INFN-CNAF status report

Andrea Chierici

on behalf of INFN-CNAF staff

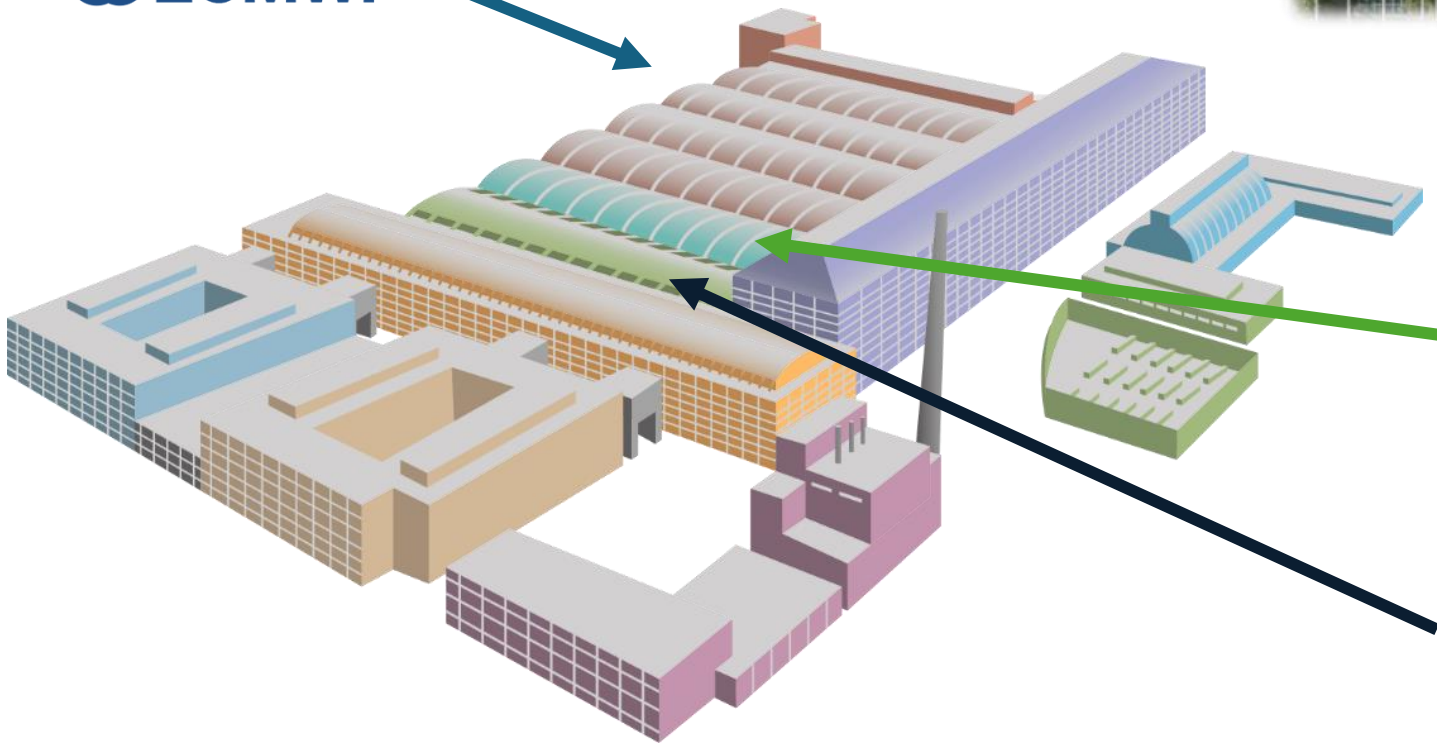
INFN-CNAF Scientific collaborations

- CNAF actively supports the computing model of:
  - More than 60 INFN experiments INFN
    - HEP including the 4 LHC experiments
    - Astro-particle and gravitational waves
    - Theoretical physics

- Other scientific domains collaborations
  - Bioinformatics
  - Biomedicine
  - Computational chemistry
  - Cultural Heritage
  - EU, National and Regional projects

