

# E4S and Frank: A Platform for CI/CD with GPUs

Trilinos Users Group Meeting (TUG'23)  
[https://trilinos.github.io/trilinos\\_user-developer\\_group\\_meeting\\_2023.html](https://trilinos.github.io/trilinos_user-developer_group_meeting_2023.html)  
10am - 10:30am MT  
CSRI, Sandia National Laboratories, Albuquerque, NM

## Sameer Shende

Research Professor and Director,  
Performance Research Laboratory, OACISS, University of Oregon  
President and Director, ParaTools, Inc.  
[https://e4s.io/talks/E4S\\_Frank\\_TUG23.pdf](https://e4s.io/talks/E4S_Frank_TUG23.pdf)



UNIVERSITY  
OF OREGON



ParaTools



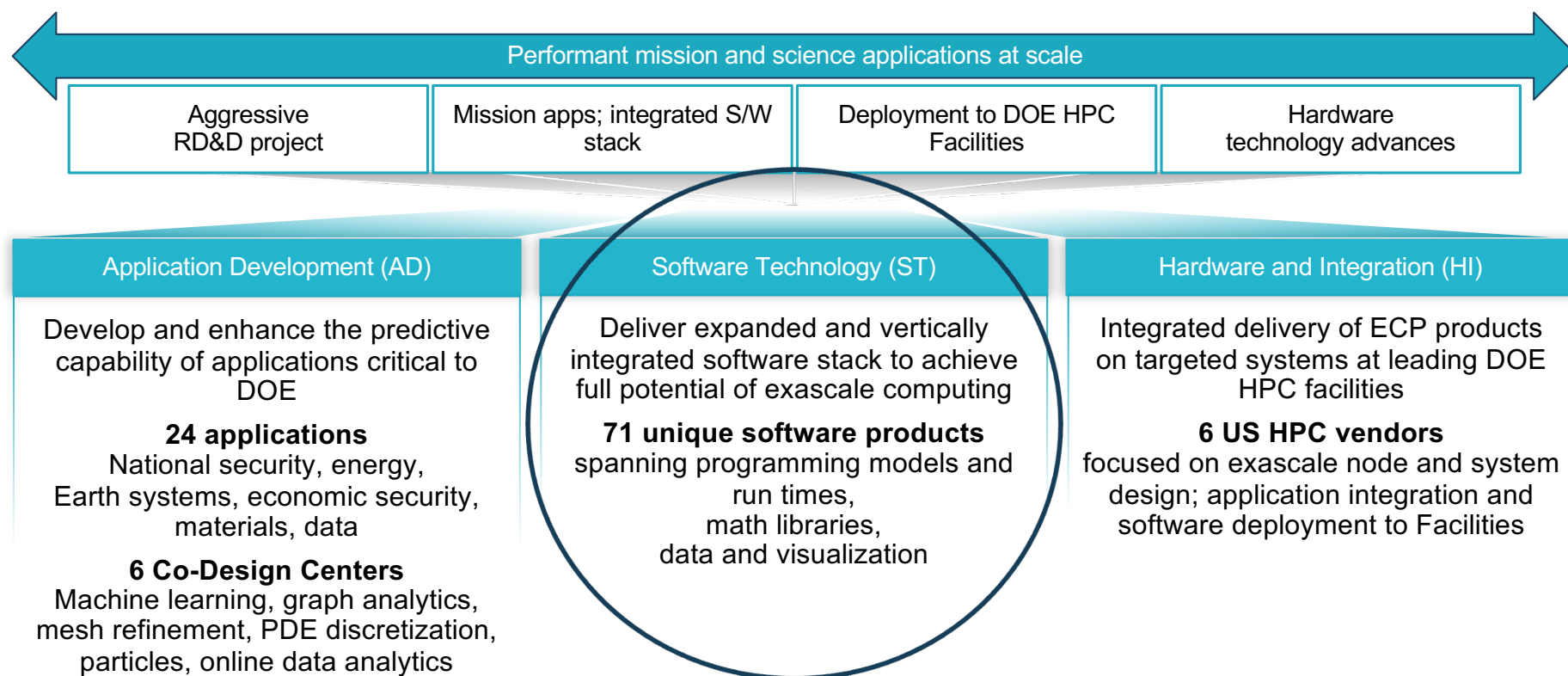
## Challenges

- As our software gets more complex, it is getting harder to install and validate HPC tools and libraries correctly in an integrated and interoperable software stack
  - E4S and Frank – a platform for CI/CD!

# Extreme-scale Scientific Software Stack (E4S)



# ECP's holistic approach uses co-design and integration to achieve exascale computing





# ECP Software Technology (ST)

## Goal

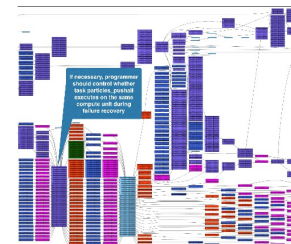
Build a comprehensive, coherent software stack that enables application developers to productively develop highly parallel applications that effectively target diverse exascale architectures

Prepare SW stack for scalability with massive on-node parallelism

Extend existing capabilities when possible, develop new when not

Guide, and complement, and integrate with vendor efforts

Develop and deliver high-quality and robust software products



# Extreme-scale Scientific Software Stack (E4S)

- E4S: HPC Software Ecosystem – a curated software portfolio
- A **Spack-based** distribution of software tested for interoperability and portability to multiple architectures with support for GPUs from NVIDIA, AMD, and Intel in each release
- Available from **source, containers, cloud, binary caches**
- Leverages and enhances SDK interoperability thrust
- Not a commercial product – an open resource for all
- Oct 2018: E4S 0.1 - 24 full, 24 partial release products
- Jan 2019: E4S 0.2 - 37 full, 10 partial release products
- Nov 2019: E4S 1.0 - 50 full, 5 partial release products
- Feb 2020: E4S 1.1 - 61 full release products
- Nov 2020: E4S 1.2 (aka, 20.10) - 67 full release products
- Feb 2021: E4S 21.02 - 67 full release, 4 partial release
- May 2021: E4S 21.05 - 76 full release products
- Aug 2021: E4S 21.08 - 88 full release products
- Nov 2021: E4S 21.11 - 91 full release products
- Feb 2022: E4S 22.02 – 100 full release products
- May 2022: E4S 22.05 – 101 full release products
- August 2022: E4S 22.08 – 102 full release products
- November 2022: E4S 22.11 – 103 full release products
- February 2023: E4S 23.02 – 106 full release products
- May 2023: E4S 23.05 – 109 full release products
- Aug 2023: E4S 23.08 – 115 full release products



<https://e4s.io>



Also include other products .e.g.,  
AI: PyTorch, TensorFlow (CUDA, ROCm)  
Co-Design: AMReX, Cabana, MFEM  
EDA: Xyce

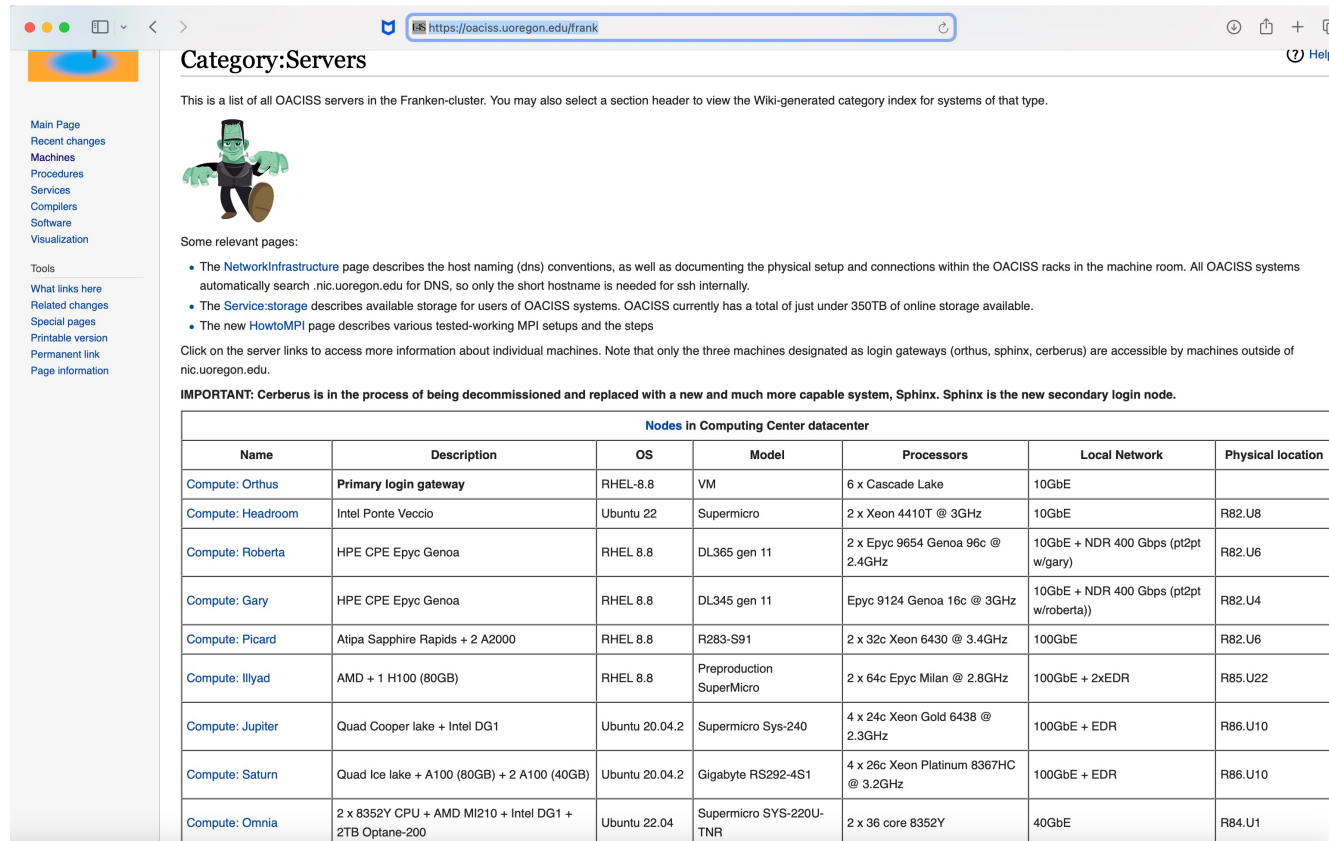
# E4S: Extreme-scale Scientific Software Stack

- E4S is a community effort to provide open-source software packages for developing, deploying and running scientific applications on HPC platforms.
- E4S has built a comprehensive, coherent software stack that enables application developers to productively develop highly parallel applications that effectively target diverse exascale architectures.
- E4S provides a curated, Spack based software distribution of 100+ HPC, 50+ EDA (e.g., Xyce), and AI/ML packages (e.g., TensorFlow, PyTorch).
- With E4S Spack binary build caches, E4S supports both bare-metal and containerized deployment for GPU based platforms.
  - X86\_64, ppc64le (IBM Power 9), aarch64 (ARM64) with support for GPUs from NVIDIA, AMD, and Intel
  - HPC and AI/ML packages are optimized for GPUs and CPUs.
- Container images on DockerHub and E4S website of pre-built binaries of ECP ST products.
- Base images and full featured containers (with GPU support).
- Commercial support for E4S through ParaTools, Inc. for installation, maintaining an issue tracker, and ECP AD engagement.
  - <https://dashboard.e4s.io> [https://e4s.io/talks/E4S\\_Support\\_Sep23.pdf](https://e4s.io/talks/E4S_Support_Sep23.pdf)
- e4s-cl container launch tool allows binary distribution of applications by substituting MPI in the containerized app with the system MPI. e4s-alc is a tool to create custom container images from base images
- Quarterly releases: E4S 23.08 released on August 31, 2023: [https://e4s.io/talks/E4S\\_23.08.pdf](https://e4s.io/talks/E4S_23.08.pdf)
- E4S for commercial cloud platforms: AWS image supports MPI implementations and containers with remote desktop (DCV).
  - Intel MPI, NVHPC, MVAPICH2, MPICH, MPC, OpenMPI

# Frank: A platform for CI/CD at U. Oregon


- Features GPUs from:
  - Intel (Data Center GPU Max 1100/PVC, DG1, DG2)
  - AMD (MI210, MI100, MI50, MI25)
  - NVIDIA (H100, A100 PCIe 80GB, A100 PCIe 40GB, A100 SXM4, A2000, V100 SXM2, P100...)
- Features CPUs from:
  - Intel (Sapphire Rapids, IceLake, CooperLake,...)
  - AMD (Epyc Genoa, Milan, Rome, ...)
  - IBM (Power 10, Power 9, Power 8, ...)
  - ARM (NVIDIA Orin, Xavier, Tegra, Apple M1, M2, SoftIron, ...)
- Operating Systems
  - RHEL, SLES, Ubuntu, Debian, Mac OS X, AIX
  - HPE Cray Programming Environment (CPE)
- Fileservers
  - IBM Spectrum Scale (GPFS) GS4S all NVMe
  - BeeGFS
  - NFS

# Frank: A platform for CI/CD at U. Oregon



**Category: Servers**

This is a list of all OACISS servers in the Franken-cluster. You may also select a section header to view the Wiki-generated category index for systems of that type.



