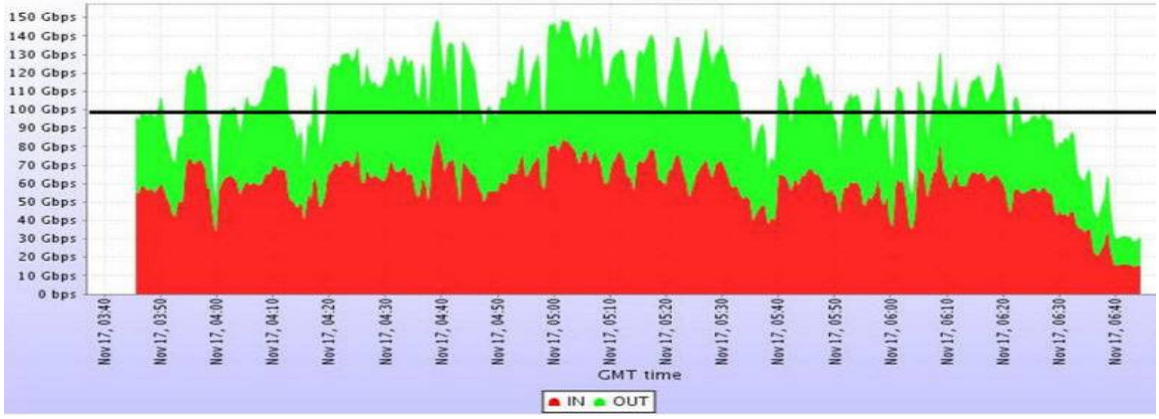
World Network Speed Record Shattered

Caltech, SLAC, Fermilab, CERN, Michigan, Florida, Brookhaven, Vanderbilt and Partners in the UK, Brazil, Korea and Japan Set 131.6 Gigabit Per Second Mark During the SuperComputing 2005 Bandwidth Challenge

SEATTLE, WA -- For the third consecutive year, the "High Energy Physics" team of physicists, computer scientists and network engineers led by the California Institute of Technology, the Stanford Linear Accelerator Center (SLAC), Fermilab and CERN and partners at the University of Florida, Vanderbilt and the Brookhaven National Lab, as well as international participants from the UK (University of Manchester, and UKLight), Brazil (Rio de Janeiro State University, UERJ, and the State Universities of São Paulo, USP and UNESP)., Korea (Kyungpook National University, KISTI) and Japan (the KEK Laboratory in Tsukuba) joined forces to set a new world record for data transfer, capturing first prize at the Supercomputing 2005 (SC|05) Bandwidth Challenge (BWC).

The HEP team's demonstration of "Distributed TeraByte Particle Physics Data Sample Analysis" achieved a peak throughput of 151 gigabits per second (Gbps), and an official mark of 131.6 Gbps measured by the BWC judges on 17 of the 22 optical fiber links used by the team, beating their previous mark for peak throughput of 101 Gbps by 50%. The record data transfer speed is equivalent to downloading five full DVD movies per second, or serving 10,000 MPEG2 HDTV movies simultaneously in real time, or transmitting all of the printed content of the Library of Congress in 10 minutes. The team sustained average data rates above the 100 Gbps level for several hours for the first time (as shown in the figure below), and transferred a total of 475 Terabytes of physics data among the team's sites throughout the US and overseas within 24 hours. The extraordinary data transport rates were made possible in part through the use of the FAST TCP protocol developed by Professor Steven Low and his Caltech Netlab team, as well as new data transport applications developed at SLAC and Fermilab and an optimized Linux kernel developed at Michigan.



Professor Harvey Newman of Caltech, head of the HEP team and US CMS Collaboration Board Chair, who originated the LHC Data Grid Hierarchy concept, said: "This demonstration allowed us to preview the globally distributed Grid system of more than 100 laboratory and university-based computing facilities that is now being developed in the US, Latin America and Europe in preparation for the next generation of high energy physics experiments at CERN's Large Hadron Collider (LHC) that will begin operation in 2007. We used a realistic mixture of streams, including the organized transfer of multi-Terabyte datasets among the laboratory centers at CERN, Fermilab, SLAC and KEK, plus numerous other flows of physics data to and from university-based centers represented by Caltech, Michigan, Florida, Rio de Janeiro and São Paulo in Brazil, and Korea, to effectively use the remainder of the network capacity. The analysis of this data will allow physicists at CERN to search for the Higgs particles thought to be responsible for mass in the universe, supersymmetry, and other fundamentally new phenomena bearing on the nature of matter and spacetime, in an energy range made accessible by the LHC for the first time."

