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| **The South Asian Telecommunication Regulator’s Council (SATRC)**  |  |
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 **SATRC REPORT ON
APPLICATIONS AND SERVICES IN BROADBAND NETWORKS**

**Prepared by
SATRC Working Group on Policy, Regulation and Services**

Adopted by
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**Chapter 1**

**Background**

**1.1 Background**

SATRC members are according a very high priority for promoting BB services and enhancing their application in various sectors of the economy including rural areas. Considerable amount of work is required to be done for promoting BB expansion in the countries especially in the rural areas. It is important to study the issues involving BB as a universal service. It is also important to study means for enhancing demand & supply. The work will focus on

• e-applications

• Communication services

• Content in local languages

**1.2 Objective and scope**

In view of the broad range of issues involved, it is necessary to study the key issues of current importance first. The scope of study could include:

• Enhancing BB applications and services in the member countries

• Promote e-applications focusing on e-government, e-health, e-businesses, e-learning in SATRC member countries

• Status of e-applications/services in the local languages in member countries

• Initiatives to promote e-applications and services, especially in the rural area

**1.3 Time frame**

The total study period would be approximately 1 year

**1.4 Utilization of the report**

Policy makers, Regulators, Service providers; Input to ITU SG and relevant APT fora

**Chapter 2**

**Introduction**

**2.1 Broadband definition dilemma**

Despite its worldwide growth and promotion by policy makers, network operators, and content providers, broadband does not have a single, standardized definition. The term “broadband” may refer to multiple aspects of the network and services, including (a) the infrastructure or “pipes” used to deliver services to users, (b) high-speed access to the Internet, and (c) the services and applications available via broadband networks, such as Internet Protocol television (IPTV) and voice services that may be bundled in a “triple-play” package with broadband Internet access. Further, many countries have established definitions of broadband based on speed, typically in Mbit/s or kilobits per second (kbit/s), or on the types of services and applications that can be used over a broadband network (that is, functionality). Due to each country’s unique needs and history, including economic, geographic, and regulatory factors, definitions of broadband vary widely.

Traditionally, however, broadband has often been defined in terms of data transmission speed (that is, the amount of data that can be transmitted across a network connection in a given period of time, typically one second, also known as the data transfer rate or throughput). Defining broadband in terms of speed has been an important element in understanding broadband, particularly since the data transfer rate determines whether users are able to access basic or more advanced types of content, services, and applications over the Internet. However, attempts to define broadband in terms of speed present certain limitations. First, broadband speed definitions vary among countries and international organizations, generally ranging from download data transfer rates of at least 256 kbit/s on the low end, as in India, South Africa, the International Telecommunication Union (ITU), and the Organization for Economic Co-operation and Development (OECD), to faster than 1.5 Mbit/s on the high end, as in Canada . Second, definitions based on speed may not keep pace with technological advances or with the speeds, services, and applications required for the application to function properly. In other words, what is considered “broadband” today may be regarded as too slow in the future, as more advanced application technologies are developed.

Thus, any speed-based definition of broadband will need to be updated over time. Third, such definitions may not reflect the speeds realized by end users.

Due to the limitations of definitions based on speed, some countries ( Brazil) and international organizations (the OECD) and Broadband Commission for Digital Development have decided or proposed not to categorize broadband in terms of speed, but are instead looking at broadband in terms of functionality, focusing on what can and cannot be done with a certain type of connection. However, establishing a definition of broadband based only on functionality may make the term overly subjective. A legal definition of broadband Internet access based on speed is easy to apply: if broadband is defined as at least 1.5 Mbit/s of download speed, then a 2 Mbit/s connection is broadband, while a 1 Mbit/s connection is not.

When broadband is defined in terms of functionality, the distinction between what is and is not broadband becomes less straightforward. Broadband can be more holistically viewed as a high-capacity ICT platform that improves the variety, utility, and value of services and applications offered by a wide range of providers, for the benefit of users, society, and multiple sectors of the economy. From a policy perspective, broadband should be viewed more broadly as an enabling ICT platform that can potentially influence the entire economy.

It is possible to define “broadband” in various ways: as a minimum upstream and/or downstream transmission speed, for example, or according to the technology used or the type of service that can be delivered. However, countries differ in their definitions of broadband, and, as technologies advance, the minimum defined speeds are likely to increase at the same pace.

These various options for definitions have been debated by the Broadband Commission for Digital Development. Three options have been considered.

Option 1: Broadband could be defined with quantitative indicators, in terms of bandwidth and technologies.

Option 2: Broadband could be defined with qualitative indicators, in terms of the applications that can be made possible, and/or the impact that broadband infrastructure could have on social and economic development.

Option 3: A combination of the above or other possible options.

**Quantitative indicators**

In general terms, using quantitative indicators alone was seen as insufficient to build a global common definition of broadband. The reason for the reluctance to prescribe specific speeds of transmission over networks, include varying capacities of infrastructure in different countries, and the dynamic nature of the industry. However, there is overall agreement that “speed” should at least be included as one of the reference indicators, and that a minimum speed should aim at ensuring access for everyone to online public services.

**Qualitative indicators**

It is argued that having too strict a technical definition could undermine the progress of developing countries towards deploying broadband; conversely, a technical definition could encourage them to install infrastructure with at least this capacity.

In line with this it is argued that basing a definition of qualitative indicators could be more realistic for developing countries, as it would help to overcome some of the issues raised against quantitative indicators: namely, that not every country’s broadband solution will be the same, and that innovation is constantly raising the bar, in terms of the data rates which can be provided.

Therefore, the best solution could be for definitions of broadband to emphasize its potential for service delivery and for stimulating economic growth, both locally and nationally.

**Combining both options**

Defining broadband using both quantitative and qualitative indicators is a potential compromise that overcomes the limitations of using only one of these options. Therefore, it is suggested that the possibility should be explored of having a general definition at the highest level (with certain parameters that would allow the definition of a global benchmark), while leaving the quantitative and technical aspects to national policy-makers or regulatory bodies. Parameters for assessing broadband development could include the following elements:

* Level of access and penetration
* Data, voice and video transfer speeds above some minimum level
* Whether ubiquitous coverage is available, and
* The criteria mentioned in favour of the previous options

However, such a combined definition might remain incomplete. The wide range of broadband indicators, the lack of homogeneity in broadband data transfer speeds and bandwidth, and a broad diversity of regulatory and geographic factors do not facilitate an accurate global definition of broadband. It would therefore be desirable to refocus the definition beyond the traditional elements and involve high-speed networks, services, applications and users, alongside policies regarding the promotion of investment, affordability, demand, availability and access.

Regardless of which option for defining broadband is selected, a global and updated definition would need to be reviewed regularly, in order to keep up with the pace of technological change and the demand for new types of service.

**A working definition**

The Broadband Commission sought to focus on considering some of the core concepts of broadband as an always-on service (not needing to make a new connection to a server each time a user wants to go online), and high-capacity: able to carry lots of data per second, rather than the particular arrival speed of the data.

The practical result is that broadband enables the combined provision of voice, data and video at the same time.

**2.2 Technical Characteristics Of Broadband**

Communications capacity, or speed, is only one of a set of performance characteristics of a broadband service. That it is not the whole picture is easily seen in the contrast between dial-up access, where the modem must place a telephone call and negotiate a connection with the ISP’s modem, and the services available today that are generally considered broadband—which frequently offer “always-on” connectivity as well as high speed. Along with speed and always-on are additional parameters such as bandwidth symmetry and addressability that are important components of a definition of broadband. Each of these is considered in the sections that follow.

**2.2.1 Speed**

The speed or bandwidth of a service—the rate at which one can transfer data to and/or from the user’s device—is a function of multiple factors. Because the effective bandwidth reflects the capacity of the end-to-end connection between sender and receiver, the speed seen by a user can be constrained at any one of a number of points between the user’s device and the device providing a particular service. However, speeds within the core network have been rising, and the capacity of the network link between the user and the broadband provider’s network is one of the crucial factors that determine how the broadband service can be used.

**2.2.2 Latency and Jitter**

While the net throughput is the most significant enabler of many applications, two additional parameters are crucial for applications that depend on real-time delivery of information or interaction, such as telephone or interactive game playing. “Latency,” or delay, is a measure of how long it takes to deliver a packet across the network to its destination. Latency is a function of the distance the packet travels (speed of light, which is of particular significance for traffic carried over geosynchronous satellites), the length of time the packet waits in queues within the network, and the delay that results from retransmission when a packet is dropped due to congestion within the network. Latency especially affects applications that depend on interaction, such as human-to-human conversations, games, and the like. “Jitter” measures the variation in latency, resulting from such factors as variations in the path taken by each packet, variable queue lengths, or variations in the level of congestion within the network. Even if the average latency is acceptable, high jitter may make the application unusable nonetheless.

**2.2.3 Symmetry Between Upstream and Downstream Capacity**

Today, telecommunications services, including broadband, do not necessarily provide the same capacity up- and downstream. At one extreme, digital cable television service and direct broadcast satellite service provide a very high data rate digital connection into the home. These services may also provide a low data rate return path—over the same link or over an alternative return link using a phone line—to enable enhanced services such as pay-per-view. However, most users probably would not think of these services as broadband—they expect broadband to include high-speed Internet access (perhaps along with these predominantly one way services). On the other hand, broadband does not necessarily imply that one must have anything close to symmetric bandwidth to and from the premises—though some would argue that it will, over time, as a consequence of the minimum bandwidth particular applications require. The asymmetric services typically found in today’s residential broadband services were designed with one of two asymmetrical application classes in mind. One class is Web browsing, where a low-bandwidth upstream connection serves to carry a user’s requests for Web pages, and the higher downstream connection returns the content the user has requested; e-commerce or other applications in which users interact via entering information in Web forms involve a similarly asymmetric communications model. The other class, audio or video delivery, in which a small amount of data is sent upstream to select and direct delivery of a particular stream (delivery of packets for playback in near-real time), is even more asymmetric. While Web browsing has been a dominant application of residential broadband, accompanied by more limited audio/video streaming, peer-to-peer applications have surged recently. These applications, which use many individual computers instead of a central server to distribute content, require significant upstream capacity for each computer. They have, as a result, presented ISPs with traffic loads that are at odds with the ISPs’ assumptions about asymmetric traffic and have raised questions about what shape user demand will take in the long term. Similar pressures result from other applications in which users host content on their local machines, creating upstream demand whenever this content is requested. These pressures, at odds with the capabilities of today’s networks, have also led some broadband ISPs to prohibit customers who subscribe to consumer/residential services from running servers on their computers. It is not clear at this point how traffic patterns will evolve as applications mature and as the population of broadband network users moves beyond early adopters. There is at least some reason to believe that the traffic patterns will in fact be asymmetric, though perhaps not as strongly as some of the broadband ISPs initially assumed in their network design and pricing models.

More generally, while much of the focus on broadband has been on its potential as a channel for delivering information, broadband also provides a more general communications channel (into and out of the premises). On the one hand, e-mail and instant messaging are prominent examples of communications applications that do not depend on large amounts of upstream bandwidth (or downstream, for that matter), but that provide evidence of demand for convenient, Internet-based communication. On the other hand, as consumers start transmitting video clips (produced using increasingly inexpensive digital video cameras), bandwidth requirements could increase significantly. On the horizon are a number of communications applications—telephony being the most obvious—that place increasing demand on the upstream channel.

