Using Continuous Integration with EasyBuild in DEEP-SEA

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as part of an automated workflow, directly from GitLab.

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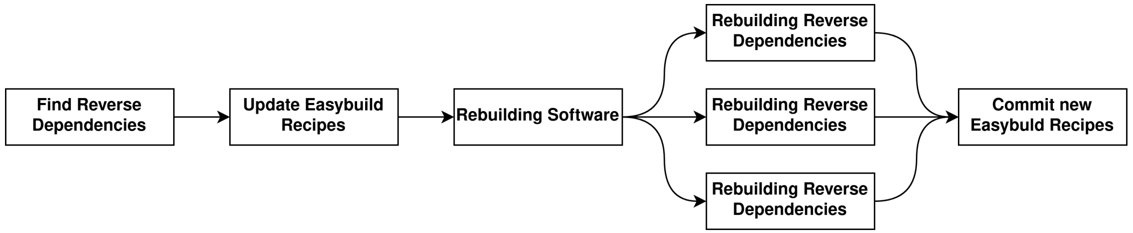
The software installations on DEEP are mostly handled by

EASYBUILD.io
building software with ease

The EasyBuild CI (cont'd)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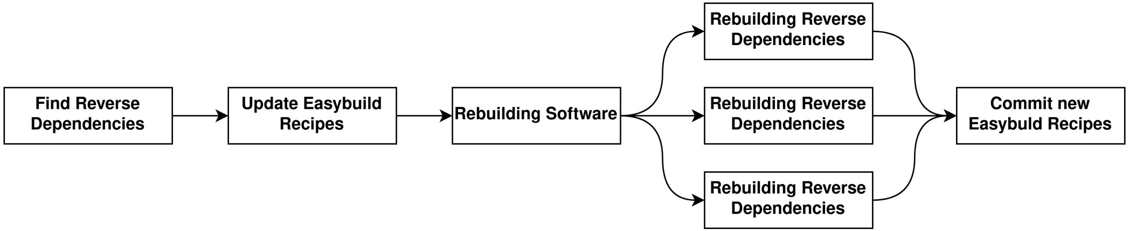
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This pipeline lives in the `deep-sea/wp3/software/easybuild-repository-deep-sea` repository, and you can trigger it as a *downstream pipeline* from your own repository.

Prerequisites

EasyBuild Recipe

```
name = 'Scalasca'
version = '2.6.1'

toolchain = {'name': 'gpsmpi', 'version': '2022a'}

source_urls = [
    'https://apps.fz-juelich.de/scalasca/releases/scalasca/%(version_major_minor)s/dist'
]
sources = [SOURCELOWER_TAR_GZ]
checksums = ['a0dbc3de82a6c0fe598de9e340513cff2882c199410a632d3a7f073ba921c7e7']

dependencies = [
    ('CubeGUI', '4.8'),
    ('CubeLib', '4.8'),
    ('OTF2', '3.0.2'),
    ('Score-P', '8.0'),
]
```

Existing EasyBuild recipes used as a *template* to generate new recipes for CI run

JSC GitLab Repository

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How use it then? You can *trigger* this pipeline from your own GitLab repository!

- Ideally: Your code repository in the JSC GitLab
- Alternatively: Create a repository just for your CI workflow

A Quick Word From Project Management

Public EasyBuild repository as Software Release:
gitlab.jsc.fz-juelich.de/deep-sea/easybuild-repository-public-release

Internal EasyBuild repository:
gitlab.jsc.fz-juelich.de/deep-sea/wp3/software/easybuild-repository-deep-sea/

↑ Please use this one to trigger CI ↑

CI Configuration from YOUR y Repository

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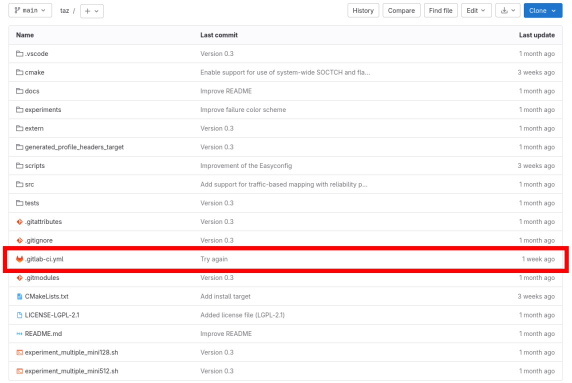
You need to configure a pipeline with the `.gitlab-ci.yml`



