

ROIHU

CSC's next supercomputer - coming 2026

DL2026 program

- **User requirements and expectations are constantly evolving**
 - Invest in an ecosystem that is flexible and meets new requirements
 - Service and functionality in focus
- **Coherent overall infrastructure for Finnish research**
 - Complementary with LUMI and other platforms



Puhti and Mahti will
be replaced by a
new
supercomputer:

ROIHU

Cloud and **Allas
services** to be
invested in and
improved as well

Roihu is an Eviden BullSequana XH3000 supercomputer



ROIHU

System overview
docs.csc.fi/roihu



AGGREGATE HIGH-PERFORMANCE LINPACK

34 PETAFLUPS

33.9 x 10¹⁵ operations per second



486 CPU nodes

2 x 192-core
AMD Turin 9965



132 GPU nodes

4 x NVIDIA
GH200 superchip

Infiniband NDR interconnect

200 Gbit/s per CPU node
200 Gbit/s per GPU

EVIDEN XH3000 SUPERCOMPUTER

9 RACKS

Fully liquid cooled - over 1 MW of power

DDN EXASCALER

6.5 PETABYTES

Fully flash-based Lustre storage

Scratch disk

6 PiB

560 GB/s read perf
280 GB/s write perf

Home & ProjAppl disk

0.5 PiB

120 GB/s read perf
100 GB/s write perf

Overview of solution – Roihu compute

- **Roihu is an Eviden XH3000 system**
 - Next generation of Mahti (XH2000)
- **CPU partition based on AMD Turin 9965**
 - 2 x 192 cores per node
 - AMD Zen 5 architecture has full AVX-512 support - twice the Flop rate vs. Mahti
- **GPU partition based on NVIDIA GH200**
 - 4 x H100 GPUs & 72-core Grace ARM CPUs per node
 - Best price/performance solution for HPC & AI
- **Special resources**
 - 4 x high memory (6 TiB) and visualization nodes (NVIDIA L40), each with 2 x 7.68 TB local disks
 - 307.2 TB disaggregate NVMe capacity

Roihu	
CPU compute nodes	486
CPU cores	186 624
Memory per node	768-1536 GiB
GPU compute nodes	132
GPUs	528
Memory per chip	120+96 GiB (CPU+GPU)
Scratch storage	6+ PiB
Home and ProjAppl	0.5 PiB
Node temp storage	960 GB
HPL aggregate perf.	33.9 PFlop/s

Overview of solution – Roihu storage

Fully flash-based Scratch storage for active data

- **10 times more bandwidth than Puhti Scratch**
 - Much better performance for difficult I/O patterns
- **6 PiB total capacity**
 - Can be expanded during lifetime of system
- **ProjData** – special disk area on Scratch filesystem for storing and sharing datasets

Home and ProjAppl storage system

- Application installations and home folders
- **Separated from Scratch**
 - Ensures responsiveness even under heavy Scratch load
- **0.5 PiB total capacity**
 - Very fast performance (100+ GB/s)

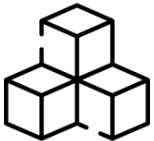
Node local storage resources

- All nodes have 960 GB local disks
 - **For temporary files**, not high-performance I/O
- Hugemem and visualization nodes have 15.36 TB high-performance NVMe storage
- 307.2 TB disaggregated NVMe capacity
 - Appears as local scratch from within a Slurm job

Features and functionality: what will **not** change

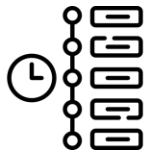


- **Roihu will have a web interface similar to Puhti & Mahti**



- **Pre-installed module environment**

- Comprehensive stack of scientific software available
- Programming environment will be similar to Mahti (GNU, AOCC, CUDA, OpenMPI, ...)



