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

Internet protocol aspects – Interworking

TDM-IP interworking – User plane interworking

ITU-T Recommendation Y.1453

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GENERATION NETWORKS

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ITU-T Recommendation Y.1453

TDM-IP interworking – User plane interworking

Summary

This Recommendation addresses required functions for network interworking between TDM networks up to DS3 or E3 rates and IP networks, in order to transport TDM traffic over IP networks. This Recommendation addresses user plane interworking mechanisms, connection multiplexing and procedures. These interworking mechanisms must ensure that TDM timing, signalling, voice quality, and alarm integrity be maintained. Details of the interworking model and required interworking functions are described. This Recommendation may not be suitable for use by Recognized Operating Agencies due to possible degradation of network synchronization performance as compared with native TDM transport.

Source

ITU-T Recommendation Y.1453 was approved on 29 March 2006 by ITU-T Study Group 13 (2005-2008) under the ITU-T Recommendation A.8 procedure.

Keywords

Interworking, IP, network interworking, TDM, UDP, user plane.

FOREWORD

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Introduction

There is a need to define network interworking wherein traffic from conventional synchronous or plesiochronous networks (hereafter denoted TDM networks) is transported over IP networks. Such interworking must ensure that TDM timing, signalling, voice quality, and alarm integrity be maintained.

ITU-T Recommendation Y.1453

TDM-IP interworking – User plane interworking

1 Scope

This Recommendation addresses required functions for network interworking between TDM networks up to and including DS3/E3 rates and IP networks, in order to transport TDM traffic over IP networks. Transport of higher rate TDM services (such as SDH) over IP networks is beyond the scope of this Recommendation. This Recommendation addresses user plane interworking mechanisms, connection multiplexing and related procedures. These interworking mechanisms must ensure that TDM timing, signalling, telephony voice quality, and alarm integrity be maintained. Details of the interworking model and required interworking functions are described. This Recommendation may not be suitable for use by recognized operating agencies (ROAs) [1] due to possible degradation of network synchronization performance as compared with native TDM transport.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendation F.110 (1996), *Operational provisions for the maritime mobile service*.
- [2] ITU-T Recommendation Y.1411 (2003), *ATM-MPLS network interworking – Cell mode user plane interworking*.
- [3] ITU-T Recommendation Y.1413 (2004), *TDM-MPLS network interworking – User plane interworking*.
- [4] ITU-T Recommendation G.809 (2003), *Functional architecture of connectionless layer networks*.
- [5] ITU-T Recommendation G.702 (1988), *Digital hierarchy bit rates*.
- [6] ITU-T Recommendation G.705 (2000), *Characteristics of plesiochronous digital hierarchy (PDH) equipment functional blocks*.
- [7] ITU-T Recommendation G.114 (2003), *One-way transmission time*.
- [8] ITU-T Recommendation G.826 (2002), *End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections*.
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- [10] ITU-T Recommendation G.824 (2000), *The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy*.
- [11] IETF RFC 791 (1981), *Internet Protocol – DARPA Internet Program – Protocol Specification*.
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- [14] ITU-T Recommendation G.703 (2001), *Physical/electrical characteristics of hierarchical digital interfaces*.
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- [21] ITU-T Recommendation Q.700 (1993), *Introduction to CCITT Signalling System No. 7*.
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- [24] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications*.
- [25] ITU-T Recommendation Y.1540 (2002), *Internet protocol data communication service – IP packet transfer and availability performance parameters*.
- [26] IETF RFC 2474 (1998), *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*.
- [27] IETF RFC 3246 (2002), *An Expedited Forwarding PHB (Per-Hop Behavior)*.
- [28] IETF RFC 2210 (1997), *The Use of RSVP with IETF Integrated Services*.
- [29] IETF RFC 2212 (1997), *Specification of Guaranteed Quality of Service*.
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- [32] ITU-T Recommendation Q.921 (1997), *ISDN user network interface – Data link layer specification*.
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- [38] ITU-T Recommendation I.231.10 (1992), *Circuit-mode bearer service categories: Circuit-mode multiple-rate unrestricted 8 kHz structured bearer service.*
- [39] ITU-T Recommendation I.231.6 (1996), *Circuit-mode bearer service categories: Circuit-mode 384 kbit/s unrestricted, 8 kHz structured bearer service.*

3 Definitions

This Recommendation uses or defines the following terms:

- 3.1 interworking:** See ITU-T Rec. Y.1411 [2].
- 3.2 interworking flow:** A pair of G.809 flows [4] capable of simultaneously transferring information in opposite directions over an IP network for the purpose of transporting TDM traffic.
- 3.3 interworking function (IWF):** See ITU-T Rec. Y.1411.
- 3.4 ingress IWF:** The point where the continuous TDM stream is segmented and encapsulated into IP packets (TDM-to-IP direction).
- 3.5 egress IWF:** The point where TDM segments are de-encapsulated from IP packets and reassembled into a continuous TDM stream (IP-to-TDM direction).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAL	ATM Adaptation Layer
AIS	Alarm Indication Signal
AP	Access Point
ATM	Asynchronous Transfer Mode
CAS	Channel Associated Signalling
CCS	Common Channel Signalling
CES	Circuit Emulation Service
CP	Connection Point
CSI	Convergence Sublayer Indication
CSRC	Contributing Source
dAIS	AIS defect
Diffserv	Differentiated Services
dLOA	Loss of Alignment defect
dLOS	Loss of Signal defect
DSn	Digital Signal level n
EF PHB	Expedited Forwarding Per Hop Behaviour
En	Electrical Interface Signal, level n
FAS	Frame Alignment Signal
FCS	Frame Check Sequence

GS	Guaranteed Service
HDLC	High level Data Link Control
Intserv	Integrated Services
IP	Internet Protocol
ISDN	Integrated Services Digital Network
IWF	InterWorking Function
LOF	Loss of Frame Synchronization
LOS	Loss of Signal
MPLS	Multi-Protocol Label Switch
MTU	Maximum Transport Unit
OAM	Operation, Administration and Maintenance
PDU	Protocol Data Unit
PDV	Packet Delay Variation
PLC	Packet Loss Concealment
PM	Performance Monitoring
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network
PT	Payload Type
QoS	Quality of Service
ROA	Recognized Operating Agency
RDI	Remote Defect Indication
RFC	Request for Comments
RTP	Real Time Protocol
SAR	Segmentation And Reassembly
SRTS	Synchronous Residual Time Stamp
SSRC	Synchronization Source
TDM	Time Division Multiplex
TFP	Termination Flow Point
UDP	User Datagram Protocol

5 Conventions

This Recommendation uses traditional terminology for digital signals at the various levels of the G.702 [5] rate hierarchy. In particular, the first level digital signal of rate 2048 kbit/s (P12 in G.705 [6] terminology) is designated E1, and the third level signal of rate 34 368 kbit/s derived from it (P31), E3. Similarly, the first level signal of rate 1544 kbit/s (P11) is designated DS1, its second level derivative of rate 6312 kbit/s (P21), DS2, and its third level derivative at rate 44 736 kbit/s (P32), DS3. DS0 has the signal rate of 64 kbit/s.