INTERNATIONAL STANDARD

ISO/IEC 29168-1

Second edition
2023-03

Information technology — Open systems interconnection —

Part 1: Object identifier resolution system

Technologies de l'information — Interconnexion de systèmes ouverts (OSI) —

Partie 1: Système de résolution d'identificateur d'objet

Reference number
ISO/IEC 29168-1:2023(E)

Documents
Document Sharing Hub

© ISO/IEC 2023

Full document details: ISO IEC 29168-1-2023

COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub

Full document details: ISO IEC 29168-1-2023

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs)

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by ITU-T as ITU-T X.672 and drafted in accordance with its editorial rules, in collaboration with Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems.*

This second edition cancels and replaces the first edition (ISO/IEC 29168-1:2011), which has been technically revised.

A list of all parts in the ISO/IEC 29168 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

© ISO 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO IEC 29168-1-2023

INTERNATIONAL STANDARD ISO/IEC 29168-1
RECOMMENDATION ITU-T X.672

Information technology – Open systems interconnection – Object identifier resolution system

Summary

Recommendation ITU-T X.672 | International Standard ISO/IEC 29168-1 specifies the object identifier (OID) resolution system (ORS). This enables (arbitrary) information to be associated with any ORS-supported OID node (of the international OID tree defined in Rec. ITU-T X.660 | ISO/IEC 9834-1). This associated information is identified by an application specification that may have a requirement for instances of that application (running on any computer system) to obtain the associated information by an ORS search, using an Abstract Syntax Notation One (ASN.1) OID-internationalized resource identifier value to identify the node.

Currently defined application information for a node includes the canonical form of an international OID, child node information, registration information about the owner of the node, a reference to an ASN.1 module identified by the node, information supporting tag-based applications and information supporting cybersecurity.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T X.672	2010-08-29	17	11.1002/1000/10831
2.0	ITU-T X.672	2022-06-06	17	11.1002/1000/14780

Keywords

Object identifier resolution system, object identifier, OID, ORS.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

AVA Documents
Document Sharing Hub

© ISO/IEC 2023 – All rights reserved

Full document details: ISO IEC 29168-1-2023

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents/software copyrights, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the appropriate ITU-T databases available via the ITU-T website at http://www.itu.int/ITU-T/ipr/.

© ITU 2023

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

© ISO/IEC 2023 – All rights reserved
Full document details: ISO IEC 29168-1-2023

CONTENTS

Page

1 Scope 1
2 Normative references 1
2.1 Identical Recommendations | International Standards 1
2.2 Additional references 1
3 Definitions 2
3.1 Imported definitions 2
3.2 Additional definitions 2
4 Abbreviations and acronyms 4
5 OID resolution system architecture 5
5.1 OID resolution process 5
5.2 Interactions between components in the general OID resolution process 5
6 DNS zone files for the ORS domain 6
6.1 Overview 6
6.2 Requirements and restrictions on DNS zone files in the ORS domain 7
6.3 Use of DNS resource records for ORS services 7
6.4 Security considerations 8
7 Operation of an ORS client 8
7.1 Functional interfaces 8
7.2 Processing a query 8
7.3 Converting an OID-IRI value to an FQDN 8
7.4 Processing DNS results 9
7.5 Security considerations 9
7.6 Local performance considerations 9
8 Requirements for ORS service specifications 10
8.1 Specification of NAPTR information 10
8.2 Recommendations for ORS application processing 10
Annex A – Assigned ORS service types 11
Annex B – Specification of the canonical OID (COID) ORS service 12
Annex C – Specification of the child information (CINF) ORS service 13
C.1 General 13
C.2 CINF XML file 13
Annex D – Specification of the registration information (RINF) ORS service 15
D.1 General 15
D.2 RINF XML file 15
Annex E – Specification of the module information (MINF) ORS service 17
Annex F – Description of use cases 18
F.1 Canonical OID (COID) ORS service 18
F.2 Child information (CINF) ORS service 18
F.3 Registration information (RINF) ORS service 18
F.4 Module information (MINF) ORS service 18
Annex G – Examples of ORS operation 19
G.1 Example of DNS zone files for the ORS 19
G.2 Examples of NAPTR resource records 20
Annex H – Implementation guidance for a local cache and copies of ORS zones 21
H.1 Local cache for OID resolution 21
H.2 Local copies of ORS zones 21
H.3 Local copies of ORS zones independent of the local DNS 21
Annex I – Operational guidance for ORS operators 23
Annex J – Changes and compatibility of this edition of this Recommendation | International Standard 24

