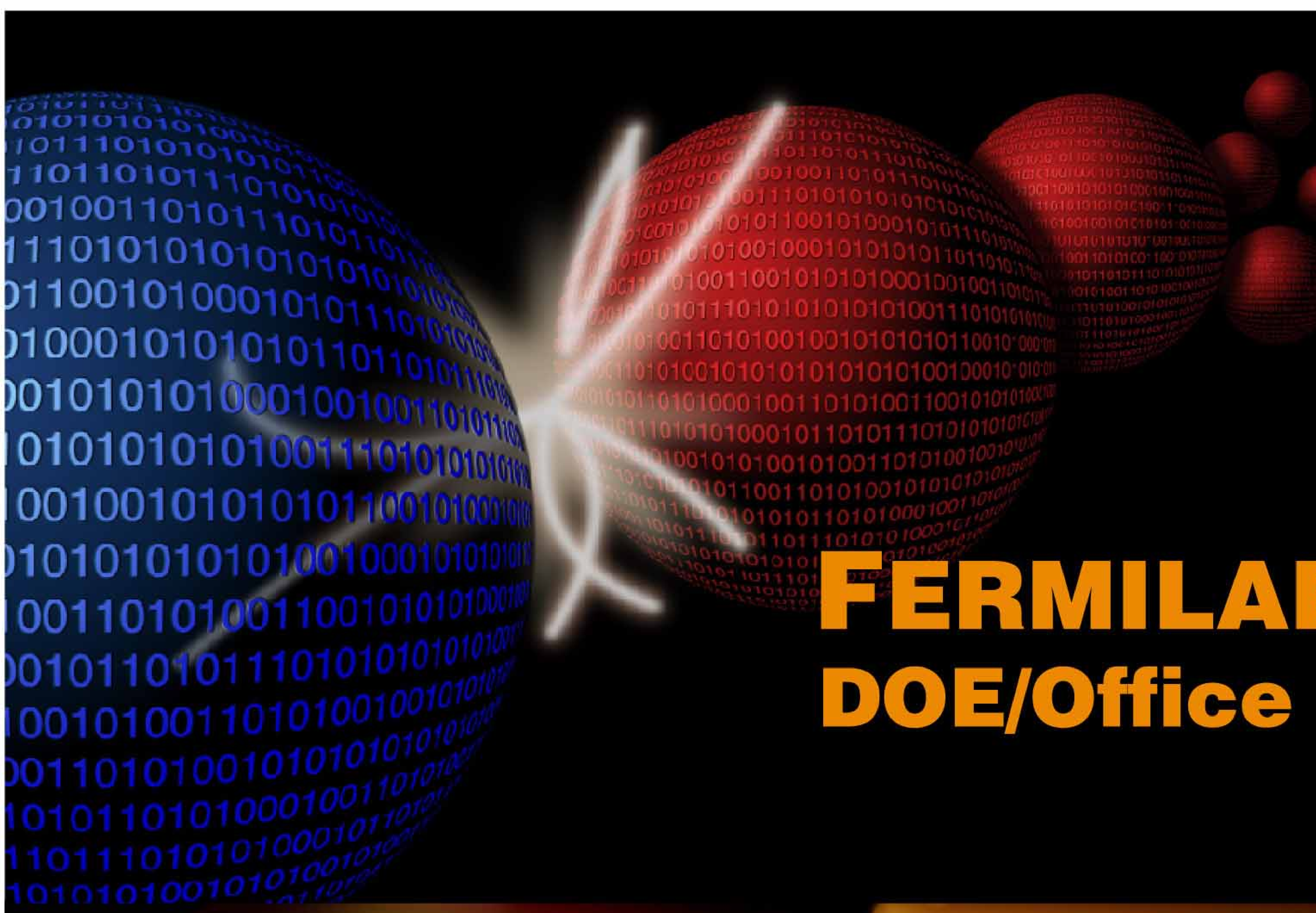

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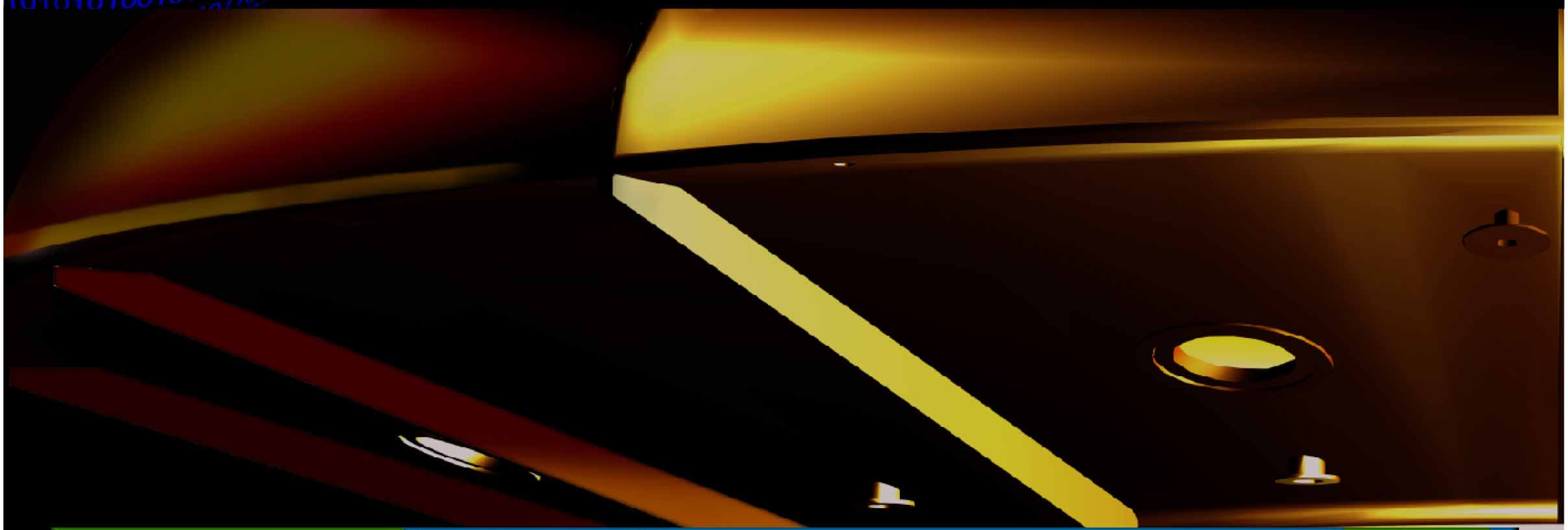


SAM Station Deployment
Distributing Data Across Continents

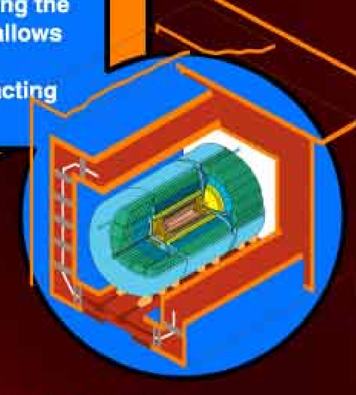
Mass Storage System — enstore

SAM Stations — Active / Inactive

World Wide Data Access and Physics Analysis

DZero DETECTOR experiment

The DZero detector is designed to observe proton-antiproton collisions of 2 TeV at the Fermilab Tevatron Collider and collect data to search for the Higgs boson. The detector allows good identification at high transverse energy for leptons and jets, including the separation of jets formed from b quarks, and allows measurement of missing transverse energy (signaling neutrinos or more exotic non-interacting particles) with good resolution.



How do 500 physicists in 17 nations collaborate in the Dzero experiment to search for new particles at the world's highest energy collider? They use a Particle Physics Data Grid System (SAM) to connect the physicists to teraflops of computing world-wide. They sift through the petabytes of data produced in picosecond-duration collisions between protons and antiprotons in Fermilab's Tevatron.

