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Mr. Allan MacGillivray
Executive Director
Telecommunications Policy Review Panel Secretariat
280 Albert Street, Room 301
Ottawa (ON)
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Email: telecomreview@ic.gc.ca

Dear Mr. MacGallivray,

These reply comments are being submitted on behalf of Tucows Inc.

They add what we hope are pertinent comments on some issues that have not been addressed in the previous submissions, namely the question of the formation and use of network identifiers, such as uniform resource indicators [URIs]. These have important implications for the Department of Industry and the regulation of telecommunications in Canada.

We also comment on some of the large questions before the Panel.

Tucows seeks the opportunity of addressing the panel in person at the appropriate time. We expect to be present at the Ottawa sessions of the panel in October. Thank you for this opportunity to respond.

Yours sincerely,

Elliot Noss

President and Chief Executive Officer

F.1 *What other issues should the Panel take into account in making its recommendations? Please provide specific facts, analysis and suggestions that you think are relevant to the Panel's recommendations?*

1. Heretofore the basic function of telecommunications regulation was to control the behaviour of economic entities within the jurisdiction of the state. The general problem was the monopolistic tendencies of communications economics, which was characterized by declining unit costs and greater returns the larger the network. Regulation was focussed inward to the territory of the state to control the behaviour of the national economic actors.

2. The current debate in the submissions before the TPR dwell on the ways to address the problem of market power of incumbents. Some favour sector-specific regulation, while others favour an approach based in competition policy principles, or some different combination than we currently have.

3. This debate about the proper tools to control market power is important and interesting, and Tucows has made specific recommendations in our original submission on these matters. Nevertheless we will venture to say that this issue, however important it may be now, will decline in *relative* importance as the Internet revolution proceeds. We do not doubt that the control of market power will always be of great, indeed of central importance to telecommunications policy, for a long time to come. Nevertheless we are persuaded that the bundle we have labelled "identifier issues" will grow in importance.

4. Identifiers are the names and addresses whereby machines locate end-points of the network where the person sought can be found. Telephone numbers, which are under the jurisdiction of the CRTC, and derive from the ITU, have traditionally served as these identifiers. Now identifiers are being created and shaped by institutions like the Internet Engineering Task Force[1], and influenced by such entities as ICANN. The IETF is not under any particular national jurisdiction, and ICANN functions in a complicated relationship to the US Government. In addition, private, non-universal systems, such as Skype and Instant Messaging, are being created.

5. The Internet revolution has been accompanied by new forms of identifiers, of addressing and naming systems, which are not tightly bound to national jurisdictions. These identifiers have been created – and are being created - in forums in which governments in the past have had little influence, and may not be able or even wish, to exercise much influence.

6. The Canadian government has a legitimate interest in the universality of the communications network. The basic bargain that created the Bell system in

[1] http://www.ietf.org/

1919 was “universal service”, which gradually ended the islands of subscribers to municipal systems who could not communicate with each other. The price that was paid to obtain the one integrated end-to-end system was the Bell system monopoly in long-distance. Now that voice telecommunications is a horizontally disaggregated application riding on a transport layer, universal naming and addressing systems do not need to come at the price of monopoly in the transport layer.

7. The interest of the government in universal addressing and naming system or systems does not mean either of the following:

   - That the definition of universal service should be restricted to time-division multiplexed (TDM) PSTN service over copper pair, nor
   - That private, non-universal addressing and naming systems should be restricted or somehow disfavoured.

8. The interests of the government in naming and addressing systems may be more extensive than the preservation of universal service or services only. The arrangements for the governance of the telephone numbering system are overseen in order that they may not be used as a source of undue competitive advantage. As the telephone numbering system shifts into a domain name-based scheme over the next few years, naming and addressing systems will be a matter where the government will want to be aware of the changes and keep an eye out for anti-competitive behaviour.

9. The current arrangements for the assignment of telephone numbers to users will probably not continue unchanged if these arrangements become a source of undue competitive advantage for one class of carrier over another. Moreover, if a universal system of identifiers, such as telephone numbering, is to be maintained while the technical basis of using those numbers undergoes the transformation to IP-based technologies, then it is likely that this quiet backwater of numbering administration will need to be more actively managed or looked after by government than it is now.

B.25 Should the regulatory framework for numbering be changed? If so, how and by whom should telephone numbers be administered?

B.26 Over the next 10 years, is there likely to be a new method of assigning addresses to telecommunications devices which would replace traditional numbering? If so, what might that method be, who should administer it, and how?

