
**Information technology — Open Systems
Interconnection — Systems Management:
Software management function**

*Technologies de l'information — Interconnexion de systèmes
ouverts (OSI) — Gestion-systèmes: Fonction de gestion de logiciel*

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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 10164-18 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.744.

ISO/IEC 10164 consists of the following parts, under the general title *Information technology — Open Systems Interconnection — Systems Management*:

- Part 1: Object management function
- Part 2: State management function
- Part 3: Attributes for representing relationships
- Part 4: Alarm reporting function
- Part 5: Event report management function
- Part 6: Log control function
- Part 7: Security alarm reporting function
- Part 8: Security audit trail function
- Part 9: Objects and attributes for access control
- Part 10: Usage metering function for accounting purposes
- Part 11: Metric objects and attributes
- Part 12: Test management function
- Part 13: Summarization function
- Part 14: Confidence and diagnostic test categories
- Part 15: Scheduling function
- Part 16: Management knowledge management function
- Part 17: Change over function

- *Part 18: Software management function*
- *Part 19: Management domain and management policy management functions*
- *Part 20: Time management function*
- *Part 21: Command sequencer*
- *Part 22: Response time monitoring function*

Annexes A to F form an integral part of this part of ISO/IEC 10164. Annexes G and H are for information only.

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Introduction

Operations Systems (OS) Network Elements (NE) and other systems will occasionally be subject to software changes. These changes may include program code, such as a new version of some call processing related programme or revised routing tables. The need within a network is to be able to manage software that can be changed or modified by some remote OS. In this context management can include: control over the downloading process for transfer of a software product from an OS to another system such as an OS or NE; control of installing downloaded software into the suite existing at the system; and the ability to check the version of software installed in a system. This Recommendation | International Standard provides a standard X.700 message based means to manage this software process to meet these needs. The method of software transfer between an OS and another system is not specified or constrained in any way by this Recommendation | International Standard but practically could include file transfer, electronic mail or postal services with floppy disks. The role of this Recommendation | International Standard in this transfer is to manage the start of delivery to another system by maintaining information about the start of a software delivery and relating this to actual receipt, resulting from a notification by the receiving system of successful delivery.

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – SYSTEMS MANAGEMENT: SOFTWARE MANAGEMENT FUNCTION

1 Scope

The Software Management Function includes management of a system for delivery of software and also management of software within a system.

There are two aspects of software that need to be considered separately. These two aspects can be described as the "dormant" view and the "active" view of software.

The dormant view of software is related to the data that is stored in a managed system and the way in which it is delivered and installed. In general, the data is stored information, such as data files and tables, but may also be files containing executable code. The scope of this Recommendation | International Standard includes the dormant view of software.

The active view of software is related to the management of resources that utilize the software. There is no real difference between this view and the normal view of management of resources. The scope of this Recommendation | International Standard does not include the active view of software. However, the relationship between managed objects representing resources that utilize software, and the managed objects representing the software that they are using (i.e. dormant view of software) is within the scope of this Recommendation | International Standard.

The scope of this Recommendation | International Standard includes:

- initiation of transfer of software;
- post transfer control of software;
- software activation (includes version update and patching);
- software de-activation;
- software reversion change;
- software validation;
- software enquiry;
- software backup;
- software restore.

NOTE 1 – Backup and restore are defined in a generic way so that they can apply to resources other than software.

The scope of this Recommendation | International Standard does not include:

- transfer mechanism of software;
- physical storage of software (mapping of software to physical file store, such as to a floppy disk, hard disk, etc.);
- formatting of software;
- naming of software products;
- sequencing of software management commands;
- software monitoring;
- management of processes running in a system.

NOTE 2 – The support for license charging activities (i.e. billing, accounting) and software tracing (i.e. tracing execution of software for debugging) is outside the scope of this Recommendation | International Standard and is open for further study.

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 International 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 International 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.210 (1993) | ISO/IEC 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI services.*
- CCITT Recommendation X.701 (1992) | ISO/IEC 10040:1992, *Information technology – Open Systems Interconnection – Systems management overview*¹⁾.
- 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.723 (1993) | ISO/IEC 10165-5:1994, *Information technology – Open Systems Interconnection – Structure of management information: Generic management information.*
- 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.730 (1992) | ISO/IEC 10164-1:1993, *Information technology – Open Systems Interconnection – Systems management: Object management function.*
- 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.*
- ITU-T Recommendation X.738 (1993) | ISO/IEC 10164-13:1995, *Information technology – Open Systems Interconnection – Systems management: Summarization function.*
- ITU-T Recommendation X.739 (1993) | ISO/IEC 10164-11:1994, *Information technology – Open Systems Interconnection – Systems management: Metric objects and attributes.*
- CCITT Recommendation X.740 (1992) | ISO/IEC 10164-8:1993, *Information technology – Open Systems Interconnection – Systems management: Security audit trail function.*
- ITU-T Recommendation X.741 (1995) | ISO/IEC 10164-9:1995, *Information technology – Open Systems Interconnection – Systems Management: Objects and Attributes for Access Control.*
- ITU-T Recommendation X.742 (1995) | ISO/IEC 10164-10:1995, *Information technology – Open Systems Interconnection – Systems management: Usage metering function for accounting purposes.*
- ITU-T Recommendation X.745 (1993) | ISO/IEC 10164-12:1994, *Information technology – Open Systems Interconnection – Systems management: Test management function.*
- ITU-T Recommendation X.746 (1995) | ISO/IEC 10164-15:1995, *Information technology – Open Systems Interconnection – Systems management: Scheduling function.*

