



**COMMENTS ON DRAFT REPORT OF THE SECRETARY-GENERAL
ON IP TELEPHONY FOR THE WTPF 2001
SECOND DRAFT - 15 NOVEMBER 2000**

1. COMMENTS RECEIVED FROM JAPAN

10 January 2001

Dear Mr Utsumi,

First, may I thank you very much for your excellent preparation for the upcoming Third ITU World Telecommunications Policy Forum (WTPF). I would also like to express our appreciation of the work of Mr Wong and the other members of the Informal Expert Group (IEG), as well as the ITU Secretariat staff. Thanks to all these tireless efforts on behalf of Member States and Sector Members, I am sure the WTPF will be a great success.

Referring to your Draft Report on IP Telephony, of 15 December 2000, I would like to offer the views of the Administration of Japan on this topic. We would be very grateful if you would kindly forward the attached comments for consideration by the second meeting of the IEG in January 2001, and for possible inclusion in the draft opinions to be considered by the WTPF.

Yours sincerely,

Masahiro Nishimori
Counsellor of Japan

JAPAN

Comments on the Secretary-General's Draft Report on IP Telephony

We recognise that IP telephony is expected to be a key application that is essential for developing the global IP-based network; at the same time, it is likely to have a significant effect on infrastructure development and the nature of universal services provided by traditional PSTN operators. We understand that for these reasons, as mentioned at the ITU Council 2000, many Member States, including developing countries, are very interested in this theme, making global discussion urgent. Therefore it is appropriate that the third World Telecommunication Policy Forum (WTPF) has chosen IP Telephony as its focus.

Structure of the report

We suggest the structure of the report would be improved by identifying problems of IP Telephony in Introduction, and by summarising the premises for specific discussions. Those premises include definitions of IP Telephony (including VoIP and Internet Telephony), typical and anticipated examples of current services and networks, and anticipated trends in IP Telephony.

Economic aspects of IP Telephony and its impact on Member States and Sector Members

The cost advantage of IP Telephony can promote competition with traditional PTOs in the telecommunications market and reduce PTOs' costs. In the long term, IP Telephony also creates many economic and social opportunities with the deployment of various IP-based applications and services.

Therefore, in considering how developing countries can be assisted to introduce IP Telephony, and to shift from circuit-switched networks to IP-based networks whenever necessary, the ITU should continue studying the cost advantages of IP technologies in detail, taking case studies into account.

Concerning issues for international access charges for IP networks, including international accounting rate, we should have the further discussions in ITU-T SG 3, taking the results of the third WTPF into account.

Policy and Regulatory issues concerning IP Telephony

Because countries have different views on service definitions and regulatory categories for IP Telephony, we support the opinion of the first meeting of the Informal Expert Group (IEG) that working definitions should be established, so that effective and integrated discussions can take place at the WTPF. Of course, this does not imply comments of each Member State having its own regulatory regime for IP Telephony.

Recently, many new types of telecommunications services have emerged to satisfy diversifying consumer demands. In these circumstances, we recognise that it is useful to consider basing IP Telephony regulations not only on the traditional criteria many countries are using at present, such as voice or data transmission, but also on other factors, such as the nature of services, including quality of services (QoS).

Traditional telephony is strongly bound to the hardware of network facilities. On the other hand, IP Telephony services can be provided using only application-related facilities (such as the software), without the need to own hardware. Because IP Telephony service suppliers do not need to have their own network facilities, we need to examine possible new regulatory frameworks, which may be different from those applied to traditional telephony that is based on network facilities. As part of this effort, countries should examine which applications should be regulated. For example, it might be considered essential to regulate telephone numbers as an indispensable element in both the hardware and the software of IP Telephony.

Impact of IP Telephony on Universal Service Schemes

"Functional equivalence" is an important notion and should be referred to when considering regulation of IP Telephony, taking traditional voice telephony regulations into account.

Whether IP Telephony should be designated a universal service in a particular country should be determined by not only the functional equivalence concept, but also with reference to the condition of the country's telecommunication market, how its whole network infrastructure (including PSTN, IP-based networks and mobile networks) is deployed, the extent of IP Telephony dissemination and the expected future share of IP Telephony in the voice telephony market.

The digital divide and bypass

Taking into consideration the challenge posed to developing countries by the decline in international settlement rates, it is important to enable those countries to have a clear view of how IP-based networks should be treated in maintaining universal service schemes and the benefits that will result from investing in IP-based network development.

For this purpose, studies of the economic aspects of IP Telephony and its effects should be continued after the WTPF. We also need to create a “knowledge centre” at which Member States and Sector Members can share essential knowledge and views of global trends in IP technologies, including the performance of other standardisation bodies, infrastructure development, IP-based services and applications, and regulatory activities and policies.

Human Resource Development

The ITU should co-ordinate its activities regarding Human Resource Development (HRD) with all soon-to-be-launched activities aimed at bridging the digital divide, thus integrating all relevant efforts as a whole.

Future Development of IP Telephony

Future development of IP Telephony must take into account the following:

- IP Telephony has emerged along with the new IP technology, which is rapidly progressing. Market circumstances for IP-based services are also changing.
- it is important to share information and expertise among Member States and Sector Members so that the experiences of developed countries are available as very important references for developing countries
- there must be action regarding IP Telephony across regulatory policies, standardisation, and development activities. These three areas need to be well co-ordinated in implementing planned activities.

We would like to acknowledge the high standards of work of the SPU of the General Secretariat, which has taken the lead in dealing with questions of IP Telephony and excellently completed its tasks in the short period since the first Strategic Planning Workshop was launched in June 2000.

2. COMMENTS RECEIVED FROM **Telefónica SA**

COMENTARIOS DE TELEFONICA AL SEGUNDO BORRADOR DEL INFORME DEL SECRETARIO GENERAL SOBRE TELEFONIA IP – FMPT 2001

Ante todo Telefónica agradece la oportunidad de poder expresar sus comentarios sobre este segundo borrador del informe que con motivo de la celebración del II Foro Mundial de Política de las Telecomunicaciones ha preparado el Secretario General.

En nuestra opinión el tema central de este foro refleja uno de los desafíos más interesantes con los que se enfrenta actualmente el sector de las telecomunicaciones en su camino hacia la Sociedad Global de la Información. Por este motivo felicitamos al Secretario General por la elección y por el magnífico trabajo desplegado en la preparación del mismo.

A continuación se recogen una serie de comentarios cuyo propósito es llamar la atención sobre aspectos que nos parecen importantes para el buen entendimiento y desarrollo posterior de lo que supone la Telefonía sobre Protocolo Internet (IP).

1. COMENTARIOS GENERALES.

Es de primordial importancia, a la hora de debatir sobre Telefonía IP, el definir de forma clara de lo que se esta hablando. En este sentido hay que especificar en cada caso si se esta refiriendo a telefonía sobre IP (*VoIP*) o a telefonía sobre Internet (*VoInternet*) de acuerdo a la diferenciación que se hace en la sección 1, apartado 1.2. basada en la red subyacente, que a nuestro entender resulta bastante acertada y básica a la hora de decidir sobre un hipotético tratamiento regulatorio.

Esta clara diferenciación, sin embargo, no resulta tan evidente en muchos de los apartados del resto del documento. Ello lleva a que se planteen situaciones concretas en las cuales se utiliza el termino de Telefonía IP de forma genérica sin especificar si se trata de Telefonía sobre Internet (*VoInternet*) o telefonía sobre IP (*VoIP*) con la consiguiente ambigüedad, lo que permite diversidad de interpretaciones y comentarios. Ello es bastante acusado en varios apartados de las secciones 2 y 3.

Así pues, en aras de una mayor claridad, recomendamos que cada vez que se utilice el termino Telefonía IP se especifique a que grupo principal se esta refiriendo.

Por otro lado, opinamos que el debate sobre Telefonía IP, aunque muy importante no deja de ser un aspecto más a considerar en camino hacia la *convergencia de servicios* en el sector de las telecomunicaciones, por lo que el tratamiento tanto tecnológico como regulatorio que se establezca deberá estar ligado a la evolución que se produzca en el sector.

2. ASUNTOS DE POLITICA Y REGULACIÓN DE LA TELEFONIA IP

Telefonía sobre IP (VoIP) vs Telefonía sobre Internet (VoInternet)

De la misma manera que en el documento se manifiesta una cierta ambigüedad en el uso del termino de Telefonía IP, la carencia de un acuerdo global sobre lo que se entiende por *telefonía IP* lleva a que su tratamiento regulatorio en los diversos Estados Miembros sea muy diferente. Uno de los objetivos debería ser el establecer un concepto común de lo que significa, para así poder comparar y en su caso poder sugerir tratamientos armonizados a nivel global

Entendemos que si se atiende al principio de *neutralidad tecnológica*, la variedad de telefonía sobre IP (VoIP) no deja de ser una elección tecnológica, tan válida como cualquier otra disponible en el mercado, del operador para soportar el/los servicio/s por él ofertado/s, así pues el problema surge cuando la red soporte para el servicio de voz es precisamente la Internet.

Consecuentemente, para evaluar la importancia de este servicio de voz a través de Internet (VoInternet) deben basarse en la naturaleza y la calidad de la oferta y no en base al tipo de tecnología empleada, en este sentido resultan esenciales los siguientes aspectos:

- *Conmutación en tiempo real, y*
- *Ser objeto de una oferta comercial al público, para todos y en las mismas condiciones.*

En tanto que el marco regulatorio sea el actual, la telefonía sobre Internet (VoInternet), si se realiza sin ser el componente fundamental del servicio ofrecido por el ISP, es decir como un servicio complementario secundario, no sustitutivo al de la telefonía vocal tradicional, puede quedar fuera del ámbito de definición de telefonía vocal, por tanto no regulado.

Ahora bien, si el servicio puede ser sustitutivo de la telefonía clásica, es decir, componente principal de la oferta, deberá afrontar idénticas obligaciones, con independencia de la tecnología que lo sustente (*neutralidad tecnológica*) e independientemente de que cumpla o no con los criterios definidos actualmente para caracterizar un servicio como de telefonía vocal ¹.

No obstante, la importancia real de este servicio que puede ser sustitutivo de la telefonía vocal tradicional y en consecuencia su tratamiento regulatorio, debe hacerse en función de su impacto comercial y de competencia respecto al servicio tradicional de voz. En otras palabras, la mejor valoración de su impacto la proporcionará el mercado, lo que determinará en consecuencia la necesidad de arbitrar alguna medida regulatoria a este tipo de servicios.

En definitiva, aunque el objetivo final que se debe perseguir es que se apliquen criterios de mercado en la regulación (buscando una regulación ex post y limitando la regulación ex ante), tanto de servicios sobre Internet como en servicios tradicionales, en tanto esto no ocurra, lo oportuno es que se apliquen a todos aquellos servicios ofertados por un ISP que sean sustitutos del servicio telefónico tradicional, los mismos criterios regulatorios.

Convergencia y Telefonía IP

Es importante resaltar que en el documento se destaca la oportunidad de las redes IP como una solución que abarata los costes de transmisión (apartado 1.4), esta aseveración no es del todo correcta, pues hay que tener en cuenta una serie de factores a la hora de decidirse por la introducción de una plataforma IP para transportar voz y entre ellos no está precisamente el menor coste de estas redes. Tal como se establece en el apartado 4.32, nadie construye una red IP solo para transmitir voz, sino como parte de una *estrategia global de oferta de servicios multimedia*.

¹ Quizás podría resultar adecuado el definir con más precisión lo que se entiende como servicio sustitutivo y las recomendaciones para los distintos niveles de oferta que puedan definirse.

La situación de partida del operador pesará mucho a la hora de elegir el tipo de red soporte. Para un nuevo entrante el optar por una red IP puede suponerle menores costes teniendo en cuenta las posibilidades de desarrollo posterior en la oferta de servicios convergentes, para un operador establecido que tiene una red que amortizar el planteamiento es diferente.

Así pues, en un planteamiento de futuro, no por barata, sino por considerar las posibilidades de integración de servicios (*convergencia*), la elección de redes IP sí puede resultar adecuada, en este sentido lo trascendental de este proceso de cambio de paradigma, no es en si mismo la Telefonía IP, en sus diferentes modalidades, sino las consecuencias que estas redes IP, como posibilitadoras de la integración de servicios van a tener en el fenómeno de la convergencia.

Esta capacidad de las redes IP, puesta de manifiesto en el apartado 4.29, como integradora de todos los servicios multimedia, la dificultad en diferenciar lo que es tráfico de voz del que es de datos obligará por supuesto, a un replanteamiento de los marcos regulatorios actuales, incluso quizás a modificar los acuerdos internacionales sobre todo en el marco de la OMC², lo que podrá afectar, entre otros temas, a las obligaciones de interconexión tanto nacionales como internacionales (comunicaciones transfronterizas; Encaminamiento de tráfico, nuevos sistemas de liquidación, etc.).

Por supuesto la evolución hacia ese mundo convergente vendrá influenciada por una serie de factores tanto de tipo técnico como normativo que deberán ser abordados por los diversos actores y organismos implicados. No obstante, a nuestro entender, ello no debe implicar un aumento de la regulación existente o una aplicación de esta a los nuevos servicios sino más bien una desregularización gradual del sector (*regulación ex post*), a la vista de la convergencia no resulta lógico mantener una regulación diferenciada, es necesario evolucionar hacia una mayor vigilancia del cumplimiento de las reglas de la competencia tanto a nivel nacional como internacional, actuando solo en casos en que aparezcan ineficiencias, como pueden el no cumplimiento de las obligaciones inherentes al Servicio Universal o la aparición de actores dominantes que distorsionen el mercado.

El problema está no sólo en los nuevos servicios y en la evolución futura, sino en la dificultad de aplicar la regulación existente a la nueva situación en la que la voz está siendo transmitida por enlaces de datos.

² El uso de Internet como plataforma, red subyacente, no debe ser óbice para que los servicios sobre ella ofertados no cumplan los compromisos adquiridos en el anexo de telecomunicaciones y el Papel de Referencia del Acuerdo General sobre el Comercio de Servicios (AGCS, GATS siglas en inglés), Internet no puede ser una escapatoria o servir de subterfugio para eludir las responsabilidades adquiridas en la firma.

3. COMMENTS RECEIVED FROM **Guyana**

January 08, 2000.

Mr. Yoshio UTSUMI
Secretary-General
International Telecommunication Union
Place des nations
Ch – 1211 Geneva 20,
Switzerland

Attention: Mr. Arthur Levin

Dear Sir,

Further to circular letter DM –1187, requesting comments from Member States and Sector Members on the Second Draft Report of the Secretary- General on IP Telephony, Guyana is pleased to submit its comments.

Overview

Guyana strongly supports your efforts to focus and bring to the forefront the important issues and considerations to be contemplated by Developed and Developing Countries in the implementation and possible regulation of IP Telephony in this rapidly changing environment.

Your Second Draft report has provided some important issues for consideration, specifically on the concept of introducing Regulation to IP Telephony and VoIP systems.

Presently the Internet in Guyana is unregulated and is used primarily for data communication, with some amount of IP telephony traffic using the PSTN. Although there is no restriction to web sites that support IP telephony, its use is restricted due to the poor quality of communication and long delays involved in signal transfer, caused by limited bandwidth availability from our incumbent operator, the Guyana Telephone and Telegraph Company Ltd.

Note – all ISPs are connected to the world wide web via the incumbent operator.

Comments on the Second Draft Report on IP Telephony of the Secretary-General

The Draft Report provides some useful insights on the technical, economic, and regulatory aspects of IP and VoIP Networks, highlighting their differences and the various approaches to encourage its growth and applications.

However there is need for statistical evidence to support the assumption that IP and VoIP traffic will exceed the traffic over the circuit switched network and the possible implication that this might have for developing countries with an incumbent operator.

Section 1.8 presents a very important and contentious position on the issue of IP Telephony, especially in an environment preparing for liberalization such as Guyana, and we would appreciate if this issue can be further discussed and elucidated.

The balanced view provided in section 3 on the Economic Aspect of IP Telephony and its Impact on Member States and Sector Members and the discussions on market aspects and economic benefits are well commended. However, Section 3.5 should elaborate more on the issue of revenue

generating opportunities created by this technology for the benefits of regimes that are moving towards liberalization.

Guyana finds favour with the proposal made in section 3.1,1 however there are many limitations for third world country such as Guyana where IP Telephony is at its infant stage.

While section 4 of the draft report provides an excellent overview of the Policy and Regulatory Issues for IP Telephony and cites some examples of the approaches by other administrations, it should consider and expound on the benefits and/or implications of such actions as taken by those administrations.

Guyana views Human resource development as an essential ingredient in this transition from the traditional PSTN to the new IP Telephony era, and would require assistance in this area.

(Kindly note that Guyana has embarked on a telecom modernization, which is geared at creating an environment to modernize, and liberalized the telecom sector in Guyana within 2 years).

Should you require any further information or clarification, please contact Mr. Radjesh Azore, Assistant Engineer or the undersigned.

All for your information.

Yours faithfully,

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Seo Persaud
Chief Executive Officer

4. COMMENTS RECEIVED FROM **France**

Version 2
15 December 2000

Draft Report of the Secretary-General on IP Telephony

PREAMBLE

i) The ITU World Telecommunication Policy Forum (WTPF) was established by Resolution 2 of the 1994 Kyoto Plenipotentiary Conference and was confirmed by Resolution 2 of the 1998 Minneapolis Plenipotentiary Conference. The purpose is to provide a forum where ITU Member States and Sector Members can discuss and exchange views and information on emerging telecommunication policy and regulatory matters arising from the changing telecommunication environment. Although the WTPF shall not produce prescriptive regulatory outcomes or outputs with binding force, it shall prepare reports and, where appropriate, opinions for consideration by Member States, Sector Members and relevant ITU meetings.

ii) By Decision 498 (attached as Annex A), the 2000 session of the ITU Council decided to convene the third World Telecommunication Policy Forum (WTPF-01) in Geneva, from 7 to 9 March 2001, in order to discuss and exchange views on the theme of Internet Protocol (IP) Telephony, with the following agenda:

- *the general implications of IP Telephony for the ITU membership with respect to: (a) the telecommunications policies and regulations of ITU Member States; (b) the implications of IP Telephony for developing countries, particularly with respect to policies and regulatory frameworks, as well as technical and economic aspects; (c) the impact of IP Telephony on the operations of Sector Members, notably in terms of the financial challenges and commercial opportunities it presents;*
- *actions to assist Member States and Sector Members in adapting to the changes in the telecommunication environment due to the emergence of IP Telephony, including analysing the current situation (e.g., by case studies) and formulating possible cooperative actions involving ITU Member States and Sector Members to facilitate adaptation to the new environment;*
- *actions to assist Member States and Sector Members in meeting the human resource development challenges presented by new telecommunication technologies such as IP Telephony, in particular, skills shortages and the need for education, and technology transfer.*

iii) In accordance with Decision 498 of the Council, and in keeping with past practice, discussions at WTPF-01 shall be based on a report from the Secretary-General, incorporating the contributions of ITU Member States and Sector Members, which will serve as the sole working document of the Forum, and which shall focus on key issues on which it would be desirable to reach conclusions.

iv) Pursuant to the Council's Decision, the arrangements for the third Forum will be similar to those for the first two. To give the Membership as much opportunity as possible for contributing to the preparations for this important event, and pursuant to Decision 498 of the Council, the Report of the Secretary-General shall be prepared according to the following timetable:

1 November 2000: the first draft shall be circulated with an invitation to comment, drawn up on the basis of available material (notably, the Strategic Planning Workshop on IP Telephony³);

1 December 2000: deadline for receipt of membership comments on the first draft;

15 December 2000: the second draft shall be circulated, incorporating comments received and with an invitation for further comments;

10 January 2001: deadline for receipt of membership comments on the second draft.

The **Final Report** shall be circulated by the **end of January 2001**.

In order to strengthen this iterative process, we would welcome the designation of a focal point in your office to follow up this matter.

The first draft of the Report of the Secretary-General was distributed to the ITU Membership on 1 November 2000. It was intended that the first draft would serve to trigger written comments from Member States and Sector Members. In response, the secretariat received 18 written comments from the ITU membership, as well as comments from other entities. These comments have been posted on the website for the Forum at <http://www.itu.int/wtpf/>.

Council Decision 498 also requires that the Secretary General shall convene a balanced, informal group of experts—who are active in preparing for the Forum in their own country—to assist in the successive stages of the preparatory process. This group will meet twice during the consultation process. Invitations to participate in the informal group of experts (IEG) were sent out by the Secretary-General to those who contribute to the consultation process plus others who can make significant contributions and can assist in achieving the desired balance.

The first meeting of the Informal Experts Groups (IEG) was held on 16-17 November 2000 in Geneva. The Group discussed and offered a number of suggestions to revise the first draft of the Report of the Secretary-General and also established a procedure to develop the draft Opinions for the Policy Forum. Those draft Opinions will be attached to the final Report of the Secretary-General. A second meeting of the Experts Group is scheduled for **18-19 January 2001** in Geneva.

³ The workshop took place in June 2000. See: <http://www.itu.int/iptel/>

v) This second draft of the report has been revised to incorporate the views expressed by the Membership in written comments. In addition, this draft reflects the discussions that took place at the first meeting of the Informal Experts Group. The Report is designed as well to address the issues raised in Council Decision 498. Annex B contains tables and information on the regulatory status of IP Telephony in some ITU Member States.

vi) If WTPF-01 is to prove a success, it will be because the final Report of the Secretary-General reflects the opinions and contributions of the ITU membership as a whole. For that reason, you are encouraged to submit your comments on this second draft by **10 January 2001**, by email to the address: IEG-wtpf@itu.int. They will then be posted on the website so that they can be viewed by others involved in the process.

Alternatively, your comments can be sent by post, enclosing an electronic copy on diskette, to:

**International Telecommunication Union
Strategies and Policy Unit
Office T.1314
Place des Nations
CH-1211 Geneva 20
Switzerland**

vii) In addition to this Report, other background information relating to WTPF-01, as well as the case studies which have been commissioned and materials on the general topic of IP Telephony, are being posted on the ITU website, also at: <http://www.itu.int/wtpf/>.

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1. SUMMARY

1.1 The increasing use of Internet Protocol (IP) networks for communication services, including applications such as telephony, has become a pivotal issue for the telecommunications industry worldwide. The possibility of transmitting voice over IP-based networks, with all its challenges and associated opportunities, such as voice and data integration, constitutes a milestone in the convergence of the communications sector. It also reflects a convergence between two technologies that have emerged under very different policy and regulatory circumstances:

- **the Public Switched Telephone Network (PSTN)⁴, based on circuit-switched technology, which has been fairly extensively regulated by most countries (until recently);**
- **the Internet, which is based on packet-switched technology, and which has evolved as a data network subject to few, if any, controls.**

1.2 The term “IP Telephony” can mean different things to an engineer or policy-maker and there is no consensus at this point on its exact definition. However, for purposes of discussion, it is necessary to provide some delineation of the various forms that IP Telephony can take. Accordingly, as a working definition and for the purposes of this Report, “IP Telephony” is used as a generic term for the different ways of transmitting voice, fax and related services over packet-switched IP-based networks. The transmission of voice over IP-based networks can be subdivided into two major subsets: VoIP (Voice over IP) and Internet Telephony. The difference lies in the nature of the underlying IP network: VoIP utilizes managed, private IP-based networks, while

⁴ The term PSTN (public switched telephone network) is used in this document as a synonym for traditional circuit-switched telephone networks offered by Public Telecommunication Operators (PTOs), as well as Integrated Services Digital Networks (ISDN), and Public Land Mobile Networks (PLMN). Generally with convergence, today’s telecommunications networks and transport technologies are increasingly complex and difficult to categorize.

Internet Telephony primarily uses the public Internet. Since IP Telephony is a broad term, throughout the Report an effort has been made to clearly identify the specific type of network or service that is being described and discussed.

1.3 One key issue that has gained the attention of policy-makers, regulators, and industry alike is the fact that the Internet, and other IP-based networks, are increasingly being used as alternatives to the circuit-switched telephone networks and to some extent are becoming the technology of choice as new infrastructure is deployed.

1.4 Several major international Public Telecommunication Operators (PTOs) have announced that they will migrate all their international traffic onto IP platforms and have committed substantial investment sums to make that transition. One reason for this transition is the apparently lower cost of moving traffic over IP-based networks; one company estimates that this technology will allow it to carry traffic at a quarter of the cost of doing so over a conventional, circuit-switched network. Liberalization of markets is also contributing to this migration to IP-based networks. As of late 2000, more than three-quarters of all international traffic originated in countries in which the provision of IP Telephony is liberalised. Furthermore, the majority of IP Telephony now travels over managed, private IP-based networks as opposed to the public Internet.

1.5 While there are a range of views as to the pace at which IP Telephony will grow in the coming years, it is commonly believed that it will increase fairly rapidly. Some market forecasters project that, within five years, IP Telephony will account for between 25 and 40 per cent of all international voice traffic. Worldwide, the volume of traffic on IP-based networks already far exceeds the voice traffic that travels over the public switched telephone network. Consequently, few countries can ignore IP Telephony. Nonetheless, the PSTN will remain robust for the foreseeable future, and an important issue for policy-makers will be the need to oversee the co-existence of the two network technologies and, increasingly, combinations of the two.

1.6 The growth of IP-based networks around the globe has profound and broad implications for societies, including consumers, industry, and national administrations. In part, this is because telecommunications infrastructure is increasingly being viewed as a fundamental element of national competitiveness in the age of the Information Society and improvements to communications networks may serve as a dynamic stimulus to economic growth.

1.7 IP Telephony is an important part of this picture. For consumers, ~~IP-Internet~~ Telephony offers potentially much cheaper long-distance and international telephone calls compared with the alternative of using a circuit-switched, fixed-line or mobile network. These cost savings may, at least partially, offset the possible loss of quality. IP Telephony also offers consumers advanced services, integrating voice and data, such as merged World Wide Web and voice services (e.g., “click-to-talk”) or integrated messaging. Adding voice to traffic on IP-based networks further raises issues of substitution for circuit-switched services and strategies for network transition.

1.8 For PTOs, the potential cost advantages of IP Telephony are more complex to calculate. That is because incumbent PTOs have existing revenue streams and technologies that may be adversely affected if customers shift to other services or other companies that offer lower-priced IP Telephony. However, such concerns may be viewed in the context of national policy objectives designed to improve the performance, cost and range of services offered by telecommunications networks.

1.9 The regulatory approach to IP Telephony varies significantly among ITU Member States and reflects the different interests involved. In some countries, governments have defined IP Telephony services in such a way as to permit the delivery of this service to the public, despite the existence of market exclusivity of the incumbent over basic voice telephony.

In others, the service is prohibited, while in others it is licensed and promoted. In some countries, IP is treated as just another technology that can be adopted by PTOs, or is not regulated at all.

1.10 Given that IP Telephony calls are mainly carried outside of the PSTN—and hence outside the regulatory and financial structures which have grown up around the PSTN—it is the view of some that, for incumbent PTOs in developing countries, IP Telephony may undermine not only current revenue streams but also existing universal service programmes aimed at extending networks and services in unserved or underserved areas. In other countries, IP Telephony, and particularly the roll-out of IP networks, is viewed as a means to offer and encourage new and cheaper services, and thus to exert downward pressure on the price of circuit-switched telephony.

1.11 This Report seeks to provide background for the key issues that are posed by IP telephony. Section 2 of the Report looks at technical and operational aspects of IP Telephony. Section 3 deals with the economic aspects of IP Telephony and its impact on Member States and Sector Members. Section 4 discusses the different policy and regulatory approaches that Member States have taken to IP Telephony, and its significance for universal service schemes and convergence. Section 5 examines the relationship between IP Telephony and Human Resource Development and also discusses the particular concerns of developing countries.

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2. TECHNICAL AND OPERATIONAL ASPECTS OF IP NETWORKS

Introduction

2.1 A fundamental paradigm shift has been underway in the telecommunications industry—a shift that is arguably as important as that from the telegraph to the telephone or from the mainframe to the personal computer. That change is a shift from traditional PSTN *circuit-switched* voice networks to *packet-switched* data networks, using Internet Protocol (IP) technology. This Section discusses the technical and operational aspects of IP Telephony. Since transmitting voice over IP networks is just one of many possible IP-based applications, the discussion is framed within the broader context of IP networking technologies.

2.2 The largest (and most well known) IP network in the world is “the Internet”; referred to by many as the “public Internet”. There are many definitions for the Internet but simply put, it is a globally connected set of computer networks, using the Internet Protocol, sharing a common IP address space. Computers connected to the Internet use software that “serves” or provides interchange of information using widely available standard applications (e.g., email, file transfer). The popularity of the Internet grew tremendously in the 1990’s with the deployment of World Wide Web technology—allowing users easy access to hyperlinked information around the globe.

2.3 The Internet Protocol and related applications can also be used in private networks based on Internet technology (e.g., “Intranets” or LANs). Therefore, applications or services such as IP Telephony can be deployed on either the public Internet or private IP-based networks—or across a combination of both.

2.4 Technological innovation means that IP-based networks will continue to evolve and provide increasingly sophisticated services and applications on top of basic Internet data communications. Despite being originally designed for not real-time, *asynchronous* communications, extensions to the Internet Protocol are currently under development to support application services that require

“real time” transport such as audio and video streams. VoIP can be viewed as one specific example of interactive, real time audio between users.

2.5 VoIP technology, integrated with data applications, offers the potential for new, multifunctional end-user portable devices which may be much more user-friendly, interactive, and personal than traditional telephones or personal computers. For example, such devices may include services linked to a user’s current location. These new modes of access and related services will spawn new applications, which in turn will drive further evolution of global telecommunication network infrastructures.