Some relevant pages:

- The [NetworkInfrastructure](#) page describes the host naming (dns) conventions, as well as documenting the physical setup and connections within the OACISS racks in the machine room. All OACISS systems automatically search .nic.uoregon.edu for DNS, so only the short hostname is needed for ssh internally.
- The [Service-storage](#) describes available storage for users of OACISS systems. OACISS currently has a total of just under 350TB of online storage available.
- The new [HowtoMPI](#) page describes various tested-working MPI setups and the steps

Click on the server links to access more information about individual machines. Note that only the three machines designated as login gateways (orthus, sphinx, cerberus) are accessible by machines outside of nic.uoregon.edu.

**IMPORTANT:** Cerberus is in the process of being decommissioned and replaced with a new and much more capable system, Sphinx. Sphinx is the new secondary login node.

Nodes in Computing Center datacenter						
Name	Description	OS	Model	Processors	Local Network	Physical location
<a href="#">Compute: Orthus</a>	Primary login gateway	RHEL-8.8	VM	6 x Cascade Lake	10GbE	
<a href="#">Compute: Headroom</a>	Intel Ponte Vecchio	Ubuntu 22	Supermicro	2 x Xeon 4410T @ 3GHz	10GbE	R82.U8
<a href="#">Compute: Roberta</a>	HPE CPE Epyc Genoa	RHEL 8.8	DL365 gen 11	2 x Epyc 9654 Genoa 96c @ 2.4GHz	10GbE + NDR 400 Gbps (pt2pt w/gary)	R82.U6
<a href="#">Compute: Gary</a>	HPE CPE Epyc Genoa	RHEL 8.8	DL345 gen 11	Epyc 9124 Genoa 16c @ 3GHz	10GbE + NDR 400 Gbps (pt2pt w/roberta))	R82.U4
<a href="#">Compute: Picard</a>	Atipa Sapphire Rapids + 2 A2000	RHEL 8.8	R283-S91	2 x 32c Xeon 6430 @ 3.4GHz	100GbE	R82.U6
<a href="#">Compute: Illyad</a>	AMD + 1 H100 (80GB)	RHEL 8.8	Preproduction SuperMicro	2 x 64c Epyc Milan @ 2.8GHz	100GbE + 2xEDR	R85.U22
<a href="#">Compute: Jupiter</a>	Quad Cooper lake + Intel DG1	Ubuntu 20.04.2	Supermicro Sys-240	4 x 24c Xeon Gold 6438 @ 2.3GHz	100GbE + EDR	R86.U10
<a href="#">Compute: Saturn</a>	Quad Ice lake + A100 (80GB) + 2 A100 (40GB)	Ubuntu 20.04.2	Gigabyte RS292-4S1	4 x 26c Xeon Platinum 8367HC @ 3.2GHz	100GbE + EDR	R86.U10
<a href="#">Compute: Omnia</a>	2 x 8352Y CPU + AMD MI210 + Intel DG1 + 2TB Optane-200	Ubuntu 22.04	Supermicro SYS-220U-TNR	2 x 36 core 8352Y	40GbE	R84.U1

# Frank: A platform for CI/CD at U. Oregon

Compute: Gilgamesh	AMD + 2 Mi210 + A100 (40GB)	RHEL 8.8	Preproduction SuperMicro	2 x 24c Epyc Milan 7413 @ 2.6GHz	100GbE + 2xEDR	R85.U26
Compute: Instinct	Mi100+M40+A770 all in one	Ubuntu 20.04.2	Supermicro SC747	2 x 64c Epyc Milan 7763	10GbE	R85.U6
Compute: Mammatius	P10 system	Ubuntu 20.04.2	IBM S1022	10c P10	100GbE	R86.U31
Compute: Reptar	2x6248R CPU + AMD + nVidia	RHEL 8.8	Supermicro 7049	2 x 24c Xeon Gold 6248R @ 2.9GHz	10GbE + 100GbE	R84.U37
Compute: Voltar	A100 (80GB) + P100 + V100 GPU node	RHEL 8.8	Cascade Lake GPU server	2 x 16c Xeon Gold 6226R @ 2.9GHz	10GbE + EDR	R86.U26
Compute: Mothra	Intel + 2 x A770 (DG-2)	Ubuntu 22.04	Cascade Lake GPU server	2 x 24c Xeon Gold 6248R @ 3.0GHz	10GbE	R84.U3
Compute: Cyclops	IBM Power9 + 4 V100	RHEL 8.8	IBM AC922	2 x 20c Power9 @ 3.66GHz	10GbE + 2xHDR (200 Gbps)	R86.U18
Compute: Gorgon	IBM Power9 + 4 V100	RHEL 8.8	IBM AC922	2 x 20c Power9 @ 3.66GHz	10GbE + 2xHDR (200 Gbps)	R86.U16
Compute: Medusa	IBM Power9	RHEL 8.8	IBM AC922	2 x 20c Power9 @ 3.66GHz	10GbE	R86.U14
Compute: Typhon	IBM Power9	RHEL 8.8	IBM AC922	2 x 20c Power9 @ 3.66GHz	10GbE	R86.U12
Compute: Delphi	Intel + GV100	RHEL 8.8	Intel SDP	2 x 18c Xeon E5-2697 v4	100GbE	R86.U35
Compute: Godzilla	Broadwell + 3 x M40	RHEL 8.8	Broadwell GPU server	2 x 14c Xeon E5-2680v4 @ 2.3GHz	40GbE + EDR	R85.U6
Compute: Centaur	IBM Power8 + 2 K80	Ubuntu 20.04	IBM S822LC	2 x 20c Power8 @ 3.5GHz	10GbE	R85.U18
Compute: Minotaur	IBM Power8 + 2 K80	Ubuntu 20.04	IBM S822LC	2 x 20c Power8 @ 3.5GHz	10GbE	R85.U20
Compute: Eagle	IBM Power9 + 2 x T4	RHEL 8.8	IBM IC922	2 x 16c Power9 @ 2.1GHz	10GbE + 2xEDR	R86.U24
Compute: Pegasus	Compute node	RHEL 8.8	Intel Skylake server	2 x 18c Xeon Gold 6140 @ 2.3GHz	100GbE + EDR	R86.U22
Compute: Vina	Raptor Talos II	Ubuntu 20.04	Talos workstation	2 x 22c Power9 @ 2.2GHz	10GbE	R84.U44
Compute: Pike	Raptor Talos II + Mi25	Ubuntu 20.04	Talos workstation	2 x 22c Power9 @ 2.2GHz	10GbE	R84.U29
Compute: Cumulus-AIX.stor	AIX machine	AIX 7.2	IBM S-924 server	2 x 20c Power9 @ 3.6GHz	10GbE	R85.U10
Compute: Nimbus-AIX.stor	AIX machine	AIX 7.2	IBM S-924 server	2 x 20c Power9 @ 3.6GHz	10GbE	R85.U14
Compute: Mammatius-AIX.stor	AIX system	AIX 7.3	IBM S1022	10c P10	100GbE	R86.U31

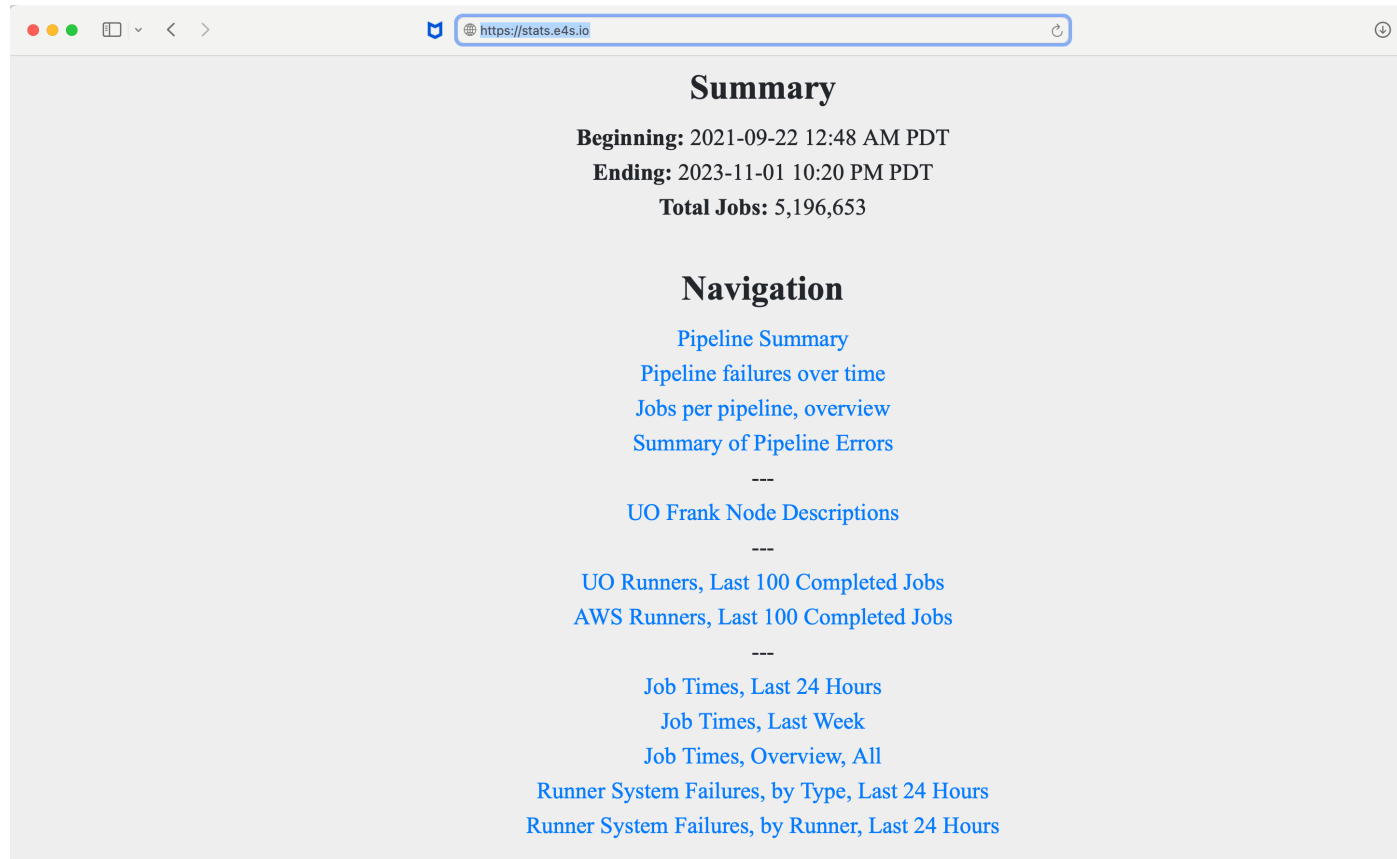
# Frank: A platform for CI/CD at U. Oregon

https://oaciss.uoregon.edu/frank

Compute: KNL Grover	Intel Phi system	RHEL 8.8	Intel KNL server	68c Xeon Phi 7250 @ 1.4GHz	1GbE	R86.U20
Compute: Axis cluster	DL580 G7 nodes	RHEL 8.6	HP 4U compute nodes with Slurm	4 x 8c Xeon Nehalem @ 2.3GHz	10GbE	R82
Compute Nodes in Streisinger						
Name	Description	OS	Model	Processor	Local Network	Physical location
Compute: Sphinx	Secondary login gateway + cluster	Ubuntu-20	Dell T640	2 x 16c Cascade lake	10GbE	Str-470
Compute: Orin Cluster	Nvidia AGX Orin	Ubuntu-20.04	Jetson Orin	12c ARM v8l rev 1	1GbE	Str-470 mini-rack adjacent
Compute: Xavier Cluster	Nvidia Tegra 3	Ubuntu-18.04.3	Jetson TX-3	8c ARM v8l rev 0	1GbE	Str-470 mini-rack adjacent
Jetson ARM64 cluster	Tegra TX-2	Ubuntu-20.04	4 x Jetson-TX2	4c ARM V8l rev 3	1GbE	Str 470 mini-rack
Jetson ARM64 cluster	Tegra TX-1	Ubuntu-18.04.3	12 x Jetson-TX1	4c ARM V8l rev 1	1GbE	Str 470 mini-rack
Compute: OD1K	ARM64 v8	Ubuntu	SoftIron	ARM64	1GbE	Str-470 mini-rack adjacent
Compute: Omicron	M1 Mac	OSX	M1 Mini	M1	1GbE	Str-470 foyer
Compute: M2 Mac cluster	M2 Mac	OSX	M2 Mini	M2	1GbE	Str-470 foyer
Compute: Lambda	M1 Ultra 20 core Mac Studio	OSX	Mac Studio	M1	1GbE	Str-470 foyer
Compute: Sever	Intel Xe	Ubuntu 20.04	XPS 13	Quad core i7 Gen11 @ 2.8GHz	10GbE	Str-470 foyer
Compute: Silicon	VLSI simulation node	Debian 10	Supermicro mobo	6c 3.6GHz Broadwell CPU	1GbE	Str-473
Compute: Echs	Intel box	Ubuntu 20	MSI X590	8 core i7-10700	2.5GbE	Str-470 foyer
Infrastructure Nodes						
Name	Description	Model	Processor	Network	Physical location	
Infrastructure: orion	VM host	SuperMicro	16c Xeon Platinum	10GbE	R35.U37	
Infrastructure: mecha	?	Silicon Mechanics	2x Xeon E5410	1GbE	R34.U37 left	
Infrastructure: mnemosyne	NFS Server	Supermicro X11	2 x Xeon 6248R	100GbE + EDR	R35.21	
Infrastructure: lighthouse	Backup infrastructure	Qlogic Comet HA600	Core i5-10500 x6 @ 2.3GHz	1GbE	Str-470	

ComputeSkeleton - Outline for new machine entries

# Spack PR Merge Jobs on Frank and AWS



Over 5M jobs!