The largest physics collaborations at the LHC, CMS and ATLAS, each encompass more than 2000 physicists and engineers from 160 universities and laboratories. In order to fully exploit the potential for scientific discoveries, the many Petabytes of data produced by the experiments will be processed, distributed and analyzed using a global Grid. The key to discovery is the analysis phase, where individual physicists and small groups repeatedly access, and sometimes extract and transport Terabyte-scale data samples on demand, in order to optimally select the rare "signals" of new physics from potentially overwhelming "backgrounds" from already-understood particle interactions. This data will amount to many tens of Petabytes in the early years of LHC operation, rising to the Exabyte range within the coming decade.

Matt Crawford, head of the Fermilab network team at SC|05 said "The realism of this year's demonstration represents a major step in our ability to show that the unprecedented systems required to support the next round of high energy physics discoveries are indeed practical. Our data sources in the bandwidth challenge were some of our mainstream production storage systems and file servers, which are now helping to drive the searches for new physics at the high energy frontier at Fermilab's Tevatron, as well the explorations of the far reaches of the universe by the Sloan Digital Sky Survey."

Les Cottrell, leader of the SLAC team and Assistant Director of Scientific Computing and Computing Services said: "Some of the pleasant surprises at this year's challenge were the advances in throughput we achieved using real applications to transport physics data, including bbcp and xrootd developed at SLAC. The performance of bbcp used together with Caltech's FAST protocol and an optimized Linux kernel developed at Michigan, as well as our xrootd system, were particularly striking We were able to match the performance of the artificial data transfer tools we used to reach the peak rates in past years."

Future optical networks, incorporating multiple 10 Gbps links are the foundation of the Grid system that will drive the scientific discoveries. A "hybrid" network integrating both

traditionally switching and routing of packets, and dynamically constructed optical paths to support the largest data flows, is a central part of the near-term future vision that the scientific community has adopted to meet the challenges of data intensive science in many fields. By demonstrating that many 10 Gbps wavelengths can be used efficiently over continental and transoceanic distances (often in both directions simultaneously), the high energy physics team showed that this vision of a worldwide dynamic Grid supporting many Terabyte and larger data transactions is practical.

Shawn McKee, Associate Research Scientist in the University of Michigan Department of Physics and leader of the UltraLight Network technical group, said: “This achievement is an impressive example of what a focused network effort can accomplish. It is an important step towards the goal of delivering a highly capable end-to-end network-aware system and architecture that meet the needs of next-generation e-Science”.

The team hopes this new demonstration will encourage scientists and engineers in many sectors of society to develop and plan to deploy a new generation of revolutionary Internet applications. Multi-gigabit/s end-to-end network performance will empower scientists to form "virtual organizations" on a planetary scale, sharing their collective computing and data resources in a flexible way. In particular, this is vital for projects on the frontiers of science and engineering, in “data intensive” fields such as particle physics, astronomy, bioinformatics, global climate modeling, geosciences, fusion, and neutron science.

