Centre de Calcul
de l'Institut National de Physique Nucléaire
et de Physique des Particules

CC-IN2P3 site report

HEPiX Spring Paris '24

Sébastien Gadrat & Mattieu Puel– april 2024

IN2P3 Computing Center

Located in Lyon (Villeurbanne)

IN2P3 Computing Center

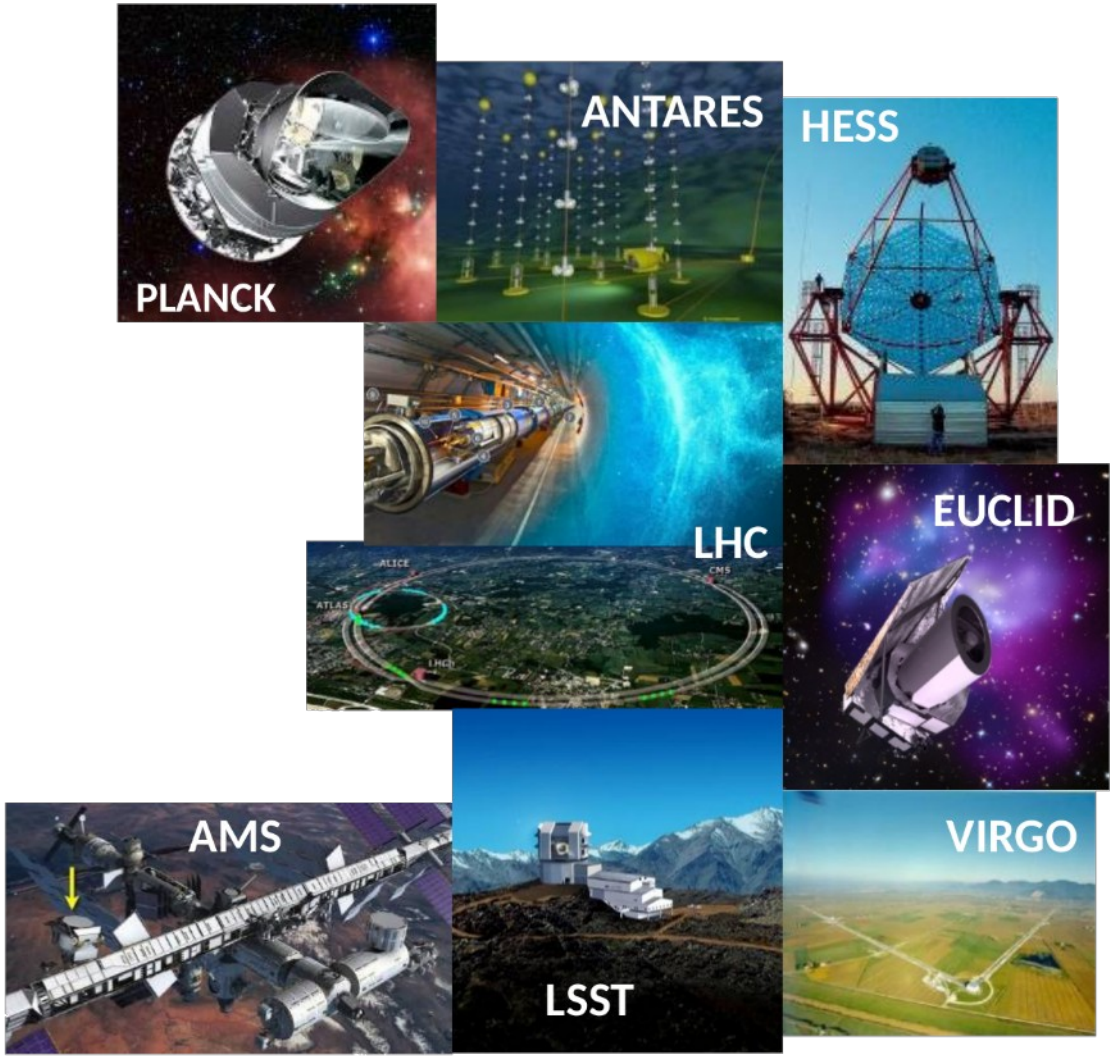
Resources
- 80 people (**65 IT engineers**)
- Budget : 7.3M€ (HR excluded)
  - 2.5M€ buildings running costs (incl. **1.2M€ electricity**)
  - 4M€ IT investments (incl. 2M€ for WLCG)

Facilities
- **1700 m2** over two computer rooms
- 1,4 MW total (PUE 1.4)

Computing
- ~850 servers, 55k HTC, **931 kHS23**

Storage
- Total allocated storage : **~240 PB** (62% tapes)

Networking
- 2x 200Gbps for WLCG (LHCOP & LHCONE)
- 1x 100 Gbps dedicated to IDRIS
- 1x 100 Gbps as backup and general purpose