# Trilinos: SYCL Enabled Builds Added to Nightly Testing

- SYCL-enabled builds of Trilinos now tested nightly on:
  - Intel Data Center Max 1100 GPU (PVC)
  - Intel A770

- Packages built:
  - Tpetra
  - Zoltan2
  - Ifpack2
  - Amesos2
  - Belos

uo-public > Trilinos > Pipelines > #9814

**build trilinos packages with known sycl support [ci skip]**

passed Administrator created pipeline for commit [ce1cb986](#) finished 12 hours ago

For [master](#)

Scheduled latest 8 Jobs 173 minutes 35 seconds, queued for 1 seconds

Pipeline Needs Jobs 8 Tests 0

Group jobs by Stage Job dependencies

**Results from October 30, 2023**

Prep	Test
Trilinos-Commit	AMD-MI100
	AMD-MI210
UO Frank - Mothra	INTEL-A770
UO Frank - Headroom	INTEL-DATA-CENTER-MAX-1100
	NVIDIA-A100
	NVIDIA-A2000
	NVIDIA-H100

# Spack Developer Workflow Integration

Trilinos development branch nightly builds now orchestrated using **Spack developer workflow**

[https://spack-tutorial.readthedocs.io/en/latest/tutorial\\_developer\\_workflows.html](https://spack-tutorial.readthedocs.io/en/latest/tutorial_developer_workflows.html)

```
69
70 if [[ ! -d $TRILINOS_ROOT ]]; then
71     cmd git clone https://github.com/$TRILINOS_REPO $TRILINOS_ROOT
72     cmd git -C $TRILINOS_ROOT checkout $TRILINOS_COMMIT
73 else
74     echo $TRILINOS_ROOT already exists, proceeding without clone and checkout
75 fi
76
77 cmd cd $TRILINOS_ROOT
78 cmd spack dev-build --quiet -j$BUILD_PARALLELISM $(cat $TARGET_ENV/spec.txt)
79 cmd spack env deactivate
80 HASH=$(spack find --format "{hash:7}" trilinos)
```

1. Clone Trilinos, checkout development branch

2. Spack development build

Script excerpt from <https://gitlab.e4s.io/uo-public/trilinos/-/blob/master/ci.sh>

# Trilinos Ctests Run Post-build

The screenshot shows a GitLab CI/CD job page for the Trilinos project. The URL is <https://gitlab.e4s.io/uo-public/trilinos/-/jobs/224286>. The job is titled "Trilinos TPetra CTests Running on NVIDIA H100". The job log shows the execution of various tests, including "Test #758: TpetraCore\_guide\_initializing\_tpetra\_with\_teuchos\_serial\_MPI\_4" and "Test #760: TpetraCore\_guide\_map\_contiguous\_and\_uniform\_MPI\_4". The job status is "Passed" with a duration of 173 minutes 26 seconds. The job ID is #224286. The runner is #328 (WWb7HzjNF) on the illyad-h100 node. The tags are h100, docker, and x86\_64. The job artifacts are available for download.

https://gitlab.e4s.io/uo-public/trilinos/-/jobs/224286

uo-public > Trilinos > Jobs > #224286

Search job log

620 259/269 Test #758: TpetraCore\_guide\_initializing\_tpetra\_with\_teuchos\_serial\_MPI\_4  
..... Passed 3.41 sec

621 **Trilinos TPetra CTests Running on NVIDIA H100**

622 260/269 Test #759: TpetraCore\_guide\_map\_contiguous\_and\_uniform\_MPI\_4  
..... Passed 3.69 sec

623 Start 760: TpetraCore\_guide\_map\_contiguous\_and\_uniform\_MPI\_4

624 261/269 Test #760: TpetraCore\_guide\_map\_contiguous\_and\_uniform\_MPI\_4  
..... Passed 3.53 sec

625 Start 761: TpetraCore\_guide\_map\_contiguous\_no\_global\_num\_MPI\_4

626 262/269 Test #761: TpetraCore\_guide\_map\_contiguous\_no\_global\_num\_MPI\_4  
..... Passed 3.62 sec

627 Start 762: TpetraCore\_guide\_map\_cyclic\_MPI\_4

628 263/269 Test #762: TpetraCore\_guide\_map\_cyclic\_MPI\_4  
..... Passed 3.52 sec

629 Start 763: TpetraCore\_guide\_vector\_MPI\_4

630 264/269 Test #763: TpetraCore\_guide\_vector\_MPI\_4  
..... Passed 3.60 sec

631 Start 764: TpetraCore\_guide\_power\_method\_1\_MPI\_4

632 265/269 Test #764: TpetraCore\_guide\_power\_method\_1\_MPI\_4  
..... Passed 5.68 sec

**NVIDIA-H100**

Duration: 173 minutes 26 seconds  
Finished: 12 hours ago  
Queued: 2 seconds  
Timeout: 6h (from job) ?  
Job ID: #224286  
Runner: #328 (WWb7HzjNF)  
illyad-h100  
Tags: h100 docker x86\_64

Job artifacts ?  
These artifacts are the latest. They will not be deleted (even if expired) until newer artifacts are available.  
Keep Download Browse

Commit [ce1cb986](#)  
build trilinos packages with known sycl

# Automated CI Container Image Creation

<https://gitlab.e4s.io/uo-public/trilinos-images>

https://gitlab.e4s.io/uo-public/trilinos-images/-/pipelines/9626

uo-public > Trilinos Images > Pipelines > #9626

### sycl image: use external kokkos

passed Administrator created pipeline for commit c26f5de8 finished 1 week ago

For main

latest 7 Jobs 17 minutes 1 second, queued for 2 seconds

Pipeline Needs Jobs 7 Tests 0

Group jobs by Stage Job dependencies

1. Use Spack to build dependencies  
2. Push dependencies to build cache

3. Generate GPU Targeted Containers

Dependency-1	Dependency-2	Dependency-3	CI-Images
✓ CUDA-Packages	✓ ROCM-Packages	✓ SYCL-Packages	✓ CUDA-Docker
			✓ ROCM-Docker
			✓ SYCL-Docker

```
65 #14 writing image sha256:48c6645b10e590ff17a9064e97caerfe818fe37072773cf778ed76775dd461
29 done
66 #14 naming to docker.io/esw123/trilinos-cuda:pipeline-9626 0.0s done
```

# Automated CI Container Image Creation

- Automated generation of CI container images makes it easier to:
- Bring in changes from upstream Spack
- Bring in latest versions of Trilinos' dependencies
- Use of Spack developer workflows means nightly build configurations tested closely mimic the builds that end-users would install themselves if they use Spack

# Trilinos nightly testing on 7 GPUs on Frank @ U. Oregon

The screenshot shows a GitLab CI/CD pipeline page for the project 'uo-public > Trilinos > Pipelines > #9798'. The pipeline is titled 'build trilinos packages with known sycl support [ci skip]' and is in a 'passed' state. It was created by 'Administrator' for commit 'ce1cb986' and finished 14 hours ago. The pipeline is for the 'master' branch and is 'Scheduled' and 'latest'. It consists of 8 jobs and 0 tests. The pipeline is grouped by 'Stage' and 'Job dependencies'. The stages are 'Prep' and 'Test'. The 'Prep' stage has one job, 'Trilinos-Commit', which is passed. The 'Test' stage has seven jobs, all of which are passed: 'AMD-MI100', 'AMD-MI210', 'INTEL-A770', 'INTEL-DATA-CENTER-MAX-1100', 'NVIDIA-A100', 'NVIDIA-A2000', and 'NVIDIA-H100'. The left sidebar shows the project navigation menu with options like 'Project', 'Pinned', 'Manage', 'Code', 'Build', 'Pipelines', 'Jobs', 'Pipeline schedules', 'Artifacts', 'Deploy', and 'Analyze'. The bottom left corner features the 'ECP EXASCALE COMPUTING PROJECT' logo.

uo-public > Trilinos > Pipelines > #9798

## build trilinos packages with known sycl support [ci skip]

passed Administrator created pipeline for commit [ce1cb986](#) finished 14 hours ago

For [master](#)

Scheduled latest 8 Jobs 173 minutes 38 seconds, queued for 1 seconds

Pipeline Needs Jobs 8 Tests 0

Group jobs by Stage Job dependencies

Prep	Test
Trilinos-Commit	AMD-MI100
	AMD-MI210
	INTEL-A770
	INTEL-DATA-CENTER-MAX-1100
	NVIDIA-A100
	NVIDIA-A2000
	NVIDIA-H100

# Trilinos Tpetra ctests nightly testing on AMD MI210 on Frank

The screenshot displays the GitHub Actions interface for a job named "Trilinos" (ID #224191). The left sidebar shows the project structure with "Jobs" selected. The main panel shows the job log, which includes the following details:

- Start 751:** TpetraCore\_guide\_matrix\_fill\_1\_MPI\_4
- 263/266 Test #751:** TpetraCore\_guide\_matrix\_fill\_1\_MPI\_4 ..... Passed 0.55 sec
- Start 752:** TpetraCore\_guide\_matrix\_construct\_heat2d\_1\_MPI\_2
- 264/266 Test #752:** TpetraCore\_guide\_matrix\_construct\_heat2d\_1\_MPI\_2 ..... Passed 0.47 sec
- Start 753:** TpetraCore\_guide\_matrix\_construct\_heat2d\_2\_MPI\_2
- 265/266 Test #753:** TpetraCore\_guide\_matrix\_construct\_heat2d\_2\_MPI\_2 ..... Passed 0.46 sec
- Start 754:** TpetraCore\_guide\_data\_redist\_1\_MPI\_4
- 266/266 Test #754:** TpetraCore\_guide\_data\_redist\_1\_MPI\_4 ..... Passed 0.55 sec
- 100% tests passed, 0 tests failed out of 266**
- Subproject Time Summary:**
- Tpetra = 488.00 sec\*proc (266 tests)**
- Total Test time (real) = 180.51 sec**
- + save ctest.out**
- Uploading artifacts for successful job** (00:01)
- Uploading artifacts...**
- artifacts: found 3 matching artifact files and directories**
- WARNING: processPath: artifact path is not a subpath of project directory: /Trilinos/spack-configure-args.txt**
- WARNING: processPath: artifact path is not a subpath of project directory: /Trilinos/spack-build-01-cmake-out.txt**
- Uploading artifacts as "archive" to coordinator... 201 Created id=224191 responseStatus=201 Created token=64\_Q3gsd**
- Cleaning up project directory and file based variables** (00:00)
- Job succeeded**

The right sidebar shows the job summary for "AMD-MI210":

- Duration:** 94 minutes 26 seconds
- Finished:** 15 hours ago
- Queued:** 1 second
- Timeout:** 6h (from job)
- Job ID:** #224191
- Runner:** #325 (Z8fBaY42Q) gtlgamesh-mi200
- Tags:** mi210, docker, x86\_64

Below the summary, there are sections for "Job artifacts", "Commit ce1cb986", "Pipeline #9798" (passed for master), and "Related jobs" (AMD-MI100, AMD-MI210, INTEL-A770, INTEL-DATA-CENTER-MAX-1100).

# Trilinos nightly testing on Intel Data Center GPU Max 1100 (PVC)

The screenshot displays the Trilinos CI/CD interface for a job named "INTEL-DATA-CENTER-M...". The interface is divided into three main sections: a left sidebar, a central job log, and a right sidebar.

**Left Sidebar:** Contains navigation links for Project (Trilinos), Pinned, Manage, Code, Build, Pipelines, Jobs (selected), Pipeline schedules, Artifacts, Deploy, and Analyze. A search bar is also present.

**Central Job Log:** Displays the output of the job, including test results and summary information. The log shows that 100% of tests passed, with a total test time of 66.66 seconds. The job is marked as "Job succeeded".

**Right Sidebar:** Provides details about the job, including Duration (10 minutes 59 seconds), Finished (17 hours ago), Queued (1 second), Timeout (6h (from job)), Job ID (#224193), and Runner (#356 (vvg6WErm)). It also lists tags (intel-data-center-max-1100, docker, x86\_64) and job artifacts (Download, Browse). The commit hash is ce1cb986, and the pipeline status is #9798 (passed) for master.

