INTERNATIONAL STANDARD

ISO/IEC 9595

First edition
1990-05-15

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

Technologies de l'information — Interconnexion de systèmes ouverts — Définition du service commun d'information de gestion

Reference number
ISO 9595 : 1990 (E)

Contents

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*.

Annex A is for information only.

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

1 Scope

This 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 ISO/IEC 7498-4. This International Standard is positioned in the application layer of ISO 7498 and is defined according to the model provided by ISO/IEC 9545.

This 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 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 International Standard.

2 Normative references

The following International Standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO/IEC 7498-4 : 1989, *Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 4: Management Framework.*

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

ISO 8649 : 1987, *Information processing systems - Open Systems Interconnection - Service definition for the Association Control Service Element.*

ISO/IEC 9545[1], *Information processing systems - Open Systems Interconnection - Application Layer Structure (ALS).*

3 Definitions

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

3.1 Basic Reference Model definitions

This International Standard makes use of the following terms defined in ISO 7498.

a) application-service-element;
b) open system;
c) systems-management.

3.2 Management Framework definitions

This International Standard makes use of the following terms defined in ISO/IEC 7498-4.

a) managed object;
b) management information;
c) systems management application-entity.

3.3 ACSE definitions

This International Standard makes use of the following terms defined in ISO 8649.

a) application-association;
b) application context;
c) association;
d) association-initiator.

3.4 Service conventions definitions

This International Standard makes use of the following terms defined in ISO/TR 8509.

a) confirm (primitive);
b) confirmed-service;
c) indication (primitive);

1) To be published.

d) non-confirmed-service;
e) request (primitive);
f) 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 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-sevice-user that invokes a management operation or notification.

3.5.8 Performing CMISE-service-user: The CMISE-service-user that perfoms a management operation or notification invoked by a peer CMISE-service-user.

4 Symbols and abbreviations

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 International Standard defines services for CMIS following the descriptive conventions defined in ISO/TR 8509. 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) a management notification service;

b) a management operation service.

The Common Management Information Service provides additional structuring facilities. These enable

a) multiple responses to confirmed operations to be "linked" to the operation by the use of a linked identification parameter;

b) 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-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 International Standard does not provide separate services for the establishment and release of application associations. The CMISE-service-user relies on the services of ISO 8649 for the control of application-associations.

During the association establishment phase, various ASEs may exchange initialisation 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 ISO 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 Service. 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.

6.4 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, indicating whether the filter is to be applied to

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).

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

All of the CMISE services listed in table 1 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 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.

NOTE — The use of the multiple reply functional unit may result in a large amount of data to be returned. Currently, CMIS provides no facility for controlling the flow of data or for controlling an operation; additional mechanisms to cater for this situation are necessary and 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.

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 notification 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, then the error code "access denied" shall be returned.

8.1 Association services

8.1.1 Association establishment

The A-ASSOCIATE service of ISO 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 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 initialisation 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	—
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 which 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 is information of unspecified form to be used as input to access control functions in establishing default access privileges for all exchanges on the association. If a subsequent service request specifies an access control parameter, then the access privileges for that and only that invocation of the service are determined from that parameter.

8.1.1.3 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 ISO 8649 is invoked by a CMISE-service-user to request the orderly termination of an association between peer application entities. This 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 parameter that is defined by this International Standard to be the abort source parameter of the A-ABORT service.

Table 3 — A-ABORT user information

CMIS Parameter	A-ABORT Req/Ind
Abort source	M

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.

8.2 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

8.2.1.1 Invoke identifier

This parameter specifies the identifier assigned to the notification. It can be used to distinguish this notification from other notifications or operations that the CMISE-service-provider may have in progress.

8.2.1.2 Mode

This parameter specifies the mode requested for the operation. The possible values are

— confirmed;

— non-confirmed.

8.2.1.3 Managed object class

This parameter specifies the class of the managed object in which the event occurred. It may be included in any confirmation.

8.2.1.4 Managed object instance

This parameter specifies the instance of the managed object in which the event occurred. It may be included in any confirmation.

8.2.1.5 Event type

This parameter specifies the type of event being reported. It may be included in the success confirmation and shall be included if the event reply parameter is included.

8.2.1.6 Event time

This parameter contains the time of generation of the event.

