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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Directory services
architecture for audiovisual and multimedia services

Directory services architecture for multimedia conferencing

Recommendation ITU-T H.350



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Recommendation ITU-T H.350

Directory services architecture for multimedia conferencing

Summary

Recommendation ITU-T H.350 describes a directory services architecture for multimedia conferencing using lightweight directory access protocol (LDAP). Standardized directory services can support the association of persons with endpoints, searchable white pages, and clickable dialling. Directory services can also assist in the configuration of endpoints, and user authentication based on authoritative data sources. This Recommendation describes a standardized LDAP schema to represent endpoints on the network and associate those endpoints with users. It discusses design and implementation considerations for the interrelation of video and voice-specific directories, enterprise directories, call servers and endpoints.

This revised version of Recommendation ITU-T H.350 introduces several enhancements and clarifications to the previous version, primarily the addition of ITU-T X.500 directories support and authentication across multiple directories, and clarifications of commPrivate and commOwner.

This Recommendation includes an electronic attachment containing two schema configuration files for commURIObject and CommObject.

History

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FOREWORD

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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.

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Recommendation ITU-T H.350

Directory services architecture for multimedia conferencing

1 Scope

This Recommendation¹ describes a directory services architecture for multimedia conferencing using lightweight directory access protocol (LDAP). Standardized directory services can support the association of persons with endpoints, searchable white pages, and clickable dialling. Directory services can also assist in the configuration of endpoints, and user authentication based on authoritative data sources. This Recommendation describes a standardized LDAP schema to represent endpoints on the network and associate those endpoints with users. It discusses design and implementation considerations for the interrelation of video and voice-specific directories, enterprise directories, call servers and endpoints.

The use of a common, authoritative data source for call server, endpoint, user, authentication and white pages information is an important aspect of large scale multimedia conferencing environments. Without a common data source, service providers must create separate processes to manage each of these functions. By standardizing the LDAP schema used to represent the underlying data, products from different system vendors can be deployed together to create an overall application environment. For example, a white pages search engine developed by one provider could serve directory information to IP telephones produced by a second provider, with signalling managed by a call server produced by yet a third provider. Each of these disparate systems can access the same underlying data source, reducing or eliminating the need to coordinate the separate management of each system. A significant benefit to the user is that the management of this data can be incorporated into existing customer management tools, allowing for quick and flexible scaling up of applications. Indeed, many technology providers have already incorporated LDAP into their products, but have been forced to do so without the benefit of a standardized schema. This Recommendation represents an effort to standardize those representations to improve interoperability and performance.

While URLs are already standardized for several conferencing protocols, their representation in a directory is not. This Recommendation supports a standardized way for URLs to be searched and located. This is a necessary step to support 'clickable dialling'.

Management of endpoint configurations can be improved if the correct settings are stored by the service provider in a location that is accessible to both service provider and endpoint. LDAP provides a convenient storage location that can be accessed by both call server and endpoint; thus it is possible to use the directory to support the endpoint configuration, which is important for simplified operation and supporting user mobility. Note that other technologies also support endpoint configuration, notably the use of SNMP for complete configuration and DNS SRV resource records for obtaining registration server addresses. Therefore, ITU-T H.350 should be viewed not as an authoritative endpoint configuration architecture, but rather one tool that can assist with this task. Note that the use of ITU-T H.350 has as a feature endpoint specific configuration, where it is desirable that each endpoint have a unique configuration.

This architecture uses a generic object class, called commObject, to represent attributes common to any video or voice protocol. Auxiliary classes represent specific protocols, such as ITU-T H.323, ITU-T H.235.x, or ITU-T H.320, as described in the ITU-T H.350.x series of Recommendations. Multiple ITU-T H.350.x classes can be combined to represent endpoints that support more than one protocol. For example, endpoints that support ITU-T H.323, ITU-T H.235.x and ITU-T H.320

¹ This Recommendation includes an electronic attachment containing schema configuration files for commURIObject and commObject.

would include ITU-T H.350, ITU-T H.350.1, ITU-T H.350.2, and ITU-T H.350.3 in their LDAP representations. Furthermore, each entry should contain commObject to serve as the entry's structural object class.

There are two basic components in the architecture. The commURI object is a class whose only purpose is to link a person or resource to a commObject. By placing a commURI 'pointer' in an individual's directory entry, that individual becomes associated with the particular targeted commObject. Similarly, each commObject contains a pointer, called commOwner, which points to the individual or resource that is associated with the commObject. In this way, people or resources can be associated with endpoints. The only change required to the enterprise directory is the addition of the simple object class commURI. CommObject data may be instantiated in the same or an entirely separate directory, thus allowing flexibility in implementation.

