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**CEPT - European Conference of Postal and Telecommunications Administrations**  
**ECTRA - European Committee for Telecommunications Regulatory Affairs**  
**ETO - European Telecommunications Office**

**CEPT / ECTRA Report of 4 July 2001**

**on IP Telephony**

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## **CEPT / ECTRA Report of 4 July 2001**

On IP Telephony

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As Chairman of the European Committee for Telecommunications Regulatory Affairs (ECTRA), I hereby confirm that this report was approved in Bratislava on 4 July 2001 at the joint meeting of the ECTRA Plenary and the ERC Plenary.

Knut Smaalund  
ECTRA Chairman

## **ECTRA Summary Report: IP Telephony**

### **1 - Introduction**

The purpose of this report is to:

- update CEPT members on current developments,
- summarise some of the ongoing regulatory issues, and
- identify those issues that need further review and where a common European approach is the preferred way forward

### **2 - Summary and conclusions**

Main points of this report are:

- a) IP technology is already used widely today by large Telcos and competitive operators in providing parts of public voice telephony service (see section 3)
- b) The change to IP technology will have a profound effect on the structure and operation of networks, and is likely to lead to diversification of services and major changes in the costs and pricing models for services (see 5.2). Existing arrangements for determining interconnection pricing will need to be considered if the market is to be allowed to create new pricing opportunities at the retail level. For example:
  - New IP based interconnection types need to be specified
  - Flat rate interconnection arrangements, which are being introduced for Internet, may need to be extended to include other services
  - New cost elements and new LRAIC cost models may be needed  
(These issues could be addressed in future.)
- c) Regulatory requirements developed for circuit switched networks need to be reviewed and their application to services provided on IP technology clarified (see 5.1). Clear definitions are needed for the application of these requirements (see 5.3). The balance of functionality between networks and terminals is likely to change and the inclusion of requirements in specifications and standards may need to be reviewed (see 5.1). The significance of the Network Termination Point and its relationship to services may be affected.
- d) Regulatory requirements need to be added into international specifications and standards so that manufacturers will produce appropriate standardized equipment that enables operators to meet these requirements at reasonable cost (see 5.9)

- e) Issues relating to ENUM which are currently being debated in the ITU will need to be addressed in the European context if there is sufficient commercial drive to support its implementation. The regulatory and competition issues are briefly outlined in 5.5.

### **3 – Market developments**

IP technology is becoming established as the common technology for the next generation of networks. It is used in two forms:

- The public Internet: a network of interconnected networks consisting of backbone networks with customer access through Internet Service Providers
- Managed IP networks, which, whilst fundamentally similar to the public Internet, provide greater control in areas such as access, security, quality, and charging

IP technology is leading to service diversification. These technologies are already being used for:

- **Public telephony, which** uses the E.164 numbering system, in the following forms:
  - Wholesale transit/international services (eg Genuity with managed IP, ITXC with public Internet<sup>1</sup>), which are already used widely by many large telcos especially for traffic to low volume international destinations
  - Indirect access (carrier selection) services
  - Telephony services from PCs. This service is called “PC-Phone” in the press.
- **Internet telephony**, which uses the Internet naming system (user@domain) and is used mainly for services to informal groups and communities. This service is called “PC-PC” in the press.

There are four main categories of companies 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

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<sup>1</sup> See Ovum’s “IP Telephony, Exploiting the Market Opportunities”

