

CIEMAT Computing activities

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EXCELENCIA
MARÍA
DE MAEZTU



- Scientific Computing within the “Unidad de Excelencia María de Maetzu” Particle Physics Unit at CIEMAT currently involves 16 members, including Particle Physicists, Computer Scientists, Engineers and Technicians, lead by
 - José María Hernández, Head of CIEMAT Scientific Computing Unit
 - Gonzalo Merino, Deputy Director of PIC
 - Josep Flix, Head of the Spanish Tier-1 center for LHC
- Current FPA project: **“Tier1 and Tier2 data processing, simulation and analysis for the LHC experiments, Phase V. FPA2016-80994-C2-1-R”**, co-IP by J. Flix and J. M. Hernández
- The team is distributed between two centers, at CIEMAT headquarters (Madrid) and Puerto de Información Científica, PIC (Barcelona), a coordinated effort with IFAE

- CIEMAT Scientific Computing participates in the development and implementation of **data-intensive distributed computing technologies**, such as Grid and Cloud computing, providing infrastructure and support to **Particle Physics, Astroparticle and Cosmology projects**
- Contributes two computing centers to the **Worldwide LHC Computing Grid (WLCG)**
 - **Tier-1 at PIC**, supporting **CMS, ATLAS** and **LHCb**, including 8k CPU cores, 2x20 Gpbs WAN, 9 PB of disk and up to 50 PB of tape storage (25 PB currently in use)
 - **Tier-2 at CIEMAT Madrid**, supporting CMS, including 2.5k CPU cores, 2x10 Gpbs WAN and 2 PB of disk



- The group has participated since the early 2000s in the **WLCG computing effort, essential for the fruitful exploitation of the LHC data**
- Our team hosts and operates a share of the **WLCG infrastructure**, which involves supporting the LHC experiments computing needs at all levels:
 - Storage and distribution of RAW LHC data (LHC-OPN to Tier-1 from CERN)
 - Centralized processing, storage and distribution of derived experimental datasets
 - Centralized tasks for production and distribution of simulated datasets
 - Dedicated resources and support for local researcher communities
- As part of the current project, we are also working to advance in:
 - **Federation of our resources** despite their geographical separation
 - **Elasticity to expand** to external resources such as Cloud and HPC

- In addition to hosting and operating the Tier-1 and Tier-2 infrastructure, the CIEMAT team actively participates in the following groups:
 - WLCG and CMS Computing Management boards
 - WLCG and CMS Computing TFs and WGs
 - HEPIX and HEP Software Foundation (HSF) WGs

- The CIEMAT computing team is deeply **involved**, together with the rest of the community, in the **R&D efforts to bridge the computing challenges that the HL-LHC phase presents**:
 - Data Organisation, Management and Access
 - Facilities and Distributed Computing

