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Ref No: PTA/S&D/Misc/43/2014/

26th March, 2014

Subject: Industry Consultation on Framework for VoIP

1. Voice over IP (VoIP) is an ever growing Over the Top service around the globe. Considering its growth rate and popularity, the telecom regulators are increasingly regulating their industry for services like emergency services and security concerns etc.
2. Pakistan Telecommunication Authority is in process of evaluating the trends, needs and requirements of VoIP in Pakistani market in order to facilitate the customers as well as all the concerned licensees in that loop.
3. A questionnaire in this regard is floated for your valuable feedback. If you have any suggestion other than mentioned in the document, please feel free to express.
4. The reference document "The VoIP regulatory Frameworks in the World" is available on PTA website for viewership of worldwide scenario.
5. Please provide your valuable feedback with reference to the questionnaire, to the undersigned office through post and also an email of the same at VoIP@pta.gov.pk. The response may kindly reach PTA, no later than **March 31, 2014**.

Wasim Tauqir,
DG(Strategy & Development)
wtauqir@pta.gov.pk

To,

List Attached,

CC,

PS to Chairman (PTA),
PS to M(C&E), PTA,
PS to M(F), PTA

Questionnaire

Issue date: March 20, 2014

Dead Line: March 31, 2014

Respond at:

Post: DG(S&D),
PTA HQ, F-5/1,
Islamabad.

Email: VoIP@PTA.gov.pk

Question 1: Is your company currently using VoIP platform at any stage of network for provision of services.

Question 2: If the answer to the previous question is yes, explain how?

Question 3: How do you see the role of VoIP (managed and unmanaged) services in Pakistan's telecom market in the near future? What types of VoIP services do you foresee to be available in Pakistan in next few years?

Question 4: What were the policy and regulatory challenges faced in VoIP after the deregulation in Pakistan?

Question 5: Which policy and regulatory options can optimize the benefits of managed as well as unmanaged VoIP services for the telecom companies as well as consumers in Pakistan?

Question 6: In your opinion, should the scope of any VoIP relevant market(s) be identified by the regulator? If yes, please explain why.

Question 7: If the answer to the previous question is yes, also specify the qualitative and quantitative impact of it on:

- a. consumers (users),
- b. Competition (Operators), and
- c. Evolution of society

Question 8: Do u think best effort VoIP services license should be provided in Pakistan?

Question 9: What should be status of APC regime in case best effort VoIP service providers may be allowed to terminate calls in Pakistan?

Question 10: How do you see the allocation of numbering plans for VoIP services?

PTA Industry Consultation on VoIP

OTT Services

Question 11: What sort of licensing regime should be followed for best effort services?

Question 12: What is your view / opinion regarding regulation of OTT services? Do u think that it should be legalized under a framework?

Question 13: Do you foresee any erosion of voice revenues from OTTs? If yes, are you experiencing any losses in voice revenues due to OTTs, please give a numeric figure of loss percentage. How do you plan to handle this situation?

Question 14: Which strategies the telecom companies are adopting in order to expand their business in an environment where OTT services are on the rise, providing business case for their operations?

Question 15: Which of the OTT services have majorly affected the revenues of the operators in Pakistan (positive and/or negative).

Question 16: What procedure should be adopted for complaint handling / dispute settlement mechanism in case of OTT services?

Question 17: In case, unmanaged (best effort) VoIP is allowed / authorized in Pakistan then what should be the pricing regime for VoIP service? Should PTA regulate it or observe "forbearance"?

Question 18: What interconnection regime including cost of different elements should be followed for VoIP? Should separate termination charges be set for best effort VoIP or Bill and Keep (BAK) approach may be adopted for it?

Question 19: Do you have any other suggestions and/or concerns related to the subject?

Draft Report

The VoIP Regulatory Frameworks in the World

1. Background

This short report has been prepared to provide international best practices and some basic facts about the countries that have adopted and regulated Voice over Internet Protocol (VoIP), in order to draw and conclude a regulatory framework for Pakistan.

2. Executive Summary

Over the last decade, voice over Internet Protocol (VoIP) services has been tremendously growing due to growth in broadband networks and reductions in costs, and this has transformed the telecommunication industry.

By 2004, VoIP had been explicitly legalized in 46 countries mainly in Europe, North America and Asia. In another 57 countries, VoIP was also broadly permitted, while 80 countries prohibited VoIP services, mainly in Africa and some Arab States.

By 2004, VoIP had been explicitly legalized in 46 countries and by September 2009, 92 countries explicitly legalized VoIP

In contrast, by September 2009, 92 countries explicitly legalized VoIP, while the number of countries banning VoIP has fallen to 49, i.e. around a quarter of all countries for which data existed.¹ VoIP has gradually become more regulated, especially in the context of security concerns and the provision of emergency calls.

¹ <http://www.itu.int/net/itunews/issues/2009/07/21.aspx>

Pakistan falls in the countries that have legalized it. Pakistan's Fixed Line telecom sector was liberalized through the technology neutral De-regulation Policy issued in 2003² by Ministry of Information Technology (MOIT) (see Annex A).

3. Definition of VoIP

In Newton's Telecom Dictionary

Internet Telephony: "In the beginning, Internet telephony simply meant the technology and techniques to let you make voice phone calls — local, long distance, and international — over the Internet using your PC ...the definition of Internet telephony is broadening day by day to include all forms of media (voice, video, image), and all forms of messaging and all variations of speed from real-time to time-delayed."

IP Telephony: (defined by Microsoft) "IP Telephony is an emerging set of technologies that enables voice, data, and video collaboration over existing IP-based LANs (local area network), WANs (wide area network) and the Internet. Specifically, IP Telephony uses open IETF (Internet Engineering Task Force) and ITU (International Telecommunication Union) standards to move multimedia traffic over any network that uses IP."

VoIP: "The technology used to transmit voice conversations over a data network using IP. Such data network may be the Internet or a corporate Intranet, or managed networks typically used by long distance and local service traditional providers and ISPs (Internet Service Provider) that use VoIP."

Wikipedia Definition

Voice over Internet Protocol (VoIP) is a methodology and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet.

Other terms commonly associated with VoIP are IP telephony, Internet telephony, voice over broadband (VoBB), broadband telephony, IP communications, and broadband phone service.³ The term *Internet telephony* specifically refers to the provisioning of communications services (voice, fax, SMS, voice-messaging) over the public Internet, rather than via the public switched telephone network (PSTN).