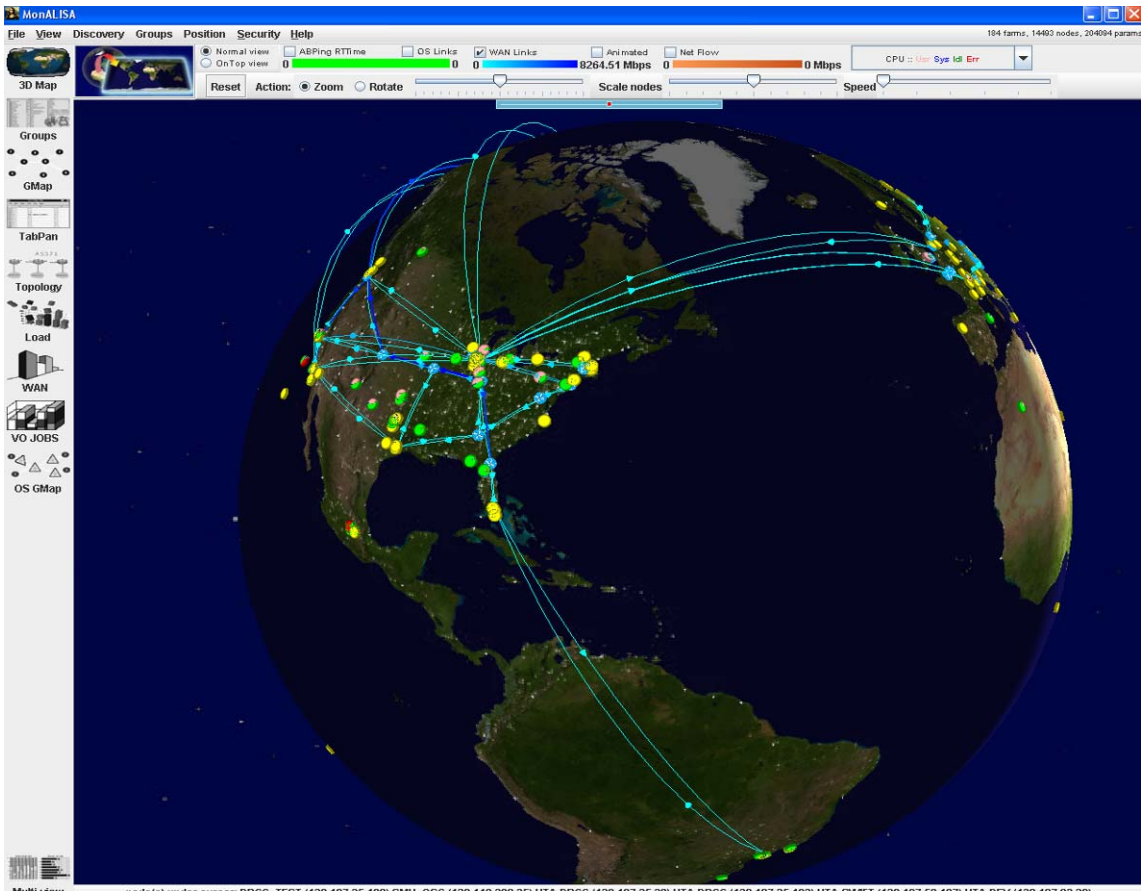
The new bandwidth record was achieved through extensive use of the SCInet network infrastructure at SC|05. The team used fifteen 10 Gbps links to Cisco 6500 series switch routers provided by Cisco Systems at the Caltech Center for Advanced Computing Research (CACR) booth, and seven 10 Gbps links to a 6500 switch at the SLAC/Fermilab booth, together with computing clusters provided by Hewlett Packard, Sun Microsystems and IBM and 10 gigabit Ethernet server interfaces provided by Neterion and Chelsio. The external network connections to Los Angeles, Sunnyvale, the Starlight facility in Chicago and Florida included the Cisco Research, Internet2/HOPI, UltraScience Net and ESnet wavelengths carried by National Lambda Rail (NLR), Internet2’s Abilene backbone, the three wavelengths of TeraGrid, an ESnet link provided by Qwest, the Pacific Wave link and Canada’s CANARIE network. International connections included the US LHCNet links (provisioned by Global Crossing and Colt) between Chicago, New York and CERN, the CHEPREO/WHREN link (provisioned by LANautilus) between Miami and Sao Paulo, the UKLight link, the Gloriad link to Korea, and the JGN2 link to Japan. Regional connections included six 10 Gbps wavelengths provided with the help of CIENA to Fermilab, two 10 Gbps wavelengths to the Caltech campus provided by Cisco Systems and California’s CENIC network, two 10 Gbps wavelengths to SLAC provided by ESnet and UltraScienceNet, three wavelengths between Starlight and the University of Michigan over Michigan Lambda Rail (MiLR), and wavelengths to Jacksonville and Miami across Florida Lambda Rail (FLR). During the test, several of the network links were shown to operate at full capacity for sustained periods.

While the SC|05 demonstration required a major effort by the teams involved and their sponsors, in partnership with major research and education network organizations in the

U.S., Europe, Latin America and Asia Pacific, it is expected that networking on this scale in support of the largest science projects (such as the LHC), will be commonplace within the next three to five years. The demonstration also appeared to stress the network and server systems used, and so the team is continuing its test program to put the technologies and methods used at SC|05 into production use, with the necessary level of reliability in time for the start of the LHC research program.

