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Via Email
The Managing Director
Information and Communications Technology Authority
P.O. Box 2502GT
Grand Cayman
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Subject: Public Consultation on a Policy for Deep Packet Inspection and Similar Technologies (Ref: CD 2009-4)

Introduction

1. BitTorrent, Inc. ('BitTorrent") has been monitoring with interest the many proceedings initiated by communications regulators regarding the Internet Traffic Management Practices ("ITMP") of Internet Service Providers. These practices often involve the use of Deep Packet Inspection ("DPI") equipment which raises significant privacy concerns given the capabilities of this technology. ITMP and DPI have been used to block, delay, degrade or throttle a particular protocol or application in violation of Network Neutrality principles.

2. Putting the privacy concerns aside, the troubling uses of DPI are in these areas of ITMP, in particular ITMP that violate Network Neutrality principles. These uses should be examined closely. And as with most technologies, there are positive uses of DPI as well.

3. We note that our company, more specifically our BitTorrent application, is often the specific target or one of a few targets of these practices. There is often some misconception as to the effect of BitTorrent, as well as in general peer-to-peer ("P2P") applications, on the Internet and in fact there has been an overstatement of the effect of such applications on network congestion.

4. BitTorrent is a technology company providing software and services devoted to making the Internet more efficient for consumers, publishers and network operators. Consumers use our software, or Internet connected consumer electronics devices with our software embedded on them, to access a wide array of content published by others using the BitTorrent protocol. For publishers, we provide technology and services that enable more content to be distributed at lower cost. For operators, we are committed to technology and protocol enhancements that allow networks to be utilized more efficiently than they are today and allow operators to get more out of every capital expense dollar spent on network upgrades.

5. By creating a technology that efficiently moves very large files among a large audience, BitTorrent has permitted the Internet to increasingly realize its potential as a multi-media platform and one that empowers every imaginable publisher with an ability to reach his or her

audience. However, the accelerated transition of the Internet, enabled by the BitTorrent technology, from the text and image based centralized broadcast model of the 90's to the audio and video interactive model today has placed many burdens on the Internet's underlying networks.

6. BitTorrent submits that the Internet requires neutral network management that will preserve the power and incentives around innovation as innovation is a key ingredient of success in using the Internet and in the marketplace. While BitTorrent recognizes that network management is essential to the preservation of Internet-based business models, it is our view that these management practices are not required to be, nor should they be, discriminatory in nature. Discriminatory network management has the potential to stifle existing technologies in their infancy as well as new technology development. As has been demonstrated by Comcast following the 2008 decision of the Federal Communications Commission that its throttling of BitTorrent traffic was illegal,[1] network management need not run afoul of the principles of network neutrality and ISPs can effectively manage their users that induce congestion rather than discriminate against the general use of a specific application

7. This submission represents the reply comments of BitTorrent and we appreciate the Authority taking the time to hear the diverse viewpoints on the matter and hope that our submission will assist the Authority to better understand these complex issues.

P2P Overview

8. P2P technology enables the Internet to be used in ways that were not previously possible. By enabling a richly connected world of peers, it transcends the top down broadcast models of traditional media. Anyone can publish content using P2P technology and efficiently deliver that content to a very large audience. P2P is far more efficient at utilizing all of the resources on the Internet - network, computing, storage, and power.

9. In the top down broadcast model of the client server Internet, content is stored on expensive servers running in data centers in the core of the network and users engage the content using different computers in the home. This involves at least two computers, two power bills, two network connections plus expensive data center facilities.

10. P2P enables the consuming computer (if available) and its associated resources (power and network) to also act as senders of the content. This means fewer computers, fewer data centers, fewer power plants to distribute the same piece of media. Just as P2P technology makes better use of idle computer cycles in the home, it is also advancing technology to make better use of idle network capacity.

[1] Memorandum Opinion and Order (FCC 08-183) (August 1, 2008). Following the FCC order, Comcast ceased its application specific throttling practices and implemented user based traffic management.

11. P2P itself is a very large ecosystem of diverse technologies. There are P2P technologies that enable a wide range of applications from voice communication/telephony (Skype), broadcast radio and television (PPLive, Octoshape, Abacast and others), video on demand downloads and streaming (BitTorrent and others) as well as electronic software distribution (BitTorrent). P2P is even broader when you consider the P2P distributed computing applications that are being applied in the scientific realms of astronomy, genetics, mathematics and elsewhere. The potential of P2P is only at its infancy and it remains one of the most heavily researched topics in computer science today with future applications only now being envisioned.

