LHCb activities

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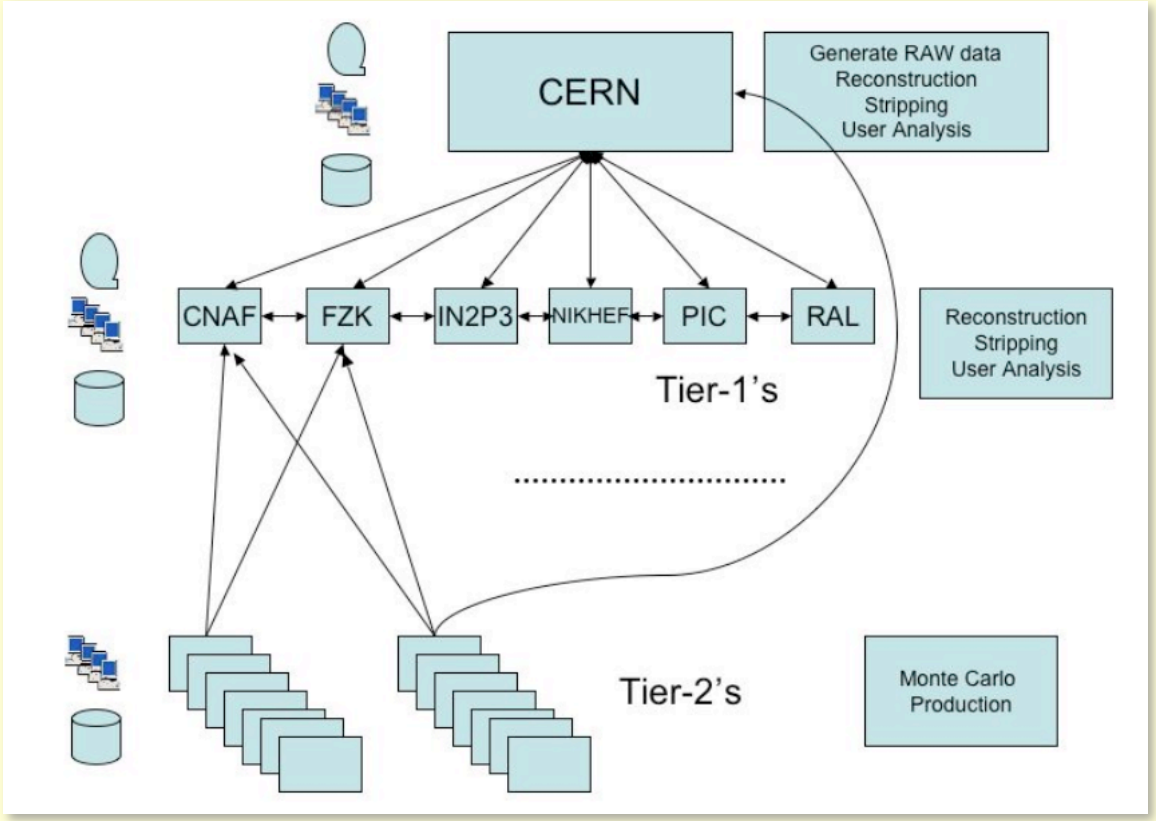
Outline

- LHCb Computing Model reminder
- Activities in 2008
- LHCb computing resources in France
- Future activities
- Conclusion

LHCb Computing Model

- Simulation is using non-Tier1 CPU resources
  - MC data are stored at Tier0-1s, no permanent storage at Tier-2/Tier-3 sites
- Real data are processed at Tier0-1 (up to analysis)



CCRC'08 Overview

- The Common Computing Readiness Challenge (CCRC'08) aims to test all tasks envisaged during data taking in 2008
  - All Grid services tested at full capacity
  - All experiments are running simultaneously
- For LHCb this includes the following activities:
  - RAW data distribution from pit -> Tier-0 centre
  - RAW data distribution from Tier-0 -> Tier-1 centres
  - Reconstruction of RAW data at CERN & Tier-1 centres
  - Stripping of data at CERN & Tier-1 centres
  - Distribution of DST data to all other Tier-1s

CCRC'08 Timeline

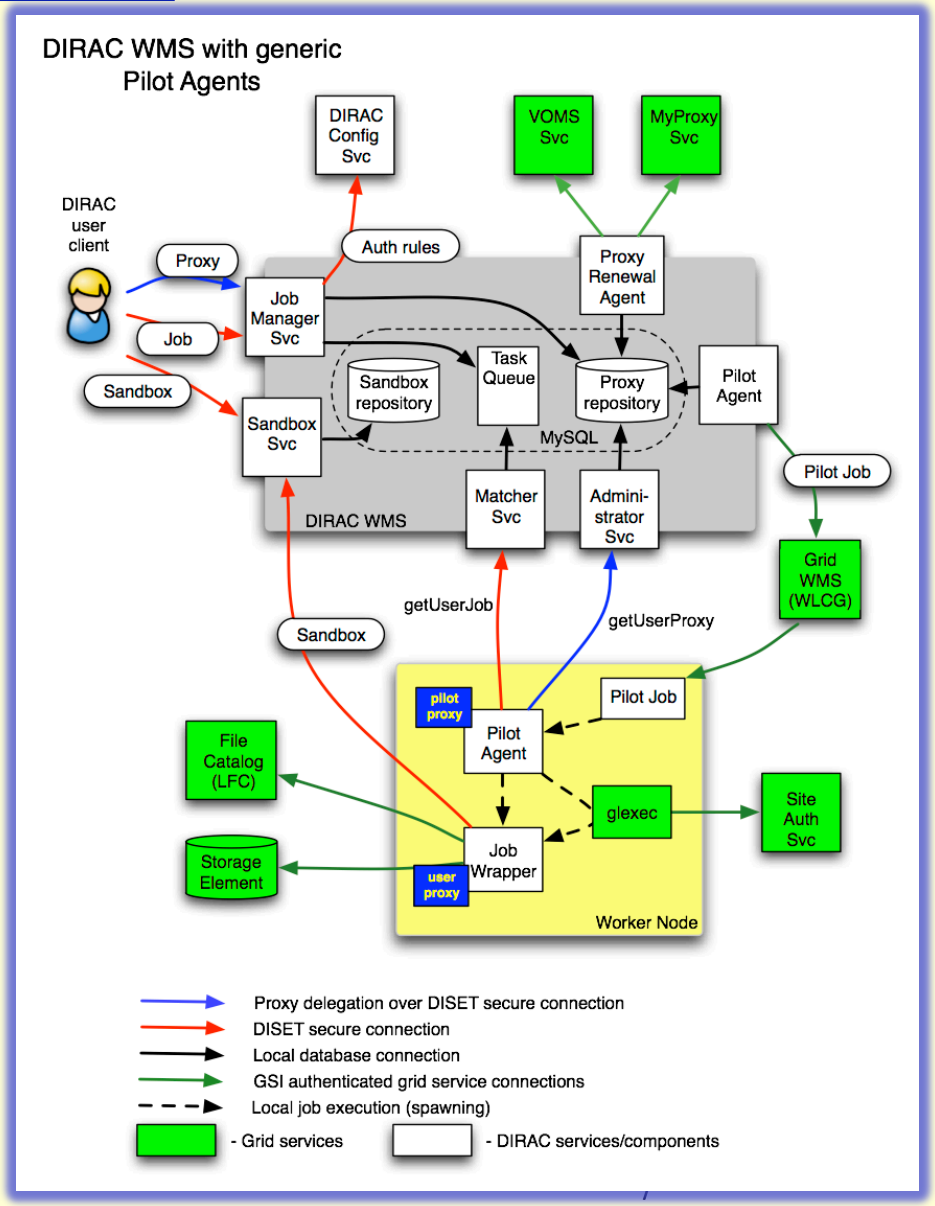
- Two windows were arranged for the CCRC'08 activity
  - Phase 1 (February)
    - Maintain equivalent of 2 weeks data taking
    - Assume a 50% machine cycle efficiency
    - Use fake RAW files of ~2 GB in size
  - Phase 2 (May)
    - Maintain equivalent of 1 month data taking
    - Assume a 50% machine cycle efficiency
    - Introduce user analysis activity in parallel to the production activities
  - Continued throughout the summer
    - At slower pace

