

Build & Infrastructure

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CERN

2022-09-26 - ACTS Workshop



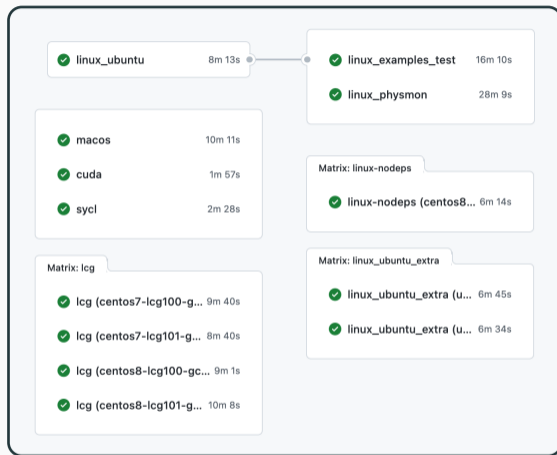
Build & Infrastructure

- Continuous integration
- Developer tools
- Release strategy

Continuous Integration

Continuous Integration jobs overview

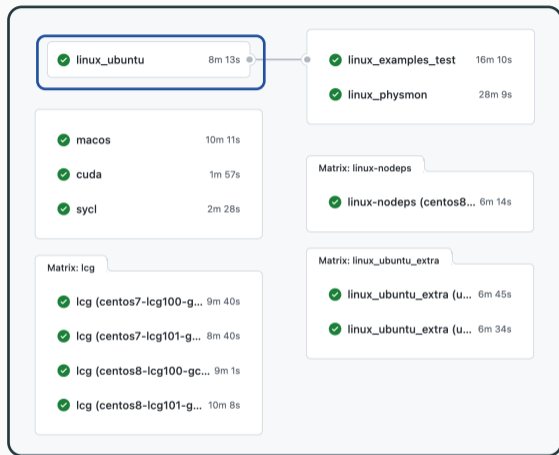
- Continuous integration tests our code automatically
- Is required to pass for PRs to be merged



CI: Build workflow

linux_ubuntu

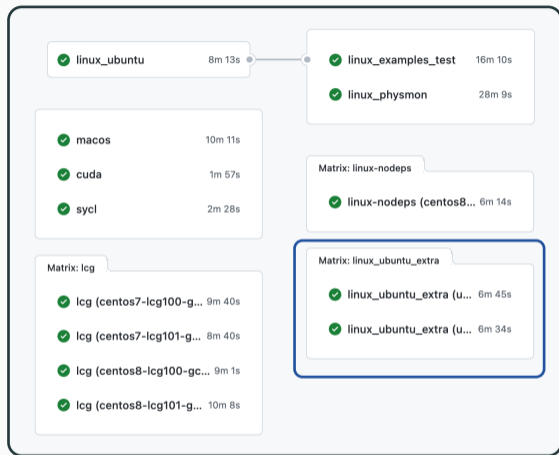
- The main CI build: this job builds everything!
- Runs unit tests, integration tests, downstream project usage
- Uses Ubuntu 20.04 image that bundles all dependencies



CI: Build workflow

linux_ubuntu_extra

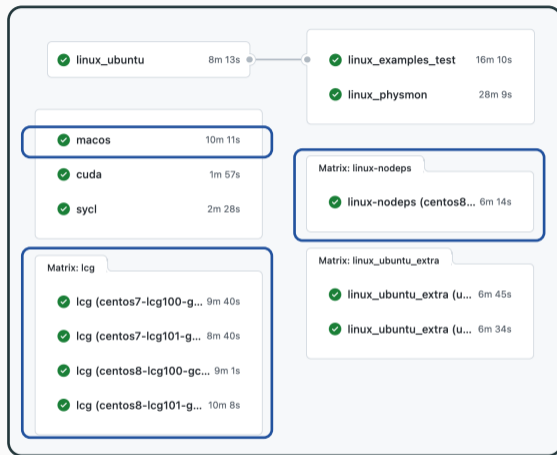
- Build using Ubuntu 22.04 with updated GCC, based on central Ubuntu test
- Ubuntu 22.04 test using clang (+libstdc++) instead of GCC



