

Contribution to the 2015 Open Consultation of the ITU CWG-Internet

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Abstract

It is generally agreed that Internet Exchange Points (IXPs) can help to reduce the cost of international Internet connectivity and to increase local service offers. But other means can also reduce the cost of international Internet connectivity, and IXPs can have other benefits, in particular increasing security and data privacy, and protecting against illegal mass surveillance.

This contribution explores the issues mentioned above and suggests possible follow-up work, in particular to address issues that have been priority issues since at least 2005: reducing the cost of international Internet connectivity for developing countries, and improving security (which includes data privacy and protection against mass surveillance).

1. Background and Introduction

On 3 February 2015 the Council Working Group decided that Open Consultations would be convened on the following issue:

"With a view to discussing the establishment of Internet Exchange Points (IXPs) to advance connectivity, improve service quality and increase network stability and resilience, fostering competition and reducing interconnection costs, as proposed by Opinion 1 of WTPF-13 and consistent with PP-14 Resolutions 101 and 102, stakeholders are invited to elaborate and exemplify on the challenges faced and identify widely accepted best practices for the design, installation and operation of IXPs."

It is generally agreed that IXPs can contribute to reducing interconnection costs and broadening network access (*recalling* (a); *considering* (a) and (b); and *is of the view* (a) and (b) of WTPF-13 Opinion 1²). And that local content capacity in developing countries should be encouraged and supported within the enabling environment that local/ regional IXPs provides (*is of the view* (e) of WTPF-13 Opinion 1).

Article 3.7 of the 2012 International Telecommunication Regulations (ITRs) states that "Member States should create an enabling environment for the implementation of regional telecommunication traffic exchange points, with a view to improving quality, increasing the connectivity and resilience of networks, fostering competition and reducing the costs of international telecommunication interconnections".³

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² <http://www.itu.int/md/S13-WTPF13-C-0016/en>

³ The term "Internet" does not appear in this provision, but it nevertheless does refer to IXPs, see pp. 97-98 of Hill, Richard, *The New International Telecommunication Regulations and the Internet: A Commentary and Legislative History* (Schulthess/Springer, 2013).

It is also generally agreed that IXPs are not the only means that can contribute to reducing international Internet interconnection costs. According to Supplement 2 to Recommendation ITU-T D-50⁴ the following means should be considered:

1. Establishment of Internet exchange points (IXPs)
2. Development of local services including local hosting and local applications
3. Access to landing points for submarine cables and related issues
4. Mirror sites and caches
5. Additional infrastructure
6. Submarine cable build out
7. Implementation of elements of ITU-T D.50

It is worth recalling that the three highest-priority issues identified by the Working Group on Internet Governance (WGIG) in 2005 were⁵:

1. Unilateral control by the United States Government of the administration of the domain name system root zone system and files.
2. Uneven distribution of interconnection costs.
3. Improving security and reducing spam.

As already noted, IXPs can contribute to WGIG issue 2 by reducing international interconnection costs. They can also contribute to issue 3 because development of local services including local hosting and local applications may help to improve security. But it must be stressed that IXPs are not the only means to be considered in order to reduce interconnection costs or to improve security.

In what follows we will focus on some relevant aspects of the installation and operation of IXPs: direct and indirect reductions in costs, and improved security and data privacy. We conclude by suggesting follow-up issues that could be discussed in CWG-Internet in the future.

2. Direct reduction in the cost of international interconnection

As stated in 3.1 of ITU-T D.50 Suppl. 2, IXPs allow exchanges of local Internet traffic between two Internet service providers within the same country, thereby saving on the use of international bandwidth. The more Internet service providers (ISPs) concentrated in one IXP, the better the economic equation. Also, the joint leasing of bandwidth achieves a considerable reduction of the cost per Megabit.

However, to the extent that content is located outside a country, the issue of relatively high international interconnection costs will persist even after IXPs are implemented. As stated in 3.7 of ITU-T D.50 Suppl. 2, the current international Internet connection model operates, in the case of transit traffic, on the assumption that the receiver pays the cost of connection. Operators in developing countries thus pay the cost of Internet connection as far as the global Internet provider's point of presence (POP), as well as paying for use of the point of presence and for transit. Thus users in

⁴ <http://www.itu.int/rec/T-REC-D.50-201305-!Sup2/en>

⁵ See paragraphs 15-17 of the cited report, available at: <http://www.wgig.org/docs/WGIGREPORT.pdf>

developing countries pay the full costs of international Internet interconnection while users in developed countries pay no such compensation to operators in developing countries. A model is therefore required that will allow cost sharing, although the traffic element remains a key element in measuring the use of a given link. (Some analysts take a different view, and consider that other factors, such as network value, could also be used).

