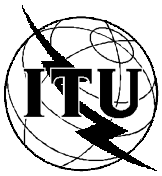

INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

X.480

(09/92)

DATA COMMUNICATION NETWORKS

MESSAGE HANDLING SYSTEMS AND DIRECTORY SERVICES – CONFORMANCE TESTING

Recommendation X.480

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT 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 Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation X.480 was prepared by Study Group VII and was approved under the Resolution No. 2 procedure on the 10th of September 1992.

CCITT NOTE

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

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Recommendation X.480

MESSAGE HANDLING SYSTEMS AND DIRECTORY SERVICES – CONFORMANCE TESTING

(1992)

0 Introduction

This Recommendation provides the principles and requirements which specifically apply for the testing *of X.400/X.500 products* implementing Message Handling Systems (MHS) and Directory Services (DS) protocols.

This Recommendation is to be considered together with appropriate CCITT Recommendations, Implementor's Guides, *Conformance Testing Specification documents* and relevant ISO Standards identified in clause 2.

1 Scope

This Recommendation covers the testing of protocols on the Application Layer for *X.400/X.500 products.*

This Recommendation does not give any reference to the *Conformance Testing Specification documents* which are necessary to support conformance assessment of the underlying layers (up to Presentation) of an *X.400/X.500 product.*

Message Handling Systems and Directory Services protocols are respectively specified in the X.400 and X.500-Series Recommendations. The *Common Application Service Element* protocols (ACSE, ROSE and RTSE) relevant to X.400/X.500 are specified in the X.200-Series Recommendations. Additional information relevant to conformance testing of *X.400/X.500 products* is contained in the appropriate CCITT Implementor's Guide.

In order to carry out the conformance assessment process this Recommendation makes use of TSS and TPs, ATSs and PICS Proforma documents. These separately defined documents follow the rules defined in ISO/IEC 9646 part 1 to 5. References to TSS and TPs, ATSs and PICS Proforma documents are to be found in Annex A.

This Recommendation is intended for *X.400/X.500 product* designers and implementors, OSI test tool providers, conformance test laboratories and more generally to OSI product procurers and users.

Clause 2 lists the relevant references to CCITT Recommendations, ISO Standards and other normative documents.

Clause 3 gives definitions of specific concepts used within this Recommendation.

Clause 4 lists the abbreviations used in this Recommendation.

Clause 5 lists the conventions used in this Recommendation.

Clause 6 identifies and defines all relevant testing documents.

Clause 7 introduces the Test Specifications Catalogue.

Clause 8 gives a description of the methodology for conformance testing of the *X.400/X.500 products.*

Clause 9 gives an identification and guidance on the conformance requirements applicable to X.400/X.500 conformance testing.

Clause 10 defines additional requirements placed on *X.400/X.500 products* to be tested.

Annex A lists the *Conformance Testing Specification documents* applicable to X.400/X.500 conformance testing.

