



Preparations 2007

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CMS Today

CMS recently completed the Computing Software and Analysis Challenge for 2006 (CSA06)

- ➔ Designed to demonstrate the computing system at 25% of scale
 - Goal was to sustain 40Hz of reconstruction at the Tier-0 center
 - Transfer data at 150MB/s aggregate to Tier-1 centers continuously
 - Transfer data to CMS Tier-2 centers at 20MB/s for bursts
 - Submit 50k jobs per day
 - 80% Tier-2 and 20% Tier-1
- ➔ Demonstrate event selection and skimming
- ➔ Demonstrate re-reconstruction of events
- ➔ Analysis and data serving

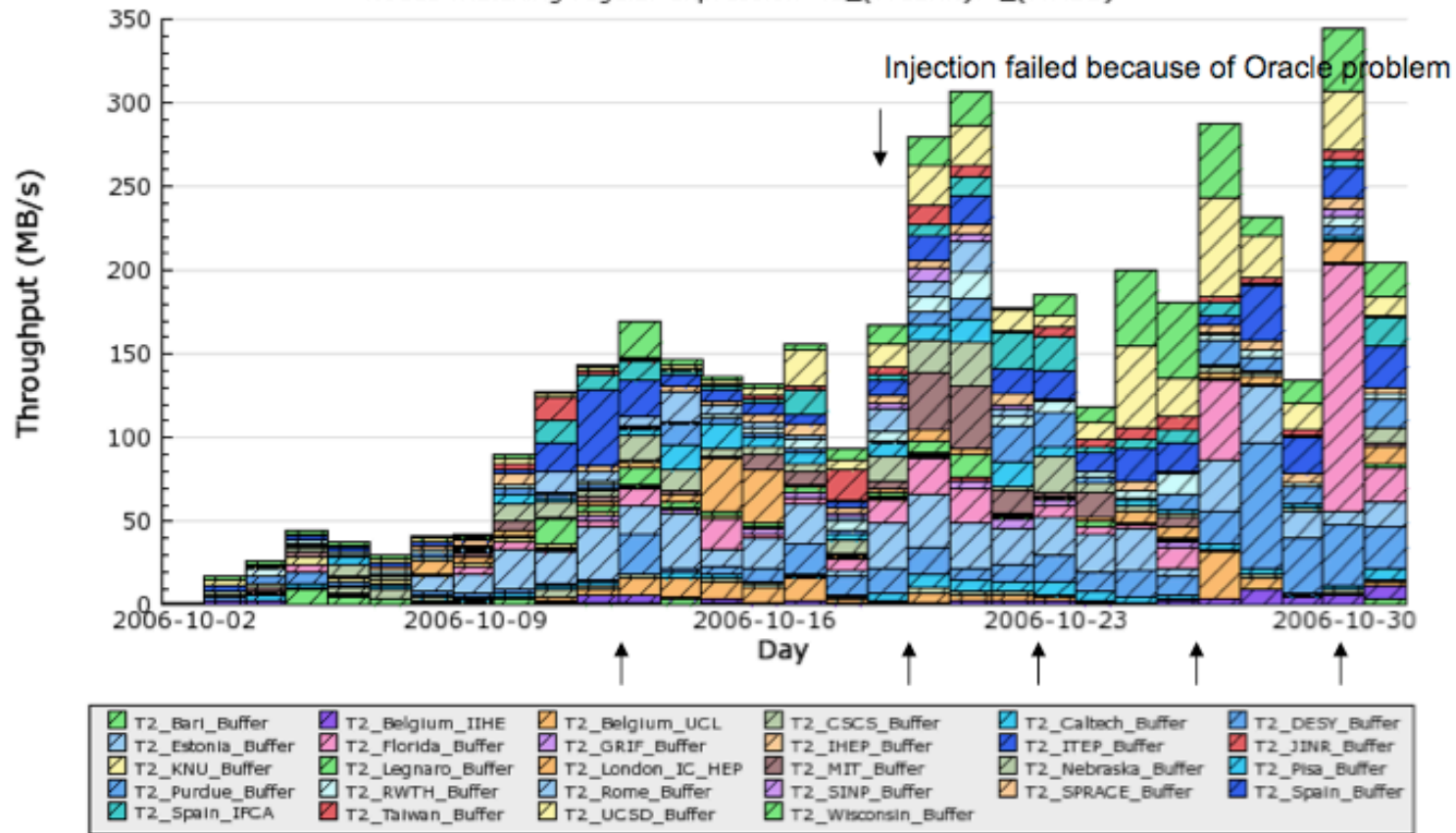


Participation of Tier-2 Centers

Transfer Plots

PhEDEx Prod Data Transfers By Destination

30 Days from 2006-10-02 to 2006-10-31 GMT
Nodes matching regular expression 'T2_(?!CERN).*(?!MSS)'



Reconstruction Rate

54Hz

110Hz

170Hz

160Hz

Turn off Tier-0

numerous intermediate PhEDEx/DB problems



Rate Plots to Tier-2s

PhEDEx Prod Data Transfers By Link

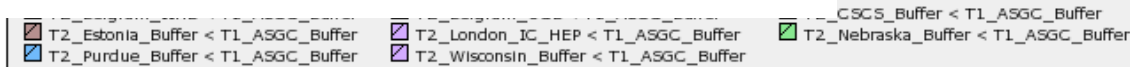
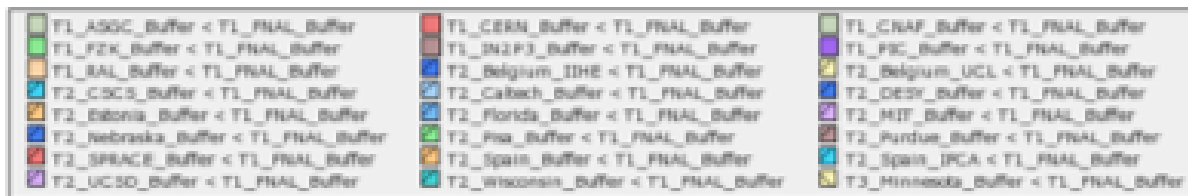
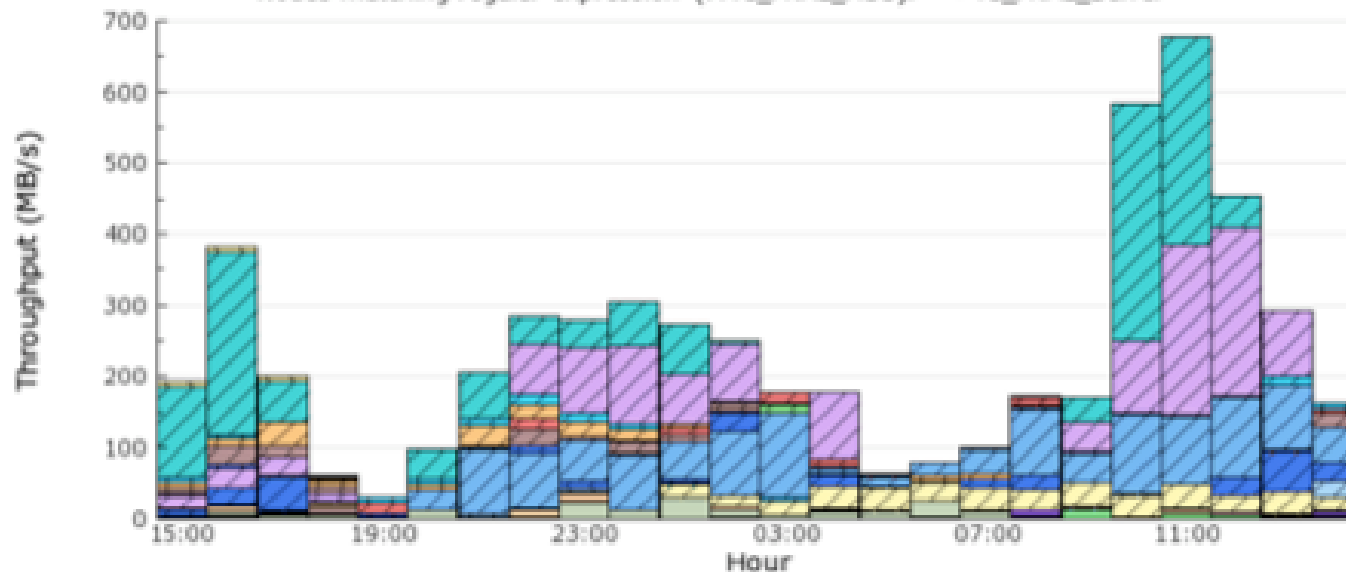
24 Hours from 2006-11-07 01:00 to 2006-11-08 00:00 GMT
Nodes matching regular expression 'T2_.* < T1_FZK_Buffer'



