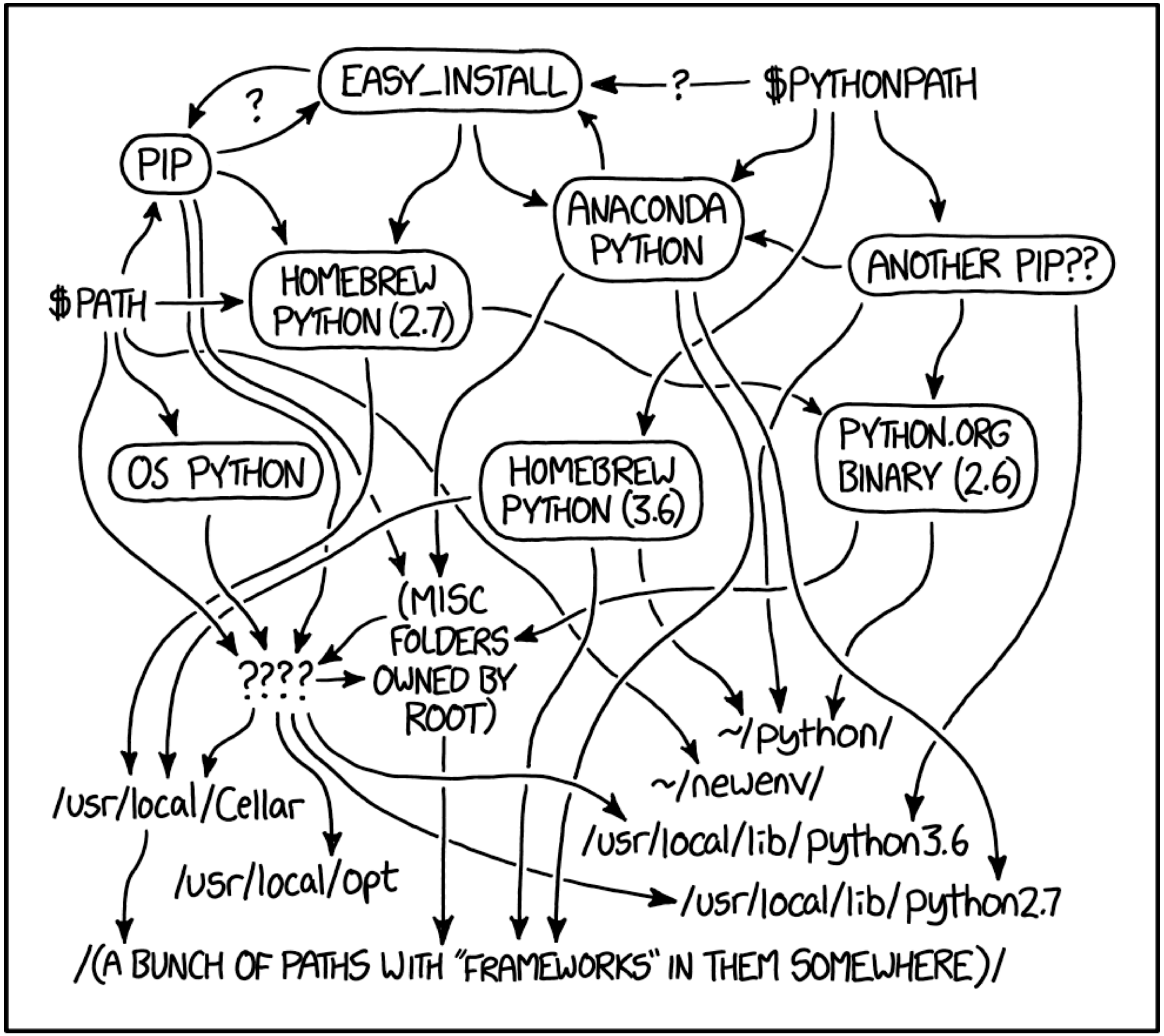
Packaging for Python and Beyond

Chris Burr

PyHEP 2019 ○ 16th October 2019

Image: CERN-EX-66954B © 1998-2018 CERN



MY PYTHON ENVIRONMENT HAS BECOME SO DEGRADED
THAT MY LAPTOP HAS BEEN DECLARED A SUPERFUND SITE.

https://xkcd.com/1987/

Python Package Index

- PyPI is the main repository of Python packages
  - Almost 200,000 packages
  - Almost 1.5 million releases
- Anyone can claim a name and upload without any review

Pip Installs Packages

- pip is the standard way to install packages
- Should be as simple as:

```
pip install PACKAGE_NAME
```

https://xkcd.com/2038/

Pip Installs Packages

- pip is the standard way to install packages
- Should be as simple as:

```
pip install PACKAGE_NAME
```

- You should not:

```
sudo pip install PACKAGE_NAME

pip install --user PACKAGE_NAME
```

https://xkcd.com/2038/

Virtual environments

Python 3.3+

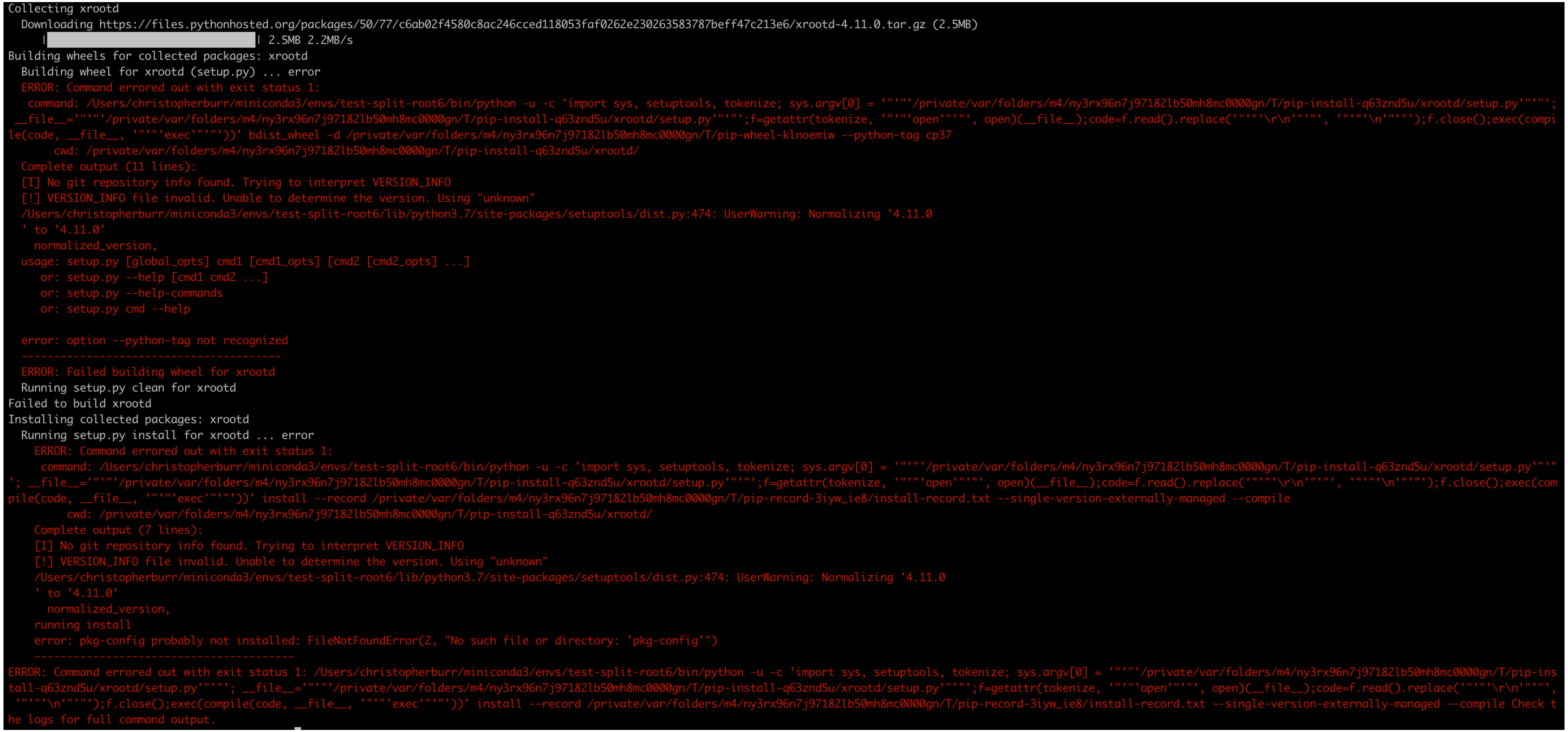
- ➤ Standard library module to create environments in isolated folders

```
python -m venv /path/to/new/virtual/environment
source /path/to/new/virtual/environment/bin/activate
```