12. Economically, P2P enables a very cost effective means to reach an audience. Fewer computers to buy or provision means that media distribution is no longer the domain of those with deep pockets. P2P allows small companies, as well as individuals, to distribute their works through the Internet to a global audience at relatively little cost.

13. P2P is not just the domain of the independent artists, even major media companies are coming to the realization that P2P technology provides a faster, more efficient, more reliable way to distribute mass media.

14. The Canadian Broadcasting Corporation (CBC) in March 2008 distributed the final episode of its reality television program *Canada's Next Great Prime Minister* for download via BitTorrent. However, while the distribution of the program was very popular, many Canadian users experienced longer down load times than non-Canadian users due to the traffic management practices of several Canadian ISPs.

15. Two other examples of BitTorrent and related P2P technologies being used as an effective distribution method are NBC and the P2P enabled NBC direct platform and the P2P enabled live events covered by CNN such as the recent inauguration of the 44th president of the United States.[2]

16. BitTorrent is but one P2P application, though we consider ourselves leaders in innovation. As the first P2P protocol effective at moving large files, our role in the video on demand ecosystem has been substantial. We are constantly evolving the technology to both improve the application as well as solve even harder problems, such as Internet congestion, in partnership with the ISP community.

Technical Overview

17. This section will touch on some technical aspects of BitTorrent and the current congestion control mechanism of the broader Internet as well as respond to several assertions made in the various submissions in this proceeding.

[2] Other BitTorrent embedded customers include Netgear, Buffalo, D-Link, QNAP, Planex and Verismo while many other devices are embedding third party BitTorrent clients. BitTorrent has also distributed content for Fox, Paramount, MTV, Warner Bros. Lionsgate, PBS and other major studios in conjunction with the Torrent Entertainment Network video portal.

18. Network congestion on the Internet is not a new problem. Without a mechanism to control congestion, the early Internet, as with today's Internet would collapse. Abiding by the guiding principles of the Internet, intelligence at the edge and simplicity at the core of the network, the early Internet architects developed the TCP protocol by which every application could manage the collective congestion on the Internet. TCP uses packet loss as a congestion detection method. When packets are lost due to congestion, TCP reduces the data rate of the application and further congestion is avoided. TCP strives to achieve fairness among competing flows, so that all suffer equally when facing the weak part of the network. With a few notable exceptions like Skype, nearly every P2P protocol uses TCP to regulate congestion.

19. With the heavy volume of traffic that is involved in moving large media (some media files can be many Gigabytes in size), congestion can still overwhelm weak links in the network, reducing every application's throughput to unacceptable levels. This is a volume problem and it is driven by the popularity of consuming media on the Internet. It is not a P2P problem.

20. The value of P2P and the BitTorrent technology is that it enables unreliable peers to be aggregated into a very reliable and efficient delivery system. By finding areas of the network and peers in the system that are free to deliver pieces of the file, the resulting solution is fast for users and efficiently utilizes the overall resources of the network by making many connections to a diverse collection of peers. It is commonly suggested that a high number of connections subverts the underlying fairness of TCP. However, while many connections are made, very few (4-5) are used at any one time in the upload of a file and never more than one between the same two peers. The rest of the connections are used to exchange control information (at a very low volume), monitoring the performance of the network and the state of the file between the two peers communicating.

21. If upstream congestion is the concern, as suggested by some, it is not because P2P subverts any underlying fairness of TCP. P2P leverages each member of the audience to assist in the delivery of the file to other members of the audience. This "upload" is what makes the "download" work. Others have claimed that consumers do not care about the upload performance of their service, since they extract no value from assisting with something they have already consumed. However, when you consider that the uploading of others enables the download in the first place, the systemic value of the upload is obvious to most consumers who use P2P.

22. There is another common misconception that BitTorrent and P2P generally is a background application, as opposed to a "real time" or interactive application. Some P2P applications, like Skype, are clearly interactive and some BitTorrent clients support streaming, obviously an interactive use case where the user is expecting immediate playback of the video being delivered. To the network, this interactive use of the BitTorrent protocol looks exactly the same as the background download use case. Any "delay" of this streaming application will create a bad user experience. The key point here is the network, on its own, will never know what is important to the application or the user. Whether the BitTorrent protocol is asking for a piece of the file that

is about to be viewed at the player or the rarest piece of a download, this looks exactly the same to the network. Only the application knows what is of priority and any broad classification at the network or by ITMP is bound to involve many false positives.

