



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

I.381

(03/2001)

SERIES I: INTEGRATED SERVICES DIGITAL
NETWORK

Overall network aspects and functions – General network
requirements and functions

ATM Adaptation Layer (ALL) performance

ITU-T Recommendation I.381

(Formerly CCITT Recommendation)

ITU-T I-SERIES RECOMMENDATIONS
INTEGRATED SERVICES DIGITAL NETWORK

GENERAL STRUCTURE	
Terminology	I.110–I.119
Description of ISDNs	I.120–I.129
General modelling methods	I.130–I.139
Telecommunication network and service attributes	I.140–I.149
General description of asynchronous transfer mode	I.150–I.199
SERVICE CAPABILITIES	
Scope	I.200–I.209
General aspects of services in ISDN	I.210–I.219
Common aspects of services in the ISDN	I.220–I.229
Bearer services supported by an ISDN	I.230–I.239
Teleservices supported by an ISDN	I.240–I.249
Supplementary services in ISDN	I.250–I.299
OVERALL NETWORK ASPECTS AND FUNCTIONS	
Network functional principles	I.310–I.319
Reference models	I.320–I.329
Numbering, addressing and routing	I.330–I.339
Connection types	I.340–I.349
Performance objectives	I.350–I.359
Protocol layer requirements	I.360–I.369
General network requirements and functions	I.370–I.399
ISDN USER-NETWORK INTERFACES	
Application of I-series Recommendations to ISDN user-network interfaces	I.420–I.429
Layer 1 Recommendations	I.430–I.439
Layer 2 Recommendations	I.440–I.449
Layer 3 Recommendations	I.450–I.459
Multiplexing, rate adaption and support of existing interfaces	I.460–I.469
Aspects of ISDN affecting terminal requirements	I.470–I.499
INTERNETWORK INTERFACES	I.500–I.599
MAINTENANCE PRINCIPLES	I.600–I.699
B-ISDN EQUIPMENT ASPECTS	
ATM equipment	I.730–I.739
Transport functions	I.740–I.749
Management of ATM equipment	I.750–I.759
Multiplexing aspects	I.760–I.769

For further details, please refer to the list of ITU-T Recommendations.

ATM Adaptation Layer (AAL) performance

Summary

This Recommendation describes an approach for the performance description of AAL processes. It is motivated by the need, based on field experiences, to examine more carefully the performance aspects of some specific applications of ATM network technology. The approach presented here provides a unified framework for describing the performance of processes that depend upon AAL Type 1 (AAL-1), AAL Type 2 (AAL-2), AAL Type 3/4 (AAL-3/4), AAL Type 5 (AAL-5), or potentially other types of AAL. For each AAL, parameters that describe loss and delay performance are for further study. These parameters are related to relevant ATM cell transfer performance parameters from ITU-T I.356.

Source

ITU-T Recommendation I.381 was prepared by ITU-T Study Group 13 (2001-2004) and approved under the WTSA Resolution 1 procedure on 1 March 2001.

Keywords

AAL PDU transfer outcomes, ATM Adaptation Layer (AAL), circuit emulation, constant bit rate (CBR) service, internal reference event (IRE), measurement point (MP), PDU reference event (PRE), quality of service (QoS), reference event.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 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.

NOTE

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

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

© ITU 2001

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from ITU.