² See Annexure A

³ Wikipedia Definition

4. Managed/ Unmanaged VoIP Services

The **managed VoIP** service is offered by the same operator installing the BB connection or through an appropriate wholesale agreement; in this case the Operator/ISP can control the quality of the end user service and the connection is made using standard terminating equipment (it does not need a PC or its types)

The **unmanaged VoIP** service is offered through an Internet access on a best effort basis by an over the top provider (requiring a PC or its types) and without controlling the connection (as the data traffic on the Internet).

5. Regulatory Approaches⁴

Regulatory responses can be broadly classified into those countries where:

- a) **VoIP has been made illegal**, often to protect the revenues of the incumbent (and government, in those markets where the incumbent is a State-Owned Enterprise). These are often developing countries. According to ITU's analysis.
- b) **VoIP is unregulated**, through a regulatory decision that VoIP should not be regulated. (This is different from category c below).
- c) **The absence or lack of regulation**: This is often temporary. The regulator (expected to) reach(es) a decision on regulation, sometimes through public consultation or otherwise.
- d) **VoIP may be subject to similar/same regulation as PSTN**, or some forms of VoIP are subject to some/all of the same regulation as PSTN, depending on the technology used (hence the importance of definitions). This can amount to a 'light regulatory touch' e.g. in the US.
- e) VoIP may be subject to its **own set of regulations**, with its own specific licenses.

6. Regulatory Framework Of VoIP in different Countries

Feb 2013: A survey by media marketing research firm Arbitron⁵ discovers that mobile users from Japan and Indonesia are more likely to use VoIP for calls rather than conventional calls.

⁴ <http://www.itu.int/osg/spu/ni/voice/papers/FoV-VoIP-Biggs-Draft.pdf>

⁵ <http://e27.co/japan-and-indonesia-are-top-mobile-voip-users-survey-reveals/>

Arbitron Mobile recently conducted a survey by February 2013, on the usage of Voice over Internet Protocol (VoIP) in mobile devices across seven countries, namely Japan, Indonesia, China, US, UK, German and France. The survey revealed that Japan tops the utilization of VoIP mobile followed by Indonesia in the second spot.

The survey found that 40.9 percent of respondents from Indonesia use VoIP on their mobile device, with the average of 134.9 minutes every month or 65.9 sessions every month. Japan is leading with 68.2 percent using VoIP on their devices. Given this information, Japan and Indonesia determined to be among the two surveyed countries in which mobile users are more likely to use VoIP on their devices rather than conventional voice calls.

TechNavio⁶ estimates the North American Mobile VoIP market will exceed a yearly growth rate of 55% between 2010 and 2014. Market growth continues to be driven by demand for less costly communication solutions. In North America, an increasingly competitive environment is pushing vendors to offer cheaper services. Rising concern regarding data security among end-users constitutes a potential challenge to market growth. Leading vendors operating in this market include Fring, Truphone, Vonage and Skype.

Please see Annex-B for the tabulated Country statuses

a. India

The Telecom Regulatory Authority of India (TRAI) provided its recommendations to Government on Internet telephony on 20 February 2002⁷ to foster competition, to improve options and prices for the consumers and provide technological flexibility to the providers while maintaining QoS. VoIP has been legal since 1 April 2002. Facility-based (Infrastructure) operators can provide Internet telephony and use VoIP technology to manage their networks, subject to QoS considerations. TRAI issued regulations on quality for VoIP ILD calls, differentiating between toll quality and below-toll quality in November 2002¹⁰. Subsequent amendments abolished the below-toll quality distinction and refer only to one category of toll-quality QoS⁸. TRAI has recommended that:

- *the one-way end-to-end delay should in no case exceed 150 μ seconds;*
- *Variability (jitter) should be less than 5%;*
- *Packet loss should not exceed 1%.*

⁶ North American Mobile VoIP Market 2010-2014 <http://www.reportlinker.com/p0575177-summary/North-American-Mobile-VoIP-Market.html>

⁷ Press Release, "TRAI provides its recommendations to the Govt. on the Introduction of Internet Telephony", 20 February 2002, http://www.trai.gov.in/PressReleases_content.asp?id=280.

⁸ VoLGA Forum. <http://www.volga-forum.com/>

Tariffs for toll quality service offered by facility-based operators should be the same as for equivalent PSTN-based services. The tariffs of VoIP services offered by ISPs over the public Internet are not regulated, as this is an application of a Value-Added Service.

The DOT has permitted VoIP only to licensed internet service providers (ISPs) for providing the internet telephony in the licensed service area.⁹

b. Bangladesh

VoIP Services in Bangladesh are licensed services. These are licensed through open [and/or auction] licensing procedure. Open Licensing is defined in annexure C below.

In September 2006, the Bangladesh Telecommunications Regulatory Commission (BTRC) invited bids from private sector for Voice over Internet Protocol licenses, following cabinet approval of VoIP in the private sector in November 2003. The 'regulatory and licensing guidelines of VoIP' state that VoIP licenses will be awarded to the interested operators who fulfill the technical and financial specifications of the regulatory commission. Licenses will be given initially for five years with a renewal option.

According to the licensing conditions, a mobile phone operator has to pay Tk 10 crore to the BTRC as license fee, plus Tk 2 crore in annual license fees and 5% of VoIP revenues. The regulatory commission will keep Tk 20 lakh in security deposit in case of prepaid VoIP services. A land phone operator will have to pay Tk one crore for license acquisition, Tk 20 lakh in annual license fees, and 2% of its VoIP revenues. The commission will charge a nationwide internet service provider Tk 50 lakh for a VoIP license, Tk 7 lakh in annual fees, and 1% of revenues. An ISP has to keep Tk 5 lakh as security deposit with the commission for offering prepaid VoIP services.

The licensing of VoIP in Bangladesh was delayed while attempts were made to establish a common platform to route all VoIP calls for national security reasons and to monitor VoIP revenues. Then these licenses were issued in 2009. The Amended Regulatory and Licensing Guidelines for IP Telephony Service provider license was released in June 2009 by the BTRC.

Bangladesh now requires all calls including inter-operator VoIP calls to be routed through Interconnection Exchanges or International Gateways. Intra-operator VoIP calls and other domestic data traffic must be routed through National Internet Exchanges. The regulator, the BTRC, is still catching illegal VoIP operators. In the first eight months of 2011, they seized Voice over Internet Protocol (VoIP) equipment from eight unauthorized VoIP business centers.

⁹ www.lexmundi.com/Document.asp?DocID=1863

Bangladesh Telecommunication Regulatory Commission (BTRC) has issued the VoIP Service Provider or VSP licenses for the first time in the country in early 2013. The Licensing guidelines are attached as Annex E for quick reference. Following was the fee chart given in guidelines.

