
PeerApp White Paper

Why QoE is Important to Service Providers

September, 2008



Executive Summary

This paper has two objectives: explain why broadband Quality of Experience (QoE) is critically important to Internet Service Providers (ISPs) today and provide some solutions for the most crucial QoE-related problems within ISP networks.

The Video Internet is changing the definition of QoE for ISPs and subscribers alike. Subscribers expect much more from their broadband services, particularly those subscribers who have upgraded their broadband packages from 1 or 2 Mbps to 8, 10, 20 or 50 Mbps., They are using the Internet for much more than reading the local newspaper or getting weather information. They are using the Internet for video. They are using it for streaming video on demand and downloading to be played back on any number of devices.

Consumers are relying more and more on the Internet for entertainment, education and information and their expectations of their broadband provider have increased as well.

Basic connectivity is a given and “always on” is no longer an effective differentiator for a broadband provider. To differentiate against competition ISPs must differentiate themselves using QoE which means to provide fast and efficient downloads as well as immediate and uninterrupted streaming of video, After all, if you are not able to use your entertainment applications of choice, what good is upgrading to a 20 Mb service?

Traffic and Usage Trends

The Internet is undergoing yet another secular shift: It is evolving from a platform for publishing and sharing static images, to a platform for publishing and sharing multimedia content, most notably video – and it’s evolving at a breakneck pace.

Data on Internet traffic and subscriber trends provides meaningful insight on how use of the Internet has changed and how it will continue to change.

Cisco Systems’ most recent report on Internet traffic¹ states that video traffic – P2P and streaming – represents the bulk of consumer Internet traffic in 2008: the equivalent of more than 500 million DVDs crossing the Internet each month.

The report notes:

IP traffic will nearly double every two years through 2012. Total IP traffic will increase by a factor of six from 2007 to 2012. Driven by high-definition video and high-speed broadband penetration, consumer IP traffic will bolster the overall IP growth rate so that it sustains a steady growth rate through 2012, growing at a compound annual growth rate (CAGR) of 46 percent.

Cisco estimates that 5×10^{20} bytes of IP video traffic will traverse the Internet by 2012.

AT&T Vice President of Legislative Affairs Jim Cicconi stated that video traffic will be 80% of all Internet traffic by 2010 and that the “unprecedented new wave of broadband traffic” will increase 50-fold by 2015. Driving this traffic growth is the compounding of two major trends. First is the dramatic improvement in

¹ Cisco Virtual Networking Index – Forecast and Methodology 2007 – 2012, June 2008

video quality which in turn consumes more bits. Second is the rapid increase in popularity of video web sites and applications.

Streaming data rates have increased 3x to 4x in two years. In 2005 and 2006, notable streaming sites such as YouTube and MLB.com were streaming video clips as well as live events at 400Kb/s to 500kb/s. In 2008, some of the notable streaming sites are delivering videos at much faster rates:

Hulu: 700kb/s to 1Mb/s

Move Networks: ~ 1.3Mb/s

Fox Interactive: 1.1Mb/s to 1.5Mb/s

ABC.com 1.5Mb/s to 2Mb/s+, Standard Definition or HD Streaming Selectable

Faster data rates mean higher-quality video viewing, approaching high-definition-equivalent quality on large video displays. Improved definition video – like High Definition (HD) – requires substantially greater data rates to be streamed across the Internet. As consumers begin to experience improved video quality, their expectations will continue to increase, and ultimately requiring more bits per second and faster downloads.

This increase in video quality leads to more adoption from consumers. And the demographic data indicates that consumers are watching more videos and spending more time doing so. ComScore reports that in July 2008, the US broadband population viewed 11.4 billion videos for a total duration of 558 million hours. By comparison, in July 2007, the same group viewed about 9.1 billion videos for a total duration of 408 million hours. This represents an increase of 25%/year in (streaming) videos watched and a 37% increase in hours spent watching. ComScore also reveals that US internet users watch an average of 3 hours of online video per month. This represents phenomenal growth, particularly considering that YouTube did not exist prior to Fall 2005. As of December 2007, Google/YouTube not surprisingly ranked as the top US video property, with 3.3 billion videos viewed (32.6%).

