INFN

- The **National Institute for Nuclear Physics** (INFN) was founded on 8th August 1951
  - Funded from Italian government under the supervision of the Ministry of Universities and Research (MUR)
- Main mission is the theoretical and experimental research in the fields of subnuclear, nuclear and astroparticle physics
- Composed by several units
  - ~ 20 units dislocated in the main Italian University Physics Departments
  - 4 Laboratories
  - 3 National Centers dedicated to specific tasks
- CNAF is the National Center dedicated to computing applications

INFN computing at a glance

- Experiments at LHC are (so far) the most demanding in terms of computing and storage for INFN

- INFN computing infrastructure is distributed among several sites
  - CNAF, which hosts the INFN Tier1 for WLCG is the main one
  - 9 other sites host the WLCG Tier2s
  - Other smaller sites host departmental farms (or Tier3s)

- Computing activities of other INFN experiments are mostly located at CNAF

- The Tier1 accounts for nearly half of total computing and storage resources dedicated to INFN experiments

- Computing for theoretical physics is mostly performed on HPC resources at CINECA (the Italian Supercomputing center, PRACE Tier0)

Milano

Rome

Catania

Bari

CNAF

Napoli

T2 Catania
Potenziamento
IBISCO
In allestimento

LNF

Turin

Pisa

LNL

July 22, 2024

CNAF

CNAF

- CNAF (Bologna) is the "National Center of INFN dedicated to Research and Development on Information and Communication Technologies"

- Previous mission ('63-80s) : develop technologies for the analysis of photograms from bubble chambers

- Then involved in setting-up and managing GARR (Italian NREN) until 2001

- Deeply involved in the scientific computing since 2000
  - Development of Grid middleware (and currently cloud)
    - VOMS, StoRM, IAM,...
  - Participation and/or leadership of EU/national/regional projects
  - Management of the Grid infrastructure and Tier1
  - Participation to EOSC projects

- Current staff: ~60 people (9 technicians, 30 technologists, ~20 fixed term)

INFN
CNAF
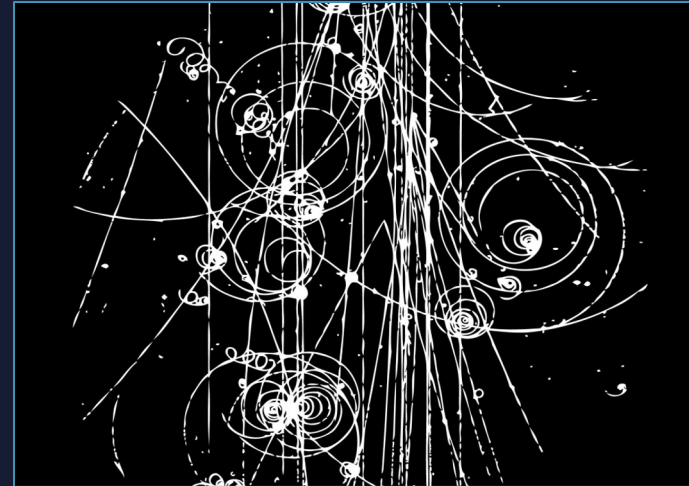
The computing center

- CNAF hosts the Italian Tier-1 data center for the high-energy physics experiments at the Large Hadron Collider at CERN

- CNAF is one of the most important centers for distributed computing in Italy
  - Computing for more than 60 physics experiments supported
  - INFN has other 8 (smaller) data centers for WLCG (Tier2s)

- The first instance hosted in the Physics department

- The expected huge increase in IT resources over the long term (HL-LHC era) led us to look for a new location

