CMS Tier 3 Overview

Rob Snihur
University of Nebraska, Lincoln

OSG Storage Forum
University of Chicago

Tier 3 - Why?

- **Analysis**
  - **Now: Use CMS framework: cmsRun exe, submit via <u>C</u>MS <u>R</u>emote <u>A</u>nalysis <u>B</u>uilder (CRAB)**
  - **Future: ROOT/PAT ntuple analyses?**
  - **Priority given to local physicists (<20), but also CMS & non-CMS VOs**

- **Monte Carlo production**
  - **opportunistic**

- **Leverage campus computing resources**

What is a Tier 3?

- **No official definition of a "Tier 3"**
  - **Different sites tried different approaches**
  - **Organic evolution:
    large Tier 3s learn from Tier 2s,
    small Tier 3s learn from large Tier 3s**
  - **Community support**
- **About 30 Tier 3 sites in US**
  - **More coming online**

Site Set Up

- **Batch system**
  - **Condor (most popular), pbs, sge, etc.**
- **Grid enabled with OSG**
  - **Compute Element**
  - **Storage Element**
- **CMS specific**
  - **CMSSW, multiple versions**
  - **Phedex**
  - **CRAB**

Hardware

- **Service nodes**
  - **Many sites have a single node**
  - **A few have multiple nodes to split services (CE, GUMS, etc)**
- **Storage**
  - **Most have a single storage element (SE)**
  - **0.1 – 100 TB**
  - **Raid boxes: RAID5, RAID6 ==> O(10) TB**
  - **nfs mounted**
  - **No tape storage**
- **Worker nodes**
  - **From 2 to 1400 (Vanderbilt) cores ; generally 10's to 100's**
  - **Many sites planning to expand**
- **Authentication**
  - **Grid-mapfile**
  - **GUMS – requires a dedicated node (or VM)**

US T3: Support

Each T3 site is supported by up to a few individuals
- grad students, faculty, USCMS software engineers, campus computing staff
- they usually have other responsibilities as well
- they install and maintain non-CMSSW software

Bockjoo Kim (Florida) installs CMSSW on any T3 if wanted.

USCMS Tier 3 coordinator: Bob Clare (UC Riverside).
USCMS dedicated T3 support:
Rob Snihur (@FNAL) & Doug Johnson (@Colorado)

Additional support from staff at FNAL, OSG, and at T2s.
- dedicated hyper news forum for osg-tier3
- community-support meetings every other week

Workshops

- **March: part of OSG All Hands**
  - **Why have a Tier 3? CRAB advantages**
  - **Start up hurdles**
  - **Distribution of expertise**

- **August: hands-on at Vanderbilt Univ**
  - **Install OSG components**
  - **Install CMS components**
 - **Discuss software choices, pros & cons**

PhEDEx

- **Physics Experiment Data Export**
  - **Data transfer tool**
  - **CMS specific**
  - **Subscribe to datasets via web interface**
  - **Highly flexible**
  - **Difficult to configure**

-

- **Central phedex service for USCMS Tier 3s**
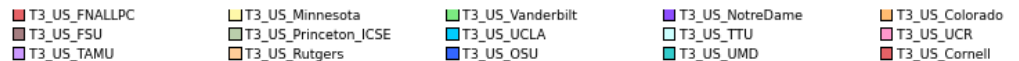 - **Maintained at FNAL**
  - **Easy to use & configure: need SE**
  - **Lcg-copy**
  - **FTS?**

CMS PhEDEx - Cumulative Transfer Volume
90 Days from Week 25 of 2010 to Week 38 of 2010
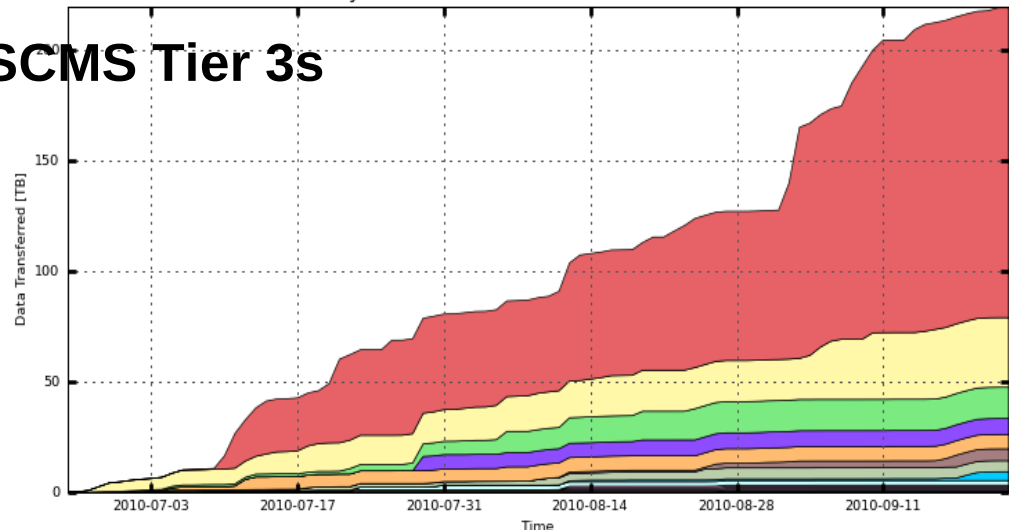
Total: 218.98 TB, Average Rate: 0.00 TB/s

Types of Storage

- **File servers with disks shared via nfs**
- **BeSTMan**
  - **Simplest & most common on USCMS Tier 3s**
  - **VDT install**
  - **Gateway mode**
- **ReDDNet – Vanderbilt, Texas Tech**
- **Xrootd – Cornell, Omaha, Riverside**
- **LUSTRE – Florida, Texas Tech**
- **HADOOP – Omaha, Colorado, Maryland**
- **Disk distributed on worker nodes**
  - **Bring job to the data?**

Summary

- **Tier 3 sites want to enable local physicists to analyze data**
  - **Desirable to run jobs just like at T2: CRAB**
- **Various hardware & software configurations**
  - **Choices influenced by existing T2 & T3**
- **Little support ==> easy to set up**
  - **Central Phedex service for T3s**
- **Storage:**
  - **BeSTMan primarily**
  - **File servers with RAIDs shared via nfs**
  - **Other solutions in use:**
  - **HADOOP, ReDDnet, LUSTRE, xrootd WAN**