



THE INTERNET'S POPULARITY PUSHES RESEARCH FURTHER

THE INTERNET IS A PROFOUNDLY POPULAR

venue for both work and play, but the number of players presents a new challenge for research and educational institutions. Once the sole domain of scientists and researchers, the Internet has become a victim of its own success. Now that the Internet is private and frequently congested, many researchers and educators are deprived of the network capability needed to support advanced research.

Three initiatives are now underway to improve Internet infrastructure, trial new services and enhance network management to better serve the scientists and researchers who depend on it. The key players, the research and educational institutions, telecommunication providers (such as MCI Worldcomm Inc.), and government agencies may fund or participate in more than one initiative.

Very high-speed backbone network service (vBNS) is a joint project between MCI and the American National Science Foundation (NSF). The backbone network currently in place has a total of only 56 nodes; 52 high performance connection awardes and four supercomputer centers. "The vBNS supports scientific applications between NSF-supported supercomputer centres, directly connected research institutions, and research institutions which are served by other networks," says MCI. "The vBNS also provides a test environment for early deployment and evaluation of new internetworking technologies."

The vBNS originally came online in April 1995. It is implemented as an IP-over-ATM network, which means that its network layer (layer 3 of the OSI reference model) runs the Internet protocol on top of the asynchronous transfer mode (ATM)

protocol. Those protocols are then run over a synchronous optical network (Sonet) backbone at an OC-12 (optical carrier) rate of up to 622Mbps, or about 4.3 times faster than the current backbone — 144Mbps.

The next generation Internet initiative (NGI), is a multi-agency federal (American) research and development program to develop, test and demonstrate advanced networking technologies and applications, promising to be 100 to 1,000 times faster than today's Internet.

The goals of the initiative are to conduct research and development in advanced end-to-end networking technologies to improve reliability, robustness, security, quality of service/differentiation of service (including multicast and video) and network management (including allocation and sharing of bandwidth).

The NGI intends to establish and operate two testbeds: The "100x" testbed will connect at least 100 sites including universities, federal research institutions, and other research partners at speeds 100 times faster (end-to-end) than today's Internet. This testbed will be built on existing federal networks such as the NSF's vBNS service, among others. The "1,000x" testbed will connect about 10 sites with end-to-end performance at least 1,000 times faster than today's Internet. This testbed will be built on federal networks such as the multi-agency Advanced Technology Demonstration network (ATDnet) and DARPA's ACTS ATM Internetwork (AAI). ACTS is NASA's Advanced Communication Technology Satellite.

Internet2 is promoted by the University Corporation for Advanced Internet Development (UCAID), a non-profit con-

sortium led by university members working with corporate and affiliate members.

The goals of the Internet2 project focus more on services and include valuable objectives such as demonstrating new applications to enhance researchers' ability to collaborate and conduct experiments by leveraging a concept termed virtual proximity. Virtual proximity is enabled by the advanced communications infrastructure linking researchers. Internet2 will also facilitate the development, deployment and operation of an affordable communications infrastructure, capable of supporting differentiated Quality of Service (QoS) based on applications requirements of the research and education community, states UCAID.

One of the most important goals is for participating institutions to coordinate and adopt working standards and common practices to ensure end-to-end quality of service.

The three initiatives will help research and educational institutions to conduct leading edge research, but each has a slightly different aim: vBNS aims to improve the Internet backbone; NGI to improve end-to-end connection speeds; and Internet2 to improve types and quality of services available. The benefit to the rest of the Internet community is that many of these advancements will likely trickle down and become the tools of the common Web surfer. ■

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