The CMS Analysis Model

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WLCG STEP'09
Post-Mortem Workshop
CERN 09-10 July '09

OutLine

- Introduction
- Tools, CRAB
- Performances & efficiency
- Summary

Data Driven Model

The CMS analysis model is data location driven: the user analysis runs where data is located.

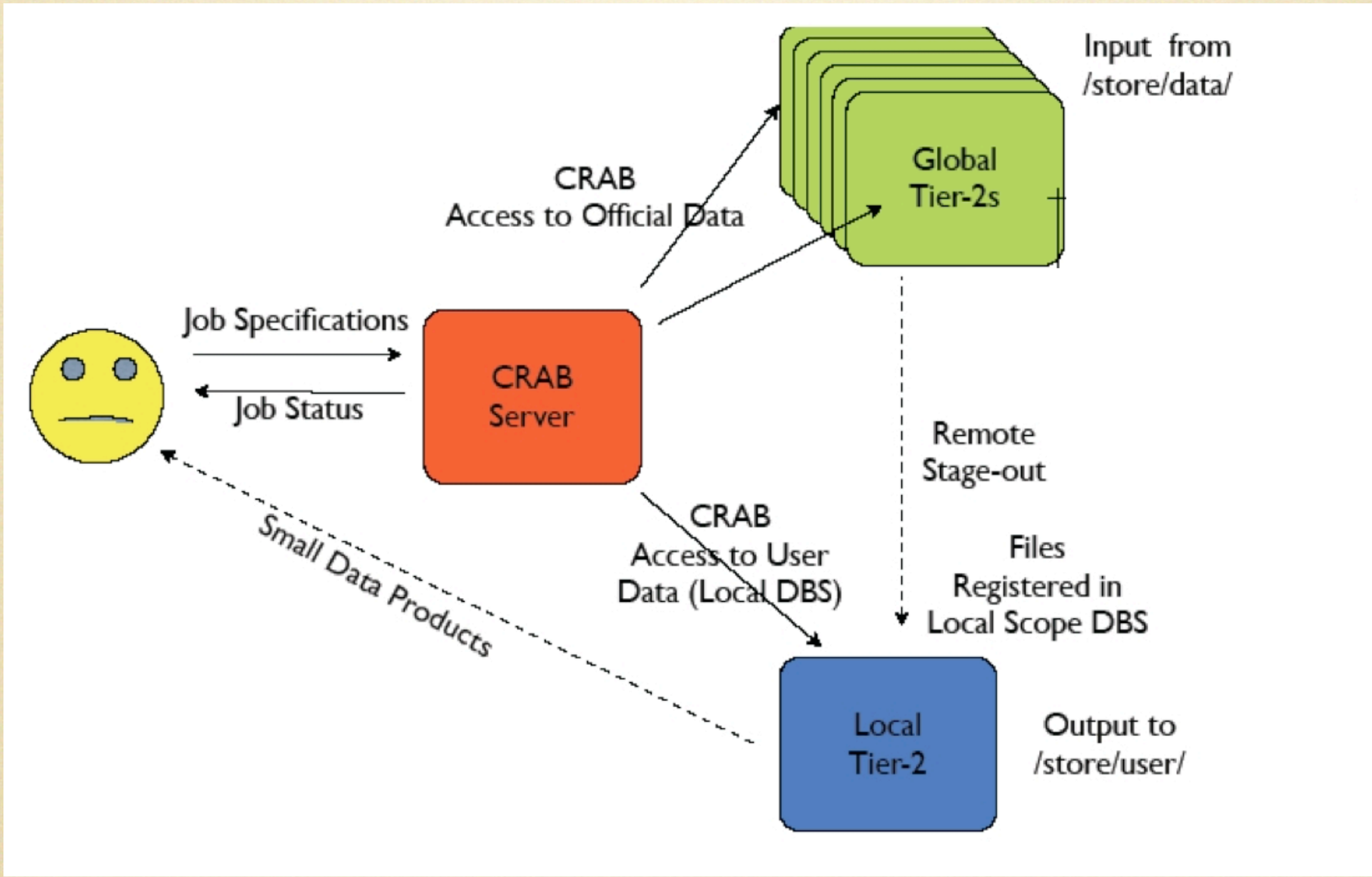
- User runs interactively on small data sample developing the analysis code.
- User selects large data sample to run the very same code.
- User's analysis code is shipped to the site where sample is located.
- Results are made available to the user for the final plot production.