8.2.1.7 Event information

This parameter contains information that the invoking CMISE-service-user is able to supply about the event.

8.2.1.8 Current time

This parameter contains the time at which the response was generated. It may be included in the success confirmation.

8.2.1.9 Event reply

This parameter contains the reply to the event report. It may be included in the success confirmation.

8.2.1.10 Errors

This parameter contains the error notification for the operation. It shall be included by the performing CMISE-service-user in the failure confirmation. The following errors may occur

— duplicate invocation: the invoke identifier specified was allocated to another notification or operation;

— invalid argument value: the event information value specified was out of range or otherwise inappropriate;

— mistyped argument: one of the parameters supplied has not been agreed for use on the association between the CMISE-service-users;

— no such argument: the event information specified was not recognized;

— no such event type: the event type specified was not recognized;

— no such object class: the class of the specified managed object was not recognized;

— no such object instance: the instance of the specified managed object was not recognized;

— processing failure: a general failure in processing the notification was encountered;

— resource limitation: the notification was not processed due to resource limitation;

— unrecognized operation: the operation is not one of those agreed between the CMISE-service-users.

8.2.2 M-EVENT-REPORT procedures

8.2.2.1 The invoking CMISE-service-user reports an event to a performing CMISE-service-user by issuing an M-EVENT-REPORT request primitive to the CMISE-service-provider.

8.2.2.2 The CMISE-service-provider issues an M-EVENT-REPORT indication primitive to the performing CMISE-service-user.

8.2.2.3 In the confirmed mode, the performing CMISE-service-user reports acceptance or rejection of the M-EVENT-REPORT request primitive by issuing an M-EVENT-REPORT response primitive to the CMISE-service-provider.

8.2.2.4 In the confirmed mode, the CMISE-service-provider issues an M-EVENT-REPORT confirm primitive to the invoking CMISE-service-user.

8.3 Management operation services

8.3.1 M-GET service

The M-GET service is used by a CMISE-service-user to retrieve attribute values from a peer CMISE-service-user. It is defined as a confirmed service.

8.3.1.1 M-GET parameters

Table 5 lists the parameters for this service.

Table 5 — M-GET parameters

Parameter Name	Req/Ind	Rsp/Conf
Invoke identifier	M	M(=)
Linked identifier	—	C
Base object class	M	—
Base object instance	M	—
Scope	U	—
Filter	U	—
Access control	U	—
Synchronization	U	—
Attribute identifier list	U	—
Managed object class	—	C
Managed object instance	—	C
Current time	—	U
Attribute list	—	C
Errors	—	C

8.3.1.1.1 Invoke identifier

This parameter specifies the identifier assigned to the operation. It can be used to distinguish this operation from other notifications or operations that the CMISE-service-provider may have in progress.

8.3.1.1.2 Linked identifier

If multiple replies are to be sent for this operation, then this parameter specifies the identification that is provided by the performing CMISE-service-user when those replies are returned. The linked identifier shall have the same value as that of the invoke identifier provided in the indication primitive.

8.3.1.1.3 Base object class

This parameter specifies the class of the managed object that is to be used as the starting point for the selection of managed objects on which the filter (when supplied) is to be applied.

8.3.1.1.4 Base object instance

This parameter specifies the instance of the managed object that is to be used as the starting point for the selection of managed objects on which the filter (when supplied) is to be applied.

8.3.1.1.5 Scope

This parameter indicates the subtree, rooted at the base managed object, which is to be searched. The levels of search that may be performed are

— the base object alone;

— the n^{th} level subordinates of the base object;

— the base object and all of its subordinates down to and including the n^{th} level;

— the base object and all of its subordinates.

The default scope is the base object alone.

8.3.1.1.6 Filter

This parameter specifies the set of assertions that defines the filter test to be applied to the scoped managed object(s). Multiple assertions may be grouped using the logical operators AND, OR and NOT. Each assertion may be a test for equality, ordering, presence, or set comparison. Assertions about the value of an attribute are evaluated according to the matching rules associated with the attribute syntax. If an attribute value assertion is present in the filter and that attribute is not present in the scoped managed object, then the result of the test for that attribute value assertion shall be evaluated as FALSE. The managed object(s) for which the filter test evaluates to TRUE is(are) selected for the application of the operation. If the filter is not specified, all of the managed objects included by the scope are selected.