Evolution in Network Infrastructures

2.6 For most of the last century, voice traffic was the predominant use of telecommunications networks. While voice traffic continues to grow, it represents an ever-diminishing percentage of overall telecommunications traffic when compared to data. The result is that support for IP-related technologies is now a strategic element in the design, development and use of telecommunication networks.

2.7 Architectural differences between circuit-switched and IP-based networks are rooted in their origins. IP networks were originally designed for two-way, not real-time, or *asynchronous* communication, typically referred to as “connectionless” or “stateless”. In other words, no unique end-to-end circuit is created and held for the duration of a particular session. On the other hand, telephone networks have been engineered to provide real-time or *synchronous*, two-way voice conversations possible between almost any two points on earth, using circuits created as necessary and held for the duration of the call.

2.8 IP technology chops up electronic transmissions into packets of varying numbers of bytes. Each packet is given a “header” or address label, and forwarded from one *router* to another, armed at each “hop” with enough information to get it to the next, where the process is repeated. By contrast, on circuit-switched networks, using protocols such as Signalling System 7 (SS7), a call is typically routed through a hierarchy of local, inter-urban and international switches to establish an end-to-end circuit between caller and called party.

2.9 In general, telecommunication vendors and operators are transforming themselves from voice-centric, circuit-switched providers to data-centric, IP-based solution providers. Therefore, deployment of core networks solely for the delivery of voice services is increasingly uncommon. As a consequence, there are enormous efforts underway to support real-time applications and carrier grade quality with IP technologies. Many operators, both wireline and wireless, have begun investing in upgrading their entire networks towards a more flexible “all IP” architecture. As one example, 3rd generation (i.e., IMT-2000) mobile network vendors and operators plan to migrate core networks to IP technologies, thus improving integration of mobile telephony and Internet services.

2.10 It should be recognized that there are several technological scenarios under which voice is carried on IP networks—often involving different treatment from a policy or regulatory perspective. One scenario is where IP Telephony is carried solely across the public Internet between computers. Another scenario is where IP is just used as an underlying transport technology for networks that provide PSTN services. In this scheme, signalling and network intelligence still use the Signalling System Seven (SS7) protocol widely used on the PSTN. A third scenario is where IP Telephony is based on full end-to-end IP technology (e.g., on private IP networks or next generation “greenfield” mobile networks). This scenario does not use SS7 signalling but may use new “soft switch” technology to manage network call control and provide intelligent network management—including well-known telephony network features such as busy tone, call forwarding, call data records for billing, etc. Finally, there may also be use of gateways or interconnection between the Internet or private IP networks and the PSTN. In this regard, ITU-T Recommendation E.370, proposed for

final approval by ITU-T Study Group 2 in January 2001, addresses in more detail various scenarios and principles related to interworking between PSTN and IP-based networks.⁵

IP Telephony Standards Activities

2.11 Of course, most telephones are—and for several years to come will continue to be—connected to traditional circuit-switched telephone networks. IP Telephony services must be able therefore to accept calls originating on the PSTN, to terminate calls on the PSTN, and to do it all seamlessly. The first generation IP Telephony services that linked to the PSTN via gateways were not capable of Intelligent Network (IN) functionality, such as calling party identification, nor could they interface with PSTN signalling systems such as Signalling System 7. In order to address these requirements, the latest standardization activities have focused on the distributed architecture of *gateways* linking PSTN and IP networks. These gateways convert and forward calls in one direction or another as well as provide call management functionality.

2.12 Technical standardization for IP Telephony is underway in many industry and regional entities, as well as in standardization bodies such as the ITU Telecommunication Standardization Sector (ITU-T), the ITU Radiocommunication Sector (ITU-R), the European Telecommunications Standards Institute (ETSI) and the Internet Engineering Task Force (IETF).

2.13 One example of ITU standardization is the H.323 series of Recommendations from ITU-T Study Group 16. The scope of the H.323 series is very broad and supports both audio and video multimedia conferencing, call setup and control, bandwidth management, as well as interfaces between different network architectures. Also notable is the Internet Engineering Task Force's Session Initiation Protocol (SIP), a protocol for conferencing, telephony, presence detection, events notification and instant messaging. In some circumstances, the IETF and ITU-T have cooperated directly on IP telephony standardization—producing the joint protocol called H.248 (ITU-T name)⁶ and Megaco (IETF name). H.248/Megaco defines a master/slave protocol to control media gateways that can pass voice, video, facsimile and data traffic between PSTN and IP-based networks. The ITU-R is also involved in standardization related to fixed and mobile wireless access using IP networks.

2.14 Currently, many of the deployed IP Telephony solutions, even when based on standards, are from single vendors and encounter interoperability issues with other systems. For IP Telephony to further advance, common standards work still needs progressing.

Quality of service (QoS) and Capacity

2.15 Quality of Service and its related topic, network capacity, is at the core of voice telephony and, as such, is often the focal point of the IP Telephony debate, especially in determining regulatory classifications. There are many aspects to quality, including reliability, throughput and security. However, it is the perceived poor transmission quality of voice delivered over the public Internet that explains why Internet Telephony is often not considered as a carrier-grade service. There are, in general, two ways in which this quality can be improved—implementing quality of service support and increasing available capacity. The latter may be easier to achieve because it does not require coordinated action across Internet service providers.⁷

⁵ <http://www.itu.int/itudoc/itu-t/com2/reports/r077.html>

⁶ Approved in June 2000.

⁷ See Odlyzko, A.M., "The current state and likely evolution of the Internet," presented at IEEE Globecom '99, <http://www.research.att.com/~amo/doc/globecom99.pdf>; and Huston, G., "Quality of Service: Fact or Fiction?" The Internet Protocol Journal (Cisco) (March 2000), http://www.cisco.com/warp/public/759/ipj_3-1/ipj_3-1_qos.html.

2.16 Generally, there is less of an issue when, instead of the public Internet, privately managed IP networks are used to provide VoIP. In the latter, more capacity, faster transmission, and better voice quality combine to produce more satisfied customers. Privately operated capacity is therefore typically a key component today in commercially viable IP Telephony, and much more so at present than QoS.

Numbering and Addressing

2.17 One of the technical challenges raised by the ever-closer integration between circuit-switched and packet-switched networks is how to address calls that pass from one network service to another. Generally, it is assumed to be desirable that an integrated global subscriber access plan exists. For example, the same ITU-T E.164 telephone number would reach a subscriber regardless of whether IP-based or PSTN network technologies are used.

2.18 It is now widely possible to originate calls from IP address-based networks to other networks, but it is uncommon to terminate calls from other networks to IP address-based networks. Rather, calls are generally terminated on the PSTN, so the called party can only use a terminal device connected to those networks. In order to access a subscriber on an IP address-based network, some sort of global numbering/addressing scheme across both PSTN and IP address-based networks needs to be developed and implemented.

2.19 ITU-T Study Group 2 (SG2) is currently studying a number of possible options whereby users in IP address-based networks can be accessed from/to PSTN users. One option is the assignment of E.164 numbering resources to IP devices. Another approach is to support service interworking between different subscriber addressing systems in the PSTN and IP networks; for example, using the IETF's ENUM protocol. ENUM⁸ defines a Domain Name System (DNS)-based architecture and protocol for mapping an E.164 telephone number⁹ to what are known as Uniform Resource Identifiers (URIs)¹⁰. URIs are strings of characters that identify resources such as documents, images, files, databases, and email addresses. For example, <http://www.itu.int/infocom/enum/> is the URI for the ITU website providing an overview of ENUM activities.

~~2.20~~ ~~2.20~~—During the last year, SG2, responsible for E.164, and the IETF, have held discussions and collaborative activities related to the deployment of ENUM services. Since E.164 numbers may be synchronized with the DNS, the ENUM protocol would appear to have important implications for national Administrations responsible for numbering policies under “country codes”. It appears that it is absolutely necessary that ENUM domain names totally match to the E.164 numbers. If not, ENUM would lose its core advantage which is the utilization of a widely used numbering system to which the general public is accustomed. The view of SG2 is that administrative entities, including DNS administrators, should adhere to the applicable tenets of existing pertinent ITU-T Recommendations¹¹ with regard to the inclusion of E.164 resource information in the DNS. Specifically, in a recent liaison statement¹² to the IETF, Study Group 2 has noted that since most E.164 resources are utilized nationally, ENUM service and administrative decisions are primarily national issues within the purview of ITU Member States. In order to guarantee a perfect adequacy of the ENUM domain names with the E.164 numbering system, a guiding principle should be clearly adopted: the ENUM domain names management must be subordinated to the E.164 numbers management. Consequently, even if the technical management of the root domain

⁸ <http://www.ietf.org/rfc/rfc2916.txt>

⁹ <http://www.itu.int/itudoc/itu-t/rec/e/e164.html>

¹⁰ <http://www.ietf.org/rfc/rfc2396.txt>

¹¹ For example, ITU-T Recommendations E.164, E.164.1, E.190, and E.195.

¹² http://www.itu.int/infocom/enum/wp1-39_rev1.htm

name servers may be sub-contracted, the best solution is to assign the responsibility of the ENUM domain to the current management body of the E.164 numbering system: the ITU.

2.21 2.21—National regulatory authorities may wish to consider, their appropriate level of involvement in ENUM related activities in ITU-T SG2. One method of involvement is by providing contributions to SG2 in developing Recommendations that recognize and/or safeguard current national approaches and standards. Another issue of interest to Administrations is the appropriate international management of the root of the ENUM DNS structure, on which Administrations would be dependent for services.

2.22 IP telephony may have an impact on IP addresses management. It could stress indeed the growing lack of IPv4 addresses. For instance, the dynamic allocation mechanism of IP addresses is used to limit the number of IP addresses needed for end-users Internet connections. However this mechanism is not compatible with solutions of IP telephony which require end-users to be identified with fixed IP addresses. Furthermore, the use of private addressing plan combined with network address translators (NAT) may neither be compatible with IP telephony solutions which tend to be time-real and to reduce the packets trip time through the networks. Consequently, the lack of IPv4 addresses and the solutions imagined to minimize it may appear as a barrier to the wide development of IP telephony. Furthermore, the rules of assignment of the remaining IPv4 addresses and of IPv6 addresses should be determined on a fair basis and not discriminate any operator or country.

ITU Study Group Activities

2.23 2.22—In general, all ITU-T and ITU-R Study Groups have refocused their activities on IP-related standardization. Relevant IP Telephony standardization includes, *inter alia*, work on differentiated QoS IP services, interworking between PSTN and IP networks, naming and addressing, support for charging and settlements, integrated network management of telecom and IP-based networks, IP signalling, routing principles, traffic management, network integrity and reliability (e.g., important for emergency services), optical networks, and fixed and mobile wireless systems (e.g., IMT-2000).

2.24 2.23—Specific ITU-T Study Group activities include ITU-T Study Group (SG) 2 (naming and addressing), SG3 (charging and settlements), SG4 (network management), SG7 (Frame Relay Interworking with IP), SG9 (cable network services including IP Telephony support), SG11 (signalling), SG12 (end-to-end performance), SG13 (ITU-T lead SG on IP), SG15 (optical networks), SG16 (H.323, H.248 and related Recommendations), and the recently established Special Study Group on “IMT-2000 and beyond”. Concerning ITU-R, relevant Study Groups include SG6 (broadcasting, terrestrial and satellite), SG8 (mobile, terrestrial and satellite, IMT-2000 included) and SG9 (terrestrial fixed service), all dealing with wireless access to IP networks. More detailed information on specific ITU Study Group IP activities can be found in a report to the 2000 ITU Council¹³ and on the ITU-T and ITU-R web pages.¹⁴

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¹³ <http://www.itu.int/itudoc/gs/council/c00/docs/27a.html>

¹⁴ <http://www.itu.int/ITU-T/> and <http://www.itu.int/ITU-R/>, respectively.

3. ECONOMIC ASPECTS OF IP TELEPHONY AND ITS IMPACT ON MEMBER STATES AND SECTOR MEMBERS

The IP opportunity

3.1 Throughout the world, enormous sums are being invested to establish IP-based networks, both for creating new capacity and for enabling existing narrowband networks and future broadband ones to run IP-based services. It is in this broader context that any consideration of the economic aspects of IP Telephony should be rooted. The initial driving force behind this investment has been the desire to widen and improve access to the Internet. There are now more than 350 million Internet users worldwide. While for many, the Internet is primarily a source for information and entertainment; it also brings significant opportunities for economic and social development:

- By using IP-based networks for electronic commerce, firms can widen their potential customer base and reduce transaction costs, while national economies can benefit from new trade opportunities;
- By using IP-based networks to retrieve information, health care professionals can keep up-to-date with developments in specialist areas and can pass on their own knowledge to others;
- By using IP-based networks as research media, schools and universities can greatly expand the range of information services available to their students and ensure that teachers remain abreast of the latest developments in their field;
- By using IP-based networks as communications tools, governments can make their services more accessible to their citizens and can establish websites to promote events or provide information.

These are just a few of the endless possibilities opened up by IP-based technologies for both fixed-line and mobile networks. Even though the Internet is still at the start of its growth cycle, already the number of emails sent each year exceeds the volume of fax messages and the volume of data and text transmitted exceeds the volume of international telephone calls

3.2 Most countries have adopted a supportive attitude to the Internet, and are taking steps so that all citizens have access to the possibilities it brings for commerce, communication, education and entertainment. ITU research carried out for the 2001 edition of the World Telecommunication Development Report shows how governments in different countries have adopted policies to promote the development of the Internet¹⁵:

- In Egypt, the Government's Information and Decision Support Centre played a critical role in introducing the Internet into the country by investing in international connectivity and establishing websites for the tourism and healthcare sectors;
- In Hungary, the Hungarnet academic network provides free Internet access to 400'000 or so of the nation's higher education students and professors;
- In Nepal, a government task force is examining ways to promote electronic commerce to market the nation's handicrafts, tourist potential and software expertise.

3.3 But IP-based networks can be used for much more than just text messaging and data communications. As capacity expands, new and innovative multimedia applications become possible. One of these is the facility for carrying voice, both in real-time and stored form, over IP-

¹⁵ See www.itu.int/ti/casestudies.

based networks. Packetised voice communications can attain levels of quality that are as high, if not higher, as that carried over more conventional circuit-switched networks, especially where bandwidth is plentiful. In most cases, this service of IP Telephony can be offered to customers at prices that are significantly below those offered over circuit-switched networks. This is partly because call origination and termination costs may be lower, but mainly because of savings in the long-distance transmission component of the call. Traditionally, pricing of calls on circuit-switched networks has been highly distance sensitive, with profits made on long-distance and international calls being used to cross-subsidise subscriber access and local call costs. But pricing of traffic on IP-based networks is largely independent of distance.

Markets, services and players

3.4 Projections vary widely as to the economic market opportunity that IP Telephony creates. TeleGeography estimates that some 3.7 billion minutes of international traffic were carried over IP-based networks in 2000, or just over 3 per cent of the global total, but the market is growing fast. Market analysts forecast that, by 2004, IP Telephony will account for between 25 per cent (Analysys) and 40 per cent (Tarifica) of the global total. Most studies show that the main use of IP Telephony at present is for international traffic rather than for domestic long-distance or local traffic. The United States is currently the main source of IP Telephony traffic. TeleGeography estimates that all of the top 20 IP Telephony routes worldwide by traffic volume are between the United States and other countries (though some of this traffic may simply be being switched via the United States). In the longer term, there is a market opportunity for IP Telephony also in long-distance and local networks, especially if the transition of prices towards costs is delayed.

3.5 The IP Telephony marketplace, its products and players, differs considerably from the traditional PSTN telephony market which, even today, is dominated by incumbent national operators. Although the majority of IP Telephony Service Providers (IPTSPs) are US-owned, the main focus of their operations is global rather than national, and they often work in partnership with incumbent PTOs, bringing training and expertise as well as revenue-generating opportunities. The market can be segmented into several different types of applications, including (in the approximate order in which they have appeared): PC-to-PC; PC-to-Phone; Phone-to-Phone and value-added services.

3.6 The market can also be segmented between wholesale and retail operations; or between those IPTSPs that offer priced services and those which offer applications which are free-of-charge to the end-user, funded by advertising revenue. It is also useful to distinguish between the ways in which IP is used to carry voice, for instance: in the networks of incumbent carriers migrating to IP; in the networks of newer PTOs without direct connection to customers; in managed IP-based networks offering multimedia services; or via ISPs (Internet Service Providers) which interconnect the public Internet with the PSTN. The mainstay of the business, for the moment at least, is price arbitrage, but this is evolving over time as value-added services—such as integrated messaging, presence management (“find me, follow me”), click-to-talk website functions etc.—provide an increasing share of revenue.

Costs and prices

3.7 3.7—While the long-term potential for IP Telephony lies in the new functions and applications it makes available, the short-term advantage lies in cost-savings compared with conventional circuit-switched telephony. For consumers, IP Telephony, with generally less quality of service¹⁶, is invariably *cheaper* than a circuit-switched call, especially for calls originating in non-liberalised markets or that are carried over the public Internet. Taking into account different factors as— quality, convenience, reliability, etc

¹⁶ using non managed IP networks or the public Internet

satisfied or not by service provision, the choice to use IP Telephony could be an economically rational one. Current IP Telephony offerings do not always match up to consumer expectations in such factors dealing with quality of service or in user-friendliness. At present, consumers must generally make a trade-off between price and quality. Willingness to make that trade off will generally depend on price sensitivity. But comparisons with only the price criteria is not sufficient. Comparisons between various telephony services shall be made not only on price issues but also on others factors dealing with the service provision (quality of service, user-friendliness, terminal availability, subscribers which could be reached, etc.). For instance, in Hungary, where consumers have had a choice of using IP Telephony since 1999, the price advantage over standard PSTN calls ranges between 20 and 50 per cent per minute. If all other factors—quality, convenience, reliability, etc.—are equal, the choice to use IP Telephony is an economically rational one. But current IP Telephony offerings do not always match up to consumer expectations. At present, consumers must generally make a trade-off between price and quality. Willingness to make that trade off will generally depend on price sensitivity:

- Consumers in low income countries, or in low income families in developed countries, will be more inclined than other less-price-sensitive consumers to choose IP Telephony, where it is available; In case of Internet telephony, there is the trade off between price and quality.
- Residential consumers may be more inclined to use IP Telephony than business users, for whom transmission quality and reliability are more important. Generally, this is a choice for a second telephony line.

3.8 3.8—For Public Telecommunication Operators, the potential cost advantages of IP Telephony are more complex to calculate. That is because incumbent PTOs have existing revenue streams, which may be affected by a shift to lower-priced IP Telephony. In the case of Hungary quoted above, the initial pressure to offer IP Telephony came from mobile service providers that saw the opportunity to bypass *Matav*'s monopoly on carrying international calls, although *Matav* itself is now an IPTSP.

All networks are based on two distinctive parts : the core network and the access network. The access network is considered as the more sensitive ones even if sometimes different technical solutions exist (copper, Radio Local Loop, ADLS, mobile, etc.). Within some countries, competition issues, like unbundling, are essential in this network part to increase service provisions compared to long distance and core network provisions. Within developping countries, the access network is subject to investment issues where radio technologies could be considered as the most suitable. The core network is also subject to more and more investment due to the growth of traffic resulting from deregulation and new service provisions.

3.9 The precise nature of the cost advantage to PTOs offered by IP networks is the subject of much debate. It will depend, for instance, on:

- Whether a particular investment in IP is as a new-build network, or as an upgrade or overlay to an existing network. The incentive to choose IP will be greater for new, or substantially new, networks. For instance, in Senegal, where existing networks serve only just over 1 per cent of the population, *Sonatel* plans to migrate its existing core network to an IP backbone by 2004 and to offer both voice and data services over the same integrated IP network.

- Whether a particular carrier is an incumbent or a new market entrant. New market entrants, with no legacy network to defend, are likely to be the first movers towards IP Telephony. In China, for instance, *China Netcom*, a new market entrant which is based upon the Ministry of Railway's network, is building a voice over IP network which will cover 15 cities and include some 9'600 kilometres of fibre optic cable by the end of 2000. The use of IP has allowed *China Netcom* an earlier entry into the market than might otherwise be the case.
- The extent to which value-added services are being offered. In economies such as Hongkong SAR and Singapore, where local call charges are free (bundled into the access charge), new market entrants are offering value added services that allow, for instance, voice users to retrieve their email (*T2mail.com*) or the provision of voicemail and fax communication services (*2Bsure.com*) over an IP platform.
- The costs of international IP connectivity. Some countries have argued that the costs of international leased lines used to establish IP connectivity are too high and the costs are unequally shared. This issue is current being discussed within ITU-T Study Group 3 (see ITU-T Recommendation D.50).

3.10 In reviewing these factors, it seems likely that the pressures and incentives to shift towards IP Telephony will vary among economies at different states of development and with differing degrees of market competition.

- In countries where prices for international traffic are high, the main opportunity for IP Telephony will be for price arbitrage of simple voice transmission mainly with less quality of service. In many of these countries, however, outgoing IP Telephony is banned. Thus, the main form of IP Telephony is for incoming traffic. Even though the use of IP Telephony for incoming traffic may be no more legal than for outgoing traffic, it is harder to detect and block.
- In countries where prices for international traffic are falling—for both retail (consumer) and wholesale (settlement) rates—IP Telephony traffic may already be playing a role in promoting price competition (as, for instance, in Hungary or Thailand) or in providing an alternative to the services of the fixed-line incumbent (as, for instance, in Colombia). However, a critical factor is how easy it is for subscribers to use the service. In Peru, for instance, the success of IP Telephony was partly based on the availability of a telephone-like device (*Aplio*) that could use either IP-based networks or the PSTN for establishing calls.
- In countries where prices for international traffic are already low, due to the effects of competition, IP Telephony is likely to be important for reasons other than price arbitrage. The market opportunity for IP Telephony is likely to lie, on the one hand, in the prospects of value-added integrated services for users and, on the other hand, cost reductions for PTOs. As an example of the former, in the United Kingdom, *yac.com* offers a service for personalised numbers and automated call forwarding via the Internet. As an example of the latter, the *BT/AT&T* joint venture, *Concert*, is building a new managed IP-based global network to deliver services, such as electronic commerce and global call centres, to link some 90 cities worldwide. Even though the required investment is of the order of US\$1 billion per year, an integrated IP network is considered to offer the most cost-effective solution for handling multiple traffic streams.

~~3.11 To better evaluate the interplay of these factors, it would be of assistance to Member States and Sector Members to further develop the following:~~

~~1. a reliable empirical analysis of the current price advantage that Internet Telephony enjoys over PSTN services~~

~~2. a comparison between the cost structure aspects of IP-based networks and Internet Telephony and their individual components, and traditional telecommunications networks.~~

Substitutability and traffic migration

3.12 A further economic issue raised by IP Telephony is that of substitutability between services. Clearly, much of the traffic carried over PC-to-PC Internet Telephony will be “new” traffic, which would not otherwise have existed on the PSTN. Much of the discount traffic generated over PC-to-Phone services is also likely to be new traffic, especially that which is offered “free of charge”, for instance by companies such as *DialPad.com* or *phonefree.com*. But some of this traffic, and the majority of calls carried over Phone-to-Phone services, might otherwise have been made over the PSTN, and could therefore be regarded as substitute traffic. The cheaper prices generally available for IP Telephony may spur higher growth rates in traffic, where demand is elastic. IP Telephony will also spur additional traffic on local and long-distance networks. In the longer-term, as PTOs move their backbone networks to an IP-based platform, the issue will become one of traffic migration, rather than substitution. Thus, some countries consider that the development of common strategies for migration from circuit-switched to IP-based networks would be of assistance to Member States and Sector members, especially for developing countries. Moreover, new multimedia services using IP telephony could generate new voice traffic which does not exist for the time being.

Impact on Member States and Sector Members

3.13 ~~IP-based networks arguably represent the future for the telecommunications industry. Therefore, investment in IP-based networks may be regarded as an investment in the future, irrespective of the state of economic development of a particular Member State. The business case for investment in IP would rarely be based on the potential of IP Telephony alone, but rather on the wider potential of IP-based networks to carry data, text and video traffic as well as voice. Future mobile networks, like fixed-line networks, are likely to be based on use IP technology. Thus those Member States that choose to ban the use of IP technology for carrying voice may be blocking the technological migration path of national operators and new entrants.~~

3.14 Some Member States have chosen to promote the Internet for text and data services, but not for voice. Their objective may be to protect the incumbent operators from potential competition. The risk in such an approach however, lies in the fact that those operators may be ill-prepared for operating in the future global environment. The PTO of the future may “own” the customer, in terms of providing billing and customer care support, and may “own” the local network, in terms of providing origination and termination of calls. However, it is unlikely to be able to “own” or control the types of application that the customer chooses, and IP Telephony might be better viewed as an application rather than a service.

3.15 Operators have traditionally used profitable long-distance and international services to cross-subsidise the functions of network access and local calling. In increasingly competitive markets, such hidden cross-subsidies can no longer be sustained. In the future, operators will need, instead, to address new challenges that may require substantial tariff rebalancing and a greater reliance on locally generated revenues.

3.16 ~~3.16~~ While IP Telephony may bypass certain parts of an operator’s network, it will not take away the need for local networks. Indeed, insofar as the web IP Telephony is a new “killer application” and makes access to the Internet even more popular, it will actually

increase the volume of local calls and the demand for second lines. Already, in some Member States, as much as a third of all local calls are to the Internet and around 15 per cent of all local lines are used primarily for Internet access. IP telephony is currently a very small part of the dial-up Internet access traffic and of the worldwide data traffic. Furthermore, dial-up Internet access is on a steeply rising curve while international traffic growth is slowing down. Competition will drive prices closer to costs and, where IP Telephony offers the lowest cost alternative, it could—will be the preferred solution depending on the choice mainly between quality of service, user-friendliness and price.

3.17 For Sector Members that are equipment vendors, the development of new IP-based product lines is likely to be essential to future growth and profitability. In developed country markets, demand for circuit-switched network technology has declined steeply and although demand in developing countries remains strong, this cannot be expected to continue indefinitely. Third generation mobile networks (IMT-2000), which are also IP-based networks, offer vendors additional opportunities to offer new products.

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4. POLICY AND REGULATORY ISSUES FOR IP TELEPHONY

Introduction

4.1 This section discusses the different policy and regulatory approaches that Member States have taken to IP Telephony, and the methods used to categorize it within those frameworks. The significance of IP Telephony for convergence, universal service schemes, and cross-border issues is also considered.

4.2 IP Telephony is treated in a range of different ways within ITU Member States. Some allow or do not regulate it, others prohibit it, while some apply a range of controls and restrictions, either through licensing or other regulatory tools. It should be noted as well that this issue arises within the context of a period when many Member States are lightening their regulatory regimes for telecommunications and moving to a greater reliance on competition policy to ensure a level playing field in telecommunications markets, as opposed to sector-specific regulation.

4.3 Within these broad policy frameworks, IP Telephony raises a number of specific questions for policymakers and regulators, that require a careful and informed balancing of different and sometimes competing interests. Where does IP Telephony “fit” within telecommunication regulatory regimes, if at all? How should the rights and obligations of IPTSPs compare with those of traditional telephony providers, many of whom are subjected to common carriage regulations and universal service commitments? Should Internet Telephony, VoIP, and PSTN voice-traffic be treated the same way, or differently? Should IPTSPs be required to hold a license as most traditional voice telephony carriers do? ~~Or should IP Telephony be viewed as an emerging technology offering new services and applications that could best develop with minimal or no governmental regulation?~~

4.4 To explore these questions, this section attempts an approximate categorization of the different ways in which IP Telephony is presently treated in many Member States and the factors that have been considered by national policy-makers. It provides illustrative examples of some of the different national approaches. As background, the tables in Annex B classify the approach to IP Telephony taken by certain Member States, based on their responses to a recent ITU regulatory questionnaire.

Policy objectives

4.5 As a threshold matter, it is useful to set forth possible government policy objectives for IP Telephony that could or should form the basis for any regulatory approach that is adopted. These objectives, which could also form the parameters for a cost/benefit analysis of any policy, would include:

- Universal Service/Universal Access
- Affordable telecommunications services
- Tariff re-balancing
- Ensuring a level-playing field for competitors and new entrants
- Promotion of new technologies and services
- Stimulating investment in network build-out and new services
- Impact on revenue streams of incumbent operators
- Technology transfer
- Human resource development
- Economic growth as a whole and in particular in the communications sector.

The general picture

4.6 Depending on various IP telephony models and configuration, different national policies could emerge. In fact, there are various IP telephony models : PC to PC, PC to Phone, Phone to PC, Phone to Phone. Within all these models, IP telephony could cover various services from Internet telephony using public Internet as the IP network to the voice over IP delivered over managed IP access or core networks with quality of service. At present, three broad national policy approaches emerge:

First, there are countries, depending on the model which is considered, that include some forms of IP Telephony within their regulatory system and/or which do not regulate the other forms of IP Telephony;

- Second, there are countries that prohibit all forms of IP Telephony;
- Third, there are countries which do not regulate IP telephony
- Lastly, there are countries where the situation is uncertain or the issue remains to be formally addressed.

4.7 This latter group of countries, where there is no specific policy on IP Telephony, constitutes the majority of ITU Member States. As can be seen from Table B, countries have taken widely differing regulatory approaches, which may be related to different prevailing market conditions or degrees of liberalization. It is important to note that it is the service component, i.e., voice telephony *service* delivered by means of the Internet or IP-based networks, which is most frequently the subject of policy, not the use of IP *technology* itself.