Tools

To enable an effective distributed analysis a set of tools have been designed and developed:

- Access Data: **CRAB**
  - Jobs builder. (see next slides)
- Move Data: **PhEDEx**
  - End user can request the transfer of a data sample to a T2 site for analysis
  - Every T2 site have data managers which approve or disapprove transfer requests according to global policies and available storage space.
- Find available data (track produced data) : **DBS**
  - Handles to bookkeeping of datasets

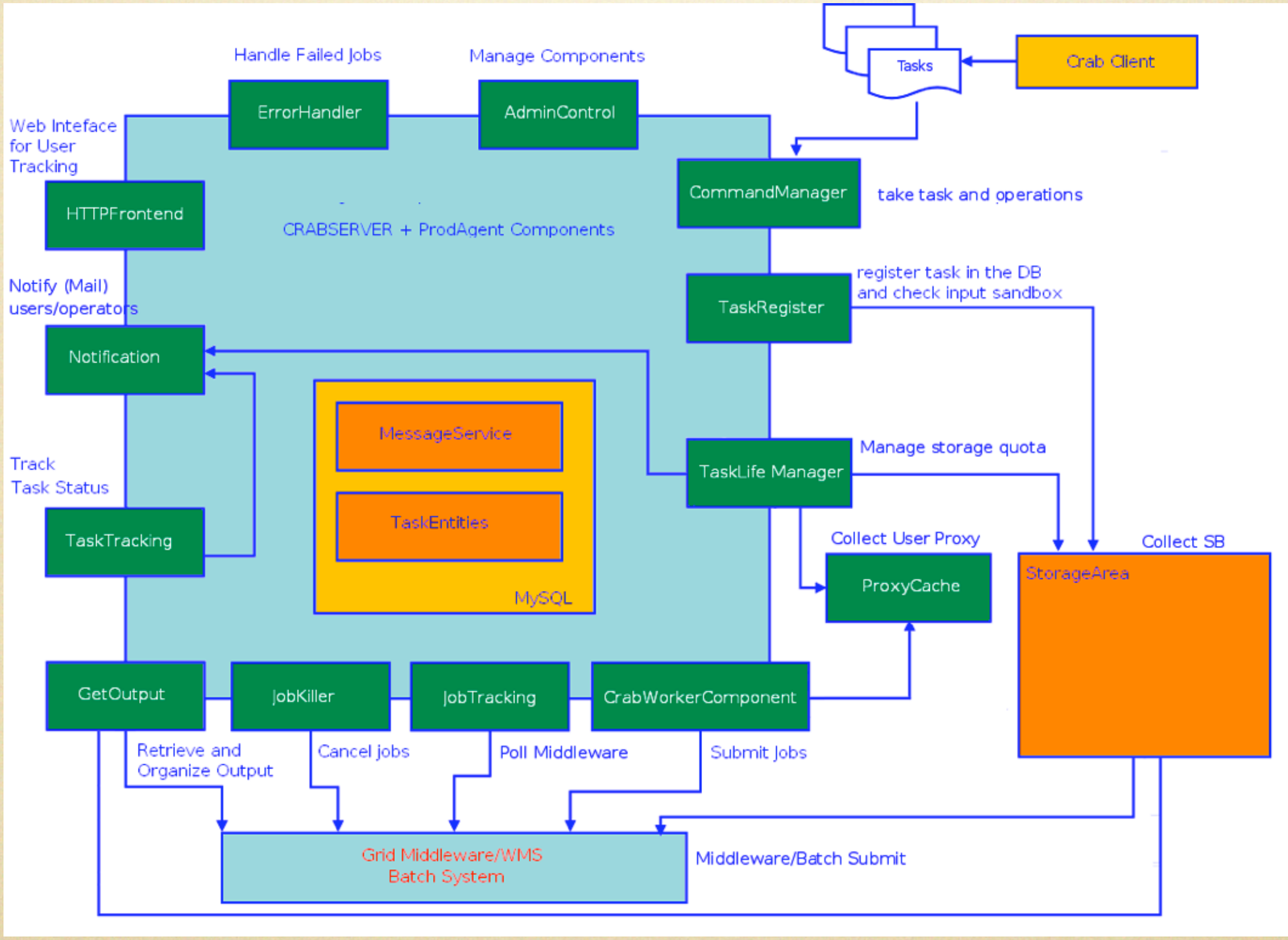
Analysis Workflow



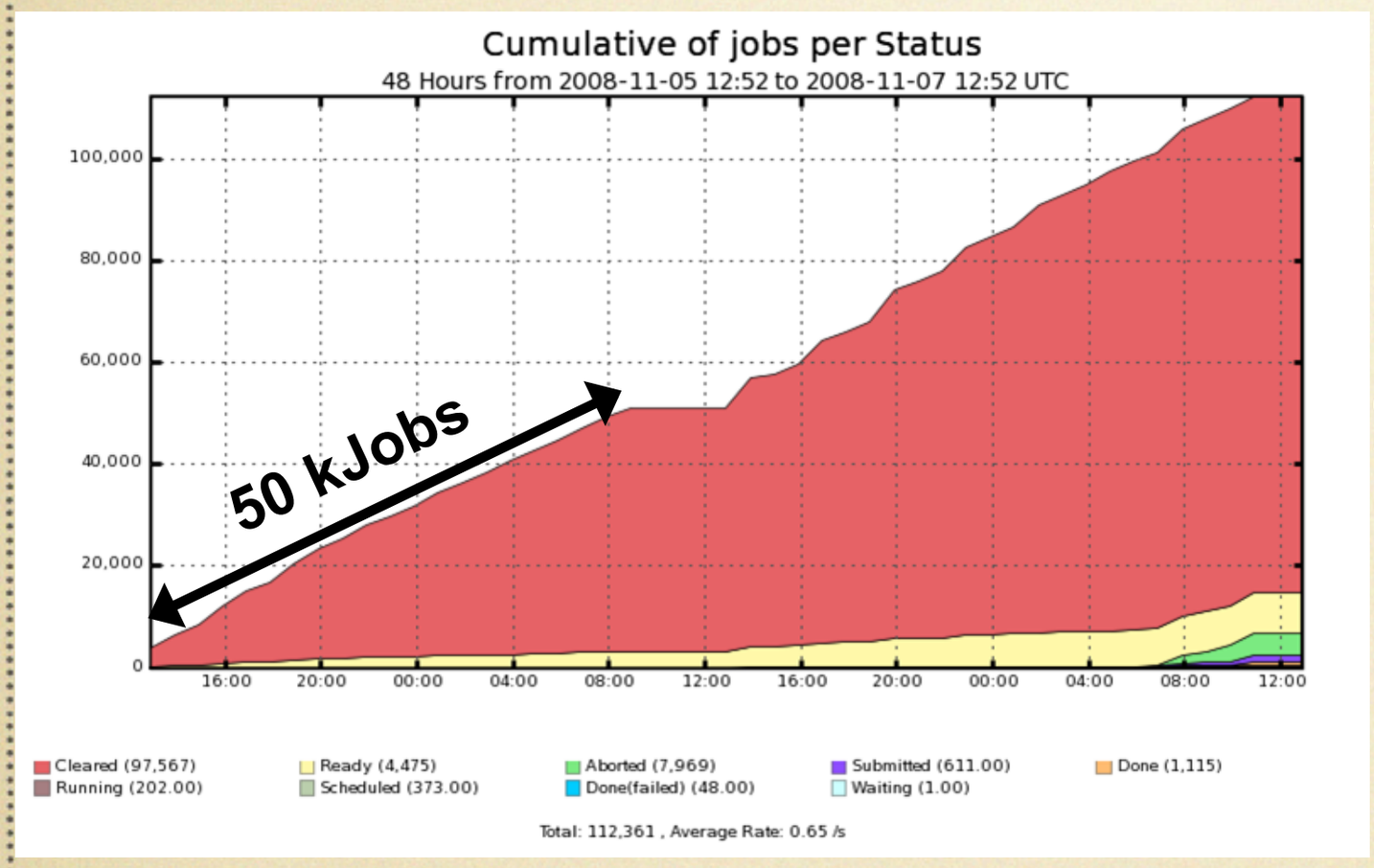
CRAB

- Provides the user with a simple interface and a lightweight client
  - Command line python application using an SQLite database for logging purpose.
- Provides a service platform to automate the user analysis workflow
  - Intermediate service responsible for the analysis flow automation: submission/resubmission/error handling/output retrieval....

