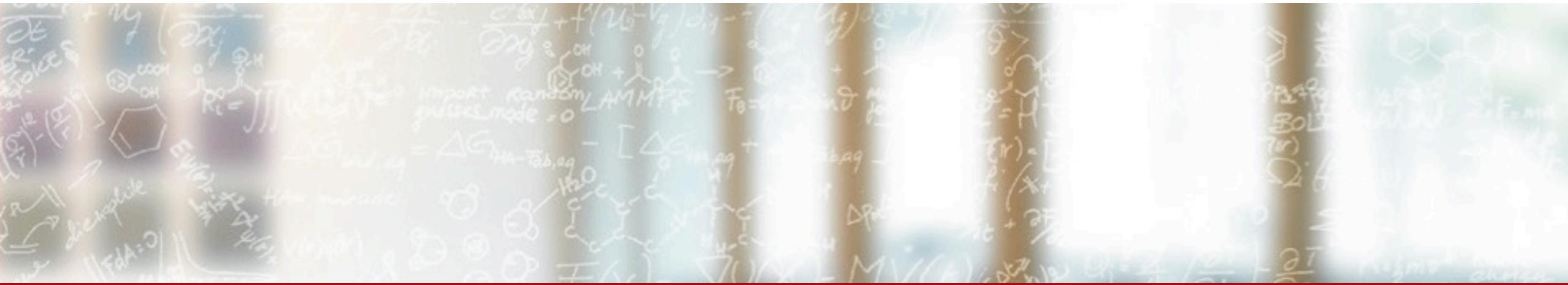




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# General Information for Users on Alps

User Lab Day 2025

Luca Marsella, Service Manager at CSCS

# Outline of the Presentation

- Introduction of Platforms
- Policies and Service Catalogue
- Documentation and Troubleshooting
- Community Slack Space and Status Page



Alps infrastructure in the CSCS machine room  
Source: <https://www.cscs.ch/computers/alps>



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# Introduction of Platforms

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# Glossary

**Platform** A subset of Alps on top of the infrastructure that enables the deployment of one or multiple vClusters

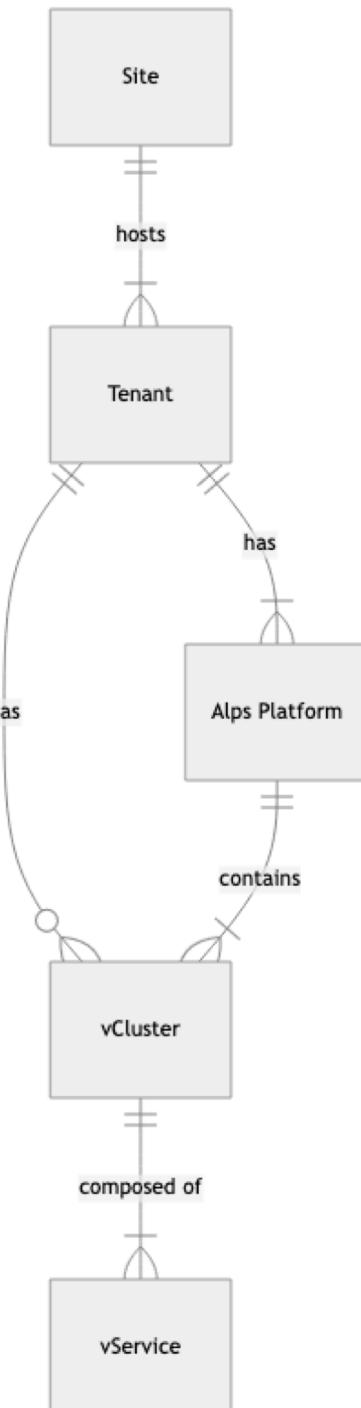
**Site** A physical place with the facilities to operate the infrastructure (CSCS in Lugano, EPFL in Lausanne, PSI in Villingen, ECMWF in Bologna)

**Tenant** Organization holding the underlying platform (CSCS, MCH, PSI,...)

**vCluster (versatile cluster)** Fusion of HPC and cloud technologies providing software-defined clusters on a supercomputing ecosystem

**vService (versatile cluster microservice)**

Small, independent, and loosely-coupled service hosted on a vCluster



# HPC Platform

**The HPC Platform targets general purpose HPC computing on Alps**

## Resources

- **GPU** nodes on **Piz Daint** (quad-socket Grace-Hopper superchip nodes)
- **Multicore** nodes on **Eiger** (dual-socket AMD CPU-only nodes)

## Audience includes

- **User Lab** (Peer reviewed allocation programs)
- **Partners** (EMPA, ETH Zurich, Marvel, UZH, USI,...)
- [cscs2go](#) (targeting primarily Swiss researchers from Academia and SMEs)