- ➤ No special privileges required
- ➤ Easy to manage many independent environments

Why virtual environments aren’t enough

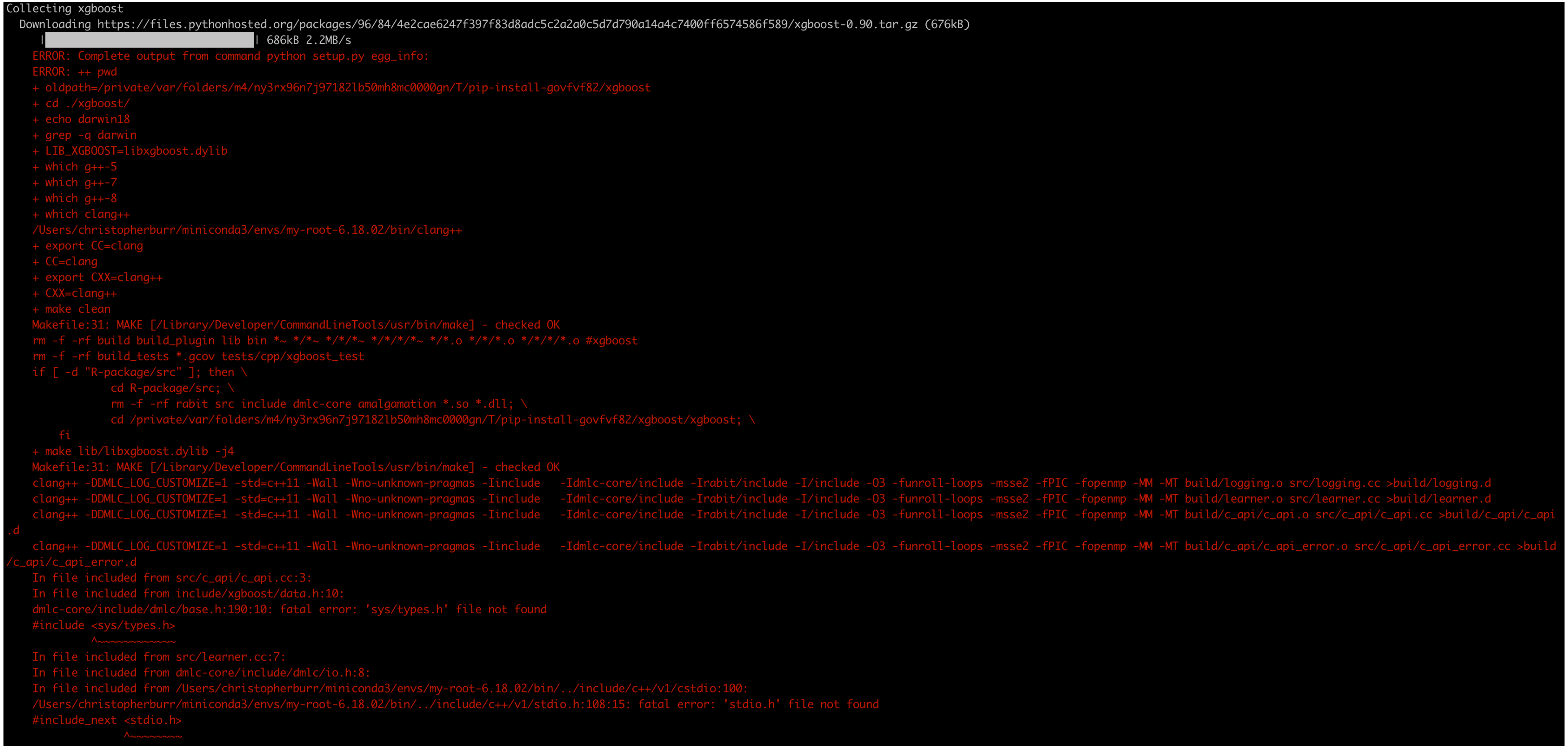
```
pip install xrootd
```



```
Collecting xrootd
  Downloading https://files.pythonhosted.org/packages/50/77/c6ab02f4580c8ac246cced118053faf0262e230263583787beff47c213e6/xrootd-4.11.0.tar.gz (2.5MB)
     |████████████████████████████████| 2.5MB 2.2MB/s
Building wheels for collected packages: xrootd
  Building wheel for xrootd (setup.py) ... error
  ERROR: Command errored out with exit status 1:
   command: /Users/christopherburr/miniconda3/envs/test-split-root6/bin/python -u -c 'import sys, setuptools, tokenize; sys.argv[0] = '"'"'/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/setup.py'"'"';
 __file__='"'"'/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/setup.py'"'"';f=getattr(tokenize, '"'"'open'"'"', open)(__file__);code=f.read().replace('"'"'\r\n'"'"', '"'"'\n'"'"');f.close();exec(compi
le(code, __file__, '"'"'exec'"'"'))' bdist_wheel -d /private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-wheel-klnoemiw --python-tag cp37
       cwd: /private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/
  Complete output (11 lines):
  [I] No git repository info found. Trying to interpret VERSION_INFO
  [!] VERSION_INFO file invalid. Unable to determine the version. Using "unknown"
  /Users/christopherburr/miniconda3/envs/test-split-root6/lib/python3.7/site-packages/setuptools/dist.py:474: UserWarning: Normalizing '4.11.0
  ' to '4.11.0'
    normalized_version,
  usage: setup.py [global_opts] cmd1 [cmd1_opts] [cmd2 [cmd2_opts] ...]
     or: setup.py --help [cmd1 cmd2 ...]
     or: setup.py --help-commands
     or: setup.py cmd --help

  error: option --python-tag not recognized
  ----------------------------------------
  ERROR: Failed building wheel for xrootd
  Running setup.py clean for xrootd
Failed to build xrootd
Installing collected packages: xrootd
  Running setup.py install for xrootd ... error
    ERROR: Command errored out with exit status 1:
     command: /Users/christopherburr/miniconda3/envs/test-split-root6/bin/python -u -c 'import sys, setuptools, tokenize; sys.argv[0] = '"'"'/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/setup.py'"'"
'; __file__='"'"'/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/setup.py'"'"';f=getattr(tokenize, '"'"'open'"'"', open)(__file__);code=f.read().replace('"'"'\r\n'"'"', '"'"'\n'"'"');f.close();exec(com
pile(code, __file__, '"'"'exec'"'"'))' install --record /private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-record-3iyw_ie8/install-record.txt --single-version-externally-managed --compile
         cwd: /private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/
    Complete output (7 lines):
    [I] No git repository info found. Trying to interpret VERSION_INFO
    [!] VERSION_INFO file invalid. Unable to determine the version. Using "unknown"
    /Users/christopherburr/miniconda3/envs/test-split-root6/lib/python3.7/site-packages/setuptools/dist.py:474: UserWarning: Normalizing '4.11.0
    ' to '4.11.0'
      normalized_version,
    running install
    error: pkg-config probably not installed: FileNotFoundError(2, "No such file or directory: 'pkg-config'")
    ----------------------------------------
ERROR: Command errored out with exit status 1: /Users/christopherburr/miniconda3/envs/test-split-root6/bin/python -u -c 'import sys, setuptools, tokenize; sys.argv[0] = '"'"'/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-ins
tall-q63znd5u/xrootd/setup.py'"'"'; __file__='"'"'/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-q63znd5u/xrootd/setup.py'"'"';f=getattr(tokenize, '"'"'open'"'"', open)(__file__);code=f.read().replace('"'"'\r\n'"'"',
 '"'"'\n'"'"');f.close();exec(compile(code, __file__, '"'"'exec'"'"'))' install --record /private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-record-3iyw_ie8/install-record.txt --single-version-externally-managed --compile Check t
he logs for full command output.
```

