INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

E.671

(03/2000)

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

Quality of service, network management and traffic engineering – Traffic engineering – Definitions

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Post-selection delay in PSTN/ISDN networks using Internet telephony for a portion of the connection

ITU-T Recommendation E.671

(Formely CCITT Recommendation)

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ITU-T RECOMMENDATION E.671

POST-SELECTION DELAY IN PSTN/ISDN NETWORKS USING INTERNET TELEPHONY FOR A PORTION OF THE CONNECTION

Summary

This Recommendation proposes a post-selection delay Grade of Service (GOS) parameter and target values when part of a PSTN/ISDN connection is replaced by Internet Protocol (IP) based network(s). This parameter is defined and their target values specified assuming that the network and the network components are fully operational. Also, only point-to-point connections supporting basic call flows are considered in this release of the Recommendation.

Source

ITU-T Recommendation E.671 was prepared by ITU-T Study Group 2 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 13 March 2000.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The 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 Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 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.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Recommendation E.671

POST-SELECTION DELAY IN PSTN/ISDN NETWORKS USING INTERNET TELEPHONY FOR A PORTION OF THE CONNECTION

(Geneva, 2000)

1 Scope

This Recommendation proposes a post-selection delay Grade of Service (GOS) parameter and target values when part of a PSTN/ISDN connection is replaced by Internet Protocol (IP) based network(s). This parameter is defined and their target values specified assuming that the network and the network components are fully operational. Also, only point-to-point connections supporting basic call flows are considered in this release of the Recommendation.

NOTE 1 – Other GOS parameters such as answer-signal delay, call-release delay, and probability of end-to-end blocking, require further study.

NOTE 2 – This release of the Recommendation is concerned only with the case of *transparent service*, i.e. users will not be aware of the fact that a portion of the circuit-switched connection is being replaced by IP telephony. When this is not the case, IP telephony may be used to facilitate the offering of a set of service classes with different qualities of service. This subject requires further study.

2 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; all 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 Recommendation E.500 (1998), *Traffic intensity measurement principles*.

– CCITT Recommendation E.540 (1988), *Overall grade of service of the international part of an international connection*.

– CCITT Recommendation E.541 (1988), *Overall grade of service for international connections (subscriber-to-subscriber)*.

– ITU-T Recommendation E.651 (2000), *Reference connections for traffic engineering of IP access networks*.

– ITU-T Recommendation E.721 (1999), *Network grade of service parameters and target values for circuit-switched services in the evolving ISDN*.

– ITU-T Recommendation E.771 (1996), *Network grade of service parameters and target values for circuit-switched land mobile services*.

– ITU-T Draft Recommendation Y.1231, *IP access network architecture*.

– ITU-T Draft Recommendation Y.1530, *Call processing performance for voice service in hybrid IP networks*.

3 Abbreviations

This Recommendation uses the following abbreviations:

GOS Grade of Service

IP Internet Protocol

ISDN Integrated Services Digital Network

PSTN Public Switched Telephone Network

TE Terminal Equipment

VOIP Voice Over Internet Protocol

4 Post-selection delay GOS

4.1 GOS concepts

GOS parameters were developed for traditional circuit-switched PSTN and standards set in Recommendations E.540 and E.541. GOS concepts were refined and new standards set in the context of circuit-switched services on ISDN. The new standards are given in Recommendations E.720 and E.721. This Recommendation is based on the concepts, parameter definitions, and service types given in Recommendation E.721.

4.2 Definitions

The following two definitions of "post-selection delay", as specified in Recommendation E.721, are reproduced herein for ease of reference.

4.2.1 post-selection delay (overlap sending) is defined as the time interval from the instant the first bit of the INFORMATION message containing the last selection digit is passed by the calling terminal to the access signalling system until the last bit of the first message indicating call disposition is received by the calling terminal (ALERTING message in case of successful call).

4.2.2 post-selection delay (*en bloc* sending) is defined as the time interval from the instant the first bit of the initial SETUP message containing all the selection digits is passed by the calling terminal to the access signalling system until the last bit of the first message indicating call disposition is received by the calling terminal (ALERTING message in case of successful call).

NOTE – In case of automatic answering terminals, the ALERTING message is replaced by the CONNECT message.

4.3 Target values

When IP-based networks are used to substitute for a portion of the circuit-switched PSTN/ISDN connection, users will expect and network providers should meet comparable end-to-end post-selection delay as is encountered on connections provided entirely on PSTN/ISDNs. Refinement of the target values which are provisionally specified herein is for further study.

