

Massive data processing for the ATLAS Combined Test Beam

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on behalf of the
ATLAS Combined Test Beam Group

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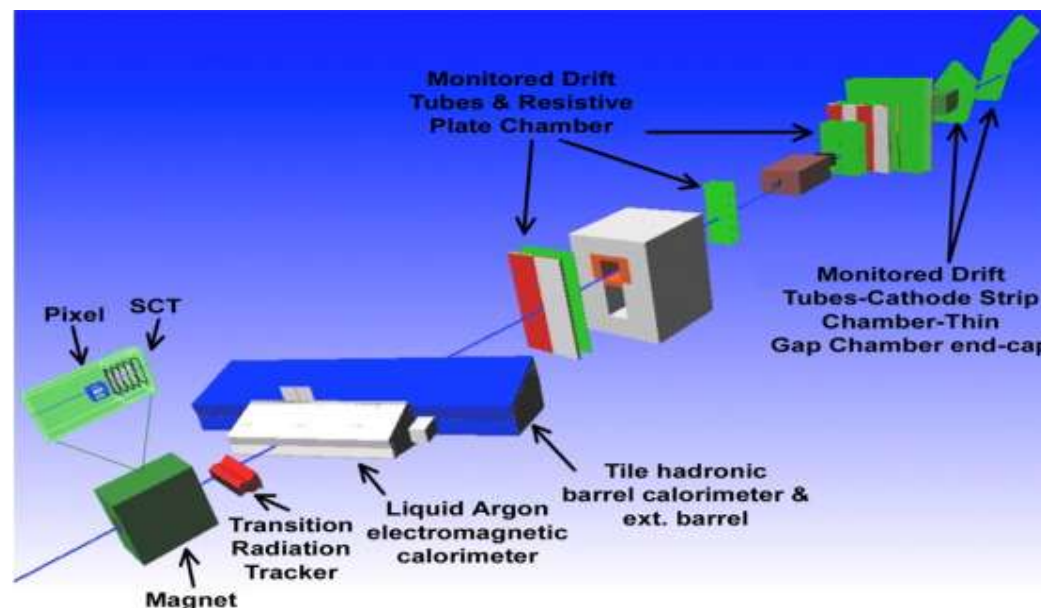


Outline of talk

- ATLAS combined test beam data
- Productions
 - on CERN batch system
 - on LCG
 - on NorduGrid
- Conclusions and outlook



ATLAS combined test beam data



- CERN – 2004
- Elements from all ATLAS sub-detectors
- 90 million events collected, ~0.05 MB each
- 4.5 TB of data stored on CERN tape system
- Monte Carlo simulations performed with the exact specifications of the collected real data
→ accurate comparison studies

