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**ISO/IEC JTC 1/SC 6**

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| ISO/IEC JTC1/SC6 Secretariat Ms. Jooran Lee, KSA (on behalf of KATS)<br>Korea Technology Center #701-7 Yeoksam-dong, Gangnam-gu, Seoul, 135-513, Republic of Korea ;<br>Telephone: +82 2 6009 4808 ; Facsimile: +82 2 6009 4819 ; Email : <a href="mailto:jooran@kisi.or.kr">jooran@kisi.or.kr</a> |   |

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**INTERNATIONAL STANDARD ISO/IEC XXXX**

**ITU-T RECOMMENDATION X.XXX**

**Information technology –  
Open Systems Interconnection –  
Object Identifier Resolution System**

**Summary**

This Recommendation | International Standard specifies OID (Object Identifier) Resolution System which provides information associated with any object identified by an Object Identifier. This associated information can be access information, child node information, or the canonical form of the OID International Resource Identifier (OID-IRI).

**Keywords**

OID, resolution, Object Identifier

# **Information technology – Open Systems Interconnection – Object Identifier Resolution System**

## **Introduction**

This Recommendation | International Standard specifies an Object Identifier (OID) Resolution System which provides information associated with any object identified by an Object Identifier.

## **1 Scope**

This Recommendation | International Standard specifies an OID Resolution System including the overall architecture and a DNS-based protocol. The OID Resolution System provides access to the information associated with a given OID using DNS servers.

The OID Resolution System consists of two processes: a general OID resolution process and an application-specific OID resolution process. The general OID resolution process utilizes the DNS (Domain Name System) protocol.

This Recommendation | International Standard applies to the implementation, administration and maintenance of the OID Resolution System.

## **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**

- ITU-T Recommendation X.660 (2008) series | ISO/IEC 9834:2008, *Information technology – Open Systems Interconnection – Procedures for the operation of OSI Registration Authorities: General procedures*.
- ITU-T Recommendation X.680 (2008) series | ISO/IEC 8824:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.
- ITU-T Recommendation X.690 (2008) series | ISO/IEC 8825:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Encoding Rules*.

### **2.2 Additional references**

- 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 4033:2005, *DNS Security Introduction and Requirements*.

## **3 Definitions**

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

### 3.1 Imported definitions

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

- a) object identifier.

### 3.2 Additional definitions

**3.2.1 canonical form (of an OID internationalized resource identifier):** A form which uses only integer valued Unicode labels.

**3.2.2 OID resolution:** a process which translates OID into associated information with the OID

**3.2.3 OID Resolution System:** a system which provides OID resolution functions

**3.2.4 OID resolution client:** the client-side of OID Resolution System which is responsible for initiating OID resolution process

**3.2.5 OID resolution server:** the server-side of OID Resolution System which maintains distributed database of associated information with OIDs

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

|         |   |
|---------|---|
| DNS     | Domain Name System                        |
| FQDN    | Fully Qualified Domain Name               |
| NAPTR   | Naming Authority Pointer                  |
| OID     | Object Identifier                         |
| OID-IRI | OID internationalized resource identifier |

## 5 OID Resolution System Architecture

### 5.1 Overview

The overall architecture and operation of the OID Resolution System is illustrated in Figure 1. The OID Resolution System consists of two processes: a general OID resolution process and an application-specific OID resolution process. The general OID resolution process uses the DNS protocol between the OID resolution client and the OID resolution server. The OID resolution client submits an OID for resolution and this OID is resolved via a series of linked OID resolution servers. An OID resolution server sends information related to an object identified by the OID back to the OID resolution client.

