INTERNATIONAL TELECOMMUNICATION UNION

ITU-T X.296

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(11/95)

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

PUBLIC DATA NETWORKS – INTERFACES

OSI CONFORMANCE TESTING METHODOLOGY AND FRAMEWORK FOR PROTOCOL RECOMMENDATIONS FOR ITU-T APPLICATIONS – IMPLEMENTATION CONFORMANCE STATEMENTS

ITU-T Recommendation X.296

(Previously "CCITT Recommendation")

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). 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, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation X.296 was prepared by ITU-T Study Group 7 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 21st of November 1995.

NOTE

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

ITU-T X-SERIES RECOMMENDATIONS

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

ORGANIZATION OF X-SERIES RECOMMENDATIONS

Subject area	Recommendation Series
PUBLIC DATA NETWORKS	
Services and Facilities	X.1-X.19
Interfaces	X.20-X.49
Transmission, Signalling and Switching	X.50-X.89
Network Aspects	X.90-X.149
Maintenance	X.150-X.179
Administrative Arrangements	X.180-X.199
OPEN SYSTEMS INTERCONNECTION	
Model and Notation	X.200-X.209
Service Definitions	X.210-X.219
Connection-mode Protocol Specifications	X.220-X.229
Connectionless-mode Protocol Specifications	X.230-X.239
PICS Proformas	X.240-X.259
Protocol Identification	X.260-X.269
Security Protocols	X.270-X.279
Layer Managed Objects	X.280-X.289
Conformance Testing	X.290-X.299
INTERWORKING BETWEEN NETWORKS	
General	X.300-X.349
Mobile Data Transmission Systems	X.350-X.369
Management	X.370-X.399
MESSAGE HANDLING SYSTEMS	X.400-X.499
DIRECTORY	X.500-X.599
OSI NETWORKING AND SYSTEM ASPECTS	
Networking	X.600-X.649
Naming, Addressing and Registration	X.650-X.679
Abstract Syntax Notation One (ASN.1)	X.680-X.699
OSI MANAGEMENT	X.700-X.799
SECURITY	X.800-X.849
OSI APPLICATIONS	
Commitment, Concurrency and Recovery	X.850-X.859
Transaction Processing	X.860-X.879
Remote Operations	X.880-X.899
OPEN DISTRIBUTED PROCESSING	X.900-X.999

CONTENTS

SUMMARY

This Recommendation specifies requirements for the development of Implementation Conformation Statement (ICS) for protocols, profiles and information objects. An ICS contains necessary information required for conformance testing specified in OSI specifications and related profiles.

INTRODUCTION

Recommendation X.290 defines terminology and introduces general concepts for both protocol and profile testing. Recommendation X.291 specifies the requirements on the production of OSI conformance testing standards and standardized abstract test suites. Recommendation X.292 defines a standardized test notation, the Tree and Tabular Combined Notation (TTCN) for the specification of a standardized Abstract Test Suite. Recommendation X.293 places requirements on test realization, and Recommendation X.294 places requirements on the conformance assessment process. Recommendation X.295 specifies requirements for the production of OSI protocol Profile Test Specifications.

This Recommendation specifies requirements for the development of Implementation Conformance Statements (ICSs) for protocols, profiles and information objects (such as managed objects).

An ICS contains the necessary information required for conformance testing to the relevant requirements specified in OSI specifications and their related profiles.

The ICS proforma is in the form of a questionnaire or check-list that is intended to cover all requirements, all optional and conditional functions, elements of procedure, parameters, PDUs, timers, etc. and other capabilities identified in the specification. The ICS proforma is to be completed by the supplier or the implementor.

An overview of the System Conformance Statements (SCSs), ICSs and their proforma is discussed in clause 6.

Clause 7 describes the structure of the SCS proformas.

Clause 8 discusses requirements and layout of ICS proforma specifications and profile Requirements Lists (RLs).

Clause 9 provides a complete specification for ICS proformas, as well as profile RLs, and describes requirements on the notation.

Appendix I provides guidance on the meaning of ICS status values and support answers.

Appendix II provides examples of profile RLs and profile specific ICSs.

Appendix III provides examples of PICS proforma tables and profile RL tables.

Appendix IV provides guidance for interpreting additional status information.

Appendix V provides guidance on IXIT proformas.

Appendix VI provides information on information objects.

Appendix VII provides guidance on multi-specification dependencies.

Appendix VIII provides guidance on status values for parameters on received Protocol Data Units.

Appendix IX provides guidelines on ICS templates.

Recommendation X.296

OSI CONFORMANCE TESTING METHODOLOGY AND FRAMEWORK FOR PROTOCOL RECOMMENDATIONS FOR ITU-T APPLICATIONS – IMPLEMENTATION CONFORMANCE STATEMENTS

(Geneva, 1995)

1 Scope

This Recommendation gives guidance on the concepts of Implementation Conformance Statements (ICSs) and System Conformance Statements (SCSs) related to OSI specifications and specifies requirements and gives guidance on the production of ICS, ICS proformas, ICS templates and profile Requirements Lists (RLs).

This Recommendation specifies for these documents, the structure, the questions to be asked, the syntax and notation to be used and the semantics of the questions and expected answers.

No generic ICS template is provided because of the wide variety of OSI specifications for which conformance requirements are stated. Nevertheless, this Recommendation provides general requirements that are applicable to any OSI specification.

Other than guidance on the relation between ICS and Implementation eXtra Information for Testing (IXIT), requirements and guidance on IXIT are outside the scope of this Recommendation.

2 References

The following 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, and parties to agreements based on this Recommendation are 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.

- ITU-T Recommendation X.200 (1994), *Information technology – Open Systems Interconnection – Basic reference model: The basic model.* (See also ISO/IEC 7498-1:1994.)

- ITU-T Recommendation X.290 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T Applications – General concepts*. (See also ISO/IEC 9646-1:1994.)

- ITU-T Recommendation X.291 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Abstract test suite specification*. (See also ISO/IEC 9646-2:1994.)

- ITU-T Recommendation X.294 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Requirements on test laboratories and clients for the conformance assessment process*. (See also ISO/IEC 9646-5:1994.)

- ITU-T Recommendation X.295 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Protocol profile test specification*. (See also ISO/IEC 9646-6:1994.)

- ITU-T Recommendation X.724 (1993), *Information technology – Open Systems Interconnection – Structure of management information: Requirements and guidelines for implementation conformance statement proformas associated with OSI management*. (See also ISO/IEC 10165-6:1994.)

- ISO/IEC TR 10000-1:1992, *Information technology – Framework and taxonomy of International Standardized Profiles – Part 1: Framework*.

3 Definitions

For the purposes of this Recommendation, all definitions given in Recommendation X.290 apply, and also the following definitions apply.

3.1 **ICS proforma specification**: The specification which provides a complete ICS proforma.

3.2 **ICS template**: A template which is to be used as the basis for developing an ICS proforma.

4 Abbreviations

4.1 X.290-Series Recommendations abbreviations

For the purposes of this Recommendation, the following abbreviations defined in Recommendation X.290 apply:

ATS Abstract Test Suite

ICS Implementation Conformance Statement

IUT Implementation Under Test

ISP International Standardized Profile

IXIT Implementation eXtra Information for Testing

PCTR Protocol Conformance Test Report

PDU Protocol Data Unit

PICS Protocol Implementation Conformance Statement

PSTS Profile Specific Test Specification

PTS Profile Test Specification

RL Requirements List

SCS System Conformance Statement

SCTR System Conformance Test Report

TTCN Tree and Tabular Combined Notation

XRL IXIT Requirements List

NOTE – The following abbreviations were defined in ISO/IEC TR 10000-1 but are superseded in Recommendations X.290 to X.296 by more general terms:

IPRLISP Requirements List (general term is profile RL)

ISPICS ISP Implementation Conformance Statement (general term is profile ICS)

ISPIXIT ISP Implementation eXtra Information for Testing (general term is profile IXIT)

4.2 Recommendation X.724 abbreviations

For the purposes of this Recommendation, the following abbreviations defined in Recommendation X.724 apply:

MCS Management Conformance Summary

MIDS Management Information Definition Statement

MOCS Managed Object Conformance Statement

MRCS Management Relationship Conformance Summary

5 Compliance

5.1 An OSI specification to which an implementation may be claimed to conform (i.e. specifying a protocol, information object or one or more profiles) shall:

a) incorporate or reference the specification of an Implementation Conformance Statement (ICS) proforma;

b) include, within its conformance clause, text which is effectively equivalent to the following:

"The supplier of an implementation which is claimed to conform to this <Specification> shall provide an ICS by completing an <ICS> proforma which conforms to the <ICS> proforma specification in <reference>, and shall provide the information necessary to identify both the supplier and the implementation."

5.2 An OSI specification that specifies an ICS proforma in compliance with this Recommendation shall satisfy the requirements stated in 8.1 to 8.4, 9.1 to 9.5 and clause 10.

An OSI specification that specifies a Protocol ICS (PICS) proforma in compliance with this Recommendation shall also satisfy the requirements stated in 8.5. An OSI specification that specifies an information object ICS proforma in compliance with this Recommendation shall also satisfy the requirements stated in 8.6. An OSI specification that specifies a profile ICS proforma in compliance with this Recommendation shall also satisfy the requirements stated in 6.5.4. An OSI specification that specifies a profile specific ICS proforma in compliance with this Recommendation shall also satisfy the requirements stated in 8.7.2 and 8.7.4.

5.3 An OSI specification that specifies a profile Requirements List (RL) in compliance with this Recommendation shall satisfy the requirements stated in 8.7.3 and clause 9 (with the exception of 9.3).

5.4 An OSI specification that specifies an ICS template in compliance with this Recommendation shall specify requirements applicable to some ICS proformas, such that any ICS proforma which complies with the ICS template also complies with this Recommendation.

NOTE – In addition, the following conformance and compliance relationships are relevant to ICSs, ICS proformas and ICS templates:

a) the actual ICS proforma used by a supplier should conform to the relevant ICS proforma specification;

b) an ICS should conform to the relevant ICS proforma specification;

c) an ICS proforma should comply with the specification of an applicable ICS template, if any;

d) an ICS template may comply with the specification of a more general ICS template, if any.

5.5 An SCS proforma which is claimed to comply with this Recommendation shall satisfy the requirements of the SCS template and other applicable requirements specified in 6.6 and clause 7.

6 Overview

6.1 Introduction to System Conformance Statements (SCSs)

A conforming system or implementation is one which satisfies an identified and consistent set of static and dynamic conformance requirements specified in a set of related OSI protocol, profile, abstract syntax, encoding rule and information object specifications. Claims of conformance for a system are made in an SCS and associated ICSs which explicitly state conformance to static conformance requirements and thereby imply conformance to the associated dynamic conformance requirements.

An SCS, as defined in Recommendation X.290, is required to identify the OSI protocols, abstract syntaxes, encoding rules, and information objects to which conformance is claimed. An SCS is also required to identify the profiles to which conformance is claimed and to identify any other supported combinations of the protocols, abstract syntaxes, encoding rules and information objects, and the supported relationships between them.

A Management Conformance Summary (MCS), as defined in Recommendation X.724, is a special type of SCS, focusing on management aspects of the system. If there is an MCS for a system, the SCS shall reference the MCS.

An SCS contains the following information as a minimum:

a) information related to both the real open system and the client:

   1) administrative information to identify the client;

   2) system information to identify the appropriate OSI specific part of the system, for example, product name and version number.

b) information related to those specifications for which an ICS is provided:

   1) the identification of the specifications to which conformance is claimed, including version numbers, and in the case of a profile, the profile identification;

   2) a reference to the related ICSs;

   3) the identification of combinations of specifications that are supported, if those combinations are not covered by a profile;

   4) information on whether the support of specific profiles or other combinations of specifications involves static reconfiguration, dynamic reconfiguration, or no reconfiguration of the system.

The SCS may contain an indication of whether a System Conformance Test Report (SCTR) and its referenced Protocol Conformance Test Reports (PCTRs), received from a previous conformance assessment, are available for information.

When an SCS is submitted to a test laboratory for a conformance assessment process, the SCS should indicate which profiles or combinations of specifications are to be tested. It may also indicate if the System Under Test (SUT) is a complete or partial (N)-open system, if it is to be tested as an end-system or a relay system, and what protocols are within the SUT but not part of the IUT. For instance, if the IUT is an implementation of an application profile over layers 5 to 7, the SCS may indicate which protocols or profiles are used to provide the Transport service.

6.2 Introduction to Implementation Conformance Statements (ICSs)

For each of the specifications referenced in the SCS, the detailed statement of supported capabilities (i.e. of the static conformance requirements satisfied by the system) is provided in an ICS.

For each protocol specification for which conformance is claimed, the detailed statement of supported capabilities is called a Protocol Implementation Conformance Statement (PICS).

For each information object specification for which conformance is claimed, the detailed statement of supported capabilities is called an information object Implementation Conformance Statement (information object ICS). Specific examples of information object ICSs are Managed Object Conformance Statement (MOCS), Management Information Definition Statement (MIDS) and Management Relationship Conformance Summary (MRCS) (for details, see Recommendation X.724).

For each profile or set of profiles for which conformance is claimed, the set of detailed statements of supported capabilities for that profile is called a profile Implementation Conformance Statement (profile ICS). A profile ICS includes all the relevant PICS and information object ICS. It may also include a profile specific statement of supported capabilities, which are not covered by any of the PICSs or information object ICSs; this is called a profile specific ICS.

NOTE – To avoid potential confusion, it is not recommended to create new abbreviations of the form xxxICS or xxxCS.

6.3 ICS proformas

6.3.1 General

To ensure consistency of an ICS with the static conformance requirements of the relevant OSI specification, all OSI specifications stating static conformance requirements are required to have an associated ICS proforma.

An ICS proforma is in the form of a questionnaire to be completed by the supplier or implementor of an implementation of the relevant OSI specification, to become an ICS.

An ICS proforma is essentially a set of items. An item is provided for each optional capability and for each major mandatory capability. Each item includes an item number, an item description, a status value specifying the support requirement, and room for a support answer to be provided by the implementor.

A minimal ICS proforma item is shown in Figure 1. This example shows that item number 1 is Capability-A which, because the status value is "o", is optional. This means that the question to be answered by the implementor is "does your implementation support Capability-A (in the context applying to this table)?".

Item number	Item description	Status value	Support answer
1	Capability-A	o	

FIGURE 1/X.296

A minimal ICS proforma item

The ICS proforma is a normative document to express in compact form the static conformance requirements of a specification. As such, it serves as a reference to the static conformance review. For particular cases requiring specific information, the ICS proforma can refer to the appropriate clause of the related specification by means of notes and comments.

6.3.2 PICS proformas

Each OSI protocol defining group is responsible for specifying the conformance requirements associated with the protocol. They are also responsible for ensuring that a PICS proforma is produced consistent with these conformance requirements, in a separate PICS proforma specification or in an annex of the protocol specification.

A PICS proforma captures the mandatory capabilities and implementation flexibility allowed by the protocol specification. It details which options are left to the implementor, which are conditionally dependent on other options taken by the implementor. It also emphasizes global implementation options that can be taken in a system supporting the protocol, in terms of roles of the implementation (e.g. initiator, responder or relay) or providing for service capabilities (e.g. OSI Transport expedited data). It does not repeat the dynamic conformance requirements of the protocol specification.

6.3.3 Information object ICS proformas

For each information object specification to which conformance may be claimed, there should be an information object ICS proforma defined together with the information object definition. For example, managed object specifications should each have an associated MOCS proforma in compliance with Recommendation X.724.

The relationship between the support of an information object and the support of particular protocols or profiles should be specified in the relevant System Conformance Statement. Thus, there is no need for information object ICS proformas to include questions about the related protocols or profiles.

6.3.4 Profile specific ICS proformas

A profile may specify requirements on an implementation that cannot be mapped onto existing items in the base specification ICS proforma(s) relevant to the profile. In this case, a profile specific ICS proforma is required.

6.4 Profile Requirements Lists

A profile Requirements List is provided for each profile and captures:

a) the general options of the profile as a whole;

b) a list of the specifications selected and combined in the profile; and references to the related ICS proformas;

c) for each of these referenced base specifications, a section of the profile RL expressing the restrictions upon allowed support answers in the corresponding PICS proforma and information object ICS proforma. This section of the profile RL is derived from the ICS proformas of the relevant base specifications, indicating the changes of status values necessary to express the profile requirements.

A minimal profile RL item is shown in Figure 2. This example shows that the profile has changed the status of Capability-A, which is item number 1 in the PICS proforma, from "o" (i.e. optional) to "m" (i.e. mandatory). This means that conformance to the profile requires a support answer of "Yes" for this item in the PICS.

Item number	Item description	Protocol status value	Profile status value
1	Capability-A	o	m

FIGURE 2/X.296

A minimal profile RL item

Notice that a profile RL is not an ICS proforma; it does not contain any questions, but rather restricts the acceptable answers to questions in the ICS proformas relevant to the profile. Thus, to use a profile RL, each table in it needs to be put alongside the corresponding table from the relevant ICS proforma. This is illustrated in Figure 3.

PICS proforma table

Item number	Item description	Status value	Support answer
1	Capability-A	o	

Profile RL table

Protocol status value	Profile status value
o	m

FIGURE 3/X.296

A profile RL item alongside the corresponding PICS proforma item

6.5 Relationships between OSI specifications and their related ICS proformas and ICSs

6.5.1 The general picture

Figure 4 shows the general picture of relationships between OSI specifications (protocol, information object and profile), their ICS proformas, a profile RL, and the completed ICSs. The ICS proformas are derived from their respective specifications by converting the static conformance requirements into questions presented in a tabular format. The profile RL is derived from both the profile and the relevant ICS proformas by presenting the profile requirements as changes in status values. Finally, the ICSs are derived from the ICS proformas by providing appropriate answers to the questions.

6.5.2 Base specifications

Figure 5 highlights the part of the general picture related to base specifications. This shows the base specifications (for protocols and information objects), their ICS proformas and their ICSs.

6.5.3 Profile specifications

Figure 6 highlights the part of the general picture related to the production of a profile specification based on the relevant protocol and information object specifications.