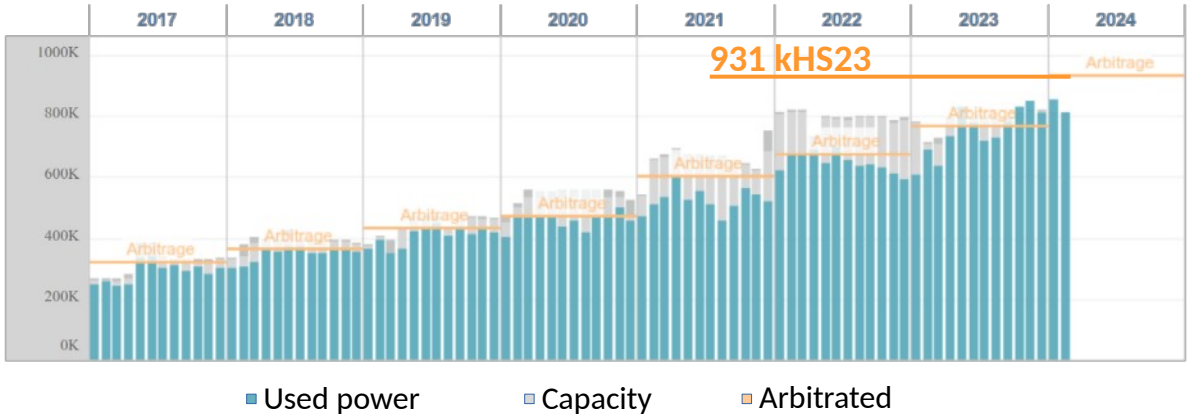


100+ scientific collaborations

Computing

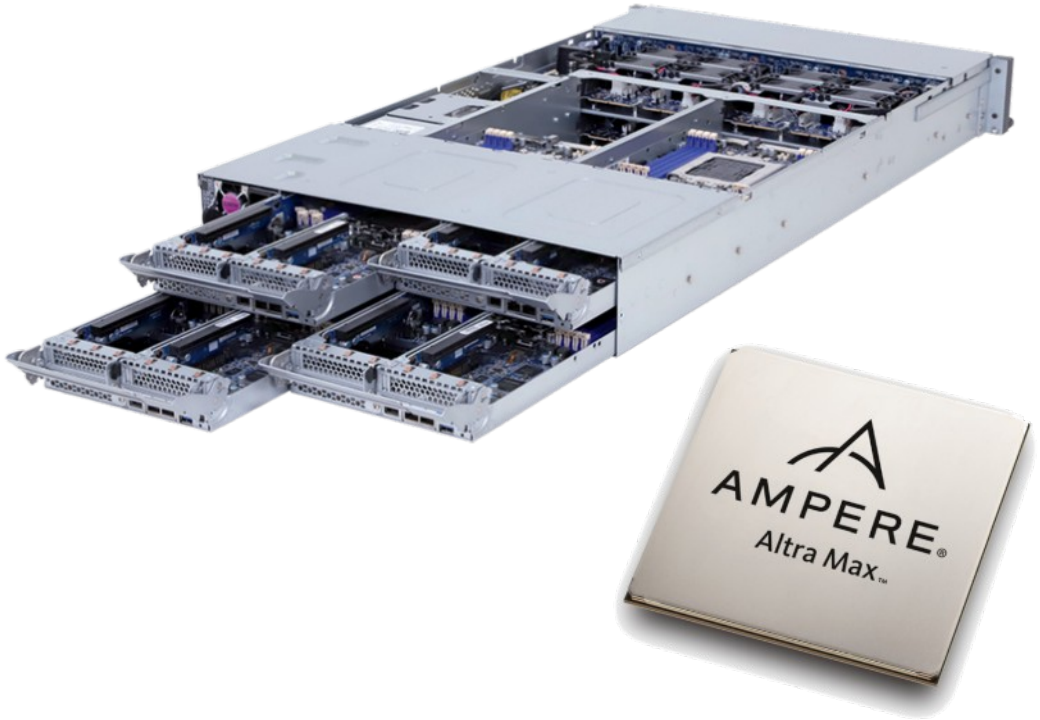
Clusters status

- **HTCondor for WLCG/EGI jobs**
  - 572 kHS23 (34k threads)
  - main users: all WLCG VOs, Belle II, Dune, T2K, Juno
- **Slurm for local jobs, HTC, HPC & GPGPU**
  - 359 kHS23 (21k threads)
  - 72 NVIDIA V100 GPUs

