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OSI management – Management functions and ODMA functions

TMN guidelines for defining coarse-grained CORBA managed object interfaces

ITU-T Recommendation X.780.1

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TMN guidelines for defining coarse-grained CORBA managed object interfaces

Summary

This Recommendation defines extensions to the set of TMN CORBA managed object modelling guidelines required to support coarse-grained interfaces. It specifies how coarse-grained CORBA TMN interfaces are to be defined. It also provides guidelines on converting fine-grained interfaces to coarse-grained. A CORBA IDL module defining the base interface types to be extended is provided.

Source

ITU-T Recommendation X.780.1 was prepared by ITU-T Study Group 4 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 August 2001.

Keywords

Common Object Request Broker Architecture (CORBA), Distributed Processing, Guidelines for the Definition of Managed Objects (GDMO), Interface Definition Language (IDL), Managed Objects, TMN Interfaces.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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TMN guidelines for defining coarse-grained CORBA managed object interfaces

1 Scope

The TMN architecture defined in ITU-T M.3010 (2000) introduces concepts from distributed processing and includes the use of multiple management protocols. ITU-T Q.816 and X.780 subsequently define within this architecture a framework for applying the Common Object Request Broker Architecture (CORBA) as one of the TMN management protocols.

This Recommendation, along with ITU-T Q.816.1, adds specifications to the framework to enable it to support a slightly different style of interaction between managing systems and managed systems than that specified in the original framework documents. This style of interaction has certain benefits, the main one being that it relieves a managing system from having to retrieve an object-oriented software address for each manageable resource it wishes to access. These software addresses could number in the millions on large systems. It also changes somewhat the way software is structured on the managed systems, which some managed system suppliers may prefer.

The scope of this Recommendation is the same as the original TMN CORBA framework. The framework and these extensions cover all interfaces in the TMN where CORBA may be used. It is expected, however, that not all capabilities and services defined here are required in all TMN interfaces. This implies that the framework can be used for interfaces between management systems at all levels of abstractions (inter and intra-administration) as well as between management systems and network elements.

1.1 Purpose

The purpose of this Recommendation is to extend the TMN CORBA framework to enable it to be used in a wider range of applications. The extensions enable a slightly different mode of interaction between the managing and managed systems which may be preferred in many situations. Thus, this Recommendation is intended for use by various groups specifying network management interfaces.

1.2 Application

The approach taken in the CORBA TMN framework Recommendations is to model manageable network resources as software objects accessible using CORBA. Information models written in the CORBA Interface Definition Language (IDL) describe the object interfaces.

CORBA provides location-transparency, enabling one software object to interact with another regardless of its location. A software object is accessed using what CORBA refers to as an Interoperable Object Reference (IOR).

The original CORBA TMN framework models each manageable resource as an independent CORBA object, each with its own unique IOR. This approach flexibly allows each object to reside anywhere. It does, however, require that managing systems have on hand an IOR for each object they wish to access. This is a burden that many companies and administrations in the telecommunications industry have sought to avoid. It also could require a managed system to support large numbers of IORs, which some managed system suppliers would like to avoid. This Recommendation, along with ITU-T Q.816.1, defines how the TMN CORBA framework is to be extended to avoid the need for large numbers of IORs.

CORBA-based interfaces using the approach where each manageable resource is addressable with a unique IOR have become known as "fine-grained" interfaces. Alternatively, those where an IOR is not assigned to each manageable resource are known as "coarse-grained" interfaces.

Because this Recommendation defines a slightly different approach to modelling manageable resources on coarse-grained interfaces, interface model specifications will be slightly different for the fine-grained and coarse-grained approaches.

