ROIHU

CSC's Next Supercomputer
Coming 2026

ROIHU

Roihu is an Eviden XH3000 supercomputer

CSC ROIHU

AGGREGATE HIGH-PERFORMANCE LINPACK

34 PETAFLOPS

33.9×10^{15} operations per second

486 CPU nodes
2 x 192-core AMD Turin 9965

132 GPU nodes
4 x NVIDIA GH200 superchip

AMD EPYC

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 storage
6 PiB
560 GB/s Read bandwidth
280 GB/s Write bandwidth

Home + ProjAppl storage
0.5 PiB
120 GB/s Read bandwidth
100 GB/s Write bandwidth

Overview of solution – Roihu compute

CPU partition: 486 nodes
- **Two 192-core AMD Turin 9965** CPUs
  - AMD Zen 5 architecture supports AVX-512 vector instruction set
- Memory per node: 768 GiB (414 nodes) or 1536 GiB (72 nodes)

GPU partition: 132 nodes
- **Four NVIDIA GH200** Grace Hopper superchips
  - Hopper H100 GPU, 96 GiB GPU memory (VRAM)
  - 72-core Grace ARM CPU, 120 GiB CPU memory
- Best price/performance solution for HPC & AI

Additionally:
- 4 high memory (3 TiB) nodes
- 4 visualization nodes (Nvidia L40)

Overview of solution – Roihu storage

- **Home and application storage system**
  - Separate from scratch to ensure responsiveness even under heavy scratch load
  - For application installations and home folders
  - 0.5 PiB total capacity, very fast performance (100+ GB/s)

- **Fully flash-based scratch storage**
  - For data in active use
  - 6 PiB in total size
  - 10x more bandwidth than in Puhti storage, much better performance for difficult I/O patterns

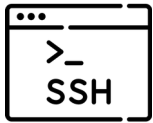- **All nodes have 960 GB local disks for temporary files**
  - High memory and visualization nodes have 2 x 7.68 TB NVMe disks each

Features and functionality – what will or will not change?

- **Roihu web interface:** ✓
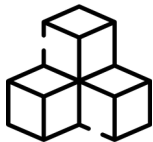 - Multi-factor authentication (MFA) will be required to login

- **Password-based SSH login:** ✗
  - SSH certificate-based authentication is the target
  - In case of delays: SSH keys as in Puhti and Mahti

Increased security

- **Apptainer containers and Tykky:** ✓
  - Improved documentation, base containers and integration of container registry
  - Tykky will remain supported

- **Pre-installed module environment:** ✓
  - Programming environment likely similar to Mahti (GNU, AOCC, CUDA, …)
  - Pre-installed collection of scientific software available similar to Puhti & Mahti
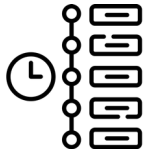
# Features and functionality – what will or will not change?

- **Disk cleaning policy:** ✓
  - ○ Will be enforced from the start, but exact details not yet decided
  - ○ Either current Puhti process or alternative approach, **feedback is welcome!**
  - ○ Also: Improved tools for moving data to/from Allas

- **Slurm batch job scheduler:** ✓
  - ○ Partitions (queues) will have characteristics of both Puhti & Mahti
  - ○ Also: FirecREST API for accessing HPC resources using HTTP requests
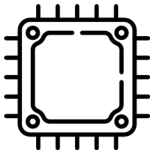
- **x86 CPU architecture:** ✓ **(CPU partition)** ✗ **(GPU partition)**
  - ○ The Grace-Hopper 200 superchips have ARM CPUs(!)
  - ○ Separate Grace-Grace login node for compiling GPU programs and creating Apptainer containers with *--fakeroot* option

New functionality that is coming

- **Increased security**
  - Short-term certificates for SSH access
  - MFA – multi-factor authentication
  - More isolation between projects/users

- **Improved support for integrations**
  - APIs for accessing compute and storage resources

- **Support for confidential data computing**
  - Integrated with Sensitive Data Desktop, based on encryption and isolation

- **Improved tools for Allas and container use**

- **Web interfaces will remain available and continuously improving!**

Another big change: Billing unit (BU) renewal

- **CSC's service offering and user base have grown substantially over the years**
  - More accurate resource and capacity management warranted (current model >30 years old!)