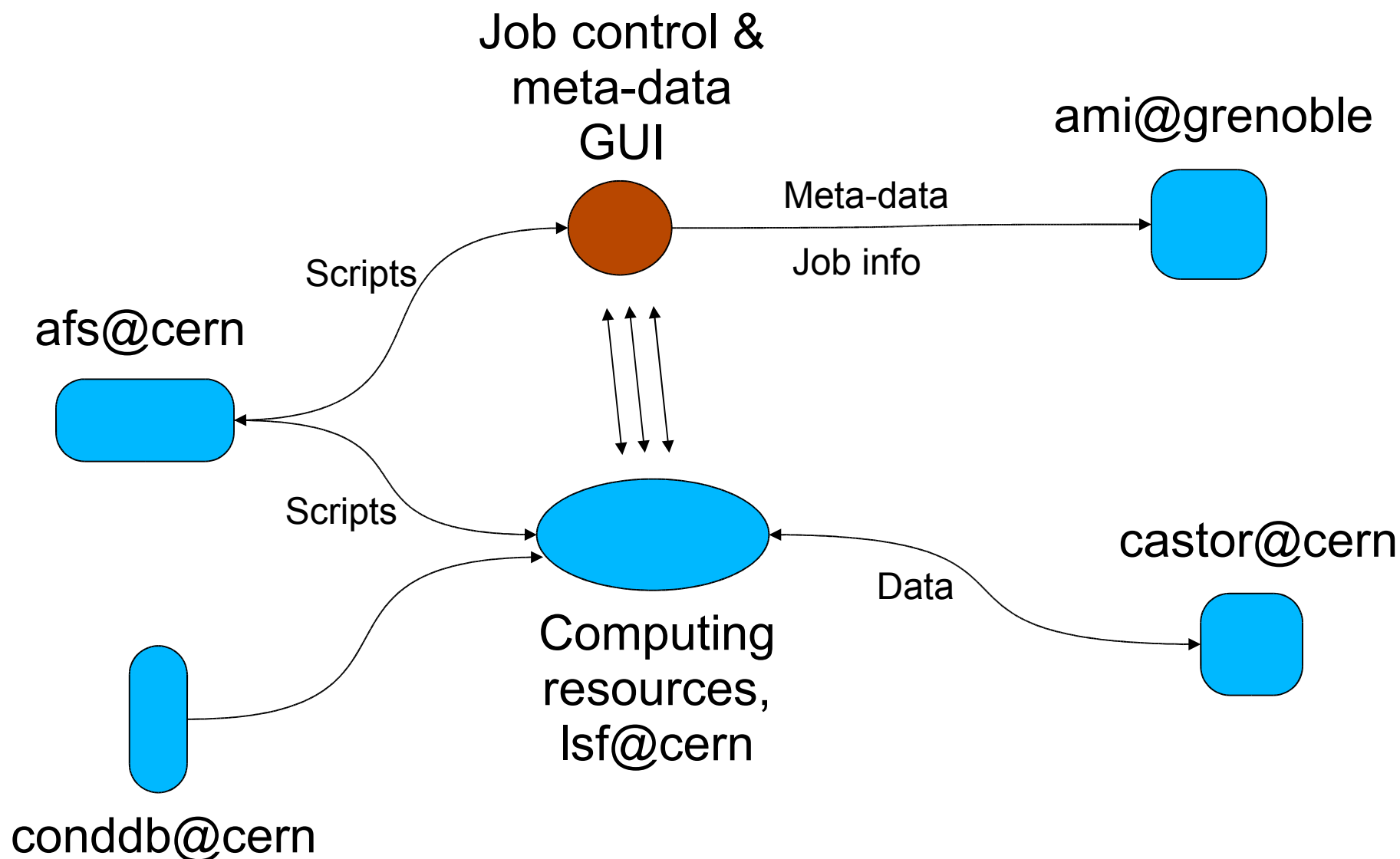


Productions

- Production **requirements** (summer 2004)
 - Support simulating data
 - Support processing simulated and real data
 - Publish information in ATLAS meta-data catalogue (AMI)
 - Copy produced files to CERN tape system (CASTOR)
- Production **constraints**
 - CERN conditions DB: hard limit of 500 connections
→ solution needed for massive MC productions
 - CERN batch system overloaded
→ solution needed (Grid) for massive MC productions