DIRAC for CCRC'08

- DIRAC ported to new framework (DIRAC3)
  - Whole software stack is completely reengineered
- New features include:
  - Certificate enabled Web Interface exposing job and production management functionality
  - Improved tools to track all kinds of activities on the Grid
  - Many features to improve reliability and redundancy
  - Lots of others…
- DIRAC is now the LHCb combined system for
  - Production and Analysis activities
  - Workload and Data Management tasks

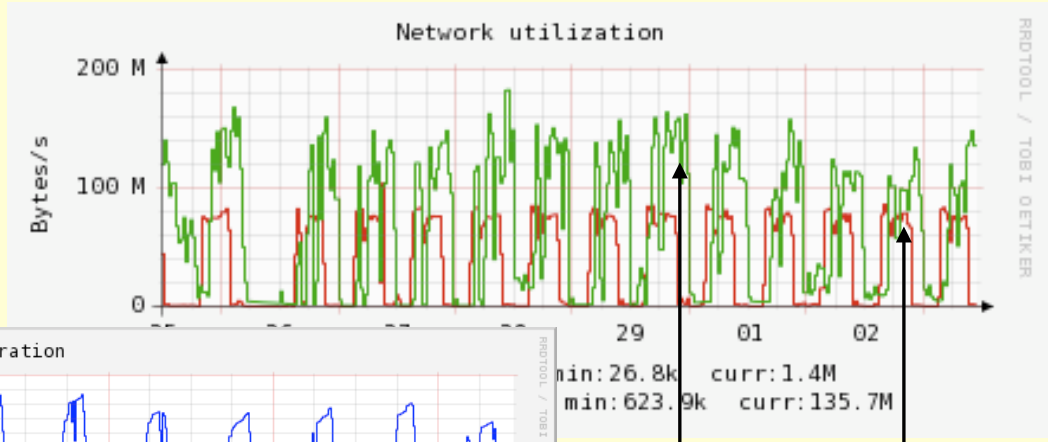
WMS with pilot jobs

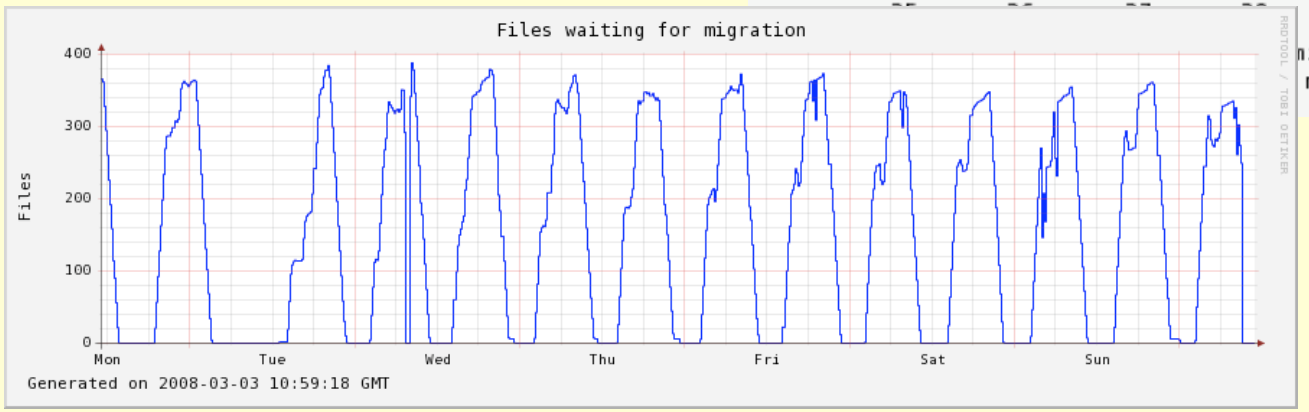
- Necessary to run both user and production jobs on the same system with common LHCb policies
- Many implications for the Grid middleware and policies
  - Approved by the WLCG management
  - Supporting grid middleware is being prepared
    - End of 2008 ?
  - We are starting tests
  - More implications on our security framework
    - Logs, tracability, etc



RAW Data Upload (Online->Tier-0)

- Online (Pit 8) to Tier-0 Transfers
  - Early February: continuous with low rate
  - As of February 18th proceeded at nominal rate (70MB/s) with ~50% duty cycle