CONTENTS

Page

1	Scope.....	1
2	References.....	1
3	Abbreviations and acronyms	1
4	Introduction.....	2
5	General aspects of performance description for AAL processes.....	3
5.1	General considerations for internal reference event definitions for all AAL types....	7
5.2	Internal reference events for AAL Type 1	10
5.2.1	Unstructured circuit emulation applications.....	10
5.2.2	Structured circuit emulation applications	13
5.3	Internal Reference Events for AAL Type 2.....	14
5.3.1	Applications where the service specific convergence sublayer is null.....	14
5.3.2	Applications where the service specific convergence sublayer is not null....	14
5.4	Internal Reference Events for AAL Type 3/4.....	14
5.5	Internal Reference Events for AAL Type 5.....	14
6	AAL PDU transfer outcomes.....	14
6.1	PDU transfer outcomes for AAL Type 1	15
6.1.1	Unstructured circuit emulation applications.....	15
6.1.2	Structured circuit emulation applications	15
6.2	PDU transfer outcomes for AAL Type 2.....	15
6.2.1	Applications where the service specific convergence sublayer is null.....	15
6.2.2	Applications where the service specific convergence sublayer is not null....	15
6.3	PDU transfer outcomes for AAL Type 3/4.....	15
6.4	PDU transfer outcomes for AAL Type 5.....	15
7	AAL performance parameters	18
7.1	Performance parameters for AAL Type 1	18
7.1.1	Circuit emulation applications.....	18
7.2	Performance parameters for AAL Type 2	18
7.2.1	Applications where the service specific convergence sublayer is null.....	18
7.2.2	Applications where the service specific convergence sublayer is not null....	18
7.3	Performance parameters for AAL Type 3/4	18
7.4	Performance parameters for AAL Type 5	18
7.4.1	Information loss parameter for AAL Type 5.....	18
7.4.2	Information delay parameter for AAL Type 5	21
8	AAL performance objectives.....	21
9	Allocation of the performance objectives.....	21

ITU-T Recommendation I.381

ATM Adaptation Layer (AAL) performance

1 Scope

This Recommendation specifies an approach for the performance description of AAL processes [1]. It is motivated by the need, based on field experiences, to examine more carefully the performance aspects of some specific applications of ATM network technology. The approach provides a unified framework for describing the performance of a process that depends upon AAL Type 1 (AAL-1) [2], AAL Type 2 (AAL-2) [3], AAL Type 3/4 (AAL-3/4) [4], AAL Type 5 (AAL-5) [5], or potentially other types of AAL. The Recommendation defines measurement points and reference events for all AAL types, and uses these to define PDU transfer outcomes and AAL performance parameters for AAL Type 5 (PDU transfer outcomes and AAL performance parameters for other AAL Types are FFS).

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.

- [1] ITU-T I.363 (1993), *B-ISDN ATM Adaptation Layer specification*.
- [2] ITU-T I.363.1 (1996), *B-ISDN ATM Adaptation Layer specification: Type 1 AAL*.
- [3] ITU-T I.363.2 (2000), *B-ISDN ATM Adaptation Layer specification: Type 2 AAL*.
- [4] ITU-T I.363.3 (1996), *B-ISDN ATM Adaptation Layer specification: Type 3/4 AAL*.
- [5] ITU-T I.363.5 (1996), *B-ISDN ATM Adaptation Layer specification: Type 5 AAL*.
- [6] ITU-T I.356 (2000), *B-ISDN ATM layer cell transfer performance*.
- [7] ITU-T I.371 (2000), *Traffic control and congestion control in B-ISDN*.
- [8] ITU-T I.350 (1993), *General aspects of quality of service and network performance in digital networks, including ISDNs*.
- [9] ITU-T I.353 (1996), *Reference events for defining ISDN and B-ISDN performance parameters*.
- [10] ITU-T G.823 (2000), *The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy*.
- [11] ITU-T G.824 (2000), *The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy*.

3 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
ATM	Asynchronous Transfer Mode

CBR	Constant Bit Rate
CDV	Cell Delay Variation
CER	Cell Error Ratio
CLR	Cell Loss Ratio
CMR	Cell Misinsertion Rate
CPCS	Common Part Convergence Sublayer
CPS	Common Part Sublayer
CS	Convergence Sublayer
MP	Measurement Point
PCI	Protocol Control Information
PDU	Protocol Data Unit
PRE	PDU Reference Event
SAP	Service Access Point
SAR	Segmentation and Reassembly Sublayer
SDU	Service Data Unit
SECBR	Severely Errored Cell Block Ratio
SRE	SDU Reference Event
SSCS	Service Specific Convergence Sublayer
VBR	Variable Bit Rate
VC	Virtual Channel
VP	Virtual Path