As part of the SC|05 demonstrations, a distributed analysis of simulated LHC physics data was done using the Grid-enabled Analysis Environment (GAE) developed at Caltech for the LHC and many other major particle physics experiments, as part of the Particle Physics Data Grid (PPDG), GriPhyN/iVDGL, Open Science Grid and DISUN projects. This involved the transfer of data to CERN, Florida, Fermilab, Caltech, and Brazil for processing by clusters of computers, and finally aggregating the results back to the show floor to create a dynamic visual display of quantities of interest to the physicists. In another part of the demonstration, file servers at the SLAC/FNAL booth, and in Manchester also were used for disk to disk transfers between Seattle and the UK.

The team used Caltech's MonALISA (MONitoring Agents using a Large Integrated Services Architecture) system to monitor and display the real-time data for all the network links used in the demonstration. It simultaneously monitored more than 14,000 grid nodes in 200 computing clusters, as illustrated in the figure. MonALISA (http://monalisa.caltech.edu) is a highly scalable set of autonomous self-describing agent-based subsystems which are able to collaborate and cooperate in performing a wide range of monitoring tasks for networks and Grid systems, as well as the scientific applications themselves.



The network has been deployed through exceptional support by Cisco Systems, Hewlett Packard, Neterion, Chelsio, Sun Microsystems, IBM and Boston Ltd., as well as the network engineering staffs of National LambdaRail, Internet2's Abilene Network, ESnet, TeraGrid, CENIC, MiLR, FLR, Pacific Wave, AMPATH, RNP and ANSP/FAPESP in Brazil, KISTI in Korea, UKLight in the UK, JGN2 in Japan, and the Starlight international peering point in Chicago. The demonstration and the developments leading up to it were made possible through the strong support of the U.S. Department of Energy and the National Science Foundation, in cooperation with the funding agencies of the international partners.

Further information about the demonstration may be found at:

http://ultralight.caltech.edu/web-site/sc05
http://www-iepm.slac.stanford.edu/monitoring/bulk/sc2005/hiperf.html
http://supercomputing.fnal.gov/
http://monalisa.caltech.edu:8080/Slides/SC2005BWC/SC2005_BWCTalk11705.ppt
and http://scinet.supercomp.org/2005/bwc/results/summary.html

About Caltech: With an outstanding faculty, including four Nobel laureates, and such off-campus facilities as the Jet Propulsion Laboratory, Palomar Observatory, and the W. M.

Keck Observatory, the California Institute of Technology is one of the world's major research centers. The Institute also conducts instruction in science and engineering for a student body of approximately 900 undergraduates and 1,000 graduate students who maintain a high level of scholarship and intellectual achievement. Caltech's 124-acre campus is situated in Pasadena, California, a city of 135,000 at the foot of the San Gabriel Mountains, approximately 30 miles inland from the Pacific Ocean and 10 miles northeast of the Los Angeles Civic Center. Caltech is an independent, privately supported university, and is not affiliated with either the University of California system or the California State Polytechnic universities. http://www.caltech.edu

About SLAC: The Stanford Linear Accelerator Center (SLAC) is one of the world's leading research laboratories. Its mission is to design, construct, and operate state-of-the-art electron accelerators and related experimental facilities for use in high-energy physics and synchrotron radiation research. In the course of doing so, it has established the largest known database in the world, which grows at 1 terabyte per day. That, and its central role in the world of high-energy physics collaboration, places SLAC at the forefront of the international drive to optimize the worldwide, high-speed transfer of bulk data. http://www.slac.stanford.edu/

About CACR: Caltech's Center for Advanced Computing Research (CACR) performs research and development on leading edge networking and computing systems, and methods for computational science and engineering. Some current efforts at CACR include the National Virtual Observatory, ASC Center for Simulation of Dynamic Response of Materials, Particle Physics Data Grid, GriPhyN, Computational Infrastructure for Geophysics, Cascade High Productivity Computing System, and the TeraGrid. http://www.cacr.caltech.edu/

About Netlab: Netlab is the Networking Laboratory at Caltech led by Professor Steven Low, where FAST TCP has been developed. The group does research in the control and optimization of protocols and networks, and designs, analyzes, implements, and experiments with new algorithms and systems. http://netlab.caltech.edu/FAST/

About the University of Michigan: The University of Michigan, with its size, complexity and academic strength, the breadth of its scholarly resources and the quality of its faculty and students is one of America's great public universities and one of the world's premiere research institutions. The University was founded in 1817 and has a total enrollment of 54,300 on all campuses. The main campus is in Ann Arbor, MI and has 39,533 students (fall 2004). With over 600 degree programs and $739M in FY05 research funding the University is one of the leaders in innovation and research. For more information, see http://www.umich.edu.

