© 2010, *Global Media Journal -- Canadian Edition* Volume 3, Issue 1, pp. 9-29

ISSN: 1918-5901 (English) -- ISSN: 1918-591X (Français)

Regulatory Lessons for Internet Traffic Management from Japan, the European Union, and the United States: Toward Equity, Neutrality, and Transparency

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Abstract:

As network neutrality has been one of the most contentious Internet public policy issues of the past decade, this article provides a comparative overview of events, policies, and legislation surrounding Internet traffic management practises (ITMPs) (e.g., network neutrality) in Japan, the European Union, the United States, and Canada. Using the frame provided by Richard Rose of "*hybrid lessons*" to create a policy synthesis, the paper details the telecom policy environment, Internet Service provider competition, legislative jurisdiction, remedies for ITMPs, consumer transparency, and adherence to privacy protection in each country. The analysis focuses on Canada's first significant regulatory effort to address network neutrality, which came during the Canadian Radio-television and Telecommunications Commission 2009 process on Internet traffic management. This paper presents a brief overview of the Canadian regulatory environment and the specific questions which were the subject of the CRTC review. Employing Richard Rose's methods for comparative public policy analysis, we offer a number of regulatory "lessons" from Japan, the European Union, and the United States based on their experiences with traffic management issues. Applying these lessons to the Canadian context, we make several specific policy recommendations, among them that competition be encouraged within the Internet service provider space, that network management practises be reasonable and limited, and that ISPs provide full disclosure of network management policies and practises.

Keywords: Internet Traffic Management; Network Neutrality Legislation; FCC; Ofcom; European Union; CRTC

Résumé:

Comme la question de la neutralité du réseau est devenue un des sujets les plus contentieux des politiques publiques entourant Internet de la dernière décennie, cet article offre un survol comparatif des événements, des politiques et de la législation entourant les pratiques de gestion du trafic Internet (PGTI) (c'est-à-dire, de la neutralité du réseau) au Japon, dans l'Union européenne, aux États-Unis et au Canada. En se basant sur les "*hybrid lessons*" (ou "leçons hybrides") de Richard Rose pour créer une synthèse de politiques, ce texte fait le dessin de l'environnement des politiques de télécommunication, la compétition entre les fournisseurs de services Internet, de la compétence législative, des solutions pour les PGTI, de la transparence du consommateur et de l'adhésion à la protection de la confidentialité dans chaque pays. Cette analyse se concentre sur le premier effort de régulation significatif au Canada pour adresser la neutralité du réseau, qui a eu lieu lors du procédé du Conseil de la radiodiffusion et des télécommunications canadiennes en 2009 à propos de la gestion de la circulation sur Internet. Cet article fait le survol de l'environnement canadien de la réglementation et des questions spécifiques qui ont été abordées par le CRTC. En utilisant la méthode d'analyse comparative de politiques publiques de Richard Rose, nous offrons un nombre de "leçons" sur la réglementation offertes par le Japon, l'Union européenne et les États-Unis et qui sont basées sur leurs expériences avec des enjeux liés à la gestion du trafic. En appliquant ces leçons au contexte canadien, nous offrons plusieurs recommandations spécifiques, notamment que la compétition devrait être encouragée dans le milieu des fournisseurs de services Internet, que les pratiques de gestion de réseaux soient raisonnables et limitées, et que les fournisseurs d'accès Internet offrent une divulgation complète des politiques et pratiques de gestion de réseaux.

Mots-clés: Gestion de trafic Internet; Législation de neutralité du réseau; FCC; Ofcom; Union européenne; CRTC

Introduction

Internet traffic management practises (ITMPs) have emerged as, perhaps, the most prominent technology regulatory issue in telecommunications of the past decade, and are inextricably linked to the problematic concept of *network neutrality*. Columbia Law School professor Tim Wu, who originated the term, described network neutrality as follows:

> Network neutrality is best defined as a network design principle. The idea is that a maximally useful public information network aspires to treat all content, sites, and platforms equally. This allows the network to carry every form of information and support every kind of application.
>
> (Wu, 2007)

ITMPs came to public prominence in 2007 when the largest cable company in the United States, Comcast Corporation, became the subject of complaints when it was found to be limiting the ability of its broadband Internet customers to use the popular file-sharing application BitTorrent (Ernesto, 2007). As detailed below, these complaints began a long series of quasi-judicial processes presided over by the American telecommunication regulator, the Federal Communications Commission (FCC).