According to 3.7 of ITU-T D.50 Suppl. 2, some take the view that the mechanisms to be established must take into account the costs engendered by the activities of the various players in the value chain, in particular regarding investment costs. From this point of view, the full set of users of the international Internet interconnection infrastructure should each bear a portion of the cost, according to its use of the infrastructure. In this way, each player will contribute to financing the cost of the infrastructure in an objective matter, and will contribute to the development and deployment of the international Internet connectivity (IIC) infrastructure, and will thus contribute to reducing the digital divide between the North and the South.

However, as pointed out in a presentation by ISOC⁶, most IXPs don't publish traffic data, so it is hard to know what the actual impact of an IXP is with respect to traffic. Further, much Internet interconnection is done on a barter basis, without precise measurement of traffic volumes, or consideration of the economic value of the exchanged traffic.⁷ According to an OECD paper⁸, a survey of 142'000 peering agreements conducted shows that the terms and conditions of the Internet interconnection model are so generally agreed upon that 99.5% of interconnection agreements are concluded without a written contract.

According to that paper, some developing countries still suffer from the effects of lack of competition or regulatory liberalization. Evidence shows that, when allowed to do so, market participants will self-organize efficient Internet exchange points, producing Internet bandwidth to the benefit of the local economy and significantly reducing their costs, including in foreign currency. This course of action is strongly recommended in economies that do not yet have abundant domestic means of Internet bandwidth production.

Others argue that lack of competition at the international level is also a factor that must be considered.⁹ Specifically, it has been said that lack of regulation of the Internet, coupled with no or little competition in the Internet access value chain, results in powerful developed-country ISPs holding sway over the

⁶ See page 17 of https://ripe70.ripe.net/presentations/99-ISOC_RIPE-70_Internet-Environ-13-May-Jane-Coffin.pdf

⁷ Weller, D. and B. Woodcock (2013), "Internet Traffic Exchange: Market Developments and Policy Challenges", *OECD Digital Economy Papers*, No. 207, OECD Publishing, Paris.
DOI: <http://dx.doi.org/10.1787/5k918gpt130q-en>

⁸ *Ibid.*

⁹ See <http://www.itu.int/ITU-T/studygroups/com03/iic/index.html> ; http://www.itu.int/ITU-D/finance/work-cost-tariffs/events/tariff-seminars/Geneva-IIC/pdf/Session2_TSFAK_presentation_en.pdf

market; and that high concentration in the international bandwidth market, implies less competition and strong downward price rigidity.¹⁰

As noted above, it is difficult to obtain sufficient data to be able to determine whether there is lack of competition at international level, and, if so, what effect that has on the cost of connectivity for developing countries. In that context, it is regrettable that various proposals to add an article regarding transparency of international pricing to the 2012 International Telecommunication Regulations were not accepted.¹¹

But a theoretical argument indicates that the undisputed fact that IXPs do result in lower costs for international Internet connectivity is itself an indication that there may be lack of competition at the international level. With present technologies, the marginal cost of carrying traffic does not really depend on distance: it costs more or less the same to send data around the world as across a country. But there are significant economies of scale in switching and routing, so a large routing center is more efficient, and less expensive per unit of traffic, than a small routing center¹². Thus one might expect that it would be economically efficient to concentrate traffic switching and routing in a few large international centers, and that the resultant cost savings would compensate for the extra distance travelled by traffic. If this is not the case, then perhaps the prices charged for international connectivity don't appropriately reflect costs, perhaps because of the lack of competition posited above.

Of course IXPs have benefits other than reducing costs, for example lower latencies resulting in better quality of service. And IXPs can result in improved service offers at the national level.

3. Indirect reduction in the cost of international interconnection through localization of services

As stated in 3.1 of ITU-T D.50 Suppl. 2, all the traffic generated by proprietary applications of the ISPs, such as the user mails of each ISP, remain within the IXP traffic, as well as the services each one can offer on the Internet, for example, the webpages hosted by any of the ISPs. This reduces international traffic. And an IXP can provide content caches. This also reduces access times and the need for international bandwidth.

As stated in 3.2 of ITU-T D.50 Suppl. 2, policy makers could examine the development of domestic content hosting services and look for ways to promote the development of a local content hosting as a way to reduce international transit costs and increase the speed of content storage and delivery.

Clearly reducing the volume of traffic that moves internationally will lower the cost of international Internet connectivity. But there are also other benefits to localized service offers.

¹⁰ See pp. 7-8 of the Report of the 23-24 January 2012 ITU Workshop on Apportionment of Revenues and International Internet Connectivity, available at: <http://www.itu.int/oth/T065B00000F/en>

¹¹ See p 59 of Hill, Richard, *The New International Telecommunication Regulations and the Internet: A Commentary and Legislative History* (Schulthess/Springer, 2013).

