CMS Computing Facilities Operations

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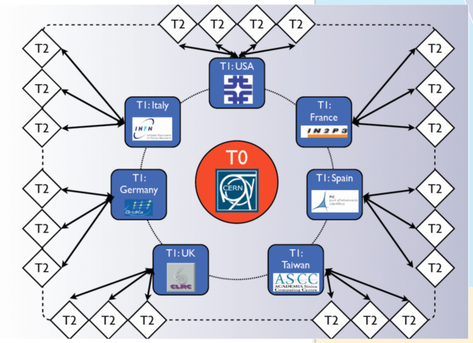
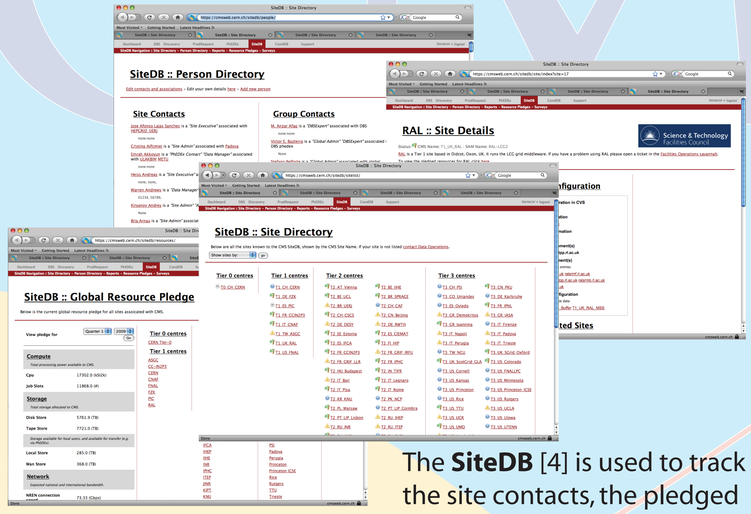
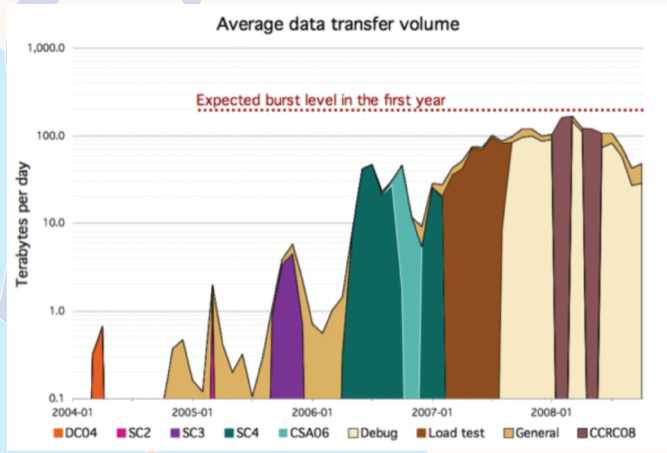
The CMS Computing Model and the Tiers supporting the CMS VO

The CMS experiment [1] has developed a Computing Model [2, 3] designed as a distributed system of computing resources and services relying on Grid technologies. The Workload Management and Data Management components of the Computing Model are now well established and are constantly being exercised and improved through CMS-wide computing challenges, and first real cosmic data taking exercises, in preparation for the LHC collision data taking.



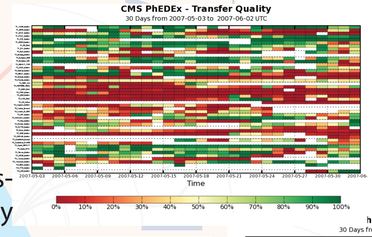


The **SiteDB** [4] is used to track the site contacts, the pledged resources, and much more [5].



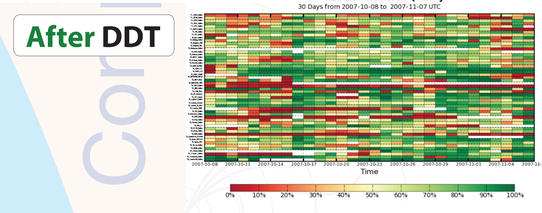
Debugging Data Transfers (DDT) and transfer links in Site Commissioning

An ad-hoc task force was created to coordinate the debugging of data transfer links, in order to commission most crucial transfer routes among CMS tiers by designing and enforcing a clear procedure to debug problematic links. The DDT procedures are now part of the commissioned links overview by the Site Commissioning project.



Before DDT

An improvement in overall transfer quality is clearly visible.



After DDT

Progressing with challenges

The CMS Facilities Operations project designed continuous scale exercise in some areas of CMS Computing, e.g. the LoadTest infrastructure for data transfers. Together with WLCG computing challenges and CMS-specific data challenges, this helped to reach confidence that the experiment will be able to deal with the data transfer rates required at the start of LHC.