4.8 Prohibitions on IP Telephony are mostly found in developing countries and this may be linked to concerns that this service or application can divert revenues from the incumbent operator, as discussed in sections three and five. Many countries that have retained telecommunication monopolies do not specifically prohibit IP Telephony. However, it is likely that they would not allow any company other than the incumbent PTO to provide it. It is possible, however, as a practical matter, that IP Telephony (or at least PC-to-Phone services) may be permitted in these countries because it is not considered voice telephony at all, and therefore not a competing service.¹⁷ However, reliable, reasonably high-speed access to the Internet is required for tolerable outgoing PC-to-Phone service, and this is often not widely available in developing countries. Consequently the issue of termination of incoming international calls is the more significant aspect of IP Telephony for many developing countries.

4.9 There are different rationales underlying the policies of those countries that either do not regulate IP Telephony or have chosen to include it within the regulatory framework for telecommunications. This approach may be motivated by a desire to encourage and stimulate emerging technologies linked to concerns about imposing regulations on technologies that are not fully mature. IP Telephony may be viewed as exerting downward competitive pressures on telephone tariffs and thus consistent with consumer welfare. Limitations placed on IP Telephony may also be seen as inconsistent with approaches designed to stimulate the deployment and migration to IP-based networks. Lastly, regulators in these countries may be hesitant to intervene in new markets unless there is evidence of a market failure.

License restrictions

4.10 Licensing is one of the principal means by which telecommunications authorities address the question of IP Telephony. Terms and conditions in existing licenses can be interpreted as either prohibiting or permitting such service offerings by new market entrants. Indeed, in non-competitive markets, the license of the incumbent operator may be viewed as precluding new market entrants from offering IP Telephony. On the other hand, a few countries expressly license PTOs to provide IP Telephony.

Regulatory distinctions

4.11 In countries that have policies on IP Telephony, it is possible to identify a number of factors which are used to distinguish IP Telephony from other, usually reserved or licensed, telecommunication services. In making the determination as to whether a particular service constitutes, or should be classified with, traditional voice telephony, a number of different regulatory distinctions are employed, alone or in combination, by many countries. Among the most commonly-used distinctions are type of service, voice versus data, mode of transmission, facilities-based operators versus resale and quality of service. These, and other distinctions, are discussed below.

Type of service

4.12 Most national IP Telephony policies specifically refer to Phone-to-Phone services. PC-to-Phone services tend to be prohibited in those countries that prohibit IP Telephony generally, while they tend to be permitted without condition in countries that permit some or all forms of IP Telephony. Calling-card services are rarely treated separately in policies. Rather, they are rolled in with other forms of Phone-to-Phone service, since the difference is largely one of marketing and billing, rather than technology. It should also be noted that, for many countries, information simply is not available as to whether or not incumbent PTOs are employing IP Telephony and if so,

¹⁷ Hungary is an example of a country where IP Telephony has been defined by the regulatory authorities in such a way as to fall outside the legal monopoly of the fixed-line voice incumbent.

whether by right of their existing licences, or under special authorization. Some PTOs may simply assume that their international franchise allows them to use IP Telephony, should they decide to pursue it, as a cost-saving measure or to offer a discounted service.¹⁸

4.13 Another aspect of type of service is the target audience for the service. Some regulators allow VoIP providers to be treated differently depending on whether or not they provide their service directly to end users, or just to other service providers.

Voice or data

4.14 Another, and perhaps the most important regulatory distinction in many countries, is whether IP Telephony constitutes voice or data. IP Telephony services can, in some cases, achieve a level of functional equivalence to traditional telephony services, making the means of transmission irrelevant to the user. Still, the voice/data distinction is often used as a definitional tool to implement policy.

4.15 The Internet, which started as a text and data network, has been treated in most countries as something other than traditional telecommunications. The trend has been in favour of little or no regulation of Internet services, even while traditional voice services are subject to extensive (albeit increasingly targeted) regulation. The reason is that Internet traffic is considered in many Member States, for regulatory purposes, as data traffic, even though in some forms (e.g., dial-up Internet sessions), the bits actually pass over PSTN circuits. Once voice became one of the applications that can be provided over the Internet, one argument for treating it differently was that it is simply another form of Internet data. ~~Hence the regulatory advantage of Internet Telephony over VoIP—being treated as something other than voice, even though voice is the actual functionality being offered.~~

Mode of network transmission

4.16 Policies may also vary depending upon whether IP/PSTN conversion takes place (i.e., whether there is a service provider) and, if so, where. In Phone-to-Phone services, the initial conversion of speech from circuit-switched mode to IP mode generally takes place on the premises of a service provider, particularly in the case of calling-card services. In PC-to-PC and PC-to-Phone services, the initial conversion takes place at the user's PC, such that there is often no requirement for a service provider to be located in the same country as the user. The location of the ISP can be important, since commercial presence is usually a precondition for regulation in many particular countries.

4.17 Another case is where a given call does not use the domestic PSTN, but goes from a private data network to an IP gateway and then over international Internet links. Thus the local PSTN has not been "used." Regulation relating to basic telephony often focuses on the local access network. If that network is not used, then the service in question may not in fact be considered a basic telecommunication service at all.¹⁹

Quality of service

4.18 Another means to distinguish IP Telephony is the question of whether or not it provides "real time" communications similar to traditional telephony. This is a technical measurement of

¹⁸ For instance, Telecom Egypt concluded exclusive agreements to offer IP Telephony within Egypt in 1999 without seeking clarification as to whether this was covered by its license.

¹⁹ **In the United States, policies generally distinguish between the Internet and other IP-based networks as the underlying means of transmission for IP Telephony calls. This can make the difference between a service being characterized as an Internet service, or simply another form of resale provided by means of a different technological platform.**

whether the service provides instantaneous, two-way transmission of speech. If not, the service is often not considered voice telephony, but rather a store-and-forward or messaging service. The latter is often considered to be a “value-added” or “enhanced” service, which have traditionally been subject to little or no regulation. The difference between real-time and store-and-forward may be measured in milliseconds as a technical matter, but is usually left undefined as a legal matter. From the consumers’ perspective, there may be a benefit in having an increased choice of different prices for different quality of calls.

4.19 Since Internet Telephony signals, transmitted over the public Internet, generally involve several conversion steps and face unpredictable traffic conditions, and as a result suffer levels of delay not generally experienced with circuit-switched telephony, they might not be considered to meet the criteria of “real time” communications. However, improvements in VoIP over private, managed IP-based networks may reduce the delay to a point at which such communications could reasonably be considered to be “real time”. Furthermore the delays involved in IP Telephony might typically be the same or shorter than those experienced in satellite telephony, and the sound quality may be comparable with mobile telephony. Thus, technical quality of service measurements that are defined to exclude IP Telephony may also unintentionally exclude other types of voice telephony from regulation.

4.20 ITU-T Recommendation G.114 (2.96 revision) (One-way Transmission Time) establishes the following technical parameters for satisfactory telephony (footnotes omitted):

“[T]he ITU-T *recommends* the following limits for one-way transmission time for connections with echo adequately controlled, according to Recommendation G.131 (*Stability and Echo*):

- 0 to 150 ms: Acceptable for most user applications.
- 150 to 400 ms: Acceptable provided that Administrations are aware of the transmission time impact on the transmission quality of user applications.
- *above 400 ms: Unacceptable for general network planning purposes; however, it is recognized that in some exceptional cases this limit will be exceeded.”*

Special categories

4.21 In some countries, mobile operators are given special rights to use IP Telephony to route international calls, allowing them to bypass the incumbent’s international gateway for incoming or outgoing calls, or both. Other countries restrict the right of mobile operators to offer or provide IP Telephony.

Functional equivalence

4.22 Functional equivalence is a regulatory concept used by some countries to link some or all of the above criteria in developing a policy as to whether some forms of IP Telephony should be treated on the same basis as conventional switched telephony. The premise for this approach is that similar or equivalent services should be treated in a similar way.

4.23 On this basis, functionally equivalent services should be subject to similar regulatory requirements, unless other policy imperatives take precedence. In determining “functional equivalence”, policy-makers look at such criteria as the quality of service, the nature of the service and service provider, the transmission networks used and such other factors as whether the service is offered to the public. Where the type of IP Telephony service under review is such that an ordinary telephone or mobile phone can be used as the originating or terminating terminal device,

the service is offered to the public, the PSTN is involved at some point and there is an acceptable technical level of call quality, then there is a reasonable basis for concluding that it is functionally equivalent to traditional telephony.

4.24 Accordingly, a possible decision path for establishing or assessing functional equivalence, and to determine whether or not regulation is advisable, would look at the following factors:

1. Is speech transmitted with significant average delays which render conversation difficult?
- ~~2. What is the originating terminal device?~~
- ~~3. Is the PSTN used on the originating end, other than in the course of a dial-up Internet sessions?~~
- 4.2. ____ Is the service available for use by the public?

Technological Neutrality

4.25 Technological neutrality is a principle that is often invoked by policy-makers and regulators when addressing IP Telephony and other emerging communications technologies. However, there are a range of understandings of this concept and it has been implemented in different ways in Member States. The concept is particularly pertinent with respect to the difference between VoIP and Internet Telephony, since the former is more likely to approximate conventional voice telephony than the latter.

4.26 One view of technological neutrality is linked to the concept of functional equivalence and provides that a basic public telephone service, even if provided over an IP-based network, should not escape from justified regulation. The definition of the voice telephony service must be based on functional criteria (e.g. transport and switching) that can be evaluated independently of the technologies used. Applying equal regulatory treatment to roughly equal services is seen as a means to neither favour nor disadvantage new or legacy technologies. As a result, appropriate telecommunication regulations might be applied to services such as IP Telephony that approximate traditional telephony. For example, regulations on emergency number services would be applied to all operators providing voice services, regardless of the technology used.

4.27 Another view is that policymakers and regulators should not be indifferent to technology. Emerging technologies might benefit from a “window”, i.e. a form of regulatory asymmetry during a transitional phase, which would allow them to develop and grow outside traditional obligations. This approach may enable small and medium-sized enterprises, offering new technologies and services, to provide competition for traditional industry operators and foster market-based results. If or when market failures arise, competition policy could be employed to reduce bottlenecks or curb abusive practices, without the need for sector-specific regulation or definitions and classifications that may quickly become outdated.

4.28 Efforts to develop a common approach to technology-neutral regulation or treatment within the ITU membership, based on a fuller explanation and understanding of this concept as it applies to the provision of functionally equivalent public voice telephony services, would seem to be a positive step toward fostering a global climate conducive to the use of IP-based networks and applications. This would not mean that all communication services should be subject to the same level of regulation, but would help avoid ineffective or conflicting applications of this principle. ~~Efforts could be made to determine those circumstances under which technological neutrality is viable (e.g., where there is a high degree of product or service substitutability), and to examine whether ‘identical’ as compared to ‘similar’ approaches are required.~~

Convergence and IP Telephony

4.29 Technology analysts have been suggesting for several years that all forms of communications will eventually merge onto one platform, and in recent years IP appears to have emerged as the unifying platform. With PTOs and broadcasters entering each others' markets in many countries, and mobile operators shifting to IP platforms as they develop third generation systems, regulatory structures the world over are being pressured to adapt. At the same time that the regulatory framework for telecommunications is being streamlined and lightened, convergence raises the issue of whether existing or new paradigms should be applied to new telecommunications platforms and the continued suitability of sector-specific regulation.

4.30 One of the key issues in telecommunication markets that have been opened to competition has been the terms for interconnection among all local service providers. It is conceivable that some IPTSPs may seek the benefits of licensed local provider status, such as interconnection rights, numbering resources, and access to essential facilities such as directory listings. This is already the case, for instance, in the United Kingdom. IP Telephony rides on top of the PSTN, in the sense that calls are sometimes originated and almost always terminated on the PSTN, but are not fully integrated with it. The question of whether the public interest *requires* that ISPs (and IPTSPs) interconnect with each other may also arise in the near future.²⁰ Another approach to this issue is to apply domestic competition laws, and relevant doctrines developed under such laws concerning essential facilities, as part of a pro-competitive policy designed to establish a level playing field.

4.31 An important aspect of this issue is access to unbundled elements of the "local loop". In many ways, local competition has proven to be the most complex regulatory undertaking in liberalized telecommunication markets. The integration of Internet and IP-based services with incumbent and new entrant circuit-switched networks will make the local environment even more complex. The inherently international nature of the Internet, in turn, will make international cooperation on such matters essential.

4.32 IP Telephony may also be considered as part of a broader process of deploying IP-based networks around the world. It is unlikely to be cost effective to develop IP-based networks solely for the carriage of voice, but rather as part of a strategy to develop a full-range of multimedia services. For countries that would seek partners to build such networks, developing best practices for creating favourable market conditions for investment and installation of IP-based networks need to be addressed.

Impact of IP Telephony on Universal Service schemes

4.33 It is widely perceived that market solutions will not ensure the expansion of networks to economically less viable regions and areas and thus universal service/access obligations and funding are a common element of national telecommunications policies.

4.34 The asymmetric regulation of voice and data services naturally creates an incentive for arbitrageurs to develop the capability to bypass the PSTN, and thereby avoid the costly regulatory obligations that are associated with voice traffic, in particular contributions towards implicit cross-subsidies or explicit universal service funds, or both. This can make offering international services profitable for small PTOs, or give larger PTOs crucial cost savings in extremely competitive markets. This incentive is particularly high where outgoing traffic exceeds incoming traffic and/or where universal service obligations are significant.

²⁰ In Chile, for instance, IPTSPs are required to offer interconnection. It is to be noted that the WTO Agreement on basic telecommunications and the Reference Paper on telecommunications only place the obligation for interconnection upon "major suppliers".

4.35 A positive policy towards IP Telephony may be designed to encourage the development of the Internet and the growth of small and medium-sized companies in a particular country. However, such a policy may not be entirely consistent with universal service/access goals due to the fact that most commercial IP Telephony traffic travels over private IP networks, and not the public Internet at all, for quality reasons. Thus, such a policy might do little to increase Internet access, while facilitating the bypass of universal service funding schemes designed to increase the accessibility of the very telephone lines most often required to access the Internet in the first place.

4.36 IP Telephony is being used more and more to offer functionally equivalent services without the regulatory burdens associated with providing traditional voice telephony. While this is good for competition, and therefore good for consumers, it can render universal service schemes increasingly unsustainable and subject to challenge. In a few countries, providers of IP Telephony that is equivalent to other forms of telephony are required to contribute to universal service funds.²¹ Thus, a basic question is whether calls on one technological platform (e.g., IP, Frame Relay or ATM-based) should be treated differently from calls on another when it comes to universal service obligations.

4.37 For some developed countries, this issue might become more acute if the definition of universal service is broadened to include Internet access and applications, which would increase the funding requirements. One option would be to broaden or redefine the category of providers that must contribute to universal service, while another option would be to consider alternative bases to generate financing for universal service.

4.38 IP Telephony can also be a helpful tool for attaining universal service/access objectives. IP-based networks, depending on the situation and circumstances, can provide lower-priced alternatives to circuit-switched networks, and thus may provide a less costly alternative when expanding or building new capacity. Further studies of the comparative costs of building IP-based networks would serve to develop this point and could provide a helpful checklist for policy-makers when making decisions on expanding national networks. In addition, to the extent that IP Telephony offers lower cost calls, this may facilitate and increase the access that lower-income citizens have to basic telephony services.

4.39 Increasing access to the Internet is a policy goal in most countries, and low-cost long distance and international voice services can be easily added to the range of Internet services already available at community telecentres. Such services would not necessarily compete with an incumbent's existing business, and could be used as an interim strategy to provide easy and affordable access to those without a telephone in their home.²²

Cross-border issues

4.40 The treatment of Phone-to-Phone IP Telephony may have implications for the international telephony market. IP Telephony may serve the public interest in the originating country by placing significant downward pressure on international settlement rates and consumer prices. In the terminating country, it may serve to introduce an alternative calling option, even though policy-makers have otherwise decided to restrict or prohibit competition. In addition, IPTSPs may benefit from a lighter regulatory approach than that imposed on incumbent PSTN operators. Where a liberalised approach in the originating country conflicts with clear and restrictive policies in foreign markets in which the services are terminated, it might be useful to have a means to address such difficulties, while respecting the sovereign rights of Member States.

²¹ This is the situation in Canada, where a test of functional equivalence is applied and it is a policy objective in Nepal.

²² See the information on public Internet access centres in Peru in the ITU-commissioned case study available at <<http://www.itu.int/osg/sec/spu/ni/iptel/countries/peru/index.html>>.

4.41 Different approaches to the concept of technological neutrality and its implementation may create uncertainties among investors as to the regulatory climate and can impede the global expansion of IP-based networks and IP Telephony. For that reason, the principle of comity and attempts to develop common understandings of these concepts can serve to foster the development of seamless global networks. By ensuring that competing technologies are neither advantaged nor disadvantaged at the global level, opportunities for diversity, flexibility and innovation in the supply of services would be encouraged.

4.42 More generally, an assessment could be made as to the extent, if any, to which some forms of IP Telephony are or should be subject to international agreements and procedures, such as the numbering plan or conventions on routing traffic and settling accounts, that apply to traditional international telephony. Finally, as discussed in section 2, interoperability of IP-based networks and the development of necessary global technical standards are an important cross-border concern.

5. THE DEVELOPMENT DIMENSION AND HUMAN RESOURCE DEVELOPMENT ISSUES

The digital divide and bypass

5.1 Of those developing countries that have adopted a specific policy towards IP Telephony, many have chosen either to ban it outright, or to restrict its provision to the incumbent PTO.²³ Relatively few developing countries that have monopolistic telecommunication structures have taken a liberal approach to IP Telephony, though China is a major exception. In China, after a period during which IPTSPs were blocked and even jailed, IP Telephony has now been adopted by each of the major licensed international operators and they have been permitted to provide nationwide and international IP Telephony services. In China, IP Telephony has permitted the earlier introduction of competition than might otherwise have occurred and this has prompted a significant reduction in prices for international calls.

5.2 The position of those developing countries that ban or limit the provision of IP Telephony may benefit from a period of reassessment, if it is concluded that IP Telephony promises to bring lower call prices and make services more accessible, both of which are goals in the battle to narrow the digital divide. While most developing country governments have been supportive of IP-based networks in general, and the Internet in particular, they have often been hostile to IP Telephony. Consequently, ISPs in these countries have been deprived of a potentially valuable revenue source, and this may slow Internet development. In some cases, ISPs have been requested to block access to specific websites, based in foreign countries, which offer free-of-charge IP Telephony calls. As more websites integrate voice applications, such bans will become more difficult to enforce and the result may be that application service providers and website developers in developing countries are less able to compete with those in countries where IP Telephony is liberalised.

5.3 While some developing countries have chosen to limit outgoing IP Telephony calls, and the advertising of those services, they have often been unable to limit incoming IP Telephony calls. One of the main motivations for PTOs to route traffic via IP-based networks is to reduce the level of settlements that are due to partner countries. Under the international settlements system, the PTO(s) in the country where a call is originated make a compensatory payment to the PTO(s) in the country where the call is terminated. Payments are made when traffic in one direction is greater than traffic in the return direction. The level of payment is based on bilaterally negotiated "accounting rates". A net settlement payment is usually made on the basis of excess traffic minutes, multiplied by half the

²³ In India, for example, the 1999 National Telecom Policy states "Internet telephony shall not be permitted at this stage. However, Government will continue to monitor the technological innovations and their impact on national development and review this issue at an appropriate time".

accounting rate (the accounting rate share, or settlement rate). The accounting rate system is undergoing reform, and new systems for the settlement of traffic accounts are being developed. Nevertheless, accounting rate traffic still accounts for a considerable proportion of the 20 per cent or so of international traffic that either originates or terminates in a country that retains a monopoly.

5.4 Net settlement payments, primarily from developed countries, have grown larger as traffic flows have become less balanced²⁴. PTOs that send more traffic than they receive have an incentive to develop alternative routing procedures. They do this to avoid having to make settlements based on above-cost accounting rates and instead pay interconnection fees, based on local call rates. Some developing countries fear that, if an increasing share of their incoming traffic is routed over IP-based networks, then settlement payments will be reduced. They are concerned that reduced settlement revenues will endanger their ability to roll-out the basic telecommunications infrastructure, and hence to narrow the digital divide.

5.5 Net settlement payments have been declining worldwide since the mid-1990s, and arguably this would have happened even without IP Telephony. This trend is principally the result of increased competition and pressure from countries that make net settlements. Markets for international calling are shrinking in value as, on the one hand, prices fall sharply and, on the other hand, traffic is routed via least cost routes and settlement rates are forced downwards. This market change is particularly affecting those PTOs that have traditionally relied upon revenues from international service to cross-subsidise their local access networks. It is forcing the pace of tariff rebalancing. Nevertheless, many PTOs in developing countries are embracing IP Telephony, and bearing the consequences of reduced per-minute revenues from long-distance and international services, rather than risk missing the opportunity to generate revenues in future IP-related growth areas²⁵.

5.6 IP Telephony thus presents a dilemma for developing countries, especially for their incumbent PTOs:

- On the one hand, it promises to reduce the price of international telephone calls, for instance, enabling residential customers to make calls to relatives living abroad that might otherwise be too expensive, and enabling business customers to participate more effectively in the global marketplace. IP Telephony may also result in increases in traffic and network usage and provide another means for PTOs to tap into in new markets outside their country.
- On the other hand, IP Telephony could be viewed as a threat to undermine the pricing structure of the incumbent PTO and undercut its profitable business in originating and terminating international calls. IP Telephony might also reduce the revenues available to the PTO to invest in extending the domestic network or in meeting its universal service obligations.

Human resource development issues

5.7 Over the last two decades, PTOs around the world have shifted from analogue to digital networks. This has required the development of a new set of skills among their staff. ITU Member States and Sector Members have frequently worked together to facilitate the transfer of technology, human resources development and network maintenance, to the benefit of developing countries. The shift from circuit-switched to IP-based networks is equally as fundamental as the shift from

²⁴ ITU estimates that, during the 1990s, net flows of settlement payments from developed to developing countries, amounted to some US\$50 billion. See, for instance, the analysis in ITU/TeleGeography Inc. "Direction of Traffic: Trading Telecom Minutes", ITU, Geneva, October 1999, 347 pp, available at: <http://www.itu.int/ti/publications/DOT99/index.htm>.

²⁵ These PTOs include *Telecom Egypt*, *GamTel* (Gambia), *Matav* (Hungary) and *CAT* (Thailand).

analogue to digital and requires similar co-operative arrangements among ITU Members. Because the change coincides with the advent of more competitive markets, and because IP skills are frequently in short supply, many developing country PTOs fear that they will be left behind. As developing country PTOs are often major employers and revenue generators in their respective countries, this makes the need for assistance in human resources development even more critical.

5.8 Education and training are primary determinants of a country's prospect for economic and human development and international competitiveness. As well as a need for IP-based skills among a country's service providers and manufacturers, there is also a need for training for those involved in regulatory and policy functions, and awareness-raising among the user community.

5.9 Council Decision 498 asked that the WTPF consider actions to assist Member States and Sector Members to adapt to changes in the telecommunication environment due to the emergence of IP Telephony, including analysing the current situation (e.g., by case studies) and formulating possible cooperative actions involving ITU Member States and Sector Members to facilitate adaptation to the new environment. The Decision also invites the WTPF to consider actions to assist Member States and Sector Members in meeting the human resource development challenges presented by new telecommunication technologies such as IP Telephony, in particular, skills shortages and the need for education, and technology transfer.

5.10 Possible elements for an action plan for meeting the human resource development challenges raised by IP Telephony are:

- Upgrading of technical skills for staff through training, seminars, workshops and tutorials amongst Member States.
- Sharing of pilot project and developmental activities amongst Member States.
- Exchange of skilled manpower amongst Member States.
- Setting up of a separate fund for HRD development.
- Encouraging the sharing of knowledge and skills among Member States, industry players and policy makers and regulators.

Annexes: Annex A Council Decision 498.
 Annex B Status of IP Telephony in ITU Member States.
 Glossary of Acronyms

Annex A

DECISION 498

Third World Telecommunication Policy Forum

The Council,

considering

Resolution 2 of the Plenipotentiary Conference (Minneapolis, 1998), on the maintaining of the Policy Forum in order to discuss and exchange views and information on telecommunication policy and regulatory matters, especially on global and cross-sectoral issues,

noting

- a) the Report of the Secretary-General, as contained in Council Document C2000/3;
- b) the experiences gained from the previous Policy Fora, on Global Mobile Personal Communications by Satellite (1996) and on Trade in Telecommunications (1998),

considering further

- a) that Internet Protocol (IP) Telephony is one of the topics of high-current interest to ITU Member States and Sector Members;
- b) that the development of IP Telephony also has significant implications for several domains, particularly for human resource development, especially in developing countries,

decides

1 to convene the third World Telecommunication Policy Forum in Geneva from 7-9 March 2001 in order to discuss and exchange views on the theme of Internet Protocol (IP) Telephony, with the following draft agenda:

- a) the general implications of IP Telephony for the ITU membership with respect to:
 - the telecommunications policies and regulations of ITU Member States;
 - the implications of IP Telephony for developing countries, particularly with respect to policies and regulatory frameworks, as well as technical and economic aspects;
 - the impact of IP Telephony on the operations of Sector Members, notably in terms of the financial challenges and commercial opportunities it presents;
- b) actions to assist Member States and Sector Members in adapting to the changes in the telecommunication environment due to the emergence of IP Telephony, including analysing the current situation (e.g. by case studies) and formulating possible cooperative actions involving ITU Member States and Sector Members to facilitate adaptation to the new environment;
- c) actions to assist Member States and Sector Members in meeting the human resource development challenges presented by new telecommunication technologies such as IP

Telephony, in particular, skills shortages and the need for education, and technology transfer;

2 that the Forum shall draw up a report and, if possible, opinions for consideration by ITU Members and relevant ITU meetings;

3 that arrangements for the third WTPF shall be similar to those of the previous Fora. In particular:

- a) discussions shall be based on a report from the Secretary-General, incorporating the contributions of ITU Member States and Sector Members, which will serve as the sole working document of the Forum, and shall focus on key issues on which it would be desirable to reach conclusions;
- b) the final report of the Secretary-General shall be circulated at least six weeks before the opening of the Policy Forum;
- c) the report of the Secretary-General shall be developed in the following manner:
 - i) the Secretary-General shall convene a balanced, informal group of experts, each of whom is active in preparing for the Policy Forum in his/her own country, to assist in this process;
 - ii) a first draft of the report shall be circulated, based on available material, with an invitation to comment, not later than four months before the opening of the Forum;
 - iii) a second draft, incorporating comment from the membership, with an invitation to comment, shall be circulated ten weeks before the opening of the Forum;
- d) participation in the Forum shall be open to Member States, Sector Members and small and medium-sized enterprises with attendance, as observers, by the public;
- e) the Secretary-General shall encourage ITU Member States, Sector Members and other interested parties, to make voluntary contributions to help defray the costs of the Policy Forum and facilitate the attendance of the LDCs;
- f) Forum Meetings should be conducted in line with the Rules of Procedure used at the previous two Fora.

ANNEX B

STATUS OF IP TELEPHONY IN ITU MEMBER STATES

Tables B.1, B.2, and B.3 are based on available data and show the current regulatory status of IP Telephony in a range of ITU Member States. However, the Tables do not include all Member States, because many of them simply *do not have* specific IP Telephony policies or have not responded to the ITU survey. Member States are invited to provide additional data or clarifications so that the tables can be kept up-to-date.

Table B.1: Countries that include IP Telephony (i.e. voice and fax over both the public Internet and IP-based networks) within their Regulatory System or that do not specifically regulate IP Telephony

<i>No specific prohibition for voice/fax over the Public Internet or over IP-based networks</i>	<i>Permitted or not regulated, if not real-time (not considered voice telephony)</i>	<i>Permitted. If real-time, subject to light conditions (notification/registration may be required, other basic provisions of voice regulation)</i>	<i>Permitted. If real-time, treated similarly to other voice telecommunications services (licensable, subject to more extensive provisions of voice regulation)</i>
Angola Antigua and Barbuda¹ Bhutan Congo Costa Rica Dominican Republic Estonia² Gambia Guatemala Madagascar Malta Mexico Mongolia² New Zealand Poland Slovak Republic St Lucia¹ St Vincent³ Tonga Uganda United States⁴ Viet Nam	EU Countries⁵ Hungary (if delay =>250ms and packet loss >1%) Iceland	Czech Republic (except Phone-to-Phone by other than incumbent) Hong Kong SAR Japan Singapore Switzerland	Australia Canada China Korea (Rep.) Malaysia

¹ Antigua & Barbuda and St Lucia: the use of the public Internet is not prohibited for voice and fax, but no data is available on the use of IP-based networks for these services.

² In Estonia, both domestic and international phone calls over IP-based networks are prohibited until Dec. 31, 2000. Public IP telephony is also prohibited until 31 Dec 2000. In Mongolia, international telephone calls over the public Internet are prohibited until Dec. 31, 2000.

³ St Vincent: the use of IP-based networks is not prohibited, but no data is available regarding the use of the public Internet for voice and fax services

⁴ The United States permits IP Telephony unconditionally, i.e. it is exempt from the international settlements regime.

⁵ The 15 countries of the European Union are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

Notes: Depending on whether or not speech transmission is “real-time”, normal voice regulation may apply to varying degrees. Regulatory information on the real-time nature of the service is not available for all countries.

Source: This table is based on the ITU 2000 Regulatory Survey and ITU case studies. No changes or clarifications to this table have been submitted by Member States in the context of WTPF-01.

Table B.2: Countries that permit voice/fax services over either the Public Internet or IP-based networks (but not both)

<i>Country</i>	<i>Use of Public Internet</i>	<i>Use of IP-based networks</i>
Argentina	Prohibited	Not prohibited
Cyprus	Prohibited	Not prohibited
Ethiopia	Prohibited	Not prohibited
Kenya	Prohibited (voice services; includes call back and refile)	Not prohibited
Kyrgyzstan	Not prohibited	Prohibited (IP telephony until 2003)
Moldova	Not prohibited	Prohibited (IP telephony until 2003)
Peru	Prohibited (voice services in real-time are prohibited as they are considered voice telephony)	Not prohibited
Philippines	Prohibited	Not prohibited
Sri Lanka	Not prohibited	Prohibited (voice services)

Source: This table is based on the ITU 2000 Regulatory Survey and no changes or clarifications have been submitted by Member States in the context of WTPF-01.