INFN-T1 new Data Center

ECMWF



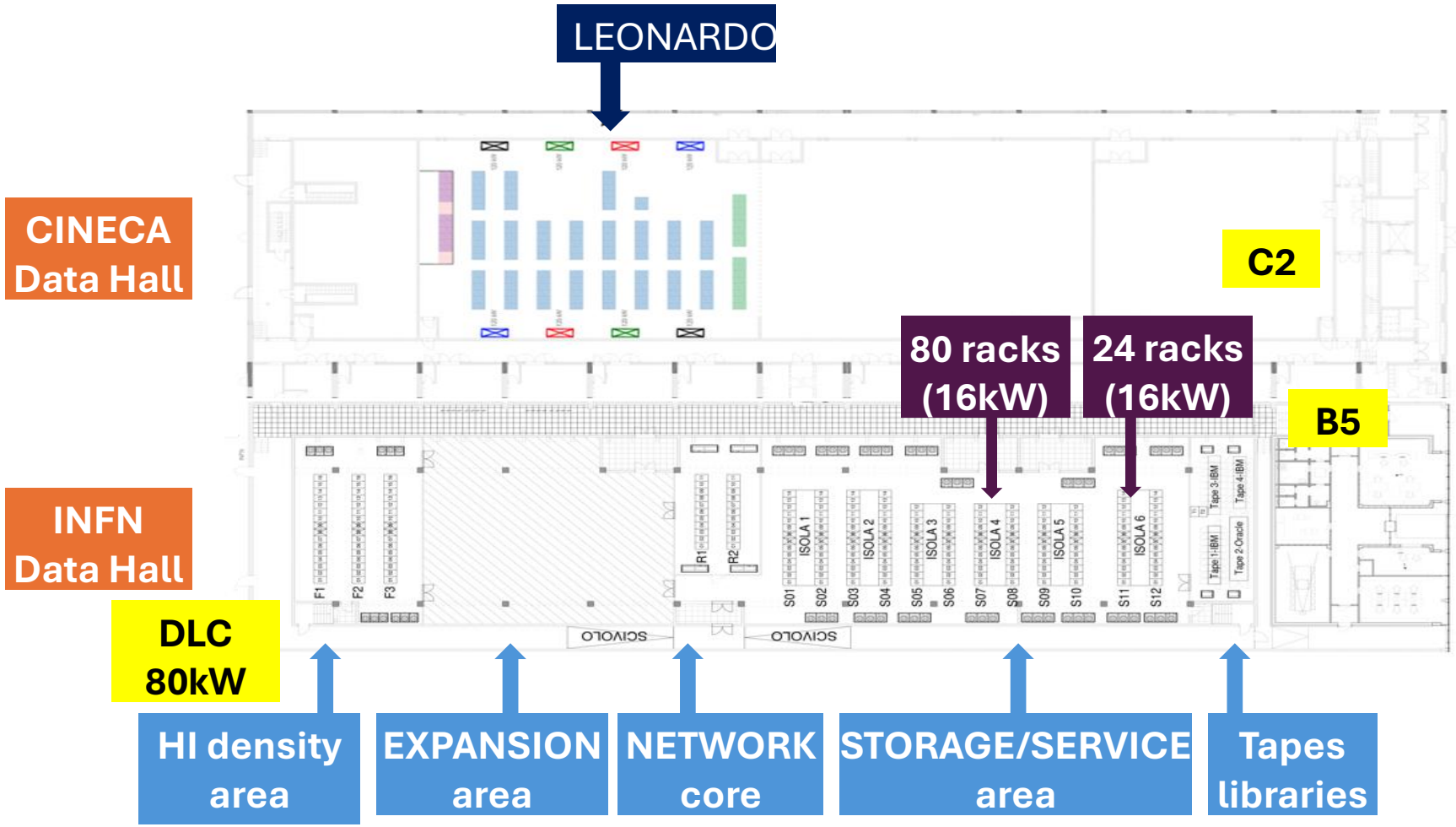
INFN CNAF

Our new DC building

LEONARDO

BOLOGNA TECHNOPOLE
the factory of the
FUTURE

Layout of the new Data Center



Resources:
80.000 CPU cores
80PB Disk
