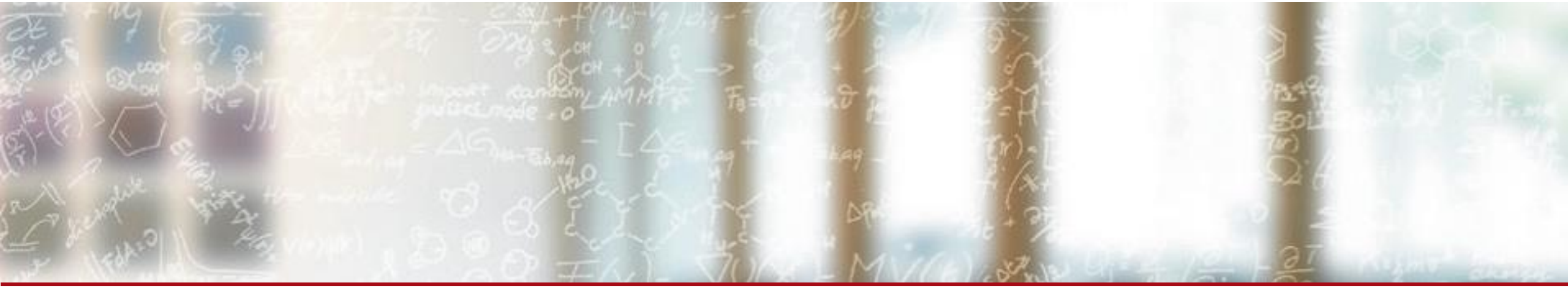
CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

ETH zürich



Swiss SRC Net Infrastructure

Science Day with SKAO Council

Pablo Fernandez

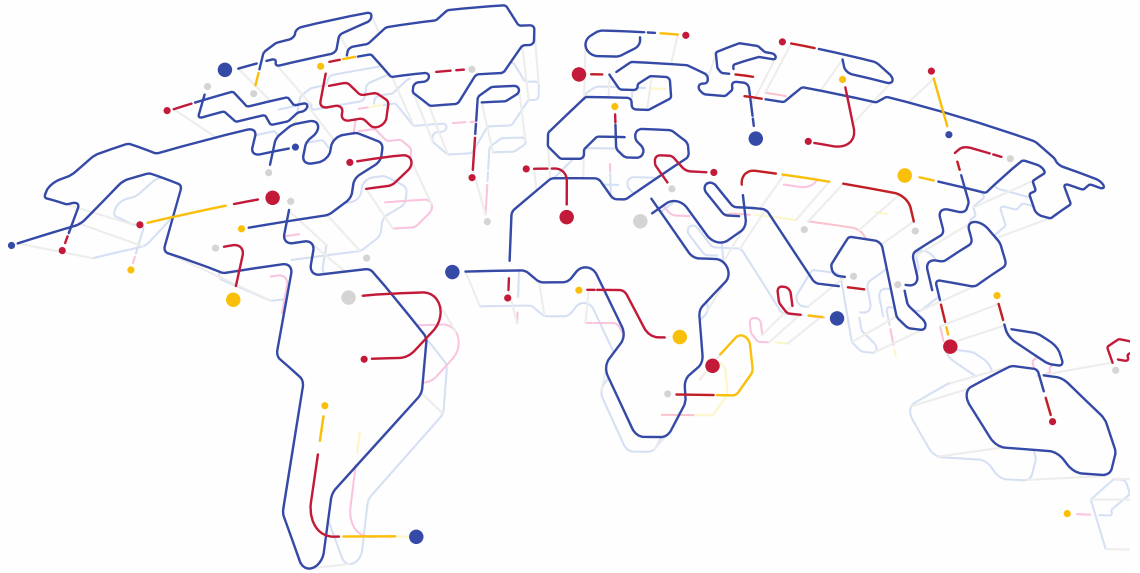
17th March, 2025

CSCS Mission

«We develop and operate a high-performance computing and data research infrastructure that supports world-class science in Switzerland»

- Located in Ticino since 1991
- A unit of the Swiss Federal Institute of Technology, ETH Zurich

- National and international collaborations in the research of new technologies for HPC with strong emphasys on innovation.