NOTE – If and when IP telephony is used to provide a set of service classes with different qualities of service, the services so provided will not be transparent to the user in the sense of Note 2, in clause 1. In this case, the target values for the respective service classes will necessarily be different from the ones specified in this Recommendation.

5 Reference connections

This Recommendation is concerned with the class of *PSTN/ISDN-to-PSTN/ISDN via IP* reference connections as specified in 6.2.3/E.651. It is reproduced in Figure 1.

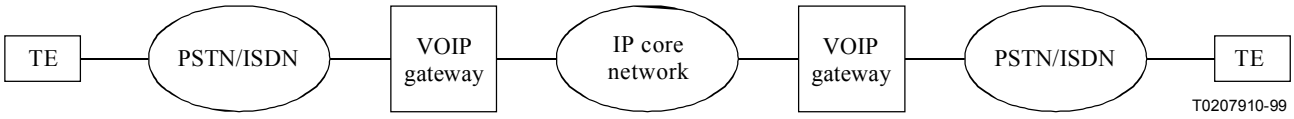


Figure 1/E.671 – PSTN/ISDN-to-PSTN/ISDN connection via IP

The *IP core network* "cloud" in the diagram is also commonly referred to as the "IP backbone". It provides wide-area coverage and interconnection between domains. As specified in Draft Recommendation Y.1231, the IP core network may include one or more IP service provider networks.

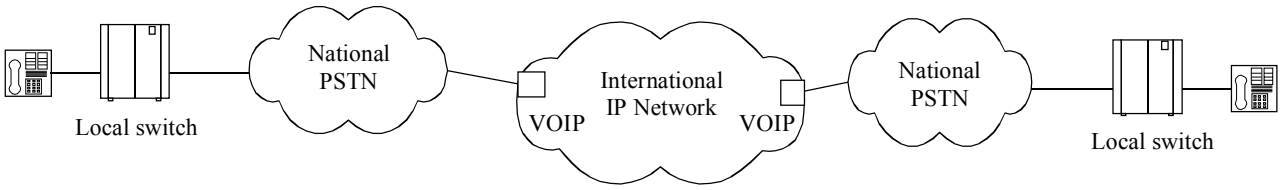
The *Voice Over IP (VOIP) gateway* is responsible for the translation and handling of voice calls between PSTN/ISDN and IP core network.

For this class of reference connections, there are three cases of interest for which separate standards for the IP portion of an overall connection can be set. These are:

- *Connection type 1*: IP as a national network where the IP-based network replaces a national PSTN/ISDN in a long-distance connection.
- *Connection type 2*: IP as an international network where the IP-based network replaces the international portion of an international connection. There are three subcases:
  a) The PSTN/ISDNs at both the originating and terminating ends are not replaced by an IP-based network;
  b) The PSTN/ISDN at the originating end is replaced by an IP-based network;
  c) The PSTN/ISDN at the terminating end is replaced by an IP-based network.
- *Connection type 3*: IP as an end-to-end network where the IP-based network replaces both the national and international portions of an international connection.

These three types of reference connections are given in Figure 2. [For connection type 2, only subcase a) is shown in the figure.]

Connection type 1: National IP network



Connection type 2: International IP network

Connection type 3: National/international IP network

Figure 2/E.671 – Reference connections

6 GOS objectives

The target values for the post-selection delay parameter for the above three types of reference connections are given in Table 1.

Table 1/E.671 – Postselection delays for PSTN/ISDN connections with IP telephony

Reference connection	Normal load		High load	
	Mean	**95%**	**Mean**	**95%**
National IP network (equivalent to E.721 toll)	5.0 s	8.0 s	7.5 s	12.0 s
International IP network	FFS	FFS	FFS	FFS
National/international IP network (equivalent to E.721 international)	8.0 s	11.0 s	12.0 s	16.5 s

FFS For further study

NOTE 1 – The "national IP network" connection is considered equivalent to the E.721 toll connection. The "national/international IP network" connection is considered equivalent to the E.721 international connection. Consistent with E.721, except for mean delay at normal load, all other target values are provisional and require further review.

NOTE 2 – The target values are specified at the normal and high loads, with the loading conditions being specified in the same sense as Recommendation E.500. However, the definitions there may need to be adapted for use in IP-based networks. Also for further study is the application of these loading conditions in a geographically distributed network with non-coincident busy hours.

NOTE 3 – International connections are assumed to include one satellite link.

NOTE 4 – Delays for any required database lookup will need to be added to the above target values.

7 History

This is the first issue of Recommendation E.671.

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18128

Printed in Switzerland
Geneva, 2000