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General tariff principles – Principles applicable to GII-Internet

International Internet connection

Supplement 2: Guidelines for reducing the costs of international Internet connectivity

Recommendation ITU-T D.50 – Supplement 2

Recommendation ITU-T D.50

International Internet connection

Supplement 2

Guidelines for reducing the costs of international Internet connectivity

Summary

Supplement 2 to Recommendation ITU-T D.50 proposes guidelines for reducing the cost of international Internet connectivity, including (but not limited to) the establishment of Internet exchange points (IXPs), mirror sites, submarine cable rollout and local content development.

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FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

The price of broadband access plays a critical role in terms of broadband diffusion. While broadband is becoming more affordable worldwide, with prices falling everywhere, it nonetheless remains unaffordable in many parts of the developing world.

Thus, it is important to find ways and means to reduce the cost of Internet subscriptions. This supplement outlines various measures that can be considered in view of achieving that goal.

Recommendation ITU-T D.50

International Internet connection

Supplement 2

Guidelines for reducing the costs of international Internet connectivity

1   Scope

This supplement proposes guidelines for reducing the cost of international Internet connectivity (IIC), including (but not limited to) the establishment of Internet exchange points (IXPs), mirror sites, submarine cable rollout and local content development.

2   Abbreviations and acronyms

This supplement uses the following abbreviations and acronyms:

ccTLD   country code Top-Level Domain

CDN   Content Delivery Network

DNS   Domain Name System

ICT   Information and Communication Technology

IIC   International Internet Connectivity

ISP   Internet Service Provider

IXP   Internet Exchange Point

NAP   Network Access Point

OTT   Over-The-Top

POP   Point of Presence

SME   Small and Medium Enterprise

3   Ways and means to reduce the cost of international Internet connectivity

Several reasons can be cited for the high Internet access tariffs in sub-Saharan Africa, including (see clause IV.2 of [ITU-T TD26][1]):

• inadequate investment in telecommunications

• unfavourable economic market conditions

• lack of competition in some market segments

• international Internet connection costs.

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[1] ITU-T SG3 Plen/3, Document TD 26-Plen to SG3 meeting of May 2013. ITU/BDT Study on international Internet connectivity in Sub-Saharan Africa. <http://www.itu.int/md/T13-SG03-130527-TD-PLEN-0026/en>

Because of structural adjustment programmes and the reform of the telecommunications sector, investment in national backbone infrastructures has not been sufficient to serve either suburban or rural areas or to provide innovative and quality services for people living there. However, if reforms are undertaken, markets are liberalized, and the incumbent operator is privatized, then there can be greater incentives for investments in infrastructure (see clause IV.2.1 of [ITU-T TD26][1]).

Unfavourable market conditions include the lack of a local information and communication technology (ICT) production industry, insufficient demand for Internet connections, and limited market size (see clause IV.2.2 of [ITU-T TD26][1]). These conditions can be mitigated by incentives for the production of local content and local services, such as e-mail servers, and by promoting the use of country domain names (see clauses V.1.1.1 and V.1.1.3 of [ITU-T TD26][1]).

Steps should be taken to create a competitive market, in particular by ensuring that incumbent operators do not restrict competition, for example by denying access to the wired local loop or to the international connections (see clauses III.2 and IV.2.3 of [ITU-T TD26][1]).

3.1 Establishment of Internet exchange points (IXPs)

Internet exchange points (IXPs) have been established successfully in some countries. These allow exchanges of local Internet traffic between two Internet service providers within the same country, thereby saving on the use of international bandwidth (see clause V.1.1.2 of [ITU-T TD26][1]). IXPs should also be created and efforts should be made to promote traffic exchange at the regional level, as has been the case with the Mombasa regional IXP in Kenya (see clause V.1.1.2 of [ITU-T TD26][1]).

Regional interconnection of infrastructure must be encouraged in order to facilitate the exchange of Internet traffic locally without using international bandwidth (see clause V.1.1.2 of [ITU-T TD26][1]).

The more Internet service providers (ISPs) concentrated in one IXP, the better the economic equation. 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. Also, the joint leasing of bandwidth achieves a considerable reduction of the cost per Megabit (see p.23 of [ITU-T TD25][2]).