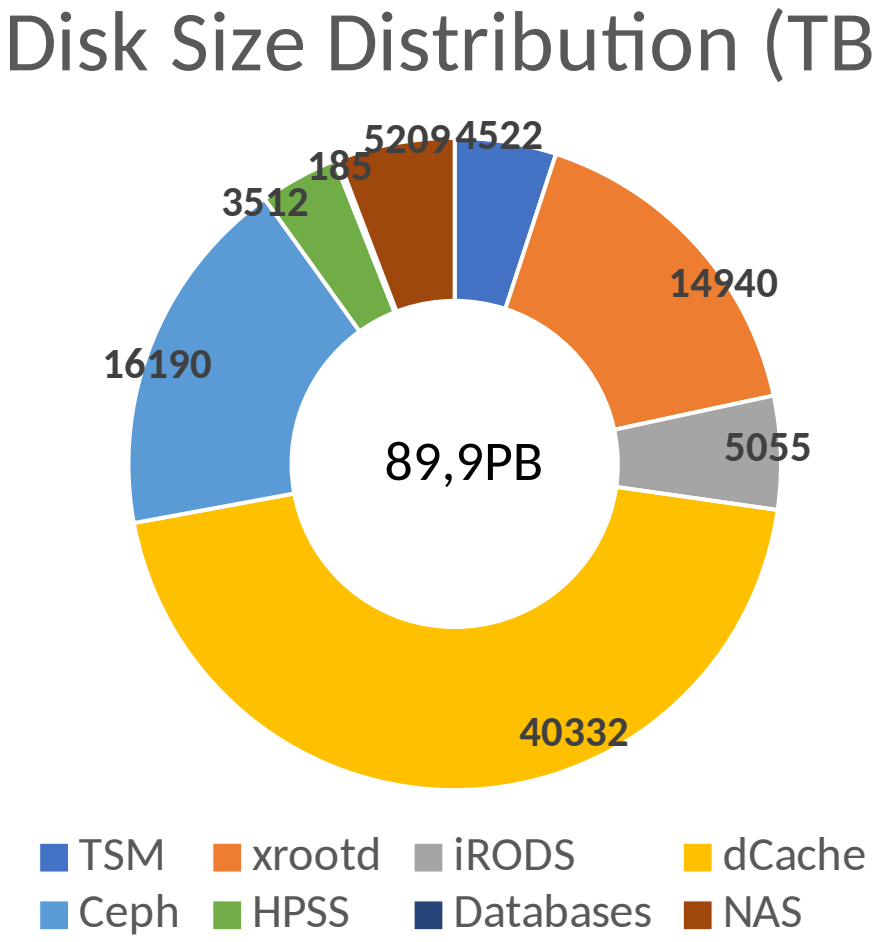


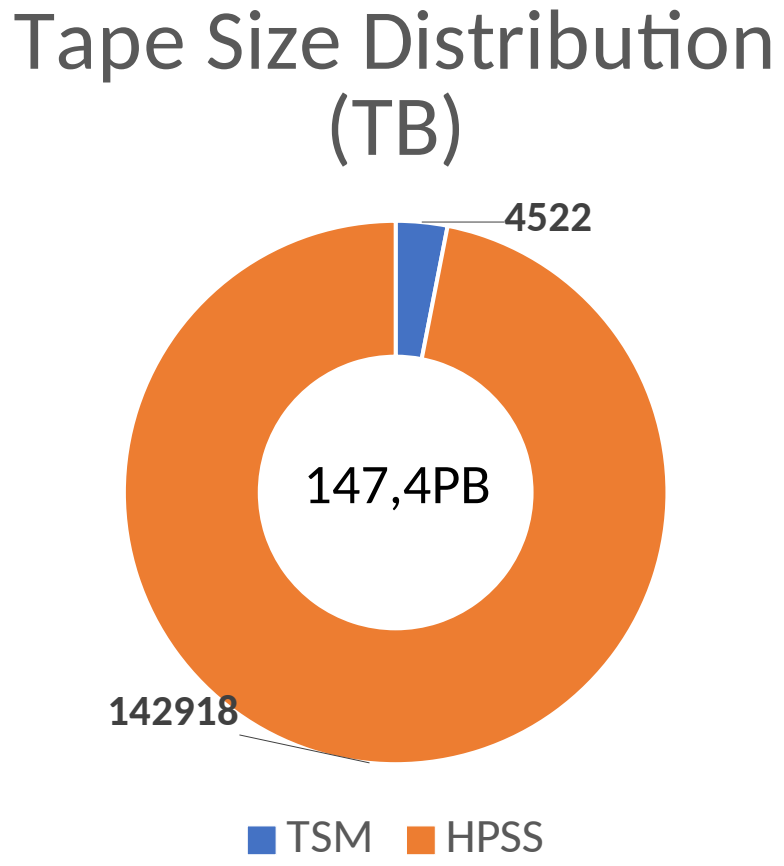
Integrating ARM

- Already evaluated Ampere Altra on HPE RL300
- Receiving a Gigabyte 2U4N-DP H262-P61 chassis (1048 cores)
- Estimating ~20/40% gains on the TCO (procurement & energy) vs AMD Milan (7nm / 2021)

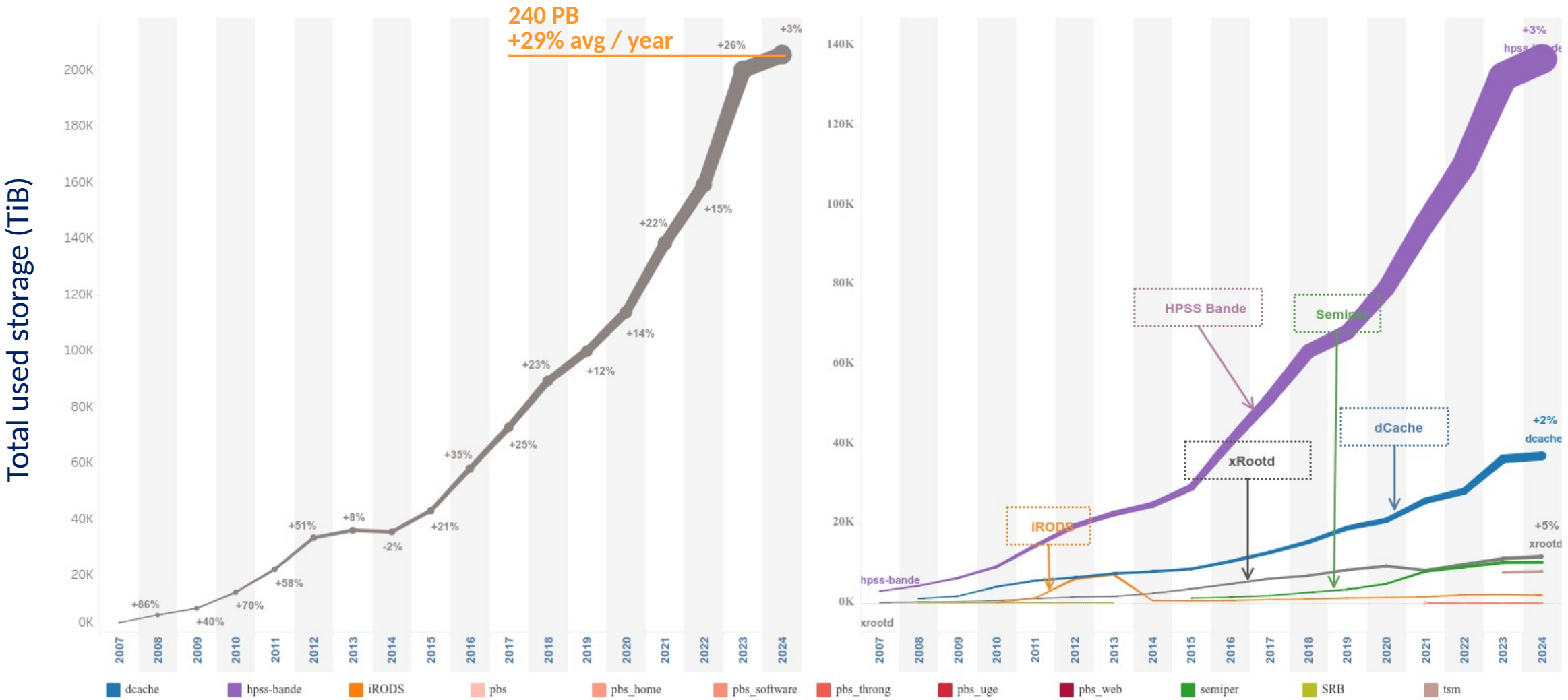


Storage


Disk Size Distribution (TB)
4522
14940
5055
40332
16190
3512
185
5209
89,9PB
TSM
xrootd
iRODS
dCache
Ceph
HPSS
Databases
NAS


Tape Size Distribution (TB)
4522
142918
147,4PB
TSM
HPSS

Storage


240 PB
+29% avg / year
Total used storage (TiB)
0K
20K
40K
60K
80K
100K
120K
140K
160K
180K
200K
+86%
+40%
+70%
+58%
+51%
+8%
-2%
+21%
+35%
+25%
+23%
+12%
+14%
+22%
+15%
+26%
+3%
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
dcache
hpss-bande
iRODS
pbs
pbs_home
pbs_software
pbs_throng
pbs_uge
pbs_web
semiper
SRB
tsm
HPSS Bande
Semiper
dCache
xRootd
iRODS
hpss-bande
xrootd
+3%
+2%
dcache
+5%
xrootd