6.5.4 Profile ICS proformas

Profile specifications do not provide a single ICS proforma for the whole profile. Instead profile specifications:

a) reference the relevant PICS proformas and information object ICS proformas;

b) specify a profile specific ICS proforma if necessary to ask additional questions;

c) specify a profile RL to modify the status values where appropriate.

This complete collection of ICS proformas plus the profile RL is called the profile ICS proforma. It is highlighted in Figure 7 and formula 1 below (where Σ means "set of all relevant" and [...] means "optional"):

$$\text{Profile ICS proforma} = \Sigma(\text{PICS proformas}) + \Sigma(\text{Information Object ICS proformas}) + [\text{Profile Specific ICS proforma}] + \text{Profile RL} \quad (1)$$

NOTE 1 – The profile RL may contain within it the profile RL of a common (sub)profile. Similarly, the profile specific ICS proforma may contain within it the profile specific ICS proforma for a common (sub)profile. See 8.7.3 and 8.7.4.

Profile specifications may include not just the profile RL and any necessary profile specific ICS proforma, but also the whole profile ICS proforma. However, if the profile ICS proforma is included in the profile specification, then the copies of the base specification ICS proformas shall be informative; the normative versions of the base specification ICS proformas shall be the ones specified for the base specifications. Nevertheless, it may be useful to include copies of these ICS proformas in the profile specification, in order to ensure that implementors of the profile have ready access to the correct versions of the ICS proformas for the profile.

NOTE 2 – This is particularly true for the common (sub)profile.

6.5.5 Profile ICS

A profile ICS is a profile ICS proforma with all the relevant answers provided for a given system. Thus, a profile ICS consists of the set of relevant PICSs and information object ICSs, the profile specific ICS if any, plus the profile RL, as highlighted in Figure 8 and formula 2 below (where Σ means "set of all relevant" and [...] means "optional"):

$$\text{Profile ICS} = \Sigma(\text{PICS}) + \Sigma(\text{Information Object ICS}) + [\text{Profile Specific ICS}] + \text{Profile RL} \quad (2)$$

The profile RL specifies restrictions on answers in each of the PICSs and information object ICSs to meet the requirements of the profile specification.

6.5.6 Profile specific information

To complete this overview of the relationships between OSI specifications and their related ICS proformas and ICSs, Figure 9 highlights the part of the general picture which is specific to a profile. This shows the profile specification, the profile specific ICS proforma, the profile RL and the profile specific ICS.

