REGULATORY IMPACT OF CONVERGENCE AND BROADBAND FOR THE AMERICAS

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FOREWORD

We are pleased to present this study for the Connect Americas Summit 2012 on *Regulatory Impact of Convergence and Broadband for the Americas.*

This study contains provides an overview of developments in converged technologies and business models, an overview of policy and regulatory frameworks in the Americas, wireless and wireline broadband in the Americas, regulatory trends in creating an enabling environment, and cross-sector cooperation to promote convergence. It also includes recommendations to promote the rapid deployment and uptake of broadband in the Americas.

As formerly discrete technologies and services have converged, enabling the provision of similar services over multiple platforms, governments, regulators and service providers have had to adjust to new realities in the ICT sector. A key driver of convergence has been the rise of broadband and the explosion in broadband-enabled services across several sectors of national, regional and global economies. Currently, policy-makers are taking steps to encourage and promote convergence, including revising regulatory frameworks to enable convergence and competition, reforming universal service programs, expanding both supply and demand of broadband, addressing the digital divide, and fostering cooperation between the telecommunications sector and other key sectors of the economy.

This report has been prepared by ITU expert Janet Hernández, under the direction of the ITU Americas Regional Office

INTRODUCTION

Beginning in the late 1980s and continuing through most of the 1990s, the countries in the Americas region were focused on the privatization of state-owned operators and the liberalization of the marketplace. These changes yielded the introduction of numerous competitors for fixed and mobile services, the establishment of new regulators, and deployment of new networks, with consumers benefiting from these policies. For the last ten years, new technologies and services have resulted in transformational changes in the communications and information technologies (ICT) sector, not only in the Americas but around the world. Such changes impact the daily lives of citizens in the ways they create and access information, do business, interact with each other, and obtain goods and services. The advent of convergence and the expansion of the Internet, and particularly Internet broadband networks, are often identified as the main drivers of this new ICT landscape.

In the past, networks (different physical infrastructures) were built to support specific services—the public switched telephone network (PSTN) provided telephony, cable television networks provided video programming and dedicated data networks allowed information to be transferred and accessed remotely. In an environment of convergence, this is no longer the case. With introduction of Internet Protocol (IP) and broadband networks, voice, data and video can be offered by the same platform.

The impacts of convergence are being felt throughout the Americas region. Based on the spread of broadband networks—and especially mobile broadband networks—new services for communicating and accessing entertainment, such as Voice over Internet Protocol and Internet video are growing rapidly. The traditional carriers (cable television and telephony) are now seeing challenges to their business models as they confront new competition from each other and from mobile providers as well as from new Internet-based service and content providers. These new services are also coming with new business models that are also forcing carriers to re-evaluate how they sell services to their customers.

Broadband penetration is still relatively nascent in the Americas, particularly fixed broadband. Mobile broadband, on the other hand, is proving to be the most widely used broadband platform in the region, given the relatively limited endowment of fixed networks in most countries, the higher cost of deploying fibre networks and current mobile penetration rates. And the numbers support this, as mobile broadband take up in the region is growing at a much faster rate than fixed broadband.

Governments in the region are quickly recognizing the importance of broadband for economic and social development. As such, as of today close to 20 countries in the Americas have adopted broadband plans that set forth specific goals and objectives. While some plans are more specific than others, they all recognize the interdependent need to expand the supply of broadband infrastructure as well as to facilitate demand by all citizens (including those in rural areas and of lower incomes), in order for them to tap into the various social, cultural and economic benefits of being "on-line."

In the region, the Internet usage and capacity has increased significantly. However, connectivity is still limited, particularly intra-regionally and within countries. In addition, significant disparity exists among countries in the region regarding connectivity, access, and penetration. In order to increase the supply of infrastructure within countries, a variety of approaches are being used by governments. In some countries, there is a recognition that private resources and investment should lead in supplying broadband infrastructure, or should partner with the governments in such efforts. In certain other countries, there has been a greater reliance on public resources to build out broadband networks. However, governments generally acknowledged that to ensure universal access to broadband, it may be necessary for the government to step in and facilitate the deployment of infrastructure in more difficult to reach areas that are considered as not economically viable. In addition, given that mobile broadband will continue to be critical for broadband deployment in the region, many regulators are taking significant steps to make additional spectrum available to support the deployment or expansion of mobile networks and services and promote competition in the market.

In order to facilitate convergence and broadband diffusion, an enabling regulatory environment must be in place. The introduction of convergence (more so than broadband) has prompted governments to take a new look at their institutional structures and consider, what, if any, modifications should be introduced to better respond to the changes resulting from this ICT environment. One trend resulting from convergence more generally has been to create one regulator to address both telecommunications and broadcasting functions. In addition, governments are simplifying their licensing processes and implementing unified licensing frameworks that allow service providers to offer a wide range of services on a technology-neutral basis under a single licence or authorization. Other measures policy-makers are implementing to create an enabling environment include establishing market-based spectrum management policies, particularly through auctions to award flexible and technology-neutral spectrum use rights, as well as focusing on convergence between telecommunications and broadcasting to promote the growth of Internet Protocol

Television (IPTV). Policy-makers further recognize the importance of promoting effective competition through regulations that facilitate smaller players and protecting consumer interests as the adoption of broadband—and potential harms to consumers—grows.

Finally, the services, applications and content that can be offered by broadband networks impact not only the ICT sector, but numerous other sectors such as governance, education, health, environment, financial, and law enforcement. As such, coordination across government agencies becomes increasingly important in order to maximize the benefits that broadband can bring to each country.

1 Developments in Converged Technologies and Business Models

Advances in technology, in particular the use of Internet Protocol (IP) and IP broadband networks, now allow networks to provide a wider range of services—voice, data and video. This convergence also means that the same services can now be provided by multiple network operators. As a result, traditional telephony providers have started to offer video and data (Internet) services and cable companies have started to offer Internet access and voice services as well. Wireless networks that previously provided mainly voice services have now become the primary means of Internet access in many countries. In short, convergence enables inter-platform competition in a wide variety of services and applications that was previously not possible.

From a business and regulatory perspective, this transformation has important implications. Service providers that previously served different markets are now competing for the same customers. At the same time, new technologies have given rise to new services or new ways of providing old services. Voice over IP (VoIP), for example, is an alternative to traditional circuit-switch voice telephony and can be used over any converged network. Video programming is now available through traditional broadcast or cable networks, but also through set-top boxes that connect to the Internet or through "smart" televisions. Content and information providers no longer need to have their own network to deliver their services; they simply connect to the Internet.

These developments have led to significant and ongoing changes in how services, applications and content are provided to consumers and how people and businesses create, share and access information (see Box 1). The rise of converged networks and the Internet has thus led to the creation of new business models that can take advantage of the flexibility that convergence offers. This section looks at the growth of converged services in the region and the impacts that new services and applications are having on business models.

Box 1: Impacts of Convergence on Services, Networks, Devices and Companies

Services—voice, data and video services and applications can all be provided over a single infrastructure platform.

- Networks—different types of transmission systems (wireline, wireless, satellite, unlicensed) can be linked together through IP to deliver converged services anywhere and at any time.
- Devices—a single device can allow access to telephone services, video streaming or broadcasting and Internet access.
- Companies—firms are combining in many different ways through mergers and acquisitions and vertical integration; to respond to consumers' demands for advanced services.

Source: TMG.

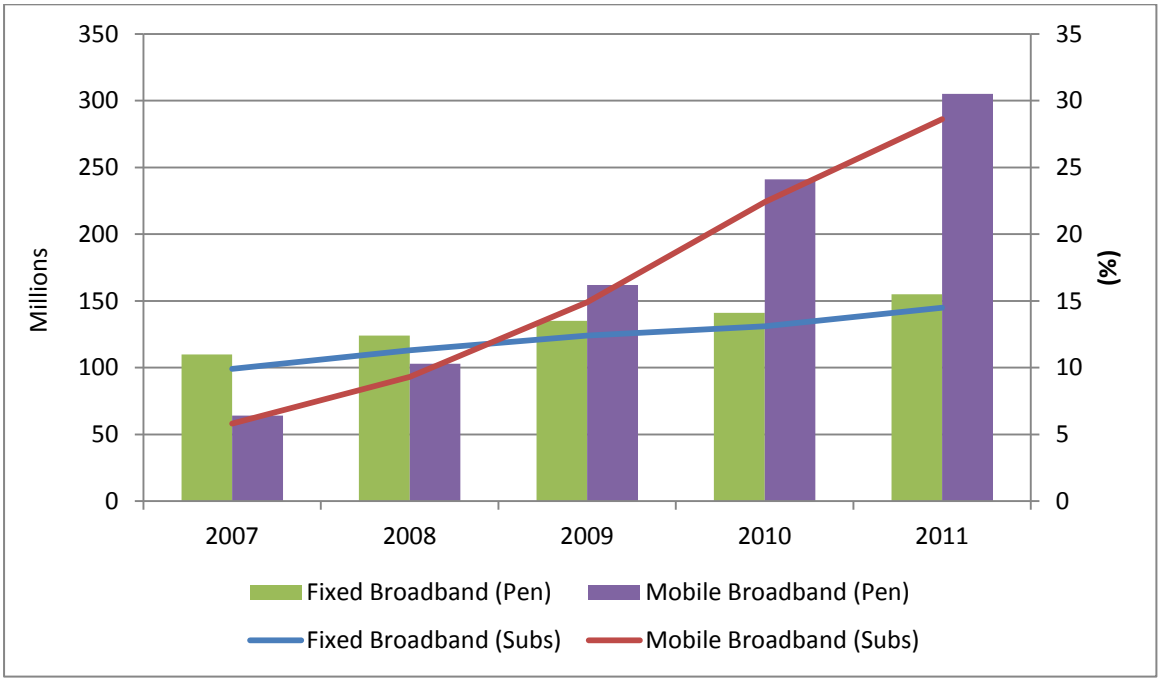
1.1 Growth of Converged Services, Applications, Content and Devices

1.1.1 Growth of Broadband in the Region

Key indicators show how the region's telecommunications networks are changing in response to the forces of convergence. Over the last five years, the number of fixed telephone lines in use has been steadily decreasing in the Americas, reflecting a larger global trend.[1] As the number of fixed-telephone subscriptions has dropped, however, the number of broadband subscriptions and the penetration of both fixed (wired) and mobile has increased, as shown in Figure 1. At the end of 2011, there were over 144 million fixed (wired) broadband subscriptions in the Americas, representing approximately a 10 per cent growth rate over 2010. Of those subscriptions, an estimated 90 million were in the United States, while Brazil and Mexico reached 16.8 million and 12.2 million, respectively.

The growth of wireless broadband services is particularly noteworthy. According to a 2010 study, total mobile data revenues are expected to grow more than twice as fast as subscription numbers, from USD 4.5 billion in 2009 to USD 10.6 billion in 2014, reflecting more data use per user. Revenues from the wireless broadband segment are expected to rise even more quickly than overall data revenues, more than quadrupling from USD 1.4 billion in 2009 to USD 6.4 billion in 2014.[2]

Figure 1: Growth of Fixed (wired) and Mobile-Broadband Subscriptions and Penetration in the Americas, 2007-2011



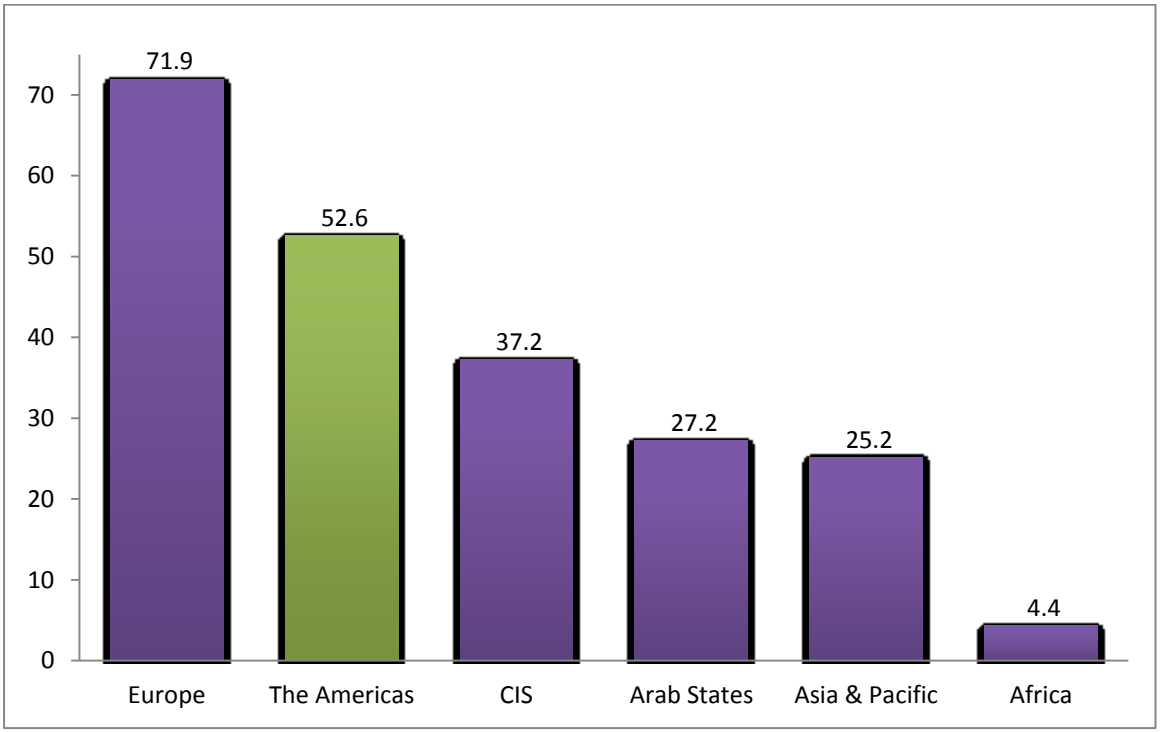
Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition), available at http://www.itu.int/pub/D-IND-WTID.OL-2011.

These trends are important because the growth of broadband is both a prerequisite for and a basic indicator of the growth of the new services made possible by converged networks. Without high-speed broadband networks, converged services would not be possible. Conversely, as broadband networks become more widespread, they are attracting more users to the wide range of converged services they make possible. Recognizing the importance of building a good broadband foundation for their countries, governments in the region are pursuing a range of policy initiatives to speed the deployment of broadband networks and encourage the adoption of broadband services (see section 3 and section 4).

1.1.2 Growth of Broadband in the Americas Region as Compared with other Regions

As a whole, the Americas region compares favourably to most other regions in terms of households with Internet access. With more than 50 per cent of households having some form of Internet access, the Americas region tops the Commonwealth of Independent States (CIS), the Arab States, the Asia/Pacific region and Africa (see Figure 2). On the other hand, the Americas region lags behind Europe in this metric by almost 20 points.

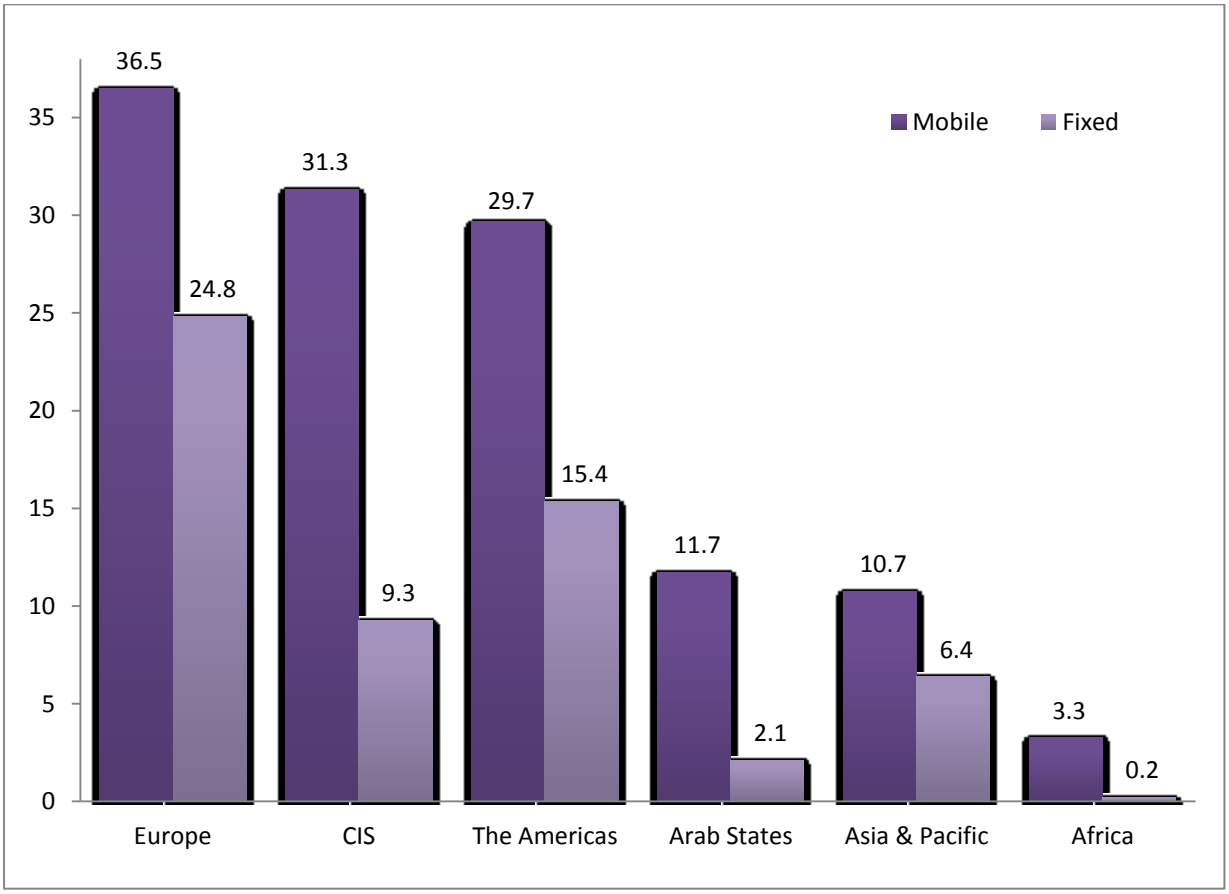
Figure 2: Households with Internet access, by region, 2011 (per cent)



Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

The situation is very similar when both fixed and mobile broadband subscriptions in the various regions are analysed. As seen in Figure 3, there are more mobile broadband subscriptions than fixed in all of the regions; sometimes, as in CIS, the Arab States and Africa, there are multiple mobile broadband subscriptions for every fixed one. In addition, with nearly 30 active mobile broadband subscriptions per 100 inhabitants, the Americas region far surpasses the Arab States, Asia & Pacific and Africa, but lags behind Europe and CIS. Similarly, the Americas region leads almost all other regions with more than 15 fixed broadband subscriptions per 100 inhabitants. But here the Americas are far behind Europe, lagging by almost 10 broadband subscriptions per 100 inhabitants.

Figure 3: Active mobile and fixed (wired) broadband subscriptions per 100 inhabitants, by region, 2011



Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

1.1.3 Digital Divide in the Americas

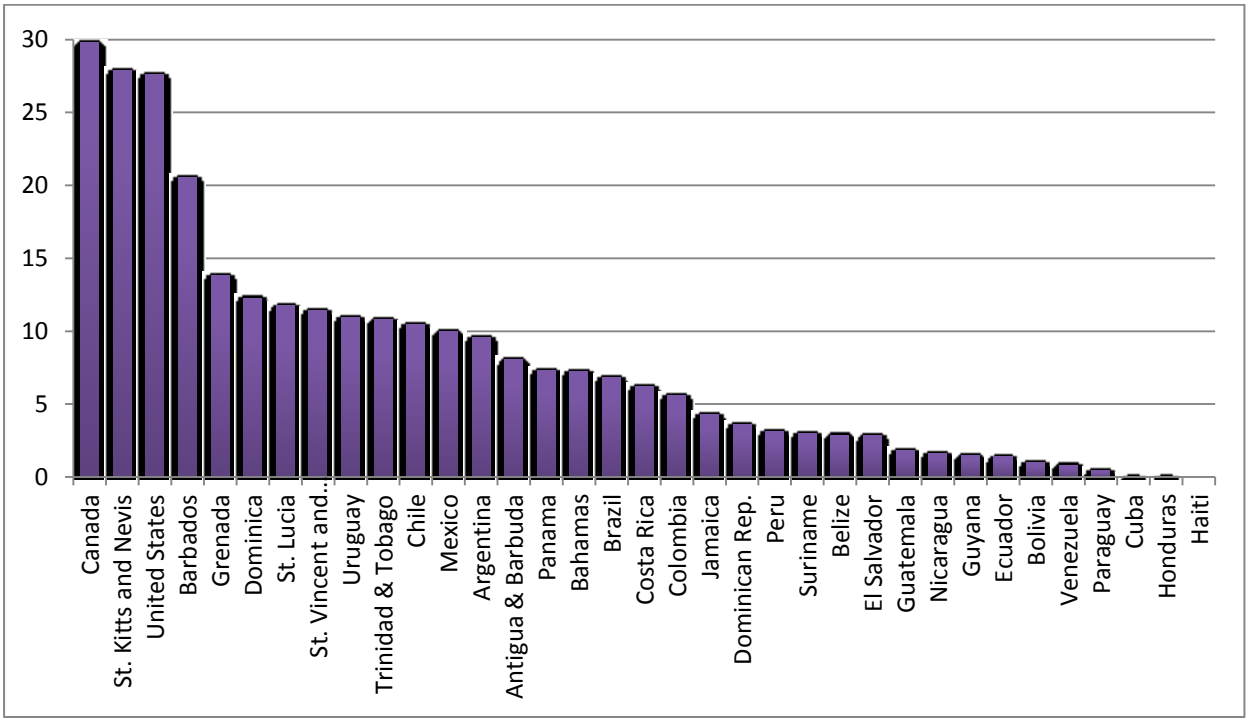
Despite the growth of broadband in the region, there are still significant differences in who has access to converged, broadband services and who does not. This gap between the "haves" and "have nots" is known as the digital divide. In reality, there are at least two kinds of digital divides. In the first instance, there can be a digital divide between countries; with some countries (and regions of the world) having better access networks and adoption, while others suffer from less developed infrastructures and lower levels of penetration. The second instance, can be framed as the difference in connectivity between certain populations (elderly, low income segments, etc.) or areas (urban vs. rural) within a single country. This section describes the digital divide in the Americas.

Digital Divide among Countries in the Region

Looking at the Americas region as a whole, two contrasting pictures appear. The region is a dichotomy of countries large and small, rich and poor, developed and less so. This divide is reflected in the large differences seen in the penetration of broadband among countries in the region.

As shown in Figure 4, Canada, St. Kitts and Nevis and the United States led the region in fixed broadband in 2010, with more than 25 subscriptions per 100 inhabitants. Barbados followed with more than 20 fixed broadband subscriptions per 100 inhabitants. Then there was a drop of more than five points before the next group of countries: Caribbean islands Grenada, Dominica, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago, as well as South American countries Uruguay, Chile, Mexico and Argentina, all with between 9 and 14 fixed broadband subscriptions per 100 inhabitants. At the far end of the spectrum, Bolivia, Venezuela, Paraguay, Cuba, Honduras and Haiti all have less than 1 fixed broadband subscription per 100 inhabitants.

Figure 4: Fixed (wired)- broadband subscriptions per 100 inhabitants, Americas, 2010

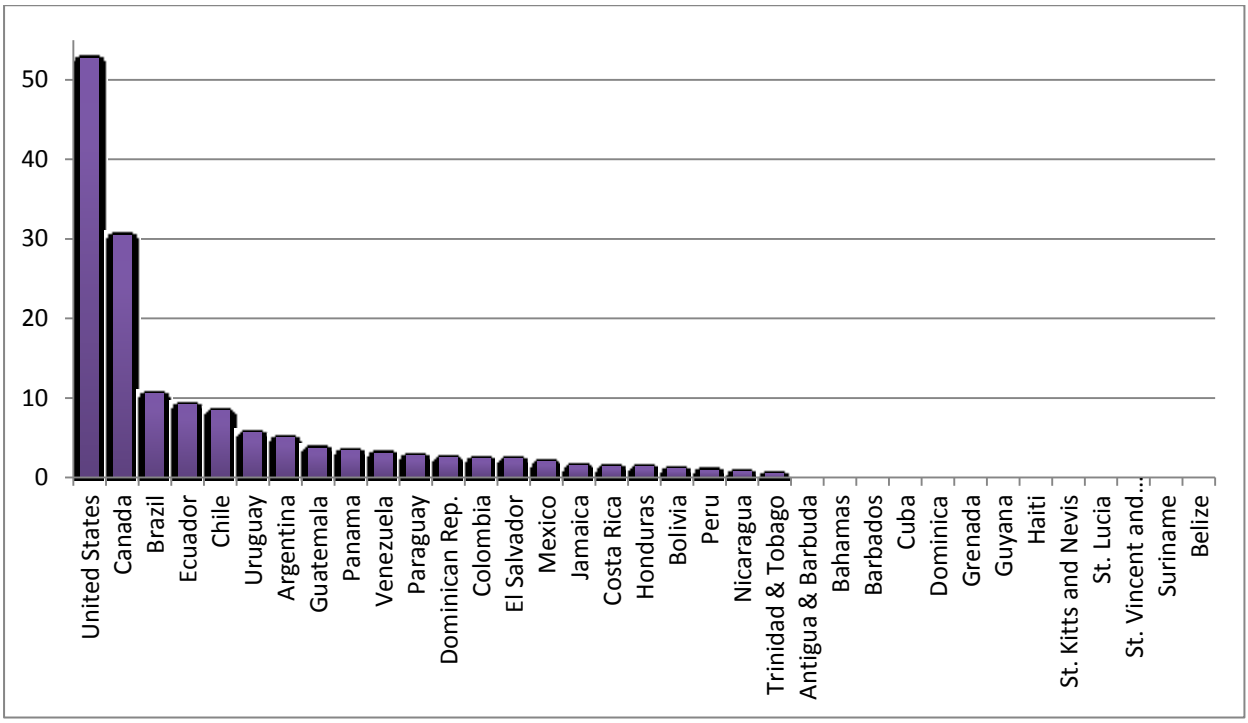


Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

The picture for active mobile broadband subscriptions in the region for 2010 was quite similar (see Figure 5). The United States and Canada led the way again, while in South America, Brazil came out on top with more than 10 active mobile broadband subscriptions

per 100 inhabitants. Ecuador, Chile and Uruguay followed, in that order; all had 5 or more active mobile broadband subscriptions per 100 inhabitants. All other countries in the region had fewer than 4 active mobile broadband subscriptions per 100 inhabitants.

Figure 5: Active mobile-broadband subscriptions per 100 inhabitants, Americas, 2010



Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

Digital Divide within Countries in the Region

The digital divide also exists within a country – between different demographic segments and in different geographic areas. This type of divide is present in every country in the region. Even within the countries with the highest penetration rates, there are populations and places that do not have adequate access to or adoption of broadband services.

The most obvious cause for the digital divide is lack of access to infrastructure; some people have networks available to them, while others do not. This is often the result of where those people live. Sparsely populated, remote and rural areas often do not have fixed networks in place, and the most remote places do not even have reliable wireless service.

In the United States, for example, the digital divide can be clearly seen in relation to population density. Prepared in conjunction with the U.S. National Broadband Plan, the FCC's *Broadband Availability Gap* study found that 7 million housing units (out of 130 million

total) were unserved by broadband service (representing about five per cent of the total U.S. population).[3]

Table 1: Population unserved by broadband in the United States, by area

Categories	Average People per Sq. Mile	% of Population Unserved	# of Unserved Housing Units (millions)	Total Housing Units (millions)
Urban Areas/Clusters	2 900	1%	0.7	100
All other areas	19	20%	6.3	30
Total	153.6	5%	7.0	130

Source: FCC, The Broadband Availability Gap (2010).

Examining these numbers more closely, however, reveals that, out of the 7 million unserved housing units, 6.3 million are located in sparsely populated, rural areas (see Table 1). This represents 20 per cent of the population in those areas; in other words, one in five persons in rural areas lacks access to broadband. By contrast, only 1 per cent of those living in urban areas or urban clusters have no access to broadband service. It is clear that within the United States, one aspect of the digital divide follows an urban/rural divide.

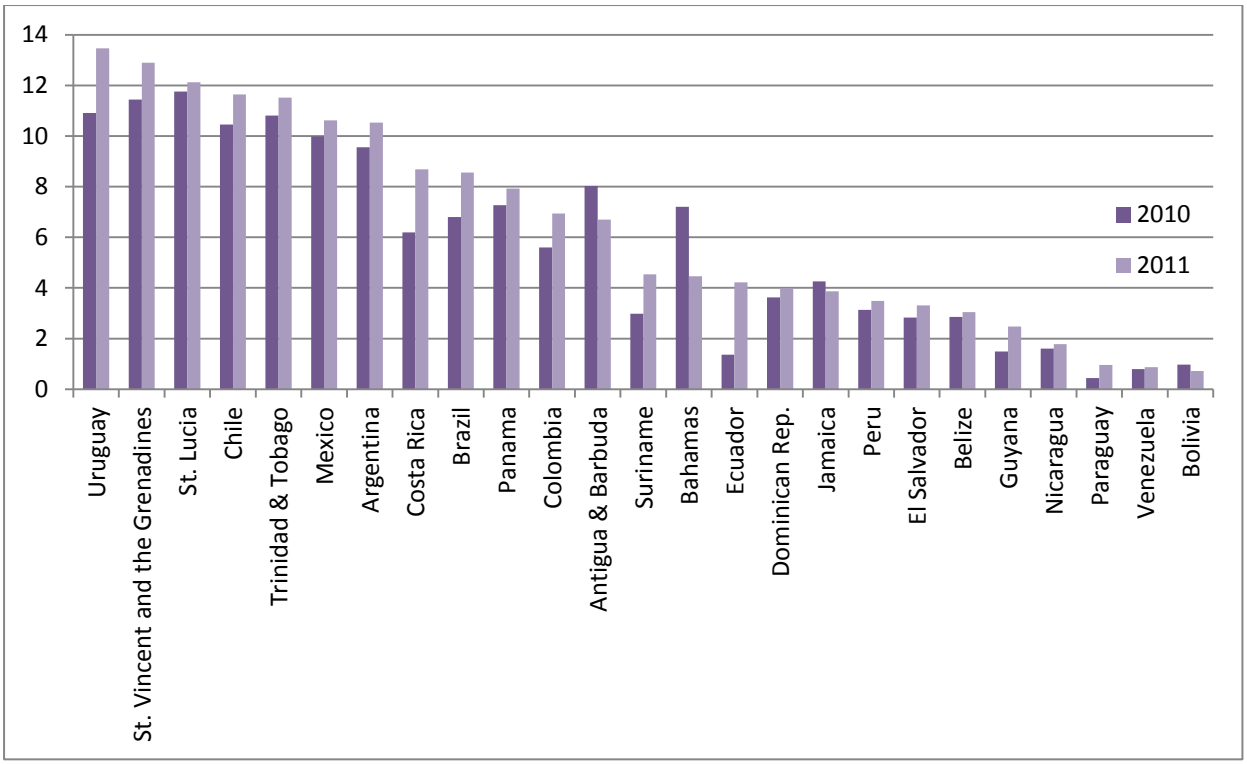
But there are other ways of looking at the digital divide within a country, for example, according to income, level of education, age or sex. Research has found that in Latin America, Internet penetration rates are highly correlated not only to landline telephone densities as expected, but also to other indicators such as per capita GDP and adult literacy rates.[4] For example, the richest states within Mexico in terms of per capita GDP tend to have the highest rates of Internet use, while the poorest have the lowest.[5] A separate study finds that the young make up the majority of Internet users in Mexico.[6]

The findings of the most recent Internet study by the Brazilian Institute of Geography and Statistics (IBGE) paint a similar picture.[7] A higher proportion of the population in the wealthier southeast region use the Internet more than those living in the poorer northeast. Younger people access the Internet in much higher proportions than those 50 years or older. In addition, the relationship between years of education and using the Internet was almost linear. More than 80 per cent of adults with 15 years or more of education used the Internet, 57.8 per cent of those with between 11 and 14 years, 38.7 per cent of those with between 8 and 10 years, 23.4 per cent of those with between 4 and 7 years and only 7.2 per cent of adults with less than 4 years of education used the Internet.

1.1.4 Critical Role of Mobile Broadband in the Region

Aside from the absolute numbers, analysing growth patterns also helps to understand what is happening in the region. Comparing 2010 with preliminary 2011 data, fixed broadband subscriptions in the region continue to be low. Leaving aside Barbados, Canada, St. Kitts and Nevis and the United States, none of the countries in the region surpass 14 broadband subscriptions per 100 inhabitants. In addition, as seen in Figure 6, the trend for fixed broadband subscriptions in the regions is mixed. In some countries, including Uruguay, St. Vincent and the Grenadines, Chile, Argentina, Costa Rica, Brazil, Colombia, Suriname, Ecuador, Guyana and Paraguay, there was healthy growth in fixed broadband subscriptions from 2010 to 2011. But in others, such as Antigua & Barbuda, Bahamas, Jamaica and Bolivia, the number of fixed broadband subscriptions per 100 inhabitants actually fell from 2010 to 2011 (probably in part because the population grew faster than the number of subscribers).

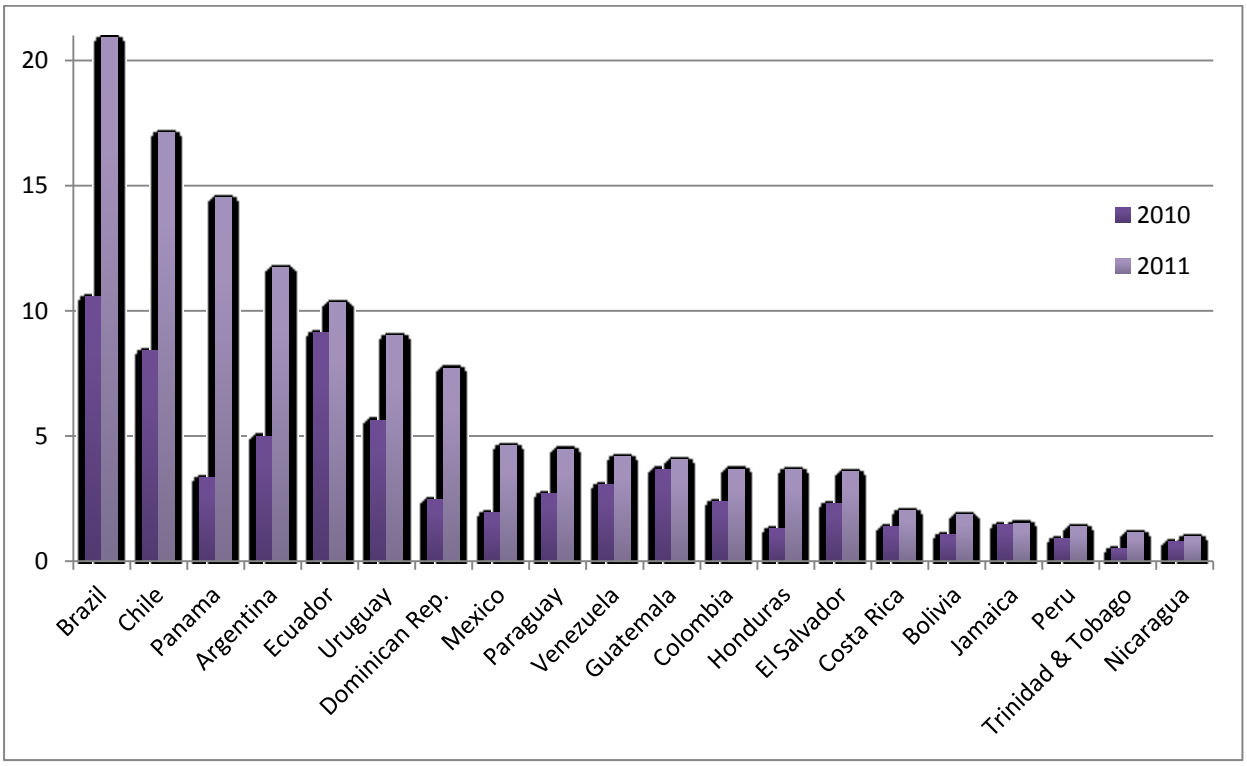
Figure 6: Fixed (wired)-broadband subscriptions per 100 inhabitants, Americas (selected countries), 2010-2011



Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

However, the trend in mobile broadband is much more promising than in fixed. Some countries have seen the number of active mobile broadband subscriptions per 100 inhabitants double and even triple from 2010 to 2011, with Brazil growing from about 10 to more than 20, Chile from about 8 to more than 17, Panama from about 3 to more than 14 and Argentina from 5 to almost 12 (see Figure 7). Growth has also been strong in other countries, including Uruguay, the Dominican Republic, Mexico, Paraguay, Venezuela, Colombia, Honduras and El Salvador. Of the countries reporting active mobile subscription data for 2010 and 2011 in the region, none had negative growth. Although the growth in many of these countries did start from a low base of mobile broadband subscriptions, the general trend is hard to ignore.

Figure 7: Active mobile broadband subscriptions per 100 inhabitants, Americas (selected countries), 2010-2011



Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

The strong growth in wireless broadband reflects the fact that in many countries in the region, wireless networks may be the easiest and most cost-efficient solution for broadband deployment – and the best way to reduce the digital divide within a country. Depending on topography, spectrum cost, wireline infrastructure endowments and other variables,

wireless networks may be less expensive to deploy than wireline networks, while providing similar broadband capabilities. In a concept sometimes called "wireless leapfrogging," countries with poor penetration of wireline networks may see much greater investment in next-generation wireless, causing the number of wireless users to surpass the use of wireline networks for broadband access.[8]

1.1.5 Growth of converged services, applications and content in the Americas

As broadband networks have been deployed in more areas in the region, more people have access to new, converged information, communications and entertainment services. These services are available (where permitted), from an increasing number of providers, including traditional wireline telecommunication operators, cable companies, Internet service providers (ISPs), mobile operators and other alternative providers. Importantly, an increasing number and range of services are being provided by third parties through the use of downloadable software or applications ("apps" in the mobile setting). These "over-the-top" (OTT) companies provide software and/or content without owning or operating a network themselves; rather, their services run over the converged networks of other companies, and in many cases, compete with those companies for customers. This section discusses the various converged services that are now being used and how they are growing in the Americas.