12.2 Following fees and charges will be applicable to the applicant/Licensee:

1.	Application Fee (non refundable)	Tk. 5,000.00 (five thousand) only
2.	License Acquisition Fee	Tk. 5,00,000.00 (five lac) only
3.	Annual License Fee	Tk. 1,00,000.00 (one lac) only
4.	Audited Gross Revenue Sharing with the Commission	20% (twenty percent) of {clause-12.2(5)(i)}.
5.	International incoming call rate sharing(termination charge) with IGWs, ICXs, ANS and Commission	<p>International incoming call rates (termination charge) shall be decided by the Commission, which may be reviewed from time to time.</p> <p>After deducting VAT (if applicable) the prevailing international incoming call rates in Bangladesh Taka (BDT) shall be shared in the following proportion:</p> <p>(i) VSP shall keep 15% (fifteen percent) of the call</p>
		<p>rates.</p> <p>(ii) VSP shall pay to IGW(s) 15% (fifteen percent) of the call rates, and</p> <p>(iii) VSP shall pay to ICX(s) 15% (fifteen percent) of the call rates, and</p> <p>(iv) VSP shall pay to ANS 20% (twenty percent) of the call rates.</p> <p>(v) VSP shall pay to the Commission 35% (thirty five percent) of the call rates.</p>
6.	Performance Bank Guarantee	Tk. 2,50,000.00 (Two Lac and Fifty Thousand) only

1,004 VoIP licenses were awarded to operators. A number of IGWs had taken VoIP licenses themselves, and were now only handling their own calls.

“As the IGWs are handling calls terminated by their VoIPs, they now show little interest in receiving calls from us.” wrote Rabiul Karim, convener of the VoIP Service Provider Association (VSPA), in a written speech ¹⁰

c. Indonesia

Indonesia VoIP service is regulated by the Indonesian government. Indonesia formally awards VoIP licenses. VoIP license is generally awarded to ISP – Internet Service Provider. The Government has issued 14 licensed VoIP (phone-to-phone) operators, including existing PSTN and cellular operators.

These VoIP operators are classified as service-based operators, because they do not have their own customer base, but provide services to the customers of PSTN and Mobile operators. Almost all of VoIP operators are using a two-step dialing scheme using the 170XY access code and dependent of E1 line from PSTN and/or mobile operators. Other than the existing PSTN and cellular operators, other operators may be given single step dialling using 010XY access code, but they cannot operate this method before they have the agreement of the incumbent PSTN and mobile operators. VoIP PC- to-PC is classified as an ISP service.

VoIP has several benefits for Indonesia. Indonesia VoIP service has much more bandwidth¹¹ than regular telephone service, meaning that more calls, faxes, data, and videoconferencing can take place at the same time, and because Indonesia VoIP service uses the Internet instead of regular PSTN (Public Service Telephone Network) long distance links, Indonesia VoIP providers do not need to lease airtime on these links. This saves the providers money, a savings that can be passed on to their customers.

There are five major telecommunications firms working with VoIP in Indonesia. These companies have worked to integrate VoIP applications into the PSTN. Almost all the companies offer pre-paid VoIP cards for long distance calls that reduce the cost to quarter.

d. Japan

VoIP is permitted and is subject to minimal regulation. The legal framework distinguishes three types of VoIP services, based on the quality of service. Providers that do not need numbers for their operations (e.g. PC-to-PC communications) do not have to comply with QoS requirements;

- If the provider can ensure minimum standards of QoS (in end-to-end voice quality and end-to-end voice delay), they qualify for the 050-prefix numbers assigned by the regulator since September 2002.

¹⁰ <http://www.voipmonitoringzone.com/articles/351620-bangladesh-voip-operators-unable-place-international-calls.htm>

¹¹ <http://www.voipreview.org/news-indonesia-voip.aspx>

- Where quality is as good as PSTN, providers have been allowed to use the same numbers as PSTN, since 2003.
- Tariffs and access charges for VoIP services are not regulated. Emergency calls and direct access must be available from VoIP lines, and numbers must observe location correspondence.

Only if the VoIP provider is a facility-based operator is interconnection required. VoIP providers have to pay access charges to the PSTN operators when calls are terminated on their networks.

It is required to obtain registration from Ministry of Internal Affairs and Communications (MIC) or submit notification to the MIC to operate VoIP business in Japan, according to Telecommunications Business Law. If you want to allocate telephone numbers to VoIP terminal equipments, you have to get additional allowance from the MIC. There is no difference between legal interception of ordinary telephone calls and that of VoIP calls.¹²

e. United Kingdom

Background

The Ofcom started regulating VoIP in 2004, by adopting a consultation process and thus came up with interim guidelines for VoIP services in 2004. Under these guidelines Ofcom ensured that consumer' interests were best met keeping in view both the constraints of relevant European Community directives and also the relative infancy of the market. Ofcom therefore resorted on forbearance policy position to allow providers of VoIP services to enter the market and offer emergency services access without having to meet all the regulatory requirements associated with PATS. However there were a number of further developments that required a reassessment of Ofcom's previous proposals to ensure that the objectives in relation to VoIP services are achieved. Therefore the Ofcom once again went into consultation and came up with changes in the 2004 regulations for VoIP. In the paragraphs below first VoIP guidelines of 2004 are summarized followed by amendments made in 2007.

2004 Forbearance Policy

With increased popularity of Voice over Internet Protocol (VoIP), Voice over Broadband (VOB) and Internet Telephony, Ofcom now refers to these services as "New Voice Services" (NVS). The distinctive feature of these services is that they provide call origination and termination outside PSTN. In case of NVS both participants of the call use NVS or a PSTN breakout for call origination and termination. The main regulatory issue was whether they constitute Publicly Available Telephone Service (PATS). VS are like PSTN voice services

¹² Information and communication Policy site : http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/fags.html

with difference like network and location independence, network integrity, reliability and access to emergency services. PATS in UK are subject to General conditions over and above those applicable to Public electronic communication services generally. For NVS it was crucial, as to which category these services fall. Therefore Ofcom preliminary interim regulatory policy of NVS is as follows;

1. It is not possible for all voice services to be required to offer the same feature as traditional telephone service.
2. Criteria such as appearance of a service or whether it is used as a second line should be relied on to decide whether the service is regulated in a similar way as a traditional telephone service.
3. It is not currently necessary or appropriate for access to calls to emergency services to be a requirement for all voice services, if NVS do not provide access to emergency calls it is better to allow them to provide less reliable access rather than preventing them from offering any access at all.
4. Providers should be allowed to offer range of differentiated services and consumers should be enabled to make informed decision about the products they are buying and using, including awareness that access to emergency services will not always be available.
5. As interim policy, pending further clarification from European Commission NVS are allowed to operate and offer access to emergency services without having to meet all the obligations of PATS.
6. Providers of NVS are entitled to and obliged to provide, number portability if their services amounts to PATS

Further Ofcom allocated numbering range of 56 to location independent Electronic Communication Services to enable operators of NVS to provide to their customer with non geographical numbers associated with NVS.