Why virtual environments aren’t enough

`pip install xgboost`



```
Collecting xgboost
  Downloading https://files.pythonhosted.org/packages/96/84/4e2cae6247f397f83d8adc5c2a2a0c5d7d790a14a4c7400ff6574586f589/xgboost-0.90.tar.gz (676kB)
     |████████████████████████████████| 686kB 2.2MB/s
    ERROR: Complete output from command python setup.py egg_info:
    ERROR: ++ pwd
    + oldpath=/private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-govfvf82/xgboost
    + cd ./xgboost/
    + echo darwin18
    + grep -q darwin
    + LIB_XGBOOST=libxgboost.dylib
    + which g++-5
    + which g++-7
    + which g++-8
    + which clang++
    /Users/christopherburr/miniconda3/envs/my-root-6.18.02/bin/clang++
    + export CC=clang
    + CC=clang
    + export CXX=clang++
    + CXX=clang++
    + make clean
    Makefile:31: MAKE [/Library/Developer/CommandLineTools/usr/bin/make] - checked OK
    rm -f -rf build build_plugin lib bin *~ */*~ */*/*~ */*/*/*~ */*.o */*/*.o */*/*/*.o #xgboost
    rm -f -rf build_tests *.gcov tests/cpp/xgboost_test
    if [ -d "R-package/src" ]; then \
                cd R-package/src; \
                rm -f -rf rabit src include dmlc-core amalgamation *.so *.dll; \
                cd /private/var/folders/m4/ny3rx96n7j97182lb50mh8mc0000gn/T/pip-install-govfvf82/xgboost/xgboost; \
        fi
    + make lib/libxgboost.dylib -j4
    Makefile:31: MAKE [/Library/Developer/CommandLineTools/usr/bin/make] - checked OK
    clang++ -DDMLC_LOG_CUSTOMIZE=1 -std=c++11 -Wall -Wno-unknown-pragmas -Iinclude   -Idmlc-core/include -Irabit/include -I/include -O3 -funroll-loops -msse2 -fPIC -fopenmp -MM -MT build/logging.o src/logging.cc >build/logging.d
    clang++ -DDMLC_LOG_CUSTOMIZE=1 -std=c++11 -Wall -Wno-unknown-pragmas -Iinclude   -Idmlc-core/include -Irabit/include -I/include -O3 -funroll-loops -msse2 -fPIC -fopenmp -MM -MT build/learner.o src/learner.cc >build/learner.d
    clang++ -DDMLC_LOG_CUSTOMIZE=1 -std=c++11 -Wall -Wno-unknown-pragmas -Iinclude   -Idmlc-core/include -Irabit/include -I/include -O3 -funroll-loops -msse2 -fPIC -fopenmp -MM -MT build/c_api/c_api.o src/c_api/c_api.cc >build/c_api/c_api
.d
    clang++ -DDMLC_LOG_CUSTOMIZE=1 -std=c++11 -Wall -Wno-unknown-pragmas -Iinclude   -Idmlc-core/include -Irabit/include -I/include -O3 -funroll-loops -msse2 -fPIC -fopenmp -MM -MT build/c_api/c_api_error.o src/c_api/c_api_error.cc >build
/c_api/c_api_error.d
    In file included from src/c_api/c_api.cc:3:
    In file included from include/xgboost/data.h:10:
    dmlc-core/include/dmlc/base.h:190:10: fatal error: 'sys/types.h' file not found
    #include <sys/types.h>
             ^~~~~~~~~~~~~
    In file included from src/learner.cc:7:
    In file included from dmlc-core/include/dmlc/io.h:8:
    In file included from /Users/christopherburr/miniconda3/envs/my-root-6.18.02/bin/../include/c++/v1/cstdio:100:
    /Users/christopherburr/miniconda3/envs/my-root-6.18.02/bin/../include/c++/v1/stdio.h:108:15: fatal error: 'stdio.h' file not found
    #include_next <stdio.h>
                  ^~~~~~~~~
```

Why virtual environments aren't enough

- Dependent on having a suitable existing Python installation
- Dependent on the upstream maintainers having good packaging
- Incomplete: uses parts of the host system, especially its compilers

Why virtual environments aren’t enough

- Dependent on having a suitable existing Python installation
- Dependent on the upstream maintainers having good packaging
- Incomplete: uses parts of the host system, especially its compilers
- Limited to PyPI packages (though this is evolving: QT and CMake are now available)

Conda

- Language agnostic package manager (Python, C++, R, Julia, Rust, Go, Java, Ruby, Fortran, …)
- Multi platform (Linux, macOS, Windows)
- Multi architecture (i386, x86_84, aarch64, ppc64le)
- Usage is similar to venv

```
conda create --name my-environment python=3.7 ipython numpy jupyterlab
conda activate my-environment
```

- Anaconda, Inc. provides around 2,000 packages

- Language

..)

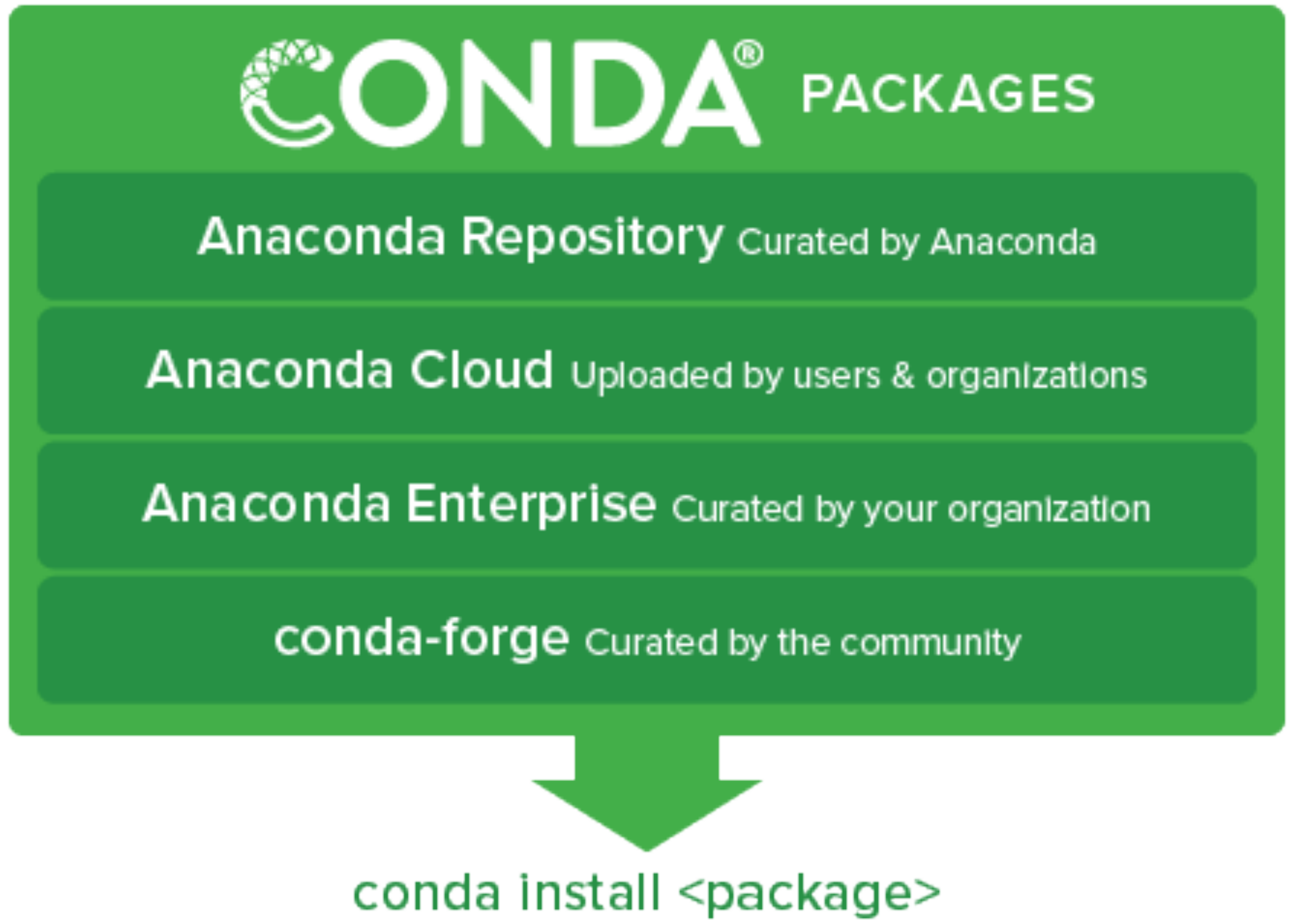
- Multi plat
- Multi arch
- Usage is s

```
conda create                                               jupyterlab
conda activa
```