By the time similar issues found their way before Canada's equivalent to the FCC, the Canadian Radio-television and Telecommunications Commission (CRTC), the U.S. regulator had already ruled that Comcast's traffic management practises violated American law. Network neutrality had first surfaced as an issue in Canada in 2005, when telecommunications provider Telus temporarily blocked Internet users' access to websites supporting unions during a labour dispute, along with hundreds of other sites hosted on the same server (OpenNet Initiative, 2005). However, it was not until 2008 that the issue of Internet traffic management came before the CRTC. The Canadian Association of Internet Providers (CAIP), an organization of service providers that resold wholesale bandwidth from Bell Canada to retail customers, requested that the Commission order Bell to cease the shaping of Internet traffic; as in the Comcast case, Bell was degrading BitTorrent traffic (Canadian Association of Internet Providers [CAIP], 2008, July 23rd).

Under section 27 of the Canadian *Telecommunications Act*, the CRTC has powers relating to unjust discrimination and undue preference. CAIP argued that Bell was violating several sections of the *Act*: section 24 and subsection 25(1) concerning setting of tariffs; subsection 27(2) concerning unjust discrimination; and, section 36 concerning control of content of messages (Canadian Radio-television and Telecommunications Commission [CRTC], 2008a). CAIP also claimed that Bell violated CRTC privacy rules, and rules requiring advance notice of network changes.

In a 2008 decision, the CRTC denied CAIPs claims. However, this decision also announced a wide-ranging review of the Internet traffic management practices of Canadian Internet service providers, to take place in 2009. The objective of the review was to examine Internet traffic management practices and determine if they were consistent with the *Telecommunications Act* (CRTC, 2008b). It is in the context of this review that our research was conducted. Campaign for Democratic Media (CDM), a non-profit public interest media advocacy group (now called OpenMedia.ca), retained the Canadian Internet Policy and Public Interest Clinic (CIPPIC) to conduct research and make specific recommendations on Internet traffic management to the Commission. We were asked by the staff at CIPPIC to summarize the policy and regulatory environments for Internet traffic management in other large, industrialized jurisdictions (Fewer, Israel & Lawson, 2009). This paper is based on that research.

The paper begins with a summary of Internet traffic management basics and a brief methodological discussion. We then examine a number of regulatory approaches to Internet traffic management by Internet services providers (ISPs) in Japan, the European Union, and the

United States. Drawing on the lessons we derive from these countries, we close by evaluating to what extent these practises align with the CRTC's Regulatory Policy on Internet traffic management practices, released in October 2009.

Methods

In this research we drew primarily on Richard Rose's method of comparative public policy analysis (Rose, 2005). Internet traffic management offers an example of what Rose described as "a parallel programme": policy challenges that many governments must address, but often in separate and distinct manners. Rose argues that parallel programs need not converge; even similar national programs do not, together, constitute a single program (Rose, 2005: 30). Many national jurisdictions have some sort of regulation or law (often evolving) concerning Internet traffic management. The scope of this governance varies considerably; in some cases, state control of access to content is of primary importance. In others, the reverse is true, and regulations are established to protect the individual's right of access to content, and to protect privacy.

In the context of comparing policy between or among jurisdictions, Rose promotes the concept of the *lesson*: a policy or programme to address domestic problems, developed from both domestic experience and by distilling the relevant experience of other jurisdictions (Rose, 2005: 33). According to Rose, a lesson should not be overly general nor too specific, but restrict itself to essential ingredients, including legal frameworks, and impacts on the public, industry, and other organizations. Rose (2005: 34) described the power of international lessons and their ability to add stimuli to the domestic policy discourse. Because they are grounded in the practical experiences of other jurisdictions, they help avoid utopianism or, in many cases, partisan disagreements.

Rose (2005: 100) warns us of the danger of *selective imitation*, when policy makers focus only on those aspects of policy in other jurisdictions with which they agree, essentially "cherry-picking" features that come with little or no political cost. We therefore consider this work the first step in a process of creating what Rose described as a *hybrid lesson* on network management to create a policy synthesis (Ibid: 99). Rose compares this policy design process to reverse engineering (Ibid: 80): the mechanisms by which the studied policy was created must be examined, with a particular concern for the supporting policy environment and its influence.

This study is limited to the examination of three jurisdictions (in addition to Canada): Japan, the European Union, and the United States of America. The selection of these jurisdictions was, to some extent, a response to the specific requirements of the CRTC telecommunications regulatory process. Given the sheer amount of information presented to the CRTC during this process, it was imperative that we provide clear information from which a limited set of high level policy lessons could easily be drawn. We therefore selected industrialized jurisdictions with quite different regulatory traditions.