# ML Platform

**The Machine Learning Platform targets AI/ML computing on Alps**

## Resources

- **GPU nodes on Clariden** (quad-socket Grace-Hopper superchip nodes)
- Additional vClusters with NVIDIA A100, AMD MI250 and MI300 GPUs

Audience is primarily the **Swiss AI Initiative**

- Build capacities for advanced, large-scale AI systems for the benefit of society
- Over 70 professors from Swiss universities and research centres
- Co-led by ETH Zurich and EPFL

# CW Platform

**The Climate and Weather Platform targets climate science computing on Alps**

## Resources

- **GPU nodes on Säntis** (quad-socket Grace-Hopper superchip nodes)

## Audience includes

- **EXCLAIM**  
Project for ICON-based km-scale climate simulations (ETH Zurich)
- **C2SM** Center for Climate Systems Modelling  
Eawag, EMPA, ETH Zurich, MeteoSwiss, WSL
- **User Lab** projects in climate and weather domains



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# Policies

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# General Policies

The [code of conduct](#) outlines some responsibilities of the user community

- **Access to Source Codes:** you agree to make codes available for support
- **Scientific Advisory Committee:** committee members must not be contacted
- **Acknowledgements:** you must acknowledge the use of CSCS resources in all publications related to your allocation with reference to the “*project ID ####*”

[User Regulations](#) define guidelines for the usage of CSCS resources

- **Accounts are personal** and sharing them is forbidden
- **Data ownership:** access to and use of data of other accounts without prior consent from the principal investigator is strictly prohibited
- [ETH Zurich Acceptable Use Policy for Information and Communications Technology](#)

Access to CSCS resources **may be revoked to users violating these policies**

# Resource Allocation Policies

Computing time on Alps vClusters is allocated and accounted in **node hours**

- Resources are assigned in **three-month windows**
  - **Quotas are reset** on April 1st, July 1st, October 1st and January 1<sup>st</sup>
- Use your compute budget evenly and consistently across the windows
- Unused resources in a given window **cannot be transferred to the next**

See [\*\*Resource Allocation Policies\*\*](#) at <https://docs.cscs.ch/policies/#computing-budget>

# Data Retention Policies

Data backup for **active projects**:

- Data in **/users** and **/capstor/store** folders is backed up (past 90 days)
- Data in **/capstor/store** folders removed **3 months** after the **end of the project**
- Snapshots of the last 7 days available in the path **\$HOME.snapshot**

As soon as a project **expires**:

- Data backup is **disabled** immediately
- **No data recovery** after the final data removal

**No backup** for data on **scratch file system**:

- No recovery in case of **accidental data loss**
- No recovery of data deleted due to the cleaning policy

More on Data Retention Policies at <https://docs.cscs.ch/policies/#data-retention-policies>

# Policies of the scratch file system

**The capacity storage (capstor) features the scratch in a Lustre file system**

**Cleaning policy:** files **older than 30 days deleted** daily

**No backup:** you should transfer data after batch job completion

Soft quotas to prevent performance degradation

- Quota on **total number of files and folders** (inodes)
- Quota on **amount of data** with a **grace time** to allow data transfer

More information on **scratch** at <https://docs.csccs.ch/storage/filesystems/#scratch>

# Fair Usage Policies

## Slurm workload manager

- The batch scheduler is a shared resource
- **Do not continuously poll the scheduler** to determine job states
- **Do not submit hundreds of jobs** in a short space of time
- We may be forced to kill jobs and limit new submissions

## Login (User Access) nodes

- **Compute- or memory-intensive processes are not permitted**
- Heavy processes will be terminated **without warning**
- **Submit Slurm batch jobs** to run application codes on compute nodes

[Fair Usage Policies](https://docs.csrs.ch/policies/#fair-usage-of-shared-resources) at <https://docs.csrs.ch/policies/#fair-usage-of-shared-resources>

# User Support Policies

We offer timely response with **direct assistance or escalation processes**

- Support is **limited to the scope** of your project proposal
- We cannot guarantee the resolution of all issues

**Supported community codes** and user applications

- We are committed to help you run up-to-date supported community codes
- Best-effort support deploying and optimizing user applications

**Prioritization** case impact, complexity, knowledge transfer, time to solution

**Collaborative support** consult online docs and provide detailed information

See the [User Support Policies](#) at <https://docs.csccs.ch/policies/support>

# Scheduled Maintenance and System Unavailability Policies

We continue to implement rolling updates aimed at reducing downtime

- Ensure the reliability and performance of the Alps production vClusters
- Regular interventions are still necessary at this stage

## Advance notice

- We strive to announce scheduled system unavailability one week in advance
- Earlier notice may be possible, although this depends on external factors and internal approval processes

## Shared infrastructure

- Alps is a shared research infrastructure supporting a diverse range of research communities, partners, and projects
- Occasionally, the system may be temporarily dedicated to specific scientific projects to enable large-scale capability runs

# Maintenance and availability cadence

Tentative schedule of system unavailability to help you plan each quarter.