200PB Tape

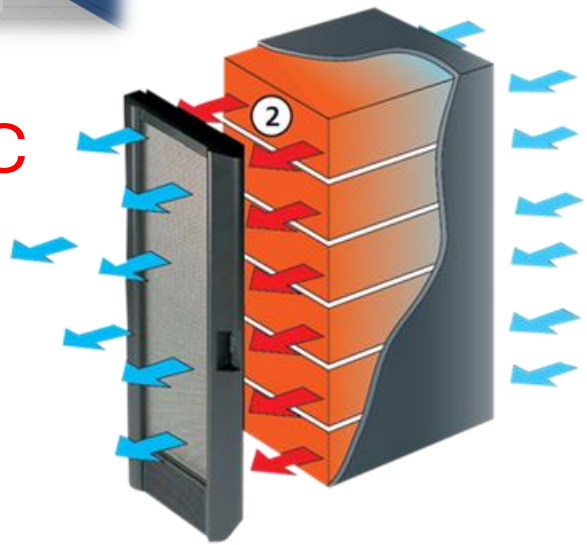
20% year-over-year growth rate

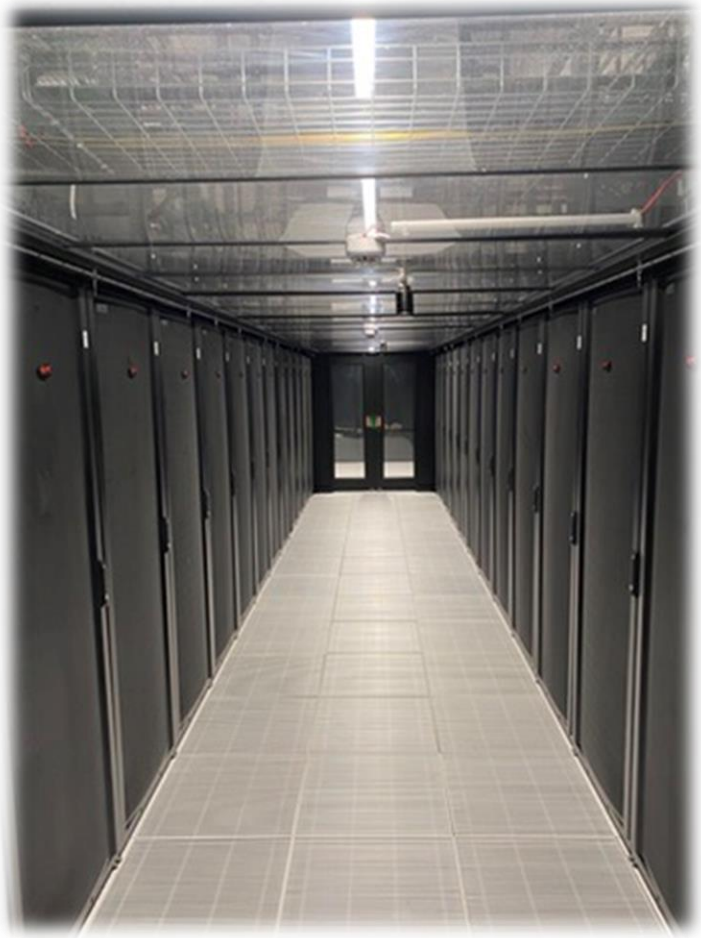
- Air cooled Cold Corridor aisles
- DLC in High Density
- 3+1 redundancy in all infrastructure facilities

