# CMS Computing Readiness

11/13/09

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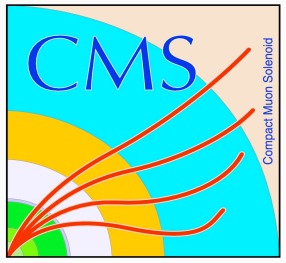
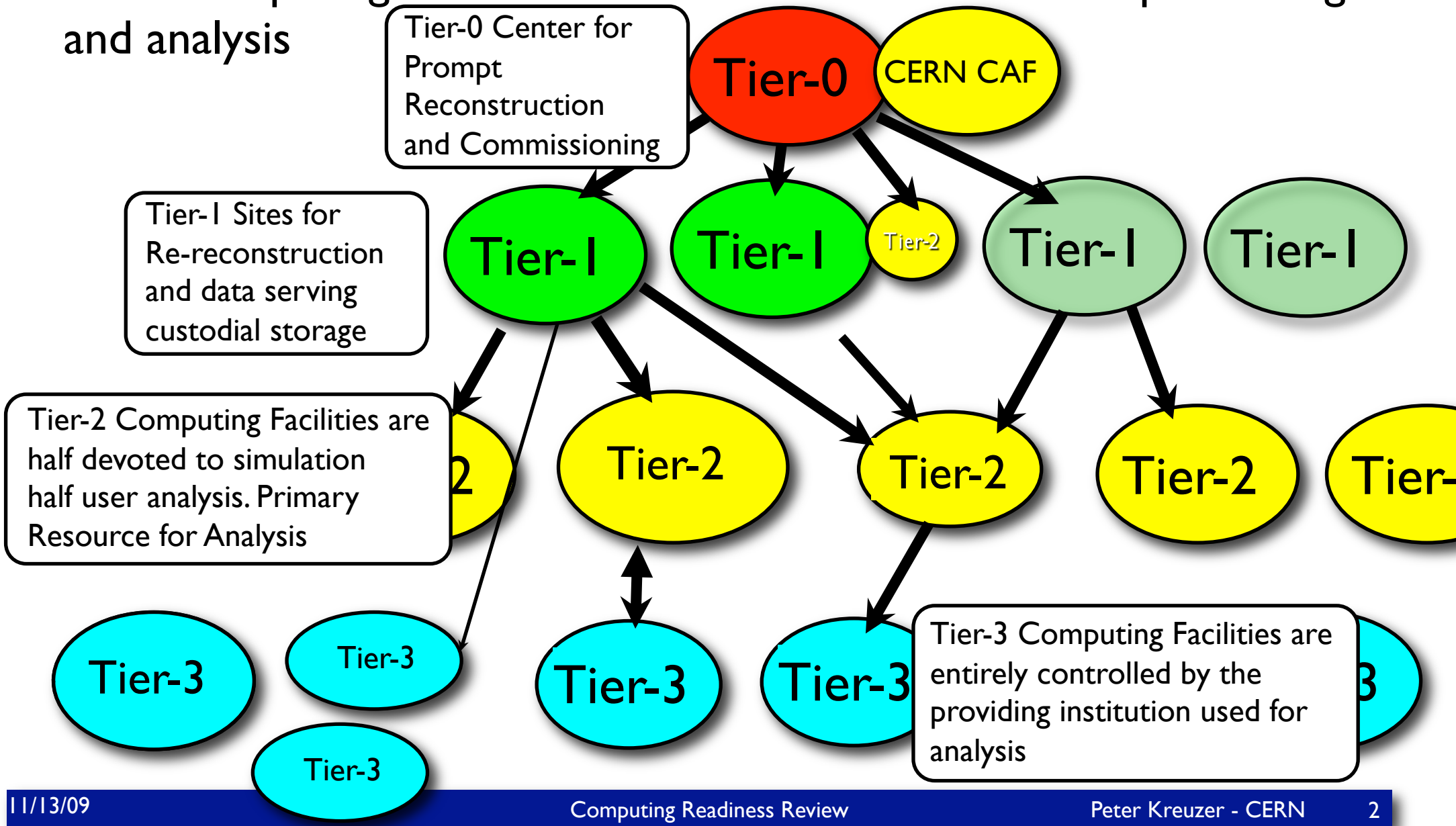
For the CMS Computing Project



