Computing at CC-IN2P3

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Lisa meeting : APC – CCIN2P3
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Le CC-IN2P3

- **CC-IN2P3** : Dedicated data processing center for **IN2P3** scientific field :
  - High Energy Physics
  - Nuclear Physics
  - Astroparticle Physics
- «Research and Service Unit » of **CNRS** in partnership with the **CEA**

CC-IN2P3

- 24/24, 7/7, 365/365
- 2 000 m^2 office space ~100 people
- 4 000 m^2 technical areas
- 2 computing room of 850 m^2 each

- CPU : ~35 000 vcores – 400 kHS06
- Disk : ~25 Po (~ 2,5 Po high performance)
- Tape : ~55 Po (capacity 340 Po)
- Back-up (TSM) : ~1.1 Po (capacity 5 Po)

Experiments using CC-IN2P3

Particle physics

- Standard model and beyond : ATLAS, CMS, D0, H1, …
- Symmetries violation : LHCb, Babar, …

Astroparticles physics

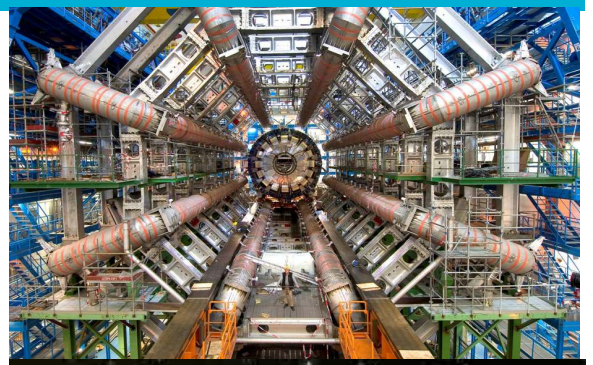
- Neutrinos : DOUBLE-CHOOZ, NEMO, OPERA, …
- Cosmology : PLANCK, EDELWEISS, SNLS, SNF, …
- Cosmic rays : AMS, ANTARES, AUGER, FERMI, HESS, …
- Gravitationnal waves : VIRGO

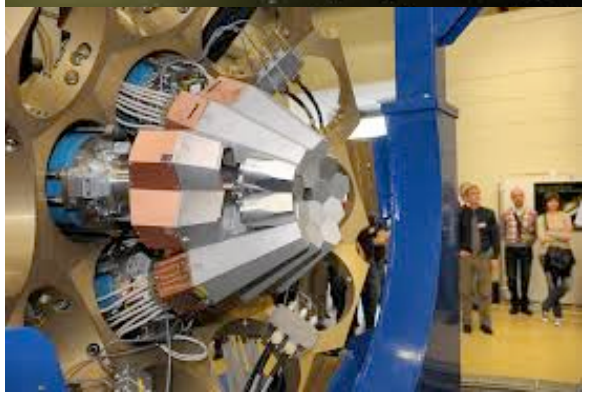
Hadronic / Nuclear physics

- Quark-gluon plasma : ALICE, Phenix, …
- Nuclear structure : AGATA, INDRA, …
- Radiobiology, Imaging, … : HADRONTHERAPIE, …

Theoretical physics

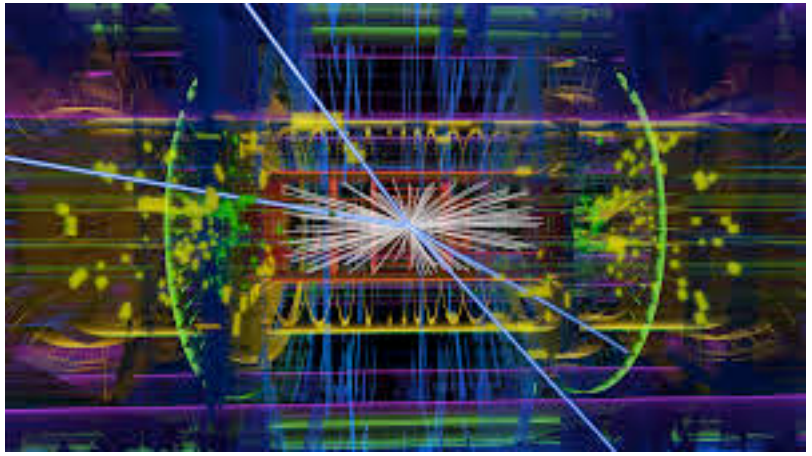
- QCD (strong interaction), EPOS (HEP), …

