**DC06 Aims**

- To produce data for the LHCb physics book
- Realistically test the LHCb Computing Model
  - Jobs
    - Monte Carlo simulation on all available sites
    - Reconstruction and Stripping at Tier-1s
    - User Analysis mostly at Tier-1s
    - All jobs submitted to the DIRAC WMS
  - Data Storage
    - Real RAW data on tape at CERN + 1 Tier-1
    - Reduced DST on tape at Tier-1
    - Full DST on disk at all Tier-1s
- Challenge DIRAC and the LCG production service

**Monte Carlo simulation**

- 700 million events were simulated since May 2006
  - 1.5 M events / day through the DC06 period
- 1.5 million jobs successfully executed
- Up to 10000 jobs running simultaneously (figure below)
- Most requested simulations have been completed

**Data distribution**

- MC raw data distribution to Tier-1s for reconstruction
  - Implemented by a central DIRAC-DMS using FTS
  - Raw data distribution was part of WLCG SC4 (autumn 2006)
  - Good throughput seen
  - SE instabilities – no transfer to 6 sites simultaneously
  - Data-driven job creation and submission

**DC06 Resources and data distribution**

- Resources required
  - Bandwidth of 10 MB/s from CERN to Tier-1s
  - FTS to distribute data from CERN to Tier-1s
  - 1 MB/s from Tier-2 to associated Tier-1 Storage Element
  - Disk space of 80 TB at CERN and all Tier-1s (by Sept 07)
  - User analysis needs another “few” TB
  - Primarily root files by physicists
  - Processing power of 2.5 MSI2K cpu-days / day
- Data distribution patterns implemented
  - MC raw data distributed from CERN to Tier-1s
  - Reduced DSTs stored at the Tier-1 where produced
  - DSTs distributed to CERN + 2 Tier-1s

**Data Storage**

- Sets a request on a VO-box if
  - LCG utilities used (lcg-cp)
  - Sustained total transfer rates > 50MB/s (figure below)

**Reconstruction and Stripping**

- 100 million events have been reconstructed
  - 200,000 files recalled from tape
- 10 million events stripped
- 10,000 jobs submitted
- Up to 1200 jobs running simultaneously
- All the Tier-1 sites used
- Work still continuing

**Monte Carlo simulation**

- 10 million events stripped
- 100 million events have been reconstructed
- 10,000 jobs submitted
- All the Tier-1 sites used
- Work still continuing

**Issues faced**

- Data access issues on Worker Nodes
  - ROOT - SE incompatibilities (configuration of SEs)
  - Files need to be pre-staged
- SRM endpoint problems
  - Bad SM configuration, disk space availability, server overload, etc
  - Seen at all the sites
- Problems with computing elements
  - CE acting as “black hole” for the DIRAC pilot agents
  - Bad CE configuration, queue manager problems, etc
  - Wrong job environments on the worker nodes
- Problems with grid middleware and services
  - BDII server overload
  - VOMS problems – access permissions errors, role changes, etc
  - proxy lifetime issues (expiration in the batch queue, …)
  - smrGet not staging files on dCache
  - Firewall problems when accessing software
  - Firewall problems when accessing data (SE behind a firewall)
  - gLite WMS not yet in production
  - Unforeseen issues (fire in a computer facility!!!, cooling breakdowns, …)

**Summary**

- LHCb computing model successfully exercised
- All requested Monte Carlo events have been simulated
- Reconstruction and stripping is currently ongoing
- Satisfactory data transfer rates have been observed
- Many issues still with SEs, services and middleware

**Data upload from jobs on worker nodes**

- Sets a request on a VO-box if
  - destination(s) are not available (fail-over mechanism)
  - multiple destinations are required
- Sustained total transfer rates > 50MB/s (figure below)

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- Bad SM configuration, disk space availability, server overload, etc
- Seen at all the sites

**Data transfer issues**

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