# Computing Model in CMS

- CMS Computing makes user of more than 60 sites for processing and analysis



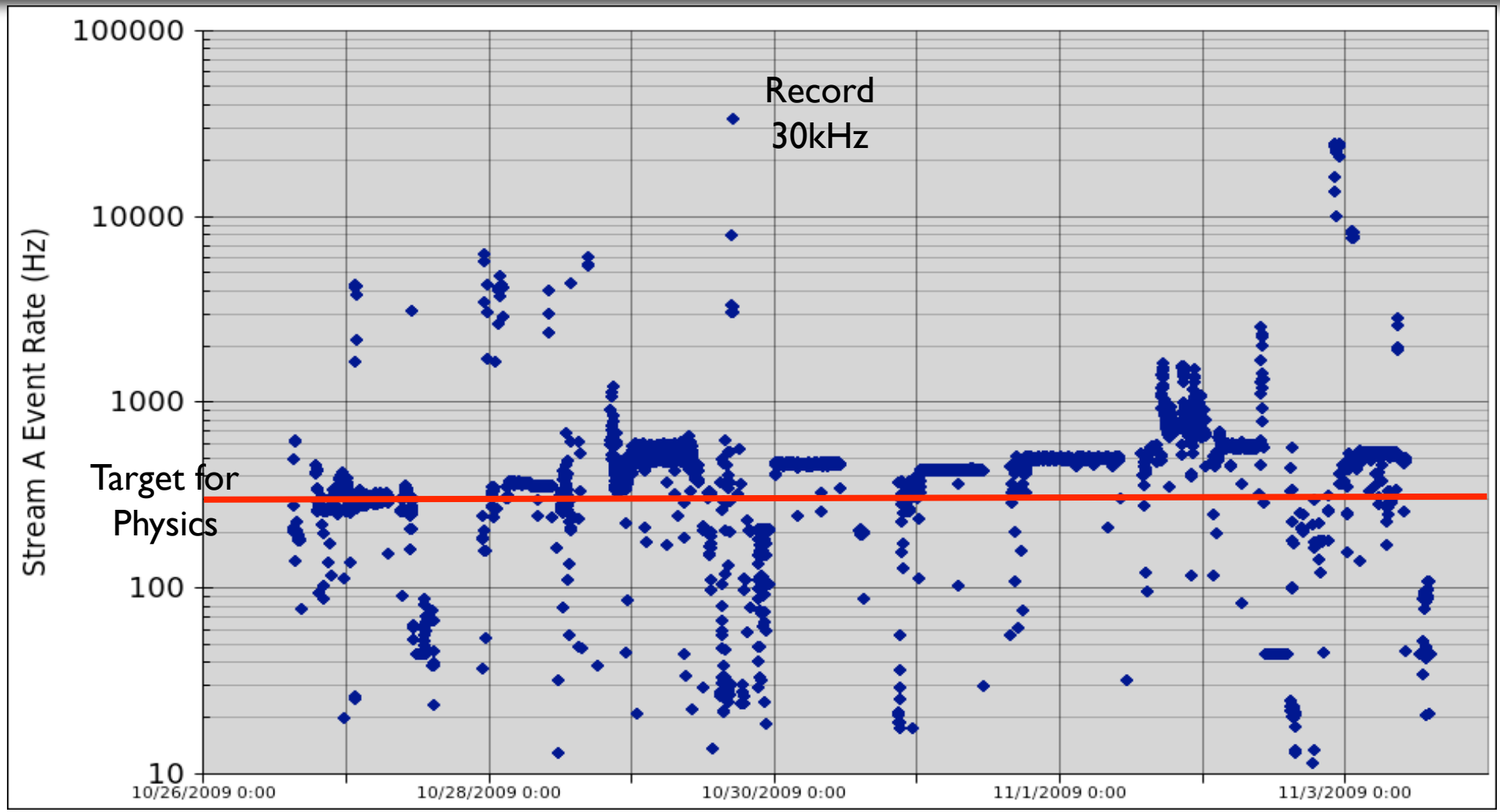
# Readiness of T0 reconstruction

- Tier-0 Facility has been routinely exercised with cosmic data taking and simulated event samples
  - Performing well

| Job Type | Total Jobs | Failures | Success Rate |
|---|---|---|---|
| Express | 342186 | 31 | 99.9909% |
| Repack | 134730 | 2 | 99.9985% |
| PromptReco | 38911 | 18 | 99.9537% |
| AlcaSkim | 41659 | 3 | 99.9928% |

- ~3000 cores
  - Local submission to farm with multiple workflows
  - Good stability and performance of CMS software

