Source: LSST

Overview of CC-IN2P3

an LSST perspective

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CCIN2P3

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IN2P3

[in2p3.fr]

- Institut National de Physique Nucléaire et de Physique des Particules (IN2P3)

  National Institute of Nuclear Physics and Particle Physics

  2500 researchers, engineers and technicians

  25 laboratories and research platforms in France, 16 international laboratories

  40 major international projects

  218 M€ annual budget

- Part of CNRS, the largest publicly-funded research organisation in France

- Mission: to promote and unify research activities in the field of subatomic physics

IN2P3 (cont.)

- Scientific themes

  matter's most elementary constituents and fundamental interactions

  structure of nuclear matter

  Universe's composition and behaviour

  theory, instrumentation, accelerator R&D, computing

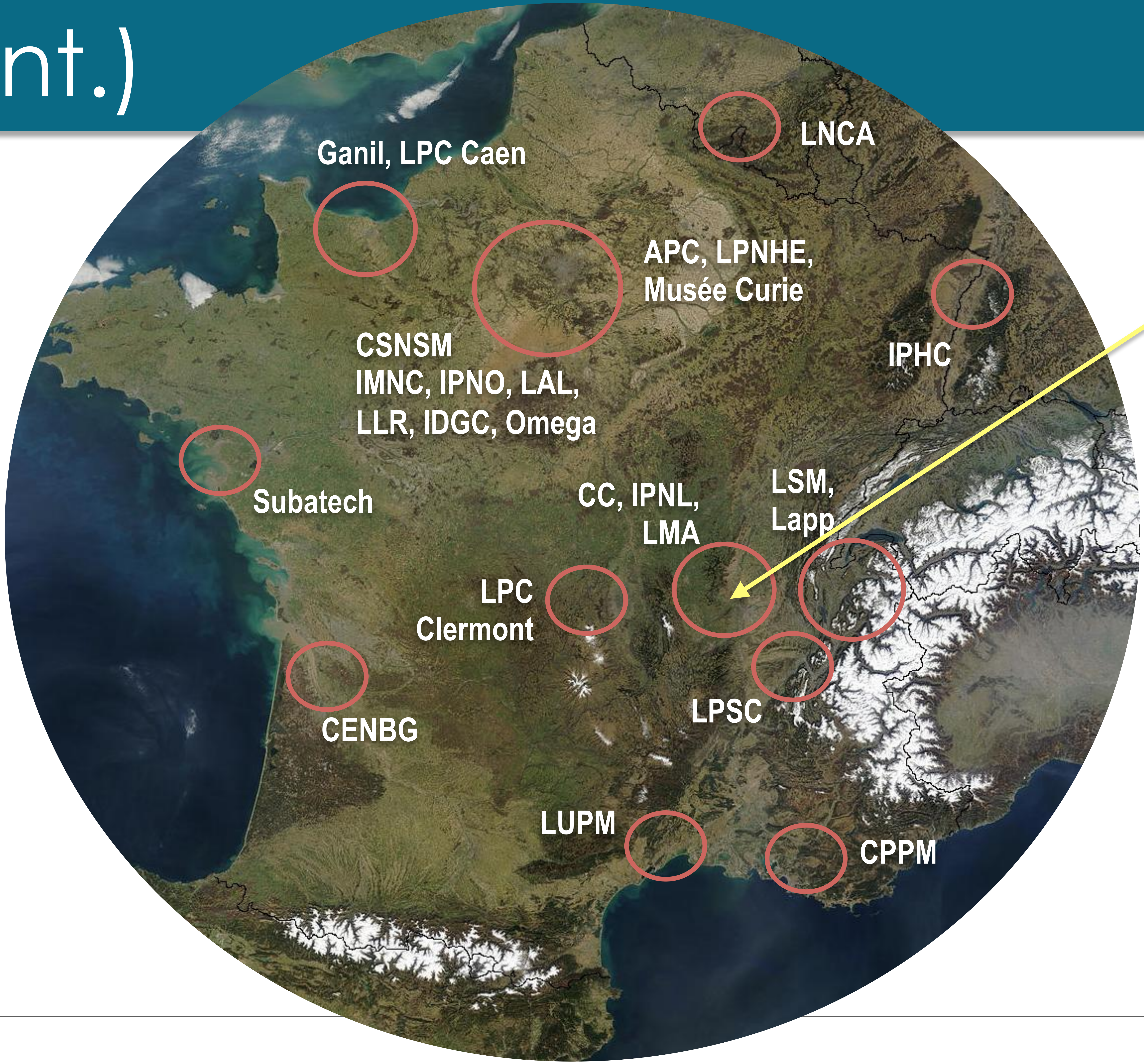
- IN2P3 is contributing to two subsystems of LSST

  camera construction

  data management

- CC-IN2P3 focus is data management

IN2P3 (cont.)