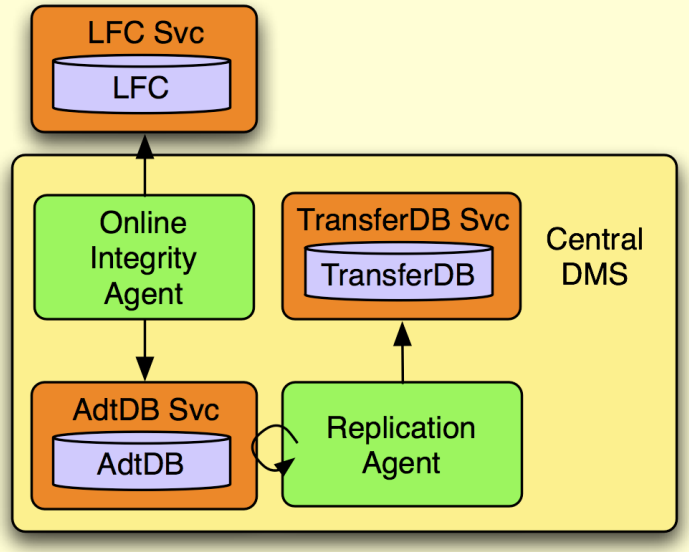




Migration

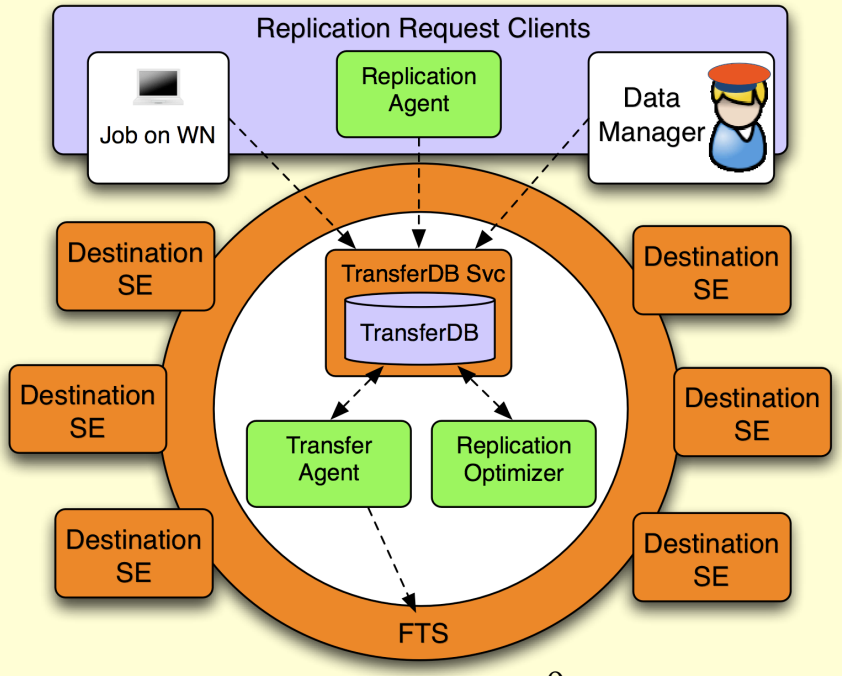
Tier-1 transfers

RAW Data Distribution to Tier-1s



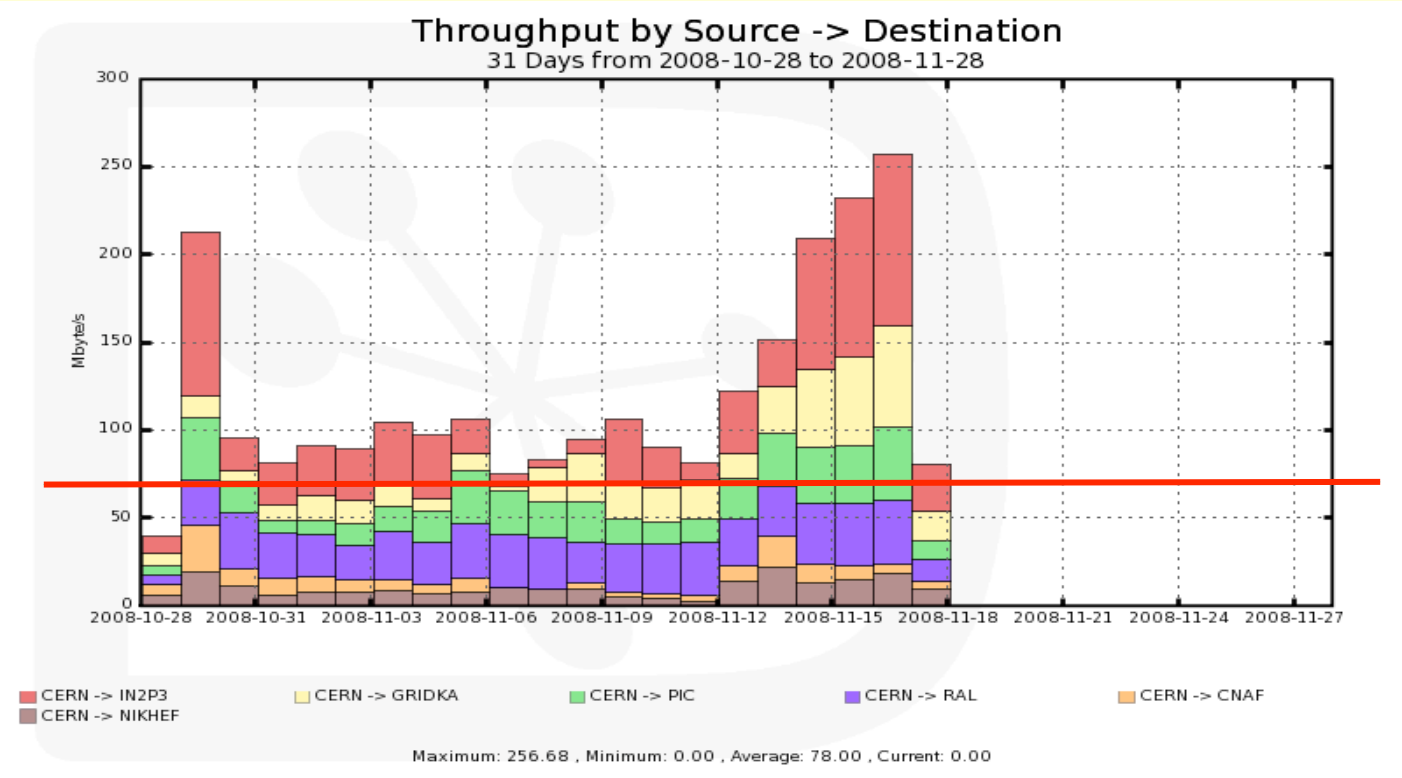
- Transfer Agent polls TransferDB
  - Creates bulk transfer requests
  - Submits and monitors transfers through File Transfer Service
  - Requests retried in case of failure

- File registered in AutoDataTransferDB when safely migrated
- Replication Agent splits files according to site shares
- Places transfer requests in TransferDB



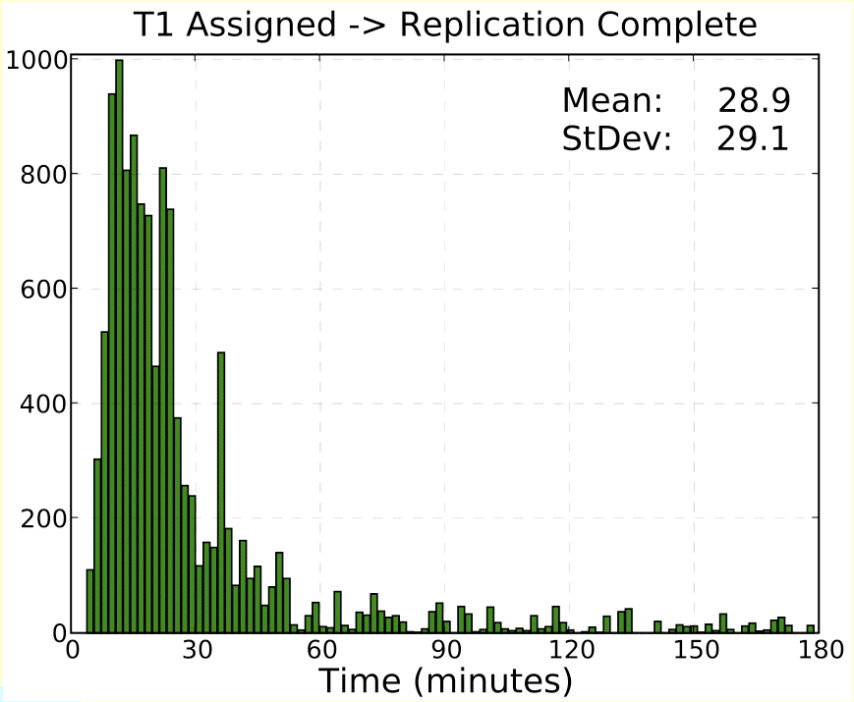
RAW Data Distribution to Tier-1s

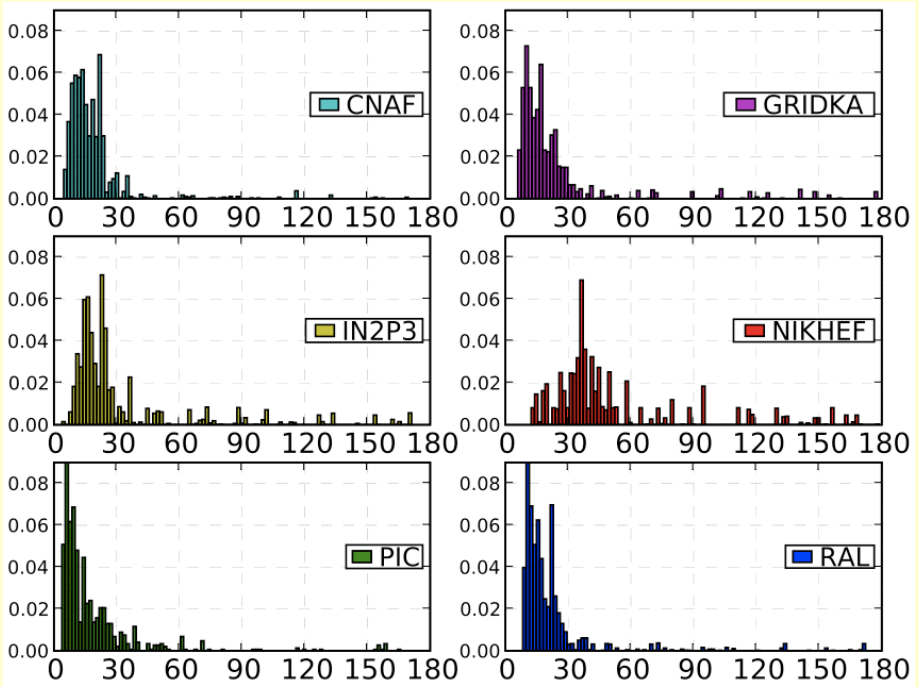
- Nominal transfer rate to the Tier-1s (70MB/s with 50% duty cycle) achieved
  - Data replication according to pledged resources successful
- Bulk file removal successfully tested



