INTERNATIONAL STANDARD

ISO/IEC 10021-6

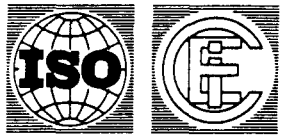
First edition
1990-12-01

Information technology — Text Communication — Message-Oriented Text Interchange Systems (MOTIS) —

Part 6:
Protocol Specifications

Technologies de l'information — Communication de texte — Systèmes d'échange de texte en mode message —

Partie 6: Spécification de protocole



Reference number
ISO/IEC 10021-6 : 1990 (E)

Contents

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

List of Figures

List of Tables

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 10021-6 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

ISO/IEC 10021-6 consists of the following parts, under the general title: *Information technology — Text Communication — Message-Oriented Text Interchange Systems (MOTIS)* —

- *Part 1: System and Service Overview*
- *Part 2: Overall Architecture*
- *Part 3: Abstract Service Definition Conventions*
- *Part 4: Message Transfer System: Abstract Service Definition and Procedures*
- *Part 5: Message Store: Abstract Service Definition*
- *Part 6: Protocol Specifications*
- *Part 7: Interpersonal Messaging System*

Annexes A and B form an integral part of this part of ISO/IEC 10021. Annexes C, D and E are for information only.

Introduction

This part of ISO/IEC 10021 is one of a number of parts of ISO/IEC 10021 (the International Standards for Message-Oriented Text Interchange Systems (MOTIS)).

MOTIS provides for the exchange of messages between users on a store-and-forward basis. A message submitted by one user (the *originator*) is transferred through the Message Transfer System (MTS) and delivered to one or more other users (the *recipients*). A user may interact directly with the MTS, or indirectly via a message store (MS).

The MTS comprises a number of message-transfer-agents (MTAs), which transfer messages and deliver them to their intended recipients.

This International Standard was developed jointly by CCITT and ISO/IEC. The equivalent CCITT document is CCITT Recommendation X.419.

Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 6 : Protocol Specifications

Section one - Introduction

1 Scope

This part of ISO 10021 specifies the MTS Access Protocol (P3) used between a remote user-agent and the MTS to provide access to the MTS Abstract Service defined in ISO/IEC 10021-4.

This part of ISO/IEC 10021 also specifies the MS Access Protocol (P7) used between a remote user-agent and a message-store (MS) to provide access to the MS Abstract Service defined in ISO/IEC 10021-5.

This part of ISO/IEC 10021 also specifies the MTS Transfer Protocol (P1) used between MTAs to provide the distributed operation of the MTS as defined in ISO/IEC 10021-4.

ISO/IEC 10021-2 identifies the other International Standards which define other aspects of Message Handling Systems.

Section two of this part of ISO/IEC 10021 specifies the MHS Access Protocols (P3 and P7). Clause 6 provides an overview of the MHS Access Protocols. Clause 7 defines the abstract-syntax of the MTS Access Protocol (P3). Clause 8 defines the abstract-syntax of the MS Access Protocol (P7). Clause 9 defines the mapping of the MHS Access Protocols onto used services. Clause 10 specifies conformance requirements for systems implementing the MHS Access Protocols.

Section three of this part of ISO/IEC 10021 specifies the MTS Transfer Protocol (P1). Clause 11 provides an overview of the MTS Transfer Protocol (P1). Clause 12 defines the abstract-syntax of the MTS Transfer Protocol (P1). Clause 13 defines the mapping of the MTS Transfer Protocol (P1) onto used services. Clause 14 specifies conformance requirements for systems implementing the MTS Transfer Protocol (P1).

Annex A provides a reference definition of the MHS protocol object identifiers cited in the ASN.1 modules in the body of this part of ISO/IEC 10021.

Annex B describes protocol rules for interworking with implementations of the CCITT Recommendation X.411 (1984) using the MTS Transfer Protocol (P1).

Annex C identifies the differences between the CCITT Recommendation X.411 (1984) and this part of ISO/IEC 10021.

Annex D identifies the technical differences between the ISO/IEC and CCITT versions of CCITT Recommendations X.419 and ISO/IEC 10021-6.

Annex E provides an index to this part of ISO/IEC 10021, categorised into: Abbreviations; Terms; Information Items; ASN.1 modules; ASN.1 macros; ASN.1 types; and ASN.1 values.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 10021. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 10021 are

encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of ISO and IEC maintain registers of currently valid International Standards.

2.1 Open Systems Interconnection

This part of ISO/IEC 10021 cites the following OSI specifications:

ISO 8649:1988, *Information processing systems - Open Systems Interconnection - Service definition for the Association Control Service Element.*

ISO 8822:1988, *Information processing systems - Open Systems Interconnection - Connection oriented presentation service definition.*

ISO 8824:1990, *Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1).*

ISO/IEC 9066:1989, *Information processing systems - Text communication - Reliable Transfer -*

Part 1: Model and service definition.

Part 2: Protocol specification.

ISO/IEC 9072:1989, *Information processing systems - Text communication - Remote operations -*

Part 1: Model, notation and service definition.

Part 2: Protocol specification.

2.2 Message Handling Systems

This part of ISO/IEC 10021 cites the following Message Handling System specifications:

ISO/IEC 10021:1990, *Information technology - Text communication - Message-Oriented Text Interchange Systems (MOTIS) -*

Part 1: Service and system overview.

Part 2: Overall architecture.

Part 3: Abstract service definition conventions.

Part 4: Message transfer system : Abstract service definition and procedures.

Part 5: Message store : Abstract service definition.

Part 7: Interpersonal messaging system.

2.3 Directory Systems

This part of ISO/IEC 10021 cites the following Directory System specification:

ISO/IEC 9594-2:1990, *Information technology - Open Systems Interconnection - The Directory Part 2: Models.*

3 Definitions

For the purposes of this part of ISO/IEC 10021 the definitions given in ISO/IEC 10021-2 apply.

4 Abbreviations

For the purposes of this part of ISO/IEC 10021 the abbreviations given in ISO/IEC 10021-2 apply.

5 Conventions

This International Standard uses the descriptive conventions described below.

5.1 Terms

Throughout this part of ISO/IEC 10021 the words of defined terms, and the names and values of service parameters and protocol fields, unless they are proper names, begin with a lower-case letter and are linked by a hyphen thus: defined-term. Proper names begin with an upper-case letter and are not linked by a hyphen thus: Proper Name.

5.2 Abstract Syntax Definitions

This part of ISO/IEC 10021 defines the abstract-syntax of the MHS protocols using the abstract syntax notation (ASN.1) defined in ISO 8824 and the remote operations notation defined in ISO/IEC 9072-1.

Section two - Message Handling System Access Protocol Specifications

6 Overview of the MHS Access Protocols

6.1 MHS Access Protocol Model

Clause 6 of ISO/IEC 10021-4 describes an abstract model of the Message Transfer System (MTS), and the MTS Abstract Service which it provides to its MTS-users.

Clause 6 of ISO/IEC 10021-5 describes an abstract model of a Message Store (MS), and the MS Abstract Service which it provides to its MS-user.

This clause describes how the MTS Abstract Service and the MS Abstract Service are supported by instances of OSI communication when an abstract-service user and an abstract-service provider are realised as application-processes located in different open systems.

In the OSI environment, communication between application-processes is represented in terms of communication between a pair of application-entities (AEs) using the presentation-service. The functionality of an application-entity is factored into a set of one or more application-service-elements (ASEs). The interaction between AEs is described in terms of their use of the services provided by the ASEs.

Access to the MTS Abstract Service is supported by three application-service-elements, each supporting a type of port paired between an MTS-user and the MTS in the abstract model. The Message Submission Service Element (MSSE) supports the services of the submission-port; the Message Delivery Service Element (MDSE) supports the services of the delivery-port; and the Message Administration Service Element (MASE) supports the services of the administration-port. The MSSE, MDSE and MASE are asymmetric-ASEs; that is, the MTS-user ASEs act as the consumer, and the MTS ASEs act as the supplier, of the MTS Abstract Service.

Similarly, access to the MS Abstract Service is supported by three application-service-elements: the Message Submission Service Element (MSSE) supports the indirect-submission-port; the Message Retrieval Service Element (MRSE) supports the services of the retrieval-port; and the Message Administration Service Element (MASE) supports the services of the administration-port. The MS-user ASEs act as the consumer, and the MS ASEs act as the supplier, of the MS Abstract Service.

These application-service-elements are in turn supported by other application-service-elements.

The Remote Operations Service Element (ROSE) supports the request/reply paradigm of the abstract operations that occur at the ports in the abstract model. The MSSE, MDSE, MRSE and MASE provide the mapping function of the abstract-syntax notation of an abstract-service onto the services provided by the ROSE.

Optionally, the Reliable Transfer Service Element (RTSE) may be used to reliably transfer the application-protocol-data-units (APDUs) that contain the parameters of the operations between AEs.

The Association Control Service Element (ACSE) supports the establishment and release of an application-association between a pair of AEs. Associations between an MTS-user and the MTS may be established by either the MTS-user or the MTS. Associations between an MS-user and an MS may be established only by the MS-user. Only the initiator of an established association can release it.

The combination of one or more of the MSSE, MDSE, MRSE and MASE, together with their supporting ASEs, defines the application-context of an application-association. Note that a single application-association may be used to support one or more port types paired between two objects in the abstract model.

Table 1 identifies the application-contexts defined in this part of ISO/IEC 10021 for the MTS Access Protocol and MS Access Protocol.

Table 1
MHS Access Protocol Application Contexts

Application Context	Message Handling ASEs				Supporting ASEs		
	MSSE	MDSE	MRSE	MASE	ROSE	RTSE	ACSE
MTS Access Protocol							
mts-access	C	C	-	C	x	-	x
mts-forced-access	S	S	-	S	x	-	x
mts-reliable-access	C	C	-	C	x	x	x
mts-forced-reliable-access	S	S	-	S	x	x	x
MS Access Protocol							
ms-access	C	-	C	C	x	-	x
ms-reliable-access	C	-	C	C	x	x	x

Legend

x present	C	present with initiator the consumer
- absent	S	present with initiator the supplier

If the MTS Access Protocol (P3) is supported, then support for the **mts-access** and **mts-forced-access** application-contexts is mandatory for an MTA. If an MTA supports the **mts-reliable-access** application-context, it shall also support the **mts-forced-reliable-access**, and vice versa. Support for each of the MTS Access Protocol (P3) application-contexts is optional for an MTS-user.