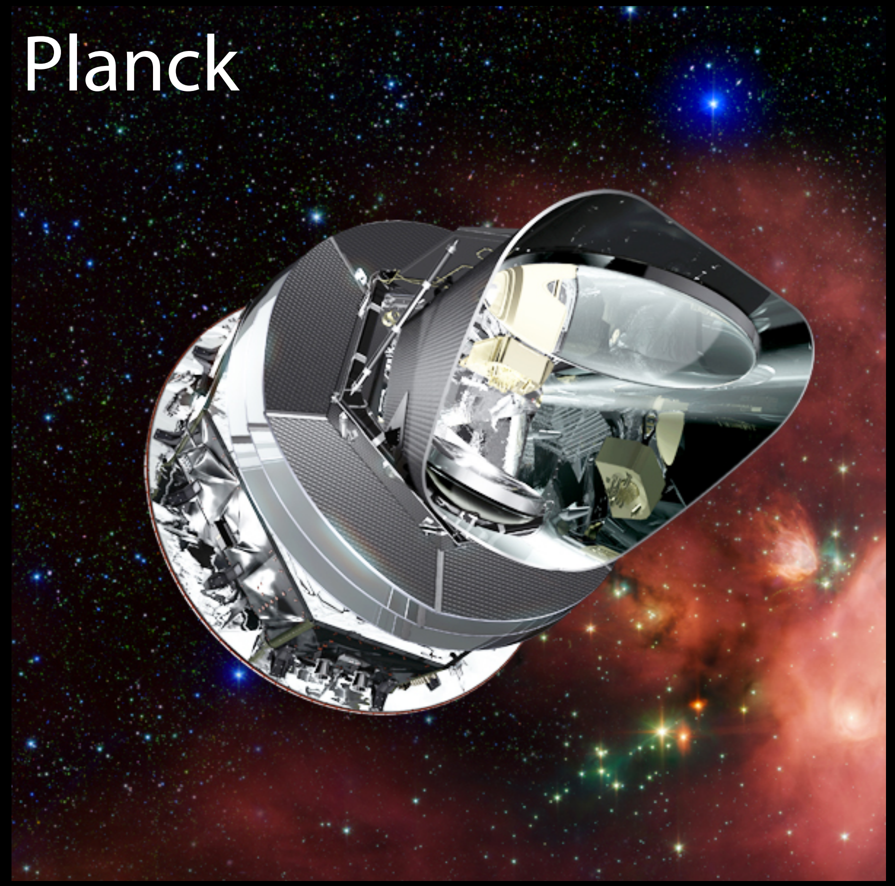


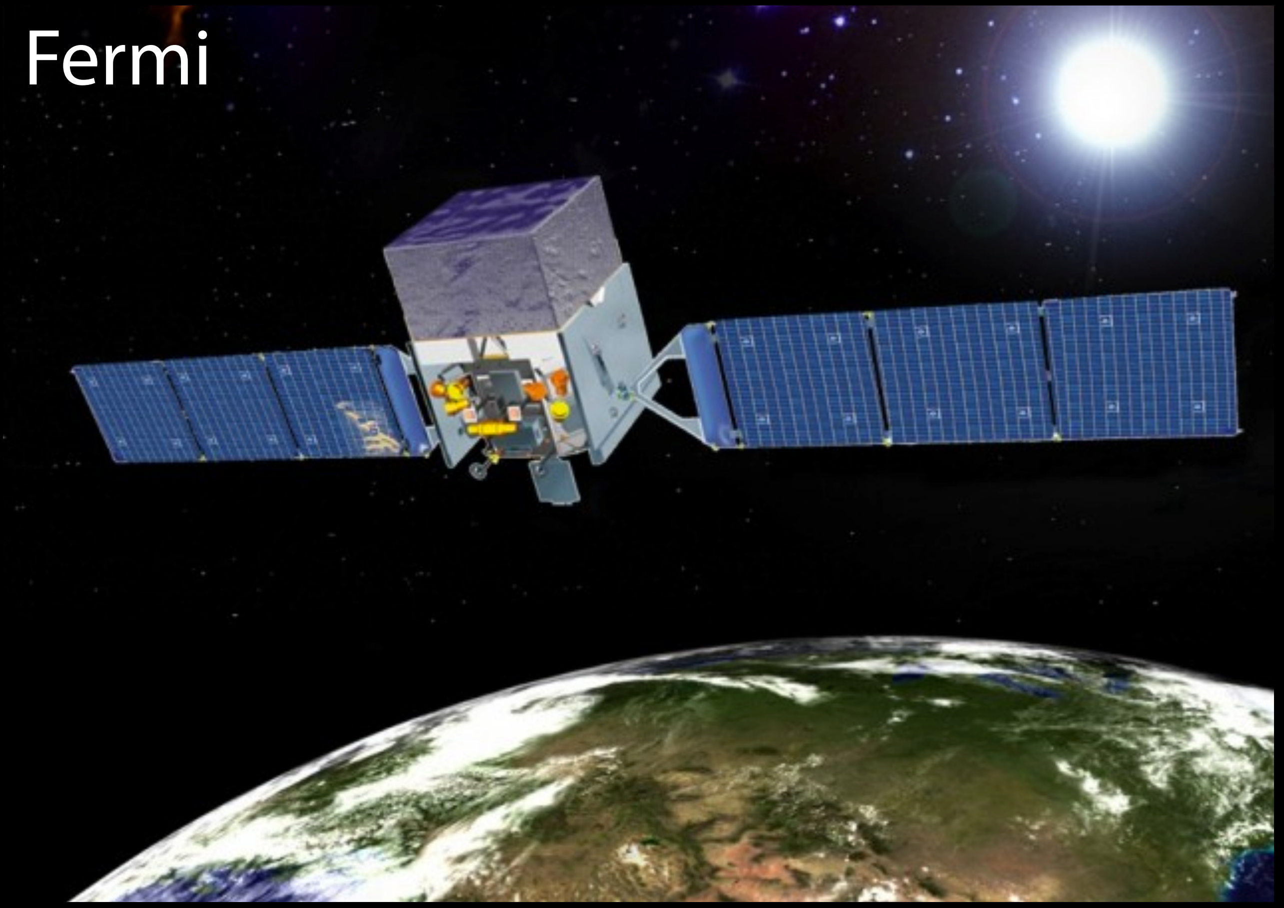
computing center, Lyon

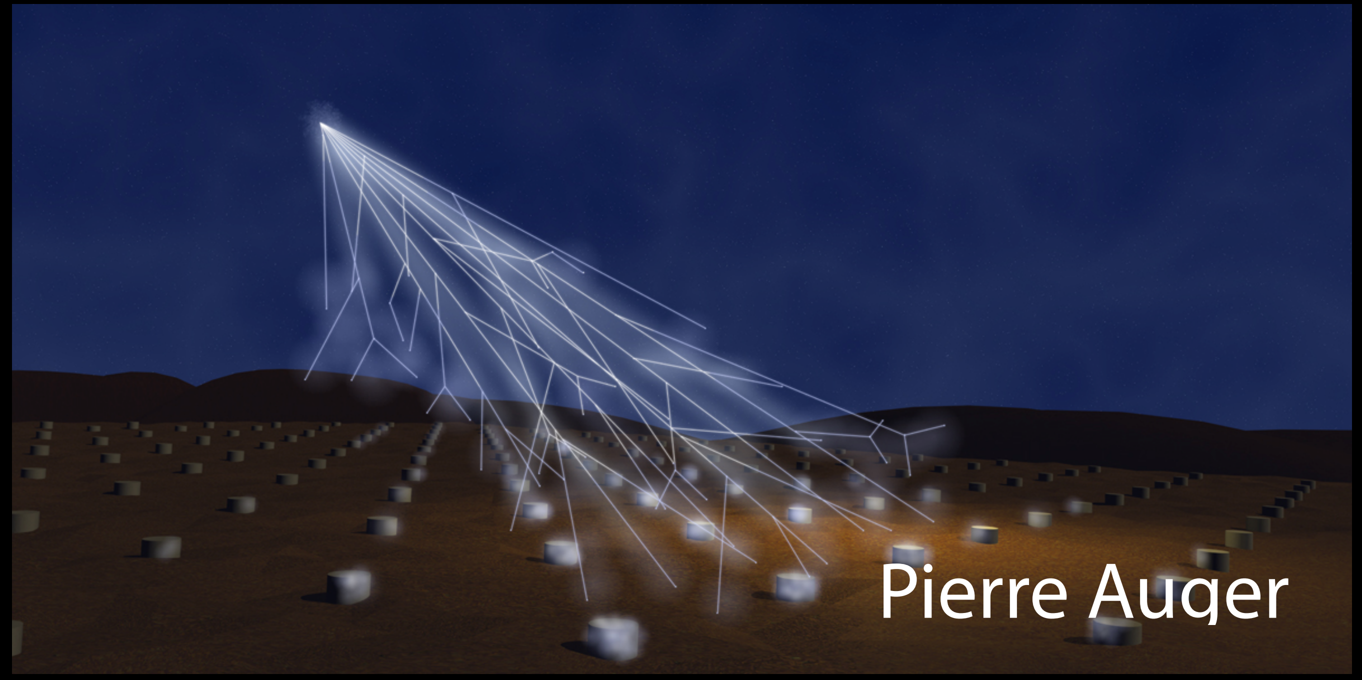
IN2P3 computing center

- CC-IN2P3
  - *87 people, 76 FTE, 70% permanent positions*
  - *~11 M€ overall annual budget: ~7 M€ equipment and operations, ~4 M€ human resources*
  - *high throughput computing, scientific data center*
