



Particle Physics at Discovery's Horizon

US Computing for the LHC

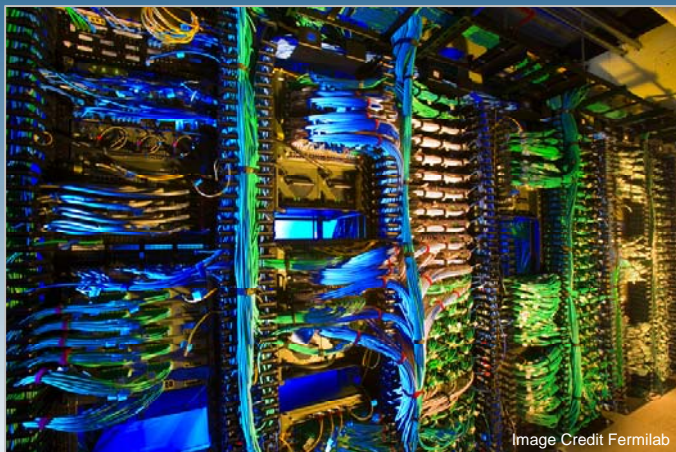


Image Credit Fermilab

The six experiments at the LHC will produce 15 petabytes—15 million gigabytes—of data every year, which has to be stored, backed up, and made available to more than 7,000 scientists around the globe.

US computing centers provide 23% of the computing capacity for the ATLAS experiment, and more than 30% of the capacity for the CMS experiment, including large amounts of tape, disk and processing capacity for the storage and analysis of acquired and simulated data. High-speed 10-gigabit networks distribute data round-the-clock from CERN to computing facilities known as "Tier-1s" at Brookhaven National Laboratory in New York and Fermi National Accelerator Laboratory in Illinois. The data will be further distributed to smaller Tier-2 and Tier-3 computer centers across the country. It will be at the Tier-2 and Tier-3 centers where physicists will analyze data leading to LHC discoveries.

Grid computing and advanced networking are needed for thousands of scientists to effectively use LHC data. More than 100 institutions around the globe have constructed a grid computing system known as the Worldwide LHC Computing Grid. The US contributes through the Open Science Grid, a national distributed computing infrastructure used by LHC scientists, other physicists and scientists from fields such as chemistry and genomics.

US LHC Computing Centers

US Tier-1 centers: 2 of 11 worldwide

US Tier-2 centers: 12 of 53 worldwide

US institutions: 15 universities and 3 national laboratories

States represented: 11

Data storage: Tier-1: 13,700 terabytes
Tier-2: 3,000 terabytes

Computation time: Tier-1: 175,000 hours per day
Tier-2: 283,000 hours per day

Percent of worldwide computing capacity:

23% of Tier-1 and Tier-2 for ATLAS

40% of Tier-1 and 30% of Tier-2 for CMS

The Open Science Grid

A national computing infrastructure for science

Consortium members: 90

US states represented: 23 + District of Columbia

Examples of OSG applications: Astrophysics, bioinformatics, nanotechnology, geography, education

Partners: 14 grid and network organizations and international, national, regional and campus grids

Computation time on OSG resources: 317,000 hours per day on average since August 2007

OSG for LHC: In 2006-2007 OSG provided ATLAS and CMS with 30% of total processing cycles and moved more than 100 terabytes of data across 7 sites.



Image Credit BNL