The CMS Facilities Operations tasks

Facilities operations at CERN
- Coordination of systems/networking provision and Operations with CERN-IT; CMS VoBoxes maintenance; T0/CAF set-up [6]

Distributed working fabric on Grid WM's
- overview on usage of submission systems
- liaisons with developers and WLCG/EGEE/OSG projects and Grid ROC's

Distributed working fabric on DM (Storage/SRM)
- SRM specifications /implementations for storage systems in use by CMS
- constant control over PhEDEx interface to gLite FTS

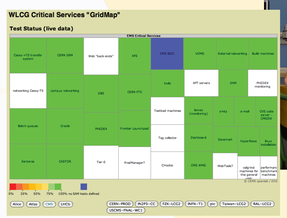
Resource allocation and planning
- planning and progress tracking on CPU, storage, network
- interface to IT and Grid accounting projects

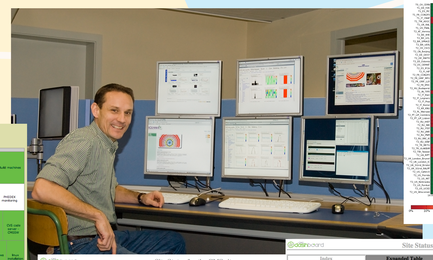
Site usability and protection of CMS use-cases
- CMSSW deployment; CMS T1 and T2 coordination; contact with SiteDB project [4,5]
- downtime/upgrade/availability overview
- Overall LoadTest infrastructure and Prod/Debug/Dev PhEDEx set-up

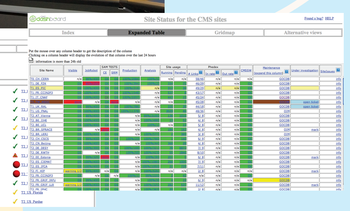
Facilities Troubleshooting and Ticket tracking
- "error listing" project in data transfers; regular reports to WLCG Ops daily call
- constant tickets overview, maintenance of a 'hot topics at sites' blackboard
- steering of computing-related {Savannah, GGUS} tickets for Operations

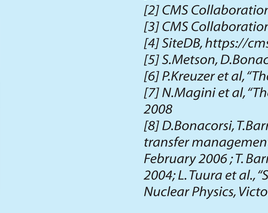
CMS Computing shifts

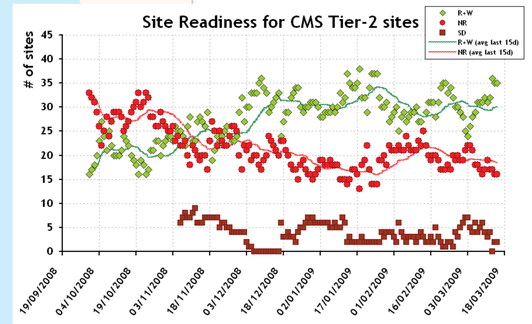
The CMS Facilities Operations project overviews the CMS Computing shifts, aimed to enforce systematic and procedural controls over the overall computing infrastructure. It is a running activity since Fall 2008, profiting of a growing team of (currently) >35 people. Procedures are set and constantly improving. Warning and alarm are triggered to operators, site contacts, and expert on-call per activity. The shift activity is also very important to link the CERN P5 control room to the CMS Center and the distributed centers. Monitoring tools and overview systems are widely improved by and used for regular computing shifts . Some examples are shown below.











References

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[2] CMS Collaboration, "The CMS Computing Model", CERN LHCC 2004-035
[3] CMS Collaboration, "The CMS Computing Project Technical Design Report", CERN-LHCC-2005-023
[4] SiteDB, https://cmsweb.cern.ch/sitedb/
[5] S.Metson, D.Bonacorsi, "SiteDB: Marshalling the people and resources available to CMS", this same Conference
[6] P.Kreuzer et al, "The CMS CERN Analysis Facility (CAF)"
[7] N.Magini et al, "The CMS Data Transfer Test Environment in Preparation for LHC Data Taking", NSS-IEE, Dresden 2008
[8] D.Bonacorsi, T.Barrass, J.Hernandez, J.Rehn, L.Tuura, J.Wu, I.Semeniouk, "PhEDEx high-throughput data transfer management system", CHEP06, Computing in High Energy and Nuclear Physics, T.I.F.R. Bombay, India, February 2006 ; T. Barrass et al, "Software agents in data and workflow management", Proc. CHEP04, Interlaken, 2004; L. Tuura et al., "Scaling CMS data transfer system for LHC start-up ", CHEP07, Computing in High Energy and Nuclear Physics, Victoria, BC, Canada, September 2007