About the University of Florida: The University of Florida (UF), located in Gainesville, is a major public, comprehensive, land-grant, research university. The state's oldest, largest and most comprehensive university, UF is among the nation's most academically diverse public universities. It has a long history of established programs in international education, research and service and has a student population of approximately 49,000. UF is the lead institution for the GriPhyN and iVDGL projects and is a Tier-2 facility for the CMS experiment. For more information, see http://www.ufl.edu.

About Fermilab: Fermi National Accelerator Laboratory (Fermilab) is a US Department of Energy national laboratory located in Batavia, Illinois, outside Chicago. Fermilab's mission is to advance the understanding of the fundamental nature of matter and energy through basic scientific research conducted at the frontiers of high energy physics and related disciplines. The Laboratory hosts the world's highest energy particle accelerator, the Tevatron. Fermilab-supported experiments generate petabyte-scale data per year, and involve large, international collaborations with requirements for high volume data movement to their home institutions. The Laboratory actively works to remain on the leading edge of advanced wide area network technology in support of its collaborations.

About CERN: CERN, the European Organization for Nuclear Research, has its headquarters in Geneva. At present, its member states are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom. Israel, Japan, the Russian Federation, the United States of America, Turkey, the European Commission, and UNESCO have observer status. For more information, see http://www.cern.ch.

About StarLight: StarLight is an advanced optical infrastructure and proving ground for network services optimized for high-performance applications. Operational since summer 2001, StarLight is a 1 GE and 10 GE switch/router facility for high-performance access to participating networks and also offers true optical switching for wavelengths. StarLight is being developed by the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago (UIC), the International Center for Advanced Internet Research (iCAIR) at Northwestern University, and the Mathematics and Computer Science Division at Argonne National Laboratory, in partnership with Canada's CANARIE and the Netherlands' SURFnet. STAR TAP and StarLight are made possible by major funding from the U.S. National Science Foundation to UIC. StarLight is a service mark of the Board of Trustees of the University of Illinois. See www.startap.net/starlight.

About the University of Manchester: The University of Manchester has been created by combining the strengths of UMIST (founded in 1824) and the Victoria University of Manchester (founded in 1851) to form the largest single-site university in the UK with 34,000 students. On Friday 22nd October 2004 it received its Royal Charter from Her Majesty the Queen, with an unprecedented £300m capital investment programme. With a continuing proud tradition of innovation and excellence, twenty-three Nobel Prize winners have studied at Manchester. Rutherford conducted the research which led to the splitting of the atom there, and the world's first stored-program electronic digital computer successfully executed its first program there in June 1948. The Schools of Physics, Computational Science, Computer Science and the Network Group together with the E-Science North West Centre research facility are very active in developing a wide range of e-science projects and Grid technologies. See www.manchester.ac.uk.

About UERJ (Rio de Janeiro): Founded in 1950, the Rio de Janeiro State University (UERJ; http//www.uerj.br) ranks among the ten largest universities in Brazil, with more than 23,000 students. UERJ's five campuses are home to 22 libraries, 412 classrooms, 50 lecture halls and auditoriums, and 205 laboratories. UERJ is responsible for important public welfare and health projects through its centers of medical excellence, the Pedro

Ernesto University Hospital (HUPE) and the Piquet Carneiro Day-care Policlinic Centre, and it is committed to the preservation of the environment. The UERJ High Energy Physics group includes 15 faculty, postdoctoral and visiting Ph. D physicists and 12 Ph. D. and Masters students, working on experiments at Fermilab (D0) and CERN (CMS). The group has constructed a Tier2 center to enable it to take part in the Grid-based data analysis planned for the LHC, and has originated the concept of a Brazilian "HEP Grid", working in cooperation with USP and several other universities in Rio and São Paulo.

