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SERIES E: OVERALL NETWORK OPERATION,  
TELEPHONE SERVICE, SERVICE OPERATION AND  
HUMAN FACTORS

International routing plan

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**Service principles when public circuit-switched  
international telecommunication networks  
interwork with IP-based networks**

ITU-T Recommendation E.370

(Formerly CCITT Recommendation)

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## **ITU-T Recommendation E.370**

### **Service principles when public circuit-switched international telecommunication networks interwork with IP-based networks**

#### **Summary**

This Recommendation defines the principles applicable to international public correspondence services provided by IP-based networks interworking with the ITU-defined, circuit-switched, public, international telecommunication networks (for example, the PSTN, ISDN and PLMN).

This Recommendation is applicable to those cases where the IP-based network is implemented by a separate service provider (e.g. ROA) from the service provider of the public, circuit-switched international telecommunication network. It does not cover the case where IP technology is integrated within the international telecommunication network of a single service provider.

#### **Source**

ITU-T Recommendation E.370 was prepared by ITU-T Study Group 2 (2001-2004) and approved under the WTSA Resolution 1 procedure on 2 February 2001.

## FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

## NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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## ITU-T Recommendation E.370

### Service principles when public circuit-switched international telecommunication networks interwork with IP-based networks

#### 1 Introduction

There is an increased availability of Internet Protocol (IP)-based networks on an international and a national basis. Users of these IP-based networks expect to be able to be connected with users of public, circuit-switched, international telecommunications networks. In order to ensure that the needs of both IP-based network users and circuit-switched, international telecommunication network users are met, principles of interworking between IP-based networks and the circuit-switched, international telecommunication networks are presented in this Recommendation.

#### 2 Scope

This Recommendation defines the principles applicable to IP-based networks interworking with the ITU-defined, circuit-switched, international telecommunication networks (for example, the PSTN, ISDN and PLMN) for the purposes of providing international telecommunications services.

This Recommendation does not cover the case where IP is used as a transport technology within the international telecommunication network of a single service provider.

#### 3 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- ITU-T E.105 (1992), *International telephone service*.
- ITU-T E.106 (2000), *Description of an international emergency preference scheme (IEPS)*.
- ITU-T E.164 (1997), *The international public telecommunication numbering plan*.
- ITU-T H.323 (2000), *Packet-based multimedia communications systems*.

#### 4 Definitions

This Recommendation defines the following term:

**IP-based network:** a network in which the Internet Protocol is used as the ISO layer 3 protocol (OSI Reference Model).

## 5 Abbreviations

This Recommendation uses the following abbreviations:

DTMF	Dual Tone Multi-Frequency
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
IWF	Interworking Facility
OSI	Open Systems Interconnection
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
ROA	Recognized Operating Agency
SIP	Session Initiation Protocol

## 6 General principles of interconnection

**6.1** In general, the interconnection of an IP-based network to an existing international telecommunication network should not impose any requirement for additional functionality in the international telecommunication network, nor any restriction in the normal operation of the international telecommunication network. Any added functionality should be provided in the IP-based network, unless otherwise agreed between the operators of the IP-based and international telecommunication networks. The international telecommunication network should not have to be specially engineered to compensate for possible performance variation of services supported by the IP-based network interconnected to it in order to match the performance of similar services fully supported by the international telecommunication network.

**6.2** The interconnection arrangements could be formalized by an agreement between the operators of the two networks. The agreement could cover the following areas:

- network topology;
- interface specifications, including signalling systems;
- provisioning procedures;
- operations and maintenance procedures;
- performance monitoring (quality of service, grade of service, traffic measurement, etc.);
- growth management (forecasts, network planning, etc.);
- charging and accounting arrangements.

Interconnection arrangements should enable calls to be set up:

- a) which originate at a terminal on an IP-based network and terminate at terminals on PSTN/ISDN/PLMN networks;
- b) which originate at terminals on PSTN/ISDN/PLMN networks and terminate at a terminal on an IP-based network; and
- c) which allow for backward and forward call clearing.

The detection of a non-recoverable failure of any of the critical resources involved in the call shall initiate the clearing of the call.

User services, which make use of end-to-end bidirectional and unidirectional DTMF signalling, should be supported, e.g. voicemail applications, conference bridge applications, etc.

An inability to complete the call within the PSTN/ISDN/PLMN network should be detected and communicated to the calling party (e.g. busy tone).

The ability for inband audio tones and announcements to be received by the caller should be supported (e.g. special information tones, referral messages, etc.).

In order to preserve existing PSTN/ISDN/PLMN service features the following should be supported:

- a) presentation of a number in ITU-T E.164 format identifying the Calling Party for Calling Line Identification Presentation;
- b) transport of calling line identification;
- c) transport of calling line identification restriction;
- d) malicious call tracing;
- e) emergency calling;
- f) International Emergency Preference Scheme (see ITU-T E.106);
- g) E.164 number portability.

