

Researchers aim to make Internet bandwidth a global currency



Dollar bill coming out of an ethernet wire. Credit: Johan Pouwelse

Computer scientists at Harvard's School of Engineering and Applied Sciences, in collaboration with colleagues from the Netherlands, are using a novel peer-to-peer video sharing application to explore a next-generation model for safe and legal electronic commerce that uses Internet bandwidth as a global currency.

The application (available for free download at <http://TV.seas.harvard.edu>) is an enhanced version of a program called Tribler, originally created by scientists at the Delft University of Technology and Vrije Universiteit, Amsterdam to study video file sharing. The software exploits the power of peer-to-peer technology, which is based on forming networks among individual users.

"Successful peer-to-peer systems rely on designing rules that promote fair sharing of resources amongst users. Thus, they are both efficient and powerful computational and economic systems," says David Parkes, John L. Loeb Associate Professor of the Natural Sciences at Harvard. "Peer-to-peer has received a bad rap, however, because of its frequent association with illegal music or software downloads."

Unlike traditional, centralized approaches, peer-to-peer systems are incredibly robust, as they can scale smoothly since the software adjusts to the number and behavior of individual users. The researchers were inspired to use a version of the Tribler video sharing software as a model for an e-commerce system because of such flexibility, speed, and reliability.

"Our platform will provide fast downloads by ensuring sufficient uploads," explains Johan Pouwelse, an assistant professor at Delft University of Technology and the technical director of Tribler. "The next generation of peer-to-peer systems will provide an ideal marketplace not just for content, but for bandwidth in general."

The researchers envision an e-commerce model that connects users to a single global market, without any controlling company, network, or bank. They see bandwidth as the first true Internet "currency" for such a market. For example, the more a user uploads now (i.e. earns) and the higher the quality of the contributions, the more s/he would be able to download later (i.e. spend) and the faster the download speed. More broadly, this paradigm empowers individuals or groups of users to run their own "marketplace" for any computer resource or service.

Another idea the researchers believe has enormous but untapped potential is the combination of social network technology with peer-to-peer systems. "In the case of sharing and playing video, our network-based system already allows a group of 'friends' to pool their collective upload 'reserve' to slash

download times. For Internet-based television this means a true instant, on-demand video experience," explains Pouwelse.

The researchers concede that the greatest challenge to any peer-to-peer backed e-commerce system is implementing proper regulation in a decentralized environment. To keep an eye on the virtual economy, Parkes and Pouwelse envision creating a "web of trust," or a network between friends used to evaluate the trustworthiness of fellow users and aimed at preventing content theft, counterfeiting, and cyber attacks.

To do so they will use a feature already included in the enhanced version of the Tribler software, the ability for users to "gossip" or report on the behavior of other peers. Their eventual goal is to find a way to create accurate personal assessments or trust metrics as a form of internal regulation.

"This idea is not new, but previous implementations have been costly and are dependent on a company and/or website being the enforcer. Addressing the 'trust issue' within open peer-to-peer technology could lead to future online economies that are legal, dynamic and scaleable, have very low start-up costs, and minimal downtime," says Parkes.

By studying user behavior within an operational "Internet currency" system, with a particular focus on understanding how and why attacks, fraud, and abuse occur and how trust can be established and maintained, the researchers imagine future improvements to everything from on-demand television to online auctions to open content encyclopedias.

Source: Harvard University

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