Submission to the Broadcasting and Telecommunications Legislative Review Panel

January 11, 2019

About CIRA

1. The Canadian Internet Registration Authority (CIRA) welcomes the opportunity to provide comments to the Broadcasting and Telecommunications Legislative Review. CIRA is the member based not-for-profit organization best known for managing the .CA top level domain on behalf of all Canadians, developing and implementing policies that support Canada's internet community, and representing the .CA registry internationally.

2. CIRA's core role is ensuring the stability and security of the .CA top-level domain registry and the underlying domain name system technologies that support the accessibility of every .CA domain. Related to this role, CIRA also provides cybersecurity services such as a DNS anycast service, for which we operate networks and equipment in Canada and on five continents internationally, and a DNS monitoring tool, which enables network operators, businesses and Canadians to protect their networks.

3. CIRA takes pride in being one of the many thousands of organizations that ensure the global internet functions on a daily basis, while playing a unique role in Canada's internet ecosystem. It is with this technical understanding of how the internet functions, as well as our long-time involvement in domestic and international issues related to the governance of the internet that CIRA offers the following comments.

Introduction

4. As internet infrastructure increasingly serves as the delivery mechanism for culture, commerce and communications, governments everywhere are grappling with challenges brought about by the digital age. These challenges include:

    - how to protect user privacy,
    - how to exercise oversight of content distribution to address a range of issues, including cultural policy objectives, copyright infringement, hate speech and fake news,
    - growing concerns about cybersecurity and how to protect against attacks,
    - issues of jurisdiction on a global network,
    - and how to uphold the spirit of the internet envisioned by its founders amidst these concerns.

5. We have reached an inflection point where the internet is seen as not only a bastion of progress, but also a challenge to long-held government policy objectives. The paradigm shift is evident in recent battles fought by policymakers around the world. In the United States these battles have taken the form of the repeal of net neutrality and the failed Stop Online Piracy Act

(SOPA). In the European Union, the challenges are evident in the controversial Copyright Directive and the recently implemented General Data Protection Regulation (GDPR).

6. Canada faces many of the same challenges. It is increasingly clear that the internet is not a direct analogue for the publishers, broadcasters or even the telephone companies of the past. In order to contend with the above named concerns today and into the future, Canada's communications legislation requires updates. CIRA's comments will focus on three issues we believe are important for ensuring the continued power of the internet to unleash innovation and creativity. First, we will address the hazards of treating the internet and the broadcast system as equivalent entities. Next, we discuss Canadian content in the digital age. Finally, we examine the need to recognize emerging players and the evolving architecture of the content distribution landscape.

The internet is more than a content delivery system

7. The telecommunications system is a general-purpose conduit for many forms of communications, but it is not a form of communication in and of itself. The internet, in particular, serves as the transportation system for many "applications" including telephony, file transfers, email, streaming audio and video, graphics and the written word, to name a few. It is important to distinguish between the internet and the applications delivered over it.

8. The user situated at the end-point of a network defines which types of communications they access and the device they choose to access them on. The user's ability to freely define which applications are used at the end-point is known as the end-to-end principle. This allows many different systems to interconnect and interoperate. The end-to-end principle is a precursor to the principle of net neutrality and the decentralization it brought about in packet-switched networks represented a major departure from the centralized architecture of traditional telephony networks. With the internet, the intelligence of the network is primarily located at the end-points, with end-users.

9. A helpful reference model for understanding the functions of communications infrastructure is the Open System Interconnections (OSI) model, or OSI stack. [1] The seven layer model (Figure 1) was developed by the International Standards Organization (ISO) in the 1980s and standardizes the functions of the different layers of communications and computing systems. The reference model describes the conceptual division of tasks on a network and facilitates the interoperability of many communications systems, including the internet.

[1] ISO/IEC 7498-1:1994, Information technology -- Open Systems Interconnection -- Basic Reference Model: The Basic Model. International Organization for Standards, 1994.