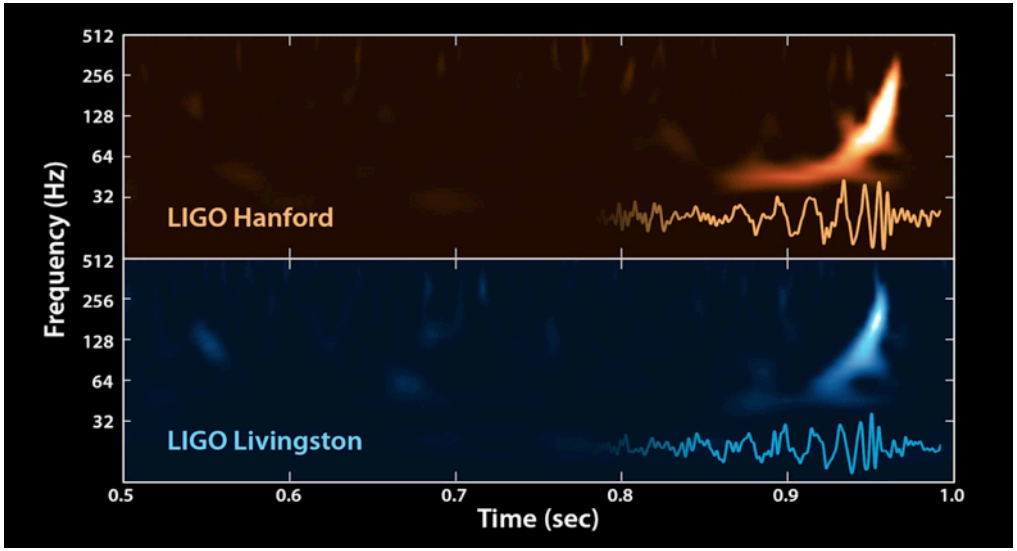




Data types

- **Events : (ROOT format)**
  particles, gamma, neutrinos, cosmic rays,
- **2D Images : (FITS format)**
  Télescopes, …
- **1D signals :** virgo, planck, …



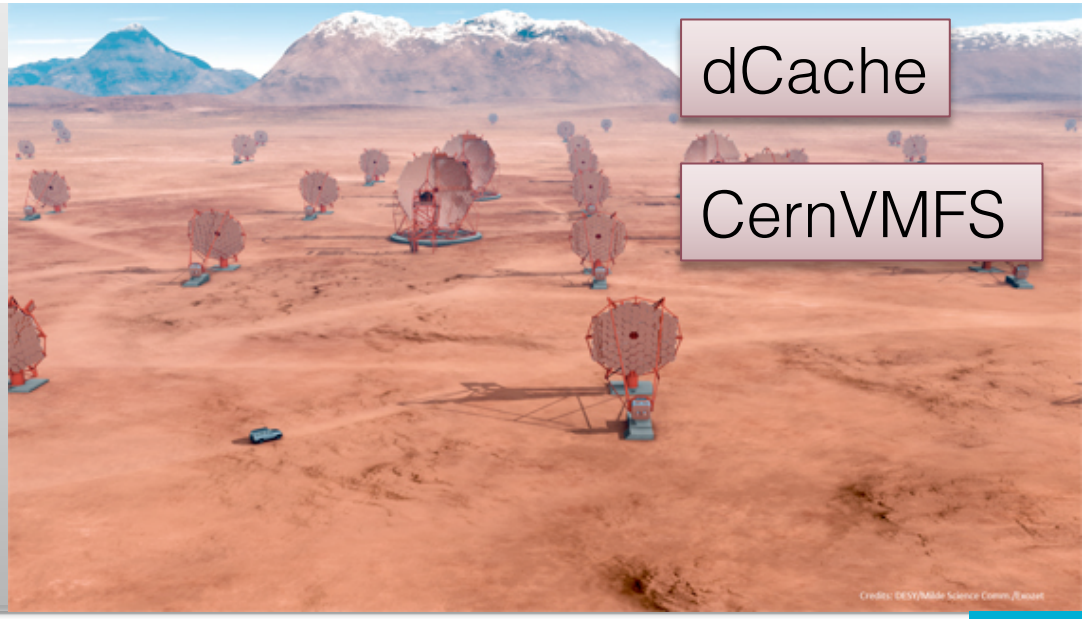


- CC-IN2P3 is providing 3 computing facilities in production.
  - The High Throughput Computing (**HTC**) farm, grew up.
    - From 234 589 HS06 in 2015 to 319 045 in 2017 (**+36%**).
  - Simba, a High Performance Computing (**HPC**) cluster.
    - Previous aging cluster replaced in June 2016.
    - +16% HS06, remains with 512 physical cores.
    - Relies on 16 DELL C6320 servers and an QDR IB interconnect.
  - Nala, a **GPGPU** cluster.
    - In production since September 2016.
    - Relies on new DELL servers C4130 with K80 GPU.
    - High speed interconnect using IB network.