**2.2.4 Always-On**

In addition to higher bandwidth, a broadband connection also generally provides an always-available connection to the Internet. One principal implication of always-on broadband service is that, for the first time, residential users have nearly instant access to Web or other Internet services on demand. Before the advent of broadband services, residential and many small business Internet users were confined to using a dial-up line to access the Internet. With dial-up, the user faces a noticeable delay—the sum of the time it takes to place a call between the user and ISP modems, the time it takes for the two modems to negotiate a connection, and the time it takes to log in (generally by authenticating the user via a password) to the ISP. The delay is increased if the user makes a habit of turning off the PC between sessions, since the time it takes the computer to boot up must also be added to the time it takes before a user can access the Internet. By eliminating the need to place a telephone call, broadband services greatly reduce the time required. The term “always-on” might conjure up visions of some sort of compelled use in which computers or any devices used for Internet access- applications must be left running all of the time. Always-on does not imply this; it refers merely to a characteristic of broadband networks that enables network communications to be initiated at any time. Users remain free to close software programs or shut down computers as they wish. Of course, some applications and computer devices will be designed to work best when they are always connected, and many users may choose to keep some computers or applications in an always-connected state. Research has shown that removing the start-up delay changes the way that users perceive and use the Internet. Because the overhead associated with accessing the Internet becomes very small, there is more casual use of the network for very short tasks—sending a short message or looking up a piece of information. This change also has the effect of significantly reducing the length of a typical “session,” as users begin to regard the network as an always-available utility, even though total use may stay the same or increase. Users also may change their behavior to leave their PCs on more of the time, either fully powered up or in sleep mode.

For the full utilization of instant messaging (and chat rooms) , social networking sites such as facebook twitter etc. and OTTs such as WhatsApp, viber, Skype etc always-connected broadband environment, become much more powerful. For example, the value of an Internet telephony, WhatsApp, viber, Skype etc. application is limited if calls can only be placed if the person being called is online.

There will be important new applications—health monitoring, security, and the like—which will be possible only with the always-on characteristic, but users will choose whether they want to use those applications. The notion is familiar—telephones are generally left connected, ready to respond to a ring signal. What always-on should conjure up, however, are concerned about security. Today’s end-user computing devices are vulnerable to a variety of network attacks. Always-on connectivity increases their exposure to these threats.

**2.2.5 Connectivity Sharing and Home Networks**

Another attribute that users sometimes associate with broadband access is that of a premises network. Dial-up access is generally done from a single machine. The speed of the dial-up connection is slow even for a single machine, so trying to share that bandwidth among multiple machines is not generally very desirable. Moreover, it is common for each PC to have an analog modem. Thus, users generally arranged to timeshare the household phone lines sequentially among a number of machines in a home (though quite possibly not without disharmony resulting from contention over access to the phone lines). A broadband connection, however, by virtue of its always-on nature and greater capacity, makes it reasonable to support multiple machines concurrently. Thus, broadband Internet access and use of home networks will increasingly be interrelated. Spurred in large part by the initial deployments of broadband services to the home, a variety of home networking technologies are available in the consumer market.

**2.2.6 Addressability**

A critical requirement of many applications is that a user’s computer be addressable in some fashion by software running on computers elsewhere on the Internet. This means that someone on the Internet can initiate communications with the user, much as a telephone caller can place a call to a subscriber by dialing the subscriber’s telephone number. Addressability is most easily provided when each computer device within the home has its own globally addressable Internet Protocol (IP) address.

**2.2.7 Controls on Applications and Content or Net Neutrality**

 Net neutrality (also network neutrality or Internet neutrality) is the principle that Internet service providers and governments should treat all data on the Internet equally, not discriminating or charging differentially by user, content, site, platform, application, type of attached equipment, and modes of communication. The debate is going one for and against the principle of net neutrality.

**Chapter 3**

**Broadband Applications**

**3.1 Trends on the use of broadband Internet**

Historically, the need for faster Internet connections was influenced by a combination of increasing software complexity, higher-resolution displays, and the shift from the transmission of plain text to images and then audio and video. The trend toward more data-intensive transmission formats continues in the present with the widespread uptake of high-definition (HD) video (1920 x 1080 pixels); next on the horizon is the introduction of ultra-HD formats, which have 16 times as many pixels as HD video. Over the past few years, consumption of online video has been evolving from low-quality, short-form clips to high quality, long-form programs and movies, delivered through platforms such as Apple TV, BBC iPlayer, and Netflix. Consumer behavior is also changing, with the result that people are tending to watch less linear broadcast programming (which is arguably better delivered on other platforms such as terrestrial or satellite systems), and more on-demand content at a time and place and on a device to suit them, whether delivered over the Internet (“over the top”) or as a telco managed service. Next-generation applications, such as consumer telepresence, place even greater demands on network performance. Based on two-way simultaneous transmission of video, voice, and application traffic, tele-presence requires sustained high bit rates both downstream (from the Internet to the user) and upstream (from the user to the Internet), as well as low latency and jitter (transmission delay and variation), so that users can interact in an environment that feels like real time. In contrast to the bursty, asymmetric nature of data-based applications such as web browsing, video-centric applications such as tele-presence create sustained, symmetric traffic flows. Video communication also underpins many other next-generation services, including telemedicine, remote care for the elderly, online learning, and building security. In 2009, the Cisco® Visual Networking Index (VNI) revealed that video had become the dominant type of Internet traffic, exceeding traffic from peer-to-peer file sharing for the first time. In the June 2011 update to this study, Cisco forecast that the annual global Internet traffic will quadruple between 2010 and 2015, to reach 966 exabytes - or nearly a zettabyte. Internet video will constitute 61 percent of the total traffic carried in 2015, up from 26 percent in 2010, making it the most significant factor in that growth. The increase in Internet traffic predicted by the Cisco VNI forecast will also be influenced by changes in the way that we access the Internet. In 2010, PCs generated 96 percent of consumer Internet traffic, but this rate will fall to 84 percent by 2015 due to a sharp increase in the number of Internet-enabled devices such as tablets, smart phones, and connected TVs. In turn, this increase will give rise to a doubling of Internet-enabled device connections by 2015, to nearly 15 billion global network connections, meaning there will be more than two connected devices for every person on earth. The growing popularity of connected devices will enhance the desirability of cloud-based data storage, because it enables users to access their data from any device and synchronize data across multiple devices. Business and consumer cloud-based applications are already firmly established and are certain to grow in popularity as broadband connections become faster and more reliable. Remote data storage facilities such as Amazon Cloud Drive and Dropbox, hosted applications such as Google Docs and Microsoft Office Web Apps, photo and video sharing websites, blogs, and social networking tools are all examples of services that reside in the cloud. Bit rates have to be fast enough, ideally symmetrical, to support transmission in a reasonable time, particularly when uploading large files (minutes, not days, should be needed to back up a hard disk, for example). In addition, low latency is essential for cloud applications that require a response, such as online games and business productivity tools.

**3.2 Generic Classes Of Broadband Applications**

Key technical characteristics—the bandwidth (upstream and downstream),latency, jitter, addressability, and “on-ness” (always-on), as defined in Chapter 2—distinguish several currently deployed or potential classes of applications. This section outlines the overall characteristics of each class and provides one or more specific examples of applications within each class. Notwithstanding their seeming variety, possible applications by and large depend on a few core, or primitive, signal or traffic types and connection characteristics, such as always-on. These core traffic types are characterized by their basic data rates, by whether they rely on file download or streaming (which in turn may have particular latency and jitter requirements), and the like. Performance and quality trade-offs reflect the interaction between the broadband link and other capabilities such as coding and compression and local storage.

Although there is no rigorous taxonomy of broadband applications, it is useful to draw associations between key characteristics of broadband and major application classes. For example, video-on-demand and other media streaming applications rely on the availability of downstream bandwidth; while information appliances require always-on service even though the bandwidth requirements may be low (see Table 3.1).



Also of interest are “composite” applications that rely on a set of capabilities. For example, shared sports viewing require substantial upstream and down-stream bandwidth simultaneously. Furthermore, the composite broadband use in a home may be made up of multiple applications being used simultaneously by different family members.

**3.3 Faster General Internet Access and General Internet Applications**

**3.3.1 Browsing and Related Activities**

The primary motivation even today for residential broadband access is simply to improve the performance of the overall Web browsing experience. In addition to making the general Web experience more enjoyable, this speed improvement can also mean that new types of content become usable by the consumer. There is, for example, a widely held belief among commerce site operators that it is essential to minimize page-load times. Commerce sites thus depend on network performance in designing their pages, and any increase in that performance (either on average or for specific users that they can identify) means that they can increase the richness (and hence possibly the value) of their pages. For example, small images might be replaced by higher-resolution pictures that more closely approximate the quality available in print catalogs.

Other Web usage, such as simply reading long articles (for example, from online news sources), becomes more enjoyable with greater bandwidth, and hence the Web is a more attractive medium when the effective speed of information display approaches that experienced in physical

page turning. Finally, certain types of real-time applications, such as streaming stock quotes, depend upon speed and timeliness to be valuable. Such applications can often run continuously in a part of the screen and attract user attention intermittently. However, to be effective, bandwidth must be sufficient for the performance of these applications and that of whatever other network interactions the user may be involved with.

**3.3.2 Messaging**

Messaging of various kinds continues to show up in surveys as an important application. Although many saw it as an application geared toward entertainment, messaging is also seeing increased use in a variety of business environments. While not demanding in terms of bandwidth, broadband enhances messaging because it is always on.

**3.3.3 Fast File Downloading**

Many users are familiar with downloading e-mail attachments or software upgrades. But many bulk file transfers are simply not practical without broadband. Even a constant connection to the network at a modest broadband speed may make such transfers time consuming. It is important not to underestimate the impact of fast file-downloading capability in a very wide range of applications, including audio and video. Streaming is complicated compared with file downloading, and the main reasons that people do it, other than for real-time delivery, is because the files are so large that users do not want to wait while the files download; the files are too big to store locally conveniently (although storage space is rapidly becoming very inexpensive); and/or there are intellectual property protection concerns (but application of digital rights management technologies to stored files can provide protection comparable to that of encrypted streams). If one can move music files in a few seconds, videos in a minute or two, or an entire newspaper or book in a minute, many applications becomes practical. In addition, the economics are becoming more appealing with the spread of very large, cheap storage units. Downloading is of particular value when one wants the content for portable appliances—such as e-book readers or music players—though making this easy for consumers depends on addressing the in-home connectivity issues.

**3.3.4 Games**

The interactivity demands of some games were alluded to above. Multiplayer games are of considerable interest because they connect growing numbers of people in a shared activity (“massively-multiplayer role playing games”), providing both social and demand-stimulating dimensions.