# Readiness of T0 reconstruction



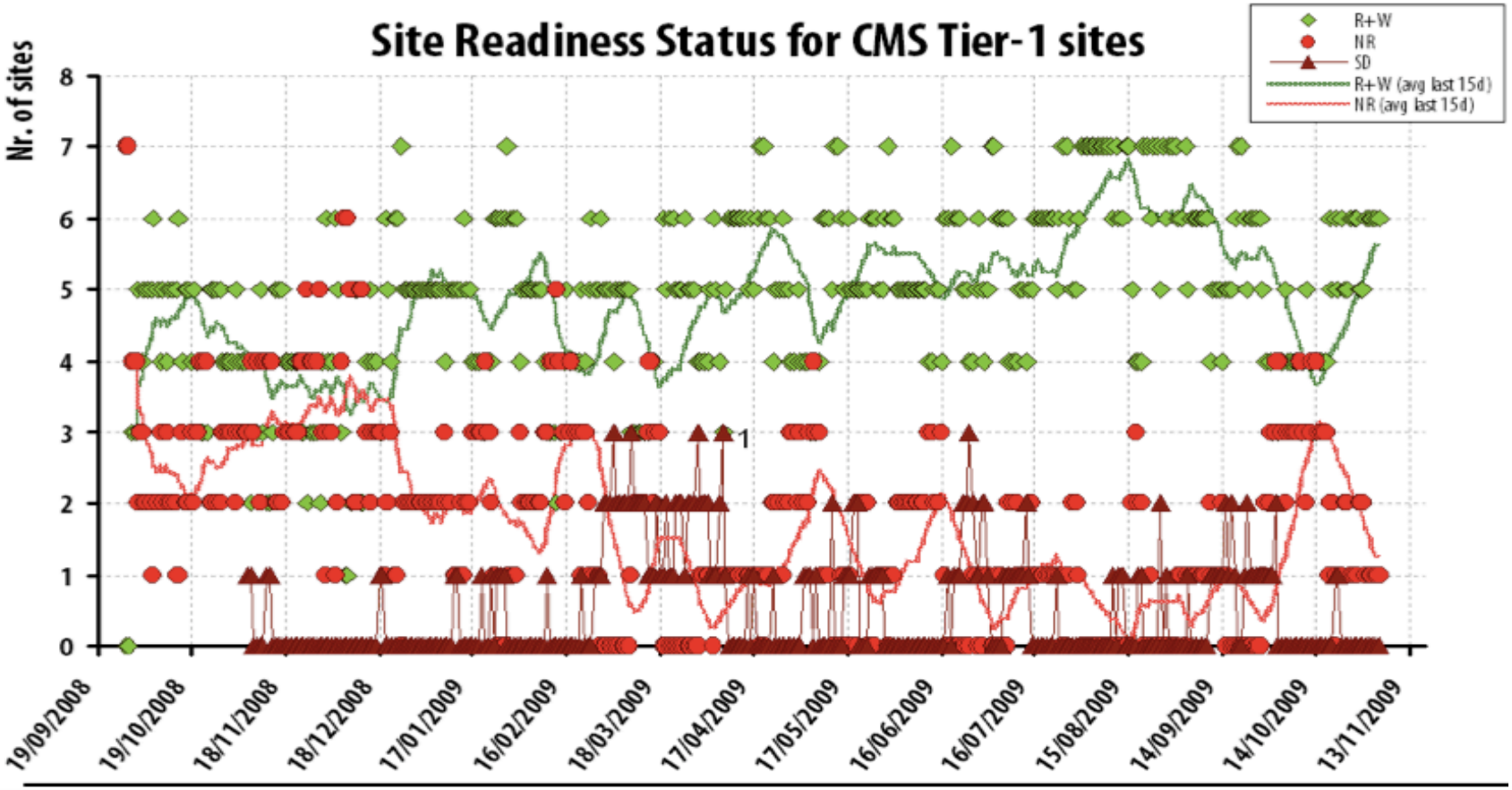

- Large dynamic range of data into Tier-0
  - Working to keep sustained operations

# CAF Readiness

- CERN Analysis Facility (CAF) is used for commissioning and low latency work
  - CPUs on the CAF are heavily used
    - CERN pledge for T0+CAF will soon increase from 29.6 to 44 kHSPEC06 ~= x1.5. Some will go into much needed increase in commissioning resources
    - Currently using multiple batch queues for prioritization. OK for startup
    - Need to provide more monitoring by group for a better overview of CPU fair share and ensure equitable usage
  - Data management
    - CAF Production and User disks well separated
    - Disk space monitoring will be done by groups
      - Need automated clean-out of older samples

