

Annex 8. Programme of Work for the Deployment of the WLCG and Sharing of Responsibilities for its Execution

Data Recording

CERN must be capable of accepting data from the experiment data acquisition (DAQ) systems and recording it on magnetic tape at a long-term sustained average rate of 1.6 GBytes/sec during the proton-proton run and 1.85 GBytes/sec during the heavy-ion run. During 2004 the disk-tape writing rate was demonstrated at 1 GByte/sec. In March 2005 the recording rate for simulated DAQ through mass storage system to tape was demonstrated at 450 MBytes/sec. The target DAQ-mass-storage-tape rate achievable at the end of December 2005 is 750 MBytes/sec, rising to the full nominal data rate of 1.6 GBytes/sec by August 2006. These demonstrations must be performed in parallel with the Service Challenge activities described below.

The LCG Service Challenges

The LCG Service Challenges are a mechanism by which the readiness of the overall LHC Computing Service to meet the requirements of the experiments is measured and if necessary corrected.

Service Challenges 1 and 2 focussed on building up the necessary data management infrastructure to perform reliable transfers between the Tier-0 and Tier-1 sites as permanent production services with the appropriate throughput. Service challenge 1 involved a core set of Tier-1 sites and proved an important learning experience for providing these services. Service challenge 2 met its throughput goals of 100MBytes/sec per site with a total of 500MBytes/sec sustained out of CERN, but did not yet include experiment-specific software or offline Use Cases.

Service Challenge 3

Service Challenge 3 commenced in July 2005 involving all Tier-1 sites, together with a small number of Tier-2s. It has two phases – a setup phase, during which an initial throughput test was made, followed by a four-month service phase of stable operation during which experiments are committed to carry out tests of their software chains and computing models. A further throughput test is scheduled for late October, following debugging and optimisation of the components involved, as a result of the initial tests in July.

The throughput targets for each Tier-1 are 150 MBytes/sec network-disk, and 60 MBytes/sec network-tape, with CERN capable of supporting 1 GByte/sec for the transfers to disk and 400Mbytes/sec for those to tape at the Tier-1s. Most of the Tier-1 centres are supporting Tier-2 sites for upload of simulated data – some are also performing transfers in the opposite direction, corresponding to download of analysis data.

The service phase of Service Challenge 3 started on 1st September 2005 and includes additional software components, including a grid workload management system, grid catalog, mass storage management services and a reliable file transfer service. The service phase is scheduled to operate for four months from September to December 2005.

Service Challenge 4

Service Challenge 4 aims to demonstrate that all of the offline data processing requirements expressed in the experiments' Computing Models, from raw data taking through to analysis, can be handled by the Grid at the full nominal data rate of the LHC. All Tier-1 sites will be involved, together with the majority of the Tier-2s. The challenge must complete at least 6 months prior to first data taking, when it will become the production service for LHC and is made available to the experiments for final testing, commissioning and processing of cosmic ray data.

As for Service Challenge 3, it consists of both a setup and service phase. The setup phase ends with a throughput demonstration sustaining for three weeks the target data rates at each site as defined in the following table. The throughput is measured network-tape at each Tier-1, and disk-network at CERN. The target date for completing the throughput test is end April 2006.

<i>Centre</i>	<i>ALICE</i>	<i>ATLAS</i>	<i>CMS</i>	<i>LHCb</i>	<i>Target Data Rate MBytes/sec</i>
<i>Canada, TRIUMF</i>		X			50
<i>France, CC-IN2P3</i>	X	X	X	X	200
<i>Germany, FZK-GridKA</i>	X	X	X	X	200
<i>Italy, CNAF</i>	X	X	X	X	200
<i>Netherlands LHC/Tier1</i>	X	X		X	150
<i>Nordic Data Grid Facility</i>	X	X	X		50
<i>Spain, PIC Barcelona</i>		X	X	X	100
<i>Taipei, ASGC</i>		X	X		100
<i>UK, RAL</i>	X	X	X	X	150
<i>USA, BNL</i>		X			200
<i>USA, FNAL</i>			X		200
<i>Target data rate at CERN</i>					1,600

Table 1 – Nominal Network/Tape Data Rates by Site

The service phase of Service Challenge 4 will include the basic software components required for the initial LHC data processing service, as defined in the LCG Technical Design Report. The service must be able to support the full computing model of each experiment, including simulation and end-user batch analysis at Tier-2 centres. The service phase is scheduled to operate for four months from May to September 2006.

Initial LHC Service

The initial LHC service is scheduled to enter operation by end-September 2006, capable of handling the full nominal data rate (see Table 1). The service will be used for extended testing of the computing systems of the four experiments, for simulation and for processing of cosmic data. During the following six months each site will build up to the full throughput needed for LHC operation, twice the nominal data rate.