- It is currently being moved to a new, larger, site
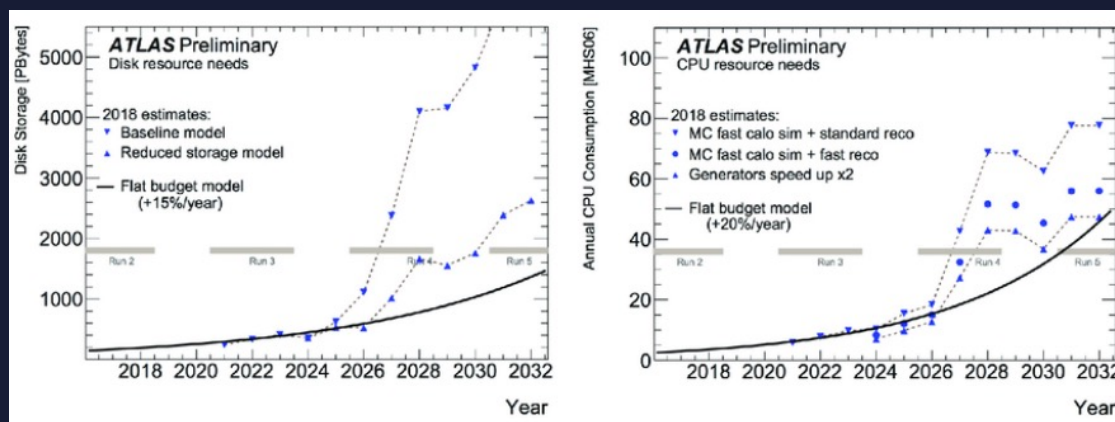
← INFN will account for ~10%

CNAF in the global environment

- **INFN –** hosting the INFN National ICT services and the Information System
- **WLCG –** one of the few centers supporting the 4 LHC experiments
- **CINECA –** in the last ~6 years we included HPC resources in the WLCG distributed computing
- **EU projects**: SPECTRUM, ARC-TREE, EOSC-Beyond, Riscale, Intertwin, AI4EOSC, Skill4EOSC, Artemis
  - In the past seminal projects (i.e. Datagrid, Indigo, XDC) leading to the development of middleware components widely adopted (e.g., VOMS and, more recently, IAM)
- **National Recovery and Resilience Plan (NRPP): ICSC, Terabit, Ecosister, DARE**
- **DATACLOUD –** INFN initiative to build a INFN cloud including the resources from Tier1 and Tier2s
- Participation in several projects related to Health Sciences
- **Technology Transfer**: TT-LAB (various projects with industrial partners)

Health Sciences

- **CNAF (and INFN through Datacloud) is involved in several biomedical projects**
  - Also, as part of PNRR projects (DARE, ICSC)
  - Scientific collaborations with several medical institutions