## 7 Services

The services, including any supplementary services, offered by IP-based networks (voice, data, etc.) when interworking with the international telecommunication networks to provide public correspondence services should be similar to those provided on international telecommunication networks and work on an end-to-end basis unless otherwise agreed. For example, when interworking with users on the PSTN, ITU-T E.105 defines the requirements of the International Telephone Service. While it is recognized that the manner in which the services, including any supplementary services, are presented to users on an IP-based network may be different from the way in which those services are presented to users of the PSTN, ISDN and PLMN; the basic functions, as defined in the appropriate ITU-T Recommendation, should still operate across the various networks.

## 8 Service scenarios

### 8.1 General cases

A number of scenarios may be deployed to reflect particular configurations of networks, namely:

**Scenario 1:** communication between IP-based network users and International Telecommunication Network users, in which the call set-up is originated by the IP network user.

**Scenario 2:** communication between IP-based network users and International Telecommunication Network users, in which the call set-up is originated by the International Telecommunication Network user.

**Scenario 3:** communication between International Telecommunication Network users, using IP-based networks for the connection/trunking between the involved users.

**Scenario 4:** communication between IP-based network users, using International Telecommunication Networks for the connection/trunking between the involved users.

In principle the interworking between the IP-based network and the international telecommunication network can be at any level in the international telecommunication network hierarchy, e.g. local exchange, transit exchange, international exchange.

### 8.2 Call from IP-based network to international telecommunication networks (Scenario 1)

In this configuration, the call is established within the IP-based network towards the international telecommunication networks (see Figure 1). Any added functionality to enable interworking should be provided in the IP-based network, unless otherwise agreed between the operators of the IP-based and international telecommunication networks.

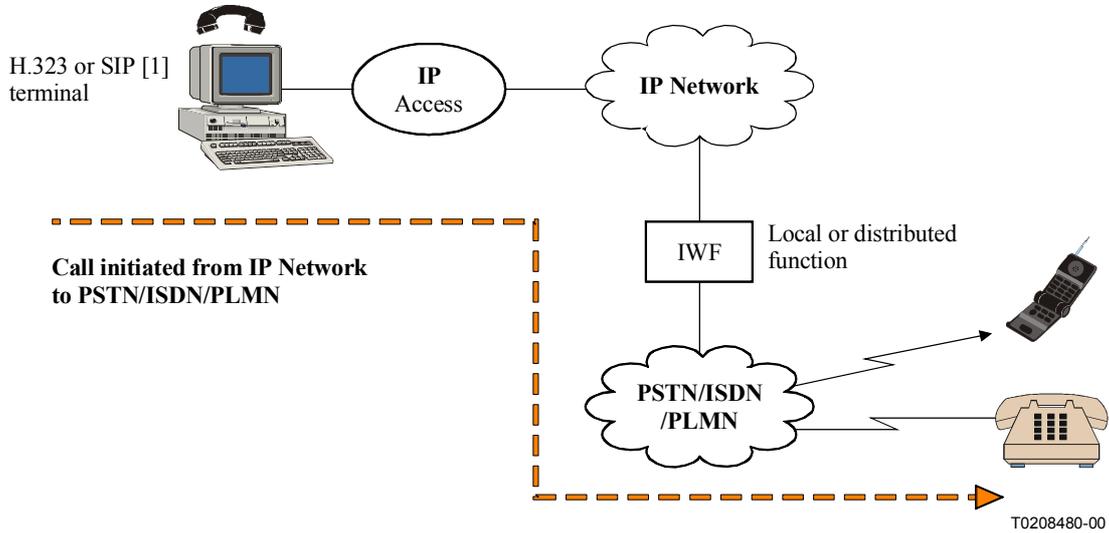


Figure 1/E.370 – Call from IP network user to the international telecommunication network

### 8.3 Call from international telecommunication networks to IP-based network (Scenario 2)

In this configuration, a call is established from the international telecommunication networks towards the IP-based Network user (see Figure 2). Any added functionality to enable interworking should be provided in the IP-based network, unless otherwise agreed between the operators of the IP-based and international telecommunication networks.