- Anaconda, Inc. provides around 2,000 packages

Conda-forge

- ➤ Community maintained collection of conda packages
  - ➤ Over 1,600 members
- ➤ Over 8,000 packages available and rapidly growing



CONDA® PACKAGES
Anaconda Repository Curated by Anaconda
Anaconda Cloud Uploaded by users & organizations
Anaconda Enterprise Curated by your organization
conda-forge Curated by the community
conda install <package>

Conda-forge

- Community maintained collection of conda packages
  - Over 1,600 members
- Over 8,000 packages available and rapidly growing
- Now includes:

ROOT Data Analysis Framework

uproot

Awkward Array

zfit

Pythia 8

VOMS

XRootD

HepMC

iminuit

DIRAC THE INTERWARE

cppyy

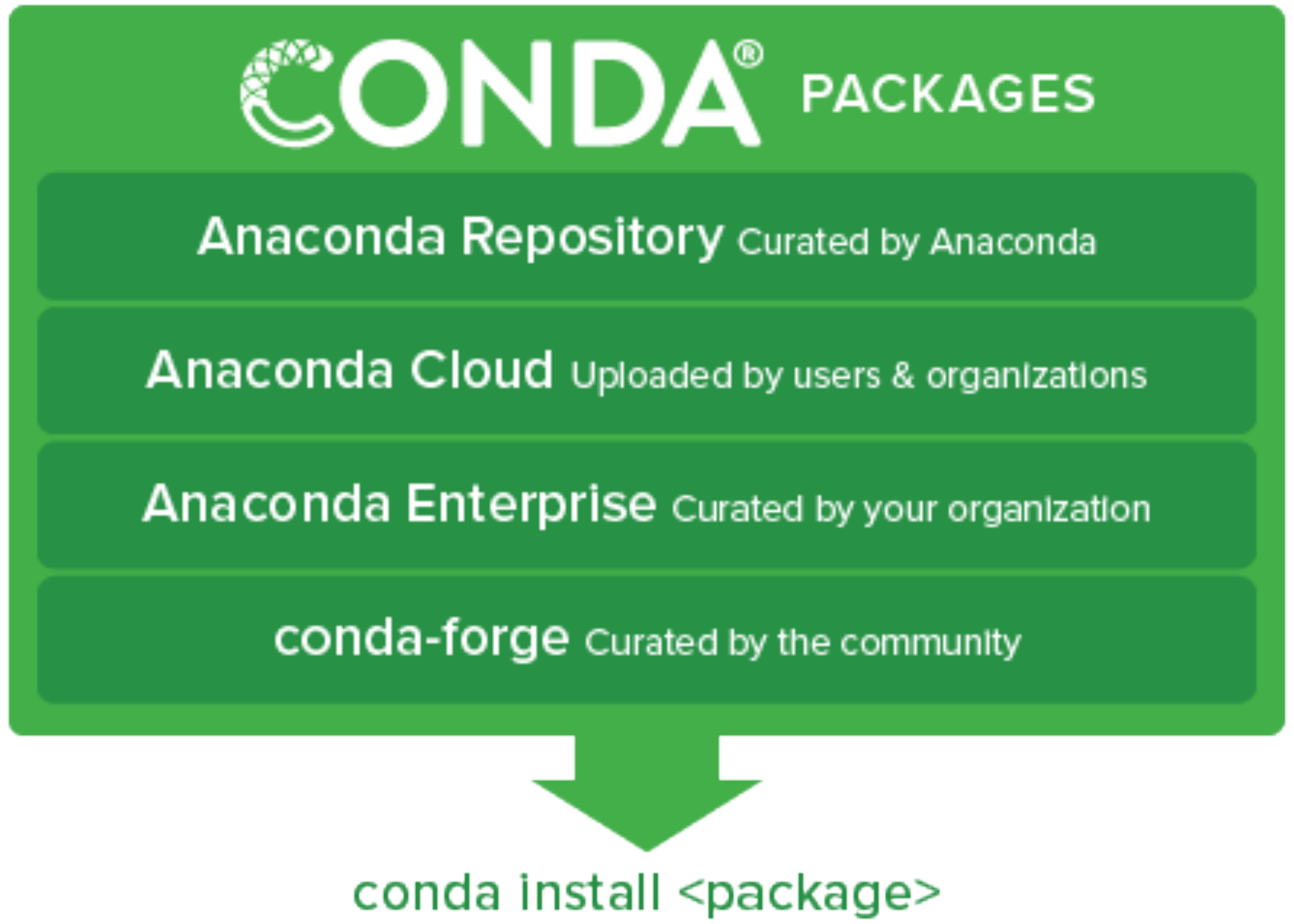
mcerp monte carlo error propagation

Xeus Cling

GEANT4 A SIMULATION TOOLKIT

RapidSim

AlphaTwirl


CONDA® PACKAGES

Anaconda Repository Curated by Anaconda

Anaconda Cloud Uploaded by users & organizations

Anaconda Enterprise Curated by your organization

conda-forge Curated by the community

conda install <package>

CONDA-FORGE

Why conda-forge?

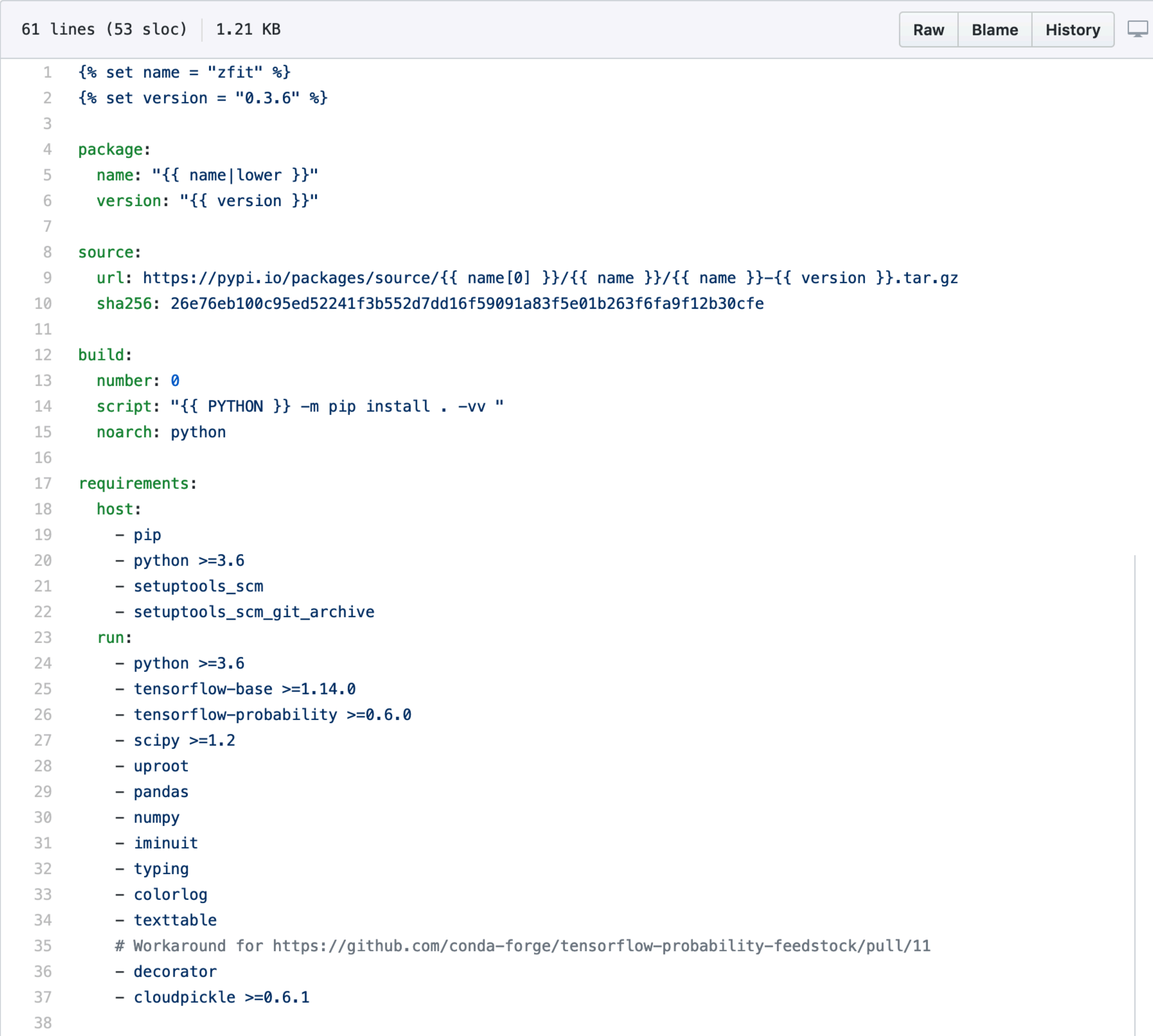
- ➤ Language agnostic!
  - ➤ Provides it’s own compiler toolchain with full C++17 support (Clang 9/GCC 7.3)
  - ➤ “Hard” packages are already present and maintained (build systems, Boost, X11)
- ➤ It’s not just analysis tools
  - ➤ Install bash, htop, vim, singularity
- ➤ Effectively no dependencies on the host system
  - ➤ MacOS 10.9+/CentOS 6+/Windows 64bit
- ➤ Open community
  - ➤ Missing package: You can add it
  - ➤ Broken/hard to install package: You can fix it (and people are generally happy to help)