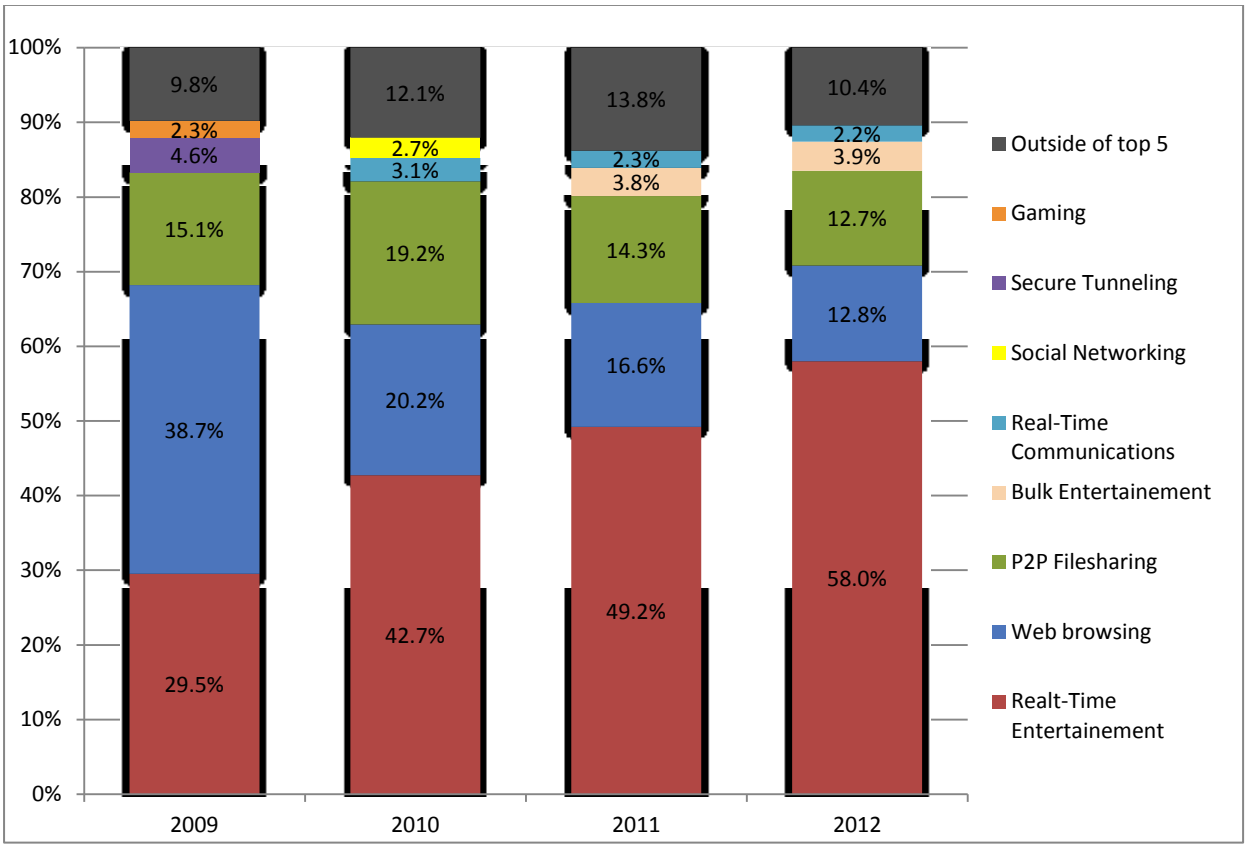
The growth of converged services both globally and in the region has been significant, and is reflected in the growth of IP traffic generally. Cisco noted that global IP traffic increased eightfold between 2006 and 2011, with traffic expected to quadruple between 2010 and 2015.[9] In Latin America, traffic grew 56 per cent in 2010 and is expected to show the fastest growth in the world between 2010 and 2015, at a CAGR of 48 per cent. In North America, the 2010 growth rate was 42 per cent, with a forecasted growth rate for 2010-2015 of 30 per cent annually.

Growth in mobile data traffic has exploded in the Americas region—in 2010, Latin America saw growth of 172 per cent compared to 169 per cent in North America. Comparing traffic flows in the fixed line and mobile sectors also illustrates the different impacts convergence is having on service availability in the Americas. In the fixed line broadband sector, a recent report by networking equipment company, Sandvine, noted that per-subscriber traffic in North America continues to grow rapidly; with median monthly usage increasing from 7.0 GB to 10.3 GB (roughly 50 per cent growth) in 2011.[10] However, the median monthly usage in Latin America is less than a third of that of North America, at 3.1 GB, and is the lowest in

the world, due to slower overall connection speeds and the corresponding lower level of entertainment (video) use.[11] Increases in the number and size of downloads are responsible for much of the traffic growth.

The growth of IP traffic is due largely to the new and innovative applications, content and devices available. Applications focused on entertainment are the top drivers of traffic throughout the region, but is much more prominent in North America. Figure 8 shows the rise of entertainment-oriented services over the last several years, and the contraction of peer-to-peer services, due largely to the growth of Internet video services such as Netflix, which alone accounts for a third of all downstream traffic during peak hours.[12]

Figure 8: Applications Used over Fixed Line Networks in North America, Peak Period Aggregate Traffic Composition

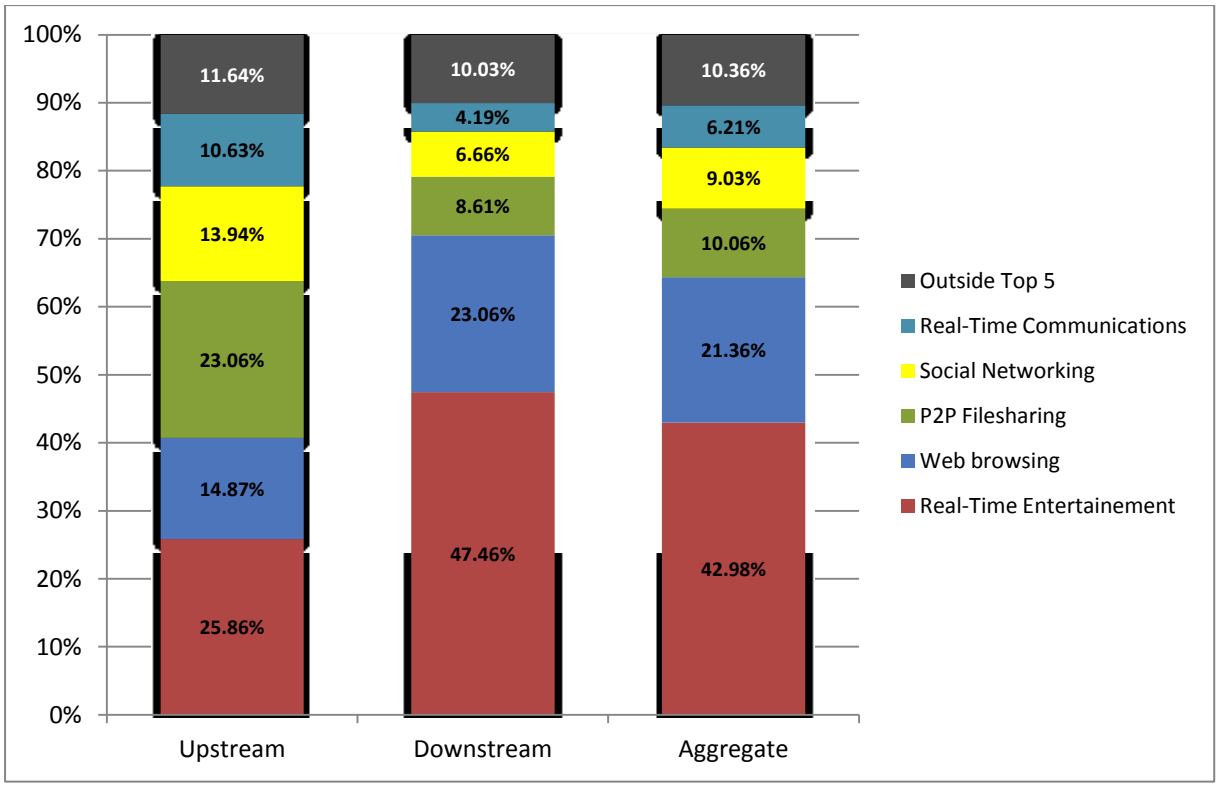


Source: Sandvine, "Global Internet Phenomena Spotlight: North America Fixed Access," 1H 2012, available at http://www.sandvine.com/news/global_broadband_trends.asp.

In contrast, the Latin American market still lags in using the Internet to access entertainment, which represents only 43 per cent of traffic, compared to 58 per cent in

North America (see Figure 9).[13] This can be attributed to the relatively lower level of fixed line broadband infrastructure development in Latin America and the fact that many of the entertainment-oriented services, such as Netflix, iTunes and Hulu have only entered the Latin American market in the last year or two. Importantly, as more content providers enter the market, this may help spur additional infrastructure development. For example, Level 3, one of the companies that provides content delivery network services to Netflix in the United States, is now expanding its presence in the region with a partnership with regional carrier Internexa.

Figure 9: Applications Used over Fixed Line Networks in Latin America, Peak Period Traffic Composition



Source: Sandvine, "Global Internet Phenomena Spotlight: Latin America Fixed Access," 1H 2012, available at http://www.sandvine.com/news/global_broadband_trends.asp.

Overall, the differences in entertainment are reflected in the most popular services generally, as shown in Table 2.

Table 2: Ranking of Most Popular Services/Applications in the Americas (by peak period volume)

Latin America		North America	
1. YouTube	26.6 per cent	1. Netflix	29.0 per cent
2. Browsing	20.0 per cent	2. YouTube	12.2 per cent
3. BitTorrent	9.2 per cent	3. Browsing	11.5 per cent
4. Facebook	7.0 per cent	4. BitTorrent	11.3 per cent

Source: Compiled from Sandvine Global Internet Phenomena, 1H2012.

Also noteworthy is the fact that mobile subscriber use in the Americas is becoming increasingly download-centric, as users flock to entertainment services (e.g., music and video streaming) in growing numbers. However, within the region, there are still significant differences in the amount of data downloaded, mirroring those in the fixed line segment. The daily downstream-to-upstream traffic ratio is 2.80 in Latin American countries compared to 8.06 for North America, indicating that North American users download far data more than their Latin American counterparts.[14] This may reflect the larger percentage of smartphone users in North America who are able to download bandwidth-intensive material such as music or video, and the fact that entertainment comprises 50.6 per cent of North America's mobile network aggregate usage, compared to 40.0 per cent for Latin America. It can be expected that once smartphone penetration picks up and more content is available locally, that download amounts will equalize (see section on Smartphones below).

Another difference in the mobile sector is that Latin America tends to have much higher use of prepaid data plans, and operators have been pushing such plans aggressively.[15] These prepaid packages, along with better devices, appear to be pushing users to smartphones and away from laptop modems ("aircards"). Although aircards are still widely used in many countries, the shift to smartphones may be seen in the declining share of P2P file sharing (see below) as a portion of mobile Internet traffic.

VoIP and Video Chat. Perhaps the most popular of the new services made possible by converged IP networks is VoIP. VoIP, which originally started as a no-cost alternative for voice calling from computer to computer, has now evolved into a mainstream product that offers call quality comparable to traditional telephone service and can be used on most computers, tablets and smartphones, as well as to "call out" to traditional telephones. As networks have increased their bandwidth, many providers are now also offering video chat,

where the user sees the person he or she is talking to through the use of a webcam or a smartphone/tablet's built-in camera.

There are two types of VoIP that are generally distinguished by who provides the service. OTT VoIP applications are typically provided by third party developers and are designed to run on any computer or tablet/smartphone data connection. Some applications, such as Fring, Tango, Tru and Mig33, are designed only for mobile devices, while others, such as Apple's FaceTime, Skype, Google Voice, Jajah, Rebtel and Raketu offer VoIP across platforms. Such OTT VoIP applications often allow interconnection with the PSTN (e.g., Skype) or may only permit users of the application to communicate (e.g., FaceTime).

OTT VoIP services are growing quickly. Skype, founded in 2003, is perhaps the best-known of the independent VoIP providers, and currently has over 700 million registered users.[16] There are 40 million connected users (those using the service as opposed to those who are simply registered) in the Americas, 25 million in the United States alone.[17] As a result, the Americas represents 28 per cent of all users worldwide. For the period 2007-2009, Skype reported annualized growth rates of 67 per cent in the United States and 42 per cent in the rest of the Americas—rates that were the highest in the world. Fring claims "tens of millions of fringsters in all 221 countries." [18] In two years, from its inception in 2009 to June 2011, Tango amassed 17 million registered users, giving it a faster growth rate than Skype, and it continued to add approximately 2.5 million users a month.[19]

The second type of VoIP is provided by the network operators themselves (i.e., it is not a separate application that has to be downloaded, but does still use a data connection that connects to a regular telephone). The market for carrier-provided VoIP services also continues to grow in the region. At the end of 2011, Point Topic reported that there were 5.16 million VoIP subscribers in Latin America and 35.75 million in North America.[20] Year-over-year growth between 2010 and 2011 was 18 and 16 per cent, respectively. Importantly, the United States accounts for the vast majority of users in North America, with almost 31 million subscribers. More than half of those subscribers get their service through a cable television provider, with the remainder of subscribers split between VoIP providers such as Vonage, and traditional telecommunication service providers.[21]

In Latin America, Brazil is currently the largest VoIP market, with 3.75 million subscribers and a yearly growth rate of 19 per cent. This makes Brazil one of the top ten largest VoIP markets in the world. Signals Telecom Consulting estimates that Brazil will surpass USD 1 billion in VoIP revenue in 2012, while Mexico and Argentina are expected to reach that figure in 2013 and 2014, respectively.[22] VoIP growth is also seen in significant increases in

VoIP equipment sales. In 2011, for example, Latin America experienced a 34 per cent increase in carrier VoIP and IMS equipment sales, driven largely by expansions in Brazil and Mexico.[23] Signals also predicts that the Latin American VoIP services market will continue to thrive in the next few years, growing at a compound rate of 70 per cent annually through 2014, driven largely by mobile VoIP services as 3G wireless coverage expands throughout the region.[24]

Video Content Services. Video services and applications have emerged as the driving force of Internet use, at least in terms of capacity. There are various forms and ways in which video content is being made available online, generally through network operators themselves via IPTV (services that provide traditional channel selections and VoD); content providers (with no network of their own) through their own websites; and user-generated video content that is uploaded to social media and networking sites. The following sections address each category in detail and discuss how each is growing in the Americas region.

- **Internet Protocol Television (IPTV).** IPTV refers to the video programming that is made available by network operators/service providers over their own IP networks.[25] One important difference between IPTV and Internet video is that IPTV is a managed service with distinct quality of service standards, whereas Internet video is an unmanaged service that, like most public Internet traffic, works on a best effort basis. As traditional telephone networks have been upgraded to next-generation networks utilizing IP technology, network operators have been able to add services to their traditional mix of telephone and low-speed data; video programming and high-speed data have been introduced. Although there may be regulatory challenges to providing such services, the technology now allows such providers to offer traditional television (broadcast) programming, as well as the specialty channels found on cable networks. Between 2010 and the end of 2011, IPTV subscribers rose from 7.84 to 9.71 million in North America, representing an annual growth rate of 24 per cent, while Latin America rose from a very low base of 0.23 to 0.28, representing 22 per cent growth.[26] The United States again took the top spot in IPTV subscriptions in the Americas region, with 8.93 million in 2011, and was the only country in the region in the top 10 countries for IPTV subscribers worldwide.[27] Overall, Latin America currently accounts for only 0.5 per cent of the global IPTV market and had the second slowest growth rate in 2011, well behind the Eastern Europe and Asia-Pacific regions, which grew at 59 and 37 per cent, respectively.[28]

- **OTT Internet Video:** Internet video can generally be described as any service that allows users to download or stream video over the public Internet. Cisco estimated that Internet video traffic accounted for 40 per cent of global Internet traffic in 2011, and is expected to account for 91 per cent of such traffic by 2015.[29] In 2010, Internet video traffic represented 46 per cent of all Latin American traffic and 52 per cent of all traffic in North America.

  According to ComScore, Internet video grew rapidly in the Americas in 2011, due to increasing numbers of online viewers and increased videos viewed per viewer.[30] As a result, the total number of videos viewed grew by double digits across Brazil, Mexico, Argentina and Chile, for example. In particular, entertainment-oriented sites grew 14 per cent, reaching nearly 97 per cent of all online users in the region. Peruvian, Colombian and Chilean viewers averaged more than four hours per visitor last year, the most in the region. The company also reported that Internet video users in Canada and the United States viewed (on average) the highest number of videos in the world, at 303 videos and 286 videos per viewer, respectively, in October 2011.[31] Although markets in Latin America showed lower viewership than in other regions, Chile, Argentina, Brazil and Mexico ranked among those markets with the highest penetration.

  With the entry of new OTT video providers to the Latin American market in 2011, there are currently 15 OTT video services, three of which are regional (Netflix, Terra and Totalmovie), and two others planning to expand regionally (América Móvil and Bazuca).[32] Going forward, analysts note that despite infrastructure and regulatory challenges, Latin America is potentially a very lucrative market for OTT video, with one company forecasting a compounded annual growth rate of 88 per cent in OTT transactions from 2011 to 2016.[33] According to research firm Dataxis, by 2016, the Latin American VoD/OTT market will reach 12.8 million active accounts, representing a 924 per cent growth rate from 2011 to 2016.[34] Box 2 highlights some of the most popular Internet video applications for both proprietary (i.e., television shows and movies), user-generated and peer-to-peer (P2P) file sharing sites.

Box 2: Over-the-top Video Applications

Proprietary Internet video applications: Netflix, Hulu, Apple's iTunes and Vudu are the main sites offering streaming video and VOD, as addressed below.

- Netflix provides movie and television program streaming service in the Americas

with 26 million streaming video subscribers, of which 23 million are in the United States.[35] The company launched service in 43 countries and territories in Latin America in September 2011, and has since doubled the number of movie and TV shows available.[36] Growth in the region has been slower than expected due to several factors, including lack of customer knowledge and experience with premium streaming services, relatively underdeveloped infrastructure and relatively low credit card usage and tighter debit/credit card requirements.[37]

- Hulu, which launched in 2007 and is only offered in the United States and Japan, is an ad-supported video streaming service with both a free option and a pay subscription option that adds high-definition content and the ability to stream video to various Internet-connected devices including set-top boxes, game consoles, and "smart" TVs.
- Apple's iTunes service is by far the largest service dedicated to renting and selling movies online, with 65 per cent market share in the United States as of August 2011.[38] In December 2011, Apple launched the iTunes Store in Brazil, and 15 additional Latin American countries including Argentina, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru and Venezuela.

User-generated video applications: YouTube is one of the oldest and most successful of the user-generated video-sharing sites. From its start in 2005, YouTube has grown very quickly and is now the third most-visited site in the world.[39] In May 2012, YouTube reported that, globally, 60 hours of video are uploaded every minute, with over 4 billion videos are viewed per day and over 800 million unique users visit YouTube each month. YouTube has also been building its Latin American presence, launching localized sites in Brazil (June 2007), Mexico (October 2007) Argentina (September 2010), Colombia (December 2011) and most recently in Chile (March 2012). One research firm has identified Google sites (including YouTube) as the most-visited sites by Latin American Internet uses in December 2011, reaching 123.4 million visitors in the region.[40] While 21 per cent of its visitors come from the United States, the growth of YouTube in Brazil has been particularly impressive. It currently ranks as the fourth largest audience in the world based on video views, accounting for 3.9 per cent of overall YouTube users and reaching 79 per cent of Internet users, while Mexico ranks 8th, accounting for 3 per cent of visitors.[41]

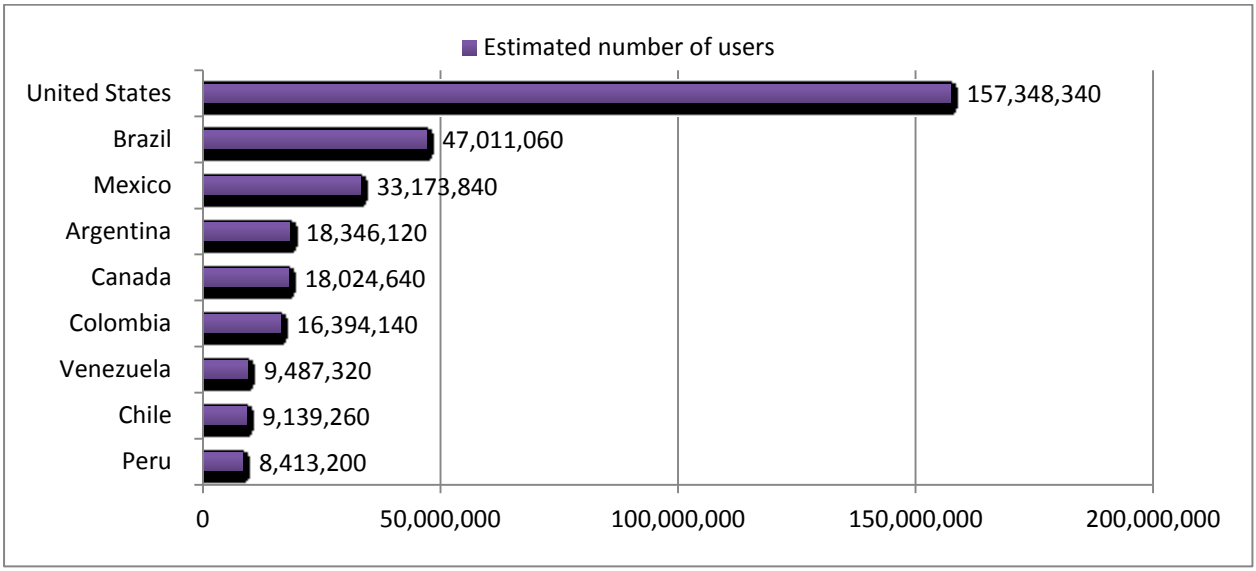
Peer-to-peer file sharing: P2P file sharing has long been a popular way for users to share (often pirated) video, as well as music and games. There are a number of P2P applications

that users can download to their computers (which is the primary device used as opposed to smartphones or tablets), including BitTorrent, eDonkey, Gnutella, Ares, Winny, Share, Foxy and Pando. The increasing prevalence of larger entertainment-related downloads noted above is also seen in the contraction of P2P downloads over fixed networks in North America. As a result, the daily downstream-to-upstream traffic ratio has risen to 5.05, compared to 2.47 in Latin America, indicating the greater prevalence of downloading (entertainment) in North America. However, P2P still accounts for 56.3 per cent of daily upstream traffic.[42] By contrast, Latin American P2P accounts for only 29.9 per cent of daily uploads. Similar differences appear in the composition of mobile P2P traffic between North and Latin America. As in the fixed case, North America tends to download significantly more P2P material than upload, while in Latin America the ratio of download to upload is much closer. One researcher posits that this is because more Latin American users use a mobile data connection as a substitute for a fixed broadband connection and the increasing prevalence of laptops running P2P applications is leading to increasing upload traffic on mobile networks.[43]

Social media and networking. In addition to user-generated video sites, such as YouTube, photo-sharing sites have become a big market for personal computer, tablet and smartphone users. There are a number of websites, such as Flickr, Photobucket and Google's Picasa that allow users to upload photos and videos that anyone can see or that can be shared only with specific groups. Each of these services has amassed 50 million or more users globally. One of the most popular things that users are finding to do with their camera-equipped mobile devices is take and share photos. One example is Instagram (recently acquired by Facebook), which signed up 35 million users in just 18 months, and attracted significant investments from top venture capital firms.[44] Other companies in this market include lightbox.com, picplz.com and dailybooth.com.

The world's most popular social networking site, Facebook, has grown tremendously since its U.S. launch in 2004. As of May 2012, Facebook had 901 million subscribers worldwide. Although the United States has the greatest number of subscribers, Canada and seven Latin American countries—Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela—are also among the top 25 countries ranked by number of users (see Figure 10). These countries represent 37.67 per cent of total Facebook users, with a total of more than 317 million. Brazil recently took over the number two spot in terms of Facebook users – with more than 47 million. The Americas region as a whole represents 40.39 per cent of total Facebook users, with over 340 million users.

Figure 10: Facebook Statistics by Country (as of May 2012)



Source: Social Bakers, available at http://www.socialbakers.com/facebook-statistics/.

Apps. Development of applications for smartphones and tablets, commonly known as "apps," has exploded in recent years. For example, a recent study shows that the "app economy" in the United States accounted for almost 500 000 jobs at the end of 2011.[45[A separate study estimated that the app economy in the United States generated close to USD 20 billion in revenue in 2011, projected to grow to more than USD 75 billion by 2015.[46] This same study found that the typical user in the United States spends one hour per day accessing the Internet on a smartphone and that two-thirds of this time the Internet was accessed through apps. We could say that users prefer two-to-one to consume data through apps rather than directly through their mobile web browser.

These apps depend on a mobile broadband connection to function: stream music and video, send pictures and receive messages and notifications. Apps for Skype, Facebook and Twitter, among others, let users stay connected to their friends, colleagues and customers no matter where they are by monitoring the Internet signal for incoming updates. Advertising-supported apps use the Internet to download fresh and relevant ads to present to the user – part of the bargain of using low-cost or no-cost apps.

Encouraging app development at the local level would help further drive broadband demand. Apps providing access to local content could help users discover content of relevance to them, while apps centred on local attractions and pastimes may prove more compelling to users than comparable "generic" apps.

1.1.6 Growth of converged devices in the Americas

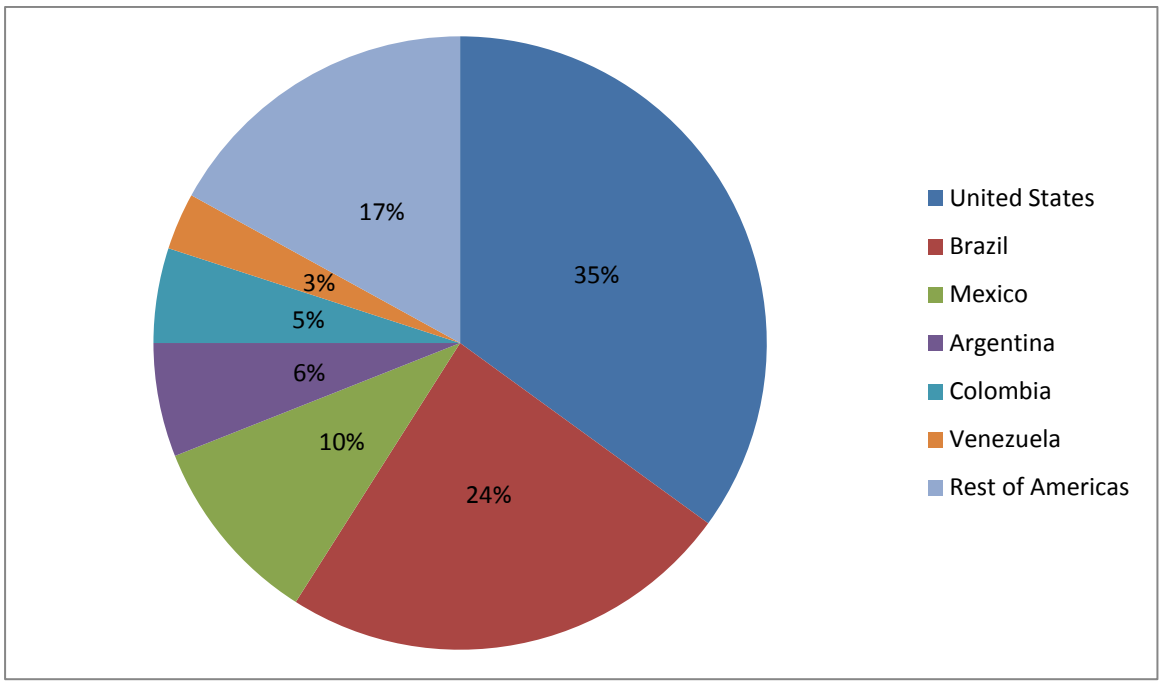
Convergence affects not only networks and services, but also the devices used by consumers and businesses every day, including set-top boxes and "smart" TVs, as well as smartphones and tablet computers.

- **Set-top boxes (STBs) and Smart TVs.** Originally, such devices were associated with cable or satellite television providers, which used set-top boxes to decode the video programming for viewing. Today, both pay TV and telecommunication providers use STBs to deliver video (regular programming channels and VoD) to subscribers. These are generally managed systems that allow access only to content provided by the subscriber's carrier. For such STBs, Latin America is still lagging other regions, but has a high growth rate. In 2010, for example, the region accounted for only 11 million unit shipments, although that represented annual growth of more than 50 per cent.[47] In recent years, however, as more and more content and services have become available through the Internet, content providers and consumer electronics manufacturers have developed various types of OTT equipment to get the wide variety of information and entertainment into the home. The range of new devices now includes Internet-connected DVD players and A/V receivers; dedicated Internet content boxes such as Boxee, Roku and AppleTV; and smart TVs, which are just entering the market.

- **Smartphones.** Similar to how converged networks have broadened capabilities compared to the traditionally service-specific communications and media infrastructures, devices have also become more capable as they have added more and more features and applications to what was once a simple mobile phone. Smartphones combine the ability to make calls, process email and access a wide variety of information and entertainment (audio and video) sources. Sales trends show just how much convergence is driving the ICT marketplace. In 2011, IDC estimated that 491.4 million smartphones were sold, representing 61.3 per cent growth compared to the 304.7 million devices shipped in 2010.[48] Similarly, Gartner estimated worldwide 2011 sales of smartphones was 472 million, and up 58 per cent from the 297 million sold in 2010.[49] Importantly, smartphones are becoming an increasing share of the market. Gartner estimates that in 2010 smartphones accounted for 19 per cent of the 1.6 billion mobile phones sold that year, while in 2011 that percentage had increased to 31 per cent.

- In the Americas, smartphone penetration is concentrated among the top three countries, which together account for almost 70 per cent of the smartphones in the region (see Figure 11).

Figure 11: Broadband-enabled phones, percentage of total in the Americas



Source: ITU, "Trends in Telecommunication Reform 2012: Smart Regulation for a Broadband World," p. 5.

Despite the fact that smartphone penetration is lower in Latin America than in other parts of the world, but there are signs that smartphone sales are accelerating and even exceeding other regions. For example, the penetration of broadband-enabled phones in Latin America and the Caribbean is close to 15 per cent of the 3G/4G installed base, exceeding the rates in both Africa and the Arab States.[50] Research firms note that smartphone sales in the region were up 117 per cent in 2010, and were expected to grow by 75.7 per cent in 2011, totaling 34 million smartphones sold with revenues of USD 6 billion.[51] In Chile, for example, IDC has forecast 43 per cent growth for the Chilean smartphone market in 2012 over 2011.[52] At least some analysts see this trend continuing and accelerating, predicting that the region's smartphone market will grow to 100m devices in 2014.[53] This growth reflects the increased use in many countries, particularly Argentina, Mexico, Venezuela, and Brazil, of mobile applications, social networking, gaming and multimedia messaging,

as well as falling costs for devices. As a result, although starting off from a relatively lower base, Latin American countries are now catching up to other smartphone markets worldwide.

- **Tablet computers.** Since their introduction only two years ago, tablets are also becoming increasingly popular, although their production and sales numbers are still far below smartphones. Tablet sales to date have been significantly concentrated in the developed markets in the region, and in fact, North America has seen higher tablet sales than any other region in the world with expected sales of 45 million units this year, up from 35 million in 2011.[54] However, sales in the emerging markets in the region are expected to reach significant levels as prices begin to decline. One research firm predicts that tablet sales will rise 70 per cent in 2012 compared to 2011.[55] Euromonitor forecasts tablets sales of USD 1.2 billion for the region in 2012, rising to USD 3.7 billion in 2013.[56] In that group, Brazil is expected to account for the majority of sales in 2013, reaching USD 1.7 billion (46 per cent of expected total revenues). Factors that may slow the growth of tablets include: limited disposable income, still-limited broadband access and lack of region-specific content.[57] Unlike in the United States, where Apple's iPad has dominated, Latin American markets appear to be adopting more Android-based devices. For example, among the 100,000 tablets sold in Chile in 2011, Android captured the largest market share.[58]

1.2 Impact of Convergence on Business Models

As the trend toward converged networks and services accelerates, markets are changing as well. Competition for all forms of communication—voice, broadband data and video—is increasing as traditional network operators and new service and content providers meet in a converged market. This new competition is coming from existing companies that are entering new businesses made possible by their newly-converged IP networks, as well as brand new, start-up companies that have found more efficient and attractive ways to offer traditional services. In many cases, these new services are "disruptive;" the innovation they offer changes how consumers use technology and view their existing services. Thus, they create new markets or fundamentally change existing ones; they disrupt existing business models and force companies to find new ways to do business—in terms of pricing and services offered.

As the distinctions between services and service providers has blurred, one thing has become clear: users are increasingly losing their loyalty to their old providers. In the early days of convergence, few envisioned that cable companies would take telephony customers

from the telephone companies. Now, with a wide range of brand new companies offering applications that can provide a wide variety of communications and entertainment services over broadband networks, it is also evident that consumers are increasingly willing to get their basic services in different ways and from firms that did not even exist five or ten years ago; third-party startups are making significant inroads in most market segments.

One important point to note is that, because many of these services are so new—and are still evolving—the business models to support them have not been developed or solidified in many cases. This is not unique to the Americas region, but applies worldwide. Although the region may pose some unique challenges in terms of regulation, infrastructure development or customer experience/acceptance, the relative immaturity and uncertainty surrounding many of these services and the companies providing them mean that business models will continue to be developed, changed and refined as experience with customer demand grows. Continual evolution of business models and approaches will be the reality for some time. This section looks at the impact some of the converged services have had, and are having, on both existing service providers' business models, and how new business models are being created around new services and markets.

1.2.1 Impact of Converged Services on Traditional Voice Services

Convergence has brought a number of challenges for traditional voice telephony providers, who now face competition from both wireless carriers and VoIP providers. Users are forgoing fixed wireline telephony and relying solely on their mobile phones; a trend that is most pronounced in younger people, but is spreading to other demographics. For example, according to the Centers for Disease Control in the United States, as of the first half of 2011, almost one-third of American homes (31.6 per cent) had only a mobile phone, a more than eightfold increase over just six years.[59] In Colombia, the gap between fixed and mobile telephone was even wider; at year 2010 9 out of 10 homes had mobile telephone access while only 4 out of 10 homes had fixed line access.[60]

Traditional telephone service providers are also facing increasing competition from VoIP. The treatment of voice traffic as just another data stream has profound implications for the business cases of both fixed line and mobile providers, as does the idea that a telephone service provider need not have a physical network to offer service. The traditional telephone network operators face competition from cable companies that are offering VoIP over their own broadband networks, as well as from the OTT VoIP providers, like Skype.

Mobile operators are not immune to the competitive challenges offered by VoIP. OTT VoIP services like Fring and Tango are designed to work specifically on a mobile device, using a data connection provided either over 3G or WiFi. These applications provide voice and video calling (and messaging services, see below) and compete directly with operators' voice and short messaging services (SMS). In the end, carriers could become "invisible," just a "dumb pipe," unless their business models evolve to take advantage of this environment.[61]

As noted in section 1.1, VoIP was originally developed to provide free or low-cost voice communications between users; a computer was needed on both ends and users could only "call" other people with compatible software. From a business model perspective, the case was easy to make that traditional voice calls, especially long distance calls, could be made much more inexpensively using VoIP, thereby undercutting the traditional carriers' revenue models. In recent years, however, the OTT VoIP service and business model began to change. One of the key enablers of the evolution of VoIP is the greater speed and prevalence of fixed line and mobile broadband connections. This enables more people to use VoIP services. OTT VoIP software is itself also more prevalent; it now works on smartphones and tablets (in addition to computers), and allow users to call and receive calls from traditional telephone numbers. Finally, the quality of the calls themselves has improved as the software has been refined. All these factors are helping to drive the spread of VoIP.

Implications

Over the longer term, OTT VoIP threatens to undermine the traditional telephony business model by divorcing the service from the network. VoIP providers have no distribution network per se, since they use existing broadband/Internet connections. The OTT companies do have servers and other equipment necessary to connect users, however. Without the need for large capital and operating/maintenance expenditures, VoIP providers can offer their services for free or at very low cost.

As a result of technology improvements and more innovative and aggressive companies entering the market, VoIP is now considered a much more potent challenger to traditional carriers, and may be capable of taking significant market share from them, particularly in the mobile segment.[62] By the end of 2010, for example, Skype carried approximately 25 per cent of all international call minutes and was adding minutes of use twice as fast as all the world's international carriers, combined.[63] Analysts also note that Microsoft's acquisition of Skype is likely to lead to even greater integration/convergence with other services such as

voice mail, instant messaging and social networking sites, across a wide variety of platforms and devices.[64]

As a result of the rise of mobile (and to a lesser extent VoIP) calling, fixed line telephony subscriptions have been declining for almost 10 years across the entire Americas region. In Colombia, for example, fixed telephone subscriptions decreased to 7.1 million in 2011—equivalent to 15.19 per cent of the population.[65] Similarly, in Chile, fixed telephone subscriptions fell to 3.4 million in 2011, or less than 20 per cent of the population. Table 3 shows that for almost all countries, fixed line penetration rates are declining.

