INTERNATIONAL STANDARD

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Information technology — Open Systems Interconnection — Systems Management: Response time monitoring function

Technologies de l'information — Interconnexion de systèmes ouverts (OSI) — Gestion-systèmes: Fonction de contrôle de temps de réponse

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 10164 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 10164-22 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.748.

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 function*

— *Part 20: Time management function*

— *Part 21: Command sequencer for systems management*

— *Part 22: Response time monitoring function*

Annex A forms a normative part of this part of ISO/IEC 10164. Annexes B to G are for information only.

Introduction

This Recommendation | International Standard is developed according to ITU-T Rec. X.200 | ISO/IEC 7498-1 and CCITT Rec. X.700 | ISO/IEC 7498-4. This Recommendation | International Standard is related to the following Recommendation | International Standards:

- ITU-T Recommendation X.701 (1997) | ISO/IEC 10040:1998, *Information technology – Open Systems Interconnection – Systems management overview.*
- ITU-T Recommendation X.710 (1997) | ISO/IEC 9595:1998, *Information technology – Open Systems Interconnection – Common management information service definition.*
- ITU-T Recommendation X.711 (1997) | ISO/IEC 9596-1:1998, *Information technology – Open Systems Interconnection – Common management information protocol: Specification.*
- CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management information model.*

OSI management standardization inevitably involves coordinated work by a number of standards bodies. ITU-T SG7 and ISO/IEC JTC 1/SC 21/WG 4 are jointly responsible for the development of Recommendations | International Standards that describe the architecture for OSI management, the services, protocols and functions that are used for systems management, and the structure of management information. Other groups, in ITU-T, ISO/IEC JTC 1/SC 21, ISO/IEC JTC 1/SC 6 and elsewhere, are responsible for the development of Recommendations | International Standards that describe the management aspects of particular layers of the OSI Basic Reference Model; these may describe (N)-layer management protocols, management aspects of (N)-layer operation, and managed objects that provide a "management view" of aspects of the layer operation and are visible to systems management.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – SYSTEMS MANAGEMENT: RESPONSE TIME MONITORING FUNCTION

1 Scope

This Recommendation | International Standard defines a systems management function which may be used by an application process in a centralized or decentralized environment to interact for the purposes of systems-management, as defined by CCITT Rec. X.700 | ISO/IEC 7498-4. This Recommendation | International Standard defines the response time monitoring function that consists of services, functional units, generic definitions and protocols. It is positioned in the application layer of ITU-T Rec. X.200 | ISO/IEC 7498 and is defined according to the model provided by ISO/IEC 9545. The role of systems management functions are described by ITU-T Rec. X.701 | ISO/IEC 10040.

This Recommendation | International Standard:

- establishes user requirements for the response time monitoring function;
- establishes a model that relates the services and generic definitions provided by this function to user requirements;
- defines the services provided by the function;
- defines generic notification type; and
- specifies the protocol that is necessary in order to provide the services.

This Recommendation | International Standard does not:

- define the nature of any implementation intended to provide the response time monitoring function;
- specify the manner in which management is accomplished by the use of the response time monitoring;
- define the nature of any interactions which result in the use of the response time monitoring;
- specify the services necessary for the establishment, normal and abnormal release of a management association;
- preclude the definition of further notification types.

The functions and the management information defined in this Recommendation | International Standard include:

- Summarization of the response time on any request of information and its management;
- Definition of the relationship on response monitoring;
- Setting and modification of the monitoring and the summarization conditions;
- Scheduling of the monitoring and the summarization; and
- Notification when response information or its statistical result is over a threshold.

The functions and the management information defined in this Recommendation | International Standard do not include:

- Management information definitions for summarization of response time statistical;
- How to retrieve response times locally (e.g., the test function to confirm response times); and
- Local mechanisms to summarize information related to the response request and response.

2 Normative references

The following Recommendations | 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 | 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 | International Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunications 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.701 (1997) | ISO/IEC 10040:1998, *Information technology – Open Systems Interconnection – Systems management overview.*
- ITU-T Recommendation X.710 (1997) | ISO/IEC 9595:1998, *Information technology – Open Systems Interconnection – Common management information service.*
- ITU-T Recommendation X.711 (1997) | ISO/IEC 9596-1:1998, *Information technology – Open Systems Interconnection – Common Management Information Protocol: Specification.*
- 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 (1996) | ISO/IEC 10165-6:1997, *Information technology – Open Systems Interconnection – Structure of management information: Requirements and guidelines for implementation conformance statement proformas associated with OSI management.*
- ITU-T Recommendation X.725 (1995) | ISO/IEC 10165-7:1996, *Information technology – Open Systems Interconnection – Structure of management information: General Relationship Model.*
- 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.*
- CCITT Recommendation X.733 (1992) | ISO/IEC 10164-4:1992, *Information technology – Open Systems Interconnection – Systems Management: Alarm reporting function.*
- CCITT Recommendation X.734 (1992) | ISO/IEC 10164-5:1993, *Information technology – Open Systems Interconnection – Systems Management: Event report management function.*
- CCITT Recommendation X.735 (1992) | ISO/IEC 10164-6:1993, *Information technology – Open Systems Interconnection – Systems Management: Log control function.*

– ITU-T Recommendation X.737 (1995) | ISO/IEC 10164-14:1996, *Information technology – Open Systems Interconnection – Systems Management: Confidence and diagnostic test categories.*

– 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.*

– 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.743 (1998) | ISO/IEC 10164-20:1999, *Information technology – Open Systems Interconnection – Systems Management: Time Management Function.*

– ITU-T Recommendation X.746 (1995) | ISO/IEC 10164-15:1995, *Information technology – Open Systems Interconnection – Systems Management: Scheduling function.*

