Telecom Regulatory Authority of India

Recommendations

on

Regulatory framework for Internet Telephony

New Delhi

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Telecom Regulatory Authority of India
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CONTENTS

CHAPTER-I

INTRODUCTION

1.1 Telephony networks have in the course of time undergone major evolutionary changes, driven essentially by technological progress in various fields (switching, transmission, access and maintenance). The end purpose of a telephone network was always associated with the provision of a universal communication service with a certain quality. This has several implications for the technologies used and the mode of interconnection between sub-networks.

1.2 Every telephone operator throughout the world operates a sub-network of the global telephone network. In order to provide a universal communication service to all of their respective subscribers, they have an obligation to interconnect their networks and to agree on a single and coherent system for designating their subscribers. The quality-of-service requirement implies that adequate resources (circuit capacities, transmission speeds, and management arrangements) must be mobilized throughout the duration of a call in each of the sub-networks involved in the call between the two communicating parties. This has a bearing not only on the technology used to carry voice, but also, and more fundamentally, in the design of the logic incorporated in the network's active components (switches) and the language (signalling) they use to ensure proper routing of a call between two or more subscribers

1.3 The Public Switched Telephone Network (PSTN) has been supported worldwide as the primary means of voice communication. The legacy PSTN is a connection-oriented, circuit-switched network in which a dedicated channel (or *circuit*) is established for the duration of a call. Originally transmitting only analog signals, the PSTN has switched to

digital communication, which offered solutions to the attenuation, noise and interference problems inherent in the analog system. The modern PSTN uses Pulse Code Modulation (PCM) to convert all analog signals into digital transmissions at the originating network and reverses the processes in the receiving network.

1.4 In circuit switched networks, calls are routed through a hierarchy of several layers of exchanges. A circuit-switched network creates a dedicated path between two nodes in the network to establish a connection. The established connection is thus dedicated for the period of communication between the two nodes. It is based on the principle that a resource (circuit) must be reserved for a call from the time of its setting-up to its conclusion. The size of this resource – expressed as a bit rate since the digitization of telephone networks – is 64 kbit/s. This limit was chosen because it made for the efficient digitization of human voice samples, the spectrum of which lies between 300 and 3400 Hz. More recent voice coding techniques allow for a considerable reduction in the 64 kbit/s defined for a circuit; however, since this is the rate that is used in most of the active and transmission components throughout the global telephony network, it would be difficult to change it without incurring excessive costs and without jeopardizing one of the main qualities of that network: the universal service. As a case in point, one can mention that although modern wireless GSM networks use an encoding that consumes as low as 8 kilobit/s on the radio part, this is transformed to a 64 kbit/s encoding when voice reaches the mobile switches.

1.5 Although highly rated for reliability and Quality of Service (QoS), Circuit Switched Networks have two significant disadvantages:

(a) Expensive bandwidth, which results in high cost for the telecom service providers as well the users of telecom services.

(b) Inefficient use of networking channels, which results from dedicating an entire channel for each conversation.

1.6 Packet Switched Networks offer solutions to such problems and are increasingly being used as alternative to the traditional circuit switched telephone service. Major Telecom Service Providers (TSPs) in India have implemented Internet Protocol (IP) based core transport network for carrying voice and data traffic, by deploying IP/Ethernet elements extending into access and aggregation networks. The high costs of maintaining legacy networks alongside the requirement to upgrade to intelligent networks with inherent monitoring and adaptive capabilities are the key reason for the growing adoption of IP based Network. The present world scenario indicates that IP has become a ubiquitous means of communication, and the total volume of packet-based network traffic has surpassed traditional circuit switched network traffic.

1.7 The use of IP-based networks continues to grow around the world due to the multitude of applications it supports and particularly due to Voice over Internet Protocol (VoIP). IP-based networks are capable of providing real-time services such as voice and video telephony as well as non real-time services such as email and are driven by faster Internet connections, widespread take-up in broadband and the emergence of new technologies.

1.8 VoIP enables users to make real time voice calls, transmitted over packet switched network using the Internet Protocol. VoIP enables network operators, service providers, and consumers to make significant savings, by reducing the underlying costs of a telephone call. VoIP uses network resources much more efficiently than conventional telephone service, reducing the cost of providing a call (albeit with the loss of some call quality and service features), and, creating opportunities for regulatory arbitrage that enable TSPs and consumers to reduce or avoid

call charges. The volume of VoIP traffic is growing rapidly and the potential exists for packet switched, Internet Protocol networks to become the primary medium for most voice and data services.

1.9 The terms 'IP Telephony', 'VoIP', 'Internet Telephony' and other variants often generate confusion as there are many different definitions used by various organizations. Some use them interchangeably while others give them distinct definitions. Further confusion is caused by using the terms to refer to both the IP-based technologies and the services that are enabled by these technologies.

1.10 Internet Telephony can be deemed to be a subset of Voice over IP, in the sense that, when voice is carried over an IP network it can be termed as Voice over IP. And if the IP network in this case is the public Internet then it can be called Internet Telephony. The primary difference between voice services on managed and unmanaged IP Networks is in quality of speech. However, this difference is getting narrower with technological advancement, new coding techniques and availability of higher bandwidth broadband connections.

1.11 The existing licensing framework in India has been effective and has contributed to growth of telecom sector. However, fast technological development, convergence of networks, services and end-devices is blurring the boundaries of scope of services among different licences. Rapid changes are taking place worldwide with respect to business models, service delivery platforms and regulatory frameworks to meet the challenges posed by the convergence.

1.12 The present licensing framework permits Basic Service Licensee, Unified Access Service Licensee (UASL), Cellular Mobile Telecom Service (CMTS) licensees and Unified Licensee (access service) to provide unrestricted Internet Telephony. These licences further permit that while providing

Internet Telephony Service, the licensee may interconnect Internet Telephony network with PSTN/PLMN/GMPCS network. Despite the fact that these licences allow to provide unrestricted Internet Telephony since 10 years, the Internet Telephony service has not taken off in the country. Perhaps understandably, as the existing operators do not wish to cannibalize their higher-margin services offerings.

1.13 With a view to bring out all the aspects of the relevant issues and to provide a suitable platform for discussion, TRAI issued a consultation paper on "Internet Telephony (VoIP)" on 22nd June 2016. The objective of the consultation paper (CP) was to identify issues in providing Internet Telephony Services and address them in a holistic manner. Some important issues like allocation of numbering resources for Internet Telephony, Interconnection, Interconnection Usage charges, Quality of Service and access to Emergency services were raised in the consultation paper.

1.14 Written comments on the consultation paper were invited from the stakeholders by 21st July 2016 and counter comments by 4th August 2016. On the request of some of the stakeholders, the dates were extended to 5th September 2016 for comments and 13th September 2016 for counter comments. This consultation elicited many responses. Comments were received from 34 stakeholders and counter comments were received from 6 stakeholders. Subsequently, a letter dated 26.12.2016 was received from DoT with a request to expeditiously submit the recommendations on Internet Telephony. An Open House discussion was also conducted on 12th January 2017 at New Delhi. Based on the written submissions of the stakeholders and the discussions in the open house the issues have been examined in depth and the recommendations have been framed.

1.15 This chapter provides a background to the subject. The technical aspects of Internet Telephony are covered in the second chapter. A detailed analysis of the issues raised in the consultation paper along with the responses given by the stakeholders is contained in the third chapter. Some peripheral issues raised by the stakeholders are also discussed in the same chapter. The responses were widely divergent and the Authority has taken a holistic view of the different facets of Internet Telephony service to arrive at the recommendations. The fourth chapter describes some of the global practices in Internet Telephony. The fifth chapter gives the summary of the recommendations.

CHAPTER II

TECHNICAL ASPECTS OF INTERNET TELEPHONY

A. Definition and Meaning

2.1 International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) Study Group 2 (SG2) issued the following explanation of the term "IP Telephony":

"IP is an abbreviation for Internet Protocol. It is a communications protocol developed to support a packet-switched network. The protocol has been developed by the Internet Engineering Task Force (IETF). IP telephony is the exchange of information primarily in the form of speech that utilizes a mechanism known as Internet Protocol."

2.2 The many different 'flavours' of IP Telephony provide, to varying degrees, alternative means of originating, transmitting, and terminating voice which would otherwise be carried by the public switched telephone network (PSTN). While the emergence of IP Telephony is often associated with the rise of the Internet itself, it is important to appreciate that IP Telephony often does not involve the public Internet at all – but rather only its underlying technology, the Internet Protocol suite.

2.3 Globally, there are primarily two methods for voice transmission over IP networks; based on type of IP network used. When voice is transmitted over public Internet, it is termed as Internet Telephony. Similarly when voice is transmitted over managed IP networks, it is termed as Voice over IP (VoIP).

2.4 Traditional telephony uses circuit-switching technology while VoIP uses packet switching. In circuit-switched networks, network resources are dedicated to the circuit during the entire conversation, and the entire information follows the same dedicated path. In packet switched networks, the message (voice data) is broken into packets, each of which

can take a different route to the destination, where the packets are recompiled into the original message. As such, packet switching is supposed to be a much more efficient and cost effective way of sending voice messages and data.

B. Evolution of Internet Telephony

2.5 The history of Internet Telephony began with conversations by a few computer users over the Internet. Initially, Internet Telephony required a headset to be plugged into the computer, and the participants could only speak with others who had a similar set up. They had to phone each other ahead or send a text message, in order to alert the user at the other end of the incoming call and the exact time.

2.6 As early as November' 77, the Internet Engineering Task Force (IETF) published the "Specifications for the Network Voice Protocol (NVP)". This was primarily aimed for supporting Advanced Research Projects Agency (ARPA) Network's Secure Communications project to demonstrate the feasibility of secure, high-quality, low-bandwidth, real-time, full-duplex (two-way) digital voice communication over packet-switched computer communication networks. However, actual growth of Internet Telephony started in mid-90's with the extensive growth in the use of personal computers. This was aptly supported by rise in deployment of IP Networks.

2.7 IP Telephony is used as a generic term for many different ways of transmitting voice, fax and related services over packet-switched IP-based networks. Internet Telephony is a form of IP telephony, which uses Internet Protocol (IP) for transmitting IP packets over Internet cloud. The basic steps involved in originating an IP telephone call are conversion of the analog voice signal to digital format (binary data) at subscriber premise itself and compression/translation of the data into IP packets for transmission over the Internet. The process is reversed at the receiving

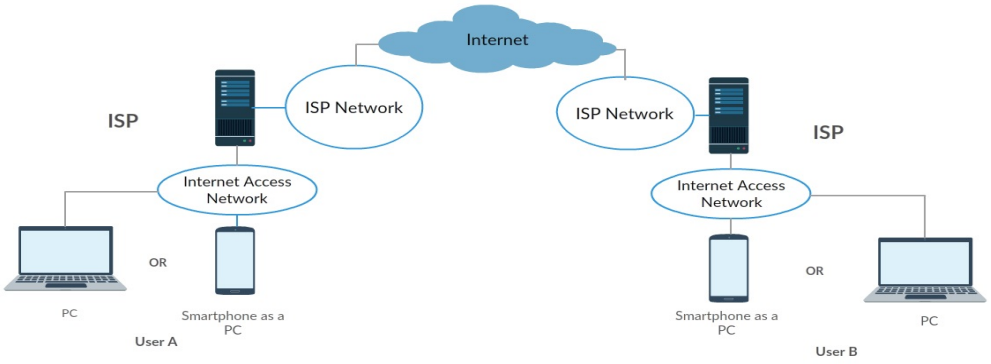
end. The communication usually takes place in real time. Thus, the main difference between IP Telephony and normal telephony is that while in normal telephony, circuit-switching technology is used (particularly in the access network), whereas IP Telephony is based on packet switching technology. As per present service models three main deployment scenarios for IP Telephony are possible:

- PC-to-PC Internet Telephony
- Phone-to-Phone over IP
- PC-to-Phone and Phone to PC Internet Telephony

The details have been discussed below.