**Job Log Details:**

```
617 258/263 Test #353: TpetraCore_guide_vector_MPI_4 .....
..... Passed 0.19 sec
618 Start 354: TpetraCore_guide_power_method_1_MPI_4
619 259/263 Test #354: TpetraCore_guide_power_method_1_MPI_4 .....
..... Passed 0.21 sec
620 Start 355: TpetraCore_guide_matrix_fill_1_MPI_4
621 260/263 Test #355: TpetraCore_guide_matrix_fill_1_MPI_4 .....
..... Passed 0.18 sec
622 Start 356: TpetraCore_guide_matrix_construct_heat2d_1_MPI_2
623 261/263 Test #356: TpetraCore_guide_matrix_construct_heat2d_1_MPI_2 .....
..... Passed 0.18 sec
624 Start 357: TpetraCore_guide_matrix_construct_heat2d_2_MPI_2
625 262/263 Test #357: TpetraCore_guide_matrix_construct_heat2d_2_MPI_2 .....
..... Passed 0.19 sec
626 Start 358: TpetraCore_guide_data_redist_1_MPI_4
627 263/263 Test #358: TpetraCore_guide_data_redist_1_MPI_4 .....
..... Passed 0.21 sec
628 100% tests passed, 0 tests failed out of 263
629 Subproject Time Summary:
630 Tpetra = 195.68 sec*proc (263 tests)
631 Total Test time (real) = 66.66 sec
632 + save ctest.out
633 Uploading artifacts for successful job 00:01
634 Uploading artifacts...
635 artifacts: found 3 matching artifact files and directories
636 WARNING: processPath: artifact path is not a subpath of project directory: /Trilinos/spac
k-configure-args.txt
637 WARNING: processPath: artifact path is not a subpath of project directory: /Trilinos/spac
k-build-01-cmake-out.txt
638 Uploading artifacts as "archive" to coordinator... 201 Created id=224193 responseStatus=
201 Created token=64_KedSq
639 Cleaning up project directory and file based variables 00:01
640 Job succeeded
```



# Trilinos nightly testing on NVIDIA H100 on Frank

The screenshot displays the Trilinos CI/CD interface, showing a successful job run on NVIDIA H100. The interface is divided into three main sections: a left sidebar, a central job log, and a right sidebar.

**Left Sidebar:** Contains navigation links for Project, Pinned, Manage, Code, Build, Pipelines, Jobs (selected), Pipeline schedules, Artifacts, Deploy, and Analyze. The 'Jobs' section is highlighted.

**Central Job Log:** Displays the output of the job, including test results and summary information. The log shows that all tests passed, and the job was successful.

**Right Sidebar:** Provides details about the job, including duration, finished time, queued time, timeout, job ID, runner, and tags. It also includes a section for job artifacts and a pipeline status indicator.

**Job Details:**

- Duration:** 173 minutes 28 seconds
- Finished:** 14 hours ago
- Queued:** 2 seconds
- Timeout:** 6h (from job)
- Job ID:** #224189
- Runner:** #328 (WWb7HzJNF) illyad-h100
- Tags:** h100, docker, x86\_64

**Job Artifacts:** These artifacts are the latest. They will not be deleted (even if expired) until newer artifacts are available. Buttons: Download, Browse.

**Commit:** ce1cb986. build trilinos packages with known sycl support [ci skip]

**Pipeline:** #9798 (passed) for master. Test dropdown menu.

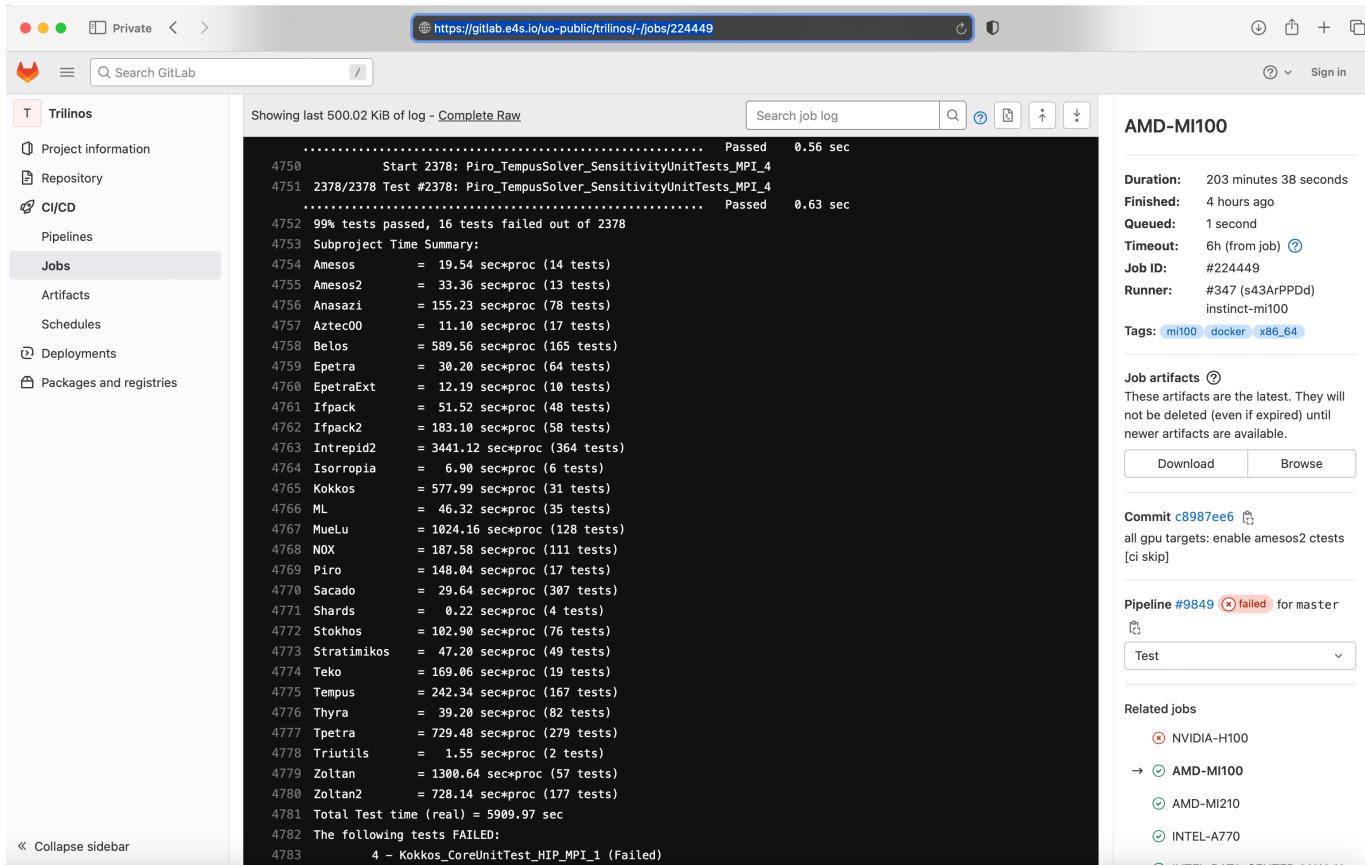
**Related jobs:**

- AMD-MI100
- AMD-MI210
- INTEL-A770
- INTEL-DATA-CENTER-MAX-1100

**Job Log Details:**

```
631 ..... Passed 3.51 sec
632 Start 764: TpetraCore_guide_power_method_1_MPI_4
633 265/269 Test #764: TpetraCore_guide_power_method_1_MPI_4 .....
634 ..... Passed 5.70 sec
635 Start 765: TpetraCore_guide_matrix_fill_1_MPI_4
636 266/269 Test #765: TpetraCore_guide_matrix_fill_1_MPI_4 .....
637 ..... Passed 3.55 sec
638 Start 766: TpetraCore_guide_matrix_construct_heat2d_1_MPI_2
639 267/269 Test #766: TpetraCore_guide_matrix_construct_heat2d_1_MPI_2 .....
640 ..... Passed 4.97 sec
641 Start 767: TpetraCore_guide_matrix_construct_heat2d_2_MPI_2
642 268/269 Test #767: TpetraCore_guide_matrix_construct_heat2d_2_MPI_2 .....
643 ..... Passed 3.21 sec
644 Start 768: TpetraCore_guide_data_redist_1_MPI_4
645 269/269 Test #768: TpetraCore_guide_data_redist_1_MPI_4 .....
646 ..... Passed 3.57 sec
647 100% tests passed, 0 tests failed out of 269
648 Subproject Time Summary:
649 Tpetra = 3379.37 sec*proc (269 tests)
650 Total Test time (real) = 1899.31 sec
651 + save ctest.out
652 Uploading artifacts for successful job
653 Uploading artifacts...
654 artifacts: found 3 matching artifact files and directories
655 WARNING: processPath: artifact path is not a subpath of project directory: /Trilinos/spack-configure-args.txt
656 WARNING: processPath: artifact path is not a subpath of project directory: /Trilinos/spack-build-01-cmake-out.txt
657 Uploading artifacts as "archive" to coordinator... 201 Created id=224189 responseStatus=201 Created token=64_r3zDz
658 Cleaning up project directory and file based variables
659 Job succeeded
```

# Triaging errors with expanded tests on AMD GPUs



Showing last 500.02 KIB of log - Complete Raw

```
..... Passed 0.56 sec
4750 Start 2378: Piro_TempusSolver_SensitivityUnitTests_MPI_4
4751 2378/2378 Test #2378: Piro_TempusSolver_SensitivityUnitTests_MPI_4
..... Passed 0.63 sec
4752 99% tests passed, 16 tests failed out of 2378
4753 Subproject Time Summary:
4754 Amesos = 19.54 sec*proc (14 tests)
4755 Amesos2 = 33.36 sec*proc (13 tests)
4756 Anasazi = 155.23 sec*proc (78 tests)
4757 Aztec00 = 11.10 sec*proc (17 tests)
4758 Belos = 589.56 sec*proc (165 tests)
4759 Epetra = 30.20 sec*proc (64 tests)
4760 EpetraExt = 12.19 sec*proc (10 tests)
4761 Ifpack = 51.52 sec*proc (48 tests)
4762 Ifpack2 = 183.10 sec*proc (58 tests)
4763 Intrepid2 = 3441.12 sec*proc (364 tests)
4764 Isorropia = 6.90 sec*proc (6 tests)
4765 Kokkos = 577.99 sec*proc (31 tests)
4766 ML = 46.32 sec*proc (35 tests)
4767 MueLu = 1024.16 sec*proc (128 tests)
4768 NOX = 187.58 sec*proc (111 tests)
4769 Piro = 148.04 sec*proc (17 tests)
4770 Sacado = 29.64 sec*proc (307 tests)
4771 Shards = 0.22 sec*proc (4 tests)
4772 Stokhos = 102.90 sec*proc (76 tests)
4773 Stratimikos = 47.20 sec*proc (49 tests)
4774 Teko = 169.06 sec*proc (19 tests)
4775 Tempus = 242.34 sec*proc (167 tests)
4776 Thyra = 39.20 sec*proc (82 tests)
4777 Tpetra = 729.48 sec*proc (279 tests)
4778 Triutils = 1.55 sec*proc (2 tests)
4779 Zoltan = 1300.64 sec*proc (57 tests)
4780 Zoltan2 = 728.14 sec*proc (177 tests)
4781 Total Test time (real) = 5909.97 sec
4782 The following tests FAILED:
4783 4 - Kokkos_CoreUnitTest_HIP_MPI_1 (Failed)
```

**AMD-MI100**

Duration: 203 minutes 38 seconds  
Finished: 4 hours ago  
Queued: 1 second  
Timeout: 6h (from job)  
Job ID: #224449  
Runner: #347 (s43ArPPDd)  
instinct-mi100  
Tags: mi100 - docker - x86\_64

Job artifacts  
These artifacts are the latest. They will not be deleted (even if expired) until newer artifacts are available.  
Download Browse

Commit c8987ee6  
all gpu targets: enable amesos2 ctests [ci skip]