Other effects that result from the creation of network access points (NAPs) are the following (see p.24 of [ITU-T TD25][2]):

i) An IXP can mirror a domain name system (DNS) root server, thereby reducing search times and the need for international traffic.

ii) Implementation and greater use of the national country code top-level domain (ccTLD) in order to increase local content.

iii) An IXP can provide content caches. This also reduces access times and the need for international bandwidth.

iv) An increase in the geographical area of Internet service provision (improved capillarity).

v) A reduction of the cost of bandwidth for the providers; in some cases a very important reduction.

vi) An increase in the quality of service provided.

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[2] ITU-T SG3 Plen/3, Document TD 25-Plen to SG3 meeting of May 2013. ITU/BDT Study on international Internet connectivity – Focus on Internet connectivity in Latin America and the Caribbean <http://www.itu.int/md/T13-SG03-130527-TD-PLEN-0025/en>

vii)   The possibility of providing broadband to locations which are far from urban centres.

viii)   The development of small and medium enterprises (SMEs) in this sector.

3.2   Development of local services including local hosting and local applications

Empirical research shows that there is a strong correlation between the development of network infrastructure and the growth of local content, even after checking for economic and demographic factors (see p.4 of [ITU-T TD27][3]).

That is, there is a strong correlation between local content, infrastructure development and access prices, but it is the empirical research that is not able to positively determine the direction of causality due to data constraints and complex mutual dependencies. What is most likely is that these three elements are connected and feed into each other in a virtuous circle. The interlinkages between the different elements lead to three key lines of policy considerations evolving out of this research: fostering content development, expanding connectivity and promoting Internet access competition (see p.5 of [ITU-T TD27][3]).

Local content is growing very fast in volume, often at astonishingly high rates. Further, its composition is changing and local content is no longer dominated by developed countries. Various measures show that developing countries are quickly becoming important sources of content and that their share of global content creation is increasing. The growth of local content varies across countries and is tied to enabling factors such as the level of Internet infrastructure development (see p.5 of [ITU-T TD27][3]).

Creating local content, then recording and distributing it, benefit from a specific set of skills and tools. Governments, especially ministries of education, should evaluate the level of multiple skills, such as ICT skills, knowledge and attitudes which would lead to the critical mass of competences existing at local level and take appropriate measures to create an enabling learning environment. Key steps include improving basic literacy (e.g., drafting, language, etc.), critical thinking ability, as well as media, information and digital literacy skills. Policy steps to improve ICT, digital, media and information literacy should include both the formal educational system and lifelong learning. Targeted programmes aimed at certain segments of the youth and adult population can also teach necessary skills to members in a community who can then help others to create, record and disseminate local content (see p.5 of [ITU-T TD27][3]).

Government should take action regarding the hosting of all webservers with a ccTLD within the country (e.g., the .sn servers should be located in Senegal).

In addition to Internet connectivity, ICT equipment such as computers, mobile phones, cameras, scanners and audio/video recorders are important tools for digital content creators. Any trade barriers, taxes or levies that limit the development, production and importation of these devices, or increase their cost, could have a negative effect on local content creation and distribution at the local level (see p.5 of [ITU-T TD27][3]).

Software is an important component of digital content creation but its cost can mean that it is beyond the reach of many users. Open free online tools and materials, as well as open access to content, especially local scientific content, are an increasingly important way for users throughout the world to access sophisticated software, tools and services that can help in all steps of content creation (see p.5 of [ITU-T TD27][3]).

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[3] ITU-T SG3 WP1/3, Document TD 27-WP1 to SG3 meeting of September 2012. Report by ISOC, OECD and UNESCO: The relationship between local content, Internet development, and access prices <http://www.itu.int/md/T09-SG03-120903-TD-WP1-0027/en>

Some of the key components of content development are the collection, localization and preservation of content to be disseminated. Anything that helps to reduce the price of recording media for content creators and distributors can help to promote the recording and dissemination of local content. Some countries have chosen to impose levies on blank media (e.g., CDs and DVDs) as a way to help compensate artists for illegal copying of their work. These levies may benefit certain content creators receiving compensation as part of a licensing collective but the blanket nature of the levies means that many other content creators outside the collective must pay more to record and distribute their original content (see p.6 of [ITU-T TD27][3]).

