Use of LC GitLab for RADIUSS Open-Source Projects

Extending development workflows for versatile integration and automation

radiuss radiuss.llnl.gov

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Why add **continuous integration** and/or **continuous delivery** (CI/CD) pipelines to an open-source project?

- Test and validate pull requests to integrate new changes
- Add and schedule testing of the main branch to automate the release process

Our approach methodically **improves the development cycle** of RADIUSS projects by sharing common practices, leveraging existing workflows, and complementing cloud solutions. GitLab allows us to **connect projects' CI/CD together**, so we can now envision a streamlined process for multi-project development workflow.

We hope this information helps prevent teams from having to synchronize and solve multiple integration issues. We also aim to **create solid foundations** for RADIUSS.

We have helped Umpire, RAJA, CHAI, SUNDIALS, MFEM, Conduit, Serac, and Uberenv to add CI on LC GitLab for pull request testing. Extending this process to the release workflow will introduce multi-project integration and automate time-consuming steps.

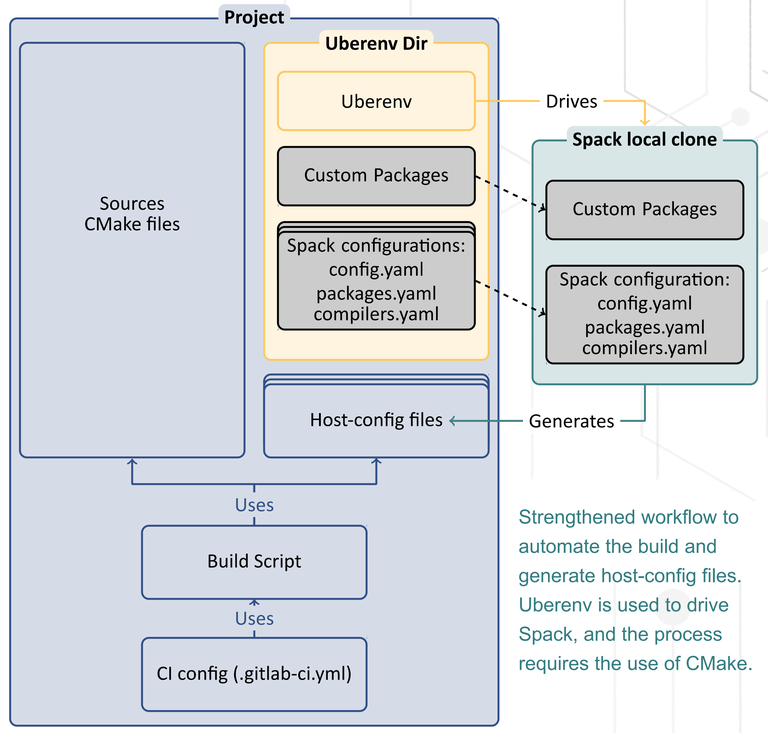
AUTOMATED BUILDS

Some RADIUSS projects share a common build infrastructure based on CMake/BLT and version-controlled host-config files. Others use Spack to generate their host config-files for CMake, relying on Uberenv to drive Spack. Advantages of **consolidating this workflow**:

- Bringing Spack closer to the development workflow—automation of dependencies builds and generation of host-config files—increases confidence in future packaging tasks.
- Similar workflows between projects improve familiarity and lay the groundwork for multi-project integration.

RADIUSS PACKAGING

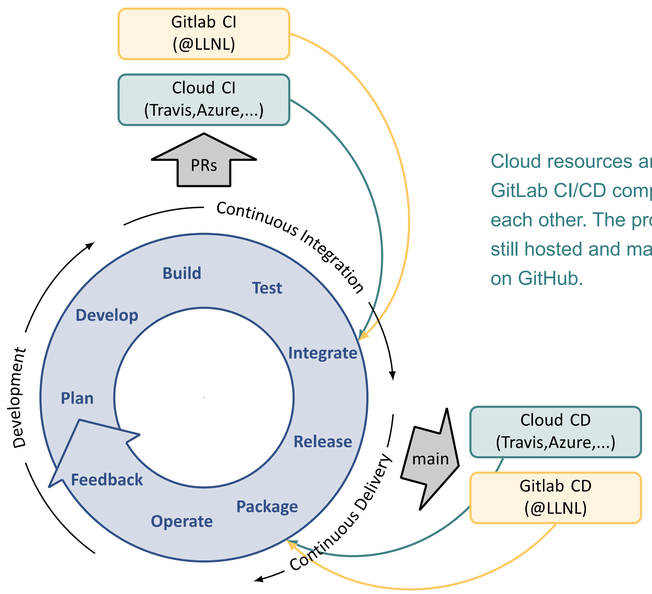
Access to LC resources in CI allows us to **automate larger tasks** such as bundling RADIUSS projects into a single Spack package and building it on our systems. This work-in-progress leverages new features in Spack, namely *spack stacks* and *spack ci*.