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO IEC 29168-1-2023

Page

Annex K – History of object identifiers 25

Bibliography 26

© ISO/IEC 2023 – All rights reserved

Full document details: ISO IEC 29168-1-2023

Documents
Document Sharing Hub

Introduction

This Recommendation | International Standard specifies the object identifier (OID) resolution system (ORS). This provides the return (using an ORS client) of information associated with an OID node.

It uses a mapping of the International OID tree naming scheme (using OID-internationalized resource identifier (OID-IRI) values) on to the domain name system (DNS) naming scheme (see 7.3).

This Recommendation | International Standard specifies requirements for the management of DNS zone files that are mapped from ORS-supported OID nodes to provide (standardized) information related to an international OID tree node for a variety of applications, and on the behaviour of an ORS client that interacts with the DNS system to obtain that information and provide it to an application.

Six requirements emerged in the mid/late-2000s:

- an application to be able to translate any OID-IRI value into a canonical OID-IRI (a unique string of numeric Unicode labels that would identify a node): the canonical OID (COID) ORS service, supporting IRI comparison of names in the IETF "oid" IRI scheme (see Annex B);
- an application to determine child information (CINF) from an OID node: the CINF service (see Annex C);
- an application to obtain registration information (such as contact information about the owner of the OID node and how to request a child node; RINF): the RINF service (see Annex D);
- an application to obtain a reference to the Abstract Syntax Notation One (ASN.1) module (if any) associated with a node: the module information (MINF) service (see Annex E);
- support for access to multimedia information (triggered by tag-based identification) using the ORS;
- support for access to information contained in an OID node that relates to cybersecurity features.

Three requirements emerged in 2019-2020:

- enhancement of the local performance of OID resolution to reduce the response time;
- high availability of the ORS;
- resolution of ORS-supported OID nodes for which not all superior OID nodes are ORS supported.

There are probably other applications that will require further information (specified by an application standard) contained in an ORS-supported OID node and accessible by the ORS.

To meet these needs, it was decided to map the OID tree into a part of the DNS tree (see IETF RFC 1035), with the root of the international OID tree mapped into .oid-res.org (see 7.3).

The mapping is from any OID-IRI value that identifies an international OID node into a DNS name (in the ORS domain). The information about an ORS-supported OID node is inserted into DNS zone files and can then be retrieved by any ORS client (running on any computer system with DNS access), using any of the OID-IRI identifications for that international OID tree node.

The associated information is specified by those applications that choose to use the ORS. The requirements on such applications are included in this Recommendation | International Standard. Some application specifications are included as normative annexes to this Recommendation | International Standard. Others are specified externally.

All DNS zone files for the ORS domain correspond to ORS-supported OID nodes, but not all DNS names algorithmically mapped from an OID-IRI are present in the DNS. All DNS zone files in the ORS domain are required to conform to this Recommendation | International Standard.

Information for an international OID tree node (for each application) is specified by the owner of that node, and determines the appropriate configuration of DNS zone files, in accordance with the specification for each ORS service (see Annex A), and would be retrieved by an application using a local ORS client implementation interacting with a local DNS client (see clause 7). The information would be included in naming authority pointer (NAPTR) resource records, qualified by the ORS service type.