File Transfer Service Performance

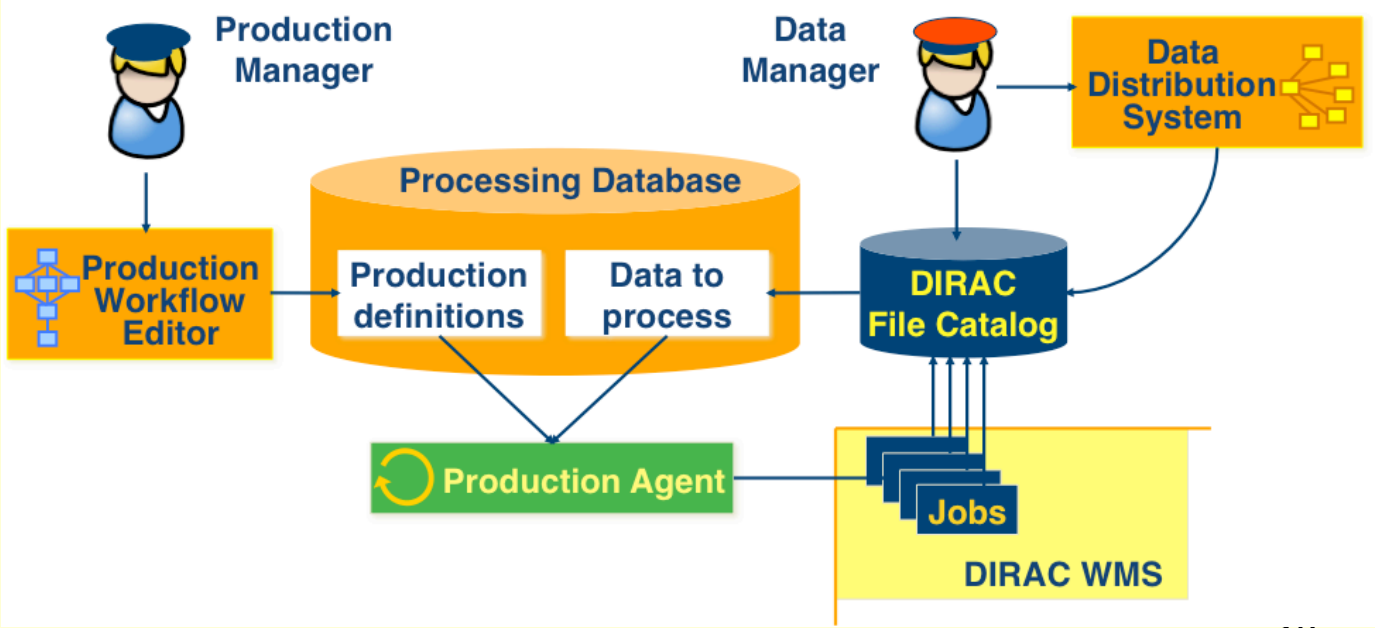
- Histograms of time between a file being ‘Assigned’ and ‘Transferred’ to the LHCb Tier-1s (minutes)
  - File Transfer Service submit / monitor / done cycle
- Most sites show stable behaviour





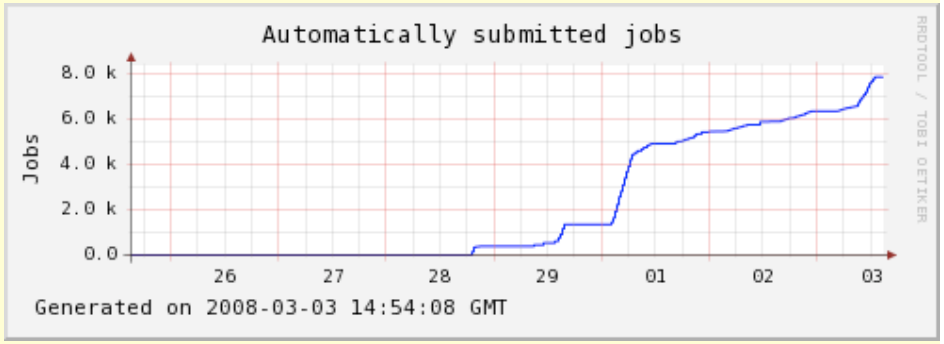
Production Management Infrastructure

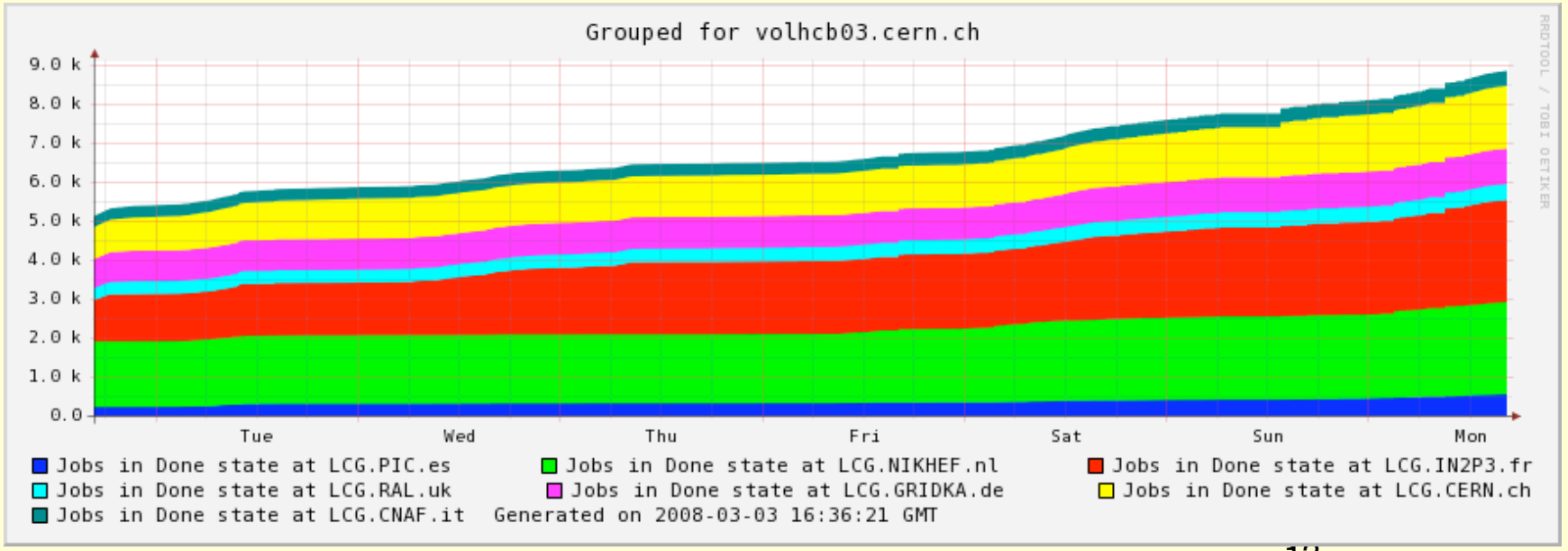
- Eligible files are entered in the DIRAC Production Catalogue
  - Sorted according to the transformation definitions
  - Transformation agent creates the production jobs
- Tier-1 shares are allocated according to quotas
- The Production Manager controls the job submission
  - Production service
  - Web portal



