REASON, NOT ROMANCE: A BETTER INTERNET IN THE BALANCE

Iain Grant, Amit Kaminer, Cynthia Lee and Anna Mazur

Advocates of Net neutrality often overly romanticize the Internet, its history and its future, and do so to its ultimate detriment. Treating the Internet as some sort of pastoral Elysium rather than a tool to be used and managed will cause it to lose efficacy and overall value. The authors recommend that government forbear from overt regulation of the Internet and that market forces, coupled with existing legislation and regulation that safeguard consumer and corporate interests, be allowed to continue to shape the Internet.

Les partisans de la neutralité d'Internet ont souvent de son histoire et de son avenir une vision romantique finalement nuisible à son développement. Considérer Internet comme une sorte d'asile bucolique plutôt qu'un outil qu'il faut utiliser et gérer en conséquence lui fera tôt ou tard perdre son efficacité et sa valeur. C'est pourquoi les auteurs déconseillent aux gouvernements de le réglementer explicitement. Mieux vaut laisser aux forces du marché, combinées aux lois et règlements qui protègent déjà les intérêts des consommateurs et des entreprises, le soin d'en façonner le développement.

The concept of Net neutrality, although lacking a precise definition, is widely accepted to mean that all content flowing through the network should be treated equally, regardless of user, application or destination — the equivalent of social justice for the packet. For the majority of its advocates, the allure of Net neutrality lies in its utopian flavour.

We argue that despite any noble intentions, packet equality does not make for a better Internet. Given society's growing appetite for data-intensive applications and content and the corresponding scarcity in bandwidth, prohibiting network management practices is both counter-intuitive and impracticable; counter intuitive because a congested network erodes network value, and impracticable because the costs of a neutral Net (impotent network) outweigh the benefits (equality for all packets). We contend that traffic management practices are essential to a functioning and sustainable Internet that ultimately benefits all stakeholders — service providers, application and content providers, and users alike.

The Internet is a tool, designed by government network engineers and motivated by utilitarian objectives, that enables the interconnections of multiple computer networks that otherwise function in isolation.

The genesis of the Internet has, however, become shrouded in utopian mystique and many myths have been created about its inception. The network has come to be seen as some sort of electronic frontier; something more than engineering protocols and optical plumbing. Note the following quote by the US Federal Communications Commission commissioner Michael J. Copps in 2003:

> *From its inception, the Internet was designed, as those present during the course of its creation will tell you, to prevent government or a corporation or anyone else from controlling it. It was designed to defeat discrimination against users, ideas and technologies.*

The Internet was in fact born out of the efforts of the US Department of Defense Advanced Research Projects Agency (ARPA) in the 1960s to connect existing computer networks that were architecturally and technologically different, with a priority on survivability in a military context. Interconnection between different networks was achieved in the mid-1970s, with the emergence of ARPA's Transmission Control Protocol/Internet Protocol (TCP/IP) software suite and gateway interface devices such as switches or routers connecting several incoming and outgoing transmission links per device.

It became clear during initial stages that data transmission was being negatively affected by congestion. TCP/IP protocol became widespread anyway due largely to the growing use of e-mail and the government's own campaign to promote its acceptance. Possible solutions to the conges-

tion issue were deferred until the problem — thought to be "years away" — was later realized.

Although the Internet was initially publicly funded, the private sector has been integral to its development and growth, as it has been private risk-bearing investment that has facilitated expansion of Internet capacity and access over the course of its evolution and fuelled its explosive growth since the mid-1980s.

In the mid-1980s, the National Science Foundation (NSF) embarked on network expansion plans to connect universities and researchers with private sector investors in order to capitalize on the increasingly obvious benefits to US research and competitiveness of computer communication networks. By 1992, NSFNET traffic volume was near capacity and, given limited NSF resources, private sector investment was again sought for network expansion. As a result, private interests created a non-profit — Advanced Networks and Services (ANS) — that built a new backbone with 30 times more capacity. Notably, for the first time, principal ownership of the backbone was private rather than government held.

Concurrently, the number of privately owned networks climbed steadily with the establishment of the Commercial Internet Exchange (CIX) in 1991. It was formed as a response by several private commercial backbone operators to NSFNET's restrictions on its own backbone usage. CIX members interconnected their own backbones to exchange commercial data traffic with each other. Eventually, by 1995, this growing network of commercial backbone replaced the NSFNET, in essence privatizing the Internet.