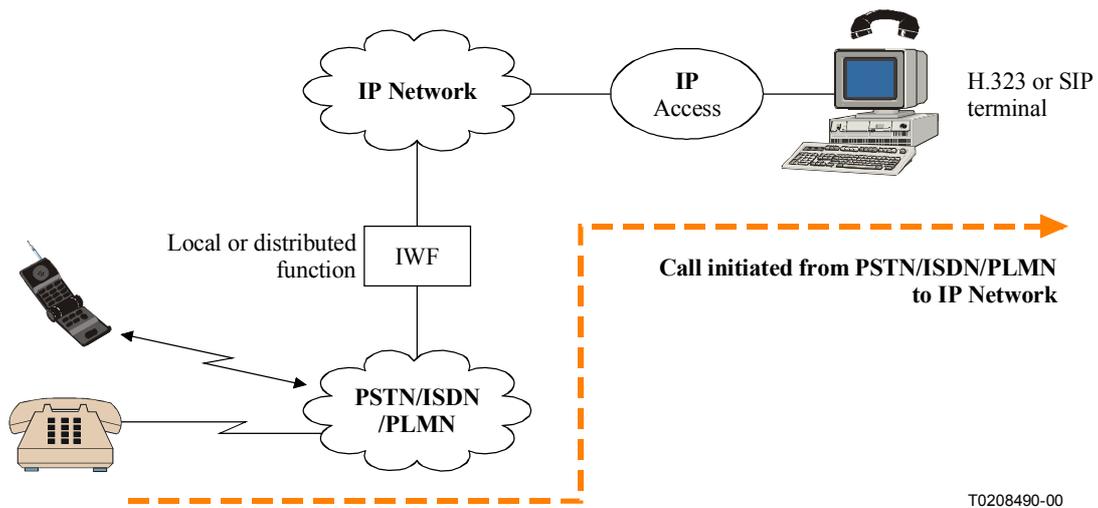


Figure 2/E.370 – Call from international telecommunication networks to an IP-based network user

#### 8.4 Interconnection of international telecommunication networks using IP-based network (Scenario 3)

In this case, the IP-based network is provided by a separate entity (e.g. ROA) from the international telecommunication network (see Figure 3). It does not cover the case where IP technology is integrated within the international telecommunication network of a single service provider.

The traffic, technical, economical, and administrative advantages/disadvantages should be considered before such interconnection is proposed by network operators.

Any added functionality to enable interworking should be provided in the IP-based network, unless otherwise agreed between the operators of the IP-based and international telecommunication networks.

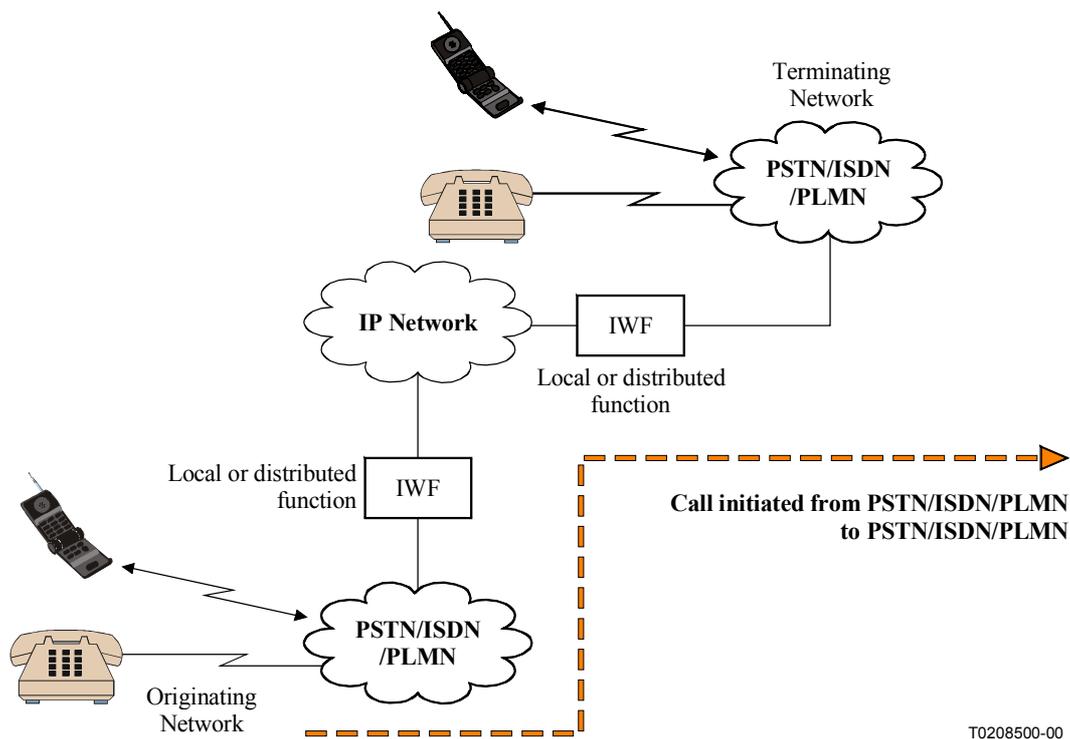
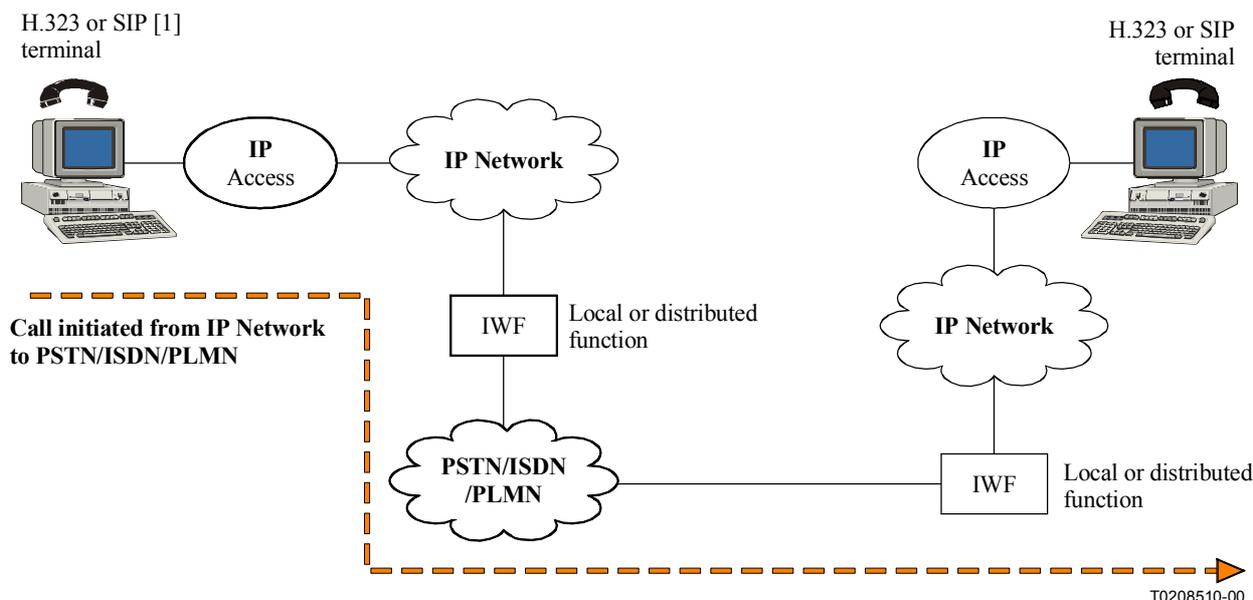