4 Introduction

This Recommendation specifies an approach for the performance description of AAL processes [1]. It is motivated by the need, based on field experiences, to examine more carefully the performance aspects of some specific applications of ATM network technology. A means for describing, in a standardized manner, the performance aspects of particular ATM Adaptation Layer (AAL) processes is needed. The approach provides a unified framework for describing the performance of a process that depends upon AAL Type 1 (AAL-1) [2], AAL Type 2 (AAL-2) [3], AAL Type 3/4 (AAL-3/4) [4], AAL Type 5 (AAL-5) [5], or potentially other types of AAL.

The description of performance provided by specific AAL types is important for characterizing and measuring the performance of specific telecommunications applications or services that are supported in whole or in part by ATM-based telecommunications technology. As such applications can be quite diverse in nature, specific performance analysis for each such application is generally needed. While a standardized means for performance description at the ATM layer is available [6], performance analysis for a specific ATM-based application must currently invoke specialized methods to account for relevant aspects of the particular AAL used by that application. This Recommendation provides a unified framework for the performance description of any ATM-based application in terms of an approach that uses standardized methods up to the point at which AAL layer actions have been completed.

Examples of the diverse nature of applications supported by specific AAL types are as follows. AAL-1 supports Deterministic Bit Rate applications that generally have sensitivity to Cell Delay

Variation, AAL-2 is intended to support bandwidth-efficient transmission for low-rate, short length packet applications that are delay sensitive [3], and has the potential for supporting significant emerging uses such as wireless in combination with ATM. AAL-5 processes are significant for popular and emerging ATM applications, which include Transmission Control Protocol/Internet Protocol (TCP/IP) services supported over ATM-based network equipment and the ATM-based Available Bit Rate (ABR) transfer capability [7].

This Recommendation first reviews some general aspects of performance description as they apply to AAL processes. The establishment of reference events that are suitable for measuring the performance of an AAL process is addressed from the viewpoints of both the AAL Service Access Point (SAP) and currently established Measurement Points within telecommunications networks. The Recommendation then proposes an approach for the performance description of AAL processes that is consistent with the general structure provided in ITU-T I.350 [8] and with the use of the reference events specified in ITU-T I.353 [9].

The remainder of this Recommendation is organized as follows. Clause 5 gives a general discussion of performance description for the AAL. This section includes definitions of appropriate Measurement Points, PDU Reference Events, and Internal Reference Events for each AAL type. This is followed by a discussion of the various AAL PDU transfer outcomes in clause 6. Clause 7 describes the performance parameters for each AAL type.