  - *well connected to national and international networks*
  - *in partnership with France's Atomic Energy Commission's Irfu*
- Shared computing facility supporting the institute's research program
  - *~70 experiments in high energy physics, nuclear physics and astroparticle physics*

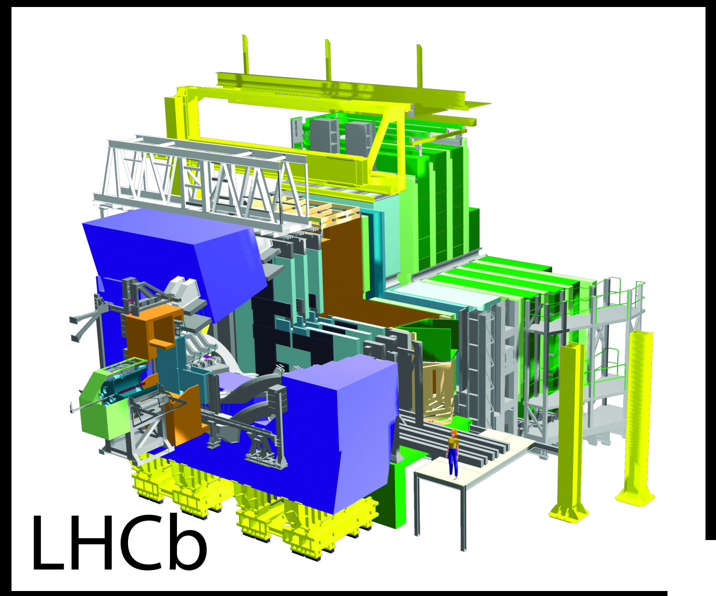
- Operations: 24x7
  - *unattended during nights and weekends*
  - *engineer on duty during off-hours*