# Tier-1 Availability

- CMS Stores Data Custodially at Tier-1 Centers
  - Reliability has improved, but we still see issues
    - Fall site visits were productive and action items being followed
    - During First Running non-custodial samples will ensure availability



# Readiness of data distribution to T1 for custodial copy

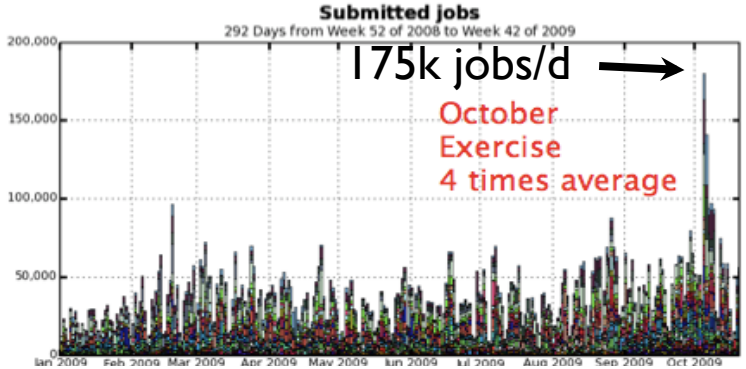
- In order to maximize availability CMS will be storing data on both sides of the Atlantic
  - We can do this in the opening of the experiment
  - Good use of distributed Tier-1 centers

| Site | CPU [slots] | Tot. Tape [TB] | Custodial [TB] | Non-Custodial [TB] | Currently Free [TB] | Currently Available (Tot.-Custodial) [TB] | Assigned PD | Available Space after tot. Storage [TB] |
|---|---|---|---|---|---|---|---|---|
| **ASGC** | 1600 | 800 | 167 | 105 | 528 | 633 | MinBias | 427 |
| **CNAF** | 750 | 804 | 677 | 162 | -35 | 127 | ZeroBias | -136 * |
| **IN2P3** | 1100 | 1309 | 608 | 50 | 651 | 701 | BeamHalo,MinBias | 530 |
| **FNAL** | 8000 | 7100 | 1370 | 1400 | 4330 | 5730 | MinBias,ZeroBias, BeamHalo,Cosmics,Calo,FEDMonitor,HcalHPDNoise, MinimumBiasNoCalo, RandomTriggers, RPCMonitor, HcalNZS, TestEnables | 3839 |
| **KIT** | 700 | 2000 | 472 | 1 | 1527 | 1528 | Calo,HcalHPDNoise, HcalNZS,TestEnables | 1396 |
| **PIC** | 560 | 974 | 297 | 217 | 460 | 677 | FEDMonitor, RandomTriggers, RPCMonitor,MinimumBiasNoCalo | 419 |
| **RAL** | 1000 | 1887 | 574 | 76 | 1237 | 1313 | Cosmics | 1136 |