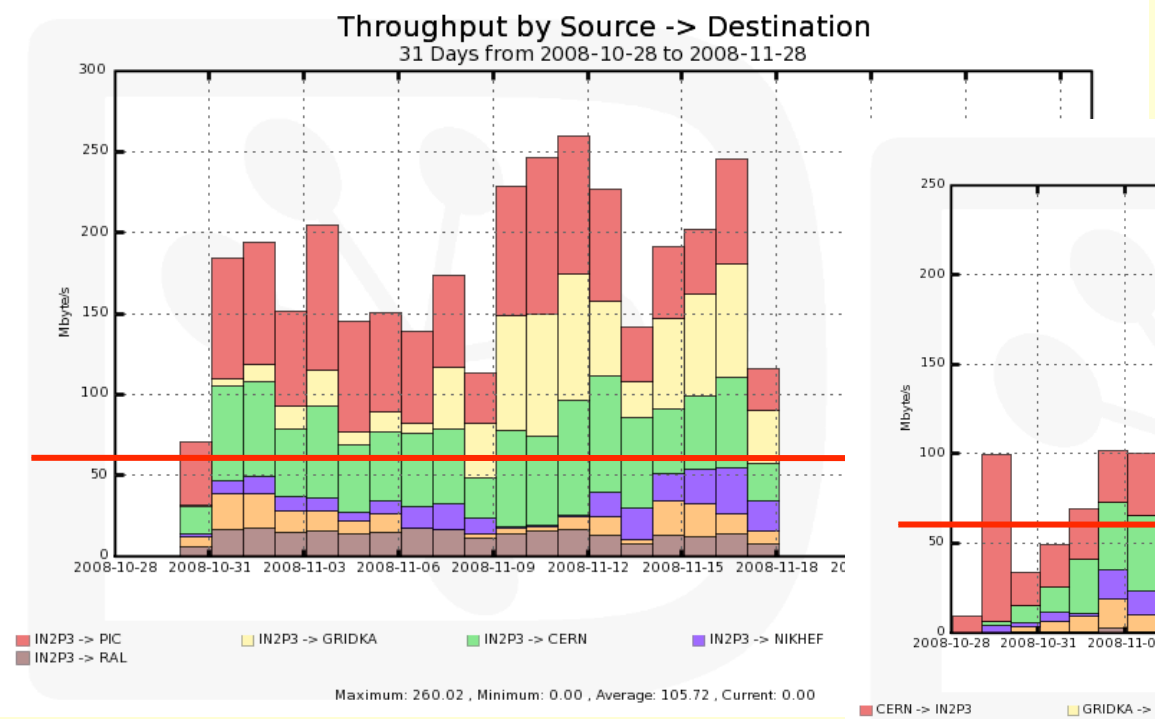
Data Reconstruction at Tier-1s

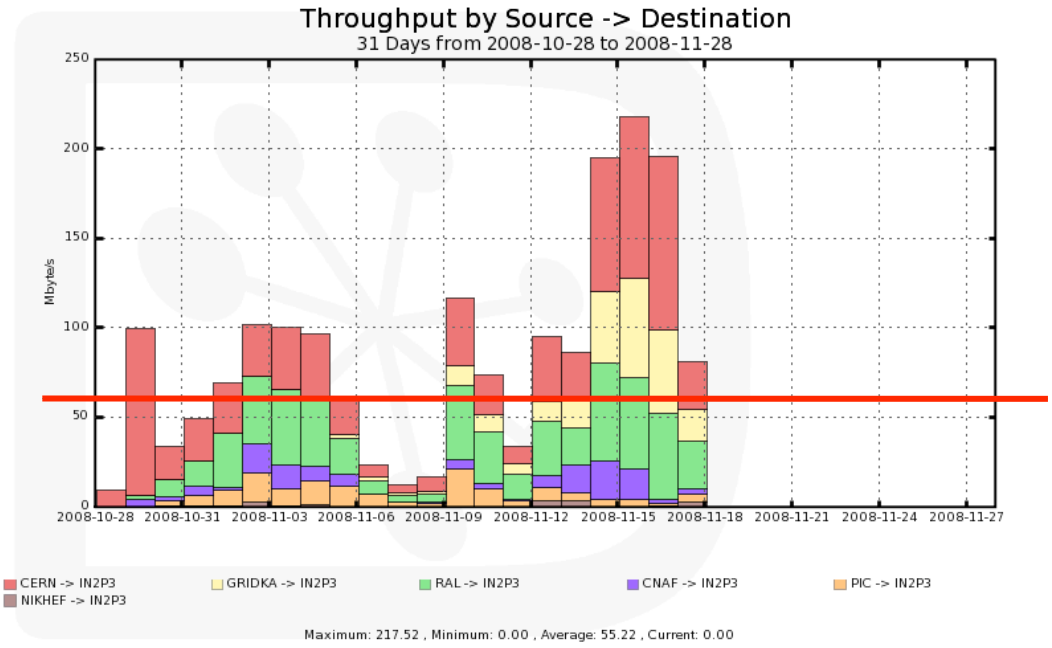
- Jobs submitted steadily and running at all Tier-1 sites
  - Mechanism for automatic job submission to DIRAC successfully demonstrated