2 References

- CCITT Recommendations Series X.400-X.420, *Data Communication Networks, Message Handling Systems (MHS)*. Blue Book, Volume VIII, Fascicle VIII.7, 1988.
- CCITT Recommendation X.403, *Conformance testing*.
- CCITT Recommendation X.411, *Message transfer system: abstract service definition and procedures.*
- CCITT Recommendation X.413, *Message store: Abstract-service definition*.
- CCITT Recommendation X.419, *Protocol Specifications*.
- CCITT Recommendation X.420, *Interpersonal Messaging System.*
- CCITT Recommendations Series X.500-X.521, *Data Communication Networks, Directory*. Blue Book, Volume VIII, Fascicle VIII.8, 1988.
- CCITT Recommendation X.501, *Models*.
- CCITT Recommendation X.509, *Authentication.*
- CCITT Recommendation X.511, *Abstract Service Definition*.
- CCITT Recommendation X.518, *Procedures for Distributed Operations*.
- CCITT Recommendation X.519, *Protocol Specifications*.
- CCITT Recommendation X.520, *Selected Attribute Types*.
- CCITT Recommendation X.521, *Selected Object Classes*.
- CCITT Recommendations Series X.200-X.219, *Data Communication Networks, Open Systems Interconnection (OSI), Model and notation, service definition*. Blue Book, Volume VIII, Fascicle VIII.4, 1988.
- CCITT Recommendation X.208, *Specification of Abstract Syntax Notation One (ASN.1).*
- CCITT Recommendation X.209, *Specification of Basic Encoding Rules (BER) for ASN.1*.
- CCITT Recommendation X.217, *Association Control service definition for Open Systems Interconnection for CCITT Applications*.
- CCITT Recommendation X.218, *Reliable transfer model and service definition.*
- CCITT Recommendation X.219, *Remote operations model, notation and service definition*.
- CCITT Recommendations Series X.220-X.290, *Data Communication Networks, Open Systems Interconnection, Protocol specifications, conformance testing*. Blue Book, Volume VIII, Fascicle VIII.5, 1988.
- CCITT Recommendation X.227, *Association Control protocol specification for Open Systems Interconnection for CCITT Applications*.
- CCITT Recommendation X.228, *Reliable transfer: Protocol specification*.
- CCITT Recommendation X.229, *Remote operations: Protocol specification*.
- ISO/IEC 9646-1:1991, *Information Technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 1: General concepts*.
- ISO/IEC 9646-2:1991, *Information Technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 2: Abstract test suite specification*.
- ISO/IEC 9646-3:1991, *Information Technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 3: The tree and Tabular Combined Notation (TTCN).*
- ISO/IEC 9646-4:1991, *Information Technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 4: Test realization*.

– ISO/IEC 9646-5:1991, *Information Technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 5: Requirements on test laboratories and clients for the conformance assessment process*.

– ISO/IEC 10169-1:1991, *Information Technology – Open Systems Interconnection – Conformance test suite for the ACSE protocol – Part 1: Test suite structure and test purposes*.

MHS Implementor's Guide, Version 8.

Directory Implementor's Guide, Version 5.

3 Definitions

This Recommendation is based on the concepts developed in ISO/IEC 9646 and in the X.200, X.400 and X.500-Series Recommendations, and makes use of the following terms therein defined:

3.1 common ASEs

Refer to Association Service Elements (RTSE, ACSE and ROSE) used by various Application protocols (e.g. P3 and DAP) as parts of distinct Application Contexts.

3.2 X.400/X.500 product

An implementation of one or more Messaging or Directory Systems working as defined in X.400 or X.500-Series Recommendations.

3.3 implementor

Responsible party for the implementation of the protocols in an *X.400/X.500 product.*

3.4 Conformance Testing Specification documents

Set of documents consisting of TSS and TPs and ATSs documents.

4 Abbreviations

ACSE Association Control Service Element (Rec. X.200)

ASE Application Service Element

ASN.1 Abstract Syntax Notation One

ASP Abstract Service Primitive

ATS Abstract Test Suite

BER Basic encoding rules

CTSM Conformance Testing Specification Manual

DAP Directory Access Protocol (Rec. X.500)

DIT Directory Information Tree (Rec. X.500)

DS Distributed Single-layer [test method] (ISO/IEC 9646)

DS Directory Services (Rec. X.500)

DSA Directory System Agent (Rec. X.500)

DSE Distributed Single-layer Embedded [test method] (ISO/IEC 9646)

DSP Directory System Protocol (Rec. X.500)

DUA Directory User Agent (Rec. X.500)

IPMS Interpersonal Messaging System (Rec. X.400)

IUT Implementation under test

MHS Message Handling System (Rec. X.400)

MPDU Message Protocol Data Unit (Rec. X.400)

MS Message Store (Rec. X.400)

MTA Message Transfer Agent (Rec. X.400)

MTS Message Transfer System (Rec. X.400)

OSI Open Systems Interconnection

PCO Point of Control and Observation (ISO/IEC 9646)

PICS Protocol Implementation Conformance Statement (ISO/IEC 9646)

PIXIT Protocol Implementation extra Information for Testing

ROSE Remote Operation Service Element (Rec. X.200)

RS Remote Single-layer (test method) (ISO/IEC 9646)

RSE Remote Single-layer Embedded (test method) (ISO/IEC 9646)

RTSE Reliable Transfer Service Element (Rec. X.200)

SUT System Under Test (ISO/IEC 9646)

TP Test Purpose (ISO/IEC 9646)

TSS Test Suite Structure (ISO/IEC 9646)

TTCN Tree and Tabular Combined Notation (ISO/EEC 9646)

UA User Agent (Rec. X.400)

5 Conventions

Terms are rendered in **bold** when defined, in *italic* when referenced.