Table B.3: Countries that prohibit the use of both the Public Internet and IP-based networks for voice or fax services

<i>Countries</i>	<i>Specifics given</i>
Albania	Voice services over IP-based networks prohibited until 2003
Azerbaijan	
Belize	All services prohibited
Botswana	Voice prohibited over the public Internet
Cambodia	Voice prohibited indefinitely
Cameroon	Telephony prohibited over public Internet; Telephony and Fax prohibited over IP-based networks
Côte d'Ivoire	Voice prohibited over public Internet until 2004
Croatia	
Cuba	Telephony prohibited over the public Internet and IP networks Telephony prohibited over IP-based networks, but not fax
Ecuador	Voice prohibited over public Internet Voice temporarily prohibited over IP-based networks
Eritrea	Voice is prohibited for some years to come (both over the public Internet and IP-based networks)
Gabon	Telephony prohibited (both over the public Internet and IP-based networks)
Indonesia	Telephony prohibited over the public Internet. Regulation now under preparation to allow voice over IP-based networks
India	India prohibits the use of voice services over the public Internet, but did not respond to the question relating to IP-based networks
Israel	Telephony prohibited over the public Internet Both voice and fax prohibited over IP-based networks
Jordan	Voice prohibited over the public Internet. Voice and fax services prohibited over IP-based networks until the end of 2004
Latvia	
Lithuania	Voice prohibited over both the public Internet and IP-based networks until Dec. 31, 2002
Morocco	
Mozambique	Voice and Fax services prohibited over both the public Internet and IP-based networks
Myanmar	
Nicaragua	Voice services prohibited over both the public Internet and IP-based networks
Nigeria	Voice and fax prohibited over IP-based networks at this time
Pakistan	Voice termination services prohibited over the public Internet Voice prohibited over IP-based networks
Paraguay	Voice services prohibited over both the public Internet and IP-based networks
Qatar	Telephony and Fax prohibited over both the public Internet and IP-based networks, subject to review
Romania	Voice services prohibited over the public Internet Voice services prohibited until at least Jan. 1, 2003
Senegal	Telephony prohibited over the public Internet
Seychelles	Voice and fax over the public Internet are prohibited, but Internet telephony which is an Internet application rather than a telecommunication service provided by an ISP is permitted. All services over IP-based networks are prohibited.
Swaziland	
Thailand	Voice and fax services prohibited over both the public Internet and IP-based networks
Togo	
Trinidad and Tobago	Voice services prohibited over IP-based networks
Tunisia	
Turkey	Voice prohibited over both the public Internet and IP-based networks

Source: This table is based on the ITU 2000 Regulatory Survey and no changes or clarifications have been submitted by Member States in the context of WTPF-01.

GLOSSARY OF ACRONYMS

ATM	Asynchronous Transfer Mode
DNS	Domain Name System
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force
IN	Intelligent Network
IP	Internet Protocol
IPTSP	IP Telephony Service Provider
ISDN	Integrated Services Digital Networks
ISP	Internet Service Provider
LAN	Local Area Network
PLMN	Public Land Mobile Networks
PSTN	Public Switched Telephone Networks
PTO	Public Telecommunication Operators
QoS	Quality of Service
SIP	Session Initiation Protocol
SS7	Signalling System Seven
VoIP	Voice over IP

5. COMMENTS RECEIVED FROM **Telia AB**

ITU WTPF-01 on IP Telephony, Telia contribution

1 Introduction

1.1 Objective

The intention of this document is to contribute to the final drafting of the ITU Secretary-General's background report for the ITU WTPF-01 on IP Telephony. It provides observations based on the draft background report, version 2, which gives an excellent overview of pertinent topics. The objective is to focus on key regulatory issues and conclusions to be drawn regarding them. It is hoped that this contribution can be taken into consideration in editing the final report.

1.2 Overview

The first part of the document attempts to summarise some established facts from the technical background in order to provide a basis for the second part which presents some policy conclusions regarding a few key regulatory matters in the international field. This regulatory focus does in no way imply that other international issues such as cooperation regarding development, standardisation, investments and development of skills should be neglected. On the contrary, they are vitally important.

The terminology regarding IP Telephony used here is that established in the ITU report (par. 1.2). IP Telephony is thus the generic term subdivided into the subsets Internet Telephony and Voice over IP (VoIP). Unfortunately there is no generally accepted harmonised terminology, so due care is needed when comparing documents from various sources.

2 Technology

2.1 Public Switched Telephone Networks (PSTNs)

PSTNs have been developed and extended globally with one prime service in mind, public voice telephony. The basic network features (circuit-switching and real-time transmission) are particularly suited for this application. Real-time in this case means no intermediate storage of signals during transmission. (The transmission time for a "real-time" round-trip may however be anywhere between zero and close to 0.5 seconds for a satellite path). A PSTN supplies voice telephony (voice-grade sound transmission) if suitable terminals (telephones) are attached to the network termination points. Such a network can also support a few other services (facsimile and data transmission) through use of appropriate alternative terminals (fax machines and modems).

PSTN technology has been continuously developed and networks are now largely digitalised. Such networks can generally provide good transmission quality even over long distances, once a connection has been established. The transmission mode is however not very flexible, nor is it particularly efficient in its use of transmission capacity. Technical developments have generally reduced costs, particularly for long-distance transmission, resulting in much reduced production costs for international traffic. Improved features for signalling (SS7) have added flexibility and extended services.

2.2 Internet Protocol Networks (IPNs)

IPNs have been developed over a few decades with a particular set of services in mind like data base search, e-mail, file transfer etc. The basic network features (packet switching which implies store-and-forward transmission of bit streams in small packets) result in variable transmission times, particularly when traffic is intense. This is not so important for the intended services. IPNs are flexible and employ transmission facilities efficiently (no capacity used when no data are transmitted). The explosive growth of IPNs, including the public Internet, is a clear demonstration of the market response for IPN based services.

The public Internet is a set of linked IPNs with a common set of addressing principles allowing for global public service, but with no total control of traffic management, so end-to-end quality can not be guaranteed (best effort principle). A desire to overcome this has prompted the establishment also of major managed IPNs of global reach, where the network operator has better opportunities of controlling quality over large distances. IPNs are growing at such a rate that their capacities are outgrowing PSTNs in many areas. This is a key reason for drawing attention to IP Telephony at the ITU WTPF-01.

2.3 IP Telephony

The public Internet is thus in general not particularly well suited to carry voice telephony service, which is a real time service that can not tolerate more than minimal transmission delays. However, it has been demonstrated that managed IPNs can provide a viable alternative for haulage of telephone traffic if special measures are taken to enhance transmission quality. One way is to provide high capacity, so that operations are always far from saturation, another is to enhance traffic control and provide priority for certain services, for instance telephony.

IP Telephony can be of three kinds: PC-PC, PC-phone and phone-phone depending on the terminal equipment. The third kind is of particular relevance when it comes to comparison with the traditional PSTN. Such comparison will depend on several factors. IPNs now seem able to provide an infrastructure capable of gradually superseding the long distance part of the PSTNs as prime carrier of voice telephony services. This would happen when the VoIP technology can provide superior price/performance properties relative to existing technology. In that case it will provide economic benefits.

From a general standpoint the development possibilities created through IP Telephony in this case are hardly any different in principle from earlier technological improvements.

3 Policy implications

Three IP Telephony regulatory issues are addressed below. They are related to:

- IP Telephony regulation
- Universal service provision
- Economic consequences for international traffic

3.1 IP Telephony regulation

It was mentioned above that IP Telephony can be of three kinds: PC-PC, PC-phone and phone-phone. The first two kinds will mostly be used as add-on services in connection with other IP-based services and thus be essentially new applications. They will in that case not merit any particular new regulation and should be treated like other IP-based applications.

The particular case of phone-phone IP Telephony over the public Internet can hardly provide a viable voice telephony service due to quality limitations, but VoIP can improve the provision of voice telephony. There seems to be no need to change existing voice telephony regulation for this sake. The underlying VoIP will be indirectly influenced by the existing regulation, like any other transport technology. So, there seems to be no reason to introduce any particular additional regulation for the VoIP part either.

So, Telia's conclusion is that there is no valid reason for introducing any particular IP Telephony regulation.

3.2 Universal service provision

Universal service is widely defined as the provision of voice telephony as a basic service that merits regulatory supervision or even monopoly provision. Thus it is primarily the phone-phone IP Telephony that is relevant in this context. When PSTNs are used in both ends, the prime consequence of the introduction of IPNs is that the long distance portion of the PSTN is replaced by

new alternative technology, as described above. This is in essence not fundamentally different from any other previous upgrading of the long-distance PSTN networks.

Universal service regulations, if they are still needed, should be directed towards the service provided and should be independent of the technology used to provide the service in question. Then such regulations would not be affected by the introduction of IP Telephony.

IP Telephony will be implemented if it provides a price/performance ratio that is competitive. So, it can be expected to improve also the conditions for providing universal service.

Telia's conclusion is that universal service regulations should be independent of technology and that IP Telephony should be accepted as a potential means for improved universal service provision without any particular additional regulation.

3.3 Economic consequences for international traffic

The international telephone traffic market has been the subject of considerable change since the days when monopoly provision was the general rule and operators could apply settlement rates well above the underlying costs. Liberalisation and the consequent emergence of competition have opened new patterns for sending traffic along least cost routes to its destination. This has put pressure on inflated price levels and caused general worries for the economy of PTOs, particularly those in developing countries. The second ITU WTPF on trade in telecommunications was largely devoted to this issue. There has been some progress in developing ITU recommendations for the reduction of accounting rates. Prices are in effect being brought downwards by the market forces to the benefit of telecom end users.

IP technology will bring little fundamentally new to this picture, but can certainly bring additional factors of change into play. First, as has already been indicated above, IP technology offers potential cost reductions. This will reinforce the influence of other cost-reducing technological improvements. Second, IP-networks can offer new and more flexible traffic patterns also for telephony services. Possibilities for rerouting will most certainly increase and thus add to competition.

The attitude to these changes is certainly different for different observers. Governments and PTOs wishing to rely on high prices for international traffic as a source for high-margin revenues will feel new challenges. Users on the other hand are prone to gain from increased competition and so are national economies at large.

Liberalisation and competition will continue to create both difficulties and benefits. This may happen at a somewhat increased rate, as IP technology is being introduced. Adaptation of both government and PTO policies will be required, but there hardly seems to be any new major element due particularly to IP technology in this scenario.

In Telia's view, no regulations to restrain the introduction of IP technology should therefore be introduced.

4 Conclusions

It is Telia's view that IP Telephony, the theme defined for ITU WTPF-01, is a highly interesting one. It seems that the potential regulatory issues resulting from the introduction of IP technology are largely generic. The emerging trends seem to be generally well known in principle, but they may be put in new light by the developments.

When it comes to the three regulatory issues discussed above, it is Telia's opinion that

- No particular IP Telephony regulation should be introduced
- Any regulation for universal service provision should be technology independent and IP Telephony should be accepted as a potential means for improved universal service provision without any particular additional regulation
- No regulations to restrain the introduction of IP technology should be introduced

An interesting topic for WTPF-01 could thus be a future elaboration of scenarios for the likely use of IP technologies for telephony. This could in Telia's view form one conclusion for the conference.

6. COMMENTS RECEIVED FROM **Ipsaris**

10 January 2001

The Secretary General
International Telecommunication Union
Place des Nations
CH-1211 Geneva 20
Switzerland

Dear Secretary General Utsumi:

I would like to take this opportunity to congratulate you on a report on IP Telephony that will serve as a constructive and useful basis for discussions at the upcoming World Telecommunications Policy Forum in March 2001. Your description of IP Telephony, analysis and assessment will serve the ITU Membership well as it convenes to discuss the implications and benefits of IP Telephony.

We are very supportive of your efforts to identify the issues and the needs of all Member States and Sector Members in migrating to IP based networks and services. As mentioned in our previous letter, ipsaris is currently building an extensive (ie approximately 7,000 km) fibre optic network throughout the United Kingdom and Europe. We will be offering extensive broadband coverage to users within Europe with plans to expand to other continents in the foreseeable future.

As a network operator that is - and will continue to be - a new entrant in many markets throughout the World, we have read the Report with great interest and offer the following comments and thoughts on different portions of the Report.

- **Market Conditions for spurring growth of IP Networks and Services (4.32)**

We concur with your assessment that IP Telephony is part of a broader process of deploying IP-based networks worldwide. It is also the case that, for countries seeking partners to build such networks, it is worthwhile to identify favourable market conditions for the building and installation of IP-based networks. It is our view, however, that an important component of these market conditions is a simplified regulatory structure that is not cumbersome or overly restrictive for network operators. Furthermore, any regulatory structure should ensure that new market entrants are treated fairly, even permissively, vis-à-vis the incumbent PTOs or dominant network operators.

- **Technological Neutrality and Functional Equivalence (4.25-4.28)**

Applying the concepts of “technological neutrality” or “functional equivalence” to determine the amount and type of regulation can be difficult and may even be inappropriate. For example, there could be adverse consequences to regulating IP Telephony as traditional PSTN telephony, such as the placement of unnecessary or undeserved restrictions on small ISPs. Furthermore, it could lead to all IP services, not just IP Telephony, being unnecessarily regulated and worse, limit their ability to provide cost-effective services.

We would agree, though, with the assertion in 4.27 that policymakers and regulators should be mindful of technology. Emerging technologies or new market entrants would benefit from asymmetrical regulation that would allow them to grow and develop outside of more traditional regulatory regimes. As suggested, if or when market failures arise, competition policy could be employed to remedy a situation without the need for sector-specific or technology-specific

regulation or definitions that may quickly become outdated or counter-productive. ipsaris believes that competition-based regulatory regimes allow regulating governments to protect their national interests and those of their populations whilst also enabling them to benefit from the global economic opportunities which such technologies offer.

- **Cross Border Issues (4.42)**

Regarding the suggestion to make an assessment of the extent to which some forms of IP Telephony should be subject to international agreement and procedures (4.42), it is important to recognise that although technical standards or numbering conventions may require international agreement, commercial arrangements between operators are best handled by the parties outside of international agreements. Business confidentiality can be essential to promoting and preserving competition, and so, by extension, to promoting the development of multiple, affordable services in a given market.

ipsaris thanks you for this opportunity to comment on your revised Report. We look forward to participating in the WTPF itself, and wish you well in the final preparations leading up to the Forum. If there is anything that I or ipsaris can do to ensure a successful meeting, please do not hesitate to contact me.

Yours sincerely,

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7. COMMENTS RECEIVED FROM **ETSI Tiphon**

Source: John Horrocks (ETSI TIPHON)

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Definitions for IP Telephony

We need to establish some workable and stable definitions if we are to have a basis for clear and unambiguous discussions on how the policy towards IP telephony should develop. Regulators will in particular need sound definitions on which to base any changes in regulation.

Definitions should satisfy the following criteria:

- They should be clear and simple to apply leading to obvious answers whether a particular instance is inside or outside the definition
- They should be stable in the face of technology developments
- They should be stable in the face of commercial and economic developments
- They should use language in accordance with its natural meaning if possible

The situation that we are all facing is of a technology change (use of IP based technologies for voice) that is leading to diversification in services. The diversification in services is upsetting the current regulatory framework in either of two ways:

- For countries where regulation is **service** related, new services involving voice are being introduced and there is a question whether they are within the scope of the regulation
- For countries where regulation is **technology** related, new services are being introduced outside the scope of the regulation and since they involve voice there is a question whether they should also be regulated

This situation is causing considerable confusion because the definitions and terminology that are agreed formally in standardisation bodies have not kept up with the developments in the technology and the market place.

In addition to the multiplication of service types, there is innovation in service presentation and access, and innovation in the way in which what we categorise as different services may be combined together.

Services

We suggest that the most urgent need is to have clear definitions for services from a user's perspective because whatever regulation remains in the future is most likely to be service based.

This is appropriate because:

- the service is the ultimate product for the user
- the main aim of telecommunications regulation is to support/protect the user

There are two fundamental and reasonably stable aspects to the type of service:

- the type of traffic – does it involve real-time voice? Does it include other traffic types as part of multimedia?

- the method of identifying correspondents and setting up a call – either public telephony based on E.164 numbering or “Internet telephony” based on Internet naming (user@host)

Some people would argue that quality and price are equally important aspects of a service. We agree, but we think that price issues and the whole way in which telephony is funded may change significantly in the future and that there may be some changes in quality with a wider range of qualities available. Consequently we think that price and quality are too unstable for use in definitions. Some parties consider that regulation should be used to maintain a certain minimum level of quality in public telephony but this objective can be met better by applying a requirement to “public telephony” than by including quality in its definition. A further consideration is that including price or quality in the definitions would create market distortions and could, for example, provide a disincentive to improve quality – if regulation applies to telephony with a quality above some threshold, then operators will have an incentive to keep the quality below that threshold.

We propose that the term **Voice over IP (VoIP)** should be used as a general term for any service involving voice that is implemented using IP either as the public Internet or as a managed IP network. The reasons are:

- this meaning reflects the simple meaning of the words
- the distinction between the public Internet and managed IP networks is blurred and operators may migrate from one to the other whilst providing the same service

We propose that the term **IP telephony** should be used for telephony (a switched pre-dominantly one-to-one service voice service) provided on any network that uses IP either as the public Internet or as a managed IP network.. In other words IP telephony includes either E.164 naming or user@domain naming.

The same reasoning applies as for VoIP.

We propose that **Public Telephony Service (Public Telephony)** should be used for a switched pre-dominantly one-to-one voice service that uses E.164 numbering. This is its existing name and meaning and it would continue to apply whether the service is provided on circuit switched technology or the public Internet or managed IP.

We propose that **Internet Telephone Service (Internet telephony)** should be used for a switched pre-dominantly one-to-one voice service that uses public Internet naming, thus the “Internet” refers to the naming and not the technology nor the public Internet as opposed to managed IP.

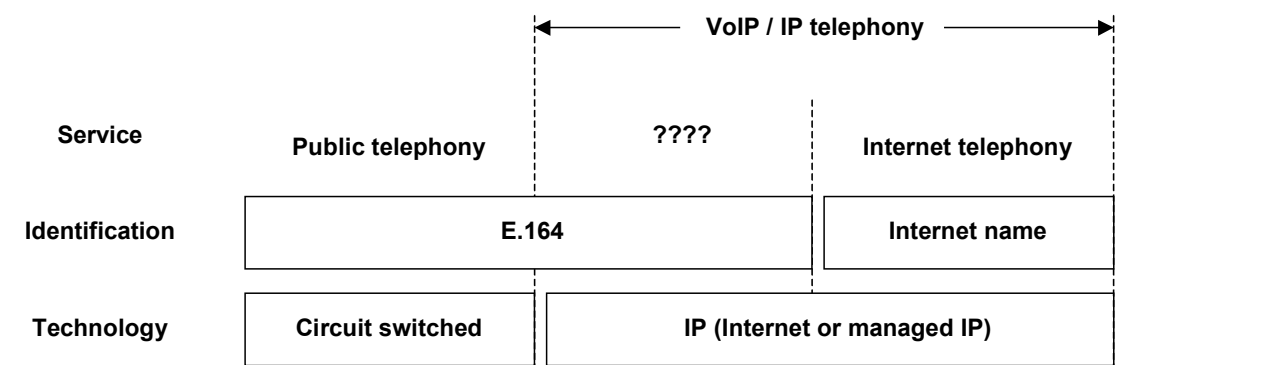
We see these as two distinct and different services because they have different identification systems even though the traffic (voice) is similar. In practice many operators will offer both services and IP can support both, but **we consider that they are fundamentally different because a subscriber to only one service cannot communicate with a subscriber to only the other service because the caller can only use one identification system and the called party does not have a identifier within that system.** (Note: ENUM does not solve this because ENUM relies on called parties having **both** types of identifier.)

We note that most of the early implementations of Internet telephony support calls only to users on the same system (same domain name) rather than a full any-any service and that these services are tailored to use by informal closed user groups. They are sometimes marketed as part of an Instant messaging service.

We note also that **Multi-media services** may use either E.164 numbering or Internet naming. Multi-media services are at a very early stage of development with video telephony being one of the main examples to date. It is difficult to say more about them at present. They will need further study

Figure 1 shows the main area of confusion about the relationship of definitions to services, identification and technology. The main uncertainty is how the definitions relate to the services using E.164 that are implemented on IP technology.

Figure 1: Area of uncertainty in definitions



Unless there is a clear decision over the definitions for E.164 services provided on IP, clear discussions will be impossible. The choices are either:

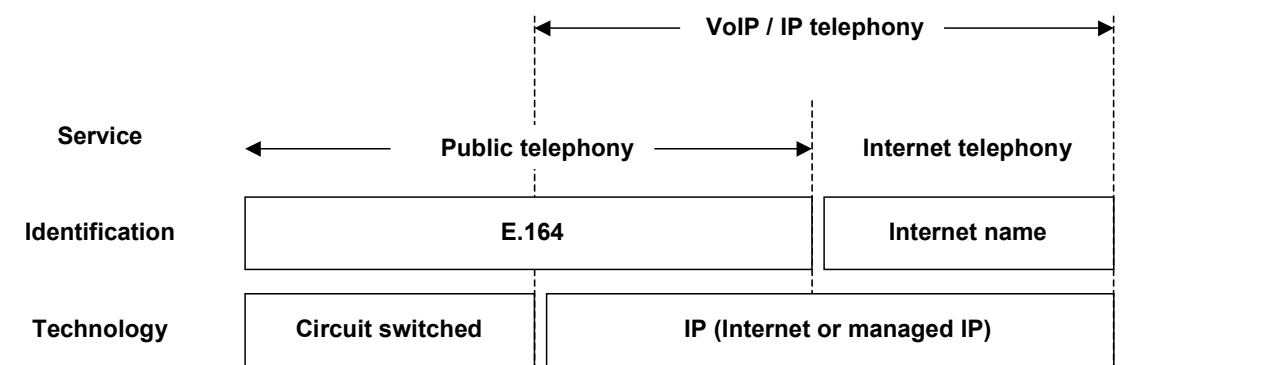
- To extend the scope of "Public telephony" to cover this area
- To extend the scope of "Internet telephony" to cover this area

This paper proposes the former because:

- The current use of "public telephony" is largely technology independent
- If "Internet telephony" is defined to include E.164 on IP and "Public telephony" is restricted to circuit switching, then there is no name for the whole service area that uses E.164 and such a name is needed

Figure 2 shows the terms with the definitions proposed in this paper.

Figure 2: Proposed terms and definitions



The Internet trade-jargon describes two services:

- **PC-Phone**: where a call can be made to a traditional telephone from a PC and where the call will be carried most of the way on the Internet and handed to a circuit switched network operator at the terminating end. This would be "public telephony" under the proposed definitions because the called party is identified by an E.164 number.
- **PC-PC**: where a call will be made entirely on the Internet. This would be "Internet telephony" under the proposed definitions because the called party is identified by an Internet name.

Both PC-Phone and PC-PC would fall within the proposed meaning of VoIP and IP telephony as both include voice/telephony and use IP technology.

Although the definitions proposed appear to be the best solution, we must recognise that there will be some practical difficulty in adopting this terminology because in practice some people are using the term "Internet telephony" to include E.164 services provided on IP. If this practical problem is considered to be too severe to allow the definitions proposed here to be adopted, then other new terms should be introduced to indicate the boundary between services that relates to identification.

Service provision

There are four main categories of company that are providing services:

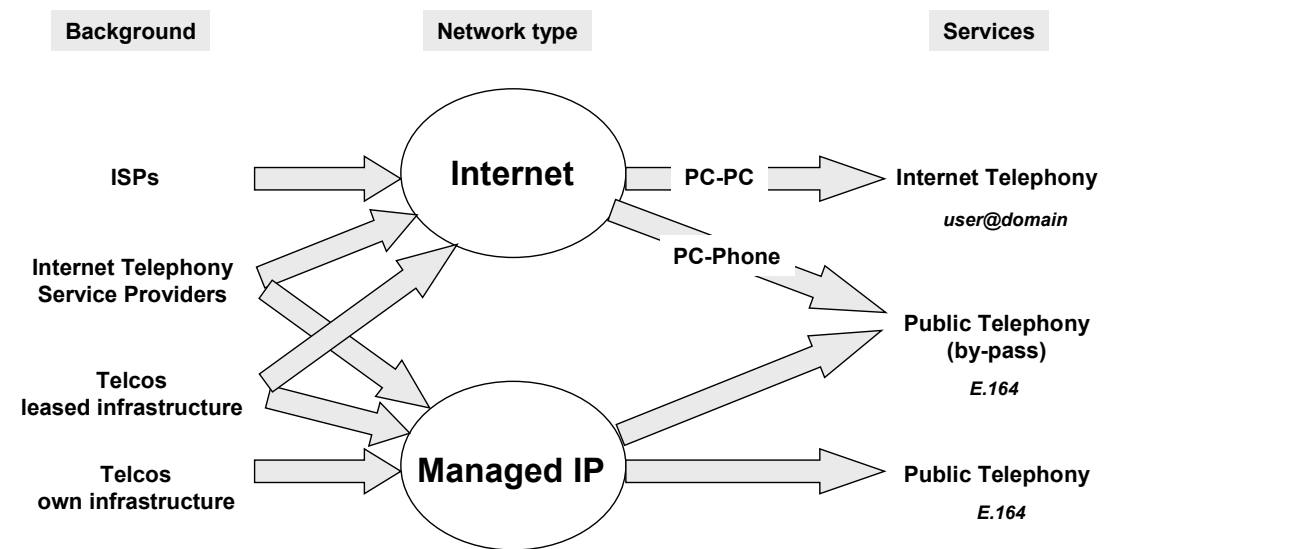
- a) Traditional telcos with a significant proportion of their own infrastructure
- b) Telcos who work mainly or wholly as indirect operators (their customers use carrier selection, carrier pre-selection or 2-stage call set up) and use leased lines for transmission
- c) Internet Telephony Service Providers (ITSP), who predominantly use the Public Internet and have little infrastructure under their own control (here Internet refers to technology rather than naming)
- d) Internet Service Providers who are adding voice related service features

The motivation for the telco culture operators, a) and b), is to use IP to provide cost savings and enable them to catch up with some of the service developments of the other types of operator.

The motivation for the Internet culture operators, c) and d), is to capture the established public telephony service market and establish themselves as the service providers of the future. In practice many larger companies may appear under more than one or even all categories. Many large telcos are currently backing all options because they are uncertain how the market will develop.

Figure 3 shows the relationship between three of the service categories that we define and the development routes being followed by the different players. This diagram does not show multi-media services because they have not developed significantly yet.

Figure 3: Development routes



This diagram should help the reader to gain an overview of what is happening.

If regulation addresses services, then there is no need to have formal definitions of ISP, ITSP, telco etc, nor of the public Internet and managed IP

ENUM

How does ENUM fit with these definitions?

One function of ENUM (probably the main one) is to translate from one identification system (E.164) to another (Internet name).

- If the caller accesses ENUM then he does so before selecting which service to use (public telephony based on E.164 or Internet telephony based on Internet names). The caller sets up the call with whichever service they choose after reviewing the communication possibilities listed by ENUM.
- If the network accesses ENUM after accepting a call to a party identified by an E.164 number then the network is still providing the Public Telephony service to the caller but is delivering the call on a different service and can be thought of as providing a service translation.
-

Effect of draft 2 of the Policy Forum Report

The draft report currently says:

1.2 The term “IP Telephony” can mean different things to an engineer or policy-maker and there is no consensus at this point on its exact definition. However, for purposes of discussion, it is necessary to provide some delineation of the various forms that IP Telephony can take. Accordingly, as a working definition and for the purposes of this Report, “IP Telephony” is used as a generic term for the different ways of transmitting voice, fax and related services over packet-switched IP-based networks. The transmission of voice over IP-based networks can be subdivided into two major subsets: VoIP (Voice over IP) and Internet Telephony. The difference lies in the nature of the underlying IP network: VoIP utilizes managed, private IP-based networks, while Internet Telephony primarily uses the public Internet. Since IP Telephony is a broad term, throughout the Report an effort has been made to clearly identify the specific type of network or service that is being described and discussed.

These proposals take the same view of the term “IP telephony” but a different view of “VoIP (Voice over IP)” and “Internet Telephony”. The draft report has not yet defined services and we think that adequate coverage of services needs to be added.

Regulation and functional equivalence

The discussion of functional equivalence as the basis for applying the existing regulations on telephony on circuit switched networks to some services on IP is focussing on the equivalence of the traffic rather than on the identification system. Consequently the discussion is struggling because the various aspects of the traffic do not provide clear, simple and stable handles for distinguishing where regulation should be applied.

The definitions proposed here would enable the existing regulations for public telephony to be applied to telephony that uses E.164 numbering but is provided over IP. Some countries may wish to review/simplify/reduce these regulations, but that is a de-regulation/liberalisation issue not one concerning IP.

The regulations for public telephony would not apply to Internet telephony (or instant messaging) unless positive actions are taken to apply them also to these services. Such actions may not be needed until the market develops to the point where some customers start to have only Internet telephony and no longer have public telephony, but that is some time away, possibly a long time away as it will be a commercial imperative to provide compatibility with users who still have only circuit switched technology.

The two areas that are driving the quest for a definition of functional equivalence are:

- Subsidies to support universal service
- High termination rates (accounting rates) in some countries

which are currently applied only to public telephony and therefore create an added incentive for using Internet telephony instead of public telephony. However for these issues the main question is not the definitions to use but the desirability and practicability of continuing these policies in their current form given the developments in technology.

