

INTERNATIONAL
STANDARD

ISO/IEC
10165-7

First edition
1996-09-01

**Information technology — Open Systems
Interconnection — Structure of
management information: General
relationship model**

*Technologies de l'information — Interconnexion de systèmes ouverts
(OSI) — Structure des informations de gestion: Modèle général relationnel*



Reference number
ISO/IEC 10165-7:1996(E)
Documents

AVA Document Sharing Hub

Contents

1	Scope	1
2	Normative references	1
2.1	Identical Recommendations International Standards	1
2.2	Paired Recommendations International Standards equivalent in technical content	2
3	Definitions	2
3.1	Management framework definitions	2
3.2	Systems management overview definitions	2
3.3	CMIS definitions	3
3.4	Management information model definitions	3
3.5	Guidelines for the definition of managed objects definitions	3
3.6	Requirement and guidelines for implementation conformance statement proformas associated with OSI management definitions	3
3.7	State management function definitions	4
3.8	Additional definitions	4
4	Abbreviations	4
5	Conventions	5
6	Requirements	5
7	Model	5
7.1	Managed relationships	5
7.2	Relationship mappings	7
7.3	Re-usable specifications	8
7.4	Representation and management of managed relationships	8
8	Generic definitions	10
8.1	Relationship management operations and notification	11
8.2	Managed object class – genericRelationshipObject	11
8.3	Name binding – genericRelationshipObject-system	11
8.4	Attributes	11
8.5	Attribute group – relationships	12
8.6	Parameters	12
Annex A	Relationship templates	13
A.1	Relationship class template	13
A.2	Relationship mapping template	17
Annex B	Definition of management information	21
B.1	Allocation of object identifiers	21

© ISO/IEC 1996

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

B.2	Definition of managed object classes.....	21
B.3	Definition of name bindings	21
B.4	Definition of attributes	21
B.5	Definition of parameters	22
B.6	Abstract syntax definitions.....	22
Annex C	Managed relationship conformance statement proforma for General Relationship Model	23
C.1	Introduction.....	23
C.2	Instructions for completing the MRCS proforma	23
C.3	Symbols, abbreviations and terms	23
C.4	Managed relationship support.....	23
Annex D	MIDS (attribute) proforma.....	25
D.1	Introduction.....	25
D.2	Attributes.....	25
D.3	Parameters.....	25
Annex E	Illustration of representation methods	27
Annex F	Examples of use of templates	29
F.1	Allocation of object identifiers	29
F.2	Symmetric relationship example.....	29
F.3	Dependency relationship example	30
F.4	General composition relationship example.....	36
F.5	Access control domain example	37
Annex G	Commentary.....	41
G.1	Introduction.....	41
G.2	Dependency between managed objects in a managed relationship.....	41
G.3	Consistency of views	41
G.4	Expression of relationship management operations and notifications	41
G.5	Generic management.....	42
G.6	Relationship awareness	42
G.7	Role specification.....	42
G.8	Re-use of specifications	42
G.9	AND SUBCLASSES	42
G.10	Relationship between relationships.....	42
G.11	Naming Scope of relationship objects	43
G.12	Allowable representation methods.....	43

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 10165-7 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 21, *Open Systems Interconnection, data management and open distributed processing*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.725.

ISO/IEC 10165 consists of the following parts, under the general title *Information technology — Open Systems Interconnection — Structure of management information*:

- *Part 1: Management Information Model*
- *Part 2: Definition of management information*
- *Part 4: Guidelines for the definition of managed objects*
- *Part 5: Generic management information*
- *Part 6: Requirements and guidelines for implementation conformance statement proformas associated with OSI management*
- *Part 7: General relationship model*

Annexes A to D form an integral part of this part of ISO/IEC 10165. Annexes E to G are for information only.

Introduction

This Recommendation | International Standard provides a model for the definition, representation and management of relationships between resources and the notational “tools” for specifying these. In addition, the definitions of general management information that may be used in the representation of relationships are specified. Finally guidelines for the development of conformance statement proformas are provided. The capability afforded by this Recommendation | International Standard is important for those concerned with specifying a management information model.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – STRUCTURE OF MANAGEMENT INFORMATION: GENERAL RELATIONSHIP MODEL

1 Scope

This Recommendation | International Standard provides:

- a) a model for reasoning about, representing, managing, and developing re-usable specifications for relationships between resources;
- b) notational tools for specifying relationships, their representation, and management;
- c) definitions of generic management information that may be used in the representation and management of relationships;
- d) guidelines for the development of conformance statement proforma;
- e) example definitions.