CI: Build workflow

lcg + macos

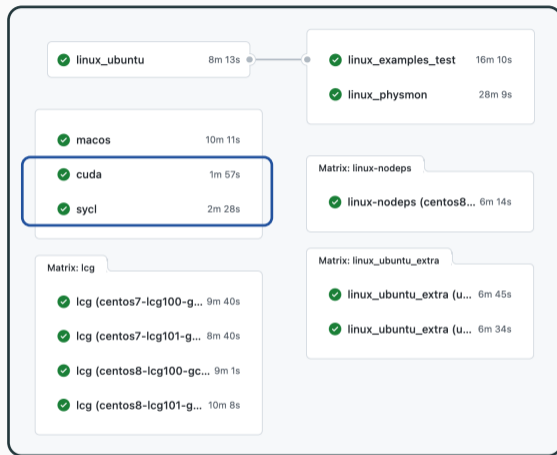
- LCG tests ensure compatibility with LCG releases
 - ▶ At this point: CentOS 7+8 and LCG 100+101 (plan to add 102)
 - ▶ Reduced features because of outdated DD4hep and EDM4hep versions, tests + downstream test
 - ▶ Uses locally installed RPMs in docker container: CVMFS on GitHub Actions too unreliable
- macOS: All dependencies, tests + downstream test
- nodeps: build core without external dependencies



CI: Build workflow

cuda + sycl

- Will go away in the very near future

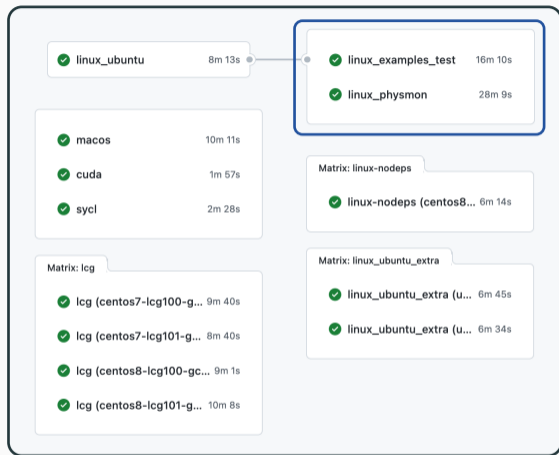


CI: Build workflow

Performance monitoring

linux_examples_test

- Uses Python bindings for the examples
- Python-level tests



Python level examples tests

- Comprehensive suite of `pytest` tests
- Directly tests the examples code, but indirectly also the core code
- Implements **hash-based ROOT file-level reproducibility checks**
 - ▶ CI notifies on PRs if outputs change
 - ▶ Manual follow up and reference update required
- Allows us to catch regressions early
- Ordering independent: reproducibility checks on MT code

CI: Build workflow

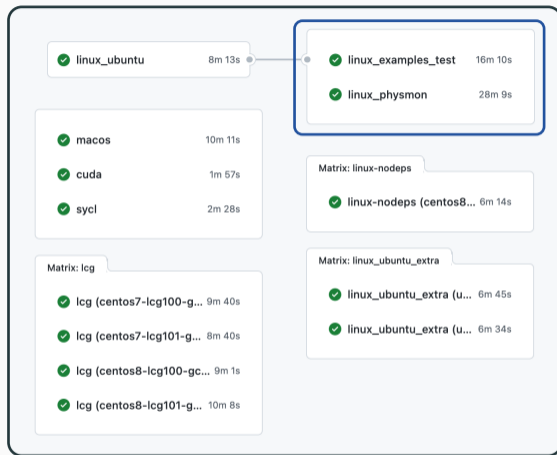
Performance monitoring

linux_examples_test

- Uses Python bindings for the examples
- Python-level tests

linux_physmon

- Runs characteristic tracking workflows and records performance metrics
- Automatically compares to references, and fails on discrepancies