Architecture



Overall performances



Results of a stress test:

Reached 50kJobs/day

Setup:

- ➡ One CRABSERVER instance
- ➡ Two gLite WMSs
- ➡ multi users environment

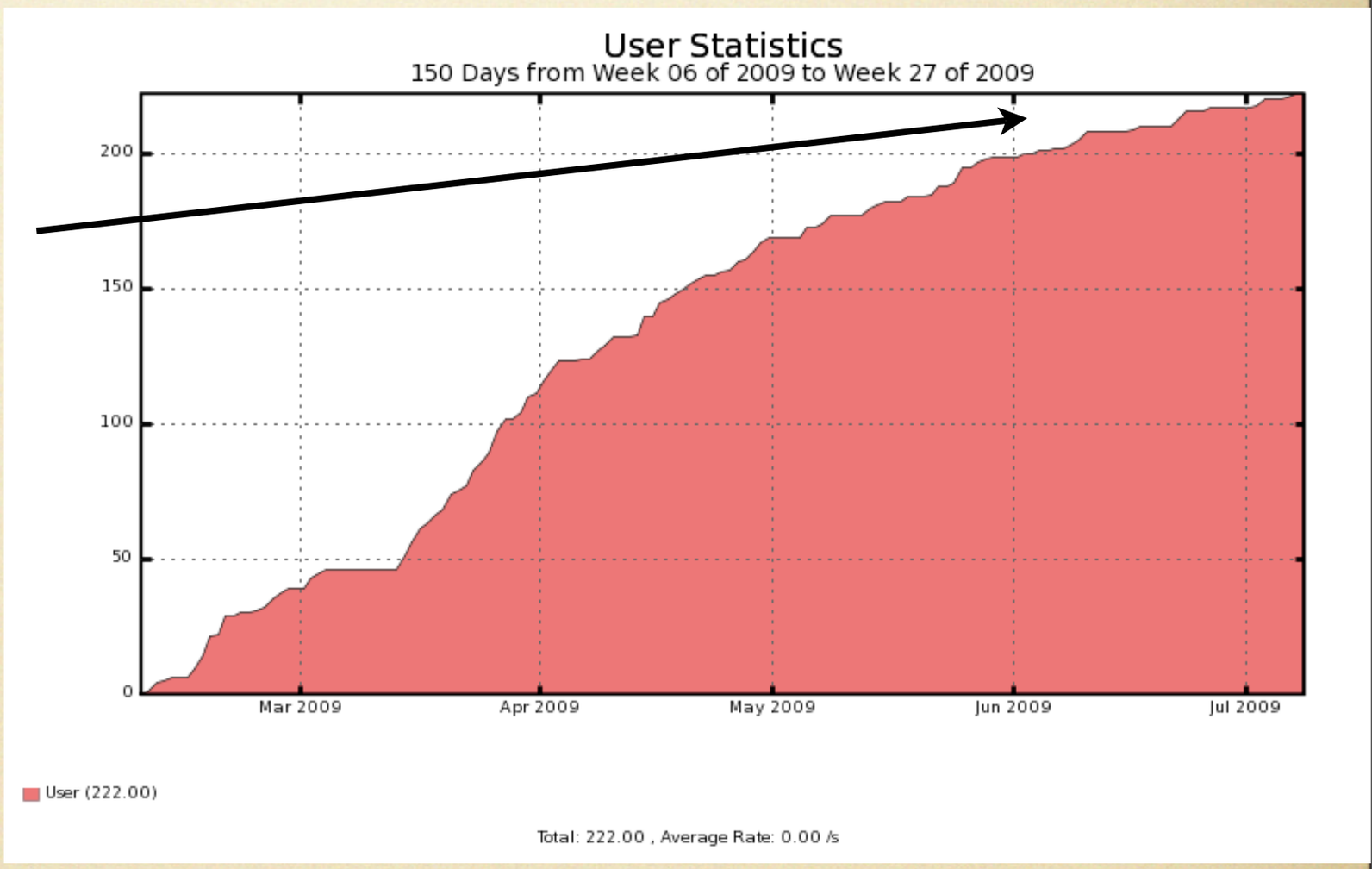
- ✓ No Bottleneck shown by the system
- ✓ No scale problems foreseen at expected rates

  100/200 kJobs/day for analysis

Server & user multiplicity

~220 distinct users.