**3.3.5 Speed and Response-Time-Sensitive Internet Applications**

While activities based on Web browsing are generally improved by faster network connectivity, a small number of Internet-based applications are particularly sensitive to connection speed, latency, and response time. The two most prominent are day trading and some forms of multiplayer games (in which delays of as little as 50 milliseconds can impair game play). Note that these activities are not generally done through Web browsers, but rather through special-purpose interface software. Both of these call for functionality not easily achievable through any other means, suggesting they will continue to drive interest in broadband.

**Static Image Delivery**

Several interesting video applications depend on the ability to deliver still photos or short video clips. The emergence of inexpensive—albeit more expensive than their analog counterparts—digital still and video cameras enables easy capture of photos.

**Audio**

All of the currently deployed broadband technologies are fast enough to support the key audio applications that have emerged to date. These include conventional voice similar to telephony; voice as a complement to games and other interactive applications; and a full range of sound applications, beginning with music but including other types of content (e.g., news and other spoken word). As a result, some experience has been gained with the delivery of audio applications over the Internet in general, and via residential broadband in particular. Factors such as which home networking technologies are used, the availability of special-purpose appliances, and the nature of user interfaces are also critical enablers of widespread use of audio applications.

**Specific Audio Applications**

*Playback of Music, Listening to the Radio over the Net, Network-Based Voice Telephony or IP Telephony or VoIP;Audio Filtering and Searching.*The fundamental idea behind this class of applications is that one can use a computer program to “listen” for certain keywords in one or more audio streams using speech recognition technology. When the program recognizes one of the keywords it is looking for, it takes various actions, such as saving a segment of the audio stream, notifying a person, or putting the stream on speaker. (This, of course, presupposes the availability of large vocabulary, speaker-independent keyword recognition software.) Key networking issues include how many streams need to be monitored and how large the streams are.

**Video**

Video applications—considered broadly—form a useful complement to the audio applications discussed above in terms of understanding what broadband connections may enable and what else other than mere connectivity must be in place. In the public mind, video applications are

perhaps the premier consumer applications for broadband.

Video also permits a number of possible variants with interesting implications for both users and

the broadband providers that carry these applications. These include:

 • *Interactivity.* Another trend is toward interactivity—transforming video from a passive experience into an active one. Interactive television is providing exposure to consumer options for, say, selecting a camera at a sporting event. Such early experience with interactivity raises questions about the locus of control (at the transmitter or the receiver), the relative costs of bandwidth and the other technology needed to implement the interaction, and the potential for approximations to interactivity, such as broadcast of navigable objects.

• *Video for social communication.* Another possibility is the combination of traditional entertainment with social communication. The scenario is that people are watching a sporting event, with the traditional live broadcast coming into the home—but also sharing live video with friends who are watching the same game at the same time in different cities or simply different homes. This implies fairly high bandwidth peer-to-peer video communication in conjunction with passive video delivery. It is a very different concept—implying very different behavior—from today’s scheduled videoconferences.

• *Home and community video.* Developments in video capture and editing technology enable new options for user-generated video. One obvious application is home movies. Another is further decreasing the technical barriers to community access-type video production and delivery.

• *Large numbers of simultaneous video streams.* People can interact with video content quite differently from how they interact with audio. One audio signal per room (or perhaps one per person if headphones are used) at a time is a basic limit—playing 10 radio channels at once simply creates cacophony. But with enough display screens, a room or an individual can make use of many video signals at once. People can divide their attention by simply looking from one screen to another. One can imagine people receiving a number of different video signals continuously (for example, multiple TV-type feeds) with the sound usually suppressed.

Another source of multiple video streams could be a new class of video display devices—video picture frame appliances that periodically download images for display from the Internet. With the always-on capabilities of broadband and an in-home network, one can easily see these evolving into video portals that look out on favorite scenes, into the homes of family and friends, and the like—perhaps at fairly high resolution, but with a relatively low frame rate.

Video services are key applications for New Generation Network. Examples include-IPTV, Multicast, Download service, VOD,Up-stream of Video information, Video Home Page, Video Meta-Verse (i.e. Second life),Central Monitoring System for Security, Digital Signage, Town Advertisement (Huge Screen on Building, at Station, in Stadium),Store Advertisement , Retail network, Super Presence,UDTV: 4K(Digital Cinema), 8K(Super-Hivision),3DTV: Multi-view, Integral Photography, Electronic Holography,Multi-modal and Interaction system.

**Requirements for New Generation Network**

•Ultra-high Speed：to distribute UDTV and 3DTV video signals with the data rate of T bps

•Broader band width: to up-load lots of video streams from home, office, and city

•Low latency：for smooth interaction, less than several tens of milliseconds

•Plug and Play : to adapt various kinds of video formats

•High stability: to be used as a basic distribution infrastructure

•High reliability and security: to protect from illegal use

•Quick response：for smooth channel zapping

**3.6 Telepresence**

When video is considered as a personal communications medium, most people probably think of teleconferencing. However, widespread broadband may also make practical a more general capability of telepresence—having a continuous video window open into another space. Whereas teleconferencing brings to mind a fairly formal notion of communication, similar to a telephone call, telepresence can enable much more informal interaction. For example, in a business setting it may enable casual interactions between lab spaces that could permit easier collaborations.

In a personal setting, telepresence may enable a parent to have a continuous window on a child at a day care facility, thus enabling a closer ongoing relationship, even with working parents. Telepresence could possibly enable new forms of extended-family relationships over distances. An interesting attribute of telepresence is that it potentially poses higher bandwidth demands than one might expect from videoconferencing applications. This is because the premise of telepresence is that the window is always open, to enable spontaneous observations and interactions. One example that is a simple evolution of telephone use today is school children holding shared homework sessions, connecting their respective homes for many hours of working, chatting, and collaborating on assignments. Telepresence can encompass not only audio and video, but also haptic interaction, force feedback, and control of remote devices (teleoperation).

**3.7 Telemetry**

Telemetry applications involve primarily numerical data streams. They are expected to grow with the proliferation, and networking, of embedded computing and communications systems—smart appliances and so on—as well as networking capabilities within and from the home. Sensors and controls are being developed for a variety of functions in a household, such as temperature and energy management, utility monitoring, appliance operation, and security. More sophisticated health-monitoring systems are also being developed. For example, it may become possible to undertake skin cancer screening from home, which requires an ability to capture and send high-resolution images. Telemedicine services that require broadband acess has already been practised. Possible connections include patient-to-doctor (e.g., in rural health care, where travel to the doctor’s office is difficult), patient-to physical therapist (e.g., supporting rehabilitation after a patient returns home following hip surgery), and patient-to-family (e.g., to allow a family to watch a newborn in neonatal intensive care). Telemetry applications rely critically on the always-on characteristics of broadband and the ability of broadband to multiplex many data streams (for example, to allow a medical device or an appliance to emit and transmit a data stream regardless of what else is going on over the broadband connection).In many cases the data streams involved are low bandwidth. However, some applications, such as webcams or health-monitoring devices that transmit images, could result in demand for capacity that is higher upstream than downstream.

**3.8 Internet Appliances**

The majority of existing and potential broadband applications assume a person at the end of the pipe actively using the content being served, whether he or she is watching a movie, shopping on the Web, or talking to a doctor. With this assumption, there is a potential upper bound on the demand for broadband, as it is limited by the number of people in a typical home. However, some futurists, as well as some commercial appliance vendors, anticipate a demand that is more accurately bounded by the number of information appliances in the home—autonomous consumers and producers of content that rely on the always-on capabilities of a broadband connection.This concept is now called Internet of Things.

**3.9 Internet of Things**

The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects. The semantic origin of the expression is composed by two words and concepts: “Internet” and “Thing”, where “Internet” can be defined as “The world-wide network of interconnected computer networks, based on a standard communication protocol, the Internet suite (TCP/IP)”, while “Thing” is “an object not precisely identifiable” Therefore, semantically, “Internet of Things” means “a world-wide network of interconnected objects uniquely addressable, based on standard.

The Internet of Things (IoT) is the network of physical objects accessed through the Internet, as defined by technology analysts and visionaries. These objects contain embedded technology to interact with internal states or the external environment. In other words, when objects can sense and communicate, it changes how and where decisions are made, and who makes them.

The IoT is connecting new places–such as manufacturing floors, energy grids, healthcare facilities, and transportation systems–to the Internet. When an object can represent itself digitally, it can be controlled from anywhere. This connectivity means more data, gathered from more places, with more ways to increase efficiency and improve safety and security.

With these kinds of applications, imagine the requirement of broadband connectivity. The figure below provides a summary of the concept of the Internet of Things from idea to market.



 Fig.-The Internet of Things-from idea to market

**3.10 Telecommuting and telework**

Although the concepts of "telecommuting" and "telework" are closely related, there is still a difference between the two. All types of technology-assisted work conducted outside of a centrally located work space (including work undertaken in the home, outside calls, etc.) are regarded as telework. Telecommuters often maintain a traditional office and usually work from an alternative work site around 1 to 3 days a week. Telecommuting refers more specifically to work undertaken at a location that reduces commuting time. These locations can be inside the home or at some other remote workplace, which is facilitated through a broadband connection, computer or phone lines, or any other electronic media used to interact and communicate.

As a broader concept than telecommuting, telework has four dimensions in its definitional framework: work location, that can be anywhere outside of a centralized organizational workplace; usage of ICTs (information and communication technologies) as technical support for telework; time distribution, referring to the amount of time replaced in the traditional workplace; and the diversity of employment relationships between employer and employee, ranging from contract work to traditional full-time employment. Many companies have offered a telecommuting option to employees, presumably as a result of the proliferation of personal computing and communications options as well as the impetus provided by a variety of situations (earthquakes, floods etc.) that have increased transportation problems. This has been facilitated by the proliferation of broadband access anywhere at an affordable place. This is motivated by the increased travel time due to traffic jams.

**3.11 Distributed Work and Education**

Distributed work and education—which depend on e-mail, file transfer, and sometimes on audio- and videoconference capabilities—have long been touted as applications for information networks; both have already benefited from narrowband Internet access. Distributed education, like to distribute work, involves remote access to information and communications. Discussions of distributed education are more likely to involve the use of still and moving images with broadband; they also involve conferencing for interaction among multiple students. Note that distributed education is expected to benefit both adults and children.This concept is popularly implemented as e-education, e-learning or m-learning etc. and is supported by broadband connectivity.

**3.12 Tele-webbing**

A new sort of composite application that some have begun to call “ tele-webbing,” which combines Internet access with conventional television viewing, is beginning to appear. Simplistically, accessing the Web while also watching television would qualify for this description, and indeed it is common for people to engage in other activities while also watching entertainment television that has low attention demands. More interesting, however, are cases now emerging where the television watching and Web access are interrelated. For example, many sports Web sites now provide real-time Web applications that feed game statistics to a browser. Having such a site open while watching a televised sports event provides a deeper experience of the event.

Various levels of viewer interactivity have been evaluated for making television game shows (which have long elicited vicarious play-along-at-home experiences) truly interactive. All of these ideas involve taking advantage of a second screen that the user can selectively use for added experiences. Importantly, all these applications involve constraints on tolerable latency for the data streams relative to the primary video streams. This class of applications may be another example of where the total bandwidth demand to a home may exceed what the user can consume at any instant because the value of these applications lies at least in part in the user’s ability to instantly shift attention from one video feed to another screen full of information.