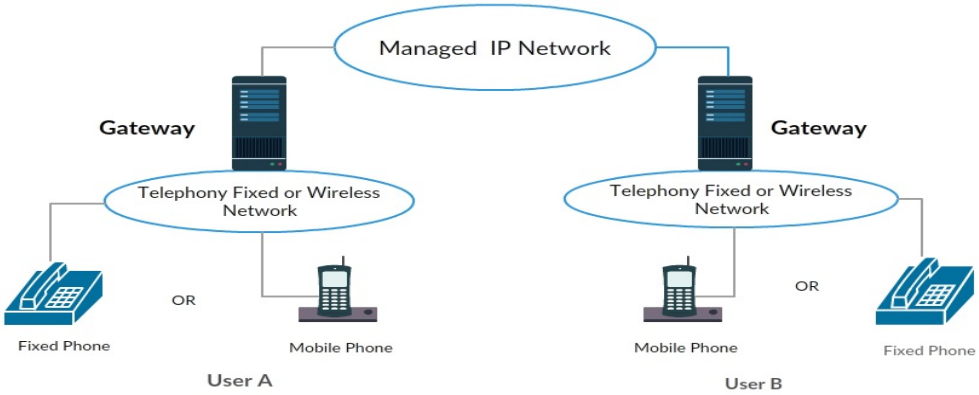
2.8 **PC-to-PC Internet Telephony**: In this scenario, the calling and called parties both have computers or similar devices that enable them to connect to the Public Internet (refer Figure1). Both end-users are able to establish communication (Data or voice communication) only by prior time fixation, as they have to be connected to the Internet at the same time and use compatible software. Presently, large numbers of VoIP applications are available on Internet to make PC-to-PC Internet Telephony possible. The Internet Service Provider (ISP)'s role in such scenario is limited to providing access to the Internet. The ISP network is transparent to such application used by the subscribers. The voice application used by the customer is transparent for the ISP, which takes no specific measures to guarantee the quality of the voice service but merely of the use of a voice application via the Internet. Today, PC equivalent devices like tablets or smartphones are available, which can also run such software supporting Internet Telephony. This type of Internet Telephony is permitted under existing ISP licence. It is also considered to be an 'Over the Top' (OTT) application service.

Figure 1: PC to PC Internet Telephony



2.9 **Phone to Phone over IP**: In this case, the calling and called parties are both subscribers to the public telephone network (fixed or mobile) and use their telephone set for voice communication in the normal way. There are two methods for communicating by means of two ordinary telephone sets via an IP based network. One or more telecommunication players have established gateways that enable the transmission of voice over an IP based network in a way that is transparent to telephone users. What we have in this case is not the Internet but a "managed" IP network, i.e. a network which has been dimensioned in such a way so as to enable voice to be carried with an acceptable quality of service. Such types of calls are not Internet Telephony calls. Figure 2 below illustrates such a scenario.

Figure 2: Phone to Phone over IP



In this scenario, the gateways and managed IP network could belong to different players, depending on whether we are looking at:

a) the purely internal use of VoIP within the network of a single telephone operator, which owns and manages the entire operation, handling both users A and B;

b) the provision of a long-distance voice service by a long-distance operator using VoIP technology (users A and B in this case belonging to different networks), in which case the whole operation belongs to and is managed by such a long-distance operator.

The present regulatory framework allows for this type of telephony and is normally termed as VoIP because the public Internet is not coming into picture.

2.10 **PC-to-Phone or Phone-to-PC Internet Telephony**: In this scenario, one of the users has a computer by which he connects to the Internet via an access network and an ISP while the other user is a 'normal' subscriber to a fixed or mobile telephone network(refer Figure 3).

PC-to-Phone

In this scenario User A has to use the services of an ISP to get connected to the Internet via the network of his ISP. Once connected, he uses the services of an Internet Telephony service provider (ITSP) operating a gateway which ensures access to the point that is closest to the telephone exchange of the called subscriber. It is this gateway that will handle the calling party's call and all of the signalling relating to the telephone call at the called party end. User A runs software (Dialer) installed at his PC (Equivalent device) to dial the number of the user B.

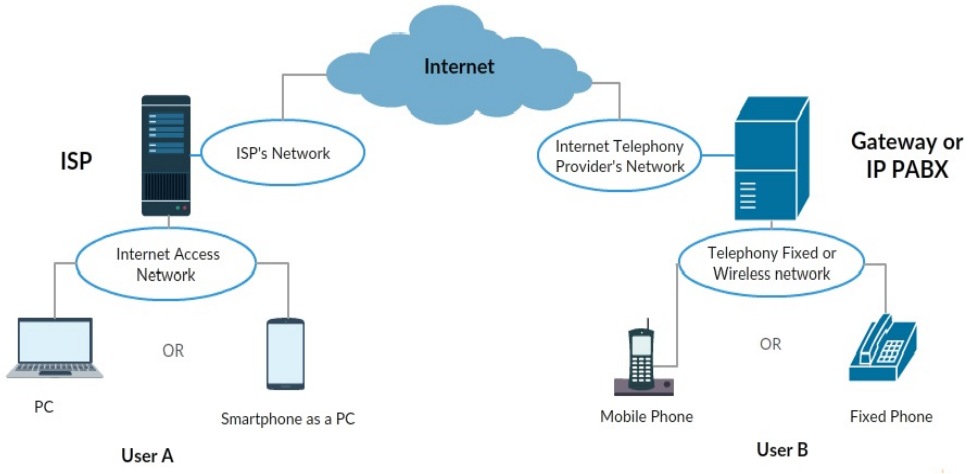
It should be noted that the ITSP provides a one-way PC-to-phone service and does not manage subscribers as such; in fact, the PC subscriber uses the ITSP's services solely for outgoing calls. It

should also be noted that the ITSP has a managed IP network, thereby ensuring a certain quality of service for voice as far as the gateway closest to the called subscriber, and that the ITSP also manages the interconnection with the latter's telephone operator. The provision of Internet access and provision of Internet Telephony service may be done by the same service provider or by different service providers, meaning thereby that the ISP and ITSP may be same or different.

Phone-to-PC

In this case, the calling party is the telephony user and the called party is the PC or equivalent device user. Since a telephony user can essentially dial an E.164 number to reach the called party, then somehow the PC user should have an E.164 number by an IP telephony operator.

Figure 3: PC-to-Phone or Phone-to-PC Internet Telephony



In India ISPs are presently permitted to provide one-way PC-to-Phone Internet Telephony service for International long distance outgoing calls only on PSTN/PLMN to such countries where termination of Internet Telephony calls are permitted. The ISPs are not permitted to have PSTN/PLMN connectivity and are not allowed voice communication to

and from a telephone connected to PSTN/PLMN in India. The present regulatory framework permits Unified Access Service Licensee(UASL), Cellular Mobile Telecom Service (CMTS) licensees and Unified Licensee (access service) to provide unrestricted Internet Telephony which means both PC to Phone and Phone to PC calls within India as well as abroad. However, as stated earlier, this service has not picked up because the access service providers do not want to cannibalize their higher margin voice services over PSTN/PLMN.

2.11 In addition to the type of scenarios discussed above, it is also possible to provide a hybrid or a mix of Internet Telephony and PSTN/PLMN in which the last mile access network can be conventional last mile wireline/wireless access or/and Public Internet(refer Fig. 4 and Fig. 5). The subscriber will be able to dial using his conventional fixed line telephone or by using a software application (app) running on his PC or Smartphone when he is connected to the Public Internet. Similarly a mobile subscriber will also have an option to dial through the conventional 2G/3G/4G access network of his mobile service provider or by using a software application (app) on his smartphone or using native voice over WiFi capability of his smartphone connected to Public Internet by any Internet access network (by WiFi or Internet data services of any mobile service provider). In this case the access to Public Internet may be provided by any Internet Service provider including the one who is providing the PSTN or PLMN service. The same E.164 number which has been allocated for PSTN/PLMN service may be used while using the Public Internet for originating or terminating the calls. The choice of the last mile access network (PSTN/PLMN or Public Internet) may depend on the network availability or may be chosen /pre-decided by the customer. However, in this scenario Internet Telephony is an additional service over and above the normal conventional PSTN/PLMN service using the same E.164 number. This type of service can increase the call completion rate.

Figure 4: Hybrid/Mix of Fixed line and Internet Telephony

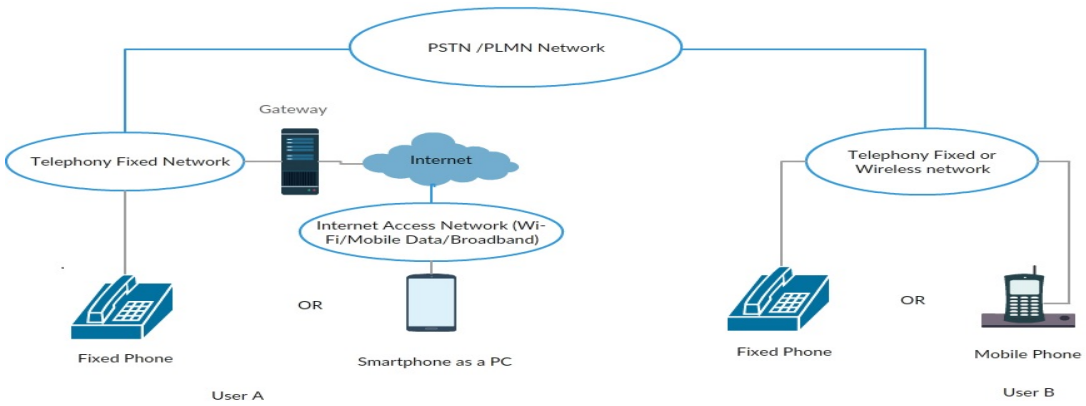
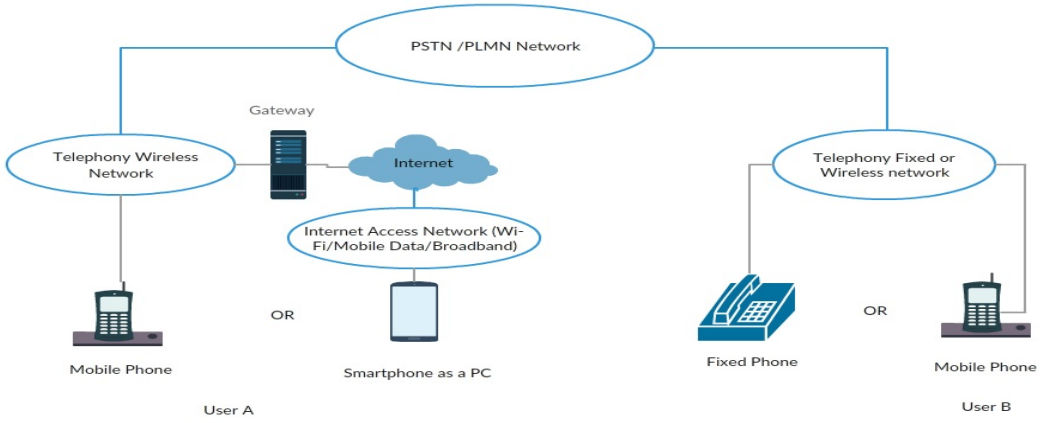


Figure 5: Hybrid/Mix of Mobile and Internet Telephony



C. Quality of Service

2.12 Quality of Service of an IP network used for telephony is the most important issue. The packet mode of data transmission used by IP networks may introduce degradation in speech quality due to following factors:

- Packet Loss: Possible disappearance of packets during the communication. Highly stable media like optical fiber reduces packet loss to virtually zero.