Layout of the new Data Center

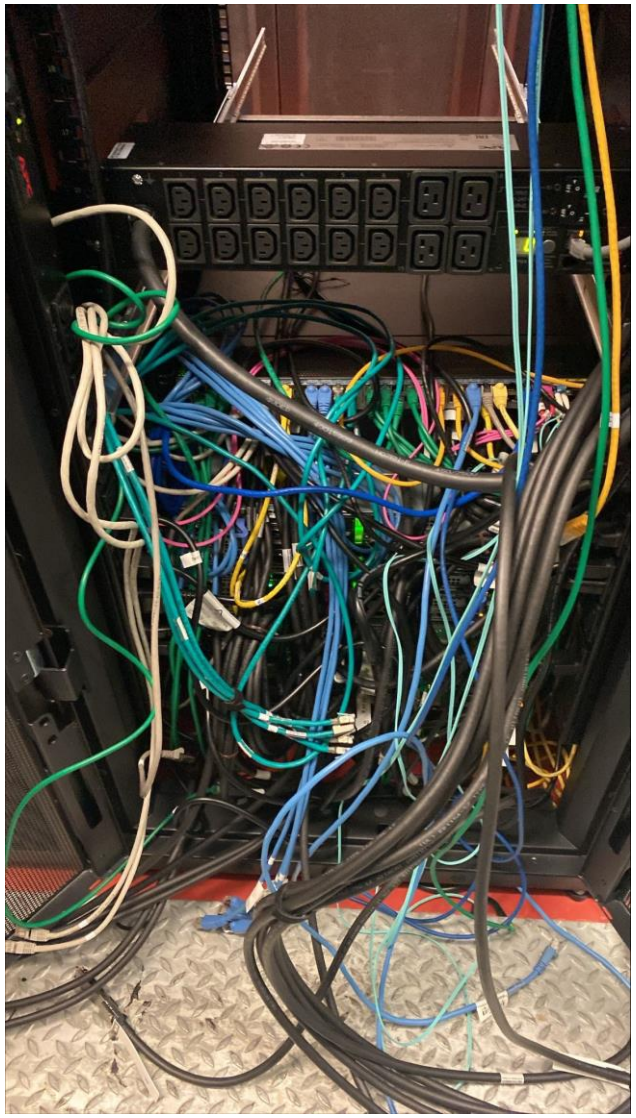
- The new CNAF Datacenter will feature the following main areas
  - High Density – 3 rows for 80kW racks
  - Low density – 80+24 16kW racks
  - Expansion area
  - Tape libraries area
    - Up to 4 libraries

- The CPU area can host up to 3MW of CPUs via 42 DLC high density racks
- The low-density area will be used to host
  - Storage systems
  - CNAF Cloud Infrastructures
  - ISO certified Cloud racks