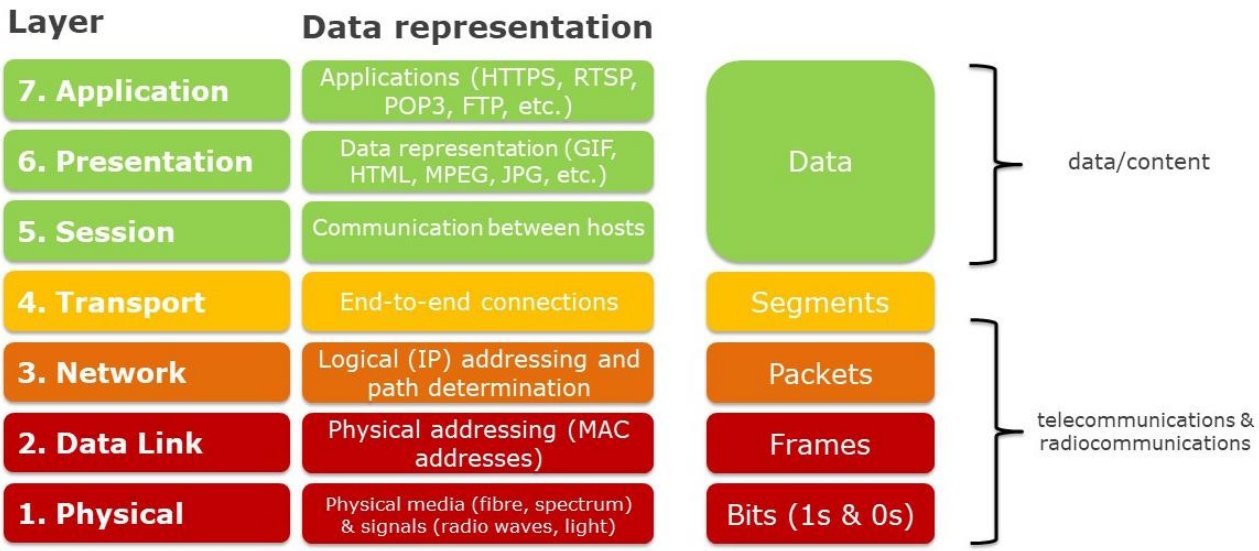

Figure 1: The Open Systems Interconnection (OSI) model

10. Communications law in the digital age should attempt to regulate at the layers associated with its policy objectives. The bottom 3 layers of the OSI model (the physical, data link, and network layers) constitute basic, network-specific functions. This is the realm of telecommunications, which the *Telecommunications Act* defines as "the emission, transmission or reception of intelligence by any wire, cable, radio, optical or other electromagnetic system, or by any similar technical system." [2] The upper layers of the OSI model perform application specific functions.

11. The upper layers are more closely associated with the realm of broadcasting or content distribution. The *Broadcasting Act* defines broadcasting as, "any transmission of programs, whether or not encrypted, by radio waves or other means of telecommunication for reception by the public by means of broadcasting receiving apparatus, but does not include any such transmission of programs that is made solely for performance or display in a public place." Telecommunications network operators are not responsible for initiating the transmission or reception of programming on the internet. This is the role of over-the-top service providers. Internet service providers (ISPs) merely carry the signal once a transmission is initiated.

12. The relationship between telecommunications and content distribution has caused some to conclude the internet is synonymous with the broadcast system and that it ought to be treated as such for regulatory purposes. However, the intentions behind telecommunications law and broadcasting law are fundamentally different. The *Telecommunications Act* exists to facilitate competitive market outcomes and the development of a robust communications system.[3] The *Broadcasting Act*, on the other hand, is a vehicle for cultural policy and Canadian identity with

[2] Telecommunications Act (S.C. 1993 c.38) ss 1, *Definitions.*
[3] Telecommunications Act (S.C. 1993, c. 38) ss 7, *Objectives.*

the objectives of reflecting Canadian society and strengthening the production and consumption of Canadian programming.[4]

13. While programming prepared for conventional broadcasting distribution is also delivered online, that does not mean online delivery of this programming is "broadcasting." An approach that blends broadcasting and telecommunications legislation because Canadians access television programs and radio on the internet is analogous to combining the *Bank Act* and the *Telecom Act* because Canadians bank online. The internet is a delivery platform for a diverse array of activities, with audio-visual content being only one of them.

14. According to CIRA's primary research, 39% of Canadians watch movies, television, and other videos online. We also found that 32% of Canadians access music and podcasts on the internet. However, Canadians also engage in a wide variety of other online activities. In 2018, more Canadians said they use the web to shop (52%), access the news (55%), bank (73%), engage on social media (61%), and send email (89%) than those who said they watch video or listen to audio content.[5]

15. This joint review of legislation seeks to accomplish two difficult and possibly conflicting priorities. The first is determining how to continue funding Canadian content creation in the globally interconnected digital economy. The second is achieving universal access to high quality, affordable broadband. In pursuit of the first goal, some have proposed that internet service providers ought to contribute to Canadian content creation. However, internet service providers already face many challenges related to ensuring all Canadians, including those in rural, remote and Indigenous communities, have access to high quality, affordable broadband.

