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**Information technology — Open Systems  
Interconnection — Common management  
information service**

*Technologies de l'information — Interconnexion de systèmes ouverts  
(OSI) — Service commun d'informations de gestion*

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## 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 9595 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 33, *Distributed application services*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.710.

This third edition cancels and replaces the second edition (ISO/IEC 9595:1991), which has been technically revised. It also incorporates Amendment 4:1992, Technical Corrigendum 1:1992, Technical Corrigendum 2:1992, Technical Corrigendum 3:1994 and Technical Corrigendum 4:1995.

Annexes A and B of this International Standard are for information only.

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## INTERNATIONAL STANDARD

## ITU-T RECOMMENDATION

## INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – COMMON MANAGEMENT INFORMATION SERVICE

### 1 Scope

This Recommendation | International Standard defines an Application Service Element (the Common Management Information Service Element), which may be used by an application process in a centralized or decentralized management environment to exchange information and commands for the purpose of systems management, as defined by the OSI Management Framework in CCITT Rec. X.700 | ISO/IEC 7498-4. This Recommendation | International Standard is positioned in the application layer of ITU-T Rec. X.200 | ISO/IEC 7498-1 and is defined according to the model provided by ITU-T Rec. X.207 | ISO/IEC 9545.

This Recommendation | International Standard defines:

- a set of service primitives that constitute the application service element;
- the parameters that are passed in each service primitive;
- any necessary information for the semantic description of each service primitive.

This Recommendation | International Standard does not define:

- the nature of any implementation intended to provide the defined service;
- the semantics associated with the information or commands that are exchanged by means of the service;
- the manner in which management is accomplished by the user of the service;
- the nature of any interactions which result in the use of the service.

No requirement is made for conformance to this Recommendation | International Standard.

### 2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

#### 2.1 Identical Recommendations | International Standards

- ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*.
- ITU-T Recommendation X.207 (1993) | ISO/IEC 9545:1994, *Information technology – Open Systems Interconnection – Application layer structure*.
- ITU-T Recommendation X.210 (1993) | ISO/IEC 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI Services*.

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- ITU-T Recommendation X.217 (1995) | ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the Association Control Service Element*.
- ITU-T Recommendation X.711 (1997) | ISO/IEC 9596-1:1998, *Information technology – Open Systems Interconnection – Common management information protocol: Specification*.

### 2.2 Paired Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.700 (1992), *Management framework for Open Systems Interconnection (OSI) for CCITT applications*.  
ISO/IEC 7498-4:1989, *Information processing systems – Open Systems Interconnection – Basic Reference Model – Part 4: Management framework*.

## 3 Definitions

For the purposes of this Recommendation | International Standard, the following definitions apply.

### 3.1 Basic reference model definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.200 | ISO/IEC 7498-1:

- application-service-element;
- open system;
- systems-management.

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### 3.2 Management framework definitions

This Recommendation | International Standard makes use of the following terms defined in CCITT Rec. X.700 | ISO/IEC 7498-4:

- managed object; [ISO/IEC 9595:1998](https://standards.iteh.ai/catalog/standards/sist/380b1e81-a61c-4d39-9416-890fa298135f/iso-iec-9595-1998)
- management information; [890fa298135f/iso-iec-9595-1998](https://standards.iteh.ai/catalog/standards/sist/380b1e81-a61c-4d39-9416-890fa298135f/iso-iec-9595-1998)
- systems management application-entity.

### 3.3 ACSE definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.217 | ISO/IEC 8649:

- application-association;
- application context;
- association;
- association-initiator.

### 3.4 Service conventions definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.210 | ISO/IEC 10731:

- confirm (primitive);
- confirmed-service;
- indication (primitive);
- non-confirmed-service;
- request (primitive);
- response (primitive).

### 3.5 Additional definitions

**3.5.1 attribute:** A property of a managed object. An attribute has a value.

**3.5.2 Common Management Information Service Element:** The particular application-service-element defined in this Recommendation | International Standard.

**3.5.3 Common Management Information Services:** The set of services provided by the Common Management Information Service Element.

**3.5.4 CMISE-service-provider:** An abstraction of the totality of those entities which provide CMISE services to peer CMISE-service-users.

**3.5.5 CMISE-service-user:** The part of an application process that makes use of the Common Management Information Service Element.