Note that the schedule is subject to change based on operational requirements

## Routine maintenance

**Cadence:** Occurs weekly, depending on need

**Typical duration:** Half a day; occasionally up to one full day

## Extraordinary maintenance

**Cadence:** At least once per quarter

**Typical duration:** Two days; may be extended if necessary

## Dedicated large-scale capability runs of scientific projects

**Cadence:** At most once per quarter

**Typical duration:** One week



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# Service Catalogue

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# Multi-factor authentication and SSH connections

Users are required to authenticate using multi-factor authentication (MFA)

- MFA implemented at CSCS as **two-factor authentication**
- Users receive an email with the details about the procedure
  - One factor is the **user login and password pair** ("thing you know")
  - The other factor is the **one-time password** (OTP, "thing you have")

MFA applies to web-based services and SSH connections

- CSCS supports MFA authenticators that follow the TOTP open standard
- SSH is only possible with keys generated by the CSCS SSHSERVICE
- **Keys are valid for 24 hours**, after which a new key must be generated

More information on MFA at <https://docs.cscs.ch/access/mfa>

# Programming Environment

We provide several ways to build software for running on vClusters

- **uenv** developed and fully supported at CSCS
- **Containers** (often a good choice for machine learning workloads)
- Cray Programming Environment (CPE) - limited support via HPE/Cray

**No modules** are loaded by default at login!

- You need to load the module **cray** first with the following command  
**module load cray**
- Then the modules available in the default CPE can be listed with  
**module avail**

More details at <https://docs.cscs.ch/software/prgenv/#programming-environments>

# **uenv**: User Environments

**uenv** provide programming environments and application software

Typically application-specific, domain-specific or tool-specific

- **uenv** contains only what is required for the application or tool to run
- CSCS provides some ready-made and supported user environments
- Advanced users can create their own **uenv** with the tools provided

Packaged in a single **squashfs** file

- Can be shared in an artifactory or stored on a file system
- Independent of each other and of CPE
- Built on top of the base image, not the CPE

# uenv: Tools

## Command Line Interface (CLI)

- **squashfs-mount**: low-level tool for mounting environments
- **uenv**: command line tool for interacting with environments

Slurm plugin at <https://github.com/eth-cscs/slurm-uenv-mount>

- Manages the loading of images on compute nodes

Stackinator at <https://eth-cscs.github.io/stackinator>

- Tool for generating images from a declarative recipe

Github with CSCS images at <https://github.com/eth-cscs/alps-spack-stacks>

- CI/CD pipeline to build, test and deploy images

# **uenv: Mount Points**

## **/user-environment**

- **Programming environments**
  - Compilers, libraries, profilers (e.g.: HDF5, FFTW, MPI, OpenBLAS...)
  - Can be application specific (e.g.: supporting ICON builds)
- **Application environments**
  - CP2K, GROMACS, LAMMPS, NAMD, QuantumEspresso, VASP...

## **/user-tools**

- **Supporting tools**
  - Debuggers (DDT)
  - Text editors
  - Visualization (ParaView, Visit, ...)

# **uenv: Benefits for You**

## **Single image** in a SquashFS file

- Managed in a registry/artifactory
- Performance decoupled from file system

## Defined by a **simple declarative recipe**

- The same environment can be easily rebuilt
- Useful after system upgrades

## **Small set** of system dependencies

- Only need to rebuild if **libfabric** or **Slurm** are changed

More on **uenv** at <https://docs.cscs.ch/software/uenv>

# Container Engine

Container Engine **runs Linux containers** on HPC environments

- Developed following the specific requirements of HPC systems
- Spawns isolated containers built by users for a specific application
- Extensible runtime by means of OCI hooks for custom hardware

Compatible with the [Open Container Initiative \(OCI\)](#) standards

- Pulls from registries with OCI Distribution Specification or Docker
- Imports and convert images with the OCI Image Format (e.g. Docker)
- Uses an OCI-compliant runtime to spawn the container process

More on [Container Engine](#) at <https://docs.cscs.ch/software/container-engine>

# Continuous Integration / Continuous Deployment (CI/CD)

CI/CD to **build containers** and run them at CSCS

- Dockerfile with build instructions
- Name for the container in the registry
- The build will be taken care by the CI implementation