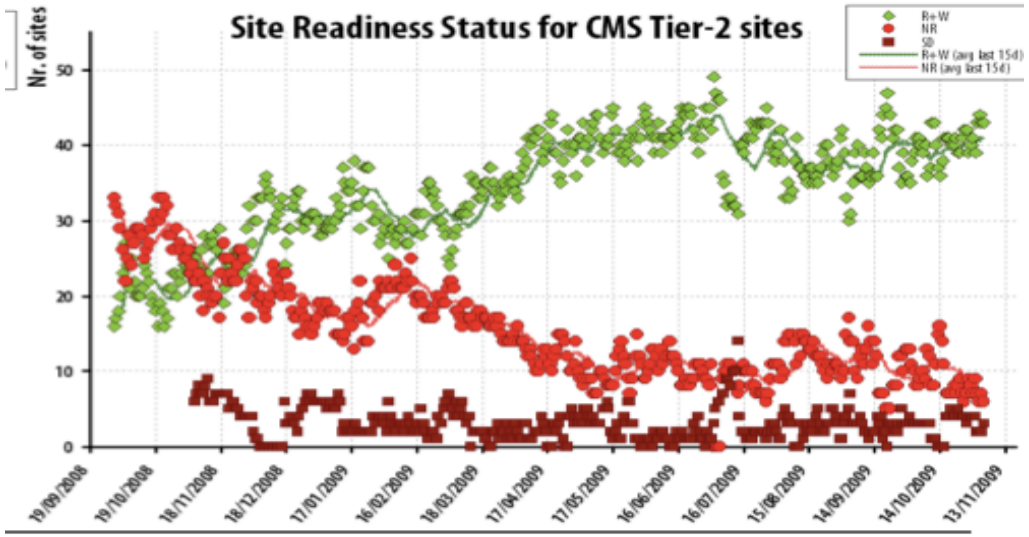
* Plan depends on additional media

# Readiness for Analysis

- During October CMS conducted a large scale analysis exercise
  - Have large experience and demonstrated success in users using CRAB (CMS Analysis submission tool) to process MC data,
  - Rate of jobs is similar to expectations in the Computing Model
  - Some scaling issues of workflow architecture specifically in staging out user files.

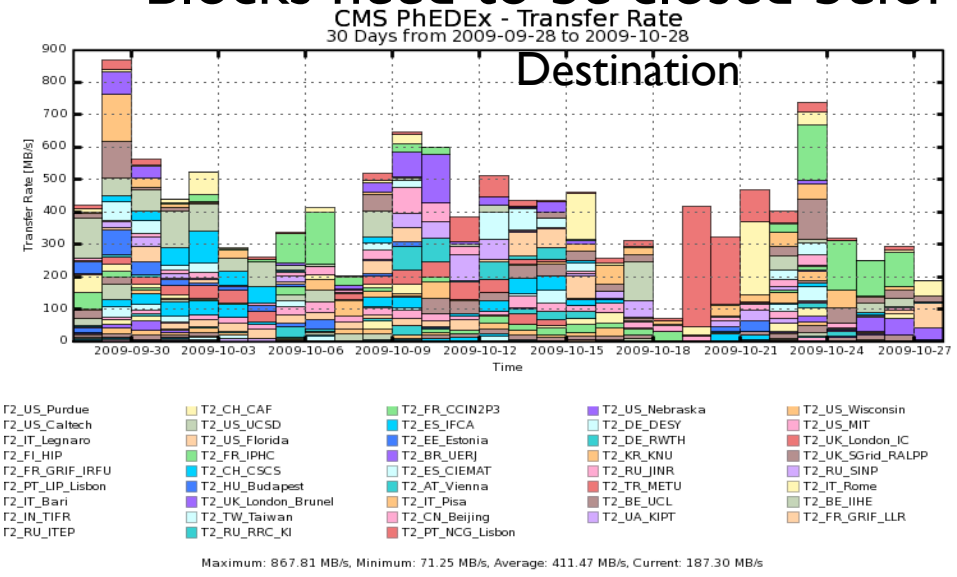


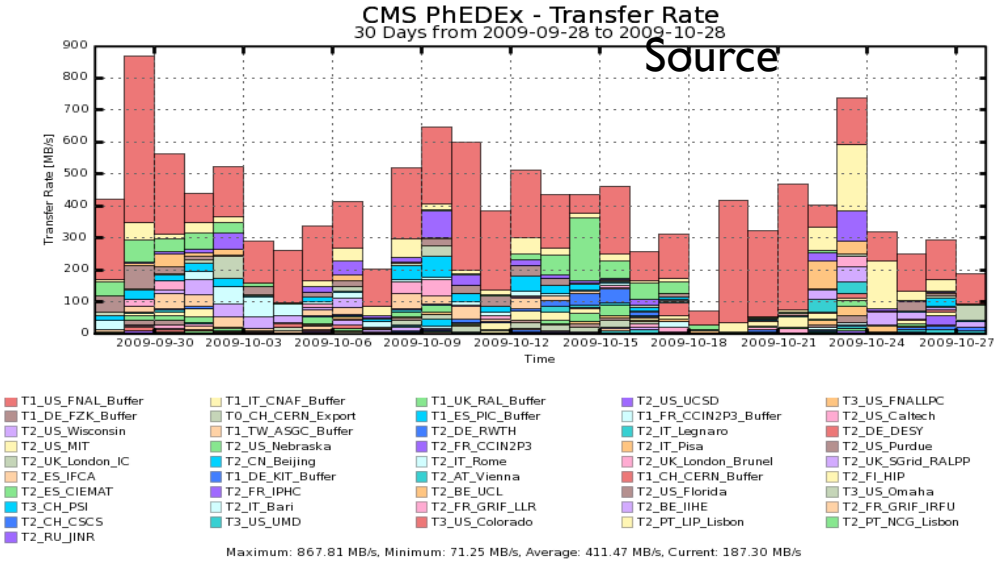

Introduced CRAB client that checks against common user errors before job submission.