**3.5.6 functional unit:** The unit of service used for the negotiation of service options.

**3.5.7 invoking CMISE-service-user:** The CMISE-service-user that invokes a management operation or notification.

**3.5.8 performing CMISE-service-user:** The CMISE-service-user that performs a management operation or notification invoked by a peer CMISE-service-user.

**3.5.9 set-valued attribute:** An attribute whose value is a mathematical set of values of the same type. Values in the set cannot be repeated and no ordering is implied.

## 4 Symbols and abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

ACSE	Association Control Service Element
ASE	Application Service Element
CMIS	Common Management Information Service
CMISE	Common Management Information Service Element
Conf	Confirm
Ind	Indication
Req	Request
Rsp	Response

## 5 Conventions

This Recommendation | International Standard defines services for CMIS following the descriptive conventions defined in ITU-T Rec. X.210 | ISO/IEC 10731. In clause 8, the definition of each CMIS service includes a table that lists the parameters of its primitives. The definition of parameters in the Rsp/Conf column of a table apply only to the confirmed service. For a given primitive, the presence of each parameter is described by one of the following values:

M	The parameter is mandatory
(=)	The value of the parameter is equal to the value of the parameter in the column to the left
U	The use of the parameter is a service-user-option
–	The parameter is not present in the interaction described by the primitive concerned
C	The parameter is conditional. The condition(s) are defined by the text which describes the parameter

## 6 Service overview

Management information services are used by application processes in peer open systems, to exchange information and commands for the purpose of systems management.

There are two types of information transfer service:

- a management notification service;
- a management operation service.

The Common Management Information service provides additional structuring facilities. These enable:

- multiple responses to confirmed operations to be “linked” to the operation by the use of a linked identification parameter;
- operations to be performed on multiple managed objects, selected to satisfy some criteria and be subject to a “synchronizing” condition.

The CMISE services are listed in Table 1.

**Table 1 – CMISE services**

Service	Type
M-CANCEL-GET	Confirmed
M-EVENT-REPORT	Confirmed/non-confirmed
M-GET	Confirmed
M-SET	Confirmed/non-confirmed
M-ACTION	Confirmed/non-confirmed
M-CREATE	Confirmed
M-DELETE	Confirmed

### 6.1 Association services

This Recommendation | International Standard does not provide separate services for the establishment and release of application associations. The CMISE-service-user relies on the services of ITU-T Rec. X.217 | ISO/IEC 8649 for the control of application-associations.

During the association establishment phase, various ASEs may exchange initialization information to establish an association using ACSE. The application context specifies the rules required for coordinating the information belonging to different ASEs, embedded in ACSE user information service parameters. The application context, presentation and session requirements are conveyed using parameters of the A-ASSOCIATE service.

The A-RELEASE and A-ABORT services of ITU-T Rec. X.217 | ISO/IEC 8649 are used for the termination of an association. These may be invoked by either of the CMISE-service-users.

### 6.2 Management notification services

The definition of the notification and the consequent behaviour of the communicating entities is dependent upon the specification of the managed object which generated the notification and is outside the scope of the Common Management Information service. However, certain notifications are used frequently within the scope of systems management and CMIS provides the following definition of the common service that may be used to convey management information applicable to the notification.

The M-EVENT-REPORT service is invoked by a CMISE-service-user to report an event about a managed object to a peer CMISE-service-user. The service may be requested in a confirmed or a non-confirmed mode. In the confirmed mode, a reply is expected.



### 6.3 Management operation services

The definition of the operation and the consequent behaviour of the communicating entities is dependent upon the specification of the managed object at which the operation is directed and is outside the scope of the Common Management Information Services. However, certain operations are used frequently within the scope of systems management and CMIS provides the following definitions of the common services that may be used to convey management information applicable to the operations.

**6.3.1** The M-GET service is invoked by a CMISE-service-user to request the retrieval of management information from a peer CMISE-service-user. The service may only be requested in a confirmed mode, and a reply is expected.

**6.3.2** The M-SET service is invoked by a CMISE-service-user to request the modification of management information by a peer CMISE-service-user. The service may be requested in a confirmed or a non-confirmed mode. In the confirmed mode, a reply is expected.

**6.3.3** The M-ACTION service is invoked by a CMISE-service-user to request a peer CMISE-service-user to perform an action. The service may be requested in a confirmed or a non-confirmed mode. In the confirmed mode, a reply is expected.