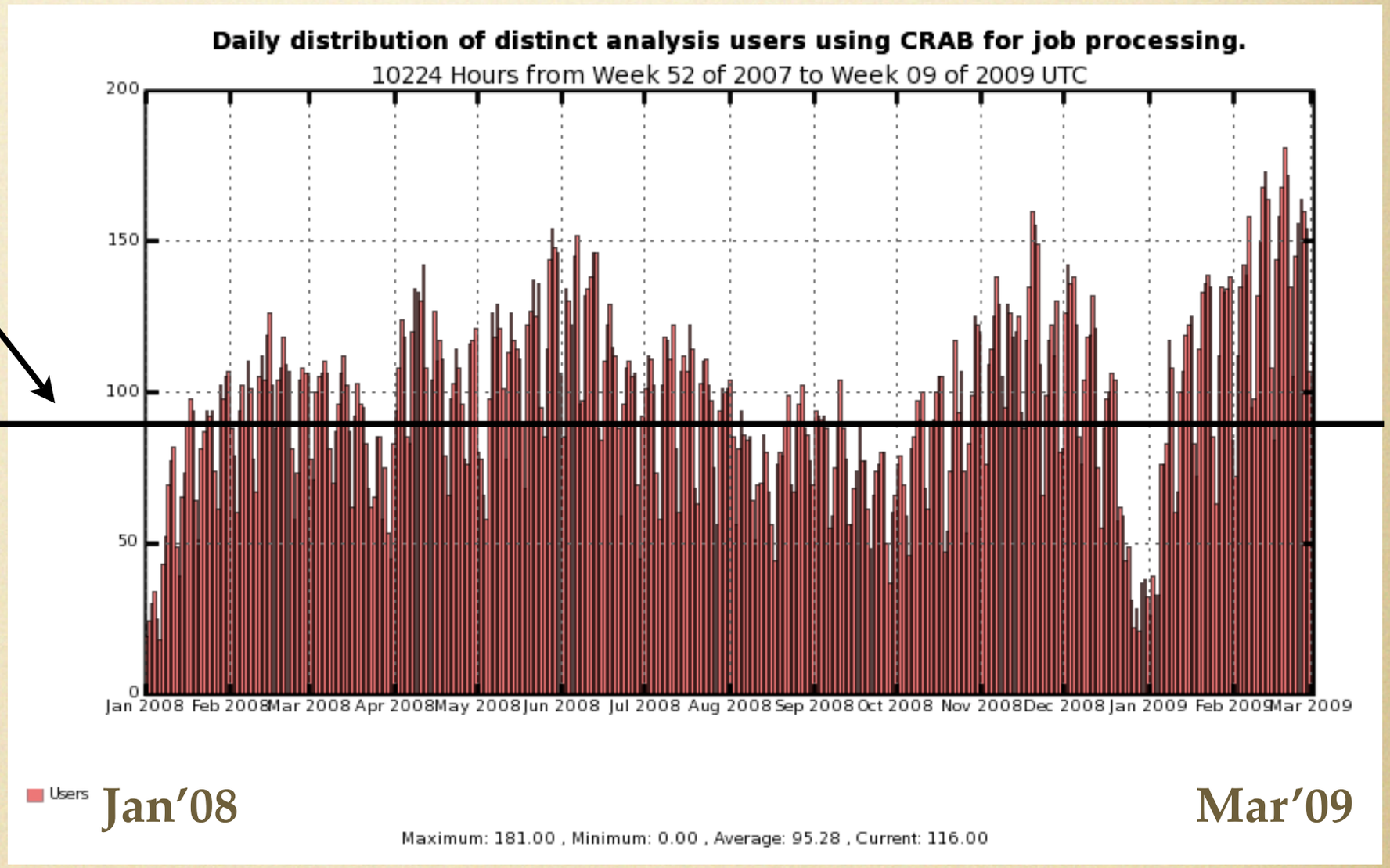
Real usage of a single server instance during last ~5 months