16. Any move toward a regulatory framework that could link broadcasting policy to the price of an internet connection would be a step in the wrong direction and could lead to higher consumer costs. The internet is a general-purpose telecommunications service, which remains prohibitively expensive in some rural and remote locations. Canadians rely heavily upon their internet connections for a variety of day-to-day tasks. They access banking, shopping and e-mail in greater numbers than streaming audio and video. Streaming audio and video is only one of many activities Canadians engage in online. As a result, we should not view the internet through the prism of the broadcasting industry.

Canadian content in the digital age

17. CIRA's 2018 Internet Factbook research identified Canadians' appetite for home-grown content. Of respondents who use a home internet connection to access audio or video, 58% said they actively seek out Canadian programming at least occasionally. As the stewards of the .CA country code top-level domain, CIRA understands the importance of asserting Canadian identity

[4] Broadcasting Act (S.C. 1991, c. 11) ss 3, *Declaration.*
[5] Canada's Internet Factbook 2018, Canadian Internet Registration Authority (CIRA), June 13, 2018.

and maintaining relevance online. CIRA marketing encourages Canadians to "Choose Canada. Choose .CA," and they are. The market share of .CA domain names in Canada grew from 25% in 2009 to 33% in 2018. Market share for .COM dropped from 59% to 54% in the same period. Canadians are increasingly choosing .CA to represent their brands and personal presence online. It is against this backdrop that we recommend the objectives of broadcasting policy should emphasize discoverability, amplification, and recognition of Canadian content distributed via the internet.

18. There are technical challenges and repercussions associated with the 20th century tools of broadcasting regulation that must not enter the telecommunications system. In pursuit of cultural objectives, the *Broadcasting Act* has been leveraged to limit foreign television channels that compete with Canadian channels. Broadcasting policy has also required broadcasting distribution undertakings (BDUs) to grant priority carriage to Canadian TV stations and to offer a majority of Canadian channels. These measures, if implemented on the internet, would take the form of content blocking, bandwidth throttling[6] or granting priority carriage to Canadian programming. Any of these would undermine the principles of net neutrality.

19. Fortunately, the language of net neutrality is already present in section 27 of the *Telecommunications Act*, which prevents undue preference and discriminatory rates, and in section 36, which prohibits influencing the meaning of communications. It is this legislation that empowered the CRTC to develop the internet traffic management practices (ITMP) policy framework. This framework forms the basis of Canada's net neutrality regulations. These century old principles of common carriage are not technology specific, but the concepts continue to serve us well in the digital age. However, the window is open to strengthen the language and explicitly enshrine net neutrality in law rather than as a matter of regulatory policy. Given the rapidly changing nature of internet architecture, we caution against any language that is overly technology-specific.

20. The tools of the *Broadcasting Act,* however, include preferential treatment for Canadian programming. This is diametrically opposed to the concept of an 'open internet.' CIRA submitted views on the issue of blocking in response to the 2018 *FairPlay Coalition Application to disable online access to piracy websites.*[7] CIRA does not see limiting the openness of the internet as sacrosanct, but as a measure that should only be permitted in exceptional circumstances such as in cases of child abuse and infrastructure abuse (e.g. distribution of malware, denial of service attacks). Preferential treatment of Canadian programming would not qualify as one of these exceptions.

[6] According to Wikipedia, "*bandwidth throttling* is the intentional slowing or speeding of an internet service by and internet service provider."

[7] Intervention of the Canadian Internet Registration Authority in CRTC Public process 2018-0046-7 Asian Television Network International Limited application on behalf of itself and a number of other persons (collectively, FairPlay Canada) on website blocking.

21. Furthermore, any bid to apply the tools of 20th century broadcasting regulation would fail on a technical level. Efforts to block or limit access are generally ineffective and users who discover blocking have many options to defeat or circumvent it. Even average users can circumvent blocking with moderate technical skills and knowledge. We also know that blocking tends to cause collateral damage. Interception and alteration of IP addresses or DNS responses leads to problems that take other valid services offline.