We recognize that examining individual European jurisdictions in greater detail (such as the United Kingdom or Austria), as well as other Organisation for Economic Co-operation and Development (OECD) states (particularly Republic of Korea, Australia, and New Zealand) may well provide other useful policy lessons, but such work was beyond the scope of this research. This paper provides an overview of the policy environment in each of the selected jurisdictions, and can only provide an initial component that might contribute to the design of network policy in Canada.

Network Management Basics

Internet *traffic management* (or *traffic engineering*) has been a technical challenge for more than 20 years. Initially, the Internet's design was relatively simple, with similar hardware deployed across the network and substantial excess bandwidth available (Nagle, 1984). In the mid-1980s, however, rapid usage growth and interconnection revealed limitations in the Internet's foundational protocols, resulting in concerns that the Internet could face "congestion collapse" and cease to function. Network protocols were therefore modified to enhance the abilities of Internet nodes and links to control traffic flows; in periods of congestion, a principle of fairness was generally applied that "backed off" all network traffic regardless of source, providing an environment of "equitable sharing of bandwidth" (Floyd, 2000).

At that time, the vast majority of Internet traffic was of one type: text. The contemporary Internet, however, is the medium for numerous classes of content, some of which can only be functional if traffic is prioritized, or *shaped*. For example, the packets of data making up a voice-over-IP (VoIP) call are most useful if they flow between participants in as timely a manner as possible. Network service providers may therefore establish technical control mechanisms which will reserve and prioritize network resources depending on network use (Evans & Filsfils, 2007: 114-115). For example, VoIP might typically be prioritized over electronic mail, which is less time-sensitive data. These control mechanisms are called *quality of service* (QoS).

Internet traffic beyond the network components ability to manage can lead to *network congestion*, with resulting increases in *latency* (the measure of time delay experienced when using the network) and *packet delay variation* (which users may experience as "*jitter*" when streaming media is being received).

The question of when it is appropriate to implement QoS, and in what way, is a key network policy question. Using QoS, service providers have the ability to severely limit, and even block, certain classes of Internet traffic, as well as specific applications; this practise is typically called *bandwidth throttling* (Reisman, 2007). In some instances, applications will endeavour to obscure their use of the network in order to avoid throttling, attempting to make their traffic indistinguishable from that of other applications. Service providers have therefore turned to the use of specialized network surveillance technologies that allow them to analyse the contents of the data flowing through their network (Abelson, Ledeen & Lewis, 2009). This practise is called *deep packet inspection* (DPI).

Japan

Japan, along with South Korea, has the fastest commercially available Internet speeds in the world, as well as among the lowest prices for bandwidth (Organization for Economic Co-operation and Development [OECD], 2007). Japan has seen a significant increase in Internet use over the past decade, accompanied in large part by very high bandwidth fibre-to-the-home (FTTH) deployments (Shinohar, 2007: 2). The Japanese government in 2007 set a target of 100-percent penetration of broadband services within three years (Ministry of Internal Affairs and Communications, 2007).

According to Yasu Taniwaki of the Japanese Ministry of Internal Affairs and Communications, Japan maintains an Internet service provider environment that is relatively more competitive than that of North America, due primarily to the opening of Nippon Telegraph and Telephone (NTT) infrastructure to third party DSL resellers in the early-2000s (Taniwaki,

2007: 8). The bulk (26.7 million) of Japan's Internet households utilize DSL or fibre; only 4.2 million access the Internet through cable (Paul Budde, 2010).

As part of its "New Competition Policy Program 2010", the Japanese government has indicated that the Internet in Japan should provide "equal access to networks" with "equitable cost distribution [between] networks" (Taniwaki: 18). Therefore, traffic management practises should allow the network to be generally accessible to a variety of applications, protocols, and users.

In response to public concerns about ISP traffic management practises, in 2007 the government mandated Japan's telecommunication industry and Internet service providers to create a set of operational guidelines for traffic management, which would be compatible with Japanese law and government policies. Four telecommunications carrier organizations—the Japan Internet Providers Association (JAIPA), the Telecommunications Carriers Association (TCA), the Telecom Services Association (TELESA), and the Japan Cable and Telecommunications Association (JCTA)—established the Study Group on the Guideline for Packet Shaping in September 2007, and published a national ISP "Guideline for Packet Shaping" in May 2008 (Peake, 2008).

In the *Guideline*, Peake (2008) provides a clear set of prioritized responses to traffic management issues on Japanese networks. It states that its "basic concept" is that the first response to network congestion should be increasing network capacity (Ibid). Only in "exceptional circumstances" should traffic shaping be used "where the traffic of a specific heavy user excessively occupies the network bandwidth and consequently degrades the service of general users" (Ibid: 4). The Guideline describes two types of acceptable traffic shaping: restricting the bandwidth, or cancelling the access, of heavy users, and restricting the bandwidth use of specific network applications.