**3.13 Push Content**

Various business models assume ability for different kinds of parties to push content into homes/individual mobile set—that is, rather than await a specific request, always-on connectivity would enable these parties to transmit content into homes on a variety of schedules. Some of these arrangements would be highly functional—updates to device software, regular and automatic updates to databases maintained in the home, diagnostic probes (which would trigger responses), and so on. Other arrangements may be part of the “price” of a device or service, such as advertising.

**3.14 Over-the-top (OTT) applications, services and content**

“Incumbent” telecommunications operators that offer services such as fixed and mobile telephony, broadband and pay TV services, among others, are being invaded by online content, specifically those known as over-the-top (OTT) applications, services and content. The best known examples of OTT are Skype, Whatsapp, online video games and movies (Netflix, Pandora). A fundamental characteristic of OTTs is that the Internet Service Provider (ISP) does not profit nor is involved in the distribution of the OTT applications, services and content. Furthermore, in general, OTT suppliers, which need the ISP infrastructure to reach the user, offer products that compete with the services offered by the ISPs (voice, instant messaging, online TV).

Table below presents a diagram and classifies the different types of OTTs. 

OTT services are enabled by the [**de-layering**](http://www.ictregulationtoolkit.org/2.1.4.1) of the industry. IP has separated carriage from content and allowed ‘over-the-top’ content and application providers to deal directly with end users over networks whose owners and operators are excluded from these transactions. The move to LTE’s all-IP architecture will create a more open environment for these OTT providers and third party services.

It is not only telecommunications that are affected. Internet television over broadband fixed and mobile networks is de-stabilizing existing broadcasting industries.

Internet telephony, or “Voice over the Internet Protocol” (VoIP), is the first ‘over-the-top’ (OTT) service with major implications for the business models of both fixed and mobile network operators. More recently, text messages (SMS) have also been delivered OTT affects the revenues of fixed and mobile operators.

**Policy Issues**

Proliferation of content and application services is to be welcomed that they add utility for users. Some new over-the-top (OTT) services did not previously exist and do not undermine the current operator business models (e.g. location-based GPS mobile services). Some new OTT services may threaten the economics of investing in fast broadband networks and (e.g. internet television).

But, change is inevitable. As network operators migrate to next generation networks, voice services will become software applications riding over the network. During this transition, policy-makers are finding different paths to balancing innovation, investment and competition.

**Key Concepts**

VoIP has been around for a number of years, but there are several other over-the-top (OTT) concepts that will become increasingly important. The concepts are all the products of the digitization of fixed and mobile networks. Key concepts include:

* [**VoIP**](http://www.ictregulationtoolkit.org/2.5.3)also known as voice-over-broadband (VOB) or internet telephony takes a number of different forms. Across different platforms, VoIP services can be phone-to-phone, PC-to-PC, PC-to-phone, phone-to-PC and phone-to-phone between different networks). The different forms are reflected in licensing conditions.For a helpful power-point presentation on VoIP technology basics, see the Ofcom power-point pack presented by [**Peter Ingram**](http://www.ictregulationtoolkit.org/en/document/3254).
* **SMS** -the short message service (texting) has been a very lucrative business for fixed and mobile operators. While network quality is a major constraint to some OTT voice applications, SMS applications are less reliant on QOS, due to them using less data and having a higher tolerance for latency.
* **Applications (Apps)** - This term is now associated with smart phones. Early examples include Skype (first on fixed networks, but now also mobiles) and there are now thousands provided by mobile operators and third partiesA source on trends in this new industry is www.distimo.com. Their important characteristic is that they are carried over the data part of mobile service.
* **Cloud Services** - The general idea of the cloud is to store your media on the internet so you can access it from any device anywhere, as opposed to leaving it on a hard drive. Apple, Google, Amazon, Microsoft and Dropbox all offer cloud services.
* **Internet Television** - With Internet TV (e.g. Apple TV, Google TV, Netflix) the consumer pays for the content package separately, and in addition to, the broadband access package. There is no guarantee of the quality of service. The content provider may use a VPN (Virtual Private Network) to try and secure the content from copying or may be encrypted and decrypted. But, it is delivered over the top of the Internet Service (ISP) provider’s network.
* **IPTV** - IPTV is not over-the-top service because it is provided directly by carriers and ISPs. The consumer pays the ISP for both the content package and the broadband delivery package (e.g. Triple Play bundles telephony, broadband and television). This allows the ISP to guarantee some quality of service with its Content Delivery Network (CDN) to ensure that the video content is coming from the nearest possible server to the consumers premise and over its own network.

**Other Over-the-Top Services**

* There are a number of other OTT services apart from VoIP that have been enabled by IP and which all have significant implications for market developments. They may pose a challenge for existing providers but do not seem to be as challenging for regulators as VoIP.
* Apps that enable instant messaging and voice communication via data plans compete directly with the SMS and voice services upon which operators depend for a substantial portion of revenue. The average revenue per delivered byte is dropping, as SMS bytes, are replaced by over-the-top bytes.
* But SMS is not dead. This part of the discussion of SMS and email draws on http://www.phonearena.com/news/The-death-of-SMS-has-been-greatly-exaggerated\_id1The apps that compete with it depend upon both ends of the communication using the same app: they are closed systems. But SMS is on every phone: not just smart phones.
* SMS is almost as good as email which runs on every platform and carrier throughout the world. Email is not available on every phone but in some cases it is better than SMS. For example, in Japan SMS is not cross-carrier. So a DoCoMo customer cannot text a Softbank user. But, if the phone has an e-mail client and an email address, it is the best messaging option in Japan; as long as you have a cheap data plan. And, it is easier for manufacturers to build email clients into phones than anything else, because email has standard protocols behind it.

**3.15 Cloud Services**

Traditionally, users had to physically connect devices to move, say, a photo from a Smartphone to a home computer. With cloud services, as soon as a photo is taken it can be uploaded immediately to the cloud to be viewed anywhere, on any device. Google, Microsoft, Apple, and Amazon have all made significant investments in their operating systems and cloud services so that computers and mobile devices will seamlessly and silently upload files to one master location.

Cloud services put more pressure on network capacity. Traditional (physical) syncing placed no demands on the network but the cloud changes things. Now, instead of consuming no bandwidth when syncing 100 MB of photos back to a computer, cloud syncing uses 100 MB of data when uploading data and then an additional 100 MB downloading to each device connected to the cloud. While most services offer the option to sync only when on Wi-Fi networks (e.g. coffee shops, living rooms), these cloud services could still result in significant additional bandwidth costs and potential bill shock for consumers. For subscribers who perform complete system back-up, the shock could be even greater.

There are no clearance issues yet for competition and pricing, and any that emerge are likely to be addressed first in developed markets.

**3.16 E-applications**

WSIS identifies a number of areas for e-applications and services in Geneva Plan of Action 2003 listed below for easy reference and fully explained in chapter 4.

* E-government
* E-business
* E-learning E-health
* E-employment
* E-environment
* E-agriculture
* E-science

**3.17 Currents services that consume most of the Internet Bandwidth**

The Global Internet Phenomena Report: 1H 2014 indicates that Real-Time Entertainment (comprised of streaming video and audio) continues to be the largest traffic category on virtually every network and its continued growth is expected to lead to the emergence of longer form video on mobile networks globally through 2014.

The findings of this report is summarized below-

In North America, the dominance of Real-Time Entertainment is due in large part to the continued market leadership of Netflix which saw growth in share thanks to the continued rollout of high bit rate Super HD content. In the United Kingdom and Ireland Netflix has also established itself as the second largest source of network traffic during peak evening hours. In other regions, YouTube continues to be the largest single source of Real-Time Entertainment traffic on both fixed and mobile access networks, which makes it the leading source of Internet traffic in the entire world. Twitch.TV and Snapchat have emerged and are now top-ranked applications in many regions across the globe. Twitch. TV is a service that allows subscribers to watch people play video games and the service now generates more traffic than HBO GO in the US. Snapchat on the other hand has seen high traffic volumes on many mobile networks due to the fact it only allows subscribers to send picture messages, while competing services such as WhatsApp allow users to send plain text. In North America, Subscribers who exhibit “cord cutting” behavior (the top 15th-percentile of Real-Time Entertainment users) consume on average 212GB a month, more than seven times the usage of a typical subscriber. These “cord cutters” consume an average of 100 hours of video a month and account for 54% of total traffic consumed each month.

The tables below present the top 10 peak period applications for the Broadband fixed access and mobile access customers in the Asia Pacific.



Table - Top 10 Peak Period Applications – Asia-Pacific, Fixed Access



Table - Top 10 Peak Period Applications – Asia-Pacific, Mobile Access

Asia-Pacific is the first region to exceed 1GB a month on average. Consumption in Asia-Pacific is driven by the use of Real-Time Entertainment, which accounts for over 50% of total downstream traffic during peak period. A unique characteristic of the Asia-Pacific region is the popularity of peercasting applications, particularly QVoD and PPStream. These applications allow users to stream live events while simultaneously helping to distribute the stream to other viewers, which drives large volumes of upstream traffic.

**Chapter 4**

**E-applications**

**4.1 General E-applications**

WSIS identifies a number of areas for e-applications and services in Geneva Plan of Action 2003 listed below for easy reference.

* **E-government** focuses on applications aimed at innovating and promoting transparency in public administrations and democratic processes, improving efficiency and strengthening relations with citizens. It is adapted to the needs of citizens and business, to achieve a more efficient allocation of resources and public goods, to enhance transparency, accountability and efficiency at all levels of government.
* **E-business** promotes the benefits of international trade, helps to stimulate private sector investment, foster new applications, content development and public/private partnerships.
* **E-learning** is designed to achieve universal education worldwide, through delivery of education and training of teachers, and offering improved conditions for lifelong learning, encompassing people that are outside the formal education process, and improving professional skills, to eradicate adult illiteracy; to promote e-literacy skills for all; targeting girls in the ICT education with the aim of increasing the number of women in ICT career.
* **E-health** has been promoted for creating a reliable, timely, high quality and affordable health care and health information systems and for promoting continuous medical training, education, and research through the use of ICTs, while respecting and protecting citizens’ right to privacy; to ffacilitate access to the world’s medical knowledge and locally-relevant content resources for strengthening public health research and prevention programs and promoting women’s and men’s health, such as content on sexual and reproductive health and sexually transmitted infections, and for diseases that attract full attention of the world including HIV/AIDS, malaria and tuberculosis; to alert, monitor and control the spread of communicable diseases, through the improvement of common information systems; to promote the development of international standards for the exchange of health data, taking due account of privacy concerns; to improve and extend health care and health information systems to remote and underserved areas and vulnerable populations, recognizing women’s roles as health providers in their families and communities; to provide medical and humanitarian assistance in disasters and emergencies.