1.1 Design goals

Large-scale deployments of IP video and voice services have demonstrated the need for complementary directory services middleware. Service administrators need call servers that are aware of enterprise directories to avoid duplication of account management processes. Users need 'white pages' to locate other users with whom they wish to communicate. All of these processes should pull their information from canonical data sources in order to reduce redundant administrative processes and ensure information accuracy. The following design criteria are established for this architecture. The architecture will:

- 1) enable endpoint information to be associated with people. Alternatively, it enables endpoint information to be associated with resources such as conference rooms or classrooms;
- 2) enable online searchable "white pages" where dialling information (e.g., endpoint addresses) can be found, along with other "traditional" directory information about a user, such as name, address, telephone, e-mail, etc.;
- 3) enable all endpoint information to be stored in a canonical data source (the Directory), rather than local to the call server, so that endpoints can be managed through manipulations of an enterprise directory, rather than by direct entry into the call server;
- 4) support the creation of very large scale distributed directories. These include white pages "portals" that allow searching for users across multiple institutional directories. In this application, each enterprise directory registers itself with (or is unknowingly discovered by) a directory of directories that is capable of searching across multiple LDAP directories;
- 5) be able to support multiple instances of endpoints per user or resource;
- 6) represent endpoints that support more than one protocol, for example, endpoints that are both ITU-T H.320 and ITU-T H.323;
- 7) store enough information about endpoint configuration so that correct configuration settings can be documented to end users on a per-endpoint basis, as a support tool, or loaded automatically into the endpoint;
- 8) be extendable as necessary to allow implementation-specific attributes to be included;
- 9) be non-invasive to the enterprise directory, so that support for multimedia conferencing can be added in a modular fashion without significant changes to the enterprise directory.

The scope of this Recommendation does not include extensions of functionality to protocols as defined within the protocols themselves. It is not the intent of this Recommendation to add features, but merely to represent existing protocol attributes. The exception to this case is when functionality is implied by the directory itself, such as the commPrivate attribute.

1.2 Extending the schema

ITU-T H.350 object classes may be extended as necessary for specific implementations. For example, a class may be extended to support billing reference codes. Extensions to the schema are not considered as part of this Recommendation and do not signify compliance.

In some cases it may be necessary to extend the ITU-T H.350 schemas in order to represent more information than is supported by the Recommendations. This may be important for developers that implement proprietary endpoint functionality that needs to be represented by attributes in the directory. It may also be important for enterprise applications. For example 'modelNumber', and 'accountNumber' are examples of attributes that are not defined in this Recommendation, but may be useful if implemented. Adding attributes to this architecture must be done in a way that does not break compatibility with this Recommendation.

A full discussion of schema design and extension is beyond the scope of this Recommendation. See [IETF RFC 4510] for details. Two basic approaches to schema extension that do not break compatibility with this Recommendation are extension through subclass and extension through the use of auxiliary classes.

1.2.1 Extension through subclass

It is possible to create a subclass of an existing predefined object class in order to add new attributes to it. To create a subclass, a new object class must be defined, that is a subclass of the existing one, by indicating in the definition of the new class that the existing class is its superior. Once the subclass is created, new attributes can be defined within it.

The following example shows how the commObject class can be subclassed in order to add an attribute to represent a billing account and a billing manager.

```
objectclass ( BillingInfo-OID
NAME 'BillingInfo'
DESC 'Billing Reference Information'
SUP commObject STRUCTURAL
MAY ( BillingAccount $ BillingManager $ )
)
```

Note that BillingInfo-OID must be replaced by an actual OID. Also note that, whenever a structural class is extended, its subclass must also be structural.

The following sample entry shows the newly created attributes. This example also uses [ITU-T H.350.1] for h323Identity.

```
dn: commUniqueId=2000,ou=h323Identity, dc=company, dc=com
objectclass: top
objectclass: commObject
objectclass: h323Identity
objectclass: BillingInfo
commUniqueId: 2000
BillingAccount: 0023456
BillingManager: John Smith
```

Note that this example and approach demonstrate an extension of the general commObject object class, and not any individual ITU-T H.350.x classes. If it is desired to extend an ITU-T H.350.x auxiliary class, then that should be accomplished through the definition of additional auxiliary classes that support the desired attributes, as described in clause 1.2.2.

