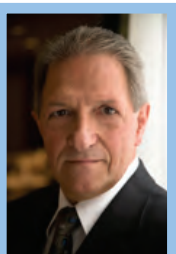


IS NET NEUTRALITY ECONOMICALLY EFFICIENT?

In November 2008, the Canadian Radio-television and Telecommunications Commission (CRTC) denied a request from the Canadian Association of Internet Providers which wanted Bell Canada to cease its network “traffic-shaping” practices. The CRTC concluded that Bell’s measures did not violate the law and were not discriminatory since the company applied the same policies both to its wholesale and retail customers. However, the CRTC has decided to examine the broader issue of traffic management by Internet service providers – and thus indirectly to tackle the issue known as “net neutrality”. This proceeding will include a public hearing that is scheduled to begin in July.



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There are many facets to the net neutrality issue such as content, bandwidth allocation and pricing, among others. This debate is highly polarized and complex, but it is of the utmost importance to clarify this issue and design and implement a policy that stresses transparency, efficiency and proper reliability. This Economic Note deals mainly with net neutrality in terms of differential pricing of differentiated bandwidth access and not with the neutrality of content.

Proponents of net neutrality believe that the Internet was designed as a public information network and should “aspire to treat all content, sites, and platforms equally”¹ and refrain from “purposely downgrading speeds of certain Internet users or giving one website faster speeds than another.”² The underlying theory is that net neutrality, by allowing innovation and trade between people without restrictions from service providers, would be beneficial for the economy. Advocates of net neutrality call for government intervention in the form of regulation to prevent broadband providers from prioritizing or interfering with the data that flow on their networks. Indeed, a bill to this effect was introduced by an



opposition MP at the House of Commons.

On the one hand, there is concern that broadband providers could restrict access to some websites or limit some forms of use. On the other hand, broadband providers are arguing that, even though they continue to invest in their networks, their customers would still be affected by congestion during peak periods in the absence of traffic management measures.

This problem is certainly not new or specific to Internet service providers. Other large networks, like the electricity grid, the natural gas distribution network, the road system or the voice telephony network face the same type of issues. Service providers’ main concern is how to

manage the traffic on the network in order to ensure optimal usage.

It is commonly believed that the historically open and free nature of the Internet has proven to be a great platform for innovators, entrepreneurs, and creators.³ In light of the new applications and uses, these characteristics may now have potential drawbacks: proposed net neutrality measures might hinder the

1. Tim Wu, *Network Neutrality FAQ*, http://www.timwu.org/network_neutrality.html.

2. Peter Nowak, “Net neutrality: FAQ – The battle over whether the Internet will remain open in Canada has begun in earnest,” *CBC News*, April 1, 2008.

3. Google, *Comments concerning CAIP Part VII Application requesting certain orders directing Bell Canada to cease and desist from “throttling” its wholesale ADSL Access Services*, July 3, 2008, p. 4.

innovation of new services or even reduce the Internet's stability and security: "The Internet needs a makeover. Unfortunately, [U.S.] congressional initiatives aimed at preserving the old Internet threaten to stifle the emergence of the new one. [...] Network neutrality is supposed to promote continuing Internet innovation by restricting the ability of network owners to give certain traffic priority based on the content or application being carried or on the sender's willingness to pay. The problem is that these restrictions would prohibit practices that could increase the value of the Internet for customers."⁴

There are three key elements around which the net neutrality debate is centred: transparency, blocking and tiering.⁵ Transparency relates to the degree to which broadband providers clearly disclose the rules they use in managing their respective networks.⁶ Blocking relates to the capacity of broadband providers to limit or prevent access to certain sites or applications.⁷ Proponents of net neutrality argue that, since broadband providers are often content providers, there is a risk that they may block or degrade the quality of applications that compete with their own. Finally, tiering can be defined as broadband providers' ability to give different levels of network access and priority that depend on customers' wants and needs or the quality of service they subscribe to.

Managed or unmanaged Internet: That is the question

The Internet was originally developed using "narrowband" dial-up connections on the basis of an end-to-end open architecture with networks not knowing or caring about the content being carried. Even as higher-speed broadband connections have become more prevalent, this architecture has remained relatively the same.

Under the constraints of that historical architecture, broadband providers can only provide "best efforts delivery" of data, meaning an unspecified variable bit rate and a delivery time that depends on current traffic load. However, new applications (including video streaming and VoIP)

require a higher quality of service assurance. To respond to this requirement, broadband providers are adopting new technologies that add more controls and intelligence to create "managed networks that enable applications that would fail to perform effectively if offered via the wide open (best efforts) Internet".⁸ Such upgrades are intended to ensure that subscriber demands for higher-quality services can be satisfied through preferential routing.