Storage

Backup system (TSM / Spectrum Protect)

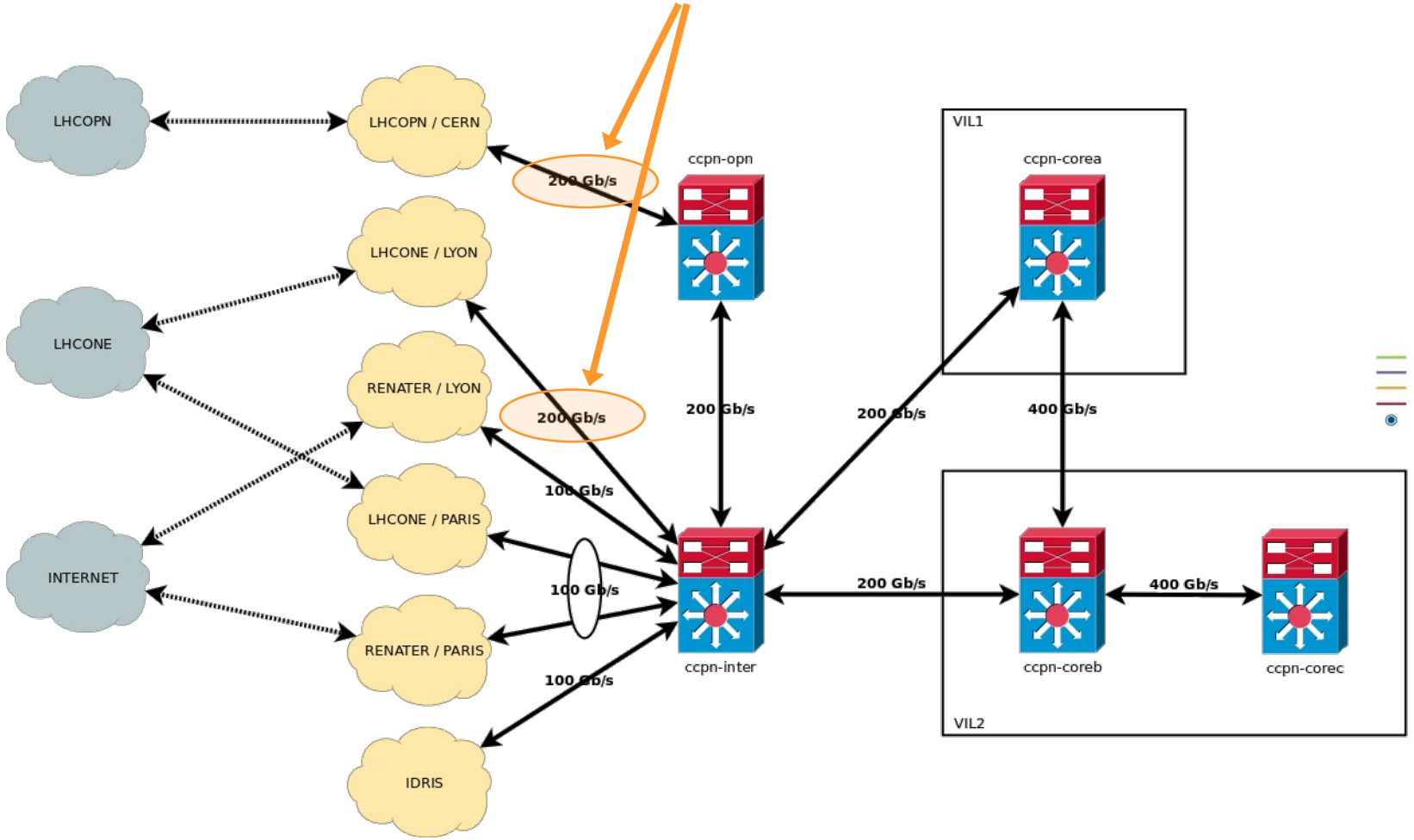
- Since 2022 : primary copy moved to disk (previously on tape, improving restoration time).
- Previous IBM TS3500 LTO6/LTO7 replaced with modular LTO9 this year.

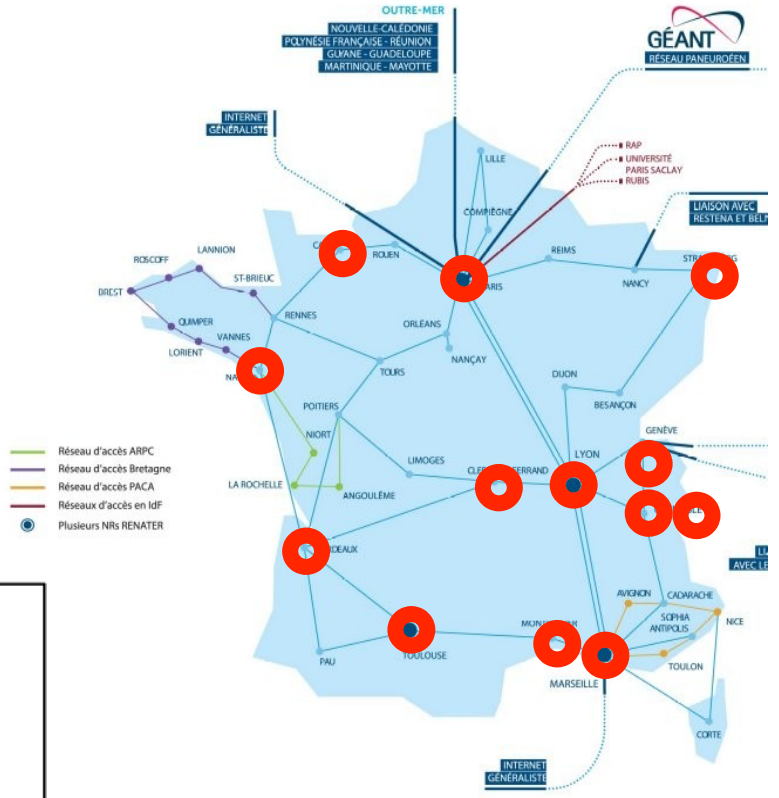
Semi permanent storage (clustered FS)

- GPFS / Spectrum Scale phased out in 2023.
- Now relies on Isilon NFS and CephFS.
- Isilon to be phased out by 2026.