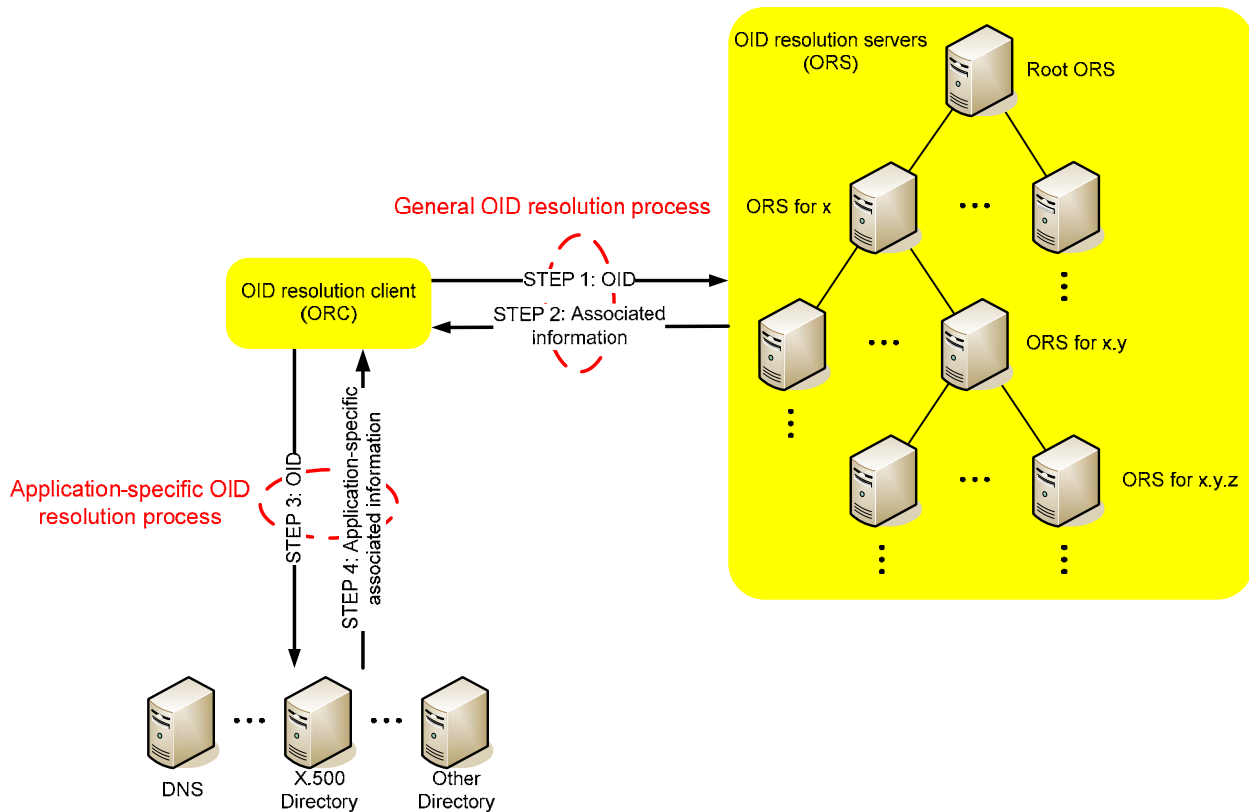


Figure 1. Architecture of the OID Resolution System

The associated information related to an object identified by the OID in STEP 2 in Figure 1 could be access information (see 6.2.1), child nodes information or the canonical form of the IRI.

If the result of the general OID resolution process is child node information or the canonical form of the OID-IRI, then the OID resolution process is finished. If the result of the general OID resolution process is access information then the application-specific OID resolution process is initiated.

NOTE – This Recommendation | International Standard specifies only the overall architecture of the OID Resolution System and general OID resolution process. The application-specific OID resolution process is out of scope of this Recommendation | International Standard.

## 5.2 General OID resolution process

The general OID resolution process utilizes DNS protocol and OID resolution client always initiates this general OID resolution process. The result of the general OID resolution process could be access information, child nodes information or the canonical form of the IRI.

## 5.3 Application-specific OID resolution process

The application specific OID resolution process is only initiated when the result of the general OID resolution process is access information. In this process any kind of protocol can be used. The access information from the OID resolution server should include access methods and locations for obtaining additional information.

# 6 The DNS protocol for the general OID resolution process

The general OID resolution process uses the DNS protocol and NAPTR Resource Record.