- **Slurm batch job scheduler**

- Queues will have characteristics of both Puhti & Mahti



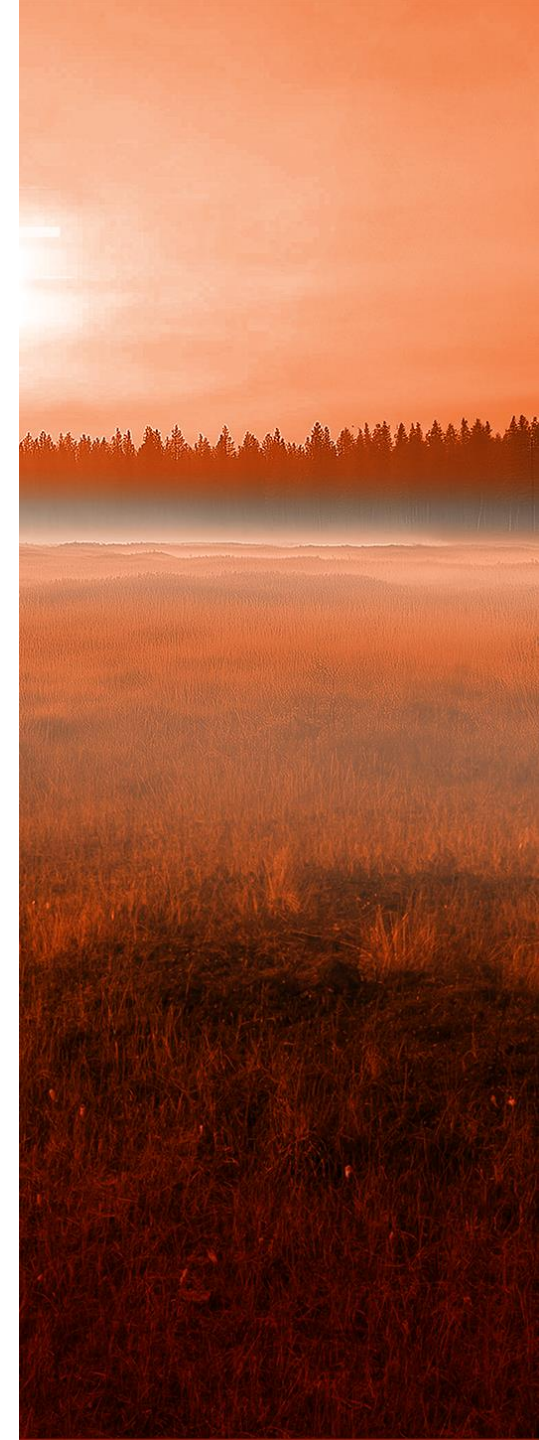
- **Apptainer containers and Tykky supported**

- Improved documentation, base containers and container registry "Satama"
- Tykky will remain available and supported

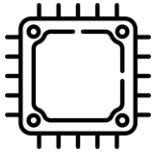


- **Disk cleaning policy**

- Will be enforced from the start, similar to current process on Puhti
- CSC will provide improved tools for moving data to/from Allas



Features and functionality: upcoming changes



- **New hardware and OS (RHEL9)**

- Intel vs. AMD, GPU nodes will have ARM CPUs (Grace)



- **Smaller, but much faster storage than Puhti & Mahti combined**

- Capacity to be expanded during Roihu lifetime

- **Disaggregated fast storage service**

- Users can request local disk mounts from centralized storage



- **Increased security**

- Short-term certificates required for SSH access
- Optional login nodes with per-user container isolation