The general relationship model is specified in clause 7. The notation tools are specified in Annex A. The generic management information is defined in clause 8 and Annex B. The guidelines for the specification of implementation conformance statement proforma are given in Annexes C and D. An illustration of the representation methods and example definitions are presented in Annex E and Annex F respectively. A commentary on the text is included in Annex G.

This Recommendation | International Standard does not provide a mechanism for the maintenance of consistency between resources that is implied by a relationship.

CCITT Rec. X.732 | ISO/IEC 10164-3 specifies a model of relationships represented by attributes and a set of generic attributes for representing specific types of relationships. The modelling concepts and specification tools defined in this Recommendation | International Standard are applicable to the definition of relationships in general, and hence, are also applicable to relationships represented by attributes as modelled in CCITT Rec. X.732 | ISO/IEC 10164-3.

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 editions 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 the currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- CCITT Recommendation X.701 (1992) | ISO/IEC 10040:1992, *Information technology – Open Systems Interconnection – Systems management overview*.
- CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management Information Model*.
- CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information*.

- CCITT Recommendation X.722 (1992) | ISO/IEC 10165-4:1992, *Information technology – Open Systems Interconnection – Structure of management information: Guidelines for the definition of managed objects.*
- ITU-T Recommendation X.724 (1993) | ISO/IEC 10165-6:1994, *Information technology – Open Systems Interconnection – Structure of management information: Requirements and guidelines for implementation conformance statement proformas associated with OSI management.*
- CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2:1993, *Information technology – Open Systems Interconnection – Systems management: State management function.*
- CCITT Recommendation X.732 (1992) | ISO/IEC 10164-3:1993, *Information technology – Open Systems Interconnection – Systems management: Attributes for representing relationships.*

2.2 Paired Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*
ISO/IEC 8824:1990, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1).*
- CCITT Recommendation X.291 (1992), *OSI conformance testing methodology and framework for protocol Recommendations for CCITT applications – Abstract test suite specification.*
ISO/IEC 9646-2:1994, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 2: Abstract Test Suite specification.*
- ITU-T Recommendation X.296 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Implementation conformance statements.*
ISO/IEC 9646-7:1995, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 7: Implementation Conformance Statements.*
- 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.*
- CCITT Recommendation X.710 (1991), *Common management information service definition for CCITT applications.*
ISO/IEC 9595:1991, *Information technology – Open Systems Interconnection – Common management information service definition.*
- CCITT Recommendation X.711 (1991), *Common management information protocol for CCITT applications.*
ISO/IEC 9596-1:1991, *Information technology – Open Systems Interconnection – Common management information protocol – Part 1: Specification.*

3 Definitions

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

3.1 Management framework definitions

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

- managed object.

3.2 Systems management overview definitions

This Recommendation | International Standard makes use of the following terms as defined in CCITT Rec. X.701 | ISO/IEC 10040:

- a) managed object class;
- b) manager;
- c) MOCS;

- d) MOCS proforma;
- e) notification;
- f) (systems management) operation.

3.3 CMIS definitions

This Recommendation | International Standard makes use of the following terms as defined in CCITT Rec. X.710 | ISO/IEC 9595:

- attribute.

3.4 Management information model definitions

This Recommendation | International Standard makes use of the following terms as defined in CCITT Rec. X.720 | ISO/IEC 10165-1:

- a) action;
- b) attribute group;
- c) attribute type;
- d) behaviour;
- e) characteristic;
- f) containment;
- g) inheritance;
- h) invariant;
- i) multiple inheritance;
- j) name binding;
- k) naming tree;
- l) packages;
- m) parameter;
- n) post-condition;
- o) pre-condition;
- p) specialization;
- q) subclass;
- r) subordinate object;
- s) superclass;
- t) superior object.

3.5 Guidelines for the definition of managed objects definitions

This Recommendation | International Standard makes use of the following terms as defined in CCITT Rec. X.722 | ISO/IEC 10165-4:

- a) managed object class definition;
- b) template.

3.6 Requirement and guidelines for implementation conformance statement proformas associated with OSI management definitions

This Recommendation | International Standard makes use of the following terms as defined in ITU-T Rec. X.724 | ISO/IEC 10165-6:

- a) Managed Relationship Conformance Summary (MRCS);
- b) MRCS proforma;
- c) Management Information Definition Statement (MIDS);
- d) MIDS proforma.