## 6.1 Query to an OID resolution server

An input to OID resolution server is a canonical form of OID-IRI (for example, /2/27/99) or OID-IRI (for example, /joint-iso-itu-t/tag-based/examplecode). In the DNS query message, these object identifiers should be converted into a FQDN form (for example, 99.27.2.oid.foo and examplecode.tag-based.joint-iso-itu-t.oid.foo). Figure 2 illustrates the DNS message format for a query.

|            |  |  |
|------------|--|--|
| Header     | OPCODE=QUERY                                   |  |
| Question   | QNAME=99.27.2.oid.foo., QCLASS=IN, QTYPE=NAPTR |  |
| Answer     | <empty>  |  |
| Authority  | <empty>  |  |
| Additional | <empty>  |  |

Figure 2. DNS message format for query

### 6.1.1 Converting canonical form of OID into FQDN form

A canonical form of OID can be converted into FQDN form using following procedure:

- 1) See that the canonical form of OID is written in its full form. For example, /2/27/99
- 2) Remove first “/”. For example, 2/27/99
- 3) Put dots (“.”) instead of “/”. For example, 2.27.99
- 4) Reverse the order. For example, 99.27.2
- 5) Append the string “.oid.foo.” For example, 99.27.2.oid.foo.

### 6.1.2 Converting OID-IRI into FQDN form

An OID-IRI can be converted into FQDN form using following procedure:

- 1) See that the OID-IRI is written in its full form. For example, /joint-iso-itu-t/tag-based/examplecode
- 2) Remove first “/”. For example, joint-iso-itu-t/tag-based/examplecode
- 3) Put dots (“.”) instead of “/”. For example, joint-iso-itu-t.tag-based.examplecode
- 4) Reverse the order. For example, examplecode.tag-based.joint-iso-itu-t
- 5) Append the string “.oid.foo.” For example, examplecode.tag-based.joint-iso-itu-t.oid.foo.

## 6.2 Response from the OID resolution server

The result of a query to the OID resolution server can be access information, child node information, or the canonical form of the OID-IRI (which has the same information content as the value of an OID). The result from the OID resolution server is delivered to OID resolution client using NAPTR Resource Record in DNS message format for response. Figure 3 illustrates DNS response message format.

|            |   |  |
|------------|---|--|
| Header     | OPCODE=QUERY, RESPONSE, AA  |  |
| Question   | QNAME=99.27.2.oid.foo., QCLASS=IN, QTYPE=NAPTR                            |  |
| Answer     | 1.27.2.oid.<br>  IN NAPTR 100 100 "flag" "service" "regexp" "replacement" |  |
| Authority  | <empty>   |  |
| Additional | <empty>   |  |

Figure 3. DNS message format for response

This Recommendation | International Standard specifies new Service Parameters for the general OID resolution process. Service Parameters take the following form and found in the service field of the NAPTR Resource Record.

Service-field = “O2I” servicespec

servicespec = "+" orpservice

orpservice = "DNS" | "X.500" | "LDAP" | "HTTP" | "HTTPS" | "COI" | "CINFO"

### 6.2.1 Access information

The access information contains access protocol and access location for the application-specific OID resolution process. An access protocol is specified in service field of NAPTR Resource Record. This Recommendation | International Standard specifies 5 access methods: DNS, X.500, LDAP, HTTP and HTTPS. An access location is specified as URI in RegExp field of NAPTR Resource Record.

An example of NAPTR Resource Record for access information is:

```
99.27.2.oid.foo. IN NAPTR 0 100 "u" "O2I+DNS" "!^.*$!examplecode.kr!" .
```

This describes that the access information for OID {joint-iso-itu-t(2) tag-based(27) examplecode(99)}. In the application-specific OID resolution process, the client can access associate information with OID using DNS protocol at "examplecode.kr".

### 6.2.2 Child node information

The child node information contains number of child nodes and primary integer value and Unicode Label of child nodes in XML file. The location of this XML file is specified as URI in RegExp field of NAPTR Resource Record.

