ATTACHMENT C

REPORT OF BILL ST. ARNAUD

Introduction

[1] This testimony aims to address claims by telcos/cablecos that they are justified in interfering with traffic such as that generated by P2P or file-sharing applications so as to alleviate congestion on their networks. Telcos/Cablecos have singled out this type of traffic as the 'cause' of congestion, and so believe they are justified in employing intrusive and discriminatory techniques such as Deep Packet Inspection (DPI) to manage such traffic. But it is impossible to determine the primary 'cause' of congestion on telco/cableco networks unless and until other factors such as oversubscription ratios and utilization rates are made known. Without awareness of subscription ratios and link utilization rates, the Commission cannot fully understand the nature of the problem, and traffic interference techniques that are unnecessary and undesirable may appear to be reasonable and fair.

[2] Telcos/cablecos have resorted to these types of intrusive and discriminatory practises in order to sell more and larger connections with less infrastructure provisioning. Indeed, many Canadian telcos/cablecos have vested interests that may lead them to make traffic management choices that are discriminatory, intrusive, and not in the best interests of their customers or of the future of the internet in Canada. They have succeeded in justifying such traffic interference in place of provisioning in large part because of a lack in transparency in oversubscription ratios and standardized link utilization rates: without such information, customers are not aware of the extent to which their internet provider is able to deliver the bandwidth that it advertises.

Where Congestion Occurs:

[3] The primary points of congestion on most cable modem and DSL networks are:

- Customer Premise Equipment (CPE) – cable or DSL modems
- Customer Aggregator Equipment (CAE) – Digital Subscriber Line Access Multiplexer (DSLAM) or CMTS (Cable Model Termination System)
- Authentication Server Router
- Interconnection to Upstream Service Provider Router

[4] Other than the Customer Premise Equipment (CPE) and last mile infrastructure, both cable and DSL network architectures manage traffic in essentially the same way. Although any of the network interconnection points mentioned above can be sources of congestion, the most frequent congestion control point is located at the DSLAM or CMTS.

[5] Typically, a significant amount of traffic from one or more users will be aggregated at one port on a DSLAM or CMTS and this will lead to congestion at that CAE. In addition to customer inbound traffic congestion at the CAE point, there can be congestion on the CAE outbound port, which connects to the headend or central office. If a competitive ISP has purchased wholesale DSL or cable modem service, they will be provided with a private channel

from the DSLAM or CMTS to their own headend. Usually this channel is provided on a best effort basis and may be subject to congestion if all the upstream channels are busy.

[6] Congestion can also occur at the authentication route server, where traffic from various CMTS and DSLAMs is aggregated. The authentication route server is the ideal location on the network for locating DPI and other congestion control equipment. Caching equipment and other servers are often co-located at this point in the network as well.

[7] Finally, the cableo or telco purchases Internet transit from an upstream Tier 1 service provider. The interconnection router to the Tier 1 service provider can also result in congestion depending on the contracted bandwidth and service.

Causes of Congestion:

[8] There are several causes of congestion at any of the points described above. The amount of traffic generated by users through any application, including peer-to-peer (P2P) applications, is certainly a factor. However, a more significant factor is the telco/cableco practice of "oversubscription" (i.e., selling more bandwidth that it can actually provide at any given time). This key factor underlying traffic management is often under-emphasized, largely because of the egregious lack of transparency surrounding it.

[9] It is common practice for telcos/cablecos to sell more aggregate bandwidth to their customers at the CAE than their networks are capable of handling. This is, to some extent, efficient and acceptable, because no customer uses their full allotment of bandwidth at all times. However, if oversubscription ratios are too high, congestion results. (The ratio between how much bandwidth a telco/cableco sells to its customers and how much it actually provisions for in its network is referred to as the telco/cableco's "oversubscription ratio".)

[10] While oversubscription can occur at any point of a telco/cablco's network, examining this practice in the context of aggregation at the DSLAM or CMTS point (as described above) is illustrative of the problem.

