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

CC IN2P3

Low-latency alerts & Data analysis for Multi-messenger Astrophysics

OUTLINE

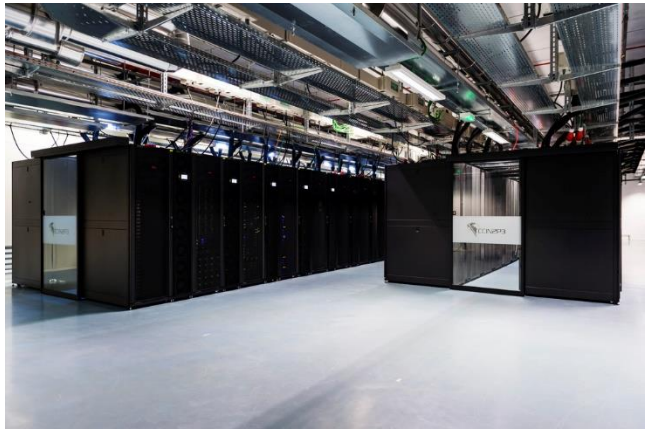
- **CC IN2P3**
  - Mission
  - Infrastructure/resources
- **Scientifics domains supported**
  - HEP/Nuclear
  - Astrophysics/Cosmology
  - Broker service
- **Conclusion**

CC-IN2P3 : French National Computing Centre of IN2P3.

- Mission : Providing computing resources and services for experiments supported by IN2P3.
- 85 agents. Most of them are engineer.
  - Providing resources (Computing/Storage/DB)
  - Providing services.
    - For our institute (mail, backup,….)
    - For developer (Github, forge,…..)
    - For users/experiment (Dirac, squid,….)
  - Providing infrastructure (Cloud, Network connection,…)
- Involving on a large landscape of collaboration (~80)
  - Small (few user) to large collaborations (many thousand of people)
  - Short lifetime (few months) to more decade (LHC,LSST,…)
  - Regional collaboration to international (the main part of them)
  - Raw data storage site for some experiments.

CC IN2P3 : Infrastructure

2 computing rooms for a total of 1500 m²



Computing Facilities

- HTC (High Throughput Computing) : ~50 000 slots
- HPC (High Performance Computing) : ~ 512 physical cores.
- GPU cluster : 20 K80 GPUs, 72 V100 GPUs

Storage

- Tapes : ~ 110 PB
- HDDs : ~45 PB (different technologies: dCache, XRootD, CEPH…)

Network

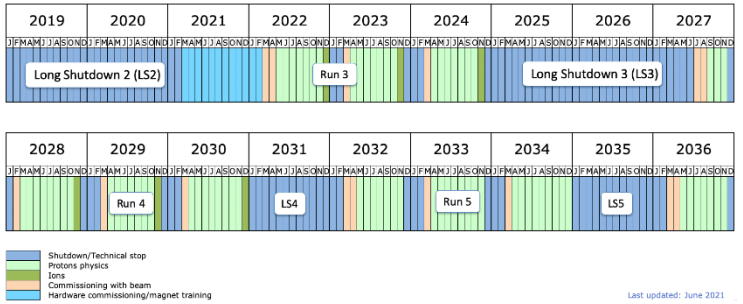
- LHCOPN : 100 Gb/s (dedicated to LHC data)
- LHCONE : 100 Gb/s (LHC, Belle2, Juno,…)
- Specific link : LSST (40Gb/s), French HPC (100Gb/s)

Service

- Mail, github, web, institutional services, cloud infrastructure,…..

High Energy Physics

- WLCG : CC IN2P3 is Tier1 for whole LHC experiments and is providing around 10% of the Tiers 1 capacities.
  - A long term engagement.
  - High level of availability/reliability.
  - Today ~60 % of the CC resources.



- BELLE2, JUNO, DUNE,….
  - All this experiments are based on distributed/Grid computing model.
- CC IN2P3 involved on analysis and simulation. A part of raw data of this experiments are available at CC.

Nuclear

- A small set of experiments

GW Activities at CC IN2P3

- Today
  - Virgo/LIGO
  - Historical computing site (with CNAF) for Virgo collaboration.
  - A full copy of Virgo Raw Data at CC IN2P3.
  - Support analysis job via
    - Local submission (Virgo)
    - Grid submission (Virgo/Ligo)
- Tomorrow ?
  - Einstein Telescope
  - A strong interest of IN2P3 to this collaboration and for the CC IN2P3 on computing aspect (computing model, resource requirement,…).

Astroparticles activities at CC IN2P3

- Activities decreasing (but again with some analyses activities and raw data available at CC IN2P3).
  - AMS (cosmic ray)
  - Antares (neutrino)
  - Hess (cosmic ray)

- Currents and futures activities (analysis, simulation, raw data storage)
  - Km3net (neutrino)
    - Provide already a large set of resource (CPU,GPU, DB, storage,..)
    - Discussion ongoing concerning the role of CC IN2P3 on the computing model .
  - Pierre Auger (cosmic ray)
  - CTA (cosmic ray)
    - Today CC is involved on grid activities (job scheduling, simulation) and provide some central grid services (Job scheduler Dirac, monitoring DB)

Cosmology activities at CC IN2P3

- Old activities still active on analysis task.
  - Planck
  - Super novae
- Current and future
  - LSST/Vera Rubin
    - Will be one of the major experiments supported at CC IN2P3 during the next decade (and more).
    - 50 % of the data at CC IN2P3.
    - Needs to satisfy a large set of resources requirement : CPU, storage, network
    - Needs to provide new set of services and/or technologies: Notebooks, GPU usage,…
  - Euclid (launch mid 2023)
    - Involved on data reduction and pipeline preparation.
  - …

Broker at CC IN2P3

- CC IN2P3 will provide the infrastructure for a LSST brokers (Fink)
  - Fink prototype is providing by IJCAB/IN2P3 laboratory
  - Expected to move on production before end of 2022 on CC IN2P3 cloud infrastructure.
  - ~500 vcpu and 1 PB of disk storage during one decade.
  - A strong constraint on availability of the service.
- Not operate by CC but by Fink team (see talk later).
- But infrastructure evolution (aka performance) has to be considered to ensure the broker service efficiency (low latency,….).

Conclusion

- **CC IN2P3 provide computing resource (analysis, storage and services) for a large set of experiment involved on Astrophysics/Cosmology which provide multi-messenger**
  - Neutrino, Cosmic ray, GW, deep sky,…
  - CC IN2P3 is not involved on the science itself but provide computing tools and services for the experiments.
  - May be a good place to provide new services (broker,…) to the scientific communities
    - Data (a part) are here.
    - Computing facilities are here.
    - Analysis (a part) is done here.
- **Fink (LSST Broker) is a first use case for us.**