The exact meanings of "heavy user" and "specific application" are allowed to vary on case-by-case basis, depending on specific ISP capacity. However, the Guideline states that objective data must be used to justify the traffic management; data must show that the quality of service for all users is being degraded by traffic from some users or applications (Peake, 2008: 4-5).

The Guideline further states that it is not reasonable to implement packet shaping measures uniformly against all users of a peer-to-peer file sharing software, as it is impossible for the ISP to determine the legality of the content distributed (Peake, 2008: 4). Further, it is also considered inappropriate to completely block the traffic from such applications, as "more moderate" methods of traffic management are available (Ibid: 9).

The Guideline also indicates that it would be contrary to Japanese law to implement traffic shaping without obtaining clear consent from customers. As a practical matter, users must be informed about their ISP's packet shaping policy in their contract terms and conditions, and agree to them. Service providers are also required to present relevant information to content providers and other ISPs about any traffic shaping that may impact them (Peake, 2008: 11). The Guideline states explicitly that traffic shaping must respect individual user privacy, therefore making such technologies as deep packet inspection unusable in Japan (Ibid: 6-7).

The Guideline allows packet shaping without consent of the user only if such network management is "lawfully justifiable", typically in cases where the integrity of the network is threatened from a security standpoint (Peake, 2008: 7).

Peer-to-peer technology, while known to be the source of significant traffic management challenges in Japan, is also considered a possible solution for the efficient, decentralized

distribution of media content (Taniwaki, 2008). Along with sponsoring the development of the Guideline, in 2007 the Japanese Ministry of Internal Affairs and Communications supported the creation of a "P2P Network Experiment Council", made up of content providers, electronics manufacturers, and ISPs (MIC, 2008). The Council was mandated with the task of studying the use of P2P technologies for the distribution of audio and video content to Japanese consumers.

In 2007, the P2P Network Experiment Council stated that it believed that Japan, despite having among the largest capacity consumer networks in the world, was unlikely to successfully distribute new media content without peer-to-peer distribution (Taniwaki, 2008). In 2007 and 2008, the Council conducted experiments on P2P content distribution, including the sharing of animation titles from GONZO K.K. (GDH K.K., 2007).

European Union

Most European households lack a "second wire" beyond that originally installed for telephony which could provide domestic high speed Internet access (Carter, Marcus & Wernick, 2008: 38). However, competition among European ISPs is generally considered more robust than in North America, as more than 40 percent of DSL service (varying substantially by country) is provided by third party resellers. According to Carter, Marcus and Wernick (2008), real competition exists in this environment only if the wholesale bandwidth provider is prevented from negatively impacting the quality of the service its retail competitors offer to their customers.

European telecom regulators have traditionally emphasized competition in the retail sector as a key mechanism to protect telecommunications and broadband consumers (Castle, 2008). Regulators believed that if a particular service provider in some way restricted user rights (for example, to access VoIP or P2P networks) the user would be able to switch to another ISP that did not engage in the practise. Rather than taking a particular stand on what network services should be offered, regulators relied on the market to provide a strong incentive for ISPs to satisfy consumers with varying services (Carter, Marcus & Wernick, 2008). Carter et al. described the 2002 European Union Telecommunications policy framework for ISPs as follows:

> The current framework explicitly allows operators to offer different services to different customer groups, since price discrimination is perceived as welfare enhancing. It does not allow those who are in a dominant position to discriminate against others in an anticompetitive manner; however, it does not provide [national regulatory agencies] with the means to intervene against operators which are not deemed to have [significant market power] in the event that they discriminate against others.
>
> (2008: 43)

In 2006, UK mobile provider T-Mobile launched its Web'n'Walk G3-based mobile Internet service, but specifically disallowed the use of voice over IP (VoIP) and instant messaging (IM) over its network (Williams, 2006). Peter Ingram (2006) of UK telecom regulator Ofcom has argued that because customers could switch to other mobile Internet offerings that did not have these restrictions, T-Mobile was forced by competition to modify its offering to allow such activities, though at an increased price, providing a "market solution" to the matter.

In 2008, the European Commission (the executive branch of European Union) made a series of recommendations concerning the imposition of minimum quality of services on

providers in order to discourage service or user discrimination. The majority of these recommendation were subsequently endorsed, in principle, by the European Parliament (Reding, 2008, September 30). While recognizing that "legitimate network management practices . . . and traffic prioritization" can be important drivers of growth and innovation for ISPs, then European Commissioner for Information Society and Media Viviane Reding stated in September 2008 that anti-competitive behaviour limiting consumer choice should be considered unacceptable. As well, Reding indicated that the EU may, in future, impose "minimum quality levels for network transmission services based on technical standards" (2009, February 3).