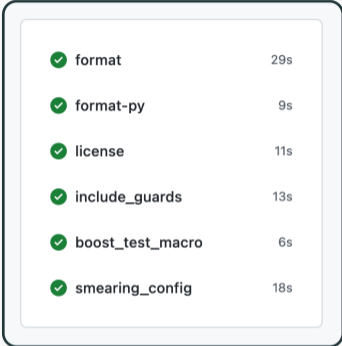


Bridged CI jobs

- Have custom setup to run CI job on CERN resources
- Currently defined
 - ▶ clang-tidy job (static code analysis, details [here](#))
 - ▶ GPU CI job: build jobs runs on CPU runner, test job runs on GPU runner under my desk
- Access steered by a custom allow-list: if you are a new contributor and are getting "Pipeline refused" on these jobs, **get in touch!**

CI: Checks workflow

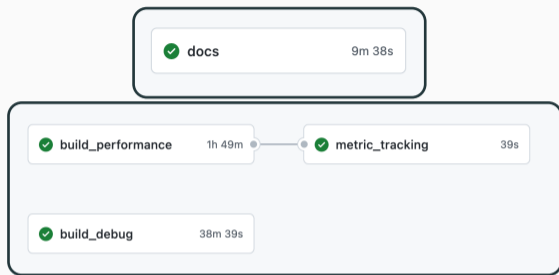
- Formatting: C++ (clang-format) and python (black)
 - ▶ Can run locally, or apply patch from CI artifact. Details [here](#)
- License check: validate that all source files start with the correct [license block](#)
- Include guards: check for *#ifndef MY_HEADER*: use *#pragma once* instead
- Check against usage of `BOOST_TEST()`
- Check smearing config



✓ format	29s
✓ format-py	9s
✓ license	11s
✓ include_guards	13s
✓ boost_test_macro	6s
✓ smearing_config	18s

CI: Code analysis and docs workflow

- Docs job builds the documentation, checks for missing comments etc.
- Build performance runs `cmakeperf` and measures compilation unit memory consumption
 - ▶ Report on the main branch [here](#)
- Build debug: similar to `linux_ubuntu`, but without examples
 - ▶ Uses debug build to run unit tests and generate code coverage report
 - ▶ Coverage report is posted to each PR



Additional bots and workflows

- **merge-sentinel**: manages which jobs / checks are required (custom bot)
- **review-required**: checks approval from one of the reviewers (self-hosted policybot instance)
- **kodiakhq**: enables auto-merging (central instance)
- **WIP**: blocks merging PRs with label "WIP" (central instance)
- **codecov**: Coverage reporting (central instance)
- **readthedocs.org**: Preview build of the documentation, deployed to RTD
- **milestone-set**: Blocks merging without a milestone

 merge-sentinel <i>In progress — Waiting for 1 job: review-required: main</i>	Required	Details
 review-required: main <i>Pending — 0/1 rules approved</i>	Required	Details
 kodiakhq: status — Ignored (no automerge label: 'automerge')		Details
 WIP <i>Successful in 2s — Ready for review</i>	Required	Details
 codecov/project — 48.57% (-0.01%) compared to eb94af6		Details
 docs/readthedocs.org:acts — Read the Docs build succeeded!		Details
 milestone-set — Milestone is set!	Required	Details

Developer tools

Developer tools

- CMake option: `ACTS_FORCE_ASSERTIONS` force-enables `assert`
 - ▶ Allows having checks in ACTS code + 3rd party code even in Release builds
 - ▶ Affects performance, be aware when benchmarking
- CMake options `ACTS_LOG_FAILURE_THRESHOLD=<LEVEL>` and `ACTS_ENABLE_LOG_FAILURE_THRESHOLD` steer log level failure threshold ([details](#))
 - ▶ If enabled, logging at or above `<LEVEL>` will cause a job to fail
 - ▶ Can be set at compile-time or at runtime via env variable or set from Python
 - ▶ Allows us to check workflows covered by CI do not produce WARNINGS and ERRORS

Release strategy

Release strategy

- We follow semantic versioning: vMAJOR.MINOR.PATCH
- General development targets the `main` via PRs
 - ▶ Requires one approval from one of our reviewers (get in touch if you want to review!)
- Mainline tagged releases go onto the `releases` branch
- Before making a release, `main` gets merged into `releases`