If the MS Access Protocol (P7) is supported, then support for the **ms-access** application-context is mandatory for an MS, and support for the **ms-reliable-access** application-context is optional. Support for each of the MS Access Protocol (P7) application-contexts is optional for an MS-user.

Figure 1 models an application-context between an MTS-user and the MTS. The consumer role of the MTS-user ASEs, and the supplier role of the MTS ASEs, is indicated by a subscript 'c', or 's', respectively.

Similarly, Figure 2 models an application-context between an MS-user and the MS.

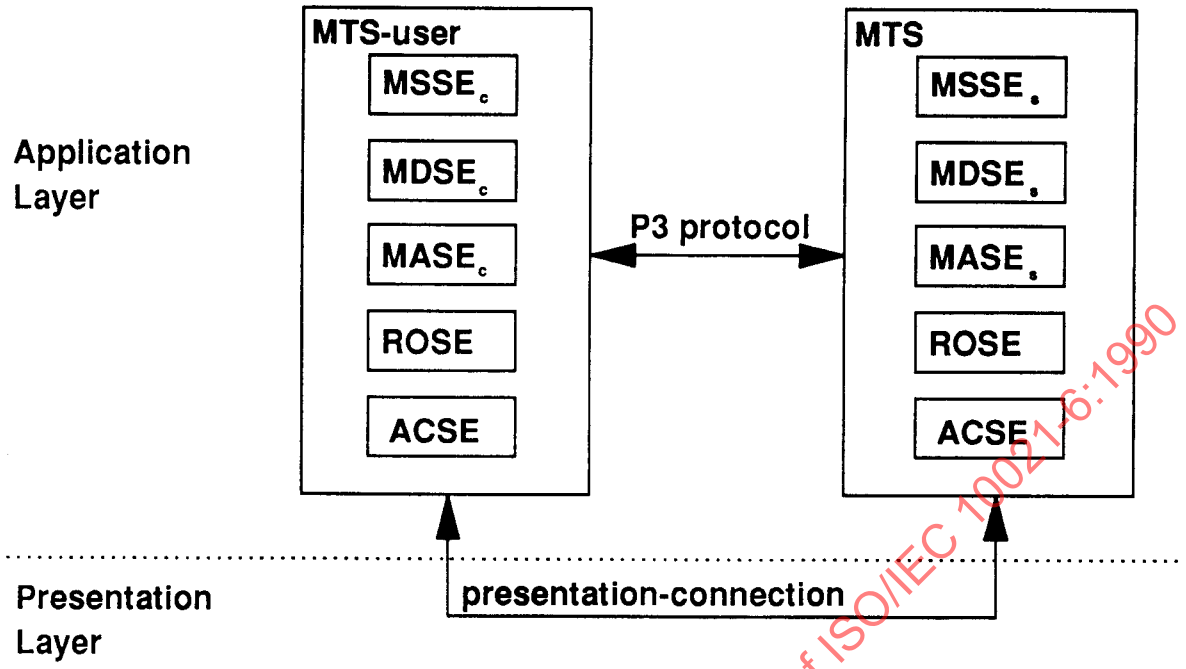


Figure 1
MTS Access Protocol Model

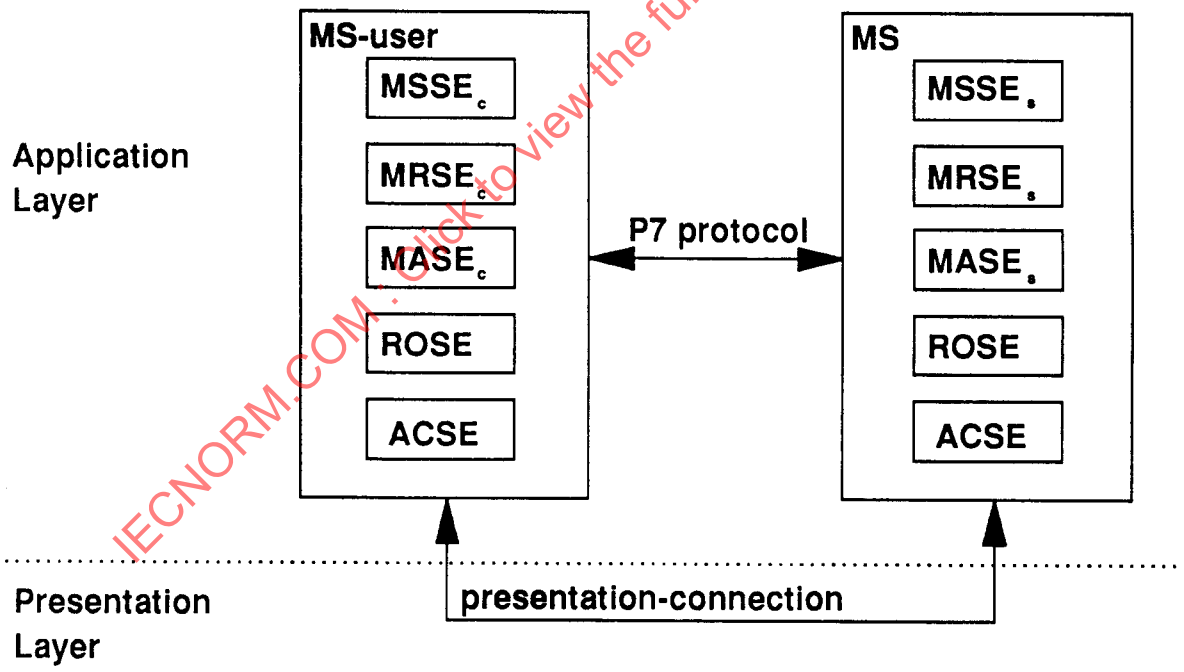


Figure 2
An MS Access Protocol Model

6.2 Services Provided by the MTS Access Protocol

The MTS Access Protocol (P3) comprises the following operations which provide the services defined in ISO/IEC 10021-4:

MTS-bind and MTS-unbind

a) MTS-bind

b) MTS-unbind

Message Submission Service Element (MSSE)

c) Message-submission

d) Probe-submission

e) Cancel-deferred-delivery

f) Submission-control

Message Delivery Service Element (MDSE)

g) Message-delivery

h) Report-delivery

i) Delivery-control

Message Administration Service Element (MASE)

j) Register

k) Change-credentials.

6.3 Services Provided by the MS Access Protocol

The MS Access Protocol (P7) comprises the following operations which provide the services defined in ISO/IEC 10021-5:

MS-bind and MS-unbind

a) MS-bind

b) MS-unbind

Message Submission Service Element (MSSE)

c) Message-submission

d) Probe-submission

e) Cancel-deferred-delivery

f) Submission-control

Message Retrieval Service Element (MRSE)

g) Summarize

h) List

i) Fetch

j) Delete

k) Register-MS

l) Alert

Message Administration Service Element (MASE)

m) Register

n) Change-credentials.

6.4 Use of Underlying Services

The MHS Access Protocols make use of underlying services as described below.

6.4.1 Use of ROSE Services

The Remote Operations Service Element (ROSE) is defined in ISO/IEC 9072-1.

The ROSE supports the request/reply paradigm of remote operations.

The MSSE, MDSE, MRSE and MASE are the sole users of the RO-INVOKE, RO-RESULT, RO-ERROR, RO-REJECT-U and RO-REJECT-P services of the ROSE.

The remote operations of the MTS Access Protocol (P3) and the MS Access Protocol (P7) are Class 2 (asynchronous) operations.

6.4.2 Use of RTSE Services

The Reliable Transfer Service Element (RTSE) is defined in ISO/IEC 9066-1.

The RTSE provides for the reliable transfer of application-protocol-data-units (APDUs). The RTSE ensures that each APDU is completely transferred exactly once, or that the sender is warned of an exception. The RTSE recovers from communication and end-system failure and minimises the amount of retransmission needed for recovery.

Alternative application-contexts with and without RTSE are defined to support the MHS Access Protocols.

The RTSE is used in the normal mode. The use of the normal mode of the RTSE implies the use of the normal mode of the ACSE and the normal mode of the presentation-service.

If the RTSE is included in an application-context, the MHS Access Protocol MTS-bind and MTS-unbind (or MS-bind and MS-unbind) are the sole users of the RT-OPEN and RT-CLOSE services of the RTSE. The ROSE is the sole user of the RT-TRANSFER, RT-TURN-PLEASE, RT-TURN-GIVE, RT-P-ABORT and RT-U-ABORT services of the RTSE.

6.4.3 Use of ACSE Services

The Association Control Service Element (ACSE) is defined in ISO 8649.

The ACSE provides for the control (establishment, release, abort) of application-associations between AEs.

If the RTSE is not included in an application-context, the MHS Access Protocol MTS-bind and MTS-unbind (or MS-bind and MS-unbind) are the sole users of the A-ASSOCIATE and A-RELEASE services of the ACSE in normal mode. The ROSE is the user of the A-ABORT and A-P-ABORT services of the ACSE.

If the RTSE is included in the application-context, the RTSE is the sole user of the A-ASSOCIATE, A-RELEASE, A-ABORT and A-P-ABORT services of the ACSE. The use of the normal mode of the RTSE implies the use of the normal mode of the ACSE and the normal mode of the presentation-service.

6.4.4 Use of the Presentation-service

The presentation-service is defined in ISO 8822.

The Presentation Layer co-ordinates the representation (syntax) of the Application Layer semantics that are to be exchanged.

In normal mode, a different presentation-context is used for each abstract-syntax included in the application-context.

The ACSE is the sole user of the P-CONNECT, P-RELEASE, P-U-ABORT and P-P-ABORT services of the presentation-service.

If the RTSE is not included in the application-context, the ROSE is the sole user of the P-DATA service of the presentation-service.