About UNESP (São Paulo): Created in 1976 with the administrative union of several isolated Institutes of Higher Education in the State of Sao Paulo, the São Paulo State University, UNESP, has campuses in 24 different cities in the State of São Paulo. The university has 25,000 undergraduate students and almost 10,000 graduate students. Since 1999 the university has a group participating in the DZero Collaboration of Fermilab, which is operating the São Paulo Regional Analysis Center (SPRACE). See http://www.unesp.br.

About USP (São Paulo): The University of São Paulo, USP, is the largest institution of higher education and research in Brazil, and the third in size in Latin America. The university has most of its 35 units located on the campus of the capital of the state. It has around 40,000 undergraduate students and around 25,000 graduate students. It is responsible for almost 25% of all Brazilian papers and publications indexed on the Institute for Scientific Information (ISI). The SPRACE cluster is located at the Physics Institute. See http://www.usp.br.

About Kyungpook National University (Daegu): Kyungpook National University is one of leading universities in Korea, especially in physics and information science. The university has 13 colleges and 9 graduate schools with 24,000 students. It houses the Center for High Energy Physics(CHEP) in which most Korean high-energy physicists participate. CHEP (chep.knu.ac.kr) was approved as one of the designated Excellent Research Centers supported by the Korean Ministry of Science.

About Vanderbilt: One of America's top 20 universities, Vanderbilt University is a private research university of 6,319 undergraduates and 4,566 graduate and professional students. The University comprises 10 schools, a public policy institute, a distinguished medical center and The Freedom Forum First Amendment Center. Located a mile and a half southwest of downtown Nashville, the campus is a park-like setting. Buildings on the original campus date to its founding in 1873, and the Peabody section of campus has been registered a National Historic Landmark since 1966. Vanderbilt ranks 24th in the value of federal research grants awarded to faculty members, according to the National Science Foundation.

About the Particle Physics Data Grid (PPDG): The Particle Physics Data Grid (PPDG; see www.ppdg.net) is developing and deploying production Grid systems vertically integrating experiment-specific applications, Grid technologies, Grid and facility computation and storage resources to form effective end-to-end capabilities. PPDG is a collaboration of computer scientists with a strong record in Grid technology, and physicists with leading roles in the software and network infrastructures for major high-

energy and nuclear experiments. PPDG's goals and plans are guided by the immediate and medium-term needs of the physics experiments and by the research and development agenda of the computer science groups.

About GriPhyN and iVDGL: GriPhyN (www.griphyn.org) and iVDGL (www.ivdgl.org) are developing and deploying Grid infrastructure for several frontier experiments in physics and astronomy. These experiments together will utilize Petaflops of CPU power and generate hundreds of Petabytes of data that must be archived, processed, and analyzed by thousands of researchers at laboratories, universities and small colleges and institutes spread around the world. The scale and complexity of this "Petascale" science drive GriPhyN's research program to develop Grid-based architectures, using "virtual data" as a unifying concept. IVDGL is deploying a Grid laboratory where these technologies can be tested at large scale and where advanced technologies can be implemented for extended studies by a variety of disciplines.

About CHEPREO: Florida International University (FIU), in collaboration with partners at Florida State University, the University of Florida, and the California Institute of Technology, has been awarded an NSF grant to create and operate an interregional Grid-enabled Center from High-Energy Physics Research and Educational Outreach (CHEPREO; www.chepreo.org) at FIU. CHEPREO encompasses an integrated program of collaborative physics research on CMS, network infrastructure development, and educational outreach at one of the largest minority universities in the US. The center is funded by four NSF directorates including Mathematical and Physical Sciences, Scientific Computing Infrastructure, Elementary, Secondary and Informal Education, and International Programs.

About Open Science Grid: The Open Science Grid (OSG; www.opensciengrid.org) aims to build and operate a persistent, coherent national grid infrastructure for large scale U.S. science, by federating many of the grid resources currently in use at DOE and NSF-sponsored U.S. labs and universities. The plan is to iteratively extend and adapt existing grids, such as Grid2003, to enable the use of common grid infrastructure and shared resources for the benefit of scientific applications. The Open Science Grid Consortium includes scientific collaborations, scientific computing centers and existing and new grid research and deployment projects, involving both computational and application scientists, working together to provide and support the set of facilities, services and infrastructure needed.