22. On the other end of the spectrum, blocking – particularly IP address blocking – can have limited effectiveness when applied to large service providers whose content is hosted across multiple data centers or in a Content Delivery Network whose IP addressing schemes are highly distributed and dynamic. In this casetheir IP addresses change all the time by virtue of their network architecture. It is for reasons like this that regulating audio-visual content on the internet is a losing battle.

Emerging issues in networking and content distribution

23. As a result of consumer demand for content, including streaming video and audio, over-the-top service providers are building private networks to improve service performance for users. These content delivery networks (CDNs) are changing global internet infrastructure. The purpose of content delivery networks is to store content, including web pages, advertisements, videos, pictures and audio, as physically close to the end user as possible. Shortening the physical path between the user at the "edge" and the servers where content is stored results in a faster, more responsive online experience. Milliseconds of performance matter. When a Toronto user accesses a Youtube video, the request is likely served by a content cache located in Toronto rather than a data centre in California.

24. In order to serve customers around the globe, CDNs distribute copies of frequently accessed files to servers located in geographically strategic locations. These are often major population centres with high concentrations of internet users, colloquially known as "eyeballs." As a result, the CDN does not need to pay an upstream Tier 2 or Tier 1 network each time a customer accesses a video, webpage or photograph. Instead, the CDN optimizes bandwidth usage by pushing and caching content on a global network of servers according to a schedule.

25. These servers or caches are often located in partnership with local access ISPs or at an internet exchange point (IXP). An IXP is a hub where independent networks can interconnect directly to one another, providing high-bandwidth and low-latency access at a lower cost than traditional transit.[8]

[8] Canada's Internet Infrastructure: Made-in-Canada Internet Exchange Points (IXPs), Canadian Internet Registration Authority (CIRA).

26. In addition to locating thousands of servers around the globe, CDNs are investing in submarine cables to move content across oceans.[9] This reduces the requirement to pay a Tier 1 transit ISP to move packets between continents.

27. Content delivery network operators include household names of major online service providers like Facebook, Google, Netflix, Microsoft and Apple. Any major enterprise with a global online presence generally operates a CDN. CDNs are also run by companies such as Akamai, Cloudflare, Fastly, and Limelight. These lesser-known entities are responsible for delivering a significant proportion of internet traffic. They operate by aggregating the needs of many web properties in order to serve their content locally. News websites, for example, may hire a CDN to replicate and store their content in major local markets around the world.

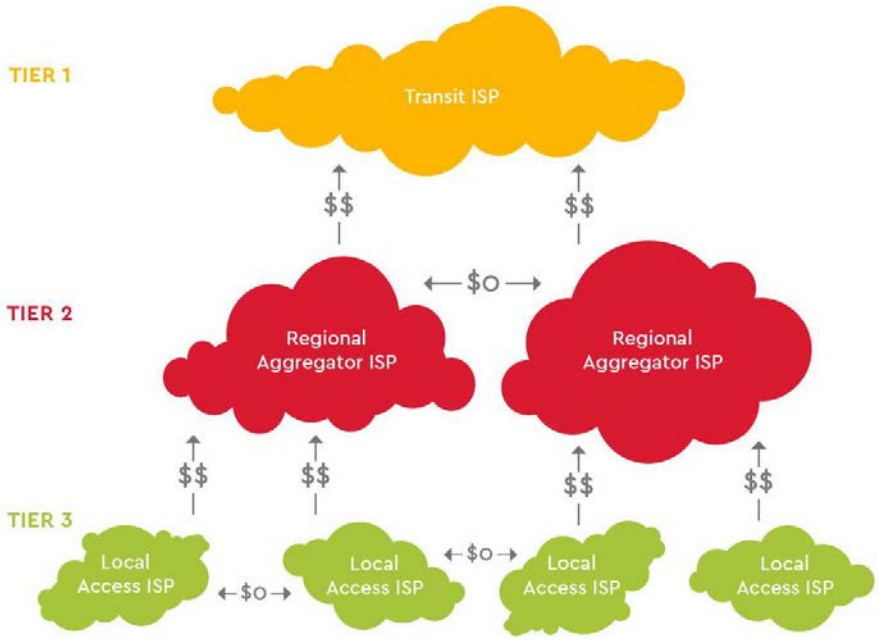

Figure 2: Old internet architecture

28. Content delivery networks are not only altering the architecture of the global internet, but also the flow of capital. In traditional global internet architecture, payments flow upstream from Tier 3 local access ISPs to Tier 2 traffic aggregators with regional footprints. From there, Tier 2 networks pay Tier 1 transit networks with global footprints. Transit networks move traffic internationally (Figure 1). There are less than a handful of Tier 1 networks with truly global footprints. Tier 1 networks have historically been the owners of submarine cables used for transmitting terabytes of data across oceans.