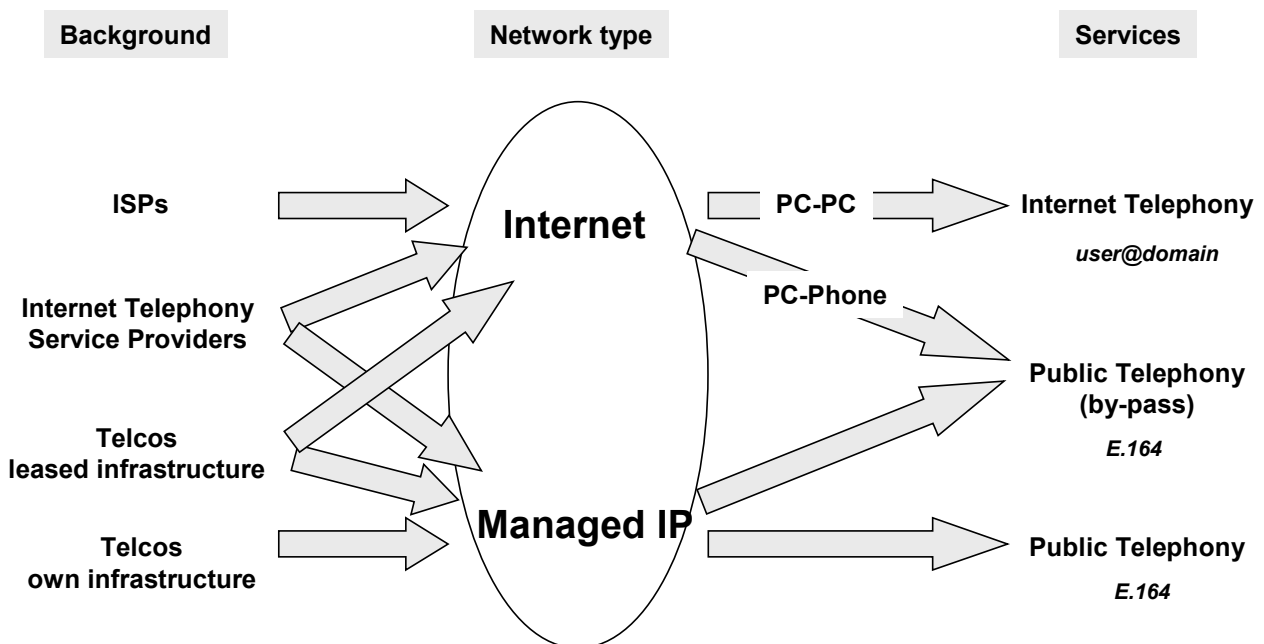
- c) Internet Telephony Service Providers (ITSP), who predominantly use the Public Internet and have little infrastructure under their own control (in "ITSP" Internet refers to technology rather than naming)
- d) Internet Service Providers who are adding voice related service features

The motivations for the telco culture operators, a) and b), are to use IP to provide cost savings (there are estimates that IP technology can reduce network costs by a factor of 4) and to enable them to catch up with some of the service developments of the other types of operator by providing greater functionality.

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 1 shows the relationship between the service categories defined above 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. The diagram shows that whilst there is some distinction between the public Internet and managed IP networks, the distinction is not very clear and some managed IP networks are part of the public Internet.

**Figure 1: Development routes**



At the national level only a small proportion of traffic is carried on IP at present but the growth rates are very high<sup>2</sup>. At the international level a significant proportion of traffic is already carried on IP.

Much attention is being drawn in ITU-T to the proposed ENUM service, which will use the Domain Name System of the public Internet to provide a list of the means available for communicating with a person identified by their E.164 number. The ENUM service could be used by callers or by service providers, and one of its main functions will be to facilitate moving traffic from circuit switched networks to IP based networks.

#### **4 - Background on European Community and ITU Developments**

##### **4.1 – European Community**

The European Commission carried out a consultation on Voice over Internet issues in Summer 2000 as a follow up to their previous 1998 Notice on VOIP. The June 2000 consultation paper reviewed the attributes of a voice service in the context of telephony over Internet and managed IP networks. The Commission confirmed that in their opinion the definition of voice telephony in the existing Services Directive 90/388/EEC is adequate for continuing to assess the regulatory position of voice telephony, and in particular that Internet telephony still continues to fall outside this regulatory definition.

