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Distributed Computing and Data Analysis in the CMS Experiment: the Spanish and Portuguese case

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By the end of 2009, the CMS Experiment at the Large Hadron Collider (LHC) has already started data taking with proton collisions at 450 GeV and 1.2 TeV per beam. CMS has invested a few years to build a robust Distributed Computing system to meet the expected performances in terms of data transfer/archiving, calibration, reconstruction, and analysis. Here, we will focus on the readiness of the Spanish and Portuguese computing centers (PIC [Tier-1], CIEMAT, IFCA, LIP-Lisbon, and NCG-INGRID-PT [Tier-2s]) to first LHC collisions and the measured performance in the Iberian region by April 2010.

Detailed analysis

Being prepared for LHC data taking does not come for free: in recent years, CMS has conducted a series of Computing, Software, and Analysis challenges to demonstrate the functionality, scalability and usability of the relevant components and infrastructure. These challenges have been designed to validate the CMS distributed computing model and to run operations in quasi-real data taking conditions or even beyond expected levels. Additionally, CMS extensively and routinely test all relevant aspects of a Grid site, such as the ability to efficiently use their network to transfer data, the functionality of all the site services relevant for CMS and the capability to sustain the various CMS computing workflows (Monte Carlo simulation, event reprocessing and skimming, data analysis) at the required scale. Some figure of merits: around 32 PBs of data transferred in 2009 among distributed >60 computing centres worldwide; millions of jobs run, so far, for CMS Monte Carlo simulation, event reprocessing and skimming, data analysis...

Conclusions and Future Work

After all the preparation work, we can proudly state (and believe) that the CMS Distributed Computing is prepared for data taking. However, the real challenge is coming now, with hundreds of users analyzing the data and central CMS Data Operations and Facilities Operations teams coping with workflows of real data coming from the detector in a quasi-continuous mode. For sure, difficulties will emerge during 2010, resulting in a very exciting first year of LHC data taking.

Impact

In February 2010, after LHC-protection and beam commissioning, first collisions at 3.5 TeV per beam are expected. CMS is confident to cope with all the computing load resulting from this long 2010 run, with hundreds of physicists using the infrastructure to easily access and start analysing the long awaited LHC data. For the first time, the CMS Distributed Infrastructure will cope with data, resulting from LHC proton collisions at the detector. The Spanish and Portuguese communities have prepared to receive and analyze the wave of real data. This contribution focus on the description of the CMS distributed system, the preparation for data taking, and the overall result of using the infrastructure, particularly focussing on first data taking experiences on the Spanish and Portuguese computing centres.

Keywords

CMS Distributed Computing Grid Analysis

URL for further information

https://twiki.cern.ch/twiki/bin/view/CMS/WorkBookComputingModel

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