- Reliably install ROOT in under 5 minutes on any machine
  - Linux, macOS, and Windows Subsystem for Linux (cling doesn't support native 64-bit Windows)
- Complete installation with C++17, graphics, OpenGL
- Seamlessly integrates with the rest of conda-forge
  - No builtin dependencies (excluding cling for now)
  - No PYTHONPATH/LD_LIBRARY_PATH mess
- Downloaded over 50,000 times since it was released 9 months ago
- Currently working with the ROOT team to integrate with their nighties
  - Plan to release the binaries to a dedicated conda channel
  - If you've be interested in using these, please let me know!

ROOT
Data Analysis Framework

How does conda-forge work?

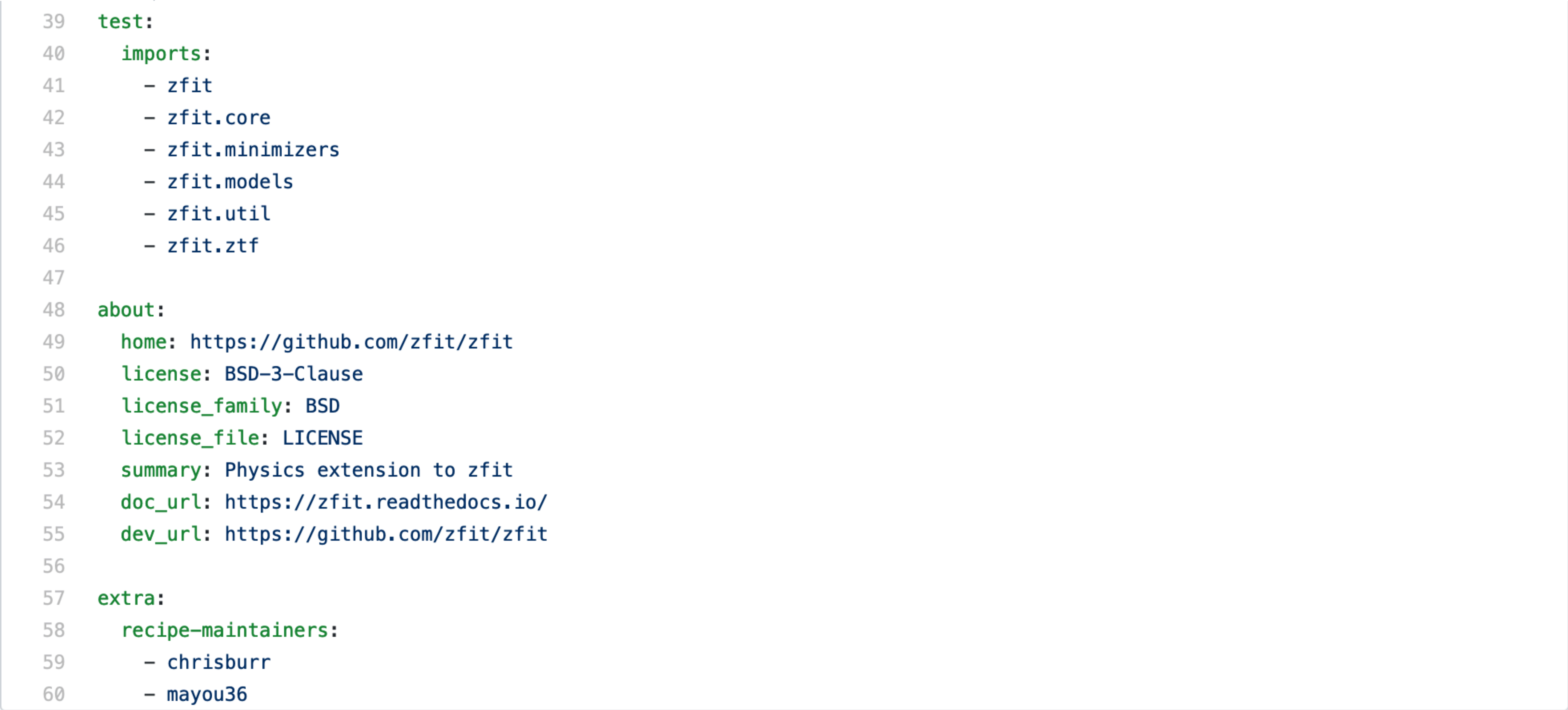
Adding a new package to conda-forge



61 lines (53 sloc) | 1.21 KB

```yaml
{% set name = "zfit" %}
{% set version = "0.3.6" %}

package:
  name: "{{ name|lower }}"
  version: "{{ version }}"

source:
  url: https://pypi.io/packages/source/{{ name[0] }}/{{ name }}/{{ name }}-{{ version }}.tar.gz
  sha256: 26e76eb100c95ed52241f3b552d7dd16f59091a83f5e01b263f6fa9f12b30cfe

build:
  number: 0
  script: "{{ PYTHON }} -m pip install . -vv "
  noarch: python

requirements:
  host:
    - pip
    - python >=3.6
    - setuptools_scm
    - setuptools_scm_git_archive
  run:
    - python >=3.6
    - tensorflow-base >=1.14.0
    - tensorflow-probability >=0.6.0
    - scipy >=1.2
    - uproot
    - pandas
    - numpy
    - iminuit
    - typing
    - colorlog
    - texttable
    # Workaround for https://github.com/conda-forge/tensorflow-probability-feedstock/pull/11
    - decorator
    - cloudpickle >=0.6.1

```

- ➤ Create a pull request against
  https://github.com/conda-forge/staged-recipes
- ➤ Can be mostly automated using
  `conda skeleton pypi zfit`



```yaml
test:
  imports:
    - zfit
    - zfit.core
    - zfit.minimizers
    - zfit.models
    - zfit.util
    - zfit.ztf

about:
  home: https://github.com/zfit/zfit
  license: BSD-3-Clause
  license_family: BSD
  license_file: LICENSE
  summary: Physics extension to zfit
  doc_url: https://zfit.readthedocs.io/
  dev_url: https://github.com/zfit/zfit

extra:
  recipe-maintainers:
    - chrisburr
    - mayou36
```

Updates

- ➤ Bots monitor for new releases
  - ➤ Even works with non-standard URLs
- ➤ Maintainers normally just have to click merge

conda-forge / phasespace-feedstock
♥ Sponsor
Unwatch ▾ 6
★ Star 0
Fork 1
<> Code
Issues 0
Pull requests 0
Actions
Projects 0
Security
Insights
Edit
Conversation 1
Commits 2
Checks 2
Files changed 2
+3 −2
Reviewers
chrisburr
mayou36
Assignees
No one—assign yourself
Labels
None yet
Projects
None yet
Milestone
No milestone
4
recipe/meta.yaml
Viewed

phasespace v1.0.4 #1

Merged chrisburr merged 2 commits into `conda-forge:master` from `regro-cf-autotick-bot:1.0.4` 2 days ago

regro-cf-autotic... commented 2 days ago

It is very likely that the current package version for this feedstock is out of date.
Notes for merging this PR:

1. Feel free to push to the bot's branch to update this PR if needed.
2. The bot will almost always only open one PR per version.
   Checklist before merging this PR:

- □ Dependencies have been updated if changed
- □ Tests have passed
- □ Updated license if changed and `license_file` is packaged

Note that the bot will stop issuing PRs if more than 3 Version bump PRs generated by the bot are open. If you don't want to package a particular version please close the PR

If this PR was opened in error or needs to be updated please add the `bot-rerun` label to this PR. The bot will close this PR and schedule another one.

```
@@ -1,13 +1,13 @@
   {% set name = "phasespace" %}
 - {% set version = "1.0.3" %}
 + {% set version = "1.0.4" %}

   package:
     name: "{{ name|lower }}"
     version: "{{ version }}"

   source:
     url: https://github.com/zfit/phasespace/archive/{{ version }}.tar.gz
 -   sha256: ad1b322c1c47378ec6687c1ec30d5b92101c883e96bbebea345526b21596516e
 +   sha256: 18e709a27111f96276aaa1f0df073e4cefc5e764ed9551de24b345aa3cc88790

   build:
     number: 0
```

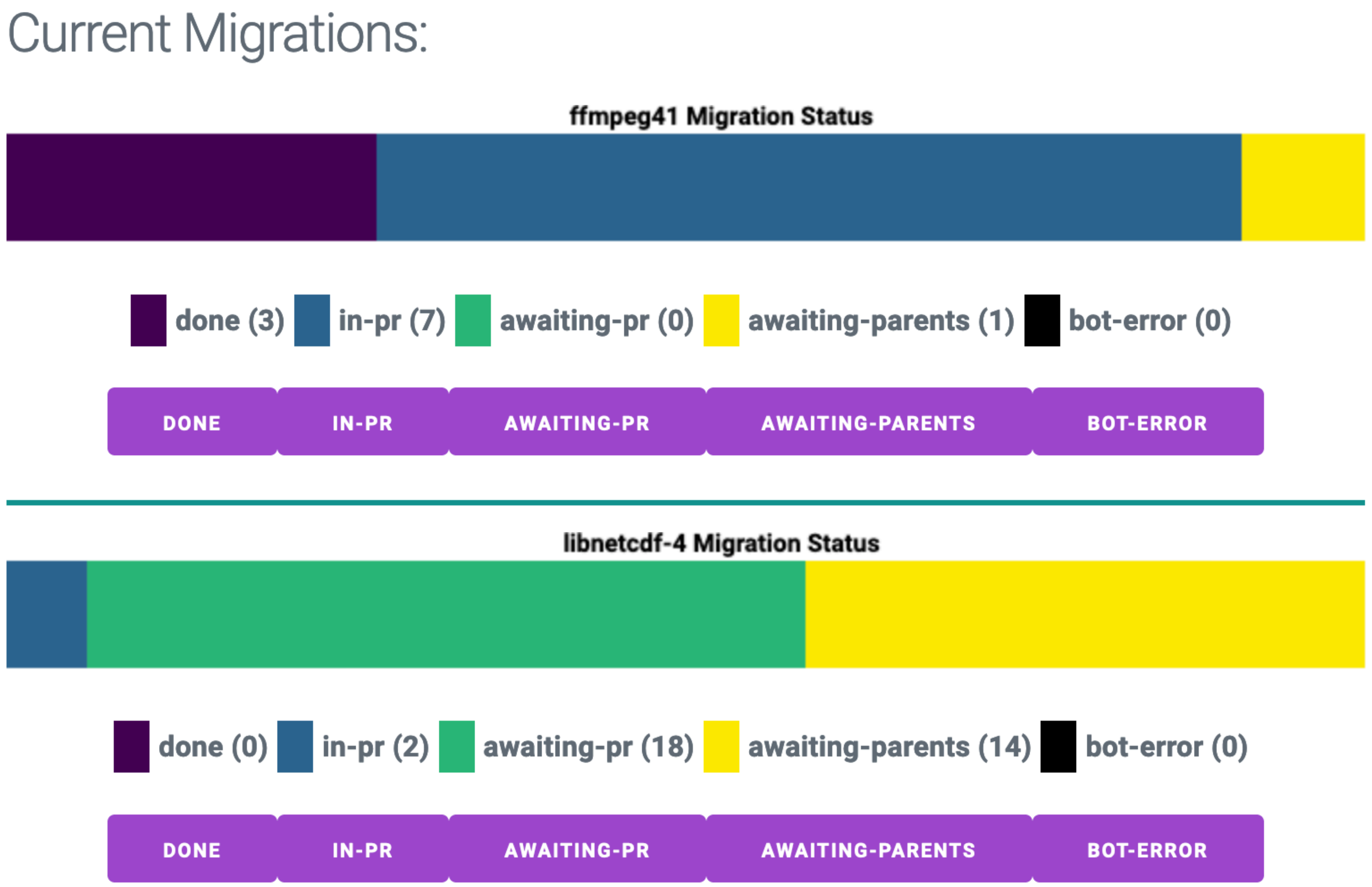
Binary only distribution

- ➤ Conda only supports installing binaries*
- ➤ Relies on the solver knowing about API/ABI compatibility
- ➤ Packages with shared libraries should specify what their ABI stability is
- ➤ Doesn’t necessarily restrict what you can do
  - ➤ Variants can be used to provide different versions of a packages
  - ➤ BLAS can be provided by netlib, mkl, blis and openblas
  - ➤ Several MPI variants
  - ➤ TensorFlow has CPU and (several) GPU variants

**Some organisations mirror the conda-forge build infrastructure for their own internal use*

Migrations

- What about when ABIs change? More 🤖!
- A line is added to a git repository
- Pull requests appear that rebuild packages in the correct order

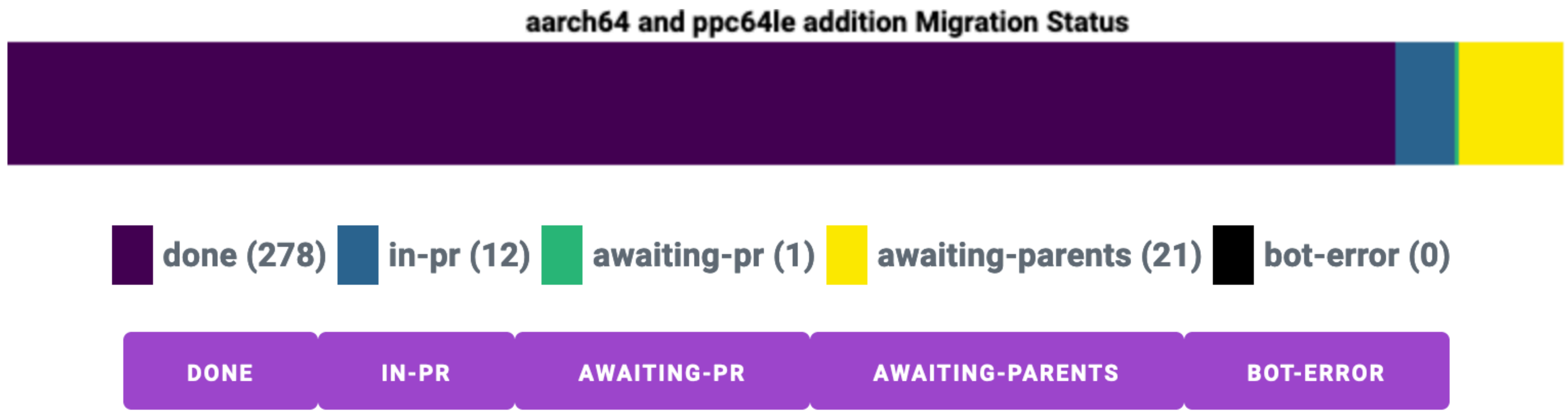


Current Migrations:

ffmpeg41 Migration Status
🟪 done (3) 🟦 in-pr (7) 🟩 awaiting-pr (0) 🟨 awaiting-parents (1) ⬛ bot-error (0)
DONE
IN-PR
AWAITING-PR
AWAITING-PARENTS
BOT-ERROR
libnetcdf-4 Migration Status
🟪 done (0) 🟦 in-pr (2) 🟩 awaiting-pr (18) 🟨 awaiting-parents (14) ⬛ bot-error (0)
DONE
IN-PR
AWAITING-PR
AWAITING-PARENTS
BOT-ERROR

Alternative architectures

- Migration is currently ongoing for ppc64le and aarch64 support
  - ROOT is included as a target



- Support for compiling CUDA with nvcc is rapidly maturing
  - Adds three additional additional targets (different driver versions)
  - Close to being fully supported by the conda-forge tooling
  - GPU variants of packages are already being added

NVIDIA.
CUDA.