[11] A typical example of an oversubscription ratio would be as follows: Assume that 50 customers in a neighbourhood share a single CMTS or DSLAM port, and that each customer has been sold a 1 Mbps service and has the physical capacity to send 1 Mb of traffic towards the CAE port in any given second. This arrangement would potentially allow for 50 Mbps of inbound traffic to that CMTS or DSLAM port. However, since it is unlikely that all 50 customers will be using their connection at full capacity at the same time, the ISP may only provision that CMTS or DSLAM port so as to handle 10 Mbps without congestion occurring. This would result in an oversubscription ratio of 5:1.[1]

[1] Oversubscription should be distinguished from overprovisioning. Overprovisioning is a necessary aspect of internet infrastructure. Overprovisioning means that the net capacity at a given link is greater than the average amount of traffic expected at that link. So if a telco/cableco wishes to allow the port in our example to handle 10 Mbps of traffic without congestion occurring, the net capacity at that port might actually be 20 Mbps. This is because congestion at a given link occurs well before a given link is operating at net capacity. So, an oversubscription ratio of 5 to 1 in our example above means that the telco/cableco is provisioning the CMTS or

[12] If the total traffic generated by the 50 customers at any given time is generally less than 10 Mbps, than the ISP has set a reasonable oversubscription ratio. If, however, the 50 customers regularly produce 15 Mbps, then congestion will occur at that CAE, and may possibly impact on the experience of the 50 customers.

[13] Generally, this type of congestion problem is easily managed. Telcos/Cablecos regularly measure utilization at any given link in their network as a proxy for congestion. For each such link on its network, a telco/cableco will have calculated a provisioning threshold. This threshold is typically based on the level of utilization a given link experiences, which in turn is presumably based on an estimate of what would lead to an unacceptable level of congestion at that link.[2] In theory, once the provisioning threshold of a link is reached, the telco/cableco responds to reduce congestion on that link so as to ensure that the 50 customers connected to it do not experience inferior service. This response typically involves an expansion of capacity at the link in question or reducing the number of subscribers on a given port.

[14] Many of the telcos/cablecos in this proceeding now claim that the growth in user-generated traffic is such that it would require unreasonable amounts of investment to respond to congested links with provisioning alone. This claim is impossible to validate without data on oversubscription ratios and targeted congestion levels. These telcos/cablecos blame users who generate traffic through P2P file-sharing and similar applications for creating conditions in which "user demand is greater than the network's capacity to effectively handle that demand."[3]

[15] While applications such as P2P file sharing applications might increase the degree to which an individual user may utilize the bandwidth for which she has paid (allowing our 50 customers to use, perhaps, 250 kbps on average instead of the 150 kbps they were using before), this does not mean that the primary cause of the congestion is the user or the application. The primary cause is, rather, the telco/cableco's decision to sell 50 Mbps worth of bandwidth on a port that can only handle 10 Mbps.

Improper Responses to Congestion:

[16] A number of the telcos and cablecos involved in this proceeding have stated that they rely on traffic management techniques involving Deep Packet Inspection ("DPI") and other similar technologies as a means of addressing congestion. This is not surprising, for a number of reasons.

DSLAM port to handle 10 Mbps of traffic without substantial congestion occurring. This might, nonetheless, require 20 Mbps of net physical capacity at that port.

[2] The Companies(CRTC)4Dec08-6 PN 2008-19, p.2 of 6, ABRIDGED, for an example of an ISP's provisioning thresholds. The ISPs have not disclosed the formula they use in setting these thresholds. It is presumed that these provisioning thresholds are in some way linked to congestion thresholds (a congestion threshold for a given link is the level of utilization of that link that an ISP considers likely to result in an unacceptable level of queuing delay at that link: See Bell's response to interrogatory question #3 for an example). But there is a marked lack of transparency on this point.

[3] The Companies(CRTC)4Dec08-3 , p.1 of 4, ABRIDGED.

[17] First, one of the major challenges for telcos and cablecos is the age and mix of their equipment. There are very few tools and techniques available to throttle traffic with older equipment. Most network operators have a mix of older and newer equipment, so a technology that is backward compatible is the most favoured solution. DPI can be used with any generation of cable or DSL system and is relatively simple to manage as it does not require per-subscriber configuration. In its simplest implementation, DPI simply looks for any P2P traffic during periods of heavy traffic, as defined by the carrier, and inserts RST packets to break the P2P data flow.