Data and technologies

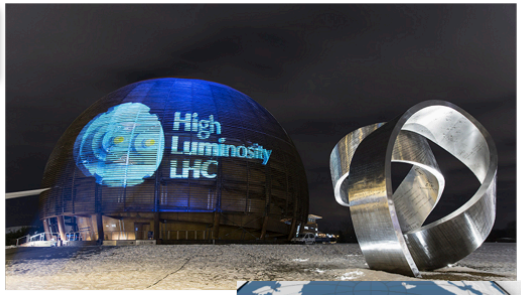
- Data transfers : experiments, laboratories — iRODS
- Mass storage : tapes — HPSS
- Productions : reconstructed data, Simulations — XRootd
- Data analysis : high performance disks — GPFS

- Grid computing — dCache
- Software distribution — CernVMFS

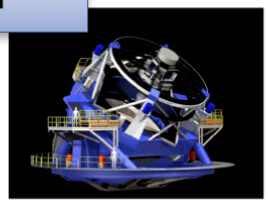


Resources needs in 2030

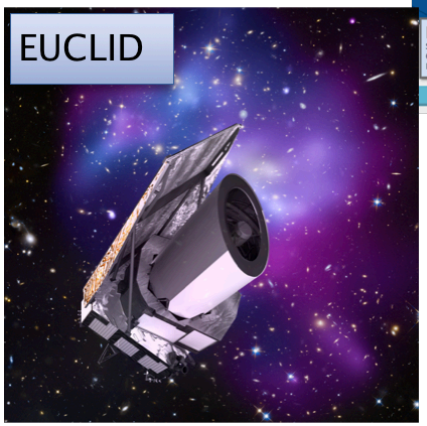
HL-LHC



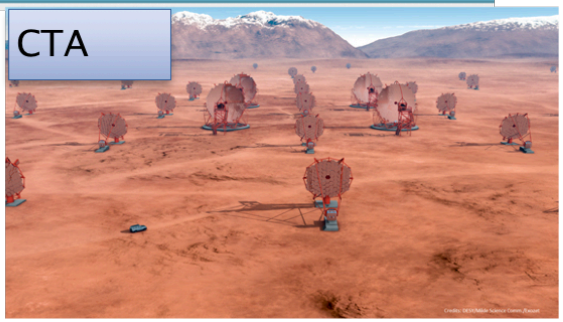
LSST

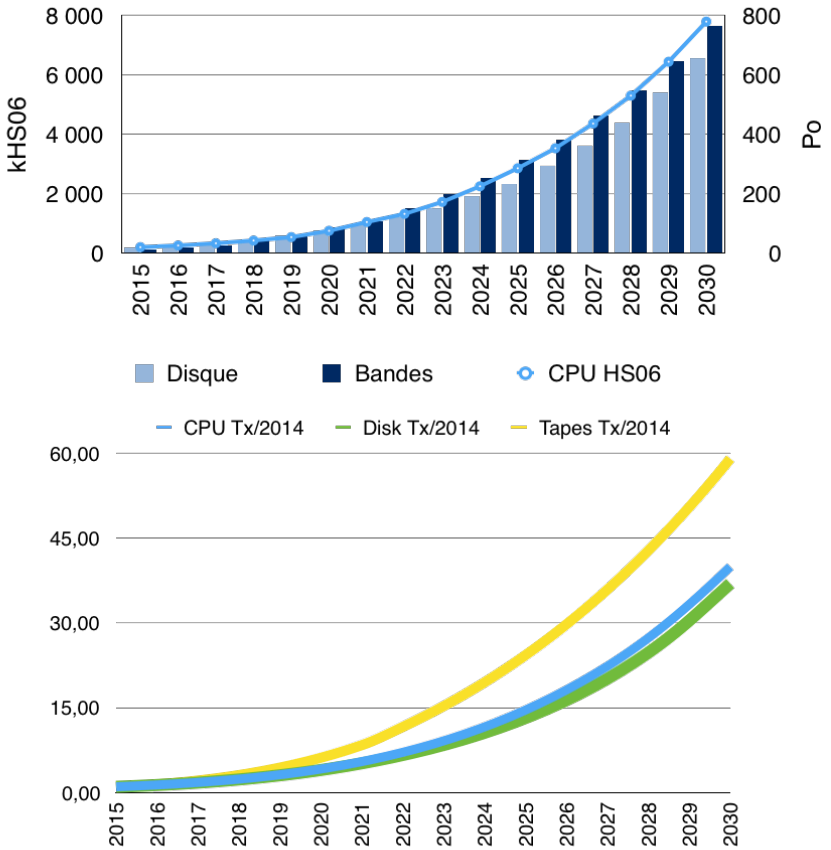


EUCLID



CTA





Computing, prospective & future

- HTCondor as an alternative to Univa Grid Engine ?
  - Keep the control on financial and human costs.
  - A first study conducted in 2016.
  - Proof of concept targeted at the end of 2017, first for the HTC grid part.
- EL7 is the default OS for HTC since April 2018
- Singularity as a container solution.
  - Software still young, evolving every day.
  - Currently deployed, waiting for the experiments to validate the solution in production.
- GPU No increase of the GPGPU cluster planned for 2018, but we stay open to new requests.