- Delay: This refers to transit time, including the time taken to reassemble the packets upon arrival and compensate for fluctuations in transit times (this overall transit time must be lower than 400 ms.). Such delays are network dependent and are taken care in network designing.
- Jitter: Variation in the packet arrival delay. Synchronization of network is very important to reduce such jitter.
- Echo: This refers to the delay between the transmission of a signal and receipt of the same signal as an echo. Effective echo cancellation can be used in well-planned networks.

2.13 In the planning of the managed IP networks these quality of service parameters are taken into consideration to ensure a good quality of real time services. However these parameters may be difficult to manage over Public Internet which may involve network of different ISPs for a real time voice service like Internet Telephony.

D. E.164 Number to URI Mapping (ENUM)

2.14 Global practices adopted by different countries advocate use of E.164 Number to URI Mapping (ENUM) being defined by Internet Engineering Task Force (IETF) in RFC3761. Internet Architecture Board (IAB), in concurrence with ITU, has selected e164.arpa domain specifically for this purpose. Under IAB supervision .arpa is considered to be a well-managed, stable and secure operational environment. A Single domain structure under e164.arpa becomes the authoritative "root" for E.164 telephone numbers. ENUM makes extensive use of the Naming Authority Pointer Resource Records (Defined in RFC 2915) in order to identify available ways and services for contacting a specific node identified through E.164 number. In nutshell, ENUM involves the following steps:

- ENUM turns a phone number into a fully qualified domain name (FQDN). It does this by first adding the city, or area, and country

code. For example, 2925-4780 of Delhi, becomes +91-11-2925-4780, where 11 is the area code, the 91 represents the country code for India, and the + indicates that the number is a fully qualified E.164 number. Then ENUM removes all the characters except for the digits and reverses the order (e.g.,+91-11-2925-4780 becomes 087452921119). Finally, it places dots between the digits and appends the domain E164.ARPA at the end of the string (e.g., 0.8.7.4.5.2.9.2.1.1.1.9.E164.ARPA).

- Use of ENUM issues a DNS query on the Fully Qualified Domain Name (FQDN) created in the first step.
- DNS returns a list of Uniform Resource Identifiers (URIs) that contains information about what resources, services, and applications are associated with that specific phone number.
- ENUM protocol can store more than one type of contact information in the DNS record that belongs to a specific ENUM number. An ENUM record associated with an Organization www.xyz.in might contain instructions for

  a. VoIP call (e.g., h323: identity@server.xyz.in or sip: identity@sip.xyz.in)

  b. A FAX call (e.g., fax: identity@fax.xyz.in)

  c. E-Mail communications (e.g., mailto:identity@xyz.in).

- Additional services can be developed in future and included in the ENUM name records. A phone number in ENUM can therefore be the single contact number for multiple types of communication to a particular entity, irrespective of type of services like voice call, fax, e-mail, mobile, text messaging, location-based services, and Web pages etc.

2.15 One potential source of confusion, when talking about ENUM, is the variety of ENUM implementations in place today. Quite often, people speaking of ENUM are really referring to only one of the following:

Public ENUM: The original vision of ENUM as a global, public directory-like database, with subscriber opt-in capabilities and delegation at the country code level in the e164.arpa domain. This is also referred to as user ENUM.

Open ENUM: An effort of mobile carriers and other parties involved in mobile numbering plans to generate complete, public database of all international numbering plan, available via public DNS (e164num.eu)

Private ENUM: A carrier, VoIP operator or ISP may use ENUM techniques within its own networks, in the same way DNS is used internally to networks.

Carrier ENUM: Groups of carriers or communication service providers agree to share subscriber information via ENUM in private peering relationships. The carriers themselves control subscriber information, not the individuals. Carrier ENUM is also referred to as infrastructure ENUM, and is being the subject of new IETF recommendations to support VoIP peering.

2.16 The SIP based Internet Telephony using Public Internet cloud and ENUM database is one of the most popularly used technique to process Internet Telephony calls. In this method, the Internet Telephony provider (ISP) allocates one E.164 number to its subscriber. He also provides a Session Initiated protocol device (SIP Device) properly configured and pointing to the Internet Telephony service provider. An Internet Telephony call from a particular service provider to a destination telephone number served by another service provider comprises of sending a Session Initiated Protocol (SIP) INVITE message from an originating device to SIP server of its provider. The SIP server queries a Telephone Number Mapping

(ENUM) server of service provider(s) (first, second or a third provider). ENUM server maintains Uniform Resource Identifier (URI) details of subscribers. The ENUM server may be internal or external to the service provider. The query of ENUM server gives details of Uniform Resource Identifier (URI) associated with the destination E. 164 telephone number. The service provider queries a Domain Name Server (DNS) based on the URI information received from ENUM server and receives Internet Protocol (IP) address of SIP server of the called party service provider. The originating service provider's SIP server and called party SIP server are used to set up a bearer path for the Internet Telephony call between the originating and destination switch. If no match is found for domain name of the ENUM server having URI details of destination telephone number, the ENUM server returns a no-record-found message to the SIP server. In this case, the SIP server defaults to a PSTN/PLMN gateway or another default route to further process the call.

CHAPTER III

ANALYSIS OF ISSUES AND RECOMMENDATIONS

A. Regulatory and Licensing Framework

3.1 Internet services in India were first launched in 1995 by erstwhile VSNL, then a Government owned PSU. However, at that time, Internet Telephony in any form was not permitted. Later in November 1998, the Government issued new guidelines for Internet services and ISP licences to private operators. Even at this stage, Internet Telephony was not envisaged as a service.

3.2 In the New Telecom Policy 1999 (NTP 1999), announced by the Government in March 1999, various steps were taken to support the Internet services, however even at this stage Internet Telephony was not allowed.

3.3 Later, Department of Telecom announced the guidelines for opening of Internet Telephony w.e.f. 1st April 2002 with restricted use. Existing ISPs were permitted to offer Internet Telephony services (ITS) only after signing the amended ISP licence called "Internet Telephony Service Provider" (ITSP) licence. Internet Telephony was permitted only in limited way, as there were restrictions on the type of technology and devices, which could be used. ITSPs were not permitted to have connectivity with PSTN/PLMN in India. Internet Telephony calls from such devices to PSTN/PLMN in India was not permitted.

3.4 In March 2006, Unified Access Service Providers (UASPs) were permitted to provide Internet Telephony service. In August 2007, all ISPs were permitted to provide Internet Telephony and separate category of Internet Telephony Service Providers (ITSPs) was done away with.

3.5 The present regulatory framework permits access service licensees to provide voice services within country. They have been permitted to provide unrestricted Internet Telephony. The relevant clauses of UASL , CMTS and US(access service) licences are reproduced below:

Clause 2.2 (a)(i) of UASL

"… Access Service Provider can also provide Internet Telephony, Internet Services and Broadband Services. If required, access service provider can use the network of NLD/ILD service licensee."

Clause 2.1 (a) of CMTS Licence

"… The Licensee can also provide Internet Telephony, Internet Services and Broadband Services. If required, the Licensee can use the network of NLD/ILD service licensee …".

Clause 2.1 (a) (i) of UL (Access Service)

"……The Licensee can also provide Internet Telephony, Internet Services including IPTV, Broadband Services and triple play i.e voice, video and data. While providing Internet Telephony service, the Licensee may interconnect Internet Telephony network with PSTN/PLMN/GMPCS network….."

3.6 Internet Telephony in the above licences has been defined as ***"Transfer of message(s) including voice signal(s) through public Internet".***

3.7 Internet Telephony has also been permitted to Internet Service Providers (ISPs) in restricted manner, under ISP licensing conditions, issued by Government in October 2007. As per ISPs licensing provisions, there is no restriction on PC-to-PC Internet Telephony calls. PC or adapter can be used to call PSTN/PLMN abroad; however Internet Telephony calls from such devices to PSTN/PLMN in India are not permitted under ISP licence. ISPs are also not allowed to have interconnection with PSTN/PLMN networks.

3.8 Under the scope of service in UL with the Internet Service authorisation the condition for provision of Internet Telephony in Clause 2.1(ii) is reproduced below:

"The Licensee may provide Internet Telephony through Public Internet by the use of Personal Computers (PC) or IP based Customer Premises Equipment (CPE) connecting only the following:
a) PC to PC; within or outside India

b) PC / a device / Adapter conforming to TEC or International Standard in India to PSTN/PLMN abroad.
c) Any device / Adapter conforming to TEC or International Standard connected to ISP node with static IP address to similar device / Adapter; within or outside India.

Explanation: Internet Telephony is a different service in its scope, nature and kind from real time voice service as offered by other licensees like Basic Service Licensees, Cellular Mobile Telephone Service (CMTS) Licensees, Unified Access Service (UAS) Licensees, Unified Licensee (Access Service), Unified Licensee with authorization for access services."

Interconnection under Clause2.2 (iii):

"The Internet Telephony, only as described in condition (ii) above, can be provided by the Licensee. Voice communication to and from a telephone connected to PSTN/PLMN/GMPCS and use of E.164 numbering is prohibited."

Addressing under Clause 2.2 (iv):

"Addressing scheme for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only and the same shall not use National Numbering Scheme / plan applicable to subscribers of Basic / Cellular Telephone service. Translation of E.164 number / private number to IP address allotted to any device and vice versa, by the licensee to show compliance with IANA numbering scheme is not permitted."

3.9 In year 2007/08, when unrestricted Internet Telephony for ISPs were deliberated, the main argument given by TSPs was that they have paid huge entry fee and have made heavy investments to create infrastructure. Opening up of unrestricted Internet Telephony to ISPs will impact their business model to a great extent as they apprehend reduction of voice traffic on their networks. They argued that as access providers are subjected to higher regulatory levies, huge upfront entry fee and have sunk-in investments on infrastructure development; their overheads will be higher as compared to ISPs. As per them, it would disturb level playing field among different licensees. They also argued that infrastructural developments can be impacted due to reduced margins, if ISPs start unrestricted Internet Telephony. Access providers were of strong opinion that in case ISPs want to offer unrestricted

Internet Telephony then ISPs should also pay the same entry fees and levies as paid by access service providers.