If the RTSE is included in the application-context, the RTSE is the sole user of the P-ACTIVITY-START, P-DATA, P-MINOR-SYNCHRONIZE, P-ACTIVITY-END, P-ACTIVITY-INTERRUPT, P-ACTIVITY-DISCARD, P-U-EXCEPTION-REPORT, P-ACTIVITY-RESUME, P-P-EXCEPTION-REPORT, P-TOKEN-PLEASE and P-CONTROL-GIVE services of the presentation-service. The use of the normal mode of the RTSE implies the use of the normal mode of the ACSE and the normal mode of the presentation-service.

7 MTS Access Protocol Abstract Syntax Definition

The abstract-syntax of the MTS Access Protocol (P3) is defined in Figure 3.

The abstract-syntax of the MTS Access Protocol (P3) is defined using the abstract syntax notation (ASN.1) defined in ISO 8824, and the remote operations notation defined in ISO/IEC 9072-1.

The abstract-syntax definition of the MTS Access Protocol (P3) has the following major parts:

Prologue: declarations of the exports from, and imports to, the MTS Access Protocol (P3) module (Figure 3 Part 1).

Application Contexts: definitions of application-contexts that may be used between an MTS-user and the MTS (Figure 3 Parts 1 and 2).

Message Submission Service Element: definitions of the Message Submission Service Element (MSSE) and its remote operations and errors (Figure 3 Part 3).

Message Delivery Service Element: definitions of the Message Delivery Service Element (MDSE) and its remote operations and errors (Figure 3 Part 4).

Message Administration Service Element: definitions of the Message Administration Service Element (MASE) and its remote operations and errors (Figure 3 Part 4).

```
MTSAccessProtocol { joint-iso-ccitt mhs-motis(6) protocols(0) modules(0) mts-access-protocol(1) }

DEFINITIONS IMPLICIT TAGS ::=

BEGIN


--      Prologue

EXPORTS
        -- Application Service Elements
        mSSE, mDSE, mASE;

IMPORTS
        -- Application Service Elements and Application Contexts
        aCSE, APPLICATION-CONTEXT, APPLICATION-SERVICE-ELEMENT
                FROM Remote-Operations-Notation-extension { joint-iso-ccitt remote-operations(4)
                        notation-extension(2) }
        rTSE
                FROM Reliable-Transfer-APDUs { joint-iso-ccitt reliable-transfer(3) apdus(0) }

        -- MTS Abstract Service Parameters
        CancelDeferredDelivery, ChangeCredentials, ControlViolatesRegistration, DeferredDeliveryCancellationRejected,
        DeliveryControl, DeliveryControlViolated, ElementOfServiceNotSubscribed, InconsistentRequest,
        MessageDelivery, MessageSubmission, MessageSubmissionIdentifierInvalid, MTSBind, MTSUnbind,
        NewCredentialsUnacceptable, OldCredentialsIncorrectlySpecified, OriginatorInvalid, ProbeSubmission,
        RecipientImproperlySpecified, Register, RegisterRejected, RemoteBindError, ReportDelivery, SecurityError,
        SubmissionControl, SubmissionControlViolated, UnsupportedCriticalFunction
                FROM MTSAbstractService { joint-iso-ccitt mhs-motis(6) mts(3) modules(0)
                        mts-abstract-service(1) }

        -- Object Identifiers
        id-ac-mts-access, id-ac-mts-forced-access, id-ac-mts-forced-reliable-access, id-ac-mts-reliable-access,
        id-as-acse, id-as-mase, id-as-mdse, id-as-msse, id-as-mts, id-as-mts-rtse, id-ase-mase, id-ase-mdse,
        id-ase-msse
                FROM MHSProtocolObjectIdentifiers { joint-iso-ccitt mhs-motis(6) protocols(0)
                        modules(0) object-identifiers(0) };


--      Application Contexts omitting RTSE

--      MTS-user initiated

mts-access APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE }
        BIND MTSBind
        UNBIND MTSUnbind
        REMOTE OPERATIONS { rOSE }
        INITIATOR CONSUMER OF { mSSE, mDSE, mASE }
        ABSTRACT SYNTAXES {
                id-as-acse,       -- of ACSE
                id-as-msse,       -- of MSSE, including ROSE
                id-as-mdse,       -- of MDSE, including ROSE
                id-as-mase,       -- of MASE, including ROSE
                id-as-mts         -- of MTSBind and MTSUnbind -- }
        ::= id-ac-mts-access
```


Figure 3
Abstract Syntax Definition of the MTS Access Protocol (P3) (Part 1 of 4)

```
--      MTS initiated

mts-forced-access APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE }
        BIND MTSBind
        UNBIND MTSUnbind
        REMOTE OPERATIONS { rOSE }
        RESPONDER CONSUMER OF { mSSE, mDSE, mASE }
        ABSTRACT SYNTAXES {
                id-as-acse,       -- of ACSE
                id-as-msse,       -- of MSSE, including ROSE
                id-as-mdse,       -- of MDSE, including ROSE
                id-as-mase,       -- of MASE, including ROSE
                id-as-mts         -- of MTSBind and MTSUnbind -- }
        ::= id-ac-mts-forced-access


--      Application Contexts including RTSE in normal mode

--      MTS-user initiated

mts-reliable-access APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE, rTSE }
        BIND MTSBind
        UNBIND MTSUnbind
        REMOTE OPERATIONS { rOSE }
        INITIATOR CONSUMER OF { mSSE, mDSE, mASE }
        ABSTRACT SYNTAXES {
                id-as-acse,       -- of ACSE
                id-as-msse,       -- of MSSE, including ROSE
                id-as-mdse,       -- of MDSE, including ROSE
                id-as-mase,       -- of MASE, including ROSE
                id-as-mts-rtse    -- of MTSBind and MTSUnbind, including RTSE -- }
        ::= id-ac-mts-reliable-access

--      MTS initiated

mts-forced-reliable-access APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE, rTSE }
        BIND MTSBind
        UNBIND MTSUnbind
        REMOTE OPERATIONS { rOSE }
        RESPONDER CONSUMER OF { mSSE, mDSE, mASE }
        ABSTRACT SYNTAXES {
                id-as-acse,       -- of ACSE
                id-as-msse,       -- of MSSE, including ROSE
                id-as-mdse,       -- of MDSE, including ROSE
                id-as-mase,       -- of MASE, including ROSE
                id-as-mts-rtse    -- of MTSBind and MTSUnbind, including RTSE -- }
        ::= id-ac-mts-forced-reliable-access
```


Figure 3
Abstract Syntax Definition of the MTS Access Protocol (P3) (Part 2 of 4)

```
--      Message Submission Service Element

mSSE APPLICATION-SERVICE-ELEMENT
        CONSUMER INVOKES {
                message-submission,
                probe-submission,
                cancel-deferred-delivery }
        SUPPLIER INVOKES {
                submission-control }
        ::= id-ase-msse

--      Remote Operations

message-submission MessageSubmission ::= 3

probe-submission ProbeSubmission ::= 4

cancel-deferred-delivery CancelDeferredDelivery ::= 7

submission-control SubmissionControl ::= 2

--      Remote Errors

submission-control-violated SubmissionControlViolated ::= 1

element-of-service-not-subscribed ElementOfServiceNotSubscribed ::= 4

deferred-delivery-cancellation-rejected DeferredDeliveryCancellationRejected ::= 8

originator-invalid OriginatorInvalid ::= 2

recipient-improperly-specified RecipientImproperlySpecified ::= 3

message-submission-identifier-invalid MessageSubmissionIdentifierInvalid ::= 7

inconsistent-request InconsistentRequest ::= 11

security-error SecurityError ::= 12

unsupported-critical-function UnsupportedCriticalFunction ::= 13

remote-bind-error RemoteBindError ::= 15
```


Figure 3
Abstract Syntax Definition of the MTS Access Protocol (P3) (Part 3 of 4)

```
--      Message Delivery Service Element

mDSE APPLICATION-SERVICE-ELEMENT
        CONSUMER INVOKES {
                delivery-control }
        SUPPLIER INVOKES {
                message-delivery,
                report-delivery }
        ::= id-ase-mdse

--      Remote Operations

message-delivery MessageDelivery ::= 5

report-delivery ReportDelivery ::= 6

delivery-control DeliveryControl ::= 2

--      Remote Errors

delivery-control-violated DeliveryControlViolated ::= 1

control-violates-registration ControlViolatesRegistration ::= 14

--      security-error ::= 12, defined in Part 3 of this Figure

--      unsupported-critical-function ::= 13, defined in Part 3 of this Figure

--      Message Administration Service Element

mASE APPLICATION-SERVICE-ELEMENT
        CONSUMER INVOKES {
                register,
                change-credentials }
        SUPPLIER INVOKES {
                change-credentials }
        ::= id-ase-mase

--      Remote Operations

register Register ::= 1

change-credentials ChangeCredentials ::= 8

--      Remote Errors

register-rejected RegisterRejected ::= 10

new-credentials-unacceptable NewCredentialsUnacceptable ::= 6

old-credentials-incorrectly-specified OldCredentialsIncorrectlySpecified ::= 5

END     -- of MTSAccessProtocol
```


Figure 3
Abstract Syntax Definition of the MTS Access Protocol (P3) (Part 4 of 4)

8 MS Access Protocol Abstract Syntax Definition

The abstract-syntax of the MS Access Protocol (P7) is defined in Figure 4.

The abstract-syntax of the MS Access Protocol (P7) is defined using the abstract syntax notation (ASN.1) defined in ISO 8824, and the remote operations notation defined in ISO/IEC 9072-1.

The abstract-syntax definition of the MS Access Protocol (P7) has the following major parts:

Prologue: declarations of the exports from, and imports to, the MS Access Protocol (P7) module (Figure 4 Part 1).

Application Contexts: definitions of application-contexts that may be used between an MS-user and an MS (Figure 4 Part 2).