<sup>2</sup> See Ovum's "IP Telephony, Exploiting the Market Opportunities"

In December 2000 the Commission adopted a further Communication confirming that the interpretation of the definition of voice telephony given in the 1998 Notice does not need changing until the new regulatory framework arising from the 1999 communications review removes distinctions between voice telephony and other telecommunication services. The intent in future is that all electronic communication services whatever their commercial features will be submitted to the same legal regime.

## **4.2 - ITU**

The ITU reviewed IP telephony issues at the March 2001 ITU World Telecommunication Policy Forum (WTPF). The ITU has recognised that the traditional telecommunication world of voice telephony and other services is already being influenced by the continuing growth of IP technology. The ITU Forum produced four opinions covering:

- general implications of IP telephony for ITU membership,
- actions to assist member states and sector members in adapting their telecommunication environment to IP telephony,
- actions to assist member states and sector members in developing human resources to meet challenges of IP, and
- inter-operability considerations and implications, when implementing “IP telephony” in developing countries

## **5 - Regulatory issues**

### **5.1 – Public voice telephony**

Most countries apply special regulations to public voice telephony and the Voice Telephony Directive 98/10/EC places requirements on Community Member States for this service. Typical requirements include:

- Provision of directory enquiry services and the exchange of data for these services
- Access to emergency services
- CLI and malicious call tracing
- QoS reporting
- Number portability
- Carrier selection
- Emergency preference schemes
- Usage record and billing accuracy

This situation raises the issues:

- Do these requirements apply when the telephony service is provided on IP?
- Do these requirements need revision?

The first of these issues concerns the definition of public telephony and the approach depends on the balance that is needed between on the one hand encouraging new innovative services and e-commerce applications to develop on new technology platforms and on the other hand the need to ensure that voice service customers have access to the basic universal service provisions.

The definition of public telephony is also expressed as a question whether IP based traffic is substituting for circuit switched traffic and a desire to define when IP based traffic is equivalent to circuit switched traffic.

On these issues it should be noted that Europe is moving towards technology independent regulations whereas the USA currently has fairly heavy regulation (including access charges and local taxes) on services on circuit switched networks provided by incumbent local operators, but very few regulations on Internet Service Providers.

The requirements relative to public telephony are normally met through the specific functions that have hitherto been provided by networks. However technology changes are expected to lead to a shift in the balance of functionality between networks and terminals (eg the IETF end-end paradigm for IP) and therefore there may be a need to assess whether particular functions should be added into the specifications and standards for terminals. These changes may affect the significance of the Network Termination Point and its relationship to services.

## **5.2 - Interconnection**

### **5.2.1 - Interconnection types**

To date interconnection arrangements and standards have addressed circuit switched to circuit switched interconnection. With the introduction of IP technology it will be necessary also to cover IP-IP interconnection in equivalent detail. An important issue will be how to extend the current peering agreements to cover guaranteed QoS and to provide appropriate interconnection billing. Where networks that need to interconnect use different technologies, one of these operators (circuit switched or IP) will need to provide the necessary inter-working functions. Inter-working functions also may be needed between IP based networks if those networks use different protocols, eg one uses SIP and the other H.323. These issues may be solved by voluntary agreement, if not it may be necessary for regulators to become involved and possibly to ensure that IP based interconnections are added to the Reference Interconnection Offer of operators with significant market power.