PhEDEx Prod Data Transfers By Link

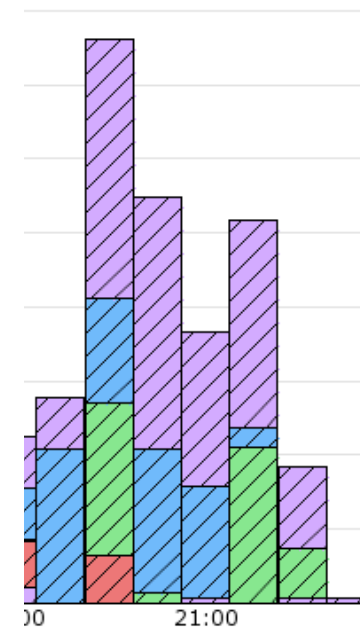
24 Hours from 2006-10-26 15:00 to 2006-10-27 14:00 GMT
Nodes matching regular expression '(?!T1_FNAL_MSS).*' < T1_FNAL_Buffer'

Throughput (MB/s)



nk

GMT
'_Buffer'



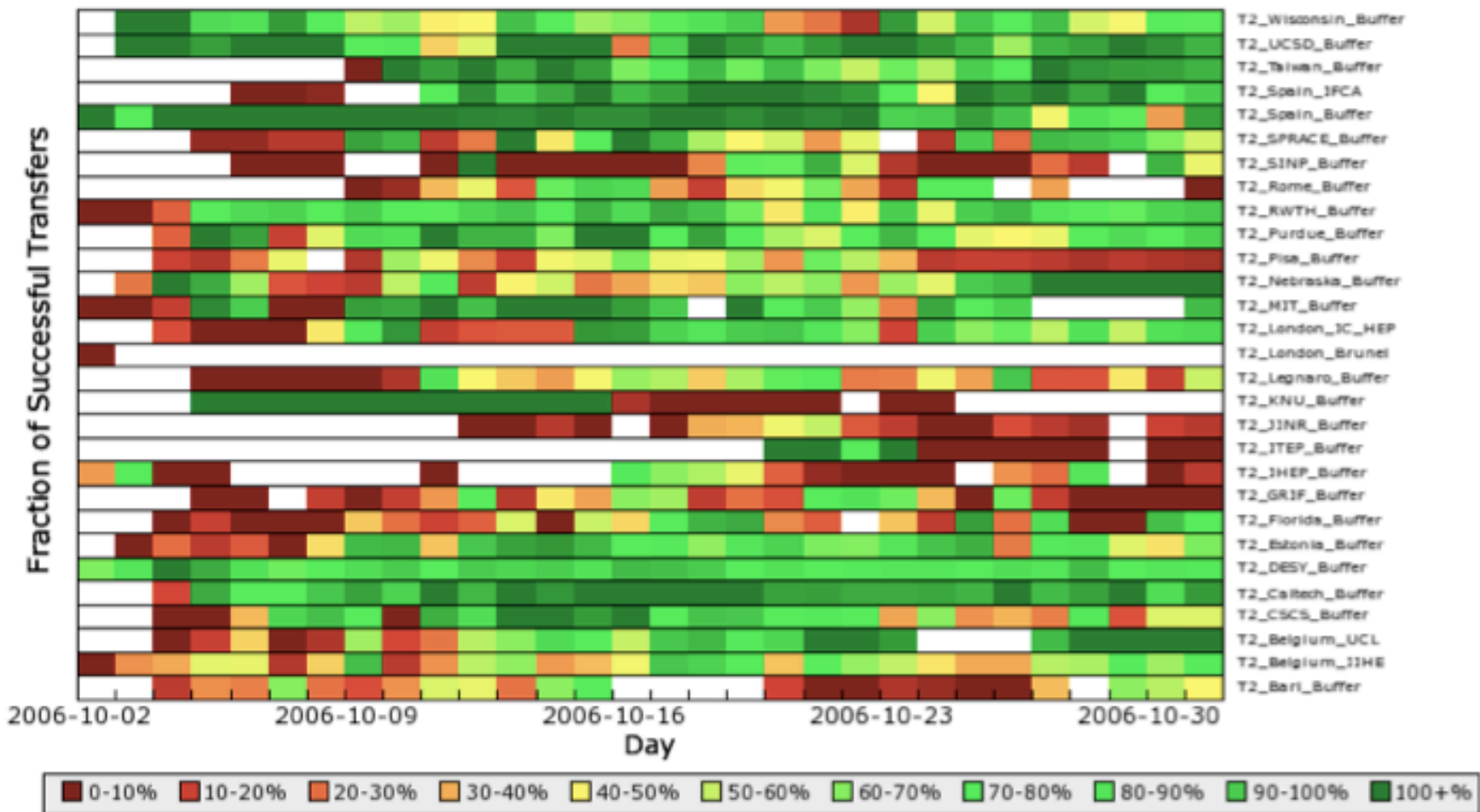


Participation of Tier-2s

PhEDEx Prod Transfer Quality By Destination

30 Days from 2006-10-02 to 2006-10-31 GMT

Nodes matching regular expression 'T2_(?!CERN).*_(?!MSS)'