6 Overview of MHS/X.400 and DS/X-500 conformance testing

It is recognized that the conformance testing of systems implemented according to OSI Standards and Recommendations shall be performed according to ISO/IEC 9646.

It is required that the conformance testing of *X.400/X.500 products* be conducted in compliance with the requirements as defined by the ISO/IEC 9646 Standard, and also in compliance with the additional requirements identified by the following CCITT documents:

a) This Recommendation.

b) The Test Suite Structures and Test Purposes (TSS and TPs).

c) The Abstract Test Suites (ATSs).

d) The relevant Protocol Implementation Conformance Statement (PICS) Proforma documents.

PIXIT documents for *X.400/X.500 products* are required by ISO/IEC 9646 but not provided within the scope of this Recommendation.

6.1 *Conformance Testing Specification documents*

Normally, *Conformance Testing Specification documents* provide the Test Suite Structure and the Test Purposes documents relevant to the conformance testing of the particular protocol implementation, and the detailed specifications of the Abstract Test Suites relevant to the selected test methods. However, in some cases, TSS and TP documents may not be provided, but the information can be derived from the relevant ATS.

Conformance Testing Specification documents referred to by this Recommendation are stand-alone documents and are not part of this Recommendation.

These documents are identified in X.400/X.500 Test Specifications Catalogue (see clause 7).

6.1.1 *TSS and TP Specification documents*

Each TSS and TP document identified in clause 7 specifies in a top-down, hierarchical manner the structure of the test suite applicable for the testing of a particular protocol. The coverage of each test suite is further described in terms of Test Purposes relating to individual or grouped conformance requirements. The Test Purposes applicable for the testing of the protocols for an *X.400/X.500 product* are expressed in natural language; they are used as basis for the specification of the Abstract Test Suite.

6.1.2 *Abstract Test Suite Specification documents*

Each ATS Specification document identified in clause 7 contains the complete specification of the abstract test cases applicable for evaluating the conformance of the protocol implementations of *X.400/X.500 products.*

6.2 *PICS Proforma*

PICS Proforma are documents that *Implementors* shall complete and provide to the test laboratory during the preparation phase of a Conformance Assessment Process.

The PICS Proforma listed in the Catalogue (clause 7) are generally organized as questionnaires itemizing the features which may be claimed by *X.400/X.500 products.* Once the PICS proforma are completed, they precisely describe the capabilities and options purported to be implemented in the *X.400/X.500 product.*

7 X.400/X.500 Test Specifications Catalogue

The X.400/X.500 Test Specifications Catalogue identifies the documents where specifications can be found for the TSS, TPs, ATS and PICS Proforma required for the testing of *X.400/X.500 products.* Specification Documents may be CCITT Documents, ISO Standards or annexes to Standards.

The Catalogue is provided in Annex A.

8 Conformance Testing Methodology

8.1 *Overview*

The purpose of the Test Specification documents referenced by this Recommendation is to establish a high degree of confidence that the relevant protocols of an *X.400/X.500 product* conform to the conformance requirements as specified by the relevant protocol Recommendations and Standards.

The recommended testing methodology is based on ISO/IEC 9646, except where otherwise explicitly specified.

8.2 *Abstract Test Methods*

The Abstract Test Methods selected in this Recommendation to test the protocols within an *X.400/X-500 product* are the Distributed and the Remote test methods. In instances where it is not possible or there is no need to access upper service boundary of an *X.400/X.500 product,* the Remote test method is used, otherwise the Distributed test method is used.

For those protocols within the *X.400/X.500 product* where there is no exposed PCO at the upper service boundary, embedded method is used (e.g. for ACSE).

Details on the application of a test method to a particular protocol and testing configurations are provided in the respective *Conformance Testing Specification documents.*

Table 1/X.480 below shows the selection of the appropriate abstract test methods for the various protocols.

