

नेपालको Broadband Policy तर्जुमा गर्ने सम्बन्धी सूचना

नेपालमा इन्टरनेट सेवाको शुरुवात भएको दशौं वर्ष भइसके पनि हालसम्म Broadband Policy तयार भइ नसकेकोले कति Bandwidth तथा कुन कुन प्रविधिलाई Broadband भन्ने हो, कुनै परिभाषा भएको छैन । त्यसैले नेपाल दूरसञ्चार प्राधिकरणले Broadband Policy तयार गर्ने उद्देश्य लिइएको र सो बमोजिम यस प्राधिकरणबाट तयार पारिएको Framing Broadband in Nepal नामक Consultation Paper यस प्राधिकरणको वेभसाइट www.nta.gov.np मा राखिएको छ ।

यस सम्बन्धमा कुनै राय, सुझाव तथा प्रतिक्रिया भए सम्बन्धित सेवा प्रदायक, विज्ञ एवं अन्य सरोकारवालाहरुले २०६६ बैशाख ३१ गते (तदनुसार मे १४, २००९) भित्र यस प्राधिकरणको निम्न ठेगानामा उपलब्ध गराइ सहयोग गरिदिनु हुन अनुरोध गरिएको छ ।



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**Nepal Telecom Authority
Broadband Policy Development Committee**

Framing Broadband in Nepal

Magh 26, 2065

Acronyms

2.5G	Transition technology from 2G to 3G
2G	Second Generation
3G	Third Generation
ADSL	Asymmetric digital subscriber line
AEC	Agro Enterprise Center
AM	Amplitude Modulation (high frequency radio)
BCI	Behavior and Communication Intervention
BW	Bandwidth
CBO	Community Based Organization
CDMA	Code Division Multiple Access
DOI	Digital Opportunities Initiative
DS	Digital Signal
DSL	Digital Subscriber Line
EDGE	Enhanced Data GSM Environment
ENRD	E-Net Research and Development
EU	European Union
FCC	Federal Communications Commission
FDDI	Fiber Distributed-Data Interface
FIT Nepal	Forum for IT Nepal
FNCCI	Federation of Nepalese Chambers of Commerce and Industries
FTTH	Fiber to the Home
GDP	Gross Domestic Product
GPRS	General Packet Radio System
GPS	Global Positioning System
GSM	Global System for Mobile Communication
HLCIT	High Level Commission for Information Technology
HSCSD	High-Speed Circuit-Switched Data service
HSSI	High-Speed Serial Interface
IBM	International Business Machines
ICT	Information and Communication Technology
ISDL	ISDN Digital Subscriber Line
ISDN	Integrated Services Digital Network
ISM	Industrial, Scientific and Medical
ISP	Internet Service Provider
IT	Information Technology
ITU-T	ITU Telecommunication Standardization Sector
LAN	Local Area Network
MEDEP	Micro Enterprise Development Project
MFI	Micro Finance Institution
MoAC	Ministry of Agriculture and Cooperatives

MoEST	Ministry of Environment, Science and Technology
MoIC	Ministry of Information and Communication
MoLD	Ministry of Local Development
NARC	National Agriculture Research Council
NEA	Nepal Electric Authority
NGO	Non Governmental Organization
NITC	National IT Center
NTA	Nepal Telecommunication Authority
NTC	Nepal Telecommunication Company
OECD	Organization for Economic Cooperation and Development
PAF	Poverty Alleviation Fund
PC	Personal Computer
PCP	Private Community Partnership
POP	Point of Presence
POTS	Plain Old Telephone Services
PPP	Private Public Partnership
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RISP	Rural ISP
RTCC	Rural Telecenter Coordination Committee
RUPP	Rural Urban Partnership Project
SDH	Synchronous Digital Hierarchy
TA	Type Approval
TAI	Technology Achievement Index
TD-SCDMA	Time Division-Synchronous Code Division Multiple Access
ToR	Terms of Reference
UMTS	Universal Mobile Telecommunications Service
UNDP	United Nations Development Project
USAID	United States Aid for International Development
VDC	Village Development Committee
VoD	Video on Demand
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WCDMA	Wideband CDMA
WiMAX	Worldwide Interoperability for Microwave Access

Notes:

- The terms "Broadband" and "Bandwidth" are double quoted throughout the document to indicate they are being officially adopted in Nepal.
- Although BW is normally used as an acronym to bandwidth, double quoted unabbreviated term is used throughout the document.
- When contextually appropriate, ICT, Internet and "Broadband" are used interchangeably.
- Although the policy document is drafted in Internet's context, it is not explicitly stated throughout the text.
- Exchange rate: 77 NPRs = 1 USD.
- "Rupees" implies Nepali currency and is used either before or after numeric representation of amount in question.
- Unless otherwise stated, the term "Bandwidth" implies overall speed of internet connectivity and not the Throughput.
- ICT4D is used to denote ICT for Development.
- ICT services and eServices are used interchangeably.
- eServices implies e-Health, telemedicine, e-commerce, VoIP, e-education and other electronic based services.
- Acronyms and letters that identifies some technology but do not have full forms are not included in the Acronym list.

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1. Background

a. Introduction

According to Newton¹, information technology (IT) is “a fancy name for data processing”. It implies a system, computerized or manual, comprised of all necessary auxiliary equipments and processes and procedures involved to support information system for any particular purpose.

More than often, the terms IT and information and communication technology (ICT) are used interchangeably without any reservation. ICT, to be precise, was coined to reflect the seamless convergence of digital processing and telecommunications. ICTs, in contrast to IT, on the other hand includes hardware, software, power and users’ interaction to generate, process, store and manage information; and to exchange it between one source to one or multiple destinations. Although ICT is generally understood as a digital system, non-digital devices such as older radios and televisions, on their own rights, are also tools that constitute ICTs.

When compared to other nations that have adopted ICT, Nepal boarded the bandwagon much later. The first telephone was connected in 1913, followed by installation of first telegram service and high frequency radio system (AM) in 1950. Public phone service followed 42 years later in 1955.

Introduction of personal computer (PC) in the country coincided with telex services in 1971. Only in 1983, digital telephone exchange replaced the older analogue system. After 13 years, in 1996, all voice transmission links were finally converted to digital standard and entire telephone network was automated.

Very Small Aperture Terminal (VSAT), a wireless satellite technology, was integrated in 1996 but was limited to voice services only. The wireless cellular telephony, Global System for Mobile Communication (GSM), was received with high demand in 1999. The following year in 2000—eleven years later from the date of first² commercial Internet³ (dial-up through public switched telephone network, PSTN, circuit) service in the United States was launched—first Internet service was launched in the country (refer to Annex I for telecom/ICT services availability chronology).

As of 2008, tele-density of both mobile and fixed telephony is 14.11% and lags behind that of Bangladesh with 16%. The statistic in the country will rise up as the government has proposed to implement “Mobile in each hand and Internet in each house⁴”, a New Nepal ICT initiative, to cover all 3915 Village Development Committees (VDCs) in foreseeable future. Despite this aggressive initiative, Internet usage is significantly low in the country: 3 in every thousand compared to 49 in south Asia region and 44 in low income countries in general⁵.

The major reasons behind country’s prevailing low tele-density and Internet usage rate is five fold: 1) landlocked between China and India, the most competitive regions in the world in terms of IT industry;

¹ Newton, H. Newton’s Telecom Dictionary, 18th edition, Yew York, 2002.

² In 1989, three commercial Internet service providers (ISP) were created: UUNET (<http://en.wikipedia.org/wiki/UUNET>), PSINET (<http://www.psi.net>) and California Education and Research Federation Network (CERFNET).

³ In its generic sense, *internet* is a common noun, a synonym for internetwork; therefore, it has a plural form and is not to be capitalized. In its specific sense, it is a proper noun, and therefore, with article, without a plural form, and with capitalization (Wikipedia).

⁴ Translated from “Haath haaath ma mobile ghar ghar ma Internet”. In Nepali: “हात हात मा मोबाईल घर घर मा ईन्टरनेट” with reference to Policy and Program proposal, 2007 .

⁵ NTA, 2007.

