



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

CC-IN2P3

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- **CC-IN2P3**
- **Virgo Usage at CC-IN2P3**
- **Conclusion**

IN2P3 Computing Center – main figures

- ▶ **Resources**
 - 80 agents (65 IT engineers)
 - Budget : 7M€
- ▶ **Facilities**
 - 1700 m² over 2 computing rooms
 - 24/7/365 operation
- ▶ **Computing**
 - 1000 servers, 40k threads, 440kHS06
- ▶ **Storage**
 - Tapes : 70 PB
 - HDDs : 30 PB
- ▶ **Networks**
 - 20 Gbps to Renater
 - 40 Gbps to CERN
 - 40 Gbps to LHCONE/WLCCG



EXPERIMENTS

▶ Particle and Hadronic physics

- Standard model and beyond : **ATLAS**, **CMS**, D0, H1, ...
- Symmetries violation : **LHCb**, Babar, ...
- Quark–gluon plasma : **ALICE**, Phenix, ...

▶ Astroparticles physics

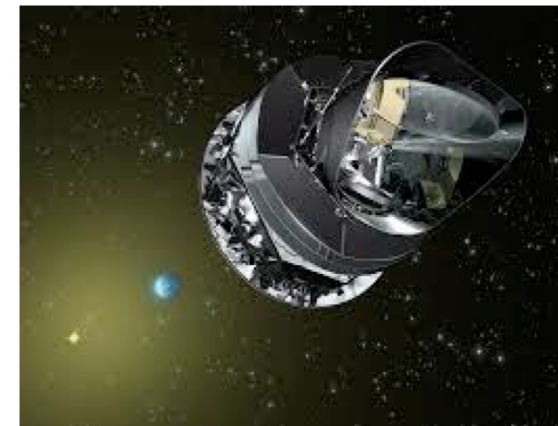
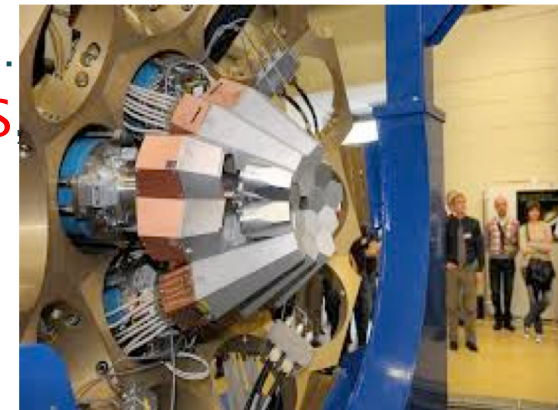
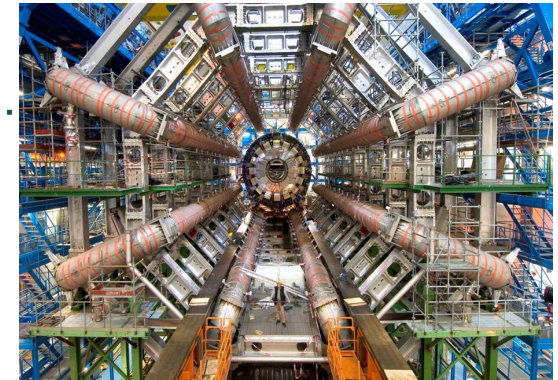
- Neutrinos : **DOUBLE-CHOOZ**, **NEMO**, DUNE, OPERA, ...
- Cosmology : LSST, EUCLID, PLANCK, SNLS, **EDELWEISS**
- Cosmic rays : CTA, KM3NET, **ANTARES**, **AUGER**, **HESS**,
- Gravitational waves : **VIRGO**, LISA

▶ Nuclear physics

- Nuclear structure : **AGATA**, **INDRA**, ...
- Radiobiology, Imaging, ... : **HADRONTHERAPIE**, ...

▶ Theoretical physics

- **QCD** (strong interaction), **EPOS** (HEP), ...