Naming and Addressing : Identifiers and the Future of Telecommunications

10. Tucows considers that these innocuous questions open a large and vital issue-area whose importance is only beginning to be appreciated. We have labelled this issue *network identifiers*.

11. There are five principal types of naming and addressing scheme at use or proposed in the world today relevant to telecommunications policy. (Many others addressing schemes exist of course, such as postal addresses and universal product codes, which we exclude from this discussion):

    - The e164 telephone numbering system
    - The IP addressing system
    - The Domain Name System, which converts human-readable words into IP addresses
    - Peer-to-peer schemes, such as Skype, and Instant Messaging
    - Conversion databases, such as ENUM, which translate e164 numbers into domain names and the DNS look-up system

Table 1: Characteristics of Identifier Schemes

Type of identifier	Supports development of further namespaces by third parties?	Vertically integrated or disaggregated?	Globally unique?	Supports deployment by third parties of applications?	Supports inter-operability of networks?
E164 Telephone numbers	no	Vertically integrated	yes	no	no
IP addressing	yes	disaggregated	yes	yes	yes
DNS	yes	disaggregated	yes	yes	yes
Skype and other peer-to-peer	Specific to the network	Vertically integrated	no	Specific to the network	Specific to the network
ENUM	no	disaggregated	yes	yes	yes

Legend:
Supports development of further namespaces by third parties – This means that others can use the namespace or addressing scheme to develop other, newer namespaces without the permission of the developers of the older namespace.
Vertically integrated or disaggregated – This means that the addressing scheme is tied to a particular service, or not.
Globally unique – Is there only one address of its kind in the world?
Supports deployment by third parties of applications?- This means that others can deploy applications using that addressing scheme without permission of the developers of the older addressing scheme.
Supports interoperability of networks – Networks running on different internal operating systems can use the addressing scheme.

12. There are other important identifier schemes not covered in this discussion. One such system is the universal product codes. When combined with RFID (radio frequency identifier) devices, these will allow a universal system of tracking products through every stage of the production and world-wide distribution process. The Universal Product Code system may soon be worth more than the entire Domain Name System. Another is the Ethernet "mac" address, which makes the Ethernet device visible to the network. This globally unique scheme adapts the physical Ethernet transport device to IP numbers (addresses).

13. The main points we wish to make about the DNS and newer network identifiers, most of which are based in IP addresses, are as follows :
    - They support innovation by third parties in applications or namespaces without permission
    - They are devised in technical forums outside of Canada, outside of national jurisdictions, and outside of the treaty-based ITU;
    - They will replace or supplant telephone numbers in a much faster time-frame than some intervenors appear to contemplate;
    - They will become the means whereby « calls » are terminated, or to use a less phone-centric term, the way machines will locate humans through the Internet;
    - So that, while telephone *numbers* will still exist, the technologies which make them work, that is, resolve to persons or devices, will be grounded in the Domain Name System (the DNS) and a set of standards and standards-making bodies in which governments have had little say or interest to date, and
    - If governments want to have a voice in these developments, they will need to develop capacities to act, directly or indirectly, in international or non-governmental forums where national jurisdiction may not be asserted.

Telephone Numbering

14. Telephone numbering used to be the most significant form of identifier. They used serve three functions simultaneously : a customer identifier, a terminal device identifier, and a routing instruction as to how to reach that device, and the persons associated with the device, could be reached.

15. Telephone numbers are a *standard* of the International telecommunications Union. The name of that standard is *e164*. Telephone numbers are referred to as *e164 numbers* after the standard of the ITU.[2]

16. In North America and those countries belonging to Country Code 1, telephone numbers are administered by the North American Numbering Plan Administration[3], which has delegated the administration of Canadian numbering to the Canadian Numbering Administration (CNA)[4]. Country Code 1 numbering arrangements are a matter that telephone companies have cooperatively arranged among themselves, with accommodations being made to wireless operators and, more recently, VoIP operators. Nevertheless, the right to assign telephone numbers is held and exercised by an agency hired by telephone companies under the jurisdiction of the national telecommunications regulator The CNA website explains the arrangements as follows :

> "The mandate of the CNA (Canadian Number Administrator) is to provide a numbering administration service to the Canadian telecommunications industry under contract to the Canadian Numbering Administration Consortium Inc. The administration of Canadian numbering resources are under the regulatory oversight of the Canadian Radio-television and Telecommunications Commission (CRTC). CNA functions include central office code administration, the processing of applications for North American Numbering Plan (NANP) resources and other telecommunications numbering resources, and includes Canadian Steering Committee on Numbering (CSCN) secretarial duties."