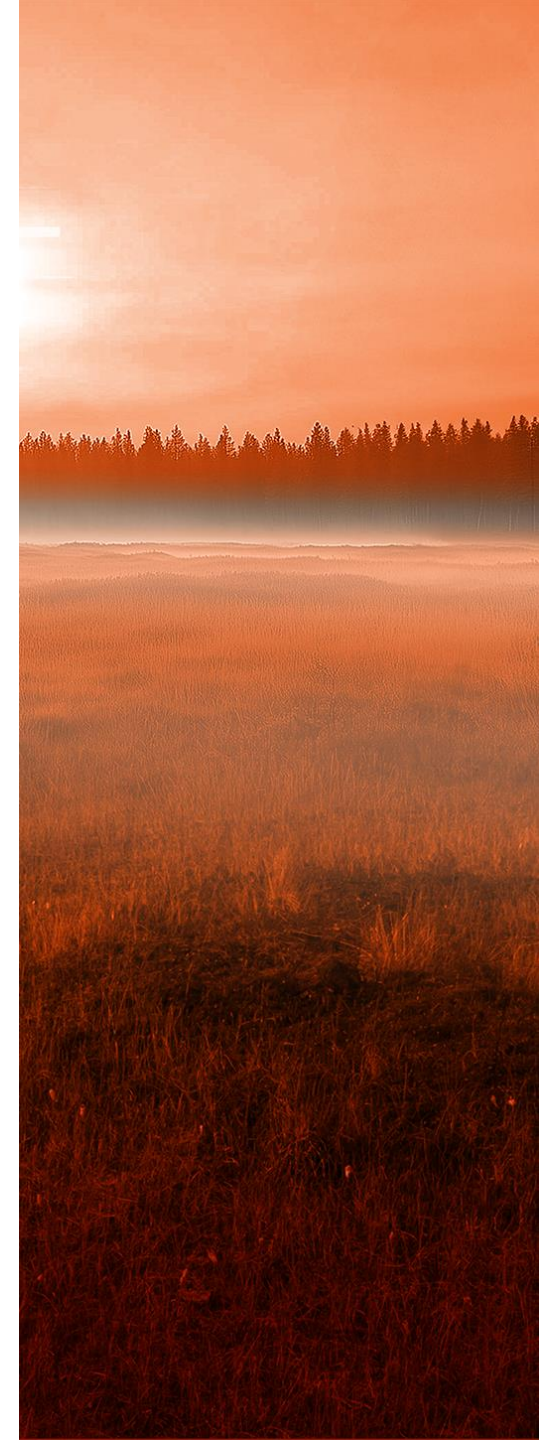
- **Support for confidential data computing will be developed**

- Integration with Sensitive Data services



- **FirecREST API for accessing Roihu compute and storage**

- Integrate workflows and web services to HPC



Deep dives into new features



New ProjData disk area

Main characteristics

- /projdata/project_1234567
- No disk cleaning, life-time limited by project life-time
- Ability to share read access to other projects
- Only available for new "Dataset Projects"
 - Computing not possible using these projects

Use cases

- Dataset made available close to compute on fast disk
- High-value static data
 - E.g. database-like set of files used for full project life-time
- Sharing applications and binaries with other groups

Apply for access via MyCSC

- Description of data, can link to Dataset-as-a-Service (DaaS) and Fairdata services
- Catalog of Roihu local datasets made available to users
- Overall quota of ProjData will be limited - life-time of projects will be enforced and free space may not be available for new projects

Satama container registry

Operational features



- **Private OCI registry**

- All container images are stored internally
- No risk of public images being removed or changed
- Full control over base images

- **Project-based isolation (multi-tenancy)**

- Separate projects for individuals, teams or research groups
- Images and permissions are isolated
- One project's changes do not affect others

- **Immutable tags & version control**

- Policy rule can be added to prevent Image version overwriting
- Prevents “latest image changed” issues (e.g. Bitnami)
- Ensures reproducible builds

- **Unified management portal**

- User-friendly UI for managing projects, users, repositories
- Provides audit logs for traceability and compliance
- REST API for automation and integration

Satama container registry

Security & compliance features

Vulnerability scanning (Trivy)

- Automatic CVE scans can be enabled for every image push
- Automatic SBOM generation can be enabled
- Visibility into high/critical vulnerabilities
- Security issues detect before deployment