Pipeline #9849 failed for master  
Test

Related jobs  
NVIDIA-H100  
→ AMD-MI100  
AMD-MI210  
INTEL-A770

- 2378 tests run
- 99% pass

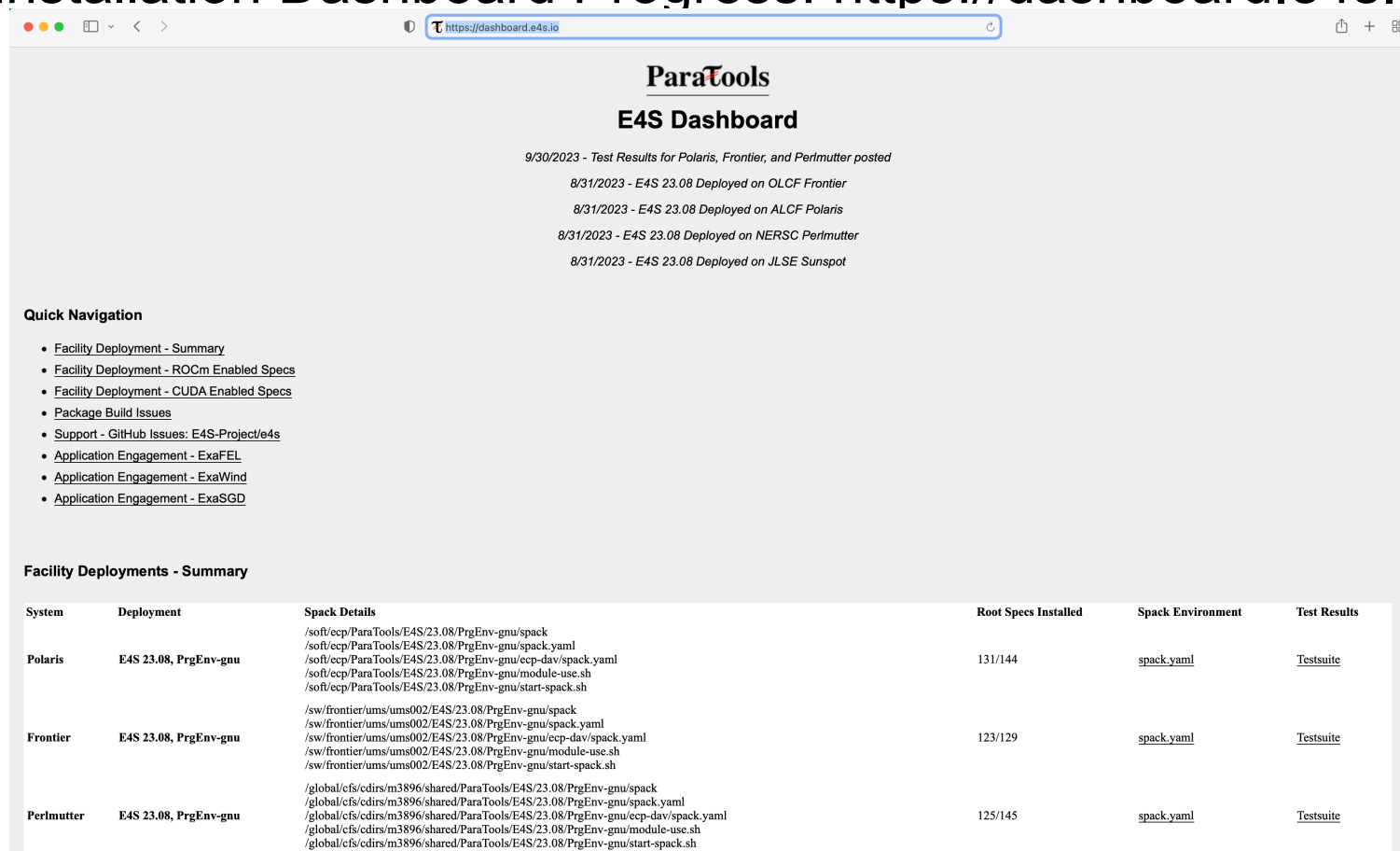
## SYCL Enabled Trilinos Issue #12420

- When Trilinos is built with external SYCL-enabled Kokkos, the build works
- When Trilinos is built with vendored SYCL-enabled Kokkos, the build fails
- We are using External Kokkos for now
- **Trilinos SYCL build failing: llvm-foreach: Error: Device name missing. #12420**
- <https://github.com/trilinos/Trilinos/issues/12420>

## Other Trilinos issues filed

- **Kokkos: Configure error with -  
DKokkos\_ARCH\_INTEL\_XEHP=ON #12016**  
<https://github.com/trilinos/Trilinos/issues/12016>
- **ShyLU: ShyLU/ShyLUConfig.cmake:164 (include): could not  
find requested file:  
../ShyLU\_Node/ShyLU\_NodeConfig.cmake #12048**  
<https://github.com/trilinos/Trilinos/issues/12048>

# E4S installation Dashboard Progress: <https://dashboard.e4s.io>



The screenshot shows the E4S Dashboard website. At the top, the ParaTools logo is displayed above the title "E4S Dashboard". Below the title, a list of recent deployment dates and locations is shown: 9/30/2023 - Test Results for Polaris, Frontier, and Perlmutter posted; 8/31/2023 - E4S 23.08 Deployed on OLCF Frontier; 8/31/2023 - E4S 23.08 Deployed on ALCF Polaris; 8/31/2023 - E4S 23.08 Deployed on NERSC Perlmutter; and 8/31/2023 - E4S 23.08 Deployed on JLSE Sunspot.

A "Quick Navigation" section on the left lists several links: Facility Deployment - Summary, Facility Deployment - ROCm Enabled Specs, Facility Deployment - CUDA Enabled Specs, Package Build Issues, Support - GitHub Issues: E4S-Project/e4s, Application Engagement - ExaFEL, Application Engagement - ExaWind, and Application Engagement - ExaSGD.

The "Facility Deployments - Summary" section contains a table with the following data:

System	Deployment	Spack Details	Root Specs Installed	Spack Environment	Test Results
Polaris	E4S 23.08, PrgEnv-gnu	/soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/spack /soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/spack.yaml /soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/ecp-dav/spack.yaml /soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/module-use.sh /soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/start-spack.sh	131/144	<a href="#">spack.yaml</a>	<a href="#">Testsuite</a>
Frontier	E4S 23.08, PrgEnv-gnu	/sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack.yaml /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/ecp-dav/spack.yaml /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/module-use.sh /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/start-spack.sh	123/129	<a href="#">spack.yaml</a>	<a href="#">Testsuite</a>
Perlmutter	E4S 23.08, PrgEnv-gnu	/global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/spack /global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/spack.yaml /global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/ecp-dav/spack.yaml /global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/module-use.sh /global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/start-spack.sh	125/145	<a href="#">spack.yaml</a>	<a href="#">Testsuite</a>

# E4S 23.08 installation on Frontier at ORNL with Trilinos 14.4.0

```
[sameer@login03.frontier ~]$ module avail
```

```
----- /opt/cray/pe/lmod/modulefiles/mpi/gnu/8.0/ofi/1.0/cray-mpich/8.0 -----
cray-hdf5-parallel/1.12.1.5      cray-mpixlate/1.0.1.10      cray-parallel-netcdf/1.12.3.3      craype-dl-plugin-py3/22.06.1.2
cray-hdf5-parallel/1.12.2.1 (D)  cray-mpixlate/1.0.1.11      cray-parallel-netcdf/1.12.3.7      craype-dl-plugin-py3/22.08.1
cray-hdf5-parallel/1.12.2.3      cray-mpixlate/1.0.2          (D)  craype-dl-plugin-ftr/22.06.1.2      craype-dl-plugin-py3/22.09.1
cray-hdf5-parallel/1.12.2.7      cray-parallel-netcdf/1.12.2.5  craype-dl-plugin-py3/21.02.1.3      craype-dl-plugin-py3/22.12.1 (D)
cray-mpixlate/1.0.0.6           cray-parallel-netcdf/1.12.3.1 (D)  craype-dl-plugin-py3/21.04.1

----- /autofs/nccs-svm1_sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack/share/spack/lmod/linux-sles15-x86_64/cray-mpich/8.1.23/Core -----
adios/1.13.1                    ginkgo/1.6.0-openmp          nco/5.1.6 (D)      slepc/3.19.1-rocm
adios2/2.9.1 (D)                ginkgo/1.6.0-rocm-openmp (D)  netlib-scalapack/2.2.0 (D)      slepc/3.19.1 (D)
alquimia/1.0.10                 globalarrays/5.8.2 (D)      omega-h/9.34.13 (D)      stc/0.9.0
amrex/23.08-rocm                h5bench/1.4                  openfoam/2306              strumpack/7.1.3-openmp
amrex/23.08 (D)                 hdf5-vol-async/1.7           openpmd-api/0.15.1 (D)      strumpack/7.1.3-rocm-openmp (D)
arborx/1.4.1-rocm              hdf5-vol-cache/v1.1          papyrus/1.0.2 (D)          sundials/6.5.1-rocm
arborx/1.4.1 (D)               hdf5-vol-log/1.4.0           parallel-netcdf/1.12.3 (D)      sundials/6.5.1 (D)
ascent/0.9.0-openmp             hdf5/1.14.0 (D)              paraview/5.11.1-rocm         superlu-dist/8.1.2-rocm
ascent/0.9.0 (D)               heffte/2.3.0-rocm            paraview/5.11.1 (D)          superlu-dist/8.1.2 (D)
axom/0.7.0-openmp (D)           heffte/2.3.0 (D)             parsec/3.0.2209 (D)          sz/2.1.12.5 (D)
boost/1.83.0 (D)               hpctoolkit/2023.03.01-rocm    petsc/3.19.4-rocm           tasmanian/7.9-rocm
butterflypack/2.2.2-openmp (D)  hpctoolkit/2023.03.01 (D)      petsc/3.19.4 (D)            tasmanian/7.9 (D)
cabana/0.5.0-rocm               hpx/1.9.1 (D)                phist/1.11.2-openmp (D)      tau/2.32.1-rocm
cabana/0.5.0 (D)               hypre/2.29.0-rocm            plumed/2.9.0 (D)            tau/2.32.1 (D)
caliper/2.10.0-rocm             hypre/2.29.0 (D)             precice/2.5.0 (D)           trilinos/14.4.0-rocm
caliper/2.10.0 (D)             lammps/20230802-openmp (D)    pruners-ninja/1.0.1          trilinos/14.4.0 (D)
conduit/0.8.8 (D)              libcatayst/2.0.0-rc3          pumi/2.2.7 (D)              unifyfs/1.0.1
darshan-runtime/3.4.4 (L,D)     libnrm/0.1.0                 py-cinemasci/1.3             upcxx/2023.3.0-rocm
datatransferkit/3.1-rc3 (D)     libpressio/0.95.1-openmp      py-h5py/3.8.0                upcxx/2023.3.0 (D)
dyninst/12.3.0-openmp (D)       libquo/1.3.1 (D)             py-libensemble/0.10.2        veloc/1.6 (D)
ecp-data-vis-sdk/1.0-rocm       mercury/2.3.0 (D)            py-petsc4py/3.19.4           visit/3.3.3
ecp-data-vis-sdk/1.0 (D)        metall/0.25 (D)              py-warpx/23.08               vtk-m/1.9.0-openmp
exaworks/0.1.0                  mfem/4.5.2-rocm              quantum-espresso/7.2-openmp  vtk-m/1.9.0-rocm (D)
faodel/1.2108.1 (D)             mfem/4.5.2 (D)               rempi/1.1.0                  wannier90/3.1.0
flecsi/2.2.1 (D)               mpi4py/2.0.0-rocm             slate/2022.07.00-openmp       xyce/7.6.0
fortrilinos/2.3.0 (D)          nccmp/1.9.1.0 (D)            slate/2022.07.00-rocm-openmp (D)

----- /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack/share/spack/lmod/linux-sles15-x86_64/Core -----
aml/0.2.1 (D)                   flit/2.1.0 (D)               kokkos/4.1.00-rocm (D)      nrm/0.1.0      superlu/5.3.0 (D)
argobots/1.1 (D)               flux-core/0.53.0 (D)         legion/23.06.0-rocm          openmpi/4.1.5  swig/4.0.2-fortran
bolt/2.0 (D)                   gasnet/2023.3.0-rocm         legion/23.06.0 (D)          papi/6.0.0.1   sz3/3.1.7
chai/2022.03.0-rocm            gasnet/2023.3.0 (D)         libunwind/1.6.2 (D)         pdt/3.25.1 (D)  umap/2.1.0 (D)
chai/2022.03.0 (D)             gmp/6.2.1 (D)               loki/0.1.7 (D)              plasma/22.9.29  umpire/2022.03.1-rocm
charliecloud/0.33              gotcha/1.0.4 (D)             magma/2.7.1-rocm (D)        qthreads/1.18 (D)  umpire/2022.03.1
cray-mpich/8.1.23 (L,D)        kokkos-kernels/4.0.00-openmp (D)  mgard/2023-03-31-openmp      raja/2022.10.4-openmp  variorum/0.6.0
darshan-util/3.4.4 (D)         kokkos/4.1.00-openmp         mpark-variant/1.4.0 (D)     raja/2022.10.4-rocm (D)  zfp/0.5.5
```