- **New model: specific units for HPC, HPC GPU, cloud and storage services**
  - To be deployed in **September 2025**
  - Affects resource applications – users must consider what resources and services are needed
  - Unused *old* BUs will be migrated **= no already granted resources will be lost**
  - **In the new model BUs will deprecate if left unused**
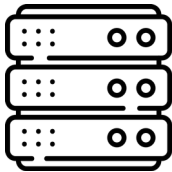
HPC BU
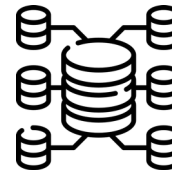Puhti, Mahti, Roihu
jobs *without* GPU
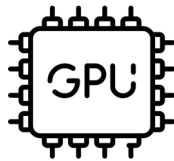
HPC GPU BU
Puhti, Mahti, Roihu
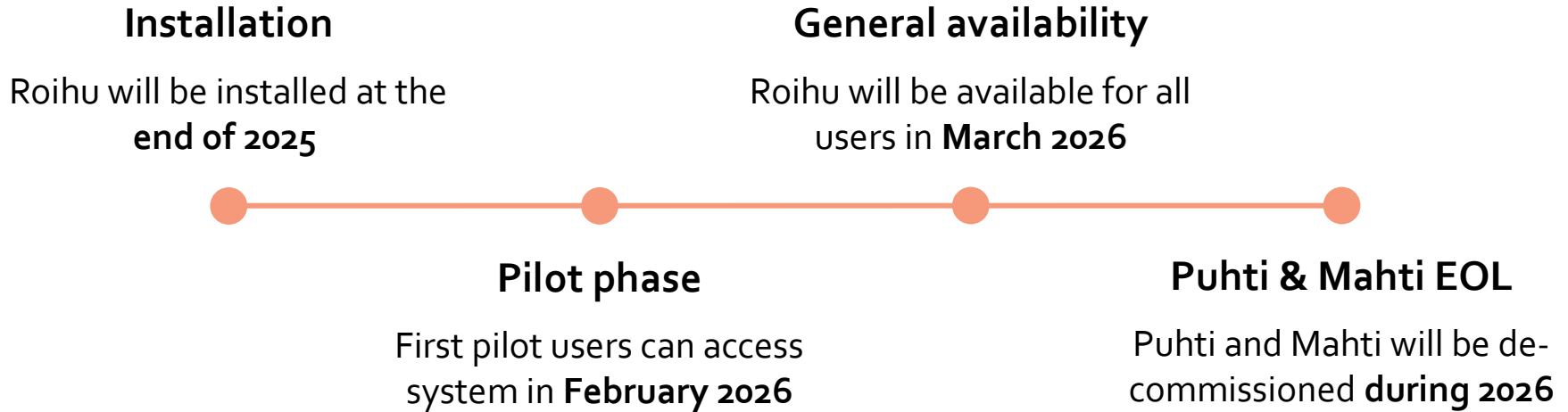jobs *with* GPU

Cloud BU
Pouta, Rahti,
Pukki, SD Desktop

Storage BU
Lustre, Allas, Shared
Fileservice, SD Connect

Roihu timetable (preliminary – subject to change!)

Installation

Roihu will be installed at the **end of 2025**

General availability

Roihu will be available for all users in **March 2026**

Pilot phase

First pilot users can access system in **February 2026**

Puhti & Mahti EOL

Puhti and Mahti will be de-commissioned **during 2026**

- Roihu installed in same datacenter as LUMI, can be brought up without disturbing Puhti and Mahti service

- Aim is to enable users to migrate to Roihu without a major break in HPC access

Allas and cloud services

- **New hardware for Allas and Pouta** will also be installed as part of DL2026 programme

- **Allas**
  - New version of Allas with **more storage capacity in 2026**
  - **New Allas 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 to Pouta,** possibility to make available in **Rahti**
  - Also storage and CPU resources
  - **ePouta updates this year, cPouta later in 2026**

DL2026 outreach project

- The project's aim is to inform about the DL2026 infrastructure renewal and help users to transition to and use the new systems

- **How?**
  - Presentations, documentation, self-learning materials, blog posts, …
  - https://docs.csc.fi/computing/systems-roihu/

- **Invite us to tell you more!**
  - We are happy to give a tailored presentation for your lab, department or university about DL2026, Roihu and what's to come
  - Contact us via servicedesk@csc.fi
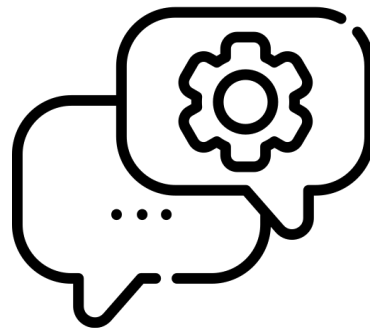
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