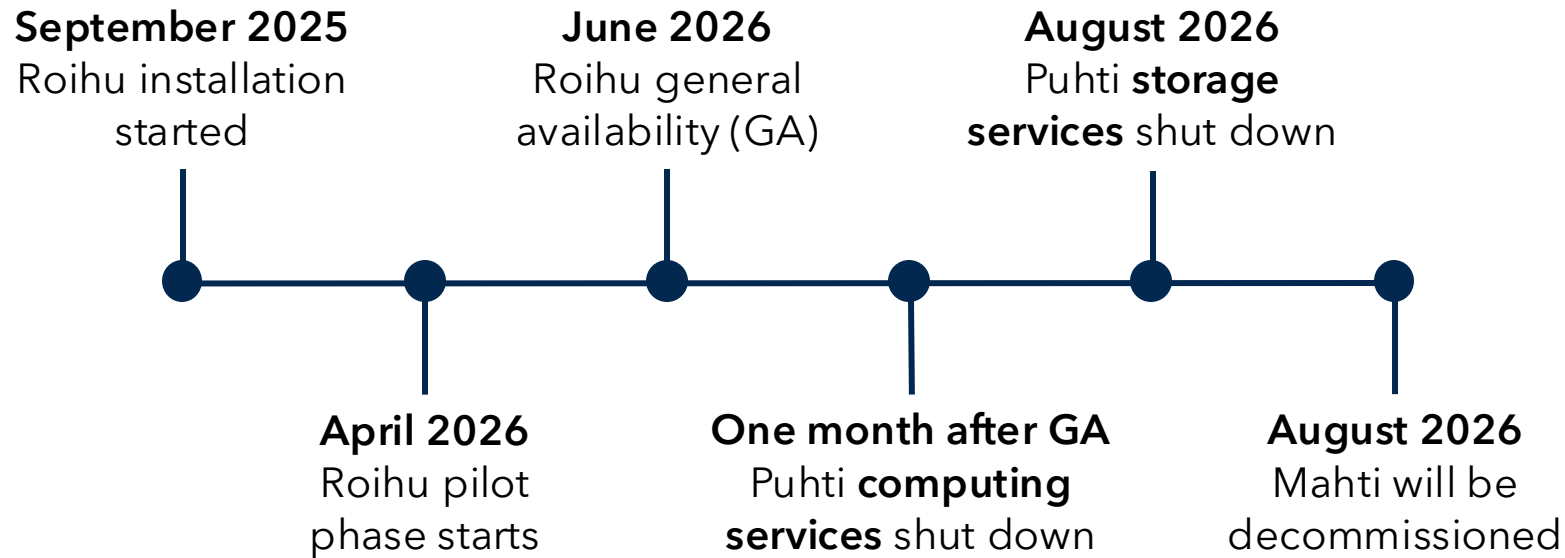
Access control & audit logs

- Fine-grained push/pull permissions
- Full traceability of who uploaded or changed images
- Supports garbage collection for unused image layers