[18] Moreover, DPI equipment can be located anywhere in the network, even hundreds of kilometres away at major aggregation points. It is easy to install into existing networks. Additionally, using DPI to manage congestion requires far less capital expenditure than merely expanding network capacity. Finally, as currently deployed, it allows telcos/cablecos to target particular applications, protocols or users that they perceive to be the cause of the congestion.

[19] That does not, however, mean that DPI-based throttling is an appropriate solution to handling network congestion. First, effective, fair and approved traffic management techniques already exist. Inherent in TCP/IP communications are congestion management mechanisms that apply equally to all users in a fair manner. These mechanisms reside in the end users' computers and at host servers, and are not embedded within the network itself. The majority of internet traffic is subject to these mechanisms. The fact that P2P file-sharing applications currently compose a large proportion of TCP/IP traffic is not sufficient justification to deviate from current internet standards by deploying additional and invasive congestion management mechanisms. The default response to traffic increases beyond what TCP/IP is capable of handling effectively should remain provisioning of additional capacity. Further, if deviations from the TCP/IP standard were ever to be justified, they should follow the same non-discriminatory and fair mechanisms that are currently at the heart of internet traffic management.

[20] Targeting P2P-based applications, and file-sharing applications specifically, is undesirable for a number of reasons:

1. Allowing telcos/cablecos to deploy traffic interference practices such as application-specific throttling unnecessarily discourages investment in infrastructure.
2. This practice is not likely to provide an enduring solution to congestion problems.
3. Allowing telecos/cablecos to target whichever applications they wish sets up perverse incentives that can foreseeably lead to discriminatory practices.
4. P2P and file-sharing applications are not the cause of congestion.
5. Allowing telcos/cablecos to throttle P2P and file-sharing application traffic puts ISP resellers, wholesalers and facility leasers at a competitive disadvantage.

Each of these points is addressed below.

A. Throttling as a substitute for infrastructure investment

[21] It is undesirable to allow telcos/cablecos to rely on non-traditional traffic interference practices such as application-specific throttling because this discourages investment in internet

infrastructure. Telcos/Cablecos have chosen DPI-based throttling because it allows them to keep their oversubscription ratios high by reducing the proportion between the amount of bandwidth they sell and the amount that can actually be used by customers.

[22] Investing in DPI equipment is less costly and more convenient for ISPs than is investing in telco/cableco networks as a response to traffic growth. But traffic interference practices such as application-based throttling do not improve the overall capacity of a given network. Rather, they degrade service for a subset of consumers by diminishing the viability of legitimate applications.

[23] In particular, by diminishing the utility of P2P file sharing instead of investing in infrastructure, telcos/cablecos are impacting on the ability of smaller content developers such as independent filmmakers and multimedia companies to distribute their materials. While P2P video streaming is only beginning to grow in popularity in Canada, relying on P2P for video streaming is ideal for small content developers as it allows them to defray the bandwidth needs required by video streaming more broadly.

[24] Given the negative impact that traffic interference practices can have on important constituent groups such as these, reliance on such techniques cannot be characterized as improving a telco/cableco's overall network. Investing in infrastructure to meet natural growth in traffic is a preferable alternative by far. Just as other types of companies need to continually improve their product in order to keep their customer base, telcos/cablecos should be pushed towards improving their infrastructure.

[25] Moreover, customers are likely to prefer an ISP that invests in infrastructure instead of in traffic interference equipment such as DPI, were they permitted to make informed choices based on such knowledge. The problem here is the shroud of secrecy that surrounds oversubscription ratios and provisioning ratios. Were these numbers to be made public, telcos/cablecos would have a hard time justifying reliance on traffic interference as a means of facilitating higher oversubscription ratios. Indeed, it is likely that such disclosure would lead to better developed internet infrastructure in Canada as ISPs are pushed to compete on oversubscription ratios.