8.3.1.1.7 Access control

This parameter is information of unspecified form to be used as input to access control functions.

8.3.1.1.8 Synchronization

This parameter indicates how the invoking CMISE-service-user wants information retrievals synchronized across the selected object instances. Two ways of synchronizing a series of retrievals are defined

— Atomic: All retrievals are checked to see whether they can be performed. If any retrieval cannot be performed, then none is performed, otherwise all retrievals are performed;

— Best effort: All retrievals are attempted. If an unsuccessful retrieval occurs, the remaining retrievals are still attempted.

If this parameter is not supplied, best effort synchronization is performed.

When the synchronization parameter is used and a single managed object is specified, then the value of this parameter has no effect on the retrieval.

8.3.1.1.9 Attribute identifier list

This parameter contains a set of attribute identifiers for which the attribute values are to be returned by the performing CMISE-service-user. If this parameter is omitted, all attribute identifiers are assumed. The definitions of the attributes are found in the specification of the managed object class.

8.3.1.1.10 Managed object class

If the base object alone is specified, then this parameter is optional, otherwise it shall specify the class of the managed object whose attribute values are returned. It may be included in any confirmation.

8.3.1.1.11 Managed object instance

If the base object alone is specified, then this parameter is optional, otherwise it shall specify the instance of the managed object whose attribute values are returned. It may be included in any confirmation.

8.3.1.1.12 Current time

This parameter contains the time at which the response was generated. It may be included in the success confirmation.

8.3.1.1.13 Attribute list

This parameter contains the set of attribute identifiers and values that are returned by the performing CMISE-service-user. It shall be included in the success confirmation.

8.3.1.1.14 Errors

This parameter contains the error notification for the operation. It shall be included by the performing CMISE-service-user in the failure confirmation. The following errors may occur

— access denied: the requested operation was not performed for reasons pertinent to the security of the open system;

— class instance conflict: the specified managed object instance is not a member of the specified class;

— complexity limitation: the requested operation was not performed because a parameter was too complex;

— duplicate invocation: the invoke identifier specified was allocated to another notification or operation;

— get list error: one or more attribute values were not read for one of the following reasons

— access denied: the requested operation was not performed for reasons pertinent to the security of the open system;

— no such attribute: the identifier for the specified attribute or attribute group was not recognized.

The attribute values that could be read are returned;

— invalid filter: the filter parameter contains an invalid assertion or an unrecognized logical operator;

— invalid scope: the value of the scope parameter is invalid;

— mistyped argument: one of the parameters supplied has not been agreed for use on the association between the CMISE-service-users;

— no such object class: the class of the specified managed object was not recognized;

— no such object instance: the instance of the specified managed object was not recognized;

— processing failure: a general failure in processing the operation was encountered;

— resource limitation: the operation was not performed due to resource limitation;

— synchronization not supported: the type of synchronization specified is not supported;

— unrecognized operation: the operation is not one of those agreed between the CMISE-service-users.

8.3.1.2 M-GET procedures

8.3.1.2.1 The invoking CMISE-service-user requests a performing CMISE-service-user to retrieve attribute value(s) by issuing an M-GET request primitive to the CMISE-service-provider.

8.3.1.2.2 If the CMISE-service-provider accepts the request, then it issues an M-GET indication primitive to the performing CMISE-service-user. Otherwise, the CMISE-service-provider rejects the request and the following procedures do not apply.

8.3.1.2.3 If the operation cannot be performed, then the performing CMISE-service-user rejects the M-GET request by issuing an M-GET response primitive with the appropriate error code. In this case, the following procedures do not apply.

8.3.1.2.4 If only one response is to be generated, then procedures 8.3.1.2.5, 8.3.1.2.6 and 8.3.1.2.7 shall be ignored.

8.3.1.2.5 The performing CMISE-service-user retrieves the requested attribute value(s) and generates a response which includes results and/or error notifications. The linked identifier shall be present in the service primitive, with its value set to be equal to the invoke identifier of the indication primitive, and the managed object class and instance shall be present.

8.3.1.2.6 The CMISE-service-provider issues an M-GET confirm primitive to the invoking CMISE-service-user which shall include the linked identifier and managed object class and instance.