Message Retrieval Service Element: definitions of the Message Retrieval Service Element (MRSE) and its remote operations and errors (Figure 4 Parts 2 and 3).


```
---

MSAccessProtocol { joint-iso-ccitt mhs-motis(6) protocols(0) modules(0) ms-access-protocol(2) }

DEFINITIONS IMPLICIT TAGS ::=

BEGIN


--      Prologue

EXPORTS
        mRSE;

IMPORTS
        -- Application Service Elements and Application Contexts
        aCSE, APPLICATION-CONTEXT, APPLICATION-SERVICE-ELEMENT
                FROM Remote-Operations-Notation-extension { joint-iso-ccitt remote-operations(4)
                        notation-extension(2) }
        rTSE
                FROM Reliable-Transfer-APDUs { joint-iso-ccitt reliable-transfer(3) apdus(0) }
        mASE, mSSE
                FROM MTSAccessProtocol { joint-iso-ccitt mhs-motis(6) protocols(0)
                        modules(0) mts-access-protocol(1) }

-- MS Abstract Service Parameters
        Alert, AttributeError, AutoActionRequestError, Delete, DeleteError, Fetch, FetchRestrictionError, List,
        MSBind, MSUnbind, RangeError, Register-MS, SecurityError, SequenceNumberError, ServiceError, Summarize
                FROM MSAbstractService { joint-iso-ccitt mhs-motis(6) ms(4) modules(0) abstract-service(1) }

        -- Object Identifiers
        id-ac-ms-access, id-ac-ms-reliable-access, id-as-acse, id-as-mase, id-as-mrse, id-as-ms, id-as-msse,
        id-as-ms-rtse, id-ase-mrse
                FROM MHSProtocolObjectIdentifiers { joint-iso-ccitt mhs-motis(6) protocols(0)
                        modules(0) object-identifiers(0) };
```

Figure 4
Abstract Syntax Definition of the MS Access Protocol (P7) (Part 1 of 3)

```
--      Application Context omitting RTSE

ms-access APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE }
        BIND MSBind
        UNBIND MSUnbind
        REMOTE OPERATIONS { rOSE }
        INITIATOR CONSUMER OF { mSSE, mRSE, mASE }
        ABSTRACT SYNTAXES {
                id-as-acse,       -- of ACSE
                id-as-msse,       -- of MSSE, including ROSE
                id-as-mrse,       -- of MRSE, including ROSE
                id-as-mase,       -- of MASE, including ROSE
                id-as-ms          -- of MSBind and MSUnbind -- }
        ::= id-ac-ms-access


--      Application Context including RTSE

ms-reliable-access APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE, rTSE }
        BIND MSBind
        UNBIND MSUnbind
        REMOTE OPERATIONS { rOSE }
        INITIATOR CONSUMER OF { mSSE, mRSE, mASE }
        ABSTRACT SYNTAXES {
                id-as-acse,       -- of ACSE
                id-as-msse,       -- of MSSE, including ROSE
                id-as-mrse,       -- of MRSE, including ROSE
                id-as-mase,       -- of MASE, including ROSE
                id-as-ms-rtse     -- of MSBind and MSUnbind, including RTSE -- }
        ::= id-ac-ms-reliable-access


--      Message Retrieval Service Element

mRSE APPLICATION-SERVICE-ELEMENT
        CONSUMER INVOKES {
                summarize,
                list,
                fetch,
                delete,
                register-MS }
        SUPPLIER INVOKES {
                alert }
        ::= id-ase-mrse


--      Remote Operations

summarize Summarize ::= 20

list List ::= 21

fetch Fetch ::= 22

delete Delete ::= 23

register-ms Register-MS ::= 24

alert Alert ::= 25
```


Figure 4
Abstract Syntax Definition of the MS Access Protocol (P7) (Part 2 of 3)

```
--      Remote Errors

attribute-error AttributeError ::= 21

auto-action-request-error AutoActionRequestError ::= 22

delete-error DeleteError ::= 23

fetch-restriction-error FetchRestrictionError ::= 24

range-error RangeError ::= 25

security-error SecurityError ::= 26

service-error ServiceError ::= 27

sequence-number-error SequenceNumberError ::= 28

END     -- of MSAccessProtocol
```

Figure 4
Abstract Syntax Definition of the MS Access Protocol (P7) (Part 3 of 3)

9 Mapping onto Used Services

This clause defines the mapping of the MHS Access Protocols onto the used services.

Clause 9.1 defines the mapping onto used services for application-contexts that omit the RTSE. Clause 9.2 defines the mapping onto used services for application-contexts that include the RTSE.

9.1 Application-contexts omitting RTSE

This clause defines the mapping of the MHS Access Protocols onto the used services for application-contexts that omit the RTSE. Support for this mapping is optional for conformance to this part of ISO/IEC 10021.

9.1.1 Mapping onto ACSE

This clause defines the mapping of the abstract-bind (MTS-bind or MS-bind) and abstract-unbind (MTS-unbind or MS-unbind) services onto the services of the ACSE in normal mode for application-contexts that omit the RTSE. The ACSE is defined in ISO 8649.

9.1.1.1 Abstract-bind onto A-ASSOCIATE

The abstract-bind service is mapped onto the A-ASSOCIATE service of the ACSE. The use of the parameters of the A-ASSOCIATE service is qualified in the following clauses.

9.1.1.1.1 Mode

This parameter shall be supplied by the initiator of the association in the A-ASSOCIATE request primitive, and shall have the value 'normal mode'.

9.1.1.1.2 Application Context Name

The initiator of the association shall propose one of the application-contexts defined in this part of ISO/IEC 10021 that omit the RTSE in the A-ASSOCIATE request primitive (see Table 1).

9.1.1.1.3 User Information

The mapping of the bind-operation of the abstract-bind service onto the User Information parameter of the A-ASSOCIATE request primitive is defined in ISO/IEC 9072-1.

9.1.1.1.4 Presentation Context Definition List

The initiator of the association shall supply the Presentation Context Definition List in the A-ASSOCIATE request primitive.

The Presentation Context Definition List comprises a presentation-context-definition for each abstract-syntax included in the application-context. A presentation-context-definition comprises a presentation-context-identifier and an abstract-syntax-name for the ASE. Each named abstract-syntax for the MSSE, MDSE, MRSE and MASE includes the ROSE APDUs.

Clauses 7 and 8 define the abstract-syntaxes included in the application-contexts.

9.1.1.1.5 Quality of Service

This parameter shall be supplied by the initiator of the association in the A-ASSOCIATE request primitive, and by the responder of the association in the A-ASSOCIATE response primitive. The parameters 'Extended Control' and 'Optimised Dialogue Transfer' shall be set to not required. The remaining parameters shall be such that default values are used.

9.1.1.1.6 Session Requirements

This parameter shall be set by the initiator of the association in the A-ASSOCIATE request primitive, and by the responder of the association in the A-ASSOCIATE response primitive. The parameter shall be set to specify the following functional units:

a) Kernel

b) Duplex.

9.1.1.2 Abstract-unbind onto A-RELEASE

The abstract-unbind service is mapped onto the A-RELEASE service of the ACSE. The use of the parameters of the A-RELEASE service is qualified in the following clause.

9.1.1.2.1 Result

This parameter shall have the value 'affirmative'.

9.1.1.3 Use of A-ABORT and A-P-ABORT Services

The ROSE is the user of the A-ABORT and A-P-ABORT services of the ACSE.

9.1.2 Mapping onto ROSE

The MSSE, MDSE, MRSE and MASE services are mapped onto the RO-INVOKE, RO-RESULT, RO-ERROR, RO-REJECT-U and RO-REJECT-P services of the ROSE. The mapping of the abstract-syntax notation of the MSSE, MDSE, MRSE and MASE onto the ROSE services is as defined in ISO/IEC 9072-1.

9.2 Application-contexts including RTSE

This clause defines the mapping of the MHS Access Protocols onto the used services for application-contexts that include the RTSE in normal mode. Support for this mapping is optional for conformance to this part of ISO/IEC 10021. No mappings are defined onto the RTSE in X.410-1984 mode. The RTSE is defined in ISO/IEC 9066-1.

9.2.1 Mapping onto RT-OPEN and RT-CLOSE

This clause defines the mapping of the abstract-bind (MTS-bind or MS-bind) and abstract-unbind (MTS-unbind or MS-unbind) services onto the RT-OPEN and RT-CLOSE services of the RTSE in normal mode.

9.2.1.1 Abstract-bind onto RT-OPEN

The abstract-bind service is mapped onto the RT-OPEN service of the RTSE. The use of the parameters of the RT-OPEN service is qualified in the following clauses.

9.2.1.1.1 Mode

This parameter shall be supplied by the initiator of the association in the RT-OPEN request primitive, and shall have the value 'normal mode'.

9.2.1.1.2 Application Context Name

The initiator of the association shall propose one of the application-contexts defined in this part of ISO/IEC 10021 that include the RTSE in normal mode in the RT-OPEN request primitive (see Table 1).

9.2.1.1.3 User-data

The mapping of the bind-operation of the abstract-bind service onto the User-data parameter of the RT-OPEN request primitive is defined in ISO/IEC 9072-1.

9.2.1.1.4 Presentation Context Definition List

The initiator of the association shall supply the Presentation Context Definition List in the RT-OPEN request primitive.

The Presentation Context Definition List comprises a presentation-context-definition for each abstract-syntax included in the application context. A presentation-context-definition comprises a presentation-context-identifier and an abstract-syntax-name for the ASE. Each named abstract-syntax for the MSSE, MDSE, MRSE and MASE includes the ROSE APDUs. The named abstract-syntax for the RTSE includes the abstract-syntax for the bind-operation of the abstract-bind service.

Clauses 7 and 8 define the abstract-syntaxes included in the application-contexts.

9.2.1.2 Abstract-unbind onto RT-CLOSE

The abstract-unbind service is mapped onto the RT-CLOSE service of the RTSE.

9.2.2 Mapping onto ROSE

The MSSE, MDSE and MASE services are mapped onto the RO-INVOKE, RO-RESULT, RO-ERROR, RO-REJECT-U and RO-REJECT-P services of the ROSE. The mapping of the abstract-syntax notation of the MSSE, MDSE, MRSE and MASE onto the ROSE services is performed as defined in ISO/IEC 9072-1.

ROSE is the user of the RT-TRANSFER, RT-TURN-PLEASE, RT-TURN-GIVE, RT-P-ABORT and RT-U-ABORT services of the RTSE. The use of the RTSE services by the ROSE is defined in ISO/IEC 9072-2.

