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G.822

DIGITAL NETWORKS

CONTROLLED SLIP RATE OBJECTIVES ON AN INTERNATIONAL DIGITAL CONNECTION

ITU-T Recommendation G.822

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation G.822 was published in Fascicle III.5 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

Recommendation G.822

CONTROLLED SLIP RATE OBJECTIVES ON AN INTERNATIONAL DIGITAL CONNECTION

(Geneva, 1980; further amended)

1 General

This Recommendation deals with end-to-end *controlled octet slip rate* objectives for 64-kbit/s international digital connections. The objectives are presented for various operational conditions in relation to the evaluation of connection quality.

Under design conditions for digital network nodes and within defined normal transmission characteristics, it may be assumed that there are zero slips in a synchronized digital network. However, the defined transmission characteristics can be exceeded under operating conditions and cause a limited number of slips to occur even in a synchronized network.

Under temporary loss of timing control within a particular synchronized network, additional slips may be incurred, resulting in a larger number of slips for an end-to-end connection.

With plesiochronous operation, the number of slips on the international links will be governed by the sizes of buffer stores and the accuracies and the stabilities of the interconnecting national clocks.

2 Scope and considerations

2.1 The end-to-end slip rate performance should satisfy the service requirements for telephone and non-telephone services on a 64-kbit/s digital connection in an ISDN.

2.2 The slip rate objectives for an international end-to-end connection are stated with reference to the standard digital Hypothetical Reference Connection (HRX) of Figure 1/G.801 [1] of 27 500 km in length.

2.3 It is assumed that international switching centres (ISC) are interconnected by international links which are operating plesiochronously, using clocks with accuracies as specified in Recommendation G.811. It is recognized that one slip in 70 days per plesiochronous interexchange link is the resulting maximum theoretical slip rate, taking into account clock accuracies according to Recommendation G.811 only, and provided that the performance of the transmission and switching requirements remain within their design limits.

2.4 In the case where the connection includes all of the 13 nodes identified in the HRX (Recommendation G.801) and these nodes are all operating together in a plesiochronous mode, the nominal slip performance of a connection could be 1 in 70/12 days or 1 in 5.8 days. However, since in practice some nodes in such a connection would be part of the same synchronized network a better nominal slip performance can be expected (e.g. where the National Networks at each end are synchronized. The Nominal Slip Performance of the connection would be 1 in 70/4 or 1 in 17.5 days).

Note - These calculations assume a maximum of four international links.

2.5 In a practical international end-to-end connection containing both international and national portions, the slip rate may significantly exceed the value computed from *n* plesiochronous interexchange links due to various design, environmental and operational conditions in international and national sections. These include:

a) configuration of the international digital network,

b) national timing control arrangements,

c) wander due to extreme temperature variations,

d) operational performance characteristics of various types of switches and transmission links (including diurnal variations of satellite facilities),

e) temporary disturbances on transmission and synchronization links (network rearrangements, protection switching, human errors, etc.).

Note - The maximum number, *n*, of plesiochronous interexchange links is under study.

2.6 A threshold of slip performance is a suitable compromise between desired service requirements and normally achievable performance. Slip levels according to category (b) (see Table 1/G.822) exceeding this threshold will begin to affect performance and can cause some services to be considered degraded. In order to ensure that a trend of performance has been identified, the threshold rate must be measured over a sufficient period to record a significant number of slips. An objective limit is placed on the total time that the threshold is exceeded during the period of one year. The performance objectives are intended to represent a uniform set of specifications.

Slip is one of several contributing factors to impairment of a digital connection. The performance objectives for the rate of octet slips on an international connection of 27 500 km in length or a corresponding bearer channel are given in Table 1/G.822. Further study is required to confirm that these values are compatible with other objectives, e.g. the error performance as listed in Recommendation G.821.

TABLE 1/G.822

Controlled slip performance on a 64 kbit/s international connection or bearer channel

Performance category	Mean slip rate	Proportion of time (Note 1)
(a) (Note 2)	≤ 5 slips in 24 hours	> 98.9 %
(b)	> 5 slips in 24 hours and ≤ 30 slips in 1 hour	< 1.0 %
(c)	> 30 slips in 1 hour	< 0.1 %

Note 1 - Total time ≥ 1 year.

Note 2 - The nominal slip performance due to plesiochronous operation alone is not expected to exceed 1 slip in 5.8 days (see § 2.4).

3 Allocation of impairments

3.1 The probability of more than one section of the network experiencing excessive slips which will simultaneously affect any given connection, is low. Advantage is taken of this factor in the allocation process.

3.2 Because the impact of slips occurring in different parts of a connection will vary in importance depending upon the type of service and the level of traffic affected, the allocation process includes placing tighter limits on slips detected at international and national transit exchanges and less stringent limits on small local exchanges.

3.3 The recommended allocation process is based on subdividing the percentage of time objectives for performance categories (b) and (c) (Table 1/G.822). A provisional allocation is made to the various portions of the HRX as shown in Table 2/G.822.

TABLE 2/G.822

Allocation of controlled slip performance objectives

Portion of HRX derived from Figure 1/G.801 [1]	Allocated proportion of each objective in Table 1/G.822	Objectives as proportion of total time	
		(b)	(c)
International transit portion	8.0 %	0.08 %	0.008 %
Each national transit portion (Note 2)	6.0 %	0.06 %	0.006 %
Each local portion (Note 2)	40.0 %	0.4 %	0.04 %

Note 1 - The portions of the HRX are defined in Figure 1/G.822. They are derived from but not identical to Recommendation G.801.

Note 2 - The allocation between national transit portion and local portion is given for guidance only. Administrations are free to adopt a different apportionment provided the total for each national portion (local plus transit) does not exceed 46%.

Note 3 - Performance levels are defined in Table 1/G.822.

Note 4 - Total time ≥ one year.

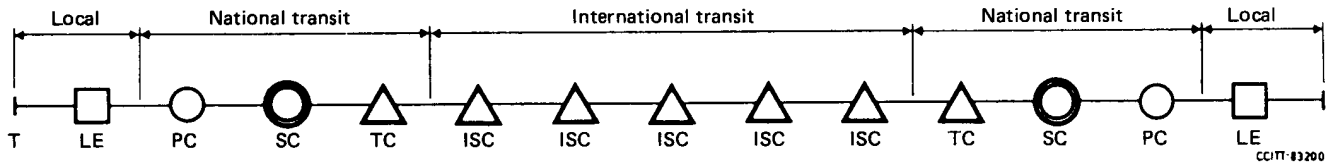

FIGURE 1/G.822

Subdivision of the HRX for the purpose of allocation of slip performance objectives

Reference

[1] CCITT Recommendation *Digital transmission models*, Vol. III, Rec. G.801, Figure 1/G.801.