# E4S 23.08 installation on Frontier at ORNL with Trilinos 14.4.0

```
[sameer@login03.frontier ~]$ module avail
```

```
----- /opt/cray/pe/lmod/modulefiles/mpi/gnu/8.0/ofi/1.0/cray-mpich/8.0 -----
cray-hdf5-parallel/1.12.1.5      cray-mpixlate/1.0.1.10      cray-parallel-netcdf/1.12.3.3      craype-dl-plugin-py3/22.06.1.2
cray-hdf5-parallel/1.12.2.1 (D)  cray-mpixlate/1.0.1.11      cray-parallel-netcdf/1.12.3.7      craype-dl-plugin-py3/22.08.1
cray-hdf5-parallel/1.12.2.3      cray-mpixlate/1.0.2          (D)  craype-dl-plugin-ftr/22.06.1.2      craype-dl-plugin-py3/22.09.1
cray-hdf5-parallel/1.12.2.7      cray-parallel-netcdf/1.12.2.5  craype-dl-plugin-py3/21.02.1.3      craype-dl-plugin-py3/22.12.1 (D)
cray-mpixlate/1.0.0.6           cray-parallel-netcdf/1.12.3.1 (D)  craype-dl-plugin-py3/21.04.1

----- /autofs/nccs-svm1_sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack/share/spack/lmod/linux-sles15-x86_64/cray-mpich/8.1.23/Core -----
adios/1.13.1                    ginkgo/1.6.0-openmp          nco/5.1.6 (D)      slepc/3.19.1-rocm
adios2/2.9.1 (D)                ginkgo/1.6.0-rocm-openmp (D)  netlib-scalapack/2.2.0 (D)      slepc/3.19.1 (D)
alquimia/1.0.10                 globalarrays/5.8.2 (D)      omega-h/9.34.13 (D)      stc/0.9.0
amrex/23.08-rocm                h5bench/1.4                  openfoam/2306              strumpack/7.1.3-openmp
amrex/23.08 (D)                 hdf5-vol-async/1.7           openpmd-api/0.15.1 (D)    strumpack/7.1.3-rocm-openmp (D)
arborx/1.4.1-rocm              hdf5-vol-cache/v1.1          papyrus/1.0.2 (D)        sundials/6.5.1-rocm
arborx/1.4.1 (D)               hdf5-vol-log/1.4.0           parallel-netcdf/1.12.3 (D)  sundials/6.5.1 (D)
ascent/0.9.0-openmp             hdf5/1.14.0 (D)              paraview/5.11.1-rocm      superlu-dist/8.1.2-rocm
ascent/0.9.0 (D)               heffte/2.3.0-rocm            paraview/5.11.1 (D)       superlu-dist/8.1.2 (D)
axom/0.7.0-openmp (D)           heffte/2.3.0 (D)             parsec/3.0.2209 (D)       sz/2.1.12.5 (D)
boost/1.83.0 (D)               hpctoolkit/2023.03.01-rocm   petsc/3.19.4-rocm         tasmanian/7.9-rocm
butterflypack/2.2.2-openmp (D)  hpctoolkit/2023.03.01 (D)    petsc/3.19.4 (D)         tasmanian/7.9 (D)
cabana/0.5.0-rocm              hpx/1.9.1 (D)                phist/1.11.2-openmp (D)   tau/2.32.1-rocm
cabana/0.5.0 (D)               hypre/2.29.0-rocm            plumed/2.9.0 (D)          tau/2.32.1 (D)
caliper/2.10.0-rocm            hypre/2.29.0 (D)             precice/2.5.0 (D)         trilinos/14.4.0-rocm
caliper/2.10.0 (D)             lammps/20230802-openmp (D)  pruners-ninja/1.0.1 (D)   trilinos/14.4.0 (D)
conduit/0.8.8 (D)              libcatayst/2.0.0-rc3         pumi/2.2.7 (D)            unifyfs/1.0.1
darshan-runtime/3.4.4 (L,D)     libnrm/0.1.0                 py-cinemasci/1.3          upcxx/2023.3.0-rocm
datatransferkit/3.1-rc3 (D)     libpressio/0.95.1-openmp     py-h5py/3.8.0             upcxx/2023.3.0 (D)
dyninst/12.3.0-openmp (D)       libquo/1.3.1 (D)             py-libensemble/0.10.2     veloc/1.6 (D)
ecp-data-vis-sdk/1.0-rocm      mercury/2.3.0 (D)            py-petsc4py/3.19.4        visit/3.3.3
ecp-data-vis-sdk/1.0 (D)        metall/0.25 (D)              py-warpx/23.08            vtk-m/1.9.0-openmp
exaworks/0.1.0                 mfem/4.5.2-rocm              quantum-espresso/7.2-openmp  vtk-m/1.9.0-rocm (D)
faodel/1.2108.1 (D)            mfem/4.5.2 (D)               rempi/1.1.0               wannier90/3.1.0
flecsi/2.2.1 (D)               mpi4py/3.1.0 (D)             slate/2022.07.00-openmp    xyce/7.6.0
fortrilinos/2.3.0 (D)          nccmp/1.9.1.0 (D)            slate/2022.07.00-rocm-openmp (D)

----- /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack/share/spack/lmod/linux-sles15-x86_64/Core -----
aml/0.2.1 (D)                   flit/2.1.0 (D)               kokkos/4.1.00-rocm (D)    nrm/0.1.0          superlu/5.3.0 (D)
argobots/1.1 (D)                flux-core/0.53.0 (D)         legion/23.06.0-rocm      openmpi/4.1.5      swig/4.0.2-fortran
bolt/2.0 (D)                    gasnet/2023.3.0-rocm         legion/23.06.0 (D)       papi/6.0.0.1       sz3/3.1.7
chai/2022.03.0-rocm             gasnet/2023.3.0 (D)         libunwind/1.6.2 (D)      pdt/3.25.1 (D)     umap/2.1.0 (D)
chai/2022.03.0 (D)             gmp/6.2.1 (D)               loki/0.1.7 (D)           plasma/22.9.29     umpire/2022.03.1-rocm
charliecloud/0.33              gotcha/1.0.4 (D)             magma/2.7.1-rocm (D)     qthreads/1.18 (D)  umpire/2022.03.1 (D)
cray-mpich/8.1.23 (L,D)         kokkos-kernels/4.0.00-openmp (D)  mgard/2023-03-31-openmp  raja/2022.10.4-openmp  variorum/0.6.0
darshan-util/3.4.4 (D)         kokkos/4.1.00-openmp         mpark-variant/1.4.0 (D)  raja/2022.10.4-rocm (D)  zfp/0.5.5
```

# E4S 23.08 installation on Frontier at ORNL

```
[sameer@login03.frontier ~]$ source /sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/start-spack.sh

Lmod is automatically replacing "cce/15.0.0" with "gcc/12.2.0".

Lmod is automatically replacing "PrgEnv-cray/8.3.3" with "PrgEnv-gnu/8.3.3".

Due to MODULEPATH changes, the following have been reloaded:
  1) cray-mpich/8.1.23    2) darshan-runtime/3.4.0

Due to MODULEPATH changes, the following have been reloaded:
  1) darshan-runtime/3.4.0

The following have been reloaded with a version change:
  1) gcc/12.2.0 => gcc/11.2.0

[sameer@login03.frontier ~]$ which spack
/sw/frontier/ums/ums002/E4S/23.08/PrgEnv-gnu/spack/bin/spack
[sameer@login03.frontier ~]$ spack find -x
-- linux-sles15-zen3 / gcc@11.2.0 -----
adios@1.13.1      charliecloud@0.33      h5bench@1.4      libnrm@0.1.0      papyrus@1.0.2      raja@2022.10.4      trilinos@14.4.0
adios2@2.9.1     conduit@0.8.8          hdf5@1.14.0      libpressio@0.95.1  parallel-netcdf@1.12.3  rempi@1.1.0      turbine@1.3.0
alquimia@1.0.10  cray-mpich@8.1.23      hdf5-vol-async@1.7  libquo@1.3.1      paraview@5.11.1      slate@2022.07.00  umap@2.1.0
am1@0.2.1        darshan-runtime@3.4.4  hdf5-vol-async@1.7  libunwind@1.6.2    paraview@5.11.1      slepc@3.19.1      umpire@2022.03.1
amrex@23.08      darshan-util@3.4.4     hdf5-vol-cache@v1.1  loki@0.1.7         parsec@3.0.2209      slepc@3.19.1      unifyfs@1.0.1
amrex@23.08      datatransferkit@3.1-rc3  hdf5-vol-cache@v1.1  mercury@2.3.0      pdt@3.25.1           stc@0.9.0         upcxx@2023.3.0
arborx@1.4.1     dyninst@12.3.0         hdf5-vol-log@1.4.0   metall@0.25        petsc@3.19.4         strumpack@07.1.3  upcxx@2023.3.0
arborx@1.4.1     ecp-data-vis-sdk@1.0   hdf5-vol-log@1.4.0   mfem@4.5.2         phist@1.11.2         strumpack@07.1.3  variorum@0.6.0
argobots@1.1     ecp-data-vis-sdk@1.0   heffte@2.3.0       hpctoolkit@2023.03.01  plasma@22.9.29      sundials@6.5.1    veloc@1.6
ascent@0.9.0     exaworks@0.1.0         heffte@2.3.0       hpctoolkit@2023.03.01  plumed@2.9.0         sundials@6.5.1    visit@3.3.3
axom@0.7.0       faodel@1.2108.1       flit@2.1.0         hpx@1.9.1          mpi4py@1.5.1         superlu@5.3.0     visit@3.3.3
bolt@2.0         flux-core@0.53.0       forttrilinos@2.3.0  kokkos@4.1.00      mpi4py@1.5.1         superlu-dist@8.1.2  vtk-m@1.9.0
boost@1.83.0     butterflypack@2.2.2    gasnet@2023.3.0    kokkos@4.1.00      nco@5.1.6            superlu-dist@8.1.2  vtk-m@1.9.0
cabana@0.5.0     gasnet@2023.3.0       ginkgo@1.6.0       kokkos-kernels@4.0.0  netlib-scalapack@2.2.0  swig@4.0.2-fortran  wannier90@3.1.0
cabana@0.5.0     gasnet@2023.3.0       ginkgo@1.6.0       lammps@20230802     nrm@0.1.0            sz@2.1.12.5       xyce@07.6.0
caliper@2.10.0   globalarrays@5.8.2    legion@23.06.0     legion@23.06.0      omega-h@9.34.13      tau@2.32.1        zfp@0.5.5
chai@2022.03.0  gmp@6.2.1             gotcha@1.0.4       libcatayst@2.0.0-rc3  openfoam@2306        quantum-espresso@7.2  trilinos@14.4.0
chai@2022.03.0  gotcha@1.0.4          libcatayst@2.0.0-rc3  papi@6.0.0.1       raja@2022.10.4      trilinos@14.4.0

==> 149 installed packages
[sameer@login03.frontier ~]$

[sameer@login03.frontier ~]$ spack find -x +rocm
-- linux-sles15-zen3 / gcc@11.2.0 -----
amrex@23.08      caliper@2.10.0      ginkgo@1.6.0      kokkos@4.1.00      paraview@5.11.1      slepc@3.19.1      tasmanian@7.9      upcxx@2023.3.0
arborx@1.4.1    chai@2022.03.0      heffte@2.3.0      legion@23.06.0     petsc@3.19.4         strumpack@07.1.3  tau@2.32.1         vtk-m@1.9.0
cabana@0.5.0    ecp-data-vis-sdk@1.0  hpctoolkit@2023.03.01  magma@2.7.1      raja@2022.10.4      sundials@6.5.1    trilinos@14.4.0
cabana@0.5.0    gasnet@2023.3.0     hypr@2.29.0       mfem@4.5.2       slate@2022.07.00    superlu-dist@8.1.2  umpire@2022.03.1

==> 30 installed packages
```