Networking

Main update : LHCOPN and LHCONE links upgraded to 200 Gbps





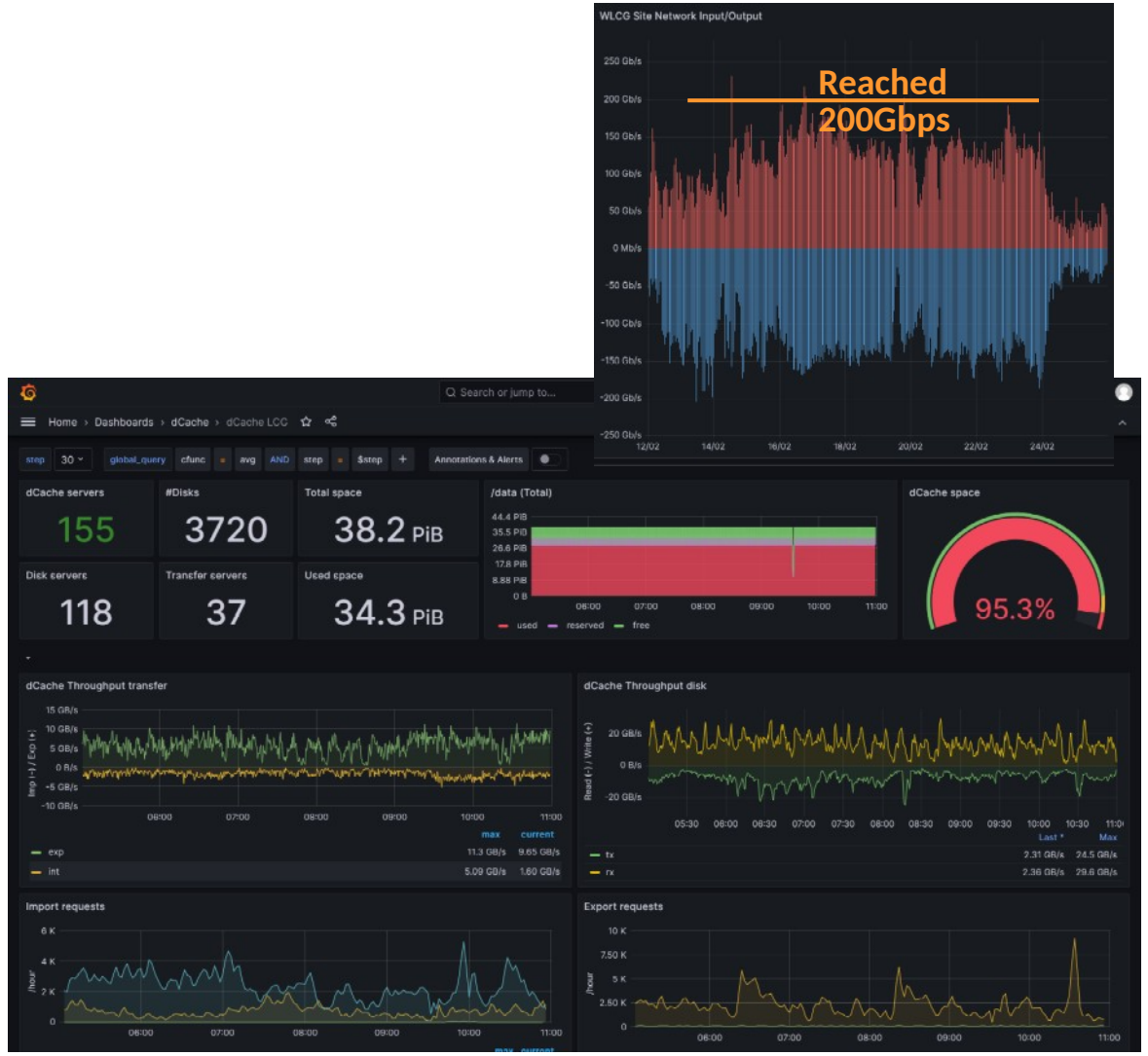
WLCG DC Feb ’24

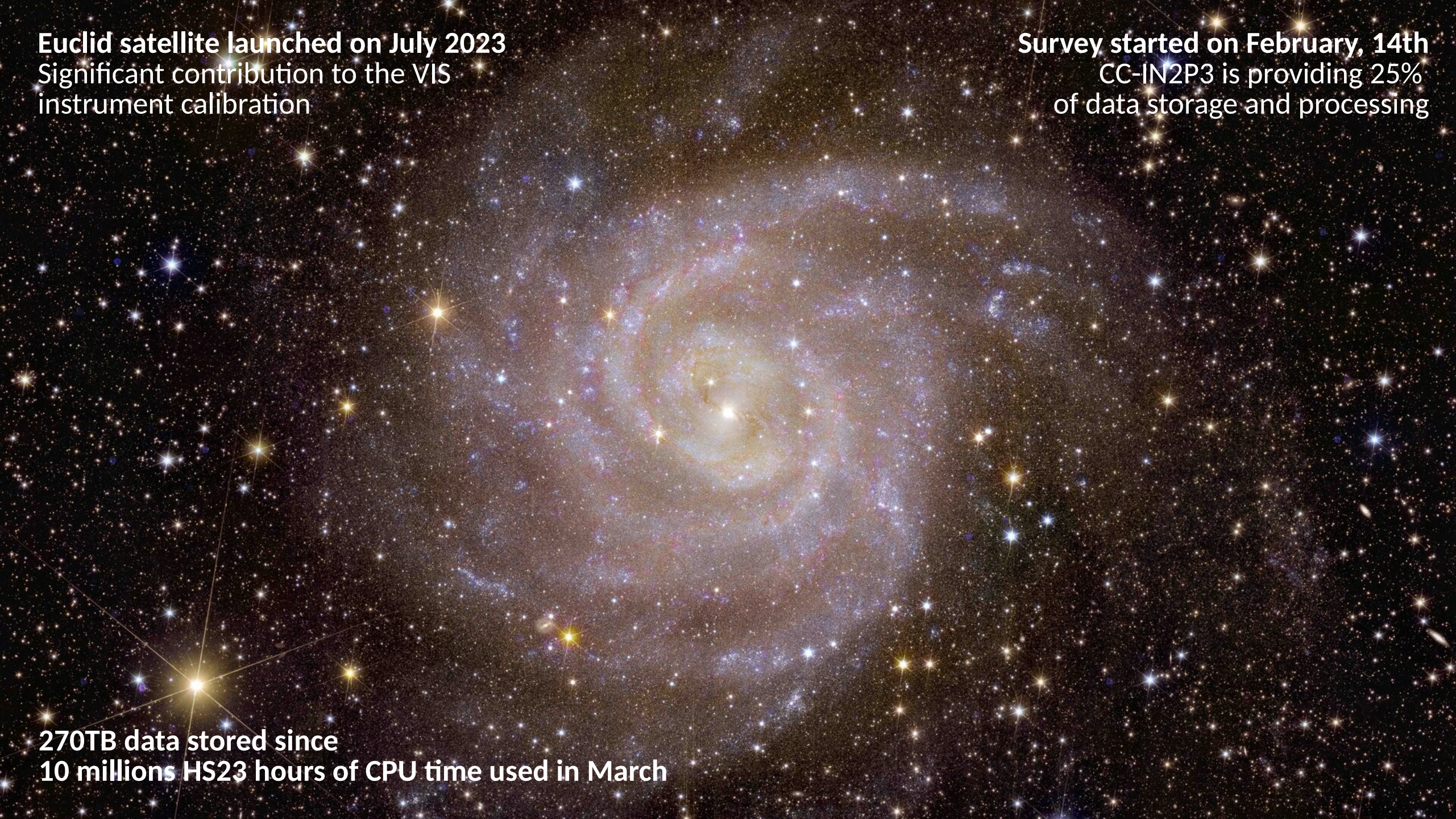
5 experiments involved in the challenge at CC-IN2P3