- We follow semantic versioning
- General development workflow
 - ▶ Requires one branch per feature
- Mainline tagged
- Before making

```

tig 13
0000000 2022-09-23 14:51 +0100 Unknown o Untracked changes
7750c1d 2022-09-23 12:28 +0000 github-actions[bot] o [releases] {origin/releases} <v20.2.0> Bump to version v2
48f9dbb 2022-09-23 13:55 +0200 Paul Gessinger M Merge remote-tracking branch 'origin/main' into release
f3b20f7 2022-09-23 11:41 +0200 Benjamin Huth o [main] {origin/main} fix: maybe-uninitialized warning i
bf86784 2022-09-23 10:20 +0200 Paul Gessinger o chore: Update policybot configuration [skip ci]
e5d1970 2022-09-22 16:07 +0200 Andreas Stefl o refactor: improve full_chain_odd.py example (#1538)
bfc3676 2022-09-22 09:20 +0100 Tim Adye o docs: remove --recursive on git clone in quick start do
b99368a 2022-09-19 23:35 +0100 Tim Adye o refactor: improve full_chain_itk.py example (#1513)
896b47e 2022-09-19 23:04 +0200 Paul Gessinger o fix: ParticleSmearing options not setup in ANMF example
d9816f2 2022-09-19 22:00 +0200 Paul Gessinger o docs: Contribution guidelines (#1525)
3da38d6 2022-09-19 11:05 +0200 Paul Gessinger o chore: Add priority merge label to kodiak config (#1532)
9e22341 2022-09-19 10:12 +0200 Benjamin Huth o feat: Allow configurable particle selection and reprodu
4a41d30 2022-09-16 15:49 +0200 Corentin-Allaire o refactor: Improve material mapping speed (#1458)
4046059 2022-09-16 15:27 +0200 Guilherme Almeida o fix: Added missing return to seedfinder::CreateSeedsFor
2a17808 2022-09-16 12:34 +0200 Benjamin Huth o docs: Gaussian Sum Filter (#1403)
b409627 2022-09-16 12:21 +0200 Benjamin Huth o feat: Exa.TrkX with torchscript backend (#1473)
ff772f1 2022-09-16 09:59 +0200 Benjamin Huth o docs: update markdown cheatsheet (#1524)
33ce28f 2022-09-16 09:46 +0200 Paul Gessinger o docs: Update logging doc, add info on thresholds (#1520)
6b97a09 2022-09-15 15:31 +0200 Paul Gessinger o docs: Tracking in a nutshell (#1399)
4ad5016 2022-09-15 13:54 +0200 Paul Gessinger o docs: Update magnetic field documentation (#1518)
71f5c74 2022-09-15 12:44 +0200 Paul Gessinger o docs: Enable sphinx linkcheck build in CI (#1523)
9d4a4fd 2022-09-15 11:12 +0200 robertlangenberg o docs: Fix seeding example documentation (#1340)
4e270e7 2022-09-14 13:14 +0200 Paul Gessinger o docs: Remove obsolete config, and invalid doc markup (#
91ae877 2022-09-13 19:56 +0200 Benjamin Huth o feat: Add operator → to Acts::Result (#1509)
487a6cc 2022-09-13 18:19 +0200 Paul Gessinger o fix: Sequencer correctly calls algorithm finalize (#151
eb94af6 2022-09-13 11:45 +0200 Paul Gessinger o refactor: Reuse MultiTrajectory in (C)KF (#1507)
087ed98 2022-09-07 14:52 +0200 Paul Gessinger o fix: Make JsonMaterialDecorator IO error more explicit
433a379 2022-09-06 19:53 +0200 Andreas Stefl o refactor: python examples log level overwrite mechanism
f3ea581 2022-09-06 17:58 +0200 Paul Gessinger o ci: Add ccache stats output (#1489)
f5d312f 2022-09-06 14:19 +0200 Paul Gessinger o refactor: Vertex performance monitoring (#1417)
5f4052a 2022-09-06 12:07 +0200 Paul Gessinger o docs: Switch to doxygen FAIL_ON_WARNINGS (#1497)
3b9108d 2022-09-05 23:38 +0200 Benjamin Huth o docs: fix image paths (#1495)
1fd479b 2022-09-05 19:04 +0200 Andreas Stefl o refactor: loop protection as a function (#1490)
df05834 2022-09-05 17:08 +0200 Benjamin Huth o docs: Add as small cheatsheet with some Myst-Markdown s
abf9f38 2022-09-05 16:53 +0200 Paul Gessinger o ci: RTD fix for API listing (#1492)
d54fa84 2022-09-05 16:40 +0200 Luis Falda Coelho o feat: split deltaR in seedFinderOrthogonal (#1471)
2b34aa1 2022-09-05 04:17 -0700 Tomohiro Yamazaki o refactor: SP builder update (#1218)
a1569de 2022-09-02 16:08 +0200 Luis Falda Coelho o feat: check if yOuter takes the square root of a negati
be36226 2022-09-02 08:17 +0000 github-actions[bot] o <v20.1.0> Bump to version v20.1.0
1a6bc29 2022-09-02 09:57 +0200 Paul Gessinger M Merge remote-tracking branch 'origin/main' into release
b172918 2022-09-02 00:46 -0700 Carlo Varni o fix: Set s_binningValues as const (#1485)
42b16ef 2022-09-01 19:12 +0200 Paul Gessinger o test: Use tempdir to produce BB vis output (#1483)
eb8bd04 2022-09-01 16:59 +0200 Andreas Stefl o test: big bounding box vs frustum intersection (#1478)
[main] Untracked changes 0%
Unknown key, press h for help

