INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

I.351

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(03/93)

INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

OVERALL NETWORK ASPECTS AND FUNCTIONS

RELATIONSHIPS AMONG ISDN PERFORMANCE RECOMMENDATIONS

ITU-T Recommendation I.351

(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 I.351 was revised by the ITU-T Study Group XVIII (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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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.

CONTENTS

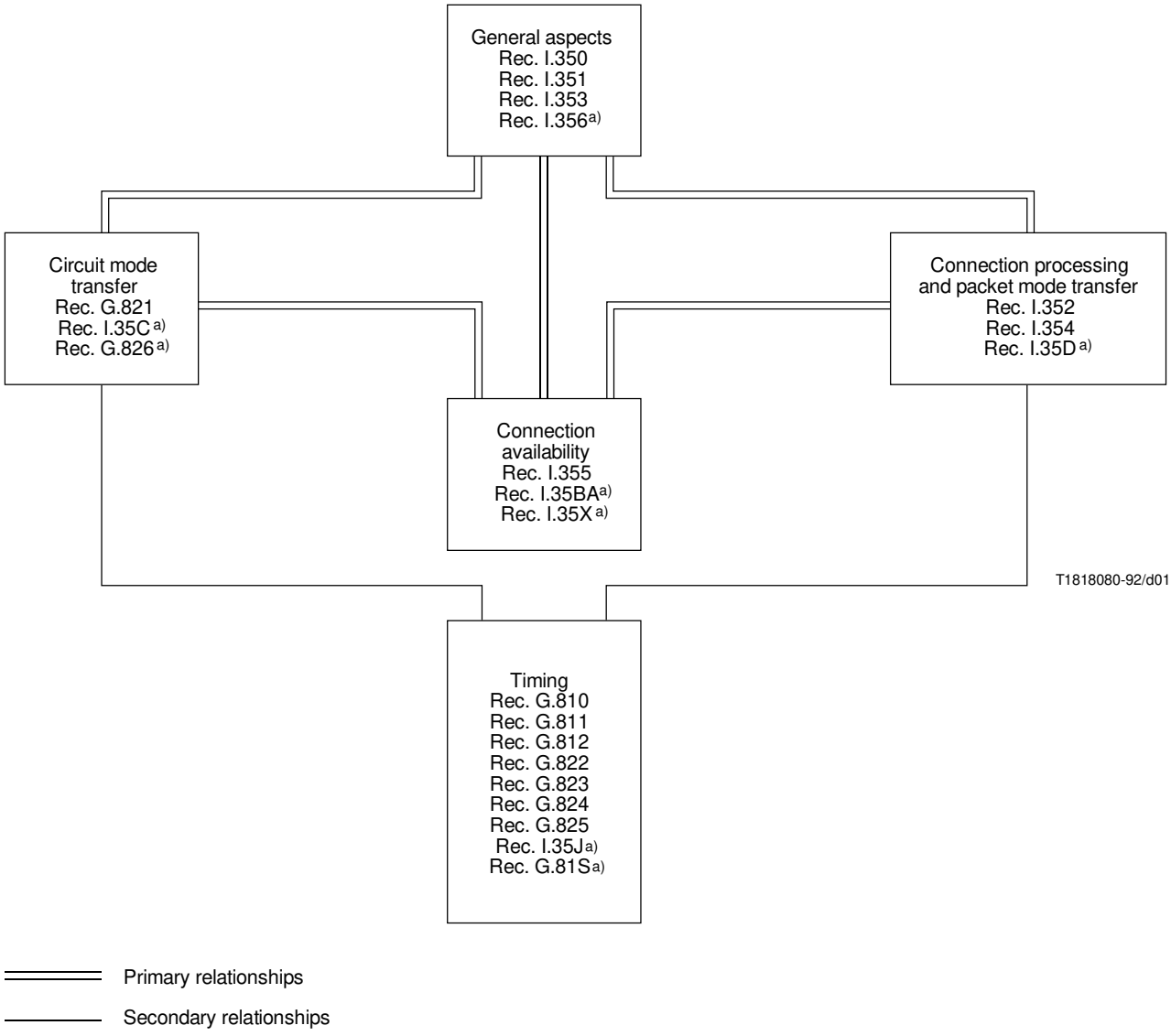
Recommendation I.351

RELATIONSHIPS AMONG ISDN PERFORMANCE RECOMMENDATIONS

(Melbourne, 1988; revised in Helsinki, 1993)

1 General

This Recommendation defines a general structure for a set of existing and planned CCITT Recommendations that collectively provide a basis for the specification and apportionment of performance in ISDNs. These Recommendations are intended to be used in describing performance at measurement points that delimit and apportion international ISDN connections. The relevant Recommendations and their relationships are illustrated in Figure 1. The general scope and content of each Recommendation is described in the following clauses.



a) These Recommendations were under development or planned at the time this Recommendation was approved.