9.2.2.1 Managing the Turn

ISO/IEC 9072-2 defines the use by the ROSE of the RT-TURN-PLEASE and RT-TURN-GIVE services of the RTSE to manage the Turn.

Table 2 defines the values of the priority parameter of the RT-TURN-PLEASE service used by the ROSE to request the Turn.

Priority zero is the highest priority, and is reserved for the action of releasing the association by the initiator.

Priority one is used by the ROSE for the RORJ APDU and ROER APDU to provide the RO-REJECT-U and RO-ERROR services of the ROSE.

Priority two is used by the ROSE for the RORS APDU to provide the RO-RESULT services of the ROSE.

Priority three to seven shall be used for the ROIV APDU to provide the RO-INVOKE service for the MHS Access Protocol remote operations. In the case of a remote operation whose arguments include a message, the ROIV APDU is prioritised as a function of the **priority** of the message - **urgent**, **normal** or **non-urgent**.

Table 2
Remote Operation Priorities

Priority	MSSE	MDSE	MRSE	MASE
0	Association release			
1	RO-REJECT-U RO-ERROR			
2	RO-RESULT			
3	Submission-control	Delivery-control		
4	Message-submission (urgent)	Message-delivery (urgent)	Alert	
5	Probe-submission	Report-delivery	RegisterMS Summarize List Fetch Delete	Register Change-credentials
6	Message-submission (normal)	Message-delivery (normal)		
7	Message-submission (non-urgent)	Message-delivery		

10 Conformance

A system (UA, MS, or MTA) claiming conformance to the MHS Access Protocols specified in this part of ISO/IEC 10021 shall comply with the requirements in clauses 10.1, 10.2 and 10.3.

10.1 Statement Requirements

The following shall be stated:

a) the type of system for which conformance is claimed (UA, MS, MTA or MTA/MS);

b) the application-contexts defined in section two of this part of ISO/IEC 10021 for which conformance is claimed.

Conformance can be claimed to the MTS Access Protocol (P3), or the MS Access Protocol (P7), or both. Table 3 classifies the support for application-contexts required for conformance to the MTS Access Protocol (P3). Table 4 classifies the support for application-contexts required for conformance to the MS Access Protocol (P7).

Table 3
MTS Access Protocol Conformance Requirements

Application Context	MTA	MTS-user
MTS Access Protocol		
mts-access	Mandatory	Optional
mts-forced-access	Mandatory	Optional
mts-reliable-access	Optional - see Note	Optional
mts-forced-reliable-access	Optional - see Note	Optional

NOTE - If an MTA claims conformance to the mts-reliable-access application-context, it shall also claim conformance to the mts-forced-reliable-access application-context, and vice versa.

Table 4
MS Access Protocol Conformance Requirements

Application context	MS	MS-user
MS Access Protocol		
ms-access	Mandatory	Optional
ms-reliable-access	Optional	Optional

10.2 Static Requirements

The system shall:

a) conform to the abstract-syntax definition(s) of the MHS Access Protocols defined in clauses 7 and 8 of this part of ISO/IEC 10021, required by the application-contexts for which conformance is claimed.

10.3 Dynamic Requirements

The system shall:

a) conform to the mapping onto used services defined in clause 9 of this part of ISO/IEC 10021, required by the application-contexts for which conformance is claimed;

b) conform to the use of underlying services defined in clause 6.4 of this part of ISO/IEC 10021.

Section three - Message Transfer System Transfer Protocol Specification

11 Overview of the MTS Transfer Protocol

11.1 Model

Clause 10 of ISO/IEC 10021-4 refines the abstract model of the Message Transfer System (MTS), first presented in clause 6 of ISO/IEC 10021-4, to reveal that the MTS object comprises a collection of message-transfer-agent (MTA) objects, which cooperate together to form the MTS and offer the MTS Abstract Service to its users.

In the refined abstract model, interactions between MTAs are modelled as a set of abstract operations which occur at the transfer-port paired between MTAs.

This clause describes how the MTA Abstract Service is supported by instances of OSI communication when the MTAs are realised as application-processes located in different open systems.

In the OSI environment, communication between application-processes is represented in terms of communication between a pair of application-entities (AEs) using the presentation-service. The functionality of an AE is factored into a set of one or more application-service-elements (ASEs). The interaction between AEs is described in terms of their use of the services provided by the ASEs.

The transfer-port services of the abstract model are supported by an application-service-element - the Message Transfer Service Element (MTSE), which in turn is supported by two other application-service-elements - the Reliable Transfer Service Element (RTSE) and the Association Control Service Element (ACSE).

The Reliable Transfer Service Element (RTSE) is used to reliably transfer application-protocol-data-units (APDUs) that contain the message, probes and reports between AEs.

The Association Control Service Element (ACSE) supports the establishment and release of an application-association between a pair of AEs. Associations between MTAs can be established by either MTA. Only the initiator of an established association can release it.

The combination of the MTSE, the RTSE and the ACSE defines the application-context of an application-association.

Figure 5 models the application-context between MTAs.

Three application-contexts are defined for the MTS Transfer Protocol as identified in Table 5. For the purposes of conformance, three combinations of these application-contexts are introduced to meet the requirements of different situations:

MTA type A is capable of interworking with all other MTAs claiming conformance to ISO/IEC 10021-6, but will not interwork with MTAs in MDs claiming conformance to CCITT Recommendation X.419 unless those MTAs implement the **mts-transfer** application-context. It is thus useful for intra-domain communication and direct communication with MTAs in other MDs claiming conformance to ISO/IEC 10021-6 (typically PRMDs), but not for direct communication with MDs which only claim conformance either to the 1984 CCITT Recommendation X.411 or to only the minimum conformance requirements of the 1988 CCITT Recommendation X.419 (typically ADMDs).

MTA type B has the interworking capabilities of **MTA type A** and, additionally, is capable of interworking with any MD (typically ADMD) claiming conformance to CCITT Recommendation X.419.

MTA type C has, in addition to the interworking capabilities of **MTA type A** and **MTA type B**, the capability to interwork with MDs implementing the 1984 CCITT X.400 series Recommendations.

Table 5
MTS Transfer Protocol Application Contexts

Application Context	P1	RTSE mode
mts-transfer	1988 P1	normal
mts-transfer-protocol	1988 P1	X.410-1984
mts-transfer-protocol-1984	1984 P1	X.410-1984

The **mts-transfer** application-context is supported by the RTSE in normal mode. It is envisaged that, over time, most systems will migrate to support the **mts-transfer** application-context. Support for the **mts-transfer** application-context is mandatory for conformance to this part of ISO/IEC 10021 for all MTA types.

The **mts-transfer-protocol** is defined to enable interworking between implementations which support the 1988 extended functionality via systems which have had a minimal upgrade from conformance to the 1984 CCITT Recommendation X.411. The **mts-transfer-protocol** provides for controlled transparency of the upgraded system to the 1988 extensions. The **mts-transfer-protocol** is supported by the RTSE in X.410-1984 mode. Support for the **mts-transfer-protocol** is not required for **MTA type A**, but mandatory for **MTA type B** and **MTA type C** for conformance to this part of ISO/IEC 10021. Note that in CCITT Recommendation X.419, support for the **mts-transfer-protocol** is mandatory.

The **mts-transfer-protocol-1984** is defined for interworking with implementations of the 1984 CCITT Recommendation X.411. In this application-context, the abstract-syntax of the MTSE is constrained to that defined in the 1984 CCITT Recommendation X.411. These constraints are identified by underlining of the 1988 extensions to the abstract syntax of the MTSE in the defining ASN.1 module in ISO/IEC 10021-4. The changes are also listed in Annex C of this part of ISO/IEC 10021 for reference. The **mts-transfer-protocol-1984** is supported by the RTSE in X.410-1984 mode. Support for the **mts-transfer-protocol-1984** is not required for **MTA type A** and **MTA type B**, but mandatory for **MTA type C** for conformance to this part of ISO/IEC 10021. Note that in CCITT Recommendation X.419, support for the **mts-transfer-protocol-1984** is mandatory.

The interworking characteristics of the combinations of application-contexts permitted by the conformance requirements of the ISO/IEC International Standard and the CCITT Recommendations are summarised in Table 6. The permitted combinations are tabulated in Table 7.

Table 6
Interworking between ISO/IEC MOTIS and CCITT X.400

MOTIS	CCITT X.400(1984)	CCITT X.400(1988) implementation excluding mts-transfer AC	CCITT X.400(1988) implementation including mts-transfer AC
MTA Type A	N	N	Y
MTA Type B	N	Y	Y
MTA Type C	Y	Y	Y

Key
Y - guarantied interworking
N - no guarantee of interworking

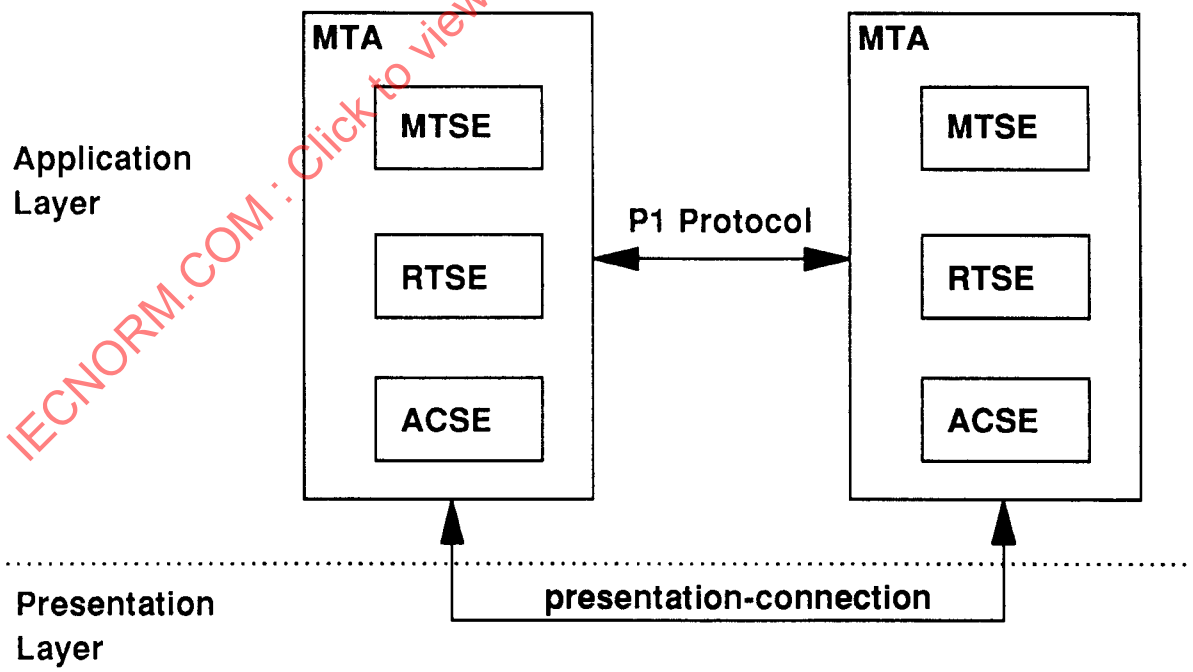


Figure 5
MTS Transfer Protocol Model

11.2 Services Provided by the MTS Transfer Protocol

The MTS Transfer Protocol (P1) provides the following services defined in ISO/IEC 10021-4:

