# Advancing Software Practices and Impact: Sustainable DAV and TOOLS Integrations for DOE HPC Software

PESO https://pesoproject.org

## The DAV & TOOLS Integrations

- A key component of software quality and advancement efforts within the **PESO** project
- **DAV Integration** curates data analysis & visualization software: **ParaView**, **Catalyst**, **ADIOS2**, **HDF5**, **PnetCDF**, **Viskores**, **VisIt**, **Ascent**, **DIY**, **ZFP**
- **TOOLS Integration** supports performance analysis & instrumentation software: **HPCToolkit**, **PAPI**, **TAU**, **ERT**, **Darshan**, **Dyninst**
- Products kept interoperable, portable, and integrated into DOE workflows via **Spack**, CDash, and CI pipelines.
- Working closely with **RAPIDS**, **STEP**, **E4S**, **FASTMath**, and **DOE** facility partners toward an exascale-ready ecosystem

## Advancing DOE software quality and sustainability in support of scientific discovery

### Continuous Integration (CI)

**Repository CI**

- Maintain per-product GitHub/GitLab workflows: builds, tests, wheels, GPU jobs, CDash reporting
- Fix breakage from evolving runners, compilers, and dependencies; share reusable CI components
- Grow coverage: CUDA/ROCm, ARM64/PowerPC, Python free-threading

**Spack CI**

- Run CI pipelines in Frank Cluster for integrations products (**DIY**, **Catalyst**, **Viskores**, **Dyninst, ADIOS2**)
- Speed up jobs with **ccache + redis** caching and runner tuning with the UO team
- Standardize GitHub to GitLab sync via the reusable **gh-gl-sync component**

**Facility CI**

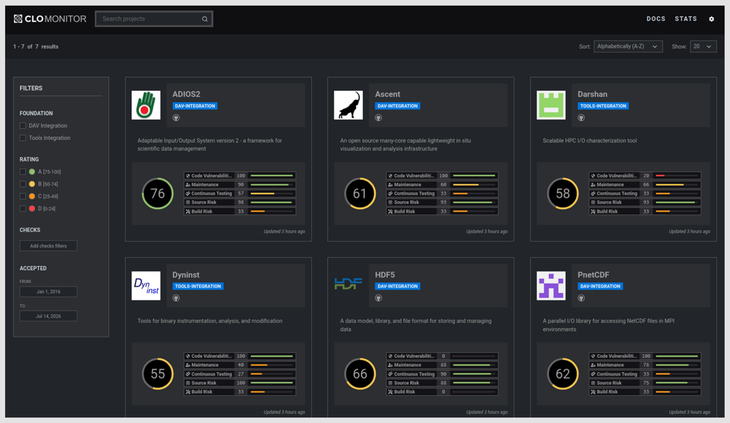
- Frontier CI under UMS projects, using **Jacamar CI** (+gh-gl-sync) for protected-branch builds
- Currently maintaining Frontier pipelines for **Viskores** and **ADIOS2**
- Integrated with each project's CDash dashboards

## Software Quality Assurance (SQA)

- Guided by the **OpenSSF** Best Practices Badge and Scorecard frameworks: recognized measures for security, dependency management, automated testing, code review, and maintainability
- Security policies created for **ADIOS2**, **Viskores**, **ZFP**, **Darshan**, and **PAPI**; **ParaView** & **Catalyst** policy in development
- Supply-chain hardening: CI dependencies pinned by hash, minimal workflow-token permissions, branch protection, Dependabot and more across many of the products.
- Several vulnerabilities fixed across many of the products.

## Highlights

- **ADIOS2** Scorecard raised from 7.1 to 8.6 / 10; passing Best Practices badge
- **CLOMonitor** fork dashboard tracks metrics for all DAV & TOOLS projects




## Spack Recipe Maintenance

- Recipes define how packages are built, configured, and integrated: the backbone of automated deployment across the Integrations and **E4S**.
- Keep recipes current across the products: new releases, new feature variants, and deprecation of ancient versions
- Create new packages, including installable configurations for the Integrations themselves
- Fix issues in Spack core and adapt recipes to ecosystem
- Provide build-system expertise and PR review across the products, easing the burden on upstream teams
- Maintain smoke tests across the products to validate installed packages at runtime

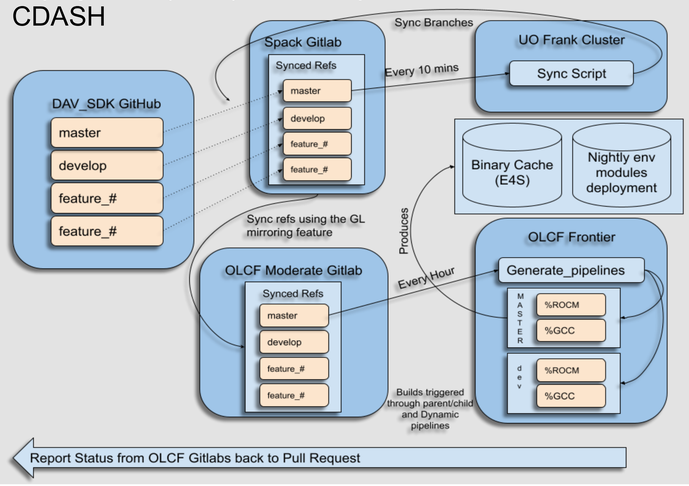
## Curated DAV & TOOLS Stacks

- Each Integration = a curated Spack environment + site-specific configs (shared with **E4S**), interoperable by design.
- Automated deployment of the DAV environment on Frontier (world-shared environment modules) + CDASH dashboard.
- Common binary caches for DAV & TOOLS packages on Frontier, refreshed automatically by facility CI.
- Curated, Frontier-tested package versions & variants that contribute to **E4S** releases.

- https://dav-sdk.github.io/
- https://tools-integration.github.io/

## DAV & Tools: Integrations on Frontier

- Periodic automated deployment of the DAV and Tools environment in **Frontier**. **Perlmutter** and **Aurora** coming.
- Fills the **E4S** binary cache and nightly env-module deployments(soon); status reported back to Github and CDASH




## Product Development

- Perform and facilitate releases across the products, including release candidates and coordinated version bumps
- Improve interoperability by design: language-standard alignment, CMake, external-dependency builds, and modern Python support across the products
- Fix critical build and packaging issues across the products to keep them deployable on all platforms

## Partnerships & Outreach

- Coordination with **RAPIDS**, **STEP**, **E4S**, and facility staff on interoperability and deployment.
- Strongly engaged with **PESO/CASS** including performing presentations of our work and organizing Community BoF session. Also strongly present in the development of our software products.


U.S. DEPARTMENT OF ENERGY | Office of Science

This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research, Next-Generation Scientific Software Technologies program, under contract numbers DE-AC02-06CH11357 (ANL), KJ0401010/FWP CC141 (BNL), DE- AC02-05CH11231 (LBNL), DE-AC52-07NA27344 (LLNL), DE-AC05-00OR22725 (ORNL), DE-AC06-76RL01830 (PNNL), DE-NA0003525 (SNL), and Triad National Security LLC ('Triad') contract grant 89233218CNA000001 (LANL).