Concurrency of users doesn't show major issues

A large amount of real users

~ 90 distinct users per day

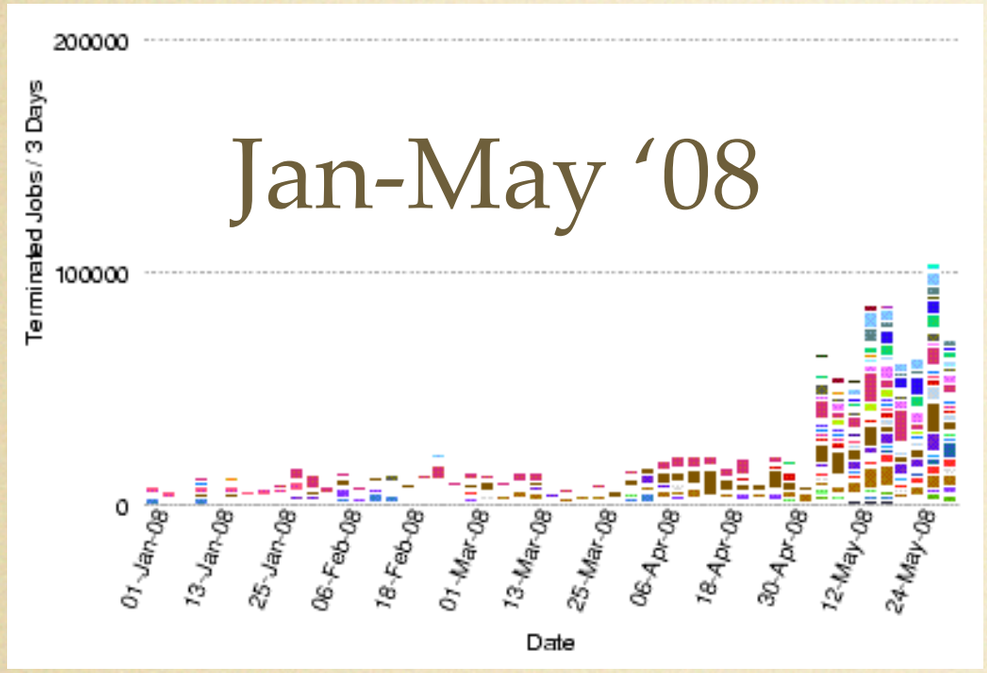


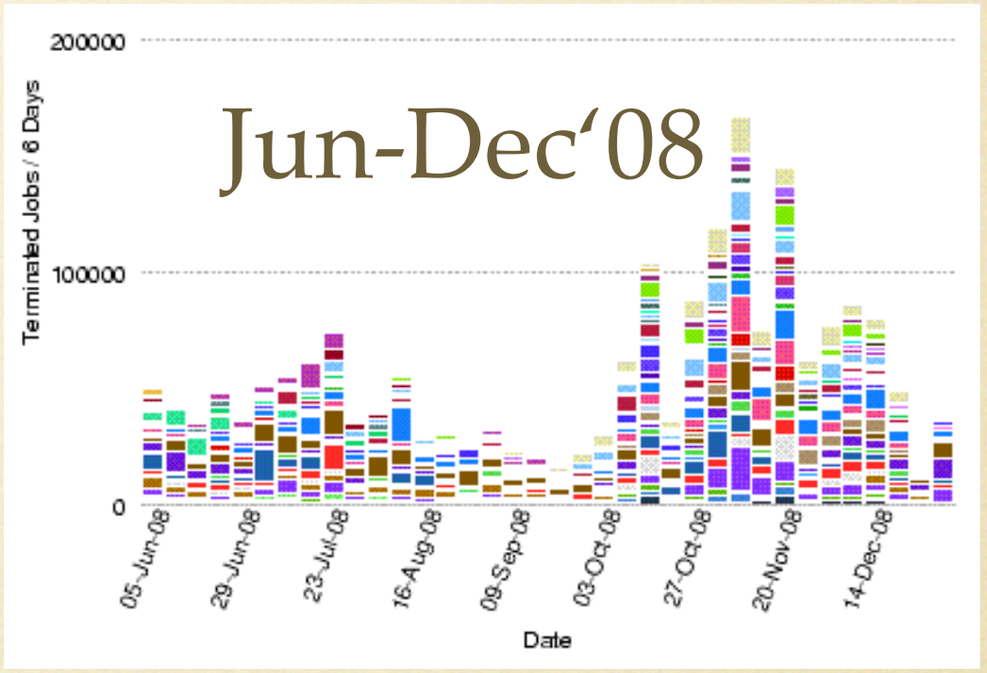
~ 1000 Distinct users during 2008

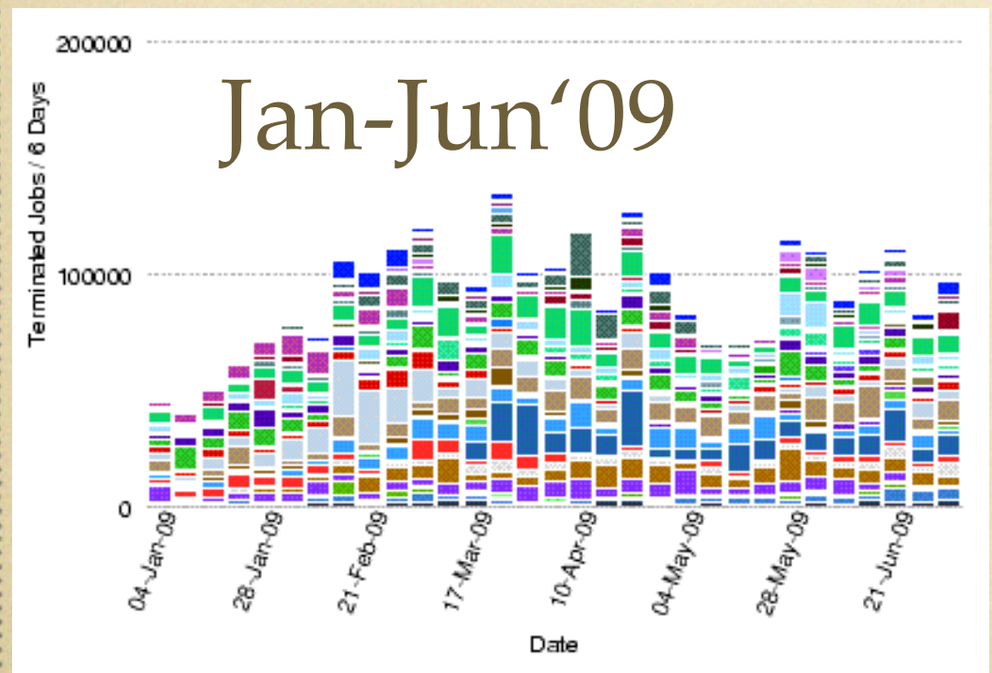
~ 40% of CMS community

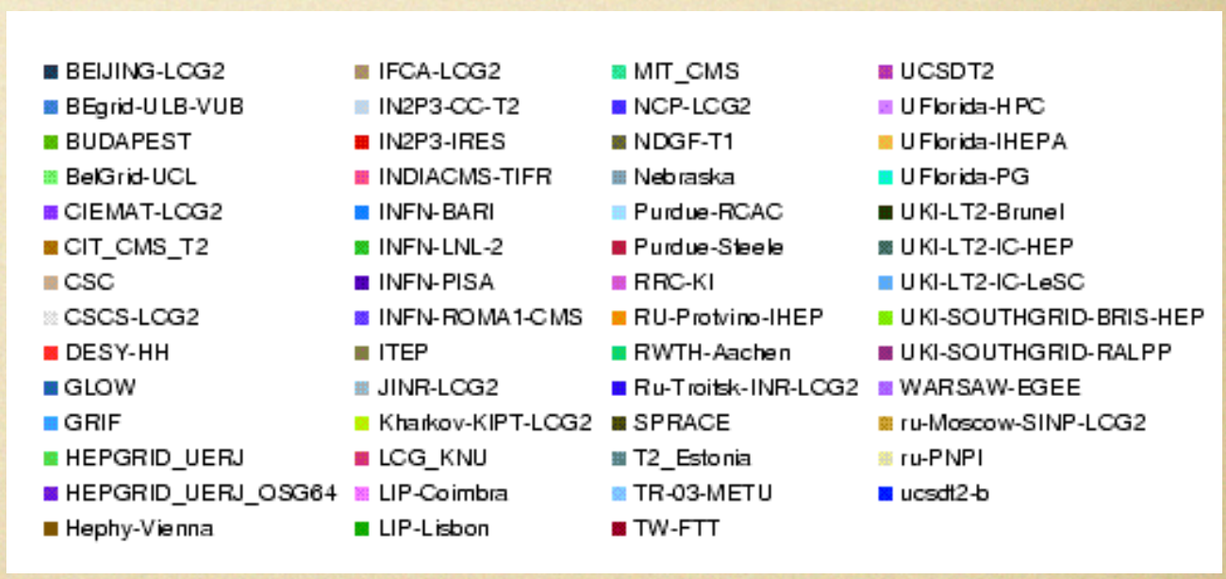
Analysis Jobs @ T2

From Beginning of 2008 - Today



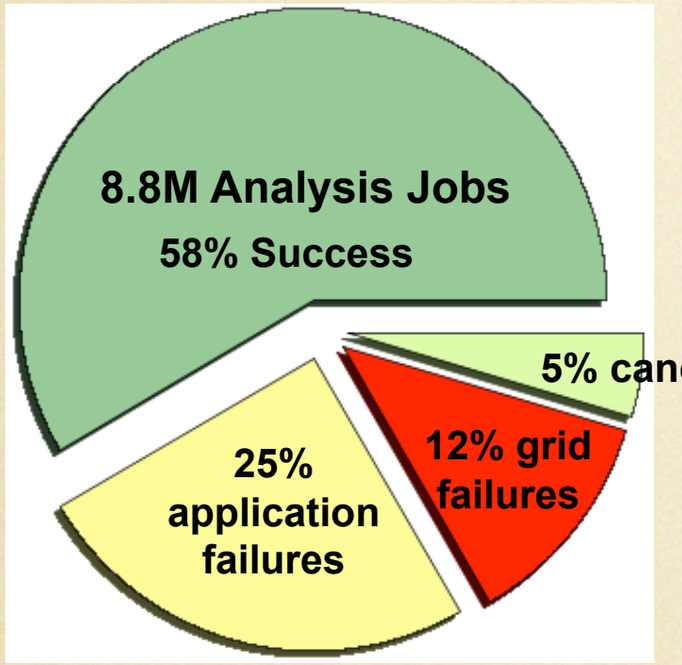






Efficiency

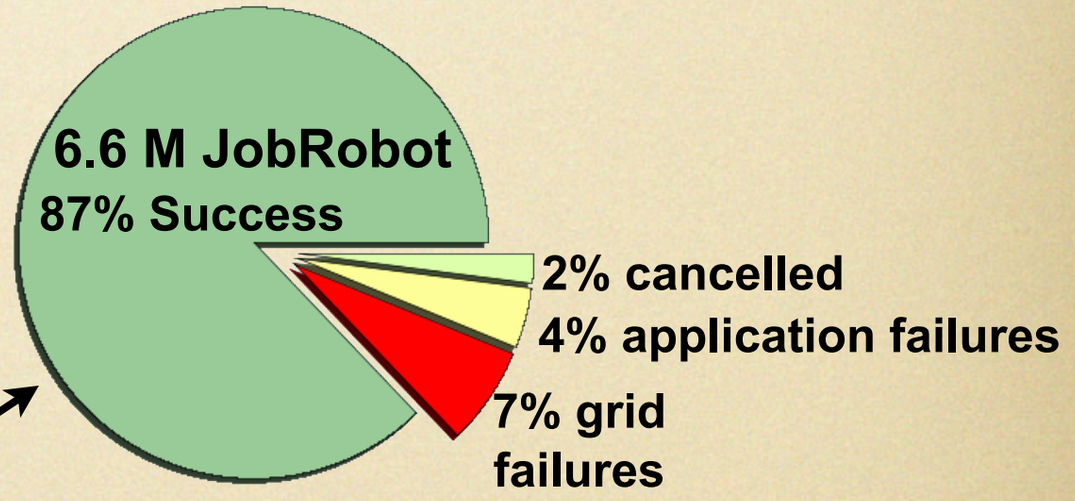
G.Codispoti: CHEP09



From May 2008 to March 2009:
~15 M total Analysis jobs submitted

- ~78% of jobs submitted with gLite WMS
- The rest submitted mainly with CondorG

1. User configurations errors
2. Remote stage out issues
3. Few % of failures reading data at site



In a more controlled environment:

Known issues

- Remote stage out cannot scale:
  - Switch CRAB to use local stage out.
  - CRAB server would then “harvest” files and trigger related transfers.
- Job output retrieval/handling can introduce some delay at scale:
  - Factorize the actual implemented workflow.
  - Designed architecture offers handles for this kind of optimizations.

The next...

- Improve the interface presented to the user.
- Concentrate effort on automation domain:
  - Integrate WMBS, converge on cross project common library.
- User support improvements:
  - Develop “ad hoc” tools/interfaces with server.

Summary

✓ Distributed analysis activity is on going from years

- more than 40% of CMS community

✓ Need to spend effort for optimization

- Stage out must be reviewed
- User support must be improved using powerful of actual tools.

✓ This same, daily used, analysis machinery has been ramped up in scale in STEP09 (see next talk).