Computer scientists devise a 'P4P' system for efficient Internet usage

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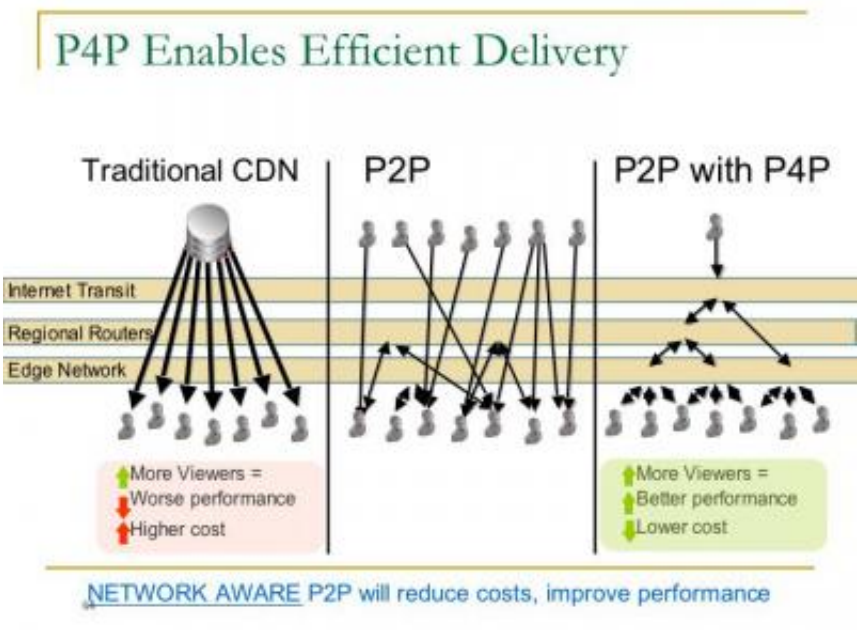

Data distribution under traditional, P2P and P4P architecture. Credit: Courtesy of Doug Pasko and Laird Popkin

A Yale research team has engineered a system with the potential for making the Internet work more efficiently, in which Internet Service Providers (ISPs) and Peer-to-Peer (P2P) software providers can work cooperatively to deliver data.

The way people use the Internet has changed significantly over the past 10 years, making computers seem to run less efficiently and putting

strain on the available bandwidth for transmitting data.

Since 1998, the percentage of Internet traffic devoted to the download and upload of large blocks of information using P2P software has increased from less than 10 percent to greater than 70 percent in many networks. By contrast, Web browsing now accounts for 20 percent and e-mail less than 5 percent of total Internet traffic, down from 60 and 10 percent respectively, in 1998.

Professors Avi Silberschatz, Y. Richard Yang, and Ph.D. candidate Haiyong Xie in Yale's Department of Computer Science are part of a research team that is proposing an architecture called P4P — which stands for "provider portal for P2P applications" — to allow explicit and seamless communications between ISPs and P2P applications.

The P4P will both reduce the cost to ISPs and improve the performance of P2P applications according to a paper to be presented at ACM SIGCOMM 2008, a premier computer networking conference in August 2008 in Seattle.

According to Silberschatz, current P2P information exchange schemes are "network-oblivious" and use intricate protocols for tapping the bandwidth of participating users to help move data. He says, "The existing schemes are often both inefficient and costly — like dialing long-distance to call your neighbor, and both of you paying for the call."

The Yale team has played many roles in this project, ranging from naming and analyzing the architecture, to testing and to implementation of some key components of the system.

"Right now the ISPs and P2P companies are dancing with the problem — but stepping on each other's toes," said Yang. "Our objective is to have an open architecture that any ISP and any P2P can participate in.

Yale has facilitated this project behind the scenes and without direct financial interest through a working group called P4P that was formed in July 2007 to prompt collaboration on the project."

The working group is hosted by DCIA [Distributed Computing Industry Association] and led by working group co-chairs Doug Pasko from Verizon, and Laird Popkin from Pando. Currently, the group has more than 50 participating organizations.

"The P4P architecture extends the Internet architecture by providing servers, called iTrackers, to each ISP," said Silberschatz. "The servers provide portals to the operation of ISP networks."

The new P4P architecture can operate in multiple modes. In a simple mode, the ISPs will reveal their network status so that P2P applications can avoid hot-spots. In another mode, P4P will operate much like a stock or commodities exchange — it will let markets and providers interact freely to create the most efficient information and cost flow, so costs of operation drop and access to individual sites is less likely to overload.

"While ISPs like AT&T, Comcast, Telephonica and Verizon and the P2P software companies like Pando each maintains its independence, the value of the P4P architecture is significant, as demonstrated in recent field tests," said Silberschatz. For example, in a field test conducted using the Pando software in March 2008, P4P reduced inter-ISP traffic by an average of 34 percent, and increased delivery speeds to end users by up to 235 percent across US networks and up to 898 percent across international networks.

Source: Yale University