Production on CERN batch system



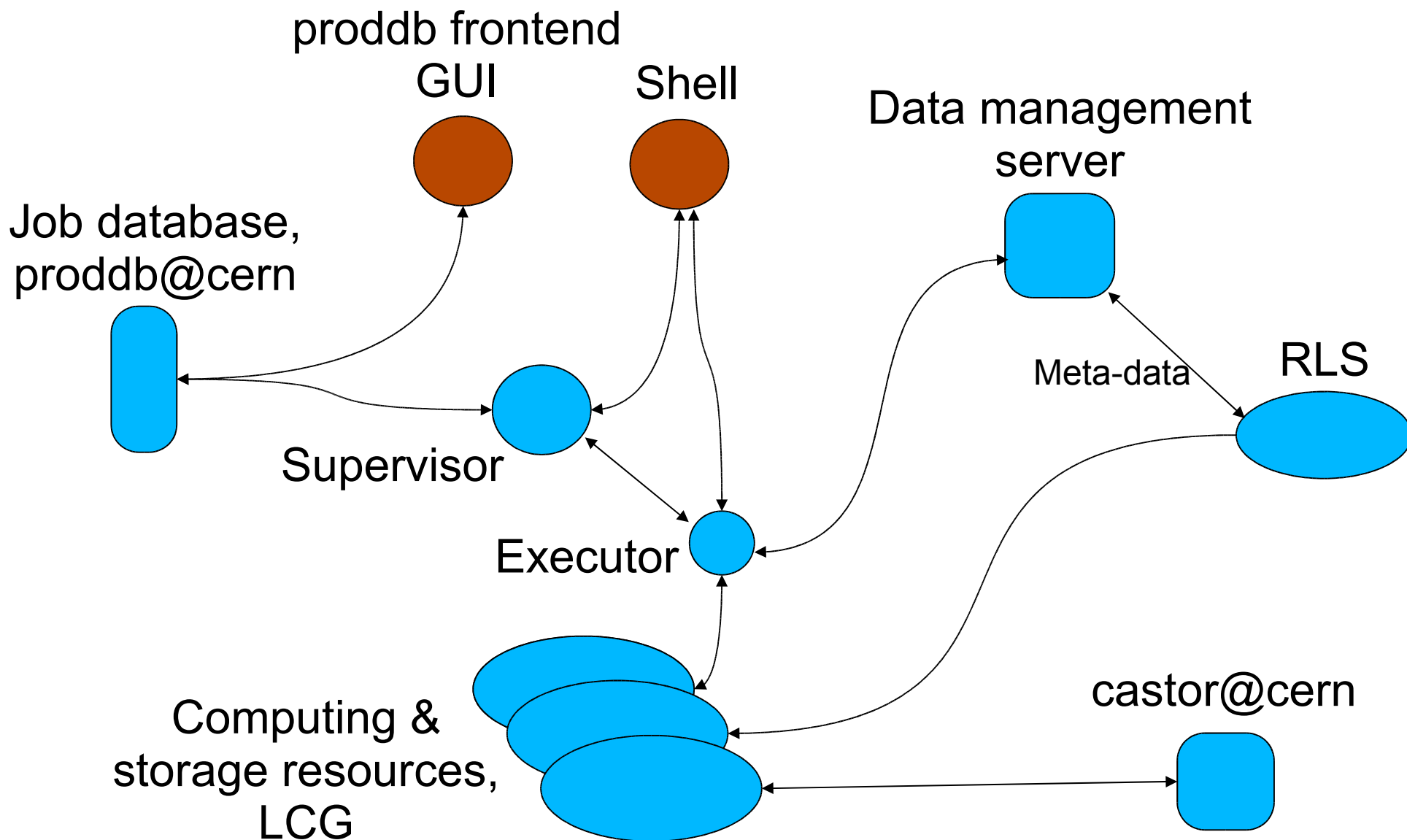


Production on CERN batch system in 2005

- Heavy reliance on local CERN infrastructure: AFS, tape system (CASTOR), conditions DB
- Performed via GUI from for ATLAS DC1 (AtCom)
- GUI developed further to support both simulation and processing of real data
- **Reconstruction of real data:** 400 runs ~ 25 million events, selected by the CTB community, reprocessing carried out with major software releases (8.8.0, 9.1.2, 10.0.2, 10.3.0, 10.4.0)
- **Production of simulated data:** 5.4 million events (e, pi, mu, p)
- CPU time for simulation: ~15 KSI2K second per event (pion)
- CPU time for reconstruction: ~1.5 KSI2K second per event (pion)
- Failure rate: ~2%



Simulation on LCG





Simulation on LCG

- Goals (spring 2005)
 - Simulate 4 million events with same conditions as real data
 - Comparison real data/simulated data in view of the Rome ATLAS Physics Workshop
 - Exercise ATLAS production system from a user's perspective
- DC2 production system used
- Digitisation and reconstruction performed on CERN batch system with GUI because of conditions DB issue



Simulation on LCG

- Results
 - **May-June 2005:** 3.92 million events simulated, digitised and reconstructed
 - List of 392 CTB runs by the Combined Performance group
 - We were to able submit between 300 and 500 jobs / day on average