3.7 State management function definitions

This Recommendation | International Standard makes use of the following terms as defined in CCITT Rec. X.731 | ISO/IEC 10164-2:

- a) administrative state;
- b) operational state;
- c) usage state.

3.8 Additional definitions

3.8.1 binding: The associating of managed objects with a given role of a managed relationship.

3.8.2 binding support: The ability of a managed relationship to support the binding of managed objects, into a given role, during the existence of the managed relationship.

3.8.3 consistency (of a subclass): A refinement of a managed relationship class such that instances of the subclass may be substituted for instances of the superclass without affecting the function of a managing system.

3.8.4 managed relationship: A collection of managed objects together with an invariant referring to the properties of the managed objects.

3.8.5 managed relationship class: A named set of managed relationships sharing the same definition.

3.8.6 participant: A managed object fulfilling a role in a managed relationship.

3.8.7 participant pointer: An attribute that identifies participants in a particular role in a managed relationship.

3.8.8 relationship cardinality: The number of instances of the same managed relationship class in which a managed object participates in the same role.

3.8.9 relationship cardinality constraint: A set of values to which the relationship cardinality is restricted.

3.8.10 relationship management notification: A notification from a managed relationship that is mapped onto one or more systems management notifications.

3.8.11 relationship management operation: An operation applied to a managed relationship that is mapped onto one or more systems management operations.

3.8.12 role cardinality: The number of managed objects participating in a given role of a managed relationship.

3.8.13 role cardinality constraint: A set of values to which the role cardinality of a given role is restricted.

3.8.14 relationship mapping specification: A named specification of the mapping of the characteristics of a managed relationship class to the characteristics of one or more managed object classes.

3.8.15 relationship class specification: A named specification of the characteristics of a managed relationship.

3.8.16 role: The properties common to a particular kind of participant in a managed relationship.

3.8.17 unbinding: The disassociating of managed objects from a given role of a managed relationship.

3.8.18 unbinding support: The ability of a managed relationship to support the unbinding of managed objects, from a given role, during the existence of the managed relationship.

4 Abbreviations

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

ASN.1	Abstract Syntax Notation One (see CCITT Rec. X.208 ISO/IEC 8824)
CMIS	Common Management Information Service (see CCITT Rec. X.710 ISO/IEC 9595)
GDMO	Guidelines for the Definition of Managed Objects (see CCITT Rec. X.722 ISO/IEC 10165-4)
MIM	Management Information Model (see CCITT Rec. X.720 ISO/IEC 10165-1)
MRCS	Managed Relationship Conformance Statement
MOCS	Managed Object Conformance Statement

OSI	Open Systems Interconnection
SMI	Structure of Management Information
MIDS	Management Information Definition Statement

5 Conventions

A distinctive combination of type weight and size is used throughout this Recommendation | International Standard where the text makes use of **ASN.1 notation**, **GDMO notation**, or the **notational tools** defined in Annex A.

The notational tools within this Recommendation | International Standard are specified according to the conventions defined in CCITT Rec. X.722 | ISO/IEC 10165-4.

6 Requirements

In the context of systems management, there can exist relationships between resources in the sense that resources may affect each other. A manager needs the ability to manage such relationships and, in particular, requires:

- a model of relationships between resources independent of the location of the resources and independent of the method of representing the relationships;
- notational tools for the specification of relationships;
- a model for the representation and management of relationships within the context of OSI Systems Management;
- notational tools for the specification of the representation and management of relationships within the context of OSI Systems Management;
- a model for the development of re-usable specifications.

7 Model

For the purposes of systems management, resources are modelled as managed objects, thus relationships between resources are modelled as **managed relationships** between managed objects. A managed relationship is defined as a collection of managed objects together with an invariant referring to the properties of the managed objects. Examples of such invariants are:

- a) a managed object must remain in the enabled operational state to fulfil the supplier role in a supplier-consumer managed relationship;
- b) a managed object must be in the enabled operational state, the idle usage state, and the unlocked administrative state to fulfil the backing-up role in a back-up managed relationship;
- c) there must be at least one managed object in the subordinate role in a superior-subordinate managed relationship.