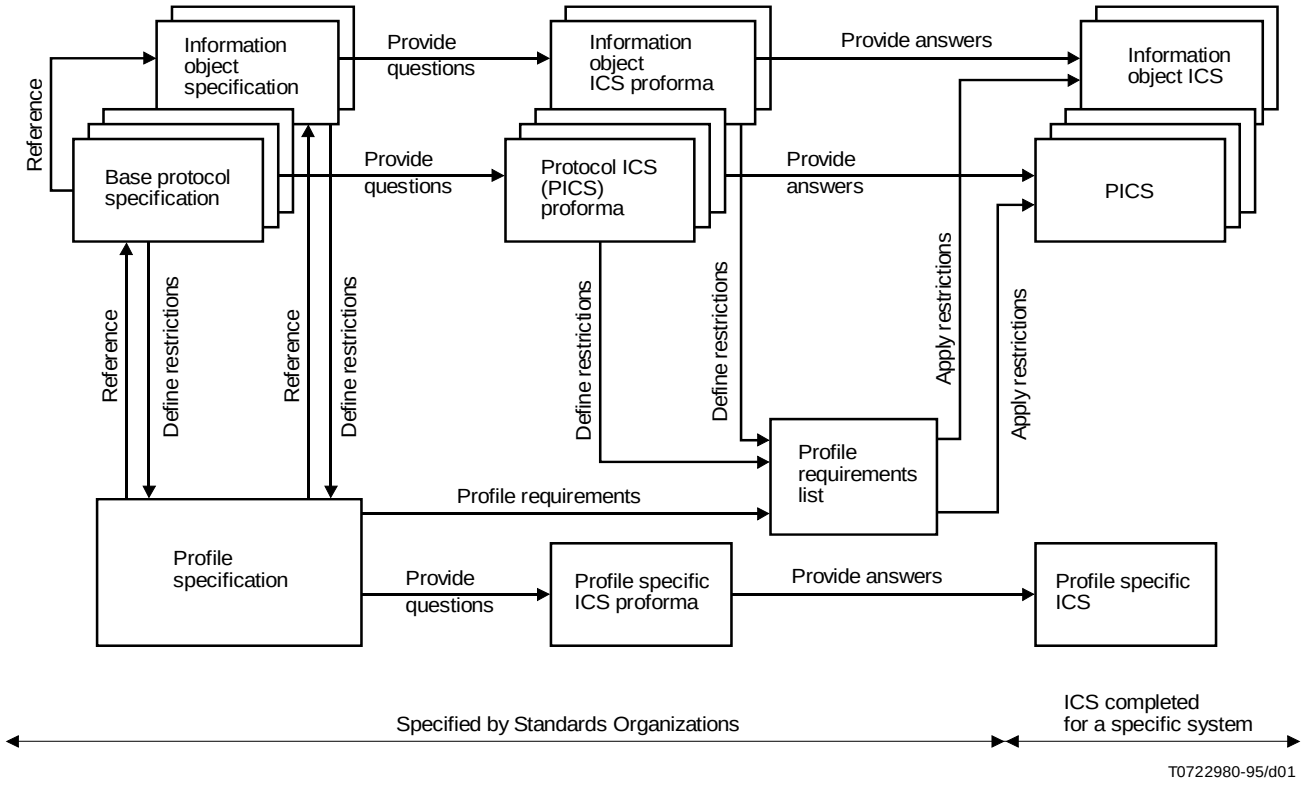

FIGURE 4/X.296

Relationships between specifications, ICS proformas and ICS

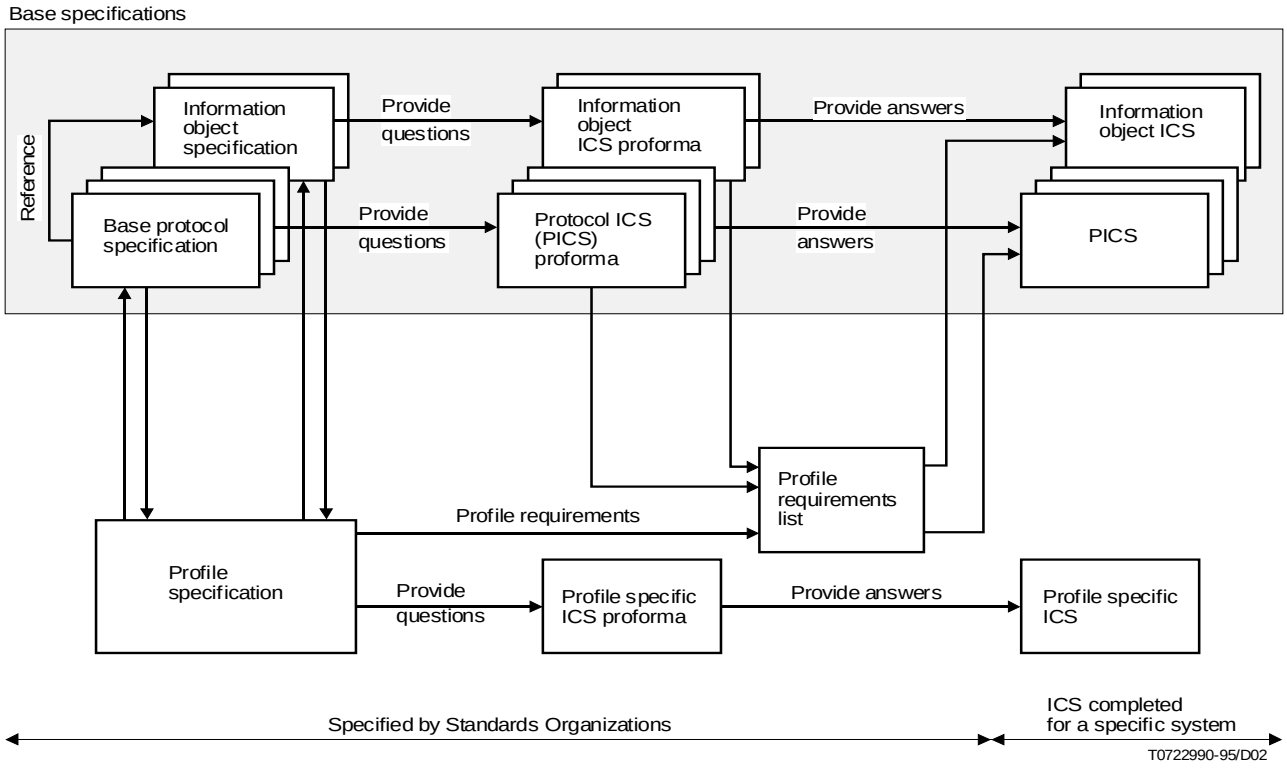

FIGURE 5/X.296

Base specifications and their ICS proformas and ICSs

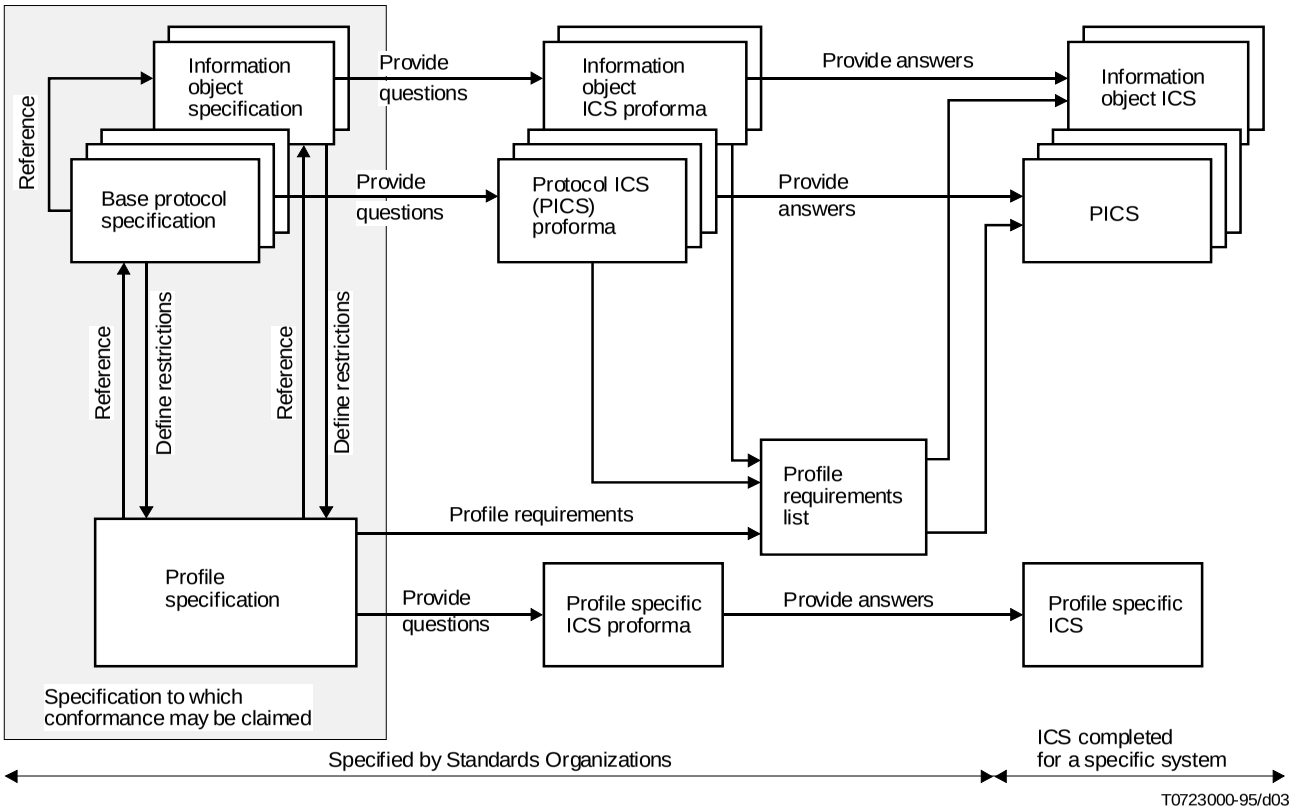

FIGURE 6/X.296

The specifications to which conformance may be claimed

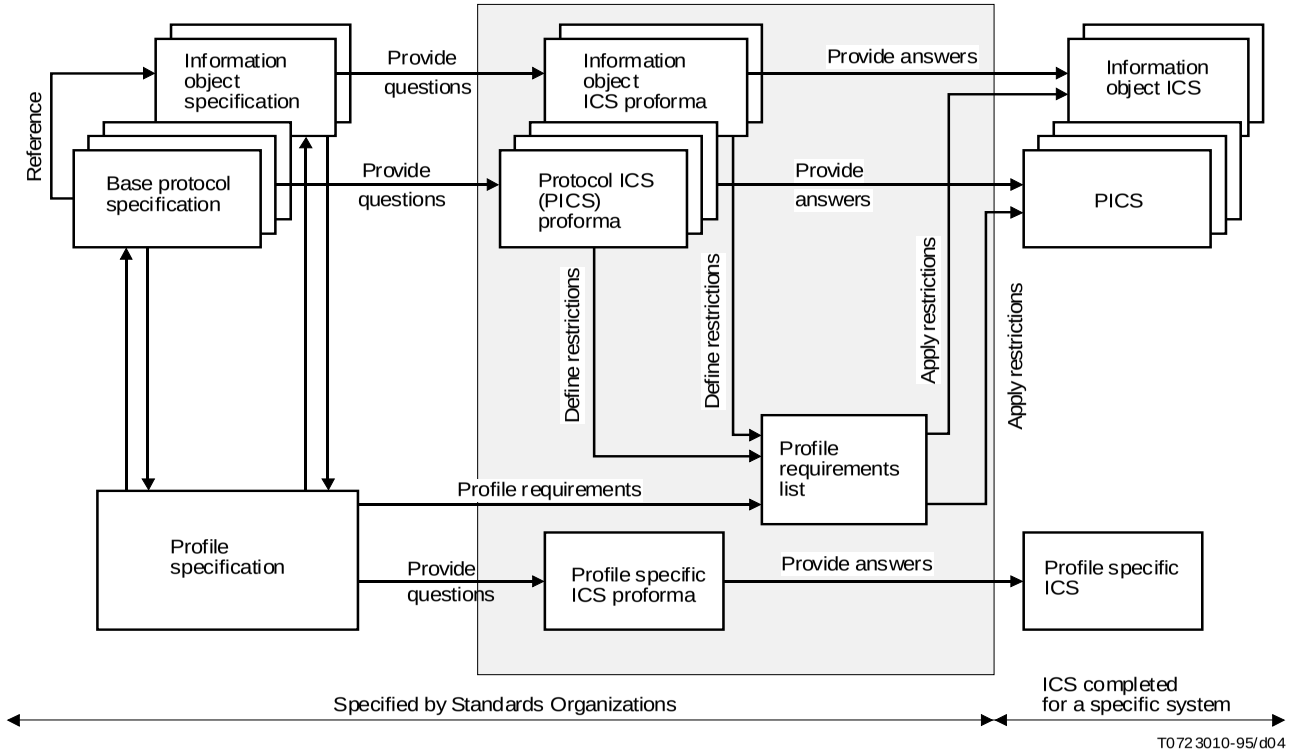

FIGURE 7/X.296

The profile ICS proforma

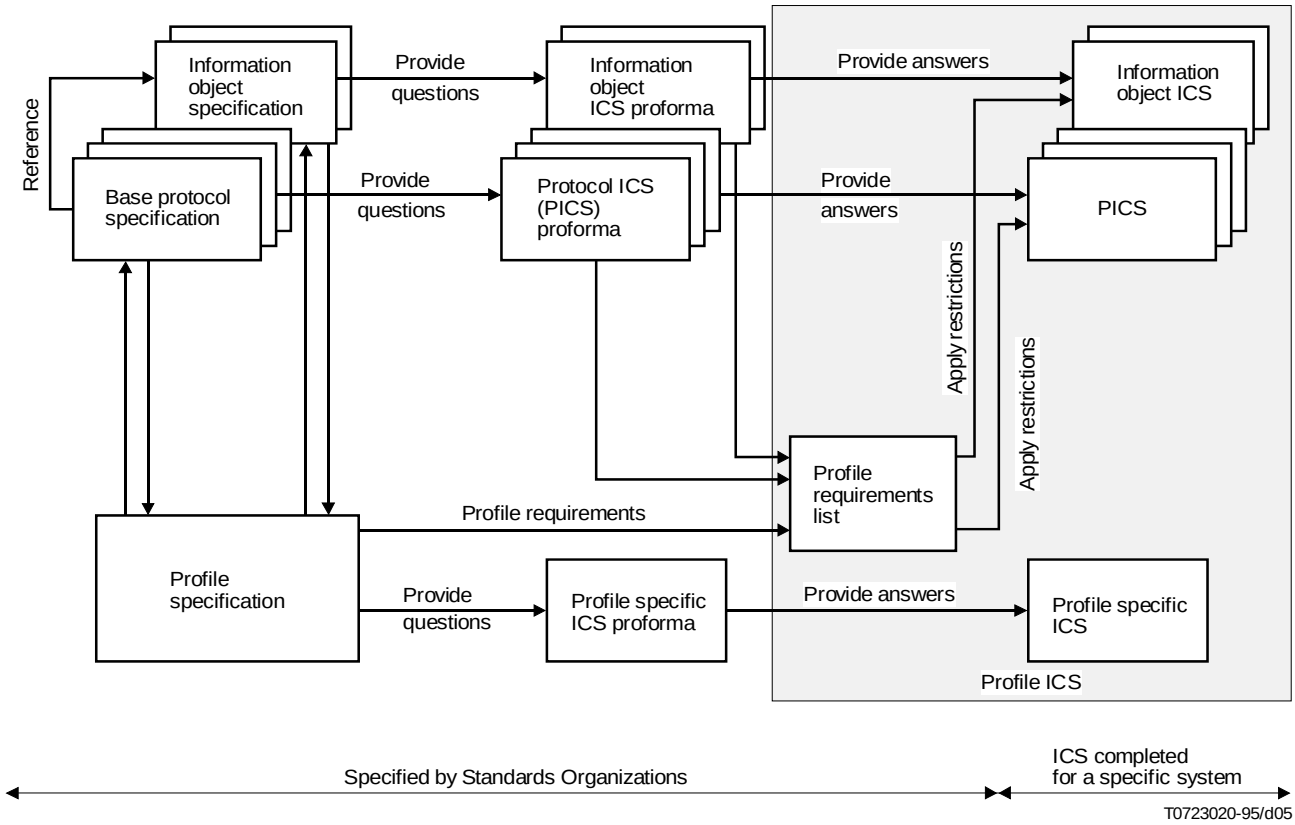

FIGURE 8/X.296

The profile ICS

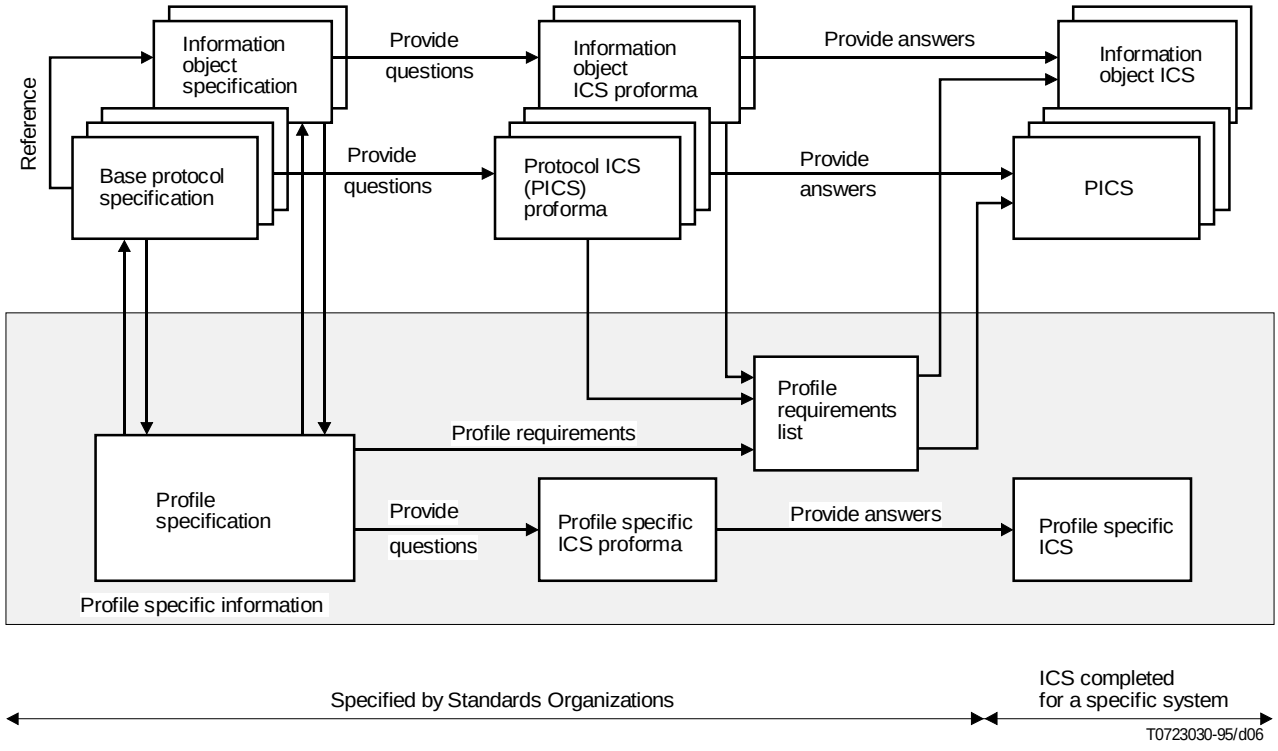

FIGURE 9/X.296

Profile specific information

6.6 SCS proformas

Figure 10 shows a graphic representation of an SCS for a system supporting two profiles, three protocols and three information objects. Profile A comprises of protocols 1, 2 and 3 with information objects X and Y, whilst profile B comprises protocols 1, 2 and 3 with information object Z. The SCS refers to the related SCTR(s), and PCTR(s), if any, resulting from previous test campaigns for some of the relevant specifications implemented in the same SUT, if any.

NOTE – It is acceptable not to list an OSI specification and its ICS in the SCS if it is identified fully in an attachment to another ICS, e.g. abstract syntaxes and encoding rules may be dealt with in an attachment to a PICS.

In addition, in the above example, the SCS shall clarify what reconfiguration of the system is necessary in order to switch from using profile A to using profile B:

a) No reconfiguration needed – In other words, the profile used is determined by the other system and if the other system chooses to use some combination of protocol capabilities partly from A and partly from B, then this is likely to be supported, provided that it does not violate the base protocol specifications.

b) Dynamic reconfiguration is used, using the protocol negotiation mechanisms to determine which profile is to be used in an instance of communication.

c) Static reconfiguration is used, using some local mechanism (e.g. selection of the profile through the user interface), rather than by using protocol mechanisms.

An SCS shall be produced by using an SCS proforma. The general requirements on the structure and format of an SCS proforma are specified in clause 7. The SCS proforma may be provided by a test laboratory, procurement agency, or profile defining group. If no suitable SCS proforma is available from one of these sources, the supplier may provide its own SCS proforma.

6.7 Use and users of ICSs and SCSs

6.7.1 Users of proformas

Possible users of ICS proformas are:

a) the implementors or suppliers, who need to document their implementations;

b) ATS specifiers, who need to ensure that the structure of the test suite is consistent with the allowed implementation flexibility;

c) the specifiers of OSI protocol profiles, who require a detailed definition of the implementation flexibility available in each base protocol specification, on which to base their profile RLs.

Profile RLs complement the ICS proformas relevant to a profile and therefore have the same users as ICS proformas, even other profile specifiers if they are specifying profiles which include by reference other profiles [e.g. common (sub)profiles].

6.7.2 Uses of ICSs and SCSs

6.7.2.1 Use in testing

The main purpose of an SCS and its associated ICSs is to support the conformance assessment process (see Recommendation X.294), where they are used in:

a) the static conformance review;

b) the test selection process, as a means of adapting Executable Test Suites to the options supported by the implementation;

c) the results analysis process, as a reference document.

For conformance testing, each protocol to be tested will be required to have a PICS and each information object to be tested will be required to have an information object ICS (see Recommendation X.290). Furthermore, a profile ICS is necessary to test conformance of an implementation to a profile.

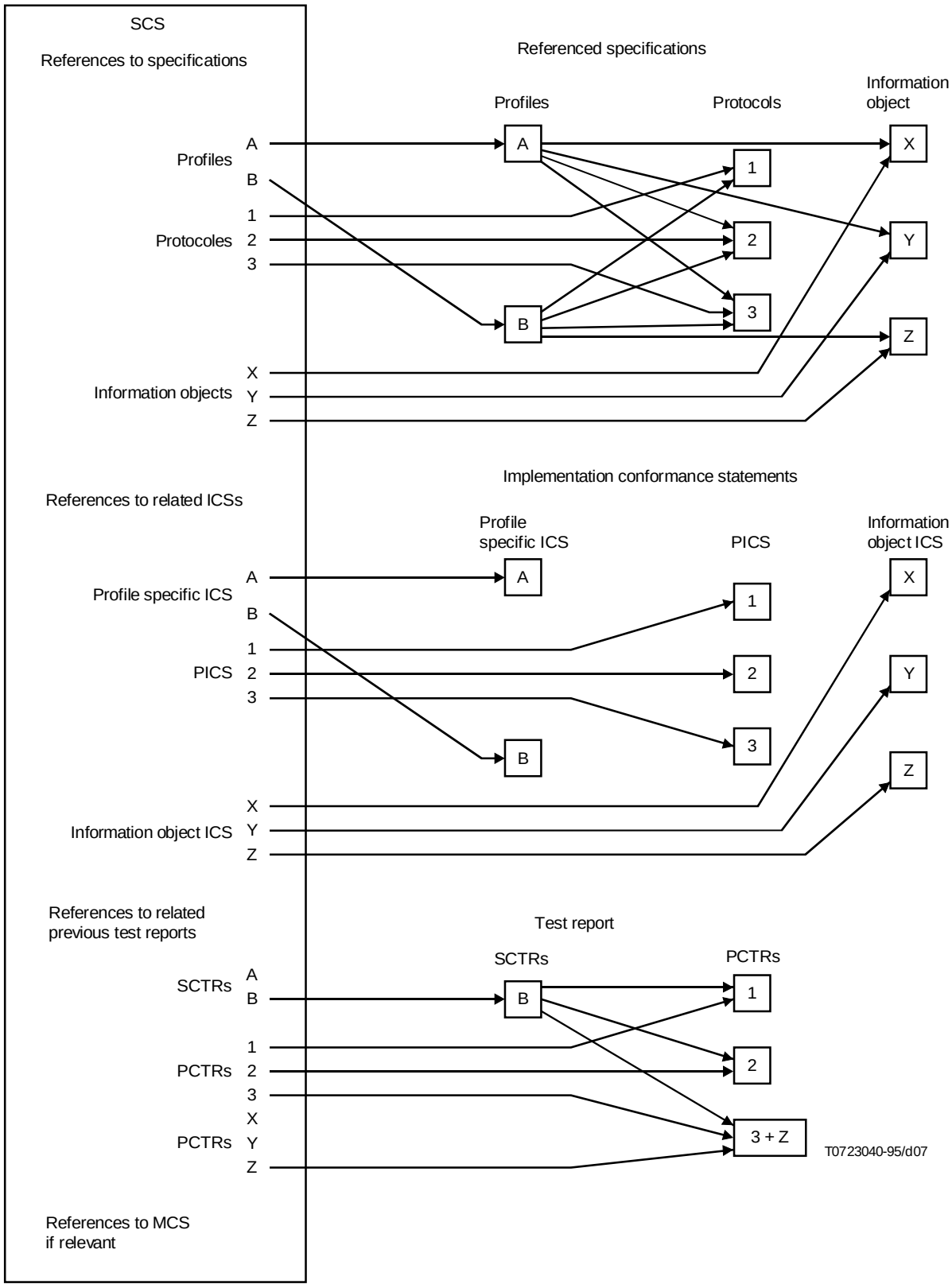

FIGURE 10/X.296

Relationship between an SCS and its referenced documents

6.7.2.2 Other uses

An SCS and its ICSs can also be used, outside the context of conformance testing, to provide an overview of the system's capabilities for which conformance is claimed.

An SCS and its ICSs can also be used to assess the ability of two systems to interwork. This can be done by a comparison of the options and parameters stated in the ICSs of the two systems. See Recommendation X.290, on interworking and conformance.

6.7.2.3 Aspects of the system covered by the SCS and ICSs

An SCS and its associated ICSs may be filled out to cover any one of the following aspects of the system's support of the relevant OSI specifications:

a) base specification support, without any reference to profiles which may or may not be supported;

b) single-profile support, without any indication whether or not the system also supports other profiles or other base specification capabilities, but with the implication that the system may be configured so that it supports only the single profile;

c) configurable multiple-profile support, i.e. with the capability for the system to be configured to support each of the profiles individually, using conditional statements as support answers as necessary;

d) non-configurable multiple-profile support, i.e. without the capability for the system to support each of the profiles separately.

Suppliers have the right to produce an SCS and its associated ICSs for whichever of these aspects of the system's support is appropriate for their purposes. A submission to a test laboratory for profile conformance assessment may be accompanied by an SCS and its ICSs covering any one of b), c) or d) in the above list, even though the test laboratory will test conformance to one profile at a time.

7 Structure of an SCS proforma

The first section of the SCS proforma shall provide space for identification of:

a) the system, precisely and unambiguously, including a product name and/or code number, version number, release date, and if relevant configuration or modification details;

b) the supplier of the system;

c) the client of the test laboratory, if relevant and if different from the supplier;

d) the person to contact if there are any queries concerning the content of the SCS.

It is not necessary for the SCS proforma to give a precise format for a table for such information. If it does not include a table for such information, then it shall, state the need for such information and should do so in the style of the above paragraph.

The second section shall identify the protocols supported and should use a table based on the one in Figure 11. The PCTR reference column may be used to refer to any PCTRs that have been obtained for these protocols in this system. The Xref column should be used to provide a unique cross-reference number or mnemonic for ease of reference elsewhere in the SCS.

Protocol name	Specification reference	PICS reference	PCTR reference	Xref

FIGURE 11/X.296

Protocol identification table

Similarly, if any information objects may be supported, the next section shall identify them and should use a table based on the one in Figure 12.

Information object name	Specification reference	ICS reference	PCTR reference	Xref

FIGURE 12/X.296

Information object identification table

The next section shall identify the profiles [including common (sub)profiles] supported, if any, and should use a table based on the one in Figure 13. This refers to the profile specific ICS, rather than the profile ICS, since all the other ICS components of the profile ICS will be referenced elsewhere in the SCS. The SCTR reference column may be used to refer to any SCTRs that have been obtained for these profiles in this system. The profile Xrefs may be used as predicates in conditional answers in the support and supported values columns in the relevant ICSs, if these ICSs are filled out to describe configurable multiple-profile support.

Profile identifier	Specification reference	Profile specific ICS reference	SCTR reference	Xref

FIGURE 13/X.296

Profile identification table

The next section shall identify which combinations of protocols, and possibly information objects, are supported by virtue of supporting these profiles, and which combinations not covered by the profiles are also supported, if any. This should use a table based on the one in Figure 14. The first column may be omitted if the only combinations supported are the identified profiles.

Combination identifier	Profile Xref	List of protocol Xrefs	List of information object Xrefs

FIGURE 14/X.296

Combination description table

The next section shall identify what kind of reconfiguration is needed in order to use each of the identified combinations. If it is known that one style of configurability will be used for all combinations, then this may take the following form:

"Tick which of the following forms of configurability applies to the system:

a) the system is not configurable;

b) the system has to be statically reconfigured for each profile or combination of protocols and information objects;

c) the system is dynamically reconfigured for each profile or combination of protocols and information objects by using the appropriate protocol negotiation mechanisms."

If, however, it is possible that different combinations have different configurability requirements, then a table such as the one in Figure 15 should be used.

Combination identifier	Available always?	Available by dynamic reconfiguration?	Available by static reconfiguration?

FIGURE 15/X.296

Configurability table

If the SCS may be used in conjunction with a submission for conformance assessment, then the next section should identify the profiles and/or base protocols and information objects which are to be the focus of the conformance assessment. This should use a table based on the table in Figure 16. It is not sufficient simply to list the profile Xrefs because it may be that only a subset of the protocols within a given profile is to be tested by a given test laboratory.

Base or profile testing	Profile to be tested (Xrefs)	Protocols to be tested (Xrefs)	Information objects to be tested (Xrefs)
Base			
Profile			
Profile			

FIGURE 16/X.296

Table of what is to be tested

Additional questions may also be asked in an SCS proforma to meet any further requirements of the type of system concerned or of the organisation that specifies the proforma. For example, the SCS proforma may refer to an MCS proforma, as defined in Recommendation X.724.

8 Layout of an ICS proforma specification and profile RL

8.1 Introduction

This clause contains requirements related to inclusion of an ICS proforma in a specification. It covers such issues as the contents of the Introduction, Scope, References, Definitions and Conformance clauses as well as the ICS proforma itself.

Requirements in this clause from 8.2 to 8.4 apply to all ICS proforma specifications (i.e. including PICS proformas, profile specific ICS proformas and information object ICS proformas).

This clause also contains requirements and guidance for specifications which specify ICS templates. An ICS template is a template which is to be used as the basis for developing an ICS proforma (e.g. see Appendix IX for an explanation of the use of ICS templates in the context of OSI Management).

8.2 Requirements for ICS proforma specifications and specifications of ICS templates

8.2.1 Publication options for ICS proforma specifications

The ICS proforma shall be incorporated as an annex in:

a) a distinct ICS proforma specification;

b) an ICS proforma part of a multi-part specification, or;

c) the specification to which implementations are to be claimed to conform.

If static conformance requirements are expressed both in the ICS proforma and separately in the specification to which implementations are to be claimed to conform, then a precedence statement shall be specified to clarify that the two specifications of the static conformance requirements are intended to be consistent but if not which takes precedence.

8.2.2 The Introduction clause

The Introduction clause of an ICS proforma specification shall include an explanation of the purpose of an ICS. The following text is recommended:

> "To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented for a given OSI specification. Such a statement is called an Implementation Conformance Statement (ICS)."

Similar text may be used in a specification which specifies an ICS template.

8.2.3 The Scope clause

The Scope clause of an ICS proforma specification shall include the text which is effectively equivalent to the following (with the appropriate substitutions made for <Specification>, <specification name> and <reference>):

> "This <Specification> provides the ICS proforma (for the <specification-name> as specified in <reference>) in compliance with the relevant requirements, and in accordance with the relevant guidance, given in Recommendation X.296."

Similar text may be used in a specification which specifies an ICS template.

8.2.4 The References clause

The References clause of a specification which specifies either an ICS proforma or an ICS template shall include the following references or the equivalent references to ISO/IEC 9646 parts 1 and 7:

– "ITU-T Recommendation X.290 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – General concepts*."

– "ITU-T Recommendation X.296 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Implementation conformance statements*."

The References clause shall also contain a reference to the relevant OSI specification which specifies the protocol, information object, or profile.

8.2.5 The Definitions clause

The Definitions clause of a specification which specifies either an ICS proforma or an ICS template shall identify which terms it uses from Recommendations X.290 and X.296. For example, it may state the following:

"This <Specification> uses the following terms defined in Recommendation X.290:

– Implementation Conformance Statement proforma;

– Implementation Conformance Statement;

– static conformance review."

In particular, the Definitions clause shall list the terms appropriate to the type of ICS proforma.

For a protocol ICS proforma, the Definitions clause should include the following terms defined in Recommendation X.290:

– Protocol Implementation Conformance Statement proforma;

– Protocol Implementation Conformance Statement.

For a profile specific ICS proforma, the Definitions clause should include the following terms defined in Recommendation X.290:

– Profile specific Implementation Conformance Statement proforma;

– Profile specific Implementation Conformance Statement.