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 (see p.6 of [ITU-T TD27][3]).

Governments collect and distribute information that is both relevant to communities and local in nature and should be role models for local content creation. Previous work such as the OECD's Council Recommendation on Public Sector Information, or several other normative instruments such as UNESCO's Recommendation concerning the Promotion and Use of Multilingualism and Universal Access to Cyberspace, can help to provide guidance. For example, policy makers should look for ways to make more public-sector information available via new media. This will increase the amount of relevant local content available and help to increase demand for Internet connectivity as a way to access this newly provided content (see p.6 of [ITU-T TD27][3]).

Governments should embrace the idea of openness where public sector data is deemed to be available for use free of charge unless specifically exempted for protection of national security interests, personal privacy, the preservation of private interests or where protected by copyright, or the application of national access legislation and rules (see p.6 of [ITU-T TD27][3]).

3.3 Access to landing points for submarine cables and related issues

Lack of access to submarine cable stations by both national and regional operators can hinder competition. A study needs to be undertaken within Africa with a view to establishing optical fibre links that will give national and regional operators access to submarine cable landing stations (see clause V.1.2.1 of [ITU-T TD26][1]).

A study should also be carried out with a view to interconnecting all the submarine cables serving the east and west coasts of sub-Saharan Africa. This would allow any operator connected to a submarine cable station to have easy access to other submarine cables and buy capacity from or sell capacity to the consortia that own them (see clause V.1.2.1 of [ITU-T TD26][1]).Creating such infrastructure will boost competition in the international Internet connection market by easing access to submarine cable stations. It will also provide an opportunity to ensure the security of all the submarine cable networks in different countries (see clause V.1.2.1 of [ITU-T TD26][1]).

Legislation is required to protect submarine cable landing stations as an essential resource for the provision of telecommunications services and especially Internet connection (see clause V.1.2.2 of [ITU-T TD26][1]).

This will impose de facto obligations for current owners of submarine cable stations with regard to terms and conditions of access to the essential resource, leasing costs charged to access and service providers, quality of service, and infrastructure sharing (see clause V.1.2.2 of [ITU-T TD26][1]).

There are two compelling reasons to adopt such legislation; namely, the significant investment needed to lay a submarine cable and the time required to see such projects through to completion (see clause V.1.2.2 of [ITU-T TD26][1]).

3.4 Mirror sites and caches

As more caches arise across countries and regions, they allow traffic exchange to be localized, and reduce the need to rely on longer-distance backhaul, including notably expensive transcontinental submarine cable capacity. Content delivery networks (CDNs) leverage IXPs to help manage the flow of content.

Content can be distributed worldwide in order to improve the performance of the Internet while reducing the amount of capacity needed. For example, a user can upload a video once onto a cloud-based service in Brazil, which may then use a CDN to distribute the video to caches around the world, often (but not always) located in IXPs. When users around the world request this content, it is delivered from their nearest cache, which speeds the delivery and lowers the cost.

Below, we summarize actions that a number of content providers or vendors have taken to increase local or regional traffic in developing regions.

- Google Global Cache: Google has begun to build out its network into Africa with cache servers and points of presence, to allow YouTube and other content to be made available locally through IXPs. According to Balancing Act, "the presence of Google cache servers has been a major motivation for ISPs and other content providers to exchange content locally". The result is savings on international connectivity, lower latency and increased Internet usage.

- Facebook Zero: Facebook offers a low-bandwidth text version of its mobile site (0.facebook.com), and has negotiated with a number of mobile operators in developing countries to allow consumers to access that page with no data charges. This allows users to access all main features of Facebook, other than viewing photos (which incurs a data charge), but is faster because it is text-only, and saves users money. When announced, Facebook had deals with 50 mobile operators in 45 countries.

- Huawei IDEOS: Huawei has developed a smartphone based on the Android operating system that sells for approximately USD 80 in Kenya – as little as 10% of the cost of unsubsidized high-end phones. The Android operating system is open source, and enables vendors to provide smartphones and tablets at a significant discount to those based on proprietary operating systems. The IDEOS has already sold 200 000 units in Kenya, giving users access to new applications and services that further stimulate demand.