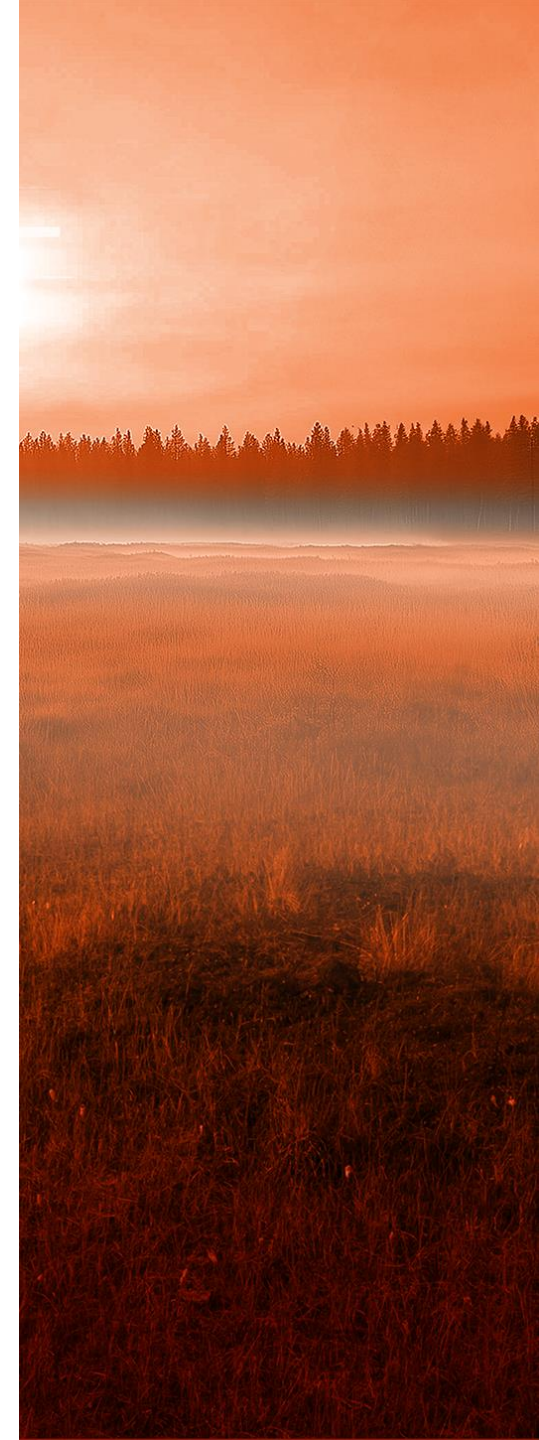
CI/CD & Kubernetes integration

- Images are scanned, tagged, and stored automatically
- Kubernetes pulls only trusted internal images
- Faster and more reliable deployments

Roihu timetable (tentative)



- Roihu installed in same datacenter as LUMI - will be brought up without disturbing Puhti & Mahti
- Aim is to enable users to migrate to Roihu without any breaks in HPC access



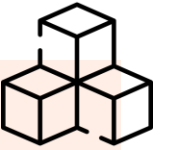
How to prepare for Roihu migration?

Data migration



- Clean up your data before migration: **only move what you really need!**
 - Roihu has less disk space than Puhti & Mahti combined, and stricter criteria for granting extended quotas
 - Existing quota extensions will not be automatically moved to Roihu
- **As a general rule, data should be moved directly to Roihu (not via Allas)**
 - Familiarize with data transfer utilities in advance: docs.csc.fi/data/moving
 - Detailed Roihu migration guide coming soon

