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The Internet of 1988

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This week is the 25th anniversary of the Robert Morris worm, the first large scale malware on the internet, before there was a world wide web. I covered the Internet as a cub reporter at the Washington Post, and it was for many readers (and journalists) an intro to this new fangled series of "pipes." The tone of wonder — and the hobbyist, noncommercial quality of the 'net — are striking. Reposted here for your enjoyment. You can also read the piece over at the Post.

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The Computer Heard 'Round the Nation;
Network Links 500,000 Users

BYLINE: Barton Gellman, Washington Post Staff Writer

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Raymond T. Kreisel, laboring in upstate New York on a tricky piece of computer graphics programming, typed a one-line question into his terminal — "What is the fastest flood fill algorithm?" — and then sat back and waited for a reply.

Kreisel was looking for an efficient way to paint patterns inside computer-drawn shapes. Paul Heckbert, a graduate student in California, did not know Kreisel, but he had a pretty good piece of code, or computer programming, to do the job. He dispatched it to Kreisel's machine, and seconds later the New Yorker's problem was solved.

It was much as though Kreisel had been missing a hard-to-find engine part and simply by calling out, he had found a mechanic to send him one — custom-made, free and virtually on demand.

Yet Kreisel's "shout into the net" and its reward were typical of the daily business of Internet, the world's largest computer network, which was disrupted earlier this month by a rogue program, known as a "virus," introduced by Robert Tappan Morris, a 23-year-old Cornell graduate student.

The virus was designed to spread from machine to machine and divert each host to its own purposes. This one, unlike others, did not destroy any data but clogged computers and wasted millions of dollars' worth of skilled labor and computer time.

It also focused attention on a network that ties together an estimated 500,000 users who turn to their terminals instead of telephones, facsimile machines or a postal system they mock as “snail mail” and rely on them as the primary means of exchanging professional knowledge. For many of Internet's users, the network is also a major part of their social and recreational lives.

“Once upon a time computers were for thinking,” said Cliff Stoll of Harvard's Center for Astrophysics in Cambridge. “That's no longer true. Computers are for communicating now, and networks allowed that to happen.”

Using Internet and overlapping networks, thousands of men and women in 17 countries swap recipes and woodworking tips, debate politics, religion and antique cars, form friendships and even fall in love.

But the networks that link tens of thousands of computers 24 hours a day also allowed the computer virus t spread much more rapidly, and with far greater potential for damage, than any previous electronic invader. That frightens many network visionaries, who dream of a “worldnet” with ever more extensive connections and ever fewer barriers to the exchange of knowledge.

“The Internet is a community far more than a network of computers and cables,” Stoll said. “When your neighbors become paranoid of one another, they no longer cooperate, they no longer share things with each other. It takes only a very, very few vandals to . . .destroy the trust that glues our community together.”

The metaphor of a community is apt. Internet, which began as a Defense Department link between four research computers in 1969, is still officially limited to universities, research facilities and government offices. But it has evolved its own language, social norms and “netiquette,” even as its sprawling growth has outrun the ability to map it.

No one can keep track of how many people use Internet, how many machines it can reach or even how man sub- and sub-sub-networks form a part of it. The “backbone” of the network — major electronic corridors established by the Department of Defense, the National Science Foundation and others — is obvious enough, but like the interstate highway system, it leads to successively smaller local byways and obscure private roads.

And while committees exist to set technical standards, and unclassified Defense Department systems form its core, no one really “runs” the network.

“The content and direction is really up to the people using it, which makes it kind of a grand social experiment,” said Eugene H. Spafford, a professor of computer science at Purdue University.

The network is much more than mail. It enables a user sitting at one machine, with permission, actually to operate another machine on the network, just as if the person were in the same room. The implications of that power, known as opening a remote shell, are revolutionary.

“We have resources,” Spafford said, “be they people resources or computer resources or data resources, that

are scattered throughout the country and the world. If I'm working on a problem and I know that other people are working on the same problem, I can either go there to where they are working or I can sit down a my terminal and travel there 'virtually.' “

Interviews and a random sampling of nearly 2 million characters of recent network “traffic” turned up a range of serious and not so serious business:Mark VandeWettering of the University of Oregon wrote a computer graphics software tool he was proud of and in August donated it — 2,000 lines of computer code — to any interested user on the network. “Here is the first release of my totally whiz-bang ray tracer,” he wrote in a cover note. “I wrote it for fun, and hope others have fun with it too.”