* **E-employment** is expected topromote teleworking to allow citizens, particularly in the developing countries, LDCs, and small economies, to live in their societies and work anywhere, and to increase employment opportunities for women, and for those with disabilities
* **E-environment** encourages the use and promotion of ICTs as an instrument for environmental protection and the sustainable use of natural resources; to initiate actions and implement projects and programmes for sustainable production and consumption and the environmentally safe disposal and recycling of discarded hardware and components used in ICTs; to establish monitoring systems, using ICTs, to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, LDCs and small economies.
* **E-agriculture** is being usedfor the systematic dissemination of information using ICTs on agriculture, animal husbandry, fisheries, forestry and food, in order to provide ready access to comprehensive, up-to-date and detailed knowledge and information, particularly in rural areas; to maximize the use of ICTs as an instrument to improve production (quantity and quality). System and efficient collection, dissemination and preservation of essential scientific digital data, for example, population and meteorological data in all countries; to promote principles and metadata standards to facilitate cooperation and effective use of collected scientific information and data as appropriate to conduct scientific research.

**4.2 Specific E-applications**

The major areas of broadband applications broadly relating to improving quality of life include- medical care, education, and governance and emergency management. These application areas are broadly recognized as:

* e-health applications;
* e-education applications;
* E–government applications;
* Emergency management operations

**4.2.1 e-Health**

e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology. Application of information technologies to the healthcare field has been slow and relatively chaotic compared to other major industries. The size, complexity, and number of stakeholders involved in the healthcare industry make it difficult to develop content and delivery standards for data. e-health is a general term used broadly to describe the use of any information technologies for healthcare, such as videoconferencing. Telemedicine is normally associated with the use of technology to provide clinical services to patient.

To provide e-health service we need to develop standards, implementation specifications, and certification criteria for health information technologies to achieve wider use of technology in the health care industry. To provide e-health service speed requirements needed for different types of e-health applications such as Digital chest film, Mammography, MRI study, Echocardiogram study etc. it is require high bandwidth that is broadband service to complete the transmission of different radiological images at different places.

 This type of health related information exchange involves different health organizations sharing records, thereby enabling a higher quality of service. The application of broadband within the e-health context, involves coordination of care among physicians to help eliminate possible misdiagnoses, and enable better medication management and chronic disease management. This health related information exchange approach requires broadband network. The wider application of broadband in e-health enables greater monitoring of patients, increased influence on patient behavior, and more information sharing between patients and healthcare professionals about symptoms, without requiring visits to hospitals or clinics. This requires an extremely reliable broadband connection at the healthcare organization and the patient’s home.

**4.2.2 e-Education**

E-learning is an inclusive term that describes [educational technology](http://en.wikipedia.org/wiki/Educational_technology) that electronically or technologically supports [learning](http://en.wikipedia.org/wiki/Learning) and [teaching](http://en.wikipedia.org/wiki/Teaching).  e-learning advocates that the "e" should be interpreted to mean "exciting, energetic, enthusiastic, emotional, extended, excellent, and educational" in addition to "electronic." This broad interpretation focuses on new applications and developments, and also brings learning and [media psychology](http://en.wikipedia.org/wiki/Media_psychology) into consideration. Much like in the healthcare industry, the use of technology in education is an expansive field with a diverse set of stakeholders and disagreement over the best way to incorporate technology. Electronic textbooks are but one of many education technology applications that are used to (1) augment traditional teaching methods in the classroom; or, (2) facilitate distance learning platforms, such as synchronous interactive online instruction, where the learning environment is created exclusively online.

There is some overlap between the two education technology application categories as some classroom applications are accessible only online. The majority traditionally are used in classroom settings and downloaded onto computer workstations. As the focus of education shifts from face–to–face or online lecture–based methods to interactive methods better suited to the modern, technology–driven society, synchronous interactive online instruction will increase in importance and use. This, in turn, will place greater strain on broadband networks and require users to upgrade their connection speeds to participate fully in the educational experience.

Serious scholarly investigation into educational consequences of synchronous interactive online instruction and the effects of a poor Internet connection on a student’s learning ability are still in a promising stage. Studies typically focus on the online platform itself and not on the effect of poor connectivity. Early studies on network latency show a relationship between subject comprehension and connection speed, however these studies fail to take into account possible critical factors such as a student’s digital literacy skills and the usability of the interface.

Similar to the gaming industry and other software developers, online learning platforms that provide synchronous interactive online instruction, such as ElluminateLive, go to great lengths to limit the amount of bandwidth needed for their applications (Elluminate, n.d.). Elluminate’s proprietary collaborative communication framework (CCF) is designed to allow users the option of configuring the application to better suit their connection speeds. [Table 6](http://firstmonday.org/ojs/index.php/fm/article/view/4066/3355#tab6) is adapted from advertised data requirements for required activities in Elluminate’s synchronous interactive online instruction learning platform.

As is the case with online gaming and video conferencing, synchronous interactive online instruction alone does not take up a considerable amount of bandwidth on a transaction–by–transaction basis. However, a two–three hour long session uses a substantial amount of bandwidth. The activity types requiring the greatest amount of bandwidth, transferring and sharing PowerPoint presentations and application sharing, vary by the size and complexity of the files.

**4.2.3 e–Government**

E–government is a term broadly used to describe online services or information provided by any government agency. The majority of e–government services typically involve downloading or uploading forms, permits, licenses, or other types of documents, as well as other account management services. Examples include renewing a driver’s license or paying a utility bill online. Most studies examine the effectiveness of e–government services based on user perceptions of the service in comparison to user perceptions of e–commerce services. The differences in bandwidth required for e–government services reflect the different service roles for the government agencies and departments. Most e–government services, such as filing taxes, purchasing permits, or checking on criminal cases, do not involve large amounts of data transfer. Connection speeds become an issue for these services only in the case of institutions, like public libraries or workforce boards that have multiple users attempting to transfer files on the same network simultaneously. Different e-government application needs different types of speed. The most widely utilized advanced applications for e–government services are geographic information systems. GIS utilize multiple layers of high–resolution images and graphics and require an ample amount of data storage for the network and a connection with a speed to avoid significant latency while using the application (Akamai, 2011).

**4.2.4 Emergency Management Operations**

Similar to the healthcare and education industry, policy experts spent much of arguing how information technology can improve emergency management and help diminish the risk of natural and man–made disasters. Also similar to healthcare and education, these efforts met with varying degrees of success. In many ways, typical Emergency Operation Centers are today operate in much the same manner as they did 30 years ago, primarily receiving information from human observers through phone calls or radio transmissions. A simple task such as accessing text messages or e–mail alerts sent to the respective organization is not uniformly applied in EOCs throughout the country. There is, however, a significant amount of skepticism from the emergency management community concerning the true feasibility of using information technologies that rely heavily on Internet connections as the growing consensus is that a multitude of communication networks better safeguard against one system being disabled. This does not mean that broadband–enabled applications are not useful for emergency managers though.

**4.3 Mobile broadband applications**

The accelerated diffusion of broadband access mobile devices has significantly increased the impact of mobile applications. In many cases, especially in emerging countries, mobile broadband may represent a substitute for fixed services in three types of situations: 1) the fixed service is not offered in the area where the user lives; 2) the quality of fixed services (for example, low speed) is less advantageous (or at least comparable to) than the available mobile service; or, 3) for economic or convenience reasons, the user opts to consolidate services and acquire only mobile broadband, which provides connectivity combined with mobility.

In the case of mobile applications, the adoption sequence is different from social media and games. In the prior two network effect groups, applications adoption precedes the purchase of a broadband subscription. Along those lines, the user becomes aware of the applications, begins using them, leading to an increase in the willingness to pay, which results in acquiring broadband services for home or individual access. In the case of mobile applications, the migration from an early generation (typically 2G feature phone access) to a 3G or 4G Smartphone based device, which is an implicit adoption of broadband service, allows the user to gain access to mobile applications of which he/she was not previously aware. In sum, while in social network and games, the applications use may precede fixed broadband adoption, in mobile broadband adoption service purchasing precedes applications use.

 In this context, mobile broadband users represent a “captive” market, ready to adopt mobile applications that enhance the value derived from wireless broadband. The installed base of wireless broadband users has been growing significantly. In the context of explosive adoption of broadband enabled devices, mobile applications serve to reinforce the awareness of broadband services. Governments can play a role in promoting the development of mobile broadband applications.

**Chapter 5**

**Promoting Content over Broadband and Regulatory Issues**

**5.1 Background**

One of the dominant adoption obstacles to broadband diffusion among people is lack of relevance.Highlighting the importance of applications and contents, the National Broadband Plan released by the Federal Communications Commission (FCC) in 2010 states that “ultimately, the value of broadband is realized when it delivers useful applications and content to end–users.”

Special emphasis has been given in WSIS Geneva Plan of Action 2003 for local content in action lines C8 under Cultural **diversity and identity, linguistic diversity and local content** especially to

* promote the production of cultural, educational and scientific content
* support local content development, translation and adaptation, digital archives, and diverse forms of digital and traditional media by local authorities
* provide content that is relevant to the cultures and languages of individuals through access to traditional and digital media services
* foster the creation of varied local and national content, including that available in the language of users
* nurture the local capacity for the creation and distribution of software in local languages, as well as content that is relevant to different segments of population, including non-literate, persons with disabilities, disadvantaged and vulnerable groups
* enhance the capacity of indigenous peoples to develop content in their own language.

There is much potential for future applications that enrich or complement traditional content and communications channels, but excitement about them should be tempered by an appraisal of the time frame in which these applications could be realized and the nontechnical obstacles that retard their deployment. Much of the expectation surrounding broadband involves more than new technology—it also requires a transformation of societal structures, media, and other institutions. One obstacle is the availability of content. Can we expect a situation in which we will be able to access every book ever published in any language and every movie ever made available, on demand over the Internet. In reality, we are sometimes away from widespread video-on-demand; thousands of channels of “radio” over the Internet; abundant, high-quality educational video content; and so forth. In addition to technical obstacles, the familiar chicken-and-egg phenomenon comes into play. Without a mass market of consumers with broadband access, it is hard to develop a business model that justifies investment in new content (or translating old content). Intellectual property rights issues are another large factor—the interests and holdings of broadband providers, users, and rights holders are not necessarily aligned. Finally, although content availability affects demand for broadband, one should not underestimate the volume and value of customer-provided content. Broadband is not only a mass media technology; it is also an interpersonal technology. As noted above, messaging and e-mail are both very popular applications, illustrating the value of broadband for communication as well as content delivery. Multiplayer games, one of the few profitable Internet applications today, rely on user-provided content. Telemedicine will rely, in large measure, on user-provided content, plus some professionally prepared patient education materials. Families will generate and want to distribute pictures and home movies. The proliferation and wide use of social networking sites such as face book, twitter, LinkedIn, Google+, Flickr, YouTube etc. have provided platforms for individual users to create lots of contents to upload and share.

**5.2 Content in local languages**

To familiarize the broadband service to the mass people it is necessary to develop broadband service application in local content. So that mass people will feel interest to use or adopt broadband service when they understand the basic of the content.

As discussed above, users purchase broadband services and devices in order to gain access to the complementary services and content. In fact, for the population at large, the network infrastructure is less important on a day-to-day basis than the availability of relevant and useful online services and applications that allow them to access, create, and share content.

