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PIC: Experience and Plans

EGI TF, Lyon, 21st September 2011

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PIC is a scientific-technological centre supporting research groups that need to analise large data sets in collaborative environments.

Tier1 centre for the LHC data processing.

Data processing services for several disciplines:

- HEP
- Astrophysics
- Cosmology
- Life Sciences

Support to multiple disciplines is in PIC's mandate.

Goal: technology transfer from the LHC Tier1 to other applications with similar needs.

High Energy Physics

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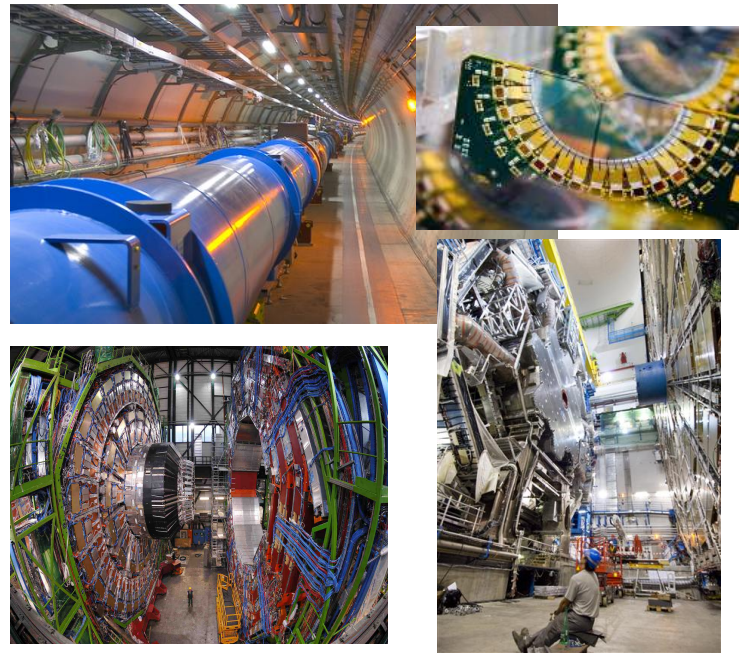
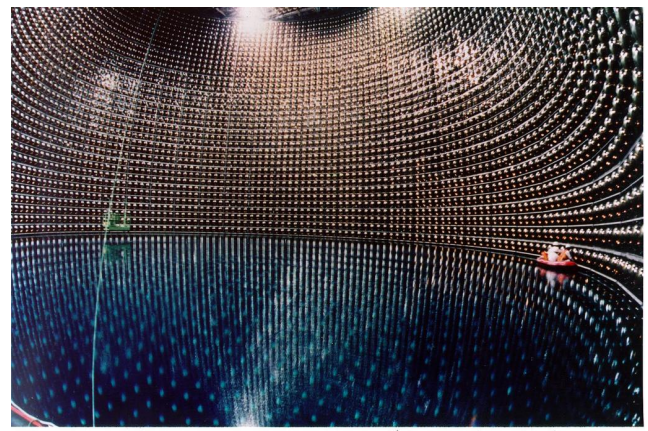
LHC:

- Tier1 for ATLAS, CMS and LHCb.
- Tier2 and Tier3 for ATLAS.



T2K: Long baseline neutrino oscillation experiment.

- Tier2 hosting replicas of raw files for distributed processing and a subset of MC.