**Pipelines:** git providers with [webhooks](#) (GitHub, GitLab, Bitbucket)

- A typical pipeline consists of at least one build job and one test job
- Build job: a new container with your most recent code changes is built
- Test job: the new container is run within an MPI job

More information on [CI/CD](#) at <https://docs.cscs.ch/services/cicd>

# FirecREST

FirecREST is a RESTful API for managing HPC resources at CSCS

- Integrate FirecREST into **web-enabled portals and applications**
- Securely **access CSCS services** (job submissions, data transfer,...)
- Hands-on introduction with [PyFirecREST](#)
  - Python wrappers for the [FirecREST API](#) to showcase its functionality

HTTP requests to perform various operations

- Basic **system utilities** like ls, mkdir, mv, chmod, chown,...
- Actions with the **Slurm** workload manager (submit, query, cancel jobs)
- **Data transfer:** internal (between CSCS systems) and external

More information on [FirecREST](#) at <https://docs.cscs.ch/services/firecrest>

# Interactive Computing with JupyterLab

[JupyterLab](#) is the web-based user interface for [Project Jupyter](#)

- Create and share **documents with live code**, equations, visualization, ...
- Ability to work with multiple documents using tabs or splitters side by side

We provide [JupyterHub](#) deployments on most vClusters

- Notebook servers are launched on compute nodes
- Some **ready-made kernels** are provided: Python, Julia, etc
- You can **add your own kernels** based on your own virtual environments
- Can **execute kernels on multiple nodes** with IPyParallel

More information on [JupyterLab](#) at <https://docs.csccs.ch/access/jupyterlab>

# Storage Resources: Capacity Storage

Most vClusters on Alps mount the capacity storage (**capstor**) as scratch file system

- 100 PB Lustre built on spinning disks
- **Best I/O performance on large files**
- Raw performance  
**1 TB/s I/O bandwidth**  
300K write IOPS and 1.5M read IOPS



# Storage Resources: Flash File System

The ML Platform also mounts the flash file system iopstor

- 3 PB Lustre filesystem built on Flash memory
- High **Input/Output operations per second (IOPS)**
- Raw performance  
240 GB/s write and 600 GB/s read bandwidth  
**13 M write IOPS and 18.4 M read IOPS**



# Storage Resources: \$HOME and \$STORE

Storage for datasets, code and scripts

- Access **r+w** from the login nodes
- Better performance with larger files (archive small files with **tar**)

**Permissions and data retention**

- Folders **backed up**: data retention until 3-months after projects end

Environment variables for quick access

- **\$HOME** pointing to personal folder **/users/\$USER**
- **\$PROJECT** and **\$STORE** pointing to group folder under **/capstor/store**

More information on **File Systems** at <https://docs.cscs.ch/storage/filesystems>

# Data Transfer

Data transfer service to get files from/to CSCS file systems ([External Transfer](#))

- Service implemented using the [Globus Online Endpoint](#)
- The CSCS endpoint requires authentication with CSCS credentials

Data mover service with a dedicated Slurm queue ([Internal Transfer](#))

- The service submits jobs on the **datamover** cluster at no charge

More information on [Data Transfer](#) at <https://docs.cscs.ch/storage/transfer>

# Long Term Storage

Storage repository with **long term retention** capabilities

- Provide **persistent identifiers (PID)** and set public access if needed
- Data easily **accessible from a web browser** (HTTPS protocol)
- RESTful API to **integrate with third party** applications
- Scalable service that can cope with **large volumes** of data
- **Resiliency** due to data protection measures against failures

User Lab: up to 2 TB of LTS storage quota (for 10 years) free of charge per project

More information on [\*\*Long Term Storage\*\*](https://docs.cscs.ch/storage/longterm) at <https://docs.cscs.ch/storage/longterm>



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# Documentation

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# Migration from CSCS Knowledge Base to CSCS Documentation

Documentation migrated from  
the **CSCS Knowledge Base** to  
the **CSCS Documentation**  
available at <http://docs.cscs.ch>

- Most of the content is already available online
- [Get in touch](#) if you can't find the information you need
- Source hosted on the public [GitHub](#) project [cscs-docs](#)

## CSCS Knowledge Base

### ⚠️ Knowledge Base Migration

The CSCS Knowledge Base is being migrated to the [CSCS Documentation](#). Please refer to the [CSCS Status Page](#) for announcements and read [How to submit a support request](#) to contact us on the CSCS Service Desk

❗ The Knowledge Base is customised for desktop view and not for the browsers of mobile devices