FIGURE 1/I.351

Relationships among the ISDN performance Recommendations

2 Recommendations concerning general aspects of ISDN performance

In addition to this Recommendation, the following Recommendations define general aspects of ISDN performance and provide a basis for the definition of specific performance parameters and values in other ISDN performance Recommendations.

Recommendation I.350

GENERAL ASPECTS OF QUALITY OF SERVICE AND NETWORK PERFORMANCE IN DIGITAL NETWORKS, INCLUDING ISDNs

Recommendation I.350 defines Quality of Service (QOS) and network performance (NP) principles; illustrates how the QOS and NP concepts are applied in digital networks, including ISDNs (providing both narrow-band and broadband capabilities); describes the features of, and the relationships between, these concepts; indicates and classifies performance concerns for which parameters may be needed; and identifies generic performance parameters.

Recommendation I.353

REFERENCE EVENTS FOR DEFINING ISDN PERFORMANCE PARAMETERS

Recommendation I.353 defines the measurement points and performance-significant reference events to be used in Recommendations I.356[1)], I.35C[1)], I.352, I.354, and I.35D[1)] to define performance parameters and specify performance objectives for international ISDN connections.

Recommendation I.356[1)]

B-ISDN ATM LAYER CELL TRANSFER PERFORMANCE
(UNDER STUDY)

Recommendation I.356[1)] will specify cell transfer performance parameters and performance objectives for the ATM layer of a Broadband ISDN. The B-ISDN performance parameters and objectives will be based on the measurement points and performance-significant reference events defined in Recommendation I.353.

---

1) These Recommendations were under development or planned at the time this Recommendation was approved.

3 Circuit mode transfer

The following Recommendations concern circuit mode transfer performance of an ISDN.

Recommendation G.821

ERROR PERFORMANCE OF AN INTERNATIONAL DIGITAL CONNECTION FORMING PART OF AN INTEGRATED SERVICES DIGITAL NETWORK

Recommendation G.821 specifies error performance parameters and objectives for each direction of a 64 kbit/s circuit-switched connection used for voice-traffic or as a bearer channel for data-type services. The 64 kbit/s circuit-switched connection referred to is an all-digital hypothetical reference connection (HRX) which encompasses a total length of 27 500 km.

Recommendation I.35C[1)]

DELAY PERFORMANCE OF CIRCUIT MODE CONNECTIONS IN AN ISDN
(UNDER STUDY)

Recommendation I.35C[1)] will specify parameters and values which describe delay aspects of the user information transfer in circuit mode ISDN connections. The delay parameters and objectives will be based on the measurement points and performance-significant reference events defined in Recommendation I.353.

Recommendation G.826[1)]

ERROR PERFORMANCE PARAMETERS AND OBJECTIVES FOR CONSTANT BIT RATE INTERNATIONAL DIGITAL PATHS AT OR ABOVE THE PRIMARY RATE
(UNDER STUDY)

Recommendation G.826[1)] will specify error performance parameters and objectives for international, constant bit rate (CBR) digital paths at or above the primary rate. These paths may be based on a plesiochronous digital hierarchy (PDH), synchronous digital hierarchy (SDH), or some other transport network fabric such as cell based. The Recommendation is generic in that it defines the parameters and objectives for paths independant of the network fabric. Compliance with the performance specification of Recommendation G.826[1)] will, in most cases, also ensure that a 64 kbit/s path will meet the requirements of Recommendation G.821.

---

1) These Recommendations were under development or planned at the time this Recommendation was approved.

4 Connection processing and packet mode transfer

The following Recommendations concern connection processing and packet mode information transfer performance in an ISDN.

Recommendation I.352

NETWORK PERFORMANCE OBJECTIVES FOR CONNECTION PROCESSING DELAYS IN AN ISDN

Recommendation I.352 defines delay performance parameters and performance objectives for connection processing in an ISDN. The connection processing delay performance parameters and objectives are based on the measurement points and performance-significant reference events defined in Recommendation I.353.

Recommendation I.35D[1)]

ACCURACY AND DEPENDABILITY NETWORK PERFORMANCE PARAMETERS FOR THE 64 kbit/s UNRESTRICTED ISDN CONNECTION TYPE

(UNDER STUDY)

Recommendation I.35D[1)] will specify connection processing denial performance parameters and objectives for the 64 kbit/s unrestricted ISDN connection type. The parameters and objectives will be based on the measurement points and performance-significant reference events defined in Recommendation I.353.

Recommendation I.354

NETWORK PERFORMANCE OBJECTIVES FOR PACKET MODE COMMUNICATION IN AN ISDN

Recommendation I.354 defines speed, accuracy, and dependability performance parameters and worst-case objectives for packet mode connection types in an ISDN. The parameters and objectives are based on the measurement points and peformance-significant reference events defined in Recommendation I.353.

---

1) These Recommendations were under development or planned at the time this Recommendation was approved.

5 Availability

The following Recommendations concern availabiity performance in an ISDN.