Astrophysics

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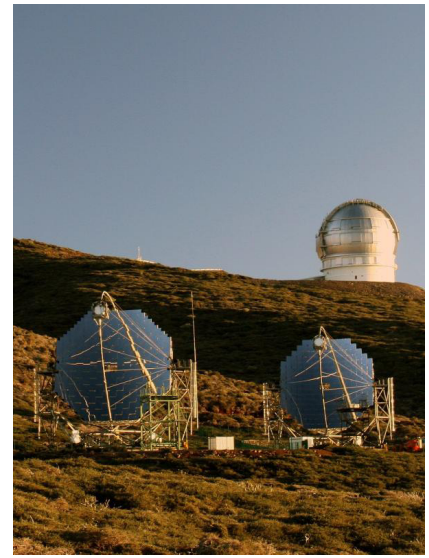
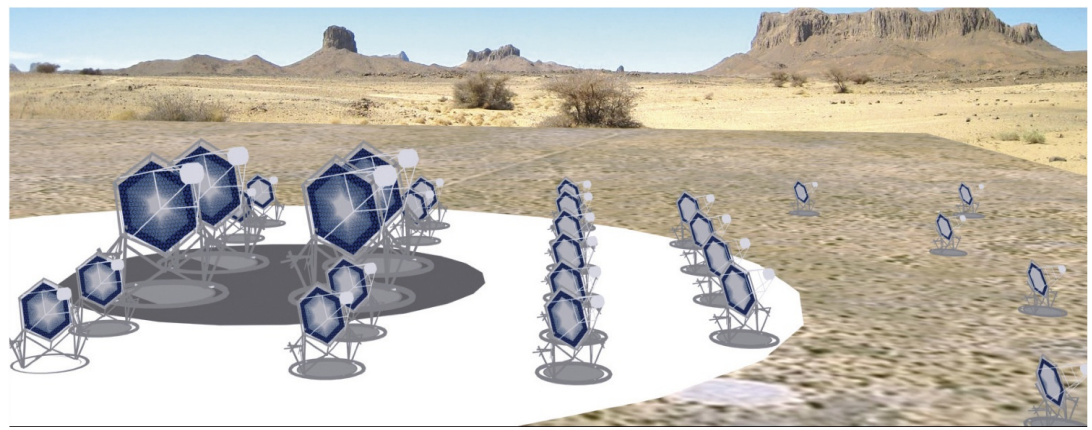
MAGIC: Gamma ray telescopes located in La Palma.

- PIC acts as the reference Data Center (Tier0).
- Analysis facility for the whole collaboration.



CTA: Array of gamma ray telescopes (preparatory phase 2010-2013).

- Grid center for MC production.
- Operation of DIRAC workflow manager servers.



Cosmology

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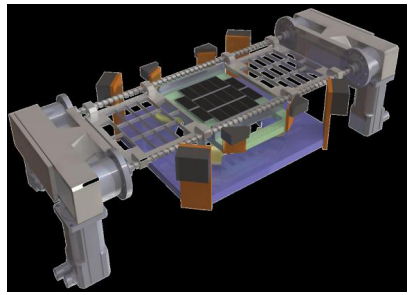
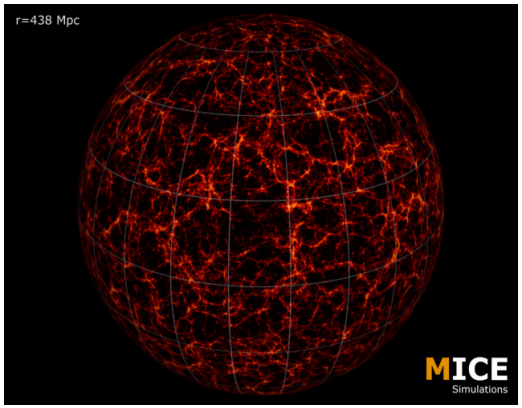
PAU: Sky survey to study cosmological parameters (dark energy).

- Storage of the data.
- Development of some of the data processing tools and the objects catalog.



MICE: Largest cosmological dark matter simulations to date.

- Generated in supercomputers.
- Transferred to PIC for further analysis.



EUCLID: ESA mission due to start in 2018.

- PIC is the Spanish Scientific Data Center.
- Simulations work to start in 2012.