3.10 After due consultation process and detailed deliberation, TRAI on 18.08.2008 recommended to the Government that ISPs may be permitted to provide Internet Telephony calls to PSTN/PLMN and vice-versa within country and necessary amendments may be made in the licence provisions. However, Government did not accept this recommendation of TRAI.

3.11 Since then, there have been significant changes in telecom licensing framework of the country. Now allocation of Spectrum has been delinked with the grant of Licence. Unified licence has been introduced with entry fee of 15 crore rupees for the whole country.

3.12 In the recent past, BSNL had proposed to introduce Fixed Mobile Telephony (FMT) value added services for its customers. BSNL informed the licensor and TRAI that FMT service will be an extension of their fixed line service using IMS based NGN core switch and IP based access network. Their Subscribers were assigned a SDCA based number from the number series allocated to BSNL for their fixed line service. Using this service, customer could move anywhere in the world and will be able to receive /make calls from his fixed telephone. The calls would have been originated or received under Wi-Fi environment and 2G/3G Internet anywhere across the world. FMT service essentially needed Internet access to reach BSNL's NGN equipment for registering SIP subscriber for making voice call. However, this service was put on hold by BSNL when the licensor stated that this service cannot be treated within the scope of Basic Service licence **(Annexure I)**. Subsequently, BSNL proposed another service termed as LFMT (Limited fixed mobile telephony) in which the mobility was restricted to the customer premises.

3.13 In view of the number of changes in the licensing and regulatory framework, the Authority issued fresh consultation on the Internet Telephony services.

3.14 During the consultation process, some of the stakeholders have raised the issue that as per present licence condition Basic/UASL/CMTS/UL (Access Services) are allowed to provide Internet Telephony on their networks only. These stakeholders were of the view that licence requires the Access providers to use their own network to provide Internet Telephony services. Hence, Internet Telephony service allowed under access service licences is bundled along with the Internet bearer provided by the licensee. In other words, the Internet Telephony service and Internet access service should be provided by the same access service provider. They were of the view that the form of Internet Telephony riding on other operator's network is against the prevalent telecom licensing ecosystem of the country.

3.15 These stakeholders were holding the view that access to the telecom services of TSPs by the subscriber through public Internet (Internet access of any other TSP) is not permitted and should not be permitted as it would facilitate bypassing of the STD/ISD calling mechanism and tariffs, as each and every call would be initiated as a local call.

3.16 These stakeholders have cited the Clause 2.1 (a) (i) of Chapter-VIII of Access Service authorisation under UL which says that:

"The Access Service under this authorization covers collection, carriage, transmission and delivery of voice and/or non-voice MESSAGES over Licensee's network in the designated Service Area. The Licensee can also provide Internet Telephony, Internet Services including IPTV, Broadband Services and triple play i.e. voice, video and data. While providing Internet Telephony service, the Licensee may interconnect Internet Telephony network with PSTN/PLMN/GMPCS network. The Licensee may provide access service, which could be on wireline and / or wireless media with full mobility, limited mobility and fixed wireless access."

They argued that UL (Access Services Authorisation)/ Basic/UAS/CMTS Licence are ACCESS licences. Only in capacity of ACCESS Licensees, have they been permitted to provide Internet Telephony on their Access Networks and the licence requires "collection, carriage, transmission and delivery of voice over Licensee's Network". Therefore, Internet Telephony over other Access Provider's Network is not permissible.

3.17 These stakeholders have further submitted that Internet Telephony, if provided over public network, will entail huge losses to the TSPs who are providing conventional voice services as there will be a shift of voice traffic from the conventional PSTN/PLMN network to Public Internet. They are of the view that huge capital and operational expenditure in creating and maintaining the last mile access network will not be compensated adequately, if Internet Telephony becomes popular. They have argued that with increased proliferation of Smartphones and Tablets, the shift in SMS and voice traffic to App based services has already started affecting the revenues of the Telecom Service Providers.

3.18 In their support, these stakeholders have also submitted that the provision of Internet Telephony requires the conversion of E.164 numbers to IP addresses and vice-versa. As per them, DoT did not allocate any numbering series/blocks for Internet Telephony and hence numbering resource allocated by DoT for Basic Services or Cellular Mobile Services cannot be used for providing Internet Telephony Service.

3.19 On the other hand, some of the stakeholders have submitted that Internet Telephony has been defined for UL, UASL, CMTS and BSO as *"Transfer of message(s) including voice signal(s) through public Internet".* The definition of Internet in the licences is as below:

> *" INTERNET: Internet is a global information system that:*
>
> *(i) is logically linked together by a globally unique address, based on Internet Protocol(IP) or its subsequent enhancements/upgradations;*

(ii) is able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite or its subsequent enhancements/upgradations, and all other IP compatible protocols;"

They argued that when the licence itself defines 'Internet' as a global information system, the term 'public Internet' cannot have more restrictive meaning than the definition of 'Internet' itself as laid out in the licence. The use of the word 'also' in Clause 2.1(a)(i) of the UL (as cited in the above paragraph) means that the Licensee can do what is permitted in the first sentence and also do what is permitted in the second sentence. This means, any restrictions in the first part of the clause will not apply to Internet Telephony since it is an added service that can be provided by the Licensee over and above the rights granted to it by the first sentence. In a similar vein, it has also been pointed out by some TSPs that the second sentence of Clause 2.1(a)(i) says the Licensee can also provide Internet Telephony, Internet Services including IPTV, Broadband Services and triple play i.e. voice, video and data. In this sentence it is clear that 'Internet Telephony' and 'Internet Services' are mentioned as separate services and hence the licence itself assumes that these two services maybe provided separately and are not mandated to be provided together.

3.20 These TSPs were of the view that the very definition of Internet Telephony in the licence implies that the last mile for Internet Telephony can be over public Internet as opposed to the private network elements of the TSP. They argued that if Internet Telephony service is bundled with last mile of the service provider, it will defeat the basic purpose of Internet Telephony. They were also of the view that the existing numbering resources provided to the licensee can be used for the purpose of Internet Telephony.

3.21 It may be noted that a complaint related to inter-connection was received in TRAI from a licensee who has recently acquired UL (Access

service) licence for Mumbai Service area. This licensee has been allotted numbering series '797' for providing basic telephone services in Mumbai service area. The licensee was facing difficulty in signing of inter-connect agreement for providing Internet Telephony with some other Telecom Service providers having access services licence. During the meetings held with them, the service providers have stated that they are ready to sign agreements for fixed wire-line services but not for Internet Telephony services because the service has not been defined with clarity by the licensor.

3.22 The Authority took note of all the submissions made by stakeholders and advancement of technology used for Internet Telephony service and observed that in the initial stage, Internet Telephony was generally provided through SIP enabled devices or Personal computer (PC) and was alternate to fixed line telephony with some more features. Internet telephony was limited to fixed line as fixed line was able to support a high speed Internet service, which was essential requirement of Internet telephony. Now with the passage of time, three major developments took place (a) cellular mobile network is able to support high speed Internet (b) Smartphones have become a very fast and efficient computing devices (c) New voice coding techniques require low data rate for Internet Telephony. These technological developments have enabled TSPs to provide Internet telephony through Smartphone through an application (app).

3.23 The Authority analysed the present access service licence conditions and observed that definition of Internet telephony envisages the transfer of message(s) including voice signal through public Internet and therefore submission of some stakeholders that Internet Telephony can be provided only on their network does not represent correct position of the licence. Public internet is a very general term and narrow interpretation

taken by some of the TSP does not represent the correct position. If the interpretation of these TSPs is taken as correct then it will defeat the basic purpose of the Internet Telephony. If Internet Telephony service is provided by the Access provider, over its own network only, it is basically managed VoIP service which cannot be intent of licensor when Internet telephony service has been allowed as a separate service. But, Internet Telephony is a different service and it should not be equated with managed VoIP. It is apparent from the prevailing international best practices that Internet Telephony service is not bundled with last mile network of the Access provider. So, the Authority is of the view that as per the present licensing framework, Internet Telephony service can be provided independent of the Internet access Service. In other words, the Internet Telephony service is un-tethered from the underlying access network.

3.24 The Authority examined the arguments of some stakeholders on revenue loss to existing operators and is of the view that the Internet use is growing at an unprecedented high rate and existing providers will generate revenue from data services which will be required by a subscriber to make even an Internet Telephony call. In any case, voice has already become an application over data services. The Authority is of the view that the increasing revenue realizations from data services due to increasing Internet traffic will not only compensate for the loss of conventional voice traffic but will also increase the revenue potential of the last mile access networks. This symbiotic relationship will increase broadband proliferation and will also contribute to the overall health of the telecom sector along with increase in consumer choice. The separation of network and service layers of telecom service offerings is the natural progression of the technological changes in this domain .It is now possible to separate provision of service contents, configuration and

modification of service attributes regardless of the network catering to such service.

3.25 The Authority is also of the view that the regulatory framework in the country should enable technological developments, innovations and growth of the telecom sector for the benefit of the common masses while ensuring that the business models of the telecom service providers are not adversely affected.

3.26 In the consultation paper, the opinion of the stakeholders was sought about the additional entry fee, Performance Bank Guarantee (PBG) and Financial Bank Guarantee (FBG) for Internet Service Providers, if they are allowed to provide unrestricted Internet Telephony. Some of the stakeholders were of the view that it should not be allowed. They were of the view that only access service providers can be allowed to provide Internet Telephony. On the other hand some of the stakeholders were of the view that the ISPs should be allowed to provide Internet Telephony without any additional financial liabilities.

3.27 In 2008, when TRAI recommended unrestricted Internet Telephony for ISPs the concept of Virtual Network operators(VNO) was in infancy. The present licence for VNO with access service authorisation allows Internet Telephony using the Interconnection framework of the parent Network Services Operator (NSO). Moreover, Internet Telephony is an important service and creating conducive environment for VNO to provide Internet Telephony will help the proliferation of Internet Telephony service. It will also fulfill the purpose of the introduction of VNO as it will amount to separation of service from the network.

3.28 The licence for VNO has been introduced in the country for delinking of licences for networks from the delivery of services. There may be some operators who may not be willing to set up complete PSTN/PLMN

network for providing Basic Services or Cellular mobile services. In such cases, the operators may choose to become the VNO of an access provider to provide Internet Telephony service.

3.29 The Authority is of the view that to promote Internet Telephony, it is necessary that the entry barriers to new entrants should be eased and at the same time the existing players may be encouraged to provide Internet Telephony service. The Authority is also of the view that there can be two type of scenario while offering Internet Telephony service over Public Internet. It can be an additional service over and above the conventional wireline/wireless service by the access service providers or by a virtual operator wherein last mile for origination/termination could be on Public Internet also. However, in both the scenarios, the Internet Telephony service can be un-tethered from any underlying network. This will increase the call success rate particularly in indoor poor coverage areas where Public Internet may be available but signal of a particular TSP is not available.

3.30 The Authority further examined whether existing ISP should be allowed to provide unrestricted Internet Telephony service and observed that in 2008, there was an UAS licence which with an entry fee of Rs. 1,658 crore. However, presently the entry fee for access service licence with National service area for providing unrestricted Internet Telephony is Rs. 15 Crore only. Moreover, VNO licence with access authorisation for National area can be obtained by paying only 7.5 crore rupees. The Authority is of the view that any ISP can provide unrestricted Internet Telephony either by obtaining UL with authorisation to access services or can become VNO of any existing Access provider.