- **One of the challenges is the use of Cloud technologies with sensitive data**

- **Management of a ISO/EIC 27001 certified Cloud**
  - Federation of 3 sites

- **Leverage technologies developed for WLCG and alike (e.g., IAM)**

EPIC@BARI

EPIC@CNAF

EPIC@CATANIA
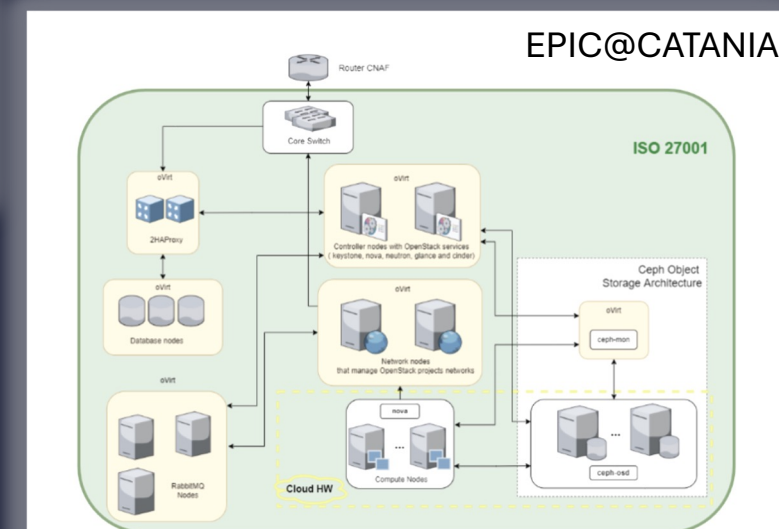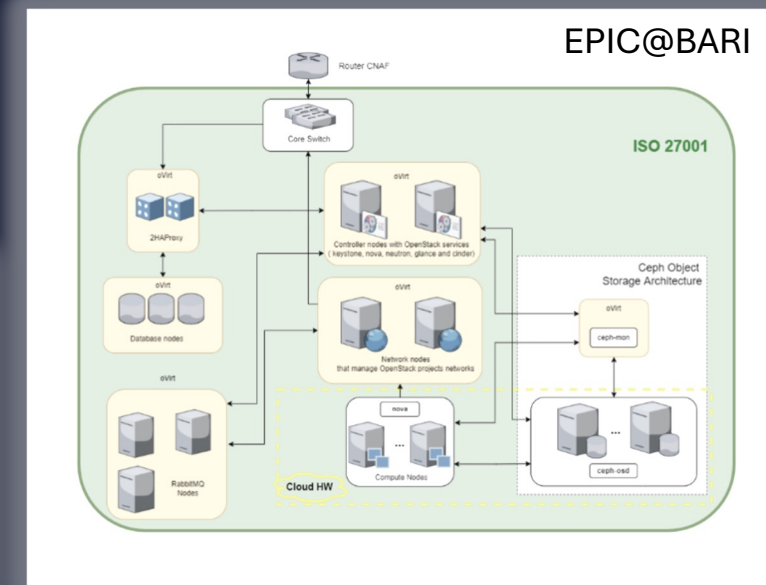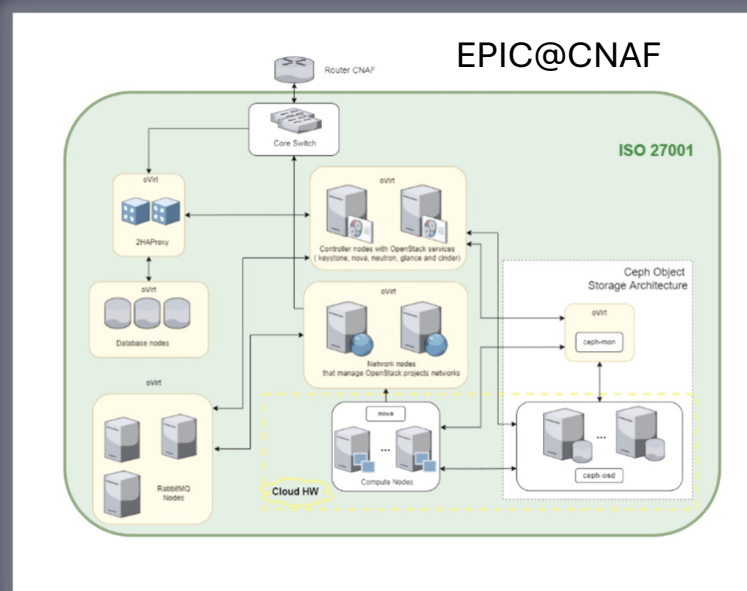
DataCloud

It is the basis for the Italian Cloud Federation

In the framework of the current NRRP projects, in particular ICSC and TeRABIT, INFN has a leading role in the creation of the Italian Cloud Federation

The goal is to access all Italian scientific computing resources through uniform interfaces

