Challenging the World's Largest Computing Grid

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Enough data to fill 17,000 CDs were transferred from Edinburgh University to the CCLRC Rutherford Appleton Laboratory (RAL) in nine days, as part of the latest networking challenge by particle physicists. Delegates to the UK e-Science All Hands Meeting in Nottingham will be able to watch the progress of the challenge in real time on a screen showing data being exchanged between sites worldwide.

This challenge is the third (Service Challenge 3 - SC3) in a series of increasingly difficult tests designed to improve the world's largest computing Grid. Particle physicists are developing the Grid to cope with the expected surge of data from the Large Hadron Collider (LHC), currently being built at CERN in Geneva. SC3 has seen, for the first time, particle physics Grid sites in the UK exchanging data at high rates for sustained periods. Researchers from the four UK labs taking part in SC3, at RAL, Imperial College London and the Universities of Edinburgh and Lancaster, will explain the challenge at the meeting.

The researchers are all part of the GridPP project, the UK contribution to the international effort to build the LHC Computing Grid (LCG) and the largest project under the UK e-Science Programme. The LHC detectors are currently being installed and tested, and the whole experiment will start operating fully in 2007, producing up to 1500 Megabytes of data a second for ten years. Nearly 200 sites worldwide currently contribute 13,000 processors to the LCG, which will be used to distribute and process the huge amounts of data from the LHC. By 2007, this number of processors will increase by up to a factor of ten, as the

Grid gears up for full-scale operation. The UK is currently the biggest single contributor to the LCG infrastructure, with more than a fifth of the Grid's processing power at its 16 sites.

Most of the computing resources being used for LCG are operated as part of the EU-funded Enabling Grids for E-sciencE project (EGEE), a consortium of national Grid infrastructures and computing centres from 34 countries.

RAL hosts the UK's leading computer centre for the LCG project - known as the UK's Tier-1 site. When the LHC is running, RAL will store and process copies of data from the experiments. Lancaster, Imperial College and Edinburgh are all known as 'Tier-2' sites, and are responsible for producing simulated data and analysing data from the LCG experiments. In SC3, as well as exchanging data with CERN at rates of up to 650 Mb/s, RAL has been transferring data to and from the other UK sites at rates of up to 480Mb/s, which is one thousand times faster than a standard home broadband connection.

Jeremy Coles, GridPP's Operations Manager, has been overseeing the Service Challenge preparations in the UK and will present a paper in Nottingham on Grid operations. He is pleased that several UK Tier-2 sites are successfully contributing to SC3. "This is the first time Tier-2 sites in the UK have been directly involved in an LCG Service Challenge. The experiences gained through those contributions greatly help all GridPP and LCG sites in preparing for SC4 and ultimately for deploying a production grid ready for the start of the LHC era."

RAL and Lancaster University have been using the new high-bandwidth UKLight internet connection as part of the service challenge. UKLight provides dedicated connections pre-booked by user groups with high bandwidth needs, using switched optical light-path technology.

Dr Roger Jones of Lancaster University, who will also be at Nottingham, is pleased with their use of UKLight, "This is our first experience of this sort of connection, and our bandwidth requirements will be much greater in the future. However, to obtain such a useful and stable connection so quickly is very encouraging, both to us and to the many potential users in other fields."

The GridPP project is funded by PPARC, and researchers will be demonstrating their results on the PPARC stand at the conference. In addition, a number of GridPP members will be presenting papers and posters.

SC3 involves 18 sites worldwide. It started in July 2005 with a testing phase, where the sites involved ensured the software and networking connections work at the high rates required. The service phase of the challenge began on 1 September 2005 and will continue for three months. During this period, particle physicists working on the LHC experiments will test aspects of their computing which rely on the Grid, sending trial jobs, deploying new software and transferring data between sites. As an example, physicists working on the ATLAS LHC experiment plan to produce more than 10 million simulated particle physics events on the LCG during the service challenge.