[26] Currently, customers are unable to make intelligent choices between various ISPs. A customer buying a 10 Mbps line from one ISP is not necessarily getting the same quality of service as she would were she to buy the same 10 Mbps line from another ISP. This is because the two ISPs may have vastly different oversubscription ratios and link utilization thresholds. Customers cannot currently know what proportion of the 10 Mbps line to which they have purchased access will actually be provisioned by the ISP - this concern is especially germane to high end users, but can be equally important to lower end users depending on the way in which the ISP applies throttling..

[27] If oversubscription ratios and link utilization thresholds were made a matter of public record, customers would be able to properly compare and make informed choices among ISPs. This would likely force ISPs to compete on provisioning, and thus push them towards network expansion instead of traffic interference as a means of addressing growth in traffic. It would also allow ISPs to adjust customer rates so as to fund lower oversubscription ratios and more provisioning as a response to traffic growth.

[28] Ideally, regulatory intervention should prevent telcos/cablecos from relying on traffic interference as a substitute for provisioning. At the very least, telcos/cablecos should not be permitted to obscure the issue by hiding oversubscription ratios and link utilization thresholds from their customers.

B. Targeting P2P file-sharing does not provide an enduring solution

[29] While P2P file-sharing may at this time be the greatest source of traffic on Canadian networks, this is not likely to be the case in the future. Many experts project a shift in traffic consumption away from file-sharing and towards video streaming and other advanced applications. The beginnings of this trend are already evident in other jurisdictions and even in Canada. In the United Kingdom, for example, the BBC's use of a video streaming application named iPlayer is targeted by ISPs as a source of congestion, just as Canadian telcos/cablecos are currently targeting P2P file-sharing applications.[4]

[30] One aspect contributing to the growth of video traffic is the availability of P2P as a vehicle for delivering video streaming. The manner in which P2P disperses bandwidth over a larger number of users makes any P2P-based method of distributing material a cost-effective and more feasible alternative to content distributors. For this reason, the BBC adopted this efficient method to fuel its iPlayer. Similarly, the CBC has begun using P2P techniques to distribute some of its video content. More recently, CNN has shipped a P2P client called Octoshape to facilitate video content distribution.

[31] To date, Canadian telcos/cablecos have primarily targeted file-sharing applications in order to meet growing traffic demands.[5] However, as video streaming traffic continues to grow, this will no longer be an effective method of reducing traffic. Video streaming traffic growth and particularly P2P video streaming will raise many of the same problems that the telcos/cablecos currently attribute to P2P file sharing.

[32] If the telcos/cablecos apply the same rationales they are currently relying on for throttling file-sharing to the increasing phenomenon of video streaming, then they are likely to throttle such practices as well. While video streaming is not 'time-sensitive', as it generally involves progressive downloads, people will not be willing to wait indefinitely, or even overnight, for a CBC video to open on their computers. If, on the other hand, telcos/cablecos decide *not* to throttle video streaming as it becomes the primary source of internet traffic, their practice of targeting P2P and other file-sharing applications will become increasingly ineffective and seemingly arbitrary.

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[4] Nate Anderson, "ISPs to Britain: We will throttle iPlayer unless you pay up" ars technica (13 August 2007), online: http://arstechnica.com/old/content/2007/08/isps-to-bbc-we-throttle-iplayer-unless-you-pay-up.ars.

[5] This is true of all the telcos/cablecos that have disclosed their throttling practices accept for Shaw. Shaw states that it currently throttles all P2P traffic in that its DPI only targets P2P protocol signatures instead of examining the application header to identify specific applications such as file-sharing applications. I can provide sources from the interrogatory responses, if necessary (see Interrogatory Responses).

[33] Further, by allowing telcos/cablecos to rely on traffic interference now as a substitute for investing in their networks, Canada will not be well positioned to deal with future growth in traffic that will come from sources other than P2P and non-P2P file-sharing applications in the not so distant future. The telcos/cablecos will also be far less prepared to deal with the increase in overall customer-generated traffic that will result when FTTH is inevitably added to their networks. By avoiding necessary investment in CAE to Tier 1 router infrastructure, telcos/cablecos are digging themselves a deeper and deeper hole that they will eventually need to fill.