23. Finally, some have claimed that the nature of the P2P application creates usage that is "on 24/7" and that this alone warrants aggressive management of an entire protocol with the first byte a user downloads. BitTorrent tracks basic client Internet use and the 24/7 claim is exaggerated. The average BitTorrent client is only active around 4 days each month, or between 10-20% of the time, far less than the claims asserted in certain filings.[3] In any event, in most networks, 24/7 usage patterns would be a good thing for at least 23 of those 24 hours considering that such usage would be during non-peak times when load on the network is essentially free.

Effects of ITMP as seen by BitTorrent

24. It is commonly asserted that ITMP does not block BitTorrent, but only delays the eventual downloads. Setting aside the interactive use of BitTorrent detailed above, it is clear that in a very competitive marketplace, these delays are critical and do in fact degrade the application and are having an effect on overall usage of the protocol. Consider P2P usage in Canada, where Canadian ISPs have been historically among the most aggressive users of ITMP. In conversations with Motion Picture executives who track P2P usage, they indicated that there has been a dramatic decline in P2P usage in Canada in the last year with a corresponding increase in other applications that are server based (and presumably not currently targeted by ITMP). We can assume this migration has occurred because these applications artificially outperform P2P. This is an example of the networks using ITMP to pick winners and losers in the marketplace and BitTorrent submits that such a practice should not be permitted in a neutral management regime.

25. BitTorrent offers commercial services using P2P technology to deliver professional content for publishers. These clients use the underlying BitTorrent protocol but are also designed to report a considerable amount of performance information about the underlying networks, as this information is critical to publishers who need to track how effectively their content is being delivered. These services are in use worldwide and the critical measurement for the system is a metric called "offload", which is essentially, the percentage of traffic that was able to be delivered using the P2P elements of the system. Overall offload for the entire ecosystem (all customers, all regions of the world) averages around 80% and when measured by individual ISP typically ranges between 70% and 90%. However, for Canadian ISPs where ITMP practices are aggressive, this metric drops to 30%, the lowest for any major network worldwide.[4] One can

[3] Source: BitTorrent Inc. client check-in data. Each client checks into BitTorrent servers when it starts up or has been on/active for 24 hours. This check in is to determine if there is a new version of the software available to download. From these logs, we know that the average client is "on" or active for 10-20% of the days of any given month.

[4] Some smaller wireless ISPs who block BitTorrent entirely show 0% offload. When these are filtered out by a minimum number of clients, 30% remains the lowest worldwide. Source: BitTorrent DNA Analytics portal]

only assume that ITMP or underlying network performance conditions are attributable to this low level of system performance in Canada.

Solving the Congestion Problem

26. The basic problem of network congestion control is a function of the transport layer (in the OSI model) built into every operating system. The current standard is TCP which is universally deployed across the Internet creating a natural barrier to innovation to solve congestion control (as evidence, consider the challenges around IPv6 when pushing any upgrade of the Internet's core infrastructure).

27. BitTorrent, as an end to end protocol with the ability to control both ends of most connections, has the opportunity to innovate beyond TCP in this critical area by working in partnership with the broader ISP and Internet community. In order to solve the congestion problem, we have leveraged our in house technology that has already been deployed and is in operation inside the commercial BitTorrent services since 2007.

28. The technology is called "uTP" and builds a "friendlier than TCP" transport service on top of UDP (the UDP protocol is used only as a framing layer).[5] The simplest way to think about uTP is that it puts a "yield sign" in front any traffic sent by the client. If some other application needs the network, uTP is designed to give way to that traffic. uTP creates a protocol that uses the network when it is available and free but yields to others when there is contention for the network resources.

29. The uTP transport collects one way delay measurements between peers as it transfers data. By using these measurements, uTP can sense congestion building in the network before it is felt by any other application. When this pre-congestive state is observed, the protocol is designed to slow down or stop, in effect, yielding capacity to other applications (e.g. VoIP, gaming or even web surfing).

30. uTP generally does not have any effect on the aggregate performance of the BitTorrent protocol, because BitTorrent can leverage strength in numbers. Understanding and avoiding congestion is good for BitTorrent, because if the network between two peers is congested, you get better performance by finding another peer that is not congested.

