INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.820/I.351/Y.1501

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TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital networks – Quality and availability targets

SERIES I: INTEGRATED SERVICES DIGITAL NETWORK

Overall network aspects and functions – Performance objectives

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT GENERATION NETWORKS

Internet protocol aspects – Quality of service and network performance

Relationships among ISDN, IP-based network and physical layer performance Recommendations

ITU-T Recommendation G.820/I.351/Y.1501

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ITU-T Recommendation G.820/I.351/Y.1501

Relationships among ISDN, IP-based network and physical layer performance Recommendations

Summary

This Recommendation defines relationships among a set of existing ITU-T Recommendations that collectively provide the basis for the specification and apportionment of performance in narrow-band and broadband ISDNs, Internet Protocol (IP)-based networks, and digital layers of transport networks, as well as jitter, wander, and network synchronization and timing performance. These Recommendations are intended to be used in describing performance between the measurement points that delimit and apportion international ISDNs, IP-based networks, and digital layers of transport networks.

Source

ITU-T Recommendation G.820/I.351/Y.1501 was approved on 29 July 2004 by ITU-T Study Group 13 (2001-2004) under the ITU-T Recommendation A.8 procedure.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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.

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ITU-T Recommendation G.820/I.351/Y.1501

Relationships among ISDN, IP-based network and physical layer performance Recommendations

1 Scope

This Recommendation describes relationships among the following ITU-T Recommendations: G.781, G.783, G.798, G.803, G.810, G.811, G.812, G.813, G.821, G.822, G.823, G.824, G.825, G.826, G.827, G.828, G.829, G.921, G.8201, G.8251, I.350, I.352, I.353, I.354, I.355, I.356, I.357, I.358, I.359, I.381, Y.1530, Y.1540, Y.1541, Y.1560 and Y.1561. Collectively, these Recommendations provide the basis for the specification and apportionment of performance in narrow-band and broadband ISDNs, Internet Protocol (IP)-based networks, and digital layers of transport networks. They include jitter, wander, and network synchronization and timing performance. These Recommendations are intended to be used in describing performance between the measurement points that delimit and apportion international ISDNs, IP-based networks, and digital layers of transport networks.

The relevant Recommendations and their relationships are illustrated in Figure 1. The 3 × 3 performance description framework defined in ITU-T Rec. I.350 is used to illustrate the relationships among particular Recommendations. Three protocol-independent telecommunication functions are identified in the matrix: access, user information transfer, and disengagement. These general functions correspond to specified aspects of ISDN, IP-based network, and transport network digital layer services conforming to ITU-T standardized protocols[1]. Each function is considered with respect to three general performance concerns (or "performance criteria"): speed, accuracy, and dependability. These express, respectively, the delay or rate, degree of correctness, and degree of certainty with which the function is performed. Recommendations shown within the matrix define sets of protocol-specific parameters ("primary parameters") that describe performance relative to each function and criterion. An associated model provides a basis for describing overall service availability. A specified availability function compares the values for a subset of the primary parameters with corresponding outage thresholds to classify the services as "available" (no service outage) or "unavailable" (service outage) during scheduled service time. Figure 1 presents the Recommendations that specify availability functions and define availability parameters associated with ISDN, IP-based network, and transport network digital layer services. Recommendations concerning jitter, wander, and timing and synchronization performance of digital networks are illustrated in Figure 1 by their relationships to the complementary aspects of network level jitter, wander, and synchronization performance and related timing equipment performance.

This Recommendation is organized as follows. The scope of the Recommendation is provided in clause 1. A list of abbreviations is provided in clause 2. The general scope and content of each Recommendation illustrated in Figure 1 is described in clause 3[2]. Annex A contains information on the history of the G-series physical layer error performance Recommendations. An index listing key concepts and associated Recommendations is also provided.

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[1] For B-ISDN, these general functions include multiparty and multipoint connection types.

[2] The most recent editions of draft and approved Recommendations should be consulted.

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General performance aspects of ISDNs, IP-based networks and digital layers of transport networks
I.350 (QoS/Network performance framework in digital networks, including ISDNs) I.353 (Reference events for defining ISDN performance parameters)

↓

ISDN, IP-based network and transport network digital layer performance			
Criterion / Function	Speed	Accuracy	Dependability
Access	I.352 (N-ISDN – CBR) I.354 (N-ISDN – PKT) I.358 (B-ISDN) Y.1530 (IP) Y.1560 (TCP)	I.354 (N-ISDN – PKT) I.358 (B-ISDN) I.359 (N-ISDN – CBR) Y.1530 (IP) Y.1560 (TCP)	I.354 (N-ISDN – PKT) I.358 (B-ISDN) I.359 (N-ISDN – CBR) Y.1530 (IP) Y.1560 (TCP)
Information transfer	I.354 (N-ISDN – PKT) I.356 (ATM) I.381 (AAL) Y.1540 (IP) Y.1541 (IP) Y.1561 (MPLS)	G.821 (CBR) G.826 (CBR) G.828 (CBR) G.829 (CBR) G.921 (CBR) G.8201 (OTN) I.354 (N-ISDN – PKT) I.356 (ATM) I.381 (AAL) Y.1540 (IP) Y.1541 (IP) Y.1561 (MPLS)	I.354 (N-ISDN – PKT) I.356 (ATM) Y.1540 (IP) I.381 (AAL) Y.1541 (IP) Y.1561 (MPLS)
Disengagement	I.352 (N-ISDN – CBR) I.354 (N-ISDN – PKT) I.358 (B-ISDN) Y.1530 (IP) Y.1560 (TCP)	I.354 (N-ISDN – PKT) I.358 (B-ISDN) I.359 (N-ISDN – CBR) Y.1530 (IP) Y.1560 (TCP)	I.354 (N-ISDN – PKT) I.358 (B-ISDN) I.359 (N-ISDN – CBR) Y.1530 (IP) Y.1560 (TCP)

