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**ISO/IEC 19500-2**

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# Information technology — Object Management Group — Common Object Request Broker Architecture (CORBA) —

## Part 2: Interoperability



*Technologies de l'information — OMG (Object Management Group) — CORBA (Common Object Request Broker Architecture) — Partie 2: Interopérabilité*



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# Table of Contents

# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO/IEC 19500-2 was prepared by Technical Committee ISO/IEC JTC1, Information technology, in collaboration with the Object Management Group (OMG), following the submission and processing as a Publicly Available Specification (PAS) of the OMG Common Object Request Broker Architecture (CORBA) specification Part 2 Version 3.1 CORBA Interoperability.



ISO/IEC 19500-2 is related to:



- ITU-T Recommendation X.902 (1995) | ISO/IEC 10746-2:1996, Information Technology - Open Distributed Processing - Reference Model: Foundations
- ITU-T Recommendation X.903 (1995) | ISO/IEC 10746-3:1996, Information Technology - Open Distributed Processing - Reference Model: Architecture
- ITU-T Recommendation X.920 (1997) | ISO/IEC 14750:1997, Information Technology - Open Distributed Processing - Interface Definition Language
- ISO/IEC 19500-2, Information Technology - Open Distributed Processing - CORBA Specification Part 1: CORBA Interfaces
- ISO/IEC 19500-3, Information Technology - Open Distributed Processing - CORBA Specification Part 3: CORBA Components

ISO/IEC 19500 consists of the following parts, under the general title *Information technology - Open distributed processing - CORBA specification*:

- Part 1: CORBA Interfaces
- Part 2: CORBA Interoperability
- Part 3: CORBA Components

It is the common core of the CORBA specification. Optional parts of CORBA, such as mappings to particular programming languages, Real-time CORBA extensions, and the minimum CORBA profile for embedded systems are documented in the other specifications that together comprise the complete CORBA specification. Please visit the CORBA download page at http://www.omg.org/technology/documents/corba_spec_catalog.htm to find the complete CORBA specification set.

Apart from this Foreword, the text of this International Standard is identical with that for the OMG specification for CORBA, v3.1.1, Part 2.

# Introduction

The rapid growth of distributed processing has led to a need for a coordinating framework for this standardization and ITU-T Recommendations X.901-904 | ISO/IEC 10746, the Reference Model of Open Distributed Processing (RM-ODP) provides such a framework. It defines an architecture within which support of distribution, interoperability and portability can be integrated.

RM-ODP Part 2 (ISO/IEC 10746-2) defines the foundational concepts and modeling framework for describing distributed systems. The scopes and objectives of the RM-ODP Part 2 and the UML, while related, are not the same and, in a number of cases, the RM-ODP Part 2 and the UML specification use the same term for concepts which are related but not identical (e.g., interface). Nevertheless, a specification using the Part 2 modeling concepts can be expressed using UML with appropriate extensions (using stereotypes, tags, and constraints).

RM-ODP Part 3 (ISO/IEC 10746-3) specifies a generic architecture of open distributed systems, expressed using the foundational concepts and framework defined in Part 2. Given the relation between UML as a modeling language and Part 3 of the RM-ODP standard, it is easy to show that UML is suitable as a notation for the individual viewpoint specifications defined by the RM-ODP.

This International Standard for CORBA Interfaces is a standard for the technology specification of an ODP system. It defines a technology to provide the infrastructure required to support functional distribution of an ODP system, specifying functions required to manage physical distribution, communications, processing and storage, and the roles of different technology objects in supporting those functions.



## Context of CORBA



The key to understanding the structure of the CORBA architecture is the Reference Model, which consists of the following components:

- **Object Request Broker**, which enables objects to transparently make and receive requests and responses in a distributed environment. It is the foundation for building applications from distributed objects and for interoperability between applications in hetero- and homogeneous environments. The architecture and specifications of the Object Request Broker are described in this manual.
- **Object Services**, a collection of services (interfaces and objects) that support basic functions for using and implementing objects. Services are necessary to construct any distributed application and are always independent of application domains. For example, the Life Cycle Service defines conventions for creating, deleting, copying, and moving objects; it does not dictate how the objects are implemented in an application. Specifications for Object Services are contained in *CORBAservices*: *Common Object Services Specification*.
- **Common Facilities**, a collection of services that many applications may share, but which are not as fundamental as the Object Services. For instance, a system management or electronic mail facility could be classified as a common facility. Information about Common Facilities will be contained in *CORBAfacilities*: *Common Facilities Architecture*.
- **Application Objects**, which are products of a single vendor on in-house development group that controls their interfaces. Application Objects correspond to the traditional notion of applications, so they are not standardized by OMG. Instead, Application Objects constitute the uppermost layer of the Reference Model.