T1-T1 transfers

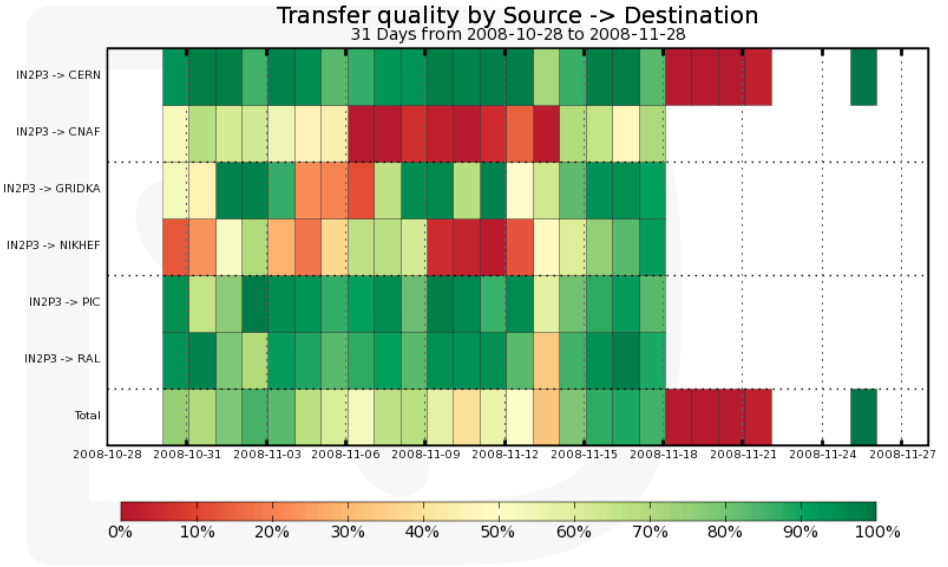




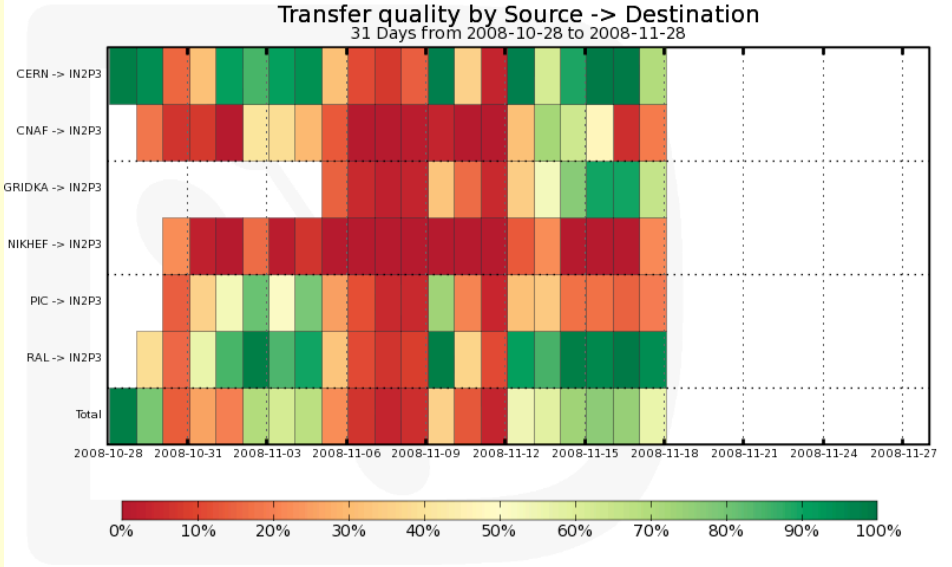
- The required throughput of ~60MB/s is achieved to and from CC/IN2P3 storage after some tuning

T1-T1 transfers

From IN2P3

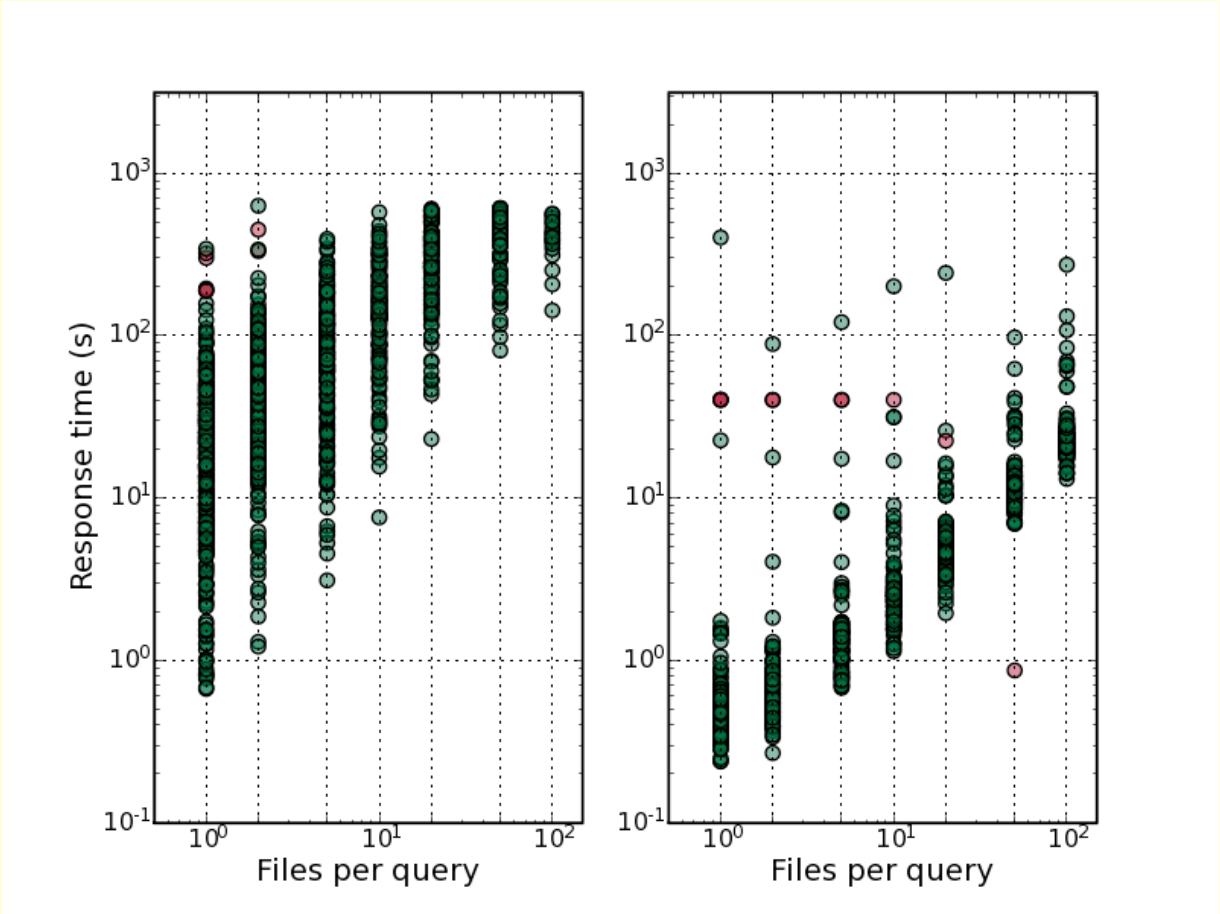


To IN2P3



- In general, IN2P3 shows stable behaviour
  - Can not say so about all the T1 counterpartners
- dCache service is still improving
  - Introducing « fast » pnfs

IN2P3 SE SRM response



before after

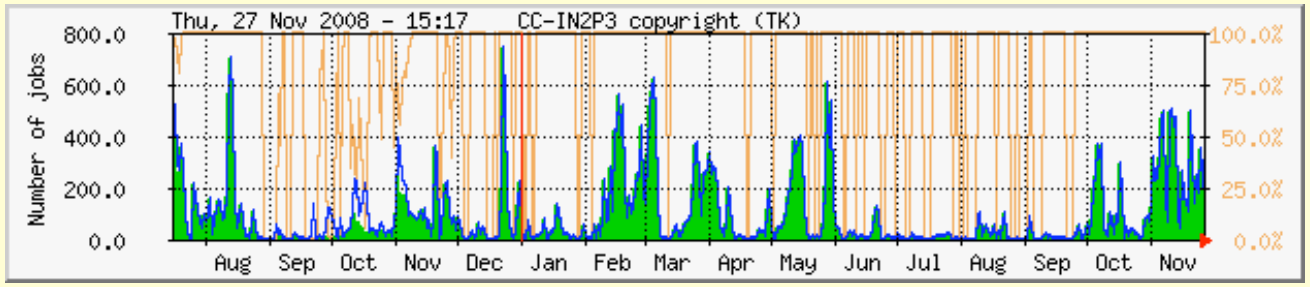
Effect of the « fast » pnfs introduction

Usage of storage at T2 centers

- Online-T0, T0-T1, T1-T1 transfers are in good shape
- T1(0) – T2 transfers are not actively tested
  - LHCb computing model does not assume data processing and analysis in T2 centers
    - Mostly motivated by the lack of the LHCb specific support at T2 sites, especially for Data Management
  - This is being reconsidered now
- Storage elements at GRIF and CPPM are configured in the DIRAC CS
  - No technical obstacles to use them
- Have to decide on the data usage policy at T2's