**5.3 Local content promotion policies**

 In order to increase demand for broadband services, citizens must first view the service as relevant. Without resources, information, and applications designed with local communities in mind, the demand for such services will only come from the segment of the population for whom the Internet was first developed – native English speakers. Even with the rise in Internet users in countries where English is not the first language, comparatively fewer websites written in other languages and characters exist. Further, the defining characteristics of a culture – such as “geographic location, religion, ethnicity, and area of interest” - shape an individual’s interest in available content.

The Internet has offered citizens the chance to create and distribute their own content more quickly and cost-efficiently than ever before. It has also allowed them to come together in such instances as crowd-sourcing or mass broadcasting. At the same time, however, lack of access further stratifies various segments of the population. Lack of access is only exacerbated by lack of local content, but in recent years, many developing countries have taken charge of the promotion and development of such resources. These efforts have commenced both to increase access and also to build a new industry of digital content.

In Kenya, for instance, the government allocated a budget of nearly US$ 4 million in an effort to increase locally relevant digital content and software. By working directly with developers, it hopes not only to increase demand for broadband services, but also to increase revenue within the industry. In the case of Egypt, governments have worked to digitize pre-existing cultural content, in turn encouraging Internet use while also allowing more people to benefit from its resources. In the Middle East, the UAE and Qatar have both developed industries centered on the distribution of digital content within the region.

In many instances, the governments turn to international corporations and organizations for both implementation and financial assistance in these endeavors. Much of this help allows these initiatives to benefit from pre-developed best practices while also establishing international support for the budding industries. Increasing content in areas such as education and technology training will also serve to strengthen the countries’ economies.

In addition to direct grants for the production of local content, governments can support the development of local content and applications in other ways, such as the development of standardized keyboards, character sets, and character encoding. This type of indirect intervention would affect the content available by enabling users to create content in their own languages. Additionally, translation and standardization of operating systems into local languages can help to facilitate the development of local applications that are relevant and comprehensible to local users. Governments can also play an important role in developing local content and local applications by directly creating local content and local applications in the form of e-government applications.

Some forms of user-generated content, such as YouTube videos, face fewer barriers to expression, as the speaker is recorded directly in his or her own language. YouTube has launched a localization system, where YouTube is available in 31 local versions as well as a worldwide version. This helps to overcome some of the barriers to content reaching a possible community of interest, but not entirely, as content generated in languages other than those used in the 31 local versions or the worldwide version may encounter barriers to reaching an audience. It is likely that greater amounts of local content will continue to become available in the near term. For example, a website called d1g.com is a platform in Arabic for sharing videos, photos, and audio, a forum, and a question and answer facility. Launched in 2007, d1g.com is one of the Arab world’s fastest-growing social media and content-sharing web- sites. Notably, nearly 100 percent of d1g.com’s content is user generated, with a small amount produced in-house.

**5.4 Digital content promotion policies**

 “Digital content” is defined as the myriad of websites, applications, and services available to broadband users. It can be based on text, audio, video, or a combination. Much of the content available on websites today can be divided into three broad categories: (a) user generated, (b) proprietary or commercial, and (c) open source. User-generated content is produced within Internet-based platforms where users function both as consumers and as producers of content. Along these lines, consumers interact with one another instead of only dealing with site operators in a top-down fashion. User-generated content includes blogs, wikis, podcasts, Twitter updates, You-Tube videos, and Flickr photos. They can be produced within social and professional networks, as well as reputational systems. The social media site stores more than 100 petabytes, or 100 million gigabytes of photos and videos alone. These forms of social media help to drive broadband demand by engaging users and ensuring the local and personal relevance of content. Due to the “bottom-up” nature of social media, policy makers can support the development of such content by taking a more hands-off approach in regulating it. They can also promote such services by becoming active users of such applications and services; more and more government agencies and even politicians are realizing the value of such tools in reaching out to citizens. As opposed to copyrighted materials, open-source content is available free-of-charge. In addition, the source code is also freely available to allow anyone wanting to incorporate the content or application into new forms of media, such as in mashups.

Open-source content has led to the creation of property rights systems that encourage collaboration by publishing source code and allowing other users to extend those applications and develop them further, with the provision that the result should also be governed by the same open-source property rights.

The delivery of content, mostly as video, over broadband is one of the key drivers of demand for broadband over fixed lines and by wireless. The days of FMS (fixed-mobile-substitution) are already history as content can now be delivered to multiple devices, from Internet high definition ‘connected TVs’ to handheld mobile devices of all kinds. This is both a challenge and an opportunity for telecom companies who mostly own the networks. By caching content at vantage points within their networks they can become wholesale content distribution networks (CDNs) offering content service providers a guaranteed quality of service that may not be available over the Internet. Their billing relationship with customers and their knowledge of the local market are competitive advantages to them. They can also deliver their own content and applications, but content creation and applications innovation is not the traditional core competency of telecom companies.

Regulators on the other hand face more of a challenge than an opportunity, apart from an opportunity to get it right. It is to be expected that telecom companies baulk at the idea of content service providers, independent CDNs or Internet access providers by-passing their networks by going Over-The-Top (OTT). The only gain for the telecom company is that this drives the demand for broadband and for higher speeds, for which they can charge customers a fee. But against that they fear to lose revenues, especially from traditional voice and SMS services for which OTT provide substitutes. How should regulators react to the lobbying of telecom companies wanting to preserve their traditional core business? The net neutrality debate in part already addresses this question, with the consensus of non-carrier content providers being predictably against the right of telecom companies to block or throttle or degrade content services which are not their own. This is also likely the position favored by most consumers.

**5.5 Issues related to Online Content**

**5.5.1 Freedom of Opinions and Expression**

While it cannot be said that everyone in the world agrees on democracy and human rights, what can be asserted with good reason is that global forces for change such as interconnected broadband and the Internet, which can do so much to alleviate poverty, illiteracy, poor health and other social ills and so much to improve the overall wellbeing of society, are not compatible with too many restrictions on the freedom of expression, and not at all with the efforts to restrict the freedom of thought.

It is important to stress these points as a guideline, because the challenges are very real. Getting the balance right between freedom of expression and freedom to access and to use the Internet on the one hand, and protecting society from serious problems is never going to be an easy one to achieve, nor if achieved will it remain in balance forever.

No society can be absolutely safe, no society can be absolutely free, but every society can be resilient if the great majority of people are convinced of the goals. Different societies have different priorities, different needs, enjoy different cultural traditions, and the resilience of every society will be determined by how far they can adjust to these global changes. The role of the Internet in giving ordinary people a voice cannot be over-estimated and regulators have an important role to play one way or the other. Social media in particular represents a genuine opportunity for user-generated news and analysis and is having repercussions throughout the world.

**5.5.2 The Open Internet and Net Neutrality**

**The Open Internet**

One of the most important features of the Internet is its openness: It uses free, publicly available standards that anyone can access and build to, and it treats all traffic that flows across the network in roughly the same way. This design has made it possible for anyone, anywhere to easily launch innovative applications and services, revolutionizing the way people communicate, participate, create, and do business - think of email, blogs, streaming video, and online shopping. The governments and regulators should focus on ensuring that every citizen has access to open and robust high-speed Internet service - known as broadband.

The "Open Internet" is the Internet as we know it, a level playing field where consumers can make their own choices about what applications and services to use, and where consumers are free to decide what content they want to access, create, or share with others.

**Net Neutrality**

Network, or "net," neutrality is just another way of referring to Open Internet principles.

These principles ensure:

1. Transparency: That all ISPs must transparently disclose to their subscribers and users all relevant information as to the policies that govern their network

2. No Blocking: That no legal content may be blocked

3. No Unreasonable Discrimination: That ISPs may not act in a commercially unreasonable manner to harm the Internet, including favoring the traffic from an affiliated entity.

**5.5.3 Child Safety**

Of particular concern to all stakeholders of the Internet is the safety of children: in particular safety from inappropriate content, from child abuse and the dangers of sexual predators and from trafficking. There are two aspects that should be noted with particular care: online behavior and dangerous websites. In 2010 the ITU also launched a Child Online Protection (COP) initiative, including the allocation of number 116111 for help lines, and issued a Guideline for Policy Makers for Child Online Protection.

The reality is that infants below the age of five can now readily use the Internet and laws and regulations will not prevent predators, nor prevent children being able to access unsuitable material, which means that at a large part of the focus must be on helping parents and guardians how to educate the children in their care to conduct and protect themselves online. Regulators also need to be aware, as ICANN has pointed out, of unscrupulous ‘fast flux hosting’ whereby “operators automate domain name service updates to hide the location of web sites where illegal activities – IP Piracy (music, videos, games), hosting of child pornography, hosting of phishing systems, sales of illegal pharmaceuticals, and execution of identity theft and fraud – are performed.” Children can very innocently find them themselves in a completely wrong environment.

**5.5.4 Intellectual Property Rights**

Intellectual property (IP), copyright in particular, is always an issue for Internet companies, especially in an era of user-generated content and content going viral. Regulators and Internet companies are grappling with appropriate and effective codes of practice with regard to safe use, copyright infringements, hate content, child pornography, libel, and so on. The only effective way forward is if there is industry agreement, but often the debate becomes infused with political, social, religious and cultural deliberations which can result in unrealistic solutions.

IP issues always put policy-makers and regulators under pressure from lobby groups, and there exists a panoply of trade agreements that commit signatory countries to protect patents, trademarks, copyright, designs and geographical indicators for country of origin, ranging from the World Trade Agreement (WTO) which administers the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) under the auspices of the World Intellectual Property Organization (WIPO) to multilateral (MTAs) and bilateral treaty agreements (BTAs) and Free Trade Agreements (FTAs).

Policy makers and regulators are undoubtedly under pressure to enter trade agreements to gain access to major markets, and as further rounds of WTO negotiations have faltered in recent years an increasing number of FTAs and BTAs have emerged, including the Trans-Pacific Partnership (TPP) initiative led by the USA.Many contain IPR provisions which are controversial because the countries owning most IP are the wealthier nations, and economists are divided on how far IPR issues should be part of trade negotiations. These are, by definition, issues of political economy. The business of trade negotiators and policy makers is to find mutually-beneficial workable compromises, but it is important in market-oriented economies that regulators remain as far as possible neutral and honest brokers for the ICT industries under their authority.

**5.6 The Challenge for Regulators**

The challenge for policy makers and regulators is really twofold. How to ensure that there will be sufficient investment in networks to maintain a steady level of innovation and upgrade in broadband for society, and what laws and regulations to apply. The first challenge is best addressed through opening the market to new entrants who are willing to invest in networks. The fear that network owners will not be able to earn a sufficient rate of return on their investment is really a fear that they will not be sufficiently adept and flexible in the market to find new business models that work. Protection of incumbents is the guaranteed way to make this fear real as rent seeking replaces competition.

The second challenge is actually the greater one. Pre-dating the Internet was cable TV as an alternative to free-to-air (FTA) and Pay-TV broadcasting. The problem for regulators was that cable was a wired-based medium and not a radio-based medium like broadcasting, so it was close to being a carrier, and indeed could be adapted to carry telephony and when upgraded to digital to providing Internet access. It also became a competitor to IPTV provided by carriers.