Life Sciences

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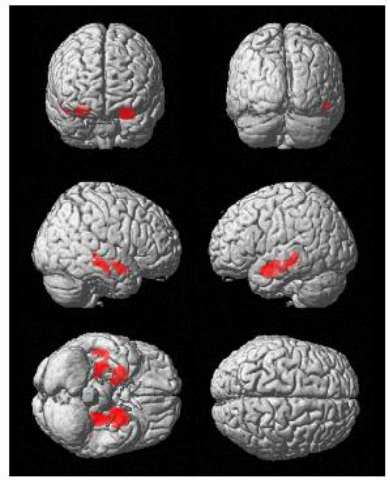
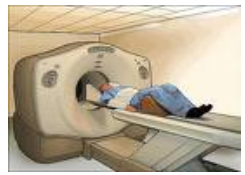


Medical Imaging:

- Collaboration with various local Hospitals to support research in neurodegenerative and psychiatric deseases.
  - Support on MRI data management, processing and analysis through portalised services.



- Pilot project: Simulations for development and validation of new generation Positron-Emission-Tomography (PET) scanner (European Research Council advanced grant).

Genomics:

- Pilot project for remote archive of genome sequencing data.

Resource Sharing: CPU

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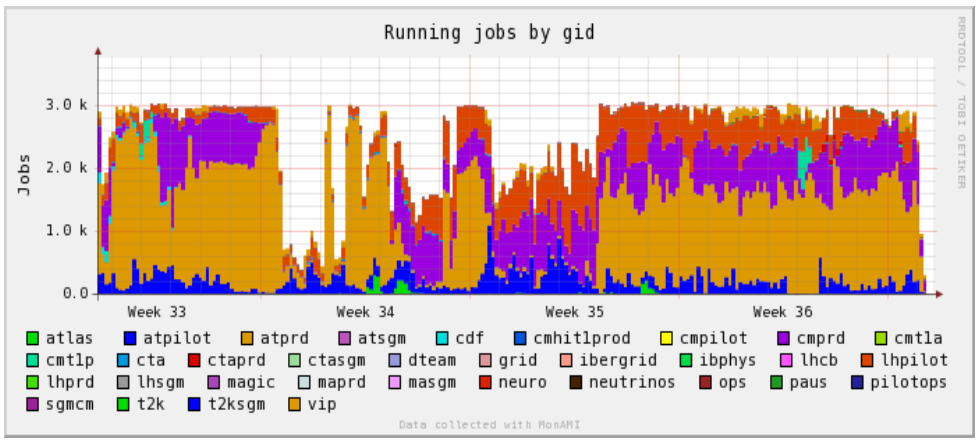
CPU considered as a "volatile" resource.

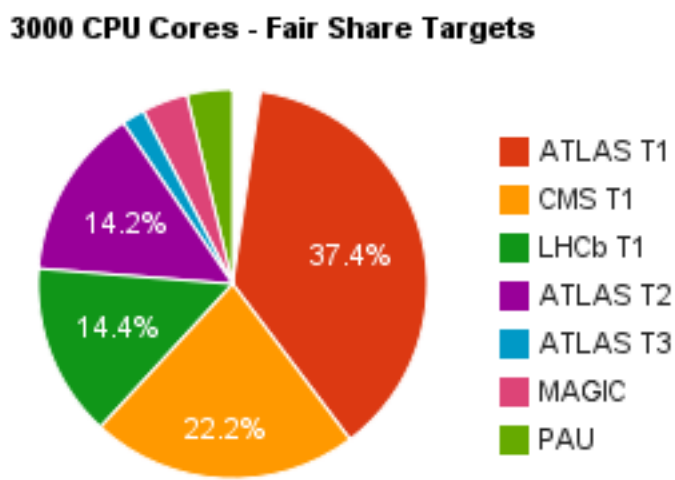
- VOs want to be able to reach their share in reasonable time (hrs).

Fair share targets set according to funding.

- 90% of resources from LHC.

Load not uniform: room for opportunistic usage of the CPU.





Storage Services

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PIC specialises in Mass Storage Services.
Several years experience with dCache.