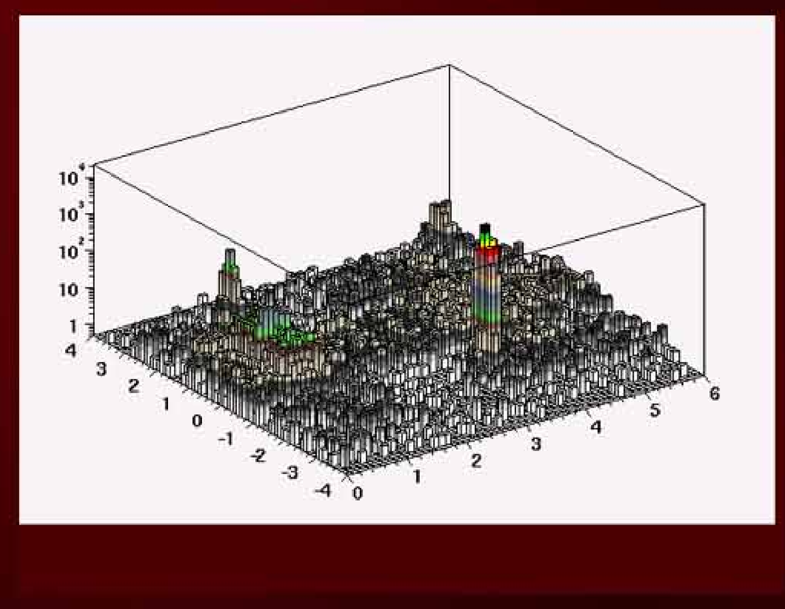
Data Storage and Access

This table shows real time values in the SAM database (column wise).
The information is displayed for a selection of the available SAM Stations (row wise).

SAM Stations	Analysis Projects	Number of Analyzed Files	Total Size of Analyzed Files (MBytes)
central-analysis	38672	1995068	490496756
clued0	341	22833	4254578
protofarm	2644	155862	46358554
TOTAL	42884	2260785	558263360

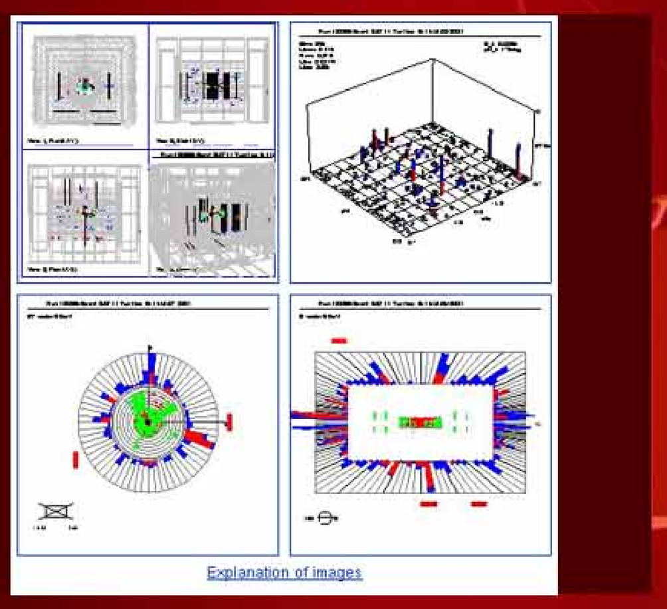
Real and simulated data enter the system at a rate of nearly one Terabyte per day. This is added into robotic storage, then retrieved by a worldwide network of processing and caching resources that includes hundreds of computers and several hundred Terabytes of cache disk. Bandwidths of hundreds of MBps are needed within the Fermilab LAN, and tens of MBps throughout the global WAN. The systems must operate continuously at >90% availability to match the production of data from the accelerator and to meet the needs of data processing and analysis.

Physics Analysis



Complex algorithms are used to reconstruct the digital signals from the nearly 1,000,000 electronic channels in the DZero detector into tracks and energies. The results are required to meet carefully tuned selection criteria and distributions of important parameters are painstakingly examined for consistency and integrity. In all, around a million lines of C++ and Python code is used to deliver the physics results.

Discovery



Searching through the reconstructed data physicists at DZero are able to measure important physical parameters enabling them to better understand and confirm existing theories, as well as to detect signals which might indicate new frontiers of knowledge. The properties of known particles can be more precisely determined and exciting new particles discovered, further exploring the structure of matter.