Broadband and the Internet now pose similar challenges to those thrown up by cable TV for the regulators. The problem with defining according to traditional “basic” and “enhanced” or “value-added” is that all telecom services are “value-added” including voice, because without the transmission mechanism there would be no communication. And if it were not adding value then no one would pay for it. The shift in regulatory perspective in recent years has been away from these technologically-differentiated definitions, which really have no objective basis to them, and towards technology-neutral and economic regulation.

As with cable TV, Internet-based services cut across the technological separations of carriers and broadcasters, including the fixed-wireless divide. But there is another separation that has become increasingly blurred, the one between apps and content. The spread of P2P communications using web-based applications, such as ‘torrents’, means for example, it is possible to download different parts of a movie or video from many different servers over a period of hours, or within minutes with fast enough broadband. Downloading a health check app similarly provides the user with health care content, or an education app allows a user to access education content and so on.

Most of these apps and the content they provide access to are provided by third parties. They can be delivered by third parties. They are part of a vibrant digital economy. But they can represent a challenge to the social norms and culture of a society and sometimes a security risk.

Many new policy and regulatory challenges have emerged due to proliferation of content via the Internet. So what lessons can be drawn? The first is that in an interconnected world in which content can go viral within minutes, and in which proxy servers can be used to by-pass national restrictions, the law may not be a very effective means to control content. The second is that, rather like the war on drugs, the most effective interventions are likely to be at the user end. At the benign end of the scale are awareness and alertness campaigns and the use of Internet filtering apps by parents and guardians to protect children.

At the other end of the scale is the use of the law. For example, it may be impossible to prevent the uploading of child pornography somewhere in the world but cyber-detection and law enforcement can identify users and break-up the crime rings that supply them. However when the law is being used, the principle of proportionality is important and this is mostly to be judged in terms of two factors: whether the intent itself was criminal or not and the social impact of the infringements weighed against the rights of the individual of freedom of access to the Internet.

**Chapter 6**

**Broadband Applications and Services in SATRC Countries**

**6.1 Background**

Though late compared to the developed countries, SATRC members have progressed well in the development of broadband infrastructure and services. Contents are slowly being developed. Governments and private sectors are also putting efforts to create contents in the local language. Due to e-government initiatives in many countries, the governments have become the major broadband users as well as content generators. The popularity of the social networking sites has given opportunity of individual users to become content creators.

Among the SATRC member countries Nepal, India, Iran, Bhutan and Bangladesh have responded to the questionnaire.

**6.2 Summary of the Response to Questionnaire**

Comparative analysis of BB applications and services in SATRC the member countries has been tabled below based on the responses to the questionnaire circulated to the membership.

|  |  |
| --- | --- |
| **Q.** | **Do you have any separate regulation /Policy/Plan for Broadband?**  |
| Bhutan | Yes |
| India | Yes |
| Iran | Yes |
| Nepal | No. But it is in the process to formulate a national broadband policy  |
| Bangladesh | Yes |
| **Q.** | **What is the definition of Broadband for your country? Specify in terms of speed (uplink/downlink) and other requirements.** |
| Bhutan | Broadband in Bhutan is defined as “high speed access services that provide connection to the internet and to other information services, a minimum download speed of 512 kilobits per second (kbps)”. |
| India | “Broadband is a data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 512 kbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide Broadband service.” |
| Iran | 128kbps |
| Nepal | Nepal has not yet defined speed for broadband yet. It is to be noted that even the UNESCO-ITU Broadband Commission for Digital Development has refrained from defining the speed of broadband. Broadband is now a matter of experience and different types of services require different speed to experience it better.  |
| Bangladesh |  Very recently Bangladesh defined the broadband with minimum speed of 1Mbps for upload and download |
| **Q.** | **What are the wireless/Wired technologies being used to support broadband in your country?**  |
| Bhutan | Microwave, Wi-Fi, BWA, Satellite and ADSL |
| India | Microwave, Wi-Fi, BWA, Satellite ,ADSL, Cable TV, FTTx,3G,EVDO/CDMA,4G |
| Iran | Microwave, Wi-Fi, ADSL |
| Nepal | Microwave, Wi-Fi, BWA, Satellite ,ADSL, 3G(HSPA+)CDMA 1x |
| Bangladesh | Microwave, Wi-Fi, BWA, Satellite ,ADSL, FTTx,3G,EVDO/CDMA,4G,WiMAX,LTE-in line to launch |
| **Q.** | **What is Internet penetration for your country?** |
| Bhutan | 29% |
| India | 16% ( 238 mil) |
| Iran | >50% |
| Nepal | 30.7% |
| Bangladesh | 30% |
| **Q.** | **What is the broadband penetration for your country?** |
| Bhutan | 10% |
| India | 4.33%( 55.2 mil) |
| Iran | - |
| Nepal | Nepal has not measured broadband penetration as such, but evaluating from the technologies used for accessing Internet, the broadband penetration is very low compared to Internet penetration in general. |
| Bangladesh | 1% |
| **Q.** | **Is mobile broadband available in your country? If yes-which technologies are being used?**  |
| Bhutan | Yes, it is available ( 3 G and LTE) |
| India | Yes- 3G,4G,EVDO/CDMA |
| Iran | Yes-HSPA & 3G |
| Nepal | Yes- WCDMA, HSPA+, WiMax, CDMA 1X-EVDO |
| Bangladesh | Yes- WCDMA, HSPA+, WiMax, CDMA 1X-EVDO,3G,LTE |
| **Q.** | **What are the popular e-applications already implemented through a broadband service? List all applications.** |
| Bhutan | M- banking and M-prescription (e-health) |
| India | e-commerce, e-business, e-banking, e-ticketing, e-governance, e-health, e-learning, e-agriculture |
| Iran | - |
| Nepal | Nepal has developed an e-Government Master Plan, which lists a number of e-applications for providing government services to government departments, businesses and also to citizens. The projects in the pipeline are-Government Representative Portal ; National Identification System; Vehicle Registration system; e-Health; e-Drivers License; Passport; e-Agriculture; e-Customs; e-Procurement; e-Commerce; e-Educational Administration System; e-Authentication ; e-Tax; e-Land Registration System; Immigration Management System; National Unified Code System Development ; Enterprise Architecture ; NID/Citizen ;e-Gov. In Public Service Commission, etc. m-applications are also being developed from the public as well as private sectors for different services. |
| Bangladesh |  Bangladesh government took several initiatives to promote and introduce different kinds of broadband services to the mass. Services are like a government web portal, e-Tatthyakosh, e- Agriculture, e-procurement(specific Organizations), e- health, e-Education, e-Educational Admission System- Tax Return, e-banking, e-Marketing. There are many private firms who are developing m-application for the people by which people can easily use the broadband application services for their different needs. |
| **Q.** | **What broadband services and applications are available in local languages? Provide the applications and services and the corresponding local language.** |
| Bhutan | None, still developing. |
| India | Applications and services, provided by the State Governments under National e-Governance Plan, are available in the local languages in some of the States.  |
| Iran | e-payment, bazaar is similar to app store |
| Nepal | Nepal is an incredibly diverse country with respect to culture and language. There are 125 different documented languages spoken in Nepal. The primary language of Nepal is Nepali which has been the push of the King and government for about 50 years now. Up to about 50 years ago, each isolated area basically spoke their own language and had their own customs. Since the launch of a national educational program in Nepal in the 1950's, the majority (58.3%) of Nepali's speaks Nepali, but by no means is it consistent throughout the kingdom.The broadband services and applications as well as the contents are not much developed in local language except in Nepali and Hindi. |
| Bangladesh | There are very few broadband services which are developed languages. |
| **Q.** | **What are the initiatives taken to promote Broadband services and applications, especially e-applications focusing on e-government, e-health, e-businesses, e-learning in the rural areas? The initiatives could be from the government as well as non-government and private sector.** |
| Bhutan | Royal Government is working with ITU to develop mobile applications and undertaking human capacity building project designed to help Bhutan to successfully transition to a modern Knowledge Society in collaboration with the Government of India.  |
| India | National e-Governance PlanThe government has initiated the National e-Governance Plan, wherein many of the government services will be available to citizens online. Under **National e-Governance Plan (NeGP),** a massive countrywide infrastructure is evolving and large-scale digitization of records is taking place to enable easy, reliable access to the citizens. **The Government is in the process of implementation of** NeGP, comprising of **31** Mission Mode Projects (MMPs) encompassing 10 Central MMPs, 10 State MMPs and 7 Integrated MMPs covers various services from state and central departments (Table-1). State data centres in various states have either been commissioned or are in various stages of commissioning. Citizens will be getting the services delivered from various departments through State data centre or the data centres of the respective departments. Table 1: Mission Mode Projects

|  |  |  |
| --- | --- | --- |
|  Central MMPs | State MMPs | Integrated MMPs |
| * Banking
* Central Excise & Customs
* Income Tax (IT)
* Insurance
* MCA21
* [Passport](http://mit.gov.in/content/passport-immigration-visa)
* Immigration, Visa and Foreigners Registration& Tracking
* Pension
* e-Office
* Posts
* UID (Unique Identification)
 | * Agriculture
* Commercial Taxes
* e−District
* Employment Exchange
* Land Records
* Municipalities
* e- Panchayats
* Police
* Road Transport
* Treasuries
* Public Distribution System
* Education
* Health
 | * CSC
* e-Biz
* e-Courts
* e-Procurement
* EDI For e-Trade
* National e-governance Service Delivery Gateway
* India Portal
 |