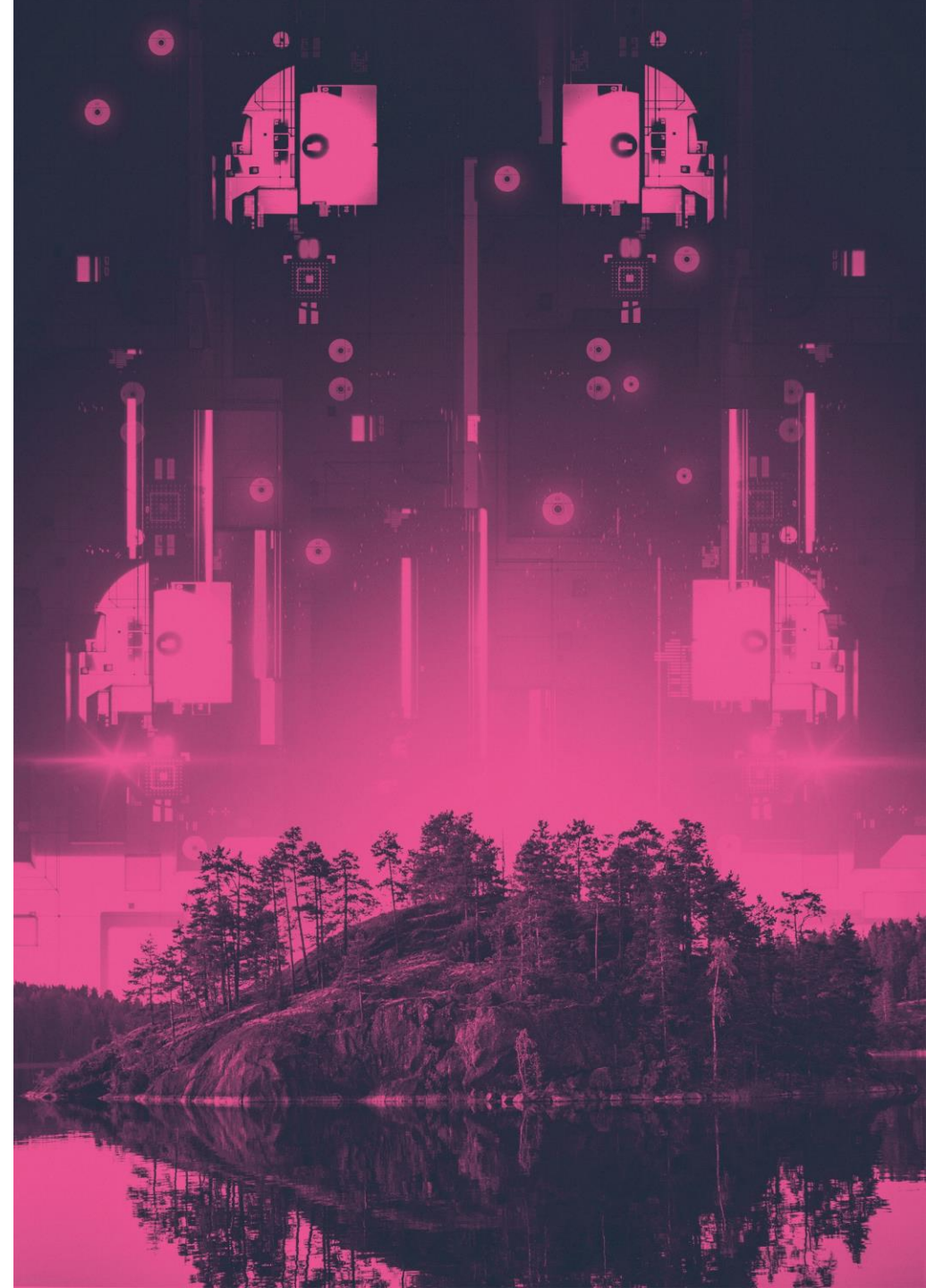
Application migration



- **New hardware, OS, module stack**
 - Prepare to recompile your own software
 - Check if/how your GPU code can run on the GH200 nodes (ARM)
 - Containerized Python environments (Tykky) and other Apptainer containers might work as is (except on GPU nodes)
- New Slurm partitions - **old batch scripts should not be expected to work**
 - CSC will develop documentation and provide templates and support for setting up new scripts and workflows

Changes to Allas and cloud services

- **New hardware for Allas and Pouta** will also be installed as part of DL2026 program
- New version of Allas with **more storage capacity** coming in late 2026
 - **"Allas 2" will only support S3 interface** – swift not supported
 - **Data will not be automatically migrated** – CSC will develop tools and documentation to help with migration in 2026
- **Pouta**
 - **More GPUs**, possibility to make available in **Rahti**
 - Also storage and CPU resource
 - ePouta updated in spring 2026, cPouta in autumn



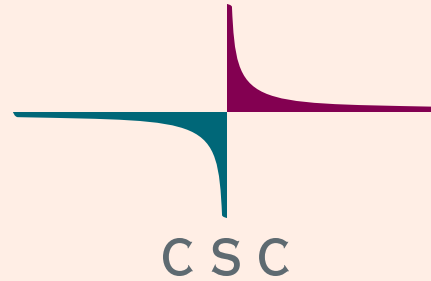
DL2026 outreach project

- Project's aim is to inform about the DL2026 infrastructure renewal and help users to migrate to and use the new systems
- **How?**
 - Presentation, documentation, self-learning materials, blog posts, ...
 - docs.csc.fi/roihu
- **Invite us to tell you more!**
 - We are happy to give a tailored presentation for your lab, department or university about DL2026, Roihu, or CSC services in general

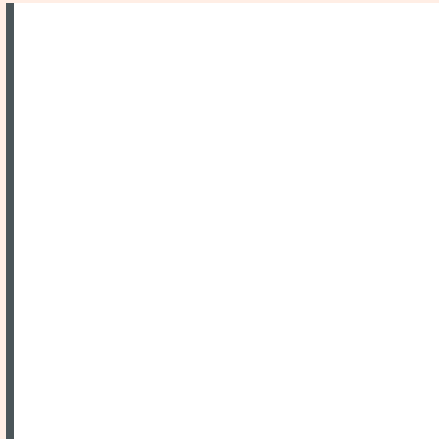


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