An example of NAPTR Resource Record for access information is:

```
99.27.2.oid.foo. IN NAPTR 0 100 "u" "O2I+CINFO" "!^.*$!http://oid.kr/example.xml!" .
```

### 6.2.3 Canonical form of an OID-IRI

A canonical form of OID is specified in the service field of a NAPTR Resource Record.

An example of NAPTR Resource Record for canonical form of OID is:

```
examplecode.tag-based.joint-iso-itu-t.oid.foo. IN NAPTR 0 100 "u" "O2I+COI" "!^.*$!/2/27/99!" .
```

The Service Parameter "O2I+COI" indicates that this NAPTR Resource Record includes a canonical form of OID-IRI.

## 7 Operation of the OID Resolution System

Figure 4 describes hierarchical structure and delegation structure of OID resolution servers.

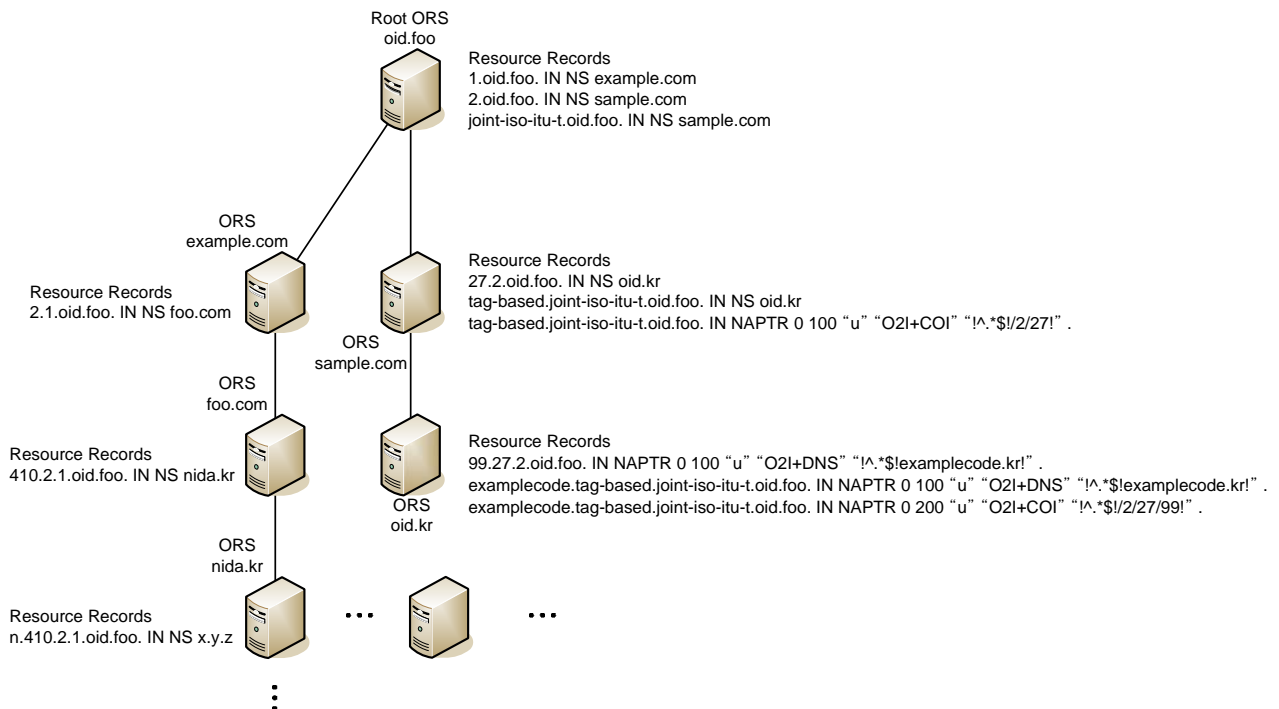




Figure 4. An example of structure of OID resolution servers

Figure 5 shows the operation example of general OID resolution process with the configuration as Figure 4.