Concerns were also raised about the use of deep packet inspection for commercial advertising targeting, and by computer security firms, by the Article 29 Data Protection Working Party, which advises the European Union on privacy matters (Horten, 2009, February 19).

Proposed amendments to existing European telecom legalisation, EU Directive 2002/22/EC concerning "universal service and users' rights relating to electronic communications networks", were considered by the European Parliament in 2009. These amendments, popularly called "the Telecom Package 2009", contained a number of recommendations dealing specifically with network management. These included provisions "to prevent degradation of service and hindering or slowing of traffic over networks", and encouraging or mandating national regulators to establish minimum quality levels and provide up-to-date information for consumers concerning their QoS practices (European Union, 2009, December 18). Some amendments, designed to ensure that users' access to particular types of content or applications were not unreasonably restricted, were opposed by telecommunications providers (Horten, 2009, February 16). While the revised Telecom Package passed in December 2009 lacked some of the proposed wording on quality of service or network neutrality, clause 28 of the Act's preamble was clear:

> End-users should be able to decide what content they want to send and receive, and which services, applications, hardware and software they want to use for such purposes, without prejudice to the need to preserve the integrity and security of networks and services.

European regulation continues to evolve. In an April 13, 2010 speech to a conference organized by the French telecommunications regulator, the new EU Digital Agenda Commissioner Neelie Kroes indicated that Europe must take stronger action on network neutrality, promising support for principles of freedom of expression and transparency (Kroes, 2010; OUT-LAW.COM, 2010, April 15). As well, on June 28th 2010, the United Kingdom telecom and media regulator began a process of reviewing Internet traffic management practises of British ISPs, the terms of which are somewhat similar to the CRTC's review (Office of Communications, 2010, June 28).

United States of America

When compared to Japan and Europe, broadband competition is more limited in the United States; according to the Congressional Research Service, the American ISP market is largely one of ISP duopolies (Goldfarb, 2006). In the United States, cable television and telephone infrastructures are regulated differently; the *Telecommunications Act* of 1996 designated cable as an *information service*, while telephone-based Internet access services are *telecommunications services* (Reardon, 2005). Only telecommunications services are subject to common carrier rules;

cable companies, unlike telephone providers, are not required by law to resell or share their infrastructure with third party retailers (Glanzer, 2005).

In August 2005 the Federal Communications Commission (FCC) adopted a Broadband Policy Statement which applied to cable, DSL, and other broadband providers (FCC, 2005). Although the statement did not have the weight of an enforceable FCC rule, the Commission indicated that it would incorporate it into future policymaking. Stating that the "Commission has a duty to preserve and promote the vibrant and open character of the Internet as the telecommunications marketplace enters the broadband age" (FCC, 2005: 3) the FCC adopted the following four principles:

> 1. To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to access the lawful Internet content of their choice.
> 2. To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to run applications and use services of their choice, subject to the needs of law enforcement.
> 3. To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to connect their choice of legal devices that do not harm the network.
> 4. To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to competition among network providers, application and service providers, and content providers.
>
> (FCC, 2005: 3)

However, in a footnote, the FCC offered the qualification that "all of these principles are subject to reasonable network management".

Rather than drafting rules which reflected the Broadband Policy Statement, the FCC instead transformed it into an enforceable standard through an adjudicatory process involving the second largest Internet service provider in the United States, Comcast Corporation (Goldman, 2008). In 2007, several media outlets reported that Comcast had been preventing subscribers from using peer-to-peer technology to legally share files online (Svensson, 2007). An investigation by the Electronic Frontier Foundation revealed that Comcast actively interfered with P2P traffic by masquerading as a user's computer and resetting peer-to-peer connections (Schoen, 2007). Comcast subscribers had not been informed about this practise (Carter, Marcus & Wernick, 2008: 25).

Comcast initially denied interfering with BitTorrent traffic, then stated that P2P traffic was "delayed" rather than blocked, a technical analogy that many considered inaccurate (Carter, Marcus & Wernick, 2008: 25-26). In November 2007, Comcast issued a statement justifying interference with P2P traffic as sound network management (Robuck, 2007).