17. Section 46.1 of the *Telecommunications Act* grants the CRTC the authority to administer numbering resources in Canada.

    46.1 The Commission may, if it determines that to do so would facilitate the interoperation of Canadian telecommunications networks,

    (a) administer

    (i) databases or information, administrative or operational systems related to the functioning of telecommunications networks, or

[2] http://www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=T-REC-E.164
[3] http://www.nanpa.com/
[4] http://www.cnac.ca/

(ii) numbering resources used in the functioning of telecommunications networks, including the portion of the North American Numbering Plan resources that relates to Canadian telecommunications networks; and

(b) determine any matter and make any order with respect to the databases, information, administrative or operational systems or numbering resources.

Industry Canada remains responsible for coordinating the Canadian position on numbering with the International Telecommunications Union (ITU).

Any numbering resources allocated to Canada by any entity become national public resources to be managed under numbering guidelines approved or mandated by the CRTC. In general, such guidelines are developed or adopted by the CSCN, agreed by the CRTC Interconnection Steering Committee (CISC), and approved by the CRTC.[5]

ENUM

18. ENUM is a translation database that takes telephone (e164) numbers and translates them into domain names. They may be pictured as a telephone number, written out in its normal form, [e.g. 1-613-992-4210] but printed as a hyperlink in coloured ink, which, when activated, leads to instructions as to how to reach a person.

19. As the PSTN collapses under its own inherited costs, carriers will seek to move the function of call completion to a DNS-based architecture. This avoids the inter-carrier settlement regimes of the PSTN. It allows cable companies and others to route calls without ever passing through the PSTN.

20. Once the Internet Engineering Task Force developed Session Initiation Protocol (SIP)[6], it was a foregone conclusion that consumers would eventually use the Internet for voice communications. SIP-based VoIP constitutes the deployment of an efficient, more robust, and functional communications, which will be marketed to consumers and will seamlessly combine voice, video, text and whatever new technologies may come along in the near and distant future.

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[5] http://www.crtc.gc.ca/cisc/eng/cisf3fg1.htm CSCN Adjunct to the CRTC Industry Steering Committee Administrative Guidelines

[6] RFC 3261 http://www.faqs.org/rfcs/rfc3261.html

21. Naming and addressing mechanisms for the PSTN and the Internet are not the same. VoIP calls that originate on one service provider's network, and which must terminate on another VoIP network, must default to the PSTN for completion. In other words, there is no authoritative database mapping e164 telephone numbers to SIP Uniform Resource Indicators (URI).

22. ENUM, whether it is made available to subscribers, or remains a purely carrier-based implementation, will allow calls between various VoIP providers to be completed without the need to make the address look-ups in the PSTN. They will also enable different forms of carrier to complete "calls" without the transmissions ever passing through the equipment of the PSTN. Thus cable operators, for instance, or anyone else, could provide a universal telephone service, using e164 numbers, without having to rely on the obsolescent PSTN.

The government's interest in identifier issues

23. The existence of transnational standards that lie outside the jurisdiction of states or even their accustomed international treaty-based organizations should be the subject of discussion in the TPR submissions and in the Panel's deliberations. In brief:
    - Numbering and identifier issues are central to the operation of networks,
    - Certain identifier schemes permit innovation while others do not;
    - IP-based identifiers are the subject of transnational standards
    - communications policy needs to accommodate this change; and
    - The Spectrum, Informatics and Telecommunications sector Department of Industry (the old Department of Communications) is in Tucows opinion the right organization to assume responsibility for these matters.

    The ministerial department has certain advantages and existing legal responsibilities that make it the natural focus for dealing with these kinds of issues, to the extent government can be involved. Regulatory tribunals are probably not well suited to the kind of international work that is involved in Internet standards-setting.

25. The question then would arise whether the CRTC is best equipped to handle database administration issues. It would seem evident that there must at a minimum be coordination between the international representative and policy-making functions of Industry Canada in identifier issues and the subsequent

administration of databases and numbering resources by the CRTC. A more active attention to these matters may be in order.

25. Another factor to be considered in our submission is the relative speed and efficiency of net-based decision-making organizations versus the baroque convolutions of the older telco-based standard-setting organizations. Government will have to act faster than in the past to keep apace of changes in these fields.