There is every reason to believe that this trend will continue. In May 2008, media research firm Ipsos reported that from February 2007 to February 2008, traditional TV viewing dropped from 75% as the source of where all video content is watched to 70%; viewing on a personal computer increased from 11% to 19%.

For a broadband provider that is trying to manage traffic on the network, this is a mixed blessing. Clearly it is good news that consumers rely on their network more than ever as a source of entertainment and information. In many respects, this is the vision that broadband pioneers had for high speed data networks. However, rapidly increasing video quality combined with rapidly increasing adoption, leads to traffic growth rates that puts serious pressure on the network infrastructure. It also means that providing not only adequate but enhanced QoE will be the primary point of differentiation when it comes to customers' satisfaction and subscriber growth.

The Opportunity

The Internet is no longer simply a source of research, news, and e-commerce.

It is a major source of entertainment in all forms, and that means video. The population as a whole is increasing its reliance upon the Internet. Consumer expectations are increasing. They are buying higher performance packages to do much more than reading an electronic newspaper or ordering commodities

on line. Consumers are buying high speed access packages in order to watch high quality video and get downloads faster.

In the US, Verizon is offering broadband packages with speeds of up to 50 Mbps or 20 Mbps downstream and 20 Mbps or 5 Mbps upstream. Comcast states that it will be offering DOCSIS 3.0 enabled Internet services in approximately 20% of its market by the end of 2008 with initial data rates in the 20 to 50Mb/s range and with data rates eventually in excess of 100Mb/s. These types of offerings are already common place in countries such as South Korea and Japan, and service providers in other regions are proposing similar offerings.

The entertainment options online have never been greater. From user generated video, to popular clips of television shows, to feature length films and live events, there has never been a greater selection of online entertainment options. These trends provide great revenue generating opportunities for both service providers and content owners.

For ISPs, video will be the number one driver in adoption of higher speed, higher priced, broadband links. For the last several years, broadband pricing has been nearly flat for an all-you-can-eat service. While ISPs have played with the idea of byte caps or usage based billing, these services are not yet a reality, and they are counter to current market expectations. However, better service is something users are accustomed to paying for. High quality video on broadband links is likely to become to primary driver to increasing the Average Revenue Per User (ARPU) for a broadband service provider. Of course this assumes that the broadband provider embraces Internet Video streaming and downloads and invests properly in a high QoE for their subscribers.

The Challenge

It has been well-documented in the press, that the emergence of the Video Internet has brought with it significant network infrastructure challenges with respect to the delivery and viewing of video content.

Over the past several years, P2P traffic has created congestion problems at various points in the networks of service providers around the world. For cable operators, or Multi System Operators (MSOs), one of the significant problem areas is in their upstream access networks. As noted by Comcast in its report on its network management practices to the United States Federal Communications Commission (FCC) , the prevalence of P2P traffic on the upstream portion of its network is cause for Comcast to implement policies that mitigate the likelihood of congestion that could cause service degradation for their customers.²

It is not that MSOs are trying to deny access to any content or service. They do believe in an open Internet and allowing services to work properly. However, when one class of application grows so fast and consumes so much traffic that it begins to interfere with the performance of other applications, and network providers need to manage it appropriately.

For ISPs around the world, there are many problems caused by this unanticipated and unprecedented increase in traffic:: increasing bandwidth and operating costs, decreasing profitability, increasing customer complaints and churn, and an overall decreasing network performance for all applications. Finally, as has been highly publicized in the U.S., there has emerged the threat of government intervention.

² *Attachment A: Comcast Corporation description of current network management practices. Report to the Federal Communications Commission, September 19, 2008.*

The growth of the Video Internet is creating network infrastructure pain in a number of specific areas.