Tom Moyer, a mechanical engineer at George Washington University, sends problems in “finite element analysis” from his desk in downtown Washington to a Cray supercomputer in Illinois. Instead of physically testing the structural strength of building materials, Moyer uses the Cray's enormous processing power to simulate the tests with mathematical models.

Spafford, the Purdue professor, reached an impasse in his attempt to write an operating system for a minicomputer called the Vax 11/750. Two weeks of inquiries at the Digital Equipment Corp., which manufactured the Vax, proved fruitless — until two strangers on the network told Spafford that Digital's manual was wrong. “It never occurred to me,” Spafford said.

Jerry Nelson, a professor at the University of California at Berkeley, needed engineering data on the massive Keck Telescope under construction in Hawaii that specified precisely the shape of its reflecting mirror. Stoll, the Harvard astronomer, transmitted the file within two minutes to Nelson's computer.

There is more to life than science, and the network publishes hundreds of special-interest forums known as news groups. They have no exact counterpart in traditional media, but seem to combine most of the functions of hobby magazines, radio talk shows, classified advertisements and singles bars.

“It's like being able to subscribe to any magazine instantly, read back issues, contribute to it as an author an unsubscribe whenever you want — all at no cost,” said Kenneth R. van Wyk, a senior consultant in user services at Lehigh University's computer center.

Together the news groups produce about 4 million characters of new material a day, the equivalent of about five average books.

“You couldn't possibly read it all,” said James E. Cottrell III, a networking guru at the National Institute of Science and Technology.

Then again, said Harvard's Stoll, you wouldn't want to: “90 percent of it is complete and utter trash.”

But which 90 percent? Browsers have their choice — among many others — of gardening, high fidelity, science fiction, firearms, jokes, model trains, the Beatles, Celtic culture, a running debate between evolution and creationism, Esperanto, ferrets, martial arts, folk-dancing, “things equestrian,” and a catch-all forum fo “political discussions and ravings of all kind.”

Pierre Malraison, in San Diego, sparked a lively colloquy in the folk-dancing forum by wondering playfully whether a branch of mathematics known as group theory could do as good a job as a human caller in running a square dance. Sean Smith, in Pittsburgh, reported that his usual partner “thought such a project would be completely antithetical to the spirit of dancing.”

Brian K. Reid, a big name in computer science, is best-known to some network users as the moderator of th gourmand news group, an on-line electronic cookbook. Reid enforces nine rules of recipe-writing, including: “no rambling,” “no preaching” (on cholesterol or vegetarianism), “no fake ingredients” (garlic powder strictly forbidden) — and “no mystical quantities,” an occupational hazard around computer types. “In a recipe making 12 liters of soup,” Reid wrote, “don't expect me to believe that it needs to have exactly 6.375 tablespoons of flour.”

Chefs who wish to be freer with their frijoles may turn to a rival cooking forum, where Arthur Wouk of Duk University recently denounced another contributor for proposing sugar as an ingredient in water bagels. “This is a bastardization of the bagel,” he wrote, “which should be stamped out.”

Wouk's riposte is a good example of why arguments sometimes intensify into bitter feuds known as flame wars, after the tendency of one character in Marvel Comics' Fantastic Four to burst into flames (“Flame on!” he shouts) when he is angry. Is Wouk truly angry or just having a good time? Because the written word conveys no tone of voice, it isn't always easy to tell.

“In a normal social setting,” said Chuq von Rospach of Sun Microsystems, “chances are the two of them would have a giggle over it and it would go away. On a network it tends to escalate. The feedback mechanisms that tell you to back off, or tell you that this person's joking, aren't there. The words are basically lifeless.”

True net-heads sometimes resort to punctuation cartoons to get around the absence of inflection. They may append a : –) if they are making a joke (turn your head to the left) or use : – (for an ersatz frown.

But with few exceptions, there is no moderator to cool off the flamers when things get out of hand. Anyone can post anything almost anywhere in the network.

“It's run almost exclusively by peer pressure,” said John Kelso, a mild-mannered computer manager at George Washington.

The one unbending rule is that thou shalt not post commercial announcements. It isn't written anywhere, but heaven help the user who tries to broadcast an advertisement.

“There's a good chance,” said Spafford, the Purdue professor, “that you may get 500 or 1,000 pieces of electronic mail telling you that's not an appropriate thing to be doing. . . . It tends to be a deterrent.”

Read Bart Gellman's current work in this area here.