- ALICE, ATLAS, Belle II, CMS and LHCb
  - dCache configured token compatible
  - Single instance for ATLAS, CMS and LHCb
- Belle II has a dedicated one
- ALICE has a dedicated XRootD infrastructure

Outcome

- **No bottleneck spotted neither on the network infrastructure, nor on the storage one**
- **dCache was able to sustain the load**
- LHCb successfully tested the Tape Rest API for dCache




Euclid satellite launched on July 2023
Significant contribution to the VIS instrument calibration
Survey started on February, 14th
CC-IN2P3 is providing 25% of data storage and processing
270TB data stored since
10 millions HS23 hours of CPU time used in March

Linux distributions

Before 2020

- CentOS by default, RHEL for specifics

2020 → 2024

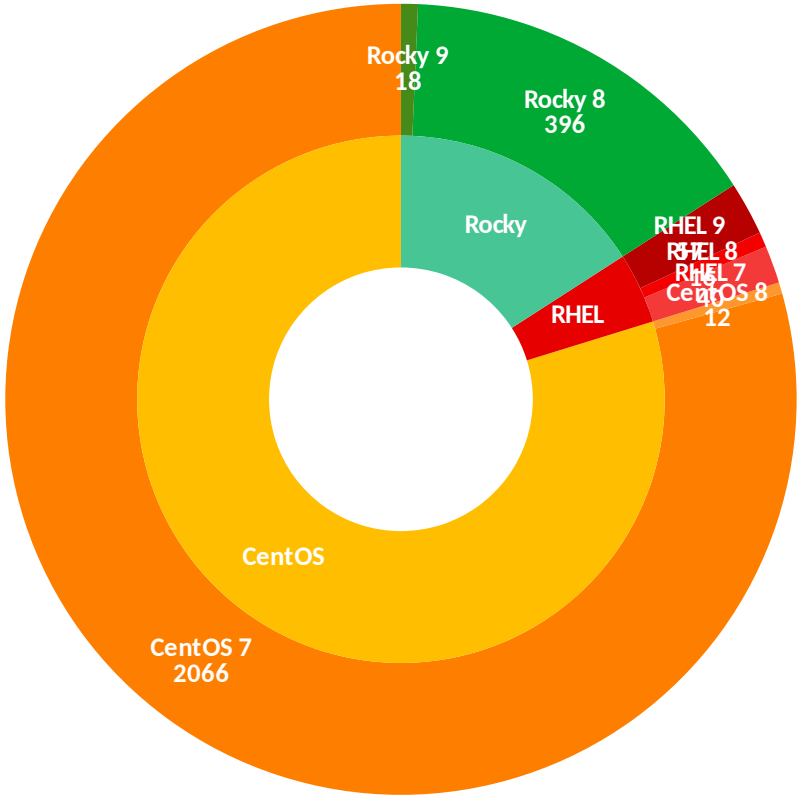
- Rocky Linux by default, RHEL for specifics.

Starting from feb 2024

- RHEL now the default.
- Self support site license since 2015, up to may ’26.
- Keep a production stock of Rocky Linux as immediate plan B.
- Evaluate Debian, Alma… as plan C.

Compute clusters EL9 migration

- Slurm / national users :
  - First production resources available on 15 may
  - end of rolling process as soon as possible, up to the end of 2024
- HTCondor / WLCG : will start as soon as UMD5 is available and most users have migrated to IAM tokens.