About Internet2®: Led by more than 200 U.S. universities working with industry and government, Internet2 develops and deploys advanced network applications and technologies for research and higher education, accelerating the creation of tomorrow's Internet. Internet2 recreates the partnerships among academia, industry, and government that helped foster today's Internet in its infancy. For more information, visit: www.internet2.edu.

About the Abilene Network: Abilene, developed in partnership with Qwest Communications, Juniper Networks, Nortel Networks and Indiana University, provides nationwide high-performance networking capabilities for more than 225 universities and

research facilities in all 50 states, the District of Columbia, and Puerto Rico. For more information on Abilene please see http://abilene.internet2.edu/

About The TeraGrid: The TeraGrid, funded by the National Science Foundation, is a multi-year effort to build a distributed national cyberinfrastructure. TeraGrid entered full production mode in October 2004, providing a coordinated set of services for the nation's science and engineering community. TeraGrid's unified user support infrastructure and software environment allow users to access storage and information resources as well as over a dozen major computing systems at nine partner sites via a single allocation, either as stand-alone resources or as components of a distributed application using Grid software capabilities. Over 40 teraflops of computing power, 1.5 petabytes of online storage, and multiple visualization, data collection, and instrument resources are integrated at the nine TeraGrid partner sites. Coordinated by the University of Chicago and Argonne National Laboratory, the TeraGrid partners include the National Center for Supercomputing Applications (NCSA) at the University of Illinois at Urbana-Champaign (UIUC), San Diego Supercomputer Center (SDSC) at the University of California San Diego (UCSD), the Center for Advanced Computing Research (CACR) at the California Institute of Technology (Caltech), the Pittsburgh Supercomputing Center (PSC), Oak Ridge National Laboratory, Indiana University, Purdue University, and the Texas Advanced Computing Center (TACC) at the University of Texas-Austin.

About National LambdaRail: National LambdaRail (NLR) is a major initiative of U.S. research universities and private sector technology companies to provide a national scale infrastructure for research and experimentation in networking technologies and applications. NLR puts the control, the power, and the promise of experimental network infrastructure in the hands of the nation's scientists and researchers. Visit http://www.nlr.net for more information.

About CENIC: CENIC (www.cenic.org) is a not-for-profit corporation serving California Institute of Technology, California State University, Stanford University, University of California, University of Southern California, California Community Colleges, and the statewide K-12 school system. CENIC's mission is to facilitate and coordinate the development, deployment, and operation of a set of robust multi-tiered advanced network services for this research and education community.

About ESnet: The Energy Sciences Network, (ESnet; www.es.net) is a high-speed network serving thousands of Department of Energy scientists and collaborators worldwide. A pioneer in providing high-bandwidth, reliable connections, ESnet enables researchers at national laboratories, universities and other institutions to communicate with each other using the collaborative capabilities needed to address some of the world's most important scientific challenges. Managed and operated by the ESnet staff at Lawrence Berkeley National Laboratory, ESnet provides direct high-bandwidth connections to all major DOE sites, multiple cross connections with Internet2/Abilene, connections to Europe via GEANT, to Japan via SuperSINET, as well as fast interconnections to more than 100 other networks. Funded principally by DOE's Office of Science, ESnet services allow scientists to make effective use of unique DOE research facilities and computing resources, independent of time and geographic location.

About Qwest: Qwest Communications International Inc. (NYSE: Q) is a leading provider of voice, video and data services. With more than 40,000 employees, Qwest is committed to the "Spirit of Service" and providing world-class services that exceed customers' expectations for quality, value and reliability. For more information, please visit the Qwest Web site at www.qwest.com.

About UKlight: The UKLight facility (www.uklight.ac.uk) was set up in 2003 with a grant of £6.5M from HEFCE (the Higher Education Funding Council for England) to provide an international experimental testbed for optical networking and support projects working on developments towards optical networks and the applications that will use them. UKLight will bring together leading-edge applications, Internet engineering for the future, and optical communications engineering, and enable UK researchers to join the growing international consortium which currently spans Europe and North America. A "Point of Access" (PoA) in London provides international connectivity with 10 Gbit network connections to peer facilities in Chicago (StarLight) and Amsterdam (NetherLight). UK research groups gain access to the facility via extensions to the 10Gbit SuperJANET development network, and a national dark fibre facility is under development for use by the photonics research community. Management of the UKLight facility is being undertaken by UKERNA on behalf of the Joint Information Systems Committee (JISC).