The Object Request Broker, then, is the core of the Reference Model. It is like a telephone exchange, providing the basic mechanism for making and receiving calls. Combined with the Object Services, it ensures meaningful communication between CORBA-compliant applications.

The architecture and specifications described in this standard are aimed at software designers and developers who want to produce applications that comply with OMG specifications for the Object Request Broker (ORB), or this standard (ISO/IEC 19500). The benefit of compliance is, in general, to be able to produce interoperable applications that are based on distributed, interoperating objects. The ORB provides the mechanisms by which objects transparently make requests and receive responses. Hence, the ORB provides interoperability between applications on different machines in heterogeneous distributed environments and seamlessly interconnects multiple object systems.

This Part of this International Standard includes a non-normative annex.

# Information technology - Object Management Group Common Object Request Broker Architecture (CORBA), Interoperability

## 1 Scope

This part of ISO/IEC 19500 specifies a comprehensive, flexible approach to supporting networks of objects that are distributed across and managed by multiple, heterogeneous CORBA-compliant Object Request Brokers (ORBs). The approach to inter-ORB operation is universal, because elements can be combined in many ways to satisfy a very broad range of needs.

This part of ISO/IEC 19500 covers the specification of:

- ORB interoperability architecture
- Inter-ORB bridge support
- The General Inter-ORB Protocol (GIOP) for object request broker (ORB) interoperability. GIOP can be mapped onto any connection-oriented transport protocol that meets a minimal set of assumptions defined by this standard.
- The Internet Inter-ORB Protocol (IIOP), a specific mapping of the GIOP which runs directly over connections that use the Internet Protocol and the Transmission Control Protocol (TCP/IP connections).
- The CORBA Security Attribute Service (SAS) protocol and its use within the CSIv2 architecture to address the requirements of CORBA security for interoperable authentication, delegation, and privileges.



This part of ISO/IEC 19500 provides a widely implemented and used particularization of ITU-T Rec. X.931 | ISO/IEC 14752. Open Distributed Processing - Protocol Support for Computational Interactions. It supports interoperability and location transparency in ODP systems.

## 2 Conformance and Compliance

An ORB is considered to be interoperability-compliant when it meets the following requirements:

- In the CORBA Core part, standard APIs are provided by an ORB to enable the construction of request-level inter-ORB bridges. APIs are defined by the Dynamic Invocation Interface, the Dynamic Skeleton Interface, and by the object identity operations described in the Interface Repository clause of this book.
- An Internet Inter-ORB Protocol (IIOP) (explained in the Building Inter-ORB Bridges clause) defines a transfer syntax and message formats (described independently as the General Inter-ORB Protocol), and defines how to transfer messages via TCP/IP connections. The IIOP can be supported natively or via a halfbridge.

Support for additional Environment Specific Inter-ORB Protocols (ESIOPs) and other proprietary protocols is optional in an interoperability-compliant system. However, any implementation that chooses to use the other protocols defined by the CORBA interoperability specifications must adhere to those specifications to be compliant with CORBA interoperability.

Figure 6.2 on page 12 shows examples of interoperable ORB domains that are CORBA-compliant. These compliance points support a range of interoperability solutions. For example, the standard APIs may be used to construct “half bridge” to the IIOP, relying on another “half bridge” to connect to another ORB. The standard APIs also support

construction of “full bridges,” without using the Internet IOP to mediate between separated bridge components. ORBs may also use the Internet IOP internally. In addition, ORBs may use GIOP messages to communicate over other network protocol families (such as Novell or OSI), and provide transport-level bridges to the IIOP.

The GIOP is described separately from the IIOP to allow future specifications to treat it as an independent compliance point.