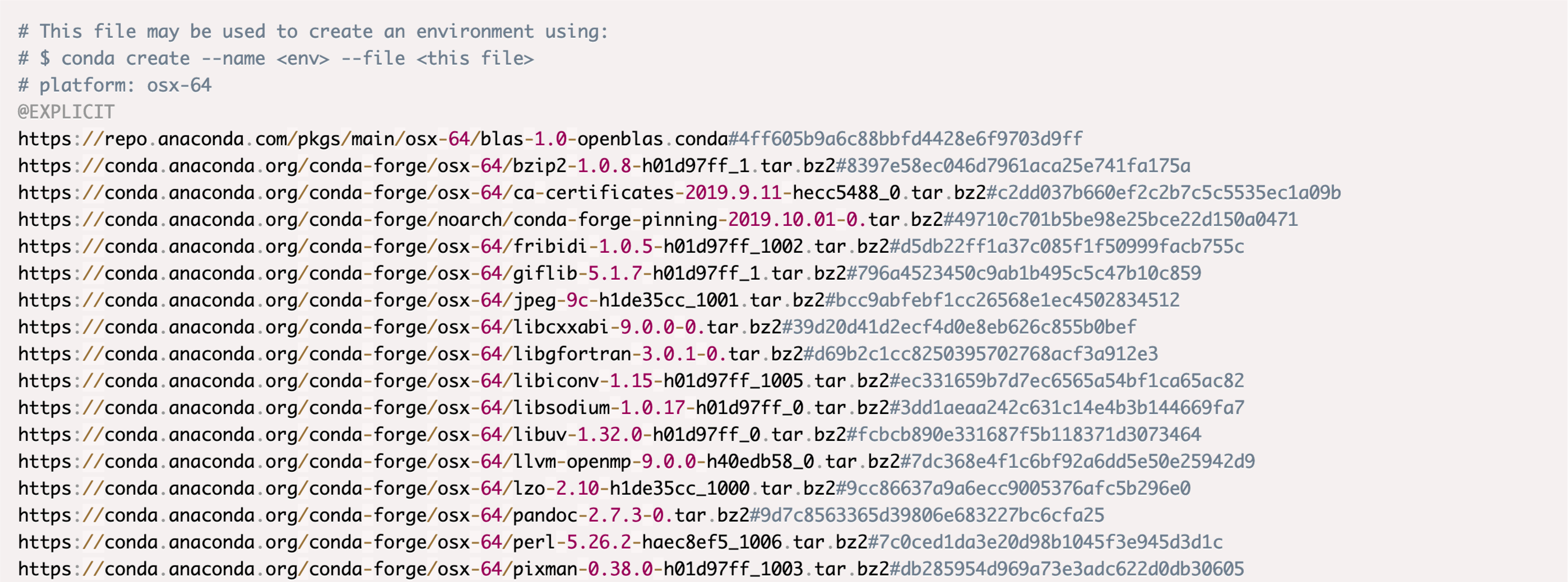
Build infrastructure for conda-forge

- One repository per package ("feedstock")
- All packages are built using well known CI providers
- A year ago this was Travis CI + Circle CI + Appveyor
- Now mostly Azure Pipelines
- Native builds for alternative architectures:
  - ppc64le with Travis CI
  - aarch64 with Drone CI
- All managed by an external package: conda-smithy
  - Used to regenerate CI configuration for each update

Long term reproducibility

- Long term reproducibly is important for science
- Easy to export exact builds of everything that was installed

```
conda list --explicit --md5 > environment.txt
```



```
# This file may be used to create an environment using:
# $ conda create --name <env> --file <this file>
# platform: osx-64
@EXPLICIT
https://repo.anaconda.com/pkgs/main/osx-64/blas-1.0-openblas.conda#4ff605b9a6c88bbfd4428e6f9703d9ff
https://conda.anaconda.org/conda-forge/osx-64/bzip2-1.0.8-h01d97ff_1.tar.bz2#8397e58ec046d7961aca25e741fa175a
https://conda.anaconda.org/conda-forge/osx-64/ca-certificates-2019.9.11-hecc5488_0.tar.bz2#c2dd037b660ef2c2b7c5c5535ec1a09b
https://conda.anaconda.org/conda-forge/noarch/conda-forge-pinning-2019.10.01-0.tar.bz2#49710c701b5be98e25bce22d150a0471
https://conda.anaconda.org/conda-forge/osx-64/fribidi-1.0.5-h01d97ff_1002.tar.bz2#d5db22ff1a37c085f1f50999facb755c
https://conda.anaconda.org/conda-forge/osx-64/giflib-5.1.7-h01d97ff_1.tar.bz2#796a4523450c9ab1b495c5c47b10c859
https://conda.anaconda.org/conda-forge/osx-64/jpeg-9c-h1de35cc_1001.tar.bz2#bcc9abfebf1cc26568e1ec4502834512
https://conda.anaconda.org/conda-forge/osx-64/libcxxabi-9.0.0-0.tar.bz2#39d20d41d2ecf4d0e8eb626c855b0bef
https://conda.anaconda.org/conda-forge/osx-64/libgfortran-3.0.1-0.tar.bz2#d69b2c1cc8250395702768acf3a912e3
https://conda.anaconda.org/conda-forge/osx-64/libiconv-1.15-h01d97ff_1005.tar.bz2#ec331659b7d7ec6565a54bf1ca65ac82
https://conda.anaconda.org/conda-forge/osx-64/libsodium-1.0.17-h01d97ff_0.tar.bz2#3dd1aeaa242c631c14e4b3b144669fa7
https://conda.anaconda.org/conda-forge/osx-64/libuv-1.32.0-h01d97ff_0.tar.bz2#fcbcb890e331687f5b118371d3073464
https://conda.anaconda.org/conda-forge/osx-64/llvm-openmp-9.0.0-h40edb58_0.tar.bz2#7dc368e4f1c6bf92a6dd5e50e25942d9
https://conda.anaconda.org/conda-forge/osx-64/lzo-2.10-h1de35cc_1000.tar.bz2#9cc86637a9a6ecc9005376afc5b296e0
https://conda.anaconda.org/conda-forge/osx-64/pandoc-2.7.3-0.tar.bz2#9d7c8563365d39806e683227bc6cfa25
https://conda.anaconda.org/conda-forge/osx-64/perl-5.26.2-haec8ef5_1006.tar.bz2#7c0ced1da3e20d98b1045f3e945d3d1c
https://conda.anaconda.org/conda-forge/osx-64/pixman-0.38.0-h01d97ff_1003.tar.bz2#db285954d969a73e3adc622d0db30605
```

```
conda create --name my-new-env --file environment.txt
```