### Live Search

🔍 Please search the Knowledge Base here

Combine terms with **AND** and **OR**, exclude words with **NOT** or minus (**-**), use wildcards **\*** and **?** to replace characters and **~** for fuzzy or proximity search. Find out more on the [Confluence Search Syntax](#)

### Q & A

[Frequently Asked Questions \(FAQ\)](#)

[How-to articles](#)

[Troubleshooting articles](#)

Submit a request on the [CSCS Service Desk](#)

## Online Documentation

### Access and Accounting

[Access to CSCS Systems](#)

[Access to CSCS Systems for MLP Users](#)

[Account and Resources Management Tool](#)

More articles in [Access and Accounting](#)

### User Guides

[Alps \(Clariden\) User Guide](#)

[Alps \(Eiger\) User Guide](#)

[Daint.Alps](#)

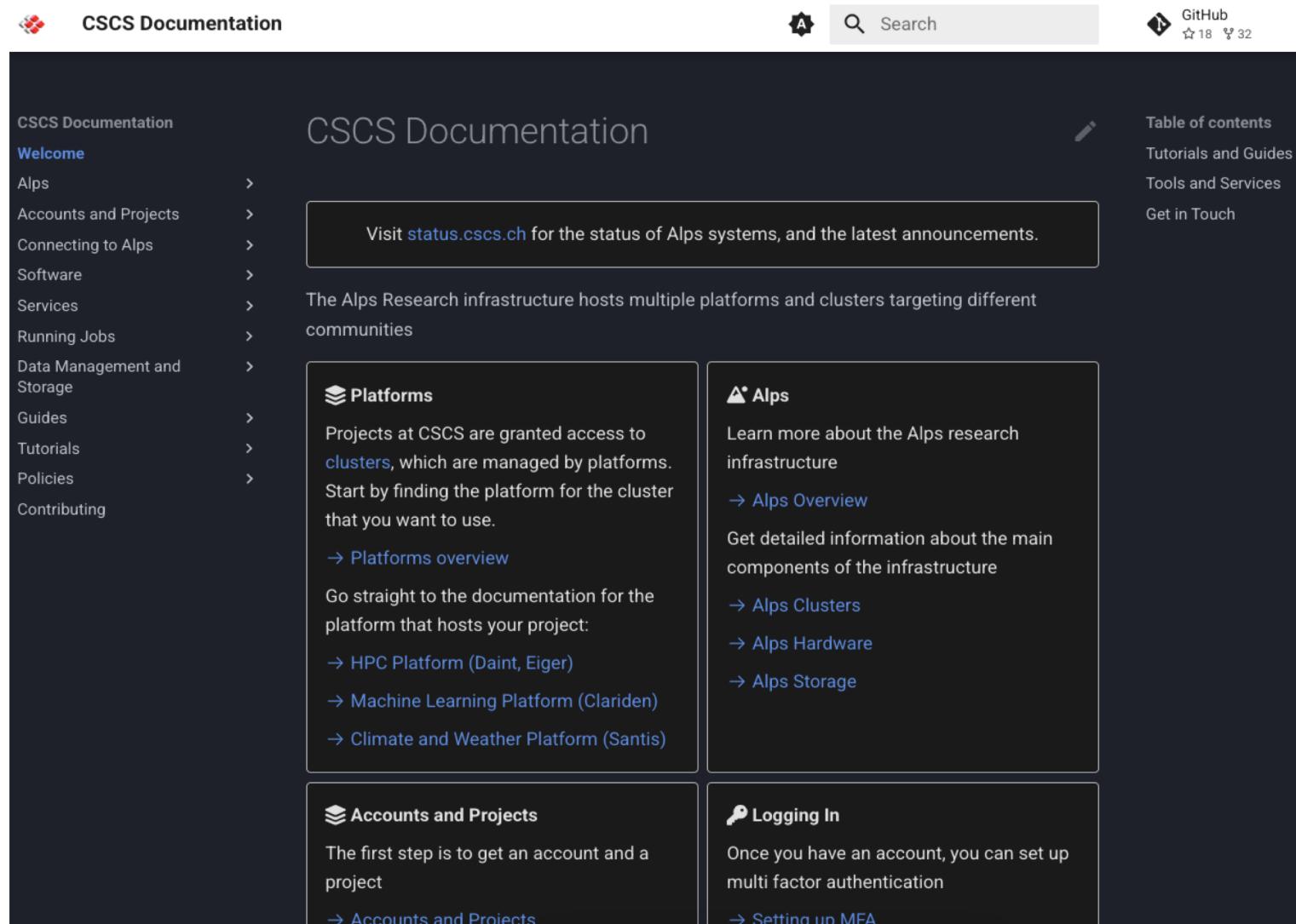
More articles in [User Guides](#)

