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Information processing systems — Text communication — Remote Operations —

Part 2 :
Protocol specification

Systèmes de traitement de l'information — Communication de texte — Opérations à distance —

Partie 2 : Spécification du protocole

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Contents

Page

Foreword iii

Introduction iv

1 Scope 1

2 Normative references 1

3 Definitions 2

4 Abbreviations 3

5 Conventions 3

6 Overview of the protocol 3

7 Elements of procedure 5

8 Mapping to used services 12

9 Abstract syntax definition of APDUs 14

10 Conformance 17

Annexes

A ROPM State tables 18

B Differences between this part of ISO/IEC 9072 and CCITT Recommendation X.410 - 1984 27

C Summary of assigned object identifier values 28

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for worldwide standardization as a whole. 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 approval before their acceptance as International Standards. They are approved in accordance with procedures requiring at least 75 % approval by the national bodies voting.

International Standard ISO/IEC 9072-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

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Information processing systems -Text communication - Remote Operations - Part 2: Protocol specification

1 Scope

This part of ISO/IEC 9072 specifies the protocol (abstract syntax) and procedures for the Remote Operation Service Element (part 1 of this International Standard). The ROSE services are provided in conjunction with the Association Control Service Element (ACSE) services (ISO 8649) and the ACSE protocol (ISO 8650), optionally the Reliable Transfer Service Element (RTSE) services (ISO/IEC 9066-1) and the RTSE protocol (ISO/IEC 9066-2), and the presentation-service (ISO 8822).

The ROSE procedures are defined in terms of

a) the interactions between peer ROSE protocol machines through the use of RTSE services or the presentation-service;

b) the interactions between the ROSE protocol machine and its service-user.

This part of ISO/IEC 9072 specifies conformance requirements for systems implementing these procedures.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9072. At the time of publication, the editions were valid. All Standards are subject to revision, and parties to agreement based on this part of ISO/IEC 9072 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.

ISO/IEC 7498: 1984, *Information processing systems - Open Systems Interconnection - Basic Reference Model.*

ISO/TR 8509: 1987, *Information processing systems - Open Systems Interconnection - Service Conventions.*

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

ISO 8650: 1988, *Information processing systems - Open Systems Interconnection - Protocol specification for the Association Control Service Element.*

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

ISO 8824: 1987, *Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1).*

ISO 8825: 1987, *Information processing systems - Open Systems Interconnection - Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1).*

ISO/IEC 9066-1: 1989, *Information processing systems - Text communication - Reliable Transfer - Part 1: Model and service definition.*

ISO/IEC 9066-2: 1989, *Information processing systems - Text communication - Reliable Transfer - Part 2: Protocol specification.*

ISO/IEC 9072-1: 1989, *Information processing systems - Text communication - Remote Operations - Part 1: Model, notation and service definition.*

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Full document details: ISO_IEC 9072-2_1989

3 Definitions

3.1 Reference Model definitions

This part of ISO/IEC 9072 is based on the concepts developed in ISO/IEC 7498 and makes use of the following terms defined in it:

a) Application Layer;

b) application-process;

c) application-entity;

d) application-service-element;

e) application-protocol-data-unit;

f) application-protocol-control-information;

g) presentation-service;

h) presentation-connection;

i) session-service;

j) session-connection;

k) transfer syntax; and

l) user-element.

3.2 Service conventions definitions

This part of ISO/IEC 9072 makes use of the following terms defined in ISO/TR 8509:

a) service-provider;

b) service-user;

c) confirmed service;

d) non-confirmed service;

e) provider-initiated service;

f) primitive;

g) request (primitive);

h) indication (primitive);

i) response (primitive); and

j) confirm (primitive).

3.3 Presentation service definitions

This part of ISO/IEC 9072 makes use of the following terms defined in ISO 8822:

a) abstract syntax;

b) abstract syntax name;

c) presentation context.

3.4 Association control definitions

This part of ISO/IEC 9072 makes use of the following terms defined in ISO 8649:

a) application-association; association;

b) application context;

c) Association Control Service Element.

3.5 Reliable Transfer definitions

This part of ISO/IEC 9072 makes use of the following terms defined in ISO/IEC 9066-1:

a) Reliable Transfer Service Element.

3.6 ROSE service definitions

This part of ISO/IEC 9072 makes use of the following terms defined in ISO/IEC 9072-1:

a) association-initiating-application-entity; association-initiator;

b) association-responding-application-entity; association-responder;

c) invoking-application-entity; invoker;

d) performing-application-entity; performer;

e) requestor;

f) acceptor;

g) linked-operations;

h) parent-operation;

i) child-operation;

j) RO-notation;

k) Remote Operation Service Element;

l) ROSE-provider;

m) ROSE-user;

n) RTSE-user;

o) Remote Operations.