Recommendation I.355

ISDN 64 kbit/s CONNECTION TYPE AVAILABILITY PERFORMANCE

Recommendation I.355 specifies availability performace parameters and objectives for ISDN 64 kbit/s circuit-switched, packet-switched, and dedicated circuit connection types based on observed values for corresponding primary performance parameters defined in other Recommendations (e.g. G.821, I.352, and I.354).

Recommendation I.35BA[1)]

AVAILABILITY PERFORMANCE FOR B-ISDN
(UNDER STUDY)

Recommendation I.35BA[1)] willl specify availability performance parameters for the ATM layer of a B-ISDN based on observed values for corresponding primary parameters defined in Recommendation I.356[1)].

Recommendation I.35X[1)]

AVAILABILITY PERFORMANCE PARAMETERS AND OBJECTIVES FOR INTERNATIONAL CONSTANT BIT RATE PATHS AND SECTIONS AT OR ABOVE THE PRIMARY RATE
(UNDER STUDY)

Recommendation I.35X[1)] will:

1) define network performance parameters describing the availability of international constant bit rate paths and sections at or above the primary rate;
2) specify and allocate values for the objectives; and
3) provide guidance on parameter measurement.

The defined availability parameters and objectives will be based on observed values for corresponding primary performance parameters defined in Recommendation G.826[1)].

---

1) These Recommendations were under development or planned at the time this Recommendation was approved.

6 Timing

The following Recommendations concern performance implications of timing in ISDNs.

Recommendation G.810

CONSIDERATIONS ON TIMING AND SYNCHRONIZATION ISSUES

Recommendation G.810 provides information and guidance concerning the various timing and synchronization Recommendations as well as insight into the fundamental related issues.

Recommendation G.811

TIMING REQUIREMENTS AT THE OUTPUTS OF PRIMARY REFERENCE CLOCKS SUITABLE FOR PLESIOCHRONOUS OPERATION OF INTERNATIONAL DIGITAL LINKS

Recommendation G.811:

1) specifies requirements for primary reference clocks;

2) promotes understanding of associated timing requirements for plesiochronous operation of international digital links; and

3) clarifies the relationship of the requirements for synchronous network nodes, constituent clocks, and the use of satellite systems.

Recommendation G.812

TIMING REQUIREMENTS AT THE OUTPUTS OF SLAVE CLOCKS SUITABLE FOR PLESIOCHRONOUS OPERATION OF INTERNATIONAL DIGITAL LINKS

Recommendation G.812 specifies requirements for slave clocks and promotes understanding of associated timing requirements for plesiochronous operation of international digital links.

Recommendation G.822

CONTROLLED SLIP RATE OBJECTIVES ON AN INTERNATIONAL DIGITAL CONNECTION

Recommendation G.822 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. The end-to-end slip rate performance objectives should satisfy the service requirements for telephone and non-telephone services on a 64-kbit/s digital connection in an ISDN. The slip rate objective for an international end-to-end connection are stated with reference to the standard digital hypothetical reference connection (HRX) of 27 500 km length.

Recommendation G.823

THE CONTROL OF JITTER AND WANDER WITHIN DIGITAL NETWORKS WHICH ARE BASED ON THE 2048 kbit/s HIERARCHY

Recommendation G.823 provides guidelines for the control of jitter in digital networks, including: a maximum network limit that should not be exceeded at any hierarchial interface; a consistent framework for the specification of individual digital equipment; and sufficient information and guidelines for organizations to measure and study jitter accumulation in any network configuration.

Recommendation G.824

THE CONTROL OF JITTER AND WANDER WITHIN DIGITAL NETWORKS WHICH ARE BASED ON THE 1544 kbit/s HIERARCHY

Recommendation G.824 provides a strategy to minimize impairments due to jitter and wander in digital networks. This strategy provides the following elements: specification of network limits not to be exceeded at any hierarchial interface; a consistant framework for the specification of digital equipment; information and guidelines to predict and analyse jitter and wander accumulation in any network configuration, facilitate satisfactory control of the impairments due to this accumulation and to provide insight into the jitter and wander performance of individual digital equipments; and measurement methodology to facilitate accurate and repeatable jitter and wander measurements.

Recommendation I.35J[1)]

JITTER AND WANDER IN B-ISDNs
(UNDER STUDY)

Recommendation I.35J[1)] will specify performance implications of jitter and wander and other timing impairments (such as slips) on B-ISDNs employing ATM.

Recommendation G.81S[1)]

TIMING CHARACTERISTICS OF SLAVE CLOCKS SUITABLE FOR OPERATION IN SDH EQUIPMENT
(UNDER STUDY)

Recommendation G.81S[1)] will specify requirements for slave clocks to be used in equipments based on the synchronous digital hierarchy (SDH) principles.

Recommendation G.825

THE CONTROL OF JITTER AND WANDER WITHIN DIGITAL NETWORKS WHICH ARE BASED ON THE SYNCHRONOUS DIGITAL HIERARCHY (SDH)

Recommendation G.825 defines parameters and values which limit the occurrence of jitter and wander in SDH line systems.

---

1) These Recommendations were under development or planned at the time this Recommendation was approved.