Table 3: Penetration Rates for Fixed-telephone Subscriptions (per 100 inhabitants)

Region	Country	2005	2006	2007	2008	2009	2010	2011
Caribbean	Antigua & Barbuda	43.47	44.14	44.10	43.74	42.54	40.94	39.60
Caribbean	Bahamas	41.67	40.60	40.40	39.79	38.11	37.71	38.31
Caribbean	Barbados	49.86	49.53	49.43	55.11	49.75	50.30	51.35
Caribbean	Cuba	7.61	8.54	9.36	9.66	9.94	10.34	10.60
Caribbean	Dominica	27.57	25.47	25.50	25.68	24.29	22.85	
Caribbean	Dominican Rep.	9.67	9.54	9.51	10.20	9.85	10.20	10.38
Caribbean	Grenada	26.70	26.89	27.60	27.55	27.22	27.15	
Caribbean	Haiti	1.55	1.58	1.13	1.11	1.08	0.50	
Caribbean	Jamaica	11.90	12.71	13.65	11.64	11.08	9.60	9.89
Caribbean	St. Kitts and Nevis	41.28	41.46	40.53	39.92	39.61	37.78	
Caribbean	St. Lucia	23.60	23.57	23.51	23.99	22.36	21.49	20.39
Caribbean	St. Vincent and the Grenadines	20.69	20.79	21.02	20.86	21.07	19.85	20.78
Caribbean	Trinidad & Tobago	24.50	24.65	23.18	23.65	22.69	21.87	21.69
Central	Belize	12.02	11.96	11.57	10.40	10.21	9.72	9.07

Central	Costa Rica	32.22	30.34	32.27	31.79	32.67	31.80	31.54
Central	El Salvador	16.06	17.07	17.70	17.57	17.84	16.16	15.25
Central	Guatemala	9.81	10.39	10.58	10.58	10.07	10.41	11.02
Central	Honduras	7.18	10.19	11.47	11.31	9.62	8.81	7.86
Central	Mexico	18.32	18.42	18.31	18.52	17.41	17.54	17.15
Central	Nicaragua	4.07	4.51	4.48	4.51	4.46	4.46	4.90
Central	Panama	14.53	14.82	14.78	15.38	15.49	15.34	15.19
South	Argentina	24.41	24.24	24.13	24.53	24.38	24.74	24.87
South	Bolivia	7.07	7.16	7.17	8.20	8.23	8.58	8.72
South	Brazil	21.43	20.64	20.76	21.53	21.47	21.62	21.88
South	Chile	21.08	20.55	20.80	21.02	21.02	20.20	19.49
South	Colombia	17.84	17.99	17.87	17.62	16.37	15.52	15.19
South	Ecuador	12.51	13.02	13.16	13.56	14.12	14.42	15.07
South	Guyana	14.76	15.77	17.12	18.47	19.53	19.86	20.18
South	Paraguay	5.43	5.51	6.45	5.94	6.11	5.61	5.55
South	Peru	8.72	9.18	10.10	10.80	10.98	10.87	11.08
South	Suriname	16.23	16.14	16.07	16.11	16.11	16.19	16.15
South	Uruguay	30.28	29.66	28.94	28.67	28.40	28.56	28.55
South	Venezuela	13.69	15.54	18.83	22.87	24.08	24.44	24.91

Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

OTT VoIP applications are also posing challenges for mobile operators. Although OTT VoIP has not yet had a major impact on individual mobile operators' voice and messaging revenues, this may change as the penetration of smartphones and use of mobile broadband

grows, and as VoIP services themselves improve. These factors could potentially result in substantial increase in VoIP revenues and a corresponding decline in operators' voice and messaging traffic.[66] Arthur D. Little, for example, forecasts the mobile OTT VoIP market to reach between USD 14-100 billion in 2016, representing up to 20 per cent of total mobile voice revenues, depending on how VoIP develops.[67]

In reaction to these threats, some operators have banned VoIP outright, while others have charged a premium to use VoIP services. In other cases, mobile operators have developed their own VoIP services in order to offer customers a (higher quality) alternative to free VoIP services. In Jamaica, for example, Digicel developed its own VoIP service, which is primarily aimed at business customers.[68] The government also requires that the company allow other (OTT) VoIP providers like Skype to use Digicel's mobile data network. According to the company, in February 2012, Digicel was processing up to 22,000 VoIP calls per hour. This type of model has the advantage of retaining at least some of the revenue that might otherwise be lost to OTT VoIP services. Likewise, T-Mobile in the United States also began rolling out its own free VoIP and messaging services, called Bobsled, in 2011.[69] What is different about this application is that both services are tied to a user's mobile phone number, allowing tighter integration of the service into existing users and networks.

The cases of T-Mobile and Digicel, however, may turn out to be unique to mobile-only companies. Mobile network operators that also have fixed, wireline subscribers may be less interested in providing VoIP because of fears that it would take business away from their traditional telephone service. So, for example, users at home could use VoIP over their existing WiFi and broadband connection and simply drop their fixed telephone service altogether. Of course, this may not be the case in all instances. For example, in May 2012, Telefónica which operates both fixed and mobile networks in various countries, launched its Tu me app, which provides free VoIP and messaging applications.

It is not only fixed line and mobile operators that are seeing challenges. OTT VoIP providers themselves have struggled to develop sustainable business cases that allow them to monetize their service. Skype, for example, has noted that although it has more than 700 million registered users, as of December 2010 it reported only 8.8 million paying users (1.33 per cent) with an average annual revenue of only USD 97/user.[70]

1.2.2 Impact of new applications on text messaging services

Mobile SMS has long been the dominant messaging medium around the world and in the Americas. In the last several years, however, the mobile industry has begun to face

significant competition in the messaging market from converged services such as Skype and Facebook, which also provide instant messaging applications, as well as from dedicated messaging applications such as Apple's iMessage and RIM's BlackBerry Messaging (BBM) service,(both which are device dependent) and Whatsapp (which works across different platforms and is not device dependent). At least one source reports that the mobile industry has lost over USD 10 billion due to the decline in SMS messaging.[71]

Similar to the case for voice, the mobile carriers have built business cases around charging for text (and photo or video) messaging, whether as part of tiered add-on packages or per individual message. The revenue involved has been significant, since according to one analysis operators enjoy an up-to 95 per cent profit margin on SMS.[72] In contrast, the OTT providers generally provide such messaging services for free. U.S. mobile operator AT&T has noted that these OTT apps, such as iMessage, are threatening the operator's revenue streams and disrupting its business model.[73] The results have been a slowing in the growth rate—and even a decline in the number of messages sent via traditional text messaging—in many countries.[74]

Implications

As the number of smartphones spreads, this trend towards increased use of OTT messaging apps can be expected to accelerate. Informa, for example, forecasts that the overall share of SMS messaging revenues will decline from 80.8 per cent in 2010 to 68 per cent in 2015, while its share of traffic will similarly decline from 71 per cent of total messaging traffic in 2010 to 45 per cent in 2015.[75] Use of SMS in the Latin American region varies widely, with some countries, such as Chile, Colombia and Peru having very low (<20 SMS/month) use, while other countries such as Argentina, Uruguay and Venezuela have very high use (up to 270 SMS/month).[76] The United States, by contrast, was significantly above these numbers, averaging 531 SMS sent per month per user in 2010. The wide differences are attributed to pricing models and cultural differences.

As with other market segments, the trends here and the consequent impact on business models are not necessarily clear. The rise of smartphones may indeed correspond to a loss of SMS revenue, all other factors being equal. For existing mobile carriers, this may force them to adopt more inexpensive pricing models as well as making their services more easy to use and relevant (as T-mobile and Telefónica are doing as noted above).

1.2.3 Impact of new video services on video programming market

The video programming market in the region is generally less mature or stable than that for voice services, and varies across countries. In the United States and Canada, for example, where OTT video services were first introduced, and where competition between cable television and PSTN providers has been underway for years, the market is much more advanced than in the rest of the region. The video programming market in many Latin American countries, by contrast, is still nascent. There are several reasons for this, including the relative newness of the various services that are being introduced, regulatory restrictions that have prevented full video competition from developing in several countries (see section 4) and the lack of ubiquitous broadband infrastructure.

As a result, Latin America is just now starting to experience the growth in video services already underway in other regions. This is due to increased competition from larger established players (IPTV vs. cable vs. satellite) and the introduction of new OTT video services from a variety of new Internet-based content providers. Regulatory reformsthat will encourage the growth of the pay television market, particularly those that reduce barriers to entry and that encourage competition, are advancing as well, with some countries eliminating restrictions on PSTN providers' ability to offer convergent video services over their networks. For example, Brazil became the latest country to authorize the entry of telecommunication companies into the pay-television market in September 2011. Consequently, the impact of these new services on existing media outlets (broadcasters and cable providers) is still unclear.

From a business model perspective, several trends that are the result of convergence are forcing changes on the traditional network operators and encouraging their deployment of IPTV services. First, telephony providers are facing declining revenue from voice services. Second, in the more mature markets in the region, growth in broadband access is also starting to slow as markets are built out and adoption rates level off. Third, increased competition from cable companies in the traditional PSTN space (voice and broadband) have been impacting traditional carrier revenues for some years now. As a result of all these pressures, the traditional PSTN operators have tried to broaden their businesses to compete in the video programming market and by bundling services together to improve revenue generation, increase customer loyalty and reduce customer defection in their voice and data businesses. By offering IPTV and other broadband-enabled services, operators can leverage their current network infrastructure in order to both protect and grow their revenues. Thus, many service providers are making significant investments in order to deploy a full set of

IPTV/VoD offerings. In addition, where the business case to upgrade existing networks or to deploy fibre is not present, PSTN providers in several countries, such as Brazil, Chile, Colombia, Peru or Venezuela are opting to roll out satellite TV service and bundle it with their existing voice and data services.

In the wireline world, OTT service providers are trying out a variety of business models. Netflix, for example, operates a pure subscription service that offers unlimited viewing for the equivalent of approximately USD7.99/month throughout the Americas. Hulu offers similar content, but has both free (Hulu.com) and subscription (Hulu Plus) versions, where users pay monthly for access to programming. There are three key areas of difference between the Hulu.com and Hulu Plus business models, both of which also rely on advertising to generate revenue for the company:[77]

- **Device access**. Hulu.com is a free option that allows users to watch TV shows, but only on their computers. Hulu Plus, allows users to watch on Internet-connected TVs, Blu-ray players, gaming consoles, set-top boxes, iPads, iPhones, and many other devices.
- **Content**. Hulu.com offers the last five episodes of the television shows it carries, while Hulu Plus viewers have access to episodes from the entire current season.
- **Video Quality**. Hulu.com streams in standard definition while Hulu Plus streams in HD (720p), when available.

Recently, Hulu's owners, which include Disney, News Corp. and Comcast (and which in turn own ABC, Fox and NBC) reportedly are considering plans to require Hulu Plus users to also be cable subscribers.[78] This would bring in more revenue, but is likely to alienate viewers. This change is illustrative of the various ways that companies are continually trying to optimize their business models in order to maximize revenue.

iTunes and Vudu, by comparison, are more like a VoD service. Vudu, for example, offers movies through its website and through apps that run on a variety of set-top boxes (Boxee Box, for example) on a pay-per-view basis. Charges are linked to whether the movie is bought or rented and based on the quality (standard definition or high definition) chosen; there are no subscription fees. Walmart's plans for expansion of Vudu into Latin America will capitalize on its large retail presence (more than 5,600 stores in 26 countries outside the United States—including such chains as Bodega Aurrera and Todo Dia), and the company may also offer Vudu prepaid cards, which would address the challenge of signing up

subscribers in countries where credit cards are not so widespread and where regulations or fraud concerns may limit their use for online services.

Finally, for one of the newest video content segments, mobile video-sharing apps, the development of business models is just beginning. Some of the start-ups, like Viddy Inc., have started charging users for the ability to edit and add effects to the videos.[79] One problem that has been identified and that particularly impacts mobile content models is that advertising can be hard to do (due to small screen sizes, even on smartphones) and users do not like the ads taking up that space.

Implications

For traditional PSTN operators, IPTV is a critical part of their strategy to compete in the video content/programming market. It is a way for them to protect against losing customers to cable and satellite video programming providers, as well as compete to take customers away from them. VoD is an equally important piece of the competitive environment for telecommunication carriers. VoD and OTT video providers compete in the same market segment—movies and television shows that can be provided on demand. All these content providers are competing for the same set of household monies; and all are now in the process of trying to determine the best business models to maximize revenues: pricing, ease of use, content variety, quality of service, all are constantly being evaluated to find the right mix for customers.

Canada, for example, has some of the highest video programming penetration, usage and revenues in the Americas region. Canada's roughly 12 million pay-television consumers represent a 95.3 per cent household penetration rate.[80] The pay video programming market, meanwhile, accounts for 21.1 per cent of overall telecommunication services revenues in the country, compared to 15.4 per cent for the United Kingdom and only 7.9 per cent for Singapore, and Canadian users spend more than two-and-a-half times more on pay-television services than consumers in the United Kingdom, according to one analyst.[81] These numbers, however, do not tell the whole story. The growth rate for video programming in Canada is perhaps slower than other countries, due largely to the fact that penetration rates are already so high. However, IPTV providers in the country, which have entered the market only in the last several years, are reportedly doing very well; with subscriber lines expanding by 44 per cent in 2011, even as cable company lines shrank by 1.4 per cent.

The situation in Canada may serve as a microcosm or a forecast of how business models will be affected throughout the region in the coming years. In the first instance, revenues from

traditional telephony and data services are declining, even as IPTV and broadband access subscribers and revenues are up. Bell Canada, for example, reported in May 2012 that wireline revenue was down 3.5 per cent from Q1 2011, and EBITDA decreased 3.9 per cent due to declines in its legacy voice and data services.[82] However, the company also reported Q1 2012 net earnings rose 14.1 per cent over Q1 2011, an increase that can be attributed in part to strong growth in its "Fibe TV" fibre-based IPTV offering (adding 33,443 net Fibe TV new subscribers to end the quarter with 120,000 total subscribers), and the addition of 12,393 new Internet customers in the quarter (to end with three million Internet subscribers). This indicates that the large traditional carriers are (and will have to continue) transitioning their business models to focus more on the full range of converged broadband-enabled services. Second, as penetration rises and subscriber growth rates slow, companies will have to find additional ways to generate revenue growth. In Canada, even though subscriber growth is almost flat, revenue growth is predicted to keep rising at a 4.4 annual growth rate through 2017.[83] This is happening as companies are refocusing their business models from building networks and adding subscribers to developing more attractive programming packages—largely driven by specialty sports and VoD.

1.2.4 Impact of smartphones on mobile operators' business models

One of the clearest effects that convergence has had on existing services is the impact of the rise of smartphones—and all their associated apps—on mobile operators' broadband business models. Originally, carriers in some countries, especially in North America, offered unlimited data use plans for a flat fee. It soon became clear, however, that the model was not sustainable. As users began using more and more high-bandwidth services, the operators' networks quickly began feeling the strain as congestion became an increasing problem; too many people trying to do too many things with their phones all at the same time. In the United States, for example, AT&T experienced an approximate 14,000 per cent increase in mobile data traffic from 2006 through the end of 2011.[84]

AT&T is not alone in this problem; the rise in smartphones and now tablets has driven wireless traffic up significantly around the world. This has led many operators to abandon unlimited plans (as AT&T did in 2010), and instead base the mobile broadband business model on "tiers" of service; where users can choose a plan based on different download levels. BTC in the Bahamas, for example, offers different tiers for both their prepaid and post-paid customers (see Table 4).

Table 4: BTC Bahamas wireless broadband plans

Prepaid Plans (2 Mbps)				
Plan	**Price (B$)**	**Price (USD)**	**MB Included**	**Valid for**
1 Day	3.00	3.01	100	1 day
7 Days	10.00	10.04	250	7 days
30 Days	30.00	30.13	1000 (1 GB)	30 days
Post Paid Plans (8 Mbps)				
Plan	**Price (B$)**	**Price (USD)**	**MB included**	
1 GB	15	15.06	1	
5 GB	20	20.08	5	
15 GB	70	70.29	15	

Source: BTC, available at http://btc4g.com/data_plans.php.

ENTEL in Chile has similar plans for its prepaid customers, but a slightly different post-paid model (see Table 5). In this case, the data limits for post-paid customers are unlimited, but after a user downloads a certain amount of data, speeds are significantly reduced. Other carriers set similar caps, but rather than "throttling" speeds, simply levy an additional fee for exceeding the cap.

Table 5: ENTEL Chile wireless broadband plans

Prepaid Plans				
Plan	**Price CHP**	**Price (USD)**	**MB Included**	**Valid for**
Weekly Navigation 7 MB	990	1.97	7	7 days
Weekly Navigation 25 MB	1990	3.97	25	7 days
Monthly Navigation	2990	5.96	60	30 days

Post Paid Plans					
Plan	**Price**	**Price (USD)**	**MB Included**	**Fair Use Limit**	**Speed after fair use limit is exceeded**
Unlimited mobile Internet	5990	11.94	Unlimited	200 MB	64 Kbps
Unlimited mobile Internet Plus	9990	19.91	Unlimited	600 MB	128 Kbps

Source: ENTEL, available at http://personas.entel.cl/PortalPersonas/appmanager/entelpcs/personas?_nfpb=true&_pageLabel=P12200587501273865026214 and http://personas.entel.cl/PortalPersonas/appmanager/entelpcs/personas?_nfpb=true&_pageLabel=P12200987501273865291888.

However, it is unclear if this business model will ultimately solve the problem. One analyst notes that "while the mobile data revenues are increasing, the margins are decreasing for many operators. As the percentage of the smartphones on the network increases, the data business is primarily becoming an *access business* that is difficult to sustain over the long-haul."[85]

Business models for mobile operators are also being re-examined, largely based on how involved in the content side of the business they should be. In the early days of mobile data/broadband, many mobile carriers adopted a "walled garden" approach to providing content and services. In this approach, virtually the only applications that a user could access were those provided directly by the operator; there were no app stores or third party alternatives from which to get software or content. For the network operators, this was an attempt to lock the customer into that carrier and its services; to "own" the customer, rather than let them develop new, direct relationships with other content/software companies that would then siphon revenues away from the operator. Carriers were—and still are—very concerned about the total commoditization of their business."

That approach and the business models built on it are turning out not to be sustainable. As devices became more capable and broadband-enabled services more compelling, it became clear that most users wanted access to a greater variety of content and services and a wider selection of providers, much like they experienced on the Internet itself. In addition, the network operators had very little experience in writing software or producing content for users. For the last several years then, a major question in the mobile industry has been what

the operators' role should be in a new broadband world that will increasingly be dominated by smartphones and tablets and content. In a joint survey done by Telecom Asia-Ovum in early 2011, most Asia-Pacific mobile providers (69 per cent) said that their role would be as a partner with the content providers, rather than trying to develop applications or sign content agreements on their own.[86] Today, the walled garden approach has been largely abandoned or changed very significantly from its original implementation. Thus, a new business model was needed that gave users more flexibility, but that also allowed carriers and manufacturers some level of control over the services run on their customers' devices and over their network. Even here, different models are being tried. Apple's App Store, for example, debuted in the United States in July 2008. The App Store bears some resemblance to a walled garden in that Apple strictly controls what apps can be offered, but it is run by the manufacturer of the device, not the operators. It is also important as a marketplace where Apple shares revenue with the developers of the apps themselves. Other manufacturers and even some operators have opened their own app stores; each with more or less restrictive policies on what can be placed in the stores. Although technically still somewhat "walled" or "closed" the vast number of applications available and the vast numbers of apps that have been downloaded indicate that the current app store business model can be a great success.

1.2.5 Importance and Trends in Bundling of Services

From a business model perspective, one of the most obvious impacts of convergence is the bundling of services and applications. In general, bundling refers to the practice of combining different services into one or more package(s) for purposes of marketing and billing. These bundled packages are often referred to as double play (usually a combination of broadband Internet access and video); triple play (broadband Internet, video and fixed line telephone service); and, more recently, quadruple play (triple play plus mobile voice and broadband).

In the past, consumers had to go to different companies to get these services—one for their fixed line telephone, the cable company (or just over the air broadcast) for television, an Internet service provider (ISP) for their low- or high-speed data service, and a mobile network operator for mobile service. The companies charged for and billed each service separately, requiring consumers to send payments to four separate providers. With the advent of converged networks, however, a single company can offer a combination of these services. Consumers can benefit by obtaining discounts for the packaged services, as well as having just a single provider and bill.

From a business model perspective, bundling also makes sense for carriers. Companies can still charge for each service separately (on the same bill), but can also offer discounts if a customer takes more than one service. This induces customers to buy more services. Although the carrier receives less revenue per service, total revenue is likely to increase as users add services to their bundles.

Having multiple services provided by the same company opens the possibility of converged functionality across devices. For example, a user can share a common address book among devices, or for incoming telephone calls, the company can provide caller identification on the customer's television screen. A more recent trend is the ability to share content across devices. Providers are now offering the ability to order a movie on one device (say a set-top box) and then watch the movie on a computer, tablet or even a smartphone. In this case, the bundling encompasses video programming (cable television or IPTV), broadband access (for the computer) and mobile broadband access (for the tablet and smartphone).

For all these reasons, bundling and multiplay based business models are expected to continue to expand. One analyst, for example, forecasts that total global multiplay penetration will increase from 22 per cent in 2011 to 35 per cent in 2017, and that triple-play offers will constitute almost a third of that number.87 In Latin America, bundling has really only taken hold in the past three years as traditional operators expanded into the pay-TV market and cable operators began to offer fixed line voice and broadband services). NET Serviços, for example, is Latin America's largest multi-service cable company offering pay TV, broadband internet access and voice services in 99 cities, including São Paulo, Rio de Janeiro and Brasília. It currently claims a 38.4 per cent share of the pay TV market and a 26.0 per cent share of the broadband segment.[88]

2 Overview of Policy and Regulatory Frameworks in the Americas

2.1 Evolution of Regulatory Frameworks

2.1.1 Liberalization of the ICT Sector in the Americas

With a few exceptions, the liberalization of the ICT sector in the Americas began in the 1990s. While each country had its own unique priorities, approach, and timing, the basic pattern can be described as initial privatization of state-owned monopolies, including fixed exclusivity periods, followed by more robust competition as exclusivity periods expired. A 2007 analysis conducted by the Latin American Forum of Telecommunications Regulators (Regulatel) identified several factors that led to the waves of privatization that swept through Latin America in the 1980s and 1990s, including:

- High degree of unsatisfied demand;
- Demand from large users to be allowed to build their own infrastructure and networks where monopolies were unable to satisfy demand;
- Traffic congestion during peak hours;
- Poor quality of service;
- Many users valued services more highly than operators were charging; and
- Limited territorial coverage.89

A common model used in the privatization of telecommunication monopolies was to grant concessions that provided telecommunication operators with exclusivity to offer services for a limited number of years. For example, Belize was among the first Latin American countries to privatize its national telecommunication company—in 1988—and gave the incumbent, Belize Telecommunications Ltd. (BTL), a 15-year monopoly concession for all fixed-line and mobile phone services.[90] In general, the investors in the privatized companies agreed to deploy their networks within a time frame stipulated in the concession contract, as well as to submit to regulation of tariffs for basic services and to meet specified build-out and service quality obligations.

With respect to the introduction of competition, multiple factors have been at play. Basic services often had, as mentioned, exclusivity periods with specified expiration dates that signalled the beginning of more robust competition. There were generally fewer restrictions on entry into the mobile and value-added services markets, allowing competition in these

services to evolve more rapidly.[91] In addition, the 1997 negotiations that led to the World Trade Organization (WTO) Agreement on Basic Telecommunications resulted in significant commitments from nations in the Americas to open their telecommunication markets to competition, although some commitments were made on a phased-in basis. Two of the most under-developed countries of the region, El Salvador and Guatemala, permitted full competition without phase-in. Chile offered complete liberalization (with the exception of local telephone service), while commitments approaching fully open telecommunication markets were offered by Peru (1999), Argentina (by November 2000), Venezuela (2000), Bolivia (2001), and Grenada (2006).[92] In addition, 20 countries in the Caribbean and Latin American region have signed on—in whole or in part—to the WTO Reference Paper on Telecommunications, which sets out general principles for the prevention of anti-competitive practices, ensuring interconnection, fair and transparent universal service obligations, public availability of licensing criteria, independent regulators, and objective and transparent allocation and use of scarce resources.[93]

Liberalization processes in the Americas have continued over the last decade. For example, as part of Central American Free Trade Agreement (CAFTA-DR) between Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua and the United States, Costa Rica agreed to open previously closed markets, including private network services, Internet services, and mobile wireless services.[94] In addition, in 2008 Costa Rica introduced a new legal framework geared toward the opening of the telecommunication market.[95] The newly created ICT regulator, Superintendencia de Telecomunicaciones (Sutel), began to issue authorizations in July 2009 to companies interested in providing Internet, VoIP, and corporate telecommunication services, and the mobile market was opened to competition in 2011 with the grant of two new licenses awarded through an auction process.

Regulatel also identified certain similarities and differences among the privatization and liberalization reforms in Latin America.[96] Similarities included:

- Focusing sector reform around the privatization of the state-owned monopoly;
- Privatization involving an international bidding process and foreign operators;
- Competition in non-basic services often introduced immediately after privatization;
- The new investors receiving a limited number of years of exclusivity; and
- Ownership being shared among a wide number of national and international, large and small, strategic and financial investors, with one or two strategic investors gaining control.

Among the differences were the amount of time necessary to complete the liberalization process; whether or not efforts were made to increase the value or efficiency of state monopolies before privatization; whether obligations and rules were included in concession contracts, sales contracts or legislation; and whether liberalization included privatization or, as was the case in Colombia, without the privatization of the state and local enterprises.

It should also be noted that more recently the change of political tides has led some countries to reemphasized the role of state-owned entities in the ICT sector. For example, countries such as Bolivia in 2008 and Venezuela in 2007 have renationalized the previously privatized national incumbents. Brazil, on the other hand, revived the dormant state-owned provider for the implementation of its national broadband plan. These state-owned entities are currently competing in liberalized markets with private providers, thus requiring clear policies to avoid distortions that may stem from state aid.

2.1.2 Policies to Promote Convergence

The advent of convergence has had a disruptive effect on the ways in which traditional ICT providers have provided their services for decades. Convergence may also mean the combination and integration of previously separate end-user equipment, such as telephones, televisions and personal computers, into a single device.[97] For consumers, convergence holds the promise of allowing access to any desired information through a single device. As detailed in section 4, policy-makers and regulators face the challenge of revising and redefining current licensing, regulatory and policy regimes so as to enable consumers, businesses, government, and service providers to benefit from the changes that are the hallmark of a converged ICT sector.

Convergence can, in particular, bring economic benefits to consumers and service providers. Although there have been few studies of the overarching benefits of convergence, a number of researchers have considered the economic impact of broadband. Broadband deployment has been found to contribute to GDP growth, although at different levels depending upon the methodology employed and the countries examined. One recent study noted impacts on job creation (both with respect to network deployment and network effects and spillover into other sectors), productivity gains, impacts on innovation, and positive externalities in consumption.[98] This study also looked at the impact of broadband on GDP growth specifically in Latin America and the Caribbean (LAC), finding that a 1 per cent increase in broadband penetration increased GDP by 0.0158 per cent.[99] Other studies show even greater gains from broadband access. For example, an Inter-American Development Bank

(IDB) econometric study on the LAC region found that a 10 per cent increase in broadband penetration boosts GDP by 3.2 per cent on average and productivity by 2.6 per cent.[100]

The ITU has played an active role in the research and consideration of policy issues related to convergence and promotion of broadband throughout the region,[101] such as a May 2012 study of the impact of telecommunications, including broadband, on the Panamanian economy. This study found that the annual contribution to GDP from fixed line broadband was approximately 0.44 per cent of GDP as a compound average annual growth rate for 2000-2010. This estimate suggests that fixed line broadband alone was responsible for 9.6 per cent of all economic growth in Panama during the decade. The study notes that there was little broadband usage before 2005, and that just considering 2005 to 2010, the contribution of fixed line broadband rose to 0.82 per cent, making it responsible for approximately 11.3 per cent of all economic growth.[102]

Regimes that streamline regulation in order to enable convergence can promote competition, allowing operators and users to leverage the benefits of new and/or more efficient technologies, possibly at reduced cost. As platforms are able to deliver multiple services that were traditionally considered separate, operators have greater flexibility to offer packages or "bundles" of services, or to customize service offerings to meet specific customer demands.

More specifically, convergence can bring about:

- **Increased revenue for service providers:** By offering a wider range of services, service providers have the opportunity to capture more subscriber revenue. A major U.S. cable operator saw its average monthly revenues per subscriber more than doubled between 2004 and 2011, from USD 50 to USD 137 with non-TV services such as telephony and broadband Internet contributing approximately one-third of its total 2011 revenues, versus less than 25 per cent in 2004.[103] In Chile, cable operator VTR in 2011 had not only 917 300 video service subscribers, but also 766 300 Internet subscribers and 647 200 telephony subscribers.[104]
- **Reduced service provider costs:** Service providers are implementing all-IP networks as a means to replace legacy networks and reduce costs. For example, BT in the United Kingdom expected in 2006 that its new all-IP network would replace 17 existing networks with one and reduce operating costs by GBP 1 billion (USD 1.57 billion) annually. Similarly, Verizon in the United States estimated in 2007 that its shift to an all-fibre optic IP network would save more than USD 1 billion annually.[105]

Service providers are thus able to maintain a single network infrastructure, rather than multiple separate networks.

- **Lower prices for consumers:** As operators are able to leverage converged networks to offer services more efficiently, they can pass on lower costs to consumers as a means to gain more business. One example of such price reductions is in the field of voice telephony, where VoIP providers offer services, notably international calls, at prices significantly below those of traditional voice service providers as previously discussed in earlier sections.
- **New media business models:** The delivery of media, video and music in particular, over Internet platforms has upended the traditional market for video service providers, artists, and advertisers. Traditional broadcasters, providers of programming to cable networks, and purveyors of movies on DVD now compete with online video services, such as YouTube and Netflix. Further, the popularity of digital music services has significantly eroded the market for the purchase of music on compact discs and other physical media. Meanwhile, advertisers have new opportunities afforded by the rise of these new online platforms.

In considering how best to appropriately regulate—or not regulate—a converging or converged ICT sector, policy-makers would be well-served to take a holistic approach, comprised of a number of possible areas of focus, including unified licensing, technology neutrality, competition, spectrum management, and interconnection, among others, as more fully described in section 4. If the current regulatory framework does not already do so, such issues could be addressed by a series of stand-alone regulations that are applied to all relevant licensees, rather than, for example, being contained within specific license instruments. By considering each of these areas, among others, regulators can develop a relatively level playing field that allows service providers to innovate and select the delivery platform that best suits their needs or their customers' expectations. Overall, several countries in the Americas have implemented legislation that is intended to promote convergence in some manner. Examples in Latin America include Argentina,[106] Brazil,[107] Chile,[108] Colombia,[109] Costa Rica,[110] Mexico,[111] Nicaragua,[112] Peru,[113] and Venezuela.[114] While each addresses slightly different aspects of convergence, it is worth noting that all except Chile were enacted since 2000.

The GSR09 Best Practices Guidelines, which focus specifically on innovative regulatory approaches in a converged world, state that policy-makers and regulators should promote convergence to further develop ICT and broadcasting markets; build effective regulatory

institutions that allow the regulatory authority to carry out its mandate, as well as ensure consistent, transparent and non-discriminatory rules; use various regulatory tools to stimulate investment and supply of broadband networks in a converged world; and stimulate growth and uptake of innovative services, applications and devices.

Box 3: Examples of GSR09 Best Practice Guidelines regarding Convergence

Part of the best practice guidelines that the regulators participating in the GSR09 put forward include measures to promote convergence to further develop ICT and broadcasting markets, which state:

1. We recognize that convergence is a technology and market-driven process.
2. We recognize that convergence is most likely to thrive in an environment which allows competition between broadband networks and infrastructure and service providers.
3. Nevertheless, we note that regulators need to be particularly attentive to the challenges stemming from convergence, in order to pave the way for the establishment of a regulatory environment that is transparent, is conducive to investment and growth, fosters fair and greater competition as well as innovation, stimulates the deployment of infrastructure, promotes the development of new services, is security conscious, and protects and benefits consumers.
4. We believe that, in doing so, policy-makers and regulators need to:
    a. Establish appropriate policy goals and refrain from imposing regulatory restrictions except when strictly necessary to promote competition and consumer protection, and that are proportionate to the established policy goals.
    b. Adopt a technology-neutral approach, including in frequency spectrum allocations and assignments, to facilitate the use of all transport mechanisms, whether wireline or wireless, and to promote the utilization of new and emerging technologies.
    c. Promote innovation and research and development.
5. Regulators need to adopt appropriate regulation on interconnection and access, including pricing, taking into account the relevant technological market developments including the roll-out of Next Generation Networks in the core (NGN) and in the access layer (NGA).

6. We note that NGNs and IP-based services may offer the opportunity for operators to take advantage of market convergence and create new revenue streams while expanding access to ICT services at lower costs to consumers.
7. We recognize that regulators should take an active part in setting international standards relating to convergence in order, for example, to ensure an optimum level of quality of service and increased interoperability between different networks, applications, services and devices, in a constantly changing technological and market environment, whilst taking utmost account of the primary role that the industry has in developing effective standards.
8. We note that voice services, no matter which technology they use, should benefit from a flexible numbering plan and simple assignment and reservation procedures both at national and international levels. A coordinated approach to numbering plan development will foster effective market entry for new players, flexible and effective number portability and fixed-mobile convergence.
9. Regulators may consider developing adequate provisions both in the fixed and the mobile Internet access services to ensure technology neutrality and effective management of Internet traffic.
10. We recognize the importance of promoting universal access to broadband services, notably by developing a broadband policy and a targeted universal access strategy and by cooperating with governments and international organizations. These strategies need to be aligned with policies of other sectors and programmes (such as e-governance, e-education, e-government, e-health, e-commerce), as appropriate.
11. With the growing dependence of government, businesses and society on converged ICT services we recognize the importance of working with other agencies to ensure the resilience of networks and services and that contingency plans are in place to safeguard critical national infrastructures, as well as during times of national emergencies.
12. We recognize that regulators need to pay particular attention to all environmental issues and where required issue guidelines on the use of ICTs to support meeting environmental commitment.

Source: ITU, "GSR09 Best Practice Guidelines on Innovative Regulatory Approaches in a Converged World to Strengthen the Foundation of a Global Information Society," 2009.

2.1.3 Focus on Broadband in Universal Access and Service Policies

Traditionally, universal access and universal service policies have referred to the provision of voice telephony service to the widest possible percentage of the population in a country. However, as data communications have become increasingly crucial to commerce, education, economic and social development and general communication, policy-makers are increasingly considering approaches to incorporate broadband into their universal access/service policies. This shift dovetails with the trend toward regulatory and policy frameworks that incorporate issues of convergence.

Some countries in the region have leveraged existing universal access and service funds (UASFs) or universal service funds (USFs) for the deployment of broadband networks (see Table 6). For example, in 2007, Peruvian UASF FITEL awarded contracts for the Rural Broadband Project, which aims to continue the policy of universal access and service by providing broadband access through public access points as well as IP telephony in rural localities located near cities with access to broadband.[115] The development objectives were improved levels of information use by the education, health, government and business sectors and improved communication between people as well as between people and the urban populations. Operators were expected to establish community portals with information on economic activities, tourist attractions, and other relevant local material. The content of the portals is to be updated by the community itself, with support from the operators. Peru's 2011 national broadband plan recommended changes to the legislation governing FITEL to allow for new fibre optic transport networks and increased funding to FITEL.[116] The increased funding is proposed to come from an additional levy on revenues generated by cable services and Internet access, in addition to current funding sources, and to modify rules such that 30 per cent of fees collected by the Ministry of Transport and Communications are directed to FITEL.

Table 6: Inclusion of Broadband or Dial-up Internet Access in Universal Service Definition

Country	Broadband	Dial-up Internet Access
Argentina	Yes	No
Bahamas	No	Yes
Brazil	Yes	No
Canada	Yes	No

Colombia	Yes	No
Costa Rica	Yes	Yes
Dominica	Yes	No
Dominican Republic	Yes	Yes
Ecuador	No	Yes
Grenada	Yes	No
Haiti	Yes	Yes
Honduras	Yes	No
Jamaica	Yes	No
Nicaragua	Yes	No
Paraguay	Yes	No
St. Lucia	Yes	No
Peru	Yes	Yes
St. Vincent and the Grenadines	No	Yes
Trinidad & Tobago	Yes	No
United States	Yes	No
Venezuela	No	Yes

Source: ITU World Telecommunication/ICT Indicators Database 2011 (15th Edition).

In 2007, the regulator in the Dominican Republic, Indotel, launched the Rural Broadband Connectivity project as part of the e-Dominicana Strategy. That strategy focuses on the long-term promotion of universal access to ICTs, with the objective of ensuring that the country's population develops the necessary skills to use ICTs through the creation of conditions, such as the availability of ICT resources and infrastructure at a reasonable distance from the place of residence and at affordable price levels. The Rural Broadband Connectivity project aims to provide 508 un-served municipalities with broadband Internet access through Internet cafés, as well as improving access to telephony, and has been funded by Indotel's UASF. The project goals are in line with the overall goals of the e-Dominicana Strategy, which include (a) providing Internet access within 5 kilometres of all households at speeds

of at least 128 kbit/s; (b) reaching an Internet penetration rate of 40 per cent of the population, with at least 30 per cent with Internet access speeds of 128 kbit/s or more; and (c) ensuring that at least 50 per cent of the population has access to a personal computer.[117]

Costa Rica's National Broadband Strategy seeks to achieve universal population coverage by 2014, community and government anchor institutions by 2016.[118] Operators and service providers are identified as the key players, but UASF FONATEL is to invest USD 80 million in a high-speed network connecting certain key development projects. The strategy dovetails with Costa Rica's National Telecommunications Development Plan 2009-2014, which counts among its goals expanding access to broadband Internet for all end users, enabling medium-term use of wireless technologies where the costs for installation and maintenance of infrastructure are high, and installing Internet access centres or providing universal service or targeted commercial service in rural and urban communities.[119]

Several countries in the region have sought to revise or expand their universal access or universal service programs and policies to include broadband access or Internet services, or leverage their UASFs to finance broadband projects. In 2011, the U.S. Federal Communications Commission (FCC) released a Report and Order and Further Notice of Proposed Rulemaking that enacted far-reaching reforms of the existing universal service regime. The major points of the order included adoption of support for broadband-capable networks as an express universal service principle for the first time, as well as setting specific performance goals; setting a budget for the high-cost programs within the USF; requiring eligible carriers to provide broadband services; and creating a fund to help make broadband available to homes, businesses and anchor institutions in areas that do not or would not otherwise have broadband service. This approach to universal service is slated to replace existing USF programs and to overall reform and modernize the U.S. approach to universal service.[120]

A lack of technology and service neutrality in UAS rules can be challenge to expanding universal access to include broadband. With respect to technology choices, UAS policies or regulations developed before the rise of broadband often were not sufficiently flexible to allow for broadband or Internet projects, instead mandating that funds be used for telephony specifically or for specific technologies, which are often based on fixed line networks that do not allow for mobile and/or satellite operators to be granted UASF funding. Such restrictions can prevent the use of UASFs for broadband connectivity projects by limiting the number of operators permitted to engage in UAS projects, as well as by setting unrealistic goals for rural and remote areas (e.g., requiring fixed line build-out in

these areas may be too costly, even with UASF support, whereas allowing mobile or satellite network connectivity may be feasible).[121] For example, in 2008, the Brazilian Ministry of Communications carried out a public consultation focused on reforming the Brazilian telecommunication framework, including a proposal that the UASF (known as FUST) should be, at the very least, technology-neutral in its distribution mechanism. Brazil's legislature is considering other ways to distribute funds and to determine appropriate projects. Draft laws have been proposed that, if passed, will amend the FUST regulations to allow the use of FUST funds for projects intended to increase access to broadband services. Establishing clear and transparent fund administration is particularly important for countries in the region, such as Brazil, which have not invested funds collected for universal service/access in an efficient manner, even in the narrow band context.