Managed relationships are additional information modelling concepts in the Structure of Management Information but are represented and managed by existing constructs of the Management Information Model (see CCITT Rec. X.720 | ISO/IEC 10165-1). Managed relationships that share the same definition are grouped into **managed relationship classes**; a notation for specifying managed relationship classes is defined in Annex A.

The model specifically recognizes that the same managed relationship class may be represented in different ways within the Management Information Model; a **relationship mapping** describes a particular representation. Relationship mappings are discussed in detail in 7.4. A notation for specifying relationship mappings is defined in Annex A.

7.1 Managed relationships

A managed relationship models the representation-independent properties of a relationship between managed objects in terms of roles, behaviour, relationship management operations and notifications, inheritance, and qualifying properties. The roles are modelled in terms of compatible managed object classes, role cardinality, relationship cardinality, and support for binding and unbinding operations. The modelling concepts are detailed in the following subclauses.

7.1.1 Relationship management operations and notifications

Relationship management operations and notifications model the representation-independent operations and notifications that a managed relationship supports. They are expressed in terms of the following prototypical operations and notification:

ESTABLISH	establish a managed relationship;
TERMINATE	terminate a managed relationship;
BIND	bind a managed object into a role in a managed relationship;
UNBIND	release a managed object from a role in a managed relationship;
QUERY	request information about a managed relationship;
NOTIFY	report events concerning a managed relationship;
USER DEFINED	user-defined operation, the semantics of which are modelled in the behaviour of the related managed relationship.

The semantics of these prototypical operations and notification are given in clause 8.

A managed relationship models the actual relationship operations and notifications supported and any semantics additional to those defined in clause 8.

A particular managed relationship may model a number of actual relationship management operations or notifications with respect to a single prototype. For example, a particular managed relationship could model an unbind operation of a participant that requires all other participants to be unbound and deleted; it could model a second unbind operation that requires that all other participants remain unaffected. A managed relationship need not model a relationship operation or notification with respect to each of the prototypes.

7.1.2 Managed relationship behaviour

Managed relationship behaviour models the representation-independent behaviour of a managed relationship in terms of invariants over participant roles and invariants, pre-conditions, and post-conditions over relationship management operations and notifications.

7.1.2.1 invariant: A logical predicate that must remain true during some scope; a scope might be the lifetime of a managed relationship or the execution of a relationship management operation.

7.1.2.2 pre-condition (for a relationship management operation or notification): A logical predicate that must be true immediately before the execution of a relationship management operation or immediately before the emission of a relationship management notification.

7.1.2.3 post-condition (for a relationship management operation or notification): A logical predicate that must be true immediately after the execution of a relationship management operation or immediately after the emission of a relationship management notification.

7.1.3 Relationship qualification

Relationship qualification models attributes that are properly associated with the managed relationship as a whole and are made available in an implementation irrespective of the representation method used. For example, a telephone call could be modelled as a managed relationship between two subscriber-role managed objects, in which case the call duration is properly a property of the call rather than a property of either subscriber. However, in a particular implementation and depending on the representation method used, the call-duration attribute could be mapped to either of the subscriber managed objects or to a relationship object.

7.1.4 Roles

Each managed object bound in a managed relationship is known as a participant and fulfils one or more roles in the relationship. A role imposes requirements on a participant and on the managed relationship. A participating managed object is required to possess certain properties to fulfil a role; a managed relationship is required to comply with the requirements of a role.

Managed objects of the same class may fulfil different roles in the same managed relationship. A managed object may fulfil more than one role in a managed relationship. A managed object may participate in more than one instance of a managed relationship.

7.1.4.1 Participant properties

The properties that a managed object must possess to fulfil a particular role are modelled in terms of a compatible¹⁾ managed object class. In general, the compatible class will model only those properties that are peculiar to the role. In a particular implementation, the managed object fulfilling the role may possess additional properties but it must possess at least the properties of the compatible class and hence must be allomorphic to the compatible class.

7.1.4.2 Role cardinality

In general, a number of managed objects may participate in a managed relationship in a given role; this number is termed the cardinality of the role. An implementation of a managed relationship is required to comply with two types of constraints on role cardinality: permitted role cardinality and required role cardinality. Each constraint is modelled in terms of a value-set – a set of non-negative integers that is often a contiguous range of values.

The permitted role cardinality constraint is a constraint on the role cardinality that an implementation is permitted to support whilst the required role cardinality constraint is a constraint on the role cardinality that an implementation is required to support. The required role cardinality constraint value-set must be a subset of, or equal to, the permitted role cardinality constraint value-set.