8. COMMENTS RECEIVED FROM **United Kingdom**

i) General comments

1. The revised structure of the report

The UK considers that the second version of the Report is a significant improvement on the first version. The reordering of the sections serves to provide a better balance in the report between setting out the benefits of IP telephony (for consumers, operators and the wider economy) and describing the regulatory challenges, particularly for developing countries yet to liberalise their ICT sectors, which need to be addressed in order create the kind of light touch regulatory framework which will allow those benefits to be realised.

2. The importance of establishing clear definitions

We think that a clear understanding of the terms VOIP, IP telephony, Internet telephony and Public Voice Telephony would help clarify the issues raised in the body of the report (e.g. technological neutrality, functional equivalence, service quality) and ensure that there is consistency in the policy approaches taken by national administrations. Although some brief description of the terms VOIP, IP telephony and Internet telephony are provided in the summary part 1.2 of the Version 2 report, it would be beneficial if perhaps a more focused text could be added as a sub-section somewhere up front for instance immediately following the Introduction of section 2. The paper submitted by Typhon (John Horrocks) dealing with definitions is a good starting point to thinking about the definition issues as well as providing some ideas for possible new text.

3. Regulation of services, not technologies.

We believe i) that the report should be consistent throughout in promoting the concept that any reference to regulation should be in relation to services, not technologies and ii) the principle of applying equal regulatory treatment to roughly equal services (as given in para. 4.26) should be introduced in the summary.

4. No extension of existing regulation to take account of new technologies

Similarly the report should not promote the idea of extending existing regulation into parallel markets with new technology platforms. This would be particularly dangerous in acting as a disincentive to investment.

5. The Opinions

We are not clear what the precise intentions are with regard to linking the Report and the Opinions as combined outputs of the WTPF. The Summary is the key part of the report and it should serve to identify all the key issues. Our view therefore is that the key elements of the Opinions should be incorporated in summary, with the full texts of the Opinions attached as some form of Annex.

ii) Specific comments on the text

Summary

The entire summary focusses on IP telephony. The broader reasons as to why IP technology is being driven by telecommunication players in competitive markets is not prominent in the summary section. We consider these reasons should be described and propose an additional paragraph as follows:

"Para 1.6 bis: In competitive markets established PTOs are evolving their networks towards IP not necessarily to provide cheaper voice services (competition has already forced down prices of traditional circuit switched services) but to offer a much wider and diverse range of multi-media services and innovative applications and particularly to be able to compete effectively in the future e-commerce markets".

2. Technical and Operational Aspects of IP Networks .

Para 2.6 *Evolution of network infrastructures* Replace "represents an ever diminishing percentage" which suggests an ultimate reduction to zero, with "a decreasing percentage".

Para 2.8 should make the point that each voice packet in an IP telephony call can take a different route through one or more networks before being re-packaged, i.e. a given circuit is not tied up as in traditional telephony.

Para. 2.15 Quality of service (QoS) and Capacity. Last sentence. Our view is that increasing capacity would require co-ordinated action across Internet service providers as a call may be routed over several providers networks. If any of these are congested then the end-to-end call quality will be degraded.

3. Economic Aspects of IP Telephony and Its Impact on member States and Sector Members

Para 3.16: Only Internet Telephony, in the specific case where the user places the call from an Internet enabled device (eg PC), would make access to the Internet more popular. It is arguable whether this would increase the demand for second lines as the additional use of the single line is not for a new application. Internet Telephony will not make access to the Internet popular if it is adopted in the form where the call originates from a normal telephone and then is converted to a VoIP call by a gateway.

4. Policy and Regulatory Issues for IP Telephony

Para 4.19 *Quality of service*: VOIP is usually referred to as private managed IP networks. However VOIP also applies to incumbents migrating to managed IP platforms and therefore VOIP applies also to public telecommunication networks.

This paragraph should also make clear that in future Internet telephony may be offered at equivalent quality to PSTN

Para 4.23 *Functional equivalence*: the example of "transmission networks used" is not a functional criterion. The functionality of a service offered is not necessarily affected by the mechanism used to implement it. Therefore "the PSTN is involved at some point" is not relevant, and point 3 in Para 4.24 is not a factor for determining functional equivalence.

Similarly, "transport and switching" (para.4.26) are not functional criteria.

Para 4.26- 4.27 *Technological Neutrality*: There are two definitions of technology neutral. We agree with the first definition in para 4.26, i.e.if it looks like a voice service, it is a voice service.

The UK generally supports this principle: regulation should be based on services, not technology and therefore there would be no automatic requirement to impose regulations on new technology.

However we believe there may be specific instances where regulation might have to be technology dependant. For example, an incumbent operator may use IP for its own traffic and achieve a lower cost base, while not offering IP interconnection to competitors, or doing so at a higher price, and thereby disadvantaging them. This might well satisfy the non-discrimination terms of the interconnection requirement under the WTO basic agreement because it does not specify cost under non-discriminatory terms and conditions.

The second definition in para 4.27 is technological non-neutrality which favours new technologies by providing a 'window' of no/light regulation. These definitions are inconsistent in our view. (This 'window' approach was one taken by the UK with regard to cable companies and was a policy specifically aimed at the need to stimulate competition, a rationale which does not apply however with regard to IP telephony).

Para 4.28 Opening sentence: We do not consider it appropriate within the increasingly competitive telecommunications community to think in terms of concerted "efforts to develop a common approach". We would recommend the following rewording:

"Efforts to develop a greater understanding of the concept of technology-neutral regulation or treatment within the ITU membership as it applies to the provision of functionally equivalent public voice telephony services, would be a positive step towards the development of a global market environment conducive to the use of IP-based networks and applications".

Para 4.31 *Local Loop Unbundling*: We believe there is a need to include in this section the likely impact of more new players being able to offer customers broadband data services (eg fast Internet access) including voice over the incumbent's unbundled local loop. The EU has a regulation for the provision of unbundled local loops and this has already started to happen in a number of countries. New operators are likely to offer both DSL data services and voice telephony over the incumbent's unbundled access line. This opens up the possibility for new competing operators in the next couple of years to offer IP telephony in conjunction with DSL broadband data. Furthermore it seems likely that the voice service will be integrated into the PC and that the market for diverse service packages by new operators using IP as the delivery mechanism will increase.

We do not understand the last sentence of para 4.31 which appears to suggest a need to co-operate internationally on local loop unbundling, an essentially domestic policy issue. We would of course support sharing knowledge and experience in addressing the difficult challenges which local loop unbundling presents for policymakers.

Communications and Information Industries Directorate
Department of Trade and Industry
UK

January 2001

9. COMMENTS RECEIVED FROM USA

Introduction

In Decision 498, the 2000 session of the ITU Council decided to convene the third World Telecommunication Policy Forum in Geneva, from 7 to 9 March 2001, in order to discuss and exchange views on the theme of Internet Protocol (IP) Telephony. Consistent with Resolution 2 (Rev.2, Minneapolis, 1998), this forum shall neither produce prescriptive regulatory outcomes nor produce outputs with binding force. Rather, the Policy Forum is an opportunity for Member States and Sector Members to discuss and exchange views and information on telecommunication policy and regulatory matters (Rev. 2, Minneapolis, 1998).

The comments contained below reflect the views of the United States of America on the Second Draft of the Secretary-General's Report on IP Telephony. We look forward to the Second Group of Experts meeting where we will discuss in greater detail the various contributions from interested parties that will shape the final Secretary-General's Report on IP Telephony. We expect that the final report will demonstrate that IP Telephony advances commercial opportunities and as a result, promotes economic development.

Our comments on each specific section of the Secretary-General's Draft Report dated 15 December 2001 on IP Telephony are articulated in detail below. The United States of America may choose to make further comments on material or related material found in this report at other upcoming preparatory events or at the Forum itself. It should also be understood that comments found in this report are related only to the "Second Draft of the Secretary-General's Report on IP Telephony" and do not prejudice any comments the United States of America would choose to make on related subjects in any other international organization or future international meetings.

Summary

The United States of America offers the following comments on the Summary of the Second Draft of the Secretary-General's Report on IP Telephony:

We note that the use of the terms "public Internet" and "private IP-based networks" is conflicting and creates confusion throughout the report. We offer the following suggestions in order to clarify the use of the terms. We do this, however, understanding that the United States of America may have further comments on this point depending on the wording of the Final Report of the Secretary-General. We see this as an important issue and one that has not been accurately or constructively dealt with in the Second Draft Report.

- Paragraphs 1.2, and all other paragraphs that cite the words "public Internet" should use the term "Internet" in lieu of the term "public Internet". The word "public" has too many connotations to be used with any specificity when referring to the Internet. For example, the globally connected Internet is neither owned by the people as a whole nor is it a highly regulated entity that is funded through government mechanisms. To the extent that the Report seeks to refer to the "globally connected set of computer networks, using the Internet Protocol, sharing a common IP address space" *see* Para. 2.2, the unmodified term "Internet" most accurately reflects the size and scope of the diverse set of interconnected networks that comprise the larger Internet.
- Paragraphs 1.2, and all other paragraphs that cite the words "private IP-based networks" should use the term "managed" in lieu of the term "private". The term "private IP-based networks" does not reflect the variety of IP-based networks that utilize VoIP, some of which are not private. For example, the PSTN, a "managed" network, uses Internet Protocol technology as it uses many

available technologies, where it makes technical and economic sense to do so. Similarly, corporate Intranets, also managed networks, use IP technology. And finally, Internet Service Providers offer telephony services.

We offer the following suggestions regarding the use of the terms "IP Telephony", Internet Telephony, and "Voice over IP":

- Our understanding is that "IP Telephony" in the Draft Report is intended to encompass the broad range of voice applications over IP-based networks. However, in practice, this concept is often referred to as "Voice over IP" or "VoIP." Our comments on this section use the terms "IP Telephony" and "Voice over IP" interchangeably. The Draft Report may want to adopt this practice. To implement this, the Paragraph 1.2 text that attempts to provide a rigid structural distinction between the terms "Voice over IP (VoIP)", "IP Telephony" and "Internet Telephony" should be replaced by more flexible, practical descriptions that recognize the dynamic nature of the environment in which these terms are used, such as:

Voice-over-IP (VoIP): This is the most generic term for many different types of voice (speech) communication application in which the principal transmission network or networks are IP-based networks.

IP Telephony: "IP Telephony" is frequently used interchangeably with VoIP. However, the term "telephony" has been used for within the industry to describe a set of capabilities and requirements for supporting voice, fax, and related applications.

Internet Telephony: This is a type of VoIP or IP Telephony communication in which the principal transmission network is The Internet. (Internet Telephony is also commonly referred to as "Voice-over-the-Net" (VON), "Internet Phone," and "Net Telephony" – with appropriate modifications to refer to fax as well, such as "Internet Fax"). Internet Telephony is a sub-set of VoIP/IP Telephony.

Technical Aspects of IP Telephony

The United States of America offers the following specific comments on the technical section of the Second Draft of the Secretary-General's Report on IP Telephony:

- In Sections 2.6/2.9 (as well as Sections 1.4/1.5) we suggest that the phrase "represents an ever diminishing percentage" when referring to "voice traffic" should be replaced by "is a decreasing percentage". It is important to note that while the benefits of IP-based networks are significant as described, the evolution of IP-based networks depends upon many factors that will result in challenges that will impact the rate of network evolution. The existing global infrastructure is extensive and efforts needed to evolve these networks are significant. In the meantime, the demand for, and revenues from, voice communications will continue to be large.
- As noted above, Sections 2.7 and 2.8 should further highlight the differences between the VoIP application and voice services over the PSTN. Paragraph 2.8 should also make the point that each "voice packet" of an IP Telephony call does not completely tie up any given circuit and may travel very different routes between callers before being re-packaged.
- Paragraph 2.10 should be modified consistent with our suggestions regarding references to "public" and "private" Internet. We also believe that the last sentence in Paragraph 2.10, including the footnote, is too specific to be consistent with the overall tone of the report. Instead, this reference to "service principles" could simply be moved to Paragraph 2.23 by adding it to the parenthetical expression describing SG 2.

- Paragraph 2.13 correctly mentions the IETF's Session Initiation Protocol (SIP). However, for the reader to understand SIP, it may be necessary to provide additional explanatory text. For example, SIP can enable web developers to create advanced telephony and multimedia applications using familiar Internet protocols and web tools.

Paragraph 2.13 should also note that other standardization work is being carried out in private sector standards consortia. In addition, testing of new IP Telephony standards and innovative applications is being conducted in a cooperative manner on the networks of IP Telephony companies.

- The last sentence in Paragraph 2.14 should be modified to read "Additional standards work is needed to *promote* interoperability and to contribute to IP Telephony progress."
- Quality of Service and its related topics are key technical parameters. References to the policy and regulatory aspects of Quality of Service in Paragraph 2.15 should be dealt with in the Policy and Regulatory sections of the Report.
- Sections 2.17 through Paragraph 2.21 focus on a very specific issue, ENUM, in a much more detailed manner than the treatment of other technical issues. Furthermore, the liaison statement referred to in Paragraph 2.20 is actually only at a Working Party level and is not at the SG 2 level as incorrectly indicated in the draft. Thus Paragraph 2.21 should be deleted since it is premature and confusing, and its consistency with the liaison statement from the Working Party left ambiguous.
- In Paragraph 2.18, the phrase "from the PSTN" should be inserted after "IP address-based network".
- In Paragraph 2.23, we believe it would be more correct to note that ITU-T and ITU-R Study Groups are *including* in their activities IP-related standardization. Other important work continues to be conducted in these Study Groups.

Economic Aspects of IP Telephony and its Impact on Public Telecommunication Operators

With reference to the chapter on Economic Aspects of IP Telephony, the United States of America would like to acknowledge the ITU staff for its valuable use of ideas provided by the Group of Experts meetings and subsequent written comments. The recognition in the second draft of the report that IP Telephony is an application not a service is encouraging. The United States of America supports further edits to the Economic section that emphasize the broader impacts of IP Telephony networks on the economy as a whole. IP Telephony is just one of the many applications that can be provided across the Internet and we believe that IP Telephony, like e-mail or fax technologies, provides broad benefits in the larger economy of any nation.

In addition, as referenced in our comments on Paragraph 2.7, the United State recognizes that IP Telephony equipment can be less expensive and more modular than circuit switches. The result is more efficient network buildout than corresponding circuit-switched network buildout. This, in turn, also provides broad economic benefits across Member State economies. We recommend that the ITU staff consider this view when making adjustments to the second draft and modify the report accordingly. For example in Paragraph 3.1, the positive impact of IP Telephony on all networks can be more accurately reflected by changing the sentence to read "The initial driving force behind this investment has been the desire to widen and improve access to communications networks."

The United States of America also supports the report's acknowledgment that IP Telephony will not eliminate the need for local networks. While the report correctly notes that incumbents and

new competitors may want to make future investments in IP products to carry a growing volume of data traffic and to support new applications that will integrate voice, data, or video, the United States of America believes that these investments should be regarded as complimentary rather than as substitutes for existing networks. In fact, IP Telephony is supported by local telecom networks, and can result in additional revenues for PTOs. For example in the case of computer-to-computer telephony, dial-up Internet access users rely on the PSTN. The "ITU Internet Reports 2001: IP Telephony" notes that dial-up Internet traffic as a percentage of total call minutes has increased for many telecom carriers that operate local networks. For example, the Swedish telecom carrier Telia increased its dial-up Internet traffic from 1998-99 by 38%.

In addition, other figures reveal that while the volume of IP Telephony traffic in 1999 was 4 billion minutes, individuals made approximately 6 trillion minutes of switched telephone calls in that same year (Cnet News, December 1999 & March 2000). This empirical evidence indicates that IP Telephony makes up only a small percentage of overall voice traffic. Consequently, IP Telephony is unlikely to replace traditional circuit switched calling any time in the near future. IP telephony is growing quickly, however, circuit-switched networks are generating far more revenues and seem likely to retain that edge for the foreseeable future.

Finally, future migration to IP telephony will not be driven exclusively by the pricing of international traffic as is suggested in the report. More likely, ISPs will simply continue to respond to marketplace demands reflecting end users' requirements for greater functionality and/or voice/video/data integrated networks handling far larger volumes of traffic. Indeed, many ISPs are already simply responding to growing marketplace demands by making greater investment in their own IP platforms thereby providing voice-enabled internet access. To ISPs, providing such services has the appeal of increasing their overall efficiencies while satisfying an end-user preference.

Policy and Regulatory Issues for IP Telephony

With respect to the "Policy and Regulatory Issues for IP Telephony" section of the Second Draft of the ITU Report on IP Telephony, the United States of America believes that this section should describe some of the many sound policy reasons not to apply legacy telecommunications networks to new Internet applications. We also reiterate concern that developing a "common policy" for technological neutrality or, more generally, for the emerging IP telephony market ignores the unique regulatory, technical and social background of each Member State and encroaches on the sovereign rights of all Member States.

Below are specific comments on how the Policy and Regulatory section of the November 1 draft report of the Secretary-General could be further improved:

- Paragraph 4.5 should be reordered and inserted after paragraph 4.3. Paragraph 4.5 reflects high-level principles that are important to consider before discussing policies or posing questions. In addition, this Paragraph should note that Member States should conduct a cost/benefit analysis for achieving their objectives prior to adopting a particular policy framework.
- Paragraph 4.17, Footnote 16 incorrectly describes current U.S. policy on IP Telephony. The United States of America does not make any regulatory distinctions relevant to IP Telephony based on "the mode of network transmission." Rather, policies in the United States of America generally distinguish between basic and enhanced services.²⁶ In the *Computer II* proceeding,

²⁶ After the adoption of the 1996 Telecommunications Act, the U.S. Federal Communications Commission (FCC) began using the terms "telecommunications" and "information" services, rather than "basic" and "enhanced" services, respectively. See 47 U.S.C. § 153(20) & (43). It defined information services to mean "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing or making information available via

the FCC stated that a basic service consisted of “an offering, on a common carrier basis, of pure transmission capacity for the movement of information.”²⁷ The FCC defined an enhanced service, by contrast, as “offering anything that is more than a basic transmission service, including: services which employ computer processing applications, that act on format, content, code, protocol or similar aspects of subscriber's transmitted information . . .”²⁸ This distinction between basic and enhanced services has been a key principle underlying non-regulation of Internet services. The Report should correctly state the relevant regulatory distinctions that the United States of America uses in this context.

- Footnote 16 should be moved to the discussion that appears in Paragraphs 4.14-4.15 of the Report, which the policy of the United States of America most closely resembles; however, we recommend replacing the “Voice or Data” heading of this piece with “Basic or Enhanced Services” to reflect more accurately the nature of the relevant regulatory distinction.²⁹ Voice can travel over data networks and data can travel over voice networks. Because voice *is* data, we recommend replacing references to a “voice or data” distinction in Paragraphs 4.14 and 4.15 with references to a “basic or enhanced services” distinction.
- Paragraphs 4.22, 4.23 and 4.24 should address some of the sound policy reasons on which Member States might rely when choosing not to regulate IP Telephony the same way as basic telecommunications. For example, subjecting new services to legacy requirements could stifle future economic growth and the development of innovative new services.
- Paragraph 4.28 inappropriately suggests developing a common approach to technology-neutral regulation or treatment. The decision about when, or whether, to implement this principle requires careful consideration of unique regulatory, economic and technical factors that will vary in each Member State. Developing a common approach to this specific question will prove difficult. Moreover, the decision of whether or not to implement technological neutral regulation or treatment should remain a sovereign right of each Member State.
- Paragraphs 4.40, 4.41 and 4.42 recommend harmonized international regulation, agreements and procedures for the emerging IP telephony market. We caution against the use of references to developing mandatory new fora, international agreements or procedures for this emerging market, including the reference to new procedures for “the numbering plan or conventions on routing traffic and settling accounts.” As basic telecommunications services become increasingly deregulated around the world, the ITU should not recommend that regulatory principles and procedures, such as the accounting rate regime, be applied to still-evolving services, such as IP telephony.

The Development Dimension and Human Resource Development Issues

As Section 5 has recently been revised, the United States of America offers comments on the chapter's theme and proposes specific changes to the text. Below are our comments on the theme of Section 5:

telecommunications, and [such term] includes electronic publishing, but does not include any use of any such capability for the management, control or operation of a telecommunication system or the management of a telecommunications service.” It defined telecommunications to mean the transmission, between or among points specified the user, of information of the user’s choosing without change in the form or content of the information as sent and received. For most purposes, the FCC equates telecommunications services to “basic” services and information services to “enhanced” services.

²⁷ See Amendment of Section 64.702 of the Commission's Rules and Regulations (Computer II), *Final Decision*, 77 FCC 2d 384 (1980), *Memorandum Opinion & Order*, 84 FCC 2d 50, *further reconsideration*, 88 FCC 2d 512 (1981) *aff'd*, *CIA*, 693 F.2d 198 (D.C. Cir. 1982), *cert. denied*, 461 U.S. 938 (1982), *cert. denied*, 461 U.S. 938 (1983).

²⁸ *Id.*

²⁹ As described above, the most recent terminology for the relevant regulatory distinction in the United States are the terms “telecommunications” and “information services.” It is our understanding that the terms “basic” and “enhanced” services are more widely used internationally; thus, we propose to use the terms for purposes of the ITU Report on IP Telephony.

- We would like to commend the ITU staff on a good first draft of this Section. We believe that this chapter should reflect a positive approach to important infrastructure transition considerations that are or will be considered by ITU Members, particularly developing and least developed countries. The primary focus of this chapter appears to be on traditional PSTN and legacy considerations related to revenue losses. A link to the economic advantages in Section 3 is important as well as to the regulatory and policy considerations in Section 4.
- Advancing infrastructure development goals also should be a primary consideration of this Section – from both a human development and technological development perspective.

The United States of America offers the following specific changes to the text below:

- The last sentence in Paragraph 5.7 should be changed to reflect that PTOs are employers and revenue generators in *all* countries.
- We recommend that the first sentence in Paragraph 5.8 include policy making and resource development as factors that may assist in determining a country's potential for success. Government action, i.e., policy-making, is an important factor in creating an environment that aids infrastructure (both human and physical) development.
- Paragraph 5.1 contains information that relates to chapter 4. There are many good examples of the progress that China has made with respect to deploying packet-switched infrastructures that support a host of applications. We suggest that these positive developments should be highlighted. The ITU should consider replacing the example used in Paragraph 5.1
- The use of the word “hostile” in Paragraph 5.2 would not appear to be the best choice of words.
- In Paragraph 5.4, we suggest that the first sentence should read, “Net settlement payments, *originating* from developing countries...” so as not to suggest settlement out-payments are paid to countries rather than to operators.
- Paragraph 5.6 should recognize the important consideration that countries will have to make as they build out their infrastructure. Indeed, there are challenges presented by new technologies, but applications like IP Telephony do present policy opportunities to lay the groundwork for the introduction of technologies as they develop.

Having made these substantive changes, we recommend that Paragraphs 5.7 - 5.10 be moved to the beginning of Section 5. Paragraph 5.1 should become Paragraph 5.5.

10. COMMENTS RECEIVED FROM **European IPS Association**

From: Joe McNamee [mailto:joe.mcnamee@village.uunet.be]
Sent: Monday, January 15, 2001 4:20 PM
To: IEG-wtpf@itu.int
Subject: European ISP Association comments

Dear Sirs,

Please find below some brief comments regarding the issue of IP telephony in advance of this week's ITU meeting in Geneva.

Best regards,

Joe McNamee
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IP telephony is a new, unique, IP-based technology, that represents the future of communication - not just PSTN in a new form IP-based technology facilitates an increasing array of new, innovative applications. It is not emulation or replication of the PSTN.

IP technologies represent a natural evolution of telecommunications technology and of the industry.

The creation and rapid growth of Internet-based industries has occurred primarily as a result of the lack of regulation. Internet-based technologies have developed in an openly competitive environment, and will continue to do so.

The promotion of IP telephony benefits everyone - from consumers to PTOs:

Use of efficient IP-based technologies will reduce the price of international telephone calls, for both residential and corporate customers.

As the price of phone calls fall to competitive levels, PTOs will see an increase in the number of calls completed both over the PSTN and over IP networks. With the increased call volume, PTOs will realise increased total revenues.

The creation and rapid growth of the Internet-based industries has occurred primarily as a result of the lack of regulation. The success and recent growth of eEurope also is a direct positive result of a fairly unregulated Internet-based industry in Europe. This growth has been fuelled by providers other than the traditional PTOs. Any change will have an impact on the growth and diversity of the Internet-based industries.

Applying legacy PSTN regulations to IP telephony will cause more harm than good:

Basic telecommunications services are becoming increasingly deregulated around the world. As a result, it would be unwise for the ITU to impose outdated regulatory frameworks, such as the

outmoded accounting rate regime, on IP telephony. The ITU and its Member States should consider new, pro-competitive policies, rather than impose old, monopoly-era regulation.

ISPs and data network providers have developed without burdensome regulation. The Internet and computer industries have spurred new market competitors to develop faster and reduce costs more rapidly than traditional telecommunications providers.

Internet-based technologies have developed in an openly competitive environment, and will continue to do so. Because these technologies are still evolving, regulators should look forward - not backward - as they evaluate regulatory initiatives that could impact these technologies.

Adopting "technology neutral" regulations is inadvisable, and can stifle the development of IP telephony AND new technologies

A cautious approach should be taken with regard to regulating new technologies. Technological convergence should not lead to regulation of new technologies or new applications of existing technology inappropriately.

Regulation should not be applied with a complete disregard for technology. A policy of "technology neutrality" could have significant effects on product substitution and product innovation within an economy. Standardising all substitutable products and services and giving them all the same regulatory treatment will stifle new service introduction and product innovations. These unintended consequences would prevent countries from gaining full benefit of these emerging technologies.

11. COMMENTS RECEIVED FROM **iBasis**

iBasis, Inc., a leading wholesale provider of IP Telephony services and an invitee to the WTPF's informal experts group (IEG), congratulates the ITU Secretariat General for the second Draft Report of the Secretary-General on IP Telephony. We commend the ITU for being responsive to many of the comments iBasis and others submitted to the ITU regarding the First Draft Report.

Please find below suggested line-by-line edits and comments regarding the Second Draft Report. Most of our comments are aimed at providing additional information on new services and technologies that IP Telephony companies are bringing to the market that are helping traditional carriers prosper in an increasingly competitive global market and that may help reduce the "digital divide" by transforming the way people communicate and retrieve information. We understand there is an ongoing discussion within the WTPF's IEG on the use of the terms "IP Telephony," "Internet Telephony," and "VoIP Telephony" Consistent with the definitions used in section 1.2 of the current draft, our edits use the more generic term "IP Telephony." Once the WTPF's IEG reaches a consensus on the use and definition of these terms, we encourage that the report be reviewed to ensure more consistency in the use of these terms in the final report.

We look forward to continuing to assist the ITU Secretariat General and the IEG on future drafts of the Report as well as with other efforts to help make the WTPF meeting a success.

**Draft Report of the Secretary-General on IP Telephony****PREAMBLE**

i) The ITU World Telecommunication Policy Forum (WTPF) was established by Resolution 2 of the 1994 Kyoto Plenipotentiary Conference and was confirmed by Resolution 2 of the 1998 Minneapolis Plenipotentiary Conference. The purpose is to provide a forum where ITU Member States and Sector Members can discuss and exchange views and information on emerging telecommunication policy and regulatory matters arising from the changing telecommunication environment. Although the WTPF shall not produce prescriptive regulatory outcomes or outputs with binding force, it shall prepare reports and, where appropriate, opinions for consideration by Member States, Sector Members and relevant ITU meetings.

ii) By Decision 498 (attached as Annex A), the 2000 session of the ITU Council decided to convene the third World Telecommunication Policy Forum (WTPF-01) in Geneva, from 7 to 9 March 2001, in order to discuss and exchange views on the theme of Internet Protocol (IP) Telephony, with the following agenda:

- *the general implications of IP Telephony for the ITU membership with respect to:*
 - (a) *the telecommunications policies and regulations of ITU Member States;*
 - (b) *the implications of IP Telephony for developing countries, particularly with respect to policies and regulatory frameworks, as well as technical and economic aspects;*
 - (c) *the impact of IP Telephony on the operations of Sector Members, notably in terms of the financial challenges and commercial opportunities it presents;*
- *actions to assist Member States and Sector Members in adapting to the changes in the telecommunication environment due to the emergence of IP Telephony, including analysing the current situation (e.g., by case studies) and formulating possible cooperative actions involving ITU Member States and Sector Members to facilitate adaptation to the new environment;*
- *actions to assist Member States and Sector Members in meeting the human resource development challenges presented by new telecommunication technologies such as IP Telephony, in particular, skills shortages and the need for education, and technology transfer.*

iii) In accordance with Decision 498 of the Council, and in keeping with past practice, discussions at WTPF-01 shall be based on a report from the Secretary-General, incorporating the contributions of ITU Member States and Sector Members, which will serve as the sole working document of the Forum, and which shall focus on key issues on which it would be desirable to reach conclusions.

iv) Pursuant to the Council's Decision, the arrangements for the third Forum will be similar to those for the first two. To give the Membership as much opportunity as possible for contributing to the preparations for this important event, and pursuant to Decision 498 of the Council, the Report of the Secretary-General shall be prepared according to the following timetable:

1 November 2000: the first draft shall be circulated with an invitation to comment, drawn up on the basis of available material (notably, the Strategic Planning Workshop on IP Telephony³⁰);

1 December 2000: deadline for receipt of membership comments on the first draft;

15 December 2000: the second draft shall be circulated, incorporating comments received and with an invitation for further comments;

10 January 2001: deadline for receipt of membership comments on the second draft.

The **Final Report** shall be circulated by the **end of January 2001**.