C. Perverse Incentives

[34] In Canada, as opposed to in the US, a large proportion of telcos and cablecos are heavily invested in broadcast and/or production facilities. Bell Canada, Shaw and Rogers are foremost among these. Much of the content currently distributed through P2P file-sharing and increasingly also distributed through video streaming is in direct competition with this aspect of their business.

[35] For example, CTV has taken to streaming many of its shows on its website.[6] A telco/cableco such as Rogers or Shaw loses money every time a Canadian decides to watch her favourite shows on CTV.ca as opposed to paying it to watch CTV on her television. In addition, the greater utility that P2P file sharing and video streaming provides for small and independent content producers allows that constituency to better distribute its content. This content is not generally carried by major broadcasters such as the telcos/cablecos at issue here, nor is it usually produced by the production studios this group owns. Such independent content is in direct competition with that of the telcos/cablecos. A similar trend was seen not long ago in the music industry, where file-sharing applications provided a venue for independent artists to disseminate their products, in direct competition with established industry players.[7] What would have happened had the major music industry companies run the internet years ago?

[36] Given these conflicts of interest, there is much potential for discriminatory practices by the major telcos/cablecos as long as they are permitted to target applications such as P2P file-sharing or video streaming as they see fit.

[37] If given a free hand in managing traffic, it appears likely that such discriminatory trends will continue. Telcos/Cablecos with interests in businesses that compete directly with certain applications are more likely than not to take these competing interests into account when deciding whether and how to interfere with internet traffic. While the development of online video streaming may be an unfortunate one for owners of broadcast and production facilities, this does not justify discriminatory practices targeting competing content (whether motivated by competitive concerns or not).

D. P2P is *not* the cause of congestion

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[6] http://shows.ctv.ca/video/.

[7] M. Madden, *Artists, Musicians and the Internet*, December 5, 2004, PEW Internet & American Life Project, available online at: http://www.pewinternet.org/pdfs/PIP_Artists.Musicians_Report.pdf, generally and specifically at p. iv.

[38] Many telcos/cablecos argue that traffic interference practices targeting P2P and other file-sharing applications are justified because these applications are the *cause* of congestion.[8] As stated above, the primary cause of congestion is not these applications, but rather oversubscription ratios. By attempting to shift the blame to certain applications, the telcos/cablecos are attempting to alleviate their own responsibility for causing congestion by selling more bandwidth to consumers than they are willing to support in their networks. This should not be allowed.

[39] This problem of characterization is particularly evident in telco/cableco attacks that focus on the P2P protocol [as opposed to attacks focus on file-sharing applications]. One of the claims against P2P is that an entity (such as the BBC, CBC, CNN or, for example, an independent filmmaker) that uses the P2P protocol to distribute its content is merely passing off distribution costs onto the telco/cableco. Instead of buying enough bandwidth to distribute its content from a centralized location (using a server, for example), the entity in question is allegedly diffusing upload bandwidth usage amongst those downloading that content.[9] This is not the case. P2P does allow for decentralization of upload bandwidth usage, but in doing so, it is only enabling individual customers to use bandwidth for which they have already paid. A content distributor relying on P2P is not making use of bandwidth that has not been paid for, as some telcos/cablecos imply. Rather, that content distributor is making use of bandwidth that the downloaders in question have already paid for.

[40] A significant part of the problem here is that telcos/cablecos are permitted to treat their oversubscription ratios in a manner akin to state secrets. Were telcos/cablecos to publicly advertise that for every 10 Mbps they sell to a consumer, they only provisioned for 1 Mbps at the CPE to CAE leg of the network and even less at various stages between the CAE and Tier 1 routers, they would have a hard time justifying their targeting of P2P protocols and file-sharing applications as a tool for reducing traffic.

[41] Forcing much needed transparency in oversubscription ratios would make this a competitive issue between telcos/cablecos. Customers could then decide among services based on oversubscription ratios as well as price. Instead of allowing the competitive market to make such decisions, telcos/cablecos are keeping their oversubscription ratios secret and unilaterally deciding to rely on discriminatory traffic interference measures such as application-based throttling in lieu of maintaining acceptable oversubscription ratios.