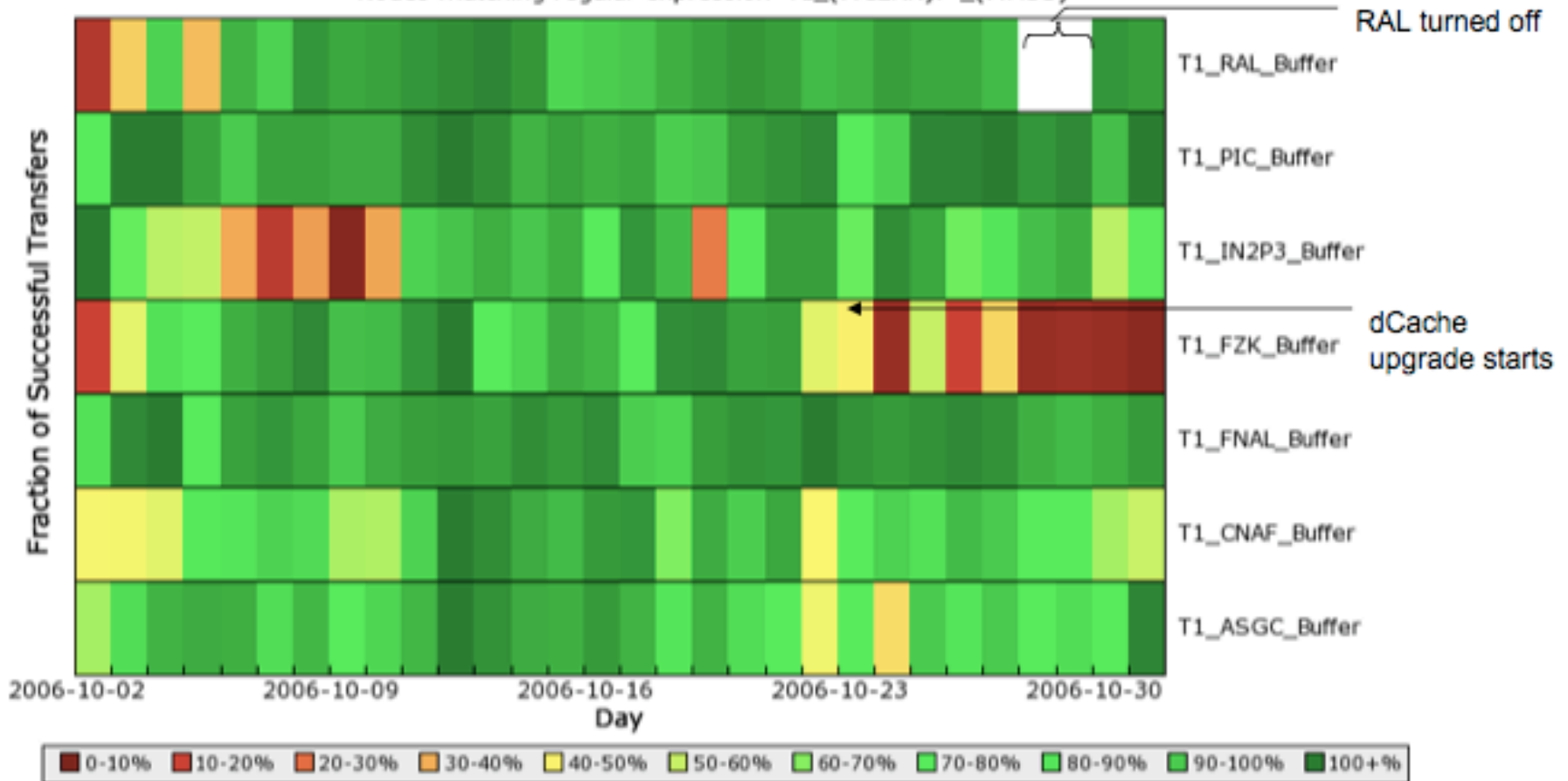


Tier-0 to Tier-I Transfer Quality

PhEDEx Prod Transfer Quality By Destination

30 Days from 2006-10-02 to 2006-10-31 GMT

Nodes matching regular expression 'T1_(?ICERN).*_(?IMSS)'