3.7 Remote Operation protocol specification definitions

For the purpose of this part of ISO/IEC 9072 the following definitions apply:

3.7.1 remote-operation-protocol-machine: The protocol machine for the Remote Operation Service Element specified in this part of ISO/IEC 9072.

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3.7.2 requesting-remote-operation-protocol-machine: The remote-operation-protocol-machine whose service-user is the requestor of a particular Remote Operation Service Element service.

3.7.3 accepting-remote-operation-protocol-machine: The remote-operation-protocol-machine whose service-user is the acceptor for a particular Remote Operation Service Element service.

4 Abbreviations

4.1 Data units

APDU application-protocol-data-unit

4.2 Types of application-protocol-data-units

The following abbreviations have been given to the application-protocol-data-units defined in this part of ISO/IEC 9072 .

ROIV RO-INVOKE application-protocol-data-unit

RORS RO-RESULT application-protocol-data-unit

ROER RO-ERROR application-protocol-data-unit

RORJ RO-REJECT application-protocol-data-unit

4.3 Other abbreviations

The following abbreviations are used in this part of ISO/IEC 9072 .

AE Application Entity

ACSE Association Control Service Element

ASE Application Service Element

RO (or ROS) Remote Operations

ROPM Remote Operations Protocol Machine

ROSE Remote Operations Service Element

RT Reliable Transfer

RTSE Reliable Transfer Service Element

5 Conventions

This part of ISO/IEC 9072 employs a tabular presentation of its APDU fields. In clause 7, tables are presented for each ROSE APDU. Each field is summarized using the following notation:

M presence is mandatory

U presence is a ROSE-user option

req source is related request primitive

ind sink is related indication primitive

resp source is related response primitive

conf sink is related confirm primitive

sp source or sink is the ROPM

The structure of each ROSE APDU is specified in clause 9 using the abstract syntax notation of ISO/IEC 8824.

6 Overview of the protocol

6.1 Service provision

The protocol specified in this part of ISO/IEC 9072 provides the ROSE services defined in ISO/IEC 9072-1. These services are listed in table 1.

Table 1 - ROSE services summary

Service	Type
RO-INVOKE	Non-confirmed
RO-RESULT	Non-confirmed
RO-ERROR	Non-confirmed
RO-REJECT-U	Non-confirmed
RO-REJECT-P	Provider-initiated

6.2 Use of services

The ROSE protocol specified in this part of ISO/IEC 9072 needs a transfer service to pass information in the form of ROSE APDUs between peer application-entities (AEs).

Two transfer services may be used alternatively:

a) the RTSE services, if the RTSE is included in the application-context, or

b) the presentation-service, if the RTSE is not included in the application-context.

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In both cases an existing application-association, established and released by means of the ACSE services, is assumed.

6.2.1 Use of the RTSE services

If the RTSE is included in the application-context, this part of ISO/IEC 9072 assumes that the ROPM is the sole user of the RT-TRANSFER service and the RT-TURN-GIVE service.

The initiating AE may only request the release of the application-association by means of the RT-CLOSE service if it possesses the Turn. Therefore the RTSE-user and the ROPM are the user of the RT-TURN-PLEASE service.

The ROPM is the user of the RT-U-ABORT and RT-P-ABORT services.

6.2.2 Use of the presentation-service

If the RTSE is not included in the application-context, the ROPM is a user of the P-DATA service.

6.3 Model

The remote-operation-protocol-machine (ROPM) communicates with its service-user by means of primitives defined in ISO/IEC 9072-1. Each invocation of the ROPM controls a single application-association.

The ROPM is driven by ROSE service request primitives from its service-user, and by indication and confirm primitives of the RTSE services, or the presentation-service. The ROPM, in turn, issues indication primitives to its service-user, and request primitives on the used RTSE services, or the presentation-service. If the RTSE is included in the application-context, the RT-TRANSFER indication, RT-TRANSFER request and RT-TRANSFER confirm primitives are used. In the case of an application-context excluding RTSE, the presentation-service P-DATA request, and P-DATA indication primitives are used. In this case the transfer is not confirmed.

The reception of a ROSE service primitive, or of a RTSE service or of a presentation-service primitive, and the generation of dependent actions are considered to be indivisible.

During the exchange of APDUs, the existence of both, the association-initiating AE and the association-responding AE is presumed. How these AEs are created is beyond the scope of this part of ISO/IEC 9072.

During the execution of operations, the existence of an application-association between the peer AEs is presumed. How this application-association is established and released is beyond the scope of this part of ISO/IEC 9072 (see ISO/IEC 9072-1, ISO 8649, ISO 8650, ISO/IEC 9066-1 and ISO/IEC 9066-2).