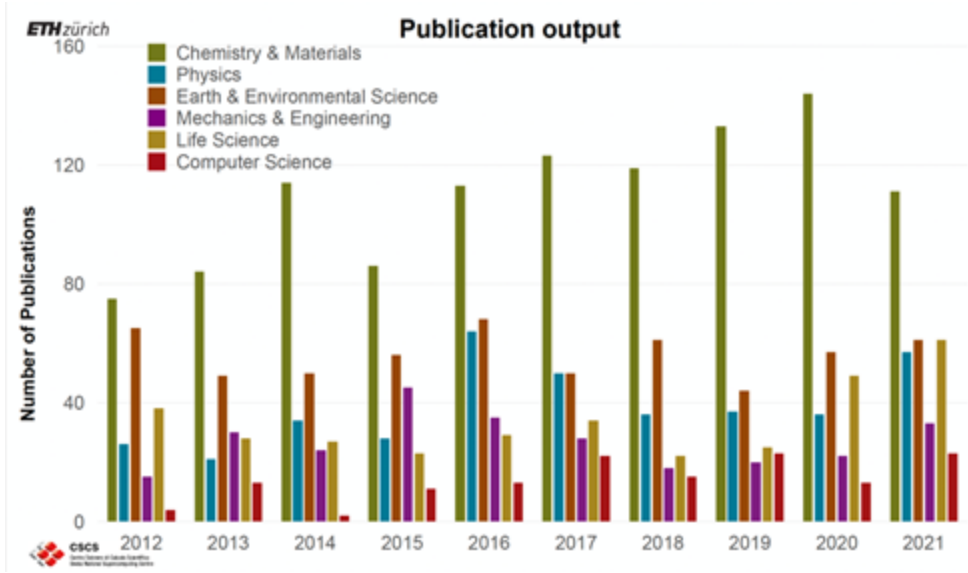
A RI connected to experiment, computational science, and the world