As of 2011, however, much progress has been made, and more than 40 countries worldwide have modified or initiated efforts so that their universal service/universal access definitions either specifically mention broadband or are sufficiently broad to encompass broadband and/or Internet services. In the Americas region, the list of countries following this approach are Argentina, Brazil, Colombia, Dominica, the Dominican Republic, Grenada, Haiti, Nicaragua, Peru, Suriname, Trinidad and Tobago, and the United States.[122] Depending on the particular approach taken by a government, there may be separate broadband and UAS policies or there may be a converged approach to the two topics. For example, Chile's Information Society Universal Access Policy merges broadband policy and the UASF and seeks to enable rural communities with productive potential to participate more effectively in the economy through innovation and increased competitiveness.[123] UASFs in Chile are used to provide Internet access and multipurpose telecentres to un-served areas. In 2010, the Chilean government launched a program to provide digital connectivity to 1 474 localities with about 3 million people in rural areas that lack access to the Internet. The program will invest about USD 100 million, including a USD 43 million subsidy financed equally by the UASF (Fondo de Desarrollo de las Telecomunicaciones - FDT) and the regional governments.[124]

In addition, efforts to provide Internet connectivity to schools and other "anchor institutions" sometimes coordinate with UAS policies. In fact, the ITU's *Connect a School, Connect a* Community toolkit encourages close coordination between the ministries responsible for education and ICTs, as well as the ICT regulator, to ensure that UASFs and universal service obligations are developed within a plan for school connectivity that concretely describes the roles of all parties.[125] The toolkit also notes that broadband-connected schools can serve as access points for subsidized Internet access in underserved

communities. In Jamaica, the Universal Access Fund (UAF) Company was established in 2005 to accelerate the deployment of broadband through public access in high schools, public libraries, post offices, and other government agencies or institutions. In April 2011, the company funded a JMD 543 million (USD 6.37 million) project with operators LIME (Cable and Wireless) and FLOW (Columbus Communications) to deploy a nationwide broadband network, again focusing on all secondary schools, post offices, and public libraries in Jamaica.[126]

2.2 Evolution of Regulatory Authorities

2.2.1 Traditional Models for Regulatory Authorities

When establishing or considering changes to the regulatory authority, governments must take into consideration numerous factors, including the level of development and liberalization of the ICT sector and the resources available within the country, as well as the historical context and the administrative and legal frameworks available for regulating the sector. As markets, technologies, policies and priorities have evolved, some countries have found an increasing need to reconsider the appropriate regulatory authority to oversee the players in the ICT sector.

According to an ITU survey, by the end of 2011, 158 countries worldwide have a separate national regulatory authority for telecommunications, including 32 in the Americas.[127] There are two traditional institutional designs for telecommunication regulatory entities.[128]

- **Single-sector regulator:** A regulator whose sole function is to oversee the telecommunication sector, often including radiocommunications and sometimes the postal sector (due to the legacy of a combined telecommunications and postal service provider in many countries). Other regulatory agencies are responsible for oversight of the broadcasting and information technology sectors. In addition, the management of spectrum resources or the issuance of spectrum licenses may be under the mandate of a separate spectrum agency or the particular ministry responsible for ICT. Historically, many single-sector telecommunication regulators arose from liberalization processes that required the separation of the operational and regulatory functions of state-owned PTTs. The benefits of or justifications for a single-sector regulator include the perception that the telecommunication sector deals with specific technical issues that are unique to the telecommunication sector and exhibits specific characteristics that differentiate it from other industries and that regulators borne out of the separation of former state-owned PTTs have a core of staff members that are familiar with the issues facing the sector. In the Americas, single-sector regulators include Colombia's Comisión de Regulación de Comunicaciones (CRC), Peru's Organismo Supervisor de Inversión Privada en

Telecomunicaciones (OSIPTEL), Suriname's Telecommunicatie Autoriteit Suriname (TAS), and the Telecommunications Authority of Trinidad and Tobago (TATT).

- **Multi-sector regulatory authority:** Such a regulator usually encompasses various industry sectors that are considered public utilities (e.g., telecommunications, water, electricity, and transportation). Examples of multi-sector regulators in the Americas include the Office of Utilities Regulation (OUR) in Jamaica, Authoridad Nacional del los Servicios Públicos (ASEP) in Panama, and the individual state public utility commissions in the United States. One justification presented for the employment of a multi-sector regulator is based on the need for economies of scale to effectively regulate different infrastructure industries and sectors. This reasoning argues that one agency staff can be used to oversee a variety of infrastructure industries. Questions have been raised, however, as to whether efficiency gains are truly achieved through the use of a multi-sector regulator when most staff are not being used across multiple sectors. In addition, some analysts have questioned the logic of housing regulators for multiple sectors in a single agency when each sector may have a different level of liberalization or other unique characteristics that require disproportionate resources or attention from the regulator. However, as noted in the ITU report *Trends in Telecommunication Reform 2012*, there is also a more recent trend in mature markets toward multi-sector regulators, particularly in Europe, including in Germany, Denmark, the Netherlands and Spain.[129]

2.2.2 Converged Regulators

The increasing convergence in the ICT sector has driven the creation of more converged regulators, following the logic that a converged regulator is better suited to respond to new technologies and the overlapping services offered by formerly separate categories of service providers. Converged regulatory entities oversee a broader range of services that can also include ICTs and broadcasting. A converged regulator tends to be strong in specialized engineering skills in the communications sector, which is an important core expertise in dealing with complex network issues. Converged regulators are often well-suited to address convergence due to the expertise of its staff in a number of related markets and specializations. This organizational model gives the authority greater flexibility to adapt to the rapid pace of technological, market and regulatory change in the ICT sector. In addition, converged regulators have a greater ability to adopt consistent positions and approaches when considering technological and service changes and how such changes affect or are affected by existing regulations. Further, converged regulatory models by design resolve some of the overlap between telecommunications and broadcasting, two of the key services that are increasingly converging and competing with each other as technology evolves.[130]

Across the Americas, there are a number of regulators whose mandates extend beyond telecommunications to include responsibility for spectrum management, broadcasting,

media, IT and other issues. An overview of several countries whose regulators have mandates extending beyond basic regulation of the telecommunication sector is presented in Table 7.

Table 7: Regulators with mandates beyond telecommunications

Country	Spectrum Planning	Spectrum Assignment	Broadcasting	Content
Argentina		X (with ministry)		
Bolivia		X	X	
Brazil		X	X	
Canada	X	X	X	B
Chile	X	X		B
Costa Rica		X		
Cuba[131]	X	X	X	
Dominican Republic	X	X	X	
Ecuador	X	X	X	B
ECTEL[132]	X	X		
El Salvador	X	X	X	
Guatemala		X	X	
Haiti	X	X	X	
Honduras	X	X	X	
Mexico	X (with ministry)	X		
Nicaragua	X	X	X	
Panama	X	X	X	B, I
Paraguay	X	X	X	
United States	X	X	X	B
Uruguay		X	X	B

Country	Spectrum Planning	Spectrum Assignment	Broadcasting	Content
Venezuela	X	X	X	B

B: Telecommunications regulator is responsible for regulation of broadcasting content
I: Telecommunications regulator is responsible for regulation of Internet content.
Source: CEPAL, based on data obtained from Regulatel and national regulatory authorities; ITU data.

Table 8 presents a list of all countries in the region, characterizing their primary telecommunication sector regulator as single-sector, multi-sector or converged. For the purposes of this table, converged regulators are those that have responsibility for spectrum management and broadcasting/media content (e.g., television and radio broadcast programming), in addition to telecommunication services. In the Americas, most countries do not regulate Internet content. Only seven countries responding to the ITU World Telecommunication/ICT Regulatory Database survey indicated that Internet content is regulated in their country, however in most of these cases the telecommunications regulator is not responsible for such content regulation.[133]

Table 8: Regulatory Authority Models in the Americas

Country	Regulator	Model
Argentina	Comisión Nacional de Comunicaciones (CNC)	Single-sector
Barbados	Fair Trading Commission	Multi-sector
Belize	Public Utilities Commission (PUC)	Multi-sector
Bolivia	Autoridad de Fiscalización y Control Social de Telecomunicaciones y Transportes (ATT)	Multi-sector
Brazil	Agência Nacional de Telecomunicações (Anatel)	Converged
Canada	Canadian Radio-television and Telecommunications Commission (CTRC)	Converged
Chile	Subsecretaría de Telecomunicaciones (Subtel)	Single-sector
Colombia	Comisión de Regulación de Comunicaciones (CRC)	Single-sector
Costa Rica	Superintendencia de Telecomunicaciones (SUTEL)	Single-sector
Cuba*	Ministerio de la Informática y las Comunicaciones (MIC)	Converged
Dominica	Eastern Caribbean Telecommunications Authority (ECTEL)	Single-sector

Dominican Republic	Instituto Dominicano de las Telecomunicaciones (Indotel)	Converged
Ecuador	Consejo Nacional de Telecomunicaciones (CONATEL)	Converged
El Salvador	Superintendencia General de Electricidad y Telecomunicaciones (SIGET)	Multi-sector and Converged
Grenada	Eastern Caribbean Telecommunications Authority (ECTEL)	Single-sector
Guatemala	Superintendencia de Telecomunicaciones (SIT)	Converged
Guyana	Public Utilities Commission (PUC)	Multi-sector
Haiti	Conseil National des Télécommunications (CONATEL)	Converged
Honduras	Comisión Nacional de Telecomunicaciones (CONATEL)	Converged
Jamaica	Office of Utilities Regulation (OUR)	Multi-sector
Mexico	Comisión Federal de Telecomunicaciones (Cofetel)	Converged
Nicaragua	Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)	Converged
Panama	Autoridad Nacional de los Servicios Públicos	Multi-sector
Paraguay	Comisión Nacional de Telecomunicaciones (CONATEL)	Converged
Peru	Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSIPTEL)	Single-sector
St. Kitts and Nevis	Eastern Caribbean Telecommunications Authority (ECTEL)	Single-sector
Saint Lucia	Eastern Caribbean Telecommunications Authority (ECTEL)	Single-sector
St. Vincent and the Grenadines	Eastern Caribbean Telecommunications Authority (ECTEL)	Single-sector
Suriname	Telecommunicatie Autoriteit Suriname (TAS)	Single-sector
Trinidad and Tobago	Telecommunications Authority of Trinidad and Tobago (TATT)	Single-sector
United States	Federal Communications Commission (FCC)	Converged
Uruguay	Unidad Reguladora de Servicios de Comunicaciones	Converged

	(URSEC)	
Venezuela	Comisión Nacional de Telecomunicaciones (CONATEL)	Converged
Country	**No Regulator (ministry serves as the regulatory authority)**	**Model**
Antigua and Barbuda	Ministry of Information, Broadcasting and Telecommunications	Multi-sector
Cuba	Ministerio de la Informática y las Comunicaciones (MIC)	Converged

Source: ITU World Telecommunication Service Sector/ICT Indicators Database 2011 (15th Edition).

2.3 Coordination of Telecommunication Regulator and Broadcasting Authority

As addressed in Section 2.2.2, countries around the world are recognizing the benefits of converging the telecommunications and broadcasting regulators in order to enable new and innovative services. In the Americas, both Canada and the United States have converged telecommunications/broadcasting regulators.[134] However, most countries throughout the region have maintained the more traditional approach of separate telecommunications and broadcasting/content authorities, including Argentina, Chile, Colombia and Mexico. For these countries, appropriate policy mechanisms should be in place in order to enable the growth of converged services, particularly IPTV, while ensuring that the regulators' efforts are coordinated and are not duplicative.

In Chile, for example, the National Television Council (CNTV) regulates broadcasting content while the telecommunication regulator, Subtel, manages the technical aspects, such as broadcast spectrum assignments. As such, the regulatory authorities operate relatively independently. Although conflicts relating to spectrum could potentially arise, particularly regarding the reclamation of broadcast spectrum during the digital television transition, CNTV has been part of the spectrum reallocation process and release of the spectrum that will be cleared by broadcasters in the 700 MHz band after the digital television transition is completed—the "digital dividend" spectrum—which is expected in 2019.[135]

2.4 Best Practices: Policy and Regulatory Frameworks

International best practices for establishing policy and regulatory frameworks to promote convergence and broadband in the Americas include:

- Streamlining regulation of ICT services can promote competition, including between platforms or technologies, allowing service providers and users to leverage new and/or more efficient technologies.
- Consider a holistic approach to regulating a converging or converged ICT sector, addressing topics including licensing, technology neutrality, competition, spectrum management, and interconnection.
- Implement any necessary reforms to enable funding of broadband deployments through universal access or universal service programs, such as removal of technology or service restrictions.
- Consider all available sources of financing for broadband deployments, including the private sector, universal service or other development funds, and public-private partnerships.
- Use regulation to encourage or incentivize deployment of broadband and advanced ICT infrastructure, including through reduced barriers to broadband build-out and access to networks.
- Consider the appropriate model for the ICT sector regulatory authority in an increasingly converged environment. In the case of separate telecommunications and broadcasting/media authorities, recognize the importance of close cooperation and coordination.

3 Wireline and Wireless Broadband in the Americas

The development of broadband networks and services are a particular focus for policy-makers in the Americas. Countries around the region have recognized the benefits that broadband can offer for their economies as well as the social and political lives of their citizens. As a result, governments have begun to develop and implement strategies to speed the deployment of broadband networks and foster greater adoption of broadband services. This section discusses the international, regional and national regulatory trends to promote broadband, including an overview of national broadband plans in the region. It describes what governments in the region are doing to promote broadband networks and services, from both the supply side and the demand side of the equation. It concludes with a summary of best practices in promoting supply and demand of broadband networks.

3.1 Regulatory Trends to Promote Broadband

Promoting the development of broadband requires attention to both the supply of broadband networks as well as the demand for broadband services. On the supply side, governments are adopting policies that encourage the build-out of broadband networks to unserved and underserved areas – to bring broadband to areas that lack high-speed access. On the demand side, policy-makers have recognized that even if networks are available, there will be people who cannot or will not be able to use them. To address demand-side issues, governments must develop policies to promote affordability, digital literacy and the development of relevant, local content and services.

Broadband supply and demand are interdependent. As narrowband Internet connections become available, users sign up and discover the benefits of the online world. These users soon start running into the limitations of narrowband, and they start demanding broadband connections. Then, as broadband connections become available, users start downloading more music and movies, sharing more pictures, and generally taking advantage of richer broadband experiences, leading them to ask for even more speed.

Due to the interdependence of supply and demand (see Figure 12), policy-makers are increasingly taking a holistic approach to developing broadband strategies and policies. This involves implementing policies that promote broadband deployments at every level of the supply chain – international connectivity, domestic backbone, metropolitan level and local access – as well as encouraging the uptake of broadband through various initiatives. Policies

to promote broadband supply and demand are intrinsically linked, and should therefore be addressed jointly to maximize the impact of a national broadband strategy or plan.

Figure 12: Broadband Ecosystem: Supply and Demand

Source: TMG.

3.1.1 International and Regional Initiatives

In recent years, various international organizations have collaborated to identify measures on promoting broadband growth. For example, the International Telecommunication Union (ITU) joined forces in May 2010 with the United Nations Educational, Scientific and Cultural Organization (UNESCO) to create the Broadband Commission for Digital Development.[136] The Broadband Commission's general goal is to bring about greater awareness of the benefits of broadband among policy-makers, particularly regarding the role that widespread broadband deployments can play in achieving the Millennium Development Goals (MDGs).[137] The Broadband Commission's most recent report, published in June 2011, identifies broadband as "becoming as crucial in the modern world as roads or electricity supplies" and exhorts governments around to world to develop and implement coordinated, trans-sectoral broadband plans.[138]

For its part, the Inter-American Development Bank (IDB) recently released a report focusing on broadband development in Latin America and the Caribbean.[139] The report finds that greater availability and use of broadband are critical to the region's economic and social development, with potentially far-reaching effects on commerce, education, healthcare,

government services and even the environment. The report concludes that is essential for "governments, their development partners and the ICT/broadband industry [to] work together to promote and nurture a vigorous expansion of broadband access and adoption."[140]

Another initiatives have focused on this region, the *Diálogo Regional de Banda Ancha*, has led to increased cooperation among countries in the region (see Box 4). In addition, since 2008, the "Enhancing Competitiveness in the Caribbean through the Harmonization of ICT Policies, Legislation and Regulatory Procedures" (HIPCAR) project has focused on regulatory reform in the Caribbean. The project is the result of collaboration between ITU, the Caribbean Community (CARICOM) Secretariat and the Caribbean Telecommunications Union (CTU). The goal of HIPCAR is to "assist Caribbean countries in adopting a more harmonized approach to ICT policy, legislation and regulation" in order to improve their competitiveness and foster investment and development.[141] After holding regional workshops and with the help of regional and international experts, HIPCAR issued Model Policy Guidelines and Model Legislative Texts for the region in November 2010. To date, ten Caribbean countries have adopted or plan to adopt the Model Policy Guidelines and Model Legislative Texts, having officially requested HIPCAR assistance in integrating the model documents into their national legislative frameworks.[142]

Box 4: Diálogo Regional de Banda Ancha

The *Diálogo Regional de Banda Ancha* initiative, organized by the UN Economic Commission for Latin America and the Caribbean (ECLAC), is meant to facilitate discussion of broadband policy among countries in the region.[143]

Since the initiative's first official meeting in August 2010, ECLAC has worked together with the participating countries to analyze the state of broadband in the region, study the best practices of broadband policy and regulation, and find more efficient alternatives for the exchange of traffic among the countries. As part of the initiative, ECLAC has launched the *Observatorio Regional de Banda Ancha* (ORBA), which tracks statistical indicators related to broadband in the region. ECLAC also developed a training programme in which policy-makers heard from representatives from ITU, the World Bank, Entel, Telefónica, América Móvil, and from other experts in telecommunication policy about the opportunities and challenges of promoting greater broadband uptake. Policy-makers responsible for broadband policies in Argentina, Chile, Colombia, Costa Rica, Ecuador, Paraguay and Peru

participated in the programme.

As a result of the initiative, the participating countries have agreed to create regional traffic exchange points; to support regulation that promote optical fibre networks in future infrastructure projects; to develop and coordinate strategies for aggregating broadband demand in the region; and to encourage conditions suitable for generation of local content and for content to be hosted locally.

Source: ECLAC, Diálogo Regional de Banda Ancha, http://www.eclac.cl/cgi-bin/getProd.asp?xml=/socinfo/noticias/paginas/3/45323/P45323.xml&xsl=/socinfo/tpl/p18f.xsl&base=/socinfo/tpl/top-bottom-orba.xsl.

The United States recently introduced an initiative, known as the Broadband Partnership of the Americas, to help countries in the region improve access to broadband (see Box 5).

Box 5: Broadband Partnership of the Americas and the Global Broadband Initiative

Broadband Partnership of the Americas

On 14 April 2012, President Obama delivered a speech at the 6th Summit of the Americas, in which he proposed the creation of a Broadband Partnership of the Americas (BPA). BPA will be a voluntary effort that brings together governments, the private sector, multilateral organizations and the donor community in an effort to improve access to broadband and other communications technologies across Latin America and the Caribbean, especially in rural areas. BPA will be managed by USAID's Global Broadband and Innovations (GBI) program (see below) and supported by the Federal Communications Commission (FCC).

Initial efforts under BPA will seek to expand access to the Internet utilizing current programs and resources available from across the U.S. government, including the Technology Leadership Program and the FCC's International Visitors Program.[144] Technical assistance is also expected to be provided through GBI. BPA will also utilize existing relationships that USAID and FCC have with other organizations, such as NetHope,[145] Connect to Compete[146] and similar partnerships to tap private and public sector broadband/development resources. There may be further opportunities to pursue alliances with regional multilateral organizations that may be similar to BPA.

BPA will use these resources to help countries in the Americas expand broadband and ICTs in a variety of ways, including developing national broadband strategies and creating or

upgrading universal service funds that can finance the expansion of broadband. Countries may also seek to improve access to broadband in the region by linking existing broadband networks, harmonizing radio frequencies and sharing best practices across countries in the region.

Global Broadband Initiative

The GBI programme was established by USAID in late 2010 to find ways to improve access to broadband and the Internet across the developing world and facilitate the innovative use of ICTs for development. The programme is based in the Office of Infrastructure and Engineering of the Bureau of Economic Growth and Trade (EGAT/I&E), and works with USAID missions and bureaus around the world on ICT initiatives. Currently, GBI is focused on ways to expand the availability and affordability of access to broadband and mobile Internet services. Much of the work is focused on assisting countries in the development and adoption of universal service programmes that can provide financial support for the development of rural broadband and mobile networks.

Within the Americas, GBI has been working with Colombia's Ministry of Information and Communications Technology and its subsidiary agency *Compartel* to aid in the reformulation of *Compartel* as the lead agency to drive ICT development in the country. GBI is presently assisting *Compartel* in preparing a national gap analysis, reviewing its existing portfolio of programmes and developing a new strategic plan.

Source: FCC, Broadband Partnership of the Americas, http://www.fcc.gov/document/fcc-and-usaid-support-broadband-partnership-americas. .

3.1.2 Broadband Plans in the Americas

A national broadband plan is a crucial tool in addressing the shortcomings of a country's broadband policies. It is a way for governments to establish a set of goals and to encourage coordination among government entities, as well as between government and the private sector, in order to work in unison towards reaching those goals. A national broadband plan should address the supply side of the equation by facilitating the availability of broadband, as well as the demand side by addressing the barriers that limit broadband uptake.

The ITU's 2012 *Trends in Telecommunication Reform* report includes a chapter on setting national broadband plans, policies and strategies.[147] Acknowledging that different countries will take different paths towards implementation (due to legacy structures, political

dictates, economic wherewithal, etc.), the report introduces a "Decision Tree" of elements to be considered when creating a national broadband plan. This way, the report prescribes no single set of best practices, but a methodology towards achieving the best broadband policy for a given country at a given time.

Based on countries' responses to the ITU Regulatory Survey for 2011, a majority of the countries in the region have now adopted national broadband plans (see Box 6). Of the 11 countries reporting that a broadband plan has not yet been adopted, seven (Belize, Costa Rica, Cuba, Grenada, Jamaica, St. Lucia, and Trinidad & Tobago) stated that there are plans to adopt one. Only two countries in the region (Bahamas and St. Vincent and the Grenadines) reported that they have no broadband plan, nor any plans to adopt one at this time.

Box 6: Countries with broadband plans in the Americas region

• **Argentina** • **Barbados** • **Brazil** • **Canada** • **Chile** • **Colombia** • **Costa Rica**	• **Dominican Republic** • **Ecuador** • **Grenada** • **Honduras** • **Mexico** • **Panama**	• **Paraguay** • **Peru** • **St. Kitts and Nevis** • **Trinidad and Tobago** • **United States** • **Venezuela**

Source: ITU World Telecommunication/ICT Regulatory Database, available at www.itu.int/icteye.

The United States, for example, released its broadband plan in March 2010. Drafted by the FCC, the plan has the general goal of ensuring "that the entire broadband ecosystem – networks, devices, content, and applications – is healthy."[148] One of the plan's boldest goals is to connect 100 million households with actual download speeds of at least 100 Mbit/s by 2020. The plan identifies key approaches to influence the broadband ecosystem, and gives 200 specific recommendations grouped into three parts: (i) innovation and investment; (ii) inclusion; and (iii) use of broadband for national priorities and particular goals to be achieved by 2020. The recommendations are directed at more than 20 government agencies, including the FCC, the Executive Branch, Congress and state and local governments.

Brazil announced its national broadband plan in May 2010. One of the main goals of the plan is to triple broadband penetration by 2014, partly through the introduction of basic packages (starting at USD 20 per month) to target 40 million households.[149] The plan also authorizes a range of tax relief and financial incentives to reduce broadband access prices. Small and medium enterprises (SMEs) that provide broadband services, for example, will be exempted from paying into Brazil's equivalent of the Universal Service Fund (FUST). Modems for broadband access will also be exempted from taxes. In addition, financing will be made available for SMEs operating cyber cafes and for the deployment of digital cities. The plan also calls for the development of a national telecommunication equipment industry, and proposes tax breaks and financing for purchases of equipment that incorporates Brazilian technology. Total investment under the plan is estimated at about BRL 13 billion (USD 6.5 billion). This will include injecting capital into Telebras, tax breaks and financing from the Brazilian National Development Bank (BNDES).

Colombia also released its national broadband plan in 2010, with the aim of transforming Colombia into a digital society by 2014. The plan, known as *Vive Digital*, includes a number of initiatives meant to encourage both broadband supply and demand (see Box 7).

Box 7: Initiatives to foster broadband supply and demand in Colombia's *Plan Vive Digital*

Supply	Demand
• **Expand the national optical fibre network** • **Assign spectrum for mobile broadband** • **Facilitate deployment of ICT infrastructure** • **Create data centres and content distribution networks (CDNs) within Colombia** • **Reduce taxes on Internet access and computer equipment** • **Create a convergence-friendly legal and regulatory framework**	• Offer local and national government services online • Strengthen the software industry • Encourage the development of mobile applications and applications for SMEs • Support the digital content industry • Sponsor ICT training programmes • Support telecommuting

Source: http://vivedigital.gov.co/iniciativas.php.

Defining broadband can itself be a challenge. A standard of some sort is necessary in order to define goals and measure against them, but a definition based solely on minimum speeds runs the risk of becoming obsolete. The Broadband Commission, for example, has steered away from defining broadband based on a specific speed and defines broadband using a "cluster of concepts" including "always on," "high capacity" and "low latency," to result in a technology that allows "the combined provision of voice, data and video at the same time."[150] By contrast, ECLAC, through its Regional Broadband Observatory (ORBA), has proposed a speed-based definition of broadband for the region (see Table 9). ORBA's proposed definition is meant to be used as a reference by countries seeking to define broadband policy goals and objectives. The definition was accepted by broadband policy-makers from Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Paraguay, Peru and Uruguay during the fourth meeting of the *Diálogo Regional de Banda Ancha* initiative held in October 2011 in Santiago, Chile.

Table 9: Broadband definition according to ORBA

Indicator	Basic wired broadband or wireless radio base peak	Advanced wired broadband or wireless radio base peak	Total wireless broadband or wireless radio base peak
Minimum download speed	256 kbit/s	2 Mbit/s	10 Mbit/s
Minimum upload speed	128 kbit/s	512 kbit/s	768 kbit/s
Availability for use	Permanent connection	Permanent connection	Permanent connection

Source: *http://www.eclac.org/cgi-bin/getProd.asp?xml=/socinfo/noticias/noticias/4/44884/P44884.xml&xsl=/socinfo/tpl-i/p1f.xsl&base=/socinfo/tpl-i/top-bottom.xsl.*

Brazil has taken an unusual route, defining broadband not by speed but by functionality. According to Brazil's broadband plan, a broadband connection is one that "enables information to flow in a continuous and uninterrupted manner, with sufficient capacity to provide access to data, voice and video applications that are common or socially relevant to users as determined by the Federal Government."[151] The Federal Government has the task of updating the list of applications periodically.

As countries throughout the region continue adopting national broadband plans, some trends and common characteristics in the goals of the various strategies are emerging, including:

- Build-out of nationwide broadband infrastructure, specially optical fibre;
- Achievement of universal access and digital inclusion, particularly for those in rural and remote areas;
- Focus on demand-side goals, particularly improving digital literacy and promoting the use of new and innovative broadband services and applications;
- Focus on both fixed line and mobile broadband deployments to achieve goals;
- Aims to connect a certain percentage of households with broadband;
- Use of public funding (USF, stimulus grants, etc.) to achieve deployment goals; and
- The provision of public and commercial services, such as:
    - e-education
    - e-health/telemedicine
    - e-government
    - e-business.

Figure 13 highlights the broadband plans adopted in the Americas. For a more detailed summary of broadband plans in the region, see Annex A.

Figure 13: National Broadband Plans in a Nutshell

	SUPPLY DRIVEN INITIATIVES						DEMAND DRIVEN INITIATIVES				
	Use of a national fibre network	Increase availability to IMT spectrum	Private sector financing	Public sector financing	Policies and regulation to increase competition	Tax breaks on services and devices	Promotes e-commerce	Support apps. and content creation	ICT R&D centres and high-skills training	Internet at health and education facilities	Digital literacy for citizens & businesses
Argentina	●	●	●	●	●			●	●	●	●
Barbados	●		●	●	●	●	●	●	●		●
Brazil	●	●	●	●	●	●	●	●	●	●	●
Canada			●	●			●	●		●	
Chile			●	●			●	●		●	●
Colombia	●	●		●	●	●		●	●	●	●
Costa Rica	●	●	●	●	●	●		●	●	●	●
Dominican Rep.	●		●	●					●		
Ecuador			●	●		●	●				
Grenada	●		●	●			●	●	●		●
Mexico	●	●	●	●	●	●	●	●	●	●	●
Panama		●	●	●	●						
Paraguay	●	●	●	●	●					●	
Peru	●			●	●	●	●	●		●	
St. Kitts and Nevis			●	●			●	●	●		●
Trinidad and Tobago			●	●							
United States		●	●	●	●					●	●
Venezuela						●	●	●	●	●	●

Source: TMG.

Additionally, the participants in the ITU's GSR11 identified and endorsed regulatory best practice guidelines "to advance the deployment of broadband, encourage innovation and enable digital inclusion for all."[152] Examples of these guidelines are identified in Box 8.

Box 8: Examples of GSR11 Best Practice Guidelines regarding Broadband Deployments

I. Funding mechanisms for promoting the deployment of broadband infrastructure

   1) Leveraging partnerships: Encouraging public-private partnerships when private sector deployments are not sufficient, employing open access arrangements and promotion of market-based schemes to promote both backbone and access networks.

   2) Modernizing universal service programs and funds: Defining universal service in a technology-neutral manner, transforming existing universal access/service programs to include broadband.

II. Fostering private investment in broadband through incentive regulation

1) Providing overall direction through a national policy: Governments should enact a consistent and overarching ICT and/or broadband policy that clarifies the government's commitment to foster broadband development across all sectors and through liberalization. This will likely include a review of existing legal and regulatory frameworks, and should include a consultation or stakeholder feedback phase.

2) Rationalizing licensing regimes: Licensing regulation can be simplified and a unified licensing introduced, and regulators should consider reducing licensing fees as well as the administrative and other market entry barriers.

3) Making spectrum available for mobile broadband: regulators and policy makers need to address a host of issues in order to ensure spectrum is used in the most efficient manner. Recommendations include an incentive-driven, market-based approach to releasing spectrum, new types of spectrum auctions, flexible spectrum use policies, and exploitation of "digital dividend" spectrum.

4) Removing barriers to broadband build-out and access to broadband networks: Reducing regulatory burdens and employing the least degree of regulatory intervention is essential to lower the cost of laying infrastructure, providing services to end users and stimulating new applications and digital content.

5) Granting tax incentives: Reduced taxes on services, devices and equipment will increase penetration levels and pave the way for increased demand of broadband services. More broadly, targeted fiscal incentives to providers of broadband networks, services and equipment can be granted to stimulate a robust and competitive broadband marketplace.

III. Stimulating innovation and development of applications and services

1) Nurturing the creation and adoption of applications, services and digital content: Government agencies are urged to adopt applications and content that allow for greater citizen participation, thus fostering the advent of a new digital culture. Policy makers and regulators can also create an environment in which dynamic digital content creation, dissemination and adoption can

thrive, beginning with a thorough and forward-looking review of the ICT sector regulatory framework to assess necessary changes to permit new and emerging services and applications.

2) Spurring investment in R&D activities: Private investment in research and development should be encouraged, and when resources are available, investment should be channelled to public research and development. In addition, government agencies, including regulators, the private sector and nongovernmental organizations can cooperate to provide incentives for others to develop innovative digital applications and content.

3) Enforcing Intellectual Property Rights: Innovation can be encouraged through intellectual property regimes that balance monopoly use of inventions with building a rich public domain of intellectual materials. In addition, ensuring a balanced, proportionate and robust mechanism for content owners to address copyright infringement endows a stable and solid basis for innovation and creation.

IV. Expanding digital literacy

1) Regulators and policy makers can promote training systems to provide creative human resources, facilitating investment in all forms of education and particularly in ICT education from early training to advanced instruction notably in the area of R&D, ICT knowledge transfer and the development of digital applications and content

Source: ITU, GSR11 Best Practices Guidelines.

3.2 Promoting Supply and Demand of Broadband Networks and Services

Providing broadband, whether over fixed line or mobile networks, requires extensive infrastructure deployments. In the case of fixed line networks, infrastructure tends to take the form of the optical fibre networks connecting regions within a country and countries to one another. In the case of mobile networks, the main input is spectrum. Promoting supply of broadband networks means addressing the infrastructure issues faced by broadband networks, whether mobile or fixed line. Ensuring that all potential users have access to a network is the first step in addressing the digital divide.

3.2.1 Promoting Supply of Fixed Line Broadband Networks

Broadband is not just about the "last mile" connecting the customer to the network. Broadband connections also depend on a healthy "backbone" – the high-speed network that interconnects regions within a country as well as countries to one another.

According to TeleGeography, international Internet capacity in Latin America has increased more than 40-fold between 2005 and 2011 – from 136 gigabits per second to 5.6 terabits per second.[153] In the region, Brazil had approximately 34 per cent (1.9 terabits per second) of that international bandwidth, which was the highest in the region. The growth between 2005 and 2011 is linked primarily to connectivity between Latin America and the United States, which grew 45 per cent between 2010 and 2011 alone.[154] In 2011, 85 per cent of Latin America's international bandwidth connected to the United States, with Miami serving as a major hub for Latin American traffic due to all major submarine cables landing in the area.[155]

While the growth noted above is impressive, it is also important to note that significant disparities exist when looking at international Internet capacity from the subregions in the Americas. In 2011, the South American subregion had 73 per cent of the region's capacity while Central America (including Mexico) had 24 per cent, and the Caribbean only about 3 per cent.[156] Intra-regional links are much more limited, accounting for 14 per cent of capacity.[157]

In an effort to provide greater coverage and to lower the cost of Internet connectivity in the region, several international submarine cable projects have been initiated or are in the planning stages. These include the América Móvil-1, South Atlantic Express (from Brazil to South Africa) and Seabras-1 (cable directly routing between Miami and Brazil). WASACE Cable is planning to construct one submarine cable from Latin America to the United States and another from Latin America to Africa.[158] Telebras has plans to build several cables linking Brazil to Africa, Europe, the United States, and to other countries in Latin America.

In addition, there are various regional initiatives to strengthen interconnection between countries and thus facilitate broadband supply intra-regionally. The Mesoamerican Information Highway, an optical fibre trunk sponsored by the Inter-American Development Bank (IDB) as a public-private partnership with electric firms, spans more than 2 000 kilometres and connects countries from Mexico to Colombia. Internexa, a Colombian provider, in partnership with Level 3, is planning to establish two hubs to serve the region –

Medellin, Colombia (to serve Colombia, Ecuador, Peru and Venezuela) and Sao Paulo (to serve Brazil, Argentina and Chile).[159] The Union of South American Nations (UNASUR) is in the initial planning stages for a 10 000-kilometre optical fibre ring to interconnect South America and expects the project to be ready in 2015. UNASUR meetings have also led to a bilateral agreement between Chile and Brazil to build and extend terrestrial and submarine cables connecting Fortaleza city (in the Northeast region of Brazil) to Chile, the United States and Europe. That project should be completed by 2014 and will be carried out by a public-private consortium. Brazil had previously entered into a similar optical fibre interconnection agreement with Argentina.

With the introduction of IP-based networks, the region also faces the need to enhance its domestic and regional interconnection infrastructure, Internet Exchange Points (IXPs). As noted by the ITU-*info*Dev Regulation Handbook, "where there is no local or regional facility for the exchange of Internet traffic, developing country ISPs must pay for international transit facilities to deliver local traffic," which increases delays, increases costs and reduces the quality of the transmission.[160] In the Caribbean and Latin American region, there are a total of 34 IXPs -- 27 IXPs in South America, 5 in the Caribbean and 2 in Central America. In contrast, there are two active IXPs in Canada and 87 active IXPs in the United States, including one in Puerto Rico.

Table 10: Countries with Active Internet Exchange Points (IXPs) in the Americas

Country	City	Internet Exchange Name	Participants	Traffic	Established
Argentina	Buenos Aires	NAP CABASE	79	1.07 G	Apr-98
Brazil	Americana	Ponto de Troca de Trafego de Americana	11	18.1 M	20-Dec-10
	Belo Horizonte	Ponto de Troca de Trafego de Belo Horizonte	21	1.53 G	
	Brasilia	Ponto de Troca de Trafego de Brasilia	15	1.7 G	
	Campina Grande	Ponto de Troca de Trafego do Campina Grande	13	41.9 M	28-Sep-10
	Campinas	Ponto de Troca de Trafego do Campinas	22	1.78 G	30-Nov-09
	Curitiba	Ponto de Troca de Trafego do Parana	27	6.29 G	Jun-02

	Florianopolis	Ponto de Troca de Trafego de Florianopolis	15	366 M	
	Fortaleza	Ponto de Troca de Trafego de Fortaleza	13	1.16 G	1-Oct-08
	Goinia	Ponto de Troca de Trafego de Goiania	13	105 M	20-Oct-10
	Londrina	Ponto de Troca de Trafego de Londrina	18	742 M	15-Feb-09
	Porto Alegre	Ponto de Troca de Trafego de Porto Alegre	39	3.57 G	2007
	Porto Alegre	Rio Grande do Sul Internet Exchange	19	3.57 G	20-Nov-00
	Recife	Ponto de Troca de Trafego do Recife	6	10.8 M	1-Dec-09
	Rio de Janeiro	Ponto de Troca de Trafego do Rio de Janeiro	23	2.96 G	
	Salvador	Ponto de Troca de Trafego de Salvador	30	1.36 G	2008
	Sao Paulo	NAP do Brasil	37	9.6 G	1998
	Sao Paulo	Ponto de Troca de Trafego Metro	306	88.6 G	4-Oct-04
	Sao Paulo	Telcomp	5	75 M	2003
	Sao Paulo	Tivit	39		
Chile	Santiago	NAP Chile	13		
Colombia	Bogota	NAP Colombia	17	17.1 G	29-Jun-00
Cuba	Habana	NAP de Cuba	5	50 M	Jun-01
Dominican Republic	Santo Domingo	NAP del Caribe			Jul-08
Ecuador	Guayaquil	NAP AEPROVI Guayaquil	34	15 M	2003
	Quito	NAP AEPROVI Quito	6	25 M	2003
Haiti	Port au Prince	AHTIC Internet Exchange Point	4	97 K	5-May-09
Netherlands Antilles	Curaçao	Caribbean Internet Exchange	11	1.74 G	20-Apr-09
	Philipsburg	Open Caribbean Internet eXchange	8		Oct-08
Nicaragua	Managua	Nicaraguan Internet Exchange	15		Apr-04

Panama	Panama City	Intered Panama	10		
Paraguay	Asuncion	CAPADI NAP-PY	15	40 M	2000
Peru	Lima	NAP Lima			
	Lima	NAP Peru			14-May-01

Source: Internet Exchange Directory, Packet Clearing House, https://prefix.pch.net/applications/ixpdir/?show_active_only=0&sort=region&order=asc.

If some or all of these international connectivity projects come to fruition, coupled with the addition of more IXPs in the region, the cost of connectivity is likely to decrease due to the greater availability of capacity and lower transiting costs. Additionally, the greater capacity will boost broadband speeds.