MTA-bind and MTA-unbind

a) MTA-bind

b) MTA-unbind

Message Transfer Service Element; (MTSE)

c) Message-transfer

d) Probe-transfer

e) Report-transfer

11.3 Use of Underlying Services

The MTS Transfer Protocol (P1) makes use of underlying services as described below.

11.3.1 Use of the RTSE Services

The Reliable Transfer Service Element (RTSE) is defined in ISO/IEC 9066-1.

The RTSE provides for the reliable transfer of application-protocol-data-units (APDUs). The RTSE ensures that each APDU is completely transferred once, or that the sender is warned of an exception. The RTSE recovers from communication and end-system failure and minimises the amount of retransmission needed for recovery.

The RTSE services are used to support the MTS Transfer Protocol (P1). Support for the RTSE in normal mode is mandatory. Support for RTSE in X.410-1984 mode is not required for **MTA type A**, but mandatory for **MTA type B** and **MTA type C**. Note that in CCITT Recommendation X.419, support for the RTSE in X.410-1984 mode is mandatory, and support for the RTSE in normal mode is optional.

The use of the normal mode of the RTSE implies the use of the normal mode of the ACSE and the normal mode of the presentation-service. The use of the X.410-1984 mode of the RTSE implies the use of the X.410-1984 mode of the ACSE and the X.410-1984 mode of the presentation-service.

The MTS Transfer Protocol (P1) is the sole user of the RT-OPEN, RT-CLOSE, RT-TRANSFER, RT-TURN-PLEASE, RT-TURN-GIVE, RT-P-ABORT and RT-U-ABORT services of the RTSE.

11.3.2 Use of the ACSE Services

The Association Control Service Element (ACSE) is defined in ISO 8649.

The ACSE provides for the control (establishment, release, abort) of application-associations between AEs.

The RTSE is the sole user of the A-ASSOCIATE, A-RELEASE, A-ABORT and A-P-ABORT services of the ACSE. The use of the normal mode of the RTSE implies the use of the normal mode of the ACSE and the normal mode of the presentation-service. The use of the X.410-1984 mode of the RTSE implies that use of the X.410-1984 mode of the ACSE and the X.410-1984 mode of the presentation-service.

11.3.3 Use of the Presentation-service

The presentation-service is defined in ISO 8822.

The Presentation Layer co-ordinates the representation (syntax) of the Application Layer semantics that are to be exchanged.

In normal mode, a different presentation-context is used for each abstract-syntax included in the application-context.

In X.410-1984 mode, a single default presentation-context is used for the underlying presentation-connection. This presentation-context includes a single abstract-syntax for all of the ASEs included in the application-context (ie MTSE, RTSE and ACSE).

Presentation Layer addressing is not used for the Message Transfer Protocol (P1) in X.410-1984 mode.

The ACSE is the sole user of the P-CONNECT, P-RELEASE, P-U-ABORT and P-P-ABORT services of the presentation-service.

The RTSE is the sole user of the P-ACTIVITY-START, P-DATA, P-MINOR-SYNCHRONIZE, P-ACTIVITY-END, P-ACTIVITY-INTERRUPT, P-ACTIVITY-DISCARD, P-U-EXCEPTION-REPORT, P-ACTIVITY-RESUME, P-P-EXCEPTION-REPORT, P-TOKEN-PLEASE, and P-CONTROL-GIVE services of the presentation-service. The use of the normal mode of the RTSE implies the use of the normal mode of the ACSE and the normal mode of the presentation-service. The use of the X.410-1984 mode of the RTSE implies the use of the X.410-1984 mode of the ACSE and the X.410-1984 mode of the presentation-service.

11.4 Establishing and Releasing Associations

Associations between two MTAs are created in accordance with bilateral agreements covering the following:

a) the maximum number of associations that may exist simultaneously;

b) whether monologue or two-way-alternate associations are used;

c) which application-context is used;

d) which MTA has responsibility for establishing the associations;

e) whether associations are permanently established, or established and released as required.

12 MTS Transfer Protocol Abstract Syntax Definition

The abstract-syntax of the MTS Transfer Protocol (P1) is defined in Figure 6.

The abstract-syntax of the MTS Transfer Protocol (P1) is defined using the abstract-syntax notation (ASN.1) defined in ISO 8824, and the remote operations notation defined in ISO/IEC 9072-1.

The abstract-syntax definition of the MTS Transfer Protocol (P1) has the following major parts (Figure 6):

Prologue: declarations of the exports from, and imports to, the MTS Transfer Protocol (P1) module.

Application Contexts: definitions of the application-contexts used between MTAs.

Message Transfer Service Element: definitions of the Message Transfer Service Element (MTSE).

MTS Application Protocol Data Units: definitions of the MTS application-protocol-data-units (APDUs): Message, Probe and Report.

```
MTSTransferProtocol { joint-iso-ccitt mhs-motis(6) protocols(0) modules(0) transfer-protocol(3) }

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

--      Prologue

EXPORTS;

IMPORTS
        -- Application Service Elements and Application Contexts
        aCSE, APPLICATION-CONTEXT, APPLICATION-SERVICE-ELEMENT
                FROM Remote-Operations-Notation-extension { joint-iso-ccitt remote-operations(4)
                        notation-extension(2) }
        rTSE
                FROM Reliable-Transfer-APDUs { joint-iso-ccitt reliable-transfer(3) apdus(0) }

        -- MTA Transfer Port Abstract Service Parameters
        Message, MTABind, MTAUnbind, Probe, Report
                FROM MTAAbstractService { joint-iso-ccitt mhs-motis(6) mts(3) modules(0)
                        mta-abstract-service(2) }

        -- Object Identifiers
        id-ac-mts-transfer, id-as-acse, id-as-mta-rtse, id-as-mtse, id-ase-mtse
                FROM MHSProtocolObjectIdentifiers { joint-iso-ccitt mhs-motis(6) protocols(0)
                        modules(0) object-identifiers(0) };

--      Application Context including RTSE in normal mode

mts-transfer APPLICATION-CONTEXT
        APPLICATION SERVICE ELEMENTS { aCSE, rTSE, mTSE }
        BIND MTABind
        UNBIND MTAUnbind
        ABSTRACT SYNTAXES {
                id-as-acse,      -- of ACSE
                id-as-mta-rtse,  -- of MTABind and MTAUnbind, including RTSE
                id-as-mtse       -- of MTSE -- }
        ::= id-ac-mts-transfer

--      Application Context including RTSE in X.410-1984 mode

mts-transfer-protocol INTEGER ::= 12

--      Application Context for Interworking with 1984 P1

mts-transfer-protocol-1984 INTEGER ::= 1

--      Message Transfer Service Element

mTSE APPLICATION-SERVICE-ELEMENT
        ::= id-ase-mtse

--      MTS Application Protocol Data Units

MTS-APDU ::= CHOICE {
        message [0] Message,
        probe [2] Probe,
        report [1] Report }

END     -- of MTSTransferProtocol
```


Figure 6
Abstract Syntax Definition of the MTS Transfer Protocol (P1)

13 Mapping onto Used Services

This clause defines the mapping of the MTS Transfer Protocol (P1) onto the used services.

Clause 13.1 defines the mapping of the MTS Transfer Protocol (P1) onto used services for application-contexts that include the RTSE in X.410-1984 mode. Clause 13.2 defines the mapping of the MTS Transfer Protocol (P1) onto used services for application-contexts that include the RTSE in normal mode.

13.1 Mapping onto RTSE X.410-1984 mode

This clause defines the mapping of the MTS Transfer Protocol (P1) onto used services for application-contexts that include the RTSE in X.410-1984 mode. Support for this mapping is not required for **MTA type A**, but mandatory for **MTA type B** and **MTA type C** for conformance to this part of ISO/IEC 10021. Note that in CCITT Recommendation X.411, support for the RTSE in X.410-1984 mode is mandatory.

Clause 13.1.1 defines the mapping of the MTA-bind and MTA-unbind services onto the RT-OPEN and RT-CLOSE services of the RTSE in X.410-1984 mode. Clause 13.1.2 defines the mapping of the Message-transfer, Probe-transfer and Report-transfer services onto the RT-TRANSFER service of the RTSE. Clause 13.1.3 describes managing the Turn using the RT-TURN-PLEASE and RT-TURN-GIVE services of the RTSE. Clause 13.1.4 defines the use of the RT-P-ABORT service of the RTSE. Clause 13.1.5 defines the use of the RT-U-ABORT service of the RTSE (not used in X.410-1984 mode).

13.1.1 Mapping onto RT-OPEN and RT-CLOSE

This clause defines the mapping of the MTA-bind and MTA-unbind services onto the RT-OPEN and RT-CLOSE services of the RTSE in X.410-1984 mode.