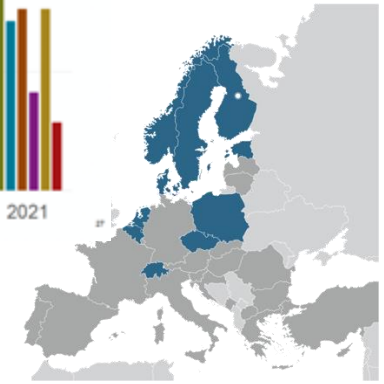
PSI

MCH

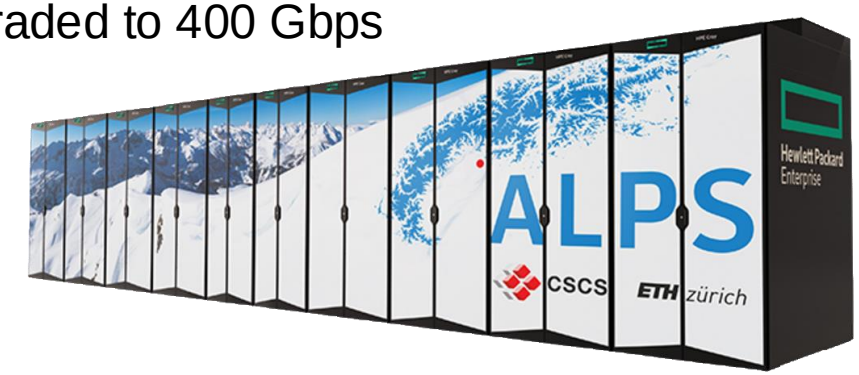
SKAO
CTAO

CSCS





Just upgraded to 400 Gbps



CERN

A RI connected to experiment, computational science, and the world

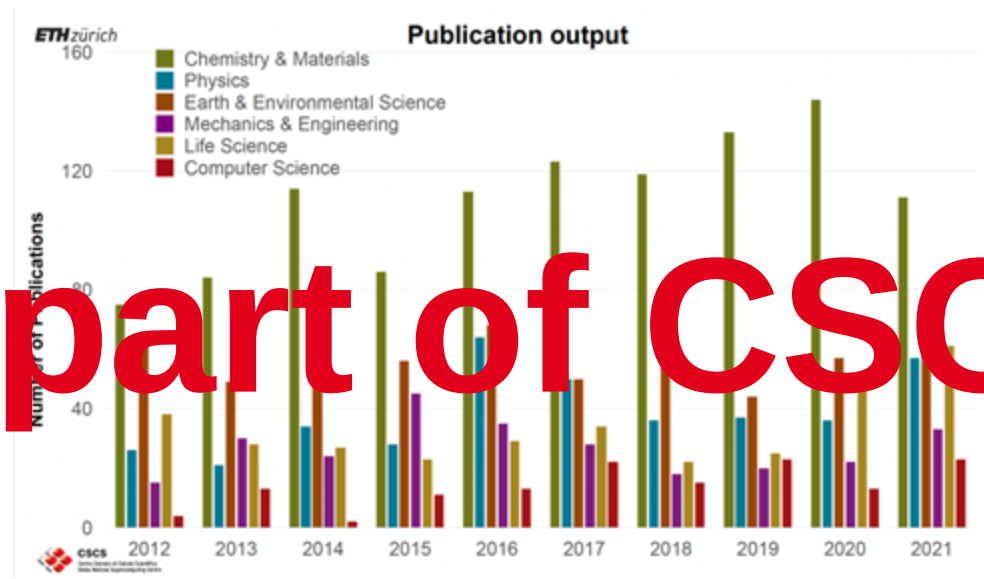
PSI

MCH

SKAO
CTAO

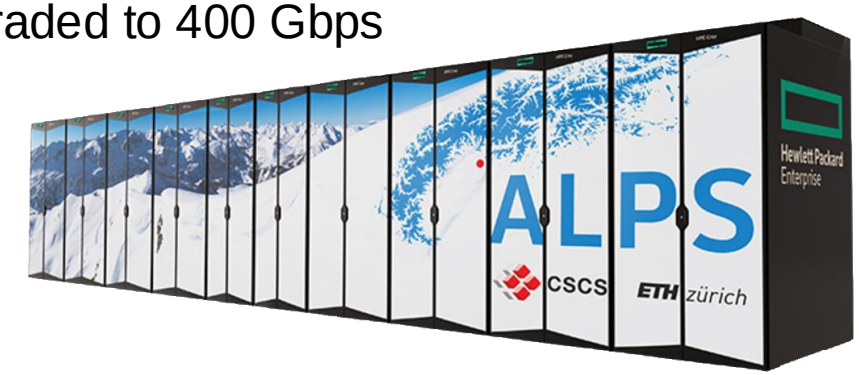
CSCS

CERN



SKAO is part of CSCS

Just upgraded to 400 Gbps



Alps is scalable

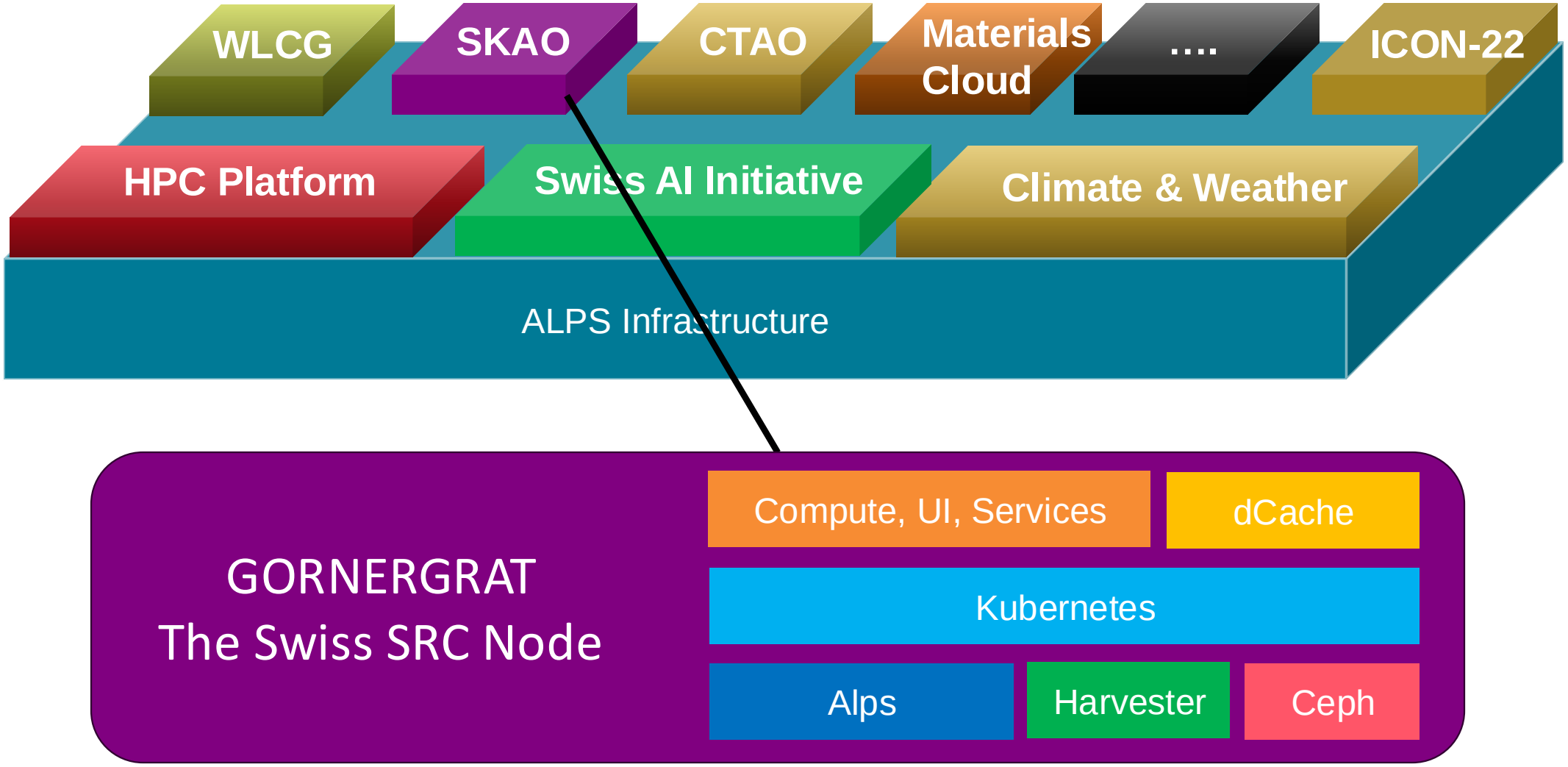
- Is the first supercomputer to enable the creation of dynamic clusters tailored to the specific needs of users while maintaining separation between them, for example:
  - Eiger – for the User Lab.
  - Clariden – for AI.
  - Tasna & Balfrin – MeteoSwiss' numerical weather forecasts.

- Geo-distributed hardware:
  - Lugano (CSCS) – main facility
    - PUE 1.2, 100% Hydro power
  - Lausanne (EPFL)
  - Villingen (PSI) for data Archives.
  - Bologna for data access to ECMWF.

- Alps has multiple architectures:
  - **1'024 multicore nodes**
    with 2 **AMD Rome processors**
  - **2'688 hybrid nodes**
    with 4 **NVIDIA Grace-Hopper superchip**
    → 10'752 processors
    → 6.9 PB of RAM
  - with additional nodes with special purpose
  - Liquid cooling
  - Slingshot network

- Storage:
  - 100 + 10 PB scratch disk
  - 5 + 1 PB Solid State Disk (SSD)
  - 2 tape libraries of ca. 130 PB each