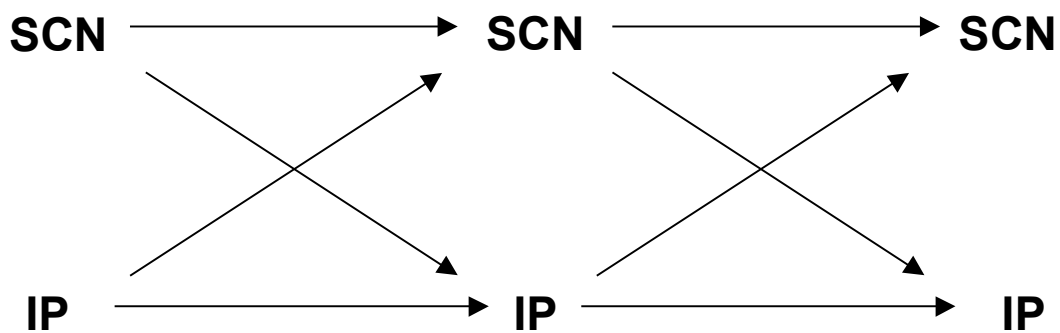
(Note: Some countries distinguish between different regulatory regimes on the basis of quality. Where this is the case, it may be appropriate for voice traffic of different quality levels to be segregated at interconnection points.)

Figure 2 shows the possibilities for calls to move from one technology to another. Although the diagram shows only a single transit network, there may be several transit networks in series.

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**Figure 2: Technology transitions**

Originating network                      Transit network                      Terminating network



### 5.2.2 - Effect of changes in retail prices

Technology is steadily reducing the cost of networks whilst the costs of billing and customer service are reducing more slowly. This is creating economic pressures for retail prices to move in the following rough sequence:

- Distance dependent, charge by the minute
- Distance independent within a country, charge by the minute
- Distance independent internationally, charge by the minute
- Distance independent, charge per call
- No call charges, all charges by subscription

IP technology is increasing this pressure and flat rate Internet access is part of this progression. Despite the wish of regulators to avoid influencing the market, interconnection rates influence the ability of service providers to set retail prices. If the trend identified above is to proceed, then changes in retail prices will have to be reflected by changes in interconnection rates, in particular the introduction of rates that are less dependent on, or independent of, call minutes.

### 5.2.3 - Effect of changes in the cost base

A change in technology from circuit switched to IP will affect the costs of providing and running networks and will alter the basis on which the costs of some key interconnection functions such as call origination and call termination have been based. This will result in regulators needing not only to revise the figures that they determine but to revise the basis of their determinations to take account of the changes in the nature of the networks. For example, where element based costing and charging are used, new elements may need to be defined and their costs elaborated.

### 5.2.4 - Transmission planning

At a technical level, IP will introduce some difficult challenges for transmission planning and interconnection topology as multiple conversions between circuit switching and IP should be avoided to minimise round trip delay and distortion. Recommendations on the choice of codecs and methods of determining which destinations can be served on IP may be needed.

### 5.2.5 - New interconnection services

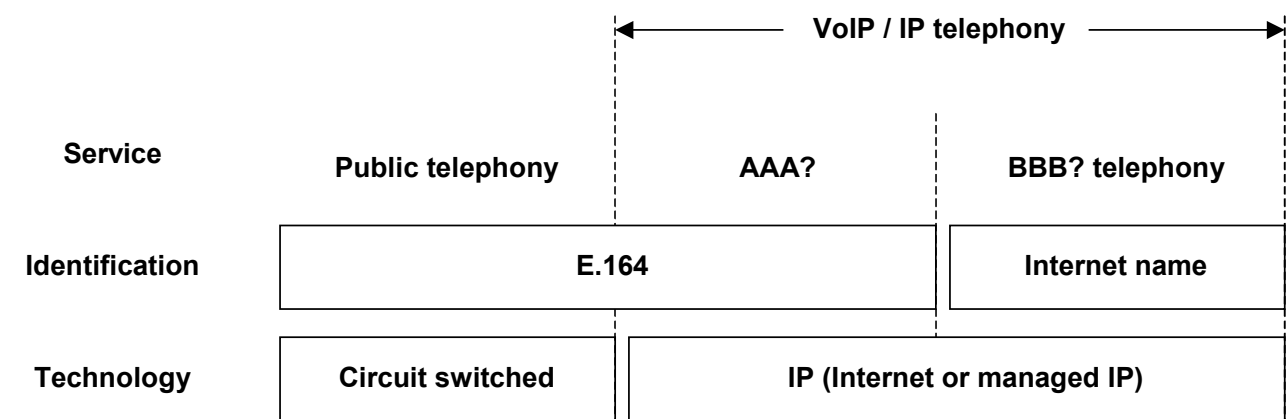
With increasing use of dial-up lines for Internet access, there is growing interest in the ability to deliver incoming public telephony calls arriving at a different operator over the Internet access. This may lead to new interconnection services and obligations.

