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SPECIFICATIONS OF SIGNALLING SYSTEM No. 7
ISDN USER PART

PERFORMANCE OBJECTIVES IN THE INTEGRATED SERVICES DIGITAL NETWORK APPLICATION

ITU-T Recommendation Q.766

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. 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, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Q.766 was revised by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 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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PERFORMANCE OBJECTIVES IN THE INTEGRATED SERVICES DIGITAL NETWORK APPLICATION

(Malaga-Torremolinos 1984; modified at Helsinki, 1993)

1 Introduction

This Recommendation gives the requirements of the Integrated Services Digital Network (ISDN) application call control service supported by Signalling System No. 7 (SS No. 7).

The MTP supports the ISDN application of Signalling System No. 7. In Recommendation Q.706, the Message Transfer Part (MTP) performance is described. The provision of a signalling network to support the ISDN application must take account of the performance of the MTP and the requirements of the ISDN application. For example, taking account of the message transfer times in Recommendation Q.706 and the requirements for message transfer times between two ISDN exchanges, a figure may be derived for the total permissible number of signalling links in tandem for a particular call.

The Recommendations E.721 [3] and I.352 [4] also relate to ISDN performance.

2 Signalling availability

2.1 Signalling route set availability

The availability of a signalling route set is determined by the availability of the individual components of the signalling network (signalling links and the signalling points) and by the structure of a signalling network.

The availability of a signalling route set (according to 1.1/Q.709) should not be less than 0.99998. This corresponds to a total downtime for a user signalling relation of ten minutes per year maximum.

2.2 Signalling network availability

The availability of the signalling network should be sufficiently high as to meet the signalling route set downtime objectives stated in 2.1. The signalling network architecture selected will strongly influence the availability. In general, the greater the number of link sets in tandem in a signalling route set the more redundant signalling paths that will be needed to meet the availability objective for the signalling route set or user signalling relation.

3 Signalling dependability

3.1 General

The ISDN application is different from other applications, such as telephony and data, in that there may be multiple paths involved for any given ISDN call. There may be several circuits (e.g. telephone conferencing) for either telephony or data and non-circuit related connections for access to data bases or for terminal-to-terminal control. This diverse set of uses may require closer control of the signalling network resources than might be required for other more simple applications.

3.1.1 Probability of false operation

By means of error detection (see Recommendation Q.703) as well as transmission fault indication (see Recommendations G.732 [1] and G.733 [2]), it is ensured that, overall, not more than one in 10^8 of all signal units transmitted is accepted that, due to errors, will cause false operation.

3.2 Probability of signalling malfunction

Unsuccessful calls may be caused by undetected errors, loss of messages, or messages delivered out of sequence (during emergency situations within the signalling network) and may result in:

- incomplete call set-up;
- misrouted calls (e.g. connection of wrong numbers);
- calls routed correctly but mishandled (e.g. false clearing);
- inability to access a data base.

Considering the above conditions and the performance for the MTP, no more than 2 in 10^5 (provisional value) of all ISDN calls should be unsuccessful due to signalling malfunction.

NOTE – No more than 1 in 10^5 of all ISDN circuit connections should be unsuccessful due to signalling malfunction.

4 Signalling delay

4.1 Functional reference points and transfer time components

Figure 1 shows the time components associated with the handling and transfer of ISUP messages at a transit exchange.