Period Between 2004-2006

In the period between September 2004 and the 2006 consultation, Ofcom noted that there were a wide and increasing number and variety of VoIP service propositions in the marketplace, including:

- PC-based services that allow calls from one PC to another (such as Skype and Google Talk), commonly referred to as PC-to-PC services

- Services marketed as secondary line services that allow calls to and from traditional telephone numbers (such as Tesco and Skype In/Out); some of these services include emergency services access and some do not;
- other services that are marketed as replacements for traditional Public Switched Telephony Network (“PSTN”) based call services; typically, the PSTN line remains in place and the VoIP service is then used only for calls; and
- Services targeted for nomadic and mobile use have also begun to enter the market: Voice over Wireless (“VoWLAN”) services are being developed and other services are being deployed which rely on wireless access solutions using licensed radio spectrum.

These services are based on a variety of software/equipment, These services are being offered by a range of providers. In some cases, they are bundled with Internet access services and in others as stand-alone services.

Regulatory Proposals for VoIP 2006

Therefore the key regulatory proposals for 2006 consultation sought to address three central policy aims identified by Ofcom—(i) ensuring consumers are well informed; (ii) enabling innovation in a technologically neutral way; and (iii) ensuring maximum availability of access to emergency services—to ensure that VoIP services being delivered to further the interests of citizens and consumers. In addition Ofcom also decided about discontinuance of Ofcom’s interim forbearance policy as set out in the 2004 consultation, withdrawal of the Essential Requirement Guidelines (and instead applying the ‘reasonably practicable’ test set out in General Condition³ (GC) on a case-by-case basis; and the publication of draft guidance on the application of PATS obligations in the GCs to VoIP service providers to ensure that they meet their obligations.

Following are the main features of 2007 consultation

Enabling innovation in a technologically neutral way

Ofcom considers that regulation should avoid special treatment of one technology over another. Ofcom explained that the regulatory framework should not prevent different business models from entering the market. Ofcom explained that regulation of services delivered via VoIP

technology did not create barriers that might limit the development of such services. Ofcom also needs to ensure, however, that the regulatory regime is not disproportionately advantageous to services delivered via VoIP technology to the detriment of services delivered via other technologies. So far as practicable, there needs to be a level playing field for technologies that deliver services that are comparable.

Ensuring consumers are well informed

Ofcom considers that consumers need to understand the features and capabilities of services delivered via VoIP technology and, in particular, they must be aware of the circumstances under which emergency services access might not be available. This will not, however, ensure that consumers will have access to emergency services in all circumstances. Moreover, services that are not PATS might not offer emergency services access at all. There is therefore a potential for consumer detriment. Ofcom considers that this can be mitigated to some extent by ensuring that consumers are well informed. This was most respondents' view as well.

Ofcom believes that, as VoIP services are sufficiently different to other voice services in that the service may be reliant on the continuation of external power supply and a broadband connection, it is reasonable to expect VoIP providers to supply additional consumer information.

. Ensuring maximum availability of emergency services access

Ofcom considers that a maximum availability of emergency services (incorporating both 999 and 112) is of paramount importance. The quality of emergency services access cannot, however, be guaranteed in all circumstances because services delivered via VoIP technology are reliant, in general, on the provision of services that are not always controlled by the VoIP provider. VoIP services typically need a broadband connection and, unless supplementary line-powering equipment is being provided, external power supply. The failure of either of these would mean that emergency services access, or any other services for that matter, could not be accessed by a customer. 3.61 The provision of supplementary line-powering is likely to increase the costs of the provision of VoIP services. The additional costs of the line-powering equipment might, potentially, make services delivered via VoIP technology less attractive to consumers. Both the technical constraints and the additional costs of line-powering equipment may delay the rollout of VoIP services and, therefore, limit consumer choice. Also, importantly, VoIP services might potentially benefit vulnerable groups in society because they are capable of offering alternative means of contacting emergency services (e.g. text or videophone). In terms of current regulation, until such time as Ofcom has imposed any requirements on other providers (which do not provide emergency services access and therefore do not satisfy all the gating criteria referred to in statement above), there is no requirement, at present, imposed on non-PATS providers to offer emergency services access.

Other issues

On switching, Ofcom agrees that ease of switching is critical for consumers to enjoy the benefits of innovation and competition. Ofcom agrees that services provided via VoIP technology and other related IP-based services offer new opportunities for disabled and vulnerable users. However, Ofcom considers that, at this stage in the market development, it

is not appropriate to require services delivered via IP technology to offer services beyond the requirements already required by regulation (for instance, under GC 15).¹³

(See annex F for reference document)

f. Singapore

In June 2005, IDA announced its policy framework for the provisioning of IP telephony services for those who wish to provide IP telephony services. Resultantly, IDA issued a number of Services-Based Operator (SBO) individual licenses for IP Telephony services and 8-digit number blocks were allocated to IP Telephony Operators (IPTOs). In early 2006, IPTOs sought to interconnect with the existing Fixed-line and Mobile operators (FMOs) for the provisioning of IP telephony services using level '3' numbers. However, there were various points of disagreement between the IPTOs and FMOs which prevented the parties from concluding interconnection agreements. In 2007, Infocomm Development Authority of Singapore (IDA) issued a consultation paper on "Proposed Regulatory Framework for Telephony Services over Wireless Broadband Access Networks and Interconnection Framework for Telephony Services". In the said consultation, IDA sought views on the long-term market and technology outlook, in particular, the increasing deployment of IP-based networks and the increasing pace of Fixed Mobile Convergence (FMC). The consultation process was closed on August 3, 2007.

On May 2008, IDA issued its Decision on Regulatory Framework for Telephony Services over Wireless Broadband Access Networks and Interconnection Framework for Telephony Services which is attached as Annex-1.