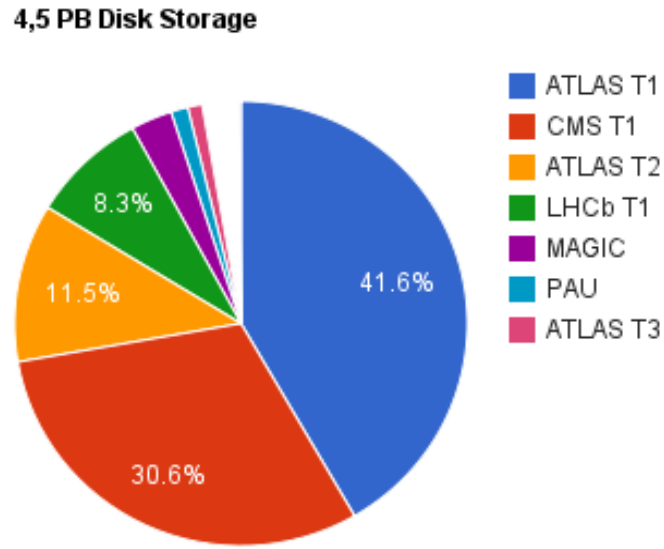
Adapt workflows of non-LHC VOs requiring lots of storage to be able to use dCache: Astrophysics, Cosmology, Genomics.

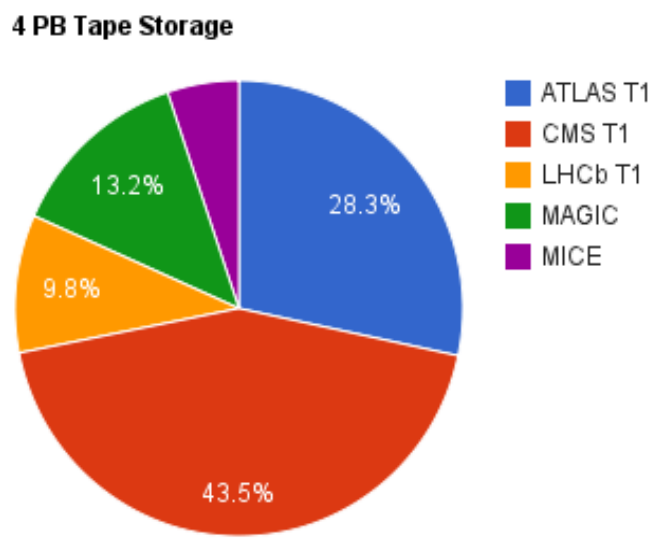
- Benefit from a scalable, robust service.

~3% NFS: users requiring POSIX access.
Few TB volumes.

Enstore (from FermiLab) used for tape.

- Good integration with dCache.
- All Tape Storage via the dCache/Enstore stack.





Multi-VO Challenges: OPS

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Large part of resources LHC Tier1 => 24x7 operations (on-call shifts)

- Limited manpower (technical group ~ 10 FTE) => Lots of effort put in monitoring and resilience.
- *Aim:* Encourage non-LHC VOs to adopt WLCG services to benefit from economies of scale.
  - **:-)** Profit from high quality services.
  - **:-(** Often needs adaptation.

Some non-LHC VOs using some Grid services. Our experience is that they are not that fans of operational tools.

- GGUS: Get 10-15 GGUS/month for the LHC. Only got 1 from T2K and 0 from Magic (using local ticketing system).
- GOCDB: Very useful to communicate SD to VOs. Used only by LHC. Need classic e-mail communication with Magic for instance.

Middleware

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Grid services at PIC: gLite stack deployed (EGEE/WLCG site)

Aim: try to use gLite tools to address needs, whenever possible.

MICE: Use FTS/scp custom deployed channel to transfer cosmology simulation data from Mare Nostrum supercomputer to PIC (*http://bit.ly/pldMaE*).

MAGIC: Use FTS/SRM to implement the data transfer from the telescopes to the Tier0 (*http://bit.ly/oZw293*).

