Developing a neighborhood watch for the Internet

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Internet network performance problems are not only annoying to users -- they are costly to businesses and network operators. But since the Internet has no built-in monitoring system, network problems often go unnoticed.

To help fix this problem, researchers at the McCormick School of Engineering and Applied Science at Northwestern University have developed a new way to detect and report such problems in real time through their Network Early Warning System.

While choppy playback on streaming video may be irritating to a user, it can drive thousands of potential customers away from the site providing the feed. As the Internet continues to grow, these network problems, or anomalies, become all the more frequent and frustrating.

Determining the existence, let alone the impact, of network anomalies is important because the Internet has no overall monitoring system. Current monitoring systems try to identify network anomalies and can look for issues that could lead to performance problems but cannot tell whether individual users are actually experiencing problems.

Yet every day, millions of Internet users worldwide naturally generate data traffic that inherently provides information about whether the network is working or not. (Think of the million of peer-to-peer users in systems like BitTorrent or Skype.). By sharing high-level information about their experience, these users could very efficiently and accurately

detect where problems occur in real time.

So Fabián Bustamante, associate professor of electrical engineering and computer science, and doctoral student David Choffnes are exploiting this observation to build a participatory approach to detecting, isolating and reporting network anomalies: the Network Early Warning System, or NEWS for short.

"You can think of it as crowd sourcing network monitoring," said Bustamante.

While the concept behind NEWS is straightforward, Bustamante and Choffnes overcame a number of design challenges to bring the approach to an Internet-scale deployment. By gathering information about network conditions from natural data traffic, NEWS focuses only on problems that affect end-users and does so without requiring any extra and potentially wasteful network-measurement traffic. NEWS incorporates knowledge of "normal" behavior for network applications to prevent false alarms and confirms suspected problems by checking with other nearby users.

NEWS is currently implemented as an extension to a popular BitTorrent client. By generating warnings about problems in the network, the software allows users to ensure that they get the proper Internet service they pay for. This was incentive enough for more than 12,000 users to install the software during its beta-testing phase. The researchers are also developing a portal for network providers to be notified about the network problems reported by their users.

Bustamante and Choffnes, who previously released the popular Ono extension for BitTorrent (now with more than 300,000 users worldwide), are applying the NEWS approach to build other valuable services, such as enabling comparison shopping for different Internet Service Providers

based on the performance seen from subscribers.

Source: Northwestern University