Name	Last commit	Last update
.vscode	Version 0.3	1 month ago
cmake	Enable support for use of system-wide SOCTCH and fla...	3 weeks ago
docs	Improve README	1 month ago
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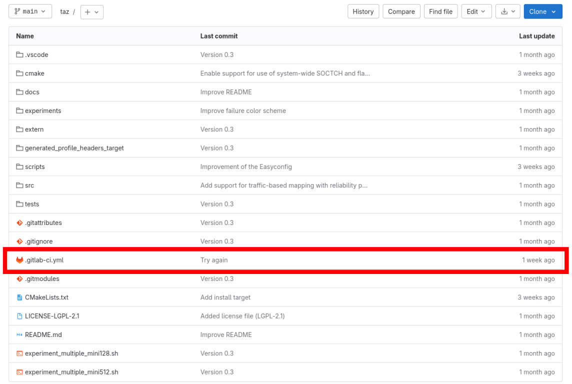
scripts	Improvement of the Easyconfig	3 weeks ago
src	Add support for traffic-based mapping with reliability p...	1 month ago
tests	Version 0.3	1 month ago
.gitattributes	Version 0.3	1 month ago
.gitignore	Version 0.3	1 month ago
.gitlab-ci.yml	Try again	1 week ago
.gitmodules	Version 0.3	1 month ago
CMakeLists.txt	Add install target	3 weeks ago
LICENSE-LGPL-2.1	Added license file (LGPL-2.1)	1 month ago
README.md	Improve README	1 month ago
experiment_multiple_mini128.sh	Version 0.3	1 month ago
experiment_multiple_mini512.sh	Version 0.3	1 month ago

CI Configuration from YOUR y Repository

You need to configure a pipeline with the `.gitlab-ci.yml`

- If you already have a JSC GitLab repo with CI workflow, integrate it there
- If not, consider putting your code in JSC GitLab
- If not, create a repository with only your CI trigger



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How To Integrate

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1. Have *one* EasyBuild recipe for your software merged in `easybuild-repository-deep-sea` Repository

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   - Bundle your sources (e.g. `.tar.gz`) and move it somewhere well known `/p/project/deepsea/ci-stage-sources`

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   - Bundle your sources (e.g. `.tar.gz`) and move it somewhere well known `/p/project/deepsea/ci-stage-sources`

3. Trigger the downstream CI pipeline:
   - For most, setting the `$SRC` and `$SRC_URLS` variable to your source file name should be enough
   - Some special care must be taken for Python EasyBuild recipes (and bundles in general). If you have one of these, talk to me!

Triggering a Rebuild

```yaml
stages: [prep, staging]
default:
  tags: [deep-sea, jacamar, shell]

create_tarball:
  stage: prep
  script:
  - mkdir -p -m 777 /p/project/deepsea/ci-stage-sources/s/Score-P/
  - tar -cvz --exclude=.git* -f /p/project/deepsea/ci-stage-sources/s/Score-P/${CI_PIPELINE_ID}.tar.gz .
  - chmod g+rw /p/project/deepsea/ci-stage-sources/s/Score-P/${CI_PIPELINE_ID}.tar.gz

trigger-downstream:
  stage: staging
  variables:
    EB_FILE_CURRENT: "Score-P-7.1-gpsmpi-2021b.eb"
    SRC: "${CI_PIPELINE_ID}.tar.gz"
    SRC_URLS: "file:///p/project/deepsea/ci-stage-sources/s/Score-P/"
    BUILD_INVERSE_DEPENDENCIES: "TRUE"
  trigger:
    project: deep-sea/wp3/software/easybuild-repository-deep-sea
    strategy: depend
    branch: ci-2023-dev
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trigger-downstream:
  stage: staging
  variables:
    EB_FILE_CURRENT: "Score-P-8.0-gpsmpi-2022a.eb"
    SRC: "${CI_PIPELINE_ID}.tar.gz"
    SRC_URLS: "file:///p/project/deepsea/ci-stage-sources/s/Score-P/"
    BUILD_INVERSE_DEPENDENCIES: "TRUE"
  trigger:
    project: deep-sea/wp3/software/easybuild-repository-deep-sea
    strategy: depend
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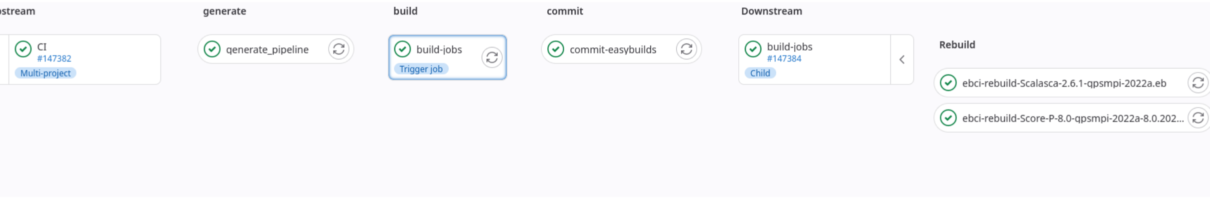
Also available:

- `REBUILD_ONLY`: Limits the reverse dependency rebuild by package names


stream
generate
build
commit
Downstream
CI
#147382
Multi-project
generate_pipeline
build-jobs
Trigger job
commit-easybuilds
build-jobs
#147384
Child
Rebuild
ebci-rebuild-Scalasca-2.6.1-gpsmpi-2022a.eb
ebci-rebuild-Score-P-8.0-gpsmpi-2022a-8.0.202...