Figure 3/E.370 – Call from international telecommunication network to another international telecommunication network via an IP-based network

#### 8.5 Interconnection of IP-based networks using International Telecommunication Networks (Scenario 4)

In this case, the IP-based network is provided by a separate entity (e.g. ROA) from the international telecommunication network (see Figure 4). It does not cover the case where IP technology is integrated within the international telecommunication network of a single service provider.

Any added functionality to enable interworking should be provided in the IP-based network, unless otherwise agreed between the operators of the IP-based and international telecommunication networks.



**Figure 4/E.370 – Call from an IP-based network user to another IP-based network user via an international telecommunication network**

## 9 Operation

**9.1** When interworking between IP-based networks and international telecommunication networks the operational procedures for services should, wherever possible, be the same as for those on the international telecommunication networks. The same tones, announcements, service codes and signals, etc., used in the international telecommunication services should be recognized and where appropriate returned by the IP-based network. For interworking between IP-based networks and international telecommunication networks, User-to-Network signalling (where a user on one network is accessing functionality supplied on the other network), Network-to-Network signalling, and User-to-User signalling must be consistently interpreted across the various networks. The latter case is particularly important when users must interact with interactive voice response systems.

**9.2** For users on the international telecommunication networks to reach users on IP-based networks, terminals on the IP-based network should be addressable using the international numbering plan applicable to the international telecommunication services (i.e. ITU-T E.164).

**9.3** There should be mechanisms in place to cater for the needs of any call recording, billing and international accounting functions that might be required. For example, an answer supervisory signal should be returned by the terminating network when an incoming call is established.

## 10 Quality of service

When international telecommunication networks interwork with IP-based networks, the quality of service experienced by the users should, as far as practicable, be the same as if there had been no interworking involved.<sup>1</sup>

<sup>1</sup> Categories of speech quality are defined in ITU-T G.109 [2].

## APPENDIX I

### **Bibliography**

- [1] HANDLEY (M.), SCHULZRINNE (H.), SCHOOLER (E.), and ROSENBERG (J.): SIP: session initiation protocol, *Request for Comments 2543, Internet Engineering Task Force* 1999.
- [2] ITU-T G.109 (1999), *Definition of categories of speech transmission quality*.

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