to other requirements files #####
-r other-requirements.txt

##### A particular file #####
./downloads/numpy-1.9.2-cp34-none-win32.whl
http://wxpython.org/Phoenix/snapshot-builds/wxPython_Phoenix-3.0.3.dev1820+49a8884-cp34-none-win_amd64.

##### Additional Requirements without Version Specifiers #####
# Same as 1st section, just here to show that you can put things in any order.
rejected
green
```

<https://tox.wiki/en/latest/example/basic.html#depending-on-requirements-txt-or-defining-constraints>
<https://pip.pypa.io/en/stable/reference/requirements-file-format/#requirements-file-format>

Tox panorama / reminder: LFN CI support

<https://docs.releng.linuxfoundation.org/projects/global-jjb/en/latest/jjb/lf-python-jobs.html#tox-verify>

<https://git.opendaylight.org/gerrit/c/releng/builder/+/98992>

an example of jjb configuration section

```
- project:
  name: transportpce-phosphorus
  jobs:
    - "{project-name}-rtd-jobs":
      build-node: centos7-builder-2c-2g
      project-pattern: transportpce
      rtd-build-url: https://readthedocs.org/api/v2/webhook/odl-transportpce/47688/
      rtd-token: 6f37ba63226bdcc6c823ee455e62237cf68813fd
    - gerrit-tox-verify:
      build-timeout: 240
      build-node: centos7-builder-4c-16g
      parallel: true
    - odl-maven-jobs-jdk11
    - odl-maven-verify-jobs

project: "transportpce"
project-name: "transportpce"
stream: phosphorus
branch: "stable/phosphorus"
java-version: "openjdk11"
mvn-settings: "transportpce-settings"
mvn-opts: "-Xmx1024m"
dependencies: "odlparent-merge-{stream},yangtools-merge-{stream},controller-merge-
{stream}"
email-upstream: "[transportpce] [odlparent] [yangtools] [controller]"

# Used by the release job
staging-profile-id: a6927323fa3d4
```



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Tox parallelization support

Tox parallelization support: overview

- built-in parallelization support for a few years
 - it used to be a separate implementation called *detox* and now obsolete
- Invocation by using the *--parallel* or *-p* flag.
-p takes an argument specifying the degree of parallelization, defaulting to **auto**:
 - **all** to run all invoked environments in parallel,
 - **auto** to limit it to CPU count,
 - or pass **an integer** to set that limit.
- *--parallel-live/-o* allows showing the live output of the standard output and error

<https://tox.wiki/en/latest/example/basic.html#parallel-mode>

Tox parallelization support: activation in LFN CI

<https://docs.releng.linuxfoundation.org/projects/global-jjb/en/latest/jjb/lf-python-jobs.html#tox-verify>

<https://git.opendaylight.org/gerrit/c/releng/builder/+/98992>

an example of jjb configuration section

```
- project:
  name: transportpce-phosphorus
  jobs:
    - "{project-name}-rtd-jobs":
      build-node: centos7-builder-2c-2g
      project-pattern: transportpce
      rtd-build-url: https://readthedocs.org/api/v2/webhook/odl-transportpce/47688/
      rtd-token: 6f37ba63226bdcc6c823ee455e62237cf68813fd
    - gerrit-tox-verify:
      build-timeout: 240
      build-node: centos7-builder-4c-16g
      parallel: true
    - odl-maven-jobs-jdk11
    - odl-maven-verify-jobs

project: "transportpce"
project-name: "transportpce"
stream: phosphorus
branch: "stable/phosphorus"
java-version: "openjdk11"
mvn-settings: "transportpce-settings"
mvn-opts: "-Xmx1024m"
dependencies: "odlparent-merge-{stream},yangtools-merge-{stream},controller-merge-
{stream}"
email-upstream: "[transportpce] [odlparent] [yangtools] [controller]"