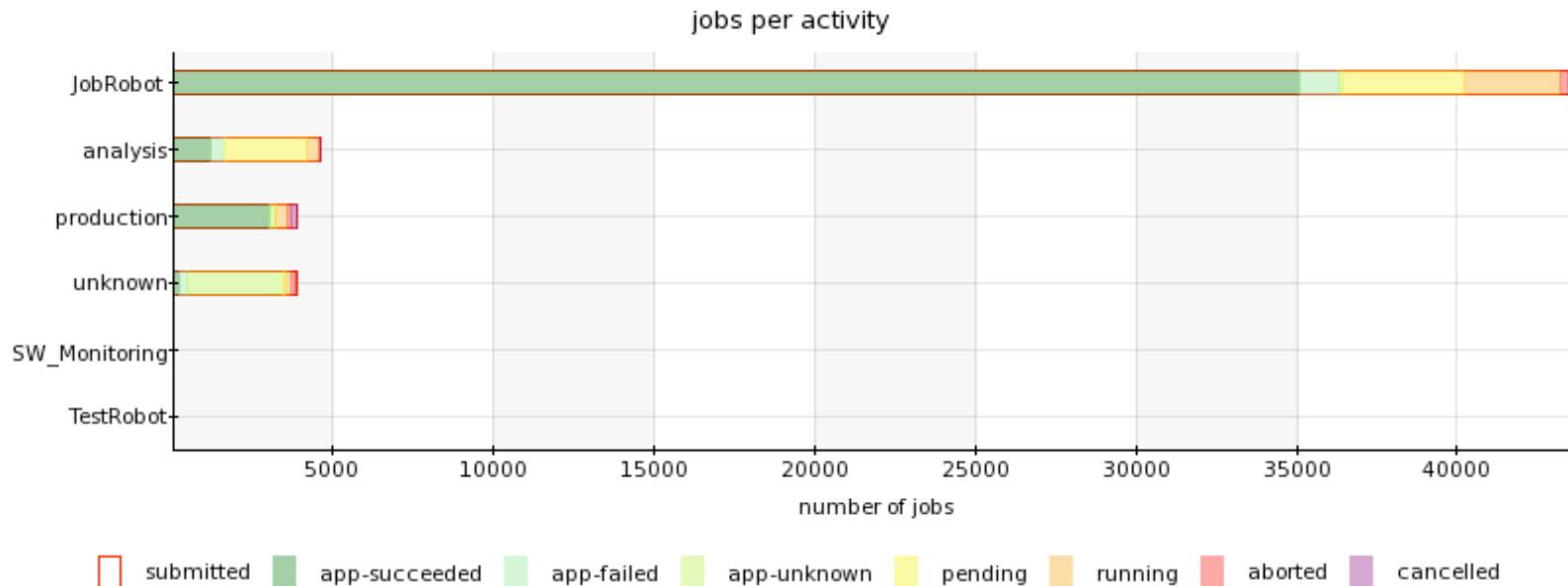




Analysis and Job Submission

The total number of jobs submitted in CMS hit 56k as a max in CSA06.
Includes over 40k job robot submissions

