BUSINESS TECHNOLOGY;
Peering Out a 'Real Time' Window

The New York Times

February 8, 1995, Wednesday, Late Edition - Final

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Distribution: Business/Financial Desk

Section: Section D; ; Section D; Page 1; Column 4; Business/Financial Desk ; Column 4;

Length: 1304 words

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Body

The view from Steve Deering's office is spectacular.

"I'm sitting here right now watching the space shuttle hovering near the Russian space station, listening to live audio from the Russian ship," said Mr. Deering, a computer scientist at the Xerox Corporation's Palo Alto Research Center.

The window through which he watched the space ballet on Monday was the screen of a desktop computer, attached to the global web of computer networks known as the Internet. And the means by which he watched and heard the space rendezvous was an emerging technology called the M-bone, which is turning the Internet into a virtual broadcasting medium.

Whether it is the astronauts on the shuttle or Mick Jagger on a Rolling Stones tour, more and more people are experimenting with the M-bone these days. But unlike conventional broadcasting, the M-bone can allow viewers and listeners to be broadcasters themselves. Practitioners call this "multicasting." (The M-bone is the Internet's multicast backbone, which functions as a network based on the Internet's framework.)

Mr. Deering, a principal developer of the underlying technology, said the M-bone could become a sort of global video telephone system that allows groups of people -- not just individuals -- to share voice and data and images in "real time" over the Internet.

Because the M-bone has been in use only since 1992, and because using the M-bone requires special hardware and software, so far only 1,500 of the estimated 70,000 networks that make up the Internet have been set up as M-bone hubs. As a result, it remains to be seen whether the M-bone will evolve into an Internet-based network connecting every business and home, or whether it is merely a limited prototype for the "information highway" that is supposed to be built eventually by telephone and cable TV companies to carry interactive audio, video and text services.

But already, some corporate researchers have begun using the M-bone as a fairly inexpensive alternative to special teleconferencing systems and even business travel. Because it employs the Internet's existing physical structure, which often leads right to office desktop computers, many businesses are already equipped to explore uses for multicasting.

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Scientists, meanwhile, use it to monitor live video and data signals from robot submarines on the ocean floor. Engineers scattered around the world use the M-bone to collaborate on complex projects, employing interactive "white boards" that allow them to share notes and drawings on-line. Medical students in Britain and Sweden can watch as a surgeon in San Francisco performs an unusual operation, voicing questions to the doctor as the procedure takes place.

Speeches by President Clinton and Newt Gingrich, the new Speaker of the House, have been carried live on the M-bone, along with performances by an assortment of musicians.

Although the quote probably won't endure as long as Samuel Morse's first telegraph message -- "What hath God wrought?" -- history was made all the same last November when Mick Jagger of the Rolling Stones opened the first major cyberspace multicast concert by saying: "I wanna say a special welcome to everyone that's, uh, climbed into the Internet tonight and, uh, has got into the M-bone. And I hope it doesn't all collapse."

The M-bone did not collapse, but the astute Mr. Jagger had alluded to the biggest drawback of multicasting, which is the limited bandwidth -- or data capacity -- of the existing Internet.

Audio and video signals consume enormous amounts of bandwidth -- far more than simple text does. And some researchers fear that widespread use of the M-bone could easily clog the Internet and interfere with more common services, including electronic mail.

Because multicasting is still experimental and not well known outside the scientific and academic communities, voluntary guidelines have been sufficient so far. M-bone users typically ask permission from other M-bone users before scheduling a multicast session, allowing those who want to tune in to do so, and those who do not to keep their data spigots closed.

There is also an informal agreement to be sparing when using the feedback capabilities. Because of bandwidth concerns, for example, Mr. Deering and other shuttle watchers have not been permitted to talk with the American and Russian astronauts. And some other multicasts are restricted only to low-quality video or audio-only communications, as a courtesy to others downstream.

The steady increase in computing power and the continuing trend toward high-bandwidth networks could ease the current barriers to widespread M-bone use. Internet bandwidth capacity is already being expanded rapidly to meet the growing demands by businesses for such services as the World Wide Web. And an increasingly popular type of high-speed telephone service known as I.S.D.N., or integrated services digital network, is offering high-capacity Internet links to commercial and residential computers.

Even without the M-bone, multicast applications are now possible on internal corporate computer networks, the kind that link personal computers within a building. But the M-bone, because it is built atop the Internet, can reach far beyond local networks to millions of computers scattered in more than 150 countries. There are M-bone links today in Russia, as well as at the McMurdo Sound research station in Antarctica.

Multicasting has obvious appeal for distance learning in Internet-connected schools; for linking remote offices to hold training sessions or distribute new-product information, and for playing new generations of interactive computer games. Music companies are eyeing the M-bone as a way to distribute new recordings, including music videos.

But potential is one thing; reality is another. Multicasting is still limited primarily to scientific and research organizations that have high-capacity phone lines and powerful computer work stations using Unix -- a complex type of software found mainly in scientific and engineering communities. And while multicasting capabilities are being built into newer networking equipment, it still requires no small amount of software and technical expertise to configure even a new network to use it.

Businesses may be wary of holding sensitive seminars or business meetings on the M-bone because it is no more secure than the notoriously insecure Internet. And what would seem the obvious security solution -- using data-

encryption software to transmit multicasts in secret code -- is thwarted by United States Government policies barring the export of data-encryption technology.

And any dreams of beaming video commercials and face-to-face sales pitches over the Internet are tempered by the reality of the existing audience.

"Most people get on the M-bone from work, and most of the workers who are on the M-bone are not consumers," noted Dave Hayes, a network specialist at the Jet Propulsion Laboratories in Pasadena, Calif.

Its current lack of commercial appeal has not stopped scores of researchers from experimenting with the M-bone.

Many of the most creative applications of the M-bone originate at the Internet Multicasting Service, a not-for-profit company in Washington. Via its Internet-based "radio station," RTFM, the company multicasts world news, and last month it began beaming live audio feeds from the House and Senate floors. Internet Multicasting hopes soon to add M-bone reports from Washington restaurants, in which chefs would show and tell what is for dinner.

Unfortunately, one of the most popular Internet radio programs, Internet Multicasting's "Geek of the Week," is not yet on the M-bone. The program, in which technical experts wax rhapsodic about protocols and bandwidth and other geeky subjects, is still available only as audio files that computer users fetch one by one.

Graphic

Photo: Multicasting is allowing personal computers to be used to watch and participate in events as they happen. Steve Deering developed the technology to transform the Internet into a virtual broadcasting medium. (Jim Wilson/The New York Times)

Diagram: "E Pluribus M-Bone"

The M-bone - or multicast backbone - on the Internet enables groups of specially equipped computers to share text, audio and video. A multicast differs from a unicast, in which one computer communicates with one other, and from a broadcast, in which one computer communicates with many. In multicasting, many computers can communicate among themselves simultaneously. (pg. D7)

Load-Date: February 8, 1995

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