31. BitTorrent is currently trying to gain acceptance of the uTP protocol within the Internet Engineering Task Force (IETF) (the standards body of the Internet) and we are co-chairing (alongside a representative from Microsoft) a working group[6] chartered by the IETF to deal with

[5] It is commonly misunderstood that our use of UDP is actually friendlier than TCP. The confusion arises from the fact that UDP alone is often considered to be more aggressive than TCP. However, uTP builds a strong traffic regulator on top of UDP to achieve these goals, but the points are easily confused by the uninformed

[6] The working group is called "LEDBAT" and the charter materials are available at http://www.ietf.org/dyn/wg/charter/ledbat-charter.html

network congestion issues. We have published the uTP specification and presented it to this working group as a draft solution to network congestion issues.

32. As the uTP technology has been deployed to our commercial clients since 2007, it has been extensively tested in the production environment as well as in the lab. Every consumer client running the latest stable version of our software is now able to communicate using uTP. The latest beta client (of which there are around 400,000 early adopters) is able to initiate connections using uTP. Once this client is stable and auto-updated, all of the BitTorrent owned clients will transition to uTP transport. We expect stability in the current beta client to occur in a matter of weeks and the eventual transition to uTP should have some very positive effects for the ISP community in the area of network congestion.

33. Once deployed uTP should allow the networks to reclaim vast amounts of bandwidth in the presence of substantial BitTorrent traffic. It will allow, on a session by session basis, a more efficient use of the network. uTP is a technology that achieves many of the stated goals of ITMP (at least as defined by these proceedings), but does so in a subtle and elegant manner allowing users near instantaneous access to the network when congestion is not an issue, and it comes at zero cost to the ISP as there is no expensive equipment to procure, manage and maintain. It also does so in a way that allows the BitTorrent application to function unimpeded when the network is not congested.

34. BitTorrent is prepared to work with ISPs to effectively implement uTP in their networks.

Solutions – Manage Users Not Applications

35. The neutral nature of the Internet is something that should be preserved or it may result in unwanted or unintended consequences (ie. lack of innovation which may slow growth of network development and capacity). However, this needs to be balanced against the recognized need for operators to manage their networks.

36. BitTorrent submits that to be reasonable, network management solutions should be non-discriminatory in nature. No solution that singles out a single application or protocol should be considered neutral. When presented with this challenge in the United States, we were able to work with one of the largest ISPs, Comcast, towards a network management solution that manages heavy users, not applications and only does so during necessary moments of intense congestion. In this way, every user is accorded his or her fair share, regardless of the applications in use or destinations involved.

37. ITMP that singles out specific applications will hamper and harm innovation at the edge and contribute to the centralized control of media, restricting the Internet to those who can afford the costs of traditional distribution on the Internet. The potential impairment of freedom of expression in this case should not be underestimated.

38. A neutral non-discriminatory network management environment will allow additional innovation to flourish, such as uTP that solves fundamental problems in a profound way to the benefits of all, users, ISPs and application developers alike.

Conclusion

39. Success or failure in the marketplace should depend on consumers and, in the context of the Internet, a neutral network is essential to this determination. A neutral network preserves the power and incentives around innovation, and innovation is a key ingredient of success in the marketplace. Discriminatory network management has the potential to disrupt these market drivers and snuff out in their infancy untold technologies that could revolutionize an economy, create jobs and better the lives of countless citizens. While recognizing that network management is essential to the preservation of Internet-based business models, these practices need not be, nor should they be, discriminatory in nature.

40. The marketplace, properly empowered, can solve many problems. Innovation in congestion control, like uTP, should also be allowed to flourish and incentives towards its success are easily envisioned. Application-specific network management, discriminatory in nature, should not be permitted and any network management if and only when necessary should focus on the heavy user (and only when necessary to deal with an immediate network congestion issue).

41. BitTorrent is a believer in the marketplace and the power of innovation and hope that the Authority and the ISPs are able to proceed in ways that preserve and empower both. In the same manner as we have worked with ISPs in the United States, BitTorrent is willing and certainly able to work with ISPs to use existing technology to better control their networks without discriminating against specific applications.

42. We thank you again for your attention and leadership on this important issue.

Yours Truly,
BitTorrent Inc.

Eric Klinker
President and CEO