Study shows internet to be resilient against terror attack

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Researchers have simulated what would happen to Internet reliability in the United States if terrorists were able to knock out various physical components of the network.

The good news is that it would be very difficult to cause major disruptions across the country, although destruction of some key parts could seriously degrade Internet quality. "When it comes to the Internet, there is strength in numbers," said Morton O'Kelly, co-author of the study and professor of geography at Ohio State University.

"There are so many interconnections within the network that it would be difficult to find enough targets, and the right targets, to do serious damage to Internet reliability nationwide."

O'Kelly conducted the study with Hyun Kim, a graduate student at Ohio State, and Changjoo Kim, assistant professor of geography at Minnesota State University. Their results were published in a recent issue of the journal Environment and Planning B.

This study continues research O'Kelly and several colleagues conducted in 2003. In that study, the researchers tested Internet reliability using the assumption that selected city network nodes were rendered completely inoperable, because of accidents or attacks. (Network nodes are places that house the equipment where Internet traffic is collected and distributed.)

But that assumption is not very realistic, O'Kelly said. Network nodes have a subnetwork of interconnections between various commercial Internet backbone providers. These backbone providers have what are known as peering agreements to share Internet traffic, and these can become critical if one of them is having troubles. The result is that it is unlikely that an entire network node could be disabled.

In this new study, the researchers developed computer simulations in which they studied a simplified nationwide Internet network.

In order to make the study more manageable, the researchers used just five of the more than 30 major commercial Internet backbone providers, and three of the nation's major public access points – places that connect traffic from many Internet Service Providers. The three access points studied were in Chicago, Dallas and San Francisco.

They then simulated disruption or failures of parts of the network to see what would happen to Internet connectivity between various pairs of cities – 946 pairs in all. However, in contrast to earlier studies, they assumed that not all the backbone providers in a network node would be disabled at once, and that peering agreements would allow at least some Internet traffic to continue flowing.

As would be expected, results differed greatly depending on the number and specific parts of nodes that were disrupted in the simulations, O'Kelly said.

For some city pairs, disruptions in nearly a dozen specific nodes would not make much difference in Internet reliability, but a disruption in a single critical node would cause major problems. And such critical nodes may be different for any particular pair of cities.

One interesting city pair in the study was Seattle and Boston.

Geographically, they were furthest apart of any pair. But in terms of reliability, they were ranked very highly – 147th of the 946 city pairs.

That was largely because there were many separate paths for Internet traffic to travel between the two cities, O'Kelly said. Moreover, traffic could be routed through any of three of the major hub cities, all of which were highly reliable because of the peering agreements between the Internet backbone providers.

"Seattle and Boston show the advantages of multiple pathways and resilient hubs," he said.

Overall, the results showed the Internet has a great resilience against accidental disruption or even targeted attacks by terrorists, O'Kelly said.

"There is a rich web of connections in these Internet nodes, and a hit on a single city node or even several of them is not likely to wipe out Internet connectivity," O'Kelly said. "That's not to say major damage cannot be done, but it would be very difficult."

O'Kelly noted that this study used a simplified model of the Internet, which means the strength of the entire network is probably even greater than what they found.

"If our simple model was resilient to damage, the real Internet would be much better off because it has so many more hubs and links than we had in our study," he said.

Source: Ohio State University