BitTyrant makes a turbulent entry into digital filesharing

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As you read this sentence, an estimated 5 million people are using BitTorrent to download their favorite movies or TV shows. The free software has achieved almost iconic status since its 2001 release, its creator profiled in glossy magazines, its users coining a new lexicon. The percentage of North American Internet traffic devoted to BitTorrent is in the double digits.

This week University of Washington computer scientists released free software that tweaks BitTorrent's cooperative core. The UW program, named BitTyrant, maximizes individual benefit by choosing file-sharing partners strategically. In doing so, it boosts downloading speeds by an average of 70 percent.

"Prior to this work, people thought BitTorrent was exactly how you want to build a peer-to-peer distributed system," said Tom Anderson, professor of computer science and engineering. "We figured out that it's easy for someone to cheat other users on BitTorrent, and we developed a set of changes that makes it much more difficult to do that."

Anderson's group began studying BitTorrent as an example of a system that uses incentives to promote cooperation. Then they went one step further, writing a program that questions BitTorrent's resistance to cheaters while improving performance. BitTyrant sparked immediate interest from the technical community, attracting more than 60,000 Web visitors on its first day.

"I hadn't expected it to blow up quite so quickly," Anderson said.

Anderson's goal isn't necessarily to help teenagers share bootlegged videos more efficiently. But BitTorrent is popular because it excels at sharing mammoth files over the Internet. Earlier versions of file-sharing, such as Kazaa and Napster, simply allowed people to trade files. BitTorrent chews up each file into a series of pieces, downloads each one separately and then stitches the pieces back together. Groups of users download files from one another, rather than a central server. A computer can be downloading a chunk of the latest episode of "The Sopranos" from one computer while simultaneously uploading another chunk to someone else.

Start-up companies are eager to develop a more reliable version of BitTorrent that can deliver high-definition television content over the Web, for instance, or distribute software releases, Anderson said. Even BitTorrent has gone legit -- creator Bram Cohen signed a multimillion-dollar contract last year to deliver content for major film studios.

"Peer-to-peer traffic is by far the largest form of traffic on the Internet today. It doesn't show any signs of dissipating," said Michael Piatek, a UW doctoral student. "Incentives are a crucial factor. Even the Internet itself can be thought of as a loosely federated group of individual organizations," he added. "How to coordinate the competing interests of these many players efficiently is an open question."

BitTyrant boosts an individual's download speed while fixing a bug in BitTorrent. Instead of choosing download partners at random, BitTyrant looks for computers that are contributing a lot of content. Choosing high-bandwidth partners boosts the individual's payoff. It also punishes people who have managed to use BitTorrent without sharing any content. So the update helps the individual, while leaving cheaters in the cold.

Philosophers have long lamented the "tragedy of the commons." This first referred to a group of shepherds who share a grazing pasture. When a single herder inflates the size of his herd he gains a huge benefit, but if everybody does it the shared pasture turns bare and everybody loses. More generally, when people act purely in their own interest they can destroy shared resources, and this ultimately harms each individual. It turns out the concept applies equally well to computer users in the twenty-first century.

For the researchers, "studying networks and file-sharing is really a way to get a picture of how we design systems that incorporate the motivations of the people using them," said Piatek. He will present a paper on the file-sharing technology at the Networked Systems Design and Implementation meeting in Cambridge, Mass., in April.

Meanwhile, the file-sharing world may be in for a jolt. An estimated 80 million people have a copy of the BitTorrent software. Many of them may be about to make an upgrade.

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For a free copy of BitTyrant and for more information, go to bittyrant.cs.washington.edu/

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