Countries in the region have also started to pay attention to the backbone networks within their borders. Some have decided to foster investment in this area by depending almost exclusively on the private sector to build the networks. Others have decided to use public funds to promote the build-out of networks throughout the country. Finally, some countries have entered into public-private partnerships where government and industry work together to invest in the infrastructure necessary to provide fast, reliable broadband services.

Argentina has favoured a public-led approach. As part of its national broadband plan, called *Argentina Conectada*, the government plans to deploy wireline infrastructure to offer telecommunication services including broadband and digital TV. The network will be managed by state-run satellite venture ArSat, which will coordinate the deployment of 12 000 kilometres of optical fibre across the country. Using this network infrastructure, the government expects to operate in the wholesale broadband access market, competing with incumbent operators Telecom Argentina and Telefónica de Argentina. In the initial phase, the government expects to sell broadband access to local cooperatives, ISPs and large and medium-sized companies. The government expects total investment in this project to reach ARS 8 billion (USD 2.03 billion) over the next three years.

Brazil has similar plans. Its national broadband plan calls for Telebras, a state-owned company, to leverage the country's existing optical fibre backhaul network. Telebras will be tasked with: (i) implementing a private communication network for the federal government; (ii) supporting policies to connect universities, schools, hospitals and other public institutions; (iii) offering infrastructure and networks to support telecommunication services

provided by private companies, state governments and non-governmental entities; and (iv) providing broadband Internet services to end users, but only in localities where service is not already offered.

Colombia has adopted a public-private development strategy. One of the goals of Colombia's *Vive Digital* plan is to provide broadband connectivity to 8.8 million people by 2014. To help reach this goal, in November 2011 the Colombian government selected a private counterpart to deploy an optical fibre network to connect 10778 municipalities across the country. Colombia's Ministry of Information and Communication Technologies expects the network, once fully deployed, to provide access to broadband to approximately 90 per cent of the country's population. The project is to be financed by private capital and by the government (which will provide financing of approximately USD 415 million).

A comparable public-private plan is under way in Costa Rica, which has launched a "social digital agreement" to promote digital technology and provide nationwide broadband for the country's underserved areas and public schools. The programme involves construction of a national broadband network, developed by the government, to reach all communities through an optical fibre backbone. The plan is to enable connectivity between intelligent community centres (known as "Cecis"), starting with 40 unserved communities, and then make public services more widely available over broadband. The infrastructure will also be available for small businesses and homes in these communities. The agreement will see the creation of 250 new Cecis, with the ICT ministry aiming to open 500 by 2014. The new centres will be available for rural and indigenous communities, and will be located in places such as community centres and children's shelters. Additionally, the education ministry plans to provide rural students and teachers with laptops and training. Funding for the project will come from the national telecommunication fund (Fonatel), as well as from the public and private sectors.

Another case of a public-private partnership can be found in Jamaica, where the government has been working on a project to implement an island-wide broadband network. Local telecommunication providers LIME (Cable & Wireless) and Flow (Columbus Communications) have been hired to build the network, which must provide 99.9 per cent availability and 100 Mbit/s backbone speeds. The project is expected to take 18 months to construct and cost nearly USD 6 million. It is to include a central server facility to host educational content that can be accessed from local area networks (LANs) established in public schools throughout the country.

Mexico is testing a more market-driven methodology. In an effort to spur competition in the ICT market, the Mexican Government is auctioning off excess capacity on the optical fibre network of state-owned power company *Comisión Federal de Electricidad* (CFE). The currently unused or "dark" fibre pair could be used to transport voice, data and video across the country. This would allow the winning bidder to avoid having to lease capacity from incumbent Telmex, which controls the largest fixed telecommunication network in the country. Mexico has already auctioned a pair of fibre strands in CFE's network for a 20-year lease. The winning bidder in that auction, with a bid of MXN 884 million (USD 64.2 million), was a joint venture between operators Megacable, Telefónica and Televisa.

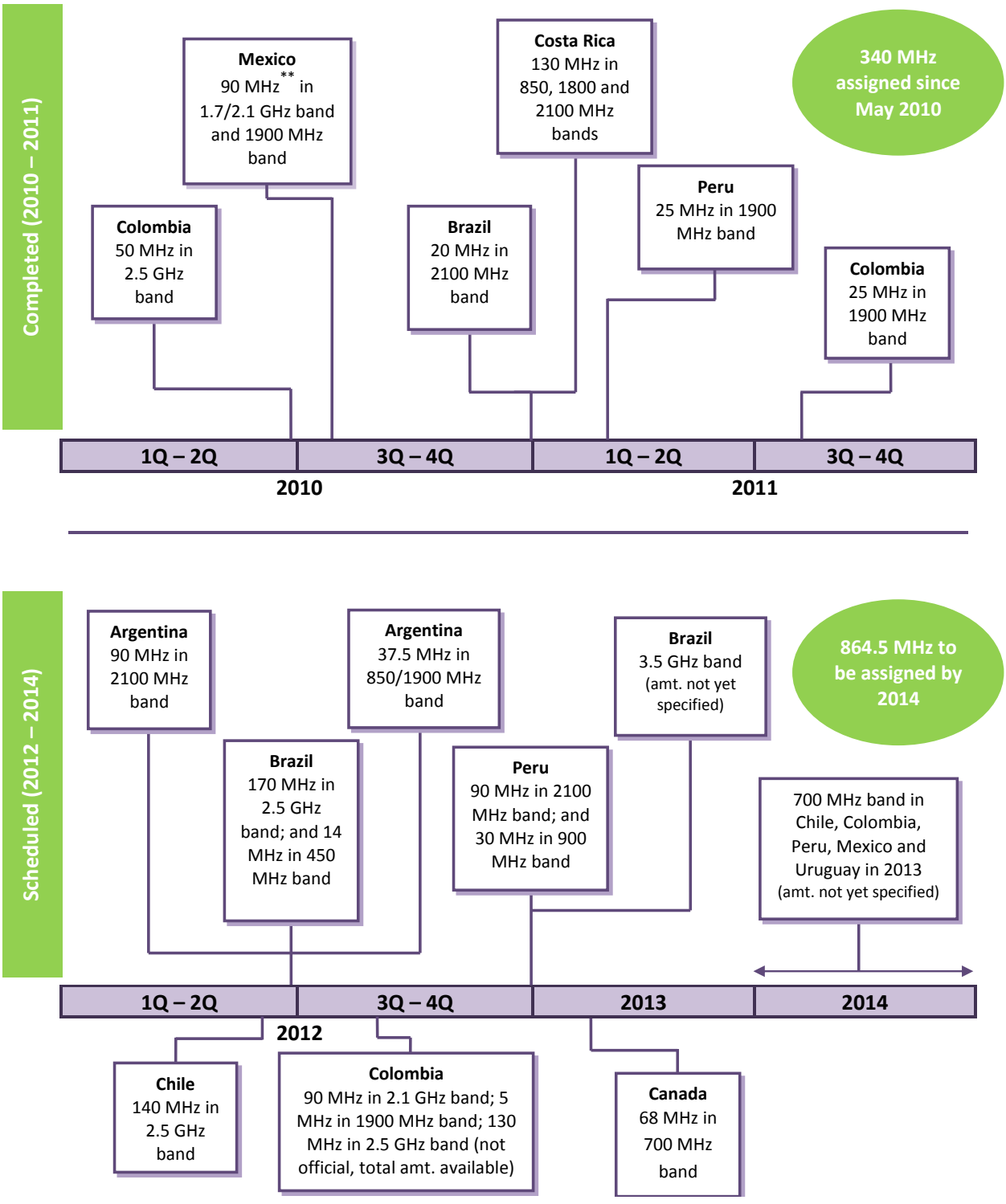
3.2.2 Promoting Supply of Mobile Broadband Networks

Spectrum is an indispensable resource for wireless communications. Governments in the region have realized that timely and fair access to spectrum must be a priority if wireless broadband is to flourish, and most have so stated in their national broadband plans. For example, the U.S. National Broadband Plan calls for awarding 500 MHz of spectrum in the next 10 years. The Americas region as a whole has seen a dramatic increase in completed and planned spectrum auctions in recent years. Some examples include:

- **Colombia:** The Colombian government offered spectrum in the 2.5 GHz band in 2010. Telecommunication provider UNE EPM acquired 50 MHz of spectrum in that auction; its LTE network running on that spectrum being launched commercially in June 2012. UNE EPM plans to offer wireless broadband plans with speeds of up to 12 Mbit/s. Colombia also auctioned spectrum in the 1.9 GHz band in 2011 for mobile services, awarding 25 MHz out of 30 MHz available.
- **Costa Rica:** After many years with only the state-owned operator offering mobile services, Costa Rica in 2011 opened the market to mobile service competition. Costa Rica awarded both Telefónica and América Móvil with between 60 and 70 MHz of spectrum in the 850 MHz, 1.8 GHz and 2.1 GHz bands.
- **Peru:** Spectrum in the 1.9 GHz band was auctioned in 2011, with 25 MHz awarded to Vietnamese operator Viettel. Viettel paid USD 1.3 million for the spectrum, along with an agreement to provide Internet access to more than 4 000 schools. It had planned to invest approximately USD 27 million in its network and start operations by 2012, but recent setbacks have postponed the launch until May 2013. Viettel would be the fourth player in the Peruvian mobile market.

- **Mexico:** In 2010, Mexico completed auctions for spectrum in the 1.9 GHz band and the 1.7 GHz/2.1 GHz band. A total of 30 MHz of spectrum was awarded in the 1.9 GHz band; 60 MHz of spectrum was awarded in the 1.7 GHz/2.1 GHz band.

Figure 14: Spectrum Licensing Processes in the Americas*



**Only reflects national licences.*

***30 MHz of this spectrum does not provide for a national licence because Region 8 is not included in the 1900 MHz band.*

Source: TMG.

As seen in Figure 14 above, since May 2010 at least 340 MHz of spectrum have been assigned to private operators in Latin America.[161] In addition, it is expected that up to 864.5 MHz will be awarded before the end of 2014. Six auctions are scheduled for 2012, including Argentina, Brazil, Chile, and Colombia. In 2012, Argentina plans to auction 90 MHz in the 2100 MHz band; Chile plans to auction 140 MHz of spectrum in the 2.5 GHz band; and Brazil is scheduled to auction of almost 200 MHz of spectrum in an auction of both the 450 MHz and 2.5 GHz bands. In addition, Colombia is auctioning 225 MHz of spectrum in 2012 in a combined auction of the 1.7 GHz/2.1 GHz bands and 2.5 GHz band. Between 2013-2014, it is anticipated that at least six countries will award spectrum in the 700 MHz band (as further discussed below).

Mobile operators are generally planning to deploy LTE technologies on these newly awarded bands, which will improve high-speed broadband access throughout the region. According to 4G Americas, the United States and Canada currently lead the LTE market globally with about two-thirds of total LTE subscriptions in March 2012.[162] Currently, there are three commercially launched LTE networks in Latin America.[163] By 2015, approximately 40 operators are expected to offer LTE services to more than 20 million subscribers using these frequency bands.[164] Despite the growth of LTE throughout Latin America, however, 3G deployments and upgrades are expected to remain the main mobile broadband technologies in the LAC region over the next several years as operators upgrade from HSPA to HSPA+ networks.[165] As of March 2012, there were 79 commercial HSPA networks in 33 LAC countries, including 33 HSPA+ upgrades in 20 countries.[166]

Countries throughout the region are also focusing on auctioning the so-called "digital dividend" in the 698-806 MHz band ("700 MHz band") as up to 108 MHz of spectrum from becomes available after terrestrial television broadcasters complete the digital television transition (see Box 9 for the status of the digital dividend and trends in the Americas). The United States auctioned this band in 2008 while Canada plans to auction the 700 MHz band in 2013.[167] In the region, many countries are not waiting for the digital television transition to take place before auctioning spectrum in the 700 MHz band, which in many countries will occur between 2015 and 2021 (see Figure 15). For example, Chile has announced plans to auction 700 MHz spectrum in 2013,[168] while Colombia, Peru and Uruguay are expected to be

among the first Latin American countries to award digital dividend spectrum, as early as 2013.[169]

Figure 15: Digital Television Transition Timeframes in the Americas

Source: TMG.

As part of the process to auction digital dividend spectrum, countries throughout the Americas are beginning to decide which band plan to adopt for the 700 MHz band. The two options being considered are the U.S. band plan and the APT band plan (see Box 9 below). This decision is significant because it will determine, in large part, economies of scale for devices and equipment and will impact regional initiatives that enable cross-border harmonization.

Box 9: Status of the 700 MHz Band in the Americas

Since the digital dividend for the Americas and Asia-Pacific are harmonized (generally the 698-806 MHz band or 700 MHz band), countries throughout these regions can adopt similar band plans. In 2010, the Asia-Pacific Telecommunity (APT), an intergovernmental organization coordinating telecommunication and spectrum issues in the region, reached an agreement on the region's paired (FDD) and unpaired (TDD) frequency arrangements for IMT in the 698-806 MHz frequency band, as follows. These are known as the "APT band plans."

Figure 16: APT FDD Frequency Arrangement for 700 MHz Band

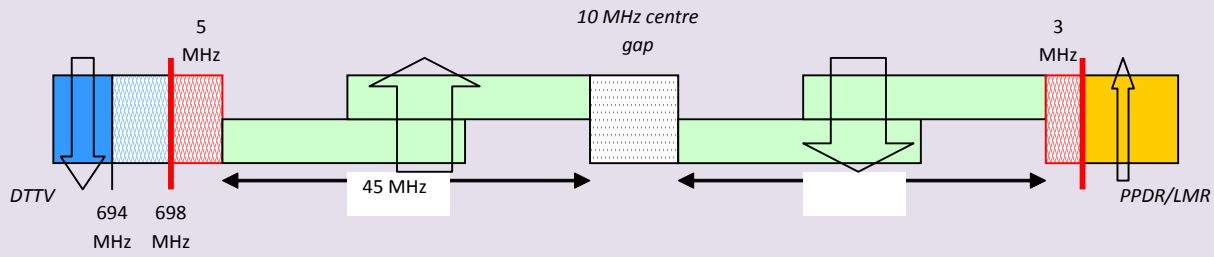
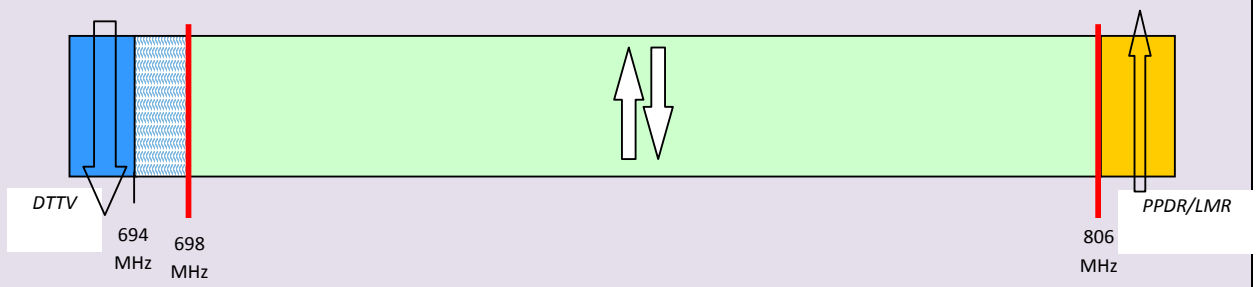
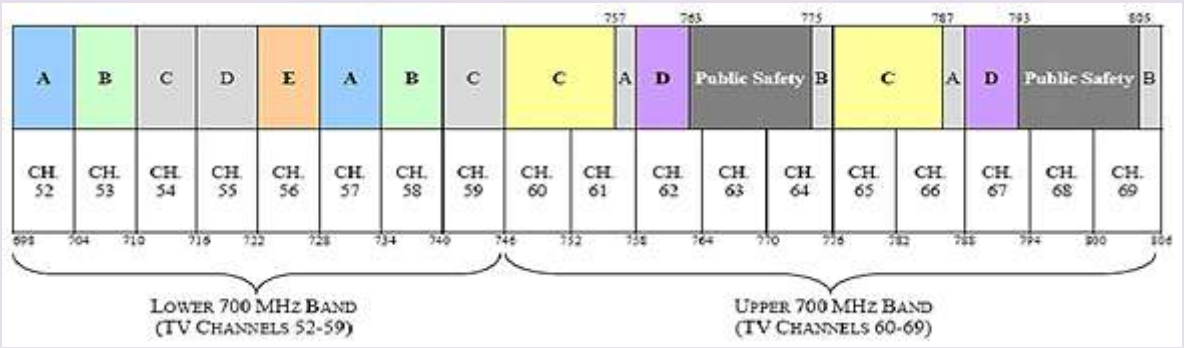


Figure 17: APT TDD Frequency Arrangement for 700 MHz Band



In contrast, the United States adopted the "U.S. band plan," which includes different-sized channels, as well as spectrum for public safety use. As such, less spectrum is available for mobile services.

Figure 18: U.S. Frequency Arrangement for 700 MHz Band



Block	Frequencies (MHz)	Bandwidth	Pairing	Area Type	Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	EA	176
B	704-710, 734-740	12 MHz	2 x 6 MHz	CMA	734
C	710-716, 740-746	12 MHz	2 x 6 MHz	CMA	734
D	716-722	6 MHz	unpaired	EAG	6
E	722-728	6 MHz	unpaired	EA	176
C	746-757, 776-787	22 MHz	2 x 11 MHz	REAG	12
A	757-758, 787-788	2 MHz	2 x 1 MHz	MEA	52
D	758-763, 788-793	10 MHz	2 x 5 MHz	Nationwide	1 *
B	775-776, 805-806	2 MHz	2 x 1 MHz	MEA	52

Sources: APT Common Views on Harmonised Frequency Arrangements for IMT in the Band 698-806 MHz, 9th Meeting of the APT Wireless Forum, Document AWF-9/OUT-12 (16 September 2010). Also see APT, Report: Harmonised Frequency Arrangements for IMT in the Band 698-806 MHz, Document AWF-9/OUT-13 (16 September 2010) at http://www.aptsec.org/sites/default/files/APT-AWF-REP-14_APT_Report_Harmonized_Freq_Arrangement.doc; Industry Canada, "Policy and Technical Framework Mobile Broadband Services (MBS) – 700 MHz Band Broadband Radio Service (BRS) – 2500 MHz Band," Decision, March 2012, http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10121.html.

In the region, many countries still have not formally decided which band plan they will pursue. Some countries have held consultations (e.g., Colombia, Mexico and Peru) have proposed adopting the APT band plan. In 2012, Canada officially adopted the U.S. band plan while Chile, Colombia and Mexico have publicly stated that they will adopt the APT band plan. Table 11 below identifies those countries in the region that have adopted and/or proposed to adopt the APT band plan, as well as status of allocation, award and use of the 700 MHz band over the next year.

Table 11: Status of Allocation, Award and Use of the 700 MHz in the Americas

Country	Award Status	Allocated to Mobile Services	Band Plan Selected/Proposed
Canada	2013	Yes	U.S.
Chile		Yes	APT*
Colombia		Yes	APT*
Mexico		Yes	APT*
Peru	2013	Yes	APT*
United States	Awarded in 2008	Yes	U.S.

Uruguay		Yes	

** The APT band plan is being favoured, but no formal decision has been issued at this time.*

Source: TMG.

In an effort to make more spectrum available for broadband, governments are looking at identifying spectrum that can be repurposed from government to commercial use or shifted from currently allocated services to mobile services. For example, as part of the effort of the U.S. government to make 500 MHz of spectrum available through auction mechanisms over 10 years (300 MHz of which should be made available within 5 years),[170] the U.S. National Telecommunications and Information Administration (NTIA) identified in a study released in 2012 up to 210 MHz of spectrum that could be repurposed for commercial use.[171]

3.2.3 Promoting Demand for Broadband Services

A complementary approach to strengthening broadband proliferation entails addressing the demand side of the ecosystem. Policy-makers have begun to recognize that only addressing supply-side factors, will not realize the economic and social benefits that broadband can bring. Governments can solve the demand problem by addressing the most common barriers to broadband adoption: awareness, affordability and attractiveness.[172]

Awareness is the most obvious stumbling block: consumers cannot subscribe to a broadband service if they are not aware that the service even exists. A large part of building awareness is ensuring that users have the right skills to use the Internet and broadband services. Thus, digital literacy, or a person's ability to use ICT tools, services and devices, has become a critical focus for countries seeking to drive broadband development. Digital literacy training can be integrated into the general educational curriculum, while training programmes can reach adults and specific communities.

Countries in the region are implementing various measures to enhance digital literacy and digital inclusion. For example, Chile has focused on improving broadband connectivity in schools and thus digital literacy through *Enlaces*, a Ministry of Education initiative.[173] Telecommunication regulator Subtel's related initiative, *Conectividad para la Educación*, has offered free broadband connections to schools since 2011. Chile now has 7 000 technology-enabled classrooms, more than 1 500 mobile computing laboratories and 3 500 schools with subsidized connections, covering 75 per cent of students (67 per cent with broadband). Chile's goal is for all schools to have a broadband connection by 2014. The programmes

have been a success: recent figures show that 66.4 per cent of students reported they were proficient at the Internet, up from 28.2 per cent in 2004, while 19.5 per cent considered themselves Internet experts, up from 4.3 per cent in 2004.[174] Uruguay has also made great strides in the school connectivity project, *Plan Ceibal*, which was first announced in December 2006,[175] and began in May 2007 when 43 per cent of primary schools did not have any computers while another 43 per cent had between just one and four computers.[176] The main goal of the program was to provide 360 000 low-cost laptops to each of the country's primary school children by 2009. Having attained this goal, by March 2012, the project had delivered about 590 000 laptops to all primary students, as well as some secondary students and teachers.[177] Additionally, *Plan Ceibal* has provided Internet connectivity to 99 per cent of the country's 4 375 primary and secondary schools, including fibre network deployments to 350 public schools and the goal of connecting another 450 schools by the end of 2012. Financing of *Plan Ceibal* is from a variety of sources, including direct government funding of USD 21 million through the education budget, funding from international institutions, such as the Inter-American Development Bank, which provided USD 6 million in 2009, and private sector investments. Affordability is of utmost importance to broadband uptake, particularly in low-income populations. Numerous studies have found that one of the main reasons people forgo broadband even though it is available is price, including the price of the service, of installation and of the necessary equipment. The *Observatorio Regional de Banda Ancha* (ORBA), an organ of the *Diálogo Regional de Banda Ancha* initiative of the ECLAC, conducted one such study in 2011.[178] ORBA found that, in the Latin America region, the average price for broadband reached USD 72.8 per Mbit/s, compared to an average of USD 5.9 in OECD countries – a twelvefold difference. The ITU's ICT Price Basket study reaches a similar conclusion.[179] While the study found that prices for fixed line broadband subscriptions in the Americas region decreased slightly – from 25 per cent of GNI per capita in 2008 to 22 per cent in 2010 – they were still many times higher than the average of 1.5 per cent of GNI per capita in developed countries.

Brazil has made affordability central to its national broadband plan. The plan sets a goal of connecting 40 million households to broadband service, with a target price of no more than BRL 35 (USD 17.5) per month. Furthermore, at least seven states will exempt broadband services from paying value added taxes (VAT), lowering the target price to BRL 29.90 (USD 15) per month. Recent reports say the government plans to establish a similar programme

for mobile services, with a price cap of BRL 30 (USD 15) for monthly packages including voice and data.[180]

Many countries in the Americas region impose significant taxes on many of the goods and services associated with broadband, including direct taxes on broadband access services, general consumption taxes and import taxes on specific types of equipment. In the mobile broadband sector in particular, countries have imposed a variety of taxes that may have a dampening effect on demand (see Table 12). Many countries, for example, impose high customs duties on imported handsets. Among the highest are Argentina and Brazil – 16 per cent – and Trinidad and Tobago and Ecuador – 20 per cent. In addition to its customs duty and a 21 per cent VAT, Argentina has also imposed a special tax on imported handsets of 25.21 per cent.[181] Brazil has also imposed a VAT of 25 per cent in addition to its customs duty. Unlike some other regions, however, most countries in the Americas do not apply a usage tax, the exception being the Dominican Republic, which imposes a 12 per cent usage tax. The result is that taxes, measured as a portion of the total cost of mobile ownership (TCMO), remain high. [182] The overall trend in the region is positive, however, with taxes as a proportion of TCMO decreasing in Latin America between 2007 and 2011, from 18.74 per cent to 16.97 per cent. Some countries enacted more significant decreases. Ecuador, for example, removed its general excise duty of 20 per cent on all service components, which reduced tax as a proportion of TCMO from 26 per cent to 13 per cent from 2007 to 2011.[183]

Table 12: Applicable Tax Rates for Mobile Services in Latin America

Countries	VAT on mobile services	Custom Duty on imported handsets	Mobile Specific Tax	
			Handset	Usage
Argentina	21%	16%	25.21%	12.90% on post paid rental only, no tax on other usage
Bolivia	13%	10%	–	–
Brazil	25 %	16%	–	–
Chile	19%	6%	–	–
Colombia	16%	5%	1.20%	–
Dominican Republic	16%	–	–	12%

Ecuador	12%	20%	–	–
Guatemala	12%	7.5%	–	–
Mexico	16%	0.8%	–	–
Nicaragua	15%	–	–	–
Paraguay	10%	2%	–	–
Peru	19%	12%	–	–
Trinidad and Tobago	15%	20%	–	–
Venezuela	12%	15%	–	–

Source: Deloitte research based on local sources and MNO's information

Attractiveness is the final challenge to increasing broadband uptake. Many people are aware of broadband and are able to afford it, but they believe that it has little to offer them. In developed countries such as the United States, this is the number one reason that people give for not using the Internet even when it is available.[184] It was also the main reason in Brazil, where 32.8 per cent of those not using the Internet explained they did not want it or need it.[185]

In order to enhance the attractiveness of broadband, a number of countries have identified the development of local content as a priority, such as Argentina, Brazil, and Colombia. Encouraging the development of local applications ("apps") can also help further drive broadband demand, as users may find local apps more relevant and useful than foreign apps.

Governments can sponsor programmes that foster the creation of local Internet content, as well as bring more of their own services online, in order to increase the attractiveness and by extension the uptake of broadband. So-called "e-government" initiatives include the e-Mexico portal, which aggregates all levels of government services to provide "one-stop shopping" for Mexicans looking to interact with their government.[186] These initiatives also include "e-procurement" programmes such as Mexico's *Compranet*.[187] The *Compranet* system was created in 1996 by the Ministry of the Controllership and Administrative Development (MCAD) to bring transparency and efficiency to the federal government procurement process in Mexico. SMEs can sell to the government after registering on the

system; registration is free. More than 80 per cent of all proposed federal government acquisitions now appear on the system, leading to savings of approximately 20 per cent.

Governments can also work together with the private sector in programmes to increase broadband demand. One such public-private partnership, between government entities, Google and other private companies, helps SMEs establish an online presence at low or no cost (see Box 10).

Box 10: Google's "Get your business online"

Since 2010, Google has been rolling out an initiative to help SMEs establish an online presence by simplifying the domain name registration process, signing up with a web host and building a website. In the United States the programme is known as "Get Your Business Online." Google has launched related programmes in the United Kingdom (Getting British Business Online), Ireland (Getting Irish Business Online), Canada (Canada Get Your Business Online) and other countries. Depending on the country, Google partners with local ISPs, NGOs, government agencies and sponsors.

In early 2012, the programme reached Mexico as *Conecta tu Negocio*. Mexico's Secretariat of Economy has said that there are more than 4 million SMEs in Mexico, and that SMEs account for more than half of the national Gross Domestic Product (GDP).[188] According to Google, SMEs are responsible for creating 8 out of 10 jobs in Mexico.[189] Google has also found that there are more than 40 million Internet users in Mexico and fully 70 per cent of them go online to research products and services.[190] Most Mexican SMEs squander this opportunity, as only 37 per cent have a presence on the Internet.

In addition to Google, partnership members in Mexico include Jimdo, Banamex, *Consejo de la Comunicación*, *Instituto Pyme*, *Universidad Virtual del Sistema Tecnológico de Monterrey* and the Secretariat of Economy's *México Emprende* programme. Google will offer participating SMEs a coupon for MXN 650 towards an advertising campaign using Google's AdWords service. Jimdo will offer its free website builder, designed to make it easy for laypersons to build a professional-looking website, and will also supply the domain name, web hosting, email addresses and technical support. Banamex will offer banking, payroll and investment services, including a free enterprise checking account. *Consejo de la Comunicación* and *Instituto Pyme* will offer enterprise advisory services, conferences and workshops, while *Universidad Virtual del Sistema Tecnológico de Monterrey* will offer

online access to courses on marketing, advertising and business solutions.

Conecta tu Negocio is free for one year. After that, SMEs may stay with the platform for a fee or migrate their website to the platform of their preference.

3.2.4 Best Practices in Promoting the Supply and Demand of Broadband Networks

Governments should observe the following list of best practices in promoting the supply and demand of broadband networks within their borders:

- Create and implement national broadband plans with ambitious but realistic goals;
- Establish an enabling regulatory environment, which includes transparent decision-making processes to develop and promote unified licensing frameworks, flexible spectrum management policies, technological convergence, effective competition and consumer protection (see section 4 for trends and best practices);
- Use public funding on a transparent and non-discriminatory basis to address broadband development needs unmet by the private sector investment, such as in rural and remote areas;
- Balance the demands of infrastructure development and the promotion of private investment with the need to encourage competition and innovation;
- Make sufficient amounts of spectrum commercially available for mobile broadband, recognizing the key role that mobile broadband can play in achieving national goals;
- Focus on creating incentives to increase demand for broadband, including digital literacy programs, improving affordability of broadband services and broadband-enabled devices (e.g., through a reduction or elimination of taxes) and local content development; and
- Continue to promote regional coordination, such as through the development of international submarine cable systems and IXPs.

4 TRENDS IN CREATING AN ENABLING REGULATORY ENVIRONMENT

In order to foster growth, innovation and investment, not only in the ICT sector, but for a country's overall economy, it is essential for policy-makers and regulators to provide an enabling regulatory environment. This means that the laws and regulations of a country do not contain artificial restrictions for entry and offer sufficient flexibility to encourage and allow the deployment of new technologies and services. In addition, an enabling environment provides sufficient safeguards to foster competition and allows providers, particularly new entrants, to operate on a level playing field. Since regulations typically follow fast-paced technological developments, these features are particularly important in the dynamic ICT sector as they tend to ensure that regulations can be adapted relatively quickly to market changes through open, informed processes.

An enabling regulatory environment is achieved through a comprehensive approach that considers the wide range of policies and regulations that impact convergence and the growth of broadband networks and services. The key policies and regulations to consider include licensing frameworks, spectrum management, policies to promote convergence, mechanisms to promote effective competition and consumer protection rules. The following section highlights each of these elements, notes how countries in the region are adopting such policies and identifies their associated best practices.

4.1 Establishment of a Unified Licensing Regime

4.1.1 Simplified Licensing Frameworks for Telecommunications Networks and Services

As addressed in section 2.1.2, policy-makers throughout the region have adopted or are considering various regulatory mechanisms to facilitate convergence, as well as encourage the deployment and uptake of broadband networks and services. Some key objectives of a converged licensing regime are to encourage the growth of new applications and services, such as the growth of VoIP (see Box 11); simplify existing licensing procedures; facilitate regulatory flexibility to address future market and technological developments; ensure efficient utilization of network resources; encourage market entry by a wide range of operators; and foster a level playing field among competitors.[191] In the Americas, countries that have introduced unified or multi-service licenses in some fashion include Argentina, the Bahamas, Brazil, Colombia, Honduras, Mexico, Paraguay, Peru, Trinidad and Tobago, and Venezuela.[192]

Box 11: Licensing of VoIP Services and Applications in the Region

The licensing of VoIP services in the Americas varies widely, but its provision is typically permitted throughout the region. According to self-reported data with the ITU Telecommunication Regulatory Database, most countries (e.g., Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Panama, the United States and Uruguay) permit "PC-to-phone" VoIP, which interconnects with the PSTN. In countries permitting interconnected VoIP, such services are generally subject to the same licensing and regulatory obligations as traditional voice telephony services, including contributions to the universal service fund.[193] Some countries in the region, such as Belize, only permit OTT VoIP (also referred to as P2P VoIP or PC-PC VoIP), but do not allow interconnected VoIP. Still others, such as Venezuela, have banned VoIP services. VoIP applications and services offer substantial consumer benefits through very cheap—or even free—voice services.

As such, it is important that VoIP services are available, and are an important aspect of promoting technology and service neutrality, with most countries setting out a clear VoIP policy for how such services will be licensed (or unlicensed). In determining whether and how the various types of VoIP services are regulated, policy-makers tend to consider, from the consumer's point of view, how similar the VoIP service is to traditional telephony services. So, for example, OTT VoIP applications with no interconnection with the PSTN may be unregulated while fully interconnected VoIP (i.e., calls can be made to and received from the PSTN) may be regulated more like a traditional voice service. However, since VoIP is seen as a disruptive technology that competes with existing traditional telephony services, there has been resistance by network operators in some countries towards policies regarding VoIP. Despite this resistance, policy-makers should consider the full benefits that VoIP has to offer consumers and the economy as a whole as they continue to update their licensing frameworks to address convergence.

Source: ITU World Telecommunication/ICT Regulatory Database.

At the 9th Global Symposium for Regulators (GSR09), for example, participating regulators identified as one of the best practices to facilitating convergence the need to:

> Build an adaptive regulatory framework by adopting a technology neutral approach, administratively simplified and flexible licensing regime providing for easy market entry of new players, such as through general authorizations and multiservice/unified licences.[194]

A key means to achieving this objective is through the implementation of a simplified licensing framework based on technology and service neutrality. Under the traditional framework, regulators issued a separate licence for each type of service and technology. This required an operator offering multiple services to obtain a separate licence for each type of service. However, technological and service convergence demands a more streamlined, adaptive approach to licensing, with countries around the world responding by moving away from more traditional technology- and service-specific licences towards multi-service/unified licences or general authorizations.

The multi-service framework generally maintains multiple licence categories (e.g., separate licences for facilities-based and service-based activities or for fixed line and mobile services), but permits a licensee to offer a range of services under a single licence, such as fixed line voice, ISP services and value-added services.[195] Hence, service providers are often required to hold multiple types of licences in order to provide a full range of services. Although more flexible and technology-neutral than a service-specific licence, multi-service frameworks do not offer full technology neutrality. In contrast, a general authorization framework typically allows all types of services to be offered under a single authorization using any type of technology. In many instances, for example under the EU Authorisation Directive, service providers are only required to submit notification to the regulator in order to offer electronic communications services—there is no application or approval process.[196]

Simplification of the licensing and authorization process offers many benefits to regulators, service providers and consumers.[197] For regulators, technology- and service-neutral licensing frameworks tend to result in lower regulatory and administrative costs. For example, a general authorization regime with no application process may not have any notification requirement, which alleviates the need for staff to review and approve applications to offer new technologies and services. Even in instances where a simple notification/registration requirement is needed under a general authorization regime, a significant number of staff is not necessary. Additionally, the regulator benefits from greater flexibility in adapting regulatory instruments since changes to the licensing regime can be introduced without amending or negotiating multiple types of individual licences. A simplified licensing framework can also help the regulator achieve overall sector objectives of increasing deployment and uptake of ICTs and improving regulatory certainty since all qualified applicants are either automatically authorized or granted a licence subject to review. For existing service providers, simplified licensing processes allow them to quickly expand their service offerings and avoid overlapping, and often contradictory, service-

specific regulatory obligations, while new entrants are able to begin offering services without extensive application procedures, all of which lowers operator costs and promotes competition and innovation. These benefits can extend to consumers who in turn have access to a greater selection of services, lower prices and higher service quality.

As shown in Table 13, although most countries throughout the LAC region have maintained service-specific licensing regimes for telecommunication services, countries are increasingly adopting technology- and service-neutral licensing frameworks to take advantage of these benefits. Argentina, Colombia and Peru, for example, have adopted unified licensing regimes, as outlined below.

- **Argentina:** A unified licensing framework (Licencia Unica de Telecomunicaciones) was adopted in Argentina in 2000, one of the first Latin American countries to do so.[198] The unified licence permits licensees to provide all types of telecommunication service to the public under a single licence, including fixed line, wireless, local, long-distance, international, facilities-based and resale-based services. However, television broadcasting services are not included in the unified licence. The regulator, Comisión Nacional de Comunicaciones (CNC), receives, reviews and grants licence requests. Applicants must submit technical and economic plans and agree to abide by the general obligations, which include annual reporting, quality of service, annual fees and other basic requirements that apply equally to all unified licensees. Once granted, a unified licence enables the licensee to operate on a national basis. These licences do not expire, are non-exclusive (i.e., there is no limit to the number that may be issued) and are explicitly technology-neutral. As of 2011, the CNC granted 3,160 unified licences.[199]

- **Colombia:** Ley 1341 de 2009 reformed the country's ICT sector, including the creation of a general authorization regime.[200] One of the guiding principles of the law is a guarantee of technology neutrality, whereby service providers are able to adopt their technologies of choice in order to promote the efficient delivery of services, content and applications, as well as ensure free and fair competition.[201] Under Article 15 of the law, providers are only required to register with the Ministerio de Tecnologías de la Información y las Comunicaciones (MINTIC) in order to offer any type of telecommunication network and/or service, including fixed line and mobile telephony, broadband Internet access and other value-added services. However, spectrum and numbering resources must be applied for separately.

- **Peru:** The unified licensing regime was set out in Ley de Concesión Unica in 2006, which recognizes that convergence is a key element for the development of the Information Society and specifically states that the law is intended to promote the convergence of networks and services, as well as facilitate the interoperability of different network platforms and the provision of various services and applications over a common technology platform.[202] The principal objectives include reducing access and entry barriers to existing service providers and new entrants by implementing a unified licence that allows the provision of all public telecommunication services, including local, long distance and international communications over fixed line or wireless infrastructure. Notably, the Ley de Concesión Unica also permits the provision of pay television services to enable IPTV.[203]

Table 13: Licensing Regimes in the LAC Region

Service-Specific Licensing	Unified Licensing
Antigua & Barbuda	Argentina
Barbados	Bahamas
Brazil	Colombia
Chile	Costa Rica
Cuba	Honduras
Dominican Rep.	Peru
Ecuador	Trinidad & Tobago
El Salvador	
Grenada	
Guyana	
Jamaica	
Mexico	
Panama	
Paraguay	
St. Lucia	
St. Vincent and the Grenadines	

Service-Specific Licensing	Unified Licensing
Venezuela	

Source: ITU World Telecommunication/ICT Regulatory Database.