However, other views have been expressed, in particular regarding CDNs. For example, some have stated that operators could host over-the-top (OTT) content, but this would require agreement on a new revenue sharing model for Internet traffic.

3.5 Additional infrastructure

Investment in new infrastructure (such as submarine cables and backbone networks), along with upgrades to increase the capacity of existing infrastructure using the above technologies, has always arisen to meet the demands of new users and applications in the past.

Multinational operators are already choosing to direct their investments to developing regions, which are also benefitting from significant investments from domestic and regional players. The resulting investments should ensure that growth is sustainable. Of course, emerging markets will face challenges similar to, or more acute than, those experienced in developed countries when deploying network infrastructure nationwide, as a result of low income levels and/or high deployment costs in certain regions. According to some, there is no evidence that such shortfalls in meeting demand cannot be addressed with best-practice policy and regulatory solutions that focus on increased investment and access.

However, according to others, there is a shortfall in the revenues available for the build out of additional infrastructure and some countries are taking actions to favour the construction of additional infrastructure, in particular for broadband access.

3.6   Submarine cable build out

The submarine cable network is extensive and covers the whole planet as can be seen by the Teleography graphic available at http://www.telegeography.com/telecom-resources/submarine-cable-map/index.html. In recent years there have been few projects or new layings that can be mentioned; the laying of the submarine cable between Venezuela and Cuba, between Uruguay and Argentina, the Dominican Republic, Jamaica and the Virgin Islands is a good example. The reasons for the low investment in technology are varied, i.e., the existing cables have idle capacity, the investment in new laying is high, and these are projects of extended duration (see p.10 of [ITU-T TD25][2]).

But this is changing, and some of the elements of this change are the multimedia services, the network videos and principally digital television, which are exponentially increasing the use of broadband in the networks, and this includes the submarine cables. Another element to be considered is the obsolescence of the existing technology in the existing networks, the latest technology notably increases the capacity of fibres, and no less important is the transmission and reception time (latency), which is vital to the Internet and to interactive digital TV (see p.10 of [ITU-T TD25][2]).

3.7   Implementation of elements of ITU-T D.50

The current international Internet connection model operates, in the case of transit traffic, on the assumption that the calling party pays the cost of connection. Operators in sub-Saharan Africa are thus forced to 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 (see clause IV.2.4.1 of [ITU-T TD26][1]).

However, the international Internet connection model used today penalizes African operators, who pay the full costs of international Internet interconnection while users in developed countries pay no such compensation to operators in sub-Saharan Africa. 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) (see clause IV.2.4.1 of [ITU-T TD26][1]).

The work of ITU-T is to be commended and should be continued in order to establish mechanisms for implementing Recommendation ITU-T D.50. Although some countries do not agree on the application of that Recommendation, mechanisms will need to be established for sharing the cost of international Internet bandwidth (see clause IV.2.4.1 of [ITU-T TD26][1]).

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 change, 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 contribution to the development and deployment of the IIC infrastructure, and will thus contribute to reducing the digital divide between the North and the South.

4 Results of benchmark studies regarding international Internet connectivity costs

There are a number of reasons for the cost of Internet connection. The first and most important is still the cost of international Internet bandwidth. The tariffs for connection between Africa and Europe bear no comparison with the much lower charges applied between Europe and North America or even between Asia and Europe. These high tariffs are the result of an absence of competition in the international Internet connection market and of the current Internet interconnection model (see clause IV.2.4.2 of [ITU-T TD26][1]).

In particular, the cost of international Internet connection is too high in sub-Saharan Africa compared to the rest of the world. The market is in the hands of a limited number of commercial groups which include the major operators, former incumbent operators and various financial consortia. This market is somewhat non-transparent and monopolistic (see clause IV.2.4.2 of [ITU-T TD26][1]).

There are huge differences in leasing prices between Africa and Europe as compared with those that apply between Europe and North America.

International Internet connection costs make up a significant proportion of the total price charged for wired broadband Internet connection.

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