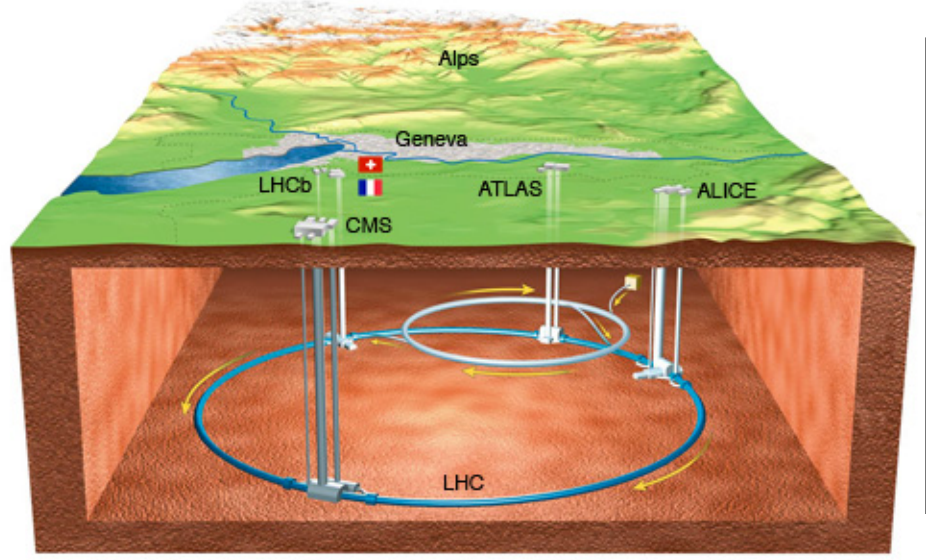


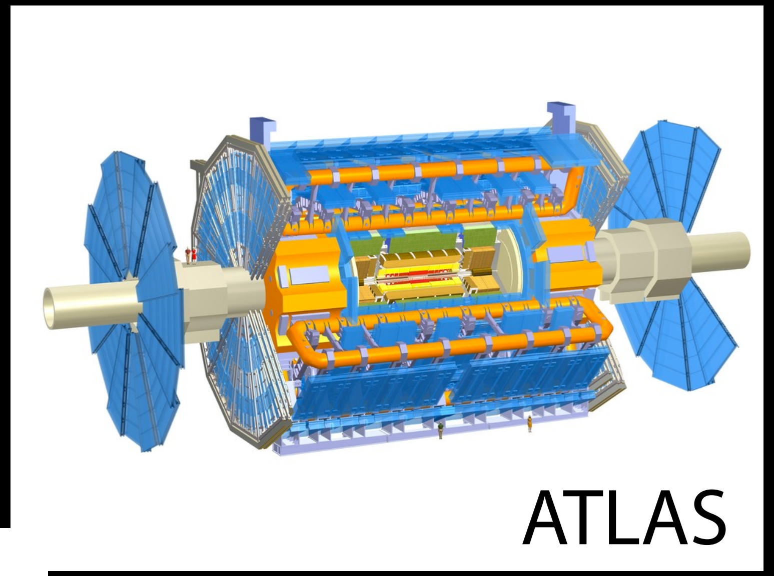


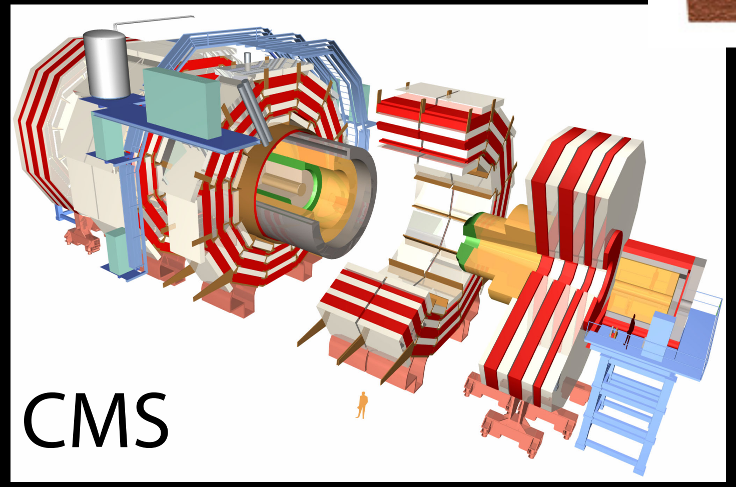
SuperNova Legacy Survey

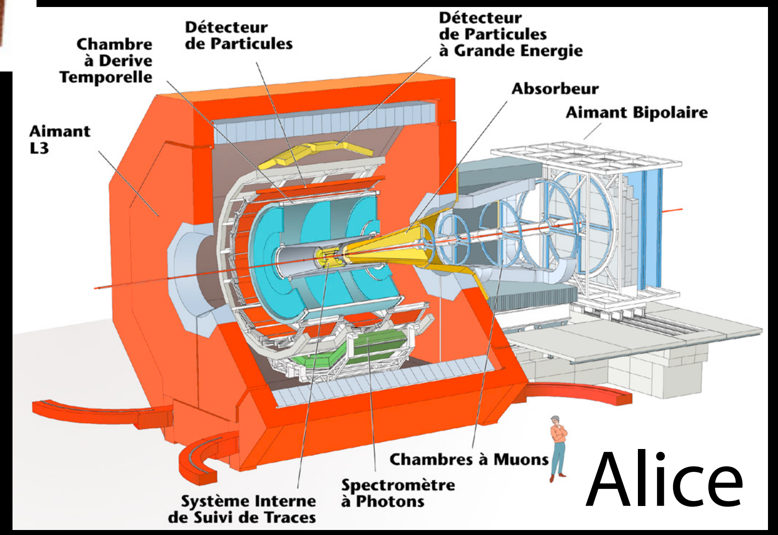


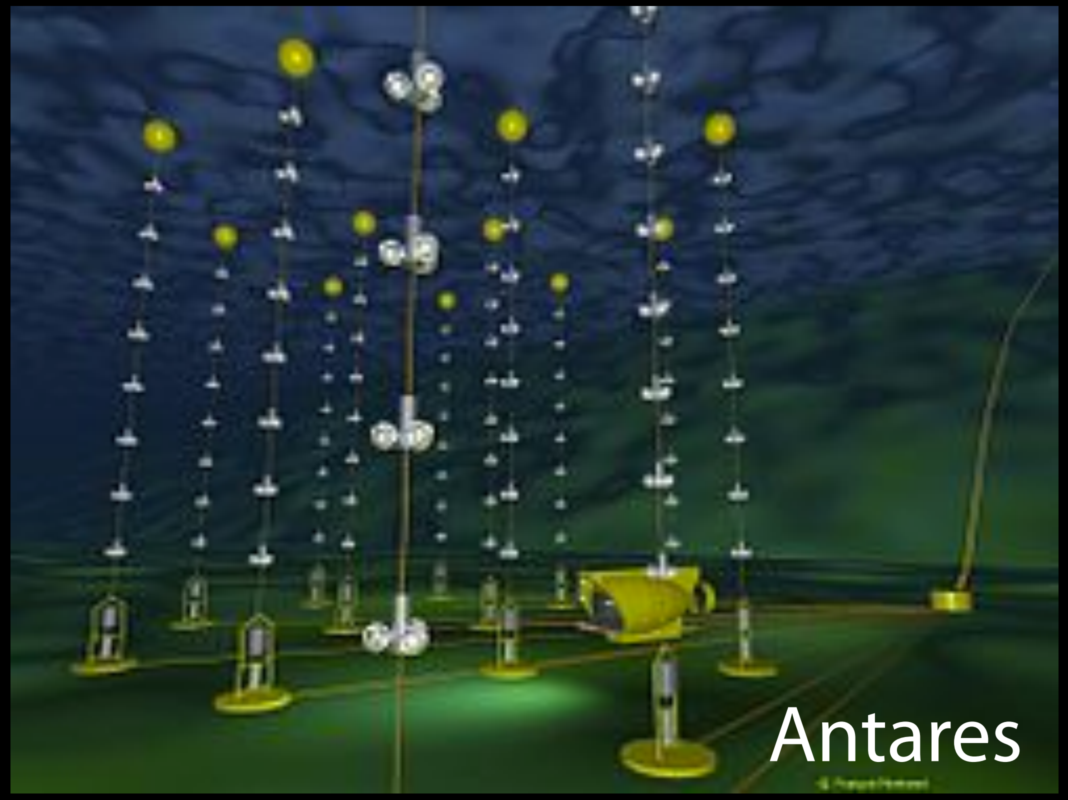
LHC @ CERN