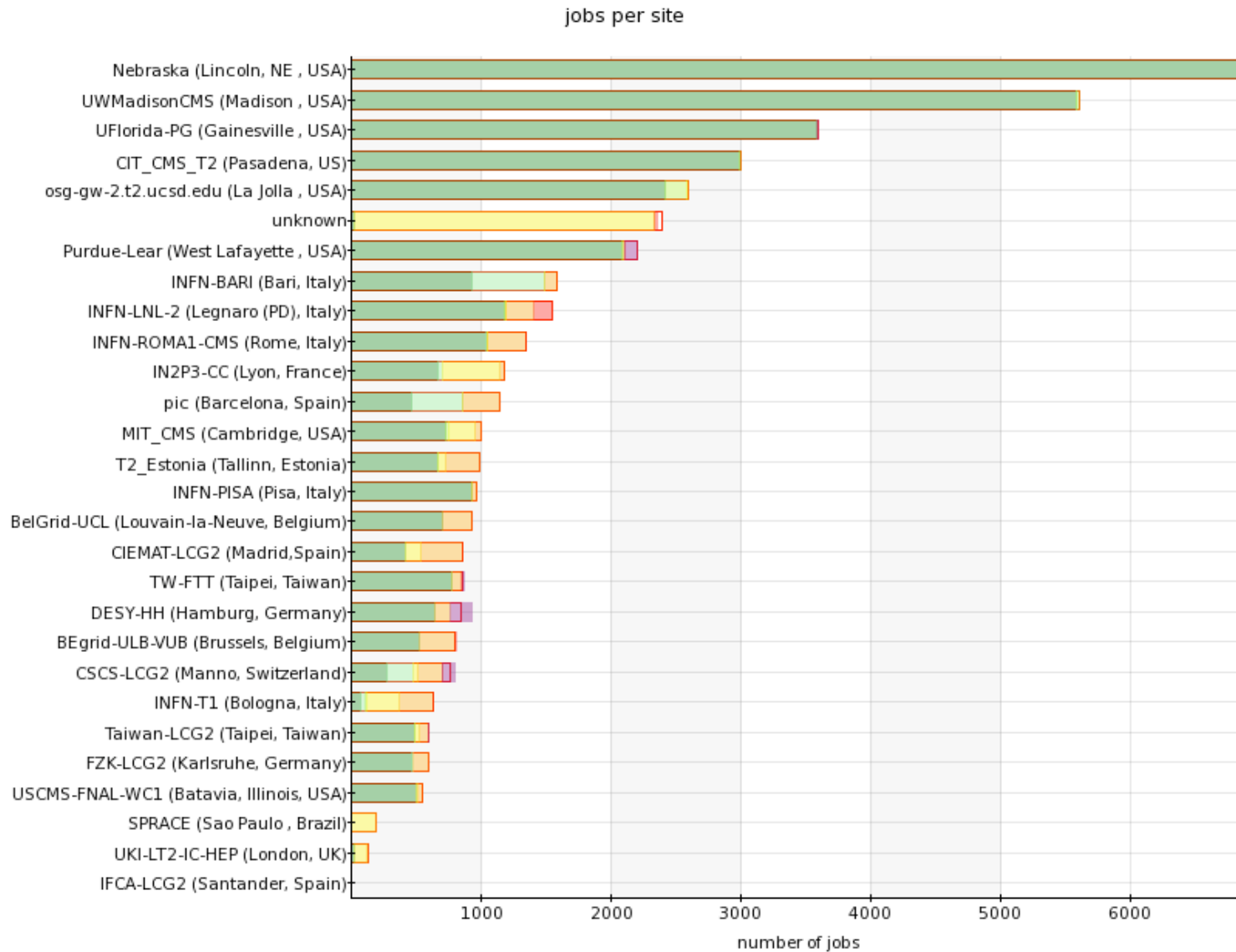
- A small contribution from Tier-I robotic submissions. Mostly T2
- ➔ 35k with exit code 0
- ➔ Nearly 5k jobs submitted by users
- ➔ 5k of jobs for skimming and production testing





Job Robots by Site

Excellent efficiency to complete jobs successfully





Improvement Plans

Tier-1 to Tier-2 transfers

➔ Tier-2 to Tier-1 Transfers

- In CSA06 we tested a reasonably realistic Tier-0 to Tier-1 transfer model
- The tests from Tier-1 to Tier-2 didn't really replicate the user driven aspects and it's operationally too much effort to sustain for long periods
- The lightweight load test doesn't reflect the data structure well