In order to strengthen this iterative process, we would welcome the designation of a focal point in your office to follow up this matter.

The first draft of the Report of the Secretary-General was distributed to the ITU Membership on 1 November 2000. It was intended that the first draft would serve to trigger written comments from Member States and Sector Members. In response, the secretariat received 18 written comments from the ITU membership, as well as comments from other entities. These comments have been posted on the website for the Forum at <http://www.itu.int/wtpf/>.

Council Decision 498 also requires that the Secretary General shall convene a balanced, informal group of experts—who are active in preparing for the Forum in their own country—to assist in the successive stages of the preparatory process. This group will meet twice during the consultation process. Invitations to participate in the informal group of experts (IEG) were sent out by the Secretary-General to those who contribute to the consultation process plus others who can make significant contributions and can assist in achieving the desired balance.

The first meeting of the Informal Experts Groups (IEG) was held on 16-17 November 2000 in Geneva. The Group discussed and offered a number of suggestions to revise the first draft of the Report of the Secretary-General and also established a procedure to develop the draft Opinions for the Policy Forum. Those draft Opinions will be attached to the final Report of the Secretary-General. A second meeting of the Experts Group is scheduled for **18-19 January 2001** in Geneva.

³⁰ The workshop took place in June 2000. See: <http://www.itu.int/iptel/>

v) This second draft of the report has been revised to incorporate the views expressed by the Membership in written comments. In addition, this draft reflects the discussions that took place at the first meeting of the Informal Experts Group. The Report is designed as well to address the issues raised in Council Decision 498. Annex B contains tables and information on the regulatory status of IP Telephony in some ITU Member States.

vi) If WTPF-01 is to prove a success, it will be because the final Report of the Secretary-General reflects the opinions and contributions of the ITU membership as a whole. For that reason, you are encouraged to submit your comments on this second draft by **10 January 2001**, by email to the address: IEG-wtpf@itu.int. They will then be posted on the website so that they can be viewed by others involved in the process.

Alternatively, your comments can be sent by post, enclosing an electronic copy on diskette, to:

**International Telecommunication Union
Strategies and Policy Unit
Office T.1314
Place des Nations
CH-1211 Geneva 20
Switzerland**

vii) In addition to this Report, other background information relating to WTPF-01, as well as the case studies which have been commissioned and materials on the general topic of IP Telephony, are being posted on the ITU website, also at: <http://www.itu.int/wtpf/>.

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1. SUMMARY

1.1 The increasing use of Internet Protocol (IP) networks for communication services, including applications such as telephony, has become a pivotal issue for the telecommunications industry worldwide. The possibility of transmitting voice over IP-based networks, with all its challenges and associated opportunities, such as voice and data integration, constitutes a milestone in the convergence of the communications sector. It also reflects a convergence between two technologies that have emerged under very different policy and regulatory circumstances:

- **the Public Switched Telephone Network (PSTN)³¹, based on circuit-switched technology, which has been fairly extensively regulated by most countries (until recently);**
- **the Internet, which is based on packet-switched technology, and which has evolved as a data network subject to few, if any, controls.**

1.2 ~~1.2~~—The term “IP Telephony” can mean different things to an engineer or policy-maker and there is no consensus at this point on its exact definition. However, for purposes of discussion, it is necessary to provide some delineation of the various forms that IP Telephony can take. Accordingly, as a working definition and for the purposes of this Report, “IP Telephony” is used as a generic term for the different ways of transmitting voice, fax and related services over packet-switched IP-based networks. IP Telephony services may also include services that integrate/imbed the transmission of voice and faxes with other media such as text and images. The transmission of voice over IP-based

³¹ The term PSTN (public switched telephone network) is used in this document as a synonym for traditional circuit-switched telephone networks offered by Public Telecommunication Operators (PTOs), as well as Integrated Services Digital Networks (ISDN), and Public Land Mobile Networks (PLMN). Generally with convergence, today’s telecommunications networks and transport technologies are increasingly complex and difficult to categorize.

networks can be subdivided into two major subsets: VoIP (Voice over IP) and Internet Telephony. The difference lies in the nature of the underlying IP network: VoIP utilizes managed, private IP-based networks, while Internet Telephony primarily uses the public Internet. Since IP Telephony is a broad term, throughout the Report an effort has been made to clearly identify the specific type of network or service that is being described and discussed.

1.3 [EDITORIAL NOTE: We suggest inserting a short paragraph here that further explains the technological/routing differences that exist between a call routed over an PSTN network – point-to-point channel – versus an IP call. The paragraph should briefly point out that IP technology and routing is seen as more efficient and affordable and that these technical differences pose a challenge to traditional telecom regulatory regimes that were designed around circuit-based-networks. The paragraph should draw on a more detailed discussion of the technological issues related to this from the technology– and the regulatory sections of the report.]

1.3 One key issue that has gained the attention of policy-makers, regulators, and industry alike is the fact that the Internet, and other IP-based networks, are increasingly being used as alternatives to the circuit-switched telephone networks and to some extent are becoming the technology of choice as new infrastructure is deployed.

1.4 Several major international Public Telecommunication Operators (PTOs) have announced that they will migrate all their international traffic onto IP platforms and have committed substantial investment sums to make that transition. One reason for this transition is the apparently lower cost of moving traffic over IP-based networks; one company estimates that this technology will allow it to carry traffic at a quarter of the cost of doing so over a conventional, circuit-switched network. Liberalization of markets is also contributing to this migration to IP-based networks. As of late 2000, more than three-quarters of all international traffic originated in countries in which the provision of IP Telephony is liberalised. Furthermore, the majority of IP Telephony now travels over managed, private IP-based networks as opposed to the public Internet.

1.5 While there are a range of views as to the pace at which IP Telephony will grow in the coming years, it is commonly believed that it will increase fairly rapidly. Some market forecasters project that, within five years, IP Telephony will account for between 25 and 40 per cent of all international voice traffic. Worldwide, the volume of traffic on IP-based and other data networks already far exceeds the voice traffic that travels over the public switched telephone network. Consequently, few countries can ignore IP Telephony. Nonetheless, most predict that the PSTN will remain robust for the foreseeable future, and an important issue for policy-makers will be the need to oversee the co-existence of the two network technologies and, increasingly, combinations of the two. As IP networks become more widespread, policymakers also face a challenge of determining whether the regulatory frameworks they have in place and which were developed initially for circuit-based networks are relevant and appropriate for IP-based networks given technological and other differences between IP- and circuit-based networks.

1.4 **1.6 The growth of IP-based networks around the globe has profound and broad implications for societies, including consumers, industry, and national administrations. In part, this is because telecommunications infrastructure is increasingly being viewed as a fundamental element of national competitiveness in the age of the Information Society and improvements to communications networks may serve as a dynamic stimulus to economic growth.**

1.7 IP Telephony is an important part of this picture. For consumers, IP Telephony offers potentially much cheaper long-distance and international telephone calls compared with the alternative of using a circuit-switched, fixed-line or mobile network. These cost savings may, at

least partially, offset the possible loss of quality. IP Telephony also offers consumers advanced services, integrating voice and data, such as merged World Wide Web and voice services (e.g., “click-to-talk”) or integrated messaging. Adding voice to traffic on IP-based networks further raises issues of substitution for circuit-switched services and strategies for network transition.

1.8 For PTOs, the potential cost advantages of IP Telephony are more complex to calculate. That is because incumbent PTOs have existing revenue streams and technologies that may be adversely affected if customers shift to other services or other companies that offer lower-priced IP Telephony. However, such concerns may be viewed in the context of national policy objectives designed to improve the performance, cost and range of services offered by telecommunications networks.

1.9 The regulatory approach to IP Telephony varies significantly among ITU Member States and reflects the different interests involved. In some countries, governments have defined IP Telephony services in such a way as to permit the delivery of this service to the public, despite the existence of market exclusivity of the incumbent over basic voice telephony. In others, the service is prohibited, while in others it is licensed and promoted. In some countries, IP is treated as just another technology that can be adopted by PTOs, or is not regulated at all.

1.10 Given that IP Telephony calls are mainly carried outside of the PSTN—and hence outside the regulatory and financial structures which have grown up around the PSTN—it is the view of some that, for incumbent PTOs in developing countries, IP Telephony may undermine not only current revenue streams but also existing universal service programmes aimed at extending networks and services in unserved or underserved areas. In other countries, IP Telephony, and particularly the roll-out of IP networks, is viewed as a means to offer and encourage new and cheaper services, and thus to exert downward pressure on the price of circuit-switched telephony.

1.11 This Report seeks to provide background for the key issues that are posed by IP telephony. Section 2 of the Report looks at technical and operational aspects of IP Telephony. Section 3 deals with the economic aspects of IP Telephony and its impact on Member States and Sector Members. Section 4 discusses the different policy and regulatory approaches that Member States have taken to IP Telephony, and its significance for universal service schemes and convergence. Section 5 examines the relationship between IP Telephony and Human Resource Development and also discusses the particular concerns of developing countries.

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2. TECHNICAL AND OPERATIONAL ASPECTS OF IP NETWORKS

Introduction

2.1 A fundamental paradigm shift has been underway in the telecommunications industry—a shift that is arguably as important as that from the telegraph to the telephone or from the mainframe to the personal computer. That change is a shift from traditional PSTN *circuit-switched* voice networks to *packet-switched* data networks, using Internet Protocol (IP) technology. This Section discusses the technical and operational aspects of IP Telephony. Since transmitting voice over IP networks is just one of many possible IP-based applications, the discussion is framed within the broader context of IP networking technologies.

2.2 The largest (and most well known) IP network in the world is “the Internet”; referred to by many as the “public Internet”. There are many definitions for the Internet but simply put, it is a globally connected set of computer networks, using the Internet Protocol, sharing a common IP address space. Computers connected to the Internet use software that “serves” or provides interchange of information using widely available standard applications (e.g., email, file transfer).

The popularity of the Internet grew tremendously in the 1990's with the deployment of World Wide Web technology—allowing users easy access to hyperlinked information around the globe.

2.3 The Internet Protocol and related applications can also be used in private networks based on Internet technology (e.g., “Intranets” or LANs). Therefore, applications or services such as IP Telephony can be deployed on either the public Internet or private IP-based networks—or across a combination of both.

2.4 Technological innovation means that IP-based networks will continue to evolve and provide increasingly sophisticated services and applications on top of basic Internet data communications. Despite being originally designed for not real-time, *asynchronous* communications, extensions to the Internet Protocol are currently under development to support application services that require “real time” transport such as audio and video streams. VoIP can be viewed as one specific example of interactive, real time audio between users.

2.5 VoIP technology, integrated with data applications, offers the potential for new, multifunctional end-user portable devices which may be much more user-friendly, interactive, and personal than traditional telephones or personal computers. For example, such devices may include services linked to a user's current location. These new modes of access and related services will spawn new applications, which in turn will drive further evolution of global telecommunication network infrastructures.

Evolution in Network Infrastructures

2.6 For most of the last century, voice traffic was the predominant use of telecommunications networks. While voice traffic continues to grow, it represents an ever-diminishing percentage of overall telecommunications traffic when compared to data. The result is that support for IP-related technologies is now a strategic element in the design, development and use of telecommunication networks.

2.7 Architectural differences between circuit-switched and IP-based networks are rooted in their origins. IP networks were originally designed for two-way, not real-time, or *asynchronous* communication, typically referred to as “connectionless” or “stateless”. In other words, no unique end-to-end circuit is created and held for the duration of a particular session. On the other hand, telephone networks have been engineered to provide real-time or *synchronous*, two-way voice conversations possible between almost any two points on earth, using circuits created as necessary and held for the duration of the call.

2.8 ~~2.8~~—IP technology chops up electronic transmissions into packets of varying numbers of bytes. Each packet is given a “header” or address label, and forwarded from one *router* to another, armed at each “hop” with enough information to get it to the next, where the process is repeated. As a result, each “voice packet” of an IP Telephony call does not completely tie up any given circuit and may travel very different routes between callers before being re-packaged. By contrast, on circuit-switched networks, using protocols such as Signalling System 7 (SS7), a call is typically routed through a hierarchy of local, inter-urban and international switches to establish an end-to-end circuit between caller and called party.

2.9 _____

~~2.9~~—In general, telecommunication vendors and operators are transforming themselves from voice-centric, circuit-switched providers to data-centric, IP-based solution providers. Therefore, deployment of core networks solely for the delivery of voice services is increasingly uncommon. As a consequence, there are enormous efforts underway to support real-time applications and carrier grade quality with IP technologies. Many operators, both

wireline and wireless, have begun investing in upgrading their entire networks towards a more flexible “all IP” architecture. For~~As~~ one example, 3rd generation (i.e., IMT-2000) mobile network vendors and operators plan to migrate core networks to IP technologies, thus improving integration of mobile telephony and Internet services. Operators are also using the increased flexibility of IP Telephony and IP networks to integrate and embed voice services with other media such as text and images to produce new IP Telephony services such as click-to-talk (placing a call by clicking on an icon in a web page), unified communications (making voicemail, email, and fax messages accessible from any device), speech-enabled access to Internet content (giving telephone users access to web content via auditory commands), and turnkey hosting solutions so that companies can to provide all of these new services on a world-wide basis through the Internet. These and many other technological innovations introduced by IP Telephony companies are further eroding the traditional distinction between voice and data services.

2.10 ~~2.10~~—It should be recognized that there are several technological scenarios under which voice is carried on IP networks—often involving different treatment from a policy or regulatory perspective. One scenario is where IP Telephony is carried solely across the public Internet between computers. Another scenario is where IP is just used as an underlying transport technology for networks that provide PSTN services. In this scheme, signalling and network intelligence still use the Signalling System Seven (SS7) protocol widely used on the PSTN and users may also access a service by using a traditional telephone or some other IP device. A third scenario is where IP Telephony is based on full end-to-end IP technology (e.g., on private IP networks or next generation “greenfield” mobile networks). This scenario does not use SS7 signalling but may use new “soft switch” technology to manage network call control and provide intelligent network management—including well-known telephony network features such as busy tone, call forwarding, call data records for billing, etc. Finally, there may also be use of gateways or interconnection between the Internet or private IP networks and the PSTN. In this regard, ITU-T Recommendation E.370, proposed for final approval by ITU-T Study Group 2 in January 2001, addresses in more detail various scenarios and principles related to interworking between PSTN and IP-based networks.³²

2.11 It is also important to consider the impact IP Telephony is having on build-out of the global Internet infrastructure and on traffic patterns, issues that are of great interest to ITU members. Initially, when most of the IP Telephony gateways were deployed in the United States, the IP Telephony traffic patterns probably mirrored in some ways the traffic patterns of traditional telephony – i.e. it was U.S.-centric -- because of the lack of advanced IP Telephony infrastructure outside of the United States. For example, an IP telephony call between two developing –countries would often have to be routed through one or more U.S.-based gateways for billing, administrative, other technical considerations. As a growing number of –IP Telephony gateways, and especially more advanced gateways, are deployed outside of the United States, the traffic patterns are likely to become less U.S.-centric and reduce the amount of IP Telephony traffic that transits through the United States. The deployment of these gateways and IP Telephony infrastructure is also increasing the demand for higher quality and lower cost IP connectivity in many countries. As this demand increases, IP backbone operators and carriers have greater incentives to further invest and improve IP networks around the world. It is also important to recognize that the deployment of the IP Telephony gateways and infrastructure were initially largely done by the smaller, pioneering IP Telephony operators and not the larger traditional carriers. These deployments have now further accelerated as a result of larger carriers embracing IP Telephony. **[EDITORIAL NOTE:** Similar text to this is suggested for the economic section. It is

³² <http://www.itu.int/itudoc/itu-t/com2/reports/r077.html>

relevant here because the discussion touches on evolution of infrastructures and networks as well as who has been driving this evolution.]

IP Telephony Standards Activities

2.11 Of course, most telephones are—and for several years to come will continue to be—connected to traditional circuit-switched telephone networks. IP Telephony services must be able therefore to accept calls originating on the PSTN, to terminate calls on the PSTN, and to do it all seamlessly. The first generation IP Telephony services that linked to the PSTN via gateways were not capable of Intelligent Network (IN) functionality, such as calling party identification, nor could they interface with PSTN signalling systems such as Signalling System 7. In order to address these requirements, the latest standardization activities have focused on the distributed architecture of *gateways* linking PSTN and IP networks. These gateways convert and forward calls in one direction or another as well as provide call management functionality.

2.12 Technical standardization for IP Telephony is underway in many industry and regional entities, as well as in standardization bodies such as the ITU Telecommunication Standardization Sector (ITU-T), the ITU Radiocommunication Sector (ITU-R), the European Telecommunications Standards Institute (ETSI), and the Internet Engineering Task Force (IETF). Other entities and consortia that are carrying out important standards related work include the International Multimedia Teleconferencing Consortium, the Internet & Telecoms Convergence Consortium, Interoperability Now!, the IP Call Detail Record Initiative and Voice on the Network.

2.13—One example of ITU standardization is the H.323 series of Recommendations from ITU-T Study Group 16. The scope of the H.323 series is very broad and supports both audio and video multimedia conferencing, call setup and control, bandwidth management, as well as interfaces between different network architectures. Also notable is the ~~IETF~~Internet Engineering Task Force's Session Initiation Protocol (SIP), a protocol for conferencing, telephony, presence detection, events notification and instant messaging that enables web developers to create advanced telephony and multimedia applications, using familiar Internet protocols and web tools. SIP is an open-source technology that will link speech recognition-based services together, much the way hypertext links link various websites on the Web that will allow consumers to 'speech-surf' through a variety of speech-activated content simply by using spoken commands through a traditional telephone, a mobile phone or other IP device and the nearest phone." In some circumstances, the IETF and ITU-T have cooperated directly on IP telephony standardization—producing the joint protocol called H.248 (ITU-T name)³³ and Megaco (IETF name). H.248/Megaco defines a master/slave protocol to control media gateways that can pass voice, video, facsimile and data traffic between PSTN and IP-based networks. The ITU-R is also involved in standardization related to fixed and mobile wireless access using IP networks. In other circumstances, standardization work is effectively being carried out entirely in private sector standards consortia because these better facilitate and speed adoption of standards in an industry driven by constant innovation. In addition, much of the testing of new IP Telephony standards and innovative applications are being tested in a cooperative manner on the networks of IP Telephony companies.³⁴

2.14 Currently, many of the deployed IP Telephony solutions, even when based on standards, are from single vendors and encounter interoperability issues with other systems. For IP Telephony to further advance, common standards work still needs progressing.

Quality of service (QoS) and Capacity

³³ Approved in June 2000.

³⁴ For example, see "iBasis Launches SIP Test Network For Internet Developers; Pingtel and Speechworks To Trial New Internet Devices and Technologies," September 11, 2000 (<http://www.ibasis.net/news/pr09112000.htm>).

2.15 Quality of Service and its related topic, network capacity, is at the core of voice telephony and, as such, is often the focal point of the IP Telephony debate, especially in determining regulatory classifications. There are many aspects to quality, including reliability, throughput and security. However, it is the perceived poor transmission quality of voice delivered over the public Internet that explains why Internet Telephony is often not considered as a carrier-grade service. There are, in general, two ways in which this quality can be improved—implementing quality of service support and increasing available capacity. The latter may be easier to achieve because it does not require coordinated action across Internet service providers.³⁵

2.16 Generally, there is less of an issue when, instead of the public Internet, ~~dedicated~~~~privately managed~~ IP networks are used to provide VoIP. In the latter, more capacity, faster transmission, and better voice quality combine to produce more satisfied customers. Privately operated capacity is therefore typically a key component today in commercially viable IP Telephony, and much more so at present than QoS. **Numbering and Addressing**

2.17 One of the technical challenges raised by the ever-closer integration between circuit-switched and packet-switched networks is how to address calls that pass from one network service to another. Generally, it is assumed to be desirable that an integrated global subscriber access plan exists. For example, the same ITU-T E.164 telephone number would reach a subscriber regardless of whether IP-based or PSTN network technologies are used.

2.18 It is now widely possible to originate calls from IP address-based networks to other networks, but it is uncommon to terminate calls from other networks to IP address-based networks. Rather, calls are generally terminated on the PSTN, so the called party can only use a terminal device connected to those networks. In order to access a subscriber on an IP address-based network, some sort of global numbering/addressing scheme across both PSTN and IP address-based networks needs to be developed and implemented.

2.19 ITU-T Study Group 2 (SG2) is currently studying a number of possible options whereby users in IP address-based networks can be accessed from/to PSTN users. One option is the assignment of E.164 numbering resources to IP devices. Another approach is to support service interworking between different subscriber addressing systems in the PSTN and IP networks; for example, using the IETF's ENUM protocol. ENUM³⁶ defines a Domain Name System (DNS)-based architecture and protocol for mapping an E.164 telephone number³⁷ to what are known as Uniform Resource Identifiers (URIs)³⁸. URIs are strings of characters that identify resources such as documents, images, files, databases, and email addresses. For example, <http://www.itu.int/infocom/enum/> is the URI for the ITU website providing an overview of ENUM activities.

2.20 During the last year, SG2, responsible for E.164, and the IETF, have held discussions and collaborative activities related to the deployment of ENUM services. Since E.164 numbers may be synchronized with the DNS, the ENUM protocol would appear to have important implications for national Administrations responsible for numbering policies under "country codes". The view of SG2 is that administrative entities, including DNS administrators, should adhere to the applicable tenets of existing pertinent ITU-T Recommendations³⁹ with regard to the inclusion of E.164 resource information in the DNS. Specifically, in a recent liaison statement⁴⁰ to the IETF, Study

³⁵ See Odlyzko, A.M., "The current state and likely evolution of the Internet," presented at IEEE Globecom '99, <http://www.research.att.com/~amo/doc/globecom99.pdf>; and Huston, G., "Quality of Service: Fact or Fiction?" The Internet Protocol Journal (Cisco) (March 2000), http://www.cisco.com/warp/public/759/ipj_3-1/ipj_3-1_qos.html.

³⁶ <http://www.ietf.org/rfc/rfc2916.txt>

³⁷ <http://www.itu.int/itudoc/itu-t/rec/e/e164.html>

³⁸ <http://www.ietf.org/rfc/rfc2396.txt>

³⁹ For example, ITU-T Recommendations E.164, E.164.1, E.190, and E.195.

⁴⁰ http://www.itu.int/infocom/enum/wp1-39_rev1.htm

Group 2 has noted that since most E.164 resources are utilized nationally, ENUM service and administrative decisions are primarily national issues within the purview of ITU Member States.

2.21 National regulatory authorities may wish to consider, their appropriate level of involvement in ENUM related activities in ITU-T SG2. One method of involvement is by providing contributions to SG2 in developing Recommendations that recognize and/or safeguard current national approaches and standards. Another issue of interest to Administrations is the appropriate international management of the root of the ENUM DNS structure, on which Administrations would be dependent for services.

ITU Study Group Activities

2.22 In general, all ITU-T and ITU-R Study Groups have refocused their activities on IP-related standardization. Relevant IP Telephony standardization includes, *inter alia*, work on differentiated QoS IP services, interworking between PSTN and IP networks, naming and addressing, support for charging and settlements, integrated network management of telecom and IP-based networks, IP signalling, routing principles, traffic management, network integrity and reliability (e.g., important for emergency services), optical networks, and fixed and mobile wireless systems (e.g., IMT-2000).

2.23 Specific ITU-T Study Group activities include ITU-T Study Group (SG) 2 (naming and addressing), SG3 (charging and settlements), SG4 (network management), SG7 (Frame Relay Interworking with IP), SG9 (cable network services including IP Telephony support), SG11 (signalling), SG12 (end-to-end performance), SG13 (ITU-T lead SG on IP), SG15 (optical networks), SG16 (H.323, H.248 and related Recommendations), and the recently established Special Study Group on "IMT-2000 and beyond". Concerning ITU-R, relevant Study Groups include SG6 (broadcasting, terrestrial and satellite), SG8 (mobile, terrestrial and satellite, IMT-2000 included) and SG9 (terrestrial fixed service), all dealing with wireless access to IP networks. More detailed information on specific ITU Study Group IP activities can be found in a report to the 2000 ITU Council⁴¹ and on the ITU-T and ITU-R web pages.⁴²

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⁴¹ <http://www.itu.int/itudoc/gscouncil/c00/docs/27a.html>

⁴² <http://www.itu.int/ITU-T/> and <http://www.itu.int/ITU-R/>, respectively.

3. ECONOMIC ASPECTS OF IP TELEPHONY AND ITS IMPACT ON member states and sector members

The IP opportunity

3.1 Throughout the world, enormous sums are being invested to establish IP-based networks, both for creating new capacity and for enabling existing narrowband networks and future broadband ones to run IP-based services. It is in this broader context that any consideration of the economic aspects of IP Telephony should be rooted. The initial driving force behind this investment has been the desire to widen and improve access to the Internet. There are now more than 350 million Internet users worldwide. While for many, the Internet is primarily a source for information and entertainment; it also brings significant opportunities for economic and social development:

- By using IP-based networks for electronic commerce, firms can widen their potential customer base and reduce transaction costs, while national economies can benefit from new trade opportunities;
- By using IP-based networks to retrieve information, health care professionals can keep up-to-date with developments in specialist areas and can pass on their own knowledge to others;
- By using IP-based networks as research media, schools and universities can greatly expand the range of information services available to their students and ensure that teachers remain abreast of the latest developments in their field;
- By using IP-based networks as communications tools, governments can make their services more accessible to their citizens and can establish websites to promote events or provide information.

These are just a few of the endless possibilities opened up by IP-based technologies for both fixed-line and mobile networks. Even though the Internet is still at the start of its growth cycle, already the number of emails sent each year exceeds the volume of fax messages and the volume of data and text transmitted exceeds the volume of international telephone calls

3.2 Most countries have adopted a supportive attitude to the Internet, and are taking steps so that all citizens have access to the possibilities it brings for commerce, communication, education and entertainment. ITU research carried out for the 2001 edition of the World Telecommunication Development Report shows how governments in different countries have adopted policies to promote the development of the Internet⁴³:

- In Egypt, the Government's Information and Decision Support Centre played a critical role in introducing the Internet into the country by investing in international connectivity and establishing websites for the tourism and healthcare sectors;
- In Hungary, the Hungarnet academic network provides free Internet access to 400'000 or so of the nation's higher education students and professors;
- In Singapore, the government modified its telecommunications licensing regime in April 2000, to foster more investment in telecommunications and the Internet - modifications that included provisions that eased and streamlined licensing for IP Telephony service providers;
- In Nepal, a government task force is examining ways to promote electronic commerce to market the nation's handicrafts, tourist potential and software expertise.

3.3 ~~3.3~~—But IP-based networks can be used for much more than just text messaging and data communications. As capacity expands, new and innovative multimedia applications become possible. One of these is the facility for carrying voice, both in real-time and stored form, over IP-based networks. Packetised voice communications can attain levels of quality that are as high, if not higher, as that carried over more conventional circuit-switched networks, especially where bandwidth is plentiful. In most cases, this service of IP Telephony can be offered to customers at prices that are

⁴³ See www.itu.int/ti/casestudies.

significantly below those offered over circuit-switched networks. This is partly because call origination and termination costs may be lower, but mainly because of savings in the long-distance transmission component of the call. Traditionally, pricing of calls on circuit-switched networks has been highly distance sensitive, with profits made on long-distance and international calls being used in part to cross-subsidise subscriber access and local call costs. These cross-subsidies have become increasingly less sustainable as competition emerged, international accounting rates are reduced and as a growing number of regulators put in place costing methodologies such as long-run incremental cost methodologies. Further downward pressure on traditional prices regimes emerged as new technologies and networks such as IP-based networks emerged with pricing structures -that are is ~~But pricing of traffic on IP-based networks is largely independent of distance.~~

Markets, services and players

3.4 Projections vary widely as to the economic market opportunity that IP Telephony creates. TeleGeography estimates that some 3.7 billion minutes of international traffic were carried over IP-based networks in 2000, or just over 3 per cent of the global total, but the market is growing fast. Market analysts forecast that, by 2004, IP Telephony will account for between 25 per cent (Analysys) and 40 per cent (Tarifica) of the global total. Most studies show that the main use of IP Telephony at present is for international traffic rather than for domestic long-distance or local traffic. The United States is currently the main source of IP Telephony traffic. TeleGeography estimates that all of the top 20 IP Telephony routes worldwide by traffic volume are between the United States and other countries (though some of this traffic may simply be being switched via the United States). In the longer term, there is a market opportunity for IP Telephony also in long-distance and local networks, especially if the transition of prices towards costs is delayed.

3.5 The IP Telephony marketplace, its products and players, differs considerably from the traditional PSTN telephony market which, even today, is dominated by incumbent national operators. Although the majority of IP Telephony Service Providers (IPTSPs) are US-owned, the main focus of their operations is global rather than national, and they often work in partnership with incumbent PTOs, bringing training and expertise as well as revenue-generating opportunities. The market can be segmented into several different types of applications, including (in the approximate order in which they have appeared): PC-to-PC; PC-to-Phone; Phone-to-Phone and value-added services.

3.6—The market can also be segmented between wholesale and retail operations; or between those IPTSPs that offer priced services and those which offer applications which are free-of-charge to the end-user, funded by advertising revenue. It is also useful to distinguish between the ways in which IP is used to carry voice, for instance: in the networks of incumbent carriers migrating to IP; in the networks of newer PTOs without direct connection to customers; in managed IP-based networks offering multimedia services; or via ISPs (Internet Service Providers) which interconnect the public Internet with the PSTN. The mainstay of the business, for the moment at least, is price arbitrage, but this is evolving over time as value-added services—such as click-to-talk (placing a call by clicking on an icon in a web page), unified communications (making voicemail, email, and fax messages accessible from any device), speech-enabled access to Internet content (giving telephone users access to web content and trade via auditory commands), ~~integrated messaging, presence management~~ (“find me, follow me”), ~~click to talk website functions~~ etc.,—provide an increasing share of revenue. Operators often learn to use IP technologies by using them to initially carry voice traffic and as they learn to run and manage these technologies they begin to offer more advanced IP Telephony services.