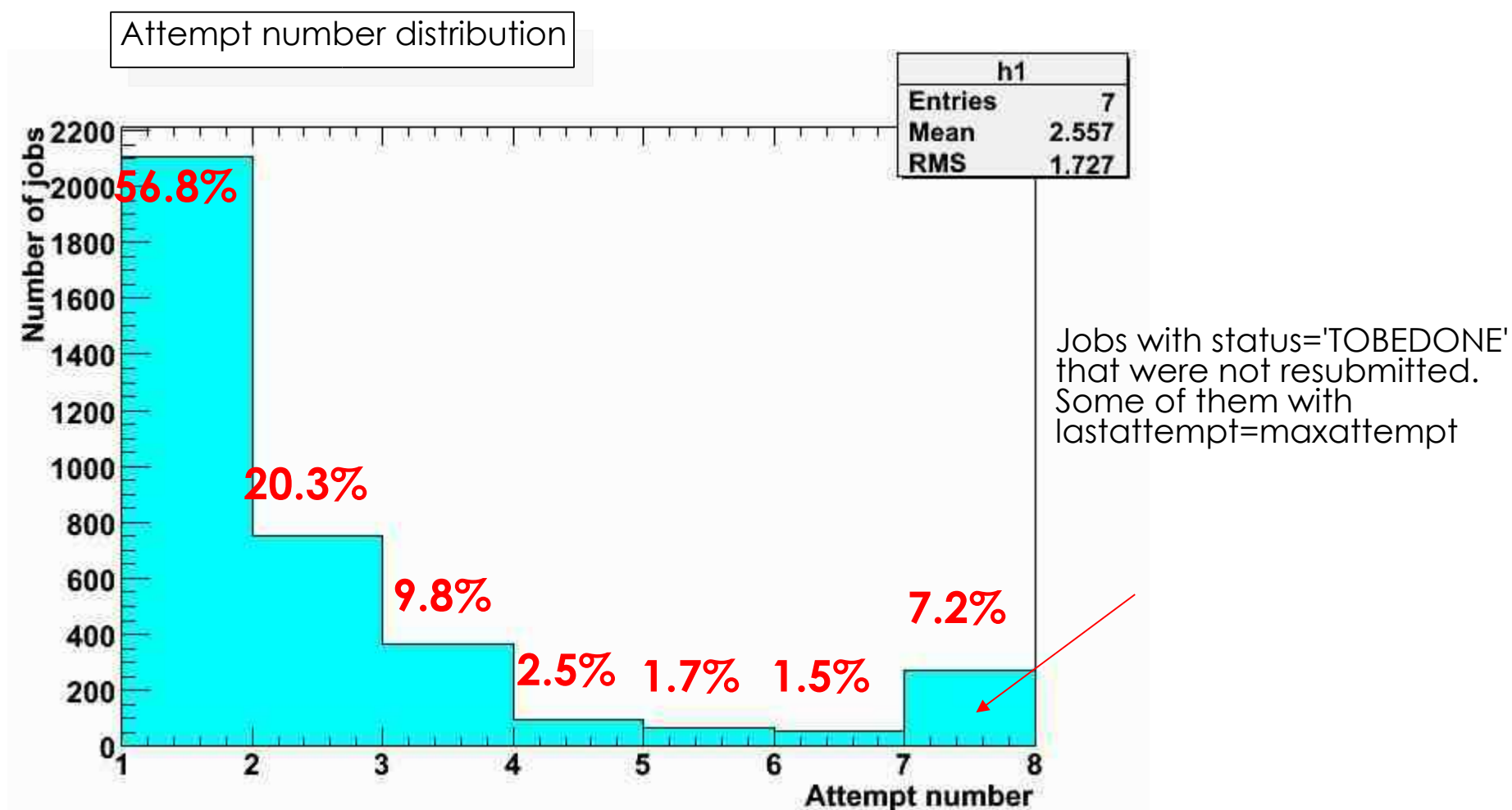
Simulation on LCG

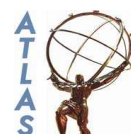
- Issues
 - Much manual work and babysitting involved
 - Undocumented system – not user oriented - only for experts
 - User must run supervisor and executor herself
 - Supervisor/executor crashes and need manual intervention
 - RLS goes down, nothing to do but wait
 - Despite global resource, the system is very CERN centric and dependent on several central services: prodDB, Jabber server, resource broker, BDII