IDA's Decision on Number Allocation for Telephony Services over WBA Networks

IDA has defined three 8-digit number levels namely '3', '6', '8' and '9' code for Facilities-Based Operator (FBO) (fixed-line), radio network services (mobile) and IP Telephony services.

Level '3'

This unique numbering series has been allocated to IP Telephony Operators (IPTOs). Operators providing telephony services over WBA networks using level '3' numbers will not be subject to specific regulatory requirements on Quality of Service (QoS) standards,

¹³ <http://stakeholders.ofcom.org.uk/binaries/consultations/voipregulation/statement/voipstatement.pdf>

access to emergency services, provision of number portability, directory enquiry services and printed directories, under the framework for the allocation of level '3' numbers.

Interconnection with Dominant and Non-Dominant Operators

IPTOs seeking interconnection with operators who has been designated as dominant operator by IDA are allowed to commercially negotiate an individualized interconnection agreement with the dominant operator. If the negotiations between them fails within ninety (90) days then either licensee may request IDA to resolve the dispute.

IPTOs seeking interconnection with non-dominant operators will have to commercially negotiate an interconnection agreement with non-dominant operator. In case of non-agreement, the parties may request IDA to provide conciliation or resolve the dispute.

IDA's Decision on Interconnection Settlement Regime

Interconnection Settlement Regime for Services using Level '3' Numbers

IPTOs are required to pay the corresponding origination, transit and/or termination charges for calls originating, transiting through and/or terminating on the fixed-line networks (where applicable).

Between the mobile operators and IPTOs, a BAK (Bill and Keep) interconnection settlement regime has been adopted as Mobile / Receiving Party Pays (MPP / RPP) regime is applicable.

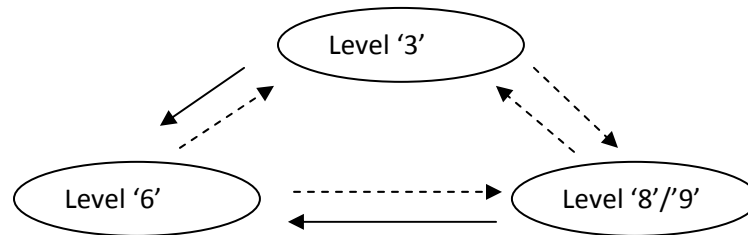
IDA has also proposed that the origination or termination charges for calls originating or terminating on Level 3 Operators' network need not to be established, as such cost of origination or termination on an efficient IP-based network is likely to be insignificant.

In summary, IDA's decision on interconnection settlement regime based on number level assignment for the services is as follows:

	Level '6'	Level '3', '8' & '9'
Interconnection Settlement Regime	'Calling Party Pays' (with network origination/transit/termination rates payable)* *includes any local,	No origination, transit or termination charges payable to operators providing telephony services

	international and ISDN calls requiring PSTN for completing transmission	based on these number levels.
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The following diagram illustrates the interconnection settlement between operators deploying service using the various number levels.



Explanation:

- Termination charge imposed for calls in this direction
- - - - -→ No charges imposed for calls in this direction

Cost of Opening of Number Levels

Initially, IDA had proposed that each operator should bear its own cost of opening up new numbers to cater to telephony traffic to and from all IP telephony operators, including the WBA operators that provide telephony services. However, IDA recognized that there is a significant disparity in the costs associated with opening up of new number levels. In this regard, IDA decided that by requiring each operator to bear its own cost for the opening up of new number levels may not be the fairest arrangement. IDA has decided that operators may recover the cost of opening up new number levels in their networks, via the imposition of **cost-based charges** upon the operator that requested the opening up of new number levels. For the case of opening up of access codes, such as 00X, 15XX and 1800 numbers, the cost shall similarly be borne by the access code operators. IDA will not hesitate to take enforcement action against any operator who attempt to levy unreasonable non cost-based number level opening charges to create barriers to entry or undermine competition. (See Annex G for reference document)

7. Americas (North & South)

- i. **Latin America: Reference Report: VoIP Regulation in Latin America attached as annex H.**
- ii. **USA: Reference Report “ The status of Telecommunication Deregulation 2012” attached as annex I.**

8. Future of Voice

The industry is moving towards the all IP- data networks and/or next-generation mobile technology. The question arises while we see the tremendous revenues mobile operators derive from mobile voice, what transformation would come to voice?

Figure 1 shows that voice currently provides the majority of operators' revenues¹⁴. Although voice revenues as a portion of total revenues are steadily declining, voice is expected to remain the primary revenue contributor for the next several years. Add into this that approximately half of data revenues come from texting (SMS) and it is clear that the contributions of voice and texting are fundamental to operators' continued commercial success till date.

The future does not seem to remain the same as the past, that voice and texting are the predominant sources of mobile operators' revenues. The data services are increasingly popular. The number of data subscribers and their data usage continues to grow rapidly. This behavior is fueled by the proliferation of 3G data networks, the widespread availability of multimedia and smartphones, the availability of content and social networking sites using mobile devices, and affordable mobile data services¹⁵.

The growth in the use of VoIP however, does not mean that a country's voice operator will lose revenue. This is because the opportunities and volumes that the new technology may open up can compensate for losses, especially if countries actively promote the expansion of VoIP