The testing of the application protocol assumes correct behaviour of all supporting ASE protocols defined by the application context associated with the application protocol. Correct behaviour is implicity required of supporting protocol layers.

TABLE 1/X.480

Abstract Test Methods for X.400/X.500 Conformance Testing

Protocol	Abstract Test Method
P2	DS
P1	DSE
P3/P7	DS and RS
DAP	DS and RS
ROSE	RSE
ACSE	RSE
RTSE	DSE

8.3 *Test Notation*

All ATS to be used for conformance testing are specified in the Tree and Tabular Combined Notation.

For pragmatic reasons, the Pl, P2 and RTSE test specifications use the notation defined in the 1988 Recommendation X.403 (Annex A), based on an early version of TTCN. This notation is used in the 1984 CTSM P1, P2 and RTS documents. The same notation was retained for the 1988 P1, P2 and RTSE Abstract Test Suites, the new 1988 Test suitesbeing largely based on the 1984 ones.

All other ATS are based on ISO/IEC 9646 Part 3, December 1989.

8.4. *Structure of Test Suites*

This subclause describes the particular design considerations which have been retained for the production of the X.400/X.500 ATSs.

- Each 1988 P1, P2 and RTSE ATS includes a subset of test case references to the corresponding 1984 ATS.

- ASN.1 test cases have been specified in P1, P2 and RTSE ATSs.

- Strategy for testing the ACSE and ROSE protocols embedded within an Application Context requires the ATSs of these protocols to be divided into a Common part and Specific parts. The Common part defines those test cases and constraints that are common to all Application Contexts. The specific parts define those constraints that are relevant for the particular Application Contexts defined by X.400/X.500-Series Recommendations

– The test suite structures and test purposes have been designed to obtain the appropriate coverage of the application protocols, e.g. event/state, parameter values, and valid/syntactically invalid/inopportune variations.

– Because of the asymmetric protocols, there is one ATS for each role of the Application protocol.

8.5 *Test Suites Coverage*

The test specifications contained in the *Conformance Testing Specification documents* do not necessarily cover all capabilities defined in the X.400/X.500-Series Recommendations. The test suites may not apply to all *X.400/X.500 product types* or physical configurations. Coverage limitations are listed below. Note that these limitations may be removed as the test suites evolve in time.

8.5.1 *MTS Transfer*

Protocol aspects related to security and physical delivery have not been covered by the actual test suites.

8.5.2 *MTS and MS Access*

– The only *X.400/X.500 products* considered at present are UA, MTA and MS/MTA (MS colocated with an MTA).

– Application contexts involving RTSE (MTS-reliable-access and MTS-forced-reliable-access) are not tested.

– Protocol aspects related to security and physical delivery have not been covered by the actual test suites.

8.5.3 *IPM Protocol*

Only UA/MTAs (UA colocated with an MTA) are tested.

8.5.4 *DAP*

Only protocol and services aspects related to the context of application of one DUA associated with one centralized DSA are covered by the Abstract Test Suites documents.

8.5.5 *DSP*

Conformance Testing Specification documents for this protocol are for further study.

9 Conformance requirements

The *Conformance Testing Specification documents* are based on the requirements of the conformance sections of the relevant X.200, X.400 or X.500-Series Recommendations.

10 Testing requirements

The following subclauses define the additional requirements placed on the *X.400/X.500 products* by the limitations inherent in the test methods. They also reflect constraints related to the SUT configurations.

10.1 *General requirement*

The reaction of an IUT on receipt of protocol errors is not defined in the X.400/X.500-Series of Recommendations. For the purpose of conformance testing the minimum additional requirement is made that the SUT subsequently continues to operate normally in such cases. If it is not the case, the *X.400/X.500 product* is not testable according to this Recommendation.

10.2 *MTS Transfer requirements*

– The ASPs defined in the P1 ATS have to be detected or generated as required by the test method.

– The SUT configuration shall be an MTA with at least two colocated UAs.

10.3 *MTS and MS Access requirements*

– UA Testing: The ASPs defined in the P3 and P7 ATS have to be detected or generated as required by the test method.