CC-IN2P3 is providing 3 computing facilities in production.

- **High Throughput Computing (HTC) farm.**
 - **Single and Multicore jobs (mostly 8 cores)**
 - RAM : 3 GB/vcore
 - ~40 000 vcores
- **High Performance Computing (HPC) cluster.**
 - **MPI jobs**
 - **512 physical cores.**
 - 16 DELL C6320 servers and Infiniband
- **GPU cluster**
 - 10 servers, 160 cores, **40 K80 GPUs**
 - 6 servers, 120 cores, **24 V100 GPUs**

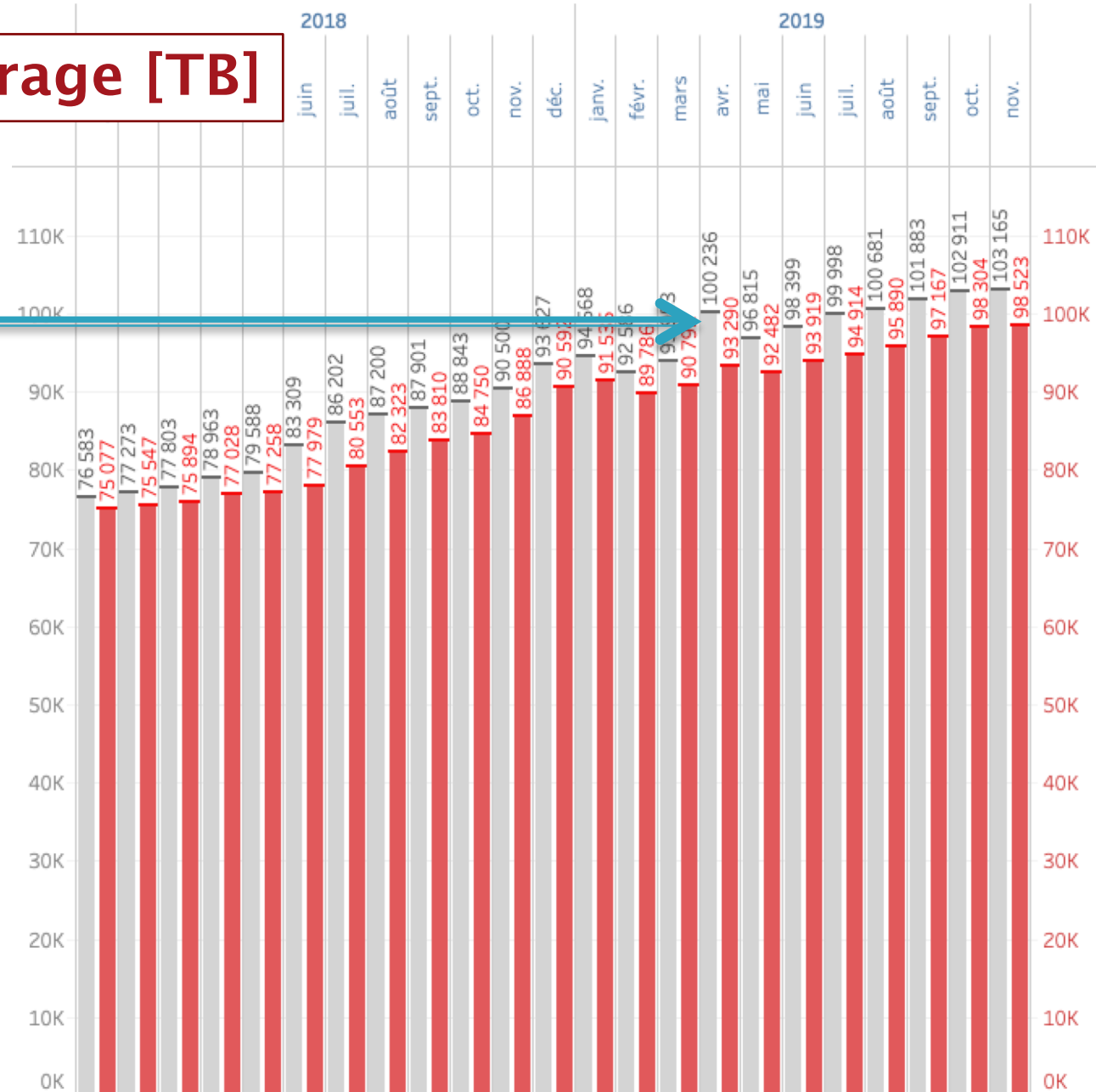
- ▶ **OS : CentOS7**
 - EL7 is the default OS since April 2018
- ▶ **Batch : Univa Grid Engine**
 - **HTCondor** for WLCG and EGI (soon)
via a grid access (HTcondor CE)
- ▶ **Grid : Tier 1 for WLCG**
 - WLCG : All 4 LHC experiments
 - EGI : European Grid Infrastructure
 - Dirac, dCache, XRootD
- ▶ **Virtualization : Singularity**
- ▶ **Cloud : Openstack**
 - Mainly for services and for tests