```

gent to review!

Release strategy

- We follow semantic versioning: `vMAJOR.MINOR.PATCH`
- General development targets the `main` via PRs
 - ▶ Requires one approval from one of our reviewers (get in touch if you want to review!)
- Mainline tagged releases go onto the `releases` branch
- Before making a release, `main` gets merged into `releases`
- When required: create `develop/vX.Y.Z` branch as needed
 - ▶ Should only receive backports, no approval needed since no new developments
- Example:
 - ▶ Created `develop/v19.x` branch after `v20.0.0` was tagged
 - ▶ `develop/v19.x` can receive MINOR and PATCH updates, but no MAJOR updates
 - ▶ Additional matching `release/vX.Y.Z` created which receives tags

Release strategy

- We follow semantic versioning
- General development
 - ▶ Requires one additional branch
- Mainline tagged
- Before making a new release
 - ▶ Should only require a new commit
- Example:
 - ▶ Created development branch
 - ▶ develop/v19.x
 - ▶ Additional matching

```
tig 13
0000000 2022-09-23 15:02 +0100 Unknown
0000000 2022-09-23 15:02 +0100 Unknown
b655e18 2022-09-23 12:35 +0000 github-actions[bot]
a6b785f 2022-09-23 13:55 +0200 Paul Gessinger
e3cfd68 2022-09-23 13:52 +0200 acts-project-service
617a244 2022-09-23 13:26 +0200 Paul Gessinger
98aed00 2022-09-23 10:20 +0200 Paul Gessinger
c55f4c5 2022-09-23 09:48 +0200 Paul Gessinger
42c6af8 2022-09-22 19:49 +0200 Paul Gessinger
a4dc506 2022-09-22 17:39 +0200 Paul Gessinger
92f84d9 2022-09-22 17:36 +0200 acts-project-service
b60219c 2022-09-22 16:46 +0200 Paul Gessinger
919e4fc 2022-09-22 15:38 +0200 acts-project-service
8c6aa54 2022-09-22 12:58 +0200 Paul Gessinger
b3fb5c3 2022-09-22 09:00 +0200 Paul Gessinger
78e04c8 2022-09-22 09:00 +0200 Paul Gessinger
d31e7cf 2022-09-20 09:59 +0200 acts-project-service
70d5869 2022-09-20 05:32 +0200 acts-project-service
fb1afdc 2022-09-20 04:41 +0200 acts-project-service
af87624 2022-09-20 03:47 +0200 acts-project-service
6bdf4bc 2022-09-20 01:39 +0200 acts-project-service
2c8f937 2022-09-19 23:12 +0200 Paul Gessinger
9431612 2022-09-19 22:30 +0200 acts-project-service
8e0ec65 2022-09-19 11:10 +0200 Paul Gessinger
bb82e7b 2022-09-14 14:50 +0200 acts-project-service
7582072 2022-09-07 09:10 +0000 github-actions[bot]
a919bba 2022-09-07 11:09 +0200 Paul Gessinger
0584907 2022-09-06 09:19 +0200 acts-project-service
d05e8d9 2022-09-02 13:15 +0200 acts-project-service
f3fdcd8 2022-09-01 16:59 +0200 acts-project-service
2f2851b 2022-08-31 23:53 +0200 acts-project-service
4612409 2022-08-31 21:37 +0200 acts-project-service
6b7415b 2022-08-31 17:20 +0200 acts-project-service
b8c99eb 2022-08-31 14:20 +0200 Paul Gessinger
e1611b9 2022-08-23 20:51 +0200 acts-project-service
2477aed 2022-08-22 15:28 +0200 acts-project-service
2d6a24e 2022-08-22 14:35 +0200 acts-project-service
20fc5e2 2022-08-22 10:23 +0200 acts-project-service
93a7bef 2022-08-19 18:12 +0200 Paul Gessinger
8e7f126 2022-08-18 14:16 +0200 acts-project-service
