

Stefan Zatschler

Laurentian University, SNOLAB, University of Toronto

Overview of SLAC S3DF computing resources for the G4CMP consortium

G4CMP workshop at RISQ2, June 15th 2026



Content

- **Part 1: S3DF Introduction**

- ▶ Motivation, Accounts, Infrastructure

- **Part 2: S3DF Demonstration**

- ▶ Bringing G4CMP applications to the cluster

SLAC | **S3DF**

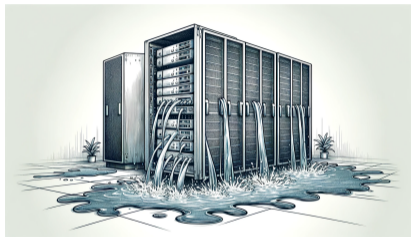


Part 1: S3DF Introduction

Motivation

Benefits of moving G4CMP to a cluster?

- **Increasingly complex physics models**
 - ▶ Long execution times per event
 - ▶ Limited statistics on personal devices
- **Cluster: parallelize simulation jobs**
 - ▶ Let a scheduler handle the overhead
- **Standardized software environment**
 - ▶ Provide standardized software environment
 - ▶ Common ground for CI/CD and unit tests



However, a cluster may not help with everything – like memory leaks.

SLAC | **S3DF** SLAC SHARED SCIENCE
DATA FACILITY

Getting access to SLAC S3DF

Disclaimer: It is a process... and it takes a bit of time and patience.

- 1) Join the [G4CMP Developer's Consortium](#) – It's free!
- 2) Check out [Accessing SLAC Computing Resources](#) on our Confluence space.
 - i) Obtain a **SLAC System ID (SID)**.
 - ii) Request **SLAC Computing Accounts** (unix, Windows).
 - iii) Complete mandatory **Cyber Security Training** (online).
 - iv) Get added to the **G4CMP hardware repository**.

We are making best effort to keep the Confluence instructions up-to-date. If you encounter any issue, do not hesitate to get in contact with the listed contact persons!

SLAC S3DF overview

The **S3DF cluster** is a compute, storage, and network architecture designed to support SLAC's experimental facilities and programs, including LCLS, the Vera C. Rubin Observatory, SuperCDMS, and many more.

Website: <https://s3df.slac.stanford.edu>

Confluence: [S3DF Computing Cluster Orientation](#)

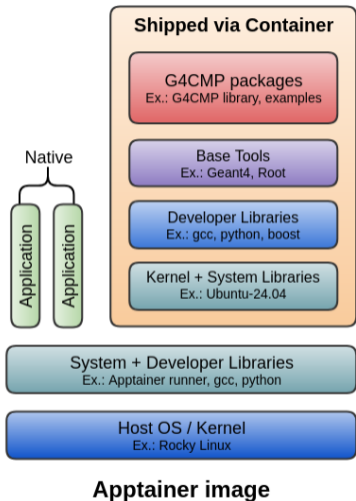
■ G4CMP hardware (+ shared resources)

- ▶ CPU: 1 Torino node (AMD Turin 9555) with 120 usable cores and 720 GB memory
- ▶ Storage: 100 TB (+ shared disk space)
- ▶ We plan to double our resources over the next 1-2 years

■ G4CMP software

- ▶ G4CMP releases: ready-to-use G4CMP installations (requires user application)
- ▶ G4CMP development: base software stack (Geant4 + scientific libraries)

Containerized G4CMP software



Confluence: Using G4CMP containers on S3DF

Start point: Apptainer in SuperCDMS

- Benefit from SuperCDMS expertise
- Established workflow on SLAC S3DF

Adopted for G4CMP consortium

- Readily available G4CMP installation
- Common development environment
- New *G4AppBuilder* utility to build containers



Confluence resources – Summary

Note: most Confluence pages require access (join the Consortium!)

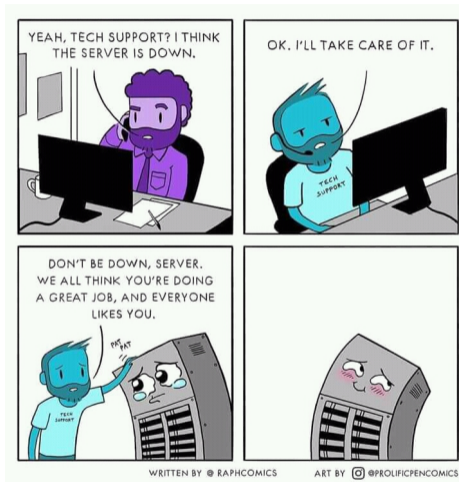
- **Public pages:** G4CMP – GEANT for Condensed Matter Physics
 - ▶ **Get involved:** Joining the G4CMP Developer's Consortium
 - ▶ **Documentation:** G4CMP Documentation
- **S3DF access:** Accessing SLAC Computing Resources
 - ▶ **Orientation:** S3DF Computing Cluster Orientation
 - ▶ **Containers:** Using G4CMP containers on SLAC S3DF
 - **Background:** Overview of Container Technology for G4CMP
 - **Development:** Code development with G4CMP containers

Our Confluence space offers a lot to explore and even more to be completed and filled with information. This is a great chance to get involved early on!

Summary

- S3DF welcomes G4CMP consortium members
- Established hardware pool and software
- **Next steps**
 - ▶ Onboard more users!
 - ▶ Integrate more packages into containers
 - ▶ Improve accessibility
 - ▶ Documentation!

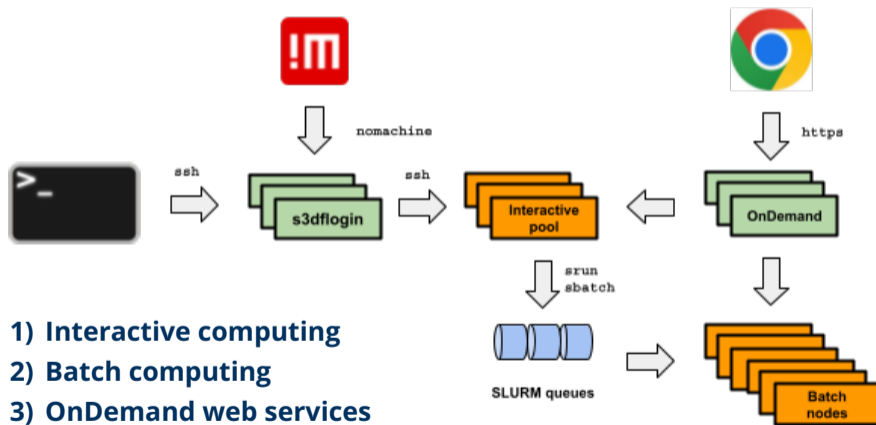
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Part 2: S3DF Demonstration

S3DF – Modes of operation

Documentation: <https://s3df.slac.stanford.edu/#/usage?id=s3df-usage>



- 1) Interactive computing
- 2) Batch computing
- 3) OnDemand web services

S3DF Demonstration

1) Interactive computing

- ▶ Login via ssh (bastion host, interactive pool)
- ▶ G4CMP environment modules
- ▶ G4CMP container interactions
- ▶ Visualization with G4CMP examples

2) Batch computing

- ▶ Submit example job

3) OnDemand web services

- ▶ Look at simulation output with Jupyter OnDemand