STORAGE EVOLUTION

100 PB
reached in april

- xRootD
- iRods
- dCache
- HPSS
- Filesystem
- ...

Storage [TB]



VIRGO USAGE AT CC-IN2P3

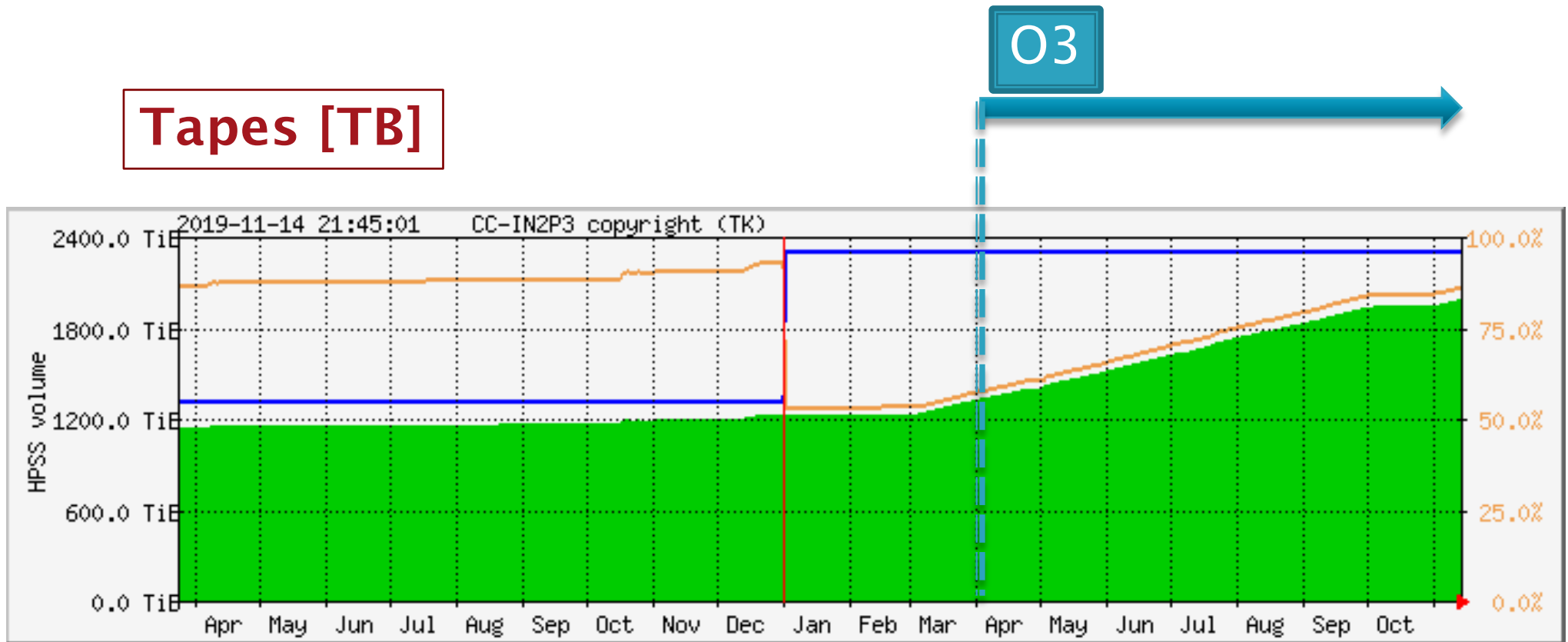
3 main Virgo activities at Lyon :