To net neutrality defenders, these arrangements are unacceptable because such upgrades could create a two-tiered system that would have a chilling effect on those unable or unwilling to pay for upgraded services. They believe "innovation without permission" represents the essence of the Internet, and allowing broadband providers to manage their networks actively would be the end of the Internet as it has existed until now.

Defenders of active management argue that the Internet has historically been completely unregulated and that imposing government legislation would be the end of the Internet as we know it: private networks have freely and openly accepted the universal Internet standards because it is in their (and their customers') best interest to do so, not because it is required. Furthermore, they worry that regulating network neutrality could stifle new investment and innovation in broadband networks: making it illegal for broadband companies to offer a diversity of choices would destroy incentives to invest continually in improved Internet bandwidth, quality and security. They argue that a free-market Internet is superior because network owners have mutual interests in solving problems, innovating, and meeting new consumer needs while earning a competitive return on their investment. They claim also that net neutrality legislation would unnecessarily

Broadband providers are arguing that, even though they continue to invest in their networks, their customers would still be affected by congestion during peak periods in the absence of traffic management measures.

4. David Farber and Michael Katz, "Hold Off On Net Neutrality," *The Washington Post*, January 19, 2007, p. A19.

5. Robert D. Atkinson and Philip J. Weiser, A "Third Way" on Network Neutrality, The Information Technology and Innovation Foundation, May 30, 2006, p. 3.

6. Rogers admitted to traffic shaping but was not willing to disclose the policies that govern these actions (Rogers' letter to the CRTC, July 3, 2008). See also Michael Geist, "Canadians deserve better ISP transparency," *Toronto Star*, October 8, 2007.

7. Bell slows down certain peer-to-peer applications at peak times of the day. See Peter Nowak, "Internet congestion a reality, Bell says," *CBC News*, June 2, 2008; and also Michael Geist, *op. cit.*, footnote 6. Bell and Rogers argue that without such measures, the quality of service will drop for all users during peak periods and that their strategy is designed to ensure a proper Internet service level for all their clients.

8. Robert D. Atkinson and Philip J. Weiser, *op. cit.*, footnote 5, p. 4.

regulate a free and competitive market when there is no real evidence of consumer harm: “the problem with rules that limit behaviour before the fact is that they often sweep broadly and address speculative harms.”⁹

What does economic theory say?

Net neutrality is a policy proposal that implies regulating how broadband providers can manage and price the use of their networks. To evaluate the efficiency of such a policy proposal, it is important to consider the underlying economics of the case.

Various networks share some common characteristics. The following six are particularly important. First, demand for network services typically follows daily, weekly, and/or seasonal cycles. Second, their cost structure is weighed toward fixed rather than variable costs. Third, network capacity expansion is fundamentally a function of the level and time at which demand attains its peak. When capacity is a binding constraint, significant economies in terms of investment costs can be obtained if peak demand can be spread over a larger time interval. Fourth, in some networks, such as electricity transmission and communications, rigorous common timing between the sender and the receiver is essential. Fifth, the uncertainty surrounding market developments (new products and services, new competitors, new technologies, changes in customers’ behaviour) is significant. Sixth, once a network is designed and built, the cost of undoing the investment is quite large and therefore the relative irreversibility of investment decisions is significant.

These characteristics have major implications. First, investments in network development are quite risky. Second, efficient use of limited network capacity as well as the possibility for network operators or owners to realize a risk-adjusted return on their investments in network maintenance and development rests on the implementation of proper pricing

strategies. These strategies take different forms: a fixed subscription charge with no charge for use, whether in off-peak or peak periods, a price structure commonly associated with net neutrality; pricing of traffic flows in peak periods, when capacity is fully utilized, thereby constraining the quality of service, with marginal cost-based pricing in off-peak periods; a menu of two-part (or multi-part) prices, with the different elements on the menu being defined by different combinations of a fixed price with a per-unit price for use; and combinations of the above in differentiated time-based (typically peak demand-based) quality of service contracts. Third, time-based quality of service contracts are a way for network operators and service providers to differentiate their products and services from those of competitors. This differentiation strategy is the key to avoiding the otherwise expected marginal cost pricing trap: outlawing the strategy