For an information object ICS proforma, the Definitions clause may include the following terms defined in Recommendation X.290:

– Information object Implementation Conformance Statement proforma;

– Information object Implementation Conformance Statement.

8.2.6 The conformance clause

8.2.6.1 Each ICS proforma specification shall include a conformance clause, which shall include text on technical equivalence, to restrict what is allowed to be a conforming ICS proforma used by a supplier without restricting such things as the natural language it is to be written in or the pagination of the ICS proforma. The text should be effectively equivalent to the following:

> "If it is claimed to conform to this <Specification>, the actual ICS proforma to be filled in by a supplier shall be technically equivalent to the text of the ICS proforma in this <Specification>, and shall preserve the numbering/naming and ordering of the ICS proforma items."

8.2.6.2 The conformance clause of each ICS proforma specification shall also include text concerning what is allowed to be a conforming ICS. The text should be effectively equivalent to the following:

> "An ICS which conforms to this <Specification> shall be a conforming ICS proforma completed in accordance with the instructions for completion given in <clause-reference>."

8.2.6.3 Each OSI specification which specifies an ICS template shall include a compliance clause which shall clarify what a complying ICS proforma specification has to preserve and what it is allowed to modify from the ICS template.

8.2.7 Copyright

ICS proformas are to be completed by the implementors in the form published in the appropriate specification. This raises an issue of copyright with respect to the section of the specification containing the ICS proforma.

The following statement shall appear in the ICS proforma specification, as a footnote on the first page of the proforma itself, referenced from the title of the annex [e.g. "Annex A[1)]"]:

> "[1)] Copyright release for ICS proformas: Users of this <Specification> may freely reproduce this ICS proforma so that it can be used for its intended purpose and may further publish the completed ICS."

The terms can be suitably modified to reflect the exact form of publication: e.g. <Specification> can be replaced by "International Standard", "Technical Report" or "Recommendation".

Also the words "Unless otherwise specified," shall be added before "no part of this publication may be reproduced..." in the copyright statement at the end of the Contents page(s).

8.3 The ICS proforma

8.3.1 Introduction

The ICS proforma itself shall be provided in an annex of the ICS proforma specification (see 8.2.1). The following subclauses specify requirements and provide guidance for the production of an ICS proforma. The following subclauses also may be used as guidance for the production of an ICS template.

8.3.2 First section – Identification of the ICS proforma corrigenda

There is a need for identification of corrigenda (i.e. Technical Corrigenda or equivalent) to ICS proformas. This is not true for Amendments to ICS proformas, as these should result in a new complete ICS proforma. However, the standards body responsible for a particular ICS proforma has the discretion to decide on the timing of the publication of revisions of the ICS proforma to accommodate a batch of corrigenda if necessary. Thus, the first section of the ICS proforma shall contain an ICS proforma corrigenda table. Figure 17 shows an example of such a table.

Identification of corrigenda applied to this PICS proforma	Rec. X.481 (1992) Corr.: Corr: Corr:

FIGURE 17/X.296

Example ICS proforma corrigenda identification table

Suppliers of the proforma should modify the proforma, or attach relevant additional pages in order to apply each corrigendum, and shall then record the application of the corrigenda in the above table.

8.3.3 Second section – Instructions

The second section of the ICS proforma shall contain instructions for completion of the proforma by the supplier of the implementation or the client of the test laboratory. This section shall:

a) explain the purpose and the structure of the document to the potential user;

b) explain the symbols, abbreviations and terms being used, together with appropriate references;

c) give explicit instructions for completing the ICS;

d) define the places in which the user can provide additional information.

NOTE – A supplier or test laboratory may provide a cover page for an ICS proforma coming before these instructions. The format of this cover page is not standardized.

8.3.4 Third section – Identification of the implementation

The third section of the ICS proforma shall provide space for identification of the implementation and the supplier or client of a test laboratory, identifying:

a) the implementation and the system in which it resides;

b) the supplier of the system and/or the client of the test laboratory;

c) the person to contact if there are any queries concerning the content of the ICS.

It is not necessary for the ICS proforma to give a precise format for a table for such information. It shall, however, state the need for the information necessary to uniquely identify both the supplier and the implementation, and should do so in the style of the above paragraph.

8.3.5 Fourth section – Identification of the protocol, information object or profile

The fourth section of the ICS proforma shall identify the OSI specification(s) to which the ICS proforma applies, including the specification reference number, and the complete title.

An ICS proforma is specified for one or more editions of a reference specification, and/or one or more protocol versions. Thus the edition(s) and/or version(s) to be supported shall be pre-printed in the proforma with a support column alongside to ascertain which of the listed edition(s) and/or version(s) are supported by the implementation.

Figure 18 shows an example of a protocol identification table.

Item number	Identification of protocol specification	Support
1	Recommendation X.882 (1994)	
2	Recommendation X.882 (1994)/Amd.1(1995)	

FIGURE 18/X.296

Example protocol identification table

8.3.6 Fifth section – Identification of corrigenda to the protocol, information object or profile

The fifth section of the ICS proforma shall provide a table in which to identify the corrigenda (i.e. Technical Corrigenda or equivalent) to the protocol, information object or profile which have been incorporated in the implementation. The existence of some corrigenda may be known at the time of publication of the ICS proforma, whereas others may be published later but still within the lifetime of the particular edition of the ICS proforma. Thus, some blank space should be provided for identification of supported corrigenda. Figure 19 shows an example of a corrigenda table.

Identification of corrigenda implemented	
Specification	Corrigenda implemented
ISO/IEC 8571-2:1990	
ISO/IEC 8571-4:1990	

FIGURE 19/X.296

Example corrigenda identification table

Specific questions related to particular corrigenda shall be pre-printed if there is a need to refer to those corrigenda in conditional status expressions.

Suppliers of the proforma should modify the proforma, or attach relevant additional pages in order to apply the corrigenda, and shall then record the application of the corrigenda in the above table.

8.3.7 Sixth section – ICS proforma tables

8.3.7.1 Introduction

The sixth section of the ICS proforma shall list the capabilities of the protocol, information object, or profile.

This section of the ICS proforma is a questionnaire in the tabular form described in 6.3. In each item of these ICS proforma tables there is a status value which shall reflect the static conformance requirements of the relevant OSI specification.

The items in these ICS proforma tables shall be structured in a hierarchical manner, beginning with the major roles and capabilities of the implementation followed by the underlying items conditional upon those major roles and capabilities.

8.3.7.2 Global statement of conformance

A question shall be included in the ICS proforma to ask whether or not all mandatory capabilities are implemented.

A note shall be added to include the sense of the following:

"Answering 'No' to this question indicates non-conformance to the OSI specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming."

8.3.7.3 Structure of the tables

The individual sections of the ICS proforma shall be presented in the form of one or more tables. The tables should reflect the static conformance requirements.

The tables shall list all the optional and major mandatory capabilities. There should be one item of the list per row.

Each table shall include the following columns:

a) a pre-printed column to the left to give the item number, for use in item referencing (see 9.5);

b) a pre-printed column to name the item for each row;

c) one or more sets of columns to specify the status and record the support of the item; one set per distinct context in which the support is to be specified (e.g. for sender, receiver and relay roles); each such set of columns may contain:

   1) a 'status' column (pre-printed) to specify the status value for the item (e.g. mandatory, optional, conditional), as defined in the relevant OSI specification (status column is mandatory);

   2) another column, if appropriate, to specify the predicate upon which a conditional status is based;

   3) a pre-printed column giving references to the appropriate static conformance requirements or other clauses in the relevant OSI specification(s) (mandatory to provide suitable references, preferably in such columns);

   4) a 'support' column, in which an answer can be made to indicate whether or not the implementation supports the item in the particular context (mandatory column);

   5) an 'allowed values' pre-printed column, if appropriate, stating any restrictions or prescriptions on the types/lengths/ranges of values to be supported, as specified in the relevant OSI specification;

   6) a 'supported values' column, if appropriate, in which the values or ranges of values supported can be indicated, as well as types and lengths, if relevant;

   7) a "mnemonic" pre-printed column, if desired, in which mnemonic identifiers are given to each item, for use in place of item numbers in item references (see 9.5);

   8) space on the right in which additional columns can be added if necessary to enable comments to be added by the user of the ICS proforma.

If within this list of values of parameters, some values are mandatory while others are optional or conditional, then an extra table listing each category of parameters with their status is required. A supported column shall be used to indicate if each category is supported or not, as usual.

8.4 Re-issuing ICS proformas following technical corrigenda

Previously guidance has been given on re-issuing ICS proformas in their entirety following the approval of a Technical Corrigendum which has conformance implications or requires modification to the ICS proforma. Since there may be many such Technical Corrigenda approved in quick succession in some cases, the organization responsible should be left the discretion to decide how to batch these up for the purposes of re-issuing ICS proformas frequently enough to meet the needs of suppliers and users alike.

8.5 PICS proformas

8.5.1 Introduction

This subclause addresses specific issues regarding the production of a PICS proforma for a protocol specification.

The function of the protocol can be broken down into major roles and capabilities (e.g. initiator, responder, relay, functional units, classes). Each major capability shall have a specific item in the PICS proforma, indicating its conformance status (e.g. mandatory, optional, conditional, etc.). To describe the capabilities related to each PDU of the protocol, there shall be one or more PICS proforma items, grouped by major capabilities.

The PICS proforma shall also cover all other optional, conditional and significant mandatory static conformance requirements identified in the protocol specification. These may include functions, elements of procedure, parameters, timers, protocol error handling and multi-specification dependencies.

The dynamic conformance requirements related to these static conformance requirements shall not be reproduced in the PICS proforma.

There shall be a well-defined mapping (by references to the relevant specification) from the PICS proforma to the static conformance requirements.

The following topics are common to many protocols, but they need to be adapted to each particular protocol in order to design the appropriate sections of the PICS proforma.

8.5.2 Roles

If the protocol can be implemented in different roles, there shall be PICS proforma items to identify which roles are supported. More detailed conformance requirements are likely to be conditional upon the roles supported. Thus, the rest of the PICS proforma shall distinguish clearly the different status values and support answers for the different roles. For example, if the protocol allows an implementation to act as initiator, responder, or both, the PICS proforma items related to these two roles may be organized as two sets of columns per table or two sets of tables. In addition, if the protocol allows an implementation to act as a relay, then this role should be treated separately from initiators and responders.

For some protocols, the roles include those that make use of different multi-party configurations (including but not limited to relays). If a protocol can be used in a multi-party context, there shall be one or more questions in the relevant PICS proforma asking (in terms appropriate for the protocol) whether or not the implementation supports only the single-party use of that protocol or also the multi-party use of the protocol. Such questions are relevant to conformance and conformance testing. However, questions concerning the maximum number of parties that an IUT can communicate with at once are questions for the PIXIT proforma rather than the PICS proforma, if they have any validity at all.

8.5.3 Major capabilities

The full functionality of the protocol may be divided into large implementation ‘blocks’ (i.e. functional units, service classes, service elements, protocol classes). If so, for each ‘block’ a relevant PICS proforma item shall give the conformance status of the capability, and provide space for the implementor support statement. Such items shall be included in a separate section in the PICS proforma (unless the protocol contains only one such ‘block’).

These ‘blocks’ are referred to as major capabilities. Each is defined (with its status) in the static conformance requirements of the relevant protocol specification. Depending on the nature of the protocol, the major capabilities may correspond to a group of PDUs to be implemented together, or to some global aspect common to several PDUs. See Appendix III, Figure III.1.

The PICS proforma shall have an item for each major capability, whatever its status.

8.5.4 PDUs

Items to identify PDU support shall be included in the PICS proforma. These shall cover all PDUs defined for the protocol, grouped according to the major capabilities whenever relevant. In addition, the status and support of each PDU should be indicated separately for the roles of sender, receiver and, if relevant, relay. See Appendix III, Figure III.2.

NOTE – The conformance clause may provide information on the optional status of specific protocol elements (PDUs, PDU parameters). In some protocols, the optional status of some protocol elements is located in the body of the protocol specification (dynamic conformance requirements), in others they are included in the conformance clause.

Support for the receipt of a particular PDU type shall be understood to imply support for parsing all valid instances of that PDU type, including all valid PDU parameters; this means supporting parsing of at least all semantically valid parameters but may also mean support for parsing all syntactically valid parameters. Thus, supporting the receipt of a PDU whilst having no ability to parse one of its valid parameters is non-conformant. The precise meaning of validity of parameters is determined by the protocol specification and may vary dynamically (e.g. depending on protocol state and the results of a negotiation phase). If the protocol includes rules for extensibility, then support for a particular PDU type shall imply the ability to parse any instance of that PDU which is syntactically valid within the rules for extensibility. See Appendix VIII for guidance on the status and support for parameters on received PDUs.

8.5.5 PDU parameters

PICS proforma items may be used to list, for each PDU type, the parameters for which implementation flexibility exists in regard to support for the full functionality (i.e. semantics) associated with those parameters. Such items are recommended whenever relevant. If no such implementation flexibility exists, then support for a PDU implies support for the full functionality of its parameters.

A statement of support for a PDU parameter in the PICS does not in itself imply anything about the presence or absence of that parameter on a particular instance of the relevant PDU. Such questions of dynamic behaviour should not be discussed in the PICS, but rather determined by the dynamic conformance requirements in the protocol specification. Profile specifications may add requirements concerning the presence or absence of particular parameters on particular PDUs, in which case support for these should be checked by questions in the profile specific ICS proforma, rather than the base specification PICS proforma.

For each documented parameter, the PICS proforma should provide:

a) its status, based on the value of a specified predicate in each role (e.g. sender, receiver and relay);

b) space to indicate whether or not it is supported in each role;

c) the lengths, ranges of values and/or data types permitted in each role by the relevant protocol, abstract syntax and encoding rule specifications;

d) space to indicate the values supported in each direction.

See Figure III.3.

If there is no implementation flexibility in regard to the parameter values allowed, only one question need be asked by the PICS proforma. If there is implementation flexibility in regard to the parameter values allowed, additional questions shall be asked in the PICS proforma. For example, an ‘unlimited’ PDU parameter calls for a question in the PICS proforma asking what is the maximum size implemented. It may also be appropriate to add a separate parameter values table to check more precisely the support of particular values (see the example given in Figure III.4).

The proforma should give a clear indication of the preferred data types to be used for specifying the supported values (e.g. number bases, string types, octets, bits, seconds, etc.)

Other categories of PICS item may also be used to cover the implementation flexibility regarding encoding rules.

For a protocol using a transfer syntax that does not strictly define the size of the parameters transferred (e.g. ASN.1 Basic Encoding Rules), it should be made clear whether or not the sizes defined include the encoding.

8.5.6 Timers

PICS proforma items may be used to list all timers defined in the protocol specification. Allowed values (or range of values) shall be specified for each. Space shall be provided for specifying which values are supported. Such items are recommended whenever relevant.

8.5.7 Negotiation capabilities

PICS proforma items may be used to describe the negotiation options available dynamically in the protocol, and provide space to indicate which have been implemented. Such items are recommended whenever relevant.

NOTE – A PICS should not discuss negotiation outside the protocol (e.g. agreement on the static reconfiguration).

8.5.8 Protocol error handling

If the protocol specification allows more than one method of handling errors on receipt of non-supported PDUs or parameters, PICS proforma items may be used to list what these methods are, and provide space to indicate which are supported. Such items are recommended whenever relevant. See II.4 for further guidance.

8.5.9 Multi-specification dependencies

Sometimes protocol specification conformance clauses include, within the static conformance requirements of the protocol, multi-specification dependency requirements. These require that a conforming system supports specific requirements on the underlying services, protocols, abstract syntax, encoding rules or information objects, not made mandatory by the underlying protocol specifications themselves. Such multi-specification dependencies may, in some cases, have to refer to non-adjacent specifications (e.g. an application protocol may require Session version 2), but if at all possible multi-specification dependencies should refer only to the adjacent specifications, especially the service(s) used explicitly in the protocol specification.

If and only if the protocol specification specifies multi-specification dependencies itself, the related PICS proforma shall include items on these dependencies. A PICS proforma shall make a distinction (by using separate tables) between items related to the static conformance requirements of the protocol itself (internal requirements) and items related to static conformance requirements on other protocols, abstract syntaxes, encoding rules, information objects, or provision for underlying service capabilities (multi-specification dependencies). For more guidance on multi-specification dependencies, see Appendix VII.

8.5.10 Other conditions

If there is a complex relationship between options which need to be checked in the static conformance review, and which cannot be associated with a specific PICS proforma item, then such relationships should be documented in the form of Boolean expressions, or matrix tables in a separate section, with predicates and variables referencing the relevant PICS proforma items.

8.6 Information object ICS proformas

In an information object ICS proforma there may, for example, be items for:

a) object classes;

b) packages;

c) attributes and their operations;

d) operations (actions, notifications, and their arguments).

See Recommendation X.724 for requirements and guidance on information object ICS proformas in the context of OSI Management.

8.7 Profile RL and profile specific ICS proforma

8.7.1 Introduction

This subclause addresses specific issues regarding the production of profile ICS proforma.

8.7.2 Use of base specification ICS proformas in a profile

A profile ICS proforma includes an ICS proforma for each relevant base specification.

If an ICS proforma of one of the relevant base specifications is not yet standardized, then the profile specification or Profile Specific Test Specification (PSTS) shall include a provisional ICS proforma to meet profile requirements, pending production of a standardized ICS proforma for the base specification.

If an existing ICS proforma does not include all questions relevant to the profile, then additional questions shall be specified in a profile specific ICS proforma.

If there are missing questions identified which are not purely profile specific, appropriate defect reports shall be raised on the relevant ICS proforma specification. Until the ICS proforma specification is amended, temporary solutions may be included in the profile specific ICS proforma.

Once a suitable ICS proforma specification is standardized, the temporary material shall be deleted and the references to it shall be amended appropriately.

NOTE – This ensures that the primacy of the base specification is retained whenever possible, without delaying the publication of the urgently needed profile.

8.7.3 Profile RL

The profile RL expresses the restrictions upon allowed support answers in the corresponding ICS proformas, which shall be unambiguously referenced.