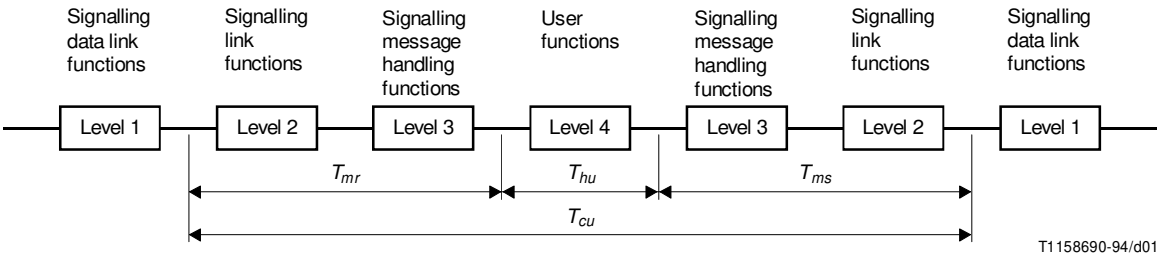

FIGURE 1/Q.766

Transit exchange cross-office transfer time components

4.2 Delays

T_{mr} and T_{ms} are defined in 4.3.2/Q.706.

4.2.1 cross-office transfer time, T_{cu}

T_{cu} is the period which starts when the last bit of the signal unit leaves the incoming signalling data link and ends when the last bit of the signal unit enters the outgoing signalling data link for the first time. It includes the user handling time T_{hu}. It also includes the queuing delay in the absence of disturbances but not the additional queuing delay caused by retransmission. It does not include the data channel propagation time.

4.2.2 user handling time, T_{hu}

T_{hu} is the period which starts when the last bit of the message has entered the upper layer functions and ends when the last bit of the derived message has left the upper layer functions.

4.2.3 Objectives for cross-office transfer time, T_{cu}

The figures in Table 1 are the objectives for the cross-office transfer time T_{cu} for the ISDN signalling points in the signalling network. These figures are related to a signalling bit rate of 64 kbit/s.

TABLE 1/Q.766

Transit exchange cross-office transfer time, T_{cu} [1)]

Message type	Exchange call attempt loading	T_{cu} (ms)	
		Mean	95%
Simple (e.g. answer)	Normal +15% +30%	110 165 275	220 330 550
Processing intensive (e.g. IAM)	Normal +15% +30%	180 270 450	360 540 900

1) Provisional values.

Delays concerning data base query functions are not included at this time. The delays corresponding to those functions are for further study.

A processing intensive message is one that arrives at an exchange and requires detailed examination (and possibly modification) before it is transmitted to the next exchange.

A simple message is one that requires little or no examination or modification (typically only label translation) before it is transmitted to the next exchange.

4.3 Answer delay

As a consequence of correction by retransmission, not more than one in 10^4 signals should be delayed more than 300 ms as a long-term average. This requirement refers to each signalling link.

This requirement is laid down in order to ensure satisfactory answer delays.

Further study is required to determine if this value is sufficient if satellite working is used.

4.4 Influence of new ISDN applications on performance

Delays relating to data base query functions have not been included. These delays, and the relationship between them are for further study, but information relating to these delays can be found in 7/Q.709.

If the load on the links is mixed with messages of significantly different lengths (e.g. from other User Parts) then the increase in the outgoing link delay T_{od} as shown in 5/Q.706, has to be taken into consideration. If satellite links are used in this case, the relevant increase is shown in 3/Q.706.

5 Signalling system limitations

5.1 Labelling potential

5.1.1 Signalling points

The label of the SS No. 7 for the ISDN application provides the potential to identify 16 384 signalling points.

5.1.2 Number of circuits in a user signalling relation

There may be up to 4096 circuits (4096 channels in each direction) for each user signalling relation.

5.1.3 Number of SCCP connections in a user signalling relation

There may be up to 2^{24} SCCP connections available at an ISDN signalling point. All of these may be available for any given user signalling relation, but must be shared over all signalling relations.

5.2 Number of ISDN call identities at a signalling point

There may be up to 2^{24} (value for further study) simultaneous ISDN calls at a signalling point with the 2^{24} call identities available. The use of ISDN call identities is for further study.

References

[1] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s,* Rec. G.732.

[2] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s,* Rec. G.733.

[3] CCITT Recommendation *Network GOS parameters and target values for circuit-switched services in the evolving ISDN,* Rec. E.721.

[4] CCITT Recommendation *Network performance objectives for connection processing delays in an ISDN,* Rec. I.352.