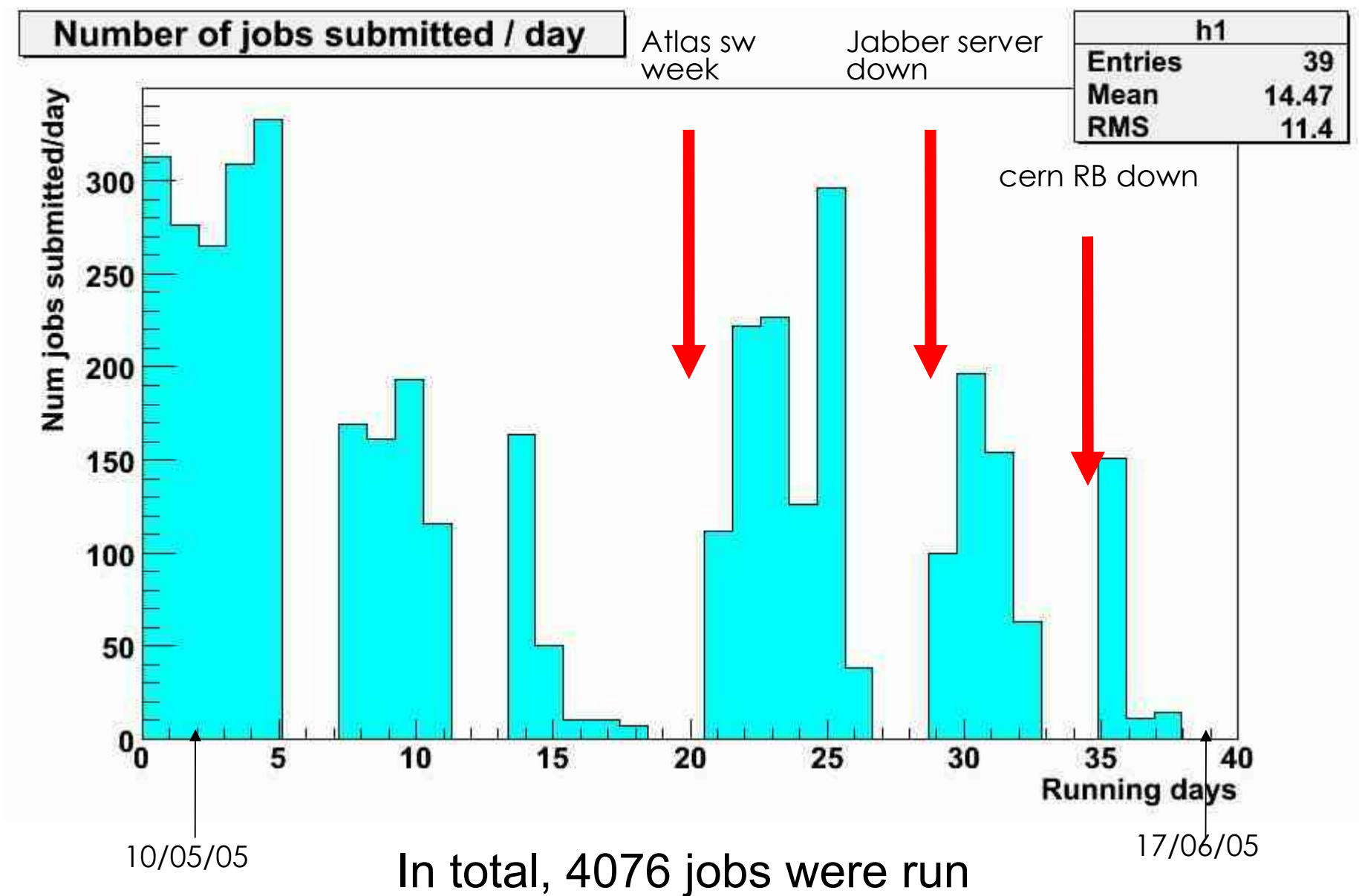
Simulation on LCG

57% of the jobs finished with only 1 attempt



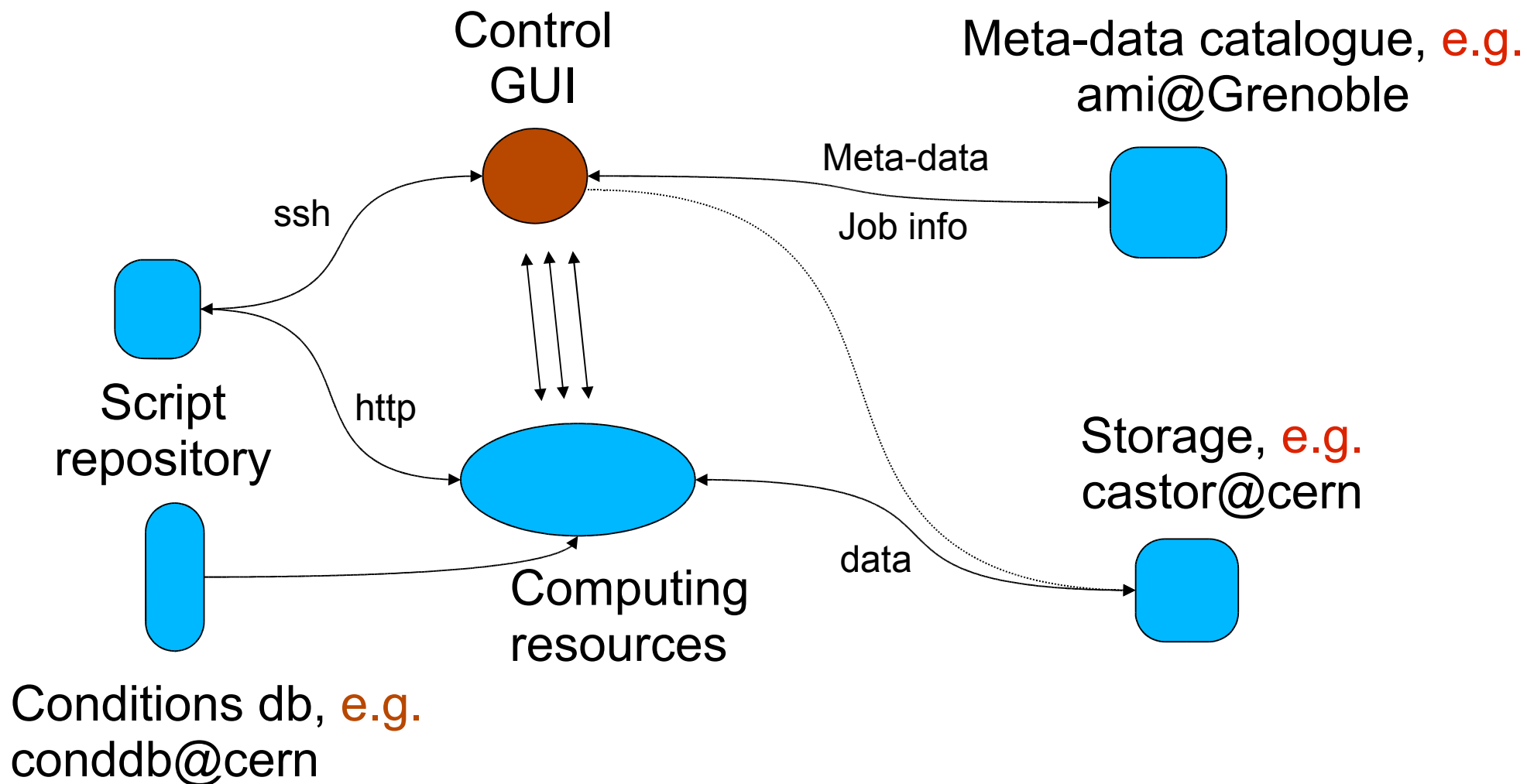


Simulation on LCG





Production on NorduGrid





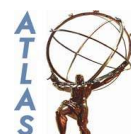
Production on NorduGrid

- Goals (November 2005)
 - Quick turnaround: <2 days for preparing and submitting jobs
 - Exercise and develop further the GUI used for DC1 production
 - **Get rid of all reliance on central CERN services** (address conditions DB issue)
- Bottom-up approach: exercise grid technology at tier-3 – tier-2 level, independently of central services
- Ultimate goal: address “man-power” problem by putting the physicists themselves in control of smaller productions



Production on NorduGrid

- Results
 - **December 2005:** 210'000 photon events simulated and digitised in a few days (420 jobs)
 - **February 2006:** 680'000 pion, muon and electron events simulated and digitised in a few days (2720 jobs)
 - **All jobs ran without using any central CERN services**
- Issues
 - Much time spent setting up static replicas of conditions and geometry DBs
 - Gridftp transfers sometimes fail (a few percent)



Conclusions and outlook

- We have explored production and processing of data on computing grids via two paths
 - Production of CTB simulated on all the three ATLAS Grid flavours via the central production system
 - A light-weight and bottom-up approach via a GUI and NorduGrid, completely independent of central resources
- We have come a good deal closer to the end goal of making ourselves redundant!
 - We are now able to produce data on the ATLAS production system
 - Large reprocessing of important datasets will run fully automatically on the ATLAS production system
 - Running small-medium-scale productions will be delegated to the physicists themselves via the GUI