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SPECIFICATIONS OF SIGNALLING SYSTEM No. 7

SIGNALLING SYSTEM No. 7 – HYPOTHETICAL SIGNALING REFERENCE CONNECTION

ITU-T Recommendation Q.709

(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.709 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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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Recommendation Q.709**SIGNALLING SYSTEM No. 7 – HYPOTHETICAL
SIGNALLING REFERENCE CONNECTION***(Malaga-Torremolinos, 1984; modified at Helsinki, 1993)***1 Introduction**

This Recommendation specifies how the elements of a signalling connection from an originating node to a terminating node are combined to meet the signalling requirements of the networks that it supports. Included are parameters for signalling transfer delay in both national and international networks, and overall signalling delay that such combinations will produce, together with the availability required, to enable the performance of the network served by the signalling network to be maintained.

A probabilistic approach has been taken, i.e. limits are specified for 50% and 95% of connections. These figures will apply to the normal operation of a signalling network. No consideration is given to the “unusually long” signalling paths that are found in some signalling networks. Any unusual routing caused by some network structures and/or reconfigurations due to network failure are considered to be covered in the remaining 5% of connections.

The hypothetical signalling reference connection (HSRC) for international working is specified in this Recommendation by defining the constituent parts of

- i) one international section; and
- ii) two national sections.

When combining the sections to produce an overall HSRC, it is necessary to consider what impact each of the three component parts have on each other and the full HSRC. This means that certain national or international limits such as the maximum number of signalling transfer points allowed in a signalling relation (see 5.2/Q.705) may require modification and account of this has been taken in this Recommendation.

The effect on the HSRC of larger message sizes (see 7.2) and database queries due to new SS No. 7 applications are also considered (see Annex A).

2 Requirements of networks served by the signalling connection

To meet the requirements of services carried on the network served by the signalling network, the signalling connection performance should be closely aligned with those requirements. Since these services are ultimately to be carried on an ISDN, the HSRC is based upon the hypothetical reference connection developed for ISDN network (see Recommendation G.801). Account must also be taken of the service requirements in Recommendations E.721, E.723 and I.352.

However, for a considerable time the majority of services in the network served by the signalling network will be telephony-based and account must therefore be taken of the reference connection for conventional telephony application (see Recommendation G.101).

3 HSRC components for link-by-link signalling**3.1 General**

The components of a HSRC are signalling points and STPs which are connected in series by signalling data links to produce a signalling connection (see Note 1). The number of signalling points and STPs depend on the size and structure of the network. Two limits are prescribed to cover 50% and 95% of cases. Separate cases are allowed for large-size countries and average-size countries (see Note 2). This clause outlines the considerations involved in formulating a HSRC for link-by-link signalling and details the number of HSRC components and the delays they produce.

NOTES

1 The term signalling point is used to designate use of a user function in a signalling point: whether or not STP function is present is irrelevant in this context. The term STP is used to designate use of the STP function in a signalling point: whether or not a user function is present is irrelevant in this context.

2 When the maximum distance between an international switching centre and a subscriber who can be reached from it does not exceed 1000 km or, exceptionally, 1500 km, and when the country has less than $n \times 10^7$ subscribers, the country is considered to be of average-size. A country with a larger distance between an international switching centre and a subscriber, or with more than $n \times 10^7$ subscribers, is considered to be of large-size. (The value of n is for further study.)

3.1.1 Number of signalling points in the HSRC

The number of signalling points in the HSRC has been determined by considering the maximum number of links allowed by the Telephone Routing Plan (see Recommendation E.171). These Recommendations define “last choice” backbone routes and only a small proportion of traffic take these routes. Traffic generated in metropolitan areas, generally the largest source of traffic, usually takes far fewer links to an international switching centre. Even for rural areas a connection to the international switching centre will not generally be required to follow the backbone route.

Limiting the number of signalling points required will reduce the signalling delay, because signalling point delay forms the largest component of signalling delay.

3.1.2 Number of STPs in a HSRC

The number of STPs in a HSRC is a function of the number of signalling points, and the signalling network topology used to connect these signalling points. The number of STPs should be kept to a minimum in order to limit the signalling delay. In some signalling relationship, associated signalling may be used for which no STPs are required. In others, one or more STPs may be used. For international signalling relationship, it is recommended that no more than 2 STPs be used in a signalling relations (see 5.2/Q.705).

3.1.3 Signalling network availability

The availability of a signalling connection is an important network parameter. It is necessary for the availability of the signalling connection to be significantly better than the availability of the component being controlled (e.g. a circuit). The total unavailability figure for any particular signalling route set (see 1.1/Q.706) should not exceed:

- 10 minutes per year.

This corresponds to an availability of 0.99998, which can be achieved by the use of suitable network redundancies.

3.1.4 Signalling message transfer delay

Signalling message transfer delay is another important network parameter. It affects call set up delay and also affects network response time to service requests made during a call. Note that in this Recommendation, the transmission propagation delays are not included (see 7.2).

3.2 International component of HSRC

The international component of the HSRC includes all international signalling points in the connection and the STPs carrying signalling messages between the signalling points. The maximum number of signalling points and STPs allowed are listed in Table 1.

The total unavailability of the overall international component of the signalling network should not exceed the following for both the 50 percent and 95 percent cases:

- 20 minutes per year for large-size country to large-size country;
- 30 minutes per year for large-size country to average-size country; and
- 40 minutes per year for average-size country to average-size country.

The maximum signalling transfer delay under normal conditions for the international component of a connection should not be worse than the values listed in Table 2.

TABLE 1/Q.709

Maximum number of signalling points and STPs in international component

Country size (Note 1)	Percent of connections	Number of STPs	Number of signalling points
Large-size to Large-size	50%	3	3
	95%	4	
Large-size to Average-size	50%	4	4
	95%	4	
Average-size to Average-size	50%	5	5
	95%	7	
NOTES			
1 See Note 2 to 3.1.			
2 See clause 7.			

TABLE 2/Q.709

Maximum signalling delays for international component

Country size	Percent of connections	Delay (ms) (Note 1)	
		Message type	
		Simple (e.g. answer)	Processing intensive (e.g. IAM)
Large-size to Large-size	50%	390	600
	95%	410	620
Large-size to Average-size	50%	520	800
	95%	540	820
Average-size to Average-size	50%	650	1000
	95%	690	1040
NOTES			
1 Only the mean delay component from Table 5/Q.706, Table 3/Q.725 and Table 1/Q.766 have been used in calculating the delay. Further study is required, eg. for the mean values as well as the inclusion of overload and/or 95 percentile cases of each component value.			
2 See clause 7.			

3.3 National components of HSRC

The national components of the HSRC includes all national exchanges in the connection (but does not include the international switching centre in the country) and all STPs carrying signalling messages between the national exchanges and between the highest level national exchange and the international switching centre. The maximum number of signalling points and STPs allowed are listed in Table 3.