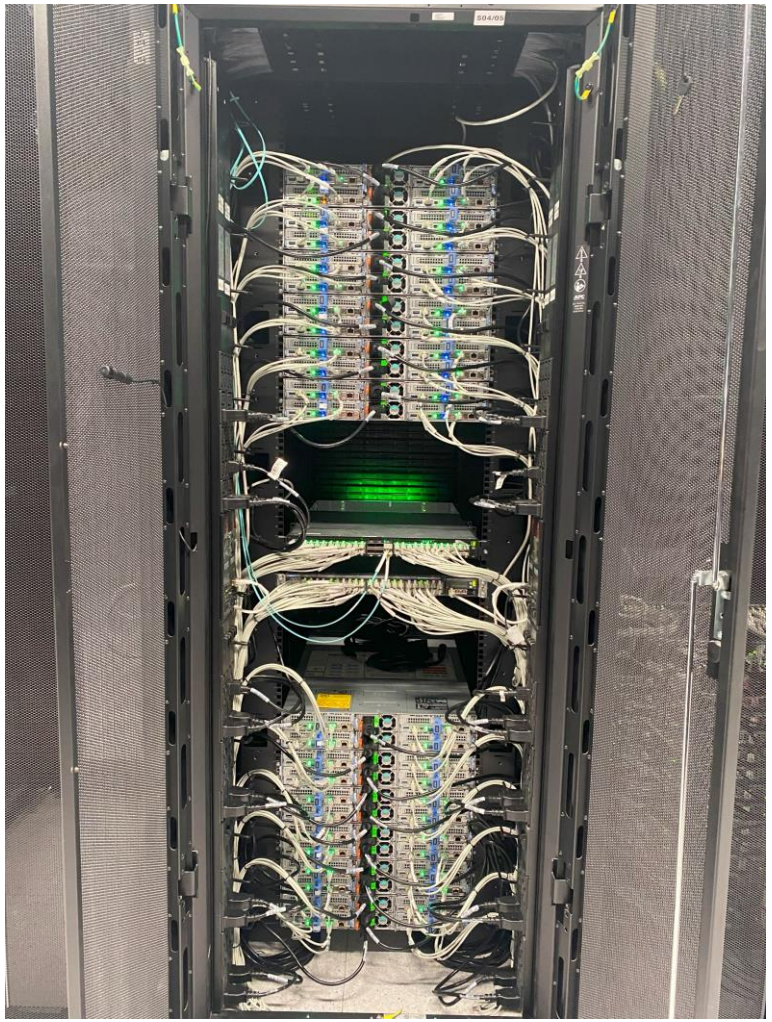





E4
NVIDIA
GRACE HOPPER
FAN 0
FAN 1
FAN 2
FAN 3
FAN 4



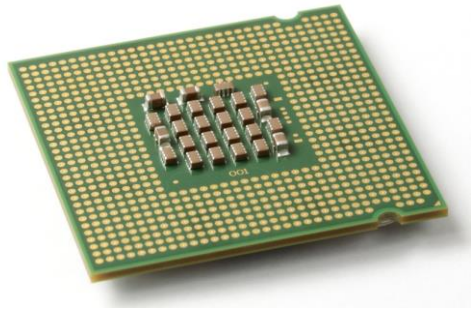
Better cabling!



Services provided

- Started as a WLCG Tier1
  - Expanded to cover several different use-cases
- HPC cluster
- Significant portion of resources is (and will be) provided through cloud (mainly IaaS)
  - Option for a ISO27001 certified cloud (aka EPIC Cloud)

Available Tier1 resources



	2024	2025
CPU Pledge (HS06)	792.000	852.000
Disk Pledge (TBN)	82.949	103.627
Tape Pledge (TB)	193.581	254.026

About 20% annual increase on all resource types.
No GPU pledged, yet already available via cloud.

Available Cloud resources

- Available resources
  - 6240 VCPUs, 38,6TB RAM, 4,19PiB Disk, 35 GPUs
- Big expansion thanks to Next gen EU funding
  - 26 nodes with 192 cores and 1.5TB RAM
  - 30 nodes with 4 H100 GPU
  - 2 FPGA “bubbles”
  - 52 storage nodes (Ceph), with obj storage, rados, filesystem
- Installation is occurring today and will continue up to end of the year.
- Some resources will be provided via an HPC cluster

EPIC Cloud

- Enhanced PrIvacy and Compliance Cloud is an ISO certified cloud platform
  - A region of INFN Cloud with a certified Information Security Management System
- EPIC Cloud offers an IaaS Community Cloud for the communities of Biomedical and genomic researchers
- Site locations: Bologna (active now), Bari and Catania sites will be added in February 2025 enabling for high availability and disaster recovery

HealthBigData
The Italian Hub.

DARE
DIGITAL LIFELONG PREVENTION

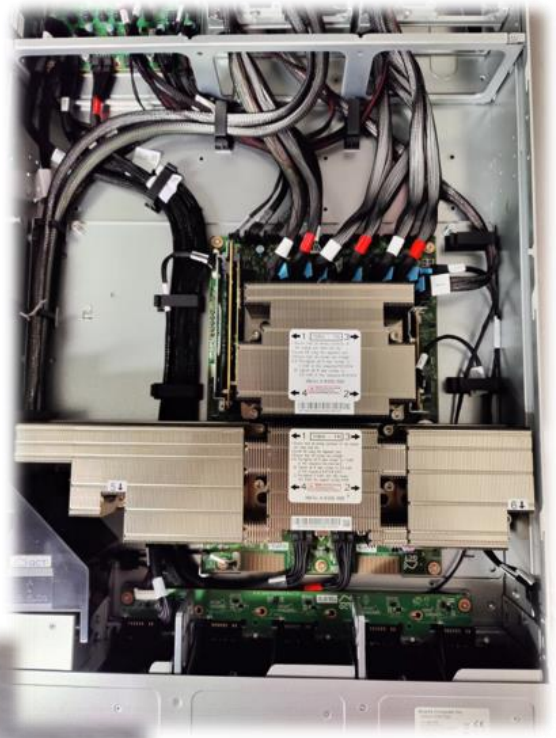
HARMONY ALLIANCE

COVIDSTAT

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliero - Universitaria di Bologna
IRCCS Istituto di Ricovero e Cura a Carattere Scientifico