**6.3.4** The M-CREATE service is invoked by a CMISE-service-user to request a peer CMISE-service-user to create an instance of a managed object. The service may only be requested in the confirmed mode, and a reply is expected.

**6.3.5** The M-DELETE service is invoked by a CMISE-service-user to request a peer CMISE-service-user to delete an instance of a managed object. The service may only be requested in the confirmed mode, and a reply is expected.

**6.3.6** The M-CANCEL-GET service is invoked by a CMISE-service-user to request a peer CMISE-service-user to cancel a previously requested and currently outstanding invocation of the M-GET service. The service may only be requested in the confirmed mode and a reply is expected.

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### 6.4 Management information tree

Management information may be viewed as a collection of managed objects, each of which has attributes, and may have defined events and actions. Names of instances of managed objects are arranged hierarchically in a management information tree.

It is conceivable that there may be dynamic changes to the management information tree and that this knowledge may not be instantaneously available to other open systems.

### 6.5 Managed object selection

Managed object selection involves two phases: scoping and filtering.

Scoping entails the identification of the managed object(s) to which a filter is to be applied.

Filtering entails the application of a set of tests to each member of the set of previously scoped managed objects to extract a subset.

The subset of scoped managed objects that satisfy the filter is selected for the operation.

NOTE – If no filter is specified, then the set of scoped managed objects is selected for the operation.

#### 6.5.1 Scoping

The base managed object is defined as the root of the subtree of the management information tree from which the search is to commence. Four specifications of scoping level are defined:

- a) the base object alone;
- b) the  $n$ th level subordinates of the base object;
- c) the base object and all of its subordinates down to and including the  $n$ th level;
- d) the base object and all of its subordinates (whole subtree).

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When the scope parameter is not specified, the scoped managed object is the object specified by the base object instance parameter.

NOTE – The base object is defined to be level zero.

### 6.5.2 Filtering

A filter is a set of one or more assertions about the presence or values of attributes in a scoped managed object. If the filter involves more than one assertion, the assertions are grouped together using logical operators. If the filter test succeeds for a given managed object, then that managed object is selected for performance of the operation.

### 6.5.3 Synchronization

A synchronization parameter is provided to allow the CMISE-service-user to indicate the manner in which operations are to be synchronized across managed object instances when multiple managed objects have been selected by the scope and filter mechanism. The CMISE-service-user may request one of two types of synchronization: atomic or best effort. Since the order in which object instances are selected by the filter is a local matter, synchronization based on order is not meaningful.

NOTE – CMIS does not provide a parameter to indicate synchronization across attributes within a managed object. This will be specified as part of the managed object behaviour and may vary for different attribute combinations and operations.

## 7 Functional units

The general service capabilities are designated as functional units, where functional units correspond to the support of service primitives or parameters.

### 7.1 Kernel functional unit

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### 7.2 Additional functional units

#### 7.2.1 Multiple object selection functional unit

This functional unit makes available the use of the scope and synchronization parameters in the services in the kernel functional unit. These parameters are not present in the M-EVENT-REPORT and M-CREATE services.

If the multiple object selection functional unit is proposed, then the multiple reply functional unit shall also be proposed.

#### 7.2.2 Filter functional unit

This functional unit makes available the use of the filter parameter in the services in the kernel functional unit. The filter parameter is not present in the M-EVENT-REPORT and M-CREATE services.

#### 7.2.3 Multiple reply functional unit

This functional unit makes available the use of the linked identification parameter in the services in the kernel functional unit. The linked identification parameter is not present in the M-EVENT-REPORT and M-CREATE services.

Multiple replies to a single management operation may only occur if the invoking CMISE-service-user selects multiple managed objects or requests an M-ACTION operation for a single managed object in which the action is defined to produce multiple responses.

NOTE – The use of the multiple reply functional unit may result in a large amount of data to be returned. Currently, CMIS provides only the M-CANCEL-GET service for controlling the flow of data. Additional mechanisms for controlling data flow or for controlling an operation are for further study.

#### 7.2.4 Extended service functional unit

This functional unit makes available presentation layer services in addition to the P-DATA service.

All of the CMISE services listed in Table 1, except for the M-CANCEL-GET service, are included in the kernel functional unit. For the services in the kernel functional unit, the linked identification parameter shall not be used unless the multiple reply functional unit is agreed for use on the association between the CMISE-service-users. The scope and synchronization parameters shall not be used unless the multiple object selection functional unit has been agreed. The filter parameter shall not be used unless the filter functional unit has been agreed.