4.1.2 Best Practices for Establishing Unified and Converged Licensing Regimes

The ITU-*info*Dev ICT Regulation Toolkit and 11th Global Symposium for Regulators (GSR11) identified several best practices for policy-makers to consider when establishing a converged licensing framework for telecommunications, including:[204]

- Ensure that the procedures for issuing the new authorizations or updating existing authorizations are as simple as possible. A registration/notification-only requirement offers the simplest process. If a licence application process is required, consider providing a "check-the-box" type application in which applicants identify which services they plan to offer;
- Create a standard set of regulations setting out the terms and conditions attached to the authorization/licences that apply equally to all service providers (although special conditions may apply to certain providers, such as universal service or number portability obligations);
- Establish a process for transitioning existing licensees to the new authorization or licensing regime, which may involve a grace period for obtaining an authorization under the new framework;
- Focus on establishing full technology neutrality through a general authorization framework as much as possible. If opting for a multi-service framework, require service providers to hold just a single licence. For example, a facilities-based licence would replace a services-based licence and include all activities authorized under a services-based licence;
- Procedurally, the decision-making process should be transparent and non-discriminatory, particularly through the use of public consultation to help instill confidence in the outcome; and
- Ensure low or reduced licensing fees to enable greater network investments, in addition to reducing or eliminating administrative and formal requirements to enter the market and provide service.[205]

4.2 Implementation of Market-Based and Flexible-Use Spectrum Management Policies

4.2.1 Market-Based Spectrum Management Policies

The mobile sector has become an integral part of the economy throughout the region, generating about USD 175 million in 2011, or about 3.6 per cent of the region's total gross domestic product (GDP).[206] Although mobile broadband penetration is still relatively low in the LAC region with a projected penetration rate of 4.84 active mobile broadband subscriptions per 100 people in 2011, the mobile-cellular penetration rate in 2011 was a projected 115 per 100 people.[207] The large percentage of mobile telephony users, combined with the more than 200 million Internet users in Latin America, suggests that significant pent-up demand exists for mobile broadband services, particularly considering that the number of subscriptions in Latin America grew 133 per cent per year between 2006 and 2011.[208] The future demand for mobile broadband is further highlighted in the explosion of data traffic over recent years, which is expected to more than double each year for the next five years.[209] Additionally, since fixed line broadband access is growing at a slower pace, mobile broadband serves as a key means for universalization of broadband in emerging economies and is "becoming the main platform for high-speed internet services for most of the Latin Americans who are currently disconnected."[210]

In order to keep pace with demand and help meet broadband access goals, policy-makers and stakeholders throughout the region recognize that sufficient amounts of spectrum must be released for mobile services, according to an effective framework for managing the spectrum as noted in section 3. The bands being auctioned include 450 MHz, 700 MHz, 850 MHz, 900 MHz, 1.8 GHz, 1.9 GHz, 1.7/2.1 GHz (or 1.9/2.1 GHz band in Brazil/Costa Rica) and 2.5 GHz bands.

A spectrum management framework based on market-oriented and flexible-use policies is increasingly viewed as an important means to promote convergence and broadband diffusion. Market-based mechanisms, including auctions and public tenders, for initially assigning spectrum use rights help ensure that spectrum will go to its most highly valued and efficient use, as well as promote competition by creating opportunities for new entrants to win or buy spectrum licences.[211] As outlined by the GSR11, "an incentive-based, market-driven approach to making more spectrum available for mobile broadband services is preferable, enabling inter-platform competition and spurring innovation."[212]

In designing auction and tender rules for IMT spectrum, regulators can achieve various public policy goals such as enhancing coverage, providing service to rural areas, as well as generating revenues for the government. In general, regulators in the region often impose specific coverage obligations on licensees which must be met in a certain number of years. In some cases, such as Colombia, regulators have accepted in-kind consideration in terms of roll-out rather than cash payments for IMT spectrum assignments. Other countries, such as Chile, have traditionally used tender processes that emphasize coverage commitments and other technical conditions over cash payments. Countries like Brazil, Costa Rica or Peru, have relied on assignment mechanisms that combine competitive bidding with specific geographic coverage targets. While the choice and design of the assignment process varies from country to country, the critical issue is for regulators to ensure transparency and accountability in the assignment of licenses and set reasonable coverage targets that can be met by operators. [213] Similarly, it is important for regulators to understand that while spectrum tenders or auctions are a legitimate mechanism for revenue generation this goal should not result in the creation of barriers for spectrum assignment via excessive pricing.

Another option being explored in the region to free up spectrum for wireless broadband is the use of incentive auctions. While no such auction has taken place, in February 2012, the U.S. Congress passed legislation authorizing the FCC to conduct incentive auctions.[214] This process would entail the FCC encouraging existing broadcasting licensees to relinquish voluntarily some or all of their licensed spectrum usage rights for reassignment to third parties. In exchange, the relinquishing licensee would share a portion (determined via reverse auctions) of the proceeds of the subsequent assignment process. This type of assignment mechanism could facilitate clearing valuable spectrum in countries or geographic areas where bands are significantly encumbered.

Similarly, regulators and policy-makers are also using their spectrum management authority to assign spectrum and facilitate entry of new mobile operators and to prevent incumbents from hoarding spectrum. In the region, the main tool being used is spectrum caps, which generally refers to rules limiting the amount of spectrum that any single operator may hold. Several countries throughout the region has implemented spectrum, including Argentina, Brazil, Chile, Colombia, Mexico and Peru (see Table 14). The use of caps does not require all operators to have equal amounts of spectrum, but generally focuses on ensuring that operators have sufficient spectrum to compete. As mobile broadband develops and consumers increasingly demand more bandwidth, regulators are also beginning to use caps to ensure that incumbents and late entrants have access to both lower and higher

frequency bands. A more even blend of spectrum is sought to facilitate competition due to the advantages stemming from the propagation characteristics of below 1 GHz spectrum; lower bands allow greater coverage and penetration of buildings. Although spectrum caps are common in the region, they can also limit investment and growth in the mobile market, especially in view of increased consumer demand. As such, policy-makers often review spectrum caps to determine whether they are still necessary, including examining whether there is effective competition in the market and whether operators have sufficient access to spectrum to deploy mobile broadband technologies.[215]

There are three main types of spectrum caps: 1) overall caps on the total amount of spectrum any single operator can hold; 2) band-specific caps on the amount that an operator may hold in a single band; and 3) auction-specific caps on how much an operator can win in a single auction process. Overall caps are generally the most common type in the region. For example, Colombia has imposed an overall cap of 85 MHz after spectrum in the 1.7/2.1 GHz and 2.5 GHz bands is assigned. However, the overall cap in Colombia will increase to 115 MHz once the auction of the 700 MHz band takes place, with a 30 MHz cap for spectrum below 1 GHz. Brazil also increased the overall spectrum cap from 50 MHz to 85 MHz with the award of 3G spectrum in the 1.9/2.1 GHz band.[216] Further, Brazil recently set a band-specific cap for the award of the 2.5 GHz band of up to 60 MHz for paired spectrum or 50 MHz for unpaired spectrum.[217] As Colombia and Brazil show, spectrum caps are generally not static, but tend to be relaxed as new spectrum is awarded or competition increases.

Table 14: Current Overall Spectrum Caps in Latin America

Country	Overall Spectrum Cap
Argentina	50 MHz
Brazil	85 MHz
Chile	60 MHz
Colombia	85 MHz
Mexico	80 MHz
Peru	60 MHz

Note: Figure for Brazil does not include 2.5 GHz band spectrum

Source: TMG.

In addition, as noted in the GSR Best Practices Guidelines for 2011, the ability for existing licensees to sell or trade spectrum rights or licenses directly without the spectrum rights

having to pass through the regulatory authority's hands (referred to as spectrum trading or secondary trading) is "key to ensuring that with market maturity and evolution spectrum moves to more productive uses, including mobile broadband."[218] As shown in Figure 19 below, there are still relatively few countries in the region that allow secondary trading.

Figure 19: Permissibility of Spectrum Trading in the Americas

Source: ITU World Telecommunication/ICT Regulatory Database. [219]

Auctions and spectrum trading are complementary market-based mechanisms to assign spectrum. Auctions generally involve the release of newly allocated spectrum to mobile services, which increases the supply of spectrum over the long-term to alleviate the "spectrum crunch" brought on by the steep rise in the number of mobile subscribers and bandwidth-hungry mobile broadband services and applications. However, considering that the re-allocation and award process for spectrum often takes years, secondary markets can act as a backstop by enabling spectrum licences to be held by those who will use it most efficiently while the release of new spectrum licences is underway. For example, the U.S. Federal Communications Commission (FCC) has noted that the process to revise spectrum allocations has historically taken between six and 13 years.[220]

In addition, certain countries in the region, such as Brazil, Chile, and Mexico, have undertaken spectrum refarming efforts in order to facilitate greater access to spectrum for mobile broadband. For example, the Brazilian regulator announced in late 2011 that the 2.5 GHz band, which is currently allocated to Multichannel Multipoint Distribution Service (MMDS) services (known also as "wireless cable"), would be reallocated for mobile broadband services to be awarded in a June 2012 auction.[221]

4.2.2 Flexible-Use Spectrum Policies

Countries around the world are increasingly shifting from more traditional spectrum management practices that are technology specific and moving toward more flexible, open spectrum management regimes. The following outlines the main benefits of market-based and flexible-use spectrum management and identifies how countries throughout the region are adopting such policies.

Ensuring that new spectrum licences are technology-neutral and allowing operators to migrate existing spectrum holdings by upgrading technologies are integral to effective flexible-use spectrum management. Technology neutrality for new and existing licences allows operators to upgrade networks and offer the most advanced and innovative services to consumers, as well as reduces administrative costs and processes.

Various countries in the region permit in-band migration -- the policy of allowing operators to use existing licensed spectrum to provide new services. Jurisdictions in the Americas have used this policy with the introduction of IMT-2000 systems, allowing existing mobile operators to deploy third generation (3G) networks and services in their originally assigned frequencies. This policy has permitted operators to decide when to deploy 3G networks and has been effective in reducing implementation costs as operators have use their existing spectrum without incurring the cost of new licences. As a result, 3G mobile networks have proliferated throughout the region. Providers in countries like Argentina, Brazil, Chile, Colombia, Peru, Uruguay, the United States and Venezuela have all benefited from this flexibility.

In the United States, for example, spectrum use rules are highly flexible and generally allow for licensees to offer any type of service, including voice, basic data, broadband Internet and broadcasting services, using any type of technology.[222] As such, the FCC has recognized that "flexible spectrum rights will help ensure that spectrum moves to more productive uses, including mobile broadband, through voluntary market mechanisms."[223] The FCC further noted that, due to technology-neutral spectrum rules and rules permitting spectrum

trading, the "combined book value of flexible-use licenses held by the four national wireless providers, reflecting the prices paid at auction as well as in mergers and other corporate transactions, is over USD 150 billion."[224] Additionally, the consumer welfare gains from flexible-use spectrum rules may be 10 times that value, which would suggest that the total "social value of licensed mobile radio spectrum alone in the U.S. is at least USD 1.5 trillion."

Aside from implementing flexible-use rules for licensed spectrum bands, most countries throughout the region have adopted "unlicensed" or "licence-exempt" rules for particular frequency bands. Unlicensed bands permit the use of low-power devices that communicate using spectrum without the need for a spectrum license, concession or other authorization. However, these devices generally are subject to a low maximum power limit, are prohibited from causing interference to other systems and are not protected against harmful interference. Unlicensed use has generally been allocated to the 2.4 GHz and/or 5.8 GHz bands. More recently, some countries have also been examining the use of unused digital broadcast television spectrum for unlicensed use—referred to as "TV white spaces." Due to the propagation characteristics of the broadcast spectrum, unlicensed use in this band will allow for wireless transmission over long distances, as well as afford excellent in-building penetration. The United States approved the use of unlicensed devices in the TV white spaces in December 2011,[225] while Industry Canada initiated a public consultation on the matter in August 2011.[226] However, only "smart" devices with geo-location capabilities will be permitted on the bands; these devices must be able to detect whether other operations are transmitting on a particular frequency in order to protect broadcasters against harmful interference.[227] Other countries in the region, such as Brazil, have also been considering allowing the use of white spaces.

The unlicensed frequency bands have enabled the growth of Wi-Fi, Bluetooth and other low power, end user devices around the world, as well as allowed mobile network operators to offload data to fixed line networks to ease mobile network congestion and enable the provision of services that use a large amount of bandwidth, such as streaming video.[228] The availability of unlicensed spectrum will only continue to grow, particularly considering that in 2011 there were 1.3 million public Wi-Fi "hotspots" worldwide (i.e., not including Wi-Fi connections for private use only), with this figure expected to increase to 5.8 million by 2015.[229] Countries permitting unlicensed use include Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Panama Paraguay, the United States, Uruguay and Venezuela.[230]

As the number of smartphones increase in the region, the use of Wi-Fi on unlicensed bands will also rise dramatically. Mobile operators and governments in Latin America are preparing

for this growth by deploying new Wi-Fi hotspots. For example, in March 2012, TIM Brazil announced plans to install 10,000 Wi-Fi hotspots in malls, universities, airports and restaurants throughout São Paulo and Rio de Janeiro.[231] In the United States, AT&T alone had deployed over 26,000 Wi-Fi hotspots by 2011.[232] In Panama, the government launched its "Internet for All" project in 2010 with the deployment of over 600 Wi-Fi hotspots offering free Internet connectivity in 11 cities.[233] In Barbados, the 11.11.11 ON project is seeking to provide free, island-wide Wi-Fi connectivity to users by 2020 through Barbados Entrepreneurship Foundation (BEF), a public-private partnership.[234] Making sufficient spectrum available for unlicensed use is expected to help bolster Wi-Fi connectivity in the region, as well as enable further broadband innovations.

4.2.3 Best Practices for Market-Based and Flexible-Use Spectrum Management

Regarding the implementation of market-based and flexible-use spectrum management, policy-makers and regulators should consider the following best practices in developing national strategies and policies:

- Adopt auctions as the mechanism to award spectrum use rights for commercial mobile services and set out transparent rules for the award and licensing process, including a clear understanding of what rights and obligations winners will be subject (e.g., coverage obligations).
- Auction a wide range of frequency bands, in both higher and lower bands (i.e., above and below 1 GHz) since higher bands tend to be suited more for urban areas while lower bands allow for greater coverage of rural areas.
- Initiate and complete spectrum auctions as quickly as possible, with the potential of conducting multi-band auctions, in order to allow licence winners to speed up the deployment of mobile services, particularly mobile broadband.
- Ensure that new and existing spectrum licences are technology- and service-neutral by setting minimal technical usage conditions on licences, and consider adopting rules for unlicensed use and/or expanding spectrum available for unlicensed use.

4.3 Promoting Technological Convergence

4.3.1 Promoting Telecommunications and Broadcasting Convergence

Just as the implementation of unified licensing frameworks for telecommunication services is an integral part of an overall strategy to create an enabling regulatory environment, as addressed in section 4.1.1, policy-makers can promote technological convergence by focusing on the establishment of uniform regulations that apply to service providers regardless of the technology used to deliver a service. Such policies and regulations include permitting all operators to offer a full range of services, including video, voice and Internet.

The provision of video services (i.e., IPTV) is increasingly becoming an important way for telecommunication operators to capitalize on their broadband infrastructure deployments and better compete in the triple play market, which in turn further incentivizes investments in broadband networks and improves broadband access to consumers.[235] However, telecommunication operators can face various regulatory hurdles to provide IPTV services since regulations are in some cases not applied uniformly to both cable TV operators and telecommunication operators. Whereas cable TV operators are generally permitted to offer triple play packages (i.e., bundled video, voice and Internet), some countries in the region prohibit or limit the ability of telecommunication operators, specifically incumbent telephone providers, to offer television services via IPTV. Several countries in the region allow telecommunication operators to offer IPTV services, including Canada, Chile, Colombia, Peru, the United States, Venezuela and, more recently, Brazil. Other countries, notably Argentina[236] and Mexico, expressly prohibit incumbent telecommunication operators from offering pay-TV services. Such restrictions, often justified on competition grounds, should generally be transitory and lifted once competition concerns have been resolved.

Another relevant issue is the regulatory classification of IPTV, with certain countries classifying it as a broadcasting service and others as a value-added service. In Colombia, for example, in 2008 the then Ministry of Communications proposed to regulate IPTV as a value-added service, which enabled telecommunication operators to offer pay-TV services at lower fees than those imposed on other pay-TV services (i.e., cable television and satellite). The former National Television Commission (CNTV) resisted this move on grounds that IPTV was a broadcasting service under CNTV's jurisdiction. Ultimately, the Ministry of Communications did not adopt the proposed regulation. The absence of a convergent regulatory framework that provides transparency and certainty to investors has likely resulted in significant delays in deployment of the service in Colombia.

Permitting convergence between telecommunication and broadcasting services is increasingly becoming important as telecommunication operators seek to upgrade their networks and provide IPTV/pay-TV services in addition to voice and Internet services to compete against cable companies offering triple play packages. This importance is demonstrated through the rapid deployment and uptake of IPTV globally. In 2010, there were 45.36 million IPTV subscribers worldwide—up 35 per cent from the prior year.[237] This includes 20.72 million IPTV subscribers throughout Europe, 16.37 million in the Asia-Pacific region, 7.3 million in the United States and 300,000 in Canada.[238] However, by the end of 2010, all of Latin America had fewer than 400,000 IPTV subscribers.[239] As cable operators expand into the telecommunication market, the ability for telecommunication operators to expand into the video market gains even more significance for promoting investment and competition in the ICT market.

The main reasons cited for slow growth of IPTV services in Latin America are low fixed line broadband penetration rates and lack of enabling regulation.[240] For example, a July 2011 market report noted that despite technological developments that blur the lines between the telecommunication and broadcasting sectors, "regulations have not kept up and this has significantly impacted the growth of IPTV services in Latin America" and, as a result, "more conventional forms of pay-TV services such as cable and satellite continue to dominate the region."[241]

Some countries in the region have responded to the need for regulatory reforms. For example, with Brazil's long-awaited enactment of its new pay-TV law in September 2011, telecommunication operators are now permitted to offer IPTV and directly compete with cable TV operators.[242] This is a major development in Brazil involving seven years of legislative debate prior to the law's passage. Under previous rules, telecommunication operators were required to partner with satellite TV or Multichannel Multipoint Distribution Service (also known as "wireless cable") providers in order to offer triple play packages. As a result of the new law, telecommunication operators are gaining traction in the pay-TV market. For example, Brazilian telecommunication operator, GVT, launched its IPTV service at the end of 2011.[243] By May 2012, GVT reached 113,000 pay-TV subscribers with a target of 400,000 subscribers by the end of 2012.

Elsewhere in the Americas, telecommunication operators are also launching IPTV. Colombia's Emcali, the government-owned operator providing telecommunications, water and electricity in the city of Cali plans to launch IPTV services in the first half of 2012.[244] In Barbados, Cable & Wireless Communications (CWC) launched its IPTV service, LIME TV, in

April 2012.[245] Although the availability and number of IPTV subscriptions throughout the region is slowly increasing, regulations to permit and enable IPTV services are only one part of increasing growth. More generally, measures to improve broadband network deployments and uptake are vital to the growth of IPTV.

In countries that continue to limit the provision of IPTV services, incumbent telecommunication operators are finding ways to circumvent restrictions through commercial partnerships with over-the-top (OTT) content providers or satellite TV providers in order to enter the triple play market and compete with cable TV operators. Telecommunication operators in Argentina, for example, are overcoming the prohibition on providing pay-TV services by relying on OTT providers to stream video-on-demand (VOD) services over the operator's broadband Internet connection.[246] Telmex in Mexico is also considering providing streaming video via OTT as a way to circumvent its license restrictions regarding the provision of pay-TV services.[247]

4.3.2 Best Practices to Promote Convergence between Telecommunications and Broadcasting

Best practices in adopting uniform regulations to promote telecommunications and broadcasting convergence include:

- Recognition by policy-makers of the importance of promoting competition in the pay-TV market, the increasing importance of bundled services, particularly triple play packages, and the need for incumbent telecommunication operators to offer IPTV services in order to attract customers and increase revenue bases. In doing so, policy-makers should assess the state of competition in the market and the potential impact that incumbent telecommunication providers' entry into the IPTV market would have on the overall competitive landscape.
- Introduction of effective, proportionate and non-discriminatory regulations to facilitate ICT and broadcasting convergence by addressing regulatory obstacles that prevent telecommunication operators from offering video services.
- Addressing other competition issues that may prevent incumbent telecommunication operators from providing IPTV services.
- In countries where telecommunication and broadcasting licences are administered by separate authorities, determining which regulatory authority will review and grant applications. It is also important to establish a framework and clear process for

how the two authorities cooperate in areas of overlapping jurisdiction, particularly spectrum-related matters.[248]

4.4 Mechanisms to Promote Competition

4.4.1 Interconnection Regulation in the Americas

With the exception of Canada and the United States, implementation of competition law in the telecommunication sector is generally still developing in the Americas, particularly considering that privatization and market liberalization reforms did not begin until the 1990s (see section 2.1.1). However, as competition in the region has grown, countries are establishing rules that provide a more level playing field for new entrants and smaller service providers through *ex ante* (i.e., forward-looking) regulations. These regulations tend to focus on fostering investment and deployment of networks and services, including through interconnection and access regulations, as addressed below. Over the last several years, some countries have also begun focusing on *ex post* enforcement to remedy specific instances of anticompetitive conduct, including in Chile and Mexico, as addressed in section 4.4.4.

A key element to promoting technological convergence is to ensure that users are able to communicate across any type of network, whether fixed line or mobile. Interconnection between networks on a technology-neutral basis is an important mechanism to promoting competition since operators can refuse access to competitors or charge competitors excessive termination rates. As such, regulators around the world often implement rules requiring service providers to interconnect with one another at non-discriminatory and fair rates. However, such *ex ante* rate regulation is generally still nascent in Latin America.

In a number of countries in the region, interconnection agreements are freely negotiated between operators and the regulator only steps in to set the rate if a dispute arises. This is the case in countries such as Argentina, Brazil, the Dominican Republic, Costa Rica, Mexico, Uruguay and Venezuela. Other countries, such as Chile, Colombia and Peru set termination rates *ex ante.*

In Mexico, for example, Cofetel, is generally only permitted to set mobile and/or fixed line termination rates if a dispute arises.[249] However, the telecommunication law also permits Cofetel to regulate the termination rates *ex ante* if an operator is deemed to be dominant in the termination market. Telmex and Telcel have been found dominant in both the fixed line and mobile termination markets, but to date the regulator has not yet issued rate regulations. The interconnection process has resulted in complex dispute resolution

proceedings involving Cofetel, the SCT and the competition authority, which could last years. Over the past several months, however, Mexico's Supreme Court has issued two major decisions that help to streamline the decision-making process. In June 2011, the Supreme Court prohibited operators from obtaining injunctions (*amparos*) against Cofetel's decisions on interconnection rates[250] while a February 2012 ruling restricts the SCT's authority to review Cofetel's interconnection rate decisions. Taken together, these decisions place greater authority with Cofetel and limit the ability to delay implementation of interconnection decisions.

In addition to more traditional interconnection and termination rate regulation issues, the rise of IP-based networks (also referred to as Next Generation Networks) has led to other types of interconnection agreements. IP-based interconnection is typically implemented through peering and transit agreements[251], or variations such as paid peering. Under a peering agreement, two Internet Service Providers (ISPs) agree to exchange traffic only between their respective subscribers, which sometimes does not include payment. Under a transit agreement, an ISP agrees to carry traffic to third parties, generally for a fee. Throughout most of the world, including in the Americas, these agreements are freely negotiated and there is little need for regulation of IP interconnection as efficient outcomes have been attained.

Although peering and transit agreements tend to effectively enable IP interconnection, problems related to "tromboning" may arise in countries without adequate domestic and regional interconnection infrastructure (i.e., Internet Exchange Points (IXPs)). Tromboning refers to the need for ISPs to connect domestic traffic through another country due to lack of national connectivity. In the Americas, tromboning is often a major issue since countries throughout Latin America lack sufficient IXPs to handle the growth in Internet traffic and therefore must route domestic traffic through the United States, which increases costs. The remedy for tromboning is not regulatory, but instead requires increasing domestic and regional broadband connectivity through the deployment of national backbone infrastructure and IXPs, as addressed in section 3.2.1.

4.4.2 Access Regulation in the Americas

Around the world, policy-makers are focusing on ensuring that new entrants and smaller operators have access to dominant operators' infrastructure. Access regulation may involve a more light-touch framework involving passive infrastructure sharing, such as access to rights-of-way, ducts, towers, trenches and masts. In contrast, active infrastructure sharing is

a more intensive regulatory approach that involves obligations on the dominant operators to make parts of their networks available to competitors at regulated or wholesale rates, and may include local loop unbundling or bitstream access. Regardless of the approach, access regulation is intended to ease entry and promote competition by allowing smaller operators to avoid duplication of network elements, thereby reducing deployment costs.[252]

Passive infrastructure sharing and access to rights-of-way can help promote supply of broadband by lowering barriers to entry. For example, digging trenches for fibre deployment represents a significant amount of the cost of deploying a high-speed broadband network – as much as 50-80 per cent according to an OECD study.[253] Accordingly, governments in countries such as Brazil and Colombia are requiring that conduits for fibre be incorporated into major infrastructure works such as roads and highways, gas pipelines or railways construction. Policies requiring access to capacity in such conduits for fibre deployments can significantly reduce the costs of deployment of broadband infrastructure.

Unlike other regions, particularly Europe, e*x ante* rules requiring active infrastructure sharing have not generally been implemented in the Americas. However, mandated passive infrastructure sharing is more common throughout the region. According to the ITU's Tariff Policies Database, just over half of the countries in the region require passive infrastructure sharing, including towers, base stations and ducts, as of 2011.[254]

4.4.3 Number Portability

Countries throughout the region are also using number portability regulation to promote competition, including Brazil, Canada, Chile, Colombia, the Dominican Republic, Ecuador, Mexico and the United States.[255] Number portability rules require operators to allow subscribers to keep their existing telephone numbers when switching to a new provider. Since number portability regulations were implemented in Brazil in September 2008, more than 13 million fixed line and mobile phone subscribers have switched service providers without changing their phone numbers—more than 5.3 million in 2011 alone.[256] In Chile, on the first day that number portability rules went into effect in January 2012, nearly 1,200 subscribers switched providers. The second largest mobile operator Entel gained the largest share of 333 subscribers while the dominant operator, Movistar, lost 279 subscribers.[257] Such a large, one-day shift in subscribers helps to demonstrate how highly the ability to keep one's current telephone number factors into a subscriber's decision to change providers.

Table 15: Status of Fixed and Mobile Number Portability in the Americas

Country	Fixed Number Portability	Mobile Number Portability
Antigua & Barbuda	No	No
Argentina	No	Yes
Bahamas	No	No
Barbados	No	No
Belize	No	No
Brazil	Yes	Yes
Canada	Yes	Yes
Chile	No	No
Colombia	No	Yes
Costa Rica	Yes	Yes
Cuba	No	No
Dominica	No	No
Dominican Rep.	Yes	Yes
Ecuador	No	Yes
El Salvador	No	No
Grenada	No	No
Haiti	No	No
Honduras	No	No
Jamaica	No	No
Mexico	Yes	Yes
Nicaragua	No	No
Panama	Yes	Yes
Paraguay	No	Yes
Peru	No	No
St. Lucia	Yes	Yes
St. Vincent and the Grenadines	No	No
Suriname	Yes	Yes
Trinidad & Tobago	Yes	Yes
United States	Yes	Yes
Uruguay	No	No
Venezuela	Yes	Yes

Source: ITU World Telecommunication/ICT Regulatory Database.

4.4.4 *Ex Post* Enforcement in the Region

a) Allocation of authority between competition authorities and sector-specific regulators

A key factor in effective enforcement of competition law in the sector relates to the allocation of responsibilities between national competition authorities and sector-specific regulators. Three general institutional approaches are identified for the allocation of oversight and enforcement authority in the telecommunication sector: 1) vesting full sectoral oversight in the competition authority (i.e., applying competition rules to all

competition and regulatory issues); 2) vesting the enforcement of competition rules within the sector-specific regulator; and 3) maintaining a functionally separate sector-specific regulator and competition authority.[258] In addition, it is possible that in some cases certain competition law related functions may be assigned to the sector-specific regulator and others to the competition authority.

The approach adopted will be influenced by a series of country-specific factors, including the existing legal framework, the existing institutional structure and the level of competition in the sector. Moreover, each has its advantages and disadvantages, with no single approach being considered optimal internationally.[259]

The main concern to consider with these various approaches is that of jurisdictional overlap which, if not managed appropriately, can result in inconsistencies and inefficiencies and potentially limit competition. While some degree of overlap is inevitable in this sector, as in liberalized markets both authorities have converging objectives to promote competition, coordination mechanisms are required to avoid regulatory failure. As such, formal or informal cooperation and coordination between authorities is critical.

In the Americas, countries have chosen to follow the two latter alternatives:

- Peru, for example, has opted for the second approach with the sector regulator, OSIPTEL, having exclusive authority to control anticompetitive practices in the sector.
- Mexico, on the other hand, has opted for the third approach, with the competition authority, COFECO, entrusted with enforcing competition law in the sector and the regulator, COFETEL, having authority to issue *ex ante* regulation. In some cases, such as tariff and price regulation discussed below, the exercise of COFETEL's duties is conditioned upon a prior opinion from COFECO.
- Chile also follows a similar approach as Mexico, with the Competition Defense Tribunal, TDLC, and the National Economic Prosecutor (FNE) being responsible for overseeing the application of competition law and having an active role in the regulation of the sector through guidelines, opinions and rulings, and the regulator, SUBTEL, being responsible for sector-specific regulation.
- Brazil uses a variation of the third approach with the competition authority, CADE, and the sector regulator, ANATEL, having joint authority to enforce competition law

in the sector and coordinating the exercise of these functions. The two agencies have operated under a series of cooperation agreements, which are time limited.[260]

b) Collaboration between competition authorities and sector regulators

In some instances, sector regulator's actions are conditioned on a prior opinion from the competition authority. Such collaboration may be required under national law or derives from case-specific requests from the sector regulator. The overall objective is to better target *ex ante* rules to promoting a more competitive market environment.

This type of collaboration is in some cases present in the case of management of scarce resources or price regulation. For example, the Federal Telecommunications Law in Mexico requires that, before COFETEL can regulate rates in a specific relevant market, COFECO must make a determination of market dominance. There have been two rounds of dominance findings in Mexico: one began in 1997, and was litigated thereafter, and the second started in 2007 and currently comprises four markets for Telmex: call origination, call termination, local transit and wholesale leased lines. In addition, Telcel has been declared as having significant market power in the relevant market of mobile telephony origination and wholesale termination.[261] On this basis, COFETEL has been working on adopting asymmetric regulation in the leased lines market since year end 2011 and is expected to also issue regulation for the mobile telephony markets.

Similarly, COFECO has been instrumental in developing spectrum tender rules in Mexico over the last several years. In the latest round of mobile auctions conducted in 2010, COFETEL asked for COFECO's opinion regarding the competitive impact of proposed tender rules, in particular the proposed spectrum caps. Ultimately, COFETEL adopted COFECO's recommendations directed at reducing spectrum concentration and promoting a more competitive market and set a cap of 70 MHz (for the 850 MHz and 1900 MHz bands) and 80 MHz (for the combined 850 MHz, 1900 MHz and 1.7/2.1 GHz bands).[262]

In Chile, the Competition Act grants the TLDC broad powers to issue guidelines to the regulator in so called "non-contentious" proceedings. Such proceedings have over the last several years been used to promote more competitive telecommunication markets, including spectrum management and spectrum caps, the provision of VoIP services, reducing switching costs (SIM locking), among others.[263] Currently, the TDLC is reviewing the competitive implications of service bundling and on-net/off-net price differentiation in the market and is expected to issue its ruling in the first half of 2012.[264]

These examples show the potential benefits of collaboration between competition and regulatory authorities in their areas of expertise, while keeping the necessary balance between the authority and competences of both institutions. As telecommunication markets in the region become more competitive, the need for such coordinated action will likely increase in order to better target *ex ante* regulation or withdraw it were it is no longer necessary.

4.4.5 Best Practices to Promote Competition

The ITU and the OECD have identified a variety of best practices to promote competition in the telecommunication sector, including:[265]

- recognize, in general, that *ex ante* regulation may need to be implemented for some period in order to promote competition in markets where competition has not yet developed effectively, including active infrastructure sharing if determined to be necessary;
- focus on the facilitation of fair, pro-competitive interconnection between networks regardless of technology;
- adopt appropriate regulation on interconnection and access, including rate regulation, taking into account the relevant technological market developments including the deployments of NGNs;
- focus on the deployment of domestic and regional IXPs, particularly in the Caribbean and Central America, to reduce costs to ISPs associated with tromboning in the region to promote IP interconnection;
- promote fair and non-discriminatory access to passive infrastructure on cost-based terms to enable network deployments;
- implement number portability regulation that enables customers to quickly and easily port phone numbers, which may include establishing a centralized database of numbers to speed up the process; and
- recognize that socio-economic, geographic, and political circumstances vary widely throughout the region and, as such, any imposition of *ex ante* regulation should be based on a thorough, fact-based assessment of a country's the market conditions.

4.5 Consumer-Related Issues

In order to stimulate broadband demand, policy-makers in the region are increasingly considering measures that protect and educate consumers, as well as create an enabling environment for the growth of new and innovative networks and services. As addressed below, network neutrality ("net neutrality") and data privacy rules are two of the most significant consumer protection issues that legislators and regulators are considering, due to their impact on broadband adoption and the range of broadband-enabled services and applications available to consumers.

4.5.1 Network Neutrality

Net neutrality as it relates to the Internet became an issue in the United States a decade ago, but has more recently been raised as a concern throughout the Americas, Europe and the rest of the world. The term refers to the notion that an Internet service provider (ISP) should treat all users' activities on the Internet equally, including use of devices and traffic related to any content, application or service.[266] Net neutrality rules generally restrict or prohibit ISPs from using network management practices to discriminate against certain types of traffic, particularly 1) blocking or throttling or 2) prioritizing their delivery (e.g., charging application or content providers for guaranteed faster delivery).[267] Such rules may require operators to treat all lawful traffic equally in order to allow consumers to use any type of application, such as VoIP or OTT streaming video, even if such applications directly compete with the operator's services or use large amounts of bandwidth. They also tend to focus on transparency by requiring operators to disclose to consumers their traffic management practices and/or detail quality of service levels.

Regulatory attention on net neutrality has arisen with the growth of broadband and increases in data traffic as consumers use more bandwidth-hungry services and applications that place greater demands on network capacity. However, regulation of net neutrality remains highly contentious, particularly with network operators who argue that network management and prioritization are necessary to ensuring a high quality of service especially during peak-use periods when networks can become congested. For example, latency-sensitive traffic, such as streaming video, may need to be prioritized over less latency-sensitive traffic, such as an email, and the consumer may suffer if the operator is prohibited from managing network traffic.

In the region, only a few countries have introduced national net neutrality rules. While Chile was the first country in the world to pass net neutrality legislation, Canada, Colombia, and the United States have also passed net neutrality regulations. Net neutrality rules are also

pending in Brazil. In general, these countries are imposing both non-discrimination and transparency obligations on ISPs, although the degree of stringency varies among the countries with Chile imposing the strictest rules relating to network management and disclosure practices.

- **Brazil:** Net neutrality has been subject to intense debate since 2009 with the Ministry of Justice and Anatel seeking to implement a new regulatory framework for Internet access and services that would include rules on net neutrality. The legislature is currently considering the *Civil Framework for the Internet* ("Internet Framework Bill") on new rules for the Internet generally, which also addresses net neutrality specifically. [268] The framework set out in the bill establishes basic principles for the general use of the Internet in Brazil, including instituting consumers' right of non-discrimination and prohibition against degrading any traffic, except in cases related to technical requirements aimed at network security or preserving quality of service, or in cases where users failed to pay their bill. The bill specifically prohibits ISPs from monitoring, filtering, evaluating or inspecting the content of data packages, unless technically necessary to preserve the contracted-for quality of service. While the bill is under consideration, Anatel established and it is implementing two regulations on QoS of broadband providers, the Multimedia Communications QoS Regulation (fixed broadband),[269] as well as the Mobile Service QoS Regulation (for mobile broadband), that specifically prohibit ISPs of any technology from discriminating against or blocking any type of traffic, independent of the technology used, unless such traffic management practices are necessary for network security or to ensure quality of service.[270]
- **Canada:** In October 2009, the Canadian Radio-television and Telecommunications Commission (CRTC) issued a decision, after public consultation, on the Review of Internet Traffic Management Practices of Internet Service Providers.[271] The main purpose of Canada's net neutrality regulation is consumer protection, although promoting competition and innovation also serve as a basis for the rules, which include non-discrimination and transparency obligations. In particular, ISPs must ensure that any traffic management practices they employ are not unjustly discriminatory or unduly preferential. As such, ISPs are permitted to engage in network management, but only to address network congestion. ISPs must also disclose to consumers all instances where they use any network management

practices to ensure that consumers are able to make informed decisions about the Internet services they purchase and use.

- **Chile:** In August 2010, the government enacted the Net Neutrality Act,[272] which focuses on the principles of non-discrimination and transparency. The Act directed Chile's regulator, SUBTEL, to draft regulations establishing the specific net neutrality rules that ISPs must follow based on the law's principles and requirements. The regulations prohibit ISPs from blocking, throttling or discriminating against the transmission of any legal application, service or content unless it is necessary to protect users' privacy or for network security purposes. However, they may also offer tiered pricing and service speeds for Internet access. The disclosure rules require ISPs to publish on their websites all information regarding Internet access services, including speeds, quality of service levels and any differentiation between national and international connections, as well as any guarantees of service. Additionally, ISPs must create a new webpage specifically for publishing and updating the terms and conditions of the Internet service offered. ISPs must also file this information with SUBTEL the terms and conditions of their services,[273] which are available on the regulator's websites to allow consumers to easily view all offers.[274]
- **Colombia:** In 2011, Colombia adopted a law regulating net neutrality[275] and implementing regulations on the matter.[276] These legal instruments focus on the principles of freedom of choice, non-discrimination, information and transparency. The implementing regulations allow ISPs to engage in reasonable and non discriminatory network management practices with regard to specific providers, services, contents and protocols, including to reduce network congestion; ensure network security and integrity; ensure QoS to users; prioritize certain types of traffic based on specific quality of service requirements for such traffic, such as latency and delays; and provide services and capacity based on the choices of users, that comply with technical requirements and standards or best practices relating to Internet governance or standards bodies.
- **United States:** In December 2010, the FCC issued the *Report and Order on Preserving the Open Internet* ("Open Internet Order"),[277] which embodies four core principles: 1) transparency (disclosure to consumers of all network management practices); 2) no blocking of traffic (users should be able to send or receive any lawful content, applications and services; 3) non-discrimination (lawful content, applications and services must be treated in a non-discriminatory manner); and 4) reasonable

network management. For a network management practice, such as slowing down traffic, it must be "appropriate and tailored to achieving a legitimate network management purpose."