7.1.4.3 Support of binding and unbinding

A managed relationship may support, on a role-by-role basis, the binding and unbinding of managed objects during the existence of the relationship. Thus, such a managed relationship supports the relationship management operations **BIND** and **UNBIND**, respectively.

Where a managed relationship supports binding, managed objects may become participants in the relationship during the existence of the relationship provided that the role cardinality constraints are not violated. An attempt to violate such constraints will cause the bind request to fail.

Where a relationship supports unbinding, participants can be released from a managed relationship during the existence of the relationship provided that the role cardinality constraints are not violated. An attempt to violate such constraints will cause the unbind request to fail.

7.1.4.4 Relationship cardinality

A managed object may participate in the same role in a number of instances of the same managed relationship class. The number of instances is termed the relationship cardinality for the role. An implementation of a managed relationship is required to comply with a single constraint on relationship cardinality – the permitted relationship cardinality constraint. The constraint is modelled in terms of a value-set – a set of non-negative integers that is often a contiguous range of values. The permitted relationship cardinality constraint is a restriction on the relationship cardinality that an implementation is permitted to support.

7.2 Relationship mappings

A relationship mapping models the representation of a managed relationship in terms of the properties of one or more managed objects, namely:

- the mapping of relationship roles and relationship qualifications to candidate object classes;
- the mapping of relationship operations and notifications to systems management operations and notifications respectively;
- relationship objects;
- participant pointers.

There may be more than one relationship mapping associated with a particular managed relationship class.

7.2.1 Participant pointers

Participants in the managed relationship and their respective roles may be identified by means of **participant pointer** attributes. The value of a participant pointer attribute identifies the participating managed object(s) whilst the type of the attribute indicates the role fulfilled by the managed object(s). Modification of these attribute values, either by attribute-based operations or by object-based operations, may be used to alter managed-object participation, subject to any constraints associated with the particular managed relationship or relationship mapping. Participant pointer definitions are derived from the definition of the attribute **participantPointer** in Annex B.

¹⁾ The concept of compatibility is discussed in 5.2 of MIM.

7.2.2 Relationship management operations and notifications

This Recommendation | International Standard does not prescribe the mapping of relationship management operations and notifications to systems management operations and notifications. However, Annex A provides templates for defining such mappings and Annex B defines suitable attributes for identifying names of managed relationships, relationship-class membership, and the relationship mapping in effect.

The potential mappings of relationship management operations and notifications may be constrained by the chosen representation method; a relationship mapping models the mappings for a particular representation of a managed relationship class. Subclause 7.4 gives more details of the constraints imposed by particular representation methods. A single relationship management operation or notification may be mapped to one or more systems management operations and notifications.

The mapping of relationship management operations and notifications is such that the pre- and post-conditions and invariant for the relationship management operations or notifications and the invariant for the managed relationship are respected by the systems management operations and notifications. The relationship mapping models the precise mechanism for meeting this requirement. For example in the case of a superior-subordinate managed relationship that requires at least one managed object in the subordinate role, a relationship mapping could model the mapping of **ESTABLISH** to:

- explicit create operations for the managed objects fulfilling the superior and subordinate roles and attribute-oriented operations to adjust the participant pointers; or
- a single create operation for the managed object fulfilling the superior role and then rely on the managed system to create the managed object fulfilling the subordinate role and to adjust the participant pointers.

7.2.3 Behaviour

The relationship-mapping behaviour models the mapping of representation-independent behaviour of a managed relationship and its associated relationship management operations and notifications to representation-dependent behaviour in terms of invariants over participants and invariants, pre-conditions, and post-conditions over systems management operations and notifications related to participants. It also models any additional behaviour related to the representation method.

7.3 Re-usable specifications

Managed relationship classes, inheritance, and specialization form the model for the development of re-usable specifications. The essence of the model is specialization – the derivation of classes from existing managed relationship classes by means of inheritance and incremental specification.

A managed relationship class may be specialized by combining characteristics inherited from one or more managed relationship classes with characteristics specified in the managed relationship class template. The specialized class is referred to as the subclass of the original class(es); the original class(es) are referred to as the superclass(es) of the specialized class. The rules for specialization defined in Annex A ensure that a subclass of a managed relationship is **consistent** with its superclass(es). The consistency of a subclass with respect to its superclass(es) is such that an instance of a subclass of a managed relationship may be substituted for an instance of one of its superclasses without affecting the function of a managing system.

