

Another view of the Internet's fragility

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The Internet may not be as vulnerable to centralized attacks as previously suggested, researchers in California reported Monday.

Researchers have built mathematical models of the Internet and used them to study the robustness of the system. One type of model, called a "scale-free" network, portrays the Internet as being unaffected by random component failures, but vulnerable to targeted attacks on highly connected hubs.

John Doyle and colleagues at the California Institute of Technology examined the abstract models and compared them with the organizing principles behind the Internet. They found that at the router level, the current Internet does not have most characteristics predicted by the scale-free models.

The authors also found technological, economic and mathematical reasons explaining why a functioning Internet could not be dominated by high-traffic hubs that render the entire network vulnerable to attacks.

The scientists propose a model involving optimization of tradeoffs under constraints.

"Understanding complex networks in technology and biology is increasingly important, since seemingly arcane aspects of their robustness and fragility are having greater impacts on everyone's lives," Doyle says.

The study appears in the online early edition of the Proceedings of the National Academy of Sciences.

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