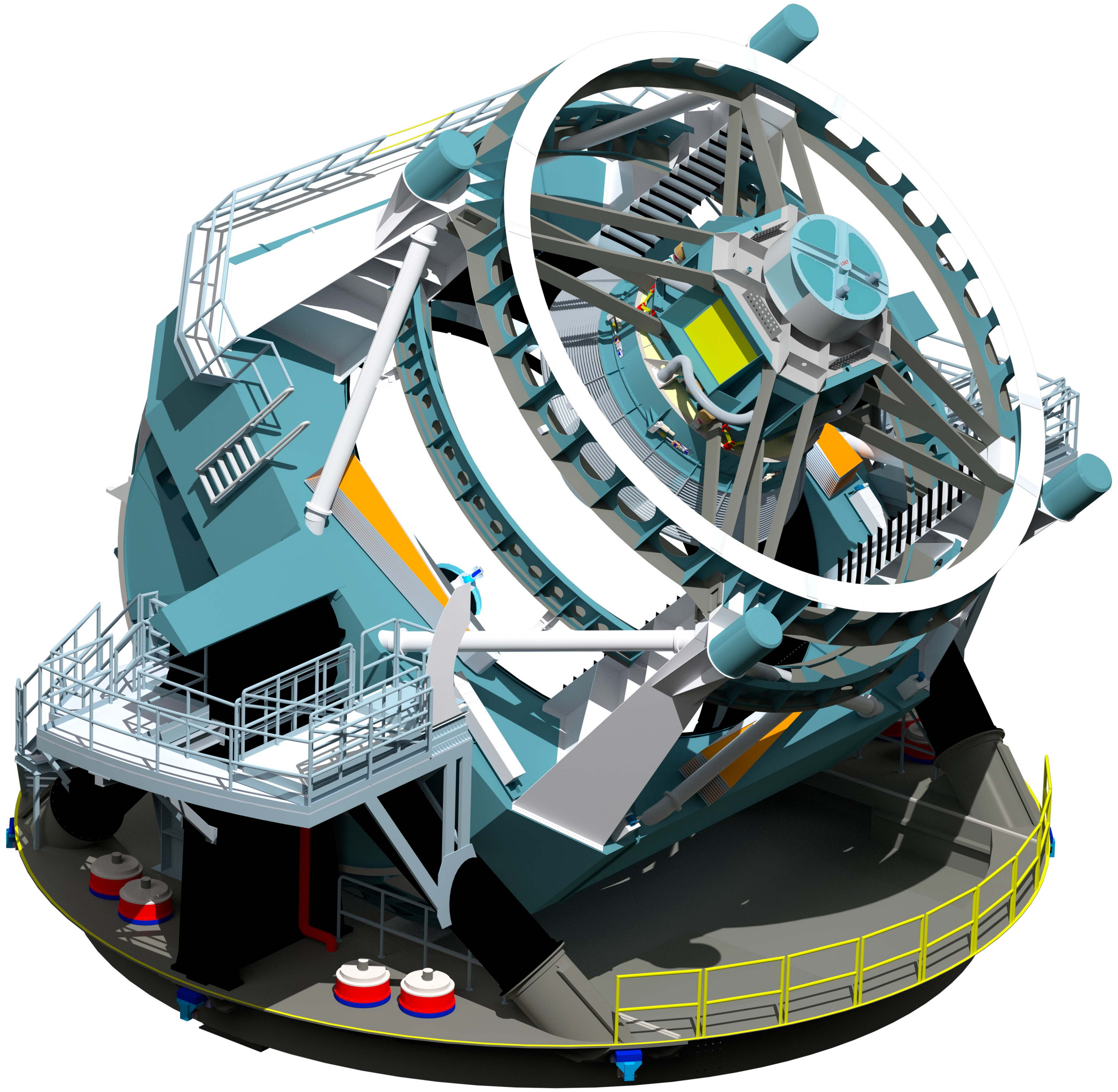


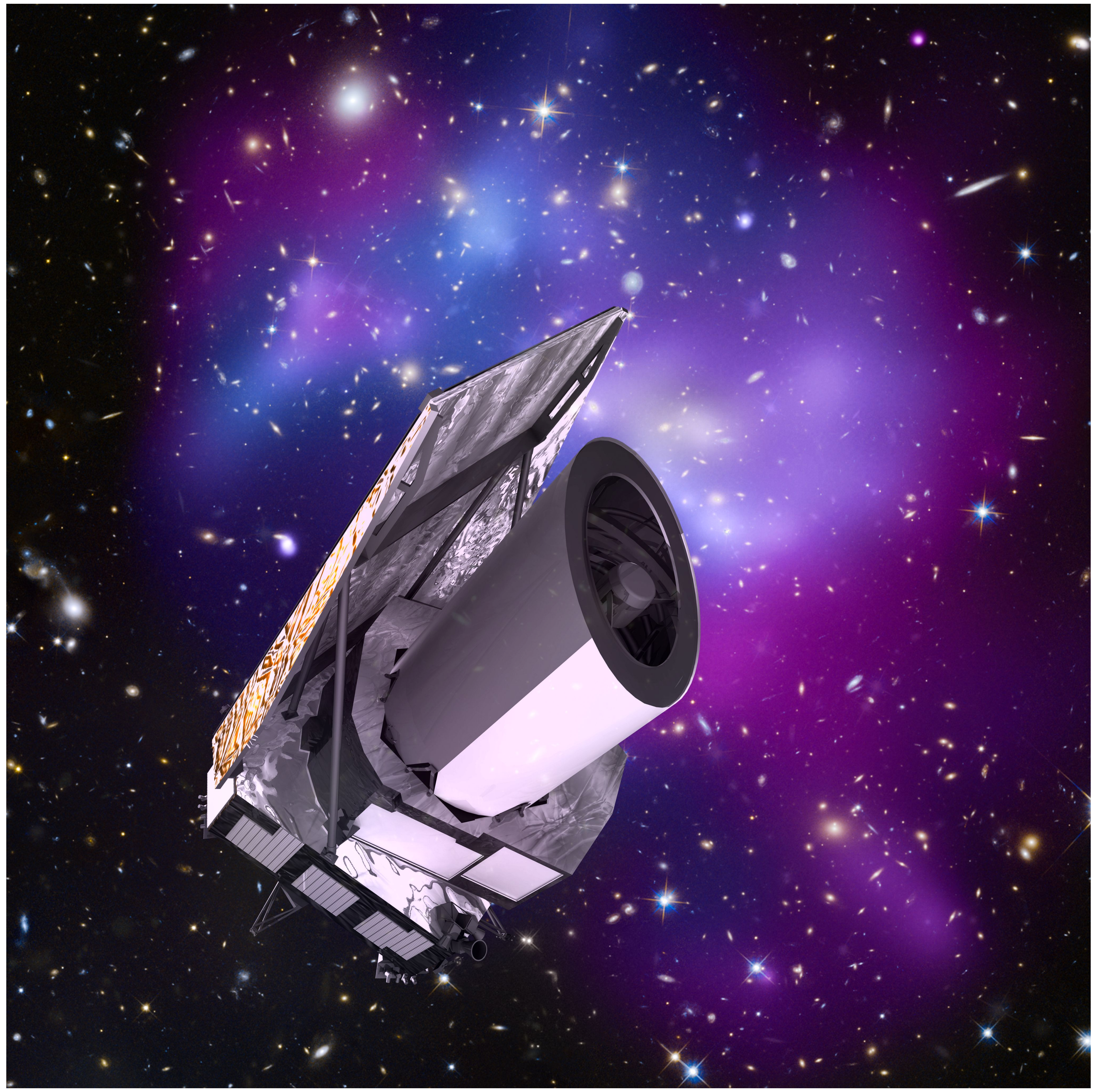




IN2P3 computing center (cont.)

- Currently working towards getting ready for both LSST and EUCLID





CC-IN2P3 - infrastructure

- Surface