1.2.2 Extension through the use of auxiliary classes

It is possible to add attributes to an LDAP entry by defining an auxiliary class containing the new attributes and applying those attributes to instantiated values in the directory. The auxiliary class will not be subclassed from any existing object class. Note that it should have the special class `top` as its superior. The following example creates the same billing account and billing manager attributes as the previous example, but does so by defining them in their own auxiliary class.

```
objectclass ( BillingInfo-OID
NAME 'BillingInfo'
DESC 'Billing Reference Information'
SUP top AUXILIARY
MAY ( BillingAccount $ BillingManager $ )
)
```

Note how the superior was changed from `commObject` to `top` and the object class changed from being a structural to auxiliary.

It is recommended that all attributes in the auxiliary class be optional rather than mandatory. In this way, the auxiliary object class itself can be associated with an entry regardless of whether any values for its attributes are present.

The following example shows a sample endpoint that utilizes the new auxiliary class and attributes. This example also uses [ITU-T H.350.1] for `h323Identity`.

```
dn: commUniqueId=2000,ou=h323Identity, dc=company, dc=com
objectclass: top
objectclass: commObject
objectclass: BillingInfo
commUniqueId: 2000
BillingAccount: 0023456
BillingManager: John Smith
```

1.2.3 Object identifiers

An attribute's object identifier (OID) is a unique numerical identifier usually written as a sequence of integers separated by dots. For example, the OID for the `commUniqueId` is 0.0.8.350.1.1.2.1.1. All attributes must have an OID. OIDs can be obtained from anyone who has one and is willing to delegate a portion of it as an arc, keeping a record of the arc to avoid duplication. Furthermore, the Internet Assigned Numbers Authority (IANA) gives out OIDs to any organization that asks.

2 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- | | |
|-----------------|--|
| [ITU-T H.350.x] | Recommendations ITU-T H.350.x-series (in force), <i>Directory services architecture for H.323</i> . |
| [ITU-T X.500] | Recommendation ITU-T X.500 (2008) ISO/IEC 9594-1:2008, <i>Information technology – Open Systems Interconnection – The Directory: Overview of concepts, models and services</i> . |
| [ITU-T X.501] | Recommendation ITU-T X.501 (2008) ISO/IEC 9594-2:2008, <i>Information technology – Open Systems Interconnection – The Directory: Models</i> . |

- [ITU-T X.509] Recommendation ITU-T X.509 (2008) | ISO/IEC 9594-8:2008, *Information technology – Open Systems Interconnection – The Directory: Public-key and attribute certificate frameworks*.
- [ITU-T X.511] Recommendation ITU-T X.511 (2008) | ISO/IEC 9594-3:2008, *Information technology – Open Systems Interconnection – The Directory: Abstract service definition*.
- [ITU-T X.518] Recommendation ITU-T X.518 (2008) | ISO/IEC 9594-4:2008, *Information technology – Open Systems Interconnection – The Directory: Procedures for distributed operation*.
- [ITU-T X.519] Recommendation ITU-T X.519 (2008) | ISO/IEC 9594-5:2008, *Information technology – Open Systems Interconnection – The Directory: Protocol specifications*.
- [ITU-T X.520] Recommendation ITU-T X.520 (2008) | ISO/IEC 9594-6:2008, *Information technology – Open Systems Interconnection – The Directory: Selected attribute types*.
- [ITU-T X.525] Recommendation ITU-T X.525 (2008) | ISO/IEC 9594-9:2008, *Information technology – Open Systems Interconnection – The Directory: Replication*.
- [IETF RFC 4510] IETF RFC 4510 (2006), *Lightweight Directory Access Protocol (LDAP): Technical Specification Road Map*.
- [IETF RFC 4511] IETF RFC 4511 (2006), *Lightweight Directory Access Protocol (LDAP): The Protocol*.

3 Definitions

This Recommendation defines the following terms:

3.1 call server: A protocol-specific signalling engine that routes video or voice calls on the network. In [b-ITU-T H.323], this entity is a gatekeeper. In session initiation protocol (SIP), this entity is a SIP proxy server. Note that not all signalling protocols use a call server.

3.2 endpoint: A logical device that provides video and/or voice media encoding/decoding, and signalling functions. Examples include:

- 1) a group teleconferencing appliance that is located in a conference room;
- 2) an IP telephone;
- 3) a software program that takes video and voice from a camera and microphone, encodes it and applies signalling using a host computer.

3.3 enterprise directory: A canonical collection of information about users in an organization. Typically this information is collected from a variety of organizational units to create a whole. For example, Human Resources may provide name and address, Telecommunications may provide the telephone number, Information Technology may provide the e-mail address, etc. For the purposes of this architecture, it is assumed that an enterprise directory is accessible via LDAP.

3.4 white pages: An application that allows end users to look up the address of another user. This may be web-based or use some other user interface.

4 Abbreviations

This Recommendation uses the following abbreviations:

CN Common Name