3.31 Therefore, the Authority is of the view that necessary clarification may be issued by DoT that Internet Telephony service is un-tethered from the

underlying access network. VNO of access service providers may also be allowed to provide un-tethered Internet Telephony service.

3.32 The Authority further observed that present licensing framework has been designed wherein service provision is an integral part of the network provision. However, in case of Internet Telephony the service provision is done by Internet Telephony Service Provider (ITSP) and access such as underlying Internet will be provided by different access/Internet service provider. In the present licensing framework, subscribers availing limited mobile facility (WLL), the mobility is restricted to the local area i.e. Short Distance Charging Area (SDCA) in which the subscriber is registered. However, for full mobility subscribers mobility is provided for the licensed service area (LSA). Mobility can also be offered to the fully mobile subscribers beyond the service area by undertaking roaming arrangements with other telecom service providers. However, Internet Telephony service is different in nature as it is providing voice as an application and therefore, mobility is not being provided by the ITSP but by the operator who is providing underlying Internet. It means, if one operator has a licence for a LSA and his subscriber roams/moves to another LSA, it may be very difficult to verify the location of subscriber as he will be able to access the Internet Telephony service whenever he gets Internet access. As the IP addresses in the country are also not allocated LSA wise it is very difficult to stop user to use services in the other LSA wherein his service provider is not authorized to provide service. During the consultation process some TSPs suggested that with technology such as GPS etc. it is possible to limit mobility within LSA. Other stakeholders argued that while making Internet Telephony calls user may like to use his laptop/desktop or may switch off their GPS in the Mobile phone; therefore limiting mobility by GPS location is not the right solution. One solution could be that only the Access providers who have National area licence are allowed to

provide Internet Telephony services with full mobility and for other TSPs to have introduction of separate National area licence for Internet telephony. However, at this stage wherein a number of LSA wise licences have been issued and all these licences provide for Internet Telephony, it will be not be a good idea to introduce new National area licence. Other solution could be that Licensee can provide service over its network to the subscribers falling within its Service area.

3.33 Similar issue of mobility arises when subscriber is roaming out of Country and able to make the call through public internet. However it was informed that this may be distinguished by the access provider on the basis of IP address. This problem can be solved by handing over call to terminating operators through ILDO. The access service provider's Internet Telephony service has to ensure that International out-roamer calls terminating in India will have to be handed over at the gateway of licensed ILDOs and International termination charge should be paid to the terminating access service provider. It is possible to ascertain from the public IP address of origination of Internet Telephony calls that whether the subscriber is located in India or abroad. It is also possible in GPS enabled handsets to ascertain the location with accuracy. In case it is not feasible to bring this type of calls through gateways of licensed ILDOs, International out-roamer calls for Internet Telephony subscribers should not be allowed.

3.34 **In view of the above, the Authority recommends that:**

i. As per Authority's understanding of present Access service licences, Internet Telephony service is un-tethered from the underlying access Network. In other words, Internet Telephony Service can be provided by Access service provider to its subscriber who may be using Internet of other Access service providers. DoT should issue a clarification to the

effect. If DoT has a different understanding, the Authority recommends that the DoT may issue amendment to Access service licences so that Internet Telephony service is un-tethered from the underlying access Network.

ii. **The UL (VNO) licensee with access service authorisation should also be allowed to provide un-tethered Internet Telephony in the designated service area.**

iii. **Internet Telephony calls originated by International out roamers from international locations should be handed over at the International gateway of licensed ILDOs and International termination charges should be paid to the terminating access service provider. In case the Access provider is not able to ensure that Internet Telephony call originated outside of the country is coming through ILDO gateway, International out-roaming to Internet Telephony subscribers of the access provider should not be allowed.**

B. Numbering:

3.35 Numbers always play a central role in telecommunications and their importance is well recognized. A well designed numbering for any service ensures structured growth of any service. Number is basically a unique identity of the subscriber. National Numbering plan 2003 provides two types of the numbering schemes (a) non geographical i.e. mobile number series and (b) Geographical i.e. SDCA linked numbering series.

3.36 To ascertain the views of the stakeholders on the desired framework for allocation of numbering resources in the consultation paper, they were requested to comments on following:

"Question 10:
What should be the framework for allocation of numbering resource for Internet Telephony services?
Question 11:
Whether Number portability should be allowed for Internet Telephony numbers? If yes, what should be the framework?"

3.37 Some of the stakeholders have suggested that the numbering series being used for mobile or basic services may be used for Internet Telephony. Some of the stakeholders have also suggested that separate 11 digit or 13 digit numbering may be used for Internet Telephony service.

3.38 Regarding number portability most of the stakeholders in the consultation process were of the view that it is too early to deliberate upon number portability. The issue of number portability can be taken up at a later stage when the service matures.

3.39 Unified Licence, however, mentioned that IP Address assigned to a subscriber for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only. Relevant is as follows:

"2.5 IP Address assigned to a subscriber for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only. Translation of E.164 number / private number to IP address and vice versa by the licensee for this purpose shall be as per directions/instructions issued by the Licensor."

3.40 It is worth noting that outgoing only Internet Telephony can be offered without allocation of number resources from E.164 numbering plan. However, it is not possible to call an Internet Telephony subscriber from an existing PSTN/PLMN network without allocation of a number, which can be recognized, by the traditional fixed and mobile telecom network. This will greatly restrict the scope and popularity of the Internet Telephony services.

3.41 As explained in chapter II, there are basically four types of ENUM implementation which take care of conversion from E.164 number to IP address. (a) Public ENUM: The original vision of ENUM as a global,

public directory-like database, with subscriber opt-in capabilities and delegation at the country code level in the e164.arpa domain. This is also referred to as user ENUM. (b) Open ENUM: An effort of mobile carriers and other parties involved in mobile numbering plans to generate complete, public database of all international numbering plan, available via public DNS (e164num.eu) (c) Private ENUM: A carrier, VoIP operator or ISP may use ENUM techniques within its own networks, in the same way DNS is used internally to networks. (d) Carrier ENUM: Groups of carriers or communication service providers agree to share subscriber information via ENUM in private peering relationships. The carriers themselves control subscriber information, not the individuals. Carrier ENUM is also referred to as infrastructure ENUM.

3.42 The clause 2.5 of UL also mentions that *"Translation of E.164 number / private number to IP address and vice versa by the licensee for this purpose shall be as per directions/instructions issued by the Licensor".* However, DOT did not issue any direction in this regard. In fact, there could be a type of translation especially private ENUM wherein a carrier, VoIP operator or ISP may use ENUM techniques within its own networks. The Authority feels that the conversion from E.164 number to IP address and vice versa is essential for providing any form of Internet Telephony with Caller ID and incoming calls. The ambiguity regarding the translation of E.164 number to IP address needs to be removed. It is also prudent in the present scenario to use a private ENUM database for this translation.

3.43 UL/UASL/CMTS/Basic licences allow licensee to provide unrestricted Internet Telephony but it is not clear that whether TSP can use same numbering resource or it will be given separate numbering resource for providing Internet Telephony.

3.44 A clarification regarding numbering series was sought from DoT. In its reply DoT stated that*: "in case of Internet Telephony service, the physical location of the subscriber may be anywhere which is akin to mobile services and the numbering series allocated for cellular mobile services can be used for Internet Telephony service. However, the numbering series allotted for Basic Services cannot be utilized for providing the Internet Telephony service."*

3.45 DoT has stated that Basic Services numbering series cannot be used for Internet Telephony. However, DoT has allowed Basic Service Licensee to provide Internet Telephony vide amendment dated 14.12.2005 **(Annexure II**).It shows that intention of DOT was to allow Basic Service Licensee also to provide Internet Telephony service. However, due to the advancement in technology used for providing Internet telephony physical location of the subscriber may be anywhere which is akin to mobile services, the DOT has stated that numbering series allocated for cellular mobile services only can be used for Internet Telephony service

3.46 The Authority examined that the above position of DoT is not in line with the prevailing global best practices. Globally, most of the countries allowed Internet Telephony service initially by allocating non-geographic and separate numbering series. However, some of the countries have also started allocating geographical numbering series for this service. Some countries do not have separate numbering series for Internet Telephony and the numbering series used for conventional services is also being used for Internet Telephony. In some countries the geographical links associated with telephone numbers is also being done away with.

3.47 The Authority is of the view that numbering series allocated for Basic Services should also be used for providing Internet Telephony service. In other worlds Basic Service licensee may be allowed to provide only

non-nomadic Internet Telephony Service using SDCA linked numbering series allocated for Basic services. This is possible by binding the Internet Telephony service with the public IP allocated to the customer. Since almost all the TSPs providing Basic/Fixed services have migrated to Next Generation IP based networks, this type of service can be provided. This will increase the value of the Basic Service and will also retain the geographical nature of the SDCA linked numbering scheme. Not allowing SDCA linked numbering series for Internet telephony will discourage Basic services licensee to migrate to Next Generation IP based network.

3.48 **In view of the above, the Authority recommends that :**

i. The mobile numbering series should be used for providing Internet Telephony by a service provider. TSPs should be allowed to allocate same number to the subscriber both for Cellular Mobile service and Internet Telephony service.

ii. The SDCA linked numbering series may also be used for providing Internet Telephony by a service provider. However, in this case, mobility should be limited to consumer premises.

iii. The clause 2.5 in UL (access service) related to translation of E.164 number to IP address may modified as below:

Present Clause	Amended Clause
"IP Address assigned to a subscriber for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only. Translation of E.164 number / private number to IP address and vice versa by the licensee for this purpose shall be as per directions/instructions issued by the Licensor."	***"IP Address assigned to a subscriber for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only.***

Similar clause in other access licences (BSO, CMTS, and UASL) should also be amended.

iv. **The access service licensee should use private ENUM in its network for Telephone number mapping from E.164 to SIP/H.323 addresses and vice-versa.**

v. **In case of provision of Internet Telephony by VNO with access service authorisation, the numbering resource allocation should be done by the parent NSO.**

C. Security issues

3.49 Some of the stakeholders have raised apprehensions about the violations of security conditions in the licence because of the nomadic nature of the service. The clause 8.5 in the UL (access service authorisation) related to location details specifies the desired accuracy for location details of mobile customers in the form of latitude and longitude besides the co-ordinate of the BTS which is already one of the mandated fields of CDR. The licence also specifies the lawful interception and monitoring requirements to be complied by the licensee which may be amended by the licensor from time to time. The licence specifies that CLI Restriction (CLIR) is also not to be provided normally. Even while providing CLIR it has to be ensured that CLI is carried from end to end on the network.

3.50 The Authority is of the view that the licensees should comply with all the interception and monitoring related requirements as specified in the UL (access services) as amended from time to time. In case of VNO, the licensee should comply to the security and monitoring related requirements as specified in the UL (VNO) licence. As far as the location of nomadic Internet Telephony subscribers is concerned, it is possible to capture the location details in case GPS service is enabled in GPS enabled Smartphone. However, in case of Internet Telephony using

desktop PC and laptop PC only the IP address can be captured which may not provide the desired granularity for locating a mobile subscriber even after using the IPDR of the Internet access service provider(in case the Internet Telephony service provider and Internet access service provider are not the same). So, the Authority is of the view the Public IP address used for originating/terminating Internet Telephony calls should be made a mandatory part of CDR in case of Internet Telephony. The location details in form of latitude and longitude should also be provided wherever it is feasible.