Currently, the Internet's thousands of global disparate networks are generally owned and managed by various private organizations; many can be credited with the Internet's explosive growth since the mid-1990s. Despite periodic upgrades to TCP/IP since its launch, the relevance of its first-in-first-out (FIFO) and "best efforts" attributes are being questioned given today's ever expanding array of bandwidth-intensive applications. The problem of network congestion that had largely been deferred since TCP/IP's early days now looms large as debate ensues over the implications of that past and present on the Internet's future development.

It has long been recognized that increasing network congestion has a negative impact on network performance. Significant investments have been made over the years to increase Internet capacity and capability in order to combat this congestion. With the Internet spawning significant growth in the number of end-users and uses since the early days of TCP/IP, it is vital that these measures continue in the future.

Globally, the number of Internet users has grown to 1.4 billion. We predict a further increase of 200 million in the next 18 months.

At the same time, new uses for the Internet are growing in popularity. No longer are people satisfied using it for simple e-mailing and file transfers. With an ever-expanding array of new technologies, devices, content and applications available almost daily, global users are using the Internet to entertain themselves, communicate with others and conduct business on local and international scales.

There are three main contributors to rising Internet demand:

- *Internet's emerging role as an entertainment platform* — Bandwidth-intensive applications like YouTube (video streaming) and BitTorrent (peer-to-peer file sharing) are surging in popularity, and are predicted to grow when YouTube starts to offer high-definition content.
- *Increasing global sensorium* — Increasinlyg popular images generated from mobile camera phones and surveillance video with IP addresses are becoming large contributors of Internet traffic.
- *Diminishing importance of local area networks (LANs)* — Businesses increasingly contribute to Internet traffic as they have their applications and proprietary data stored at a collection point by an outside third party.

Such drivers of Internet demand are also drivers of growing bandwidth consumption or IP traffic growth. With the number of users growing steadily and the number of uses growing rapidly, global packet traffic is experiencing double-digit growth. In fact, since 2004, annual average traffic growth was 104 percent, 50 percent, 74 percent and 57 percent, and we estimate that by 2010, global Internet traffic will be twice the 2007 value. While demand grew by a factor of 8.4, capacity grew by only 5 times. Largely due to leftover capacity from the halcyon days of the early 2000s, capacity growth is poised to increase once again as the leftover capacity is absorbed.

The Internet is a tool, designed by government network engineers and motivated by utilitarian objectives, that enables the interconnections of multiple computer networks that otherwise function in isolation.

In Canada, double digit growth (11 percent, 12 percent and 14 percent) in Internet access revenues between 2003 and 2006 suggests growing Internet demand. In 2006, 8.7 million Canadian households (70 percent) subscribed to Internet access services. Of those, 60 percent subscribed to high-speed Internet services, up 51 percent from the previous year according to the Canadian Radio-television and Telecommunications Commission

(CRTC) 2007 Policy Monitoring Report. Although it has been argued that Internet demand and IP traffic growth will plateau with saturating broadband penetration, that argument fails to take into consideration the probable intensity of the next wave of Internet demand growth, which will be fuelled by an increasingly Net-dependent society and mobile Internet access devices.

Given the needed investments in infrastructure and technologies to accommodate this rising demand for capacity, mandating a neutral Net and thereby decreasing the potential reward for risk capital is counterintuitive. Without large-scale infrastructure growth and an effort to manage growing traffic, the Internet will become incapacitated. The creation of policies that slow investment and disallow traffic management will have dire consequences for the future of Internet service.

New uses for the Internet are growing in popularity. No longer are people satisfied using it for simple emailing and file transfers. With an ever expanding array of new technologies, devices, content and applications available almost daily, global users are using the Internet to entertain themselves, communicate with others, and conduct business on local and international scales.

Neutralists insist that abuses by service providers are likely to occur — blocking or degrading competing services are often cited — in the absence of government regulation. They claim the government must uphold its duty to protect user interests against these abuses. We contend, however, that Canada's workably competitive broadband services market (as suggested by the 60/40 cable/DSL split) will prevent anti-competitive behaviour on the part of Internet access providers (IAPs) from within. Competition in this market is also likely to be enhanced by new service providers from the upcoming 700MHz spectrum auction.