[9] Optical Illusions: Content Providers and the Impending Transformation of International Transport, Tim Strong, Telegeography. Presentation to the North American Network Operators Group (NANOG). October 4, 2017.

29. Networks with similar traffic loads exchange traffic on a $0, or settlement free basis. Tier 3 networks may exchange traffic directly with each other for free, but are required to pay an upstream network to move packets further afield. Likewise, the Tier 1 and 2 networks exchange traffic with their peers. Content delivery networks are disrupting this model. CDNs locate their files as close to the user as possible, often at the edge of Tier 3 local access networks. This new architecture sees a high proportion of internet traffic skipping Tier 1 and Tier 2 networks, reaching consumers directly via their local access networks. According to Cisco, 72 percent of all global internet traffic will cross CDNs by 2022, up from 56 percent in 2017.[10]

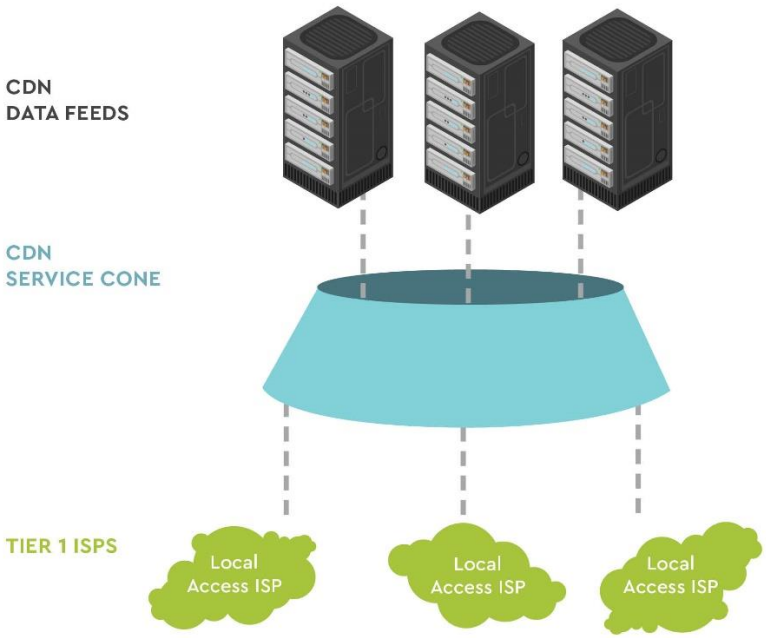

Figure 3: New internet architecture

30. For the purposes of this legislative review, it is worth noting that content delivery networks are dominant players in the internet ecosystem. Their service territories are global and their networks are unregulated by both telecommunications and broadcasting law. This is not to say that these private networks ought to be regulated under telecommunications legislation. There is no apparent market failure. In fact, the content delivery market is competitive for both enterprise and aggregator CDNs. Additionally, their efforts to locate content close to the network's edge contribute to a better quality of service and therefore a better online experience for Canadian consumers. Furthermore, when Tier 1 ISPs interconnect directly with CDNs, it

[10] Cisco Visual Networking Index: Forecast and Trends, 2017–2022, Tables 9 and 16. Global content delivery network internet traffic, 2017-2022. November 26, 2018.

reduces their costs for upstream internet transit, theoretically leading to cost savings for their downstream customers: Canadian internet users.

31. However, we point out that CDNs have caused major changes to internet architecture because the rate of change in the communications sector continues to be rapid. Any legislative updates must be flexible enough to take rapid technological change into account and must not create an environment that limits innovation or creativity in the sector.

Conclusion

32. The internet is a general-purpose, neutral conduit over which many applications run. It is imperative that we distinguish clearly between the applications that run on top of the internet, and the internet itself. While bandwidth intensive, audio-visual constitutes only a small portion of the applications Canadians access over the internet therefore broadcasting interests must not be permitted to steer telecommunications legislation. Instead, broadcasting should be regulated separately and any new policy or legislative approaches should emphasize discoverability, amplification and recognition of Canadian content that is distributed via the internet. Finally, amidst this review, it is important to consider that the rate of change continues to be rapid and that any legislative updates must be flexible enough to account for continued technological change.

*******END OF SUBMISSION*******