The problem with long term reproducibility

- Bad metadata in old packages can “poison” the solver
  - Mechanism exists for patching this but it’s fiddly
- Current solution is to move packages to a “broken” channel
  - Channel list must have “conda-forge/label/broken” appended
  - URL also changes (for now)
- Lots of benefits to having a docker container “just in case”
  - Currently setting up a mirroring proxy for conda within LHCb
  - Also deploying to CVMFS
  - Ask me if you're interested

conda-pack

- Creates a relocatable self extracting archive of a conda environment

```
jcrist computer_one $ source activate example
(example) jcrist computer_one $ # Package the current environment
(example) jcrist computer_one $ conda-pack
Collecting packages...
Packing environment at '/Users/jcrist/anaconda/envs/example' to 'example
[#########################################] | 100% Completed |  5.2s
(example) jcrist computer_one $ ls
example.tar.gz
(example) jcrist computer_one $ # The environment is packaged as a tar.g
(example) jcrist computer_one $ # Get the file size
(example) jcrist computer_one $ du -h example.tar.gz
 55M    example.tar.gz
```

```
jcrist computer_two $ # Activate the environment
jcrist computer_two $ source myenv/bin/activate
(myenv) jcrist computer_two $ # Use applications in the environment
(myenv) jcrist computer_two $ which ipython
/Users/jcrist/computer_two/myenv/bin/ipython
(myenv) jcrist computer_two $ ipython
Python 3.6.5 |Anaconda, Inc.| (default, Apr 26 2018, 08:42:37)
Type 'copyright', 'credits' or 'license' for more information
IPython 6.4.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: import numpy
```

https://conda.github.io/conda-pack/

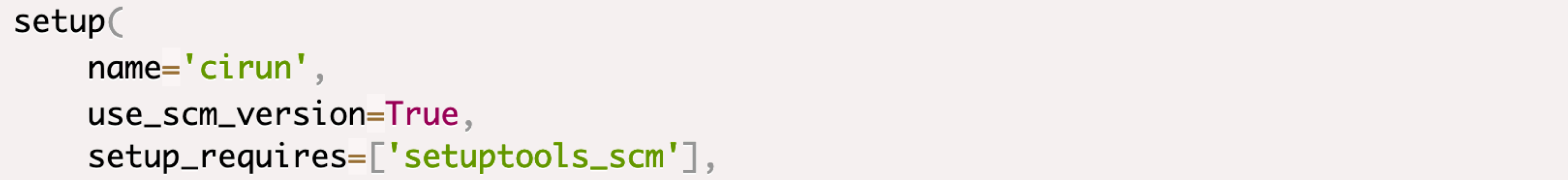
For library maintainers...

General comments

- ➤ Automate deployment
  - ➤ Keep it simple if possible
- ➤ Make it easy to run tests against a pre-existing installation
- ➤ If it’s compiled: provide as many pre-build wheels as you can
  - ➤ pip install should work for Python packages
  - ➤ But also include source distributions!

Versioning

- Use setuptools_scm
  - Removes all duplication of version numbers



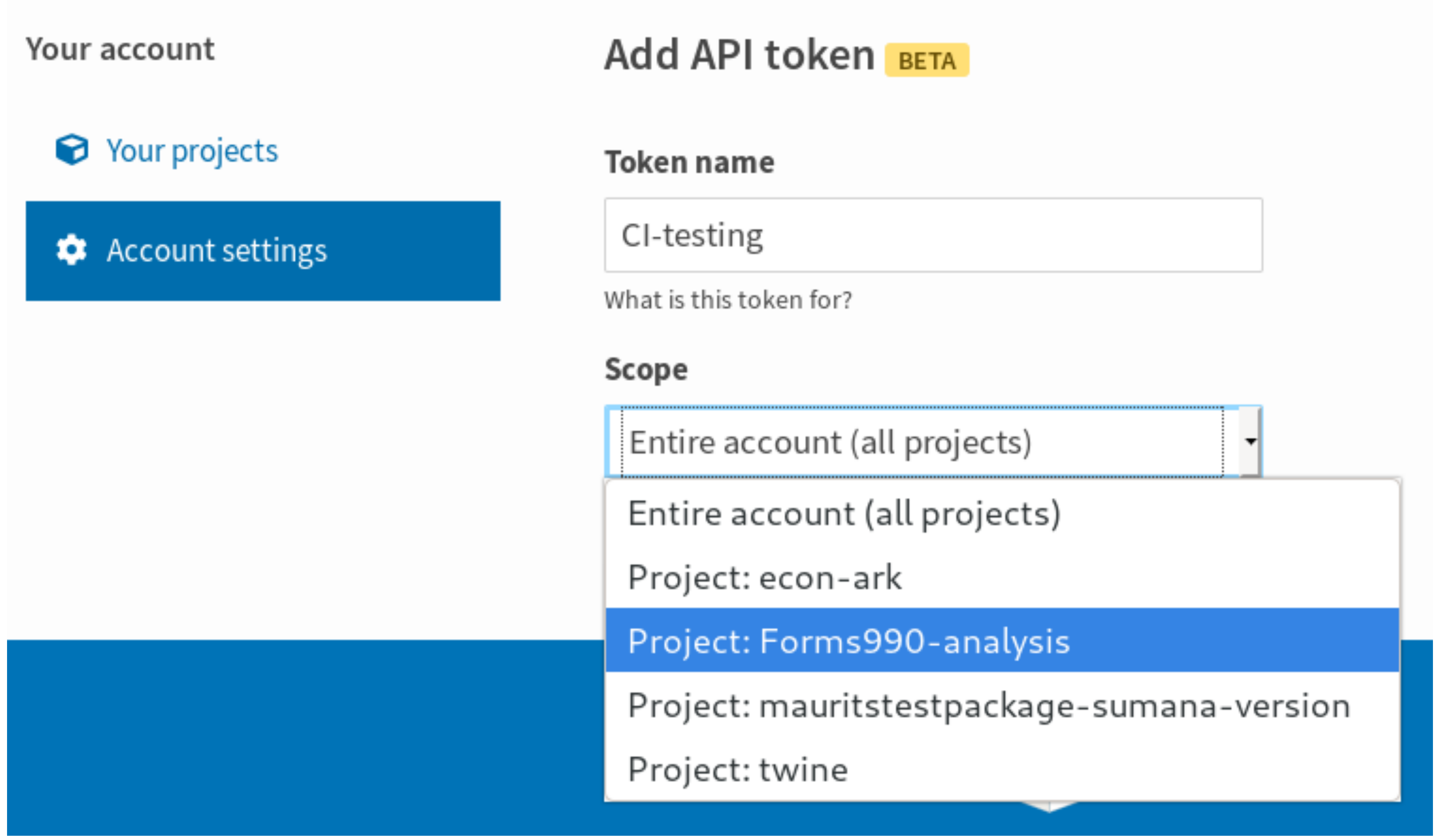
```
setup(
    name='cirun',
    use_scm_version=True,
    setup_requires=['setuptools_scm'],
```

- Uses version control to compute version numbers

```
          Release: 1.0.0
9 commits later: 1.0.1.dev9+g59ff2f1
```

- Even accounts for installs from dirty clones

- ➤ PyPI finally supports API tokens!



Your account

Your projects

Account settings

Add API token BETA

Token name

CI-testing

What is this token for?

Scope

Entire account (all projects)

Entire account (all projects)
Project: econ-ark
Project: Forms990-analysis
Project: mauritstestpackage-sumana-version
Project: twine

http://pyfound.blogspot.com/2019/07/pypi-now-supports-uploading-via-api.html

Vendoring

- First: Don’t vendor or have builtin dependencies

How To Make Package Managers Cry: *https://www.youtube.com/watch?v=NSemlYagjIU*

Vendoring

- First: Don’t vendor or have builtin dependencies
- Second: Seriously…don’t…

How To Make Package Managers Cry: https://www.youtube.com/watch?v=NSemlYagjIU

Vendoring

- ➤ First: Don’t vendor or have builtin dependencies
- ➤ Second: Seriously…don’t…
- ➤ Third: Make it easy to unvendor them

How To Make Package Managers Cry: *https://www.youtube.com/watch?v=NSemlYagjIU*

Vendoring

- ➤ First: Don’t vendor or have builtin dependencies
- ➤ Second: Seriously…don’t…
- ➤ Third: Make it easy to unvendor them
- ➤ Finally: At least make sure they’re contained
  - ➤ Statically link
  - ➤ Ensure symbols are hidden
  - ➤ Don’t put vendored files in standard locations (e.g. shared libraries in $PREFIX/lib/)

How To Make Package Managers Cry: https://www.youtube.com/watch?v=NSemlYagjIU

conda-press

- ➤ Create Python wheels from conda packages

```
$ conda press --subdir osx-64 --skip-python --fatten iminuit=1.3.7=py37h86efe34_0
created fat wheel: iminuit-1.3.7-0_py37h86efe34-cp37-cp37m-macosx_10_9_x86_64.whl
```

- ➤ Why?
  - ➤ Centralises the building of packages
  - ➤ Easier to pull in dependencies
  - ➤ Use newer ABIs than manylinux<n>

https://pydata.org/nyc2019/schedule/presentation/41/conda-press-or-reinventing-the-wheel/

Questions?