Review of the Main Points in the TPR

26. In the briefest possible terms, this is what Tucows sees as the arguments:

    - The incumbent Bell is deeply concerned to shake up the CRTC and move telecom regulation from a before-the-fact approval of rates to an after-the-fact examination by Competition Policy tools and intellectual constructs. Bell is deeply concerned that their lunch is about to be eaten by the cable industry.

    - The larger CLECs want to maintain detailed sector-specific regulation in order to be able to access the customer through the incumbents' networks.

    - The cable industry is sanguine about the incumbent telephone companies' plight and proposes a more competition-policy style of regulation when the playing field has been levelled, that is, when market share in the telephone market is reduced.

    - The CRTC looks back in contemplation of the evolution of telecommunications over seventy five years and declares itself largely satisfied with its good works, though it needs a few more regulatory tools to do its job better, and might be open to competition policy people jointly sitting in with the Commissioners on issues of market power.

27. Bell's leadership has seen the future and they do not like it. They are acutely conscious that the pace of change is accelerating and that viable cable-based broadband competition is available now. The debate before the TPR is couched in terms of

    - Should there be sector-specific regulation at all, and
    - Should there be multiple goals for telecommunications policy or not?

- What is the appropriate share of responsibilities between the Bureau of Competition Policy and the CRTC in telecommunications regulation?

28. Tucows considers that:

29. Yes, there should be sector-specific telecom regulation. The experience of New Zealand showed that competition policy principles were completely inadequate to secure interconnection by competitors.

30. The maintenance of common carrier obligations, which is itself desirable, also includes rights of access by competitors or customers to facilities. Interconnection by competitors to the networks of incumbents poses difficult regulatory tasks, we acknowledge. It also requires a comprehensive model of how networks operate in an IP-centric universe. Operators should have access to cable-based facilities as well as telco-based facilities.

31. The establishment of alternative networks likewise demands close attention to the attempts of incumbents to foreclose those opportunities by pricing and other anti-competitive techniques. Investors will not get into the field if there is doubt about their ability to reach customers, or if the prospects of eternal regulatory battles deter them.

32. Spectrum policy needs to catch up to the era of intelligent edge devices which can sort through noise and interference. Spectrum policy assignment and allocation is predicated on pre-computer stupid devices. This must stop, and spectrum policy should welcome the creation of new wireless networks that can aggregate traffic and put it on existing or new wire-based facilities.

33. The goal of telecom policy is to augment national wealth. This is broad enough a criterion to allow many kinds of argument for services to remote regions and other social policies. It is also simple enough to focus the minds of regulators on the main task and not allow them to skate among objectives.

34. Unless the CRTC is shaken up and refocused, it will continue to see the future in terms of the past (such as, its VoIP decision). Changing the Commission's statutory goals would be a good way to change organizational behaviour.

35. The key point in the Tucows' submission is that someone must start taking into account the engineering and code aspects of networks in all decisions about networks. The regulators need to empowered to think about the design principles of networks as such, rather than tariffs, interconnection, and just and reasonable rates. Whether this should be ensconced in legislation, or only in the management responsibilities of the agencies involved, is an open question on which more debate should occur.

36. Government has an interest in the nature of the networks, to foster innovation through open platforms.

37. The innovation in network principles which is represented by the Internet has led to most, if not all, the innovation we have seen in the past twenty five years in ICT. Regulators and policy makers need to be conscious of the innovations (World Wide Web, email, peer-to-peer communication etc) which the end-to-end principle of network design have made possible, and to preserve an engineering design principle because it is compatible with innovation and the wealth creation which has accompanies it.

38. On the balance of responsibilities issue, Tucows inclines to the view that the Telecommunications Act needs amending and that the mandate and operations of the CRTC need to be reconsidered in the light of such an exercise. Several possible changes were put forward for consideration in Tucows' first submission: fewer telecom commissioners, severing the broadcasting regulatory functions from the telecom regulatory functions, making the commissioners write their decisions as they do in the Copyright Appeal Board, and limiting the goals to one only. These suggestions are subordinate to the main conclusion that the Commission needs reforming. Statutory change is an effective way of causing institutional change. Other methods are also available.

Network Design, Addressing Design, Innovation and Prosperity

39. Just as Tucows has been concerned with the relationship of network design to innovation, and therefore to the nation's economic prosperity, so we have been concerned with the relationship of addressing and namespace design to innovation and prosperity. We are asking that telecommunications policy-makers lift their eyes from the details of regulation and government structure to the goal of greater prosperity through innovation. Some designs thwart innovation, others welcome it. The openness to innovation of particular network and addressing systems has not been considered as a criterion for deciding between outcomes in telecom policy. It should become so.