# CSCS Documentation at <https://docs.cscs.ch>

Documentation developed  
with [Material for MkDocs](#)

## Main improvements

- Maintainability
- Powerful search
- Simple to navigate



The screenshot shows the CSCS Documentation homepage. At the top, there's a navigation bar with the CSCS logo, a search bar, and GitHub links. The main content area has a dark background with light-colored text. On the left is a sidebar with a tree view of the documentation structure:

- Welcome
- Alps
  - Accounts and Projects
  - Connecting to Alps
  - Software
  - Services
  - Running Jobs
  - Data Management and Storage
  - Guides
  - Tutorials
  - Policies
  - Contributing

The main content area features several sections:

- Alps**: A large section with a sub-section for **Platforms**. It explains that projects are granted access to clusters managed by platforms, and provides links to HPC Platform (Daint, Eiger), Machine Learning Platform (Clariden), and Climate and Weather Platform (Santis).
- Accounts and Projects**: A section explaining the first step is to get an account and a project, with a link to Accounts and Projects.
- Logging In**: A section about setting up multi-factor authentication, with a link to Setting up MFA.

On the right side, there are links to Table of contents, Tutorials and Guides, Tools and Services, and Get in Touch.

# Contributing at <https://github.com/eth-cscs/cscs-docs>

Contributions welcome!

- [Guidelines](#)
- [Style guide](#)
- [Getting started](#)

More information at  
<https://docs.cscs.ch/contributing>

## Contributing

This documentation is developed using the [Material for MkDocs](#) framework, and the source code for the docs is publicly available on [GitHub](#). This means that everybody, CSCS staff and the CSCS user community can contribute to the documentation.

### Making suggestions or small changes

If you have a suggestion, comment or small change to make when reading the documentation, there are three ways to reach out.

1. **Edit the page inline:** click on the  icon on the top right hand corner of each page, and make the change inline. When you click "commit", and create a pull request, which will then be reviewed by the CSCS docs team.
2. **Create a GitHub issue:** create an issue on the [issue page](#) on the GitHub repository.
3. **Create a CSCS service desk ticket:** create a ticket on the CSCS service desk. This is useful if you don't have a GitHub account, or would prefer not to use Github.



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# Troubleshooting

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# What to do in case of trouble?

Access the CSCS Service Desk at <https://support.cscs.ch>



Welcome to the CSCS Service Desk! How can we help you ?

Useful links

[Knowledge Base](#)

[User Portal](#)

[Tutorials](#)

[Login first!](#)

You are currently not logged in. Please [login here](#) to submit a request and view your current and past requests.

Contact us

Only if you do not have an account or if your account is not accessible, you can [contact us here](#).

# How to submit a support request

Links to Documentation, Status Page, Tutorials, Users Slack

- Documentation at <https://docs.cscs.ch>
- Status Page at <https://status.cscs.ch>
- Tutorials at <https://www.cscs.ch/publications/tutorials>
- Users Slack [Join the Slack space](#)

Submit a support request **if you can't find a solution** in the documentation

- **Login first** using your CSCS credentials
- The contact form should only be used if you cannot login

More on [\*\*How to submit a support request\*\*](#) at <https://confluence.cscs.ch/x/LYH8LQ>

# Request types in the CSCS Service Desk

Only available after logging in

- Choose the best matching **request type**
- Use the type **Other requests** only if you can't find a match
- A better match will help us react faster

Please select a request type to open a case.



## Accounting

Administrative requests regarding your user or project accounts



## Connection

Questions regarding SSH connections and keys using multi-factor authentication (MFA)



## Network and Cloud

Questions regarding SSL certificates, firewalls, servers and Kubernetes clusters



## Scientific Applications

Questions regarding supported applications, libraries and visualization



## Software Environment

Questions regarding compiling software, containers, user environment, interactive computing (Jupyter, Python)



## Storage and Filesystems

Questions regarding backup, data transfer (globus, xfer), filesystem performance, object storage and the openstack cluster Castor



## System and job scheduling

Questions regarding system related issues with batch jobs and remote workflows



## Other requests

Other requests for support

# Example of a good support request

## Summary

- Please insert meaningful keywords

## Description

- Please provide the information needed to **reproduce the issue**
- Include the **Slurm jobid** and the path to the **Slurm job script**
- Copy scripts and source files to **\$SCRATCH** and give us the necessary permissions to access

### Summary

Slurm job failed with error "..."

### Description

Aa **B** I ... ≡ ⌂ ⌂ +

My username is <user name>, I submitted the job <job ID> on <system>. The job running <code name> exited with state FAILED. The job script (<script name>) and input files (<file list>) can be found in \$SCRATCH/failed\_job, I have already given read access to with the command chmod -R +r \$SCRATCH/failed\_job.  
The instructions to reproduce the issue are ...