Strengthened workflow to automate the build and generate host-config files. Uberenv is used to drive Spack, and the process requires the use of CMake.

THE BIG PICTURE

Open-source projects rely on **cloud resources** to build and test the project at two important stages: integration of new changes and release of a new version. Cloud resources are not always free and are certainly limited, and they do not match LLNL's HPC architecture and software stack. Building and testing both on the cloud and on LC systems cover a **large diversity of systems**.



Cloud resources and LC GitLab CI/CD complement each other. The project is still hosted and managed on GitHub.

MULTI-PROJECT INTEGRATION

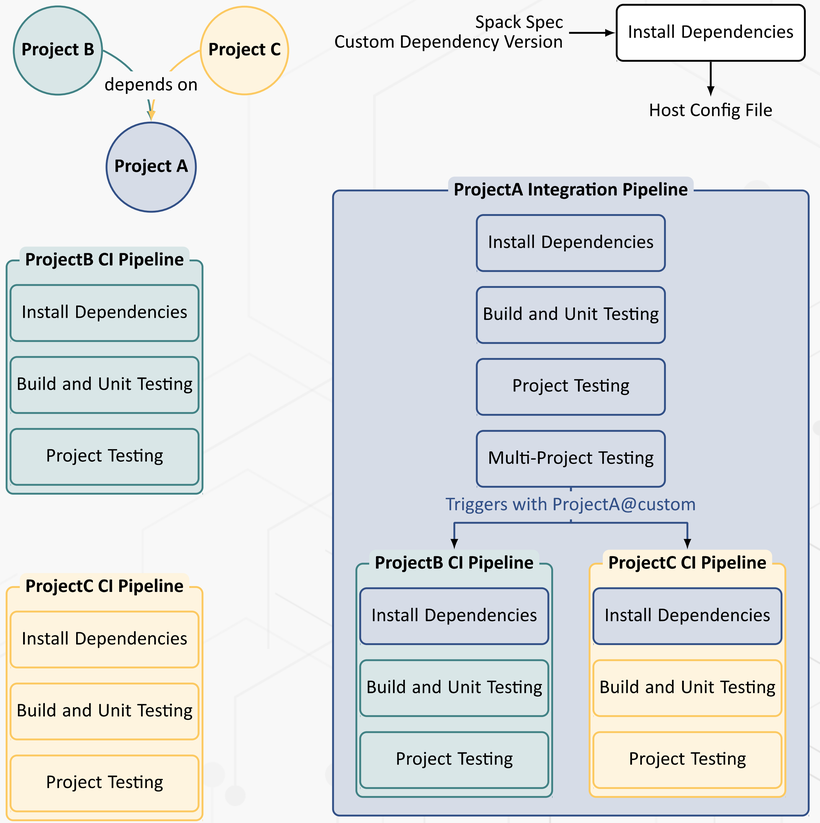
RADIUSS projects are in many ways related (e.g., RAJA, Umpire, CHAI, Conduit, and Axom), which places RADIUSS in a privileged position to coordinate their testing workflows.

Dependency	• Project A depends on B, which just released a new version: *Automatically trigger a pipeline with this new version.*
Bundle	• Project X is a bundle of A, B, and C: *Make sure A, B, and C are tested with latest releases.*
Submodule	• Project S is used as a submodule in A and B: *Integrate S into the testing workflow.*

Each project has its own testing pipeline. A dependency of this project should be able to use this logic to test new changes directly with no duplication.

GitLab allows the dependency to trigger a pipeline in the dependent project, so the latter simply needs to allow **on-the-fly updating** of the dependency controlled by environment variable.

Because *B* and *C* allow customization of the version of *A* in the pipeline, *A* can trigger their pipelines to test its own latest version.



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