# E4S 23.08 installation on Perlmutter at NERSC

```
sameer@perlmutter:login39:~> source /global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/start-spack.sh
sameer@perlmutter:login39:~> which spack
/global/cfs/cdirs/m3896/shared/ParaTools/E4S/23.08/PrgEnv-gnu/spack/bin/spack
sameer@perlmutter:login39:~> spack find -x
-- linux-sles15-zen3 / gcc@11.2.0 -----
adios@1.13.1      charliecloud@0.33      gotcha@1.0.4          kokkos-kernels@4.0.00  nccmp@1.9.1.0          pumi@2.2.7            superlu-dist@8.1.2
adios2@2.9.1      conduit@0.8.8           h5bench@1.4           kokkos-kernels@4.0.00  nco@5.1.6              py-cinemas@1.3        superlu-dist@8.1.2
adios2@2.9.1      conduit@0.8.8           hdf5@1.14.2           lammps@20230802        nvhpc@23.7             py-h5py@3.8.0         swig@4.0.2-fortran
alquimia@1.0.10   conduit@0.8.8           hdf5@1.14.2           lammps@20230802        openfoam@2306          py-jupyterhub@0.9.4   sz@2.1.12.5
aml@0.2.1          cray-mpich@8.1.25       hdf5-vol-async@1.7    legion@23.06.0         openmpi@4.1.5          py-libensemble@0.10.2 sz3@3.1.7
amrex@23.08       cusz@0.3.1             hdf5-vol-async@1.7    legion@23.06.0         openpmo-api@0.15.1    py-petsc4py@3.19.4   tasmanian@7.9
amrex@23.08       darshan-runtime@3.4.4   hdf5-vol-cache@v1.1   libnrm@0.1.0           papi@6.0.0.1          qthreads@1.18        tasmanian@7.9
arborx@1.4.4.1    darshan-util@3.4.4     hdf5-vol-cache@v1.1   libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
arborx@1.4.4.1    datatransferkit@3.1-rc3 hdf5-vol-log@1.4.0    libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
argobots@1.1      dyninst@12.3.0         hdf5-vol-log@1.4.0    libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
ascent@0.9.1      faodel@1.2108.1       hdf5-vol-log@1.4.0    libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
axom@0.7.0        flecsi@2.2.1          heffte@2.3.0          libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
bolt@2.0          flecsi@2.2.1          heffte@2.3.0          libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
boost@1.83.0      flit@2.1.0            hpctoolkit@2023.03.01  libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
butterflypack@2.2.2 flux-core@0.53.0       hpctoolkit@2023.03.01  libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
cabana@0.5.0      flux-core@0.53.0       hpx@1.9.1             libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
cabana@0.5.0      fortrilinos@2.3.0     hpx@1.9.1             libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
caliper@2.10.0    ginkgo@1.6.0          hypre@2.29.0          libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
caliper@2.10.0    ginkgo@1.6.0          hypre@2.29.0          libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
chai@2022.03.0    globalarrays@5.8.2    kokkos@4.1.00         libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
chai@2022.03.0    gmp@6.2.1            kokkos@4.1.00         libnrm@0.1.0           raja@2022.10.4        raja@2022.10.4       tau@2.32.1
==> 147 installed packages
sameer@perlmutter:login39:~> spack find -x +cuda
-- linux-sles15-zen3 / gcc@11.2.0 -----
adios2@2.9.1      chai@2022.03.0         heffte@2.3.0          kokkos-kernels@4.0.00  mfem@4.5.2             raja@2022.10.4        superlu-dist@8.1.2
amrex@23.08       cusz@0.3.1            hpctoolkit@2023.03.01  lammps@20230802        mgard@2023-03-31       slate@2022.07.00     tasmanian@7.9
arborx@1.4.4.1    flecsi@2.2.1          hpx@1.9.1             legion@23.06.0         mpi@4.0.0              slepc@3.19.1         tau@2.32.1
cabana@0.5.0      flux-core@0.53.0     hypre@2.29.0          libnrm@0.1.0           mpi@4.0.0              slepc@3.19.1         umpire@2022.03.1
caliper@2.10.0    ginkgo@1.6.0          kokkos@4.1.00         libnrm@0.1.0           mpi@4.0.0              slepc@3.19.1         umpire@2022.03.1
caliper@2.10.0    ginkgo@1.6.0          kokkos@4.1.00         libnrm@0.1.0           mpi@4.0.0              slepc@3.19.1         umpire@2022.03.1
chai@2022.03.0    globalarrays@5.8.2    kokkos@4.1.00         libnrm@0.1.0           mpi@4.0.0              slepc@3.19.1         umpire@2022.03.1
chai@2022.03.0    gmp@6.2.1            kokkos@4.1.00         libnrm@0.1.0           mpi@4.0.0              slepc@3.19.1         umpire@2022.03.1
==> 35 installed packages
sameer@perlmutter:login39:~>
```

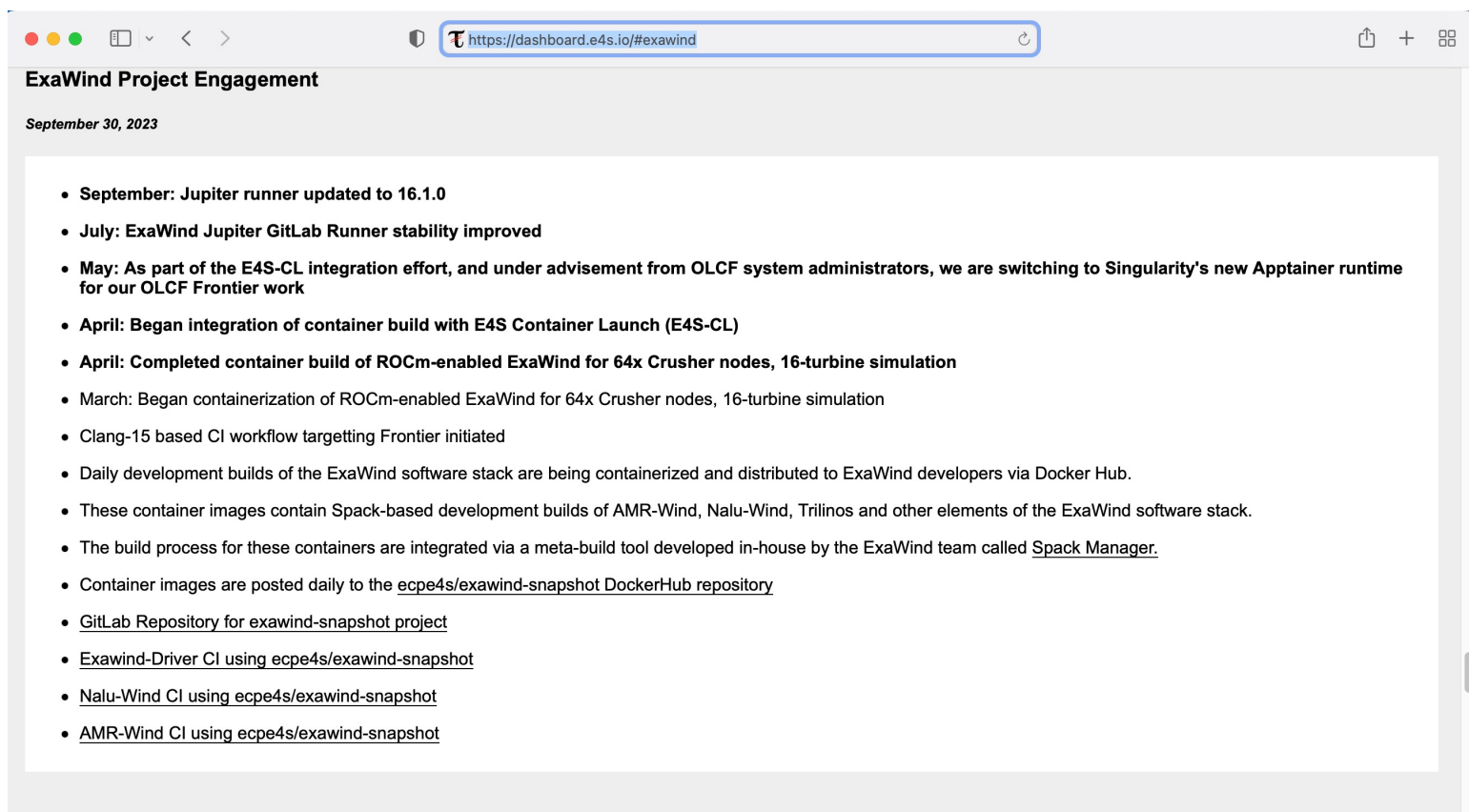
# E4S 23.08 installation on Polaris at ALCF

```

[sameer@polaris-login-01:~> source /soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/start-spack.sh
[sameer@polaris-login-01:~> which spack
/soft/ecp/ParaTools/E4S/23.08/PrgEnv-gnu/spack/bin/spack
[sameer@polaris-login-01:~> spack find -x
-- linux-sles15-zen3 / gcc@11.2.0 -----
adios@1.13.1      chai@2022.03.0      ginkgo@1.6.0      hpctoolkit@2023.03.01  magma@2.7.1      parallel-netcdf@1.12.3  quantum-espresso@7.2  tasmanian@7.9
adios2@2.9.1     charliecloud@0.33   ginkgo@1.6.0      hpctoolkit@2023.03.01  metall@0.25      parsec@3.0.2209         raja@2022.10.4        tasmanian@7.9
adios2@2.9.1     conduit@0.8.8       globalarrays@5.8.2  hpx@1.9.1            mfem@4.5.2       parsec@3.0.2209         raja@2022.10.4        tau@2.32.1
alquimia@1.0.10  conduit@0.8.8       gmp@6.2.1         hpx@1.9.1            mgard@2023-03-31  pdt@3.25.1             rempi@1.1.0
aml@0.2.1        conduit@0.8.8       gotcha@1.0.4      hypre@2.29.0         mgard@2023-03-31  petsc@3.19.4            scr@3.0.1              trilinos@14.4.0
amrex@23.08      cray-mpich@8.1.16   hdf5@1.14.0      hypre@2.29.0         mpark-variant@1.4.0  phist@1.11.2           slate@2022.07.00      umap@2.1.0
amrex@23.08      cusz@0.3.1          h5bench@1.4       kokkos@4.1.00        mpiutils@0.11.1    plumed@2.9.0           slate@2022.07.00      umpire@2022.03.1
arborx@1.4.1     darshan-runtime@3.4.4  hdf5@1.14.0      kokkos-kernels@4.0.00  nccmp@1.9.1.0     pruners-ninja@1.0.1.1  strumpack@7.1.3      umpire@2022.03.1
arborx@1.4.1     darshan-util@3.4.4   hdf5-vol@1.14.0  kokkos-kernels@4.0.00  nco@5.1.6         pumi@2.2.7             strumpack@7.1.3      upcxx@2023.3.0
argobots@1.1     datatransferkit@3.1-rc3  hdf5-vol-async@1.7  legion@23.06.0       netlib-scalapack@2.2.0  py-cinemasci@1.3      sundials@6.5.1      variorum@0.6.0
ascent@0.9.0     dealii@9.4.2         hdf5-vol-async@1.7  libcatayst@2.0.0-rc3  openfoam@2306     py-h5py@3.8.0          superlu@5.3.0        velox@1.6
axom@0.7.0       faodel@1.2108.1     hdf5-vol-cache@v1.1  libcatayst@2.0.0-rc3  openmpi@4.1.5     py-jupyterhub@0.9.4    superlu-dist@8.1.2  vtk-m@1.9.0
bolt@2.0         flecsi@2.2.1         hdf5-vol-cache@v1.1  libcatayst@2.0.0-rc3  openpm@0.15.1     py-jupyterlab@3.4.8    superlu-dist@8.1.2  wannier90@3.1.0
boost@1.83.0     flecsi@2.2.1         hdf5-vol-cache@v1.1  libcatayst@2.0.0-rc3  openpm@0.15.1     py-libensemble@0.10.2  swig@4.0.2-fortran  xyce@7.6.0
butterflypack@2.2.2  flecsi@2.2.1         hdf5-vol-cache@v1.1  libcatayst@2.0.0-rc3  openpm@0.15.1     py-petsc4py@3.19.4    sz@2.1.12.5        zfp@0.5.5
cabana@0.5.0     flit@2.1.0          hdf5-vol-log@1.4.0  heffte@2.3.0         loki@0.1.7        py-warpx@23.08        sz@3.1.7
cabana@0.5.0     flux-core@0.53.0     hdf5-vol-log@1.4.0  heffte@2.3.0         loki@0.1.7        py-warpx@23.08        sz@3.1.7
caliper@2.10.0   flux-core@0.53.0     hdf5-vol-log@1.4.0  heffte@2.3.0         loki@0.1.7        py-warpx@23.08        sz@3.1.7
caliper@2.10.0   fortrilinos@2.3.0    hdf5-vol-log@1.4.0  heffte@2.3.0         loki@0.1.7        py-warpx@23.08        sz@3.1.7
chai@2022.03.0   gasnet@2023.3.0      heffte@2.3.0
==> 157 installed packages
[sameer@polaris-login-01:~> spack find -x +cuda
-- linux-sles15-zen3 / gcc@11.2.0 -----
adios2@2.9.1     caliper@2.10.0      flux-core@0.53.0    hpx@1.9.1            lammps@20230802    mgard@2023-03-31    petsc@3.19.4      strumpack@7.1.3    tau@2.32.1
amrex@23.08      chai@2022.03.0      ginkgo@1.6.0        hypre@2.29.0         legion@23.06.0     omega-h@9.34.13     raja@2022.10.4      sundials@6.5.1    umpire@2022.03.1
arborx@1.4.1     cusz@0.3.1          heffte@2.3.0        kokkos@4.1.00        magma@2.7.1        papi@6.0.0.1        slate@2022.07.00    superlu-dist@8.1.2  upcxx@2023.3.0
cabana@0.5.0     flecsi@2.2.1        hpctoolkit@2023.03.01  kokkos-kernels@4.0.00  mfem@4.5.2         parsec@3.0.2209     slepc@3.19.1        tasmanian@7.9      zfp@0.5.5
==> 36 installed packages
[sameer@polaris-login-01:~> ]