– ITU-T Recommendation X.749 (1997) | ISO/IEC 10164-19:1998, *Information technology – Open Systems Interconnection – Systems Management: Management domain and management policy management function.*

– ITU-T Recommendation X.753 (1997) | ISO/IEC 10164-21:1998, *Information technology – Open Systems Interconnection – Systems Management: Command sequencer for systems management.*

2.2 Paired ITU-T 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).*

– 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.*

2.3 Additional references

– ITU-T Recommendation M.3100 (1995), *Generic network information model.*

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 term 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 ITU-T 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 term as defined in ITU-T 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 statement (MRCS);

b) MRCS 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 Time management function definitions

This Recommendation | International Standard makes use of the following term as defined in ITU-T Rec. X.743 | ISO/IEC 10164-20:

– accuracy.

3.9 Additional Definitions

3.9.1 one way response time: Response time in the case that the response requester role and the response confirmation role are fulfilled by two different objects.

3.9.2 response confirmation: A confirmation of receipt of the response associated with a response request by a response requester.

3.9.3 response confirmation role: A role to confirm receipt of the response associated with a response request by a response requester.

3.9.4 response monitor: An object which is aware of a monitored response requester and a monitored response confirmation role object and can provide response times between the two to managers.

3.9.5 response monitoring relationship: The relationship between one object in the response requester role which requests a response, one object in the response confirmation role which confirms the response and one object in the response monitor role which monitors that response confirmation and makes available the confirmation to managers.

3.9.6 response requester: An object which in a response monitoring relationship and has taken a response requester role.

3.9.7 response requester role: A role taken by an object in which it is capable of sending response requests.

3.9.8 response time: A time period between the time when a sending of response request is triggered and the time when its response is received by the response confirmation role object.

3.9.9 **round trip response time**: Response time in the case that both the response requester role and the response confirmation role are fulfilled by the same object.

3.9.10 **route**: An object which in a response monitoring relationship has taken a route role.

3.9.11 **route role**: A role taken by an object through which the response request or the response passes. For example, the connection or routing point between a response requester and a response confirmation role object.

4 Symbols and abbreviations

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

ASN.1	Abstract Syntax Notation One
APDU	Application Protocol Data Unit
CMIS	Common Management Information Service
EDC	Event Discrimination Counter
GDMO	Guidelines for the Definition of Managed Objects
GRM	General Relationship Model
MIM	Management Information Model
MRCS	Managed Relationship Conformance Statement
MO	Managed Object
MOCS	Managed Object Conformance Statement
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
QoS	Quality of Service
RC	Relationship Class
SMI	Structure of Management Information

5 Conventions

This Recommendation | International Standard defines services for response confirmation reporting following the descriptive conventions defined in ITU-T Rec. X.210 | ISO/IEC 10731.

The following notation is used in this Recommendation | International Standard 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 parameters 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 ITU-T Rec. X.710 | ISO/IEC 9595.

6 Requirements

In order to tune up the performance of the communication network between systems or other objects, the following functions may be needed:

- Monitoring circuit traffic;
- Selection of the best routes;
- Improvement of performance of each communication device, etc.

The goal of these communication performance management activities is to ensure that managed response delays are within desired limits. So, for performance tuning, the response times must be monitored to confirm the real result of the tuning. Here, the response time means total processing time including sending a request, transmission through physical protocol, receiving request, execution (or rejection) of request, sending response and receiving response.

6.1 Summarization of response times

The MIS-User needs the ability to:

- Summarize round trip and/or one way response time in any communication;
- Summarize response times of PDUs through a specified route or connection;
- Summarize response times of multicasted PDUs indicating the synchronization mode (single cast, atomic or best effort);
- Summarize response delay time from a constant time value or the value of a specified time attribute;
- Log and disseminate response time information.
- Summarize information related with response time accuracy.

6.2 Management and control of the summarization

The MIS-User needs the ability to:

- Establish and terminate the relationship for response monitoring;
- Bind and unbind monitored objects related to the response monitoring relationship;
- Suspend and resume the monitoring behaviour;
- Query information on the response monitoring;
- Schedule response monitoring;
- Record and log response request information in order to identify requests for which no response has been received.

6.3 Monitoring statistics on the response time

The MIS-User needs the ability to:

- Summarize response time statistics by using ITU-T Rec. X.738 | ISO/IEC 10164-13;
- Estimate response time statistics using ITU-T Rec. X.739 | ISO/IEC 10164-11;
- Summarize several types of frequency distribution (for example, histogram) of response times;
- Log and disseminate response time statistics.
- Schedule monitoring statistics on response time statistics.

7 Model

7.1 Response monitoring relationship

This Recommendation | International Standard defines the response monitoring relationship binding a response requester role, a response confirmation role, zero or more route roles and a response monitoring role as illustrated in Figure 1. These roles may be fulfilled by one or more managed object instances.

7.1.1 Response monitor role

The instance having response monitor role monitors triggering of the response request by the response requester and confirmation time of the response by response confirmation. The response monitor has an attribute representing response time of the response request and may have the function to emit a notification with the response time information. This role shall optionally have response timeout value and a QoS alarm is emitted unless the response arrives before the timeout expires.

A response monitor role may have a response synchronization attribute whose value is "single cast", "atomic" or "best effort". If the value is "single cast", the response monitor role object monitors only one response to one response request. If the value is "atomic" or "best effort", the monitor object can monitor more than one response to a response request. If the value is "atomic", the response time is monitored as the time until *all* the responses are returned. If the value is "best effort", the response time is monitored as the time until the first *one* of the responses returns. Time synchronization between these roles is needed.