```
$ module use /p/project/deepsea/ci-stage-2023-dev/easybuild/modules/all
$ module avail Score-P

---------- /p/project/deepsea/ci-stage-2023-dev/easybuild/modules/all ---------
MPI/GCC/11.3.0/psmpi/5/Score-P/8.0.20231123.105500 (u)
MPI/GCC/11.3.0/psmpi/5/Score-P/8.0.20231123.122040 (u, D)

Where:
g:  built for GPU
u:  Built by user

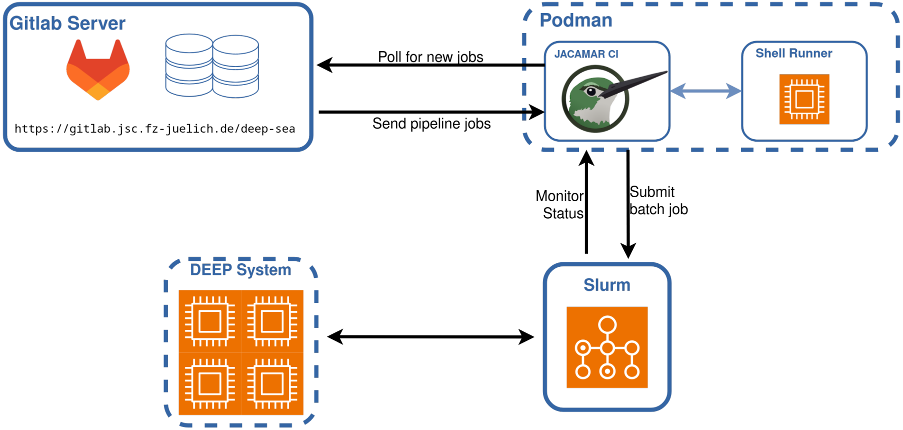
Use "module spider" to find all possible modules.
Use "module keyword key1 key2 ..." to search for all possible modules matching
any of the "keys".

$ module load MPI/GCC/11.3.0/psmpi/5/Score-P/8.0.20231123.122040
```

Thank You For Your Attention

Further Content

Continuous Integration Infrastructure



Reverse Dependency Rebuilding

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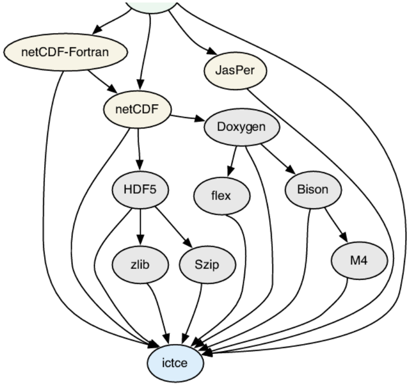

Reverse Dependency Rebuilding

EasyBuild CI needs to find reverse dependencies, update their dependency information and rebuild them

Reverse Dependency Resolution

- Not directly supported by EasyBuild
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  - We dump EasyBuilds full dependency graph, use it to locate reverse dependencies
  - We actually need a present Easybuild (base-) recipe for that
- Configurable by upstream user (that’s You):
  - Do you need reverse dependency rebuild: Yes/No?
  - All your reverse dependencies or only a select few?
  - More flexible configuration options in the works!

Rewriting EasyBuild Recipes

```
name = 'Scalasca'
version = '2.6.1'

toolchain = {
    'name': 'gpsmpi',
    'version': '2022a'
}

dependencies = [
    ('CubeGUI', '4.8'),
    ('CubeLib', '4.8'),
    ('OTF2', '3.0.2'),
    ('Score-P', '8.0'),
]
```

$\rightarrow$

```
name = 'Scalasca'
version = '2.6.1.20230726.064424'

toolchain = {
    'name': 'gpsmpi',
    'version': '2022a'
}

dependencies = [
    ('CubeGUI', '4.8'),
    ('CubeLib', '4.8'),
    ('OTF2', '3.0.2'),
    ('Score-P', '8.0.20230726.064424'),
]
```

We now have a robust and flexible solution to update EasyBuild Recipes!

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In the previous design: Build job orchestration supposed to be done by JUBE

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- Jacamar can directly submit (build) jobs to SLURM
- Jobs can be directly monitored from Gitlab CI/CD control panel
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Now: Moved to custom solution that generates downstream pipeline

- Jacamar can directly submit (build) jobs to SLURM
- Jobs can be directly monitored from Gitlab CI/CD control panel
- Shell runners are available for other tasks

Of course you can still, use JUBE to run your benchmarks on top of this stack!

How to Integrate?

Trigger?

```
workflow:
  rules:
    - if: $CI_COMMIT_MESSAGE =~ /-draft$/
      when: never
    - if $CI_PIPELIEN_SOURCE == "push"
```

When to trigger a rebuild?

- Depends on development workflow
- On push, merge request, release, manually,. . .