Please include the Slurm JobIDs of the batch jobs and briefly describe your workflow

### System

Type to search

### Project

csstaff (reporter)

### Attachment (optional)

Drag and drop files, paste screenshots, or  
browse

# Monitoring your requests

Cases in the Service Desk:

- **Filter** the list of cases
- Check case **status**
- **Review** the messages

Select a specific case:

- **Share** with other users
- **Resolve** the case if solved
- **Cancel** if sent by mistake

My cases

Open requests      Created by anyone

Type	Reference	Created	Summary
Issue details	[dom] Error using CDT 22.09 with PrgEnv-nvidia	Luca Marsella (CSCS) 03/Mar/23 11:41 AM	IN PROGRESS
[dom] Error using CDT 22.09 with PrgEnv-nvidia (SD-57760)			
<input type="text" value="Comment on this request..."/>			
ACTIVITY			
	Luca Marsella (CSCS) 03/Mar/23 11:41 AM	LATEST	
Thanks Vincenzo Annaloro (CSCS)!			
	Vincenzo Annaloro (CSCS) 03/Mar/23 11:37 AM		
Hi Luca, I'm investigating the problem on DOM about the missing cdt/22.09 on ELOGIN and CNS. Cheers, Vincenzo			
Your request status changed to: In Progress 03/Mar/23 9:59 AM			
DETAILS			
Description			
Hi, I have re-triggered the regression tests of the non default Cray PE 22.09 loading the module cdt/22.09 after the last intervention on Dom, as I have described in <a href="#">VCMSA-88</a> .			

Don't notify me  
Share  
Resolve  
Cancel Request  
Luca Marsella (CSCS) Creator

Follow the links in the notifications to add comments online to your case  
Replies by email won't be forwarded to your open support requests



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# Community Slack Space

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# Community Slack Space

CSCS Users Slack <https://cscs-users.slack.com>

A new space for you **to interact with fellow CSCS users**

- **Community** driven approach
- Get **rapid responses** to quick questions
- **Share experiences** and best practices

## Recommendations

- Encourage your team members to join!
- Please always **be kind and considerate** to others
- Misbehaviour could result in a ban from the Slack space  
Slack code of conduct <https://docs.cscs.ch/policies/slack>



# Channels

The space includes the following channels

- **#daint**  
Inquiries about the Daint vCluster on Alps
- **#quantumespresso**  
Usage of the QuantumESPRESSO suite on Alps
- **#general**  
Announcements and important updates
- Discover **more channels directly** on the Slack space