PAU: Data processing pipeline using WMS/DAG (*http://bit.ly/rh0UK8*).

- FTS/SRM usage also planned for Telescope-Tier0 data transfer.

Genomics: Remote Tape Archive for sequencing data.

- Use SRM/dCache/Enstore to let the data manager remotely trigger pre-stages from tape previous to massive data recalls.

Middleware

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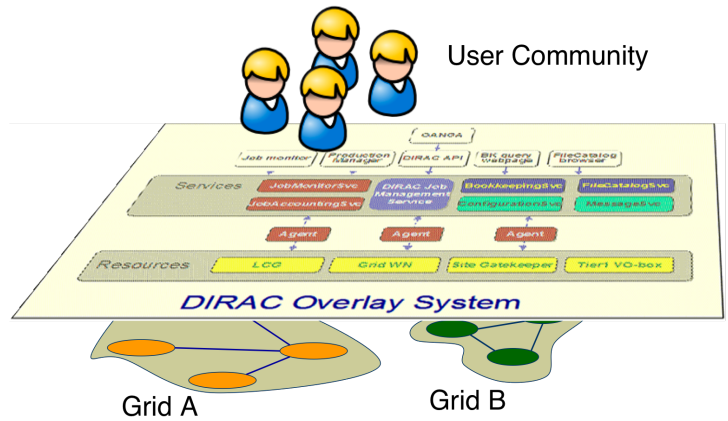
Reliability of Grid m/w has improved a lot with the years. Most important for us is that basic services are rock solid.

- Good building blocks for a distributed HTC infrastructure.
- Customization falls on the side of the VO or 3rd party (pilot or data transfer frameworks, etc).

Multi-VO sites can also help in fostering the adoption of VO-developed m/w by other disciplines.

- DIRAC: Grid framework developed in the context of LHCb, but exportable to other user communities.
  - CTA currently using DIRAC server at PIC to manage MC production on the Grid.



Portals

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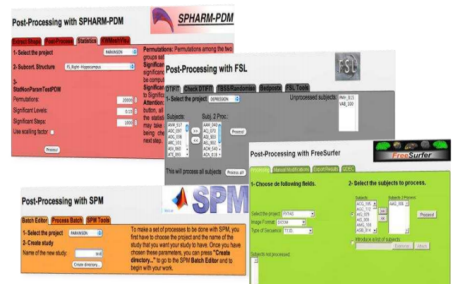
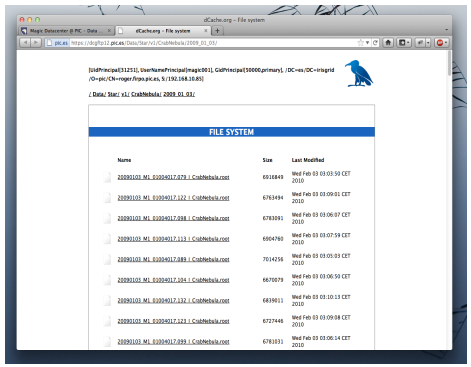
Medical Imaging:

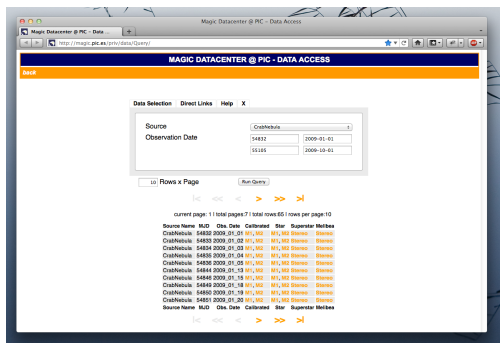
- PIC provides support in:
  - Storage and management of MRI data.
  - Fast processing of lots of images.
  - Statistical analysis of results.
- Does this through a portal (PIC Neuroimaging Center).



MAGIC Telescope:

- Web portals used for SE and Catalog browsing.