- A search looking for **compact binary sources** (MBTAoffline)
- The Virgo **raw data reprocessing** to generate vetoes using Omicron
- OSG jobs running binary sources parameter estimation code **launched from the LSC clusters.**

VIRGO STORAGE EVOLUTION

- status : 2000 TB of tapes
- 2019 : +800 TB of tapes

Tapes [TB]



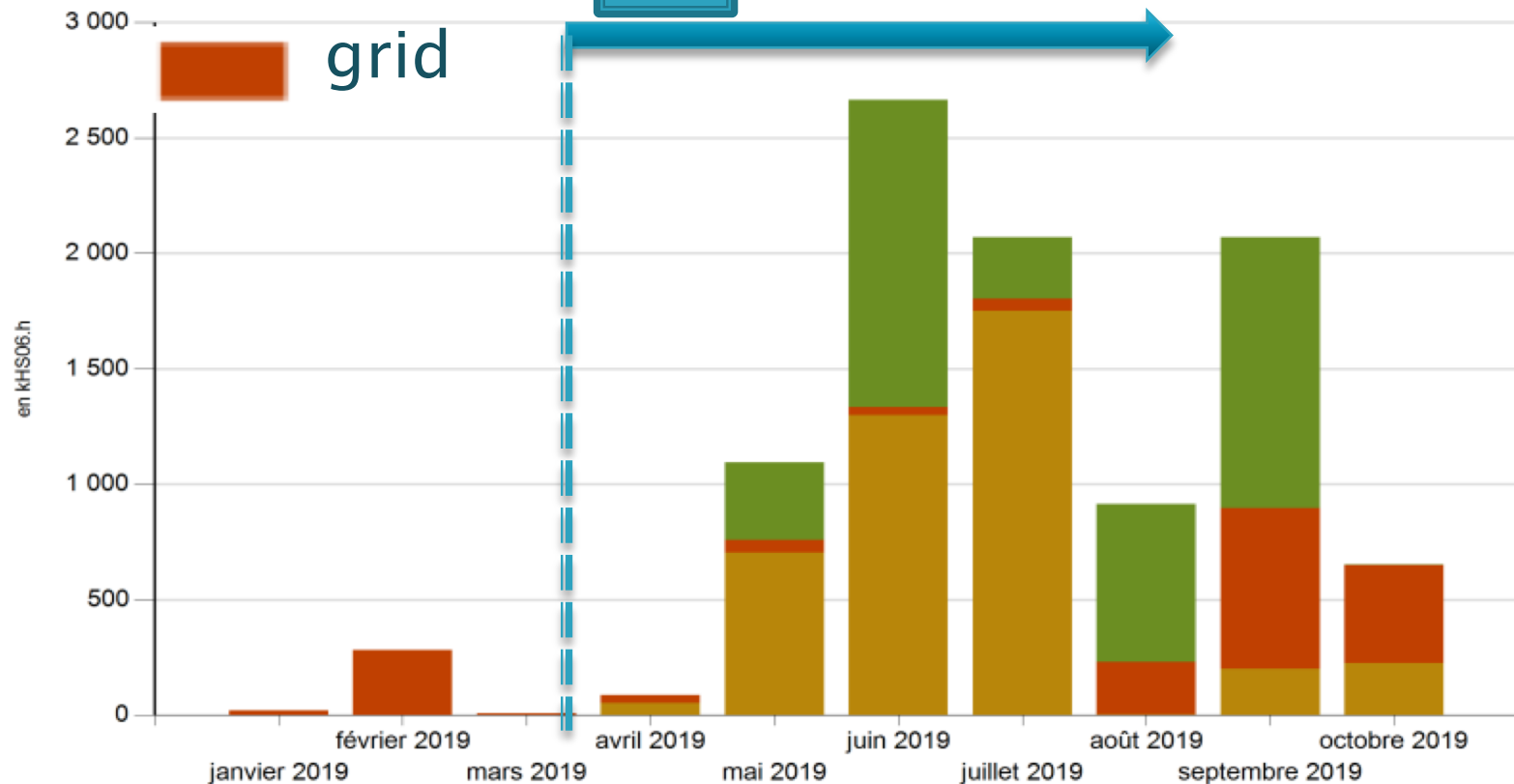
Tapes on HPSS accessed via iRods and XRootD