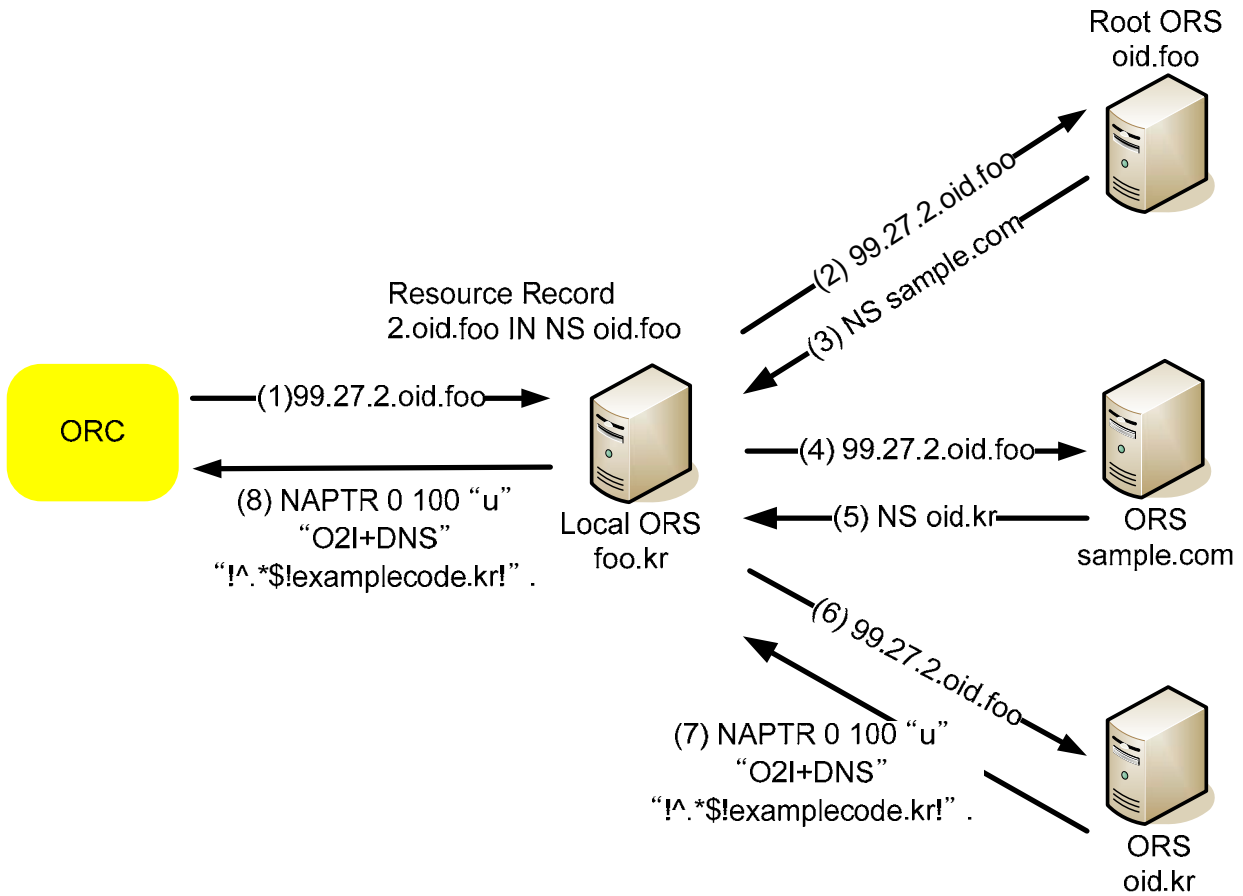


Figure 5. Example operation of general OID resolution process

## 8 Default setting of zone file for OID Resolution System

For the performance issues, all top-level arcs of OID tree should located in a root server for OID Resolution System.

## 9 Security and Trust Aspects of the OID Resolution System

As general OID resolution process in OID Resolution System uses DNS protocol, there is no mechanism for ensuring that the data one gets back is authentic. DNSsec can be used in the general OID resolution process for information requiring a high degree of trust.

## **Bibliography**

[1] TBD

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