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would increase competition artificially and thus drive prices to marginal costs, below average costs, turning socially valuable proposals to invest in network maintenance and development into money-losing schemes, to the detriment of all.¹⁰

In light of the above, the most socially efficient network maintenance and development strategy would be to let competition play its role: let network owners and operators, as well as service providers, differentiate their offerings and price them the way they choose. Customers would benefit from more diversified offers by selecting the ones best suited to their needs.¹¹ In such a competitive context, network operators and service providers would routinely aim to satisfy demand for Internet services most effectively while simultaneously aiming to manage the growth in peak demand. It is to the advantage of consumers to allow competing vendors to experiment with various price and service combinations. From this discovery process, a portfolio of winning offerings will emerge. As long as competition is present and sufficiently intense, and assuming the level of information available and provided to consumers enables them to make informed choices between the various

9. *Idem*, p. 12. Moreover, according to NetCompetition’s Net Neutrality Fact Sheet, “~20 million American cable broadband users have never had network neutrality; and ~200 million American cell phone users also have managed just fine without network neutrality”: see <http://www.netcompetition.org/docs/pronetcomp/factsheet.pdf>.

10. Network pricing can take other forms, including pricing schemes based on cooperative cost sharing rules, something we cannot discuss here. For a discussion of these different pricing schemes, see Marcel Boyer, Michel Moreaux and Michel Truchon, *Partage des coûts et tarification des infrastructures*, CIRANO, March 2006.

11. A customer’s needs and therefore demand would typically be defined in terms of connectivity, flexibility, safety, dependability, accessibility, capacity (high speed and broadband), and user-friendliness. In that sense, the demand function, defined as the relation between quantity and price, for Internet services is a derived demand rather than a direct demand. The direct demand itself is expressed in terms of the above characteristics.

offerings, regulation of price schemes is neither necessary nor desirable as it would stifle innovation and hinder discovery of the best offerings and pricing schemes.

Policy makers' duties should be to further the interests of all users and citizens and to promote and secure the optimal use of networks. In this regard, there is no shortage of examples of how price regulation creates efficiency losses in competitive markets. Nonetheless, proponents of net neutrality argue that neutrality guarantees competition, thereby ensuring innovation and wealth creation. But that is a short-term view. In the long run, eroding the property rights of broadband providers will reduce their incentive to invest in capacity building or in network upgrades. This will lead to poorer performance and relatively higher prices.¹² In the end, it is always bad policy to manipulate competitive prices or pricing plans unnecessarily to achieve social policy goals.

Measuring and regulating competition in the broadband industry

One question remains. Is the level or intensity of competition sufficient in the broadband industry? This is a difficult question, and a complete answer would need more space than is available here. However, a principle can be stated: the pursuit of a dynamic regulatory approach should be based on implementing proper *competition processes* and *information*

systems rather than on the traditional measurement of market shares and concentration ratios, which, in a changing and volatile sector such as the supply of broadband Internet, typically become obsolete at the time they are completed.¹³

Conclusion

From an economic point of view, policies that would restrict the ability of broadband providers to manage their networks are likely to do more harm than good. Regulation of prices and service offerings has generally resulted in higher costs and lower benefits, especially when competition is present. The complexity of market dynamics poses particular problems in emerging industries, such as the high-speed Internet service industry, where technologies, products and services and customers' behaviour, as well as competitors' identities, keep changing, often unexpectedly.

Instead of adopting "blanket regulations" that could induce unwanted harmful effects, it is preferable to mandate anti-trust enforcement agencies (such as the Canadian Competition Bureau) to investigate when there is evidence of abuse or unlawful actions from broadband providers. Firms should be allowed to try different pricing schemes for providing broadband access. This would provide the incentives needed for broadband providers to invest in the development of next-generation Internet services.

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12. At another level of analysis, a fundamental result in economics is that the best way of maximizing total value to society is to protect property rights (in this case rights over networks) and allow network owners, content providers and service providers to negotiate freely. The Coase theorem states that, when property rights are ill-defined or uncertain, commercial transactions cannot take place because no party knows what it owns and negotiations cannot evolve properly as parties will spend a great deal of time, money and effort to challenge property rights and to influence public authorities in defining and allocating access to property rights, inevitably to their own benefit.
13. For more on these issues, see Marcel Boyer, "The Measure and Regulation of Competition in Telecommunications Markets" in Anastassios Gentzoglakis and Anders Henten (eds.), *Regulation and the Evolution of the Global Telecommunications Industry*, Edward Elgar Publishing, forthcoming (2010).