  2 machine rooms: 1700 m^2 (~18000 sq ft)

  technical equipment: 4000 m^2 (~43000 sq ft)

  offices: 2000 m^2 (~21000 sq ft)

- Electricity

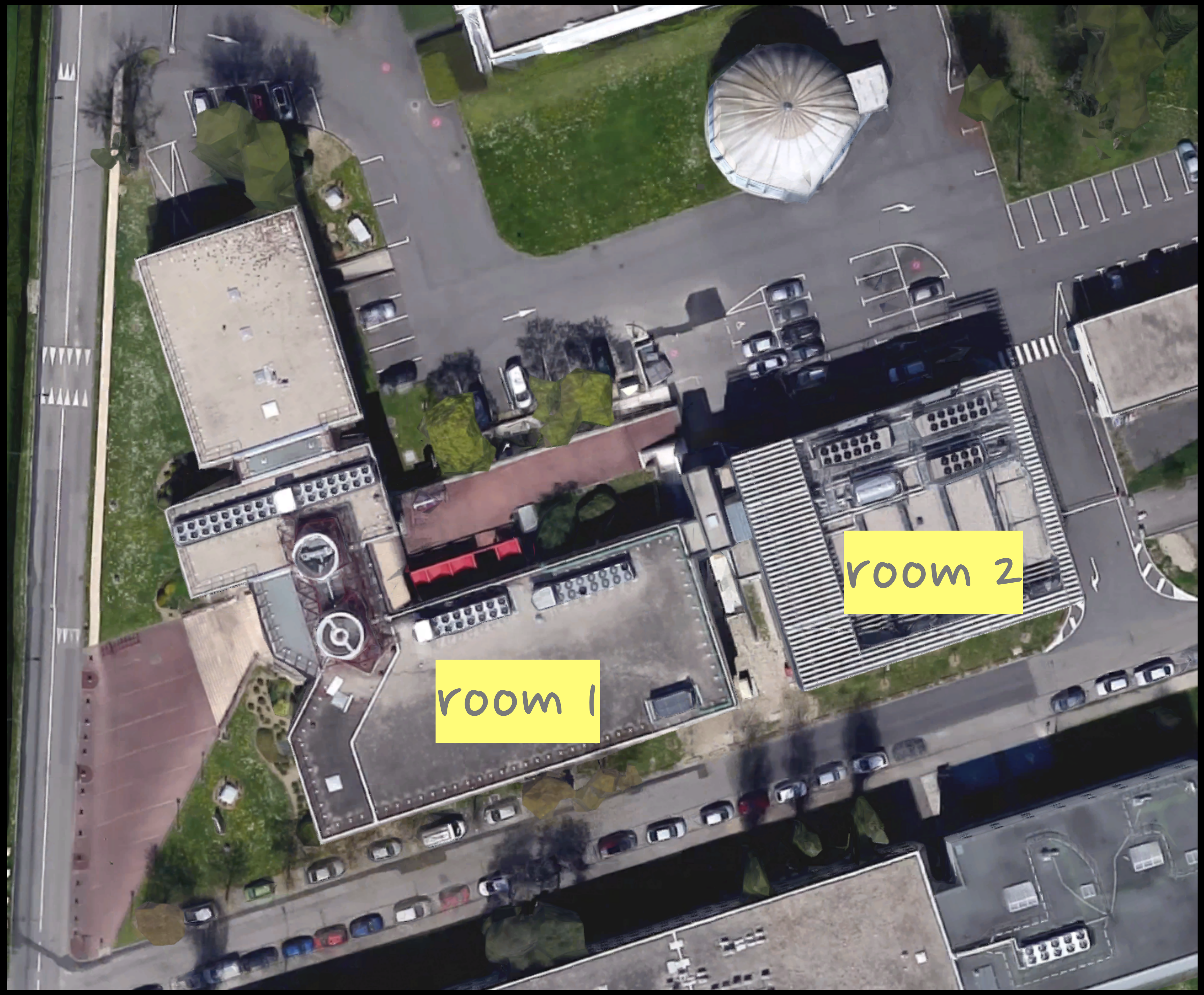
  installed power capacity: 2 independent, redundant lines (6.6 and 2 MW)