International Transit: International transit links are very expensive for many ISPs throughout the world including Asia, South and Central America, the Middle East, Africa, some portions of Eastern Europe, and in many island countries. These links range from \$20 to well over \$100 per Mb/s. The repeated and continuous retransmission (sending and receiving) of the popular content (identical files) over expensive transit links is not economically sustainable. Service providers need to find a way to reduce the amount of traffic going back and forth, while giving their subscribers the content they want and the QoE they expect.

Peering Connections: Many 2nd and 3rd tier service providers do not own and therefore must pay for peering connections. The expense for peering connections is significant in many cases. For many ISPs, this situation creates similar challenges to International Transit: reduce bandwidth consumption from P2P and streaming traffic, control costs, accelerate delivery, satisfy subscriber QoE.

Upstream Access: For operators with a shared access infrastructure like that of cable, wireless, or mobile operators upstream access networks are suffering from congestion because they have limited bandwidth that must be shared among many subscribers. P2P consumes 50%-80% of these links producing complaints from subscribers. These service providers simply cannot afford to let subscribers squander precious bandwidth. They need to dramatically reduce or eliminate consumption of bandwidth associated with redundant uploads without breaking application functionality or performance.

Solving the Problem: The PeerApp Solution

PeerApp's UltraBand™ product line uses intelligent media caching to enable service providers meet the content demands of subscribers. The solution relieves congestion at the critical problem areas, caches popular content and accelerates its delivery to subscribers providing the best possible QoE.

PeerApp's technology is based on the fact that media files, whether they be delivered via P2P or HTTP, are highly cacheable. Media files are static objects, are extremely large (often times over a GB), and tend to be prone to the flash-crowd mentality of consumers (where many consumers want the same files within a short window of time). UltraBand systems are deployed within the ISP network to localize traffic and eliminate repetitive requests saving the ISP on bandwidth costs and network infrastructure.

Intelligent media caching is the most cost-effective means of satisfying the increase in the consumption of video and other digital media, both P2P and HTTP streaming video content. It provides flexible traffic engineering and decreases network infrastructure and transit costs, while eliminating all the performance bottlenecks associated with video applications.

PeerApp's product gives ISPs three important capabilities for delivering the new QoE:

Caching: Intelligent caching enables the most efficient delivery of bits over the network. The PeerApp solution caches popular video and other multimedia content, eliminating repetitive or redundant downloading of identical files – especially important for international locations where transit links are very expensive. UltraBand generates bandwidth, giving ISPs more control over costs and reducing the need to throttle traffic, institute byte caps or implement other restrictive traffic-engineering practices that can cause a dissatisfaction among subscribers and regulators..

Acceleration: ISPs can deliver video and other forms of multimedia content up to wire speeds, creating a superior subscriber experience. They can accommodate more subscribers and gain a significant competitive advantage over competing broadband providers.

Control: ISPs can make decisions about what to cache, what to accelerate, who to partner with, and how media delivery works on their networks based on their business needs. With this level of control, they can create premium, value-added services for video content – such as services for high-definition content, Web TV “channels,” or localized ad insertion.

With these capabilities, ISPs are no longer passive participants but viable players in the Video Internet and its emerging revenue streams.

For content providers, the PeerApp technology enables distribution of multi-gigabit media content without a huge investment in so many media servers and expensive transit links or without a long-term commitment to a traditional Content Delivery Network.

Cooperation among service providers (ISPs and content providers) is essential to build an efficient mechanism for delivering a high-quality video and an optimal subscriber experience. The better the QoE, the more video content can be successfully distributed over the Internet, and the more likely the industry may be able to move subscribers to pay-for-play service models.

PeerApp’s unique technology is the only solution that meets QoE requirements across the Video Internet distribution and value chain.

It results in a better Internet – one fine-tuned to deliver video, multimedia and large-file content at scale and with high QoE. Everybody wins: service providers, content providers, and consumers.



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