# Used by the release job
staging-profile-id: a6927323fa3d4
```

Tox parallelization support: tox.ini configuration

- a concept of dependency between (testenv) profiles might be needed
 - It can be specified via [depends](#)
- tox will re-order the environment list to be run to satisfy these dependencies. Also true in sequential run too.
- in parallel mode, tox will only schedule a (testenv) profile to run once all of its dependencies finished (independent of their outcome).

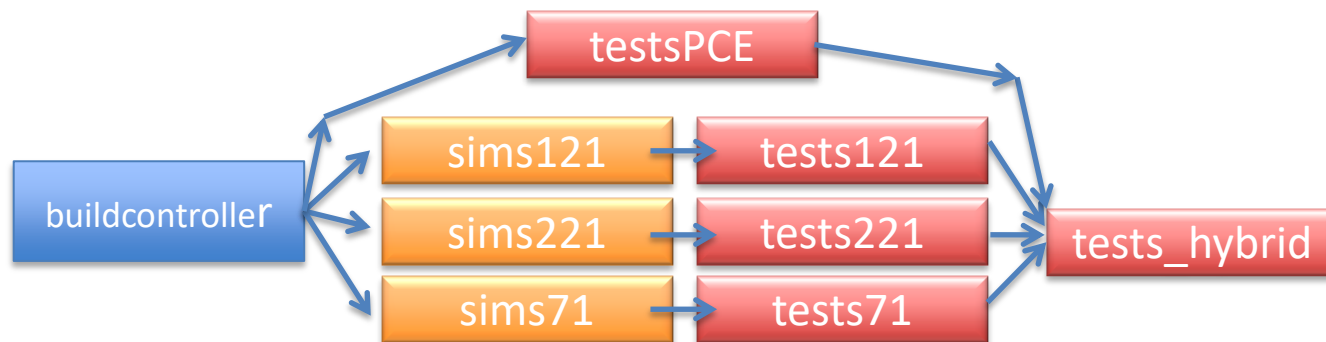
<https://git.opendaylight.org/gerrit/c/transportpce/+/96559/21/tox.ini>

<https://tox.wiki/en/latest/example/basic.html#parallel-mode>

<https://docs.opendaylight.org/projects/transportpce/en/latest/tox-guide.html>

Tox parallelization support: tox.ini configuration

- in TransportPCE functional tests for example this means at first glance:



<https://git.opendaylight.org/gerrit/c/transportpce/+96559/21/tox.ini>

<https://tox.wiki/en/latest/example/basic.html#parallel-mode>

<https://docs.opendaylight.org/projects/transportpce/en/latest/tox-guide.html>



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Implementation example

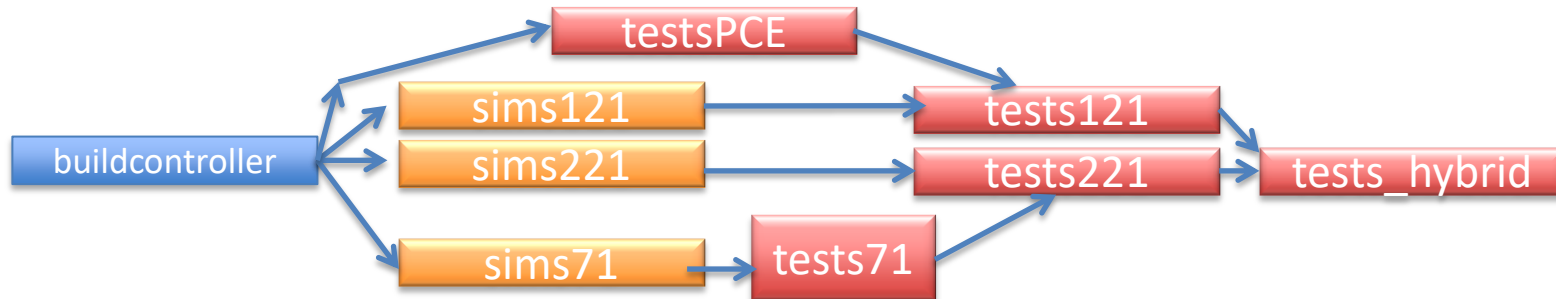
Implementation example: transportPCE in OpenDaylight CI

- in TransportPCE functional tests initial target



<https://git.opendaylight.org/gerrit/c/transportpce/+96559/21/tox.ini>

- current dependencies schema => it results in 2 tests “threads” instead of 4



<https://git.opendaylight.org/gerrit/c/transportpce/+96664>

- Python isolation limited to pip or python dependencies
 - whitelist_externals for shell script etc
 - karaf instances concurrency (one folder per instance)
- concurrency strategy “auto“ limited to CPU cores
 - in transportPCE case, RAM is more indicated

- Recent CI support of strategies different than auto

<https://docs.relog.linuxfoundation.org/projects/global-jjb/en/latest/jjb/lf-python-jobs.html#tox-verify>

<https://gerrit.linuxfoundation.org/infra/c/relog/global-jjb/+68044/7>

- “-o” display forced in jjb
- performance depends on minions system characteristics



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Conclusion: try it !

**Tox offers portability across several CI solutions (gitlab, jjb, etc).
It allows to reproduce a CI behavior easily on a local system.
Parallel mode allows to speed-up tests significantly.
TPCE CI 2h20 -> 1h30 !**



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Question & Answers

Thank you !