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Making the Connections

The ARPANET, predecessor to the Internet, started with an inspiring vision of a "galactic" network, practical theory about packet switching, and a suite of standardized protocols. But none of this would have mattered if there hadn't also been a way to make and maintain connections.

Author [Ronda Hauben](#) described some of the early concerns about network transmission quality this way:

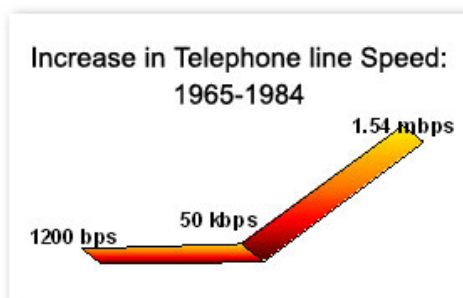


"In 1966-67 Lincoln Labs in Lexington, Massachusetts, and SDR in Santa Monica, California, got a grant from the DOD to begin research on linking computers across the continent. Larry Roberts, describing this work, explains,

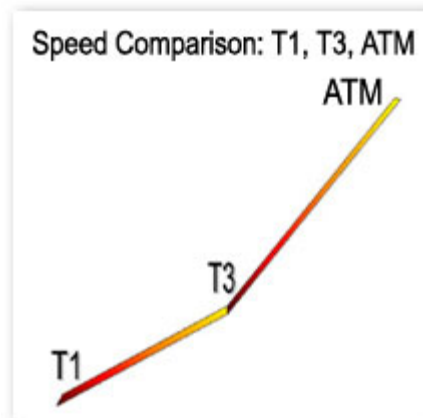
"Convinced that it was a worthwhile goal, we set up a test network to see where the problems would be. Since computer time-sharing experiments at MIT (CTSS) and Dartmouth (DTSS) had demonstrated that it was possible to link different computer users to a single computer, the cross country

experiment built on this advance." (i.e. Once timesharing was possible, the linking of remote computers was also possible.) Roberts reports that there was no trouble linking dissimilar computers. The problems, he claims, were with the telephone lines across the continent, i.e. that the throughput was inadequate to accomplish their goals."

[Packet switching](#) resolved many of the issues identified during the pre-ARPANET, time-sharing experiments. But, higher-speed phone circuits also helped. The first wide area network demonstrated in 1965 between computers at MIT's Lincoln Lab, ARPA's facilities, and the System Development Corporation in California utilized dedicated 1200 bps circuits. Four years later, when the ARPANET began operating, 50 Kbps circuits were used. But, it wasn't until 1984 that ARPANET traffic levels were such that it became more cost-effective to lease T1 lines (1.5 Mbps) than to continue using multiple 50 Kbps lines.



The increasing connection speed of [T1 lines](#) brought with it increasing demand, particularly from private sector businesses. By 1991, when all restrictions on commercial use of the Internet were lifted, the National Science Foundation (NSF) -- who from 1987 to 1995 helped the U.S. make the transition from the ARPANET to today's Internet -- had its entire network backbone connected to 45 Mbps [T3 lines](#). In 1994, a year before the private sector assumed responsibility for the maintenance of the Internet backbone, the NSF upgraded the Internet backbone to [Asynchronous Transmission Mode](#), 145 Mbps.

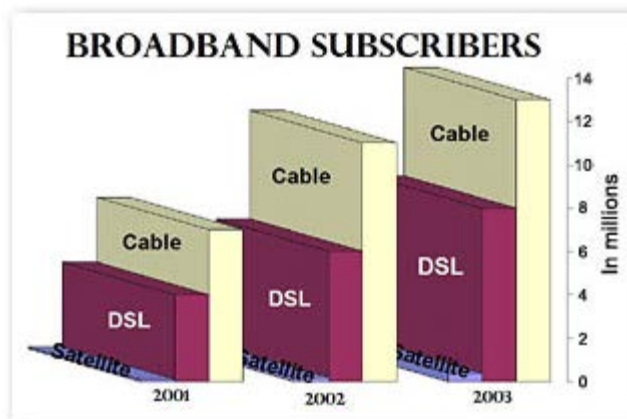


While large institutions, governments, and businesses have found it economically worthwhile to pay for high-speed connections for most of the past forty years, in most American homes - where the Internet became of interest after the introduction of the graphically-oriented World Wide Web in 1993 - affordable Internet access has been limited to 56 kbps modems operating over public phone lines. However, recently introduced broadband products and services offer North American households the possibility of getting access to a bit more of the bandwidth and connection speed actually available on the Internet. North American household's access to broadband began in 1996, when Rogers Communications introduced the first cable modem service in Canada.

Broadband encompasses several digital technologies (cable, satellite, DSL, power line, and wireless) that provide consumers with integrated access to voice, high-speed data, video-on-demand, and interactive delivery services. [The Congressional Research Service](#) says that:

"Broadband access, along with the content and services it might enable, has the potential to transform the Internet...For example, a two-way, high-speed connection could be used for interactive applications such as online classrooms, showrooms, or health clinics, where teacher and student (or customer and salesperson, doctor and patient) can see and hear each other through their computers. An "always on" connection could be used to monitor home security, home automation, or even patient health remotely through the web. The high speed and high volume that broadband offers could also be used for bundled service where, for example, cable television, video-on-demand, voice, data, and other services are all offered over a single line."

A growing percentage of U.S. households seem to agree that broadband connections have many advantages. Between 2000 and 2001, [broadband subscriptions rose](#) over 50%, with an additional 48% growth in 2003. And, [the Pew Internet and American Life Project](#) reports that 39% of adult Internet users have broadband access at home.



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