3.51 **In view of the above, the Authority recommends that**

i. The licensees should comply with all the interception and monitoring related requirements as specified in the licence as amended from time to time for providing Internet Telephony.

ii. The Public IP address used for originating/terminating Internet Telephony calls should be made a mandatory part of CDR in case of Internet Telephony. The location details in form of latitude and longitude should also be provided wherever it is feasible.

iii. CLI Restriction (CLIR) facility should not be provided for Internet Telephony Subscribers.

D. Interconnection and Interconnection Usage Charges (IUC)

3.52 Interconnection is the most important aspect of the telecom network. The existing Interconnection framework in India ensures that licensees such as access service providers, NLDO and ILDOs interconnect so that consumers of one TSP can talk to the subscriber of other TSP.

3.53 During the consultation process, some stakeholders submitted that as per the present licensing framework Internet Telephony should be

provided by an access service provider on its own last mile network and therefore existing Point of interconnection (POI) framework should continue to apply on Internet Telephony calls also.

3.54 Some of the stakeholders were of the view that Internet Telephony service should be treated like mobile service for the purpose of Interconnection. They have opined that SDCA based POI should not be mandated for Internet Telephony service. Some of the stakeholders have also expressed the view that IP based Interconnection should be mandated.

3.55 The Authority observed that present recommendations are limited to provisioning of Internet Telephony by access licensees and they are handing over Internet Telephony call to other service providers like any other voice call and therefore there is no need to prescribe separate Interconnection framework at this stage and the extant POI framework and Interconnection Usage Charges may continue for provision of Internet Telephony services also. Moreover, as mentioned in the paragraph 3.44, DOT has already stated that Internet Telephony service is akin to mobile service. However, if any change is required in the Interconnection regime , the Authority will issue separate amendment/ clarification in this regard.

E. Access to Emergency Services

3.56 The facility to call nearest authority like police, fire station, hospital, etc has been termed as access to Emergency Service. Accurate identification of geographical location of subscriber is a must for availing emergency services. The concept of emergency number calling has changed with introduction of the mobile services. It is envisaged that accurate location of the caller will also be available to the authority (Hospital, Police, Fire-

station) handling emergency situation along with emergency number calls.

3.57 Different telecom networks adopt different technologies to facilitate emergency number calling. In case of usage of Internet Telephony services from a fixed location, it is possible to map the position information and route emergency calls to appropriate agency. However, one of the promising features of Internet Telephony services is the nomadic use. In the nomadic use, it may be difficult to accurately map position information while originating the emergency call.

3.58 The prevailing International scenario to facilitate emergency number calling is different in different countries. Some of the countries have gone ahead with Internet Telephony services without mandating emergency number calling facility. They have emphasized the issue of transparency and desired that Internet Telephony service provider shall inform their subscribers that Internet Telephony service will not support emergency numbers calling.

3.59 In India, when subscriber calls from fixed line, the call goes to nearest police/fire station which has been mapped to corresponding location. For mobile, TSPs provide the information of SDCA to BSNL/MTNL along with CLI of calling party and call is routed by BSNL/MTNL to nearest Police station in that very SDCA.

3.60 The following questions were asked to ascertain the view of the stakeholders on matter related to calling Emergency numbers:

Question 12:
Is it possible to provide location information to the police station when the subscriber is making Internet Telephony call to Emergency number? If yes, how?
Question 13:
In case it is not possible to provide Emergency services through Internet Telephony, whether informing limitation of Internet Telephony calls in advance to the consumers will be sufficient ?

3.61 Some of the stakeholders were of the view that emergency number calling should be mandated for Internet Telephony service. On the other hand, some of the stakeholders were of the view although it is possible to provide the location related information to some extent, it should be sufficient to inform the limitations of Internet Telephony services with respect to emergency services. It is technically possible to ascertain the location of the subscriber in GPS enabled handsets, if GPS is activated, by the user. In case of user using Desktop PC or Laptop PC it is possible to ascertain the IP address of the user. The address derived from the IP address in an Internet access network may not provide the desired granularity which is possible in fixed line networks or mobile networks. Some of the stakeholders were of the view that access to emergency services should not be allowed as users can spoof their location or switch off location services in their devices.

3.62 The Authority is aware of the need and importance to facilitate access to emergency services. However, imposition of restrictions and mandatory obligations may kill the initiative to provide Internet Telephony before a service can commercially pick up. In order to strike a balance, the Authority is of the view that Internet Telephony service providers may be encouraged to facilitate access to emergency number calls; however they may not be mandated to provide such services at present.

3.63 **In view of the above, the Authority recommends that the access service providers providing Internet Telephony service may be encouraged to facilitate access to emergency number calls using location services; however they may not be mandated to provide such services at present. The subscribers may be informed about the limitations of providing access to emergency services to Internet Telephony subscribers in unambiguous terms.**

F. Quality of Service

3.64 Quality of speech in any communication service is an important consideration. Subscribers are accustomed to the carrier grade voice quality from PSTN/ PLMN services and expect similar quality from Internet Telephony also irrespective of the technology used to provide such services.

3.65 The quality of service has been a great challenge for Internet Telephony in the past, but it has improved to a great extent in the recent years. In many cases the quality of Internet Telephony is so good that its discrimination from carrier grade service is not easily possible. The use of advanced coding techniques and other innovative mechanism play important role in further improving voice quality.

3.66 The following question was asked to solicit the views of the stakeholders with respect to the need of QoS parameters for Internet Telephony:

"Question 14:
Is there a need to prescribe QoS parameters for Internet Telephony at present? If yes, what parameter has to be prescribed? Please give your suggestions with justifications."

3.67 Some of the stakeholders were of the view that QoS parameters may be mandated similar to TRAI regulations 2002 for VoIP based ILDO service. They argued that since it is also a telephony service it should have QoS parameters like other telephony services. On the other hand some of the stakeholders are of the view that QoS parameters should not be mandated as it cannot be ensured over Public Internet. They have also opined that market forces will compel the service providers of Internet Telephony services to compete on quality of service and price, among other factors, which should ultimately ensure that the customers receive the quality of service they demand at best price.

3.68 The Authority is of the view that QoS on Internet Telephony may be left to market forces at present. Even low quality Internet Telephony offers sufficient cost advantages over traditional voice services and customers may be willing to make this price-quality trade-off. The service provider must inform this aspect to the subscribers so that they can take an informed decision. However, the service providers should ensure QoS as per the extant regulations in the managed part of the network which is not on the Public Internet. The Authority shall review the decision regarding mandating QoS to Internet Telephony service providers at appropriate time.

3.69 **In view of the above the Authority recommends that:**

i. QoS on Internet Telephony may be left to the market forces. The service providers must inform QoS parameters supported by them for Internet Telephony so that the subscribers can take an informed decision.

ii. The Authority shall review the decision regarding mandating QoS to Internet Telephony service providers at appropriate time.

CHAPTER IV

GLOBAL REGULATORY PRACTICES IN INTERNET TELEPHONY

AUSTRALIA

4.1 Australia's telecommunications regulator, the Australian Communications and Media Authority (ACMA), only requires telecom licences to be held in relation to entities that own or operate certain types of telecommunications infrastructure, known as 'carriers'.

4.2 Under the Telecommunications Act 1997, there are two types of persons or organisations that can provide carriage services (telecommunications services) to the public: carriers and carriage service providers (CSPs).[1]

- Carriers are persons who own a telecommunications network unit to supply carriage services to the public.

- CSPs use a telecommunications network unit to supply carriage services to the public.

4.3 Carriage services include services for carrying communications, for example telephone services, Internet access services and Voice over Internet Protocol (VoIP) services. CSPs can include organisations that resell time on a carrier network for phone calls, provide access to the internet (Internet Service Providers) or provide telephone services over the internet (VoIP service providers). CSPs are not required to obtain a licence from ACMA to supply a carriage service to the public.

4.4 Australia does not expressly regulate points of interconnection; rather these are usually determined as a matter of commercial negotiation between telecommunications operators. However, various industry

[1]http://www.acma.gov.au/Industry/Telco/Carriers-and-service-providers/Licensing/carriers-carriage-providers-licensing-i-acma

standards and codes apply to the technical requirements for points of interconnection. Carriers and carriage service providers providing certain "declared services" (such as standard telephone services provided over the PSTN) have a regulatory obligation to make their telecommunications networks available to persons wishing to establish a competing service on negotiated terms (or baseline terms set by the regulator where negotiations fail). Carriers also have powers to access the telecommunications infrastructure of other carriers in order to establish and maintain a competing service on negotiated or statutory terms.

4.5 A VoIP service is regulated where it constitutes a 'standard telephone service' as defined under Australian telecommunications law. A two-way VoIP service that enables customers to make calls to, and receive calls from, users of the PSTN is likely to constitute a standard telephone service and therefore be subject to regulation, on the basis that it is a carriage service connecting with the PSTN, provided for the purpose of voice telephony and connects end-users supplied with the same service.[2]

4.6 The call termination charge for VoIP calls terminated onto a mobile or fixed line network would be the same as calls made from traditional services. In order for a call to be terminated onto a mobile network as a mobile call, or a fixed network as a PSTN call; the call will need to be delivered to the relevant carrier at its POI in the requisite form. This means that the call will need to be converted from an internet call to a standard call (with CCS#7 signaling, etc.) before it is routed to the POI of the mobile or fixed carrier, unless separate arrangements are negotiated with the mobile or fixed carrier. Assuming that the call is delivered at the POI with the requisite characteristics, it would be accepted by the mobile or fixed carrier for termination and the standard mobile terminating

[2] http://www.acma.gov.au/Citizen/Phones/Landlines/Voice-over-internet-protocol/voip-legislation-codes-standards-i-acma

access (MTAS) charge or fixed terminating access (FTAS) charge would be applied. The MTAS and FTAS charges in Australia are commercially negotiated, but default charges set by the Australian Competition and Consumer Commission (ACCC) are applied. If a call is not delivered to a carrier at the POI in the requisite format at the POI, but is rather delivered to the carrier as an internet call, then the call termination arrangements will fall outside the scope of the regulated services. In such circumstances, the charges will be determined as a matter of commercial negotiation.

4.7 Historically, nomadic location independent communication services (such as VoIP services) were assigned a dedicated special services number commencing with the numbers 0550. However, in 2015, the ACMA determined to phase out these numbers and cease making them available for allocation. Now, carriage service providers who supply VoIP services can apply for geographic numbers (also used for standard PSTN services) to use in connection with VoIP services.[3] Geographic numbers are 10 digit numbers consisting of two components: (i) a 2 digit area code corresponding to geographic regions and (ii) an 8 digit local number.

4.8 The obligations on VoIP service providers regarding emergency call services are specified in the Telecommunications (Emergency Call Service) Determination 2009 (the Determination). The determination applies to two-way VoIP services and VoIP out-only services that are capable of dialing into the Public Switched Telephone Network. Under the Determination, carriers and carriage service providers (including those providers of two-way VoIP services) must provide an indication of possible location uncertainty of the customer.