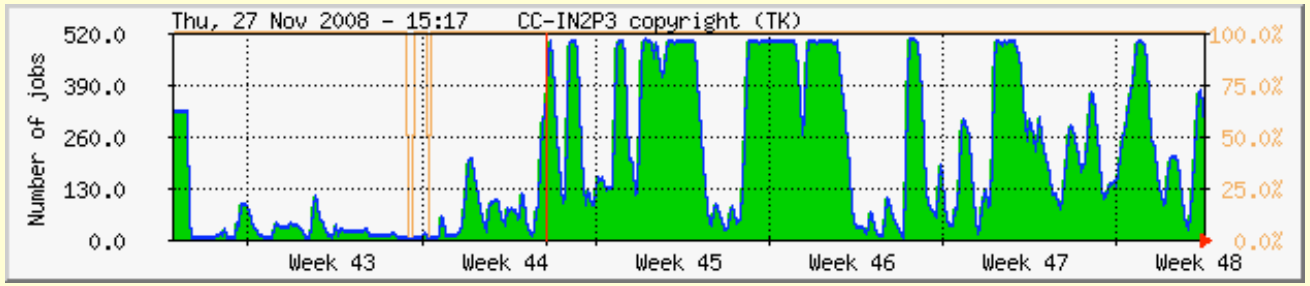
Usage of the CPU power

- Low consumption of the CPU power compared to projected numbers for 2008
  - No real data
  - Small number of MC requests from physicists
- Consumption at CC/IN2P3 - ~15% of the plan