Comcast's network infrastructure was not designed to carry the large volumes of upstream traffic essential to BitTorrent (Carter, Marcus & Wernick, 2008: 26). The Comcast network used a single router at the cable head end to control transmission in the downstream direction, allowing adequate traffic management for downloads, but making upstream management, controlled by user cable modems, much more difficult. Comcast's approach was to

reset peer-to-peer connections at regular intervals, after which the network would allow the transfer (Ibid: 27).

In November 2007, media reform organization Free Press filed a complaint with the FCC against Comcast, asking the Commission to rule "that an Internet service provider violates the FCC's Internet Policy Statement when it intentionally degrades a targeted Internet application" (Free Press, 2007). Separately, P2P video distributor Vuze filed a similar petition (Vuze, 2007).

In the subsequent proceeding, the FCC focused on determining the degree to which Comcast's actions were "reasonable network management practices", asking the ISP whether such practises had been "carefully tailored to its interest in easing network congestion" (Carter, Marcus & Wernick, 2008: 47). In August 2008, the Commission ruled that the traffic management techniques the ISP had used were unreasonable. As for alternatives and reasonable remedies, the FCC recommended that Comcast use per-user bandwidth caps and fees for high levels of traffic.

The Commission did not rule on Comcast's failure to notify its customers of its traffic management practices. However, it ordered Comcast to disclose to the Commission its network management practices and inform the public of details of its future network management practices (Carter, Marcus & Wernick, 2008: 48). In its Comcast ruling, the FCC announced its intention to deal with future traffic management issues on a case-by-case basis, creating no detailed regulation concerning traffic management.

Comcast subsequently implemented a set of "protocol-agnostic" traffic management techniques in December 2008 (Fisher, 2008). In its September 19th 2008 compliance submission to the FCC, Comcast stated that new congestion management hardware and software would be purchased and deployed between customers' cable modems and Comcast's Internet backbone (Comcast, 2008: 2-5). Comcast established two quality of service (QoS) levels for user Internet access: a "priority" (PBE) level, the default for all users, and a "best effort" (BE) level, which would limit the modem's bandwidth use (Ibid: 6). A user causing network congestion would receive BE status, limiting bandwidth while retaining network connectivity. Comcast has provided no specific indications as to what notifications customers receive when their traffic is restricted, nor if statistics detailing such management will be made publicly available (Comcast, 2010).

While Comcast modified its network management practises, it also appealed the FCC's ruling in Federal Court on a variety of grounds. On April 6, 2010, the FCC's 2008 cease and desist order against Comcast was rejected by the U.S. Court of Appeals, who ruled that the FCC had no statutory powers to regulate any Internet provider's network, or the management of its practices. On May 6th, 2010, FCC chairman Julius Genachowski announced that the agency would begin the process to reclassify broadband Internet services as a telecommunications service, exempting them from many telecommunications rules but imposing network neutrality provisions (Wyatt, 2010, May 6). This action has promoted legislative responses, as some American lawmakers have begun a review of applicable legislation, the *Communications Act* (Wyatt, 2010, May 24), while others have introduced legislation that would require that the FCC demonstrate market failure before new rules could be enacted (Corbin, 2010, July 22). At the time of this writing, the issue remains unresolved.

Internet Traffic Management: High Level Lessons and Canadian Comparisons

Our analysis leads us to highlight high level Rosean lessons on Internet traffic management practises in seven principle areas; we will briefly examine how these lessons align with the October 21st 2009 CRTC decision on Internet traffic management policy, Telecom Regulatory Policy CRTC 2009-657. We will also suggest some areas for further development by the Commission and the Canadian federal government. The ITMP regulatory environment is further summarized in *Table 1*, below.

Lack of clear jurisdiction is an ongoing issue in ITMP regulation. Network traffic management regulation remains contested in both the United States and Europe, resulting in uncertainty for both users and industry. In particular, while the FCC has made strong policy statements, they have seemingly overstepped their jurisdiction, resulting in speculation that a legislative solution will be necessary. The contrast between Japan and the United States is telling, as the Japanese government conceives of Internet traffic management as a component in a broader, long-term telecommunications strategy. The Ministry of Internal Affairs and Communications sees broadband competition as a key element in consumer choice, and has worked closely with the ISP industry to create a framework for acceptable traffic management.

As of this writing, there has been no challenge to the CRTC's authority in the area of Internet traffic management regulation. While federal jurisdiction over both telecommunications and broadcasting policy have been subject to provincial challenge in the past, that has not been an issue following this process. Therefore, Canada currently has a seemingly stable environment for Internet regulation.

Traffic throttling is typically not the first remedy applied to network congestion. All studied jurisdictions allow traffic shaping in cases of network congestion. However, in Japan and the US, other remedies for congestion are prescribed *before* traffic shaping is allowed, among them increasing network capacity and charging users for bandwidth.