## 2.1 Unreliable Multicast

### Summary of Optional Verses Mandatory Interfaces

An interface to an MIOP gateway should be considered an optional interface within the MIOP specification.

### Proposed Compliance Points

The MIOP specification is a single, optional compliance point within the CORBA Core specification.

### Changes to Other OMG Specifications

This part of ISO/IEC 19500 contains an extension to the IOP module.

```
module IOP {
    const ProfileId         TAG_UIPMC = 3;
    const ComponentId       TAG_GROUP = 39;
    const ComponnetId       TAG_GROUP_IIOP = 40
};
```



# 3 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- ITU-T Recommendation X.902 (1995) | ISO/IEC 10746-2:1996, Open Distributed Processing - Reference Model: Foundations
- ITU-T Recommendation X.903 (1995) | ISO/IEC 10746-3:1996, Open Distributed Processing - Reference Model: Architecture
- ITU-T Recommendation X.920 (1999) | ISO/IEC 10750:1999, Open Distributed Processing - Interface Definition Language
- ITU-T Recommendation X.931(2000) | ISO/IEC 14752:2000, Open Distributed Processing - Protocol Support for Computational Interactions
- ISO/IEC 8859-1: 1998, Information Technology - 8-bit single byte coded graphic character sets - Part 1: Latin alphabet No. 1
- ISO/IEC 10646-1:1993 Information Technology - Universal Multiple-Octect coded character set (UCS) - Part 1: Architecture and Basic Multilingual Plane

- ISO/IEC 10646-1: 1993/Amd 1:1996 Transformation Format for 16 planes of group 00 (UTF - 16)
- ISO/IEC 10646-1: 1993/Amd 2:1996 UCS Transformation Format 8 (UTF - 8)
- ISO/IEC 19500-1: 2011 Open Distributed Processing - CORBA Specification Part 1: CORBA Interfaces, pas/2011-08-07

## 3.1 Other Specifications

- STD 007 (also, RFC 793), Transmission Control Protocol, J. Postel, Internet Engineering Task Force, Sept. 1981
- STD 005 (also, RFC 791), Internet Protocol, J. Postel, Internet Engineering Task Force, Sept. 1981
- OSF Character and Code Set Registry, OSF DCE FRC 40.1 (Public Version), S. (Martin) O'Donnell, June 1994.
- RPC Runtime Support For I18N Characters - Functional Specification, OSF DCE SIG RFC 41.2, M. Romagna, R. Mackey, November 1994.
- [JAV2I]Object Management Group, “Java to IDL,” available from http://www.omg.org/spec/JAV2I/1.4
- [CORBASEC]Object Management Group, “Security Service,” available from http://www.omg.org/spec/SEC/
- [ASMOTS]Object Management Group, “Additional Structuring Mechanisms for the OTS,” available from http://www.omg.org/spec/OTS/
- [TRANS]Object Management Group, “Transaction Service,” available from http://www.omg.org/spec/TRANS/
- [FIREWALL]Object Management Group, “CORBA Firewall Traversal Specification,” available from http://www.omg.org/members/cgi-bin/doc?ptc/04-04-05.pdf
- [SCCP] Object Management Group, “CORBA / TC Interworking and SCCP-Inter ORB Protocol (SCCP),” available from http://www.omg.org/spec/SCCP
- [FTCORBA] Object Management Group, “Fault Tolerant Corba,” clause 23 of CORBA 3.0.3, available from http://www.omg.org/cgi-bin/doc?formal/2004-03-01
- [RTCORBA] Object Management Group, “Real-Time CORBA, version 1.2,” available from http://www.omg.org/spec/RT/
- [WATM] Object Management Group, “Wireless Access and Telecom Mobility in CORBA, Version 1.2,” available from http://www.omg.org/spec/WATM/
- [DCOMI] Object Management Group, “Interoperability with non-CORBA Systems” clause 20 of CORBA 3.0.3, available from http://www.omg.org/cgi-bin/doc?formal/2004-03-01
- [TSAS] Object Management Group, “Telecommunications Service Access and Subscription Specification,” available from http://www.omg.org/spec/TSAS/
- IETF RFC2119, “Key words for use in RFCs to Indicate Requirement Levels,” S. Bradner, March 1997 (http://ietf.org/rfc/rfc2119)