An ORS client takes as input any OID-IRI value, together with an ORS service type. It will return node information for that OID-IRI value and ORS service type (based on the configuration of the DNS zone files, and particularly of NAPTR resource records). Each resource record will consist of one or more pieces of information together with the requested ORS service type.

The procedures for the appointment of the ORS operational agency are contained in ISO/IEC 29168-2. These procedures involve only ISO/IEC for appointment and contractual purposes. They do not have any ITU-T involvement.

Clause 5 provides an overview of the ORS architecture and its interaction with the DNS.

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO IEC 29168-1-2023

Clause 6 specifies the requirements and restrictions on DNS zone files in the ORS domain in order to support navigation to DNS names mapped from the international OID tree (including the use of long arcs) and the provision of information needed for the ORS resolution process using any specified ORS service type.

NOTE – This Specification relates only to the use of delegation name (DNAME) DNS resource records and NAPTR resource records using a service field commencing "ORS+". Use of other DNS resource records lie outside the scope of this Recommendation | International Standard, and are neither forbidden (except when they would conflict with the use for the ORS) nor are they required.

Clause 7 specifies the operation of an ORS client, including the mapping of an OID-IRI value into a DNS name.

Clause 8 specifies the requirements for an ORS application specification, including specification of NAPTR information and recommendations on ORS application processing.

Security considerations are discussed and specified in 5.2.3 to 5.2.6, 6.4, 7.5 and 8.2.2.

Annex A (normative) specifies the assigned ORS service types at the time of publication of this Recommendation | International Standard.

Annex B (normative) specifies the COID service.

Annex C (normative) specifies the requirements for the CINF service.

Annex D (normative) specifies the requirements for the RINF service.

Annex E (normative) specifies the requirements for the MINF service.

Annex F (informative) provides a description of the use cases for the ORS, referencing each application that has a specified ORS service type (see Annex A).

Annex G (informative) provides examples of possible DNS zone files to support the ORS and additional examples of NAPTR resource records.

Annex H (informative) provides implementation guidance for a local cache and copies of ORS zones.

Annex I (informative) provides operational guidance for ORS operators.

Annex J (informative) explains the changes introduced in this edition of this Recommendation | International Standard.

Annex K (informative) provides a short history of the development of the international OID tree.

Annex L (informative) provides bibliographic references.

© ISO/IEC 2023 – All rights reserved
Full document details: ISO IEC 29168-1-2023

INTERNATIONAL STANDARD
ITU-T RECOMMENDATION

Information technology – Open systems interconnection – Object identifier resolution system

1 Scope

This Recommendation | International Standard specifies the object identifier (OID) resolution system (ORS), including the overall architecture and a resolution mechanism based on the domain name system (DNS).

This Recommendation | International Standard specifies the means for inserting any application-defined information associated with an OID node into the DNS (see clause 6) and the means of retrieval of that information using the ORS (see clause 7).

This Recommendation | International Standard does not restrict the number of applications it can support.

This Recommendation | International Standard specifies the required operation of an ORS client (see clause 7), including the mapping of an OID-IRI value by the ORS client into a DNS name to produce a DNS query for the specified application information and the processing of any returned information. The ORS has no role in the allocation or registration of OID nodes.

The required behaviour of an ORS client is specified, but the interfaces to it are specified only in terms of the semantics of the interaction. A bit-level application program interface is platform and software dependent, and lies outside the scope of this Recommendation | International Standard.

A special behaviour of an ORS client is specified to cache OID information in order to reduce the response time of OID resolution. This Recommendation | International Standard also specifies a mechanism to resolve an OID node when one of its superior OID nodes is not ORS supported.

This Recommendation | International Standard does not include a tutorial or complete specification on the management of DNS zone files (for that, see IETF RFC 1035 and IETF RFC 3403); it specifies (only) the DNS resource records (see 6.3) that need to be inserted in the zone files in order to support ORS access to the information associated with an OID node.