4.5.2 Protection of Consumers' Data Privacy

With the increased uptake of broadband services, policy-makers are recognizing the importance of protecting consumers' private data. This is because broadband gives operators, content providers and device makers unprecedented ability to collect, share, sell and use such information, often without the consumer's knowledge.[278] Although there are many benefits to data-collecting applications, such as cloud computing and location-based services, regulators are seeking to ensure that consumers are aware of the information collected and how it is used. For example, Google's implementation of its new privacy policy on March 1, 2012 sparked a worldwide debate.[279] Google consolidated different privacy policies for its 60 different web services into a single privacy policy and is aggregating the data collected across all applications to be used for targeted marketing, including Google search histories, Gmail, YouTube, location information and Android phone call logs. Regulators around the world are examining whether Google is violating data privacy rules through this pooling of data, as well as the fact that consumers cannot opt out of the privacy policy. In Brazil, for example, the Ministry of Justice and Department of Consumer Defense requested that Google provide more details on the manner in which the company consulted the public prior to implementing policy, as well as information on how Google would use the content of private emails to customize its advertising.

Latin American countries have tended to adopt a rights-based approach to protecting data privacy with consumers' information protected by a constitutional guarantee (known as habeas data) that limits the ability of third parties to collect and use such information.[280] Habeas data is "designed to protect, by means of an individual complaint presented to a constitutional court, the image, privacy, honour, information self-determination and freedom of information of a person."[281] As highlighted below, Argentina, Brazil, Costa Rica and Mexico are among those countries in Latin America that have developed data privacy rules under the habeas data approach.

- **Argentina:** Enacted in 2000, the Personal Data Protection Act protects all private information recorded via any technical means, regardless of whether it used for public, private or commercial purposes.[282] All individuals have a right to access the

information collected about them and may request that their information not be used for advertising purposes, market surveys or opinion polls.

- **Brazil:** The Brazilian Ministry of Justice is developing a comprehensive data protection law that would guarantee a list of basic rights regarding the collection and use of personal data, including providing the right to access one's private information, correct inaccurate information, object to the use of personal data and be compensated for the misuse of data.[283]
- **Costa Rica:** Costa Rica is in the process of adopting a law that would generally regulate personal data processing activities and would require express written consent for many such activities. Additionally, the law would create a new data protection authority that would be competent to issue sanctions for violations of the law.
- **Mexico:** In December 2011, the Mexican government enacted Regulations of the Federal Law for the Protection of Personal Data Held by Private Parties, which includes specific rules to govern the collection and use of personal data in cloud computing and notification requirements to consumers on how data is collected.[284] In particular, all businesses must provide a privacy notice on what information is collected, the purpose of its collection and the options for how consumers may limit the use or disclosure of personal data.

Although the United States has taken more of a hands-off approach to data privacy than in Latin America by relying on "broad self-regulation and targeted sectoral legislation to provide consumers with data privacy protection,"[285] there have been more recent efforts by the U.S. Federal Trade Commission (FTC) to update data privacy protections that would align the U.S. more with Latin America. In March 2012, for example, the FTC issued a report on *Protecting Consumer Privacy in an Era of Rapid Change: Recommendations for Businesses and Policymakers*, which calls on businesses that handle consumer data to abide by the recommendations set out in the report.[286] Notably, these are non-binding guidelines. The overarching principles include:

- **Privacy by Design:** Protections for consumers' data privacy should be built into every stage of the service and product development process, such as providing a reasonable level of security for consumer data, limiting collection only to relevant data, limiting how long data is stored and reasonable procedures to ensure that the data collected is accurate.

- **Simplified Choice for Businesses and Consumers:** Providing consumers an easy option to decide what information is shared and with whom it is shared, such as a "Do-Not-Track" mechanism that allows consumers to opt-out online tracking practices.
- **Greater Transparency:** Companies should provide details about what consumer information is collected and how it is used, as well as provide consumers access to the data collected about them.

4.5.3 Best Practices for Consumer Protection

- Prior to implementing net neutrality rules, determine whether it is necessary to regulate ISPs' network management practices. In particular, determine whether ISPs are engaging in practices that undermine consumers' ability to access the services, applications and content of their choice.
- If implementing net neutrality regulation, recognize the importance of transparency and disclosure rules to ensure that consumers are well-informed. The Body of European Regulators (BEREC) has identified several important characteristics to consider in developing transparency rules for net neutrality:[287]
    - Accessibility: Information about the Internet access service should be easily found and identified, such as on a dedicated, highly visible page of the operator's website. The operator should particularly state any traffic management practices employed; any instances where traffic may be blocked or throttled; any limits on the service, such as data caps; and minimum/actual speeds consumers should expect.
    - Understandability: The information must be easily understandable for consumers and should be in a user-friendly format and not be overly technical.
    - Meaningfulness: The information should be relevant, straightforward and presented in a way that helps consumers make an informed decision.
    - Comparability: Consumers should be able to easily and adequately compare service packages among various providers in ways that show their differences and similarities.
    - Accuracy: The information should be accurate and current, so operators should update the service rules and prices regularly.

- For consumer data privacy, despite the broad range of frameworks in the Americas—from a rights-based system in Latin America to self-regulatory approach in the United States—there are several best practices developing in the region, including the implementation of rules or codes that require or encourage:
    - Limiting the data collected to what is needed and ensuring the security of such data.
    - Affording consumers reasonable access to their private information and allowing them to correct or delete data;
    - Ensuring that privacy notices are clear so consumers can easily understand what information is collected and how it will be used.
- In countries where such best practices are enacted through law or regulation, policy-makers should also consider enforcement mechanisms to ensure compliance, whether through the court system or a specialized regulator that handles consumer and data protection issues.

5 Cross-Sector Cooperation to Promote Convergence

Considering that for many countries in the region, the wide-reaching impacts of broadband and technological convergence on various industries are just beginning to develop, little need has existed for inter-agency coordination between the telecommunication regulator and the regulatory authorities of other sectors. Although these sectors are generally outside the jurisdiction of the telecommunication regulator, policies to enable coordination among various agencies—particularly those that report to different ministries—is important to facilitating discussion and cooperation. As addressed below, the increase in broadband penetration and converging technologies is creating new opportunities and new regulatory considerations throughout the economy and society, including the financial services, law enforcement and environmental sectors.

5.1 Inter-Agency Coordination in the Financial Services Sector

Mobile banking ("m-banking"), which enables individuals to use their mobile devices to engage in banking and other financial transactions, is becoming an important—and often first—mechanism for those in emerging economies to gain access to financial services. As noted at the GSR11, for "unbanked" individuals, "lack of access to banking services leaves them trapped in an oftentimes poor, cash-only society" without the ability to use checks, credit cards, debit cards or save for retirement or other long-term goals.[288] In turn, countries in which a large portion of the population is unbanked are likely to develop more slowly as businesses and households are unable to save, borrow and loan money.

In the LAC region, the World Bank has estimated that 61 per cent of adults (over 250 million people) are unbanked, particularly due to costs of opening and maintaining a bank account, but also due to lack of documentation required to open an account.[289] While a 39 per cent "banked" rate is similar to figures from developing countries around the world, there is a wide "banking" divide in the Americas considering that 96 per cent of Canadian adults and 88 per cent of U.S. adults have formal bank accounts.[290] Although m-banking has been successful in other developing regions, such as Sub-Saharan Africa, uptake of m-banking services in the LAC region has been relatively slow with only 3 per cent of adults across the region using their mobile devices to send or receive money, or to pay bills.[291] An exception is Haiti, where 15 per cent of unbanked adults use m-banking services.[292] However, m-banking in Latin America is expected to grow 65 per cent annually between 2011 and 2015 as the number of m-banking users grows from an estimated 18 million to over 140 million.[293]

Eager to tap into this new market, mobile operators and financial institutions are entering into partnerships to offer m-banking services across the region. In February 2012, for example, Telefónica and MasterCard entered into a joint venture under the Wanda brand to offer mobile payment services to over 87 million customers in the 12 markets where Telefónica operates.[294] These services include money transfers, bill payments and retail purchases, and are available through mobile wallet and prepaid accounts. América Móvil and Citibank have also created a joint venture called Transfer that allows customers to use SMS messaging to conduct similar services to Wanda.[295] Transfer launched commercially in Mexico in April 2012, but will be expanded across the region over the next year to reach the operator's 236 million subscribers.[296]

Overall, countries in the region have not imposed undue regulatory barriers on m-banking, such as rules that expressly limit or prohibit partnerships between mobile operators and financial institutions. However, there is also little coordination among the various ministries and regulators that would oversee m-banking issues. In Brazil, for example, the Central Bank of Brazil (CBB) and the National Agency of Telecommunications (Anatel) held brief discussions on making banking services more accessible, including through greater entry of mobile operators in the m-banking sector. Despite such talks, the Consultative Group to Assist the Poor (CGAP) reported in 2010 that "there is little awareness and coordination on this subject among the various CBB departments, let alone between CBB and Anatel."[297] Further, CGAP found that "Anatel has shown little interest in intervening in mobile banking precisely because CBB is the competent authority for financial services."[298] Since overlapping jurisdictions can create conflicts among various agencies, it is important to develop ministerial-level policies that help define the regulatory authorities' roles and responsibilities.

One area where the telecommunication regulator can more easily coordinate with the banking regulator and other relevant agencies is through consumer education initiatives that detail the benefits of banking services generally and promote confidence in the security of m-banking specifically. According to a 2011 report by Deloitte, consumers in Latin America are expected to be relatively apprehensive about adopting m-banking services due to concerns over information security, which will require increasing consumer confidence in order to encourage more complex and transaction-based services.[299] Additionally, consumer education initiatives will be "especially important as many consumers lack financial literacy and knowledge about the benefits of card payments and mobile banking solutions."[300]

5.2 Inter-Agency Coordination on Cybersecurity Issues

Cybersecurity involves protecting vital infrastructure, particularly communications networks, as well as protecting data privacy. But as ICTs permeate more facets of everyday life, criminals discover new areas to exploit and seek new ways to hide their illegal activities. Telecommunication regulators play a key role in developing regulations and influencing national policies to address cybersecurity and cybercrime, as well as ensuring that national security and law enforcement agencies (LEAs) have the necessary information and capacity to investigate and prosecute crimes in the digital age. For decades, telecommunication regulators and LEAs have coordinated to enable lawful interception (i.e., wire-tapping), initially with the PSTN voice communications and more recently with IP-based communications.[301] Although telecommunication regulators have begun to play a stronger role in cybersecurity issues, these laws have traditionally required LEAs, as well as defence or security agencies, to take the lead due to public safety and national security interests in issues including interception of communications, data privacy, cyber theft and fraud.[302] However, the telecommunication regulator's technical expertise positions it to support and advise LEAs as broadband penetration—and cybercrime—increases, including through 1) helping to coordinate the various LEAs and national security agencies at local and national levels and 2) educating service providers and consumers in knowing their rights, obligations and mechanisms for protecting themselves online.[303]

One of the most important ways in which inter-agency coordination can develop is through national computer security incident response teams (CSIRTs), which ensure that effective mechanisms are in place to resist cyber attacks on networks, limit damage to critical infrastructure and help ensure that systems do not fail.[304] Generally, CSIRTs are headed by national security agencies and/or LEAs with the telecommunication regulator ensuring that information related to cybersecurity threats are quickly passed to the CSIRTs and appropriate authorities.

The number of national CSIRTs throughout the Americas has grown rapidly—from just five CSIRTs in 2006 (Argentina, Canada, Chile, Brazil and the United States) to 14 CSIRTs in 2011 with an additional five countries planning to launch CSIRTs.[305] In Paraguay, for example, the Convenio Marco de Cooperación Interinstitucional created the country's first CSIRT and was signed by several governmental stakeholders,[306] including the telecommunication regulator (CONATEL), the Ministry of Foreign Affairs (MRE), the Public Ministry (MP) and the National University of Asuncion.[307] The CSIRT-Paraguay (CSIRT-PY) has jurisdiction throughout the country and is be responsible for all actions related to the prevention, treatment, identification and resolution of security incidents and attacks on computer systems.

Figure 20: CSIRTs in the Americas, 2011

Source: Brian Sullivan and Belisario Contreras, "Cyber Security in the Americas and Caribbean: A Regional Perspective," Inter-American Committee against Terrorism (CICTE), Organization of American States, 2011.

Note: Countries in orange are in the process of developing their respective national CIRTs.

International and regional coordination is also vital, due to the transnational aspect of cyber threats. To improve such coordination, the ITU launched the Global Cybersecurity Agenda (GCA) in 2007 and provides "a framework for international cooperation aimed at enhancing confidence and security in the information society."[308] One of the GCA's current projects is "Disseminating cybersecurity culture and combating cyber threats in Latin America," which will engage ministerial agencies and regulators through regional and sub-regional workshops in order to help develop CSIRTs in those countries that still lack such structures. Overall, the project's aim is to implement capacity-building programs throughout the region in order to develop "a sustainable and proactive culture of cybersecurity, awareness of legal aspects for future harmonization of cybersecurity laws, development of national strategies and security standard."[309] In the Caribbean region, the ITU, Caribbean Community (CARICOM) and Caribbean Telecommunications Union (CTU) have drafted several model laws and guidelines, including texts on cybercrime and cybersecurity laws, through the Harmonization of ICT Policies, Legislation and Regulatory Procedures (HIPCAR) project. HIPCAR's *Cybercrime/e-Crimes: Model Policy Guidelines and Legislative Tex*t is intended to improve coordination among various regulatory and law enforcement authorities

throughout the region. The guidelines developed through this project are identified in Box 12.

Box 12: HIPCAR Model Policy Guidelines – Cybercrime/e-Crimes

Model Policy Guidelines that a country may wish to consider in relation to cybercrime/e-Crimes:

1. Aim to establish necessary common interpretations for key terms associated with cybercrime (e.g., uniform definitions for computer, traffic data and electronic record);
2. Develop substantive criminal law dealing with cybercrime (e.g., ensure that legislation is compatible with both international standards and best practices to better enable LEAs to coordinate with countries not only within the region, but also throughout the world).
3. Develop effective but balanced procedural instruments that enable competent authorities to investigate cybercrime but protect the rights of the suspect (e.g., the framework should enable competent authorities to order the lawful collection of traffic data and the lawful interception of content data).
4. Develop instruments for transnational cooperation in cybercrime investigations (e.g., the framework should create a designated 24/7 point of contact for requests and enable the use of expedited means of communication, such as email)
5. Develop a framework regulating the responsibility of ISPs (e.g., if ISP liability exists, then the framework should generally limit the criminal responsibility of access providers where a user has committed the offense and the provider has not assisted in the act in some way.

Source: HIPCAR, "Cybercrime/e-Crimes: Model Policy Guidelines and Legislative Text," 2012, http://www.itu.int/ITU-D/projects/ITU_EC_ACP/hipcar/reports/wg2/docs/HIPCAR_1-5-B_Model-Policy-Guidelines-and-Legislative-Text_Cybercrime.pdf.

5.3 Inter-Agency Coordination on Environmental Issues

The issues addressed by telecommunication regulators and environmental agencies have traditionally been mutually exclusive, except for electromagnetic field (EMF) and radiofrequency field (RF) emissions from broadcasting and wireless communications. However, broadband-enabled technologies that can help reduce greenhouse gas (GHG)

emissions and energy consumption is driving new avenues for cooperation among telecommunication, environmental, energy and other relevant agencies.[310] As identified by the GSMA, it is important for policy-makers to facilitate a common framework that aligns the telecommunication and other sectors to achieve goals such as encouraging consumers to recycle devices, such as mobile phones and computers, as well as reducing energy consumption and greenhouse gas emissions through smart grids and other broadband-enabled technologies .[311]

In the United States, for example, the Energy Independence and Security Act of 2007 (EISA) established the Federal Smart Grid Task Force, which is charged with ensuring "awareness, coordination, and integration of the diverse activities of the federal government related to smarter grid technologies, practices, and services."[312] Headed by the Department of Energy (DOE), there are seven federal agencies on the Task Force, including the FCC, Department of Commerce, Environmental Protection Agency, Department of Homeland Security, Department of Agriculture, Department of Defense, Department of State, Federal Energy Regulatory Commission and National Energy Technology Laboratory. Following on EISA, the FCC recommended in the April 2010 National Broadband Plan that the DOE, in collaboration with the FCC, should conduct a thorough study of the current and projected communications requirements of electric utilities to inform federal smart grid strategies, as well as collection of information the types of networks and communications services that utilities use.[313] In October 2010, the DOE had consulted with stakeholders and DOE released the report, *Communications Requirements of Smart Grid Technologies*.[314] The DOE also noted the need for close coordination with the FCC, stating that "because wireless communications will play such a key role in the smart grid, within the auspices of the larger federal agency effort to identify additional spectrum for wireless broadband, DOE will seek to work with both the Federal Communications Commission (FCC) and National Telecommunications and Information Administration (NTIA) to review possibilities for spectrum access to accommodate Smart Grid needs, either through sharing frequencies with others users, leasing spectrum, or other alternatives."[315]

Although there is significant potential in developing inter-agency coordination to implement "green" ICTs, few countries have implemented such cross-sector initiatives. As a result, it is currently unclear whether this represents a new type of policy implementation, but may develop with increased broadband deployments throughout the region.

6 Recommendations to Promote the Rapid Deployment and Uptake of Broadband in the Americas

The text below presents a consolidated list of the recommendations and best practices presented in the preceding sections.

6.1 National and Regional Guidelines

6.1.1 Policy and Regulatory Frameworks

- Streamlining regulation of ICT services can promote competition, including between platforms or technologies, allowing service providers and users to leverage new and/or more efficient technologies.
- Consider a holistic approach to regulating a converging or converged ICT sector, addressing topics including licensing, technology neutrality, competition, spectrum management, and interconnection.
- Implement any necessary reforms to enable funding of broadband deployments through universal access or universal service programs, such as removal of technology or service restrictions.
- Consider all available sources of financing for broadband deployments, including the private sector, universal service or other development funds, and public-private partnerships.
- Use regulation to encourage or incentivize deployment of broadband and advanced ICT infrastructure, including through reduced barriers to broadband build-out and access to networks.
- Consider the appropriate model for the ICT sector regulatory authority in an increasingly converged environment. In the case of separate telecommunications and broadcasting/media authorities, recognize the importance of close cooperation and coordination.

6.1.2 Promoting the Supply and Demand of Broadband Networks

- Create and implement national broadband plans with ambitious but realistic goals;
- Establish an enabling regulatory environment, which includes transparent decision-making processes to develop and promote unified licensing frameworks, flexible

spectrum management policies, technological convergence, effective competition and consumer protection (see section 4 for trends and best practices);

- Use public funding on a transparent and non-discriminatory basis to address broadband development needs unmet by the private sector investment, such as in rural and remote areas;
- Balance the demands of infrastructure development and the promotion of private investment with the need to encourage competition and innovation;
- Make sufficient amounts of spectrum commercially available for mobile broadband, recognizing the key role that mobile broadband can play in achieving national goals;
- Focus on creating incentives to increase demand for broadband, including digital literacy programs, improving affordability of broadband services and broadband-enabled devices (e.g., through a reduction or elimination of taxes) and local content development; and
- Continue to promote regional coordination, such as through the development of international submarine cable systems and IXPs.

6.1.3 Establishing Unified and Converged Licensing Regimes

- Ensure that the procedures for issuing the new authorizations or updating existing authorizations are as simple as possible. A registration/notification-only requirement offers the simplest process. If a licence application process is required, consider providing a "check-the-box" type application in which applicants identify which services they plan to offer;
- Create a standard set of regulations setting out the terms and conditions attached to the authorization/licences that apply equally to all service providers (although special conditions may apply to certain providers, such as universal service or number portability obligations);
- Establish a process for transitioning existing licensees to the new authorization or licensing regime, which may involve a grace period for obtaining an authorization under the new framework;
- Focus on establishing full technology neutrality through a general authorization framework as much as possible. If opting for a multi-service framework, require service providers to hold just a single licence. For example, a facilities-based licence

would replace a services-based licence and include all activities authorized under a services-based licence;

- Procedurally, the decision-making process should be transparent and non-discriminatory, particularly through the use of public consultation to help instilll confidence in the outcome; and
- Ensure low or reduced licensing fees to enable greater network investments, in addition to reducing or eliminating administrative and formal requirements to enter the market and provide service.[316]

6.1.4 Market-Based and Flexible-Use Spectrum Management

- Adopt auctions as the mechanism to award spectrum use rights for commercial mobile services and set out transparent rules for the award and licensing process, including a clear understanding of what rights and obligations winners will be subject (e.g., coverage obligations).
- Auction a wide range of frequency bands, in both higher and lower bands (i.e., above and below 1 GHz) since higher bands tend to be suited more for urban areas while lower bands allow for greater coverage of rural areas.
- Initiate and complete spectrum auctions as quickly as possible, with the potential of conducting multi-band auctions, in order to allow licence winners to speed up the deployment of mobile services, particularly mobile broadband.
- Ensure that new and existing spectrum licences are technology- and service-neutral by setting minimal technical usage conditions on licences, and consider adopting rules for unlicensed use and/or expanding spectrum available for unlicensed use.

6.1.5 Promote Convergence between Telecommunications and Broadcasting

- Recognition by policy-makers of the importance of promoting competition in the pay-TV market, the increasing importance of bundled services, particularly triple play packages, and the need for incumbent telecommunication operators to offer IPTV services in order to attract customers and increase revenue bases. In doing so, policy-makers should assess the state of competition in the market and the potential impact that incumbent telecommunication providers' entry into the IPTV market would have on the overall competitive landscape.

- Introduction of effective, proportionate and non-discriminatory regulations to facilitate ICT and broadcasting convergence by addressing regulatory obstacles that prevent telecommunication operators from offering video services.
- Addressing other competition issues that may prevent incumbent telecommunication operators from providing IPTV services.
- In countries where telecommunication and broadcasting licences are administered by separate authorities, determining which regulatory authority will review and grant applications. It is also important to establish a framework and clear process for how the two authorities cooperate in areas of overlapping jurisdiction, particularly spectrum-related matters.[317]

6.1.6 Promote Competition

- Recognize, in general, that *ex ante* regulation may need to be implemented for some period in order to promote competition in markets where competition has not yet developed effectively, including active infrastructure sharing if determined to be necessary;
- Focus on the facilitation of fair, pro-competitive interconnection between networks regardless of technology;
- Adopt appropriate regulation on interconnection and access, including rate regulation, taking into account the relevant technological market developments including the deployments of NGNs;
- Focus on the deployment of domestic and regional IXPs, particularly in the Caribbean and Central America, to reduce costs to ISPs associated with tromboning in the region to promote IP interconnection;
- Promote fair and non-discriminatory access to passive infrastructure on cost-based terms to enable network deployments;
- Implement number portability regulation that enables customers to quickly and easily port phone numbers, which may include establishing a centralized database of numbers to speed up the process; and
- Recognize that socio-economic, geographic, and political circumstances vary widely throughout the region and, as such, any imposition of *ex ante* regulation should be based on a thorough, fact-based assessment of a country's the market conditions.

6.1.7 Consumer Protection

- Prior to implementing net neutrality rules, determine whether it is necessary to regulate ISPs' network management practices. In particular, determine whether ISPs are engaging in practices that undermine consumers' ability to access the services, applications and content of their choice.
- If implementing net neutrality regulation, recognize the importance of transparency and disclosure rules to ensure that consumers are well-informed. The Body of European Regulators (BEREC) has identified several important characteristics to consider in developing transparency rules for net neutrality:[318]
    - Accessibility: Information about the Internet access service should be easily found and identified, such as on a dedicated, highly visible page of the operator's website. The operator should particularly state any traffic management practices employed; any instances where traffic may be blocked or throttled; any limits on the service, such as data caps; and minimum/actual speeds consumers should expect.
    - Understandability: The information must be easily understandable for consumers and should be in a user-friendly format and not be overly technical.
    - Meaningfulness: The information should be relevant, straightforward and presented in a way that helps consumers make an informed decision.
    - Comparability: Consumers should be able to easily and adequately compare service packages among various providers in ways that show their differences and similarities.
    - Accuracy: The information should be accurate and current, so operators should update the service rules and prices regularly.
- For consumer data privacy, despite the broad range of frameworks in the Americas—from a rights-based system in Latin America to self-regulatory approach in the United States—there are several best practices developing in the region, including the implementation of rules or codes that require or encourage:
    - Limiting the data collected to what is needed and ensuring the security of such data.

- Affording consumers reasonable access to their private information and allowing them to correct or delete data;
- Ensuring that privacy notices are clear so consumers can easily understand what information is collected and how it will be used.

- In countries where such best practices are enacted through law or regulation, policy-makers should also consider enforcement mechanisms to ensure compliance, whether through the court system or a specialized regulator that handles consumer and data protection issues.

6.2 Recommendations on National Broadband Plans, Policies and Guidelines

- Bolster the plans credibility through engagement at the highest political levels, as well as participation in public consultations by a wide variety of stakeholders (e.g., operators, governmental bodies, civil society and citizens);
- Provide for comprehensive plans to build-out broadband infrastructure at every level of the supply chain, including international and regional connectivity, domestic backbones, metropolitan connectivity and local access networks;
- Establish measurable objectives, over both the short-term and long-term, such as levels of access (e.g., connecting a certain percentage of households in a specific timeframe), quality of service and affordability levels (e.g., providing certain broadband speeds at a certain price), targeted populations (e.g., rural areas) and public institutions (e.g., schools and hospitals);
- Develop political will and financial commitment (from public and private sectors) to the project over the long-term that explicitly provide for adequate resources to achieve the national broadband plan's objectives;
- Consider including universal access and service in the national broadband plan;
- Focus on demand-side goals, particularly improving digital literacy and promoting the use of new and innovative broadband services and applications;
- Focus on both fixed line and mobile broadband deployments to achieve goals;
- Determine the various funding mechanisms, including the use of public funding (USF, stimulus grants, etc.) and private sector contributions to achieve deployment goals;
- Institute mechanisms to monitor the plan's progress and evaluate its effectiveness at regular intervals;

- Ensure effective regulatory oversight by clearly defining the regulator's role and responsibilities;
- Coordinate with other sectors to boost the impact of broadband throughout the economy and society, including initiatives associated with e-commerce/business, e-education, e-health/telemedicine and e-government.

ANNEX A. BROADBAND PLANS IN THE AMERICAS

Country/Plan	General Goals	Specific Targets	Financing
1. Argentina *Argentina Conectada (Connected Argentina 2010)* http://www.argentinaconectada.gob.ar/contenidos/home.html	- A five-year comprehensive plan to increment infrastructure and telecommunication services in the country - Deploy a national fibre optics network, starting in areas with no access to infrastructure, to ensure access to ICT to the population and ultimately reduce services' cost - Digital inclusion - Effective use of the spectrum - Development of universal services - National production and generation of employment in the telecommunication sector - Training and research in communications' technologies - Infrastructure	By 2012: - Installing 2,000 satellite dishes for connectivity in rural schools - Installing 11,000 digital satellite TV antennas in public and educational establishments By 2015: - Cover 1,700 localities with fibre optic networks - Increasing existing fixed broadband connectivity to speeds of at least 10 Mbit/s - Increased connectivity of local, regional and national governmental entities - Connectivity to all public schools - Establishing 250 new R&D sites - Multiplying the number of digital access points in	Funding from various fields, including: - Universal Service Trust Fund - Contributions from the budgets of the ministries involved in the project - Contributions from state owned operator ARSAT SA - Private investment on the provision of last mile connectivity

Country/Plan	General Goals	Specific Targets	Financing
	and connectivity - Competition's stimulus	the country - Spectrum refarming	
2. Barbados *National ICT: A Strategic Plan of Barbados 2010 – An Efficient Networked Island* http://ncst.gov.bb/index.php?option=com_remository&Itemid=62&func=startdown&id=13	Provide the necessary mechanisms and framework that will transform Barbados into a major regional and international ICT and services hub. - Deploy affordable, high speed, broadband telecommunication service throughout the country Six broad national goals: - An ICT literate society that enables Barbadians to participate fully in the Information Society - Utilize ICTs to encourage and promote a culture of innovation and entrepreneurship - ICTs are available to all Barbadians - Use ICTs to position Barbados as a competitive	- Integrate ICTs fully into environmental disaster management plans and programs - Encourage the business community, especially SMEs, to utilize ICTs - Ensure Internet international connectivity at an equitable price - Review the ICT framework to promote competition - Encourage e-commerce - Continuously review taxes of computer hardware and software - Design ICT literacy programs to the elderly and to the impaired - Proliferate the provision of basic	There are no specifics including outlining financing to support the implementation of the plan, but the government is tasked to partner with private stakeholders to comply with the strategy's targets.

Country/Plan	General Goals	Specific Targets	Financing
	jurisdiction - Transform the public and business sectors to an e-environment - Facilitate the continuity of Governance in national disasters to accomplish these goals	ICT awareness training in local communities - Development and deployment of an ICT backbone infrastructure and security enterprise infrastructure to connect all organs for Government - Support the development of an ICT incubation and proof of concept centre through alliances with major multi-nationals	
3. Brazil *Programa Nacional de Banda Larga (National Broadband Program - 2010)* http://www4.planalto.gov.br/brasilconectado	- A four-year plan to promote universal broadband access in Brazil to citizens, government institutions, non-government entities, and business, in order to foster opportunities, wealth distribution and digital inclusion - State-owned Telebras manages nationwide fibre optic backhaul	By 2014: - Triple broadband access penetration and provide broadband connectivity to 40 million households with basic packages at USD 20 and connections of at least 512-784 Kbit/s, using the national fibre network managed by Telebras - Auction spectrum	The total investment of the NBP is estimated at about BRL 13 billion (USD 6.4 billion), that will be provided through: - Capital to be injected into state-owned operator, Telebras - Tax breaks Financing from the Brazilian National Development Bank (BNDES)

Country/Plan	General Goals	Specific Targets	Financing
	and resells capacity to private operators on a low-cost basis to provide broadband packages at the prices established by the Plan - Broadband is characterized as the provision of telecommunicati on infrastructure that enables information traffic in a continuous and uninterrupted manner with sufficient capacity to provide access to data, voice and video applications that are commonly or socially relevant to users, as determined by the federal government from time to time - Review the national framework to spur competition in the sector - Increase access to national content and applications	in the 2.5 GHz and 450 MHz bands (2012) and in the 3.5 GHz band (2012-2013) for urban and rural areas to spur broadband access. - Connect 100% of the public buildings in urban areas (schools, libraries, governmental institutions, etc.) - Connect 100% of hospital and schools located in rural areas (with the 450 MHz band) - Achieve 60 million mobile broadband connections (45% of the population) - Implement 100,000 new telecentres for free access to the Internet	

Country/Plan	General Goals	Specific Targets	Financing
	- Increase e-government services as well as other e-commerce tools to spur demand - Provide financial lines and tax breaks to ISP providers - Provide tax breaks to broadband equipments (modems, devices, etc.)		
4. Canada *Broadband Canada: Connecting Rural Canadians* (2009) http://www.ic.gc.ca/eic/site/719.nsf/eng/home	- The government developed a geographic map to understand the extent to which Canadians remained unserved or underserved. Based on the mapping data, service areas were defined and a competitive call for applications was open to fund projects in those areas. - Eligible recipients were the private sector or consortiums of companies, not-	By 2012: - To make broadband service available to as many unserved and underserved households as possible with minimum speed of 1.5 Mbit/s at a reasonable cost - Provide infrastructure to rural Canada to access the Internet.	CAD 974 million in federal contributions were allocated. The 2009 Budget allocated CAD 225 million over three years. - Successful applicants receive federal funding up to 50% of one-time costs, non-repayable contribution, not a loan.

Country/Plan	General Goals	Specific Targets	Financing
	for-profit organizations, and provincial/territorial entities that build and operate broadband infrastructure. - The Broadband Program is technology neutral, accepting a variety of wireline and wireless technology solutions, such as fibre, digital subscriber line (DSL), cable and wireless networks (ground based and satellite)		
5. Chile *a. Estrategia Digital - 2007-2012 (Digital Strategy 2007-2012)* http://www.guiaweb.gob.cl/recursos/documentos/Estrategia_Digital_2007_2012.pdf *b. Plan de Acción Digital - 2008 (Digital Action Plan 2008)* http://www.go	a. Expand broadband access and Internet usage to spur social and economic development The government also announced a subsidy plan to build out networks in rural areas. b. Promote development of e-government	By 2012: - Duplicate broadband connectivity - Duplicate investment in ICTs - Promote the development of the ICT industry through e-government and online services to citizens - Review the legal framework for e-	Information on the funding of the projects are not clear, but it seems to be combination for public and private funding

Country/Plan	General Goals	Specific Targets	Financing
biernofacil.go.cr/e-gob/gobiernodigital/documentos/PlanAccion-2008-2010.pdf		commerce, fraud, cybersecurity and data privacy regulations - Promote distance learning and educational portals - Connect 70% of the schools, create online classes, and achieve at least one computer for each 10 students - Develop e-health applications - E-government tools - Promote the use of open and free software - Offer Internet coverage to at least 90% of the rural and remote population - 2 million broadband connections by 2010	
6. Colombia *Plan Vive Digital (Live Digital Plan – 2010)* http://vivedigital.gov.co/	- A four year plan to promote Internet usage to achieve a more democratic prosperity - The expansion of	Vive Digital's specific goals through year 2014 include: - Tripling the number of municipalities with access to	Estimated in 5.5 billion Colombia Pesos on October 2010, of which: - 3.2 billion founded by initiatives taken

Country/Plan	General Goals	Specific Targets	Financing
	Internet usage, the improvement of technology, as well as the creation of ICT jobs will reduce unemployment and poverty and increase competitiveness. - Fixed broadband is defined as an Internet service with a minimum download speed of 1 Mbit/s and upload of 512kbit/s - Sets out a series of initiatives and actions to spur the offer of infrastructure and services, as well as to increase competition and demand, including the following categories: make spectrum available and increase international Internet connectivity; provide subsidies and reduced taxes for services and users;	fibre networks to connected to the Internet - Connect at least 50% of all SMEs, as well as 50% of all households to the Internet. - Fourfold the number of Internet connections in Colombia, achieving 8.8 million connections	by the MINTIC - 2.3 billion founded by initiatives and contributions from other ministries

Country/Plan	General Goals	Specific Targets	Financing
	encourage applications development; and implement initiatives to improve users' experience, such as QoS and user protection, ICT training, and usage of ICTs by the disabled		
7. Costa Rica *Estrategia Nacional de Banda Ancha – (Broadband National Strategy – 2012)* http://www.telecom.go.cr/estrategia.htm	- A 2 to 5 year plan to spur residential and business broadband usage - Broadband is defined as a technology that allows signal transportation by any transmission means, with enough bandwidth to assure sufficient capacity and speed for the continuous transferring of any combination of voice, data, graphic, video and/or audio, through any type of format - Broadband upload and download speeds	Residential: - 100% coverage by 2014 - 10% penetration by 2014 (15% if including wireless) - 16% penetration by 2017 (21% if including wireless) - 2 Mbit/s download speeds, preferably symmetric SMEs: - 100% penetration by 2014 - Symmetric speeds of 20 Mbit/s Educational, cultural and health institutions: - 100% penetration	Financing resources will be provided by the telecommunication funding, as well as the private sector.