The Economist, Sept. 17, 2005¹⁶

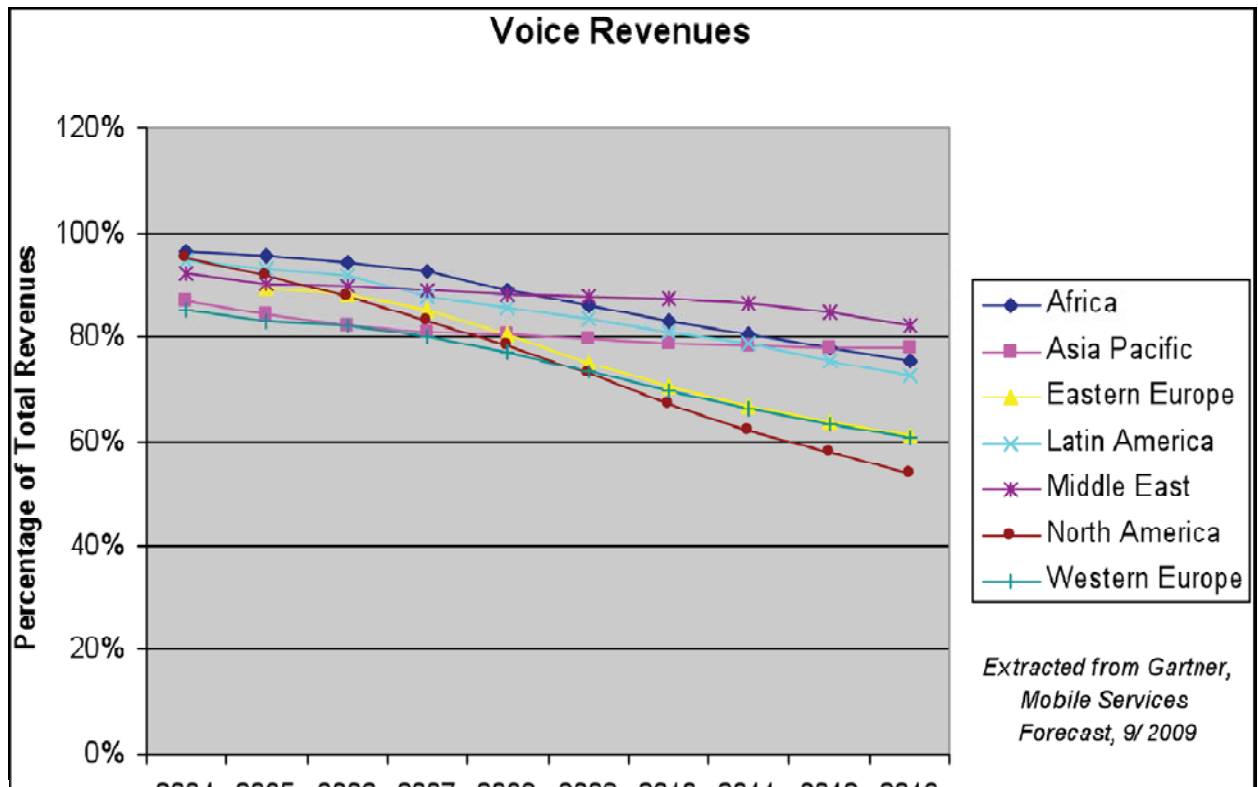
"It is now no longer a question of whether VOIP will wipe out traditional telephony, but a question of how quickly it will do so. People in the industry are already talking about the day, perhaps only five years away, when telephony will be a free service offered as part of a bundle of services as an incentive to buy other things such as broadband access or pay-TV services."

Figure 1

¹⁴ "Forecast: Mobile Services, 2004-2013," Gartner, June to September 2009

¹⁵ Alcatel-Lucent Strategic White Paper on [What's Next for Mobile Voice? The case for IMS VoIP in 3G/LTE](http://lte.alcatel-lucent.com/locale/en_us/downloads/Feb2010_IMS_VoIP_3G_LTE_Strategic_SWP.pdf), http://lte.alcatel-lucent.com/locale/en_us/downloads/Feb2010_IMS_VoIP_3G_LTE_Strategic_SWP.pdf

¹⁶ <http://www.itu.int/osg/spu/presentations/2007/kelly-melody-challenges-opportunities-of-VoIP-1-march-07.pdf>



9. VOIP Industry: Market Research Reports, Statistics and Analysis¹⁷

The number of mobile VoIP users throughout the world is expected to reach close to 170 million by 2015, according to research from IDATE Consulting & Research. This accounts for 6% of 3G subscribers and 2% of mobile subscribers. VoIP technology is expected to carry over 100 billion minutes of mobile voice calls by 2015.

Mobile VoIP will grow parallel to the existing voice market, without taking over the latter. VoIP has advantages over the traditional operator voice model, including free VoIP-to-VoIP client calls and lower cost international calls. However, regulative measures will limit mobile termination rates and roaming fees, thereby restricting the VoIP price advantage. Obstacles to market growth include commoditization and a competitive environment.

The global IP Multimedia Subsystem (IMS) constitutes a system to operate and develop applications supporting any-network on any-device, reports Mind Commerce Publishing. IMS allows messaging to break the boundary of mobile via IP to provide a comprehensive service spanning many networks, applications and media.

¹⁷ <http://www.reportlinker.com/ci02085/VOIP.html>

10. Practical data download/ upload speeds offered by 3G

a. America

A report out of *TechHive* has put America's top four carriers against each other in a 3G/4G data speed shootout. With all four carriers now offering 4G LTE in select markets, it will be interesting to see where consumers will want to spend their money. While Verizon has had the build out advantage, now reaching nearly 300 million subscribers since its launch, AT&T promptly rolled out service to 200 million Americans, while also maintaining very fast data speeds.

In their tests, they use a Galaxy Note 2 from Samsung to test out 4G LTE, while they use an iPhone 4S to test 3G speeds. Each of those devices is sold on the four networks, so making sure there was a fair playing field.

AT&T offers the fastest combo of 3G and 4G

Carrier	3G average download (mbps)	3G average upload (mbps)	4G average download (mbps)	4G average upload (mbps)	Total throughput
AT&T	2.97	0.96	13.15	6.45	23.53
Verizon	0.80	0.52	9.61	5.47	16.40
T-Mobile	3.13	1.04	9.01	2.65	15.83
Sprint	0.40	0.31	4.32	2.76	7.79

CHART NOTES: Listed 3G and 4G upload and download speeds are the averages of carrier-service speed scores measured at ten locations within each of 20 testing cities. Speeds are expressed in megabits per second (1 megabit = 1000 kilobits). We used a Samsung Galaxy Note II to test 4G service and an iPhone 4S to test 3G service.



During the 3G tests, it was found that T-Mobile shows pretty strong downloads and uploads, averaging a 3.13 mbps download and 1.04 mbps upload time. Compare that to Sprint's 3G, which does quite little at 0.4mbps down and just 0.31 mbps up. Verizon also didn't score too well on the 3G, averaging a lowly 0.8 mbps down and 0.52 mbps up. AT&T came in second place for 3G testing at 2.97 mbps on the download and 0.96 mbps on the upload.

As for 4G, T-Mobile and Verizon showed similar numbers on download, averaging around 9 mbps, while Verizon beat out T-Mobile on the upload with 5.47 mbps compared to 2.65 mbps. AT&T crushed the competition with an average download speed of 13.15 mbps and an upload speed of 6.45 mbps, basically three times that of Sprint's capabilities in both download and upload.

