Providing Vital Infrastructure for Trans-Atlantic Sharing of the World's Largest Database

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SCIENCE

Evidence of new cosmic kink found with Stanford Accelerator

We live in a matter-dominated universe, containing stars, planets and people. ESnet provides vital infrastructure for an international effort to measure "Charge-Parity Violation" the matter-antimatter asymmetry that destroyed almost all the antimatter in the first second of our universe. The BaBar experiment at the Stanford Linear Accelerator Center (SLAC) measures B and anti-B (B and B-bar) mesons produced by the Positron Electron Project II (PEP-II) "B-Factory" collider. The world's first measurement of an asymmetry between Bs and anti-Bs was announced in July 2001 - much more precise results based on 88 million collisions were announced in July 2002. (www.slac.stanford.edu/babar/)

Data acquisition and analysis will continue into 2006 and beyond, aiming at billions of collisions and a detailed measurement of the nature of matter-antimatter asymmetry. Physicists from many US universities and from many nations worked to build and operate the BaBar experiment. A large fraction of the data analysis is performed at universities in North America and Europe. BaBar created the world's largest database to store its raw and processed data. Sharing this data with US and European collaborators has made SLAC the champion user of ESnet for much of 2002. SLAC accelerator physicists plan to increase the PEP-II collision rate by a factor 10 over the next two years. At the same time, BaBar is deploying Grid middleware to facilitate data and job movement over the network. BaBar is one of the major motivations for planned ESnet upgrades.

Changing the Paradigm for Development, Maintenance, and Distribution of Large Simulation Codes for Fusion

In 1996 the Department of Energy commissioned the Non-Ideal MHD with Rotation Open Discussion project (nimrodteam.org) to develop and deploy for the fusion science community a new three-dimensional nonlinear Magneto-HydroDynamics (MHD) simulation capability that not only allowed previously unsolved plasma science problems to be addressed, but that also considered the impact of the data arising from advanced tokamak experiments and the ascendancy of massively parallel supercomputer hardware.