Similarly, the CRTC proscribed remedies for traffic congestion to place increased capacity and economic mechanisms ahead of technical ITMP. Paragraph 36 of the CRTC policy states that while ISPs are allowed to employ traffic shaping in response to network congestion, "investment in network capacity is a fundamental tool for dealing with network congestion and should continue to be the primary solution that ISPs employ". Paragraph 40 further notes that ISPs may use "economic ITMPs" which link rates to consumer consumption.

Technical ITMPs are typically limited and reasonable. In all the studied jurisdictions, ITMPs must be applied in a "reasonable" manner that reflect the circumstances of the congestion. As well, ITMP must be technically-justified and technically sound. Of note, the FCC has forcefully applied a reasonableness test to ISP traffic management practices, stating that application-based throttling is "discriminatory and arbitrary" and does not constitute "reasonable network management" (FCC, 2008: 1). In Japan, limiting of bandwidth must only be done in exceptional circumstances, after bandwidth capacity has been increased on the network. While network management practises vary across Europe, many ISPs, such as the United Kingdom's Virgin Media, engage in application-agnostic management (Virgin Media, 2008). There is no indication from any of these jurisdictions that application-agnostic techniques limit an ISP's ability to adequately manage their network.

Table 1: **Summary of approaches to Internet traffic management in Japan, the European Union, the United States and Canada**

	Japan	***European Union***	***USA***	***Canada***
Telecom policy environment	"Equal access to networks" with "equitable cost distribution [between] networks"	Different services to different customers Anti-competitive behaviour unacceptable	FCC mandated rights to access lawful content, applications, connect devices, competitive market	Regulator (CRTC) instructed by government to take market-based approach to implementing Telecom Act
Jurisdiction	Co-regulation through national government-mandated industry guidelines	Member states have varying responsibilities to regulate Rules under review and in flux at both state and EU levels Legislation: EU Telecom Policy Framework	FCC jurisdiction disputed; legislation may be required Legislation: Telecommunications Act of 1996 Regulation: FCC Broadband Policy Statement 2005 and Comcast ruling 2008	Clear jurisdiction Legislation: Telecommunications Act (1993) Regulation: CRTC Telecom Regulatory Policy 2009-657
Remedies	Increasing network capacity Traffic shaping in exceptional circumstances on individual basis Individual restricting of bandwidth	Competition among ISPs provides consumer choice among congestion remedies	Increasing network capacity Per-user bandwidth caps and fees Temporary traffic reprioritization on per user basis if network congested	Increasing network capacity Economic mechanisms Traffic shaping
Telecom policy environment	Traffic shaping must be applied reasonably on a per-user basis	Largely up to member states	Traffic shaping must be applied on a case-by-case basis; must be "carefully tailored"	Traffic shaping must be limited and reasonable; complaints-driven process
Jurisdiction	Users informed of traffic shaping policies	Inform users of QoS; changes to terms of service common	Inform public of future network management practices	Inform public of current and future ITMP
Remedies	Must be protected	Concerns raised about deep packet inspection	Applicable federal legislation	Personal information must only be used for ITMP and protected
Telecom policy environment	Application agnostic; experiments with P2P encouraged	Up to member states	Application agnostic	Application-specific ITMPs may violate the Act
Jurisdiction	Close state-private cooperation on industrial policy	Competition seen as key mechanism to insure consumer choice and protect rights	Most markets duopolies; competition limited but seen as important	Competition limited but seen as adequate by regulator

We note that the CRTC found that ITMPs may, in some cases, represent a violation of the non-discrimination provisions of the Canadian *Telecommunications Act*. Similar to the United States, the CRTC has established that disputes concerning ITMPs will be resolved using a case-by-case, *ex post* (complaints-based) regulatory approach. Users who believe that an ISP's ITMP is in violation of the *Telecommunications Act* may complain to the Commission (Paragraph 3 & 28); the policy states that the complainant must prove that the ITMP "discriminates or results in a preference or disadvantage", while the responding ISP must establish that "any . . . discrimination, preference, or disadvantage" created by the ITMP "is not unjust, undue, or unreasonable". As well, ISPs must limit their use of ITMP to the specific needs of traffic management, and not for other things (2).

Transparency around ITMP use is seen as central to consumer choice. In all three studied jurisdictions, we have seen varying commitments to clear and accessible public statements from ISPs detailing their Internet traffic management practices. In Japan and the United States, this has been required by regulators. In Europe, we found the practice to be common, and it is likely to be required soon by national regulators. Implicit in this transparency is the necessity of ISPs providing objective, verifiable data about network congestion to justify traffic management practises. This is required in Japan and of Comcast.