[42] Without transparent oversubscription ratios, telco/cableco reliance on traffic interference instead of provisioning is only likely to grow. This seems particularly likely when, in the near future, telcos/cablecos begin installing FTTH. This step in network development will allow telcos/cablecos to sell ever greater amounts of bandwidth to customers. As greater reliance on traffic interference techniques allows telcos/cablecos to set higher and higher oversubscription ratios and this is more cost effective for them, it is likely that as the total amount of bandwidth telcos/cablecos sell increases they will turn to traffic interference more and more as a default response to traffic growth. While there is an upper limit on how much traffic interference can be

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[8] Shaw(CRTC)4December 2008-08, p.2 of 4, ABRIDGED, SUPPLEMENTAL.

[9] Anderson, *supra* note 4 provides a few examples of claims of this nature made by telcos/cablecos.

utilized in place of network investment, without transparent oversubscription ratios or a regulatory ban on traffic interference, telcos/cablecos are likely to sell more and more bandwidth and provide less and less provisioning in response. Moreover, this trend will continue to *appear* somewhat legitimate, in that the cause of congestion will continue to *appear* to be customer usage and not improperly set oversubscription ratios.

E. Impact on Competitive ISPs

[43] There are 3 types of services that competitive ISPs purchase from cablecos and telcos:

- Resale DSL or Cable;
- Wholesale DSL or Cable; and
- Facilities leasing.

An ISP that resales DSL or cable modem service does not own any infrastructure. Typically it purchases resale service from a carrier at a tariffed price and then resells the service with a small markup. When a cableco or telco implements DPI or throttling, the ISP reseller disproportionably suffers as it is more likely to have high end customers who use a lot of P2P traffic.

[44] With wholesale DSL or cable, the competitive ISP controls service from the DSLAM or CMTS through a dedicated private channel back-hauled on the carrier's network to its own authentication server and router. However, the cableco or telco remains in control of throttling and subscription ratios at the DSLAM or CMTS. Regardless of this, the telco/cableco cannot usually implement DPI on wholesale services.

[43] Facilities leasing is usually only available with telco networks. With facilities leasing, the competitive ISP installs its own DSLAM in the telco Central Office and purchases dry copper to the customer. It also leases its own backhaul service from the DSLAM to its headend or CO. In general, ISPs only provide this service to business customers. The telco/cableco DPI practices have no effect on this type of service.

[45] Allowing application-specific throttling practices as a means of traffic management adversely affects competitive ISPs, particularly resalers and wholesalers. It gives telcos/cablecos tools to put their own competitors at a disadvantage in the marketplace. This is exacerbated by the lack of transparency on oversubscription ratios. Without openness in these practices, telcos/cablecos might be tempted in the future to use higher oversubscription ratios on those DSLAMs or CMTSs where there is a higher percentage of customers connected to competitive ISPs, or to put a disproportionate number of competitive ISP subscribers on a single port.

Proper Responses to Congestion

[46] All these rationales point to provisioning as the primary response to traffic congestion. Telcos/Cablecos sell their consumers a certain amount of bandwidth based on the assumption that customers will only use a proportion of what they are sold. If this proportion increases, the proper response from telcos/cablecos is to invest in network capacity accordingly. However, if left to themselves, telcos/cablecos have strong incentives to rely on more invasive techniques.

[47] Even in selecting methods of interfering with traffic, telcos/cablecos have no incentive to choose the least intrusive, least discriminatory and most fair approach to doing so. Proper traffic management beyond provisioning should follow guidelines such as the following:

- Avoid use of DPI. The use of DPI raises serious privacy concerns that have not been resolved.
- Traffic management techniques should be applied uniformly to all users. Targeting a sub-set of users can be arbitrary and therefore unfair. Application targeting is an example of this. For example, throttling all P2P file-sharing application users will also catch many users of P2P file-sharing applications that generate only a small amount of bandwidth.
- Disproportionate targeting of lower tier customers should be avoided. If, for example, a customer with a 1 Mbps line and a customer with a 10 Mbps line were, in combination, generating enough traffic to congest a link they shared, they should each be throttled in proportion to the bandwidth they have paid for.
- Targeting newly developed protocols or applications should be avoided. Such innovations may make easy targets at first, while they are only employed by a small subset of users, as interfering with such traffic will only impact on less customers. This is true of P2P throttling. Telcos/Cablecos can now say that a relatively smaller portion of users are generating a large amount of P2P traffic and so this type of traffic should be targeted. However, given the efficiency in bandwidth distribution P2P offers customers, its use is only likely to increase in the future. As P2P use becomes more ubiquitous, the rationale that a small number of users are generating large amounts of P2P traffic will be become more inaccurate. More importantly, allowing telcos/cablecos to target a newly developed application or protocol because a.) it currently has a small number of users and b.) it happens to be very effective and so generates a large amount of bandwidth traffic, is likely to hinder innovation.
- Traffic management should be fair. Many telcos/cablecos argue that P2P by its nature diverts a disproportional amount of bandwidth to its users by using multiple channels to transmit one piece of information. As P2P use becomes a standard of internet information transfer, this aspect of P2P will no longer be unfair, as most users will utilize P2P for one application or another.
- Any techniques used by telcos/cablecos should be as minimally intrusive as possible. They should only operate when there is evidence of actual congestion, and not based on approximations, as is the case with peak period throttling.

[48] There are some traffic management techniques available that achieve at least some of these goals. P4P technology, for example, is non-intrusive and reduces the overall amount of traffic produced by P2P protocol applications. In addition, Comcast has proposed an approach that is both feasible and attempts to be fair and minimally intrusive.[10] The Comcast approach is application agnostic, applies to all users equally, based on the amount of traffic they are generating at any given instance, does not target lower tier subscribers, and only operates when there is actual congestion on a given link. Options such as these are preferable if any

[10] Comcast, Submissions to FCC, File No. EB-08-IH-1518, WC Docket No. 07-52, September 19, 2008, available online at: <http://www.eff.org/files/Complete%20Comcast%20NM%20Filing%20--%20Date-Stamped%209%2019%202008.pdf>, Appendix B.

interference with traffic is to be used at all. On their own, however, telcos/cablecos have not deemed to select such options.

Conclusion

[49] For all these reasons, allowing telcos/cablecos a free hand to interfere with traffic such as P2P and file-sharing applications is not desirable. The telcos/cablecos have strong incentives to use anti-competitive and anti-consumer responses to congestion. This is evident from their attempts to abrogate responsibility for setting appropriate oversubscription ratios by casting the blame for congestion on P2P and file-sharing applications. They attempt to obscure the fact that all traffic generated by P2P and file-sharing applications results merely from customers using bandwidth that they have purchased from the telcos/cablecos. A customer who has purchased a 1 Mbps line to the CAE is incapable of producing more than 1 Mbps of traffic. In fact, even with constant use of P2P and file-sharing applications, few customers will ever utilize that entire 1 Mbps of traffic for any extended period of time. Given this reality, **the primary cause of congestion is not certain types of applications, but the practice of telcos/cablecos selling more bandwidth than they are willing to provision for.**

[50] The lack in transparency in telco/cableco practices is to a great extent responsible for their ability to succeed in carrying out such mischaracterizations. Were oversubscription rates made public, telcos/cablecos would find it much more difficult to tell their customers that, because they wish to continue to oversell bandwidth by a factor of 10 to 1, they will start interfering with customer traffic.

[51] Telcos/Cablecos have no incentive to manage traffic in an appropriate, minimally intrusive and non-discriminatory manner. They are likely to turn to traffic interference when congestion occurs, even if this is not justified. Even in deciding how to interfere with traffic, they are not likely to select the least intrusive and least discriminatory measure on their own. Nor are they likely to make issues like oversubscription ratios open and competitive matters. An objective observer must step in to ensure that telcos/cablecos are making the right decisions. Failure to do so will result in an internet that is less developed, less tailored to the needs of consumers, and not capable of meeting the internet needs of the future.