Costs and prices

3.7 While the long-term potential for IP Telephony lies in the new functions and applications it makes available, the short-term advantage lies in cost-savings compared with conventional circuit-switched telephony. For **consumers**, IP Telephony is invariably *cheaper* than a circuit-switched call, especially for calls originating in non-liberalised markets or that are carried over the public Internet. For instance, in Hungary, where consumers have had a choice of using IP Telephony since 1999, the price advantage over standard PSTN calls ranges between 20 and 50 per cent per minute. If all other factors—quality, convenience, reliability, etc.—are equal, the choice to use IP Telephony is an economically rational one. But current IP Telephony offerings do not always match up to consumer expectations. At present, consumers must generally make a trade-off between price and quality. Willingness to make that trade off will generally depend on price sensitivity as well as the interest of consumers in using some of the more advanced IP Telephony services:

- Consumers in low income countries, low income families or cost-conscious consumers in developed countries, will be more inclined than other less-price-sensitive consumers to choose IP Telephony, where it is available;
- Residential consumers may be more inclined to use IP Telephony than business users, for whom transmission quality and reliability are more important.
- Consumers who cannot afford to pay for a phone and a computer may use unified communications or other IP Telephony services to place voice calls as well as to generate and retrieve e-mail or obtain information from the Internet through voice-enabled web sites that they access via payphones or via debit mobile phones.

3.8 For **Public Telecommunication Operators**, the potential cost advantages of IP Telephony are more complex to calculate. That is because incumbent PTOs have existing revenue streams, which may be affected by a shift to lower-priced IP Telephony. In the case of Hungary quoted above, the initial pressure to offer IP Telephony came from mobile service providers that saw the opportunity to bypass *Matav's* monopoly on carrying international calls, although *Matav* itself is now an IPTSP.

3.9 3.9—Numerous studies have found that the cost of building and using IP networks are significantly lower than those of circuit-based networks. For example, one study found that the average cost of a circuit-based class 5 switch is estimated at \$20 million, while a packet-based gateway with comparable functionality costs between \$3-\$5 million.⁴⁴ Another study found that the cost of switching a bit on a circuit-based network is \$0.00125 per bit versus \$0.00002 per bit.⁴⁵ Despite the lower costs of IP-based networks, PTOs have other considerations they must take into account when determining when and how transition to IP-based networks. The precise nature of the cost advantage to PTOs offered by IP networks is the subject of much debate. It will depend, for instance, on:

- Whether a particular investment in IP is as a new-build network, or as an upgrade or overlay to an existing network. The incentive to choose IP will be greater for new, or substantially new, networks. For instance, in Senegal, where existing networks serve only just over 1 per cent of the population, *Sonatel* plans to migrate its existing core network to an IP backbone by 2004 and to offer both voice and data services over the same integrated IP network.

⁴⁴ "Latin American Telecom Odyssey: From dial tone to IP services." Hector Hernandez. IDC. III PCCI CITEL/OAS Forum. Isla Margarita, Venezuela. June 2000.

⁴⁵ Peter J. Sevcik, "Why Circuit-Switching is Doomed," Business Communications Review. (September 1999).

- Whether a particular carrier is an incumbent or a new market entrant. New market entrants, with no legacy network to defend, are likely to be the first movers towards IP Telephony. In China, for instance, *China Netcom*, a new market entrant which is based upon the Ministry of Railway's network, is building a voice over IP network which will cover 15 cities and include some 9'600 kilometres of fibre optic cable by the end of 2000. The use of IP has allowed *China Netcom* an earlier entry at a lower cost into the market than might otherwise be the case.
- The extent to which value-added services are being offered. In economies such as Hongkong SAR and Singapore, where local call charges are free (bundled into the access charge), new market entrants are offering value added services that allow, for instance, voice users to retrieve their email (*T2mail.com*) or the provision of voicemail and fax communication services (*2Bsure.com*) over an IP platform.
- The costs of international IP connectivity. Some countries have argued that the costs of international leased lines used to establish IP connectivity are too high and the costs are unequally shared. This issue is current being discussed within ITU-T Study Group 3 (see ITU-T Recommendation D.50).

3.10 In reviewing these factors, it seems likely that the pressures and incentives to shift towards IP Telephony will vary among economies at different states of development and with differing degrees of market competition.

- In countries where **prices for international traffic are high**, the main opportunity for IP Telephony will be for price arbitrage of simple voice transmission. In many of these countries, however, outgoing IP Telephony is banned. Thus, the main form of IP Telephony is for incoming traffic. Even though the use of IP Telephony for incoming traffic may be no more legal than for outgoing traffic, it is harder to detect and block. Countries that ban IP Telephony are also creating significant disincentives for the deployment of other IP Telephony service such as click-to-talk, unified communications and speech-enabled access to Internet content that could be important sources for new revenues and for new ways of reducing the digital divide.
- In countries where **prices for international traffic are falling**—for both retail (consumer) and wholesale (settlement) rates—IP Telephony traffic may already be playing a role in promoting price competition (as, for instance, in Hungary or Thailand) or in providing an alternative to the services of the fixed-line incumbent (as, for instance, in Colombia). However, a critical factor is how easy it is for subscribers to use the service. In Peru, for instance, the success of IP Telephony was partly based on the availability of a telephone-like device (Aplio) that could use either IP-based networks or the PSTN for establishing calls. In these countries, operators, especially incumbents, may also attempt to offer IP Telephony services such as click-to-talk, unified communications and speech-enabled access to Internet content in order to generate new revenues sources in the face of increased competition.
- **In countries where prices for international traffic are already low, due to the effects of competition, IP Telephony is likely to be important for reasons other than price arbitrage. The market opportunity for IP Telephony is likely to lie, on the one hand, in the prospects of value-added integrated services for users and, on the other hand, cost reductions for PTOs. As an example of the former, in the United Kingdom, *yac.com* offers a service for personalised numbers and automated call forwarding via the Internet. As an example of the latter, the *BT/AT&T* joint venture, *Concert*, is building a new managed IP-based global network to deliver services, such as electronic commerce and global call centres, to link some 90 cities worldwide. Even though the required investment is of the order of US\$1 billion per year, an integrated IP network is considered to offer the most cost-effective solution for handling multiple traffic streams.**

3.11 To better evaluate the interplay of these factors, it would be of assistance to Member States and Sector Members to further develop the following:

- 1. a reliable empirical analysis of the current price advantage that Internet Telephony enjoys over PSTN services**
- 2. a comparison between the cost structure aspects of IP-based networks and Internet Telephony and their individual components, and traditional telecommunications networks.**
- 3. a better understanding of some of the more innovative IP Telephony services, how they can assist operators prosper in the face of increased competition, how they impact Internet infrastructure build-out and how to create incentives so that these innovative services may be used to increase access, foster network build-out and reduce the digital divide.**

Substitutability and traffic migration

3.12 A further economic issue raised by IP Telephony is that of substitutability between services. Clearly, much of the traffic carried over PC-to-PC Internet Telephony will be “new” traffic, which would not otherwise have existed on the PSTN. Much of the discount traffic generated over PC-to-Phone services is also likely to be new traffic, especially that which is offered “free of charge”, for instance by companies such as *DialPad.com* or *phonefree.com*. But some of this traffic, and the majority of calls carried over Phone-to-Phone services, might otherwise have been made over the PSTN, and could therefore be regarded as substitute traffic. The cheaper prices generally available for IP Telephony may spur higher growth rates in traffic, where demand is elastic. IP Telephony will also spur additional traffic on local and long-distance networks. In the longer-term, as PTOs move their backbone networks to an IP-based platform, the issue will become one of traffic migration, rather than substitution. Thus, some countries consider that the development of common strategies for migration from circuit-switched to IP-based networks would be of assistance to Member States and Sector members, especially for developing countries.

Impact on Member States and Sector Members

3.13 IP-based networks arguably represent the future for the telecommunications industry. Therefore, investment in IP-based networks may be regarded as an investment in the future, irrespective of the state of economic development of a particular Member State. The business case for investment in IP would rarely be based on the potential of IP Telephony alone, but rather on the wider potential of IP-based networks to carry data, text and video traffic as well as voice. Future mobile networks, like fixed-line networks, are likely to be based on IP technology. Thus those Member States that choose to ban the use of IP technology for carrying voice may be blocking the technological migration path of national operators and new entrants.

3.14 Some Member States have chosen to promote the Internet for text and data services, but not for voice. Their objective may be to protect the incumbent operators from potential competition. The risk in such an approach however, lies in the fact that those operators may be ill-prepared for operating in the future global environment. The PTO of the future may “own” the customer, in terms of providing billing and customer care support, and may “own” the local network, in terms of providing origination and termination of calls. However, it is unlikely to be able to “own” or control the types of application that the customer chooses, and IP Telephony might be better viewed as an application rather than a service.

3.15 Operators have traditionally used profitable long-distance and international services to cross-subsidise the functions of network access and local calling. In increasingly competitive markets, such hidden cross-subsidies can no longer be sustained. In the future, operators will need, instead, to address new challenges that may require substantial tariff rebalancing and a greater reliance on locally generated revenues.

3.16 While IP Telephony may bypass certain parts of an operator’s network, it will not take away the need for local networks. Indeed, insofar as IP Telephony is a new “killer application” and makes access to the Internet even more popular, it will actually increase the

volume of local calls and the demand for second lines. Already, in some Member States, as much as a third of all local calls are to the Internet and around 15 per cent of all local lines are used primarily for Internet access. Furthermore, dial-up Internet access is on a steeply rising curve while international traffic growth is slowing down. Competition will drive prices closer to costs and, where IP Telephony offers the lowest cost alternative, it will be the preferred solution.

3.17 3.17—For Sector Members that are equipment vendors, the development of new IP-based product lines is likely to be essential to future growth and profitability. In developed country markets, demand for circuit-switched network technology has declined steeply and although demand in developing countries remains strong, this cannot be expected to continue indefinitely. Third generation mobile networks (IMT-2000), which are –also IP-based networks, offer vendors additional opportunities to offer new products.

3.18 It is also important to consider the impact IP Telephony is having on build out of the global Internet infrastructure and on traffic patterns, issues that are of great interest to ITU members. Initially, when most of the IP Telephony gateways were deployed in the United States, the IP Telephony traffic patterns probably mirrored in some ways the traffic patterns of traditional telephony – i.e. it was U.S.-centric because of the lack of advanced IP Telephony infrastructure outside of the United States. For example, an IP telephony call between two developing countries would often have to be routed through one or more U.S.-based gateways for billing, administrative, other technical considerations. As a growing number of IP Telephony gateways, and especially more advanced gateways, are deployed outside of the United States, the traffic patterns are likely to become less U.S.-centric and reduce the amount of IP Telephony traffic that transits through the United States. The deployment of these gateways and IP Telephony infrastructure is also increasing the demand for higher quality and lower cost IP connectivity in many countries. As this demand increases, IP backbone operators and carriers have greater incentives to further invest and improve IP networks around the world. It is also important to recognize that the deployment of the IP Telephony gateways and infrastructure were initially largely done by the smaller, pioneering IP Telephony operators and not the larger traditional carriers. These deployments have now further accelerated as a result of larger carriers embracing Internet and IP Telephony. —[EDITORIAL NOTE: Similar text to this is suggested for the technology section. It is relevant here because the discussion touches on the impact of IP telephony on network build-out, members and sector members.]

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4. POLICY AND REGULATORY ISSUES FOR IP TELEPHONY

Introduction

4.1 This section discusses the different policy and regulatory approaches that Member States have taken to IP Telephony, and the methods used to categorize it within those frameworks. The significance of IP Telephony for convergence, universal service schemes, and cross-border issues is also considered.

4.2 IP Telephony is treated in a range of different ways within ITU Member States. Some allow or do not regulate it, others prohibit it, while some apply a range of controls and restrictions, either through licensing or other regulatory tools. It should be noted as well that this issue arises within the context of a period when many Member States are lightening their regulatory regimes for telecommunications and moving to a greater reliance on competition policy to ensure a level playing field in telecommunications markets, as opposed to sector-specific regulation.

4.3 Within these broad policy frameworks, IP Telephony raises a number of specific questions for policymakers and regulators, that require a careful and informed balancing of different and sometimes competing interests. Where does IP Telephony “fit” within

telecommunication regulatory regimes, if at all? How should the rights and obligations of IPTSPs compare with those of traditional telephony providers, many of whom are subjected to common carriage regulations and universal service commitments? Should Internet Telephony, VoIP, and PSTN voice-traffic be treated the same way, or differently? Should IPTSPs be required to hold a license as most traditional voice telephony carriers do? Or should IP Telephony be viewed as an emerging technology offering new services and applications that could best develop with minimal or no governmental regulation?

4.4 To explore these questions, this section attempts an approximate categorization of the different ways in which IP Telephony is presently treated in many Member States and the factors that have been considered by national policy-makers. It provides illustrative examples of some of the different national approaches. As background, the tables in Annex B classify the approach to IP Telephony taken by certain Member States, based on their responses to a recent ITU regulatory questionnaire.

Policy objectives

4.5 As a threshold matter, it is useful to set forth possible government policy objectives for IP Telephony that could or should form the basis for any regulatory approach that is adopted. These objectives, which could also form the parameters for a cost/benefit analysis of any policy, would include:

- Universal Service/Universal Access
- Affordable telecommunications services
- Tariff re-balancing
- Ensuring a level-playing field for competitors and new entrants
- Promotion of new technologies and services
- Stimulating investment in network build-out and new services
- Impact on revenue streams of incumbent operators
- Technology transfer
- Human resource development
- Economic growth as a whole and in particular in the communications sector.

The general picture

4.6 At present, three broad national policy approaches emerge:

- First, there are countries that include IP Telephony within their regulatory system or which do not regulate IP Telephony;
- Second, there are countries that prohibit IP Telephony;
- Lastly, there are countries where the situation is uncertain or the issue remains to be formally addressed.

4.7 This latter group of countries, where there is no specific policy on IP Telephony, constitutes the majority of ITU Member States. As can be seen from Table B, countries have taken widely differing regulatory approaches, which may be related to different prevailing market conditions or degrees of liberalization. It is important to note that it is the service component, i.e., voice telephony *service* delivered by means of the Internet or IP-based networks, which is most frequently the subject of policy, not the use of IP *technology* itself.

4.8 Prohibitions on IP Telephony are mostly found in developing countries and this may be linked to concerns that this service or application can divert revenues from the incumbent operator, as discussed in sections three and five. Many countries that have retained telecommunication monopolies do not specifically prohibit IP Telephony. However, it is likely that they would not allow any company other than the incumbent PTO to provide it. It is possible, however, as a practical matter, that IP Telephony (or at least PC-to-Phone services)

may be permitted in these countries because it is not considered voice telephony at all, and therefore not a competing service.⁴⁶ However, reliable, reasonably high-speed access to the Internet is required for tolerable outgoing PC-to-Phone service, and this is often not widely available in developing countries. Consequently the issue of termination of incoming international calls is the more significant aspect of IP Telephony for many developing countries.

4.9 There are different rationales underlying the policies of those countries that either do not regulate IP Telephony or have chosen to include it within the regulatory framework for telecommunications. This approach may be motivated by a desire to encourage and stimulate emerging technologies linked to concerns about imposing regulations on technologies that are not fully mature. IP Telephony may be viewed as exerting downward competitive pressures on telephone tariffs and thus consistent with consumer welfare. Limitations placed on IP Telephony may also be seen as inconsistent with approaches designed to stimulate the deployment and migration to IP-based networks. Lastly, regulators in these countries may be hesitant to intervene in new markets unless there is evidence of a market failure.

License restrictions

4.10 Licensing is one of the principal means by which telecommunications authorities address the question of IP Telephony. Terms and conditions in existing licenses can be interpreted as either prohibiting or permitting such service offerings by new market entrants. Indeed, in non-competitive markets, the license of the incumbent operator may be viewed as precluding new market entrants from offering IP Telephony. On the other hand, a few countries expressly license PTOs to provide IP Telephony.

Regulatory distinctions

4.11 In countries that have policies on IP Telephony, it is possible to identify a number of factors which are used to distinguish IP Telephony from other, usually reserved or licensed, telecommunication services. In making the determination as to whether a particular service constitutes, or should be classified with, traditional voice telephony, a number of different regulatory distinctions are employed, alone or in combination, by many countries. Among the most commonly-used distinctions are type of service, voice versus data, mode of transmission, facilities-based operators versus resale and quality of service. These, and other distinctions, are discussed below.

Type of service

4.124.12—In countries that have IP Telephony policies, some regulators are explicitly or implicitly drawing distinctions between PC-to-PC, PC-to-Phone and Most national IP Telephony policies specifically refer to Phone-to-Phone services. PC-to-Phone and PC-to-PC services tend to be prohibited in those countries that prohibit IP Telephony generally, while they tend to be permitted without condition in countries that permit some or all forms of IP Telephony. A significant number of countries, such as the United States, most members of the European Union, and Singapore allow all forms of IP Telephony services to be provided with minimal or no regulation and or licensing requirements.

Calling-card services are rarely treated separately in policies. Rather, they are rolled in with other forms of Phone-to-Phone service, since the difference is largely one of marketing and billing, rather than technology. It should also be noted that, for many countries, information simply is not available as to whether or not incumbent PTOs are employing IP Telephony and if so, whether by right of their existing licences, or under special authorization. Some PTOs may simply assume that their international franchise allows them to use IP Telephony, should they decide to pursue it, as a cost-saving measure or to offer a discounted service.⁴⁷

⁴⁶ Hungary is an example of a country where IP Telephony has been defined by the regulatory authorities in such a way as to fall outside the legal monopoly of the fixed-line voice incumbent.

⁴⁷ For instance, Telecom Egypt concluded exclusive agreements to offer IP Telephony within Egypt in 1999 without seeking clarification as to whether this was covered by its license.

4.13 Another aspect of type of service is the target audience for the service. Some regulators allow VoIP providers to be treated differently depending on whether or not they provide their service directly to end users, or just to other service providers.

Voice or data

4.14 Another, and perhaps the most important regulatory distinction in many countries, is whether IP Telephony constitutes voice or data. IP Telephony services can, in some cases, achieve a level of functional equivalence to traditional telephony services, making the means of transmission irrelevant to the user. Still, the voice/data distinction is often used as a definitional tool to implement policy even though some argue that this distinction is becoming less sustainable as IP Telephony technology and operators are creating new services that integrate voice with the Internet, data services and other media.

4.15 The Internet, which started as a text and data network, has been treated in most countries as something other than traditional telecommunications. The trend has been in favour of little or no regulation of Internet services, even while traditional voice services are subject to extensive (albeit increasingly targeted) regulation. The reason is that Internet traffic is considered in many Member States, for regulatory purposes, as data traffic, even though in some forms (e.g., dial-up Internet sessions), the bits actually pass over PSTN circuits. Once voice became one of the applications that can be provided over the Internet, one argument for treating it differently was that it is simply another form of Internet data. Hence the regulatory advantage of Internet Telephony over VoIP—being treated as something other than voice, even though voice is the actual functionality being offered.

Mode of network transmission

4.16 Policies may also vary depending upon whether IP/PSTN conversion takes place (i.e., whether there is a service provider) and, if so, where. In Phone-to-Phone services, the initial conversion of speech from circuit-switched mode to IP mode generally takes place on the premises of a service provider, particularly in the case of calling-card services. In PC-to-PC and PC-to-Phone services, the initial conversion takes place at the user's PC, such that there is often no requirement for a service provider to be located in the same country as the user. The location of the ISP can be important, since commercial presence is usually a precondition for regulation in many particular countries.

4.17 Another case is where a given call does not use the domestic PSTN, but goes from a private data network to an IP gateway and then over international Internet links. Thus the local PSTN has not been "used." Regulation relating to basic telephony often focuses on the local access network. If that network is not used, then the service in question may not in fact be considered a basic telecommunication service at all.⁴⁸

Quality of service

4.18 Another means to distinguish IP Telephony is the question of whether or not it provides "real time" communications similar to traditional telephony. This is a technical measurement of whether the service provides instantaneous, two-way transmission of speech. If not, the service is often not considered voice telephony, but rather a store-and-forward or messaging service. The latter is often considered to be a "value-added" or "enhanced" service, which have traditionally been subject to little or no regulation. The difference between real-time and store-and-forward may be measured in milliseconds as a technical matter, but is usually left undefined as a legal matter. From the consumers' perspective, there may be a benefit in having an increased choice of different prices for different quality of calls.

4.19 Since Internet Telephony signals, transmitted over the public Internet, generally involve several conversion steps and face unpredictable traffic conditions, and as a result

⁴⁸ In the United States, policies generally distinguish between the Internet and other IP-based networks as the underlying means of transmission for IP Telephony calls. This can make the difference between a service being characterized as an Internet service, or simply another form of resale provided by means of a different technological platform.

suffer levels of delay not generally experienced with circuit-switched telephony, they might not be considered to meet the criteria of “real time” communications. However, improvements in VoIP over private, managed IP-based networks may reduce the delay to a point at which such communications could reasonably be considered to be “real time”. Furthermore the delays involved in IP Telephony might typically be the same or shorter than those experienced in satellite telephony, and the sound quality may be comparable with mobile telephony. Thus, technical quality of service measurements that are defined to exclude IP Telephony may also unintentionally exclude other types of voice telephony from regulation. In addition, as other media such as radio and other IP Telephony services use the Internet as a way to transmit voice- and as Internet QoS improve, the use of the “real time” criteria may not be sustainable as a long-term regulatory criteria to distinguish between circuit-based and IP Telephony. Critics of the using the “real time” criteria argue that there are significant additional technological and cost differences between circuit-based telephony and IP Telephony that justify treating IP Telephony differently, especially when it is provided by non-incumbents.

4.20 ITU-T Recommendation G.114 (2.96 revision) (One-way Transmission Time) establishes the following technical parameters for satisfactory telephony (footnotes omitted):

“[T]he ITU-T *recommends* the following limits for one-way transmission time for connections with echo adequately controlled, according to Recommendation G.131 (*Stability and Echo*):

- **0 to 150 ms:** Acceptable for most user applications.
- **150 to 400 ms:** Acceptable provided that Administrations are aware of the transmission time impact on the transmission quality of user applications.
- **above 400 ms:** *Unacceptable for general network planning purposes; however, it is recognized that in some exceptional cases this limit will be exceeded.*”

Special categories

4.21 In some countries, mobile operators are given special rights to use IP Telephony to route international calls, allowing them to bypass the incumbent’s international gateway for incoming or outgoing calls, or both. Other countries restrict the right of mobile operators to offer or provide IP Telephony.

Functional equivalence

4.22 Functional equivalence is a regulatory concept that is implicitly used by some countries to link some or all of the above criteria in developing a policy as to whether some forms of IP Telephony should be treated on the same basis as conventional switched telephony. The premise for this approach is that similar or equivalent services should be treated in a similar way.

4.23 On this basis, functionally equivalent services should be subject to similar regulatory requirements, unless other policy imperatives take precedence. In determining “functional equivalence”, policy-makers look at such criteria as the quality of service, the nature of the service and service provider, the transmission networks used and such other factors as whether the service is offered to the public. Where the type of IP Telephony service under review is such that an ordinary telephone or mobile phone can be used as the originating or terminating terminal device, the service is offered to the public, the PSTN is involved at some point and there is an acceptable technical level of call quality, then there is a reasonable basis for concluding that it is functionally equivalent to traditional telephony.

4.24 Accordingly, a possible decision path for establishing or assessing functional equivalence, and to determine whether or not regulation is advisable, would look at the following factors:

1.3. Is speech transmitted with significant average delays—which render conversation difficult?

2.4. What is the originating and/or terminating terminal device?

3.5. _____ Is the PSTN used on the originating end, other than in the course of a dial-up Internet sessions?

4.6. _____ Is the service available for use by the public?

Technological Neutrality

4.25 Technological neutrality is a principle that is often invoked by policy-makers and regulators when addressing IP Telephony and other emerging communications technologies. However, there are a range of understandings of this concept and it has been implemented in different ways in Member States. The concept is particularly pertinent with respect to the difference between VoIP and Internet Telephony, since the former is more likely to approximate conventional voice telephony than the latter.

4.26 One view of technological neutrality is linked to the concept of functional equivalence and provides that a basic public telephone service, even if provided over an IP-based network, should not escape from justified regulation. The definition of the voice telephony service must be based on functional criteria (e.g. transport and switching) that can be evaluated independently of the technologies used. Applying equal regulatory treatment to roughly equal services is seen as a means to neither favour nor disadvantage new or legacy technologies. As a result, appropriate telecommunication regulations might be applied to services such as IP Telephony that approximate traditional telephony. For example, regulations on emergency number services would be applied to all operators providing voice services, regardless of the technology used.

4.27 Another view is that policymakers and regulators should not be indifferent to technology. Emerging technologies might benefit from a “window”, i.e. a form of regulatory asymmetry during a transitional phase, which would allow them to develop and grow outside traditional obligations. This approach may enable small and medium-sized enterprises, offering new technologies and services, to provide competition for traditional industry operators and foster market-based results. If or when market failures arise, competition policy could be employed to reduce bottlenecks or curb abusive practices, without the need for sector-specific regulation or definitions and classifications that may quickly become outdated.

4.28 Efforts to develop a common approach to technology-neutral regulation or treatment within the ITU membership, based on a fuller explanation and understanding of this concept as it applies to the provision of functionally equivalent public voice telephony services, would seem to be a positive step toward fostering a global climate conducive to the use of IP-based networks and applications. This would not mean that all communication services should be subject to the same level of regulation, but would help avoid ineffective or conflicting applications of this principle. Efforts could be made to determine those circumstances under which technological neutrality is viable (e.g., where there is a high degree of product or service substitutability), and to examine whether ‘identical’ as compared to ‘similar’ approaches are required.

Convergence and IP Telephony

4.29 Technology analysts have been suggesting for several years that all forms of communications will eventually merge onto one platform, and in recent years IP appears to have emerged as the unifying platform. With PTOs and broadcasters entering each others’ markets in many countries, and mobile operators shifting to IP platforms as they develop third generation systems, regulatory structures the world over are being pressured to adapt. At the same time that the regulatory framework for telecommunications is being streamlined and lightened, convergence raises the issue of whether existing or new paradigms should be applied to new telecommunications platforms and the continued suitability of sector-specific regulation.

4.30 One of the key issues in telecommunication markets that have been opened to competition has been the terms for interconnection among all local service providers. It is conceivable that some IPTSPs may seek the benefits of licensed local provider status, such as interconnection rights, numbering resources, and access to essential facilities such as directory listings. This is already the case, for instance, in the United Kingdom. IP Telephony rides on top of the PSTN, in the sense that calls are sometimes originated and almost always terminated on the PSTN, but are not fully integrated with it. The question of whether the public interest *requires* that ISPs (and IPTSPs) interconnect with each other may also arise in the near future.⁴⁹ Another approach to this issue is to apply domestic competition laws, and relevant doctrines developed under such laws concerning essential facilities, as part of a pro-competitive policy designed to establish a level playing field.

4.31 An important aspect of this issue is access to unbundled elements of the “local loop”. In many ways, local competition has proven to be the most complex regulatory undertaking in liberalized telecommunication markets. The integration of Internet and IP-based services with incumbent and new entrant circuit-switched networks will make the local environment even more complex. The inherently international nature of the Internet, in turn, will make international cooperation on such matters essential.

4.32 IP Telephony may also be considered as part of a broader process of deploying IP-based networks around the world. It is unlikely to be cost effective to develop IP-based networks solely for the carriage of voice, but rather as part of a strategy to develop a full-range of multimedia services. For countries that would seek partners to build such networks, developing best practices for creating favourable market conditions for investment and installation of IP-based networks need to be addressed.

Impact of IP Telephony on Universal Service schemes

4.33 It is widely perceived that market solutions will not ensure the expansion of networks to economically less viable regions and areas and thus universal service/access obligations and funding are a common element of national telecommunications polices.

4.34 The asymmetric regulation of voice and data services naturally creates an incentive for arbitrageurs to develop the capability to bypass the PSTN, and thereby avoid the costly regulatory obligations that are associated with voice traffic, in particular contributions towards implicit cross-subsidies or explicit universal service funds, or both. This can make offering international services profitable for small PTOs, or give larger PTOs crucial cost savings in extremely competitive markets. This incentive is particularly high where outgoing traffic exceeds incoming traffic and/or where universal service obligations are significant.

4.35—A positive policy towards IP Telephony may be designed to encourage the development of the Internet and the growth of small and medium-sized companies in a particular country. However, such a policy may not be entirely consistent with traditional universal service/access funding mechanisms goals due to the fact that most commercial IP Telephony traffic travels over private IP networks, and not the public Internet at all, for quality reasons. Thus, such a policy might do little to increase Internet access, while facilitating the bypass of universal service funding schemes designed to increase the accessibility of the very telephone lines most often required to access the Internet in the first place. However, it should also be recognized that the impact of IP Telephony on universal service is highly dependent on how universal service is funded in each country. For example, some IP Telephony carriers lease PSTN and IP connectivity from carriers which in countries that have transparent and pro-competitive universal service funding mechanisms based on carrier revenues means that IP Telephony companies are indirectly increasing universal service funding by increasing the revenues of companies directly subject to universal service funding requirements.