The Slack space **is not** meant for submitting support requests

- Use the CSCS Service Desk at <https://support.cscs.ch>



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# Status Page

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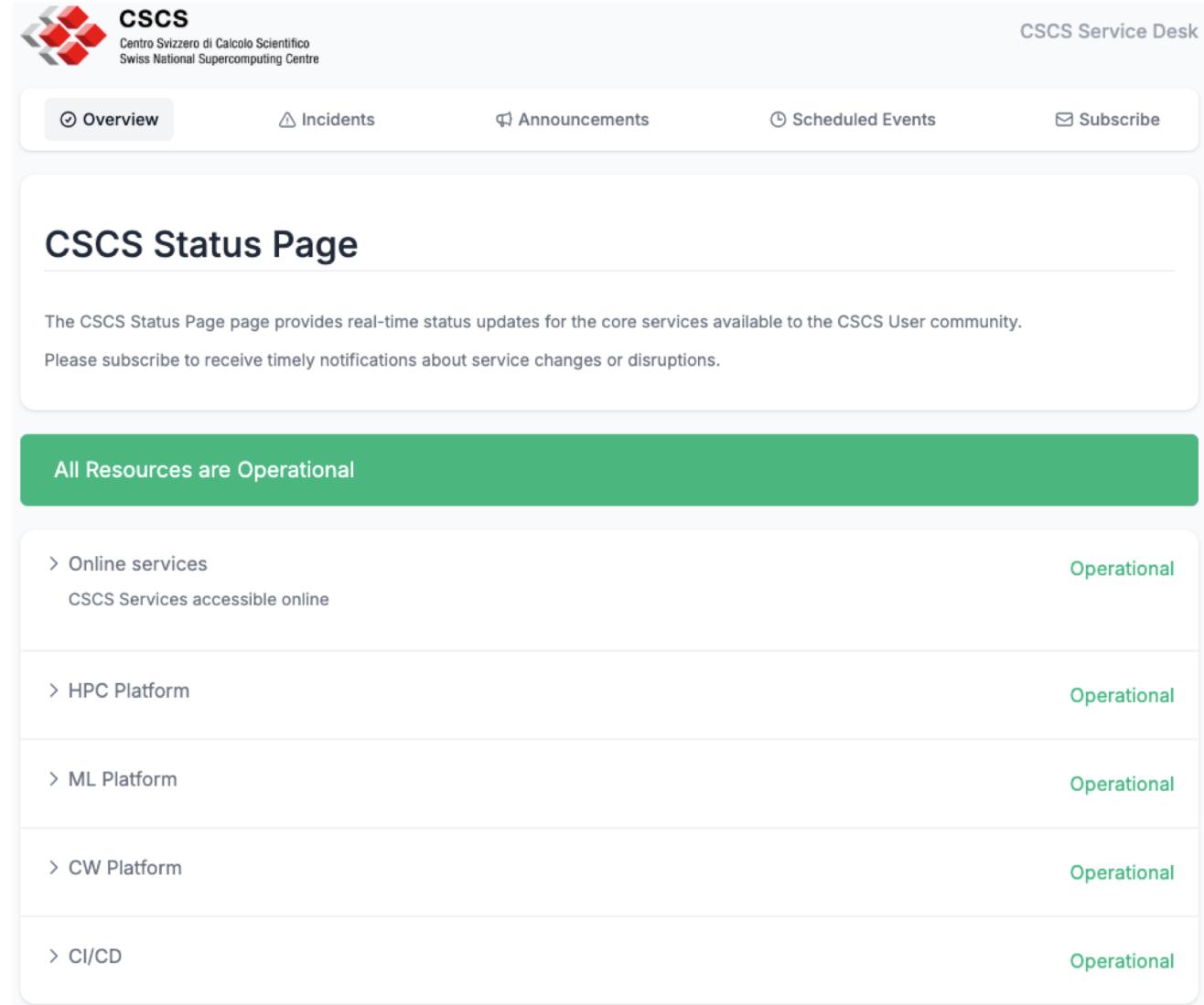
# Status Page at <https://status.cscs.ch>

## The Status Page reports

- Announcements
- Incidents
- Scheduled events

## Status of resources

- Online Services
- Platform services
- CI/CD status



The screenshot shows the CSCS Status Page interface. At the top, there's a navigation bar with the CSCS logo and the text "CSCS Service Desk". Below the navigation bar, there are five tabs: "Overview" (selected), "Incidents", "Announcements", "Scheduled Events", and "Subscribe". The main content area has a heading "CSCS Status Page" and a sub-section "All Resources are Operational". Below this, there's a table listing five service categories, each with a status indicator:

Service	Status
> Online services CSCS Services accessible online	Operational
> HPC Platform	Operational
> ML Platform	Operational
> CW Platform	Operational
> CI/CD	Operational

## Subscribe to get notifications

# Useful Links

- Documentation
  - <https://docs.cscs.ch>
- Service Desk
  - <https://support.cscs.ch>
- Status Page
  - <https://status.cscs.ch>
- User Slack
  - <https://cscs-users.slack.com>

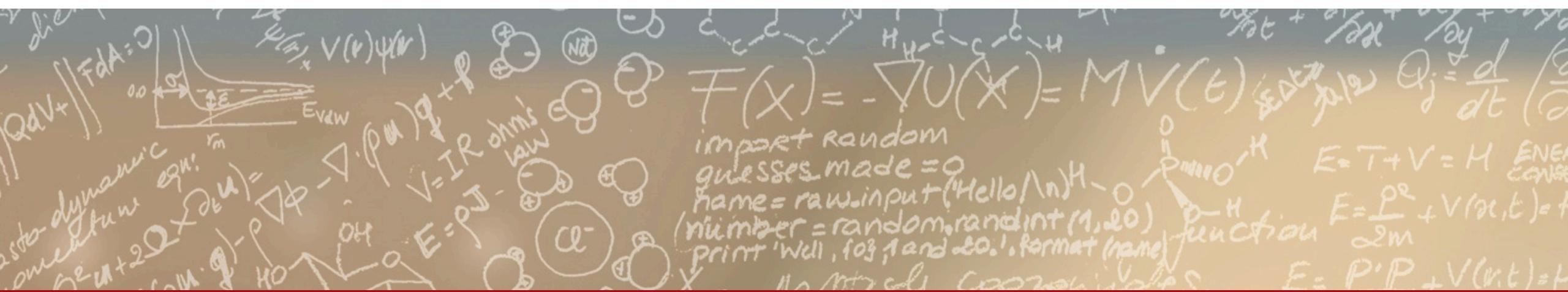




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Thank you for your kind attention