```

# Progress Report of E4S Support for ExaWind by ParaTools, Inc.



**ExaWind Project Engagement**  
September 30, 2023

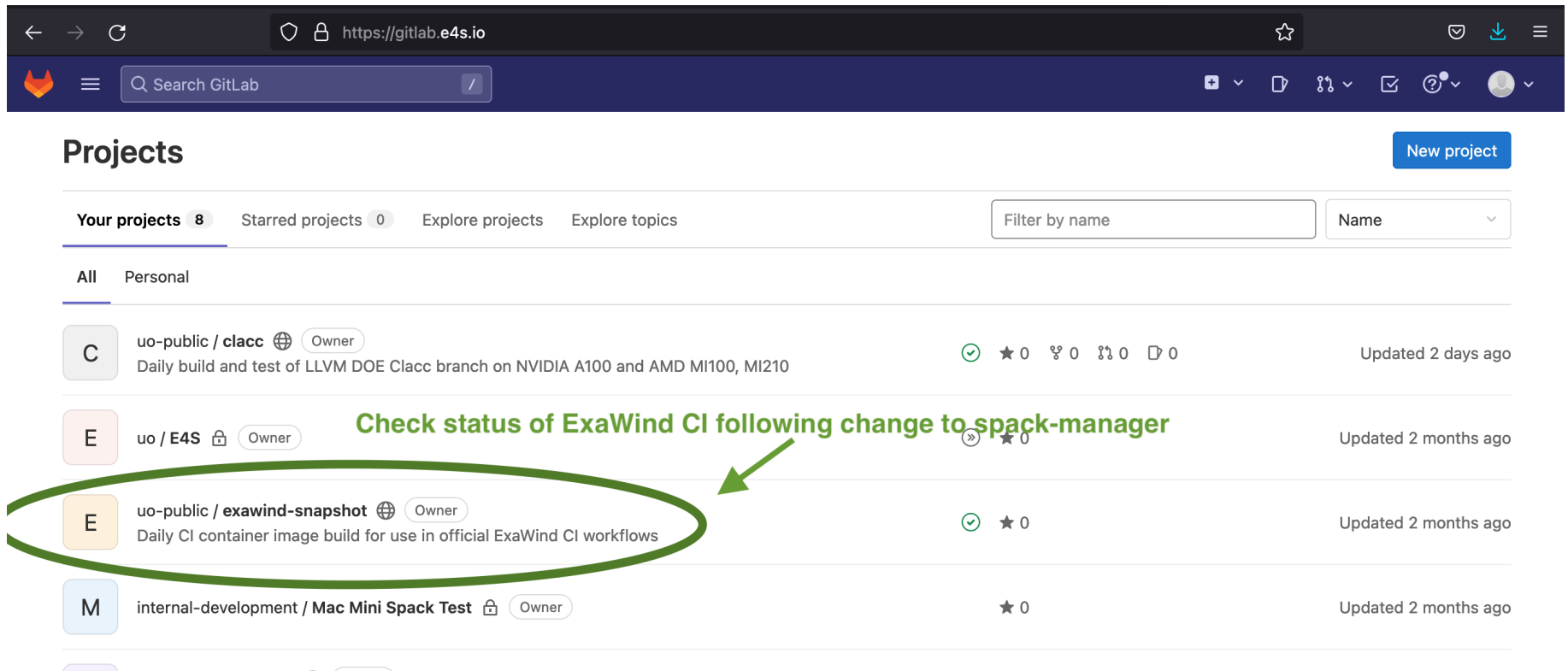
- **September:** Jupiter runner updated to 16.1.0
- **July:** ExaWind Jupiter GitLab Runner stability improved
- **May:** As part of the E4S-CL integration effort, and under advisement from OLCF system administrators, we are switching to Singularity's new Apptainer runtime for our OLCF Frontier work
- **April:** Began integration of container build with E4S Container Launch (E4S-CL)
- **April:** Completed container build of ROCm-enabled ExaWind for 64x Crusher nodes, 16-turbine simulation
- **March:** Began containerization of ROCm-enabled ExaWind for 64x Crusher nodes, 16-turbine simulation
- Clang-15 based CI workflow targetting Frontier initiated
- Daily development builds of the ExaWind software stack are being containerized and distributed to ExaWind developers via Docker Hub.
- These container images contain Spack-based development builds of AMR-Wind, Nalu-Wind, Trilinos and other elements of the ExaWind software stack.
- The build process for these containers are integrated via a meta-build tool developed in-house by the ExaWind team called Spack Manager.
- Container images are posted daily to the ecpe4s/exawind-snapshot DockerHub repository
- GitLab Repository for exawind-snapshot project
- Exawind-Driver CI using ecpe4s/exawind-snapshot
- Nalu-Wind CI using ecpe4s/exawind-snapshot
- AMR-Wind CI using ecpe4s/exawind-snapshot

# ExaWind CI: Container Image Artifacts on DockerHub

The screenshot shows the DockerHub repository page for `ecpe4s/exawind-snapshot`. The breadcrumb navigation at the top shows `ecpe4s` > `Repositories` > `exawind-snapshot`, with the last two items circled in green. The `Tags` tab is selected, displaying a list of container image tags. A green arrow points to the `latest` tag, with the annotation **ecpe4s/exawind-snapshot container artifact from successful CI**. Another green arrow points to the `2022-09-27` tag. A third green arrow points to the `2022-09-26` tag. The table lists the following tags:

TAG	DIGEST	OS/ARCH	LAST PULL	COMPRESSED SIZE
<a href="#">latest</a> Last pushed 16 hours ago by <a href="#">esw123</a>	<a href="#">0c34aa5c4339</a>	linux/amd64	---	2.25 GB
<a href="#">2022-09-27</a> Last pushed 16 hours ago by <a href="#">esw123</a>	<a href="#">0c34aa5c4339</a>	linux/amd64	---	2.25 GB
<a href="#">2022-09-26</a> Last pushed 2 days ago by <a href="#">esw123</a>				

# ExaWind CI: Exawind-Snapshot Project on gitlab.e4s.io



**Projects** New project

Your projects **8** Starred projects **0** Explore projects Explore topics

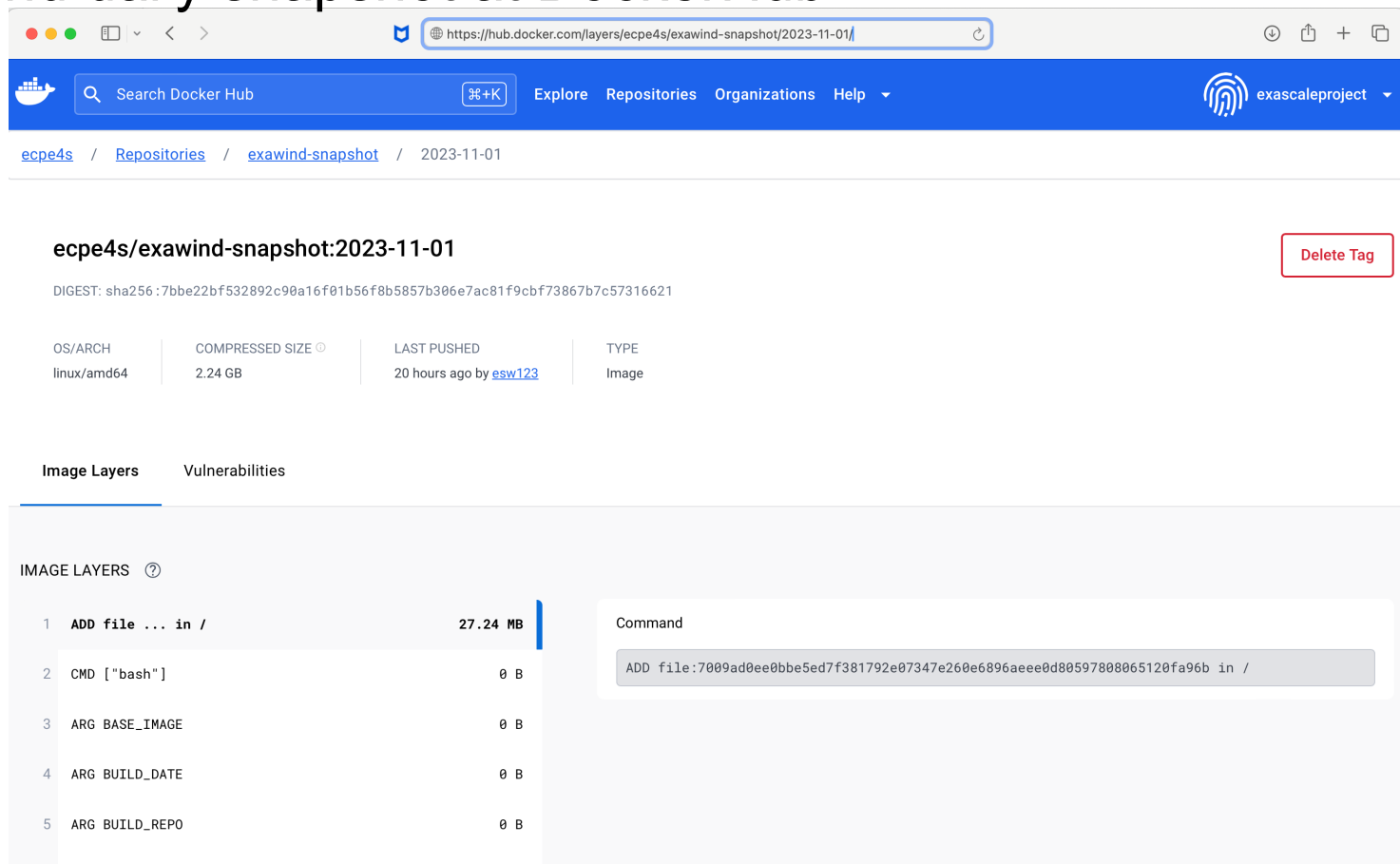
Filter by name Name

All Personal

C	uo-public / <b>clacc</b> Owner	✓ ★ 0 🐞 0 🔗 0 📄 0	Updated 2 days ago
E	uo / <b>E4S</b> Owner	🔗 ★ 0	Updated 2 months ago
E	uo-public / <b>exawind-snapshot</b> Owner	✓ ★ 0	Updated 2 months ago
M	internal-development / <b>Mac Mini Spack Test</b> Owner	★ 0	Updated 2 months ago

<https://gitlab.e4s.io/uo-public/exawind-snapshot/-/pipelines>

# Exawind daily snapshot at DockerHub



The screenshot shows the DockerHub interface for the repository `ecpe4s/exawind-snapshot` with the tag `2023-11-01`. The page displays the image's digest, OS/ARCH, compressed size, last pushed time, and type. Below this, the 'Image Layers' section is expanded, showing a list of layers with their commands and sizes. The first layer is 'ADD file ... in /' with a size of 27.24 MB. The second layer is 'CMD ["bash"]' with a size of 0 B. The third layer is 'ARG BASE\_IMAGE' with a size of 0 B. The fourth layer is 'ARG BUILD\_DATE' with a size of 0 B. The fifth layer is 'ARG BUILD\_REPO' with a size of 0 B. A 'Command' box on the right shows the command used to build the image: `ADD file:7009ad0ee0bbe5ed7f381792e07347e260e6896aeeee0d80597808065120fa96b in /`.

ecpe4s / Repositories / exawind-snapshot / 2023-11-01

**ecpe4s/exawind-snapshot:2023-11-01** Delete Tag

DIGEST: sha256:7bbe22bf532892c90a16f01b56f8b5857b306e7ac81f9cbf73867b7c57316621

OS/ARCH	COMPRESSED SIZE	LAST PUSHED	TYPE
linux/amd64	2.24 GB	20 hours ago by <a href="#">esw123</a>	Image

**Image Layers** Vulnerabilities

IMAGE LAYERS ?

Layer	Command	Size
1	ADD file ... in /	27.24 MB
2	CMD ["bash"]	0 B
3	ARG BASE_IMAGE	0 B
4	ARG BUILD_DATE	0 B
5	ARG BUILD_REPO	0 B

Command

```
ADD file:7009ad0ee0bbe5ed7f381792e07347e260e6896aeeee0d80597808065120fa96b in /
```

2023-11-01

# ExaWind CI: Container Image Artifacts on DockerHub

The screenshot shows the DockerHub repository page for `ecpe4s/exawind-snapshot`. The breadcrumb navigation at the top shows `ecpe4s` > `Repositories` > `exawind-snapshot`, with the last two items circled in green. The `Tags` tab is selected, displaying a list of container image tags. A green arrow points to the `latest` tag, with the annotation `ecpe4s/exawind-snapshot container artifact from successful CI`. Another green arrow points to the `2022-09-27` tag. A third green arrow points to the `2022-09-26` tag. The table lists the following tags:

TAG	DIGEST	OS/ARCH	LAST PULL	COMPRESSED SIZE
<a href="#">latest</a> Last pushed 16 hours ago by <a href="#">esw123</a>	<a href="#">0c34aa5c4339</a>	linux/amd64	---	2.25 GB
<a href="#">2022-09-27</a> Last pushed 16 hours ago by <a href="#">esw123</a>	<a href="#">0c34aa5c4339</a>	linux/amd64	---	2.25 GB
<a href="#">2022-09-26</a> Last pushed 2 days ago by <a href="#">esw123</a>				

# Thank you

<https://www.exascaleproject.org>

*This research was supported by the Exascale Computing Project (17-SC-20-SC), a joint project of the U.S. Department of Energy's Office of Science and National Nuclear Security Administration, responsible for delivering a capable exascale ecosystem, including software, applications, and hardware technology, to support the nation's exascale computing imperative.*



**Thank you** to all collaborators in the ECP and broader computational science communities. The work discussed in this presentation represents creative contributions of many people who are passionately working toward next-generation computational science.