  power consumption: 1.2 MW (850 k€/year)

  UPS, diesel generator

- Cooling

  installed capacity: 3200 kW, 6 chillers



aerial view

building 2

machine room 2

machine room 1

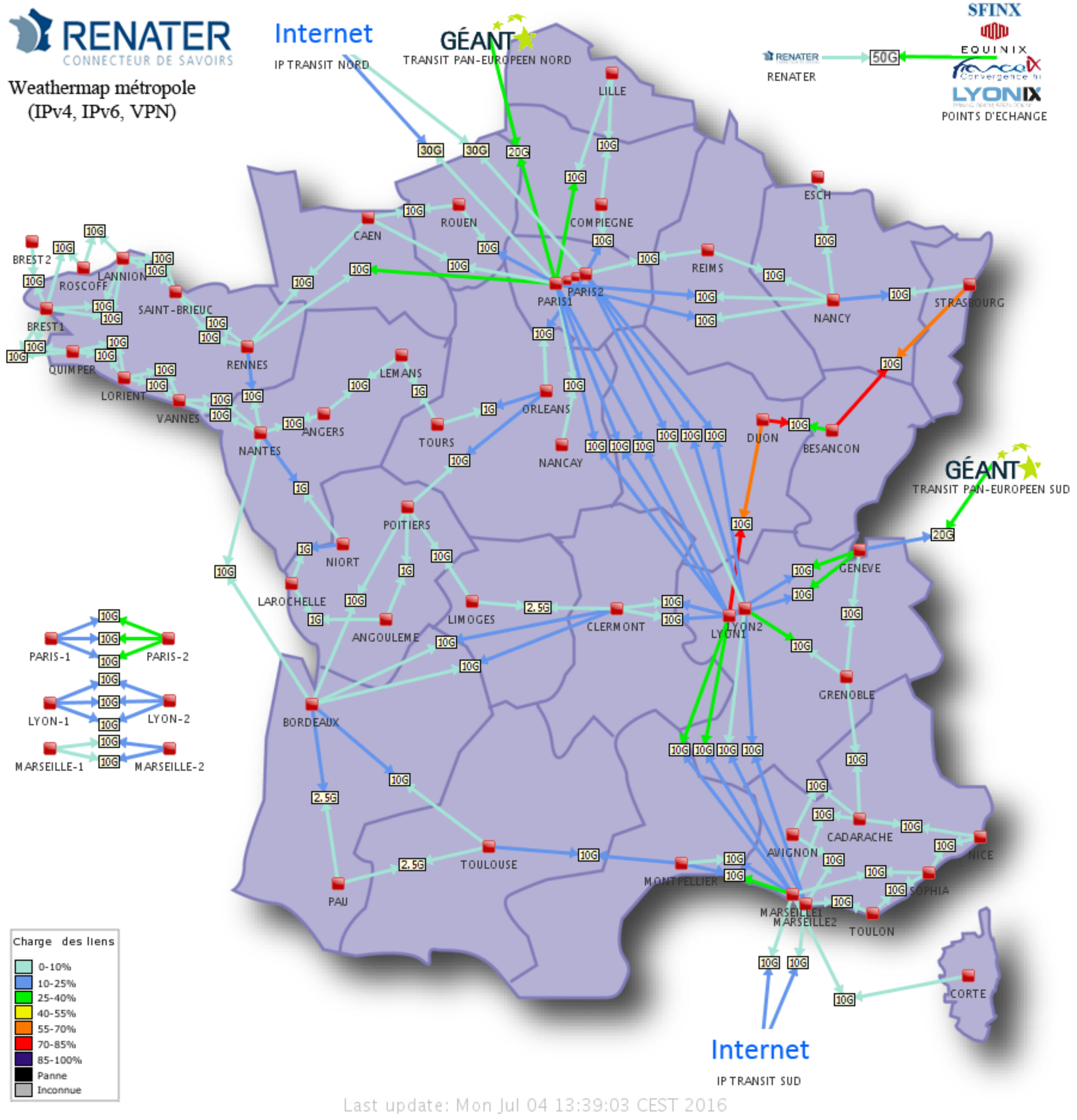
CC-IN2P3 - connectivity

- Well connected to national and international networks, via RENATER

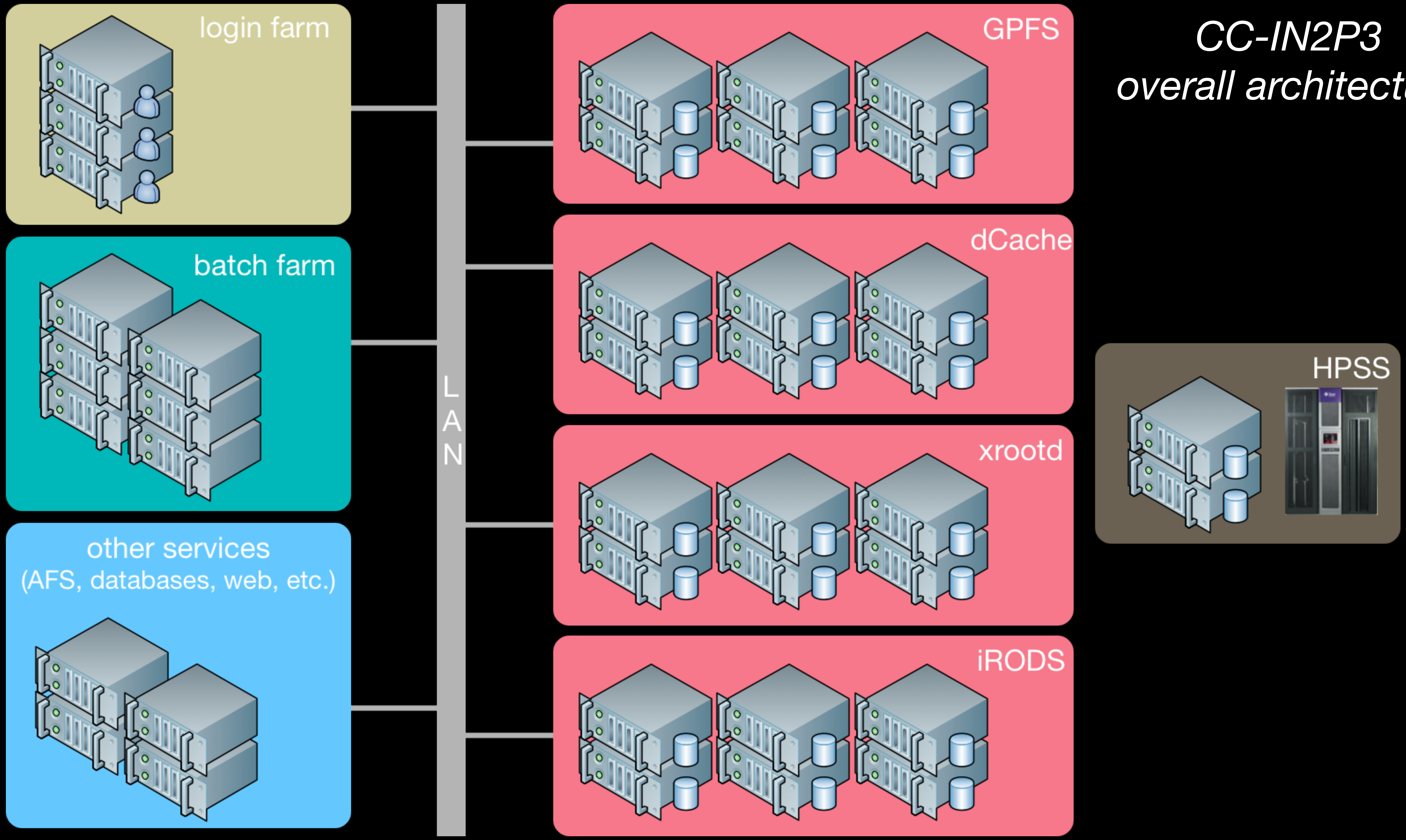
  one of two RENATER points of presence in Lyon hosted in our premises

- Connectivity to the USA via GEANT

  currently commissioning a 20 Gbps link to NCSA



CC-IN2P3 overall architecture



CC-IN2P3 - resources

- Compute

  x86-64 architecture

  700 compute nodes, ~14 k CPU cores, 210 TFLOPS

  typical compute node: 2 CPUs, 12 cores per CPU, 142 GB RAM

  batch workload: ~120 k jobs finished per day, 25 k jobs in simultaneous execution

  farm with 40 Nvidia GPUs to enter production later this year

- Storage

  disk capacity: 20 PB

  APIs: POSIX (GPFS), proprietary (dCache, xrootd, iRODS)

  typical storage node: 110 TB usable storage per node, 32 GB RAM

  tape usage: 34 PB

- Software

  AFS, GPFS, HPSS, OpenStack, xrootd, dCache, Oracle, Postgres, MySQL, Univa GridEngine, Scientific Linux & CentOS

LSST at CC-IN2P3

- Main roles

  satellite data release production

  currently working towards understanding requirements and services for a data access center

- Continued activities

  operations of Qserv development cluster: tests of non-volatile memory foreseen this year

  support for processing of CFHT data using LSST stack: activity lead by LSST-France scientists

  binary distribution of LSST software

- Ongoing and planned R&D activities

  explore how to run LSST tasks using Docker containers and how to build workflows (i.e. application-specific orchestration of containers)

  explore the suitability of HTTP2 for bulk file transport over high latency networks

  explore the suitability of object stores as emission/reception buffers for file transfers

Perspectives

- Short term

  no fundamental change in the site architecture: driven by current main users (LHC experiments)

  to continue increasing compute density (cores per CPU) and storage density (capacity per node)

  to understand if and how object stores are interesting for LSST use cases: exploration currently prevented by the Butler's POSIX-only capabilities

- Medium term

  increased use of flash storage for both compute nodes and storage nodes, when economically viable

  will ARM-based compute nodes become an alternative to Intel?

Questions & Comments