2) low literacy and ICT awareness rate in peri-urban and rural areas; 3) difficult terrains; 4) poverty; and 5) internal conflict that lasted more than a decade. These are the very reasons, however, why the country should adopt a rapid expansion of ICT infrastructures by scaling up existing setup or integrating new technologies and provide bandwidth much higher than that of a dial-up service; thereby making all three—voice, data and multimedia (graphics, video and audio)—services readily available through out the country. These services can play key roles in linking isolated rural villages to each other and to rest of the world, providing access opportunities to government services and tying their socio-economic activities with it to identify better opportunities beyond their immediate geographic boundaries.

b. Bandwidth

“Bandwidth” is the “capacity” of guided or unguided channel which carries signals in certain time frame. Best way to understand this is to illustrate it as water pipeline—or pipe—connected to any house hold. The amount of water flowing through the pipe is dictated by its internal circumference. This is the capacity of the pipe. How much water flowed through the pipe in a certain timeframe can be looked at as rate of water flow. Now replace water with digital data and the pipe with the technology (with its corresponding capacity) used, such as dial-up, Leased-line, asymmetric digital subscriber line (ADSL), and so on. The rate of water flow now is the rate of data flow, or data-rate; capacity is the “Bandwidth” of the technology used (please refer to Annex II for data-rate of different technologies); and water pipeline is the “transmission channel⁶”.

The rated throughput data-rate of PSTN dial-up services is 56 Kbps⁷. If a digital file is 1 Kilo bits in size, based on the data-rate, it would take one second to get from one point to the other. However, a transmitting system should include ‘overhead’ information: such as destination address (like physical mail requires delivery address) and routing (through which way, or route, to send the data bits) and other error checking information. Hence, data contains digital bits (1’s and 0’s) of many kinds—not all are actual payload, meaning, not all of the bits are those that make up a text file or a picture that is being sent. In fact, most of the time the payload bits are very few compared to that of the total, which includes a lot of ‘overhead’ bits. As a result, in case of dial-up services, one Kilo bits of file will take actually more time than a second to reach to the destination when it is sent.

Table 1 – Application and recommended Bandwidth

Speed, Kbps	64	128	256	512	1,024	2,048	4,096
Transaction Processing	A	A	A	A	A	A	A
Messaging/Text Apps	A	A	A	A	A	A	A
Voice	P	A	A	A	A	A	A
Still Image Transfer	A	A	A	A	A	A	A
Internet/VPN Access	P	A	A	A	A	A	A
Database Access	P	A	A	A	A	A	A
Enhanced Web Surfing	P	A	A	A	A	A	A
Low Quality Video	N	A	A	A	A	A	A
Hi-Fi Audio	A	A	A	A	A	A	A
Large File Transfer	P	A	A	A	A	A	A
Moderate Video	N	P	A	A	A	A	A
Interactive Entertainment	N	P	A	A	A	A	A
High Quality Video	N	N	P	A	A	A	A

(Source – Tallied from Broadband Strategy for Egypt and available data in the Internet)

A = Acceptable Quality

P = Poor Quality

⁶ Transmission channel can be either guided wire-line or wireless or combination of both.

⁷ Kbps, Kilo bites per second. Not to be confused with Kilo Bytes per second. If “Bytes” is used then the abbreviation will be KBps, note the capital ‘B’. ‘Speed’ is also used in common lingo to describe this.

N = Not acceptable

A recently introduced term, 'Goodput' is also useful in establishing the throughput of a network. 'Goodput' is the the number of useful bits per unit of time forwarded by the network from a certain source address to a certain destination, excluding 'overhead's listed below:

- Forward error control and preamble (including redundant information—error detection and correction);
- Addressing/routing and acknowledgment packets;
- Retransmissions of failed packet transmissions;
- Control information; and
- Bandwidth degradation due to network problems/glitches.

Bandwidth consideration is essential in network designing and particular applications that are to be run with it. Table 1 lists few applications and corresponding minimum bandwidth requirements.

2. Scope of the Committee

With a view to recommend Nepal Telecommunication Authority (NTA), the nation's regulatory body, on "Broadband" policy, under recommendation and decision of NTA, a working committee was formed on December 2nd 2008 with the following individuals:

- | | | |
|------|------------------------------------------------------------------|------------------|
| i. | Mr. Tikajit Rai, ICT expert, Mangus Consulting Group Pvt. Ltd. | Lead Coordinator |
| ii. | Mr. Anup Nepal, Ministry of Information and Communication (MoIC) | Member |
| iii. | Mr. Surendra Lal Hada, NTA | Member secretary |

Scope of work includes following:

- i. Identify relevant literature on global "Broadband" policies, frameworks and trends;
- ii. Study and analyze ICT services that exist in Nepal;
- iii. Develop a framework based on information collected and analyzed; and
- iv. Conduct consultations with concerned government agencies, voice operators, ISPs and general public.