The profile RL shall be derived from the ICS proformas of the base specifications in question, when available, indicating the changes of status values necessary to express the profile requirements. If a profile includes by reference a common (sub)profile, then in order to ensure the completeness of the referencing profile's RL (without unnecessary and error-prone duplication), its profile RL shall refer to the profile RL of the referenced (sub)profile; for the requirements of the referencing profile which are not covered by the referenced (sub)profile, the referencing profile's RL shall refer to the relevant ICS proforma of the relevant base specifications.

The profile RL could in some cases, be a simple list of restrictions placed upon the appropriate answers in the relevant ICS. However it is more likely to be produced by copying selected tables from the relevant base specifications ICS proformas, removing the column(s) to be completed by the supplier and adding a new set of columns giving the new profile requirements, both in terms of the status and allowed values.

In addition, inter-relationships between answers may be specified by the use of a profile 'predicates' column, and references to relevant clauses in the profile may be specified by the use of a 'profile references' column.

The profile RL should only include ICS proforma tables in which the status and/or allowed values have been modified, in order to avoid unnecessary duplication.

Although the profile RL is derived from several different ICS proformas, a single profile RL is the result, except where it refers to nested profile RLs for nested profiles. Items in the profile RL shall be grouped by base specification. The ordering of items and uniqueness of item numbering in a profile RL shall remain unaltered from the ICS proformas from which the items are derived, except that the item numbers shall be prefixed by a letter denoting the base specification (e.g. S for Session, P for Presentation, A for ACSE).

There needs to be a precise reference to each version and edition of each base specification referenced (including Amendments and Technical Corrigenda) and the ICS proforma used for each base specification needs to be consistent with the referenced version and edition. The requirement concerning use of the correct version and edition of each ICS proforma shall be stated in the profile RL specification.

8.7.4 Profile specific ICS proforma

The profile specific ICS proforma should have a layout similar to a PICS proforma. If questions relate to base specifications, they shall be grouped by base specification. For example, questions related to the presence or absence of particular parameters on specific instances of the relevant PDU may be included in the profile specific ICS proforma, in which case they relate to the relevant base (protocol) specification. However, questions in a profile specific ICS

proforma may also relate to multiple base specifications, in which case they should be presented in an appropriate logical order. The profile specific ICS proforma should present its further questions in tabular form with cross references to the corresponding PICS proformas and/or information object ICS proformas, identifying the corresponding ICS proforma questions and prefixing references by a unique short identifier of the protocol or information object concerned, enclosed in parentheses. Each of these unique short identifiers shall be specified as an alias for the full identifier of the relevant ICS proforma specification (see 9.5).

The profile specific ICS proforma questions should use numbering related to the corresponding base specification ICS proforma questions, taking care to ensure that there is no ambiguity with respect to numbering of other profile specific ICS proformas that relate to the same base specification.

If a profile includes by reference a common (sub)profile, then in order to ensure the completeness of the referencing profile's profile specific ICS proforma (without unnecessary and error-prone duplication), its profile specific ICS proforma shall refer to the profile specific ICS proforma of the referenced (sub)profile.

8.7.5 Asymmetry in profile static conformance requirements

Static conformance requirements may be different with respect to sending and receiving, or initiating and responding. This may apply at any level of detail, from the capability of an implementation to initiate or respond to a connection, to the capability of receiving and correctly interpreting a wider range of parameter encoding than those used on sending.

Many base specifications identify only the connection initiate-respond asymmetry in the static conformance section of the conformance clause. A profile shall clearly identify, for each conformance requirement, whether there is, or is not, an asymmetry. If there is asymmetry, the profile shall identify the asymmetric requirements and state them within the text of the profile itself and if necessary, by adding extra questions into the profile specific ICS. This clarifies the situation where the base specification was defined without asymmetry and needs to define different entries for the asymmetry instances, e.g. if the sending of a protocol element is excluded then it is probably more appropriate to indicate that the reception of the same protocol element is "out of scope" rather than "excluded".

9 Complete specification of ICS proforma and RL notation

9.1 Introduction

This clause describes the requirements on the notation to be used when creating an ICS and a profile RL.

It defines the semantics associated with:

a) the status values that are assigned to questions in the ICS proforma, and;

b) the support answers that are expected to be filled in an ICS.

The status values are also used in profile RLs, showing the changes in status values required by the profile. There are, however, no support answers to be provided in a profile RL.

The status values and support answers for various capabilities are specified in this clause. An interpretation for each status value, giving conformance testing considerations and profile RL considerations, is given in Appendix I.

9.2 Status column values

9.2.1 General notations

Each ICS proforma question shall specify the status value applicable to the capability. The common notations for the status values are:

– m or M mandatory

– o or O optional

– c or C conditional

– x or X prohibited (“x” stands for “excluded”)

– n/a or N/A or “–” not-applicable

– i or I out-of-scope (“i” stands for “irrelevant”)

The meanings of these common status values are as follows:

a) *Mandatory* – The capability is required to be implemented, in conformance with the related specification.

When applied to a parameter on a supported PDU this means that the semantics shall be supported.

b) *Optional* – The capability may be implemented, and if it is implemented it is required to conform to the related specification; options can be Boolean, mutually exclusive, or selectable (as described in I.3/X.290).

When applied to a parameter on a supported PDU this means that the parsing of the parameter shall be supported but that the semantics may be supported or not.

c) *Conditional* – The requirement on the capability depends on the selection of other optional or conditional items; the ICS proforma cannot define in advance a definite status for the capability, it can only specify how the status (mandatory, optional, prohibited, out-of-scope, or not-applicable) depends on the evaluation of a predicate or on a conditional expression.

d) *Prohibited or excluded* – There is a requirement not to use this capability in a given context.

e) *Out-of-scope* – This capability is outside the scope of the given profile, and hence irrelevant and not subject to conformance testing for that profile.

f) *Not-applicable* – In the given context the base specification makes it impossible to use this capability.

Where these values are used, they shall be used as defined above.

Additional status values may be defined for use in particular ICS proformas if necessary, but should be avoided if possible. Nevertheless, three additional notations for status values have been reserved, “f”, “p” and “d”, see IV.2. If these additional notations are used in a particular ICS proforma, the precise meaning of them in the context of the related specification shall be stated in that ICS proforma.

Status column notations are not case sensitive, but it is common practice to use lower case.

An additional convention can be used for mutually exclusive or selectable options among a set, by placing after the ‘o’ (for optional) a period followed by an integer:

– o.<integer> for mutually exclusive or selectable options among a set.

Each new integer identifies a new group, and does not identify the logic of the option which can be common to several groups.

A footnote to the relevant table shall explicitly state what the requirement is for each numbered group. Alternatively, if all uses of o.<integer> in the ICS proforma have the same meaning for each group, then the requirement may be stated in a Conventions clause at the beginning of the ICS proforma. Separate footnotes are preferred if there are few uses of this convention in the ICS proforma. It is important to describe what happens in the case of support, as well as in the case of non-support of related options. Recommended wordings for the most common requirements are as follows:

– “It is mandatory to support at least one of these options.” (Once one option is selected then all the others are optional.)

– “It is mandatory to support exactly one of these options.” (Once one option is selected, unless it says otherwise, this means that all others are prohibited. Additional wording shall be used if the others are to be considered not-applicable or out-of-scope.)

Figure 20 shows an example of a group of three related options.

Item number	Item description	Status	Support
1	Option A	o.4	
2	Option B	o.4	
3	Option C	o.4	

o.4 It is mandatory to support at least one of these options.

FIGURE 20/X.296

A group of related options

General footnotes, when there is insufficient room for a comment column, may be indicated by a status value immediately followed by a superscripted integer followed by a right parenthesis, which should refer to a unique footnote within the ICS proforma. In other words, the normal rules for referring to footnotes in Recommendations may be applied to status values. For example:

– $m^{5)}$, $o^{7)}$, $n/a^{1)}$, etc.

If extensive use of footnotes is made, then an index of cross-references should also be produced to make them easier to find.

9.2.2 Predicates

A predicate in an ICS proforma shall be either:

a) an explicit reference to an ICS proforma YES/NO answer (e.g. A.1.2.3/10a is the reference to the first space for an answer in the tenth line of the table found in subclause A.1.2.3; if the answer is 'YES', then the predicate is true, otherwise false); or

b) a predicate name, which elsewhere in the ICS proforma is identified with an explicit reference to an ICS proforma YES/NO answer, or with a relational expression involving a reference to an ICS proforma answer which gives a value as an answer, or with a predicate expression (i.e. a Boolean expression involving predicates).

NOTE – Meaningful names may be used for predicate names.

If extensive use of predicates is made, then an index of cross-references should also be produced to make them easier to find.

9.2.3 Logical negation symbol

The mathematical negation symbol, "¬", should be used for logical negation.

The carat symbol, "^", is more widely available than "¬" in different character sets and thus may be used as a practical alternative.

If neither symbol is felt to be desirable, then the word "NOT" may be used instead to express logical negation, as in TTCN.

9.2.4 Flagging of references used in predicates

An asterisk may be used to prefix the item number or mnemonic reference in the item reference column for any item that is referenced by a predicate or conditional expression elsewhere in the ICS proforma.

9.2.5 Notation for conditional requirements

9.2.5.1 Introduction

Conditional requirements, utilizing predicates names if desired, may be specified in one of the following ways:

a) separate status and predicate columns;

b) merged status and predicate columns;

c) conditional expressions referenced from the status column;

d) conditions implied by nested item numbers;

e) predicates applying to a whole table.

9.2.5.2 Separate status and predicate columns

A "c" is placed in the status column followed by a colon followed by one or more unconditional status indications on separate lines, each with a predicate, or the negation of a predicate in the predicate column.

Item number	Item description	Status	Predicate	Support
1	Item A	c: m o	p1 ¬p1	
2	Item B	c: m	p2	

FIGURE 21/X.296

Use of status and predicate columns

Figure 21 shows two examples of the use of separate status and predicate columns, with the following meaning:

a) item A is mandatory if p1 is true, but optional if p1 is false.

b) item B is mandatory if p2 is true but, by convention, not-applicable if p2 is false; there shall be a statement elsewhere in the ICS proforma clarifying this convention, if it is used.

9.2.5.3 Merged status and predicate columns

As an alternative to using the status and predicate columns as described above, a more concise notation may be used in the status column without the need for a separate predicate column.

The table in Figure 21 could be rewritten in the alternative notation as shown in Figure 22.

Item number	Item description	Status	Support
1	Item A	p1: m ¬p1: o	
2	Item B	p2: m	

FIGURE 22/X.296

Merged status and predicate columns

9.2.5.4 Conditional expressions

A conformance requirement in a specification may be expressed by a conditional expression. For such items a "c" followed by an integer is placed in the status column, providing a reference to a conditional status expression defined elsewhere in the ICS proforma. These conditional status expressions are IF-THEN-ELSE expressions which evaluate to an unconditional status depending on the value of the predicate or predicate expression that follows the "IF". The keywords in such conditional expressions shall not be considered case sensitive (i.e. "IF" or "if" may be used), but are only given in upper case in the following text.

For example, c1 and c2 could be defined as:

- c1: IF p1 THEN m ELSE o
- c2: IF p1 THEN (IF (p2 AND NOT p3) THEN m ELSE o) ELSE n/a

and used in a table as shown in Figure 23.

Item number	Item description	Status	Support
1	Item A	c1	
2	Item B	c2	

FIGURE 23/X.296

Use of conditional status

The use of:

AND, OR, NOT, (,)

in predicate expressions, should be consistent with TTCN Boolean expressions.

The syntax:

IF ... THEN (IF... THEN... ELSE ...) ELSE ...

should be used to indicate nested conditional status expressions.

In all cases, "ELSE N/A" is implied if an ELSE clause is omitted.

If extensive use of conditional expressions is made, then an index of cross-references should also be produced to make them easier to find.

9.2.5.5 Conditions implied by nested item numbering

If the relationship among the items within a single table is that there is a nested structure of conditionals, with nested items at a given level (e.g. 1.2.x) being conditional upon the immediately previous item at the next higher level (i.e. 1.2 in this example), then this structure may be shown by nested item numbering. Nested item numbering shall use the same notation as for nested clause numbering in this Recommendation. All the items which are conditional upon others within the table shall have "c:" as a prefix to the status value that is to apply if the implied condition is true. If this notation is used, there shall be an implied "ELSE N/A" with every conditional expressed this way.

This technique is equivalent to omitting the predicate column from the separate status and predicate column notation, when the predicate can be implied from the item number column.

Figure 24 shows an example of this notation.

Item number	Item description	Status	Support
1	Item A	o	
1.1	Item B	c: m	
1.2	Item C	c: o	
1.2.1	Item D	c: m	
1.3	Item E	c: c34	
2	Item F	m	
2.1	Item G	o	

FIGURE 24/X.296

Conditions implied by nested item numbering

In this example, items numbered 1.1, 1.2 and 1.3 are conditional upon item number 1 being supported. Item number 1.2.1 is conditional on both item number 1 and item number 1.2 being supported. Item number 1.3 is conditional on both item number 1 and a conditional expression, c34, defined elsewhere in the ICS. Item number 2.1, although nested under item number 2, has an unconditional status value (and hence no 'c:') because item number 2 is mandatory.

9.2.5.6 Predicates applying to a whole ICS proforma or profile RL table

If a predicate applies to a whole ICS proforma table, a prerequisite line may be specified just before the table to which it applies. A prerequisite line takes the form:

Prerequisite: <predicate>

The meaning of such a line is that if <predicate> evaluates to True then the table applies, else it is not-applicable.

NOTE – This may be used, for example, with a PDU table that is conditional upon a particular functional unit being supported, or with a PDU parameter table that is conditional upon the relevant PDU being supported.

In the same way, a prerequisite line may be used in a profile RL with the meaning that if <predicate> evaluates to True then the table applies, else it is out-of-scope.

9.3 Support column answers

9.3.1 General notations

For each question in an ICS proforma, a support answer shall be provided in the ICS.

The common notations for support answers are:

- supported Y, y, YES or yes
- not supported N, n, NO, no
- no answer required N/A, n/a or "–"

The old notation of 'I' for implemented and 'X' for not implemented is not recommended because of the possible confusion with the use of 'I' and 'X' in the status column.

The meanings of these common support answers are as follows:

a) *Supported* – The capability is implemented in conformance with the related specification.

   Support for a PDU requires the ability to parse all valid parameters of that PDU. Supporting a PDU while having no ability to parse a valid parameter is non-conformant. Support for a parameter on a PDU means that the semantics of that parameter are supported.

b) *Not supported* – The capability is not implemented.

   Where the support answer refers to a parameter of a supported PDU, parsing of the parameter shall be supported but the semantics are not supported. Non-support of the parsing of a parameter on a supported PDU is non-conformant.

c) *No answer required* – It is unnecessary to answer the question with a YES or a NO because the question has a status value of either not-applicable or out-of-scope.

Where these answers are used, they shall be used as defined above.

Other support answers may be defined for use with particular ICS proformas if necessary, but this should be avoided if possible. Nevertheless, two additional notations for the support answers have been defined as follows:

d) *Ig or Ignored* – The item (e.g. PDU or parameter) is ignored (i.e. processed syntactically but not semantically).

e) *Err or Error* – The item (e.g. PDU or parameter) is treated as a protocol error.

Space shall be provided for reference to a note in those situations where an answer needs a justification or explanation.

9.3.2 Conditional support answers

Conditional support answers shall be used if a single ICS is provided to describe multiple-profile support in a system which is reconfigurable so that it can be configured to support a single profile. In this situation, it is necessary to be able to answer that a capability is supported for one profile, not supported for another, and no answer is required for a third profile because the capability is out-of-scope for that profile.

There are two notations which may be used to express conditional support answers. Both are based on using predicates defined in the SCS, each of which refers to a single profile and which takes the value True if and only if that profile is to be used.

The first notation is to give a list of the relevant predicates, each followed by a colon and the appropriate support answer, as shown for the first item Figure 25. The alternative notation is to use a reference to a conditional support expression, similar to references to conditional status expressions, as shown for the second item in Figure 25 and the footnote under the table. Any unique reference to the conditional expression may be used, but it is recommended that it should take the form of a question mark followed by an integer.

Item number	Item description	Status	Support
1	Item A	o	p1: Y p2: –
2	Item B	o	?1

?1: IF p1 THEN Y ELSE –

FIGURE 25/X.296

Example of use of conditional support answers

A similar notation may be used, when necessary, for conditional answers in the supported values column, but in this case the support answer has to be replaced by a list of the supported values.

9.3.3 Tick boxes for support answers

As an alternative to providing white space in the support column, into which an implementor has to write an answer (YES, NO, etc.), tick boxes may be used. A separate box is provided for each possible answer and the implementor need only mark those that apply. If the implementor wished to indicate "no answer required", then the "N/A" tick box should be ticked. However, a consistent approach to labelling the tick boxes should be used. Either the columns in which the boxes reside should be labelled, or individual boxes should be labelled. Examples of these two forms of tick box labelling are shown in Figures 26 and 27.

Item number	Item description	Status	Support		
			N/A	Yes	No
1	Item A	o	[ ]	[ ]	[ ]
2	Item B	o	[ ]	[ ]	[ ]
3	Item C	o	[ ]	[ ]	[ ]

FIGURE 26/X.296

Tick box column labelling

Item number	Item description	Status	Support		
1	Item A	o	N/A [ ]	Yes [ ]	No [ ]
2	Item B	o	N/A [ ]	Yes [ ]	No [ ]
3	Item C	o	N/A [ ]	Yes [ ]	No [ ]

FIGURE 27/X.296

Individual tick box labelling

If conditional support answers are to be used with tick boxes, either the relevant predicates should be placed next to the appropriate tick boxes, or a reference to a conditional expression should be placed in the YES column.

9.3.4 Omission of irrelevant tick boxes

If tick boxes are used within the support column, then irrelevant tick boxes may be omitted. Some tick boxes become irrelevant if the status is unconditionally mandatory, not-applicable or prohibited.

NOTE – It may seem unlikely that the status could be unconditionally not-applicable or prohibited, but this is quite possible if there are multiple sets of support and status columns in a given table. For example, there may be different sets of columns for different roles, or for different versions or classes of the protocol.

Thus, for items that can only be mandatory or non-applicable, the "No" box may be omitted on the understanding that a "No" answer shall be entered explicitly in the white space if the implementation is non-conforming in respect of this item.