91c49e5 2022-08-17 09:33 +0200 acts-project-service
9433998 2022-08-16 15:30 +0200 acts-project-service
a098828 2022-08-16 12:41 +0200 acts-project-service
[main] Untracked changes 0%

o Untracked changes
o Staged changes
o [release/v19.x] {origin/release/v19.x} <v19.9.0> Bump to
M Merge remote-tracking branch 'origin/develop/v19.x' into
o [origin/develop/v19.x] fix: maybe-uninitialized warning
o refactor: SP builder update [backport #1218 to develop/
o [develop/v19.x] chore: Update policybot configuration [
o feat: Allow configurable particle selection and reprodu
o perf: Remove x87 elliptic integral in solenoid B-field
o refactor: improve full_chain_odd.py example [backport #
o refactor: improve full_chain_itk.py example [backport #
o fix: Set s_binningValues as const [backport of #1485 to
o feat: use RangeID<> class for extent [backport #1424 to
o refactor: Vertex performance monitoring [backport #1417
o feat: Add operator -> to Acts::Result [backport #1509 t
o refactor: python examples log level overwrite mechanism
o fix: ParticleSmearing options not setup in AMVF example
o fix: Added missing return to seedfinder::CreateSeedsFor
o feat: check if yOuter takes the square root of a negati
o fix: Make JsonMaterialDecorator IO error more explicit
o refactor: Improve material mapping speed [backport #145
o feat: addCKFTracks option to disable some output [backp
o feat: split deltaR in seedFinderOrthogonal [backport #1
o chore: Add priority label to kodiak config (#1533)
o fix: Sequencer correctly calls algorithm finalize [back
o <v19.8.0> Bump to version v19.8.0
M Merge remote-tracking branch 'origin/develop/v19.x' into
o refactor: Loop protection as a function [backport #1490
o feat: Checks for configuration of delta R values in see
o feat: Update RootVertexPerformanceWriter to work with t
o feat: core add particle stopped aborter [backport #1453
o feat: Identifier can be customized for sensitive surfac
o refactor: Remove dependency on deprecated std::binary_f
o refactor: no return for addx python helpers [backport o
o feat: Algorithm lifecycle methods: initialize & finaliz
o refactor: no return for addx python helpers [backport #
o [backport/1447-addCKFTracks] refactor: consistent namin
o feat: don't use TBB in Sequence(numThreads=1) [backport
o ci: Update macOS CI dependencies [backport of #1445 to
o refactor: debug print particle id value [backport #1435
o fix: navigator priority with negative boundary distance
o fix: full chain vertexing [backport #1299 to develop/v1
o fix: RootBFieldWriter incorrect output [backport #1381
```

(want to review!)

developments

OR updates

Questions?

Backup

License block

```
// This file is part of the Acts project.  
//  
// Copyright (C) 2016-2020 CERN for the benefit of the Acts project  
//  
// This Source Code Form is subject to the terms of the Mozilla Public  
// License, v. 2.0. If a copy of the MPL was not distributed with this  
// file, You can obtain one at http://mozilla.org/MPL/2.0/.
```