1.3 Recommendation roadmap

This Recommendation has the following structure:

Clause 1	Introduction, roadmap and updates.
Clause 2	References.
Clauses 3 and 4	Definitions and abbreviations used throughout this Recommendation.
Clause 5	Conventions.
Clause 6	Design considerations that must be addressed as support for coarse-grained interfaces is added to the framework.
Clause 7	TMN CORBA framework and coarse-grained requirements overview.
Clause 8	Providing facade interfaces for accessing managed objects. This clause covers the model-specific interfaces that must be implemented on coarse-grained interfaces.
Clause 9	Guidelines for defining coarse-grained CORBA interfaces.
Clause 10	Guidelines for translating fine-grained CORBA interface specifications to coarse-grained interface specifications.
Clause 11	Compliance and conformance guidelines.
Annex A	The IDL module for the coarse-grained modelling guidelines specification. This annex is normative.

2 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T X.780 (2001), *TMN guidelines for defining CORBA managed objects*.
- [2] ITU-T Q.816 (2001), *CORBA-based TMN services*.
- [3] ITU-T Q.816.1 (2001), *CORBA-based TMN services: Extensions to support coarse-grained interfaces*.
- [4] OMG Document formal/99-10-07, *The Common Object Request Broker: Architecture and Specification*, Revision 2.3.1.

3 Definitions

3.1 Definitions from ITU-T X.701

The following terms used in this Recommendation are defined in the Systems Management Overview (ITU-T X.701):

- managed object class;
- manager;
- agent.

3.2 Definitions from ITU-T X.703

The following terms used in this Recommendation are defined in the Open Distributed Management Architecture (ITU-T X.703):

- notification.

3.3 Additional definitions

3.3.1 facade: An object interface defined to provide access to a set of managed objects, all of which are of the same class.

4 Abbreviations

This Recommendation uses the following abbreviations:

CMIP	Common Management Information Protocol
CORBA	Common Object Request Broker Architecture
COS	Common Object Services
DN	Distinguished Name
EMS	Element Management System
GDMO	Guidelines for the Definition of Managed Objects
ID	Identifier
IDL	Interface Definition Language
IIOP	Internet Interoperability Protocol
IOR	Interoperable Object Reference
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
MO	Managed Object
NE	Network Element
NMS	Network Management System
OAM&P	Operations, Administration, Maintenance, and Provisioning
OID	Object Identifier
OMG	Object Management Group
ORB	Object Request Broker
OSI	Open Systems Interconnection
PDU	Protocol Data Unit

POA	Portable Object Adapter
QoS	Quality of Service
RDN	Relative Distinguished Name
TMN	Telecommunications Management Network
UID	Universal Identifier
UML	Unified Modelling Language
UTC	Universal Time Coordinated

5 Conventions

5.1 Conventions

A few conventions are followed in this Recommendation to make the reader aware of the purpose of the text. While most of this Recommendation is normative, paragraphs succinctly stating mandatory requirements to be met by a management system (managing and/or managed) are preceded by a boldface "R" enclosed in parentheses, followed by a short name indicating the subject of the requirement, and a number. For example:

(R) EXAMPLE-1 An example mandatory requirement.

Requirements that may be optionally implemented by a management system are preceded by an "O" instead of an "R". For example:

(O) OPTION-1 An example optional requirement.

The requirement statements are used to create compliance and conformance profiles.

Many examples of CORBA IDL are included in this Recommendation, and IDL specifying the TMN specific services, and supporting data types, are included in Annex A. The IDL is written in a 9-point courier typeface:

```
// Example IDL
interface foo {
    void operation1 ();
};
```

5.2 Compiling the IDL

An advantage of using IDL to specify network management interfaces is that IDL can be "compiled" into programming code by tools that accompany an ORB. This actually automates the development of some of the code necessary to enable network management applications to interoperate. Annex A contains code that implementers will want to extract and compile. Annex A is normative and should be used by developers implementing systems that conform to this Recommendation. The IDL in this Recommendation has been checked with two compilers to ensure its correctness. A compiler supporting the CORBA version specified in ITU-T Q.816 must be used.

Annex A has been formatted to make it simple to cut and paste into plain text files that may then be compiled. Below are tips on how to do this.

- 1) Cutting and pasting seems to work better from the Microsoft® Word® version of this Recommendation. Cutting and pasting from the Adobe® Acrobat® file format seems to include page headers and footers, which cannot be compiled.