Information System - IAM

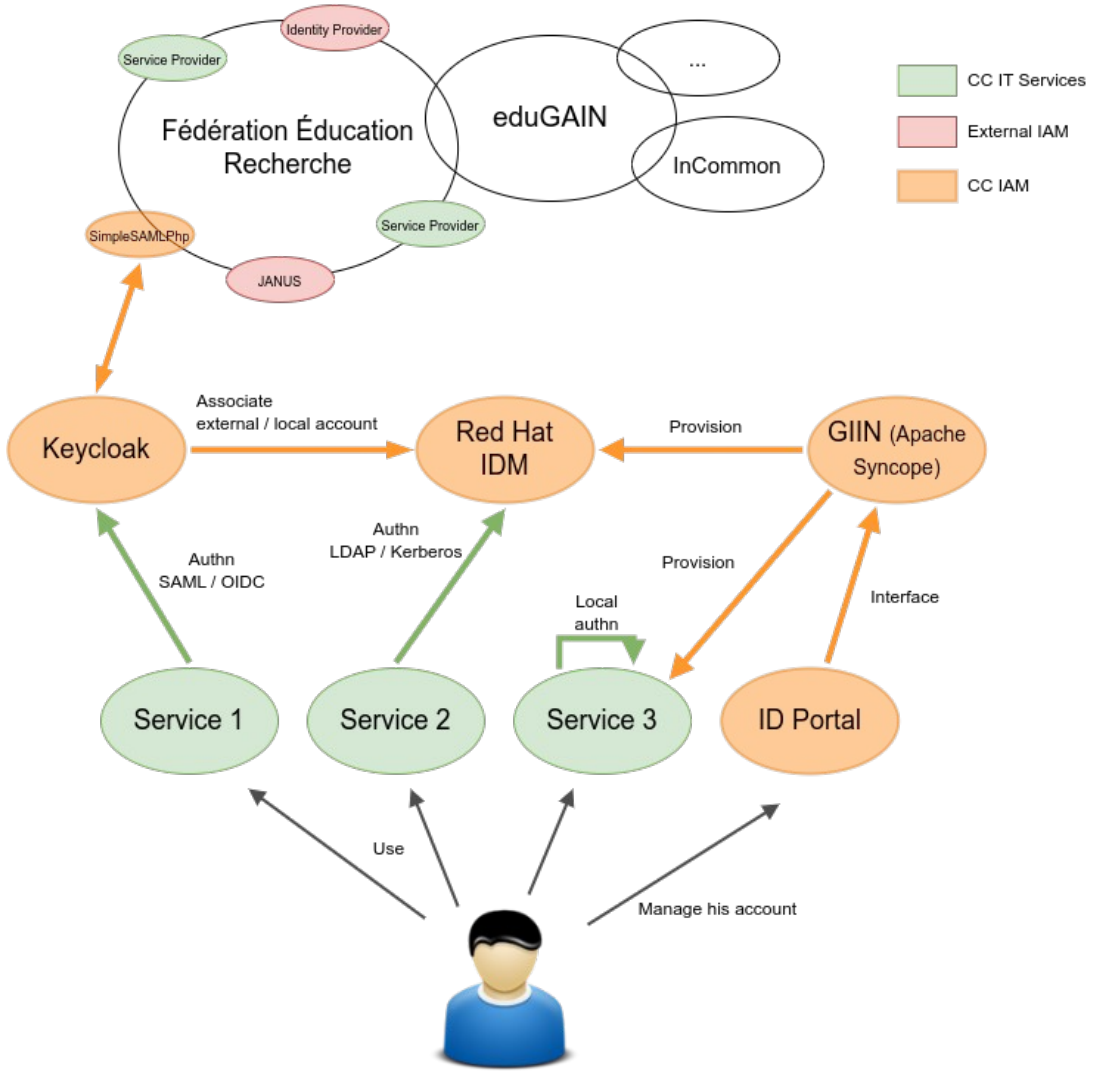
IAM revamp

- All components replaced :
  - Keycloak as SSO
  - RedHat IDM (FreeIPA) as the domain controller
  - Syncope as IAM orchestrator
- New ID portal (account self-service) now in production

Two more development phases to come

- Enhance self-service functions
- Enhance services integration

End forseen in 2025



Code & projects - Gitlab

- **Hardware renewed this year**
  - From Omnibus to Helm
  - From NFS to Ceph RBD and S3
- **A dedicated CC-IN2P3 instance on its way**
  - Consider Premium licence to increase resilience and security

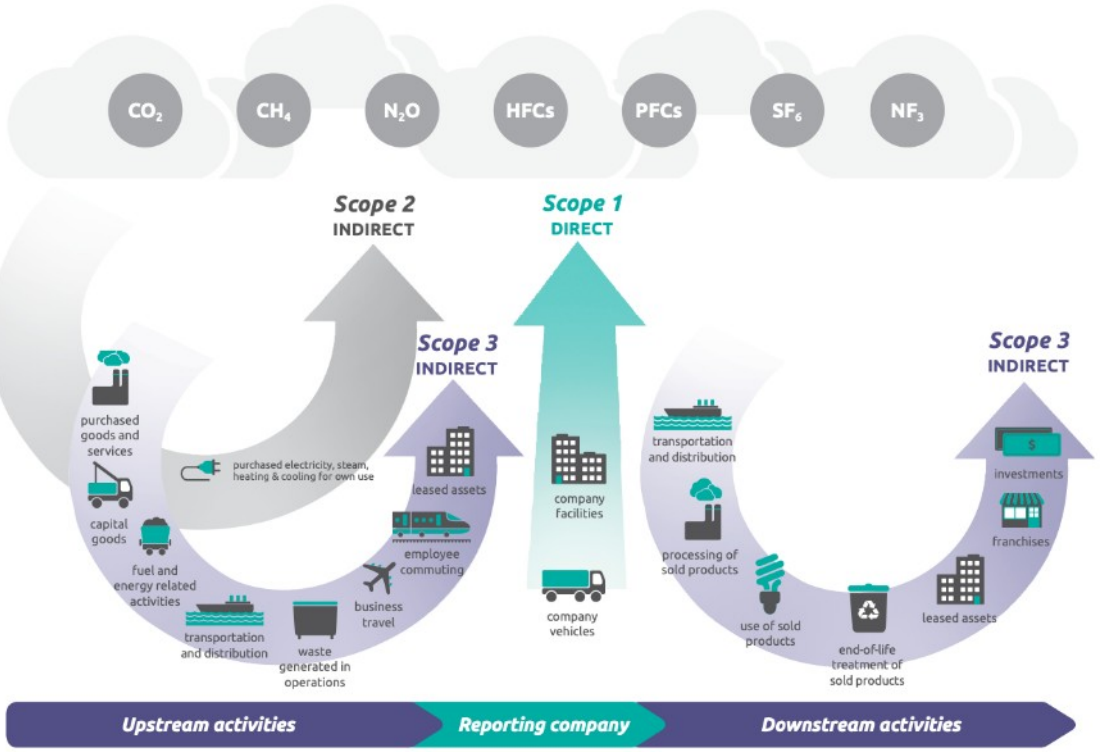
gitlab.in2p3.fr (v1.6.x)