3. Scope and Objective of the Consultation

Objective of the consultation is three fold:

- i. Consult with concerned sectors: 1) Nepal Government; 2) Voice Operators; 3) Internet Service providers on policy draft in questions;
- ii. Integrate comments, suggestions, feedback on the policy draft in question in final document; and
- iii. Based on the outcome of consultation, recommend NTA on relevant subject matters.
(Note: copy of this document will be posted at NTA's website for other sectors.)

4. Global Trend

4.1 Organization for Economic Cooperation and Development

Organization for Economic Cooperation and Development (OECD⁸), in the context of data-rate in accessing the Internet, defines "Broadband" as "...downstream access 256 Kbps..."

4.2 EU

In 2002, EU drafted an ambitious plan to transform itself into eEurope. It argued that "a widespread 'Broadband' infrastructure is essential for the development and delivery of services and applications such as eHealth, eBusiness, eGovernment and eLearning, making "Broadband" crucial to European growth and quality of life in the years ahead". In its "Broadband" policy, EU reflects: "The term 'Broadband' is often used to describe a broad set of technologies offering data rates that can vary widely. A distinction is usually made between higher bandwidth (services at speeds greater than 384kbits/s), current generation broadband (speeds of 2Mbit/s and over) and next generation broadband (speeds of 10 Mbit/s and over). An average "Broadband" connection is currently said to be 25 times faster than a dial-up connection". With this reference, the average "Bandwidth" requirement for "Broadband" is 1.6 Mbps.

4.3 ITU

The ITU Telecommunication Standardization Sector (ITU-T) defines "Broadband" as a transmission rate faster than the primary rate of Integrated Services Digital Network (ISDN). This translates into 1.544 Mbps in North America and 2.048 Mbps in most of the other countries.

4.4 Federal Communications Commission

Federal Communications Commission (FCC) has categorized Local Area Network (LAN) and Wide Area Network (WAN) as reference to define "Broadband", rather differently: "In WAN domain, 'Broadband' is an imprecise term referring to a circuit or channel providing a relatively large amount of 'Bandwidth'....The U.S. Federal Communications Commission (FCC) does not define 'Broadband', but defines high-speed services as supporting a data rate of at least 200 kbps in at least one direction and advanced telecommunications capability as at least 200 kbps in both directions". It, however, states that "Asymmetric Digital Subscriber Line (ADSL) generally is described as a 'Broadband' access technology, even though many ADSL services operate at less than 1.544 Mbps (known as T1 rate) and 2.048 Mbps (known as E1 rate), respectively. In this context, ADSL certainly operates at much higher rates than the predecessor modem technology (which operates at narrowband rates of less than 64 kbps). Relatively speaking, ADSL is 'Broadband' in nature, even at very low transmission rates".

4.5 Pakistan

Pakistan defines it as "an always-on Internet connection with a download speed of at least 128 Kbps connectivity" with a provision to increase the data-rate as the cost of "Bandwidth" decreases, local content becomes available and there is a general increase in awareness of broadband.

4.6 India

India defines it as "an always-on data connection that is able to support interactive services including Internet access and has the capability of the minimum access and has the capability of the minimum download speed of 256 Kbps to an individual subscriber from the Point of Presence (POP) of the service provider intending to provide 'Broadband' service where multiple such individual connections are aggregated and subscriber is able to access theses 'interactive services' including the Internet through this POP. The interactive services will exclude any services for which a separate license is specifically required, for example, real-time voice transmission, except to the extent that is presently

⁸ OECD (<http://www.oecd.org>).

permitted under ISP license with Internet telephony". Aforementioned 'interactive services' include tele-education, tele-medicine, e-governance, entertainment as well as employment generation by way of high speed access to information and web-based communication.

4.7 Bangladesh and Bhutan

Nepal's close South Asian neighbors, Bangladesh and Bhutan have not introduced "Broadband" policies as of today.

5. The framework in Nepal's context

When local Internet service providers advertise their business propositions by packaging it as "Broadband", there is no telling what it really means to even ICT savvies; let alone to those who are ICT illiterate. We hear local ISPs saying "dedicated" services⁹ over either wire-line (Cable TV line for example) or wireless. Except for ISPs themselves, there are not any existing mechanisms that are exercised to determine and verify how much water (recall illustration in earlier section) flows in these different types of pipes.