As detailed in Paragraphs 58 through 60 of the policy, the CRTC has mandated that ISPs must disclose both their economic and technical Internet traffic management practises to consumers. The information must be available "clearly and prominently" on ISP websites, as well as in all marketing materials, user contracts, and terms of service. Information must include why ITMPs are being used, who is effected and when the ITMP will be used, what type of traffic is impacted, and how the users' Internet used will be impacted (60). These directives align well with similar directives in other jurisdictions we studied.

The practise of deep packet inspection raised substantial privacy concerns in all jurisdictions. It is clear that the use of deep packet inspection and similar technologies, which may violate privacy laws in many countries, is not necessary to manage Internet traffic. The Japanese traffic management guideline clearly forbids the use of DPI, and Comcast also appears to have now found its use to be unnecessary.

Finding it "appropriate to establish privacy provisions in order to protect personal information", the CRTC directed ISPs to use collected personal information from both wholesale and retail customers only for the purposes of traffic management (103). Information is not to be disclosed or used for any other purpose. In this area, the policy aligns well with similar rules in the United States and Japan, and with the framework of EU communications regulation in this area.

Competition is considered an important component in protecting consumer rights. Both Japan and Europe emphasize the importance of competition to protecting consumer rights. Choice is severely limited when an upstream ISP throttles traffic for its wholesale customers. In Europe, it appears that ISPs must typically inform their wholesale customers about their traffic management practices, and must provide as close to a "vanilla" wholesale service as possible to resellers.

As in other jurisdictions, the CRTC sees competition as a key means of insuring reasonable ITMPs. However, the level of consumer choice which the Canadian regulator has judged to be adequate for market forces to function is more akin to the United States than to Europe. The CRTC reiterates its conclusion in Telecom Order 99-592, which stated that the Canadian retail ISP market was "sufficiently competitive to protect the interests of users"

(Paragraph 12), and cites the Governor in Council's Policy Direction to rely on "market forces to the maximum extent feasible".

ITMPs may limit innovation. While network management practises vary across Europe, many ISPs, such as the United Kingdom's Virgin Media, engage in application-agnostic traffic management (Virgin Media, 2008). There is no indication from any of these jurisdictions that application-agnostic techniques limit an ISP's ability to adequately manage their network. In addition to mandating the creation of a Guideline for Packet Shaping in 2008, the Japanese Ministry of Internal Affairs and Communication also sponsored a public-private partnership to study the use of peer-to-peer technology for media distribution.

In contrast, the CRTC policy speaks of innovation in relatively broad terms, but concludes that it wishes to find a "balance between society's interest in innovation in computer communications and its equally legitimate concern regarding the rights of carriers to manage the traffic thus generated" (Paragraph 9). The Commission does not elaborate on what basis ISPs have such a "right", nor how it serves to further the objectives of the Telecommunications Act.

We also note that even though it was complaints about the throttling of peer-to-peer file-sharing traffic that initiated the CRTC process, it is not specifically mentioned in the policy. By the throttling of all types of P2P traffic, Canadian service providers may be missing an opportunity to explore new means of distributing rich media content. As we have noted, the Japanese Ministry of Internal Affairs and Communication sponsored a public-private partnership to study the use of peer-to-peer technology for media distribution. Peer-to-peer technology may evolve into a legitimate form of media distribution, and it is detrimental to Canadian broadcasters and creators to allow this form of distribution to be crippled.

Conclusion

When the recommendations arising from our research were first submitted to the CRTC in 2009, it was easy to argue that Internet traffic management in Canada, as applied by ISPs and regulated by the Commission, was in an immature state, much to the detriment of Canadian Internet users. In the past several months it has become clear that, while ITM policy remains in flux in other jurisdictions, Canada presents (for the moment) a somewhat more stable regulatory environment, though one with which various stakeholders—industry and civil society both—may not be completely satisfied.

We consider this research to be a preliminary contribution to the ongoing process of Internet policy formation in Canada. As has been noted by others, including most recently by the current Chair of the CRTC, Canada has been less proactive than other jurisdictions in addressing with policy a technological milieu in which the Internet is emerging as a common platform for media distribution and communications. We believe that further comparative public policy analysis in areas of Internet regulation will be of significant benefit to the formation of similar policies in Canada.

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Citing this paper:

Stevenson, John Harris & Clement, Andrew. (2010). Regulatory lessons for Internet traffic management from Japan, the European Union, and the United States: Toward equity, neutrality, and transparency. *Global Media Journal -- Canadian Edition*, *3*(1). 9-29.