Facilities

GHG emissions

- Legal requirement for CNRS to publish a report every 3 years
- First report issued in 2023

2022 total carbon footprint
2047,27 t CO2e (+/- 267,32)

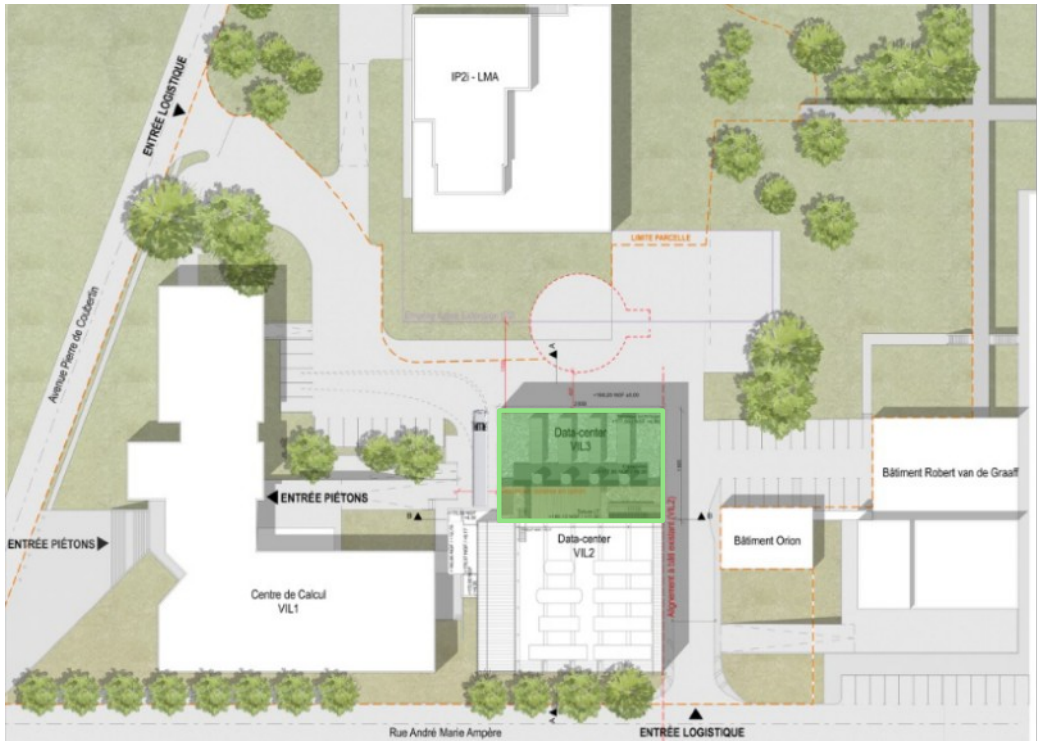


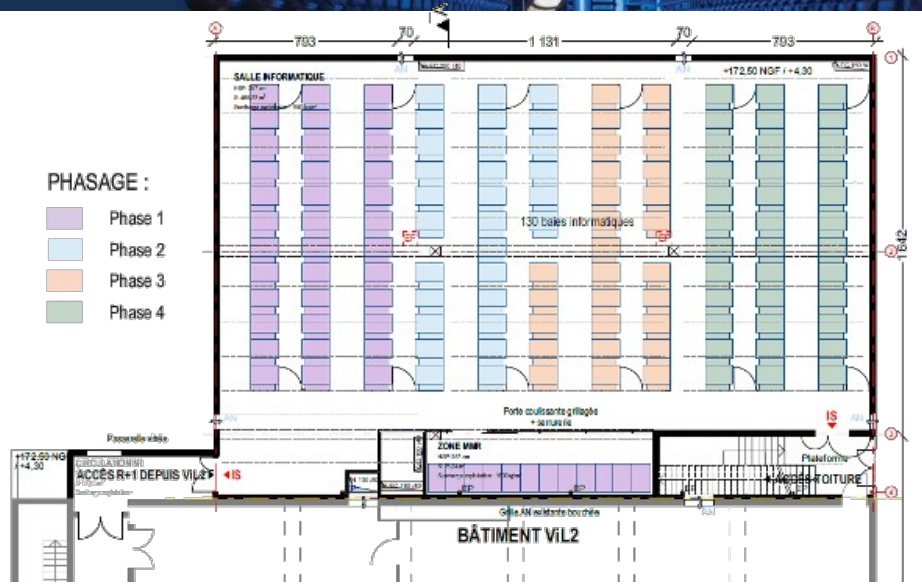
Carbon footprint	Emissions in t CO2e	Share of the total footprint
Carbon footprint of buildings	**719.84 ± 67.84**	**35 %**
|-- Carbon footprint of usage	719.84 ± 67.84	35 %
|-- Heating	0.00 ± 0.00	0 %
|-- Electricity	649.64 ± 64.96	32 %
|-- Refrigerants	70.20 ± 19.56	3 %
|-- Water	0.00 ± 0.00	0 %
|-- Carbon footprint of constructions	0.00 ± 0.00	0 %
Carbon footprint of digital devices	**460.58 ± 236.42**	**22 %**
Carbon footprint of purchases	**792.65 ± 103.01**	**39 %**
Carbon footprint of travels	**74.21 ± 18.74**	**4 %**
|-- Commuting	27.55 ± 13.04	1 %
|-- Professional travel	46.65 ± 13.46	2 %
|-- Vehicles	5.64 ± 3.40	0 %
|-- Business travel	41.01 ± 13.02	2 %
Total carbon footprint	**2 047.27 ± 267.32**	**100 %**

Facilities

New computer room VIL3

- Funded through a national project with IDRIS (CNRS HPC site)
- **Target usage : research infrastructures hosting**
- **Construction from nov 24’ end to 25’ end**
- **2MW IT (130 racks 15kW)**
- **7,7 M€ pre-tax budget**





Facilities

Photovoltaic installation

- 680 m² on the roofs
- 141 kW peak
- 150 MWh annual production
  (to compare with 12.7 GWh overall consumption)
- ~150 k€ pre-tax budget
- ~21 k€ savings / year

Questions

Thanks to colleagues
for their input

Backup slide : energy costs

Energy costs evolution