¹² An example of such a situation is given on p. 10 of Daigle, Leslie, "On the Nature of the Internet", GCIG paper no. 7, available at: https://ourinternet-files.s3.amazonaws.com/publications/gcig_paper_no7.pdf

4. Other benefits arising from localization of services

As stated in *considering* (d) of a proposal submitted to the 2014 Plenipotentiary Conference by India¹³: “at times, communication traffic originating and terminating in a country also flows outside the boundary of a country making such communication costly and to some extent insecure, and may result in violation of privacy even without any recourse to address the privacy violation issue citing non applicability of privacy protection laws to non-citizens or by having different laws for citizens and non-citizens;”. (That proposal was criticized, but some of the criticism does not appear to be valid.¹⁴)

As noted above, implementation of an IXP will result in less traffic leaving the country and, depending on the national legal regime, that might result in better protection of data privacy. However, precautions should be taken to protect the IXP from intrusions, for example by foreign government agencies that practice mass surveillance.¹⁵

States have the obligation to refrain from violating human rights, but they also have the obligation to protect their citizens from violations of human rights. Thus states have an obligation to take measures to protect their citizens from mass surveillance that violates their human rights, and in particular from the activities of states that take the view that international law does not oblige them to protect the rights of non-citizens¹⁶.

In this context, it is important to recall that the ITU Constitution has, since its inception in 1865, included an article on Secrecy of Telecommunications. At present, it is Article 37, but the present text is weak and should be strengthened, see for example a proposal¹⁷ submitted for information to the 2014 Plenipotentiary Conference by a group of civil society organizations.

Minimizing unnecessary international data flows could be a method to protect citizens against mass surveillance, even if it might not be effective with respect to the activities of the few states¹⁸ that have the financial and technical ability to carry out mass surveillance on a global scale.

¹³ Document 98, available at: <http://www.itu.int/md/S14-PP-C-0098/en>

¹⁴ See <http://www.ip-watch.org/2014/11/05/what-is-happening-at-the-itu-plenipotentiary-conference/>

¹⁵ A good review of mass surveillance, and an explanation of why it violates human rights, can be found in the Report of the Office of the United Nations High Commissioner for Human Rights on The right to privacy in the digital age, A/HRC/27/37, available at: http://www.ohchr.org/Documents/Issues/DigitalAge/A-HRC-27-37_en.doc . See also pp. 125-126 of the Internet Society Global Internet Report 2014, available at: https://www.internetsociety.org/sites/default/files/Global_Internet_Report_2014_0.pdf

¹⁶ Such as the USA, see pp. 1-2 of the United States Response to the Questionnaire on the “Right to Privacy in the Digital Age”, available at: <http://www.ohchr.org/Documents/Issues/Privacy/United%20States.pdf>

¹⁷ See pp. 2-3 of <http://www.itu.int/en/plenipotentiary/2014/Documents/publicview-HCHR%20report%20.pdf>

¹⁸ In particular, the USA, which still does not apply judicial review to surveillance of non-US persons, see <https://www.eff.org/deeplinks/2015/05/usa-freedom-act-passes-what-we-celebrate-what-we-mourn-and-where->

However, other means could also be envisaged, such as use of nationally-produced hardware and software, in order to protect against back-doors and such that may be installed in hardware and software that is acquired abroad.

And one might even envisage requirements for local data processing (in particular for sensitive data such as government records, health data, etc.), even if such requirements might have negative cost impacts¹⁹. Indeed, safety and health requirements typically do increase costs and may reduce globalization, for example safety standards for cars and airplanes, safety and efficacy tests for pharmaceutical products, standards regarding working conditions, and so forth.

Thus higher costs, reduced globalization, and reduced market efficiency are not, in and of themselves, a sufficient argument against data localization. Similarly, arguments based on the current technical architecture of the Internet²⁰, and its so-called invariants, are not convincing, because technology must adapt to policy, and not the other way around. For example, cars are engineered to comply with pollution standards, it is not pollution standards that are designed to comply with existing car performance.

5. Proposals for future discussions in CWG-Internet

Following up on the discussions regarding IXPs, it is proposed that CWG-Internet consider in the future two issues which were identified as priorities by WGIG in 2015 and which still remain priority issues: reducing international interconnection costs for developing countries, and improving security. Specifically, it is proposed that CWG-Internet consider the following issues:

- a) What means, other than IXPs, should be considered to reduce international interconnection connection costs, in particular with reference to Supplement 2 to Recommendation ITU-T D.50.
- b) What means, other than IXPs, should be considered in order to improve security and data privacy.

[we-go-here](#) and <https://www.eff.org/deeplinks/2015/04/new-usa-freedom-act-step-right-direction-more-must-be-done>

¹⁹ A discussion of negative effects of data localization requirements is given on p. 127 of the cited Internet Society Global Internet Report 2014, available at:

https://www.internetsociety.org/sites/default/files/Global_Internet_Report_2014_0.pdf

²⁰ See for example pp. 11-12 of Daigle, Leslie, "On the Nature of the Internet", GCIG paper no. 7, available at:

https://ourinternet-files.s3.amazonaws.com/publications/gcig_paper_no7.pdf