

The New Internet

Have you experienced a shutdown trying to download a large file? Are you inundated with spam? You're not alone. The Internet is now 30 years old and a mess. More than 600 million people use Web services worldwide with 72 percent of Americans on line once or more a month and 30 percent of Chinese, among others. Over \$3.9 trillion in e-business transactions will take place over the Internet in 2003.

The problem is that the Internet wasn't designed to handle this kind of volume, and, certainly no one in the 1970s anticipated its tremendous growth. Now we are adding technologies such as streaming media, file sharing, and video-conferencing to this antiquated system.

According to David duVernay, writing in the "Monadnock Shopper," who quotes from an article in the October issue of "Technology review," nearly 100 leading computer scientist, backed by some heavyweight industrial sponsors, are working to replace the Internet with a newer, smarter model. A project called "PlanetLab" will revitalizing the Internet within three years. PlanetLab hopes to achieve several improvements. You won't need to haul around your own laptop because your files will be readily accessible from any Internet terminal. You won't need to worry about computer worms and viruses as the new network will detect and destroy rogue data packets for you. You'll retrieve video and other bandwidth-hogging data instantly, no matter how many other users are competing for the same programs. You won't need disks and CD's to store data because you'll archive it on the Internet, securely and indestructibly. You'll keep tax returns, digital photographs, and all your data without using your own computer's memory.

Today's Internet utilizes dumb routers to move information around, but PlanetLab will use smart nodes instead. Routers now move whatever is sent to them wherever they're instructed to send it. It could be a virus, spam or the equivalent of a letter bomb. Smart nodes, on the other hand, are standard PC's capable of running programs and exchanging data over routers, but programmed to sort out data and keep it secure.

The 1970s Internet was a tool created mainly for a few hundred government and university researchers hence it was built on trust. But today we have viruses such as the Code Red worm. Created in July 2001, it quickly spread to 360,000 machines around the world. Cleaning up the damage took system administration months and cost businesses more than \$2.6 billion.

One PlanetLab project, called "Netbait," is designed to identify a virus, seek its origin, and stop it from infecting other machines. A recent trial on 90 smart nodes identified a spread of a variant of Code Red and successfully shut it down. Netbait will be available by year's end.

In 1999, Victoria Secret's lingerie Web broadcast, advertised during the Super Bowl, generated 1.5 million requests, but the spike in demand overloaded them and many requests never were satisfied at all. These spikes are called "flash crowds." A new

PlanetLab tool called “CoDeeN” monitors requests for page downturns and as demand grows, it automatically caches the page on additional nodes to meet the “flash crowd.”

Unusual demand isn't the only bottleneck slowing down the Web. Users access it through thousands of private, competing Service Internet Providers (ISPs). This array of barely compatible links creates a system that few understand and no one controls.

PlanetLab has developed software called “Scriptroute” using smart nodes to probe the Internet trails and send back data about their travels. This data generates a map of active links within and between ISPs' networks and measures the time it takes to traverse each link. Hopefully, in three years ISPs such as AOL and Earthlink can use Scriptroute's maps to rapidly diagnose and fix their network problems. Lost data is another frustrating plague to which anyone who has lost a PDA, or suffered a hard drive crash, can attest. PlanetLab scientists are working on a project called “OceanStore” to eliminate the problem. It's a distributed storage system that encrypts files and then breaks them into overlapping fragments that move around the planet.

An original file can be reconstituted from just a subset of the fragments even if a number of local nodes fail. The system assigns an ID code to each fragment and when a user wishes to retrieve data, his computer tells the node to search for the nearest copies of the fragments needed and reassembles them. Privacy and security are built in since the user has password-protected his data. His key contains so many digits that it is essentially impossible for others to gain unauthorized access.

Scientists plan to produce software capable of managing 100 trillion files, or 10,000 files for each of 10 billion users. This amount of capacity could make every computer your own personal one. You could archive every piece of data you own and retrieve whatever you need from any computer using your unique code.

While PlanetLab cannot enter into profit-making enterprises, businesses may soon spring from its development. Intel and Sun are now working on their own versions of OceanStore. HP Labs has installed 30 PlanetLab nodes and expects to develop a network to test new technologies. Smart nodes will reinvent the Internet and literally become the new Internet.

The profusion of devices with Internet connectivity is overwhelming the available supply of Internet Protocol (IP) addresses. The addresses created in the 1980s were made up of 32 binary digits and provided about 4.3 billion unique addresses. We are quickly running out. The next version of IP addresses available in the next few years will use 128 binary digits and will provide so many possible combinations that there will be about 670 quadrillion (thousand trillion) addresses. Let's hope this lasts for a while.