In the context of Internet, the term "Broadband" will identify minimum speed in Kbps—uplink and downlink—wherever the service is offered and will guarantee QoS—throughput on a shared or dedicated basis—on services that service provider offers. With this reference, if a telecenter for example claims to have a "Broadband" Internet (or service) then it should qualify with the criteria defined by the "Broadband" policy. At present, use of the term "Broadband" in the country does not have any bearing with speed and quality.

On the other hand, Nepal should follow and adapt to technologies and policies that developed nations have embraced so that it can also rip off benefits of ICT integration.

6. Broadband policy framework

Following global trends and taking into converging ICT services, the framework is developed on the premise that Internet diffusion, or access to Internet, will have all three categories of services: 1) Voice; 2) Data; and 3) Multimedia.

6.1 Equity and access Vs. Growth and Innovation

For those nations which have long adopted "Broadband" standards and already have surpassed 1 Mbps thresholds, growth and innovation is crucial to further penetrate market base by providing value added—or bundled—cutting-edge services: such as 3G data services, mobile advertising, internet TV, on-line gaming and video sharing. In Nepal's context, equity and access should precede it.

6.2 Rural low-income households Vs. Urban high-income households

Based on UNDP Human Poverty Index (HPI), Nepal's is of 38.1. As about 80% of the population survives rural areas with majority below poverty level, the eServices should be catered to these low-income households. In comparison, high-income households in urban areas have, although limited, choices to Internet access and other ICT services.

6.3 Cost vs. eService Delivery, Content and QoS

Affordability depends on the demands of specific eServices. This could vary from simple agro-price information e-bulletin board to e-mail to e-commerce. In rural context, these eServices must first help

⁹ Dedicated implies that the "Bandwidth" provided is not "Shared" with any other in the network.

communities improve their economic status. To further fulfill the demand, continuous on-time eService delivery, development and accessibility of content and guarantee of QoS shall be crucial.

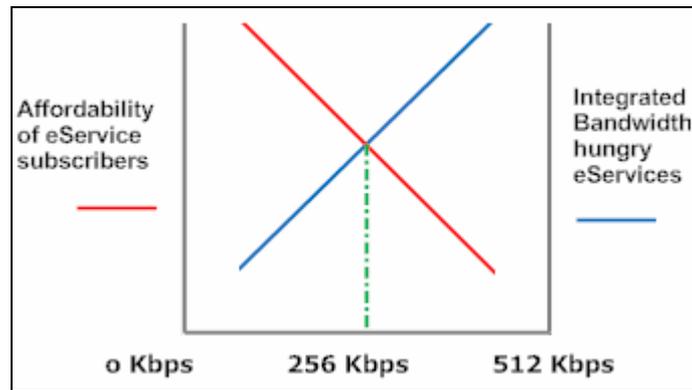


Figure 1 – Cross point

In general, dedicated 256 Kbps is required for ‘good’ service: experience wise, a good webcam conferencing would not be possible with “Bandwidth” less than 256 Kbps. In contrast, cost ceiling for the quoted “Bandwidth” needs to be considered: can a service provider can subscribe to this amount of “Bandwidth” in rural areas and become sustained?