While anyone can benchmark carriers and see who might be the fastest in a variety of areas, each user's need will differ greatly, so make sure you live in a good coverage area

before jumping from carrier to carrier.¹⁸

b. India

BSNL INDIA

BSNL INDIA is one of the 15 cellular networks in India. BSNL INDIA is owned and operated by West Bengal. BSNL INDIA has an average 3G download speed of 0.7 Mb/s, which is worse than the global average of 1.8 Mb/s. BSNL INDIA uses the GSM 900 / UMTS 2100 frequency bands for its network.¹⁹

Airtel

Airtel is one of the 15 cellular networks in India. Airtel is owned and operated by Karnataka. It has an average 3G download speed of 2.1 Mb/s, which is better than the global average of 1.8 Mb/s. It uses the GSM frequency bands for its network.²⁰

S.No	Operator	Owner & Operator	3G download Speed	Global Average Download Speed	Frequency Bands
1	BSNL	West Bengal	0.7 Mb/s	1.8Mb/s	GSM 900/ UMTS 2100
2	Airtel	Karnataka	2.1 Mb/s	-do-	GSM Bands

However, the theoretical maximum download speed for 3G is currently around 14Mbps using the advanced HSPA technology.²¹

Market offered packages, Retail Tariff

¹⁸ At: <http://www.droid-life.com/2013/05/28/americas-carrier-speeds-benchmarked-att-beats-out-verizon-while-sprint-struggles-to-perform/>

At: <http://www.techhive.com/article/2039571/atandt-clocks-best-overall-speeds-with-3g-4g-combo.html>

At: <http://www.techhive.com/article/2039307/t-mobile-wins-3g-shootout-sprint-and-verizon-speeds-fade.html>

¹⁹ At: <http://opensignal.com/networks/%E0%A4%AD%E0%A4%BE%E0%A4%B0%E0%A4%A4/bsnl-india-%E0%A4%B5%E0%A5%8D%E0%A4%AF%E0%A4%BE%E0%A4%AA%E0%A5%8D%E0%A4%A4%E0%A4%BF>

²⁰ At: <http://opensignal.com/networks/%E0%A4%AD%E0%A4%BE%E0%A4%B0%E0%A4%A4/airtel-%E0%A4%B5%E0%A5%8D%E0%A4%AF%E0%A4%BE%E0%A4%AA%E0%A5%8D%E0%A4%A4%E0%A4%BF>

²¹ <http://www.telecomindiaonline.com/telecom-station-a-close-look-at-3g-in-india.html>

Annexure A

Pakistan Case

12. Technology Neutral Licensing

12.1 The policy and licensing regime are proposed to be technology neutral.

12.2 LL / LDI licensees may employ any technology such as IP, VoIP, DWDM, CDMA and so forth within flexibility of license

Annexure B: Table for Country Case studies

#	Countries	Legal	Licensing Framework	Process	Regulations	VoIP Services	VoIP Numbering structure	QoS end-to-end one way delay	Comments
1	Bangladesh	Legal	Open Licensing ²²	Any applicant who fulfils the conditions of Section 36 of Bangladesh Telecom Act, may apply to the Commission for VSP License	BRTC Regularizes. VoIP licensees must connect to BTTB's submarine cable and/or BTTB's satellite for international VoIP services ²³	Licensee should provide Emergency Telecommunication Services through their system for the National needs and Emergency Situations.			The state guidelines on VoIP do not include software programmed IP traffic for non-business communication service (e.g. skype, google-talk, messenger, facebook etc.).
2	India	Legal	Licensing ²⁴	Voice over IP was only allowed for calls made to and from India, restricting access to International calls. But recently TRAI lifted VoIP restrictions in the country in		Internet Telephony is Permitted: 1. PC to PC 2. PC to phone 3. IP-based H.323/SIP terminals		150 μseconds ²⁵	ISPs are not permitted to use PSTN/ISDN/PLMN for their internet telephony

²² <http://www.btrc.gov.bd/licensing-procedure-2004>

²³ Page 25 Report by ITU at: <http://www.itu.int/osg/spu/ni/voice/papers/FoV-VoIP-Biggs-Draft.pdf>

²⁴ www.lexmundi.com/Document.asp?DocID=1863

²⁵ http://www.trai.gov.in/Content/Regulation/0_0_RegulationUser.aspx

				March 2012.					
3	Indonesia	Legal	Licensing	VoIP license is generally awarded to ISP			VoIP operators are using a two-step dialing scheme a. 170XY access code b. 010XY access code ²⁶		Government is now considering the growth of VoIP for network or facility-based operators, instead of as service based
	Japan	Legal	Registration	It is required to obtain registration from Ministry of Internal Affairs and Communications (MIC) ²⁷	VoIP licensees must connect to BTTB's submarine cable and/or BTTB's satellite for international VoIP services	1.Communication between two telephone terminals. 2.Communication between two data terminals (PC to PC). 3.Communication between two types of terminals – telephone and data terminals	Two types of numbers assigned assigning a dedicated array of numbers to IP telephones (a 050 prefix) IP telephones to obtain telephone	ClassA:100msec ClassB:150msec ClassC:400msec ²⁸	
	Canada	Legal	No License & Registration	CRTC regularizes the	Emergency service	Category1: P2P Category2: Oper	VoIP services		PSTN-interconnected

²⁶ “Consultation paper on Issues related to Internet Telephony Page 41”

at: www.trai.gov.in/trairegulation/145/cpaper12may08.pdf

²⁷ FAQs law and regulations Regarding VoIP services in Japan

http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/faqs.html

²⁸ SATRC Guideline on “KEY REGULATORY ISSUES ON VOICE-OVER-IP IN SATRC COUNTRIES” page 66

at: http://www.google.com.pk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCcQFjAA&url=http%3A%2F%2Fwww.apr.int%2Fsites%2Fdefault%2Ffiles%2FUpload-files%2FSATRC%2FSAPIII%2520Outcomes%2FSATRC-SAPIII-03_SATRC_VoIP_Issues.doc&ei=N6UFU7GYKMvY7AaD9oCAAw&usg=AFQjCNHZj8b9erw5IxYiLVJysYKVc9TRQw&sig2=r0z3BgsLh1LLGr7wutS8GA&bvm=bv.61725948,d.bGQ&cad=rja

			but USF fund will Apply ²⁹	VoIP	obligations for local VoIP service providers ³⁰	ate over a broadband receive or make call to PSTN as well as other Broadband Category3:Ability To receive and make Voice calls from PSTN Category4:Business services offered over network access facilities(LAN, WAN) ³¹	utilize telephone numbers that conform to the NANP		VoIP services have the regulatory status of telecommunication
	USA	Legal	Registration ³²	FCC Procedure		VOIP provider	Mandatory Emergency calls	Quality speech	Differentiate from ISP providers Open Internet Policy
	Australia	Legal	Carriage Service Provider Speech Category No License or any mandatory Registration ACMA VOIP required Legislation, codes, Standards apply Type 4 VOIP		Type 4 VOIP Connected to PSTN, Standard Telephone Service		Mandatory Emergency calls	Type 1– Type 4	VOIP differentiates to ISP in few cases Open Internet Policy