## 5.3 - Definitions

Annex A gives the current status of definitions in documents produced by the Commission and/or the subject of negotiation between the European Parliament and the Council of Ministers.

Figure 3 shows the definition issues.

**Figure 3: Definition issues**



The three main questions are:

- Should the term public telephony include AAA?
- What name should be given to telephony that uses Internet naming?
- How should VoIP, Internet telephony and IP telephony be defined?

Whatever definitions are chosen, they need to:

- Be stable as technology changes and improves (quality, and the distinction between the public Internet and managed IP are not very stable)
- Reflect as far as possible the common meaning of the words used
- Provide “handles” that enable the distinctions of interest to regulators to be grasped

#### **5.4 – Accounting rates**

Countries that use high accounting rates to finance infrastructure investment or for other similar purposes are very concerned that accounting rate arrangements are being bypassed by incoming international traffic conveyed on leased lines particularly those being conveyed using Internet Protocol (IP).

Accounting rate levels and their bypass are being addressed by ITU-T SG3.

#### **5.5 – Numbering and ENUM**

Internet Service Providers, who use both dial-up access and unbundled local loops, are expected to start providing public telephony. These service providers may request E.164 numbers. Some countries may have difficulty in accommodating growth in demand for geographic numbers.

Voice will be provided as an important element in new multi-media services. These services will need numbers and there is a choice between:

- Using the same number ranges that are used for telephony so that there can be number portability from basic telephony to multimedia
- Introducing new distinctive number ranges for multi-media services

ENUM will raise the following issues if it develops in the way that its advocates hope:

- Do European countries support the use of the .e164.arpa TLD under discussion in ITU, and do they have adequate assurance about the management of this domain given the influence of the US?
- How should NRAs select and appoint registries for the part of the DNS that relates to their country (eg .4.4.e164.arpa in UK), and should they control prices charged by the registry?
- What arrangements are needed to ensure the accuracy and authenticity of data held in the ENUM service?
- Will operators who are serving customers with an E.164 number have any obligation to provide inputs to ENUM such as number authentication?

## **5.6 - Confidentiality and privacy**

Confidentiality and privacy are fundamental for all customers when using the telecoms services, but not all networks provide the same level of confidentiality and privacy. Risks may arise where traffic is routed across less secure networks, eg where a routing takes the traffic outside an area where a particular level of confidentiality and privacy are required. Routings are becoming much more diverse and unpredictable and these problems are not confined to IP technology but may also occur with circuit switched technology due to the growth in global transmission capacity.

Whilst routings can normally be controlled on managed IP networks they cannot be guaranteed in the public Internet because routing arrangements alter frequently and dynamically. Network operators should make sure through their interconnection agreements that adequate confidentiality and privacy are provided. Where this is not possible, regulators should consider whether the customers should be informed about the possible reduction in confidentiality and privacy for each individual call that may be affected.

## **5.7 - Lawful interception**

Most countries have requirements for lawful interception, which oblige operators to make available traffic information and call contents in certain circumstances. New solutions will be needed to meet these requirements in IP based networks, and in particular there will be new challenges resulting from the planned capability for:

- customers to be able to register at any access point
- service provision to be controlled from any point worldwide.