4.36 IP Telephony is being used more and more to offer functionally equivalent services without the regulatory burdens associated with providing traditional voice telephony. While this is good for

⁴⁹ In Chile, for instance, IPTSPs are required to offer interconnection. It is to be noted that the WTO Agreement on basic telecommunications and the Reference Paper on telecommunications only place the obligation for interconnection upon “major suppliers”.

competition, and therefore good for consumers, it can render some universal service funding mechanisms increasingly unsustainable and subject to challenge. At a few countries have responded to this challenge by subjecting providers of IP Telephony that is equivalent to other forms of telephony are required to contribute, on a non-discriminatory basis, to universal service funds.⁵⁰ Thus, two basic questions are whether calls on one technological platform (e.g., IP, Frame Relay or ATM-based) should be treated differently from calls on another when it comes to universal service obligations and whether imposing universal service obligations on IP Telephony may undermine innovations introduced by IP Telephony that may help increase access to communications and information.

4.37 For some developed countries, this issue might become more acute if the definition of universal service is broadened to include Internet access and applications, which would increase the funding requirements. One option would be to broaden or redefine the category of providers that must contribute to universal service, while another option would be to consider alternative bases to generate financing for universal service, and a final option would be create incentives for IP Telephony providers to enter their markets if they help build out the IP infrastructure and offer innovative IP Telephony services that may help operators lower costs and/or benefit underserved areas or communities.

4.38 IP Telephony can also be a helpful tool for attaining universal service/access objectives. IP-based networks, depending on the situation and circumstances, can provide lower-priced alternatives to circuit-switched networks, and thus may provide a less costly alternative when expanding or building new capacity. In addition, IP Telephony services/applications such as unified communications and voice-enabled Internet access (previously described) may also create new, easier and more affordable ways for underserved populations to communicate and obtain information— especially those who cannot afford to pay for a phone and a computer to access the Internet (—e.g. people living in high cost areas, people with disabilities and/or people who are not computer—literate or have lower literacy levels). Further studies of the comparative costs of building IP-based networks and of these new services that may increase access would serve to develop this point and could provide a helpful checklist for policy-makers when making decisions on expanding national networks. In addition, to the extent that IP Telephony offers lower cost calls and increase communications resources and options to underserved populations, this may facilitate and increase the access that lower-income citizens have to basic telephony services.

4.39 Increasing access to the Internet is a policy goal in most countries, and low-cost long distance and international voice services can be easily added to the range of Internet services already available at community telecentres. Such services would not necessarily compete with an incumbent's existing business, and could be used as an interim strategy to provide easy and affordable access to those without a telephone in their home.⁵¹

Cross-border issues

4.40 The treatment of Phone-to-Phone IP Telephony may have implications for the international telephony market. IP Telephony may serve the public interest in the originating country by placing significant downward pressure on international settlement rates and consumer prices. In the terminating country, it may serve to introduce an alternative calling option, even though policy-makers have otherwise decided to restrict or prohibit competition. In addition, IPTSPs may benefit from a lighter regulatory approach than that imposed on incumbent PSTN operators. Where a liberalised approach in the originating country conflicts with clear and restrictive policies in foreign markets in which the services are terminated, it might be useful to have a means to address such difficulties, while respecting the sovereign rights of Member States.

4.41 Different approaches to the concept of technological neutrality and its implementation may create uncertainties among investors as to the regulatory climate and can impede the global expansion of IP-based networks and IP Telephony. For that reason, the principle of comity and attempts to develop common understandings of these concepts can serve to foster the development of seamless global networks. By ensuring

⁵⁰ This is the situation in Canada, where a test of functional equivalence is applied and it is a policy objective in Nepal.

⁵¹ See the information on public Internet access centres in Peru in the ITU-commissioned case study available at <<http://www.itu.int/osg/sec/spu/ni/iptel/countries/peru/index.html>>.

that competing technologies are neither advantaged nor disadvantaged at the global level, opportunities for diversity, flexibility and innovation in the supply of services would be encouraged.

4.42 More generally, an assessment could be made as to the extent, if any, to which some forms of IP Telephony are or should be subject to international agreements and procedures, such as the numbering plan or conventions on routing traffic and settling accounts, that apply to traditional international telephony. Finally, as discussed in section 2, interoperability of IP-based networks and the development of necessary global technical standards are an important cross-border concern.

5.6. the development dimension and human resource development issues

The digital divide and bypass

5.1 Of those developing countries that have adopted a specific policy towards IP Telephony, many have chosen either to ban it outright, or to restrict its provision to the incumbent PTO.⁵² Relatively few developing countries that have monopolistic telecommunication structures have taken a liberal approach to IP Telephony, though China is a major exception. In China, after a period during which IPTSPs were blocked and even jailed, IP Telephony has now been adopted by each of the major licensed international operators and they have been permitted to provide nationwide and international IP Telephony services. In China, IP Telephony has permitted the earlier introduction of competition than might otherwise have occurred and this has prompted a significant reduction in prices for international calls.

5.2 The position of those developing countries that ban or limit the provision of IP Telephony may benefit from a period of reassessment, if it is concluded that IP Telephony promises to bring lower call prices and make services more accessible, both of which are goals in the battle to narrow the digital divide. While most developing country governments have been supportive of IP-based networks in general, and the Internet in particular, they have often been hostile to IP Telephony. Consequently, ISPs in these countries have been deprived of a potentially valuable revenue source, and this may slow Internet development. In some cases, ISPs have been requested to block access to specific websites, based in foreign countries, which offer free-of-charge IP Telephony calls. As more websites integrate voice applications, such bans will become more difficult to enforce and the result may be that application service providers and website developers in developing countries are less able to compete with those in countries where IP Telephony is liberalised.

5.3 While some developing countries have chosen to limit outgoing IP Telephony calls, and the advertising of those services, they have often been unable to limit incoming IP Telephony calls. One of the main motivations for PTOs to route traffic via IP-based networks is to reduce the level of settlements that are due to partner countries. Under the international settlements system, the PTO(s) in the country where a call is originated make a compensatory payment to the PTO(s) in the country where the call is terminated. Payments are made when traffic in one direction is greater than traffic in the return direction. The level of payment is based on bilaterally negotiated "accounting rates". A net settlement payment is usually made on the basis of excess traffic minutes, multiplied by half the accounting rate (the accounting rate share, or settlement rate). The accounting rate system is undergoing reform, and new systems for the settlement of traffic accounts are being developed. Nevertheless, accounting rate traffic still accounts for a considerable proportion of the 20 per cent or so of international traffic that either originates or terminates in a country that retains a monopoly.

5.4 Net settlement payments, primarily from developed countries, have grown larger as traffic flows have become less balanced⁵³. PTOs that send more traffic than they receive have

⁵² In India, for example, the 1999 National Telecom Policy states "Internet telephony shall not be permitted at this stage. However, Government will continue to monitor the technological innovations and their impact on national development and review this issue at an appropriate time".

⁵³ ITU estimates that, during the 1990s, net flows of settlement payments from developed to developing countries, amounted to some US\$50 billion. See, for instance, the analysis in ITU/TeleGeography Inc. "Direction of

an incentive to develop alternative routing procedures. They do this to avoid having to make settlements based on above-cost accounting rates and instead pay interconnection fees, based on local call rates. Some developing countries fear that, if an increasing share of their incoming traffic is routed over IP-based networks, then settlement payments will be reduced. They are concerned that reduced settlement revenues will endanger their ability to roll-out the basic telecommunications infrastructure, and hence to narrow the digital divide.

5.5 Net settlement payments have been declining worldwide since the mid-1990s, and arguably this would have happened even without IP Telephony. This trend is principally the result of increased competition and pressure from countries that make net settlements. Markets for international calling are shrinking in value as, on the one hand, prices fall sharply and, on the other hand, traffic is routed via least cost routes and settlement rates are forced downwards. This market change is particularly affecting those PTOs that have traditionally relied upon revenues from international service to cross-subsidise their local access networks. It is forcing the pace of tariff rebalancing. Nevertheless, many PTOs in developing countries are embracing IP Telephony, and bearing the consequences of reduced per-minute revenues from long-distance and international services, rather than risk missing the opportunity to generate revenues in future IP-related growth areas⁵⁴.

5.6 IP Telephony thus presents a dilemma for developing countries, especially for their incumbent PTOs:

- On the one hand, it promises to reduce the price of international telephone calls, for instance, enabling residential customers to make calls to relatives living abroad that might otherwise be too expensive, and enabling business customers to participate more effectively in the global marketplace. IP Telephony may also result in increases in traffic and network usage and provide another means for PTOs to tap into in new markets outside their country. IP Telephony may also reduce the cost of deploying domestic infrastructure and may introduce innovative technologies and services that will increase the ability of underserved communities to communicate and access information.
- On the other hand, IP Telephony could be viewed as a threat to undermine the pricing structure of the incumbent PTO and undercut its profitable business in originating and terminating international calls. IP Telephony might also reduce the revenues available to the PTO to invest in extending the domestic network or in meeting its universal service obligations.

Human resource development issues

- a. 5.7—Over the last two decades, PTOs around the world have shifted from analogue to digital networks. This has required the development of a new set of skills among their staff. ITU Member States and Sector Members have frequently worked together to facilitate the transfer of technology, human resources development and network maintenance, to the benefit of developing countries. The shift from circuit-switched to IP-based networks is equally as fundamental as the shift from analogue to digital and requires similar co-operative arrangements among ITU Members. Because the change coincides with the advent of more competitive markets, and because IP skills are frequently in short supply, many developing country PTOs fear that they will be left behind. As developing country PTOs are often major employers and revenue generators in their respective countries, this makes the need for assistance in human resources development even more critical.**

Traffic: Trading Telecom Minutes”, ITU, Geneva, October 1999, 347 pp, available at: <http://www.itu.int/ti/publications/DOT99/index.htm>.

⁵⁴ These PTOs include *Telecom Egypt*, *GamTel* (Gambia), *Matav* (Hungary) and *CAT* (Thailand).

b. EDITORIAL NOTE: We suggest inserting a paragraph describing how IP Telephony and other companies that enter in agreements with foreign partners are training a significant number of their partners staffers on IP Telephony technology, management, etc. These de-facto and on-the-job training programs are transferring a significant amount of knowledge and expertise to developing countries. In some cases, incumbent carriers and service providers in developing countries enter into agreements with IP Telephony companies in large measure in order to determine the effectiveness of IP Telephony and to develop in an affordable manner initial expertise before fully committing to developing their own IP Telephony networks. Private sector companies have also established in-country and remote training programs that use video and audio conferences as well as web-based training tools. Furthermore, a significant number of the highly-valued core technical staff of IP Telephony companies are from many countries – staffers that often return to their home countries to establish or manage IP Telephony networks and companies. In sum, while there remains a significant need for more human resource development in developing countries, the report should recognize the importance of these private sector initiatives and perhaps foster more of these initiatives.]

5.8 Education and training are primary determinants of a country's prospect for economic and human development and international competitiveness. As well as a need for IP-based skills among a country's service providers and manufacturers, there is also a need for training for those involved in regulatory and policy functions, and awareness-raising among the user community.

5.9 Council Decision 498 asked that the WTPF consider actions to assist Member States and Sector Members to adapt to changes in the telecommunication environment due to the emergence of IP Telephony, including analysing the current situation (e.g., by case studies) and formulating possible cooperative actions involving ITU Member States and Sector Members to facilitate adaptation to the new environment. The Decision also invites the WTPF to consider actions to assist Member States and Sector Members in meeting the human resource development challenges presented by new telecommunication technologies such as IP Telephony, in particular, skills shortages and the need for education, and technology transfer.

5.10 Possible elements for an action plan for meeting the human resource development challenges raised by IP Telephony are:

- Upgrading of technical skills for staff through training, seminars, workshops and tutorials amongst Member States and Sector Members.
- Identify, publicize and foster private-sector led technical training opportunities and initiatives
- Sharing of pilot project and developmental activities amongst Member States and Sector Members.
- Exchange of skilled manpower amongst Member States and Sector Members.
- Setting up of a separate fund for HRD development.
- Encouraging the sharing of knowledge and skills among Member States, industry players and policy makers and regulators.

Annexes: Annex A Council Decision 498.
 Annex B Status of IP Telephony in ITU Member States.
 Glossary of Acronyms

Annex A

DECISION 498

Third World Telecommunication Policy Forum

The Council,

considering

Resolution 2 of the Plenipotentiary Conference (Minneapolis, 1998), on the maintaining of the Policy Forum in order to discuss and exchange views and information on telecommunication policy and regulatory matters, especially on global and cross-sectoral issues,

noting

- a) the Report of the Secretary-General, as contained in Council Document C2000/3;
- b) the experiences gained from the previous Policy Fora, on Global Mobile Personal Communications by Satellite (1996) and on Trade in Telecommunications (1998),

considering further

- a) that Internet Protocol (IP) Telephony is one of the topics of high-current interest to ITU Member States and Sector Members;
- b) that the development of IP Telephony also has significant implications for several domains, particularly for human resource development, especially in developing countries,

decides

1 to convene the third World Telecommunication Policy Forum in Geneva from 7-9 March 2001 in order to discuss and exchange views on the theme of Internet Protocol (IP) Telephony, with the following draft agenda:

- a) the general implications of IP Telephony for the ITU membership with respect to:
 - the telecommunications policies and regulations of ITU Member States;
 - the implications of IP Telephony for developing countries, particularly with respect to policies and regulatory frameworks, as well as technical and economic aspects;
 - the impact of IP Telephony on the operations of Sector Members, notably in terms of the financial challenges and commercial opportunities it presents;
- b) actions to assist Member States and Sector Members in adapting to the changes in the telecommunication environment due to the emergence of IP Telephony, including analysing the current situation (e.g. by case studies) and formulating possible cooperative actions involving ITU Member States and Sector Members to facilitate adaptation to the new environment;
- c) actions to assist Member States and Sector Members in meeting the human resource development challenges presented by new telecommunication technologies such as IP

Telephony, in particular, skills shortages and the need for education, and technology transfer;

2 that the Forum shall draw up a report and, if possible, opinions for consideration by ITU Members and relevant ITU meetings;

3 that arrangements for the third WTPF shall be similar to those of the previous Fora. In particular:

- a) discussions shall be based on a report from the Secretary-General, incorporating the contributions of ITU Member States and Sector Members, which will serve as the sole working document of the Forum, and shall focus on key issues on which it would be desirable to reach conclusions;
- b) the final report of the Secretary-General shall be circulated at least six weeks before the opening of the Policy Forum;
- c) the report of the Secretary-General shall be developed in the following manner:
 - i) the Secretary-General shall convene a balanced, informal group of experts, each of whom is active in preparing for the Policy Forum in his/her own country, to assist in this process;
 - ii) a first draft of the report shall be circulated, based on available material, with an invitation to comment, not later than four months before the opening of the Forum;
 - iii) a second draft, incorporating comment from the membership, with an invitation to comment, shall be circulated ten weeks before the opening of the Forum;
- d) participation in the Forum shall be open to Member States, Sector Members and small and medium-sized enterprises with attendance, as observers, by the public;
- e) the Secretary-General shall encourage ITU Member States, Sector Members and other interested parties, to make voluntary contributions to help defray the costs of the Policy Forum and facilitate the attendance of the LDCs;
- f) Forum Meetings should be conducted in line with the Rules of Procedure used at the previous two Fora.

ANNEX B

STATUS OF IP TELEPHONY IN ITU MEMBER STATES

Tables B.1, B.2, and B.3 are based on available data and show the current regulatory status of IP Telephony in a range of ITU Member States. However, the Tables do not include all Member States, because many of them simply *do not have* specific IP Telephony policies or have not responded to the ITU survey. Member States are invited to provide additional data or clarifications so that the tables can be kept up-to-date.

Table B.1: Countries that include IP Telephony (i.e. voice and fax over both the public Internet and IP-based networks) within their Regulatory System or that do not specifically regulate IP Telephony

<i>No specific prohibition for voice/fax over the Public Internet or over IP-based networks</i>	<i>Permitted or not regulated, if not real-time (not considered voice telephony)</i>	<i>Permitted. If real-time, subject to light conditions (notification/registration may be required, other basic provisions of voice regulation)</i>	<i>Permitted. If real-time, treated similarly to other voice telecommunications services (licensable, subject to more extensive provisions of voice regulation)</i>
Angola Antigua and Barbuda¹ Bhutan Congo Costa Rica Dominican Republic Estonia² Gambia Guatemala Madagascar Malta Mexico Mongolia² New Zealand Poland Slovak Republic St Lucia¹ St Vincent³ Tonga Uganda United States⁴ Viet Nam	EU Countries⁵ Hungary (if delay =>250ms and packet loss >1%) Iceland	Czech Republic (except Phone-to-Phone by other than incumbent) Hong Kong SAR Japan Singapore Switzerland	Australia Canada China Korea (Rep.) Malaysia

¹ Antigua & Barbuda and St Lucia: the use of the public Internet is not prohibited for voice and fax, but no data is available on the use of IP-based networks for these services.

² In Estonia, both domestic and international phone calls over IP-based networks are prohibited until Dec. 31, 2000. Public IP telephony is also prohibited until 31 Dec 2000. In Mongolia, international telephone calls over the public Internet are prohibited until Dec. 31, 2000.

³ St Vincent: the use of IP-based networks is not prohibited, but no data is available regarding the use of the public Internet for voice and fax services

⁴ The United States permits IP Telephony unconditionally, i.e. it is exempt from the international settlements regime.

⁵ The 15 countries of the European Union are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

Notes: Depending on whether or not speech transmission is "real-time", normal voice regulation may apply to varying degrees. Regulatory information on the real-time nature of the service is not available for all countries.

Source: This table is based on the ITU 2000 Regulatory Survey and ITU case studies. No changes or clarifications to this table have been submitted by Member States in the context of WTPF-01.

Table B.2: Countries that permit voice/fax services over either the Public Internet or IP-based networks (but not both)

<i>Country</i>	<i>Use of Public Internet</i>	<i>Use of IP-based networks</i>
Argentina	Prohibited	Not prohibited
Cyprus	Prohibited	Not prohibited
Ethiopia	Prohibited	Not prohibited
Kenya	Prohibited (voice services; includes call back and refile)	Not prohibited
Kyrgyzstan	Not prohibited	Prohibited (IP telephony until 2003)
Moldova	Not prohibited	Prohibited (IP telephony until 2003)
Peru	Prohibited (voice services in real-time are prohibited as they are considered voice telephony)	Not prohibited
Philippines	Prohibited	Not prohibited
Sri Lanka	Not prohibited	Prohibited (voice services)

Source: This table is based on the ITU 2000 Regulatory Survey and no changes or clarifications have been submitted by Member States in the context of WTPF-01.

Table B.3: Countries that prohibit the use of both the Public Internet and IP-based networks for voice or fax services

<i>Countries</i>	<i>Specifics given</i>
Albania	Voice services over IP-based networks prohibited until 2003
Azerbaijan	
Belize	All services prohibited
Botswana	Voice prohibited over the public Internet
Cambodia	Voice prohibited indefinitely
Cameroon	Telephony prohibited over public Internet; Telephony and Fax prohibited over IP-based networks
Côte d'Ivoire	Voice prohibited over public Internet until 2004
Croatia	
Cuba	Telephony prohibited over the public Internet and IP networks Telephony prohibited over IP-based networks, but not fax
Ecuador	Voice prohibited over public Internet Voice temporarily prohibited over IP-based networks
Eritrea	Voice is prohibited for some years to come (both over the public Internet and IP-based networks)
Gabon	Telephony prohibited (both over the public Internet and IP-based networks)
Indonesia	Telephony prohibited over the public Internet. Regulation now under preparation to allow voice over IP-based networks
India	India prohibits the use of voice services over the public Internet, but did not respond to the question relating to IP-based networks
Israel	Telephony prohibited over the public Internet Both voice and fax prohibited over IP-based networks
Jordan	Voice prohibited over the public Internet. Voice and fax services prohibited over IP-based networks until the end of 2004
Latvia	
Lithuania	Voice prohibited over both the public Internet and IP-based networks until Dec. 31, 2002
Morocco	
Mozambique	Voice and Fax services prohibited over both the public Internet and IP-based networks
Myanmar	
Nicaragua	Voice services prohibited over both the public Internet and IP-based networks
Nigeria	Voice and fax prohibited over IP-based networks at this time
Pakistan	Voice termination services prohibited over the public Internet Voice prohibited over IP-based networks
Paraguay	Voice services prohibited over both the public Internet and IP-based networks
Qatar	Telephony and Fax prohibited over both the public Internet and IP-based networks, subject to review
Romania	Voice services prohibited over the public Internet Voice services prohibited until at least Jan. 1, 2003
Senegal	Telephony prohibited over the public Internet
Seychelles	Voice and fax over the public Internet are prohibited, but Internet telephony which is an Internet application rather than a telecommunication service provided by an ISP is permitted. All services over IP-based networks are prohibited.
Swaziland	
Thailand	Voice and fax services prohibited over both the public Internet and IP-based networks
Togo	
Trinidad and Tobago	Voice services prohibited over IP-based networks
Tunisia	
Turkey	Voice prohibited over both the public Internet and IP-based networks

Source: This table is based on the ITU 2000 Regulatory Survey and no changes or clarifications have been submitted by Member States in the context of WTPF-01.

GLOSSARY OF ACRONYMS

ATM	Asynchronous Transfer Mode
DNS	Domain Name System
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force
IN	Intelligent Network
IP	Internet Protocol
IPTSP	IP Telephony Service Provider
ISDN	Integrated Services Digital Networks
ISP	Internet Service Provider
LAN	Local Area Network
PLMN	Public Land Mobile Networks
PSTN	Public Switched Telephone Networks
PTO	Public Telecommunication Operators
QoS	Quality of Service
SIP	Session Initiation Protocol
SS7	Signalling System Seven
VoIP	Voice over IP

12. COMMENTS RECEIVED FROM ETNO

(comments on Version 2, 15 December 2000, Chapter 4 – regulatory aspects particularly related to Universal Service)

ETNO recognises that ITU Decision 498 asks the WTPF to equally consider the policy and regulatory implications of IP Telephony.

In general, ETNO welcomes the work undertaken in ITU on draft Rec. E.370 to establish a commonly agreed framework for interworking between PSTN and IP Telephony. However, we feel that the Secretary-General's (SG) draft Report and its proposed approach to VoIP and Internet Telephony puts too much emphasis on a potential regulation of IP Telephony which ETNO thinks should not be seen as part of ITU's or the WTPF's remit. ETNO further shares the opinion expressed by the European Commission⁵⁵ that the SG draft Report should acknowledge more clearly the benefits of an open market, where IP Telephony can develop without regulatory barriers.

ETNO welcomes that the trend towards cost orientation of settlement rates is getting an increasingly broader support. We do at the same time recognise the concerns reflected in the SG draft Report regarding the importance of voice telephony services for the developing countries and the essential role voice services presently play in the telecommunications economy of these countries. ETNO is aware that at present a number of countries believe the income from both termination of international traffic and from international traffic origination (lack of tariff rebalancing) is necessary to ensure their Universal Service goals. These countries too often see IP telephony as a potential by-pass of these services.

In this respect, we will recall that voice services are migrating very fast from fixed networks to mobile, and mobile penetration is close to or above fixed penetration in more and more countries, both developed and developing. The consequences of this process need to be recognised. If lack of rebalancing, cost-orientation or competition lead to an 'over-taxation' of attractive fixed services, this will only deter any further investments in fixed infrastructures. The historical role of (fixed) voice applications for funding access infrastructure cannot be maintained. The future revenue of voice services will come from mobile communications. Any commitment to the preservation and even improvement of fixed infrastructures should recognise the need to retain creative, attractive services and applications on it such as Internet access and IP Telephony. For this reason alone, we recommend that no regulatory burden should be placed on IP Telephony.

ETNO shares the view of the SG draft Report (para. 4.38) that VoIP/Internet Telephony can be a valuable tool to provide universal access and to promote availability of international connections – especially in the case of markets which have not yet been opened to competition and where VoIP/Internet Telephony provides an alternative to often very costly international calls.

Evidently such substitution is less common in countries where alternative providers to the national operator, in line with the WTO and the Reference Paper from NGBT, offer international services based on e.g. indirect access, call-back or VoIP via leased lines.

⁵⁵ 30 November 2000 European Commission: Comments on Draft Report of the Secretary-General on IP Telephony for the WTPF 2001

With regard to the current regulatory status of Internet Telephony, ETNO in its contribution⁵⁶ to the recent European Commission consultation supported⁵⁷ the Commission's preliminary conclusion on 'Voice over the Internet':

Taking into account the current situation and trends...Internet telephony [IP Telephony in the SG draft Report] still continues to fall outside the definition of voice telephony. This means, generally speaking, that Member States should continue to allow Internet access providers to offer voice over Internet protocol under data transmission general authorisations, and that specific licensing conditions are not justified.

Internet Telephony should therefore not be seen as a threat but rather as a valuable alternative to the regulated voice services which in some countries can only be offered under special rights and/or specific license conditions. Internet Telephony will, as an alternative, stimulate the establishment of competitive offerings as well as the technical upgrade of networks and services (as noted in the SG draft Report para. 2.5).

Concerning regulation this means that:

- At present, it would be a mistake to impose or maintain regulatory requirements on VoIP/Internet Telephony. Internet Telephony is neither in terms of quality nor general availability a substitution for traditional PSTN based voice services.
- In the end, VoIP/Internet Telephony is likely to become a substitute to PSTN based voice services as foreseen by the 'technology neutral' approach taken by the revised European regulatory framework. At that moment, there remains no justification for a continued or renewed specific regulation of voice services as such, PSTN or IP based.

The concern expressed in the SG draft Report para. 4.36 that funding of Universal Services is threatened by VoIP/Internet Telephony is not well founded.

In general, VoIP/Internet Telephony can only develop substantially and impact the revenue from traditional voice services if the penetration rate of the public switched fixed access network has reached a certain level. When this level has been reached, i.e. in developed networks, the funding from 'Universal Service Funding sources' is less needed. Furthermore the settlement level of international traffic should become cost oriented, which implies that the importance of the contribution to Universal Service funding from lack of rebalanced international tariffs, will be reduced⁵⁸.

Finally and in line with the observation in the SG draft Report (para. 4.32), it should be kept in mind that competition stimulated by VoIP/Internet Telephony might have the potential to increase the take-up of Internet in general without any specific regulatory Universal Service based intervention.

⁵⁶ ETNO RD133 (2000/08) on the Consultative communication.... 2000/C 177/03

⁵⁷ In continuation of its Reflection Document RD56 (06/97) on the 1998 Notice (the European Commission Notice concerning the status of voice on the Internet pursuant to Directive 90/388/EEC)

⁵⁸ Being aware of the not very precise impact that can be deduced from the ITU Rec. D.140 on Universal service:

E.6 Universal Service Obligations -

Any Member State has the right to define the kind of Universal Service Obligation it wishes to maintain. However, such Obligations should be administered in a transparent, non-discriminatory and competitively neutral manner which is not more burdensome than necessary for the kind of universal service defined by the Member.

1. COMMENTS RECEIVED FROM **The Telecommunication Company of Iran**

VIEWS OF TELECOMMUNICATION COMPANY OF IRAN ON IP TELEPHONY FOR THIRD TELECOMMUNICATION POLICY FORUM

Introduction

Individual research and consultant agencies have predicted that in future IP will be the main protocol for carrying voice in public telephone networks and there is no doubt that existing current expansion of telecommunication networks especially in developing countries will be affected by the growth of IP traffic and IP telephony.

With respect to the points mentioned above and confirming related ITI-T activities, it is believed that proposed avenues for international co-ordination on IP telephony covers the most important issues. However, there are a number of other topics which could be considered in the forum and are categorized as follows:

1. Technical Aspects

Some other items in addition to the proposed avenues in the report can also be studied and finalized by ITU-T with IETF cooperation on IP telephony related studies and activities.

1.1 Standardization

It is proposed that ITU should prepare required recommendations for the following items:

1.1.1 Media gateway and media gateway controller from the following points of view:

- Functionality
- Interfaces
- Traffic engineering
- Processing
- Network management
- Signaling
- Charging format

1.1.2 Media gateway and media gateway controller interconnection and interoperability.

1.1.3 Review and confirmation of IETF existing standards by ITU-T could be considered.

1.2 Interworking

1.2.1 Integrated operation and maintenance management center for IP-based networks and PSTN should be taken into account.

1.2.2 Common cooperation between IEF and ITU-T in preparing required standards for IP-based networks and PSTN on interworking and interoperability issues is also proposed.

1.3 Numbering

Preparation of required and finalized standards for integrated addressing IP-based networks and PSTN (e.g., finalized and approved ENUM) should be considered.

1.4 Network considerations

- 1.4.1 Infrastructural requirements for backbone of a circuit switched network with respect to implementation of an IP-based network should be considered.
- 1.4.2 The implementation methods of IP telephony in ATM networks (IP over ATM) should be considered and required comments or recommendations should be established.
- 1.4.3 It is proposed that ITU-T provide a guide line for implementation of IP-based networks in developing countries.

2. Policy and Regulatory issues

In this case it is proposed that the use of IP telephony and performance of the related services to be provided in a specific country should be studied according to telecommunication regulations established by the regulatory body or related ministry and under supervision of the authorities.

In the case of international connections, ITU can play the main role by preparing the required recommendations for bilateral connection between two IP telephony service providers in originating and destination countries in accordance with the member states points of view.

For the countries in which the telecommunication industry has not been privatized yet, it is proposed that the incumbent operator to be the sole IP service provider.

3. Economic Aspects

According to the activities of study group 3 (ITU-T) on tariffs based on cost-oriented method concerning international telecommunication services, it is proposed that studies on IP telephony tariffs also should be carried out in this study group and the required recommendations on the cost of international connections to be prepared in compliance with the ITU-T member states' interests.

TCI is interested in participating in different study groups which will be defined for the proposed avenues to be studied.