NOTE Each application-association may be identified in an end system by an internal, implementation dependent mechanism so that the ROSE service-user and the ROPM can refer to it.

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7 Elements of procedure

The ROSE protocol consists of the following elements of procedure:

a) invocation

b) return-result

c) return-error

d) user-reject

e) provider-reject.

In the following clauses, a summary of each of these elements of procedure is presented. This consists of a summary of the relevant APDUs, and a high-level overview of the relationship between the ROSE service primitives, the APDUs involved, and the transfer service that is used.

The generic terms transfer service, transfer service-provider, transfer request, and transfer indication are used in the context of clause 7. Clause 8 describes how these generic service primitives are mapped either on to the RTSE services or the presentation-service.

In clause 9 a detailed specification of the ROSE APDUs is given using the notation defined in ISO 8824.

7.1 Invocation

7.1.1 Purpose

The invocation procedure is used by one AE (the invoker) to request an operation to be performed by the other AE (the performer).

7.1.2 APDUs used

The invocation procedure uses the RO-INVOKE (ROIV) APDU.

The fields of the ROIV APDU are listed in table 2.

7.1.3 Invocation procedure

This procedure is driven by the following events:

a) a RO-INVOKE request primitive from the requestor

b) a ROIV APDU as user-data of a transfer indication primitive.

7.1.3.1 RO-INVOKE request primitive

Table 2 - ROIV APDU fields

Field name	Pre-sence	Source	Sink
Invoke-ID	M	req	ind
Linked-ID	U	req	ind
Operation-value	M	req	ind
Argument	U	req	ind

The requesting ROPM forms a ROIV APDU from the parameter values of the RO-INVOKE request primitive. It issues a transfer request primitive. The user-data parameter of the transfer request primitive contains the ROIV APDU.

The requesting ROPM waits either for a transfer indication primitive from the transfer service-provider or any other primitive from the requestor.

7.1.3.2 ROIV APDU

The accepting ROPM receives a ROIV APDU from its peer as user-data on a transfer indication primitive. If any of the fields of the ROIV APDU are unacceptable to this ROPM, the provider-reject procedure is performed, and no RO-INVOKE indication primitive is issued by the ROPM.

If the ROIV APDU is acceptable to the accepting ROPM, it issues a RO-INVOKE indication primitive to the acceptor. The RO-INVOKE indication primitive parameters are derived from the ROIV APDU.

The accepting ROPM waits either for a transfer indication primitive from the transfer service-provider or any other primitive from the acceptor.

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7.1.4 Use of the ROIV APDU fields

The ROIV fields are used as follows.

7.1.4.1 Invoke-ID

This is the invoke-ID parameter value of the RO-INVOKE request primitive. It appears as the invoke-ID parameter value of the RO-INVOKE indication primitive.

The value of this field is transparent to the ROPM, however the value may be used in the provider reject procedure.

7.1.4.2 Linked-ID

This is the linked-ID parameter value of the RO-INVOKE request primitive. It appears as the linked-ID parameter value of the RO-INVOKE indication primitive.

The value of this field is transparent to the ROPM.

7.1.4.3 Operation-value

This is the operation-value parameter value of the RO-INVOKE request primitive. It appears as the operation-value parameter value of the RO-INVOKE indication primitive.

The value of this field is transparent to the ROPM.

7.1.4.4 Argument

This is the argument parameter value of the RO-INVOKE request primitive. It appears as the argument parameter value of the RO-INVOKE indication primitive.

The value of this field is transparent to the ROPM.

7.2 Return-result

7.2.1 Purpose

The return-result procedure is used by one AE (the performer) to request the transfer of the result of a successfully performed operation to the other AE (the invoker).

7.2.2 APDUs used

The return-result procedure uses the RO-RESULT (RORS) APDU.

The fields of the RORS APDU are listed in table 3.

7.2.3 Return-result procedure

This procedure is driven by the following events:

a) a RO-RESULT request primitive from the requestor;

b) a RORS APDU as user-data of a transfer indication primitive.

7.2.3.1 RO-RESULT Request Primitive

Table 3 - RORS APDU fields

Field name	Pre-sence	Source	Sink
Invoke-ID	M	req	ind
Operation-value	U	req	ind
Result	U	req	ind

The requesting ROPM forms a RORS APDU from the parameter values of the RO-RESULT request primitive. It issues a transfer request primitive. The user-data parameter of the transfer request primitive contains the RORS APDU.

The requesting ROPM waits either for a transfer indication primitive from the transfer service-provider or any other primitive from the requestor.

7.2.3.2 RORS APDU

The accepting ROPM receives a RORS APDU from its peer as user-data on a transfer indication primitive. If any of the fields of the RORS APDU are unacceptable to this ROPM, the provider-reject procedure is performed, and no RO-RESULT indication primitive is issued by the ROPM.

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