## **5.8 - Universal service obligations and funding**

Most European countries have requirements for ensuring universal service (not least because of the provisions of the Interconnection Directive 97/33/EC and the Voice Telephony Directive 98/10/EC), and their regulators have powers to adapt the financial arrangements to provide funding for meeting these requirements, although

in practice these powers have rarely needed to be used or new funding arrangements introduced.

In the short term at least, the developments relating to IP are likely to reduce the revenue of operators who in principle are subject to universal service requirements and will lead to increased pressure for regulators to introduce special funding arrangements for universal service. In order to ensure that funding arrangements are equitable amongst all operators, consideration should be given to including IP based operators in the arrangements otherwise there could be market distortions.

### **5.9 - Regulatory requirements in standards**

The requirements identified in 5.1 et seq are not yet fully clarified or included in specifications and standards for IP based networks. Operators are normally willing to comply with such requirements by implementing the necessary functionality in their networks but they need to be able to buy standardised equipment that implements these functions at reasonable prices. However manufacturers are unlikely to implement such functions until they are included in international specifications and standards. Therefore regulators should take steps to ensure that these requirements are included in the specifications and standards that are being developed.

Since VoIP and new access technologies will lead to the development of a new generation of terminals and since the RTTE Directive has removed many useful but longer absolutely essential requirements on terminals it may be useful for ETSI to formulate voluntary (non-harmonised) standards for these functions in a way that can be applied to VoIP terminals. An example is the ability to maintain calls for a period during loss of mains power, and access to emergency services with adequately fast call set-up.

## Annex A: New Regulatory Framework Definitions

The following text below is not final and represents the state of play at a specific stage in the negotiation of the new regulatory framework. The text is therefore subject to change and readers are asked to refer to the final agreed text when it becomes available later. It is included here simply to provide an idea at this point in time (June 2001) of the shape that the new definitions are likely to take and its implications in the context of the issues raised in this report on IP telephony.

### ***Definitions from the proposed Framework Directive (Council political agreement of 4 April 2001)***

#### **Electronic Communication Network**

Means transmission systems and, where applicable, switching or routing equipment and other resources which permit the conveyance of signals by wire, by radio, by optical or by other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including Internet) and mobile terrestrial networks, networks used for radio and television broadcasting, and cable TV networks, irrespective of the type of information conveyed.

#### **Electronic Communication Service**

Means a service normally provided for remuneration which consists wholly or mainly in the conveyance of signals on electronic communication networks, including telecommunications services and transmission services in networks used for broadcasting, but exclude services providing, or exercising editorial control over, content transmitted using electronic communication networks and services; it does not include information society services as defined in Article 1 of Directive 98/34/EC which do not consist wholly or mainly in the conveyance of signals on electronic communications networks (reference note 1).

(Note 1 The following additional recital is agreed: "Whereas the definition of 'Information Society service' in Article 1 of Directive 98/34/EC as amended by Directive 98/48/EC spans a wide range of economic activities which take place on-line; most of these activities are not covered by the scope of the present Directive because they do not consist wholly or mainly in the conveyance of signals on electronic communications networks; voice telephony and electronic mail conveyance services are covered by the present Directive; the same undertaking, for example an internet service provider, can offer both an electronic communications service, such as access to the internet, and services not covered under the present Directive, such as the provision of web-based content.)

### ***Definitions from the proposed Universal Service Directive (Council common position of 27 June 2001)***

#### **Public Telephone Network**

Means an electronic communication network which is used to provide publicly available telephone services; it supports the transfer between network termination

points of speech communications, and also other forms of communication, such as facsimile and data;

### **Publicly Available Telephone Service**

Means a service available to the public for originating and receiving national and international calls and access to emergency services through a number or numbers in a national or international telephone numbering plan, and in addition may, where relevant, include one or more of the following services: the provision of operator assistance, directory services, provision of public pay phones, provision of service under special terms, provision of special facilities for customers with disabilities or with special social needs and/or the provision of non-geographic services;