Similarly, for items that can only be non-applicable or prohibited, the "Yes" box may be omitted; and for items that are always applicable the 'N/A' box may be omitted.

9.4 Column headings

The use of the words "Status" and "Support" as column headings is recommended.

However, if it is necessary to save space, use of shorter column headings may be required. The abbreviated column headings should be chosen so as not to conflict with symbols which have other meanings in the ICS proforma. Single-letter abbreviations are not recommended because they tend to be ambiguous. It is, therefore, recommended that multi-letter headings as indicated here be used instead:

- Sts Status
- Spt Support
- Init Initiator
- Resp Responder
- Sdr Sender
- Rcv Receiver

9.5 Referencing items and their support answers

The item number column shall provide a means of uniquely referencing each possible answer within the ICS proforma. Such referencing is necessary for specifying predicates, conditional expressions, test suite parameters, and test suite selection expressions.

The means of referencing individual answers should be to specify the following sequence:

a) if, and only if, the reference is being made from another specification, then start with an unambiguous identifier for the relevant ICS proforma specification, enclosed in parentheses – this identifier shall be stated in the ICS proforma specification and shall be updated whenever the ICS proforma is updated – it is recommended that this identifier should be the relevant specification number and year of publication, as is used in a References clause, and this shall be the default for such identifiers;

b) the number of the relevant table or, if the tables are not numbered, of the smallest subclause enclosing the relevant table;

c) a solidus character, "/";

d) the item number or mnemonic reference to the item, to identify the row in which the answer appears;

e) if, and only if, more than one question occurs in the row identified by the item number or mnemonic reference, then each possible answer is implicitly labelled a, b, c, etc., from left to right, and this letter is appended to the sequence, prefixed by a solidus character ("/") if a mnemonic reference is used.

If mnemonic references are specified and each uniquely identify an item in the ICS proforma, then entries b) and c) in the above sequence may be omitted.

Care should be taken in choosing mnemonic names to make them as meaningful as possible for the reader of the ICS proforma. Care should also be taken to provide a ready means of enabling the reader to locate the item referred to by any given mnemonic reference (e.g. an index could be provided or the mnemonic names could reflect the structure of the ICS proforma in some way).

If it is not possible to invent names that are both meaningful and easy to locate within the ICS proforma, then item references shall use the item numbers, although predicate names may still be used, as described in 9.2.2.

9.6 Specific requirements for profile RL notation

9.6.1 When a profile RL modifies the requirements of base specification capability, it shall not change mandatory capabilities. This rule also applies, for example, to protocols which are dependent on other protocols. The possible variations to the status values that may be specified in a profile RL are shown in Figure 28.

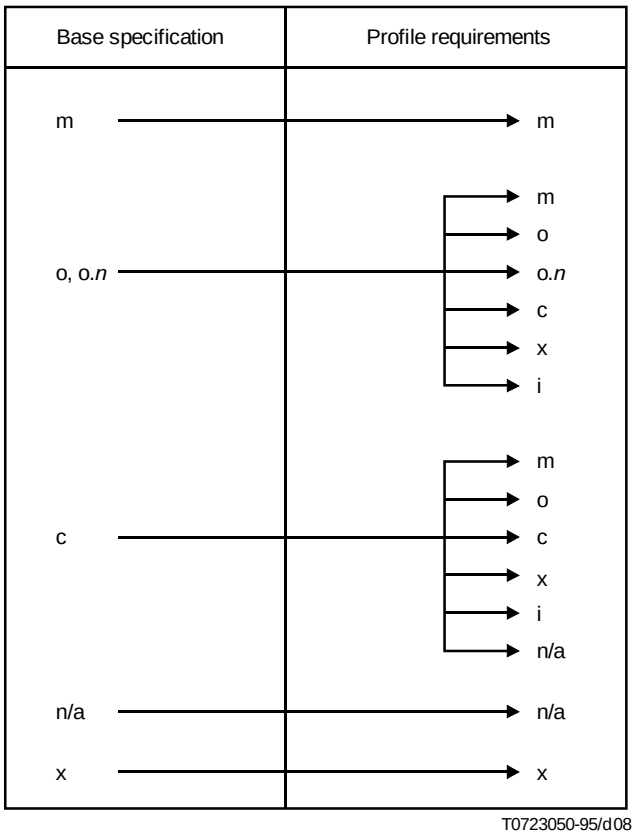

FIGURE 28/X.296

Allowed change of status values in a profile RL

9.6.2 Some base specifications specify restrictions on the choices allowed within a set of options (i.e. the use of o.*n*). A common example of this is the idea of "selectable options"; at least one of a set of options shall be implemented.

In this case, the profile shall either:

a) make at least one of the options mandatory for the profile;

b) specify that at least two of the items form a set of selectable options within the profile; or

c) both a) and b).

The remainder of the options in the original set can be changed in the profile as if they were ordinary options in the base specification.

9.6.3 If the "o.*n*" notation is used for mutually exclusive options in the base specification, the profile shall either:

a) make one of the options mandatory and the others excluded, not-applicable or out-of-scope; or

b) make a subset of the options a set of mutually exclusive options and the others excluded, not-applicable, or out-of-scope.

10 Relation of the ICS and IXIT

A clear separation exists between the functionality of ICS and IXIT.

An ICS deals with the specification of requirements to express conformance to a protocol or a profile.

An IXIT deals with the information related to the testing of the IUT and to its testing environment, but excluding any additional conformance requirements. If an IXIT proforma specifier discovers that testing requirements demand additional questions related to conformance requirements not covered by the relevant ICS proforma, then the ICS proforma shall be extended to include those questions rather than bury additional conformance requirements in the IXIT proforma.

Guidance and proformas for PIXIT and profile IXIT are provided in Appendix I/X.294.

Appendix I

Guidance on the meaning of ICS status values and support answers

(This appendix does not form an integral part of this Recommendation)

NOTE – A profile RL being derived from, and consistent with an ICS, most of this appendix applies also to profile RLs. Specific subclauses of profile RLs are included where necessary. A profile RL is not a proforma, therefore subclauses dealing with support answers do not apply to profile RLs.

I.1 Meaning of status values

In order to clarify the meaning of status values, this appendix focuses on the meaning in respect to:

a) roles and major capabilities;

b) PDUs;

c) PDU parameters.

These are chosen to highlight the differences, where they exist.

I.1.1 Meaning of status values for a role or major capability

When dealing with a role or major capability, it is important to know if this capability is implemented or not and potentially usable or not. It is important, for instance, to determine the IUT's ability to generate or accept the PDUs associated with this role or major capability.

This is considered to be a static view, and the test campaign, by exercising the dynamic behaviour, will trigger the use of the capability and check the appropriate effects on the protocol machine.

I.1.2 Meaning of status values for a PDU

The conformance requirements for PDUs can be totally expressed statically. This means simply whether the PDU is implemented or not, and whether it is potentially usable or not.

This is considered a static view and a test campaign by exercising the dynamic behaviour will trigger the PDU occurrence and check the appropriate effects on the protocol machine.

I.1.3 Meaning of status values for a PDU parameter

The conformance requirements for parameters can need several views like:

a) the potential ability to generate the parameter by the sender;

b) the interpretation of the parameter by the receiver;

c) the presence of the parameter in the PDU.

NOTE – Relaying gives rise to additional requirements relating to the relaying function:

– retention of syntax of the parameter (a relay does not need to understand the semantics);

– retention of the semantics of the parameter when relaying (the syntax can be modified by the relaying system);

– partial retention (some degradation) of semantics of the parameter.

In general there should not be entries in the PICS proforma for dynamic conformance requirements. Hence, the dynamic presence of parameters in PDUs should not be the subject of PICS proforma entries, but the comments column may be used to make remarks about the presence of parameters in an instance of communication. However, since profiles may place restrictions on the presence or absence of parameters, the profile specific ICS proforma may contain specific entries related to these restrictions.

I.1.4 Meaning of status values for a miscellaneous capability

Miscellaneous capabilities are all concerned with static requirements, i.e. statements of whether the miscellaneous capability has been implemented.

I.1.5 Meaning in other ICS proformas and RLs

The status values have the corresponding meanings to those described above when they are used in other kinds of ICS proforma and in profile RLs.

I.2 Meaning of support answers

In an ICS the support answers indicate what capabilities are supported when the IUT is configured in the way intended for the conformance assessment process and, for profile testing, when the communication with the IUT is restricted to being within the chosen profile. Thus, in the case of profiles, capabilities which are outside the scope of a profile should have support answers of 'no answer required' to avoid these capabilities being tested without the possible need of stating falsely that they are not implemented at all. In an ICS where support for more than one profile is claimed, more complex support answers may be used. If desired the conditional notation used for status values may be adapted to provide conditional support answers (e.g. giving the semantics of 'IF profile1 THEN yes ELSE -').

I.3 Interpretation of the mandatory status value

I.3.1 Meaning of mandatory for a role, major capability or PDU

I.3.1.1 Status values for a mandatory role, major capability or PDU

The capability is required to be supported (meaning implemented and available for use and testing) to be conformant to the dynamic requirements of the OSI specification.

This is a static requirement on the implementor of a product, to be taken into consideration before the system begins a test campaign.

When a mandatory capability is not supported, it is a case of non-conformance.

NOTE – When a mandatory role, major capability or PDU is implemented, flexibility remains regarding its use, especially for service-driven events. Sending a PDU belonging to an implemented capability may depend upon the initiative of the upper layer, that drives the protocol machine through a service interaction. The capability, therefore, remains 'optional to be used', although it is a mandatory requirement to implement it in that layer.

When an implementation can act in the role of a relay this will be signified in the ICS proforma by one or more extra columns, corresponding to the initiator/responder columns. The status value of "m", in this role, requires interpretation from the normal usage as it is only necessary to parse the PDU sufficiently to be able to decide whether to forward the PDU or not. It is in this sense that the PDU and its parameters should be considered as fulfilling the mandatory requirement of acting as a relay.

I.3.1.2 Support answers for a mandatory role, major capability or PDU

For a conforming implementation, there is only one support answer which is allowed for a question with a status value of unconditionally Mandatory. This is the YES answer.

NOTE – The following answers are sometimes found in ICS documents and are equivalent to YES: IMPLEMENTED (though the meaning of implemented can be broader in some cases), SUPPORTED.

I.3.1.3 Conformance testing considerations for a mandatory role, major capability or PDU

Mandatory roles, major capabilities and PDUs of a supplier's implementation are always subject to conformance testing. If a supplier indicates support of a role or major capability, associated test cases are included in the Selected Executable Test Suite for the IUT.

For some IUTs it may not be possible to successfully test for all mandatory roles, major capabilities or PDUs. In such a case, the test laboratory will select the test cases associated with the capability, but will not run them. See Recommendation X.294.

I.3.1.4 Profile RL considerations

When a role, major capability or PDU is mandatory, a profile can only specify that the status value remains Mandatory. Therefore, the support answer, with respect to the profile, has to be YES for a conforming implementation.

I.3.2 Meaning of mandatory for a PDU parameter

I.3.2.1 Status values for a mandatory PDU parameter

When the ICS proforma indicates that a parameter is mandatory, the implementation has to be capable of handling the parameter, i.e. sending it if the implementation acts as a sender, and processing it when the implementation acts as a receiver (but see also Appendix VIII).

But a mandatory parameter is not necessarily generated in each PDU instance. It can be absent from some PDUs according to the context, the service request, and different conditions of the state machine.

This capability is also defined as being able to handle, in Send or Receive mode, the syntax of the parameter, its definition, its value range and other characteristics, and to use the parameter contents or its semantics to take an action.

NOTE – Each profile role should also be clearly identified in the case of parameters, especially because the receiver may need to support parameters more than the sender.

I.3.2.2 Support answers for a mandatory PDU parameter

The implementor of a conforming implementation has to answer YES (or equivalent) in the support column corresponding to each mandatory parameter. YES is the only support answer which is allowed for a conforming implementation for a mandatory parameter item.

I.3.2.3 Conformance testing considerations for a mandatory PDU parameter

When a mandatory PDU parameter is not supported it is a case of non-conformance. Mandatory PDU parameters of an implementation are always subject to conformance testing. If a supplier indicates support of a mandatory PDU parameter, test cases associated with this capability are included in the Selected Executable Test Suite for the IUT.

For some IUTs it may not be possible to successfully test for all mandatory PDU parameters. In such a case, the test laboratory will select the associated test cases, but will not run them. See Recommendation X.294.

I.3.2.4 Profile RL considerations

A mandatory parameter in a base specification has to remain mandatory in a profile, but this need not be explicitly expressed in the profile RL, since the profile RL only needs to include items for which the status is changed.

A mandatory parameter of a profile is either a mandatory parameter of the base specification, or an optional parameter chosen to become mandatory in the definition of the profile.

I.4 Interpretation of the optional status value

I.4.1 Meaning of optional for a role, major capability or PDU

I.4.1.1 Status values for an optional role, major capability or PDU

When an ICS proforma or profile RL item indicates that a role, major capability or PDU is optional, this means that the implementor is free to implement or not the capabilities in question, in all roles defined in the OSI specification.

This is a static option for the implementor, to be taken into consideration before the implementation is submitted to conformance testing.

Usually the minimum support allowed of a major capability or PDU in the receiving role is the support of the syntax of the PDUs in such a way that the protocol machine keeps running in the appropriate state.

I.4.1.2 Support answers for an optional role, major capability or PDU

The implementor can answer YES, NO or "no answer required" (i.e. N/A, n/a, -).

If the implementor answers YES, the product behaviour has to be the same as it would be if the capability were mandatory.

If the implementor answers NO:

a) in SEND mode, the capability is not used;

b) in RECEIVE mode, a NO answer to an ICS question is definitely not sufficient to describe the protocol machine behaviour. A clause of the relevant OSI specification has to define a default behaviour, in the case of no support, and the PICS proforma item can refer to that clause.

I.4.1.3 Conformance testing considerations for an optional role, major capability or PDU

When an optional role, major capability or PDU is not supported, this is not a subject for testing and it will not be considered as a case of non-conformance. When an optional role, major capability or PDU is supported, it should be tested as for a mandatory role, major capability or PDU, see I.3.1.3.

I.4.1.4 Profile RL considerations

As a profile limits the number of options to be selected from a base specification, a clear decision is to be made by the profile specifiers:

a) to keep the options optional in the profile;

b) to make them mandatory in the profile;

c) to restrict the number of options belonging to a set of options;

d) to discard them, because they are likely to cause interworking problems to some networks or applications.

For example, the OSI Session base specification (ISO 8327) offers two options, Half Duplex or Full Duplex, for the mode of dialogue. Full Duplex is made mandatory by the FTAM profile ISP 10607, and Half Duplex is made mandatory by the MHS profile AMH24.

I.4.2 Meaning of optional for a PDU parameter

I.4.2.1 Status values for an optional PDU parameter

In many OSI specifications, many parameters are optional for the sender role (i.e. the implementation need not necessarily be capable of generating every type of parameter in each PDU) but are mandatory for the receiver role (i.e. the implementation has to have the capability to receive and accept any parameter in terms of format and syntax even if it is not handled semantically and not used – see Appendix VIII for more detail).

This asymmetry increases the chances that implementations not 'supporting' a parameter or a capability can interwork with those supporting this same parameter or capability.

Optionality for PDU parameters is an implementor's choice and does not refer to the presence of the PDU parameter dynamically.

I.4.2.2 Support answers for an optional PDU parameter

The answer from the implementor may be YES meaning that the parameter is to be handled as if it were a mandatory one and may be tested; or the answer is NO meaning that the capability is not supported and therefore is not to be tested.

I.4.2.3 Conformance testing considerations for an optional PDU parameter

These are the same as for optional roles, major capabilities or PDUs in I.4.1.3.

I.4.2.4 Profile considerations

As for the major capabilities or PDUs, the profile usually limits the number of optional parameters remaining in its definition, and declares some options of the base specification as mandatory, while others become out-of-scope and are therefore not to be tested.

Very few parameters normally remain optional, except for some values of parameters like timers, etc., which are negotiated at execution time, or supplied in the profile IXIT.

In the range of permissible values of a parameter, the profile can place additional restrictions to assist interoperability so that the range is limited and some values are excluded.

I.4.3 Sets of options in ICS proformas and profile RLs

There are variants of the Optional status value with meanings such as: ‘at least one of a list of alternatives’, or ‘one and only one of the alternatives’, specified using the ‘O.n’ notation.

A profile, built on a base specification which offers sets of options (at least one, or one and only one), can make a choice and declare that one alternative is mandatory while the other alternatives may remain optional in the selectable options case, or become out-of-scope or excluded.

When the options in a set are mutually exclusive in the base specification, selecting one is enough. From a conformance point of view, the exclusion of the others exists already in the base specification although it may be expressed in the profile RL.

An example of this case is the Packet Numbering function in ISO/IEC 8208 and Recommendation X.25. Modulo 8 and modulo 128 are both acceptable but exclusive options. In certain profiles, modulo 8 is mandatory. Modulo 128 becomes de facto excluded, but should be stated as such in the profile RL.

I.4.4 Optional PDUs within a role or major capability

When a role or major capability is implemented, whether it be mandatory, conditionally mandatory, or optional in the ICS proforma, the base specification may allow it not to be implemented in its entirety. This means, for example, that within a role or major capability there could be room for optional PDUs.

I.5 Interpretation of the conditional status value

I.5.1 Status values for a conditional role, major capability, PDU or PDU parameter

Any conformance requirement in a base specification or profile may be made conditional upon some predicate. In such cases, it is necessary to specify both the requirement that applies if the predicate evaluates to True, and the requirement that applies if it evaluates to False. For example, ‘IF True THEN mandatory’ may be accompanied by ‘IF False THEN not-applicable’.

A role or major capability can be conditional, if there are mutual conditions with another role or major capability (e.g. prerequisites, co-requisites, exclusive choices).

Co-requisites can come from symmetrical requirements, for instance, if the protocol machine is able to transmit an optional PDU it should be prepared to receive its response.

PDUs are mostly conditional, as their status depends on the support value of a major capability. A frequent error is to call them mandatory or optional, as if the implementor had a choice. But there may be no choice, once the support value of the role or major capability is decided.