↓

Availability
G.827 (B-ISDN – CBR) I.355 (N-ISDN – CBR & PKT) I.357 (ATM) Y.1540 (IP) Y.1541 (IP)

Timing and synchronization performance	
Network level jitter, wander, and synchronization	Equipment jitter, wander and timing
G.803 (Network Synchronization Architecture) G.810 (Terminology) G.822 (Slips) G.823 (Jitter/Wander – 2048 kbit/s Hierarchy) G.824 (Jitter/Wander – 1544 kbit/s Hierarchy) G.825 (Jitter/Wander – SDH) G.8251 (Jitter/Wander – OTN)	G.781 (Synchronization Distribution Layer and Network Synchronization Layer Atomic Functions) G.783 (Jitter/Wander – SDH Equipment) G.798 (OTN CBR Client Asynchronous Mapper Buffer Hysteresis) G.810 (Terminology) G.811 (Primary Reference Clock) G.812 (Synchronization Supply Unit) G.813 (SDH Equipment Clock) G.921 (Jitter – 2048 kbit/s Hierarchy) G.8251 (Jitter/Wander – OTN Equipment and ODUk Clock)

Figure 1/G.820/I.351/Y.1501 – Relationships among ISDN, IP and transport network digital layer performance Recommendations

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2 Abbreviations

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband ISDN
CBR	Constant Bit Rate
EDC	Error Detection Code
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISDN	Integrated Services Digital Network
kbit/s	kilobit/second
LSP	Label Switched Path
MRTIE	Maximum Relative Time Interval Error
MTIE	Maximum Time Interval Error
MPLS	Multi-Protocol Label Switching
N-ISDN	Narrow-band ISDN
NP	Network Performance
ODUk	Optical Channel Data Unit k
ODC	ODUk Clock
OTN	Optical Transport Network
PDH	Plesiochronous Digital Hierarchy
PKT	Packet Mode
PRC	Primary Reference Clock
PVC	Permanent Virtual Connection
QoS	Quality of Service
SDH	Synchronous Digital Hierarchy
SEC	SDH Equipment Clock
SSM	Synchronization Status Message
SSU	Synchronization Supply Unit
STM	Synchronous Transport Module
TCP	Transmission Control Protocol
TDEV	Time Deviation
VC	Virtual Channel
VCC	Virtual Channel Connection
VPC	Virtual Path Connection

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3 General scope and content of performance Recommendations

The general scope and content of each of the ISDN, IP, and transport network digital layer performance Recommendations identified in Figure 1 is summarized below. For ease of reference, the Recommendations are listed alphanumerically.

3.1 ITU-T Rec. G.781 – Synchronization layer functions (1999)

This Recommendation specifies mainly the SSM selection algorithm which is applicable to clocks of SDH equipments (ITU-T Rec. G.813). It specifies the synchronization interfaces, the Quality Level of clock sources, the SSM (Synchronization Status Message), the SDH clock selection process, some rules to prevent timing loops in SDH networks and all synchronization distribution basic functions that are required to describe a digital transmission equipment's synchronization functionality.

This Recommendation specifies 3 different options. "Option I" applies to SDH networks optimized for the 2048 kbit/s hierarchy. "Option II" applies to SDH networks optimized for the 1544 kbit/s hierarchy that includes the rates 1544 kbit/s, 6312 kbit/s, and 44 736 kbit/s. "Option III" applies to SDH networks optimized for the 1544 kbit/s hierarchy that includes the rates 1544 kbit/s, 6312 kbit/s, 33 064 kbit/s, 44 736 kbit/s, and 97 728 kbit/s.

3.2 ITU-T Rec. G.783 – Characteristics of Synchronous Digital Hierarchy (SDH) equipment functional blocks (2004)

This Recommendation covers general equipment requirements for SDH equipment. It specifically contains jitter and wander requirements in clauses 9.3 and 15. This includes jitter transfer, jitter tolerance and jitter generation for SDH regenerators, mappers, and demappers, and also wander specifications for SDH mappers and demappers. The jitter requirements for SDH regenerators ensure that the SDH jitter network limits are met. The jitter and wander requirements for SDH mappers and demappers help ensure that the jitter and wander requirements for PDH clients are met.

3.3 ITU-T Rec. G.798 – Characteristics of optical transport network hierarchy equipment functional blocks (2004)

This Recommendation covers the functional requirements of Optical Transport Network functionality within equipment. It uses the specification methodology defined in ITU-T Rec. G.806 for transport network equipment and is based on the architecture of optical transport networks defined in ITU-T Rec. G.872 and the interfaces defined in ITU-T Rec. G.709/Y.1331. The portion of ITU-T Rec. G.798 that is relevant to jitter and wander performance (i.e., relevant to the network performance specifications and objectives for which corresponding Recommendations are summarized in ITU-T Rec. G.820/I.351/Y.1501) is the specification of the maximum buffer hysteresis for the asynchronous mapper.

The requirement on maximum buffer hysteresis for the asynchronous mapper or multiplexer applies to asynchronous mapping of CBRx clients into ODUk (via the ODUkP/CBRx-a_A_So atomic function) and asynchronous multiplexing of ODUj clients into ODUk (k > j, via the ODUkP/ODUi[j]_A_So atomic function). The main purpose of the requirement on maximum buffer hysteresis for the asynchronous mapper or multiplexer is to limit the long-term wander on CBRx clients.

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