This Recommendation | International Standard specifies required DNS zone file resource records, and prohibits the use of other resource records of a similar form but with different semantics (in DNS zone files in the ORS domain) – see 6.2. It does not otherwise restrict the general use of DNS zone files.

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 edition 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 currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- Recommendations ITU-T X.660 (2011) | ISO/IEC 9834-1:2012, *Information technology – Procedures for the operation of object identifier registration authorities: General procedures and top arcs of the international object identifier tree*.
- Recommendation ITU-T X.693 (2021) | ISO/IEC 8825-4:2021, *Information technology – ASN.1 encoding rules: XML Encoding Rules (XER)*.

2.2 Additional references

- Recommendation ITU-T X.675 (2015), *OID-based resolution framework for heterogeneous identifiers and locators*.
- IETF RFC 1034 (1987), *Domain names – Concepts and facilities*.

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO IEC 29168-1-2023

– IETF RFC 1035 (1987), *Domain names – Implementation and specification*.

– IETF RFC 3403 (2002), *Dynamic delegation discovery system (DDDS) – Part Three: The domain name system (DNS) database*.

– IETF RFC 3490 (2003), *Internationalizing domain names in applications (IDNA)*.

– IETF RFC 3492 (2003), *Punycode: A bootstring encoding of Unicode for internationalized domain names in applications (IDNA)*.

– IETF RFC 4033 (2005), *DNS security introduction and requirements*.

– IETF RFC 5155 (2008), *DNS security (DNSSEC) hashed authenticated denial of existence*.

NOTE – It is recommended that the IETF RFC index be consulted for updates to its entries listed in this clause.

– IETF RFC 7564 (2015), *PRECIS framework: Preparation, enforcement, and comparison of internationalized strings in application protocols*.

– Unicode Consortium (2021). *Unicode standard*, Version 14.0.0. Mountain View, CA: Unicode Consortium. Available [viewed 2022-07-27] at: https://www.unicode.org/versions/Unicode14.0.0/UnicodeStandard-14.0.pdf.

3 Definitions

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

3.1 Imported definitions

This Recommendation | International Standard uses the following terms defined in Rec. ITU-T X.660 | ISO/IEC 9834-1:

a) object identifier;

b) integer-valued Unicode label;

c) international object identifier tree;

d) long arc;

e) OID-internationalized resource identifier;

f) Registration Authority;

g) Unicode label.

3.2 Additional definitions

3.2.1 application-specific OID resolution process: Actions by an application to retrieve application-specific information from the information returned by the general OID resolution process.

3.2.2 AXFR: DNS zone transfer protocol.

NOTE – See IETF RFC 5936.

3.2.3 canonical form (of an OID-IRI): A form which uses only integer-valued Unicode labels.

NOTE – An OID-IRI is an ASN.1 type defined in Rec. ITU-T X.680 | ISO/IEC 8824-1. The term OID-IRI value refers to the ASN.1 value notation that is the same as the Internet Assigned Numbers Authority (IANA) "oid:" internationalized resource identifier/uniform resource identifier (IRI/URI) scheme, with the omission of the initial "oid:".

3.2.4 delegation name (DNAME): A DNS resource record used to create an alias for a domain name and all of its subdomains.

3.2.5 DNS delegation: The process to create a separate zone in the DNS name space beneath the top name of a given domain.

NOTE 1 – See IETF RFC 7719.

NOTE 2 - Delegation happens when a name server RRset is added in the parent zone for the child origin, which is the domain name that appears at the top of the child zone.

3.2.6 DNS-mapped name: The result of transforming an OID-IRI value to an FQDN.

NOTE 1 – See 7.3.

NOTE 2 – The DNS-mapped name may not exist in the DNS. If it does not, then an ORS query will result in an error message (see 7.4) and the node identified by the OID-IRI is not ORS supported.

© ISO/IEC 2023 – All rights reserved
Full document details: ISO IEC 29168-1-2023