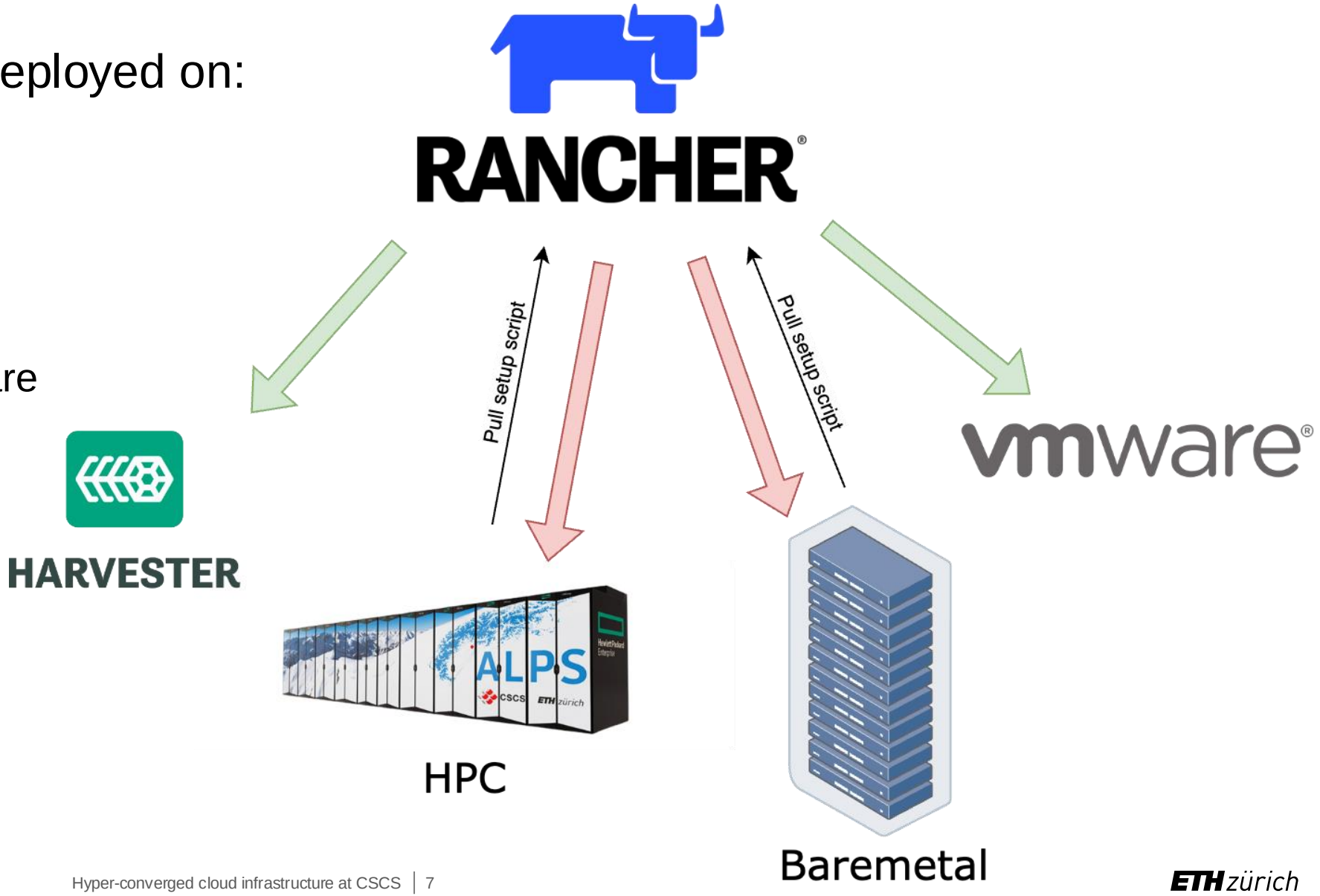
Software-defined Platforms in Alps



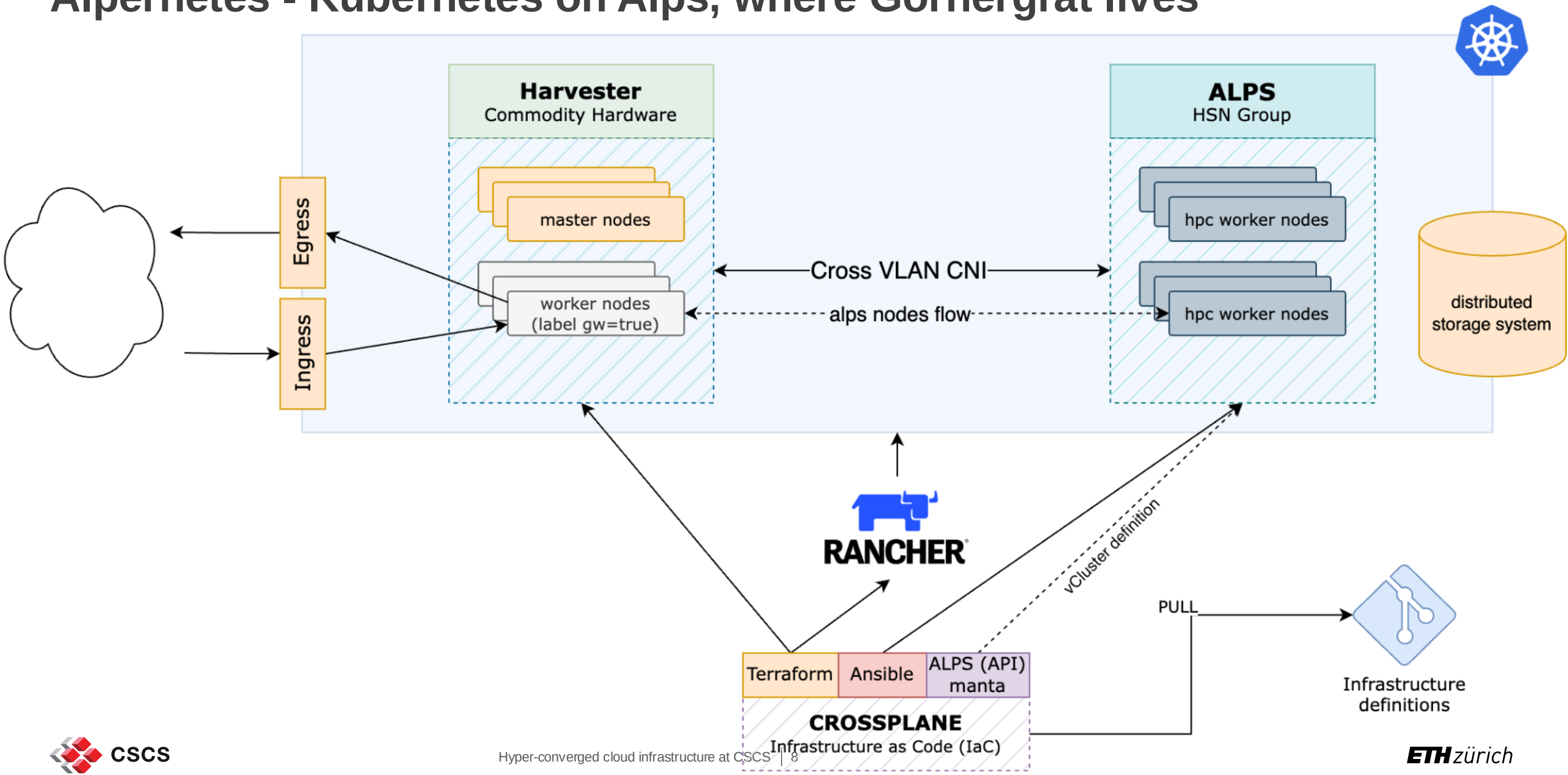