Heterogeneous computing

- We started a technology tracking program, mainly focused on computing
  - Investigate new processors technologies
  - Power consumption comparisons
  - CPU architectures
  - Understand middleware and general software readiness

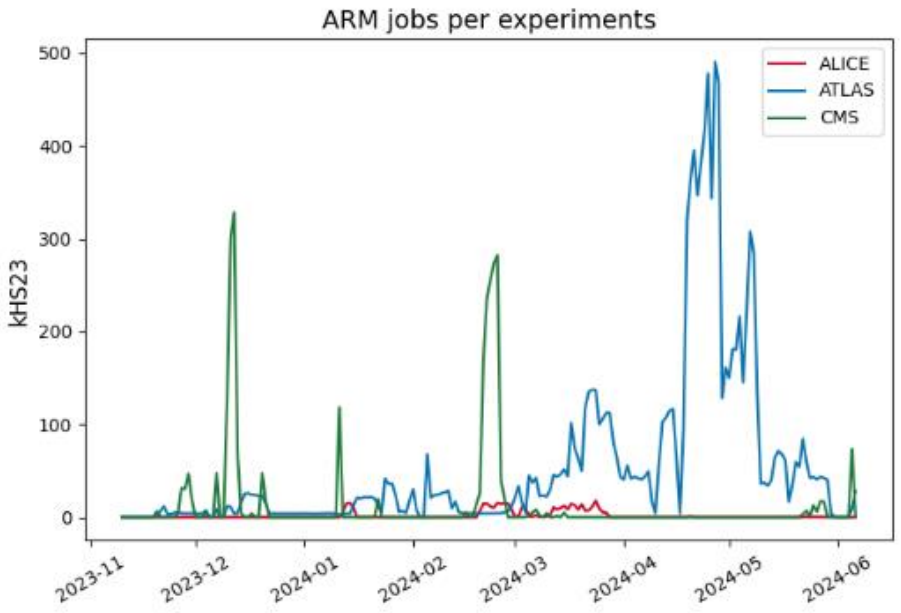


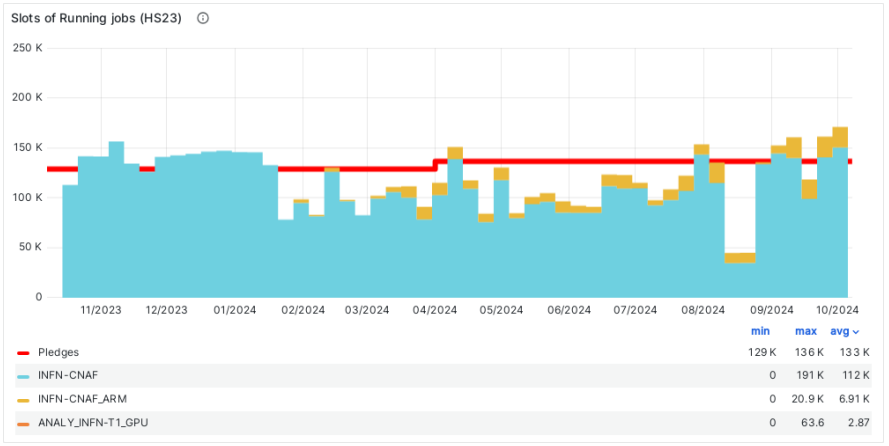
arm

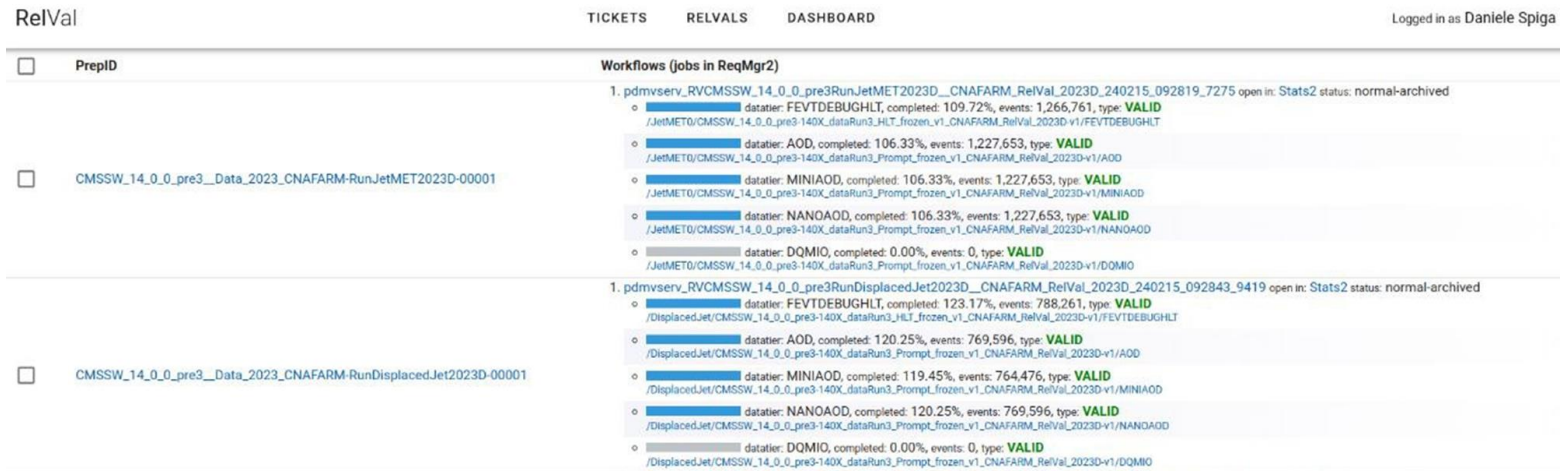
RISC-V

See our presentation at last CHEP!

ARM CPU usage at INFN-T1

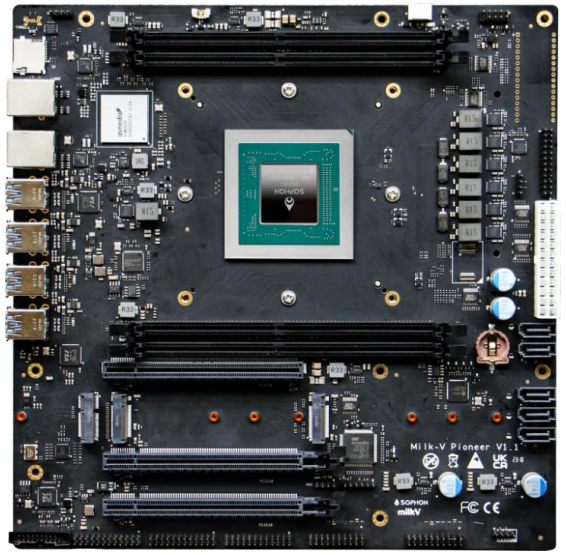






RISC-V CPU usage at INFN-T1

- 2x Milk-V Pioneer
  - 64 Core RISC-V CPU up to 2GHz
  - 128GB DDR4 3200
  - 1TB NVMe disk
  - 2x10Gbps network cards
  - Pre-installed OS: Fedora 38



CMS Point-of-view

- db12 CMS benchmark
  - milk-v: 378.3, 5.8 per core
  - e5-2640v3: 248, 3.8 per core
- Milk-v today performs better than a 2016 CPU…
- If we take out the hyperthreading, milk-v is 2-3 times slower than a modern xeon
- 64 real cores, not so common on modern CPUs
- Trade-off between core number and power (taking into account power consumption too)