Government of India also approved a scheme for setting up of 250,000 internet enabled Common Service Centers (CSCs) centers in rural areas under the National e-Governance Plan (NeGP) in a Public Private Partnership (PPP) mode. The CSCs provide high quality and cost-effective video, voice and data content and services, in the areas of e-governance, education, health, telemedicine, entertainment as well as other private services. A highlight of the CSCs is that it will offer web-enabled e-governance services in rural areas, including application forms, certificates, and utility payments such as electricity, telephone and water bills. In addition to the universe of G2C services, the CSCs are envisaged to provide a wide variety of content and services as listed below:• Agriculture Services (Agriculture, Horticulture, Sericulture, Animal Husbandry, Fisheries, Veterinary)• Education & Training Services (School, College, Vocational Education, Employment, etc.)• Health Services (Telemedicine, Health Check-ups, Medicines)• Rural Banking & Insurance Services (Micro-credit, Loans, Insurance)• Entertainment Services (Movies, Television)• Utility Services (Bill Payments, Online bookings)• Commercial Services (DTP, Printing, Internet Browsing, Village level BPO).As on 31st March 2014, a total of 1,33,847 CSCs are operational in thirty one States/Union Territories (UTs). Technology Development for Indian LanguagesDepartment of Electronics and Information Technology has initiated Technology Development for Indian Languages (TDIL) Programme to develop information-processing tools to facilitate human machine interaction in Indian languages and to develop technologies to access multilingual knowledge resources. Objectives of TDIL are1. Research and Development of Technology, Software Tools and Applications for Indian Languages.2. Proliferation of Language Technology products and solutions.3. Development of Standards for linguistic resources, tools and applications for interoperability.Initiatives have been taken for long term research for the development of the following major areas: 1. Machine Translation System, using which data available in English can be translated to various Indian languages or data can be translated from one Indian language to other Indian language. Only limited Indian languages are in implementation mode.2. Optical Character Recognition System using which printed text matter can be converted in editable format.3. On-line Handwriting Recognition System using which handwritten data on a tablet device can be converted to editable format.4. Cross-lingual Information Access System using which, a user can enter queries in languages they are familiar with and retrieve the document in the same language, although the documents are originally created in another language.5. Speech Processing System, which uses local language digital text can be read out by machine (TTS) and spoken words in a domain can be recognized.The Department of Information Technology has commenced a national initiative called National Rollout Plan aggregated Indian language software tools and fonts. They are being made available through a web based Indian Language Data Centre. |
| Iran | - |
| Nepal | The government has already started the implementation of e-Gov Master plan developed as early as 2006. They are already listed with respect to Q7. The government is also developing a legal and regulatory framework as well as a national strategy for e-payment with the technical assistance of the World Bank. A number of isolated efforts is also seen in the development and use of different kind of e-services, but their sustainable and long lasting use has been limited |
| Bangladesh | Bangladesh Government has started to implement the Digital Bangladesh which is nothing but an e-Government master plan. In this context by the help of UNDP, government already implemented few services for the people under the project Access to information.Apart of this software firm are working and developing different kinds of broadband service for mobile broadband subscribers. |
| **Q.** | **Due to socio-economic as well as cultural similarities in the SATRC member countries, how can we help each other in eenhancing BB applications and services in the member countries?** |
| Bhutan | One of the most important factors would be to develop local content in local language based on the demand of the local people. It could be designed with people –centric rather than a government push project. Secondly, educate people and develop human capacity to consume broadband application as well as to develop such application. |
| India | Some member countries have developed and implemented strategies for enhancing adoption of broadband applications and services. Sharing of experiences on various aspects of developing, implementing these strategies among member countries will be very useful.  |
| Iran | - |
| Nepal | One of the major bottlenecks in the enhancement of BB applications and services is the lack of local content. In many cases, most of the major languages spoken in the SATRC region are common to multiple countries. We can strategically work in identifying the common content requirements in line with the common language we use. Such initiative will be sustainable and will also produce economies of scale. |
| Bangladesh |  |
| **Q.** | **What are the major challenges faced in the deployment of broadband services/applications?** |
| Bhutan | 1) Major challenge is the lack of local content that would provide much benefit to local people. 2) Cost of accessing such services: right now, the cost of accessing broadband services in most of the SATRC countries is much higher than the average income of the people.  |
| India | • Availability of applications in local languages• Lack of coordination among various Government agencies• Ensure relevance of service by understanding consumer needs• Generating consumer awareness• Ensuring interoperability of applications across operating systems/network architecture so as to not incur incremental set-up costs. |
| Iran | The limitation of speed, providing local content & application, cost of services |
| Nepal | * The government /regulator are yet to come up with a broadband policy and associated broadband plan.
* The apparent lack of high level coordination within the government agencies has not only caused jurisdictional issues but also caused duplication of investment.
* Nepal lacks support infrastructure, especially – the power requirement for broadband enabled devices are not available all the time.
* PC penetration is very low
* Local contents not yet available for wider use
 |
| Bangladesh | * Lack of broadband infrastructure.
* Lack of local language content.
* Low broadband penetration rate.
* Lack of digital literacy because most of the people don’t know how to use a broadband service.
 |
| **Q.** | **What specific interventions are required on the part of the government and or regulator to enhance the availability, affordability and utilization of broadband services and applications?** |
| Bhutan | 1) If possible, the government should subsidize some of the access of broadband services, especially e-governance application in un-economical areas through the use of USF. 2) Build more broadband access point in the rural and un-economical areas so that people could have easy access to broadband services.  |
| India | * Formulation of Broadband Policy for creating countrywide broadband core network, which can be shared by broadband service providers. This shared network can help in reducing the cost of broadband.
* Facilitating use of access technologies like Wi-Fi by identifying additional license exempt frequency bands
* Ensure availability of affordable PCs and other access devices
* Creating awareness among masses especially in rural & remote areas regarding benefits of broadband services and applications. For this purpose Public service centers can be established in rural areas, where people can access broadband services. Once people experience benefits of broadband through shared service centers, they will tend to adopt broadband at individual level also.
* Ensuring that all the citizen services provided by Government are available online.
* Provide Incentives for developing applications and services in local languages
* Establish incubation centers with the help of private sector for developing applications and services in local languages
 |
| Iran | Supply and granting clear frequencies, incentive policy for tariffs and revenue sharing  |
| Nepal | The government needs to give the highest priority for ensuring availability of broadband services through specific measures such as-* Formulate and implement broadband policy
* Develop a broadband master plan and implement it
* Mandate all government agencies to provide services through the Internet
* Subsidize the availability of alternative source of energy to power broadband equipments
* Implement projects such that the government becomes the major user, buyer and provider of e-m-services for citizens and businesses etc.
* Use USF for developing broadband networks, services, applications and contents
 |
| Bangladesh | • Encourage use of education in schools to promote digital literacy• Encourage and train small and medium enterprises on the benefits of broadband services.• Support secure e-transactions/e-banking/m-banking• Lower user terminal service costs by reducing import duties and other taxes or through targeted subsidies• Support local, relevant internet content in local languages• Create more user friendly e-government and other e-applications (such as for health, education, and agriculture) |

**6.3 Challenges for Developing Future Applications**

There are a number of significant challenges for developing future broadband applications in addition to the lack of broadband availability and adoption. These are largely problems of global network architecture and design, but they are also problems focused in low–income urban and rural areas where residents are unfamiliar with technology and do not necessarily see its relevance to their daily lives. This is not meant to be an exhaustive list of all challenges but a beginning point for further discussion. Significant challenges to developing broadband applications include:

* *Limited access to capital:* A major goal for projects like Google’s and Chattanooga’s is to match investors with entrepreneurs. While initial responses to both projects are strong, it is unknown whether the real impact of either of these projects will be in actually developing applications for use. In fact, investors could view any failures from these projects as reasons not to invest in broadband application development
* *ISP network limitations:* ISPs are not necessarily supportive of efforts to develop applications that use more bandwidth. Applications that utilize large amounts of bandwidth place great strain on networks. ISPs already expend significant resources to alleviate network bottlenecks and are reluctant to use more resources on developing robust broadband networks for users in currently underserved areas without seeing the likelihood of future profits.
* *Technical engineering:* Designing and implementing sophisticated, bandwidth–heavy applications requires new network architectures and the development of appropriate protocols.
* *Social resistance:* Technology adoption in general is often met with resistance for various reasons. Professionals, such as teachers and doctors, do not always see a benefit in adopting new methods or practices to replace tested methods and practices. End users do not necessarily see the personal relevance of broadband applications without experiencing those benefits firsthand.

While there are certainly many organizations and institutions dedicated to developing applications that justify connection upgrades from current services, the challenges listed present significant issues for computer and network engineers, as well as software developers, retailers, and ISPs.

**Chapter 7**

**Conclusion and Recommendations**

**7.1 Conclusion**

In one hand the governments and regulators are working on building economically sustainable robust broadband infrastructure enabling people to best utilize the transformative potential of broadband and on the other hand there are also barriers for broadband adoption. Digital divide that exists and manifests in various dimensions such as rural-urban, age group, rich-poor, able versus disable, gender related etc is one of the major barrier for broadband adoption. The other barrier is relevance.

Access to content that is relevant to users helps to drive broadband uptake. This includes access to popular global sites as well as the development of local content including e-government applications.

Government can be a driver of increased broadband penetration and adoption through its own ICT activities including the development of online applications to facilitate citizen interaction. Content offerings from operators and emergence of “App Store” models provide a conducive environment for development of broadband ecosystem. When enough players enter a country disruptive competition takes place yielding business models that enable affordable mobile broadband, especially when voice revenues are declining. Mobile broadband has become very popular. Spectrum is the primary resource required for mobile broadband that is not within the control of the operators.

**7.2 Recommendations**

As done for broadband infrastructure development, governments and regulators need decisive interventions to ensure adoption of broadband services through the development and making available appropriate applications and services. To make use of mobile broadband, the governments and regulators should make available the spectrum resources in a timely manner. Digital dividend band needs to be made available for faster and economic availability of broadband services in the rural and remote areas.

The governments can be a major source of application and content. All G2G,G2B and G2C services should be made available online and facilitate transactions through promulgation of appropriate laws and institutional framework. The governments through the use of appropriate business models such as Public private partnership and multi-stakeholder partnership introduce all kinds of e/m-services including e/m-health/medicine,e/m-learning/education, e/m-government,e/m-commerce/business services with priority. Compelling and useful local contents in the local language is a must for attracting people to adopt broadband services. Special initiatives need to be taken to develop locally relevant content in the local language.

It is recommended that the government and the regulator should always create competition in the market by facilitating entry. Ensure that availability of spectrum is not a barrier. The governments and regulators should make this available early, and on a non-discriminatory basis, regardless of the allocation method. This is doubly important for developing nations, because most don’t have wide-spread copper networks (or copper connections of sufficiently high quality to run xDSL).

The government initiated specific ICT projects create enthusiasm and energy for ICT enabled development. This creates an ecosystem of innovation and even energizes the private sector into action (due to the threat of the government becoming a major player in the sector). Therefore, if funds are limited, they are better spent on awareness building and promotion at the nationwide level, than on individual projects, which may or may not succeed.

“Light touch regulation” in the early stages is recommended.

The race to the bottom with prices, though desirable for consumers when the market growth is slow should not be encouraged by the regulators.

**Annex-Questionnaire on Applications and Services in Broadband Networks**

**Country Name: [ ]**

1. Do you have any separate regulation /Policy/Plan for Broadband?

[] Yes [] No

If yes provide the link for the document.

1. What is the definition of Broadband for your country? Specify in terms of speed (uplink/downlink) and other requirements.
2. What are the wireless/Wired technologies being used to support broadband in your country?

[ ]  Microwave

[ ]  Wi-Fi

[ ]  BWA

[ ]  Satellite

[ ]  ADSL

[ ]  Dial Up

[ ]  Others <please explain here>

1. What is Internet penetration for your country?
2. What is the broadband penetration for your country?
3. Is mobile broadband available in your country? If yes-which technologies are being used?
4. What are the popular e-applications already implemented through a broadband service? List all applications.
5. What broadband services and applications are available in local languages? Provide the applications and services and the corresponding local language.
6. What are the initiatives taken to promote Broadband services and applications especially e-applications focusing on e-government, e-health, e-businesses, e-learning in the rural areas? The initiatives could be from the government as well as non-government and private sector.
7. Due to socio-economic as well as cultural similarities in the SATRC member countries, how can we help each other in enhancing BB applications and services in the member countries?
8. What are the major challenges faced in the deployment of broadband services/applications?
9. What specific interventions are required on the part of the government and or regulator to enhance the availability, affordability and utilization of broadband services and applications?