

Phone System Feared Vulnerable To Wider Disruptions of Service

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A switching station fire that melted fiber optic communications lines, damaged computers and interrupted telephone service in the suburbs of Chicago has raised questions about whether the nation's telephone system is becoming more vulnerable to major disruptions.

The Chicago incident illustrates a hidden consequence of new telephone technology, some experts say. Equipment like optical fibers and electronic switches allows so much telephone traffic to be concentrated in a single place that a breakdown affects far more customers than before. **Affected Areas Growing**

"The network is getting thinner and thinner and switches are getting bigger and bigger," said John C. McDonald, executive vice president for technology at the Contel Corporation, a non-Bell telephone company. "When a major outage occurs, it's going to cover bigger and bigger areas."

The phone system's vulnerability has become more important now that the circuits carry not only conversations but computer data and are crucial to the nation's commerce. Companies routinely place orders, transfer money and consult computer data banks over phone lines. A halt in phone service could ricochet through the economy, causing millions of dollars in business losses.

The Chicago-area disruption was caused by a fire on May 8 in an Illinois Bell switching center in Hinsdale. Illinois Bell does not expect service to be fully restored until early June.

The Hinsdale fire highlights the growing concerns. The switching center was not manned; it was monitored from Springfield, 200 miles away. It had no fire suppression system, a common feature of computer rooms in the data-processing industry. And local fire authorities were not contacted for more than an hour after the blaze began.

A review of the Hinsdale system's vulnerability could have wide ramifications, because most other local telephone companies have networks and procedures similar to Illinois Bell's.

James Eibel, vice president of operations at Illinois Bell, said the company was thoroughly reviewing its procedures and network design. The company has called the failure a rare event that was not easy to foresee.

The Hinsdale switching center provided local service to 35,000 customers. But it also served as a hub into which traffic from about 50 other switching centers flowed on high-capacity optical fibers to be connected to long-distance services. Hinsdale, which handled 3.5 million calls a day, was one of five such "gateways" in the Chicago area. Hence, the fire disrupted service to a vast swath of suburbs south and west of Chicago, affecting hundreds of thousands of customers.

"Ten years ago there were hubs, but there were dozens of them because you couldn't put everything you needed to handle all of Chicago in one or two buildings," said Jerry Hoppe, chief engineer of the Illinois Commerce Commission, a state regulatory agency. "There are certain advantages to scale. But there obviously is a disadvantage when you put all your eggs in one basket."

The failure has prompted many questions from customers and from the Illinois Attorney General's office, which has asked the commerce commission to investigate Illinois Bell's practices. **'A Lot of Questions'**

"There are going to be a lot of questions asked after this is all over as to why so much traffic has been concentrated in one switch and as to why they didn't have proper fire protection equipment," said David R. Yadlosky, group director of operations of the computer network used by the Florists' Transworld Delivery Association. The network's computer, in a town near Hinsdale, was cut off, making it impossible for 12,500 florists around the nation to send flowers by wire or to process their credit-card transactions.

The Hinsdale fire also cut a communications link between the Federal Aviation Administration air traffic control computers at O'Hare Airport in Chicago and other F.A.A. control centers, causing delays at O'Hare. Flight delays then rippled across the country.

The failure also disabled the reservations center that processes 35,000 calls a day for the Holiday Corporation, owner of Holiday Inns. The company was able to transfer many calls to its main reservations center in North Carolina. "I've been in this business 18 years and I've never seen a failure this disastrous," said Roger J. Hickey, director of the Midwest reservations center.

The growing concentration of telephone equipment in vulnerable centers has also worried the Defense Department, which wants to insure that the system cannot be easily disabled by a saboteur or a nuclear attack. A panel set up by the National Academy of Sciences has been studying this issue and released its first report last August. **Concern About Terrorism**

"The results are scary," said Mr. McDonald of Contel, who is chairman of the panel. "The report concludes that the network is getting thin enough in certain areas that if a guy like Qaddafi knew where they were, he could wreak havoc with the phone system."