[3] http://www.acma.gov.au/Citizen/Phones/Landlines/Voice-over-internet-protocol/understanding-voip-numbers-and-call-charges-i-acma

4.9 However, VoIP out-only service providers do not have such an obligation. If they are unable to provide free of charge access to Triple Zero (000) they must clearly inform customers that such access is not available and obtain acknowledgement from the Customer that they understand the limitations of the service.

4.10 Australia imposes QoS parameters on VoIP service providers offering a two-way service enabling customers to make and receive calls from users of the Public Switched Telephone Network. Two-way PSTN VoIP services are covered by these QoS because they are considered a "Standard Telephone Service" as defined under applicable telecommunications legislation.

4.11 Notably, however, a service provider may propose customers waive their rights under the Customer Service Guarantee by completing a waiver in writing or orally. A service provider may also choose not to supply a customer with a service if the customer refuses to agree to a waiver. Waiving the QoS guarantees or choosing not to provide the service is legally permissible and, in fact, common practice for providers of two-way PSTN VoIP service providers in Australia (with the effect that the Customer Service Guarantee does not then apply)

CANADA

4.12 The federal telecommunications regulatory authority in Canada, which is called the Canadian Radio-television and Telecommunications Commission (CRTC), has established a light-handed regulatory approach to telecom service providers (TSPs) that provide VoIP services.

4.13 The only obligations of VoIP providers under the CRTC's rules are to[4]: (i) register with the CRTC if they offer a voice communications service that

[4]http://www.crtc.gc.ca/eng/archive/2005/dt2005-28.htm

makes use of North American Numbering Plan (NANP) telephone numbers to provide universal access to and/or from the PSTN; (ii) obtain a Basic International Telecommunications Service (BITS) licence from the CRTC if their VoIP services allow customers to make international telephone calls; and (iii) comply with other, standard regulatory obligations that apply to other registered TSPs, such as the obligation to maintain customer information in confidence and to honour customer requests to "port" their telephone numbers to other service providers.

4.14 Most of the VoIP services are not tied to a specific underlying network and, therefore, they do not have a "network" to/from which other networks need to interconnect. Instead, VoIP providers connect their "cloud-based" services to the network of an underlying telecommunications common carrier (usually a local exchange carrier or "LEC") that can provide access to and from the PSTN as well as other network-based services. These arrangements are generally governed by commercial negotiations between the VoIP provider and the telecommunications common carrier.

4.15 In Canada, traffic is typically exchanged between telecommunications common carriers on a "bill and keep" basis. This means that carriers do not generally charge each other for traffic termination unless there is a significant imbalance in the exchange of traffic between the carriers.

4.16 When the CRTC first established its regulatory framework for VoIP services in 2005, it described two types of VoIP services, namely 'access-independent' and 'access-dependent' VoIP services. Specifically, the CRTC used the term 'access-independent' VoIP service to describe services that do not require the VoIP provider to own or operate the underlying network on which the service rides, nor do these services require the underlying network operator to grant permission for end-users to use the VoIP provider' s 'application'. By contrast, the CRTC

used the term 'access-dependent' VoIP service to describe IP-based voice services in which the access component and the service are necessarily linked. Providers of 'access-dependent' VoIP services typically own and operate a local access network and have simply converted the underlying technology of that network from circuit-switched to packet-switched. Despite these distinctions, the regulatory obligations that apply to TSPs that provide these services are the same. In other words, all providers of VoIP services, regardless of whether they provide 'access-independent' or 'access-dependent' VoIP services must (i) register with the CRTC, (i) obtain a BITS licence if they offer international calling capabilities and (iii) comply with the other, standard regulatory obligations that apply to other registered TSPs in Canada.

4.17 The CRTC requires all providers of local telephone services, including providers of local VoIP services, to provide access to 911 services.[5] However, the CRTC recognizes that providers of certain types of VoIP services - namely 'nomadic' VoIP services and 'fixed non-native' VoIP services - may not be able to provide accurate location information to public safety agencies. Until a technical solution is developed to address this problem, the CRTC requires providers of both 'nomadic' and 'fixed non-native' VoIP services to notify their customers (in marketing materials, terms of service, customer contracts, etc.) that there may be limitations associated with their access to 911 services. The CRTC also requires these TSPs to ensure that their customers are able to update their most likely physical address online.

UNITED KINGDOM

4.18 Under the UK's general conditions for communications networks and services, all communications service providers, including VoIP providers,

[5] http://www.crtc.gc.ca/eng/archive/2005/dt2005-21.htm

have the same general rights of interconnection.[6] Specific technical arrangements, including means of physical interconnection, are determined by the network operators and Internet-originated or terminated traffic is not treated differently.

4.19 In the UK, VOIP is treated as any other packet switched data, and VOIP is not currently seen as a 'relevant market' in the UK that requires a review to ensure that it is functioning correctly. Thus, it does not matter if the VoIP app is provided as an extension to a regulated entity's preexisting PSTN voice service or by a company providing only the VoIP capability all that matters is whether it is a 'VOIP out' or a 'VOIP in and out' service.

4.20 Termination charges in the UK are not subject to regulatory controls, except in the case of BT (with respect to fixed geographic call termination) and call termination on mobile networks. Other communications providers are only required to provide termination on fair and reasonable terms and conditions, including charges.

4.21 There is no restriction in the UK on whether a VoIP service is nomadic or non-nomadic. The potential portability of VoIP is recognized as a benefit of VoIP over a fixed line PSTN line.[7]

4.22 A non-geographic numbering range (056), which is part of the UK National Telephony Numbering Plan (NTNP), was made available by Ofcom for nomadic VOIP services and geographic numbers are available for all PATS including VOIP. While a special number range has been set

[6]https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/telecoms-competition-regulation/general-authorisation-regime
[7]https://www.ofcom.org.uk/__data/assets/pdf_file/0023/55571/voipstatement.pdf

aside for VoIP services, VoIP service providers are permitted to use any geographic telephone number in the UK number plan.[8]

4.23 In the UK, number portability is a right of any subscriber to a public electronic communications service with a number from the NTNP. Number portability is seen as a key facilitator of consumer choice and effective competition.

4.24 As In 2007 Ofcom identified a high level of consumer confusion relating to access to emergency services from a VOIP service and Ofcom requires that a VoIP service provider is expected to provide accurate and reliable CLI 'to the extent technically feasible' and at no charge to the emergency organizations. This of course is not viable for those VoIP service providers who do not use or assign an E.164 number (telephone number) as a user identifier. If the VOIP service does not provide access to emergency call numbers, this fact must be made clear at the time of signature of the relevant agreement. If the service is to be used principally at a single, fixed location, the service provider must require the customer to register with it the address of the place where the service will be used, in order to assist emergency services organisations. Customers must also be advised of any limitations on location information. If access to emergency calls is unreliable (particularly if access is cut off in the event of a power cut or failure, or a failure in the broadband connection over which the service is provided) this must be made clear to the customer, and acknowledged by the customer at the point of signature.

[8]https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2004/ofcom-to-encourage-the-development-of-new-voice-services

UNITED STATES

4.25 In the U.S., where regulation of VoIP services is generally limited to "interconnected VoIP service" i.e. those that enable calls both to and from the PSTN.[9]

4.26 The U.S. has no VoIP-specific interconnection rules. Each "telecommunications carrier" is obligated to interconnect with other "telecommunications carriers" under Section 251(a) of the Communications Act of 1934, as amended, but because VoIP services have not been classified as a telecommunications service, these obligations do not apply to VoIP services. Moreover, VoIP services are often untethered from any particular underlying network and, therefore, generally have no "network" to/from which other networks need to interconnect. Rather, the connection of a VoIP provider's cloud to a PSTN provider that is interconnected to the PSTN is managed through commercial negotiations. The point at which the parties connect their clouds and exchange traffic is not regulated. Notably, there has been no need for such regulation as the VoIP-to-PSTN marketplace in the U.S. is relatively vibrant, including network-based VoIP providers (e.g., cable companies that have added VoIP to their line-up of services) and non-network based providers (e.g., network untethered providers such as Vonage).

4.27 The U.S. does not impose any geographic restrictions on the provision or use of VoIP services. Telephone numbers in the U.S. are allocated to VoIP services in one of two ways: (i) they are sub-allocated through a commercial relationship between the VoIP provider and a telephone service provider (typically a "Competitive Local Exchange Carrier" or CLEC) which has obtained its telephone numbers directly from the U.S. number administrator; or (ii) the VoIP provider obtains the numbers

[9] https://www.gpo.gov/fdsys/pkg/CFR-2015-title47-vol1/pdf/CFR-2015-title47-vol1-sec9-3.pdf

directly from the numbering administrator because the VoIP provider has, itself, obtained a CLEC certificate or has otherwise been granted FCC authority to directly obtain the numbers. In no case are VoIP providers precluded from obtaining and using any particular type of number – i.e., there are no geographic vs. non-geographic number restrictions in the U.S. and, there are no restrictions on a VoIP provider's assignment of phone numbers to its users.

4.28 Number portability is a regulatory mandate for VoIP providers that are subject to the FCC's rules – that is, "interconnected VoIP" providers that enable calls both to and from the PSTN. Portability is critical to ensuring a robustly competitive market.

4.29 In the U.S., VoIP providers do not have an obligation to – nor is there currently a technical methodology to enable it – provide the real-time location of a nomadic VoIP user who has dialed the emergency services number, 911. Rather, the FCC has required that the interconnected VoIP providers, i.e., only those that provide a service that enables calls both to and from the PSTN, to collect a "registered location" from each customer. That registered location is then used for purposes of routing the call to the appropriate emergency call center. It is well recognized in the U.S. that the user may not be at that location when he/she calls 911. Therefore, the FCC has also required that interconnected VoIP providers provide their customers a disclaimer that informs them of the limitations of its VoIP 911 calling capabilities.

4.30 The U.S. imposes no federal QoS obligations on any type of VoIP service, including interconnected VoIP which is subject to other regulatory obligations.

CHAPTER V

SUMMARY OF RECOMMENDATIONS

5.1 The Authority recommends that:

(i) As per Authority's understanding of present Access service licences, Internet Telephony service is un-tethered from the underlying access Network. In other words, Internet Telephony Service can be provided by Access service provider to its subscriber who may be using Internet of other Access service providers. DoT should issue a clarification to the effect. If DoT has a different understanding, the Authority recommends that the DoT may issue amendment to Access service licences so that Internet Telephony service is un-tethered from the underlying access Network.

(ii) The UL (VNO) licensee with access service authorisation should also be allowed to provide un-tethered Internet Telephony in the designated service area.

(iii) Internet Telephony calls originated by International out roamers from international locations should be handed over at the International gateway of licensed ILDOs and International termination charges should be paid to the terminating access service provider. In case the Access provider is not able to ensure that Internet Telephony call originated outside of the country is coming through ILDO gateway, International out-roaming to Internet Telephony subscribers of the access provider should not be allowed.

(Para 3.34)

5.2 The Authority recommends that :

(i) The mobile numbering series should be used for providing Internet Telephony by a service provider. TSPs should be

allowed to allocate same number to the subscriber both for Cellular Mobile service and Internet Telephony service.

(ii) The SDCA linked numbering series may also be used for providing Internet Telephony by a service provider. However, in this case, mobility should be limited to consumer premises.