Neutralists also express concern about "stifling" innovations at edge of the network should neutrality not be mandated. They worry application and content developers will become discouraged from pursuing projects due to the increased risks and uncertainty of possible discrimination by IAPs against their products or services. It is our contention, however, that Net neutrality is in fact what is likely to be detrimental to the growth of innovation at the network edge. Without a mechanism to allocate bandwidth and apply prioritization, the burgeoning growth of network traffic will stifle application innovation and adoption. In fact, many Web-based innovations require data discrimination (prioritization) to operate at a dependable level; voice over IP (VoIP), video streaming, on-line gaming and real-time teleconferencing, for example, place different demands on the network with respect to bandwidth and time but each requires some kind of data prioritization to operate at an acceptable level.

Indeed, a prime source of Internet-related innovation has been in network management and traffic shaping tools. Legislating a neutral Net would effectively render such innovations useless while not addressing the underlying reality of burgeoning traffic and a finite Internet.

The neutrality campaign has attracted much of its support through the framing of the debate as a fight for freedom — a David-vs.-Goliath-type battle. A neutral Internet is needed, advocates claim, to protect the basement innovator or start-up from corporate domination and avarice.

Through the use of emotive language and a romanticized interpretation of the facts, the campaign has been very effective in garnering support, en masse. The most common example of this concerns the design motive behind the Internet's end-to-end architecture, in which intelligence or control is concentrated at the end points of the network. Though the motivation was mundane and practical concerns like speed of error detection and recovery, neutralists claim that the intent behind the decentralized design was political — a rebellious statement by socially conscious network engineers against authority and the state. Such myths are then enhanced by emotive language or phrasing such as *place of freedom*, *heart of the Internet* and *defeat discrimination,* which very effectively generates mass appeal.

Proponents claim legislation is the only way to "save" or "protect" the neutrality of the Internet. However, that would imply that the Net was ever neutral.

But the net was never neutral.

It is ironic that the Internet, born out of inequality, has become synonymous with egalitarianism. The TCP/IP protocol, which in essence is the Internet, did not win out over competing technologies because it was superior. Rather, the US government, which had been heavily subsidizing its development, actively helped it supplant competitors by paying contractors to write reference implementations of Internet protocols and then gave them away free.

The protocol itself is biased. TCP/IP "hot potato" routing policies do not exhibit neutral tendencies but rather discriminate against those data packets not destined for termination on their own networks. In order to minimize network resource use, those packets are handed off at the earliest possible point.

TCP/IP is also biased against those applications and content that are latent jitter- or time-sensitive. Even the smallest delay in response time or sequential ordering of data packets can

degrade the quality of the application or content like VoIP, video conferencing, streaming multimedia, on-line gaming and remote surgery. All require some form of data filtration and prioritization in order to operate reliably, particularly during high-congestion periods. The FIFO and "best efforts" features of TCP/IP impede dependable and effective delivery of such services by not appropriately prioritizing between data packets.

The Internet has never been a neutral or level playing field because size has always mattered with respect to data transmission. For example, Internet backbone peering — the voluntary interconnection of networks — is tiered based on the reach of a network. The larger the network, the greater the reach, and thus it pays less or nothing at all to peer with other networks. Equivalently, the smallest networks pay the most.

Performance advantages are also commensurate with size. It is well known that Google, now part of the Web's establishment, and ironically one of the most prominent of neutrality advocates, employs local caching techniques through its massive server farms in numerous undisclosed locations around the world to ensure quick and reliable delivery of its content. Others, like Amazon and eBay, pay for content acceleration services to ensure performance advantages over their competitors.

Maintaining or preserving the status quo (which is not neutral, nor has it ever been) by imposing neutrality legislation would actually force dramatic changes that would, at worst, petrify the Internet's evolution and hinder needed investment in both core and edge facilities. We argue instead for a continuance of the current dynamic evolution model where enlightened self-interest drives IAP and carrier decisions and a competitive market safeguards consumer interests.

In the absence of traffic management, growing congestion can be expected to degrade speed of service to the extent that physical access to the Net is impeded, loading Web pages becomes more time consuming, downloading or streaming video is interrupted and e-commerce transactions are stalled. With enough frequency, such degradations to the on-line experience of users may deter them from returning to the Internet. This will result not only in subscriber loss but in loss to the network value, which is a function of the number of users.