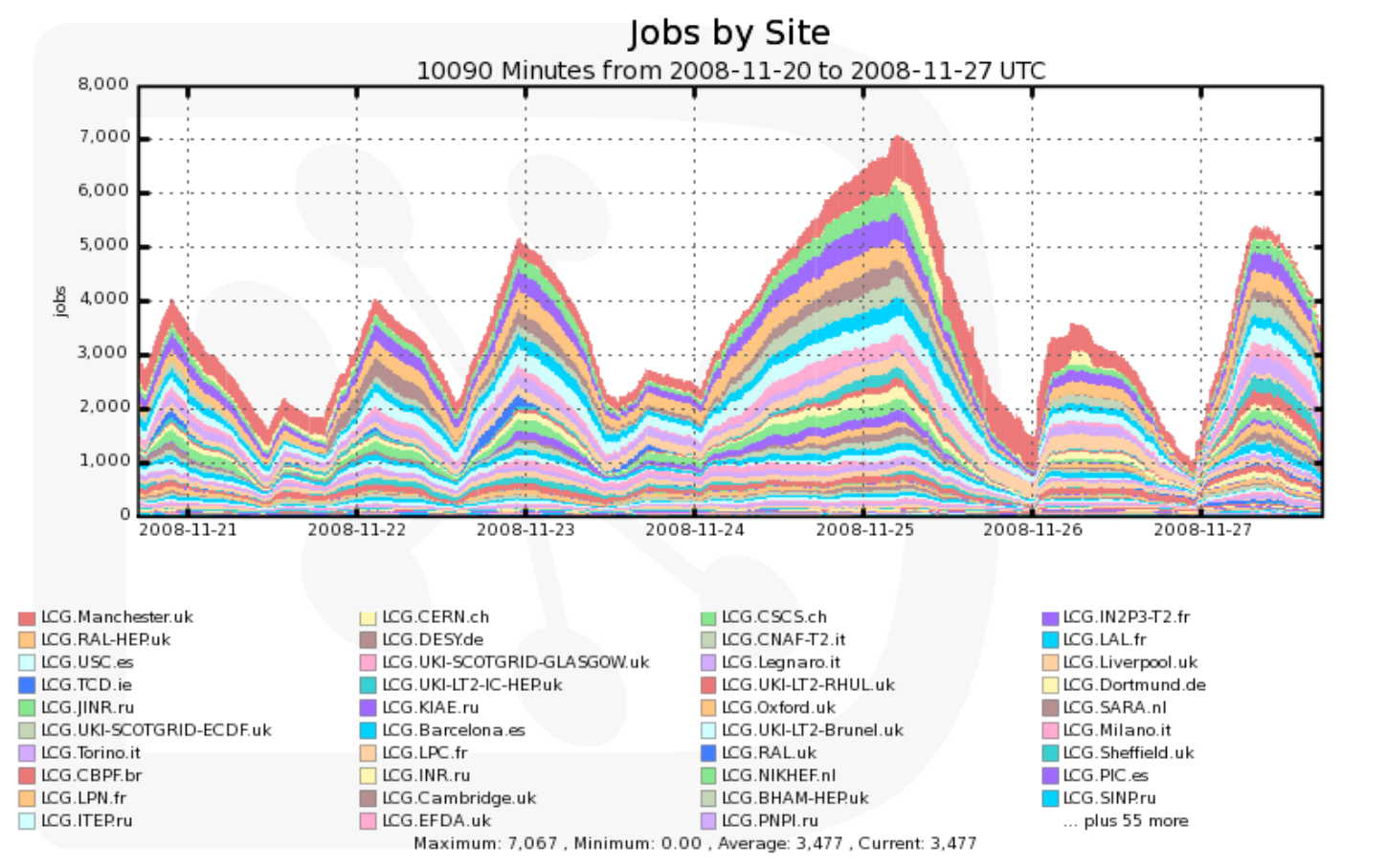


Last year

Last month

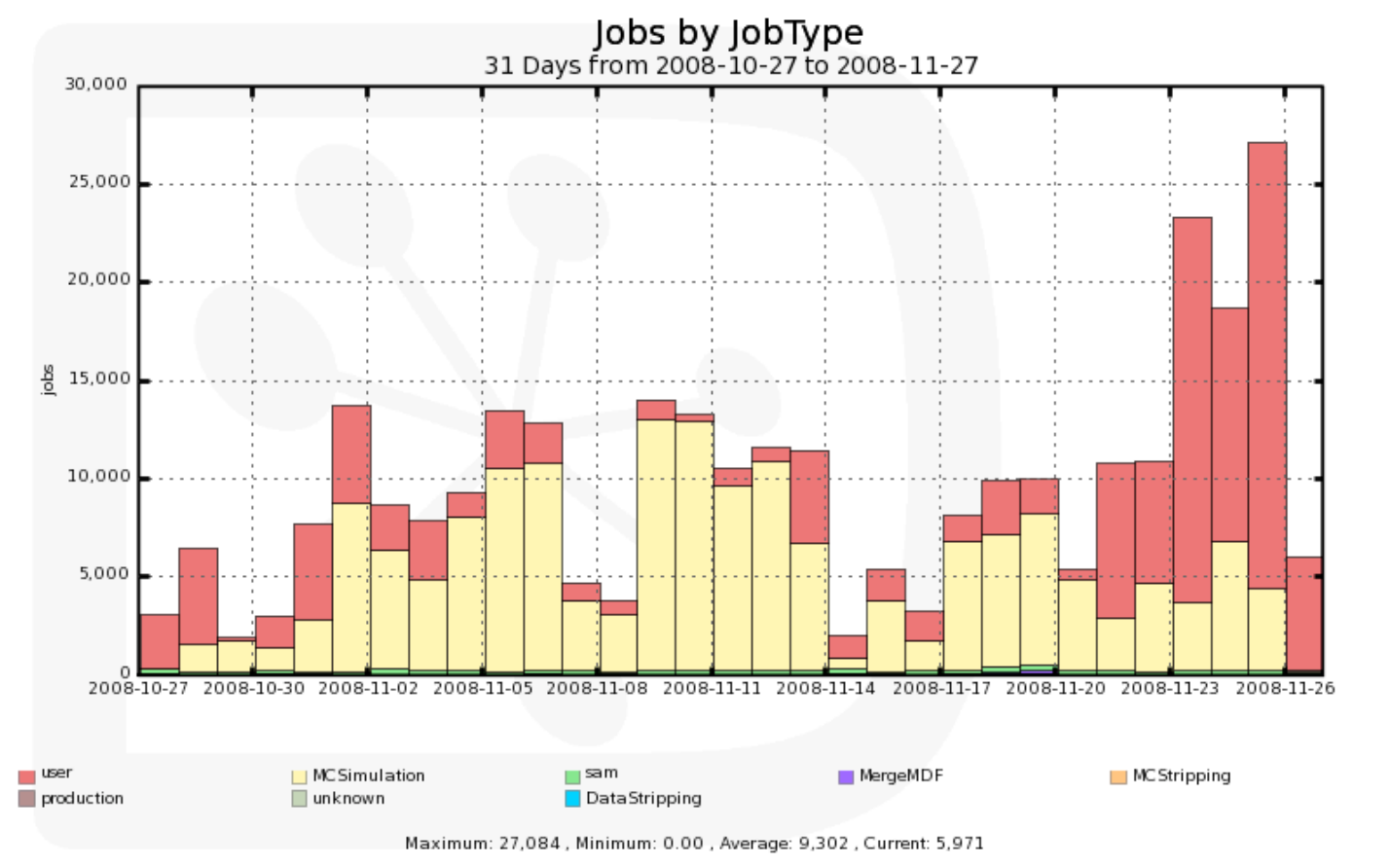


Running concurrent jobs



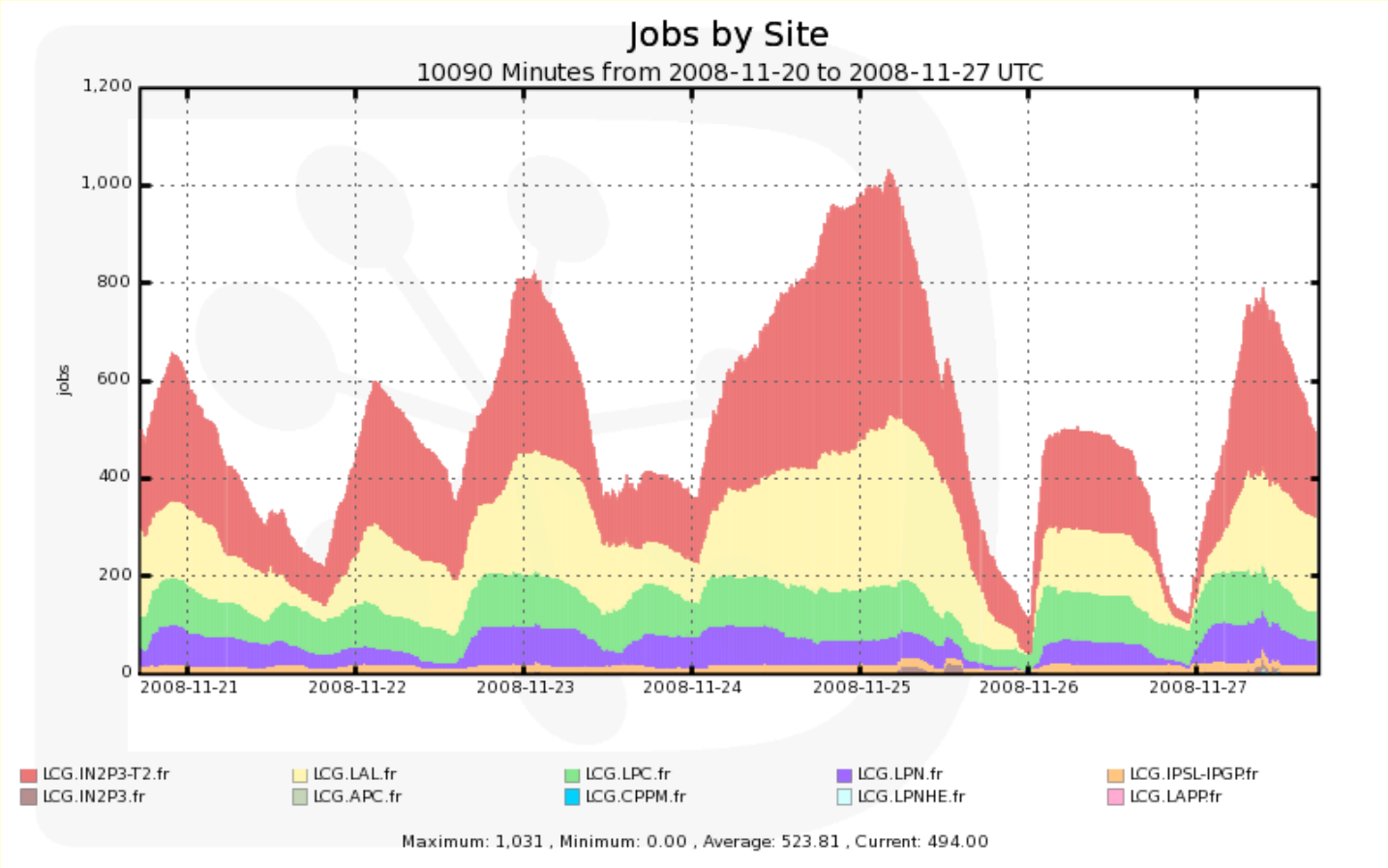
- Activity intensifies towards the end of the year
  - Expect ramp up in both MC Processing and Analysis

DIRAC3 jobs



- Current activity at about 15K jobs per day
  - Well below the limits of the DIRAC WMS

LHCb jobs at french sites



- Contribution of french sites is on the level of ~15%
  - The CPU capacity is underused in all countries

Next steps: FEST'09

- Replace the non-existing 2008 beam data with MC
- Points to be tested
  - L0 (Hardware trigger) strategy
    - ➡ Emulated in software
  - HLT strategy
    - ➡ First data (loose trigger)
    - ➡ High lumi data (b-physics trigger)
  - Online detector monitoring
    - ➡ Based on event selection from HLT e.g. J/Psi events
    - ➡ Automatic detector problems detection
  - Data streaming
    - ➡ Physics stream (all triggers) and calibration stream (subset of triggers, typically 5 Hz)
  - Alignment and calibration loop
    - ➡ Trigger re-alignment
    - ➡ Run alignment processes
    - ➡ Validate new alignment (based on calibration stream

Next steps: FEST'09 runs

- Start is planned for March 2009
  - MC data in RAW format already prepared (100M minimum bias events)
- Short test periods
  - Typically a week
  - Depending on results, take a week interval for fixing problems
- Vary conditions
  - L0 parameters
  - Event rates
  - HLT parameters
  - Trigger calibration and alignment loop

2009 resources plans revised

CPU (MSi2k*year)	Current	Revised
Online farm	0.9	?
CERN T0+T1	1.05	2.83
Tier-1s	4.97	6.15
Tier-2s	11.38	12.89
Total	18.30	21.87
Disk (TByte)	**Current**	**Revised**
Online farm	0.0	0.0
CERN T0+T1	991	895
Tier-1s	2759	3061
Tier-2s	23	21
Total	3773	3978

- Assumes more reprocessing and user analysis of the full (non-preselected) data

Conclusions

- LHCb tools are ready to the real data processing
- IN2P3-T1 demonstrates stable behavior
  - T2 centers are considered to exercise also User Analysis
- Delays in the LHC start-up resulted in a serious revision of the activities and resources consumption in 2008
- 2009 resources needs are close to the originally planned values