(iii) The clause 2.5 in UL (access service) related to translation of E.164 number to IP address may modified as below:

Present Clause	Amended Clause
"IP Address assigned to a subscriber for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only. Translation of E.164 number / private number to IP address and vice versa by the licensee for this purpose shall be as per directions/instructions issued by the Licensor."	***"IP Address assigned to a subscriber for Internet Telephony shall conform to IP addressing Scheme of Internet Assigned Numbers Authority (IANA) only.***

Similar clause in other access licences (BSO, CMTS, and UASL) should also be amended.

(iv) The access service licensee should use private ENUM in its network for Telephone number mapping from E.164 to SIP/H.323 addresses and vice-versa.

(v) In case of provision of Internet Telephony by VNO with access service authorisation, the numbering resource allocation should be done by the parent NSO. (Para 3.48)

5.3 The Authority recommends that:

i. The licensees should comply with all the interception and monitoring related requirements as specified in the licence as amended from time to time for providing Internet Telephony.

ii. The Public IP address used for originating/terminating Internet Telephony calls should be made a mandatory part of

CDR in case of Internet Telephony. The location details in form of latitude and longitude should also be provided wherever it is feasible.

iii. **CLI Restriction (CLIR) facility should not be provided for Internet Telephony Subscribers. (Para 3.51)**

5.4 The Authority recommends that the access service providers providing Internet Telephony service may be encouraged to facilitate access to emergency number calls using location services; however they may not be mandated to provide such services at present. The subscribers may be informed about the limitations of providing access to emergency services to Internet Telephony subscribers in unambiguous terms. (Para 3.63)

5.5 The Authority recommends that:

i. **QoS on Internet Telephony may be left to the market forces. The service providers must inform QoS parameters supported by them for Internet Telephony so that the subscribers can take an informed decision.**

ii. **The Authority shall review the decision regarding mandating QoS to Internet Telephony service providers at appropriate time. (Para 3.69)**

List of Acronyms

S.No.	Acronym	Description
1	ACCC	Australian Competition and Consumer Commission
2	ACMA	Australian Communications and Media Authority
3	ARPA	Advanced Research Projects Agency
4	BITS	Basic International Telecommunications Service
5	BSO	Basic Service Operators
6	CLEC	Competitive Local Exchange Carrier
7	CLI	Caller Line Identification
8	CMSO	Cellular Mobile Service Operators
9	CMTS	Cellular Mobile Telephone Services
10	CPE	Customer Premises Equipment
11	CSP	Carriage Service Providers
12	ENUM	E.164 Number to URI Mapping
13	FBG	Financial Bank Guarantee
14	FCC	Federal Communications Commission
15	FMT	Fixed Mobile Telephony
16	FTAS	Fixed Terminating Access
17	FQDN	Fully Qualified Domain Name
18	GMPCS	Global Mobile Personal Communication by Satellite
19	GSM	Global System for Mobile
20	IANA	Internet Assigned Numbers Authority
21	IETF	Internet Engineering Task Force
22	ILDO	International Long Distance Operator
23	IMS	IP Multimedia Subsystem
24	IP	Internet Protocol
25	IPTV	Internet Protocol Television
26	ISP	Internet Service Provider
27	ITSP	Internet Telephony Service Provider
28	ITU	International Telecommunication Union
29	LEC	Local Exchange Carrier
30	LFMT	Limited Fixed Mobile Telephony

31	MTAS	Mobile Terminating Access
32	NANP	North American Numbering Plan
33	NGN	Next Generation Network
34	NLD	National Long Distance
35	NSO	Network Services Operator
36	NTNP	National Telephone Numbering Plan
37	NTP	New Telecom Policy
38	NVP	Network Voice Protocol
39	PATS	Publicly Available Telephone Services
40	PBG	Performance Bank Guarantee
41	PCM	Pulse Code Modulation
42	PLMN	Public Land Mobile Network
43	POI	Point of Interconnection
44	PSTN	Public Switched Telephone Network
45	QoS	Quality of Service
46	SDCA	Short Distance Charging Area
47	SIP	Session Initiation Protocol
48	TCP	Transmission Control Protocol
49	TDM	Time Division Multiplexing
50	TSP	Telecom Service Provider
51	UASL	Unified Access Service Licence
52	UASP	Unified Access Service Provider
53	UK	United Kingdom
54	UL	Unified Licence
55	US	United States
56	VoIP	Voice over Internet Protocol
57	VNO	Virtual Network Operator

Annexure-I

Government of India
Ministry of Communications
Department of Telecommunications
(Access Services Cell)
12th Floor, Sanchar Bhawan, Ashoka Road, New Delhi

File No: 800-13/2016-AS-II Dated: 03.01.2017

To

The Secretary
Telecom Regulatory Authority of India
New Delhi

Subject: Launch of Fixed Mobile Telephony (FMT) service by BSNL.

This is in reference to TRAI letter no. 5-1/2016-BB&PA dated 24.11.2016 on the above mentioned subject wherein TRAI has requested DoT to inform as to whether the issue of proposed FMT service by BSNL has been examined in DoT and if so, the decision of DoT thereof may be shared with TRAI.

2. In this regard, it is to intimate that the Department has already conveyed their views in para 2 (i) of this office letter of even number dated 16.08.2016 (copy enclosed for ready reference). Further the proposed FMT service by BSNL cannot be treated within the scope of Basic License since:

i. As per the scope covered under the Basic License, the service may be provided to the subscribers either through Wireline mode or WLL (Wireless Local Loop) mode with/without limited mobility. However, in case of FMT, the physical location of the subscriber may be anywhere (outside SDCA - Short Distance Charging Area including abroad) which is akin to mobile services and numbering series allotted for Basic Services cannot be utilized for the service.

ii. Even the mobility within SDCA is distinguished from landline and an IUC of 14 paisa/ minute is applicable for calls originated from WLL (M) and terminated on mobile, whereas no IUC is applicable in case of calls originated from landline and terminated on mobile. Such scheme will amount to bypassing of revenues.

iii. Further, in the service proposed by BSNL, a call originated from an international location will be carried on internet bypassing the ILD gateways of ILDO. Thus, IUC charges as per applicable IUC regulations will be nil resulting in loss to exchequer. In this case the license fee payable to the department on the revenue earned by the ILDO, had the call been routed through ILDO will also become nil.

iv. M/s Reliance introduced a scheme wherein CLI was changed and IUC was bypassed and in that case a penalty of Rs 150 Crores was recovered by Department and M/s Reliance paid few hundred Crores to BSNL.

This is issued with the approval of Secretary (Telecom).

Encl.: As above.

03/01/17

(Prashant Verma)
ADG (AS-II)
Tele No. 011-23354042

Copy to: The CMD, BSNL, New Delhi.

Annexure-II

Government of India
Ministry of Communications
Department of Telecommunications
(Access Services Cell)
12th Floor, Sanchar Bhawan, Ashoka Road, New Delhi

File No: 800-13/2016-AS-II Dated: 16.08.2016

The Secretary
Telecom Regulatory Authority of India
New Delhi

Subject: Launch of Fixed Mobile Telephony (FMT) service by BSNL.

This is in reference to TRAI letter no. 5-1/2016-BB&PA dated 06.06.2016 on the above mentioned subject wherein TRAI has requested DoT to provide certain information on the BSNL FMT service.

2. The case has been examined in the context of the queries raised by TRAI and following are the views of the Department:

i. The subscriber device being used by BSNL FMT can be moved around and hooked to internet to reach BSNL's NGN equipment for making voice calls. Although the service does not use mobile services, it allows subscriber to move around and make voice calls, therefore, it is difficult to conclude that the FMT service of BSNL falls within the scope of Basic Service License and can be termed as landline/basic service.

ii. BSNL is authorized for packet data, VSAT services under its basic service license.

iii. The Basic Service License issued to BSNL has been amended to include Internet Telephony vide letter no. 10-21/2005-BS.I(Vol.II)/55 dated 14.12.2005 (copy enclosed as Annexure-I). Further a clarification regarding definition of Internet Telephony has also been issued to Basic/CMTS/USAL Licensees vide letter no. 842-582/2005-VAS dated 08.04.2008 (copy enclosed as Annexure-II).

This is issued with the approval of Secretary (Telecom).

Encl.: As above.

16/08/16
(Prashant Verma)
ADG (AS-II)
Tele No. 011-23354042

Government of India
Ministry of Communications & Information Technology
Department of Telecommunications
(Basic Services Licensing Group)
Sanchar Bhavan, 20 Ashok Road, New Delhi-110 001.

No.10-21/2005-BS.I(Vol.II)/55 Dated the 14th December 2005.

To

The Chairman-cum-Managing Director,
Bharat Sanchar Nigam Limited,
Statesman House, Barakhamba Road,
New Delhi.

Sub: Changes in the Licence Conditions.

The undersigned is directed to convey the approval of the competent authority for following changes in the licence granted to BSNL with immediate effect:

National Long Distance Service:

(i) Annual licence fee for NLD services reduced to 6% of AGR w.e.f. 1.1.2006.
(ii) NLD service providers shall be permitted to carry intra-circle traffic with mutual agreement of originating service provider.
(iii) NLD service provider can access the subscriber directly for provision of leased circuits/closed user groups i.e. can provide last mile connectivity.

Leased Circuits:

(i) Leased circuit is defined as virtual private network using circuit or packet switched (IP protocol) technology apart from point to point non-switched physical connections /transmission bandwidth.
(ii) Public network is not to be connected with leased circuits/CUGs.

Contd...p.2

Provision of Internet telephony, Internet Services and Broadband services by Access Providers.

(i) Access service provider can provide Internet telephony, Internet services and Broadband services. If required, access service provider can use the network of NLD/ILD service licensee.

VSAT commercial.

i) Annual Licence Fee reduced to 6% of AGR w.e.f. 1.1.2006.

Other terms and conditions remain the same.

(Govind Singhal)
Director (BS.III)

For and on behalf of the President of India

Copy to:

1. The Secretary, TRAI, New Delhi.
2. Sr. DDG (LF), DOT.

Government of India
Ministry of Communications & IT
Department of Telecommunications
(AS-II CELL)
Sanchar Bhawan, 20, Ashoka Road, New Delhi – 110 001.

No.842-582/2005-VAS/ Dated April 8, 2008

To
All Cellular Mobile Telephone Service Licensees
All Unified Access services Licensees
Bharat Sanchar Nigam Limited
Mahanagar Telephone Nigam Limited

Subject:- Amendment in the Cellular Mobile Telephone Service (CMTS), Unified Access services & Basic Service Licenses.

The License to provide Access Services is hereby amended for proper conduct of Telegraph with immediate effect as per details given below:

i. Addition of Definition of Internet Telephony:
"Internet Telephony" means "transfer of message(s) including voice signal (s) through Public Internet"

2. All other terms and conditions shall remain unchanged.

3. Please acknowledge the receipt of this letter.

(N.M. Manickam))
Director (AS-IV)

Copy to:
1. Secretary, TRAI,New Delhi.
2. Sr.DDG TEC,New Delhi.
3. DDG(LF), Sr. DDG(WPF), DDG(Security), DDG(AS-I), DDG(AS-II), DDG(CS), DDG(DS), DOT, New Delhi
4. DDG(C&A) for posting on DOT's website.