From an economic perspective, regulating Net neutrality is impracticable because the costs of maintaining such conditions far outweigh the benefits that can be derived from it. Aside from the various significant time and financial costs involved in the drafting, passing and enforcing of new neutrality legislation, the additional costs of a less accessible Internet — consumer welfare loss, stifled innovation and competition, and misallocation of relatively scarce resources — grossly outweigh the benefits of a neutral but frozen Internet.

The Internet has never been a neutral or level playing field because size has always mattered with respect to data transmission. For example, Internet backbone peering — the voluntary interconnection of networks — is tiered based on the reach of a network. The larger the network, the greater the reach, and thus it pays less or nothing at all to peer with other networks. Equivalently, the smallest networks pay the most.

Since accelerated content delivery services to content providers would be prohibited under a Net-neutral regime, the financial costs of infrastructure maintenance and upgrades would fall directly onto subscribers. And because these costs have to be spread over a smaller base of IAP customers, as content providers would be exempt, subscribers will have to pay higher service costs, on average. This "network access" tax would effectively squeeze out marginal subscribers who can no longer afford broadband services, thereby exacerbating the eroding network value effect.

Without the ability to differentiate service levels to content providers, IAPs can make only one standardized service offering to content and application providers, resulting in a loss to consumer welfare. Those subscribers who value enhanced quality of service must settle for less, and those who are satisfied with a relatively low quality of service must pay more for unwanted higher quality. Clearly, subscribers are adversely affected from both a financial and a welfare perspective by a Net neutrality mandate.

Adherence to Net neutrality will also reduce investment incentives for potential investors by making it more difficult to recoup investment costs. With the surge in effective demand for bandwidth-intensive content and applications, IAPs face corresponding increases in data transmission costs but would be legally barred from tapping into potential revenue streams like differentiated service levels to help offset such costs. This added risk must be reflected in returns on investment, which will in turn have the effect of decreasing the scale of projects planned or under way. Recent studies have estimated that deploying and upgrading broadband networks in North America will entail investments of US$45-$55 billion over the next five years. Any type of regulation that impedes the recouping of such investment costs will undoubtedly dampen capital formation and slow the pace of such investment.

Advocates warn that should neutrality not be mandated, the added uncertainty or risk of possible discrimination by IAPs would deter innovators of content and applications from pursuing new Internet technologies. Despite sounding logical, the reality of managed networks and the added uncertainty and risk brought on by the very debate itself has not dampened the progression paths of content- or application-related innovations in the least.

The evolution of Proactive Network Provider Participation for P2P (P4P) provides a vivid example of how active traffic management has not deterred the development of consumer driven Internet innovations. Instead, it shows how well innovators can thrive despite "discrimination" as the file transfer protocol evolved as a response to network operators slowing down, or "throttling," peer-to-peer (P2P) downloads — end-users downloading content from random global peers. Not only does it speed up P2P downloads for end-users, it decreases the backbone traffic by localizing the peering activity, thereby decreasing IAP transit costs.

Net neutrality will stifle innovation and competition by preventing IAPs from experimenting with new network management technologies and business processes that can better serve customers' evolving demands. It is clear from the success of on-line priority delivery companies like Akamai, whose revenues increased 22 percent in the third quarter of 2008 from the same quarter the previous year, that the market for access tiers is growing. However, mandated neutrality precludes IAPs from competing in such markets, thereby limiting choice for those consumers that demand more efficient data routing for their applications and content.

Legislating a neutral Net also forces a misallocation of scarce resources because it effectively forces the price of access tiering to be zero. Price promotes efficient rationing of scarce resources as it reflects the value an individual places on a good or service. Hence, those who are willing to pay a higher price for a good or service value it more than those who are willing to pay less. By prohibiting the owners of bandwidth from using efficient distribution mechanisms like market price, Net neutrality imposes a suboptimal distribution because bandwidth is not being allocated to its highest-value use, like priority delivery, where demand obviously exists. A Net neutrality mandate perversely punishes efficient and responsible network and business management practices.

The race to enact Net neutrality in Canada is fuelled in part by fears that without neutrality legislation, IAPs will abuse their powers to control access and content on the Internet. We believe that these fears of unregulated abuse are unwarranted. Two fundamental reasons for our position are:

- Regulatory mechanisms for controlling market dominance already exist in Canada. Under the *Competition Act*, supposed market dominance or other abuses by IAPs can be investigated on a case-by-case basis.
- Consumer pressure will guide the future of IAP activity. In an open market, IAPs will compete to be a preferred provider — consumers will take their businesses to the company providing the best service for the best price (provided IAP behaviour is transparent).