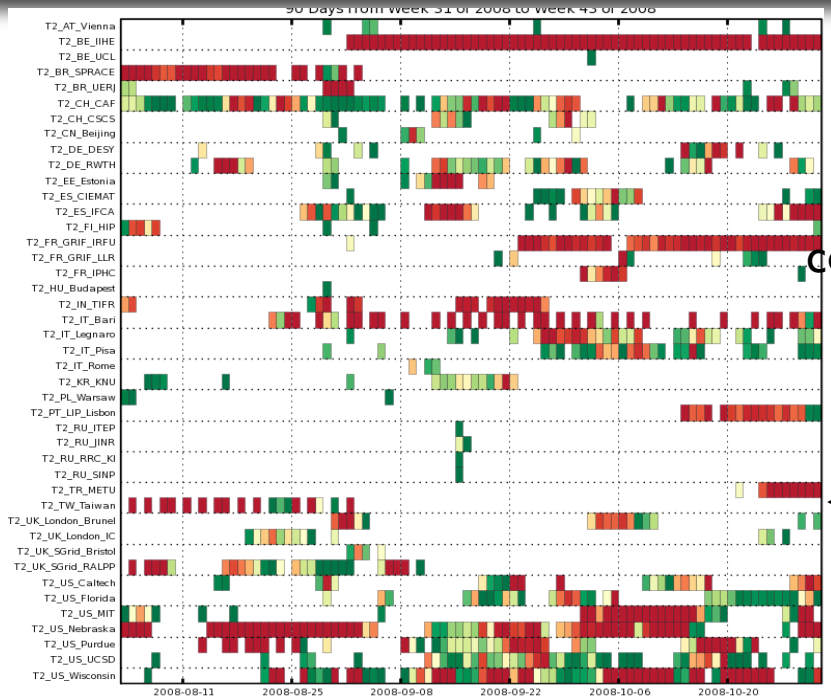
# Readiness for T2 data distribution

- Samples successfully replicated in Oct Ex.
  - 45 Tier-2s Received Data, 30 Tier-2s were a source of data
  - Rates observed total out of Tier-1s are not as high as we expect from the planning.
    - Working on dedicated load tests
  - Latency for successfully closing a block of data varies widely by destination and is generally high. Need work with developers
    - Blocks need to be closed before data is accessible