I.5.2 Support answers for a conditional role, major capability, PDU or PDU parameter

A conditional status is a transient status. Once the condition is evaluated, the value of the status becomes mandatory, not-applicable, out-of-scope, optional or prohibited. The implementor should then proceed with the evaluated status, and forget the condition.

When the supplier is able to evaluate fully the condition applying to the status, then it should be possible for the supplier to provide a support answer which is unrelated to the condition, even if the support answer is conditional for some other reason. In such cases, the condition applying to the status can then be forgotten since it is has no residual dynamic meaning. If, however, the supplier is unable to evaluate the condition fully, then a conditional support answer should be provided to give answers for each of the possible circumstances.

Figure I.1 is applicable to all uses of the Conditional status value provided that it is possible to give an unconditional support answer. The differences between a role, major capability, PDU and PDU parameter, between Implementors and Users, between profile RL and base specification ICS proformas, are not relevant to the use of conditional status values.

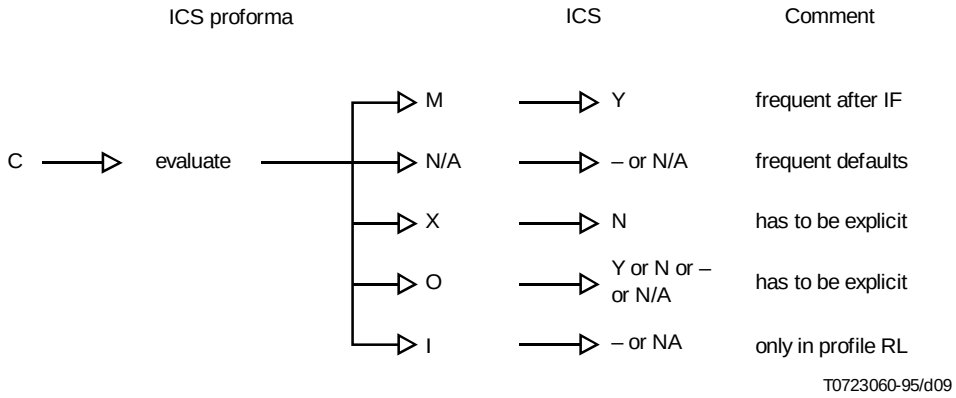

FIGURE I.1/X.296

Evaluation of the conditional status value

I.5.3 Conformance testing considerations for a conditional role, major capability, PDU, or PDU parameter

The Conditional status is transient and results in one of the other status values following evaluation of the expression associated with the condition. Thus, the testing requirements are those applicable to the resulting unconditional status.

I.5.4 Profile RL considerations

In the case of a profile, the condition may come from an option of the referenced base protocol specification, but can also come from an upper or adjacent protocol.

For example, in the FTAM profile ISP 10607-1, the functional unit 'Resynchronize' of the Session protocol is conditioned by the presence of the 'Restart data transfer' functional unit of the FTAM protocol.

If a base specification includes a conditional requirement, then the profile has to use the same predicate, but it may be possible partially or fully to evaluate it, given the conditions that are known to apply in the profile. If such a predicate is fully evaluated in a profile (to True or False) then the requirement becomes unconditional and may be transformed by the profile according to the general rules given above.

For example, if the base specification contains a conditional requirement:

– IF P THEN A ELSE B

where P represents the predicate to be evaluated, and A and B each represent a status value; if P evaluates to True in the profile, then the profile may treat it as if the base specification requirement were simply A.

On the other hand, if the base specification requirement is optional, then because the profile has a choice of which category to transform it to, the profile is permitted to make it into a conditional requirement.

I.6 Interpretation of the not-applicable status value

I.6.1 Status values for a not-applicable role, major capability, PDU or PDU parameter

A not-applicable status value is assigned to a capability when supporting it would be either meaningless, logically impossible, or physically impossible, after some conditions are evaluated.

For instance, a connection-mode capability in a connectionless-mode implementation.

NOTE – The concept of not-applicable should not be confused with the notion of 'out-of-scope' which applies to the profiles only, and not to the base specification. Out-of-scope applies when the optional capabilities not retained in the profile become irrelevant, after evaluation of conditional statements in the profile context.

I.6.2 Support answers for a not-applicable role, major capability, PDU or PDU parameter

There is no need to give a support answer if the status value N/A printed in the support column of the ICS proforma. If the status value evaluates to N/A as the result of a condition or if the profile RL changes a status to N/A, the value N/A or '–' has to be indicated in the support column.

I.6.3 Conformance testing considerations

The entries which are stated to be not-applicable in the ICS proforma or in the profile RL are not subject to conformance testing and therefore there will be no test cases in the related ATS.

I.6.4 Profile RL considerations

An N/A status in the base specification ICS cannot be changed by the profile RL. However, a profile RL can change an optional status to N/A or specify a condition which may evaluate to N/A.

I.7 Interpretation of the out-of-scope status value

I.7.1 Status values for an out-of-scope role, major capability, PDU, or PDU parameter

The out-of-scope status value is only applicable to profiles (i.e. to profile RLs or profile specific ICS proformas) when the optional capabilities in the base specification are not retained by the profile or after evaluation of conditional statements in the profile context.

I.7.2 Support answers for an out-of-scope role, major capability, PDU, or PDU parameter

The support answer for an out-of-scope status may be 'YES', 'NO' or 'no answer required'.

I.7.3 Conformance testing considerations

The out-of-scope status in a profile RL can come from an optional capability in the base specification or can be the result of a conditional statement. In any case the out-of-scope capability is not subject to conformance testing and therefore the test cases associated with the capability in the base specification context are deselected.

I.8 Interpretation of the excluded status value

I.8.1 Meaning of excluded for a role, major capability or PDU

I.8.1.1 Status values for an excluded role, major capability or PDU

Excluded and prohibited are equivalent terms. This status value can be used to specify that under certain conditions a capability is not to be used.

The excluded status is normally used by profiles, to prohibit an optional base specification capability to be used. The only difference with 'out-of-scope' is that 'out-of-scope' indicates no interest from a conformance viewpoint, while excluded is an explicit requirement to disable (or not to implement) the feature when the profile is in operation.

An additional question in the profile specific ICS proforma can make this profile requirement more explicit. The excluded status may also be used in base specifications ICS proformas as the result of a conditional status.

I.8.1.2 Support values for an excluded role, major capability or PDU

The support value in an ICS question with excluded status can only be NO.

I.8.1.3 Conformance testing considerations

See 7.3/X.295 for information on the testing implications of excluded options. In general, excluded options are not to be tested.

I.8.2 Meaning of excluded for a PDU parameter

I.8.2.1 Status values for an excluded PDU parameter

This applies to the parameter itself or more often to its value range, the range being possibly restricted in the profile compared to the range of the base specification or being restricted in a particular role or major capability.

What is excluded is to send a given parameter or to send a parameter having a given value. A FAIL verdict should be generated if such a parameter is received.

I.8.2.2 Support answers for an excluded PDU parameter

The support value has to be 'NO'.

I.8.2.3 Conformance testing considerations

The Abstract Test Suites for base specifications should include the capability to test a parameter outside its range. This leads to the conclusion that in the specific cases of parameters, the excluded parameter values do not necessitate specific exclusion tests outside the ones already available in the test suite for the base specification. Adaptation of the values given to test case parameters may be necessary, to perform tests that fit both base specification and profiles. Chosen values have to stay inside profile range or outside base specification range. See also 7.3/X.295.

Appendix II

Use of profile RL and profile specific ICS

(This appendix does not form an integral part of this Recommendation)

II.1 Introduction

This appendix describes some examples of situations requiring the use of the profile RL to list restrictions placed by a profile on the corresponding base specification requirements. It also describes some examples of situations requiring the use of a profile specific ICS proforma to give additional questions required by the profile.

These examples are chosen on the border of static and dynamic requirements, to show the incidence of profiling on these requirements.

II.2 Exclusion of a role, major capability, functional unit or parameter

An exclusion of a role or major capability or Functional Unit by a profile prohibits its use. This can be viewed as a dynamic requirement. However, it is also an explicit static requirement to disable, or possibly to not implement, a given capability allowed in the base standard, e.g. an optional or a conditional capability. Profiles can also restrict the range of parameter values of a base standard and exclude other values. These profile restrictions must appear in the profile RL.

II.3 Presence of parameters

The ICS defines for a parameter, the capability of the IUT to send or to receive and handle the semantics of a parameter. This capability can be mandatory, or optional, or conditional, as for a role, major capability or PDU.

This capability is different from the notion of 'presence' of a parameter, for example the dynamic presence of a mandatory parameter in a PDU if subject to the service requested in an instance of communication.

The conditions of the dynamic presence of a parameter may be complex to describe and are found in the OSI specification itself and **not** in the ICS of the relevant OSI specification.

A profile may require that a parameter is always present in a particular PDU while the relevant base specification does not impose this restriction. This extra requirement is to be described in the profile ICS proforma. This may require an additional question, not otherwise included in the PICS proforma, to be included in the profile specific ICS proforma.

II.4 Behaviour in case of no-support answer

Interworking between a system 'A' supporting an option and a system 'B' not supporting the same option can lead B to choose one of the following options:

a) REJECT – B refuses the event and reports it to A.

b) IGNORE – B ignores the event, nothing is transmitted to any other protocol implementation of A or B.

c) IGNORE 'and forward' – B ignores the event, but a service interaction occurs, where data, for instance, are passed to the upper layer, where a decision can be taken.

d) ERROR REPORT – B treats it as a protocol error and reports it.

Where these behaviours are new requirements of a profile, relevant additional questions are to be included in the profile specific ICS proforma.

Appendix III

Examples of PICS proforma tables and related profile Requirements List tables

(This appendix does not form an integral part of this Recommendation)

III.1 Major Capabilities

5.1 Classes implemented					
Item number	Class	Ref.	Status	Support	Mnemonic
0	Class 0	14.1	o.1		TP0
1	Class 1	14.2	c1		TP1
2	Class 2	14.3	o.1		TP2
3	Class 3	14.4	c2		TP3
4	Class 4	14.5	c2		TP4

o.1 It is mandatory to support at least one of these classes

c1 IF TP0 THEN o ELSE x

c2 IF TP2 THEN o ELSE x

FIGURE III.1/X.296

PICS proforma table for major capabilities

Figure III.1 shows an example of a PICS proforma table as might be applied to the Transport Protocol asking for the support of the classes of operation. The tabular declaration of mnemonics is shown and examples of their use are shown in conditional expressions. A simple illustration of the use of o.<integer> notation is given.

III.2 PDU support

6.1 PDU support								
Item number	PDU	Ref.	Sender end-system		Receiver end-system		Relay	
			Status	Support	Status	Support	Status	Support
1	CR	15.1	o		m		m	
2	CC	15.1	m		c3		m	
3	DT	15.2	m		m		m	
…	…	…	…		…		…	

sendCR = 6.1/1a

c3 IF sendCR THEN m ELSE n/a

FIGURE III.2/X.296

PICS proforma table for PDU support

Figure III.2 shows an example PICS proforma table as might be applied to the Transport Protocol asking for support for the various PDUs in Sender and Receiver mode. The first item shows that the status for receiving a CR is mandatory, but the sending of it is optional. An alternative means of declaring a mnemonic predicate is illustrated to describe an answer to an item in multiple support column format. This predicate is used in a conditional expression to say that support for sending a CR makes the support of receiving a CC mandatory.

III.3 Parameter support

6.3.1 Supported parameters of the XY-PDU						
Item number	Parameter	Ref.	Status	Support	Values	
					Allowed	Supported
1	Data size	15.6	m		128 256 512	
2	Timeout	15.7	o		1-3600 s	
3	Class	15.8	m		0-4	
…	…	…	…		…	

FIGURE III.3/X.296

PICS proforma table for parameters of a PDU

Figure III.3 shows an example PICS proforma table as might be applied asking for the support of parameters on an arbitrary Transport PDU. This allows for both the simple YES/NO answer and the ability to supply actual values.

III.4 Parameter value support

6.3.2 Supported parameter values of the XY-PDU			
Item number	Value	Status	Support
1	128	o	
2	256	m	
3	512	c5	

FIGURE III.4/X.296

PICS proforma table for parameter value support of a PDU

Figure III.4 shows an example PICS proforma table as might be applied asking for the support of parameter values on an arbitrary Transport PDU.

III.5 Requirements List

For profile X the profile RL could include the tables in Figures III.5, III.6 and III.7. These show how the RL tables are based upon the PICS proforma tables.

5.1 Classes implemented						
Item number	Class	Ref.	Protocol status	Profile status	Profile ref.	Mnemonic
1	Class 0	14.1	o.1	i	7.1	TP0
2	Class 1	14.2	c1	i	7.1	TP1
3	Class 2	14.3	o.1	m	7.2	TP2
4	Class 3	14.4	c2	i	7.1	TP3
5	Class 4	14.5	c2	o	7.3	TP4

FIGURE III.5/X.296

Profile RL table for classes implemented

Figure III.5 shows that class 2 is made mandatory by the profile, whilst class 4 becomes optional, all the others are out-of-scope.

6.1 PDU support									
Item number	PDU	Ref.	Profile ref.	Sender		Receiver		Relay	
				Protocol status	Profile status	Protocol status	Profile status	Protocol status	Profile status
1	CR	15.1	8.1	o	m	m	m	m	m
2	CC	15.1	8.1	m	m	c3	m	m	m
3	DT	15.2	8.2	m	m	m	m	m	m
…	…	…		…		…		…	

sendCR = 6.1/1a

c3 IF sendCR THEN m ELSE n/a

FIGURE III.6/X.296

Profile RL table for PDU support

Figure III.6 shows that the capabilities to send a CR and receive a CC and made mandatory by the profile.

6.3.1 Supported parameters of the XY-PDU							
Item number	Parameter	Ref.	Profile ref.	Protocol status	Profile status	Values allowed by protocol	Values allowed by profile
1	Data size	15.6	8.6	m	m	128 256 512	512
2	Timeout	15.7	8.7	o	o	1-3600 s	900 s
3	Class	15.8	8.8	m	m	0-4	2, 4
…	…	…		…	…	…	…

FIGURE III.7/X.296

Profile RL table for supported parameters of the XY-PDU

Figure III.7 shows that the profile selects fixed values for data size and timeout parameters, although the timeout parameter remains optional. Two discrete values are selected from the allowed range for the class parameter, consistent with Figure III.5.

Appendix IV

Guidance for interpretation of additional status notations

(This appendix does not form an integral part of this Recommendation)

IV.1 Double status notation

IV.1.1 Introduction

This subclause describes a technique for expressing dynamic requirements in an ICS proforma. Use of this technique is strongly discouraged for three reasons:

a) dynamic requirements should not be captured in the ICS;

b) some problems and ambiguities arise;

c) better techniques exist to express requirements for which the double notation was previously used.

IV.1.2 Background on the method

ICS proformas in base specifications are primarily concerned with static conformance requirements. That is, what capabilities have to be or are allowed to be implemented in a conforming system.

Profiles are sometimes concerned with the use of implemented capabilities in order to meet requirements for interworking.

It was previously recommended that a clear separation of these requirements be made, either by using two 'status' and two 'support' columns for those questions that needed them, or by using a specialized notation to express the compound requirements in a way that did not conflict with the common notation normally used for simple static requirements. For example, given the following three notional requirements:

a) optional to be implemented, optional to be used if implemented;

b) mandatory to be implemented, optional to be used;

c) optional to be implemented, prohibited to be used;

two-character notation arranged in four or two columns was employed, as illustrated in the Figures IV.1 and IV.2.

Item number	Item description	Status static	Support	Status dynamic	Use
a		o	y	o	n
b		m	y	o	y
c		o	y	x	-

FIGURE IV.1/X.296

Double status notation in four columns

Item number	Item description	Status	Support
a		oo	yn
b		mo	yn
c		ox	y-

FIGURE IV.2/X.296

Double status notation in two columns

This two-character notation was intended to make a clear distinction between the two types of requirement while maintaining as far as possible a commonality of notation with other ICS proformas.

The exact meaning of the dynamic requirements in all relevant cases was explicitly defined in each ICS proforma. For instance, whether the capability is: to be used as the preferred option in the role of sender, to be handled as an error in the role of receiver, etc. In that way, the general notation (m, o, x, c, -, i) could be given a more specific meaning for each protocol specification.

IV.1.3 The problem

The first problem with double status notation is that the precise meaning of the compound requirements depend on the type of ICS item that they are used with.

For PDUs, it would seem that "mandatory to be implemented" means "proper handling on reception has to be implemented", whereas "mandatory to be used" means the "capability of being able to transmit is mandatory". In such cases, the one question with its apparent static and dynamic questions, should be replaced by two static conformance questions, one concerning reception and the other transmission capability.

For PDU parameters, it would seem that "mandatory to be used" really means "mandatory to be present on each PDU of the relevant type that is sent". This leaves it unclear as to what is intended regarding the presence of the parameter on received PDUs.

This leads to a second problem with the double status notation. A question with a double status indication is really a muddled way of asking two separate questions. It is strongly recommended that double status notation for a specific item be replaced by separate unambiguous questions which will as a consequence be easier to answer and therefore much less prone to getting incorrect or confused answers.

The third problem with the double status notation is that the existence of the notation encourages the ICS proforma and RL specifier to ask questions concerning dynamic conformance and to apply such questions to each ICS proforma item. ICS proformas (and profile specific ICS proformas) are intended to be used to gather information about the capabilities implemented, i.e. about the static conformance aspects, not to ask questions about dynamic conformance which really just add up to the single question: "have you implemented the protocol properly?" As far as base protocol information is concerned, such detailed information about the internal working of the protocol machine is of no interest to the intended users of the ICS.

IV.1.4 Alternative Notation which should be used

The ICS proforma should address static conformance requirements. Questions pertaining to whether an option is used, is a dynamic requirement.

In some ISPs the double notation was used where a sender and receiver distinction should have been made. The protocol in question had different requirements with respect to whether the IUT was initiating a capability or responding to a capability. Use of a one column for the sender requirements and one column for the receiver requirements would allow accurate expression of the requirements without the use of double status notation.