13.1.1.1 MTA-bind onto RT-OPEN

The MTA-bind service is mapped onto the RT-OPEN service of the RTSE. The use of the parameters of the RT-OPEN service is qualified in the following clauses.

13.1.1.1.1 Application-protocol

This parameter shall be supplied by the initiator of the association in the RT-OPEN request primitive, and shall have the value **mts-transfer-protocol** (an integer value of '12') or **mts-transfer-protocol-1984** (an integer value of '1').

13.1.1.1.2 User-data

The value of the type defined in the ARGUMENT clause of the MTA-bind service is mapped onto the User-data parameter of the RT-OPEN request primitive by the initiator of the association.

If the responder of the association supplies the Result parameter of the RT-OPEN response primitive with the value 'accepted', the value of the type defined in the RESULT clause of the MTA-bind service is mapped onto the User-data parameter of the RT-OPEN response primitive.

In the case of error the responder of the association supplies the Result parameter of the RT-OPEN response primitive with the value 'rejected (permanent)' or 'rejected (transient)'. In the case of 'rejected (permanent)', the User-data parameter of the RT-OPEN response primitive shall be either authentication-error or unacceptable-dialogue-mode.

13.1.1.1.3 Mode

This parameter shall be supplied by the initiator of the association in the RT-OPEN request primitive, and shall have the value 'X.410-1984 mode'.

13.1.1.2 MTA-unbind onto RT-CLOSE

The MTA-unbind is mapped onto the RT-CLOSE service of the RTSE. In the X.410-1984 mode, the RT-CLOSE service has no parameters.

13.1.2 Mapping onto RT-TRANSFER

The Message-transfer, Probe-transfer and Report-transfer services are mapped onto the RT-TRANSFER service of the RTSE.

An MTSE may issue an RT-TRANSFER request primitive only if it possesses the Turn (see clause 13.1.3) and if there is no outstanding RT-TRANSFER confirm primitive.

The use of the parameters of the RT-TRANSFER service is qualified in the following clauses.

13.1.2.1 APDU

The value of the MTS-APDU shall be mapped onto the APDU parameter of the RT-TRANSFER request primitive by the sender.

For the Message-transfer service, the MTS-APDU is a Message. For the Probe-transfer service, the MTS-APDU is a Probe. For the Report-transfer service, the MTS-APDU is a Report.

13.1.2.2 Transfer-time

The value of this parameter is specified by a local rule of the sender. It may be related to the priority of the APDU (see clause 13.1.3.1.1).

13.1.3 Managing the Turn

This clause describes managing the Turn using the RT-TURN-PLEASE and RT-TURN-GIVE services of the RTSE.

The MTSE must possess the Turn before it can use the RT-TRANSFER service to transfer a message, probe or report.

The MTSE without the Turn may issue an RT-TURN-PLEASE request primitive, the priority parameter of which reflects the highest priority APDU awaiting transfer.

The MTSE with the Turn may issue an RT-TURN-GIVE request primitive when it has no further APDUs to transfer. It shall issue an RT-TURN-GIVE request primitive in response to an RT-TURN-PLEASE indication primitive when it has no further APDUs to transfer of priority equal to, or higher than, that indicated in the RT-TURN-PLEASE indication primitive. If it has APDUs of lower priority still to transfer, it may then issue an RT-TURN-PLEASE request primitive, the priority parameter of which reflects the highest priority APDU awaiting transfer.

13.1.3.1 Use of the RT-TURN-PLEASE Service

An MTSE issues the RT-TURN-PLEASE request primitive to request the Turn. It may do so only if it does not already possess the Turn.

If the initiator of the association supplied a Dialogue-mode parameter value of 'monologue' and an Initial-turn parameter value of 'association-initiator', the RT-TURN-PLEASE service shall not be used.

The use of the parameter of the RT-TURN-PLEASE service is qualified in the following clause.

13.1.3.1.1 Priority

The value of the Priority parameter is supplied by the MTSE requesting the Turn, and reflects the highest priority APDU awaiting transfer.

Priority zero is the highest priority, and is reserved for the action of releasing the association by the initiator.

Priority one shall be assigned to Messages whose **priority** field (defined in clause 8.2.1.1.1.8 of ISO/IEC 10021-4) has the value **urgent**. Priority one shall also be assigned to Probes and Reports.

Priority two shall be assigned to Messages whose **priority** field is **normal**.

Priority three shall be assigned to Messages whose **priority** field is **non-urgent**.

If more than one association is established between two MTAs, MTS-APDUs may be assigned to associations in accordance with their priorities. Several associations may be used to carry MTS-APDUs of the same priority. On any one association, higher priority MTS-APDUs are sent before lower priority MTS-APDUs; MTS-APDUs of the same priority are sent 'first-in-first-out'.

13.1.3.2 Use of the RT-TURN-GIVE Service

An MTSE issues the RT-TURN-GIVE request primitive to relinquish the Turn to its peer. It may do so only if it possesses the Turn.

If the initiator of the association supplied a Dialogue-mode parameter value of 'monologue' and an Initial-turn parameter value of 'association-initiator', the RT-TURN-GIVE service shall not be used.

The RT-TURN-GIVE service has no parameters.

13.1.4 Use of the RT-P-ABORT Service

The application-process is the user of the RT-P-ABORT service of the RTSE.

The RT-P-ABORT service provides an indication to the application-process that the application-association cannot be maintained (eg because recovery not possible).

The RT-P-ABORT service has no parameters.

13.1.5 Use of the RT-U-ABORT Service

The RT-U-ABORT service of the RTSE is not available in X.410-1984 mode.

13.2 Mapping onto RTSE normal mode

This clause defines the mapping of the MTS Transfer Protocol (P1) onto used services for application-contexts that include the RTSE in normal mode. Support for this mapping is mandatory for conformance to this part of ISO/IEC 10021.

Clause 13.2.1 defines the mapping of the MTA-bind and MTA-unbind services onto the RT-OPEN and RT-CLOSE services of the RTSE in normal mode. Clause 13.2.2 defines the mapping of the Message-transfer, Probe-transfer and Report-transfer services onto the RT-TRANSFER service of the RTSE.

Clause 13.2.3 describes managing the Turn using the RT-TURN-PLEASE and RT-TURN-GIVE services of the RTSE. Clause 13.2.4 defines the use of the RT-P-ABORT service of the RTSE. Clause 13.2.5 defines the use of the RT-U-ABORT service of the RTSE.

13.2.1 Mapping onto RT-OPEN and RT-CLOSE

This clause defines the mapping of the MTA-bind and MTA-unbind services onto the RT-OPEN and RT-CLOSE services of the RTSE in normal mode.

13.2.1.1 MTA-bind onto RT-OPEN

The MTA-bind service is mapped onto the RT-OPEN service of the RTSE. The use of the parameters of the RT-OPEN service is qualified in the following clauses.

13.2.1.1.1 Mode

This parameter shall be supplied by the initiator of the association in the RT-OPEN request primitive, and shall have the value 'normal mode'.

13.2.1.1.2 Application Context Name

The initiator of the association shall propose the **mts-transfer** application-context defined in this part of ISO/IEC 10021 in the RT-OPEN request primitive.

13.2.1.1.3 User-data

The mapping of the bind-operation of the MTA-bind service onto the User-data parameter of the RT-OPEN request primitive is defined in ISO/IEC 9072-1.

13.2.1.1.4 Presentation Context Definition List

The initiator of the association supplies the Presentation Context Definition List in the RT-OPEN request primitive.

The Presentation Context Definition List comprises a presentation-context-definition for each abstract-syntax included in the application-context. A presentation-context-definition comprises a presentation-context-identifier and an abstract-syntax-name for the ASE. The named abstract-syntax for the RTSE includes the abstract-syntax for the bind-operation.

Clause 12 defines the abstract-syntaxes included in the application-context.

13.2.1.2 MTA-unbind onto RT-CLOSE

The MTA-unbind is mapped onto the RT-CLOSE service of the RTSE.

No parameters of the RT-CLOSE service are used in normal mode.

13.2.2 Mapping onto RT-TRANSFER

The Message-transfer, Probe-transfer and Report-transfer services are mapped onto the RT-TRANSFER service of the RTSE.

The mapping of these services onto the RT-TRANSFER service in normal mode is identical to the mapping in X.410-1984 mode, defined in clause 13.1.2.

13.2.3 Managing the Turn

The MTSE must possess the Turn before it can use the RT-TRANSFER service to transfer a message, probe or report.

Managing the Turn in normal mode is identical to managing the Turn in X.410-1984 mode, defined in clause 13.1.3.

13.2.4 Use of the RT-P-ABORT Service

The application-process is the user of the RT-P-ABORT service of the RTSE.

The RT-P-ABORT service provides an indication to the application-process that the application-association cannot be maintained (eg because recovery not possible).

The RT-P-ABORT service has no parameters.

Note that the use of the RT-P-ABORT service in normal mode is identical to the use of the RT-P-ABORT service in X.410-1984 mode.

13.2.5 Use of the RT-U-ABORT Service

The application-process is the user of the RT-U-ABORT service of the RTSE.

The RT-U-ABORT service enables the application-process to abort the application-association. The RT-U-ABORT service may be requested by either the initiator or the responder of the association.

No parameters of the RT-U-ABORT service are used in normal mode.

Note that the RT-U-ABORT service is not available in X.410-1984 mode.

14 Conformance

An MTA claiming conformance to the MTS Transfer Protocol (P1) specified in this part of ISO/IEC 10021 shall comply with the requirements in clauses 14.1, 14.2 and 14.3.

14.1 Statement Requirements

The following shall be stated:

a) the MTA type defined in section three of this part of ISO/IEC 10021 for which conformance is claimed;

b) whether monologue, two-way alternate, or both monologue and two-way alternate dialogue-modes are supported;

c) whether the MTA can act as the initiator, or the responder, or either the initiator or the responder, of an association.

Table 7 classifies the support for application-contexts required for conformance to the MTS Transfer Protocol (P1) for each MTA type.