About AMPATH: Florida International University's Center for Internet Augmented Research and Assessment (CIARA) has developed an international, high-performance research connection point in Miami, Florida, called AMPATH (AMericasPATH; www.ampath.fiu.edu). AMPATH's goal is to enable wide-bandwidth digital communications between US and international research and education networks, as well as a variety of US research programs in the region. AMPATH in Miami acts as a major international exchange point (IXP) for the research and education networks in South America, Central America, Mexico and the Caribbean. The AMPATH IXP is home for the WHREN-LILA high-performance network link connecting Latin America to the U.S., funded by the NSF, award #0441095 and the Academic Network of Sao Paulo (award #2003/13708-0).

About the Academic Network of São Paulo (ANSP): ANSP unites São Paulo's University networks with Scientific and Technological Research Centers in São Paulo, and is managed by the State of São Paulo Research Foundation (FAPESP). The ANSP Network is another example of international collaboration and exploration. Through its connection to WHREN-LILA, all of the institutions connected to ANSP will be involved in research with US universities and research centers, offering significant contributions and the potential to develop new applications and services. This connectivity with WHREN-LILA and ANSP will allow researchers to enhance the quality of current data, inevitably increasing the quality of new scientific developments, http://www.ansp.br.

About RNP: RNP, the National Education and Research Network of Brazil, is a not-for-profit company which promotes the innovative use of advanced networking, with the joint support of the Ministry of Science and Technology and the Ministry of Education. In the early 1990s, RNP was responsible for the introduction and adoption of Internet technology in Brazil. Today, RNP operates a nationally deployed multi-gigabit network

used for collaboration and communication in research and education throughout the country, reaching all 26 states and the Federal District, and provides both commodity and advanced research Internet connectivity to more than 300 universities, research centers and technical schools. http://www.rnp.br

About KISTI: KISTI (Korea Institute of Science and Technology Information) , which was assigned to play the pivotal role in establishing the national science and technology knowledge information infrastructure, has been founded through the merger of the Korea Institute of Industry and Technology Information (KINITI) and the Korea Research and Development Information Center (KORDIC) in January, 2001. KISTI is under the supervision of the Office of the Prime Minister and will play a leading role in building the nationwide infrastructure for knowledge and information by linking the high-performance research network with its supercomputers.

About Hewlett Packard:

About Sun Microsystems: Since its inception in 1982, a singular vision – "The Network Is The Computer(TM)" -- has propelled Sun Microsystems, Inc. (Nasdaq: SUNW) to its position as a leading provider of industrial-strength hardware, software and services that make the Net work. Sun can be found in more than 100 countries and on the World Wide Web at http://sun.com

About Boston Limited: With over 12 years of experience, Boston Limited (www.boston.co.uk) is a UK-based specialist in high end workstation, server and storage hardware. Boston's solutions bring the latest innovations to market, such as PCI-Express, DDR II and Infiniband technologies. As the pan-European distributor for Supermicro, Boston Limited works very closely with key manufacturing partners as well as strategic clients within the academic and commercial sectors, to provide cost-effective solutions with exceptional performance.

About Neterion: Founded as S2IO in 2001, Neterion Inc. has locations in Cupertino, California and Ottawa, Canada. Neterion delivers 10 Gigabit Ethernet hardware & software solutions that enable OEMs to solve their customers' high-end networking problems. The company's line of products, Xframe®, is based on Neterion-developed technology and include full IPv6 support and comprehensive stateless offloads for TCP/IP performance without "breaking the stack". S2io has raised over $42M in funding with its latest C round taking place in June 2004. Further information on the company can be found at http://www.neterion.com/.

About Chelsio Communications: Chelsio Communications is leading the convergence of networking, storage and clustering interconnects with its robust, high-performance and proven protocol acceleration technology. Featuring a highly scalable and programmable architecture, Chelsio is shipping 10-Gigabit Ethernet adapter cards with protocol offload, delivering the low latency and superior throughput required for high-performance computing applications. For more information, visit the company online at www.chelsio.com.

Contacts:

Harvey B Newman
(626) 395-6656
newman@hep.caltech.edu