The one situation in which it sometimes seems necessary to know about usage, i.e. the selection of certain dynamic options, is in profiling. For the purposes of maximizing the chances of interoperability, it seems that it is sometimes necessary to require that a particular optional parameter is always present on each occurrence of the particular PDU. However, it is now recognized that this might require an additional question, not otherwise included in the ICS proforma. Instead of the profile overlaying the ICS proforma questions with a 'usage' status requirement, what is needed is an additional question for the purposes of the profile (not for the base specification) and such additional questions should be specified in the profile specific ICS proforma as supplementary questions to the related questions in the ICS proforma. Once it is realized that what is needed is a small number of additional questions for the profile, then it becomes possible to word many of them in terms of supported capabilities (i.e. statically rather than dynamically) and it becomes much easier for the supplier to understand the questions and therefore answer them properly.

IV.1.5 Recommendation

It is recommended that ICS proforma and RL specifiers formulate their questions as individual unambiguous questions that can be answered with a simple unambiguous 'Yes/No' answer. This simple answer will also help the test case selection process for a profile.

IV.2 Additional status letters

Additional status values have in the past been defined for use in particular ICS proformas, but should be avoided if possible. Nevertheless, three additional letters for status values have been reserved as follows:

- f or F full support of a set of items required;
- p or P partial support of a set of items required;
- d or D support required for the default value, as defined in the specification.

If these additional letters are used in the status column of a particular ICS proforma, their precise meaning in the context of the related specification shall be stated in that ICS proforma. Furthermore, if a profile RL is to be produced referring to a base specification ICS proforma which uses these additional letters, the possible variations to the status values that may be specified are shown in Figure IV.3.

However, despite being reserved, these status letters are deprecated. They are actually unnecessary because the same meaning can be conveyed by use of the notation defined in 9.2.1 by asking the right questions. Support for a set of items can be dealt with by having one question on support for the whole set and individual questions on each item in the set. The status "m" on all these questions is then equivalent to "f"; and the status "o" of the first question with appropriate "m"s and "o"s on the others is equivalent to "p" for the set, but goes further by giving detailed information about the allowed subsets. Support for a default value is best distinguished from support for other values by having a "supported values" table with an item for each value of interest; this can then clarify which values are mandatory, which optional, which conditional, etc.

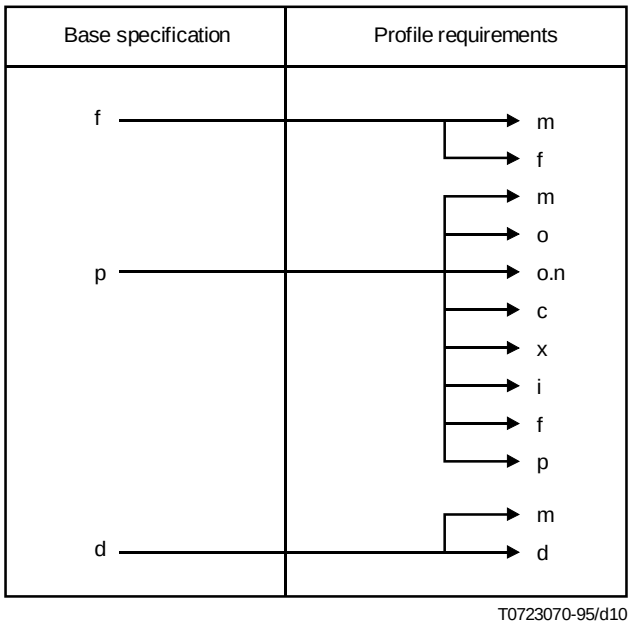

FIGURE IV.3/X.296

Allowed change of additional status values in a profile RL

Appendix V

Guidance on IXIT proformas

(This appendix does not form an integral part of this Recommendation)

The IXIT proforma contains the required parameters to enable an ATS to be run; e.g. timer values, addresses to be utilized by an ATS. It also contains requirements and information concerning the use of a particular MOT and any additional test laboratory requirements, but these are outside the scope of this Recommendation.

Although the production of IXIT proformas is the primary responsibility of a test laboratory, other Recommendations of X.290-Series specify that:

a) a partial IXIT proforma shall be produced along with an ATS in a conformance testing specification for a base specification;

b) an augmented partial IXIT proforma should be provided by a test realizer taking into account the peculiarities of the MOT they are providing;

c) the IXIT concept applies to profiles as well as protocols. The profile IXIT is composed of:

   1) the relevant protocol IXITs;

   2) the profile IXIT Requirements List (profile XRL);

   3) the profile specific IXIT.

Definitions of IXIT-related documents are found in Recommendation X.290 while the role of each document is specified in Recommendation X.294.

Appendix VI

Information objects

(This appendix does not form an integral part of this Recommendation)

VI.1 Types of information object

Information object is a generic term used to refer to a non-protocol object used in conjunction with an OSI protocol. Some examples of Information objects are FTAM document types, VT environment profiles, or VT control objects. Such objects are used within protocols but their specification may be found where they are registered, not necessarily in an OSI specification. Nevertheless, such OSI specifications may contain conformance requirements and optional features. It is, therefore, necessary to know not only which information objects are supported by a particular implementation of the related protocol, but also whether the conformance requirements are met and which of its optional features are supported.

A managed object is also an example of an information object, although perhaps a more complex one. Managed object specifications not only involve a specification of the object itself, but also a specification of the operations that can be performed on that object.

VI.2 Implementation conformance statements for information objects

If conformance to an information object is to be claimed, the statement of capabilities and options which have been implemented for the object is called an information object ICS.

In the context of managed objects, an information object ICS is called a Managed Object (implementation) Conformance Statement (MOCS). The information object ICS proforma should be defined together with the information object definition. Furthermore, there may be a need for linking a PICS to an information object ICS and/or vice versa, and an information object ICS to another information object ICS. Such linking is provided by the SCS that refers to the complete set of ICSs for the system.

NOTE – For example, a system may support FTAM plus a number of document types plus a number of character repertoires that are supported within some or all of the document types. In this case, the SCS will refer to the PICS for FTAM, the ICS for each document type, and the ICS for each character repertoire. The SCS will also specify which combinations of documents' types and character repertoires are supported with FTAM. In the same way, the SCS may need to state which managed objects and protocols are supported and in what combinations, and refer to their MOCSs and PICSs. In this case, the Management Conformance Statement (MCS) defined in Recommendation X.724 may be used to specify some of these combinations.

Appendix VII

Guidance on multi-specification dependencies

(This appendix does not form an integral part of this Recommendation)

VII.1 Background

There is a need to allow conforming protocol implementations to be built which provide only the minimum necessary functionality to support the intended application. In this case, the PDUs and functional units needed have to be determined by the application specification (the referencing specification), whilst only those protocol units required to preserve the integrity of the protocol providing the service. This is an example of a multi-specification dependency.

Multi-specification dependencies are specified by each referencing specification requiring the provision of non-mandatory features in one or more underlying service, protocol, abstract syntax, encoding rule or related information object specifications.

Multi-specification dependencies should usually be specified in terms of what elements of a given underlying service are required in order to support the given protocol. In addition, each underlying protocol specification should specify which protocol units are required if a given element of service can be said to be supported. This refers to the functionality implied by the element of service, and does not in any way imply the existence of a service interface. Note that this is not conformance to service, but rather is an expression of the conditional requirements that result from the compliance of a protocol to its service definition.

In cases where it is not possible to express dependencies through the underlying service, they can be specified in terms of the units of the underlying protocol or other specification required to support the higher protocol (the referencing specification).

Multi-specification dependencies should only be specified in a protocol specification if they are needed to preserve the integrity of that protocol. They should be avoided where they are really defining a profile.

Multi-specification dependencies may also be specified in a similar way in information object specifications.

VII.2 Formats

Three kinds of dependency relationship can be expressed in ICSs to mirror the multi-specification dependencies specified in the relevant specification. These three kinds can be described by considering two protocols A and B, where A includes a protocol unit A-pu (e.g. a functional unit or PDU) and provides a service to B including a service element A-se, as follows:

a) protocol A specifies that if service element A-se is to be provided, then protocol unit A-pu is to be provided, so the PICS for protocol A includes the items shown in Figure VII.1;

b) protocol B specifies a multi-specification dependency requirement, stating that the provision of service element A-se is mandatory, so the PICS proforma for protocol B includes the item shown in Figure VII.2 which takes the form of a requirements list item;

c) protocol B specifies a multi-specification dependency requirement, stating that the provision of protocol unit A-pu is mandatory, so the PICS proforma for protocol B includes the item shown in Figure VII.3 which takes the form of a requirements list item – in fact this form of multi-specification dependency is most useful if there is not an explicit linkage between service element A-se and protocol unit A-pu in protocol A and its PICS proforma.

Item number	Item description	Status	Support	Mnemonic
1	Service element A-se	o		se
2	Protocol unit A-pu	c1		pu

c1 IF se THEN m ELSE o

FIGURE VII.1/X.296

Dependency of a service element upon a supporting protocol unit

Item number	Item description	Status in A	Status in B	Mnemonic
1	Service element A-se	o	m	se

FIGURE VII.2/X.296

Dependency on underlying service

Item number	Item description	Status in A	Status in B	Mnemonic
2	Protocol unit A-pu	c1	m	pu

FIGURE VII.3/X.296

Dependency on underlying protocol

Appendix VIII

Guidance on status and support for parameters on received PDUs

(This appendix does not form an integral part of this Recommendation)

VIII.1 Background

It has been found that some PICS proformas record a status of "m" for some parameters on received PDUs, although on subsequent analysis by profile specifiers it is found that it is unnecessary to support the full functionality of those parameters. In such cases, it may be that the PICS proforma specifiers assumed that the status "m" is necessary whenever it is required that a conforming implementation supports the parsing of a parameter on a received PDU. It is now clear that the requirement to parse a parameter on a received PDU is implied by the support for receipt of that PDU. Therefore, a PICS proforma question concerning support for a parameter on a received PDU should be understood to relate solely to the support of the full functionality associated with that parameter.

Several questions then arise. Firstly, for which parameters on received PDUs is the status "m" appropriate and for which is it an error that should result in a defect report? Secondly, what should the profile specifier do if such an error is detected and the status in the profile needs to be something other than "m"?

VIII.2 Status in base specification PICS proformas

A parameter on a received PDU is called **transparent** if the actions to be taken on its receipt are not detectable in the subsequent behaviour of a conforming protocol implementation. All other parameters on received PDUs are called **non-transparent**. All non-transparent parameters on a received PDU should have status "m", because the protocol will assume that if the PDU is received then the subsequent behaviour will be changed in accordance with that parameter, which means that the full functionality of the parameter has to be supported. Conversely, no transparent parameters should have the status "m", because non-support of the full functionality of the parameter cannot have an adverse effect on the integrity of the protocol, which means that it would be perfectly legitimate for a profile to exclude the support for the full functionality of the parameter, or indeed make it optional or even mandatory. Conditionally transparent parameters should have conditional status with the condition that effectively means "if non-transparent then m else o".

Thus, base specification PICS proforma specifiers should check to see whether all the non-transparent parameters on received PDUs have status "m" and none of the transparent ones have status "m". Any errors in this respect should result in defect reports.

VIII.3 Status in profile RLs

For all non-transparent parameters on received PDUs, profile specifiers should respect the "m" status in the base specification PICS proforma and should therefore record in the profile RL the status "m" for the profile.

However, for transparent parameters on received PDUs, if one has the status "m" in the base specification PICS proforma and a status other than "m" is required for the profile, then the following actions should be taken:

a) a defect report should be raised against the base specification PICS proforma to request a change of status for this parameter;

b) the profile RL should honestly report the base specification status as "m" but with an associated footnote stating that a defect report has been raised and that the status is being treated as if it were "o";

c) the profile RL may then give whatever status is appropriate for that parameter for the profile.

This is illustrated in Figure VIII.1, which shows that it is possible also to raise defect reports against status entries of "m" which should be "o" in the base specification PICS proforma, but which should be "m" in the profile.

6.3.1 Supported parameters of the received XYZ-PDU

Item number	Parameter	Ref.	Protocol status	Profile status
1	Protocol version	10.1	c1	c1
2	Password	10.2	m[1)]	o
3	User data	10.3	m[1)]	m

c1 IF both-versions-supported THEN o ELSE m

1) Defect reports raised against the PICS proforma for these status entries, treated as being "o".

FIGURE VIII.1/X.296

Profile RL for parameters on a received PDU

Appendix IX

Guidance on the ICS templates and ICS proformas used in OSI management

(This appendix does not form an integral part of this Recommendation)

IX.1 Introduction

Recommendation X.724 specifies requirements and gives guidance on ICS proformas associated with OSI Management. It introduces the Management Conformance Summary (MCS), Managed Object Conformance Statement (MOCS), Management Information Definition Statement (MIDS), and Managed Relationship Conformance Summary (MRCS). Recommendation X.724 does not make a clear distinction between the ICS proforma as used by a supplier (i.e. the complete set of questions which when answered becomes an ICS) and an ICS template which is a standardized portion of the ICS proforma (i.e. what is sometimes called a proforma for a proforma). The purpose of this appendix is to clarify the relationship between the MCS, MOCS, MIDS and MRCS concepts introduced in Recommendation X.724 and the terminology and concepts used in this Recommendation.

IX.2 Possible stages towards the development of an ICS or MCS

Consideration of Recommendation X.724 reveals that there are six distinguishable stages possible towards the development of an ICS relevant to OSI Management (i.e. to a MOCS, MIDS or MRCS), as follows:

a) the requirements and guidance in this Recommendation;

b) the OSI management specific requirements and guidance in Recommendation X.724, including the very general ICS templates given in the appendixes of that Recommendation;

c) a refined ICS template, sometimes referred to as a "generic ICS proforma", which is the subject of a specification which should be in compliance with Recommendation X.724; there could in theory be several levels of refinement of ICS templates each less generic than the previous level, with each more refined ICS template possibly combining ICS templates from the previous level(s); this stage may be missing;

d) an ICS proforma (i.e. the complete set of questions to be answered by suppliers), as given in a specification which should be in compliance with this Recommendation, Recommendation X.724 and the relevant ICS template specification if any; this stage may be missing if there is at least one relevant refined ICS template specification; in particular, the ICS proforma specification should specify the definitive numbering and ordering of items and should contain a conformance clause in compliance with 8.2.6 in this Recommendation;

e) the actual ICS proforma used by a particular supplier, which should conform to the relevant ICS proforma specification, or in its absence to the relevant refined ICS template specification(s); this actual ICS proforma may differ from the specified ICS proforma, if any, in respect of such matters as pagination and natural language;

f) the ICS produced by the completion of the answers to the questions in the actual ICS proforma used by the supplier; this should be in conformance with the relevant ICS proforma specification, or in its absence with the relevant refined ICS template specification(s).

The same six stages are potentially relevant to the production of an MCS also.

These six stages and the relationships between them are depicted in Figure IX.1. In particular, it is important to note that Recommendation X.724 specifies requirements on ICS template specifications as well as ICS proforma specifications, whereas this Recommendation only specifies requirements on ICS proforma specifications. Thus, for example, this Recommendation requires the ICS proforma specification to have a conformance clause which in turn requires the supplier's ICS proforma to preserve numbering and ordering of items; whereas Recommendation X.724 has no such requirement because its requirements on ICS proforma specifications apply equally to ICS template specifications and it is inappropriate to insist upon preservation of numbering and ordering of items from an ICS template. ICS templates may well be combined and modified in order to create an ICS proforma.

IX.3 Applicability of the six stages to MCS, MOCS, MIDS and MRCS development

For a MOCS, the refined MOCS template specification stage is not used; instead MOCS proforma specifications are standardized. On the other hand, for a MIDS, a refined MIDS template is specified and this contributes to the development of relevant MOCS proforma specifications. For an MRCS, the refined MRCS template specification stage is not used; instead MRCS proforma specifications should be standardized.

An MCS is a special type of SCS, focused on support for OSI Management. For an MCS, it is possible that either a refined MCS template or an MCS proforma is specified, but not both.

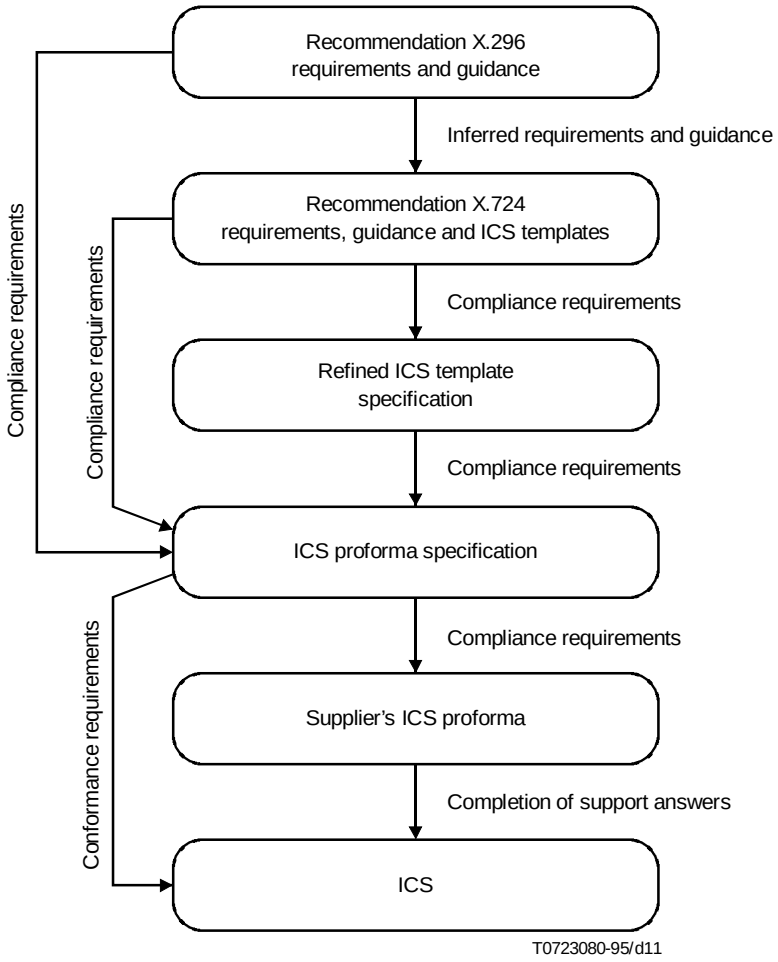

FIGURE IX.1/X.296

Relationships between stages towards development of an ICS