Table 7
MTS Transfer Protocol Conformance Requirements

Application Context	MTA type A	MTA type B	MTA type C
MTS Transfer Protocol			
mts-transfer	Mandatory	Mandatory	Mandatory
mts-transfer-protocol	Optional	Mandatory	Mandatory
mts-transfer-protocol-1984	Optional	Optional	Mandatory

14.2 Static Requirements

The MTA shall:

a) conform to the abstract-syntax definition of the MTS Transfer Protocol (P1) defined in clause 12 of this part of ISO/IEC 10021.

14.3 Dynamic Requirements

The MTA shall:

a) conform to the procedures for distributed operation of the MTS defined in ISO/IEC 10021-4;

b) conform to the mapping onto used services defined in clause 13 of this part of ISO/IEC 10021, required by the application-contexts which are supported by the MTA type for which conformance is claimed; support for the mapping onto the RTSE in normal mode is mandatory for all MTA types, and support for the mapping onto the RTSE in X.410-1984 mode is mandatory for MTA type B and MTA type C;

c) conform to the rules for interworking with MDs conforming to CCITT Recommendation X.411 (1984) defined in Annex B of this part of ISO/IEC 10021 if MTA type C conformance is claimed;

d) conform to the use of underlying services defined in clause 11.3 of this part of ISO/IEC 10021.

Annex A

(normative)

Reference Definition of MHS Protocol Object Identifiers

This annex defines for reference purposes various object identifiers cited in the ASN.1 modules in the body of this part of ISO/IEC 10021. The object identifiers are assigned in Figure A.1.

All object identifiers that this part of ISO/IEC 10021 assigns are assigned in this annex. However, this annex is not definitive for all assignments. Other definitive assignments occur in the modules in the body of this part of ISO/IEC 10021 and are referenced in this annex.

```
MHSProtocolObjectIdentifiers { joint-iso-ccitt mhs-motis(6) protocols(0) modules(0) object-identifiers(0) }

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

--      Prologue

--      Exports Everything

IMPORTS -- nothing -- ;

--      MHS Protocols

id-mhs-protocols OBJECT IDENTIFIER ::= { joint-iso-ccitt mhs-motis(6) protocols(0) }
                                                                    -- not definitive

--      Categories of Object Identifiers

id-mod OBJECT IDENTIFIER ::= { id-mhs-protocols 0 }                 -- modules

id-ac OBJECT IDENTIFIER ::= { id-mhs-protocols 1 }                  -- application contexts

id-as OBJECT IDENTIFIER ::= { id-mhs-protocols 2 }                  -- abstract syntaxes

id-ase OBJECT IDENTIFIER ::= { id-mhs-protocols 3 }                 -- application service elements

--      Modules

id-mod-object-identifiers OBJECT IDENTIFIER ::= { id-mod 0 }        -- not definitive

id-mod-mts-access-protocol OBJECT IDENTIFIER ::= { id-mod 1 }       -- not definitive

id-mod-ms-access-protocol OBJECT IDENTIFIER ::= { id-mod 2 }        -- not definitive

id-mod-mts-transfer-protocol OBJECT IDENTIFIER ::= { id-mod 3 }     -- not definitive

--      Application Contexts

--      MTS Access Protocol

id-ac-mts-access OBJECT IDENTIFIER ::= { id-ac 0 }

id-ac-mts-forced-access OBJECT IDENTIFIER ::= { id-ac 1 }

id-ac-mts-reliable-access OBJECT IDENTIFIER ::= { id-ac 2 }

id-ac-mts-forced-reliable-access OBJECT IDENTIFIER ::= { id-ac 3 }
```


Figure A.1
Abstract Syntax Definition of MHS Protocol Object Identifiers (Part 1 of 2)

```
--      MS Access Protocol

id-ac-ms-access OBJECT IDENTIFIER ::= { id-ac 4 }

id-ac-ms-reliable-access OBJECT IDENTIFIER ::= { id-ac 5 }

--      MTS Transfer Protocol

id-ac-mts-transfer OBJECT IDENTIFIER ::= { id-ac 6 }

--      Abstract Syntaxes

id-as-acse OBJECT IDENTIFIER ::= { joint-iso-ccitt association-control(2) abstract-syntax(1)
                                                                    opdus(0) version1(1) }

id-as-msse OBJECT IDENTIFIER ::= { id-as 1 }

id-as-mdse OBJECT IDENTIFIER ::= { id-as 2 }

id-as-mrse OBJECT IDENTIFIER ::= { id-as 5 }

id-as-mase OBJECT IDENTIFIER ::= { id-as 6 }

id-as-mtse OBJECT IDENTIFIER ::= { id-as 7 }

id-as-mts-rtse OBJECT IDENTIFIER ::= { id-as 8 }

id-as-ms OBJECT IDENTIFIER ::= { id-as 9 }

id-as-ms-rtse OBJECT IDENTIFIER ::= { id-as 10 }

id-as-mts OBJECT IDENTIFIER ::= { id-as 11 }

id-as-mta-rtse OBJECT IDENTIFIER ::= { id-as 12 }

--      Application Service Elements

id-ase-msse OBJECT IDENTIFIER ::= { id-ase 0 }

id-ase-mdse OBJECT IDENTIFIER ::= { id-ase 1 }

id-ase-mrse OBJECT IDENTIFIER ::= { id-ase 2 }

id-ase-mase OBJECT IDENTIFIER ::= { id-ase 3 }

id-ase-mtse OBJECT IDENTIFIER ::= { id-ase 4 }

END     --of MHSProtocolObjectIdentifiers
```


Figure A.1
Abstract Syntax Definition of MHS Protocol Object Identifiers (Part 2 of 2)

Annex B

(normative)

Interworking with 1984 Systems

This annex defines the rules to be obeyed by MTAs claiming MTA type C conformance to this part of ISO/IEC 10021 (hereafter referred to as '1988 systems') when interworking with implementations conforming to CCITT Recommendation X.411 (1984) (hereafter referred to as '1984 systems') using the MTS Transfer Protocol (P1).

Clause B.1 defines the rules for establishing associations that a 1988 system shall obey when interworking with a 1984 system.

Clause B.2 defines the rules that a 1988 system shall obey when transferring an MTS-APDU to a 1984 system.

Clause B.3 defines the rules that a 1988 system shall obey when receiving an MTS-APDU from a 1984 system.

NOTE - As Recommendation X.411 (1984) only defines the interactions at the boundary of an ADMD, the interworking rules in this annex only apply at such a boundary.

Additional types have been added to the universal class of ASN.1 types compared to those defined in CCITT Recommendation X.409 (1984). The valid replacement specifications for an ANY type are therefore extended. Note that 1984 systems may be unable to handle the extended universal types. It is likely that a 1984 system may correctly handle these fields even if they contain the extended types. However, such fields intended for a 1984 system should be restricted to the universal types defined in CCITT Recommendation X.409 (1984).

The Basic Encoding Rules for ASN.1 give more flexibility than Recommendation X.409 (1984) for the long form of the length octets. The former permits the use of more length octets than the minimum necessary, whereas the latter does not. Therefore, when interworking with a 1984 system, it is necessary to obey this restriction, and use the fewest possible number of octets, with no leading octets having the value 0.

B.1 Association Establishment

This clause defines the restrictions that a 1988 system shall observe with the MTA-bind when establishing an association with a 1984 system. There are no restrictions with the MTA-unbind.

The **mts-transfer-protocol-1984**, as defined in clause 12, shall be used for compatibility with the 1984 system.

B.1.1 Initiator-credentials/Responder-credentials

There are no restrictions placed on these elements as the corresponding elements in CCITT Recommendation X.411 (1984) were each defined to be an ANY type. Note, however, that a 1984 system will be restricted in its use of these elements when interworking with 1988 systems as described above.

B.1.2 Security-context

This optional element shall not be generated by a 1988 system when interworking with a 1984 system. Note that a 1984 system is not capable of generating this element.

B.1.3 Bind-error

The bind-error value **unacceptable-security-context** shall not be generated by a 1988 system.

B.2 Rules for Transferring to 1984 systems

This clause defines the interworking rules that a 1988 system shall obey when transferring an MTS-APDU to a 1984 system. The transformation of an MTS-APDU conforming to ISO/IEC 10021-4 to one conforming to CCITT Recommendation X.411 (1984) is called *downgrading*. The rules are expressed in terms of the actions to be taken on each protocol element of the MTS Transfer Protocol (P1) by the 1988 system.

For a given MTS-APDU, if none of the rules deem that downgrading would fail, then the MTS-APDU shall be downgraded in accordance with all applicable rules before being transferred to the 1984 system.

If one or more of the rules deem that downgrading has failed, then the action taken by the MTA is the same as if the transfer had failed (see clause 14 of ISO/IEC 10021-4.

NOTE - The potential or actual loss of information caused by applying these rules may affect an MTA's routing strategy.

The remainder of this clause specifies the rules for each of the protocol elements. Protocol elements not specifically mentioned shall be transferred unchanged. Unless otherwise specified, the rules specified apply in whichever MTS-APDU the protocol elements appear.

B.2.1 Extensions

If any per-message **extensions** elements are present, and no **extension-field** is marked **critical-for-transfer** or **critical-for-delivery**, the **extensions** elements shall be deleted.

If any per-message **extensions** elements are present, and any **extension-field** is marked **critical-for-transfer** or **critical-for-delivery**, downgrading shall fail.

These rules shall be applied before any of the rules described in the following subclauses.

B.2.2 Per-domain-bilateral-information

If a **private-domain-identifier** is present in an element of **per-domain-bilateral-information**, then that element of **per-domain-bilateral-information** shall be deleted.

Otherwise, the **per-domain-bilateral-information** shall be unchanged.

B.2.3 Trace-information/Subject-intermediate-trace-information

If an **other-actions** element is present in any **trace-information-elements** or **subject-intermediate-trace-information-elements**, the **other-actions** element shall be deleted.

Otherwise, the **trace-information** or **subject-intermediate-trace-information** shall be unchanged.

B.2.4 Originator-name/Report-destination-name

If the **originator-name** in a **message-transfer-envelope** or a **probe-transfer-envelope**, or if the **report-destination-name** in a **report-transfer-envelope**, cannot be downgraded according to the rules given for **OR-name** (see clause B.2.7), then downgrading shall fail.

Otherwise the element shall be unchanged.