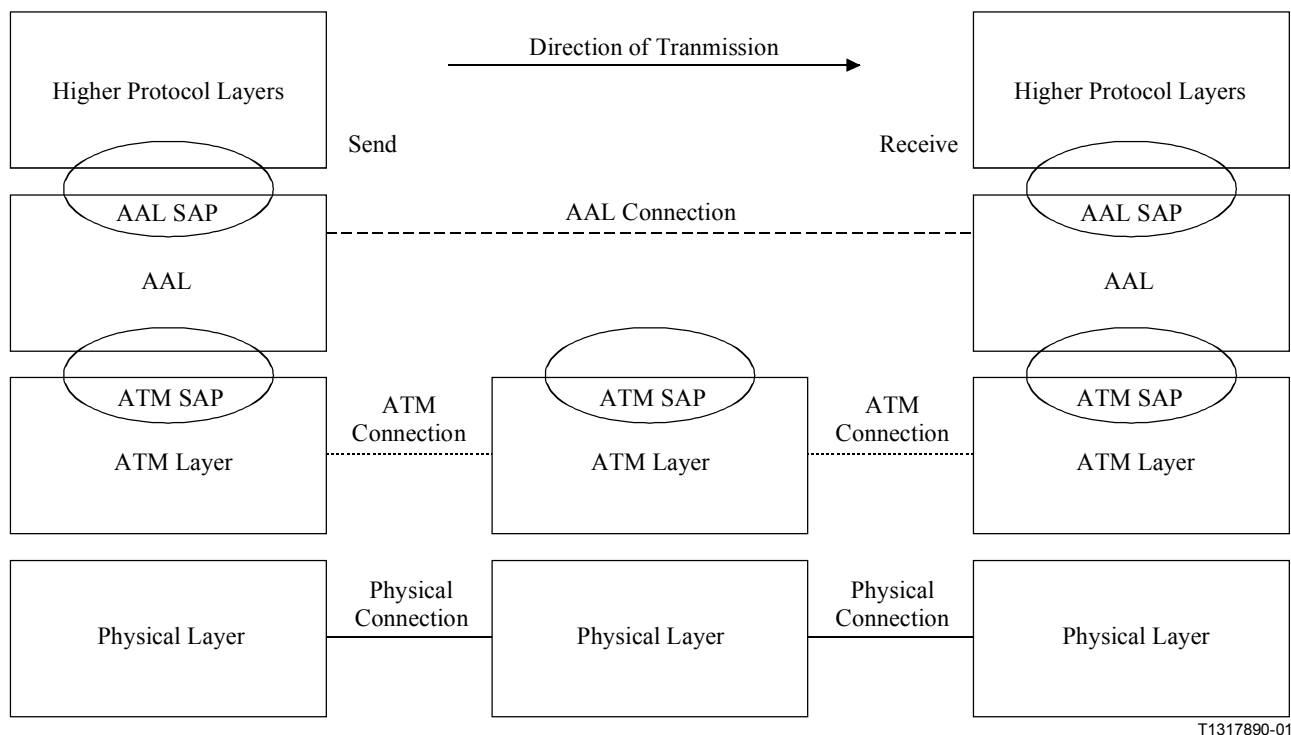
5 General aspects of performance description for AAL processes

This clause gives a general description of Measurement Points (MPs), Internal Reference Events (IREs), and PDU Reference Events (PREs) for all AAL types. Then, specific definitions of IREs are given for each AAL type.

An AAL provides functionality to facilitate the use of ATM layer cell transfer capabilities by higher layer processes, and a specific AAL type is selected to meet the needs of the particular higher layer process associated with a given application. Figure 1 shows the relations between relevant protocol layers and their associated Service Access Points (SAPs). Figure 1 is consistent with ITU-T I.363 [1] and is applicable to all of the currently defined AAL types.

To describe the performance of an AAL process consistent with the general structure provided in ITU-T I.350, it is necessary to define appropriate AAL Protocol Data Unit (PDU) Reference Events, and to then define relevant performance parameters based on these Reference Events. Consistent with ITU-T I.353, the PDU Reference Events are defined at observable MPs, i.e. at physical locations. Each PRE approximates an Internal Reference Event defined within the protocol stack. The IREs are ideally the reference events one would like to measure to determine the AAL performance. However, since the IREs are referred to interfaces within the protocol stack, they are generally not physically accessible with test sets. Each PRE is defined to approximate a respective IRE, and is observable at an MP with a suitable test set, i.e. the PRE is defined based on physical layer test access.

The IRE for each AAL is defined in terms of a specific interface and the respective PDU that crosses that interface. The interfaces and PDUs may be different for different AALs and applications; they are defined to facilitate the definitions of performance measures that are important for the respective application. (In the most general case, an IRE may be defined for each application that uses each AAL). Figure 2a shows all the sublayers and interfaces that are present in any of the currently-defined AALs.



AAL SAP AAL Service Access Point
ATM SAP ATM Service Access Point

Figure 1/I.381 – AAL protocol reference model

Copyright International Telecommunication Union (ITU) Telecommunication Sector
Provided by IHS Markit under license with ITU-T
No reproduction or networking permitted without license from IHS
Full document details: ITU-T I.381 2001