Main players: INFN, CINECA, GARR
But also: CMCC, ENEA, SISSA, IIT, UniTO, Sapienza, …
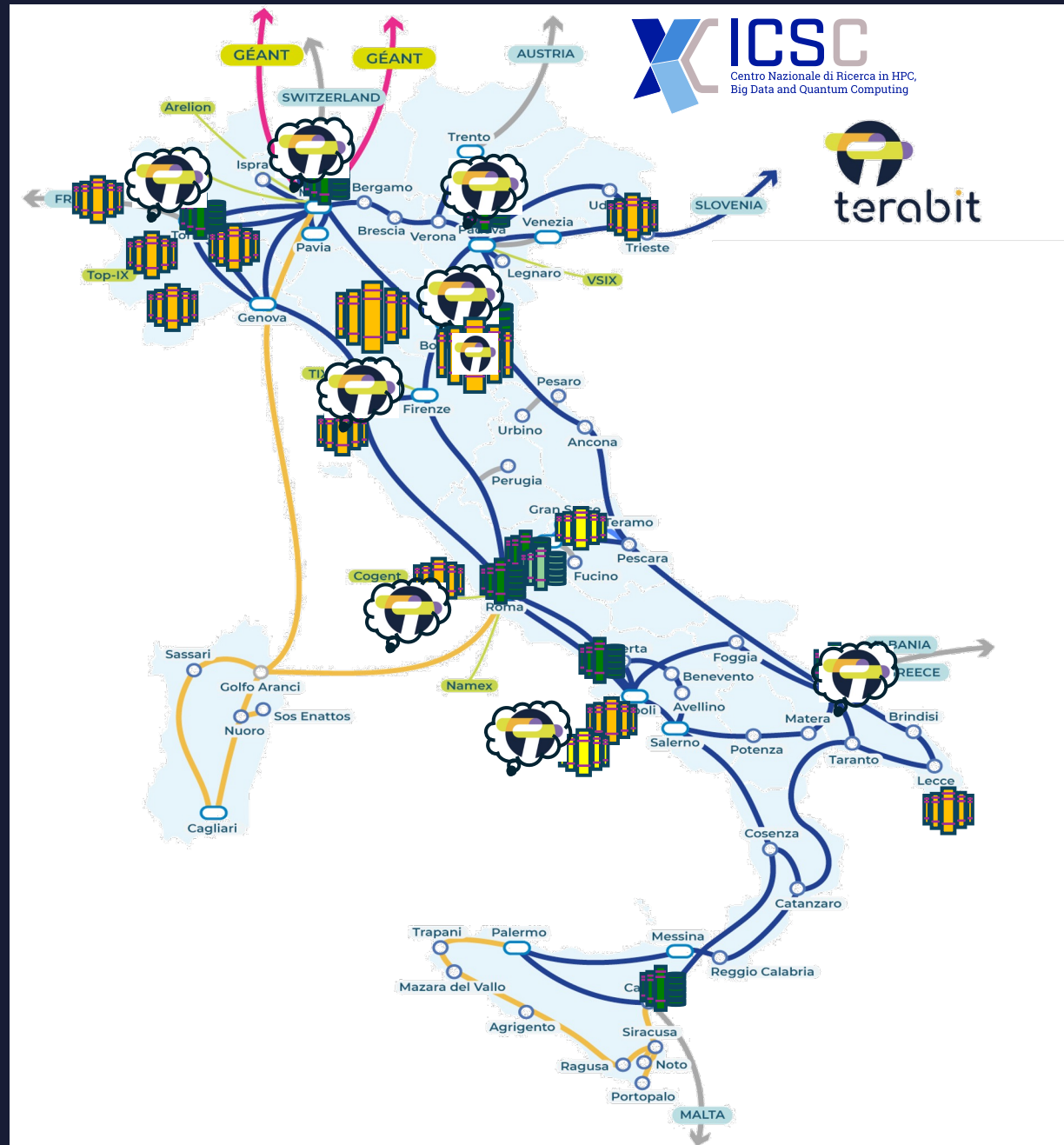
Beyond CNAF: ICSC

- A new powerful infrastructure, distributed on the Italian territory and serving multiple scientific domains
  - Membership spans several research bodies besides INFN (e.g., CINECA, INAF, CNR....), and Universities
  - **Connect** at multiple Tbps all the ICSC centers
  - **Upgrade** of the INFN Tier-2 federation
  - **Additional/Upgraded HPC/HTC centers** for CNR, INAF, ESA, SISSA, IIT, CMCC, L'Aquila, …
  - Deployment of a production-level **Quantum system**
  - Deploy and operate the resources via a national level **Datalake**
  - Establish tight links with the biggest Italian companies for **common R&D and spillover to the productive sector**
- Innovation grants for industry / research shared activities