¹⁾ As amended by ITU-T Rec. X.701/Cor.2 (1995) | ISO/IEC 10040/Cor.2:1995.

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.209 (1988), *Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)*.
ISO/IEC 8825:1990, *Information technology – Open Systems Interconnection – Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)*.
- ITU-T Recommendation X.291 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T 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 specification for CCITT applications*.
ISO/IEC 9596-1:1991, *Information technology – Open Systems Interconnection – Common management information protocol – Part 1: Specification*.

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2.3 Additional references

- ITU-T Recommendation M.3100 (1995), *Generic network Information Model*.
- ITU-T Recommendation M.3101 (1995), *Managed object conformance statements for the “generic network Information Model”*.
- ISO/IEC 15068-2²⁾, *Information technology – Portable Operating System Interface POSIX System Administration – Part 2: Software Administration (IEEE P1387.2)*.

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 defined in CCITT Rec. X.700 and ISO/IEC 7498-4:

- managed object.

3.2 Systems management overview definitions

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

- a) managed object class;

²⁾ Currently at the stage of draft.

- b) Management Information Conformance Statement (MICS);
- c) Managed Object Conformance Statement (MOCS);
- d) MICS proforma;
- e) MOCS proforma;
- f) notification.

3.3 CMIS definitions

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

- attribute.

3.4 Management information model definitions

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

- a) action;
- b) behaviour;
- c) name binding;
- d) package;
- e) superclass.

3.5 Guidelines for the definition of managed objects definitions

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

- template.

3.6 Implementation conformance statement proforma definitions

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

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

3.7 Additional definitions

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

3.7.1 backup: The **backup** operations when applied to software managed object causes a copy of the underlying resources to be made. It has no direct effect on the original software resources.

NOTE – The **backup** operation may well be applicable to other classes of managed objects, however as far as this Recommendation | International Standard is concerned, only its use with software is considered.

3.7.2 deliver: **Delivery** of software is the process of getting the resources associated with a software managed object in place on the system together with the software managed object.

NOTE – The way in which the delivery of software is done, and in particular the choice of transfer mechanism, is outside the scope of this Recommendation | International Standard.

3.7.3 executable: **Executable software** represents software for which execution may be initiated. It may be possible to cause executable software to be executed by management command, however it may only be possible to execute software by local action.

3.7.4 install: **Installation** of software puts it into a form suitable for use as opposed to the form in which it may be transferred between systems (i.e. delivered). Once software is installed, it may be **utilized** by other managed objects.

NOTE – Installation may also involve setting up relationships between software managed objects.

3.7.5 restore: The **restore** operation may be used to replace the resources associated with a software managed object with a copy made by an earlier backup.

NOTE – As with **backup**, the **restore** operation may well be applicable to other classes of managed objects, however as far as this Recommendation | International Standard is concerned, only its use with software is considered.

3.7.6 revert: The **revert** operation reverses the effect of a previous **install** operation, or cause one or more applied patches to be removed.

3.7.7 utilize: **Utilization** is represented by relationships between some active processes and software resources. It represents the fact that the processes are using the software. Software may only be utilized when it is has an Operational state of ENABLED and an Administrative state of UNLOCKED. There may well be constraints as to how many things and what things may utilize a software resource. When software is utilized its Usage state will be either ACTIVE or BUSY.

NOTE – From a management point of view, the definition of these relationships is outside the scope of this Recommendation | International Standard.

3.7.8 validate: The **validate** operation is used to check the integrity of software resources.

NOTE – How the validation check is carried out is a local matter.

4 Symbols and abbreviations

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

CMIP	Common Management Information Protocol
Conf	Confirmation
ICS	Implementation Conformance Statement
Id	Identifier
Ind	Indication
MCS	Management Conformance Summary
MICS	Management Information Conformance Statement
MOCS	Managed Object Conformance Statement
MRCS	Managed Relationship Conformance Statement
PICS	Protocol Implementation Conformance Statement
POSIX	Portable Operating System Interface
Req	Request
Rsp	Respond

5 Conventions

This Specification defines services for establishing and terminating backup relationship following the descriptive conventions defined in ITU-T Rec X.210 | ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI services*.

The following notation is used in this Recommendation | International Standard's service parameter tables:

- 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.
- P The parameter is subject to the constraints imposed by CCITT Rec. X.710 and ISO/IEC 9595.