Canada currently takes an *ex post facto* approach to regulating IAP activity that echoes that of Europe, where a combination of anti-competition laws and the European Regulatory Framework are used to protect against market abuses of IAPs. For example, the framework provides remedies if an IAP with "significant market power" were to charge for prioritization block or degrade traffic in ways considered to be anti-competitive. Europe and Canada thus both have substantial protection against market abuses without specific neutrality legislation.

Not only are Net neutrality regulations unnecessary, the creation of new, *ex ante* regulations would likely produce unwanted consequences that could stifle the growth of the Internet as a whole. Even with a significant amount of resources and effort, a regulatory scheme that specifically prohibits certain IAP behaviours will have difficulty keeping up with the incredibly fast pace of technological innovation. It is likely that neutrality laws would have to be continually updated and altered to sufficiently correspond to the realities of the market.

The CRTC, in its review of its approach to new media services on the Internet, decided in 1999 not to regulate. The commission's logic suggested that to regulate new media (and Internet) services would be to put Canada's industry at a competitive disadvantage in the global marketplace. The authors believe the CRTC got it right in 1999.

The campaign for Net neutrality has been presented as a necessary measure to "save" or "preserve" the Internet. We believe that such a mandate would only hasten its demise.

Mandated Net neutrality is detrimental to the growth and development of the Internet because it

Mandated Net neutrality is detrimental to the growth and development of the Internet because it erodes the value of the network through performance degradation. Additionally, it is economically impracticable as it results in increased costs to consumers for a standardized level of service that consequently results in a loss to consumer welfare.

erodes the value of the network through performance degradation. Additionally, it is economically impracticable as it results in increased costs to consumers for a standardized level of service that consequently results in a loss to consumer welfare. Application and content providers may also experience a welfare loss in that they cannot be offered an option to subscribe to a service that many clearly want, as evidenced by the financial success of Akamai and other accelerated content delivery service companies. Net neutrality will also have a negative impact on innovation. Aside from being counterintuitive (those edge-driven innovations they claim to want to protect require prioritization to be able to operate acceptably), legislated neutrality will dampen much-needed capital investment for infrastructure maintenance and upgrades by impeding the recouping of costs for investors. Furthermore, it prohibits IAPs from experimenting with innovations in network and business management. It clearly forces a misallocation of scarce resources and effectively punishes efficient and responsible network and business practices.

Net neutrality regulations are unnecessary because regulatory mechanisms already exist in Canada — the *Competition Act* — to ensure consumers have access to competitive prices and product choice, and small to medium-businesses have equitable access to participate in the economy. Furthermore, workably competitive market forces will guide IAPs toward appropriate behaviour.

Unintended and unwanted consequences are likely with the creation of new and unnecessary regulations. We recommend that Canada be prudent in its approach to the burgeoning IAP and broadband market and not rush to regulate the provision of Internet service.

Iain Grant is the founder and managing director of the SeaBoard Group. Established in 1986, SeaBoard is widely quoted as Canada's foremost consultancy specializing in communications-related issues. Amit Kaminer is a research analyst specializing in the Canadian telecommunications sector. Cynthia Lee is a research analyst with a background in development economics. Anna Mazur is a research analyst with a background in law.

POLICY OPTIONS POLITIQUES

POLICY OPTIONS SUBSCRIPTION ORDER FORM

SUBSCRIBE ON-LINE www.irpp.org

1470 Peel Street
Bureau 200
Montreal, Quebec
Canada H3A 1T1

☐ New ☐ Renewal (please include subscriber # _____)

1 year

☐ $49.98 (GST included)
☐ $53.73 (Quebec taxes incl.)
☐ $67.60 (US)
☐ $87.60 (Other countries)

2 years

☐ 87.46$ (GST included)
☐ 94.02$ (Quebec taxes incl.)
☐ 123.30$ (US)
☐ 163.30$ (Other countries)

PAYABLE IN CANADIAN FUNDS ONLY

Name _____
Company _____
Address _____
City _____ Province _____
Postal code _____ Telephone _____

☐ Payment enclosed ☐ VISA ☐ MasterCard ☐ Amex

Card no. _____
Card expiry date _____
Signature _____