Look Ahead

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Long term sustainability implies adopting standards and improving the ease of use for services.

This is one of the axes for the cloud computing movement.

Computing: Adapt current computing (CE/batch) services to offer cloud interfaces: private/academic cloud initiatives.

Storage: Follow the dCache track: invest in testing/prototyping services making use of NFS 4.1, http as data access protocol, etc.

Database: Cosmology projects are becoming users of large DBs. Current implementation at PIC on Relational DB - explore NoSQL technologies.

Sustainability?

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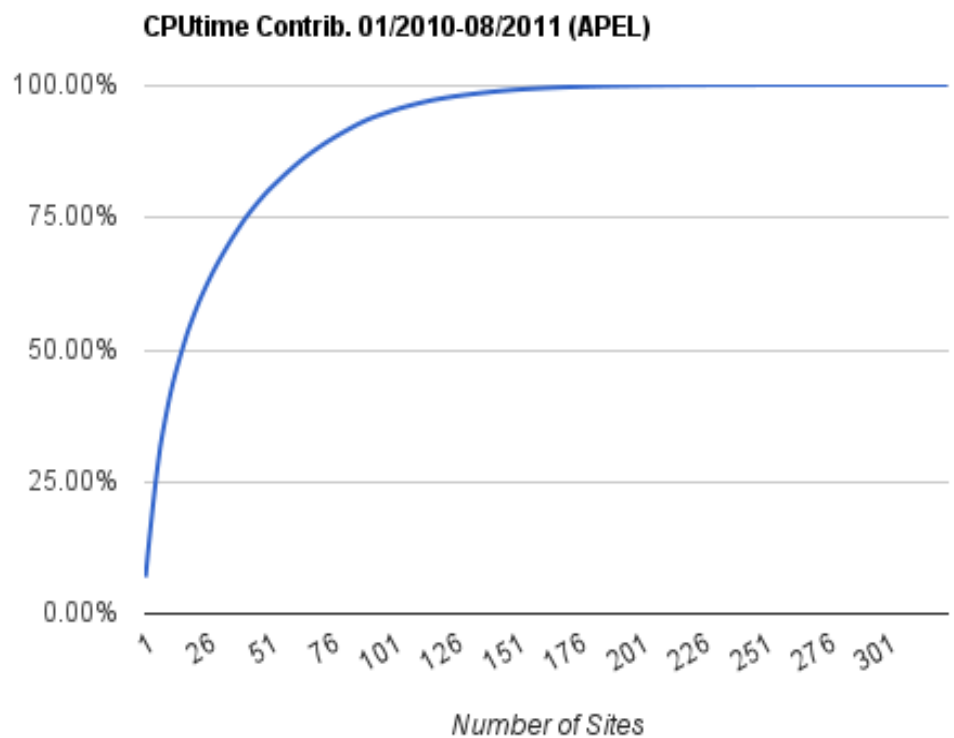
Large part of the workload goes to small fraction of large sites (50% done in 16/325 sites).

Large part of the operational effort may be goes to small sites.



Summary

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Today, production quality Grids are a reality.
From long experience from EDG/EGEE/EGI we learned:

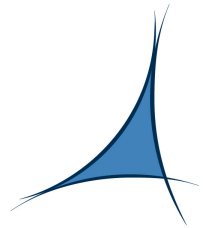
Sustainability: Focus on deploying basic & reliable building blocks.

- Services: CE, SE, FTS, (WMS, LFC)
- Operations: Monitoring, Tickets, Resources & Sched. Downtimes DB, AuthN/AuthZ, Accounting (extend to storage)

Custom services will spawn from the different UC

- E.g. workload (pilot job) frameworks, CernVM-FS, etc.
- Effort on disseminating them for multi-VO adoption. Multi-discipline large centres can play a role here.

Common situation at several of the large Resource Centres. A coordinated action could help in focusing goals and getting results.



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Thank You

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