Georgia Tech proposes Internet consumer nutrition label

August 3 2011

When it comes to broadband speeds, U.S. Internet service providers (ISPs) largely deliver on their promises, says a report issued today by the Federal Communications Commission, but "throughput" is only one of several metrics listed in the report that affect network performance. ISPs should provide a broadband "nutrition label"—easy-to-understand information about service-limiting factors—and users need better ways of measuring the performance their ISPs are delivering, concludes a study from the Georgia Tech College of Computing.

Out of some 2 billion Internet users worldwide, about 500 million are residential broadband users, and recent figures show that two-thirds of U.S. households are hooked up to high-speed Internet. Generally speaking, these customers' throughput—the "width" of their Internet pipeline—lives up to speeds advertised by their ISPs, says the FCC report, "Measuring Broadband America." But many home Internet users simultaneously run multiple applications that each use network resources, and the behavior of one application can affect the performance another application receives, says Nick Feamster, associate professor in the School of Computer Science at Georgia Tech.

"People should care about more than just throughput," Feamster says. "Optimal network performance depends on several other factors, but measuring these important metrics and explaining them to consumers is challenging. It goes back to transparency—we want to give users the information that will help them make the best decisions about which service plan to purchase, and to give them ways to verify that they're

getting the level of service that they're paying for."

Feamster and his Ph.D. student, Srikanth Sundaresan, consulted with the FCC on its study data, which were gathered from about 10,000 homes across the United States and involved many different ISPs. Their recommendations incorporated data from both the FCC study and from an independent study, Project BISMark (projectbismark.net/), a new open-source router platform that allows users to continuously monitor the performance that they are getting from their ISP.

For the initial BISMark study, Feamster and Sundaresan deployed network-measurement devices in 16 homes across three ISPs in the Atlanta metropolitan area. The recommendations are spelled out in the paper, "Broadband Internet Performance: A View From the Gateway," to be presented at the Association for Computing Machinery's SIGCOMM 2011 conference, Aug. 15-19 in Toronto (visit the #GTSIGCOMM website to learn more). The home routers used in BISMark (as well as the platform source code) are available too; Feamster and Sundaresan have been shipping them to home users since early 2011.

"We found that performance of U.S. ISPs more consistently matches their advertised promises than the ISPs in other countries—they do a pretty good job," Feamster says. "But at the same time, those advertisements are based on performance metrics that don't tell the full story about how users' applications will actually perform. Throughput might have been the dominant metric when the debate was dial-up versus broadband, but it no longer gives the complete picture about application performance."

Today's broadband is fast and ubiquitous enough that most applications can function well on a fraction of the throughput that most service plans offer, Feamster explains. But when several applications or activities are

using the network at the same time—for example, a user might be streaming a high-definition movie while making a video call over Skype—or when many other users are simultaneously on the network, that's when performance can suffer. Often the network gives preference to activities or users with the biggest bandwidth appetites and leaves the rest foraging for scraps.

One key factor is "latency," a general term that refers to several kinds of delays incurred in the processing of network data. For instance, in the "last mile" of connectivity to a household—the final leg of connectivity from the ISP to the home—data errors and packet loss often crop up at a disproportionate rate, and these can significantly impair activities like streaming video or voice over IP services. To minimize this problem, ISPs often perform error correction in the last mile, which comes at the cost of some additional delay.

"They're basically introducing a time lapse that, if you scaled it out to the appropriate physical distance, would equate to half the width of the country," Feamster says. "So, if you're a gamer and you chose your service plan based solely on throughput speed, you might not receive the level of service you expected."

Feamster and Sundaresan also found that certain cable and DSL modems can introduce excessive latency, depending on the activities and applications that users are performing in their homes. "Any user who has noticed that certain activities like uploading photos can render the network unusable has been a victim of excessive buffering, or 'bufferbloat,'" Feamster says.

In addition to proposing an Internet "[nutrition label](#)" that would detail network performance in terms of throughput, latency and other measurements, Feamster and Sundaresan have included mechanisms in the BISMark router to give priority to latency-sensitive applications like

Skype so that they might function normally while their hungrier counterparts eat up the remaining bandwidth. If throughput can be thought of as the number of lanes on the Information superhighway, the new technique in the BISMark router provides an "HOV lane" for voice and video traffic, so that the real-time traffic doesn't get stuck waiting for your photos to finish uploading.

"Consumers need better tools for understanding whether their home network is performing as well as it should. A major part of making this possible is giving users an easy way to monitor their home network activity and performance over time, which is our vision for the BISMark router," Feamster says. "For example, I can see that, in the past few days, the performance of my access ISP has been declining during peak hours.

"Ultimately, we envision the platform enabling applications that solve a much wider range of problems," he continues, "such as giving users the ability to manage usage caps that ISPs are now instating, to implement parental controls or to diagnose performance problems inside the home itself."

Provided by Georgia Institute of Technology