Where we run kubernetes

Kubernetes clusters deployed on:

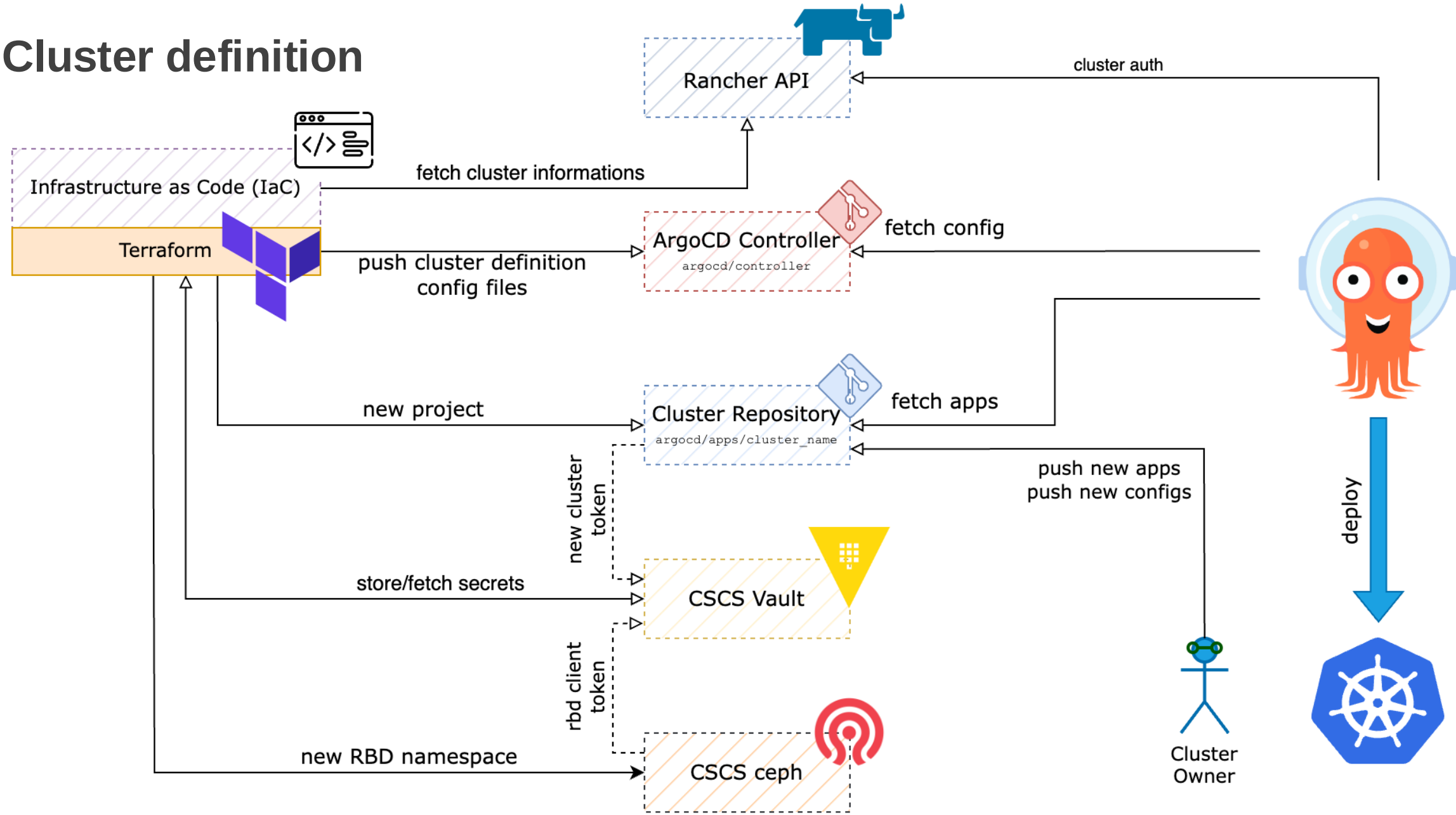
- Harvester
- VMware
- Bare metal
  - Commodity Hardware
  - HPC (CSCS Alps)