One vulnerable area, the report said, is in a system called common channel signaling. This is a separate network that sets up paths for telephone calls over the A.T.& T. long-distance circuits, by far the nation's largest telephone network. The signaling network has only 14 switching centers.

A.T.& T. said the 14 centers were heavily protected and backed each other up in case one was disabled.

The technology that allows for more concentration of phone traffic clearly has its benefits, just as a highway has advantages over a grid of small streets. Economies of scale allow for lower telephone rates and electronic features allow for new services like call-forwarding. With competition growing in the telephone industry since the Bell System breakup in 1984, some authorities say, both local and long-distance phone companies are rushing to employ these cost-saving technologies. **Benefits of Electronic Switches**

One major advance is the electronic switch, which has replaced the electromechanical switch in routing calls. The newest such switch made by the American Telephone and Telegraph Company can handle four times as many calls as its electromechanical predecessor, and new switches are starting to appear that will do twice again as much, said Amos E. Joel Jr., a consultant on switching and a former Bell Laboratories switch designer. Mr. Joel estimated that since divestiture, local telephone companies have reduced their number of switches by about 10 percent.

Optical fibers, which are hair-thin strands of glass, carry phone conversations as pulses of light. A single fiber can carry at least 8,000 phone conversations, compared with 24 on a pair of copper wires. Now, phone companies are moving toward the ability to cram 24,000 conversations through a fiber.

The General Electric Information Services Company, which runs one of the nation's largest computer networks and leases lines from A.T.& T., has had to buy a satellite communications system as a backup for the failures that occur because of optical fiber breaks.

"What began to happen as fiber optics came in is that A.T.& T. began to concentrate more and more traffic on a single fiber route," said Richard J. Lewis, manager of network operations for the General Electric Company subsidiary. "The outages aren't that frequent but when they do occur they are massive," he said. **Other Causes of Failures**

The company has recorded eight A.T.& T. fiber failures in two years, caused by problems like cables cut by backhoes and mudslides.

Phone company officials generally dispute suggestions that the phone system is becoming less reliable.

"I think that perception is wrong," said Joseph P. Nacchio, director of network engineering and operations for A.T.& T. "We have more route miles, more circuit miles and more alternate path capabilities than we had before."

For big companies that lease lines, the level of reliability depends on how many circuits they order, Mr. Nacchio said. But for consumers, who use the public network, any break in a line or fiber is usually not noticeable, as traffic is immediately switched to another line. **New Equipment More Reliable**

The newer equipment is also more reliable than the older technology, said Patrick E. White, assistant vice president of new architecture and service concepts for Bell Communications Research, which does network planning for the seven regional Bell operating companies. He said electronic switches had no moving parts and broke down less frequently than electromechanical devices.

Still, some of these assertions could be called into question by what happened at Illinois Bell. While the phone company had backup fibers in case a fiber broke, both sets went through the same switching center and were destroyed by the same fire, Mr. Eibel said.

The fact that the Hinsdale center was unmanned at the time of the fire is also a result of new technology. Because switches are essentially computers, they can be monitored from a remote location over the telephone lines. Hence, Illinois Bell, like other phone companies, monitors many switching centers from a central control room. But remote technicians cannot put out a fire. **What Might Be Done**

Experts said it might not be economically feasible to add more redundancy to the system without increasing telephone rates. Therefore, they said, all possible care should be taken to protect such major phone switches and high-capacity lines from accidents.

A sprinkler system, all concede, would do as much harm to the equipment as a fire. But questions have been raised on why the center did not use a halon gas fire suppression system like those employed in many large computer rooms. A spokesman for Illinois Bell said the company had considered such a system but had doubts about its effectiveness.

The Illinois Attorney General's office is also looking at why it took more than an hour after the fire began for the fire department to be contacted. The Illinois Bell spokesman said that when the technician in Springfield who was responsible for monitoring the Hinsdale station received the alarm, he tried to call the fire department in Hinsdale. But the call could not get through. The fire had already knocked out the phone lines.