SAM Tests

- ### ➔ CMS would like to begin putting experiment specific elements in the site functional testing
- Analysis Submission
 - Production
 - Frontier
 - Data Transfer



Transfers

CMS currently has a load test generator that tries to keep 20MB/s between sites

- ➔ Continuous transfer of reasonably large files

The CERN to Tier-1 transfers are much higher than that and the Tier-1 to Tier-2 transfers are expected to transfer in bursts

- ➔ Looking at transfer load tools that more accurately reflect the CMS activities
 - Work with data blocks and transfer between sites in bursts
 - Connect the data bookkeeping and publication tools to the transfer tests



Tier-2 Tools

One area we know we have to improve is the tools available to the Tier-2s to manage data on their sites

- ➔ Currently data is subscribed centrally
- ➔ Goal is to develop a series of web based tools that allow authorized local site representatives to
 - request data samples
 - remove subscriptions
 - Including cleaning the physical space and the data catalogs
 - reset items like cool off
 - set priorities for transfers

Currently several tasks are performed with e-mail

- ➔ We want to put the Tier-2s in control of the local data



Evolving Expectations of Tier-2s

MC Production

- ➔ Tier-2s were a significant contributor to the 25M events per month for CSA06
- ➔ When the experiment is running the Tier-2s are the only dedicated simulation resources and the expectation is 100M events per month
 - Half of the simulation for CSA06 was minbias
- ➔ We will shortly begin pile-up simulation, which is a increase in CPU time but additionally combines aspects of data serving and simulation

Analysis Submission

- ➔ The Tier-2s are expected to support communities
 - Either local groups or regions of interest
- ➔ Unlike the Tier-1 data subscriptions and processing expectations, which are largely specified by the experiment centrally, the Tier-2s have control over the data and the activity



Production for 2007

Production has begun for using `CMSSW_I_I_x`

- ➔ Request for resources to WLCG for 2007 is 30M events per month, which is similar to the rate in the preparation for the challenge
- ➔ Lot of validation and trigger work to do

The big addition to the workflow in the next several weeks is the addition of pile-up serving

- ➔ The pile-up sample will need to be available on all sites
 - Expected sample is 200GB
 - Hopefully not a problem for any site
 - Sits in a consistent space in the TFC
- ➔ In the past pile-up processing was reserve for a selected number of sites
 - IO and load on the mass storage should be reduced in the new framework due to the reduced number of files open
 - There is not a lot of experience with the new framework. We will have a better understanding of the IO load shortly



Tier-2 Analysis for 2007

Tier-2s are the primary analysis resource controlled by physicists

- ➔ The activities are intended to be controlled by user communities
- ➔ They are expected to be accountable to communities

Up to now most of the analysis has been hosted at Tier-1 sites

- ➔ Need to increase the ability of Tier-2 communities to support analysis and users

The hope is to enable analysis support by hosting important physics samples exclusively at Tier-2 centers

- ➔ We have roughly 10-15 sites that have sufficient disk and CPU resources to support multiple datasets
 - Skims in CSA06 were around ~500GB
 - The largest of the raw signal samples was ~8TB



Other Driving Activities

CMS has a large production for physics validation

- ➔ This will impact the Tier-2s both in production capacity and analysis serving
- ➔ There are a series of notes proposed
 - As I understand the schedule, we need to have the events produced by ~June to complete analysis by ~September

There will be a next generation of magnet test and cosmic challenge with the detector assembled in the cavern

- ➔ The goal would be to use more of the proposed computing infrastructure for event reconstruction, bookkeeping, and distribution
 - ~March
- ➔ Tier-2s will have the opportunity to support the final samples



Data Challenge

CMS successfully demonstrated 25% of scale this fall. We have two more factors of 2 before data taking in 2008

- ➔ The data transfer between Tier-0 and Tier-1 reached about 50% of scale
 - Very successful test, but some signs of system stress were visible
- ➔ Job submission reached 25%. Another factor of 2 will be possible with the current systems
 - The next factor of two is less clear

CMS is considering another formal challenge in 2007

- ➔ A 50% challenge
- ➔ Some constraints given physics activities over the summer
 - Looking at how to couple activities without jeopardizing the success of either unnecessarily