Alpernetes - Kubernetes on Alps, where Gornergrat lives



Cluster definition



Ceph - NARET

- Ceph Reef (v18.2.4)
  - 29 PiB RAW HDD space (1836 OSDs)
  - 700 TiB RAW NVMe space (224 OSDs)
- 3 Monitor Nodes
- 51 OSD Nodes
- 3 RGW Nodes (S3)

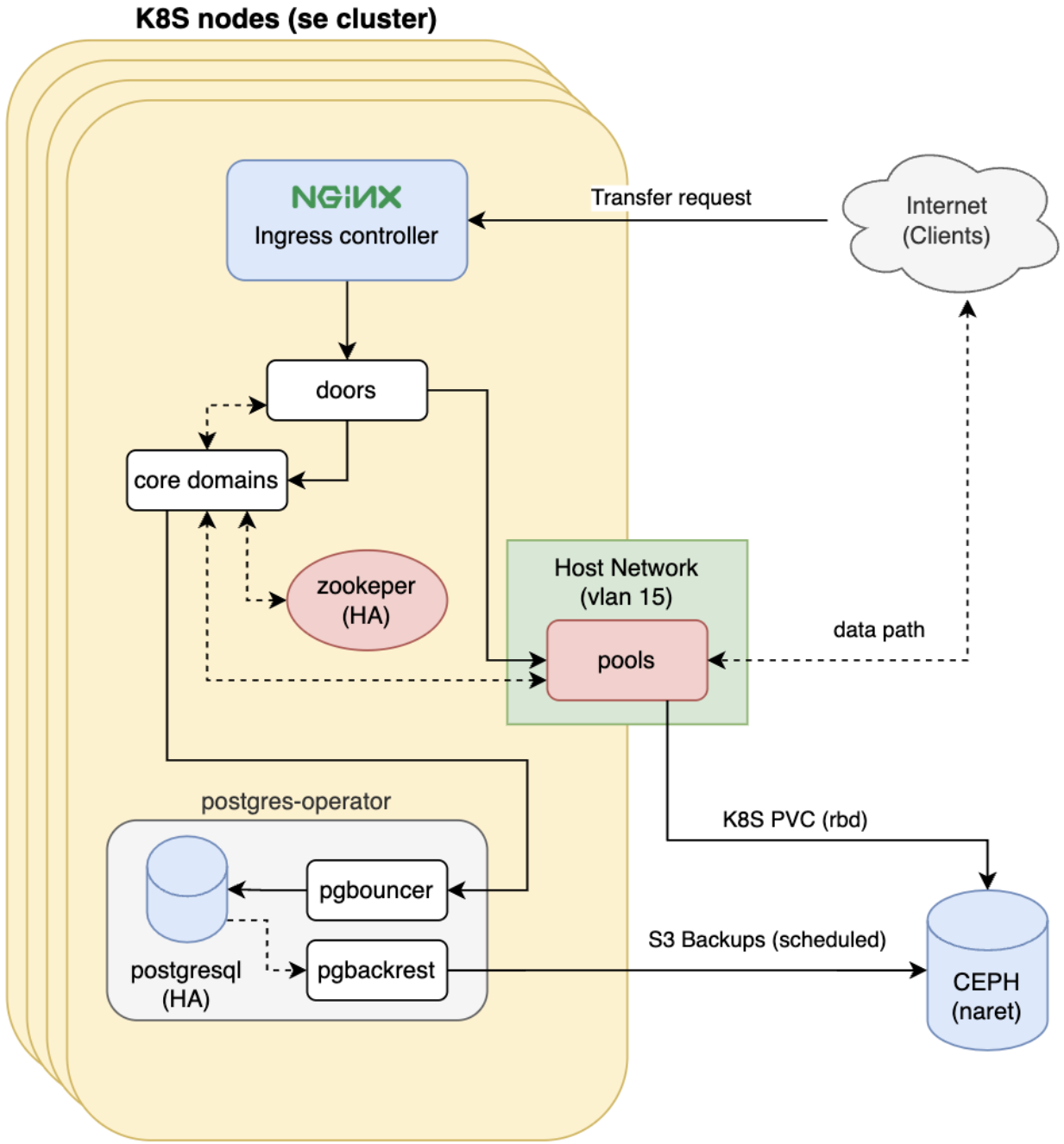
Ceph - TOM

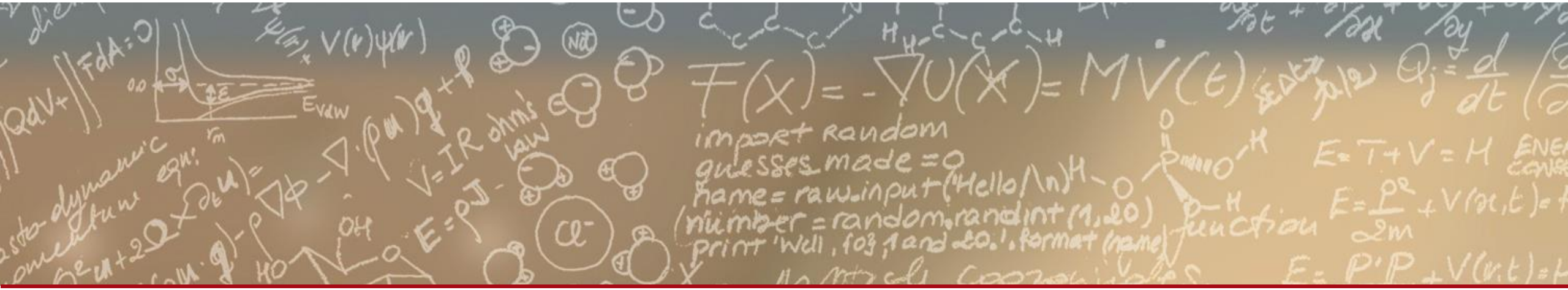
- Ceph Quincy (v17.2.7)
  - 11 PiB RAW HDD space (552 OSDs)
- 3 Monitor Nodes
- 23 OSD Nodes

- Erasure Coding (EC) 4+2
  - ~ 66% efficiency
  - Max 2 host failures
- 2 RBD images per pool
  - 48 TiB data on HDD
  - 2 GiB metadata on NVMe

dCache on Kubernetes

- Similar setup compared to CTAO and WLCG, all together ~14 PB usable
- Pool pods with HostNetwork
  - Public IP
- NGINX Ingress Controller
  - TCP services for doors
  - Ingress for HTTPS services
- Cilium CNI (IPv4 + IPv6)
- Node failover in case of failure
- Logs and metrics collection
  - Filebeat + Metricbeat
- Check HEPIX presentation from Elia Oggian: https://indico.cern.ch/event/1450798/contributions/6205799/





Thank you for your attention.