10 MHS06.hours in 2019

- 20 % grid jobs
- 80 % local jobs

CPU / month (HTC)

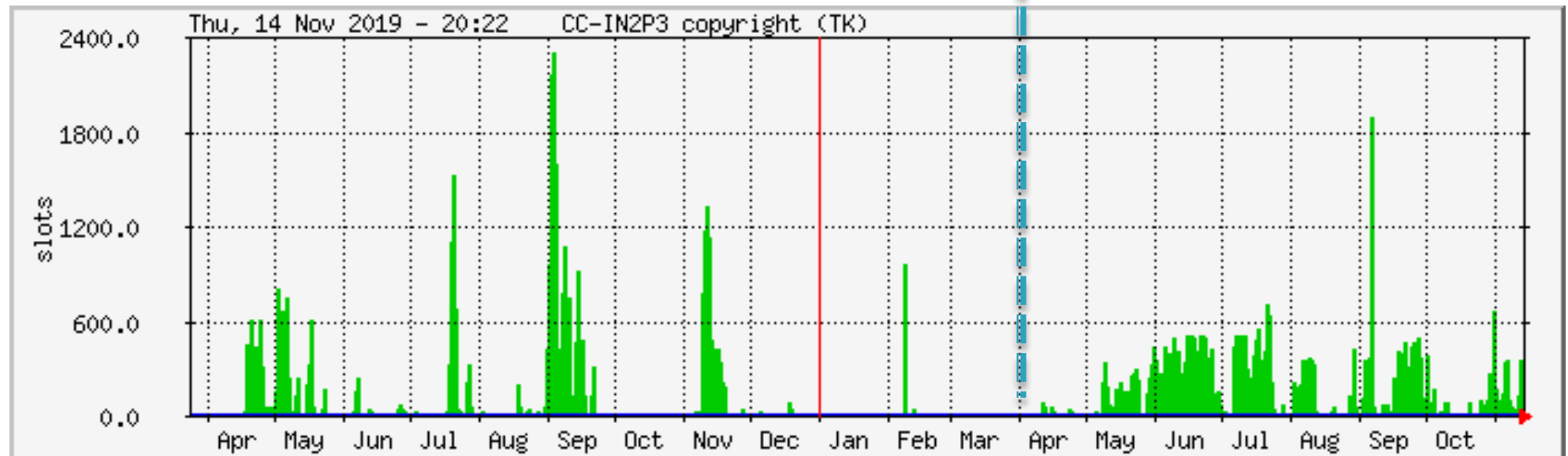
03



- average of 125 jobs
- peak at ~2000 jobs

O3

Number of JOBS (HTC)



- ▶ LIGO is starting using CC-IN2P3 resources
- ▶ VIRGO has long been using CC-IN2P3 resources
- ▶ Future : Evolution of the computing model of VIRGO/LIGO