Country/Plan	General Goals	Specific Targets	Financing
	should be symmetric - Deployment of a fibre network to provide symmetric speeds of 20-100 Mbit/s to R&D - Implement measures to increase competition	in universities, R&D sites and hospitals with symmetric speeds of 20-100 Mbit/s - 100% penetration in schools, public libraries, cultural institutions, and health centers, with speeds of at least 6 Mbit/s, preferably symmetric	
8. Dominican Rep. a. *Indotel te Conecta (Indotel Connects You 2008)* http://transparencia.indotel.gob.do/OAI/transparencia/POA%202010/Depto%20Comunicaciones/Indotel%20te%20conecta.htm b. *Proyecto Conectividad Rural de Banda Ancha II (Rural Broadband Connectivity Project II – 2010)* http://www.indotel.gob.do/p	a. Deployment of broadband infrastructure in remote localities b. Bringing telephony and broadband access to all communities with more than 300 inhabitants, or 80 households, not yet covered c. Facilitate interconnection of private and public fibre networks, with the aim of bringing broadband to all municipalities	a. Select a provider of telecommunications to deploy infrastructure needed to provide broadband access, as well as all other services attached to it, to 503 localities in 345 days b. Deployment of infrastructure necessary to provide broadband and related services (e.g., basic telephony services) and also in places where the regulator has been promoting social inclusion	a. CLARO-CODETEL won the project and currently provides broadband services to such localities through ADSL and wireless broadband models. Estimated budget information is not available b. Estimated budget of USD 3 million (DOP 118,880,000) from governmental subsides c. The total estimated budget for the project is around USD 4 billion (DOP 157,887,500) from governmental

Country/Plan	General Goals	Specific Targets	Financing
royectos-indotel/proyectos-indotel/conectividad-rural-de-banda-ancha-segunda-etapa.html c. *Capilaridad de Fibra Óptica para Áreas no Servidas en República Dominicana (Fibre Optics in Areas not served in the Dominican Republic- 2010)* http://www.indotel.gob.do/index2.php?option=com_docman&task=doc_view&gid=3283&Itemid=745		and projects related to R&D c. To promote interconnection between fibre optics deployed by private cable companies and the national fibre optic operated by the government	subsides

Country/Plan	General Goals	Specific Targets	Financing
9. Ecuador *Estrategia Ecuador Digital 2.0 (Digital Ecuador Strategy 2.0 – 2011)* http://www.mintel.gob.ec/index.php?option=com_content&view=article&id=1562:material-de-estrategia-de-ecuador-digital&catid=39:ecuador-digital	To access and generate knowledge and information, through the effective use of ICT, as part of the social development and solidarity of Ecuador Three primary policies: - Social development and inclusion of marginalized populations through the use of ICTs - Improvement of government administration and services through the use of ICTs - Make ICTs an axis of productive transformation and economic development	By 2014: - 20% decrease in price per kbit/s By 2015: - 80% increase in broadband connectivity among SMEs - At least 50% of households to have broadband access - At least 50% of rural communities to have broadband connections - At least 40% of households in Quintiles 1 and 2 to have broadband access By 2016 - Triple the number of broadband connections By 2017 - At least 75% of households have broadband access	No specific funding sources identified for broadband development plan, but the financing model includes: - Defining the investment necessary to conduct the necessary diagnostics and analyses of the market - Participation by both public and private sectors - Stimulating the private sector - Leveraging the Universal Access Plan
10. Grenada *ICT 2006-2010 - A Strategy and Action Plan for Grenada* http://www.cari	- To put ICT at the centre of Grenada's economic development as a dynamic industry	- Development of a legal framework to regulate and facilitate all electronic interactions	- Online advertising is one potential source of financing for e-government Services

Country/Plan	General Goals	Specific Targets	Financing
b-is.net/sites/default/files/ICT_strategy_grenada.pdf	sector in itself, and in support of the development of other sectors of the economy - Promotion of the widespread use of the Internet - Promotion of widespread utilization of e-commerce and e-government tools	- Provision of IT and Internet education and training - Provision of mail and free access to e-government services to accelerate Internet uptake - Establishment of e-government service kiosks in selected sites - Development of a high quality and affordable telecommunication infrastructure - Establishment of a permanent National Commission that will catalyze the ongoing development of an Information Society	- Annual government budget would provide additional financing - External financing should be considered - Government and non-government financing would likely be needed
11. Mexico Agenda Digital.mx 2012 http://e-mexico.gob.mx/	- Deployment of a high-capacity network to offer connectivity to government and schools - Promotion of market competition through an appropriate	By 2015: - 55% of urban and suburban homes connected to 5 Mbit/s+ broadband - All urban and suburban areas connected to high-capacity networks	- Government strategies to encourage universal access include encouraging competition, investing in unprofitable areas and promotion of public-private

Country/Plan	General Goals	Specific Targets	Financing
	framework - Boost broadband access by making broadband available to every person by any means - Synergy between public and private sectors to promote broadband Internet access - Increase of spectrum availability and promotion of the efficient use of the spectrum - Encourage the deployment of optical fibre networks - Promote supply and network competition - Simplify rights of way availability, including effective coordination between the federal, state and municipal authorities - Encourage establishment of network exchange points	- 38% fixed and mobile broadband penetration - Universal access before the end of the decade - 60 million+ computer users - Internet connectivity in all basic education schools, health centers and offices - 30,000+ digital community centers - 80% of Internet users making digital transactions - Broadband available to 70% of SMEs with 20+ employees - Legal certainty to use tools such as e-signature and e-invoicing, sole medical and educational records	partnerships - Public financing mechanisms supporting the development of the fibre networks - Facilitate funding of ICT sector by strengthen the developments of the development banking and the state and mixed funds to expand the access to funding for the ICT sector - There are support mechanisms for the development, research and innovation of the ICT sector, which will continue to be strengthened on the basis of their transverse impact in economy - A mix of public and private funds as well as involvement of the Ministry of Communication, the Regulator, State and Municipal Government, Ministries and the Industry

Country/Plan	General Goals	Specific Targets	Financing
	- Digital literacy and inclusion of indigenous peoples and communities, women and the disabled, and senior citizens - Provide connectivity to all educational and health centers - Promote SMEs' use of ICTs - Boost science and innovation through ICTs - Promote e-commerce/e-banking		
12. Panama *Red Nacional Internet (Internet National Network)* http://internetparatodos.gob.pa/	- To bring wireless connectivity to all corners of Panama so that any citizen can access the free WiFi service in designated public places - Create conditions to improve access to the Internet - Bring broadband to remote areas and areas of social interest in order to accelerate adoption - Generate direct	- In one year, double the penetration of broadband Internet, especially in areas of greatest impact in the countryside - Broadband speeds of at least 512 kpbs	- Funded by the Universal Access and Service Fund created in 2008, which taxes commercial operators - A tender process was held to allow private companies to provide the service. Liberty Technology Corp. scored the highest of the applicants

Country/Plan	General Goals	Specific Targets	Financing
	connectivity benefits for the neediest citizens - Reduce the digital divide - Increase international competitiveness		
13. Paraguay *Plan Nacional de Telecomunicaciones (National Telecommunications Plan 2011-2015)* http://www.conatel.gov.py/index.php/informaciones/105-plan-nacional-de-telecomunicaciones	- A four year plan to make broadband available in all public institutions and provide coverage to at least 50% of the population with broadband speeds of at least 512 kpbs - Develop an extensive mapping to understand the extent to which Paraguayans remain unserved or underserved - Review the legal framework to include measures to stimulate competition, investment, innovation and convergence - Programs aimed at bringing connectivity to schools	By 2015: - 1,000 km of fibre optic cable laid in each of the five preceding years to provide access to 200 municipalities - 50% of mobile handsets broadband-enabled - 10% broadband teledensity - 40 Gbit/s international gateway connectivity - 200 municipalities connected via fibre optic cable - 200 municipalities with broadband - 50% broadband penetration - Make IMT spectrum available in the 1700/2100, 700 MHz and 2500 MHz bands	- USD150 million annually, including projects supported by the Universal Service Fund - Fibre optic backbone to be deployed by the private sector with support of the universal service fund - In addition, the plans also tasks the government to subsidize companies that offer broadband in currently unserved areas, as well as access to school, municipalities and call centers

Country/Plan	General Goals	Specific Targets	Financing
	- Establish a framework for IP interconnection and quality of services		
14. Peru *Plan Nacional Para el Desarrollo de la Banda Ancha en el Perú (National Broadband Development Plan for Peru – 2011)* http://www.mtc.gob.pe/portal/proyecto_banda_ancha/index.html	A 5 year plan, which general objectives includes the following: - Facilitate the deployment of fibre optics and make IMT spectrum available enabling access to broadband - Availability of infrastructure and service offerings suitable for the development of broadband at the national level - Stimulating demand and the inclusion of the population in the Information Society - Strengthen the institutional framework oriented toward infrastructure sharing to enable public companies to reduce costs with the implementation of broadband	Goals for 2016: - Broadband connections of at least 2 Mbit/s for all schools and health facilities, police stations and other state agencies in urban areas - Broadband coverage of at least 2 Mbit/s for all districts, serving at least municipalities, schools and health facilities - 4 million broadband connections nationwide - 500,000 broadband connections of at least 4 Mbit/s	- Recommends changes to the legislation governing FITEL to allow for new fibre optic transport networks and increased funding to FITEL - Increased funding is proposed to come from an additional levy on revenues generated by cable services and Internet access - Modify rules such that 30% of fees collected by the Ministry of Transport and Communications goes to FITEL

Country/Plan	General Goals	Specific Targets	Financing
	services - Spur competition and offers of broadband services - Reduce costs to devices and services to end users		
15. St. Kitts and Nevis *National ICT Strategic Plan – 2006* http://www.carib-is.net/national-ict-strategic-plan-st-kitts-and-nevis	- Sets out a comprehensive and overarching national ICT roadmap. The plan will allow the government to achieve its goal of cementing ICT as one of the leading sectors of the economy - There is no specific definition of broadband or definition of broadband speed	- Building the information infrastructure - Enabling policy and legal environment - Developing ICT human resources and building capacity - Modernizing government and delivering services electronically - Leveraging ICT for economic and social development through public-private partnerships	- There are no specifics addressing financing. There is discussion with respect to financing of ICT in the education sector as a partnership between the government and private entities, as well as bilateral and multilateral organizations
16. Trinidad and Tobago *Draft National Broadband Plan (under consideration)* http://www.fastf	- 100% broadband coverage in the country by 2020 - There is no specific definition of broadband	Proposed specific targets for coverage to all citizens: - By 2014: minimum of 5 Mbit/s - By 2016: minimum of 10 Mbit/s	- Public-private partnerships to support broadband growth and deployment - Universal Service

Country/Plan	General Goals	Specific Targets	Financing
orward.tt/		- By 2020: minimum of 100 Mbit/s	Fund to assist with connecting unserved and underserved areas
17. United States *Connecting America: The National Broadband Plan (2010)* http://www.broadband.gov/plan/	- Promote mobile broadband infrastructure and innovation - Increase opportunities for unlicensed devices and alike - Expand incentives and mechanisms to reallocate spectrum and allocation transparency - Accelerate broadband access and adoption to advance national purposes (e.g., education and health care) - Continue to connect public libraries and classrooms - Connect more public health facilities and foster telemedicine applications and services - Foster competition - Establish consistent policy	By 2015: - 100 million U.S. homes with access to actual download speeds of 50 Mbit/s and actual upload speeds of 20 Mbit/s. By 2020: - Make 500 MHz of spectrum available - Review the national universal service fund to support broadband service and use federal funds/lines to achieve, at least, 90% of penetration - Provide affordable access to at least 1 Gbit/s to institutions such as schools, hospitals and government building - Create a nationwide, wireless, interoperable broadband public	- The USD 4.6-billion-a-year program would transition into a new Connect America Fund over 10 years, with the FCC expecting to put USD 15.5 billion into broadband deployment over the next decade - Qualified broadband providers that wish to benefit from the FCC's fund would have to provide service of at least 4 Mbit/s - Update of the Universal Service Fund to include broadband

Country/Plan	General Goals	Specific Targets	Financing
	frameworks for special access and wholesale wireline competition - Improve consumer disclosures and FCC data collection to better monitor and promote broadband competition - Drive increased broadband adoption and use by ensuring that video navigation devices are available to consumers - Promote cybersecurity and protect infrastructure	safety network - Create a Health Care Infrastructure Fund to support deployment of dedicated health care networks to unserved areas - Create a Connect America Fund to extend broadband to unserved areas - Create a Mobility Fund to bring all states to a baseline level of 3G coverage	
18. Venezuela *Plan Nacional de Telecomunicaciones, Informática y Servicios 2007-2012* *(National Plan of Telecommunications, Information and Services 2007-2012)* http://www.mcti.gob.ve/Tices/PNTIySP/	- Expand access to ICT by deploying infrastructure in rural areas and reducing prices of devices - International agreements and deployment of networks, services and applications on a regional level - Promote NAPs and free and open software - Stimulate e-	--	--

Country/Plan	General Goals	Specific Targets	Financing
	government and development of services and applications - Promote the use of ICTs to enable development and the use of new technologies in all sectors to increase productivity - Promote training as a methodology to increase technology and development of skills		

Source: TMG.

ANNEX B. GLOSSARY, ACRONYMS AND ABBREVIATIONS

The following definitions are meant to assist readers of the Regulatory Impact of Convergence and Broadband for the Americas and are adapted from non-definitive reference sources. They are not intended to replace or contradict the terms and meanings used by each ITU Member State in its national laws and regulations or in international agreements.

2G:	*Second-generation mobile network or service.* A general term for second-generation networks, for example GSM.
3G:	*Third-generation mobile network or service.* Generic term for the next generation of broadband digital mobile cellular systems, which has expanded broadband capabilities for mobile data applications. See *IMT-2000*.
4G:	*Fourth-generation mobile network or service.* Mobile broadband standard offering both mobility and very high bandwidth.
A/V:	Audiovisual services.
Active infrastructure sharing:	Provision of specified services and active network elements needed to ensure interoperability of end-to-end services to users, including facilities for intelligent network services or roaming on mobile networks (Directive 2002/19/EC, TRAI.
ADSL:	*Asymmetric digital subscriber line.* A technology that enables high-speed data services to be delivered over twisted pair copper cable, typically with a download speed in excess of 256 kbit/s, but with a lower upload speed. Corresponds to ITU-T Recommendation (standard) G.992.1.
ADSL2+:	*Asymmetric digital subscriber line 2 plus* (ITU-T G.992.5). This revised version of ADSL2 enables increased speeds by increasing the frequencies used on the copper line.
AIG:	*Autaridad Nacional para la Inovación Gobernamental – Panamá.*
Analogue:	Transmission of voice and images using electrical signals. Analogue mobile cellular systems include AMPS, NMT and TACS.
ANATEL:	*Agência Nacional de Telecomunicações* of Brazil
Applications (*apps*):	Function-specific software that uses the data stream to deliver content to users.
API:	*Application program interface.*

APT:	*Asia-Pacific Telecommunity*.
ARPS	*Average revenue per subscriber.* Total revenue divided by total number of subscribers.
ASEP:	*Authoridad Nacional del los Servicios Públicos de Panamá.*
Backbone:	Network that handles the major voice and data traffic of a country. It employs the highest-speed transmission paths in the network. The access networks are attached to the backbone to directly connect the end user.
Bandwidth:	The range of frequencies available to be occupied by signals. In analogue systems it is measured in terms of Hertz (Hz) and in digital systems in bits per second (bit/s). The higher the bandwidth, the greater the amount of information that can be transmitted in a given time.
Base station:	A radio transmitter/receiver and antenna used in the mobile cellular network. It maintains communications with cellular telephones within a given cell and transfers mobile traffic to other base stations and the fixed telephone network.
Basic service:	Refers to the provision and carriage of voice telephony service, though some definitions also include telex and telegraph services.
BDT:	Telecommunication Development Bureau (ITU).
BEF	Barbados Entrepreneurship Foundation
BEREC:	*Body of European Regulators.*
Bit (binary digit):	A bit is the primary unit of electronic, digital data. Written in base-2 binary language as a “1” or a “0”.
Bit/s:	*Bits per second.* Measurement of the transmission speed of units of data (bits) over a network. Also Kbit/s: kilobits (1000) per second; Mbit/s: megabits (1 000 000) per second; Gbit/s: gigabits (1 000 000 000) per second; and Tbit/s: terabits (1 000 000 000 000) per second.
Bitstream access:	A form of network unbundling. With bit-stream access, the incumbent maintains management control over the physical line. Unlike full unbundling and line sharing, access seekers can only supply the services that the incumbent designates.
Blog:	Blog is short for weblog. A weblog is an online journal (or newsletter) that is frequently updated and intended for general public consumption.

BNDES:	*Banco Nacional de Desenvolvimento do Brasil.*
BPA:	*Broadband Partnership of the Americas.*
Broadband:	Broadband is defined, for the purposes of this report, as Internet access with a minimum capacity equal to or greater than 256 kbit/s in one or both directions. Fixed broadband is implemented through technologies such as digital subscriber line (DSL), cable modem, fibre-to-the-home (FTTH), Metro Ethernet, wireless local area networks (WLAN), etc. Mobile broadband is implemented through technologies such as wideband CDMA2000, CDMA2000 1xEV-DO, HSDPA, etc.
Broadcast:	A transmission from a single sender to all connected devices. See also *Unicast* and *Multicast*.
Browser:	Application that retrieves WWW documents specified by URLs from an http server on the Internet. Displays the retrieved documents according to the hyptertext markup language (HTML).
Byte:	(1) A set of bits that represent a single character. A byte is composed of eight bits. (2) A bit string that is operated upon as a unit and the site of which is independent of redundancy or framing techniques.
CADE:	*Conselho Administrativo de Defesa Econômica* (Council for Economic Defense) of Brazil.
CAGR:	*Compound annual growth rate.*
CARICOM:	*Caribbean Community.*
CATV:	*Cable television.* A system for delivery of television video and audio content via a wired network, employing either co-axial cable or fibre.
CBB:	*Central Bank of Brazil.*
CDMA:	*Code division multiple access.* A technology for digital transmission of radio signals based on spread spectrum techniques where each voice or data call uses the whole radio band and is assigned a unique code.
CDNs:	*Content Distribution Networks.*
Cellular:	A mobile telephone service provided by a network of base stations, each of which covers one geographic cell within the total cellular system service area.
CERTs:	*Computer emergency response teams.*
CFE:	*Comisión Federal de Electricidad.*
CGAP:	*Consultative Group to Assist the Poor.*
Channel:	One of a number of discrete frequency ranges utilized by a base station to transmit and receive information from cellular terminals (such as

	mobile handsets).
CICTE:	*Inter-American Committee against Terrorism*.
Circuit-switched connection:	A temporary connection that is established on request between two or more stations in order to allow the exclusive use of that connection until it is released. At present, most voice networks are based on circuit-switching, whereas the Internet is packet-based. See also *Packet-based*.
Cloud computing:	Typical cloud computing providers deliver common business applications online, which are accessed from a web browser, while the software and data are stored on servers.
CNC:	*Comisión Nacional de Comunicaciones of Argentina.*
CNTV:	*Comisión Nacional de Televisión – Colombia.*
COFECO:	Comisión Federal de Competencia - Mexico
COFETEL:	Comisión Federal de Telecomunicaciones - Mexico
Collocation:	(Also Co-location/Colocation.) Facility-sharing in which the incumbent operator houses communications equipment of competitive operators to facilitate connectivity to end users.
CONATEL:	*Comision Nacional de Telecomunicaciones of Honduras.* *Conseil National des Telecommunications of Haiti.* *Comisión Nacional de Telecomunicaciones of Paraguay.*
Connectivity:	The capability to provide, to end users, connections to the Internet or other communication networks.
Convergence:	A term used to describe a variety of technological and market trends in-volving the blurring of previously distinct lines between market segments such as cable television, telephony and Internet access, all of which can now be provided through a variety of different network platforms.
Coverage:	Refers to the range of a mobile cellular or any wireless network, measured in terms of geographic coverage (the percentage of the territorial area covered by mobile cellular) or population coverage (the percentage of the population within range of a mobile cellular network).
CRC:	*Comisión de Regulación de Comunicaciones - Colombia.*
CRTC:	*Canadian Radio-television and Telecommunications Commission.*
CSIRT:	*Computer Security Incident Response Teams.*
CTU:	*Caribbean Telecommunications Union .*

Cybersecurity:	Protection of network integrity and content from electronic infiltration or "hacking" to disrupt networks or to illegally obtain private or restricted data.
Dark fibre:	Fibre optic cable that is not being used at the time.
Digital:	Representation of voice or other information using digits 0 and 1. The digits are transmitted as a series of pulses. Digital networks allow for higher capacity, greater functionality and improved quality.
DOE:	*U.S. Department of Energy.*
Domain name:	The registered name of an individual or organization eligible to use the Internet. Domain names have at least two parts and each part is separated by a dot (point). The name to the left of the dot is unique for each top-level domain name, which is the name that appears to the right of the dot. For instance, the International Telecommunication Union's domain name is itu.int. "ITU" is a unique name within the gTLD "int".
DSL:	*Digital subscriber line.* See also ADSL, ADSL2, ADSL2+, SHDSL, SDSL, VDSL and xDSL.
Duct:	A tube or passage that confines and conducts cables (copper or fibre optic) of a physical network.
DVB:	*Digital video broadcasting.* An open standard for digital television maintained by the DVB Project, an industry consortium with more than 270 members, and published by a Joint Technical Committee (JTC) of the European Telecommunications Standards Institute (ETSI), the European Committee for Electrotechnical Standardization (CENELEC) and the European Broadcasting Union (EBU). A number of DVB standards exist including DVB-C (Cable), DVB-H (Handheld), DVB-T (Terrestrial television) and RCS (Return channel via satellite).
DVD:	*Digital Versatile Disc.*
ECLAC:	*UN Economic Commission for Latin America and the Caribbean.*
E-commerce:	*Electronic commerce.* Term used to describe transactions that take place online, where the buyer and seller are remote from each other.
EISA:	*Energy Independence and Security Act of 2007* of the United States.
EMF:	*Electromagnetic field.*
End user:	The individual or organization that originates or is the final recipient of information carried over a network (i.e. the consumer).
Essential facilities:	Network facilities that may serve as bottlenecks to national or

	international capacities and act as a barrier to the provision of telecommunication services. The definition of such facilities varies by market.
EU:	*European Union.*
***Ex-ante* and *ex-post* Regulation:**	*Ex-ante* regulation involves setting specific rules and restrictions to prevent anti-competitive or otherwise undesirable market activity by carriers before it occurs; *ex-post* regulation, by contrast, calls for setting few or no specific rules in advance, but applying corrective measures and punishments if and when transgressions do occur.
FCC	*Federal Communications Commission - United States.*
FDD:	*Frequency Division Duplex.*
FITEL:	*Fondo de Inversión de Telecomunicaciones.*
Fixed line:	A physical line connecting the subscriber to the telephone exchange. Typically, fixed-line network is used to refer to the PSTN (see below) to distinguish it from mobile networks.
FMC:	*Fixed-mobile convergence* (ITU-T Recommendation Q.1761 (04), 3.6). Mechanism by which an IMT-2000 user can have his basic voice as well as other services through a fixed network as per his subscription options and capability of the access technology.
FNE:	*Fiscalía Nacional Económica (National Economic Prosecutor)* - Chile.
FONATEL:	*Fondo Nacional de Telecomunicaciones - Costa Rica.*
Frequency:	The rate at which an electrical current alternates, usually measured in Hertz (see *Hz*). It is also used to refer to a location on the radio-frequency spectrum, such as 800, 900 or 1800 MHz.
FTC:	*Federal Trade Commission.*
FTTH:	*Fibre-to-the-home.* A high-speed fibre optic, Internet connection that terminates at a residence.
FTTB:	*Fibre-to-the-building.* A high-speed fibre optic, Internet connection that terminates at a building.
Full unbundling:	(Sometimes referred to as access to raw copper.) A form of network unbundling where the copper pairs connecting a subscriber to the main distribution frame (MDF) are leased by a new entrant from the incumbent. The new entrant takes total control of the copper pairs and can provide subscribers with all services, including voice and ADSL. The incumbent still has ownership of the unbundled loop and is responsible for maintaining it.
Functional (or also	It entails establishing a new business division (kept separate from the

operational) separation:	incumbent's other business operations) to provide wholesale access to the incumbent's non-replicable (or bottleneck) assets, which competitors need in order to compete with the incumbent in downstream retail markets.
FUST:	*Fundo para Universalização do Serviço de Telefonia - Brazil.*
FDT:	*Fondo de Desarrollo de las Telecomunicaciones – Chile*
Gateway:	Any mechanism for providing access to another network. This function may or may not include protocol conversion.
GCA:	*Global Cybersecurity Agenda* of the ITU.
GHG:	*Greenhouse Gas.*
GDP:	*Gross domestic product.* The market value of all final goods and services produced within a nation in a given time period.
GHG:	*Greenhouse gas.* A gas in an atmosphere that absorbs and emits radiation within the thermal infrared range.
GHz	*Gigahertz.*
GNI:	*Gross national income.* The market value of all final goods and services produced in a nation's economy, including goods and services produced abroad. GNI, in constant prices, differs from GNP in that it also includes a terms-of-trade adjustment, and gross capital formation, which includes a third category of capital formation: net acquisition of valuables.
GPS:	*Global positioning system.* Refers to a "constellation" of 24 "Navstar" satellites, launched initially by the United States Department of Defense, that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy ranges from 10 to 100 metres for most equipment. A Russian system, GLONASS, is also available, and a European system, Galileo, is under development.
GSM:	*Global system for mobile communications.* Digital mobile standard developed in Europe, and currently the most widespread 2Gdigital mobile cellular standard. GSM is available in over 170 countries worldwide. For more information, see the website of the GSM Association at: www.gsmworld.com
GSR:	ITU Global Symposium for Regulators, at: www.itu.int/ITU-D/ treg/bestpractices.html.
HDTV:	*High-definition television.* A new format for television that offers far superior quality to current NTSC, PAL or SECAM systems. The resolution

	of the picture is roughly double previous television signals and the pictures are displayed with a screen ratio of 16:9 as compared with most of today's TV screens, which have a screen ratio of 4:3.
HFC:	*Hybrid fibre/coaxial.* A telecommunication industry term for a network that incorporates both optical fibre along with coaxial cable to create a broadband network.
Hotspot:	An access point to a wireless local area network (WLAN). Hotspots are areas where wireless data can be sent and received, and Internet access is provided to wireless devices. For ex-ample, a laptop computer can be used to access the Internet in a hotspot provided in an airport or hotel.
HIPCAR:	*Harmonization of ICT Policies, Legislation and Regulatory Procedures.*
HSDPA:	*High-speed downlink packet access.* This is a mobile telephony protocol, also called 3.5G (or "3½G"). High-speed downlink packet access is a packet-based data service with data transmission up to 8-10 Mbit/s (and 20 Mbit/s for MIMO systems) over a 5 MHz bandwidth in W-CDMA downlink. HSDPA implementation includes adaptive modulation and coding (AMC), multiple-input multiple-output (MIMO), hybrid automatic repeat request (HARQ), fast scheduling, fast cell search, and advanced receiver design.
HSPA	*High Speed Packet Access*. refers to 3G technologies that allow for peak download rates of 14 Mbit/s while HSPA+ provides for peak download rates of 56 Mbit/s through more efficient use of spectrum
Hz:	*Hertz.* The frequency measurement unit equal to one cycle per second.
ICT:	*Information and communication technologies.* A broad subject concerned with technology and other aspects of managing and processing information, especially in large organizations.
IDB:	*Inter-American Development Bank.*
IMS:	*IP Multimedia Subsystem.* A standardized Next Generation Networking (NGN) architecture for telecom operators that want to provide mobile and fixed multimedia services.
IMT-2000	*International Mobile Telecommunications 2000.* A family of third-generation (3G) mobile telecommunications standards that meet technical standards developed by the ITU.
Incumbent:	The major network provider in a particular country, often a former State-owned monopoly.

INDOTEL:	*Instituto Dominicano de Telecomunicaciones.*
Interconnection:	The physical connection of separate ICT networks to allow users of those networks to communicate with each other. Interconnection ensures inter-operability of services and increases end users' choice of network operators and service providers.
***info*Dev:**	*info*Dev is a global partnership program within the World Bank Group which works at the intersection of innovation, technology, and entrepreneurship to create opportunities for inclusive growth, job creation and poverty reduction around the world.
International gateway:	Any facility that provides an interface to send and receive electronic communications (i.e., voice, data and multimedia images/video) traffic between one country's domestic network facilities and those in another country.
International mobile roaming:	Services allowing customers of one mobile operator to use mobile services when travelling abroad.
Internet:	Interconnected global networks that use the Internet protocol (see IP).
Internet video:	Generally described as any service that allows users to download or stream video over the public Internet.
IP:	*Internet protocol.* The dominant network layer protocol used with the TCP/IP protocol suite.
IP telephony:	*Internet protocol telephony.* IP telephony is used as a generic term for the conveyance of voice, fax and related services, partially or wholly over packet-based, IP-based networks. See also *VoIP* and *Voice over broadband*.
IPR:	*Intellectual property rights.* Copyrights, patents and trademarks giving creators the right to prevent others from using their inventions, designs or other creations. The ultimate aim is to act as an incentive to encourage the development of new technology and creations that will eventually be available to all. The main international agreements are the World Intellectual Property Organization's (WIPO) Paris Convention for the Protection of Industrial Property (patents, industrial designs, etc.), the Berne Convention for the Protection of Literary and Artistic Works (copyright), and the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).
IPTV:	*Internet protocol television.* A system where a digital television service is delivered by using Internet protocol over network infrastructure, which may include delivery by a broadband connection.
IPv4:	*IP version 4.*

IPv6:	*IP version 6.*
ISP:	*Internet service provider.* ISPs provide end users access to the Internet. Internet access providers (IAPs) may also provide access to other ISPs. ISPs may offer their own proprietary content and access to online services such as e-mail.
IT:	*Information technology.*
ITU:	*International Telecommunication Union.* The United Nations specialized agency for telecommunications. See: www.itu.int.
IXP:	*Internet exchange point.* A central location where multiple Internet service providers can interconnect their networks and exchange IP traffic.
LAC:	*Latin America and the Caribbean region.*
LDCs:	*Least developed countries.* These are the 49 least developed countries recognized by the United Nations.
LEA:	*Law enforcement agencies.*
Leased line:	A point-to-point communication channel or circuit that is committed by the network operator to the exclusive use of an individual subscriber. Under national law, leased lines may or may not be permitted to interconnect with the public switched network.
Licensing:	An administrative procedure for selecting operators and awarding franchises for the operation of particular telecommunication services, for instance cellular radio.
Line sharing:	A form of network unbundling that allows a competitive service provider to offer ADSL using the high-frequency portion of a local loop at the same time that an incumbent continues to offer standard switched voice service over the low-frequency portion of the same loop.
LLU:	*Local loop unbundling.* The process of requiring incumbent operators to open the last mile of their legacy networks to competitors. See ULL.
Local loop:	The system used to connect the subscriber to the nearest switch. It generally consists of a pair of copper wires, but may also employ fibre-optic or wireless technologies.
LRIC:	*Long-run incremental costs.*
LTE:	*Long-term evolution.*
Malware:	Software designed to infiltrate or damage a computer system without the owner's informed consent.

MDGs:	*Millennium Development Goals* agreed to by all the world's countries and all the world's leading development institutions at the Millennium summit of the United Nations (New York, 2000) and contained in the United Nations Millennium Declaration.
MHz	*Megahertz.*
MINTIC	*Ministerio de Tecnologías de la Información y las Comunicaciones – Colombia*
MMDS	*Multichannel Multipoint Distribution Service*.
Mobile:	As used in this report, the term refers to mobile cellular systems and to mobile phones.
Mobile banking (or m-banking):	Financial services provided over a mobile phone.
Mobile TV:	Wireless transmission and reception of video and voice television content to platforms that are either moving or capable of moving. The transmission can be over a dedicated broadcast network or a cellular network.
MP:	*Ministerio Público (Public Ministry) - Brazil*
MPLS:	*Multi-protocol label switching.* A data-carrying mechanism that emulates some properties of a circuit-switched network over a packet-switched network. In practical terms, MPLS is a mechanism that allows the establishment of virtual paths (known as label switched paths) for an un-connected mode protocol. The most famous protocol used with MPLS is IP, even though MPLS is a multiprotocol mechanism.
MRE:	*Ministerio de Relaciones Exteriores (Ministry of Foreign Affairs) - Paraguay*
Multicast:	A transmission from a single sender to multiple, specific receivers on a network. See also *Unicast* and *Broadcast*.
Multimedia:	The presentation of more than one medium, typically images (moving or still), sound and text in an interactive environment. Multimedia requires a significant amount of data transfer and bandwidth, and it invariably requires computational facilities.
NAP:	*Network Access Point.* (ITU-T Recommendation Q.1290 (98), 2.150). The point of connection of a physical entity that provides network access for users.
National (mobile) roaming:	Refers to an agreement among operators to use each other's networks to provide services in geographic areas where they have no coverage.
Net Neutrality:	A philosophy or public policy position advocating equal access and non-

	discrimination for content, services and applications available over the Internet or other publicly accessible IP-based networks.
Network topology:	The pattern of links connecting pairs of nodes of a network.
NGN:	*Next-generation network.* A broad term for a certain kind of emerging computer network architectures and technologies. It generally describes networks that natively encompass data and voice (PSTN) communications, as well as (optionally) additional media such as video.
Node:	A point of connection to a network. A switching node is a point at which switching occurs.
NTIA:	*National Telecommunications and Information Administration – United States.* The NTIA is located within the U.S. Department of Commerce and principally advises the U.S. president on telecommunications and information policy issues, as well as manages federal government use of spectrum.
Number portability:	The ability of a customer to transfer an account from one service provider to another without requiring a change in number. Other forms of portability allow end users to change residence or subscribe to a new form of service (e.g., ISDN) while retaining the same telephone number for their main telephone line.
OECD:	*Organisation for Economic Co-operation and Development.*
Open access:	The creation of competition in all layers of the network, allowing a wide variety of physical networks and applications to interact in an open architecture. (*info*Dev 2005)
ORBA:	*Observatorio Regional de Banda Ancha - ECLAC.*
OSIPTEL:	Organismo Supervisor de Inversión Privada en Telecomunicaciones of Peru
OTA:	*Over the air.*
OTT:	Over the top VoIP application
OUR:	*Office of Utilities Regulation – Jamaica.*
P2P	Peer-to-Peer Sharing.
Packet:	Block or grouping of data that is treated as a single unit within a communication network.
Passive infrastructure sharing:	Collocation or other forms of facility sharing, including duct, building or mast sharing (Directive 2002/19/EC).
PDA:	*Personal digital assistant.* A generic term for handheld devices that

	combine computing and possibly communication functions.
Peering:	The exchange of routing announcements between two Internet service providers for the purpose of ensuring that traffic from the first can reach customers of the second, and vice-versa. Peering takes place predominantly at IXPs and usually is offered either without charge or subject to mutually agreed commercial arrangements.
Phishing:	The fraudulent process of attempting to acquire sensitive information such as usernames, passwords and credit card details by masquerading as a trustworthy entity in an electronic communication.
Penetration:	A measurement of access to telecommunications, normally calculated by dividing the number of sub-scribers to a particular service by the population and multiplying by 100. Also referred to as teledensity (for fixed-line networks) or mobile den-sity (for cellular ones), or total tele-density (fixed and mobile combined).
POP:	*Point of presence.*
Portal:	Although an evolving concept, the term portal commonly refers to the starting point, or a gateway through which users navigate the World Wide Web, gaining access to a wide range of resources and services, such as e-mail, forums, search engines and shopping malls.
PPP:	*Public-private partnership.* An arrangement or partnership combining funding and activities of both government and private-sector entities to build network infrastructure.
Private ownership/ Privatization:	The transfer of control of ownership of a state enterprise to private parties, generally by organizing the enterprise as a share company and selling shares to investors. More generally, the term is sometimes used to refer to a wide range of modalities whereby business is opened to private enterprise and investment.
Protocol:	A set of formal rules and specifications describing how to transmit data, especially across a network.
PSTN:	*Public switched telephone network.* The public telephone network that delivers fixed telephone service.
QoS:	*Quality of service.* A measure of network performance that reflects the quality and reliability of a connection. QoS can indicate a data traffic policy that guarantees certain amounts of bandwidth at any given time, or can involve traffic shaping that assigns varying bandwidth to different applications.
R&D:	*Research and Development.*

REGULATEL:	*Foro Latinoamericano de Entes Reguladores de Telecomunicaciones.*
Rights of way:	Strip or area of land, including surface and overhead or underground space, which is granted by deed or easement for the construction and maintenance of specified infrastructure elements such as copper or fibre optic cables, etc.
PTT:	*Public Telephone and Telegraph administration.* See PTO.
RF:	*Radiofrequency.*
RFID:	*Radiofrequency identification.* The use of a wireless non-contact system that uses radiofrequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.
SCT:	Secretaría de Comunicaciones y Transportes of Mexico
Server:	A host computer on a network that sends stored information in response to requests or queries. The term is also used to refer to the software that makes the process of serving information possible.
STBs:	*Set-top boxes* deliver video (regular programming channels and VoD) to subscribers. These are generally managed systems that allow access only to content provided by the subscriber's carrier.
SIM:	*Subscriber identification module (card).* A small printed circuit board inserted into a GSM-based mobile phone. It includes subscriber details, security information and a memory for a personal directory of numbers. This information can be retained by subscribers when changing handsets.
Site sharing:	*See Collocation.*
Smartphones	Broadband enabled mobile phones.
SME:	*Small and medium enterprise(s).*
SMS:	*Short message services.* A text messaging service component of mobile communications systems.
Spam:	Unwanted, nuisance e-mail, some of which may contain computer viruses or worms, fraudulent consumer scams or offensive content.
Spectrum:	The radio-frequency spectrum of hertzian waves used as a transmission medium for cellular radio, radio paging, satellite communication, over-the-air broadcasting and other services.
Spectrum trading:	This spectrum management approach allows parties to transfer their spectrum rights and obligations to another party, in return for a financial or market benefit. The market determines the value.

SUBTEL:	Subsecretaría de Telecomunicaciones of Chile
SUTEL:	Superintendencia de Telecomunicaciones of Costa Rica
Switch:	Part of a mobile or fixed telephone system that routes telephone calls or data to their destination.
TAS:	*Telecommunicatie Autoriteit – Suriname.*
TATT:	*Telecommunications Authority of Trinidad and Tobago*
TDD:	*Time Division Duplex.*
TDLC:	*Tribunal de Defensa de la Libre Competencia (Competition Defense Tribunal)* of Chile.
Technology-neutral:	A general term referring to rules that allow operators to adopt any technology standard for a particular service.
Terminal equipment:	Any user-premises equipment designed to be connected directly or indirectly to a network termination point for the transmission, processing or reception of information.
Traffic exchange point:	Traffic exchange points are used by operators to exchange traffic through peering directly between service networks rather than indirectly, via transit through their upstream providers.
Triple play:	A term referring to the bundling of fixed and/or mobile voice, video and broadband Internet access services.
Tromboning:	The need for ISPs to connect domestic traffic through another country due to lack of national connectivity.
UASFs	*Universal Access and Service Funds.*
ULL:	*Unbundled local loop.* See *LLU.*
UN:	*United Nations.*
UNASUR:	*Union of South American Nations.*
UNESCO:	*United Nations Educational, Scientific and Cultural Organization.*
Universal access:	Refers to reasonable telecommunication access for all. Includes universal service for those that can afford individual telephone or other ICT service and widespread provision of public access to ICTs (i.e., telecentres, cybercafés, etc.) within a reasonable distance.
USAID:	*United States Agency for International Development.*
USD:	*United States dollar.*

USF:	*Universal Service Funds.*
USO:	*Universal service obligations.* Requirements that governments place on operators to offer service in all areas, regardless of economic feasibility.
Value-added services:	Those services that use the basic services for a carrier and add facilities in order to satisfy specific new telecommunication needs. These include such services as voice mail, electronic mail, and on-line data processing.
VHF:	*Very high frequency.*
VoD:	*Video on Demand* (ITU-T J.127 (04), 3.3). Programme transmission method whereby the programme starts playing after a certain amount of data has been buffered while receiving subsequent data in the background, where the programme is completely created by the content provider. Using this system, users are able to select and watch video and multimedia content over a network as part of an interactive television system. VoD systems either "stream" content, allowing viewing in real time, or "download" it, in which the programme is brought in its entirety to a set-top box before viewing starts.
Voice over broadband or Voice over DSL (VoDSL):	A method of making voice calls over a broadband connection. The calls can be either made via a computer or through traditional phones connected to voice over broadband equipment. See also *IP telephony* and *VoIP*.
VoIP:	*Voice over IP.* A generic term used to describe the techniques used to carry voice traffic over IP (see also *IP telephony* and *Voice over broadband*).
VoIP Video Chat:	A method of making voice video calls over a broadband connection. The calls can be either made via a computer or through traditional phones connected to voice over broadband equipment. User sees the person he or she is talking to through the use of a webcam or a smartphone/tablet's built-in camera.
WAN:	*Wide area network.* WAN refers to a network that connects computers over long distances.
W-CDMA:	*Wideband code division multiple access.* A 3G mobile standard under the IMT-2000 banner, first deployed in Japan. Known as UMTS in Europe. See also *CDMA*.
Web 2.0:	A term referring to a perceived second generation of web-based communities and hosted services such as social-networking sites and wikis that facilitate collaboration and sharing between users.

Wi-Fi:	*Wireless fidelity.* A mark of interoperability among devices adhering to the 802.11 specification for wireless LANs from the Institute of Electrical and Electronics Engineers (IEEE). However, the term Wi-Fi is sometimes mistakenly used as a generic term for wireless LAN.
WiMAX:	Fixed wireless standard IEEE 802.16 that allows for long-range wireless communication at 70 Mbit/s over 50 kilometres. It can be used as a backbone Internet connection to rural areas.
Wireless:	Generic term for mobile communication services which do not use fixed-line networks for direct access to the subscriber.
WRC:	*ITU-R World Radiocommunication Conference.*
WSIS:	*The United Nations World Summit on the Information Society.* The first phase of WSIS took place in Geneva (hosted by the Government of Switzerland) from 10 to 12 December 2003, and the second phase in Tunis (hosted by the Government of Tunisia), from 16 to 18 November 2005. For more information, see: www.itu.int/wsis
WTO:	*World Trade Organization.*

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