²⁹ THE STATUS OF VOICE OVER INTERNET PROTOCOL (VOIP) WORLDWIDE ITU, 2006 Page 22
<http://www.itu.int/osg/spu/ni/voice/papers/FoV-VoIP-Biggs-Draft.pdf>

³⁰ Emergency Service 911 should be provided by VoIP providers at:
<http://www.google.com.pk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCcQFjAA&url=http%3A%2F%2Fwww.crtc.gc.ca%2Feng%2Farchive%2F2005%2Fdt2005-21.pdf&ei=ENUGU83tGcqtAaHjoBY&usg=AFQjCNFWpiGOjPR-uoaXVijjpziaD8HIJQ&sig2=Vc-MBzIRhTPLb2iX67AbVA&bvm=bv.61725948,d.Yms&cad=rja>

³¹ *Canadian Radio-television and Telecommunications Commission “Regulatory framework for voice communication services using Internet Protocol” VoIP service categories*

At: http://www.crtc.gc.ca/eng/archive/2005/dt2005-28.htm#sII_3

			Connected to PSTN, Standard						
	Singapore	Legal	Licensing	Companies intending to offer VoIP services are required to obtain Service-Based Operator (SBO) individual licenses.	IDA has issued Regulatory Framework for Telephony Services over Wireless Broadband Access Networks in 2008	IP Telephony Operators are not subject to specific regulatory requirements on Quality of Service (QoS) standards, access to emergency services, provision of number portability, directory enquiry services and printed directories.	Separate 8-digit number blocks have been allocated to VoIP Operators.	No QoS has been defined for VoIP.	IDA is not regulating OTT services.

Annex C

Bangladesh Case

Clause 5 of BTRC Regulation No. 1 of 2004, The BTRC **(Licencing Procedure) Regulations, 2004**

5. Open Licencing Procedure 1[* * * * *]:-

- (1) The Commission shall give wide publicity in newspapers and electronic media of its programme/intention of issuing licence of different categories specifying the time and manner of how the applications shall be made.
- (2) The Commission may invite applications for the consideration of granting licence through, the newspapers and/or internet 1[or its website] to intending operators. The Commission may verify the 1[applicants] information on location, space, installation, apparatus, finance, manpower etc. as furnished with the application.
- (3) It shall specify the criteria and conditions the applicants have to fulfill in order to be eligible for getting licence for providing particular service.
- (4) The Commission may frame guide lines and prescribed application forms which shall be available at the relevant time in its office with or without payment of price.
- (5) The Commission may determine, fix and revise from time to time according to exigencies of 1[*] situation licence fee, application fee, 1[the] evaluation fee and other charges as it deems appropriate.
- (6) The Commission shall prepare licence forms as far as practicable of international standard for different telecom services keeping pace with the changing scenario.
Page 6 of 11
- (7) The Commission shall determine the duration of different categories of licence, renewal and other conditions, rights and liabilities.
- (8) The Commission shall by all reasonable means and subject to the provisions of the Act, 2001 undertake steps to regulate the activities of the licensee operators and ensure healthy growth and consumer friendly environment in 1[the] telecom sector.

Annex D

Regulatory Questions by ITU , Mid 2006		
	VoIP service legal and Authorized in Countries	VoIP is (explicitly) legal in Algeria, Australia, Austria, Argentina, Azerbaijan, Bangladesh, Barbados, Belgium, Brazil, Canada, Chad (internationally), Chile (at the local level), Colombia, Croatia, Czech Rep., Denmark, Estonia, Finland, Hong Kong, Hungary, Iceland, India, Israel, Italy, Japan, Kenya, Rep. of Korea, Luxembourg, Malaysia, Mauritius, Mexico, Morocco, Nicaragua, Nigeria, Norway, Panama (domestically), Philippines, Portugal, Romania, Singapore, Slovak Rep., Slovenia, S.Africa, Spain, Sweden, Switzerland, Taiwan (China), Tanzania, Thailand, Togo, Turkey, Uganda, UK, Uruguay, US, Viet Nam, Zambia.
	VoIP is explicitly banned in Countries	Countries where VoIP is explicitly banned (according to most recent data): Benin, Bolivia, Botswana, Cameroon, Comoros, Costa Rica, Cote d'Ivoire, Eritrea, Ethiopia, Gabon, Ghana ("yet to legalise VoIP"), Guinea, Guyana, Honduras, Kuwait, Liberia, Mozambique, Namibia, Paraguay, Qatar, Seychelles, Swaziland, UAE.
	If Legal, are VoIP services regulated	VoIP is explicitly deregulated or subject to only light regulation in Argentina, Azerbaijan, Brazil, Barbados, Canada, Czech Rep., Denmark, Estonia, France, Greece, Hungary, Ireland, Italy, Poland, Nicaragua, Romania, Turkey, Uruguay, US
	Is it necessary to obtain a license?	(Certain) VoIP services may require a license in Algeria, Bangladesh, Barbados, Brunei, China (to be officially confirmed), Croatia, Dominican Rep., Egypt, Israel, Luxembourg, Mauritius, Mexico, Morocco, Nigeria, Pakistan, Peru, Portugal, Singapore, Saudi Arabia, Slovak Rep., South Africa, Spain, Taiwan (China), Tanzania, Uganda, Venezuela. VoIP services may be provided by the incumbent (only) in Bahrain, DRC Congo, Jordan, Oman, Tunisia, Uganda, Viet Nam, and Zambia.
	Should VoIP services be regulated like PSTN? (& what regulations apply to PSTN).	PSTN – Finland, Iceland, New Zealand, Norway, Sweden, Switzerland, UK.
Source: ITU ³³		

Annex E, Bangladesh VSP Guidelines

Annex F, UK Case

³³ <http://www.itu.int/osg/spu/ni/voice/papers/FoV-VoIP-Biggs-Draft.pdf>

Annex G, Singapore Case

Annex H, Latin America Case

Annex I, USA Case

are attached as separate files.

10 Regulation, “Regulation on Quality of Service for VoIP-based International Long Distance Service 2002” , 15 November 2002, available at: <http://www.trai.gov.in/trai/upload/Regulations/29/Regulation%20on%20ILD-QOS.pdf>.