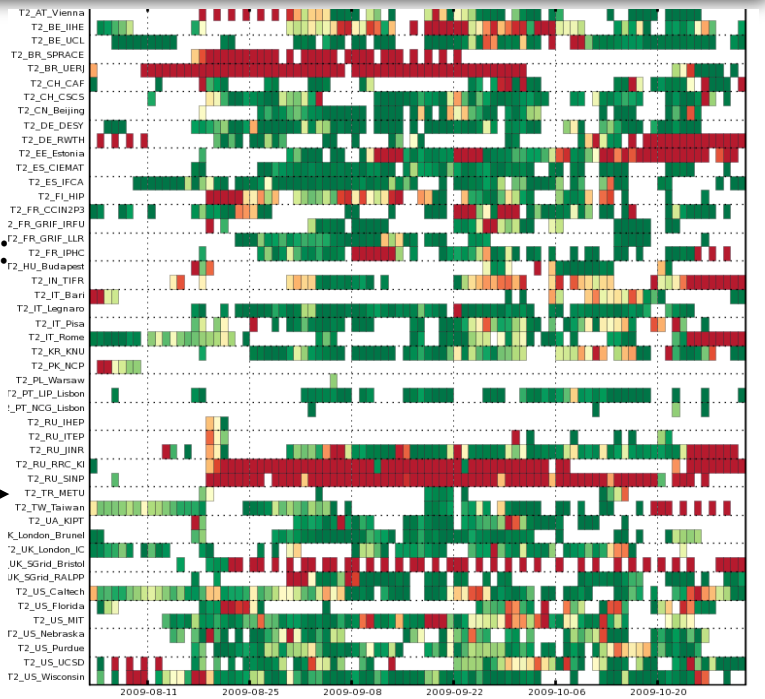



# Readiness for T2 Data Distribution

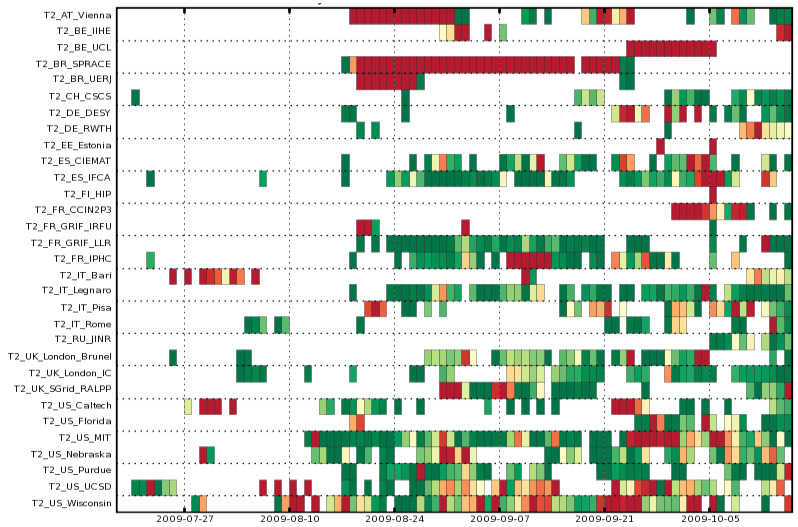



Considerable effort in commissioning transfers:
Transfer Quality
Tier-1 to Tier-2
3rd quarter

2008 → 2009




Tier-2 to Tier-2 Transfers:
Many permutations improving quality

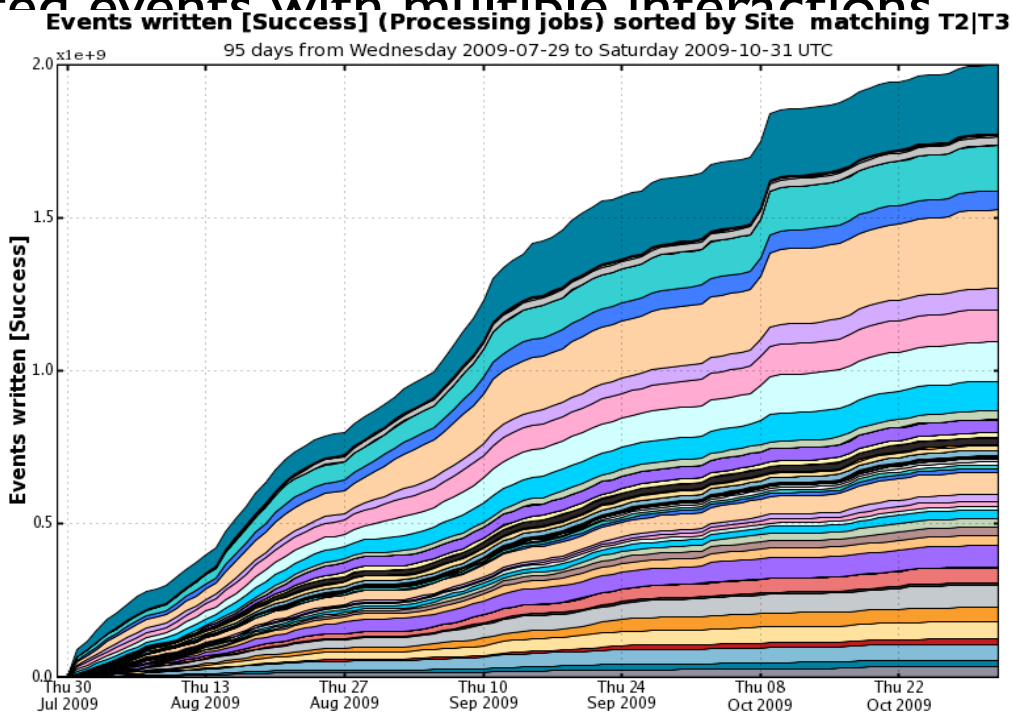


# Readiness for creation of secondary datasets and skimming

- During October Exercise we exercised the Tier-1 samples to produced skimmed samples
- 41 workflows: 100% complete, 7 workflows: >99.3% complete
- Exercised Skimming
  - Samples Skimming From Stored Data
    - Based on tool used for producing simulated event
      - Operationally intensive
  - Samples Produced with the prompt skimming system
    - Based on system used in the Tier-0
- Preparing configurations to produce analysis samples for physics