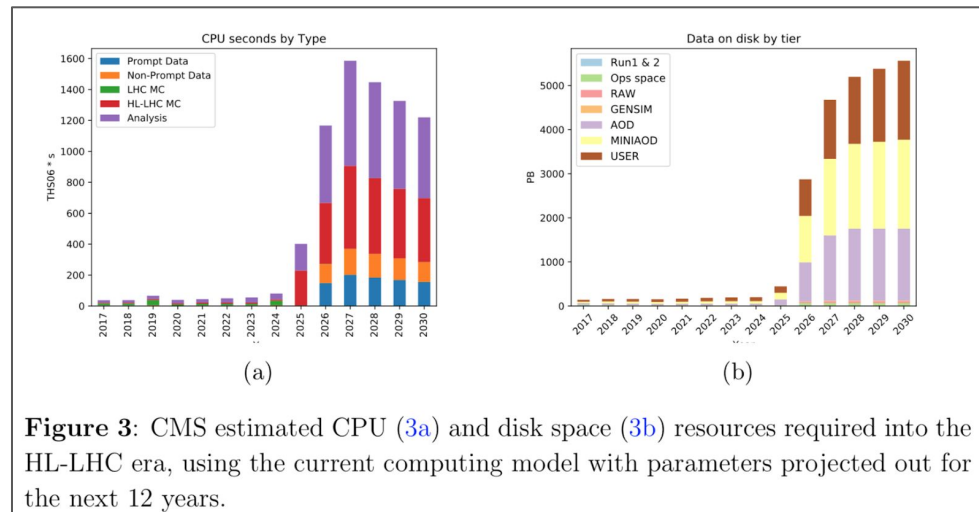
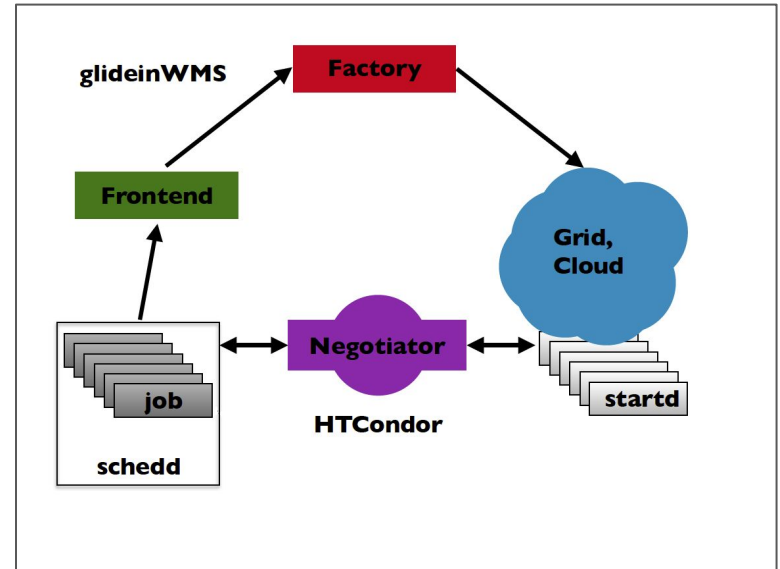
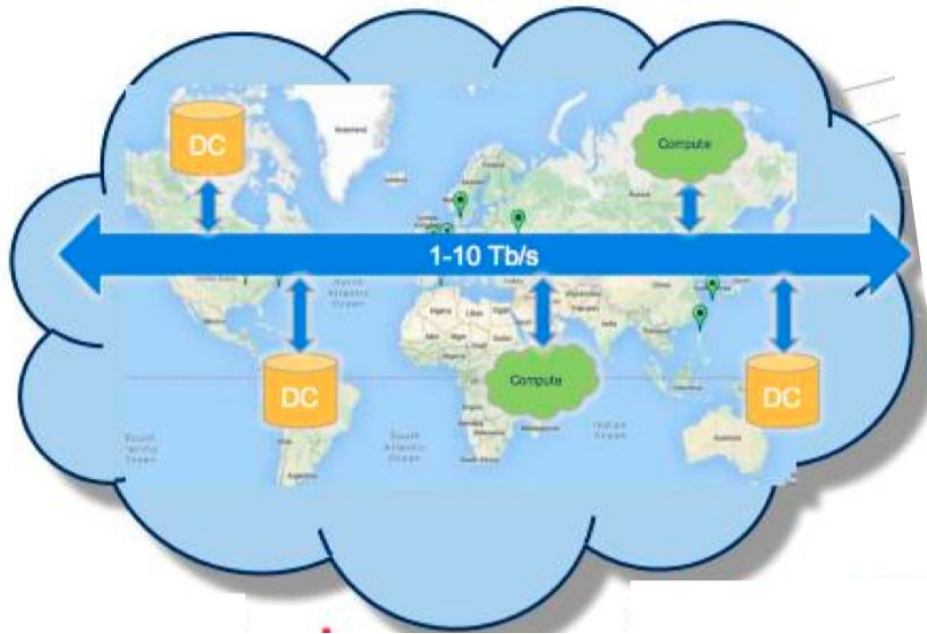


Figure 3: CMS estimated CPU (3a) and disk space (3b) resources required into the HL-LHC era, using the current computing model with parameters projected out for the next 12 years.

A couple of examples:

- CMS Submission Infrastructure
- DOMA project for “data lakes”



- CIEMAT Scientific computing
- Summary of research activities in the CIEMAT Computing group
- Research at PIC
- HSF work towards the CWP
- A Roadmap for HEP Software and Computing R&D for the 2020s