6.4 Technology Neutrality

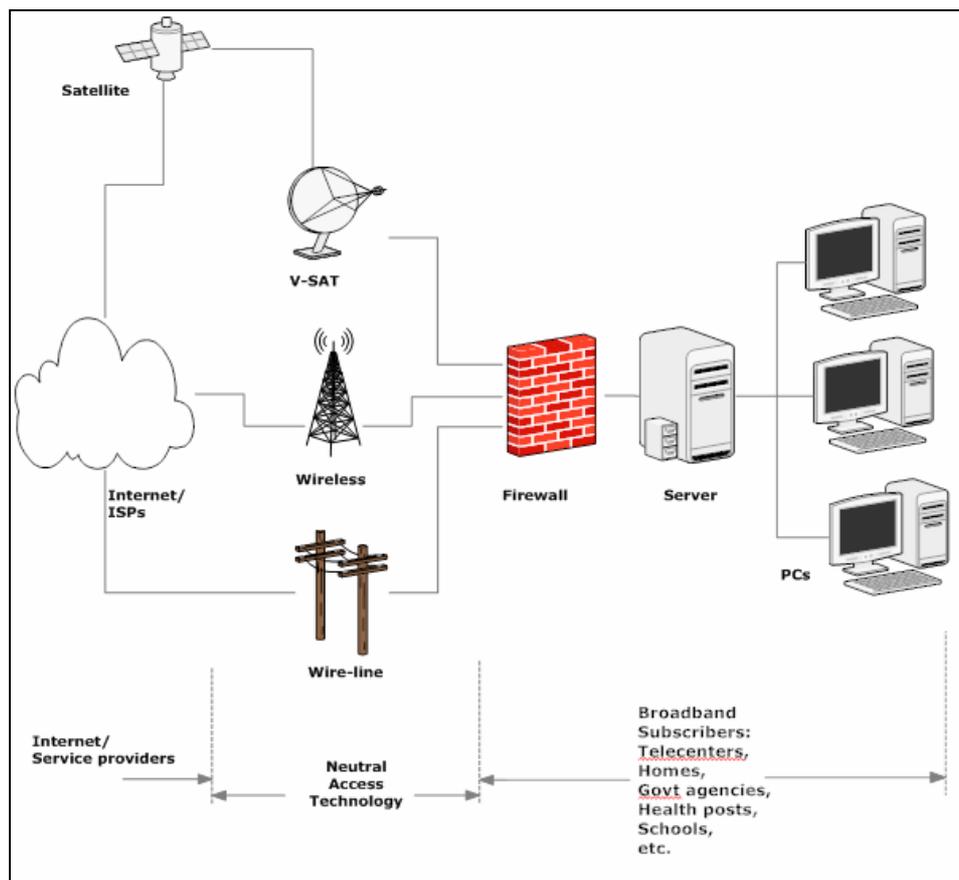


Figure 2 – Neutral Access technologies

Service roll-out, scalability, mobility and portability should be left to service providers. For both wire-line and wireless technologies government has licensing provision for different access technologies under

the categories. Therefore a technology-neutral (see figure 2) policy should be adopted by the nation to ensure there is an environment for open competition.

6.5 Facilitation and Promotion

Policy intervention and promotion should be top-down and government's top priority. As custom tax and license fees have been reduced, incentives from government should not be extended through such breaks. Rather, urgent policy amendments to create enabling environment for service providers to penetrate rural areas should take place.

Government sectors should mobilize VDC and postal offices and concerned officials there to introduce and promote "Broadband" and eServices. Other sectors should do it through Telecenters, branch offices, and CBOs.

6.6 What generation of Broadband?

Categorizing "Broadband" in terms of "Bandwidth" makes a logical sense considering good chance of price per bit coming down and need for policy amendment. Proposed "Broadband" framework should have label that reads "First Generation" or "G1" (see Figure 3). When speed surpasses certain mark, then it should be upgraded to G2 and so on.

6.7 Benchmarking QoS

In an effort to identify the speed and QoS with "Broadband", the "Broadband" service providers should get a certification (see Figure 3) from NTA based on customer's "Bandwidth" subscription verification. Services that do not comply with "Broadband" minimum requirement cannot be packaged or promoted as "Broadband" service.



Figure 3 – Broadband certification

Same should apply if the subscribers are, instead of individuals, homes and corporate and government offices, second-tier service providers, such as cyber cafes, telecenters, health posts, schools, VDC offices and PCOs. With label as shown in Figure 3, an individual can identify that the service provider is "Broadband" certified.

6.8 Broadband or Not?

Service providers have the flexibility of packaging both "Broadband" and non-"Broadband" services to its clients. Clients shall have the choice to make their decision based on their needs.

7. Recommendations by the committee

"Broadband" in Nepal is, irrespective of access technologies used, an always-on Internet connection with minimum upload and download speeds of 64 Kbps and 256 Kbps, respectively, to an individual subscriber from Point of Presence (PoP) of the service provider. The speed stated herein does not imply the 'throughput' to compensate for the applicable 'Overhead' bits.

The committed speeds shall not be on a shared basis and service provider should guarantee these minimum speeds to qualify as “Broadband” service provider.

8. Comments on the framework

Please, use Annex I to put your comments on “Broadband” framework.

9. Additional general comments/suggestions

10. Please, use Annex II to put your general comments/suggestions.

7. Benchmarking QoS

8. Broadband or Not?

9. Recommendation by the committee

Annex II

(Please, include your rationale behind each comment/suggestion)