# Readiness for MC production

- Simulated Event production using distributed computing infrastructure has been extremely successful in 2009
- 2B successfully written events
- Good contribution from more than 50 sites
  - Moving to more advanced simulated events with multiple interactions



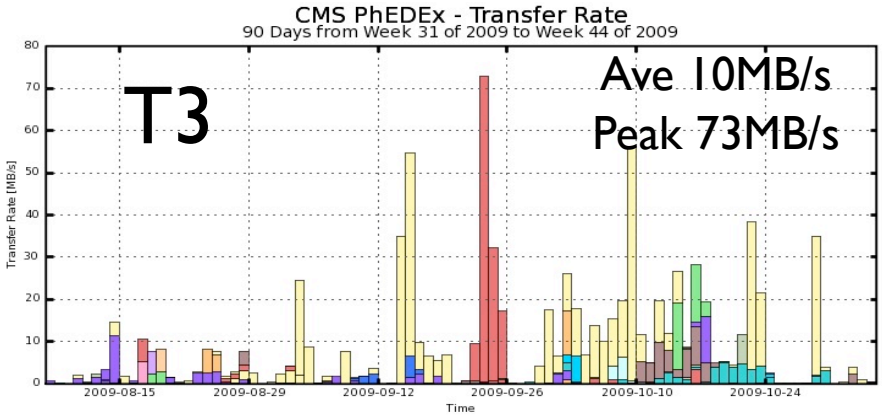
# Readiness for Operations

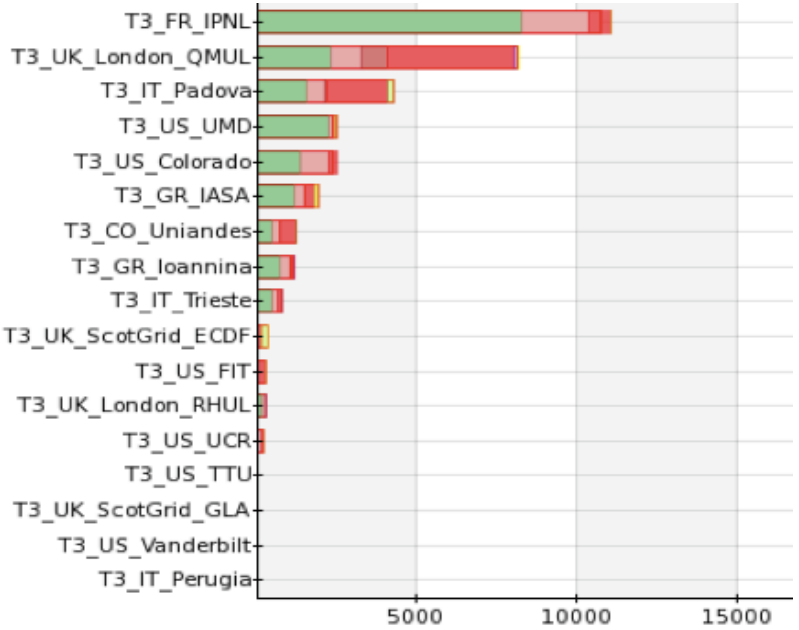
- Computing Operations still require intense effort
  - Good shift team in 3 time zones, weekly coordinators, and a team of analysis operators
  - Counting on continued improvements from Offline in capabilities of tools to improve operational efficiency and reliability and availability of sites

- Computing Operations relies heavily on monitoring information
  - Globally distributed system with transfer and processing requests coming from hundreds of people
  - Rely heavily on Dashboard, PhEDEx pages, Reporting from workflow tools
    - Still work to do on having better homogeneity in the monitoring system

# Readiness for Tier-3s

- The Tier-3s are analysis facilities for CMS
  - Though they are not very strictly defined and vary by size and capability.
- Current CMS has 45 Tier-3 centers registered in PhEDEx
  - 25 have successfully received data during the last quarter
    - About an equal mix of Tier-1 and Tier-2 sources
      - Compares to 48 Tier-2 destinations



# Outlook

- The Computing Project believes we are ready for the start of collision data
  - There are open issues, some of which can be addressed in the final weeks and some will need to be worked around
    - Working on handling the occasional high data rates
    - We believe we can analyze data, but important issues were identified in the Oct Ex, not all of which can be fixed in the short term
    - The Tier-1s, Tier-2s, and a growing number of Tier-3s are ready for running
      - We still see stability issues, but redundancy in the early run will alleviate some issues
    - Good team of shifters though more effort will be needed for long running.