### 7.2.5 Cancel get functional unit

This functional unit makes available the use of the M-CANCEL-GET service.

## 8 Service definition

The CMISE services are listed in Table 1.

Parameters returned as part of the confirm primitive may occur as the result of a successful operation (these are described as “included in the success confirmation”), or as the result of an error condition (these are described as “included in the failure confirmation”).

Some operations may report an error code. In the event of multiple errors with one of the errors being a security violation, the error code “access denied” shall be returned, subject to the security policy in effect.

### 8.1 Association services

#### 8.1.1 Association establishment

The A-ASSOCIATE service of ITU-T Rec. X.217 | ISO/IEC 8649 is invoked by a CMISE-service-user to establish an association with a peer CMISE-service-user. Association establishment is the first phase of any instance of management information service activity.

Table 2 lists the parameters that are defined by this Recommendation | International Standard to be the CMIS specific part of the user information parameter of the A-ASSOCIATE service. This information is specified by the association-initiator and exchanged when establishing an association. Exchange of this initialization information is required prior to using management operation and notification services.

**Table 2 – A-ASSOCIATE user information**

Parameter name	Req/Ind	Rsp/Conf
Functional units	U	U
Access control	U	U
User information	U	U

#### 8.1.1.1 Functional units

When supplied by the initiating CMISE-service-user, this parameter specifies the set of additional functional units that the initiating CMISE-service-user is proposing for use on the association. When returned by the responding CMISE-service-user, this parameter specifies the set of additional functional units that the responding CMISE-service-user is proposing for use on the association.

When this parameter is not supplied, it is assumed that no additional functional unit is proposed.

Any additional functional unit that has been proposed by both CMISE-service-users is agreed to be available for use on the association.

If the extended service functional unit is successfully negotiated, then presentation layer services other than the P-DATA service are available for use. Details of those other presentation services, and how they are used, are described in the definitions of the application context in use on the association.

#### 8.1.1.2 Access control

This parameter may be used by access control functions to verify the privileges of the association-initiator and for the establishment of default access privileges for all exchanges on the association. Subsequent exchanges may specify additional access control information which is used by access control functions in conjunction with the default access privileges to determine the access status of the initiating CMISE-service-user for that exchange. If the access control policy permits, the additional access control information may be used to determine the access status for subsequent exchanges.

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The definition of access control functions is outside the scope of this Recommendation | International Standard, and the CMIS user may specify how this field is to be used.

### 8.1.13 User information

The initiating CMISE-service-user and/or the responding CMISE-service-user may optionally include user information on the request and/or response primitive respectively. The meaning of this parameter is application context specific.

### 8.1.2 Association release

The A-RELEASE service of ITU-T Rec. X.217 | ISO/IEC 8649 is invoked by a CMISE-service-user to request the orderly termination of an association between peer application entities. This Recommendation | International Standard does not specify any use of the parameters of the A-RELEASE service.

The A-ABORT service is invoked by a CMISE-service-user to request the abrupt termination of the association between peer application entities.

Table 3 lists the parameters that are defined by this Recommendation | International Standard to be the CMIS specific part of the user information parameter of the A-ABORT service.

**Table 3 – A-ABORT user information**

CMIS Parameter	A-ABORT Req/Ind
Abort source	M
User information	U

#### 8.1.2.1 Abort source

The abort source parameter indicates the initiating source of the abort. It takes one of the following symbolic values:

- CMISE-service-provider;
- CMISE-service-user.

#### 8.1.2.2 User information

The initiating source of the abort may include user information. The meaning of this parameter is application context specific.

## 8.2 Management notification service

The M-EVENT-REPORT service is used by a CMISE-service-user to report an event to a peer CMISE-service-user. It is defined as a confirmed and a non-confirmed service.

### 8.2.1 M-EVENT-REPORT parameters

Table 4 lists the parameters for this service.

**Table 4 – M-EVENT-REPORT parameters**

Parameter name	Req/Ind	Rsp/Conf
Invoke identifier	M	(M=)
Mode	M	–
Managed object class	M	U
Managed object instance	M	U
Event type	M	C(=)
Event time	U	–
Event information	U	–
Current time	–	U
Event reply	–	C
Errors	–	C