7.4 Representation and management of managed relationships

Managed relationships may be represented by the following methods based on constructs defined in the Management Information Model (see CCITT Rec X.720 | ISO/IEC 10165-1):

- naming;
- participant pointers;
- relationship objects;
- systems management operations.

Not all categories of managed relationships can be represented by all of the representation methods. A single relationship mapping may use a combination of these representation methods. For example, a relationship mapping of a managed relationship with three roles could represent two roles by naming and the third by participant pointers.

7.4.1 Representation and management by means of naming

A relationship mapping may model the representation and management of a managed relationship by means of naming. A number of subordinate managed objects are named within the naming scope of a superior managed object. The relationship mapping indicates the name binding associated with the managed relationship.

Relationship management operations may be mapped to systems management operations on either the superior or subordinate managed objects. Table 1 enumerates the possible mappings; mappings for a particular representation are modelled by the associated relationship mapping.

The participants in the managed relationship may be discovered by analysis of the components of the distinguished name of the subordinates for a given name binding.

Table 1 – Operation mappings for naming relationship

Prototypical relationship management operation	Candidate systems management operations on the superior managed object	Candidate systems management operations on the subordinate managed objects
BIND	Create, Action	Create
UNBIND	Delete, Action	Delete
QUERY	Action	Get + name analysis, Action
ESTABLISH	Create, Action	Create, Action
TERMINATE	Delete, Action	Delete, Action

7.4.2 Representation and management by means of participant pointers

A relationship mapping may model the representation and management of a managed relationship by means of participant-pointer attributes exhibited by the participants in the managed relationship. Relationship management operations may be mapped to attribute-based operations on participant pointers or object-based operations on participating managed objects. Table 2 enumerates the possible mappings; mappings for a particular representation are modelled by the associated relationship mapping.

Table 2 – Operation mappings for relationship attributes

Prototypical relationship management operation	Candidate attribute-based systems management operations on participating managed objects	Candidate object-based systems management operations on participating managed objects
BIND	Replace, Add	Create, Action
UNBIND	Replace, Remove	Delete, Action
QUERY	Get	Action
ESTABLISH	Replace, Add	Create, Action
TERMINATE	Replace, Remove	Delete, Action

7.4.3 Representation and management by means of a relationship object

A relationship mapping may model the representation and management of a managed relationship by means of a managed object – such a managed object is called a **relationship object**. The superclass of all relationship object classes, **genericRelationshipObject**, has the following attributes:

- relationship name – which identifies the name of the managed relationship;
- relationship class – which identifies the class of the managed relationship;
- relationship mapping – which identifies the relationship mapping in effect.

Relationship object classes include a participant-pointer attribute for each role defined in the relationship class to identify participants in an instance of a managed relationship.

The **relationships** attribute group (see CCITT Rec. X.732 | ISO/IEC 10164-3) is exhibited by **genericRelationshipObject**. All participant-pointer attributes may be included in this attribute group.

Relationship management operations are mapped to object-based or attribute-based systems management operations on the relationship object. Table 3 enumerates the possible mappings; mappings for a particular representation are modelled by the associated relationship mapping.

Table 3 – Operation mappings for relationship object

Prototypical relationship management operation	Candidate attribute-based systems management operations on the relationship object	Candidate object-based systems management operations on the relationship object
BIND	Replace, Add	Create, Action
UNBIND	Replace, Remove	Delete, Action,
QUERY	Get	Action
ESTABLISH	Replace, Add	Create, Action
TERMINATE	Replace, Remove	Delete, Action

7.4.4 Representation and management by means of systems management operations

A relationship mapping may model the representation and management of a managed relationship by means of object-based systems management operations on participating managed objects. Relationship management operations are mapped to object-based systems management operations on participating objects. Table 4 enumerates the possible mappings; mappings for a particular representation are modelled by the associated relationship mapping.

Table 4 – Operation mappings for relationships represented by management operation

Prototypical relationship management operation	Candidate object-based systems management operations on participating managed objects
BIND	Create, Action
UNBIND	Delete, Action
QUERY	Action
ESTABLISH	Create, Action
TERMINATE	Delete, Action

8 Generic definitions

This Recommendation | International Standard defines the semantics of generic management information and prototypical relationship management operations and notification. The formal specification of the syntax of the generic management information is given in Annex B.