

At Comcast, we are actively working on the subject of network management and P2P transport optimization, as well as real-time applications and broadband services. Therefore, we believe we have many relevant contributions for the IETF P2Pi Workshop on May 28, 2008.

Background

Comcast operates a large ISP infrastructure serving over 14 million broadband customers. As large bulk file distributions over the network increased in frequency, we observed cases where services provided by Vonage, Skype, and certain gaming applications would intermittently experience degraded quality. These degradations occurred during times of network congestion, and the addition of network capacity was at best a temporary solution. Therefore, it has been our experience that network management is critical in order to maintain high performance, especially for delay-sensitive services such as gaming and VoIP.

At that time, and as a result of this experience, we started deploying network management technology using implementations similar to many of the other ISPs around the world. The operation of this equipment did alleviate the majority of issues related to third-party, delay-sensitive applications. In addition, it helped to maintain a much more consistent user experience for web surfing and other activity.

As the Comcast implementation and the topic of network management came under review this year, we investigated all possible alternatives. Our objective was to find alternatives that would be effective at solving the problem and at the same time impact as few users as possible.

As we canvassed the practices of cable, DSL, and FTTH providers nationally and internationally, we found that management techniques generally fell into one of two approaches: one was for network providers to slow P2P traffic that caused congestion, and the other was for network providers to manage the traffic of individual customers who use significant amounts of bandwidth during times of network congestion. We ignored a third approach, which was prohibiting or blocking P2P traffic altogether, which is more common among wireless broadband providers and university networks.

It should also be noted that virtually all of the companies that we were able to find public information on are managing their networks to prevent congestion. In private conversations, most network operators, ISPs, and application providers agree that some form of network management is required.

Our research also revealed that within the Internet community, there was a strong preference for the second approach, which was managing the traffic of individual customers who use significant amounts of bandwidth during times of network congestion, and that has influenced our current implementation plans for network management. We should

point out that there is still significant debate within the ISP community as to which practice is the most effective, and which practice provides the overall most fair environment for application providers and consumers. We believe, as a result of this technical debate and consensus building activity within the IETF, that new Best Current Practices may be developed over time in this area.

Engineering Activities

With respect to network management and P2P optimization, Comcast engineering has defined three key subject areas:

- 1 - Congestion Management Improvements
- 2 - P2P Optimizations (such as P2P caching and tracker optimizations)
- 3 - DOCSIS 3.0

Current Comcast engineering projects related to the P2Pi Workshop are:

- 1 - Congestion Management Improvements (Policies and technologies for managing network congestion without managing specific protocols or applications.)

Comcast will be migrating to a new network management approach, which will be agnostic to any protocol or application, by the end of 2008. In short, during times of peak congestion, our new network management system will focus on the traffic of individuals who are using a disproportionate amount of bandwidth and are creating congestion that degrades the experience for other users. The goal of this network management technique is a good online experience for broadband customers, even during periods of network congestion.

- 2 - P2P Optimizations (Potential Long-Term Technical Solutions)

Comcast has been investigating potential longer-term technical solutions that require further discussion among stakeholders in the Internet community, and in some cases coordination between the broadband ISP and P2P vendor communities.

We believe the longer term technical solutions *may* include (and are not limited to) some of the following capabilities:

- a) - A method for a network to communicate available network bandwidth and congestion status to applications, so that applications and/or users of applications may take some action in response to this. This method may leverage Explicit Congestion Notification, Pre-Congestion Notification, and other technologies.
- b) - A method for applications to share Quality of Service (QoS) preferences and/or user-selected priorities to networks, so that during times of congestion networks may take some action according to Internet consumer priorities. This method may include DiffServ marking by consumer applications, and other technologies.

c) - Improved methods for allocating network resources more fairly in TCP or other protocols, which is an area that the IRTF and other groups are currently focused on. These methods may be coupled with proposals for specific TCP transport of lower priority data, such as TCP-LP (<http://cs.northwestern.edu/~akuzma/rice/doc/TCP-LP.pdf>).

d) - Optimized methods for the selection of peers (possibly including P2P caching servers) by P2P trackers, based on ISP network topology and other network information, such as proposed by the P4P Control Plane (http://www.dcia.info/documents/P4P_Overview.pdf) and Ono (<http://www.mccormick.northwestern.edu/news/articles/365>). Further research is required as to whether these P2P-specific technologies are in need of additional standardization, whether these mechanisms are an effective way to improve the performance of P2P while also protecting other network uses as necessary, and whether there are technically interesting uses for such technologies beyond their current P2P-specific application.

3 - DOCSIS 3.0

Comcast is working to deploy DOCSIS 3.0 technology in up to 20% of its markets by the end of 2008. This will make available downstream wideband speeds of up to 50 Mbps, and greater speeds in the long term.

The deployment of DOCSIS 3.0 and greater upstream DOCSIS capacity will not solve the challenge of meeting the ever-increasing Internet bandwidth demand of consumers. Broadband ISPs cannot simply build their way out of network congestion. Every broadband network faces periods of congestion. Even some of the fastest broadband access networks in the world, such as in Japan and Europe, face similar congestion challenges every day, and employ some form of network management.

The authors look forward to participating substantively in the IETF P2Pi Workshop, and hope that an invitation to the workshop will be extended to us.

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