– MTA and MS/MTA Testing: The SUT configurations are as follows:

  – a standalone MTA shall at least support two remote UAs;

  – an MS/MTA shall at least support access from two remote UAs;

  – the SUT configuration shall be one MTA colocated with at least two MSs.

10.4 *IPM requirements*

– The ASPs defined in the P2 ATS have to be detected or generated as required by the test method.

– The SUT configuration shall be an MTA with at least three colocated UAs.

10.5 *DAP requirements*

For DUA, the following objects classes must at least be supported:

– Country;

– Organization;

– Organizational Person;

– Organization Unit.

For DUA, mandatory attributes that belong to these objects shall be supported.

Data written to the DIT through the DSA shall retain its value unless otherwise modified by the DSA.

A DSA must at least support structure rules as defined in the DAP/DSA ATSs.

For DAP the IUT must at least claim conformance to the security level 'NONE'.

ANNEX A

(to Recommendation X.480)

X.400/X.500 Test Specifications Catalogue

(This annex forms an integral part of this Recommendation)

A.1 *PICS Proformas*

Reference	*Content*
CCITT Recommmendation X.481:1992	PICS Proforma for P2
CCITT Recommmendation X.482:1992	PICS Proforma for P1
CCITT Recommmendation X.483:1992	PICS Proforma for P3
CCITT Recommmendation X.484:1992	PICS Proforma for P7

CCITT Recommmendation X.581:1992	PICS Proforma for DAP
CCITT Recommmendation X.582:1992	PICS Proforma for DSP
CCITT Recommmendation X.249:1992	PICS Proforma for ROSE
CCITT Recommmendation X.248:1992	PICS Proforma for RTSE
ISO/IEC 8650-2	PICS Proforma for ACSE

A.2 *Conformance Testing Specification documents*

A.2.1 *P2 Protocol (Rec. X.420)*

Reference	*Content*
CCITT-TSP1	TSS and TPs for P2 Protocol (Rec. X.420)
CCITT-ATS1	ATS for P2 conformance testing

A.2.2 *P1 Protocol (Rec. X.419)*

Reference	*Content*
CCITT-TSP2	TSS and TPs for P1 Protocol (Rec. X.419)
CCITT-ATS2	ATS for P1 conformance testing

A.2.3 *P3 Protocol (Rec. X.419)*

Reference	*Content*
CITT-ATS3.1	ATS for P3 UA conformance testing
CCITT-ATS3.2	TS for P3 MTA conformance testing

SS and TPs documents are not available as a separate document.

SS can be derived from ATS naming conventions of test groups and test cases.

Ps can be extracted from ATS test cases headers.

A.2.4 *P7 Protocol (Rec. X.419)*

Reference	*Content*
CCITT-ATS3.3	ATS for P7 UA conformance testing
CCITT-ATS3.4	ATS for P7 MS conformance testing

TSS and TPs documents are not available as a separate document.

TSS can be derived from ATS naming conventions of test groups and test cases.

TPs can be extracted from ATS test cases headers.

A.2.5 *DAP Protocol (Rec. X.519)*

Reference	*Content*
CCITT-ATS4.1	ATS for DAP/DUA conformance testing
CCITT-ATS4.2	ATS for DAP/DSA conformance testing

TSS and TPs documents are not available as a separate document.

TSS can be derived from ATS naming conventions of test groups and test cases.

TPs can be extracted from ATS test cases headers.

A.2.6 *DSP Protocol (Rec. X.519)*

Reference	*Content*

For further study.

A.2.7 *ROSE Protocol (Rec. X.229)*

Reference	*Content*
CCITT-TSP6	TSS and TPs for ROSE Protocol (Rec. X.229)
CCITT-ATS6	ATS for ROSE conformance testing

A.2.8 *RTSE Protocol (Rec. X.228)*

Reference	*Content*
CCITT-TSP7	TSS and TPs for RTSE Protocol (Rec. X.228)
CCITT-ATS7	ATS for RTSE conformance testing

A.2.9 *ACSE Protocol (Rec. X.227)*

Reference	*Content*
ISO/IEC 10169	TSS and TPs for ACSE Protocol (Rec. X.227)
CCITT-ATS8	ATS for ACSE conformance testing