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## Revision Summary

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1 Introduction

The Lightweight Directory Access Protocol (LDAP) Version 3 Extensions is a set of extensions to LDAP, as described in [RFC4511] and [RFC4512], and the LDAP user schema, as described in [RFC4519], that defines new attributes and values for existing attributes related to the operation of e-mail clients and servers.

Sections 1.5, 1.8, 1.9, 2, and 3 of this specification are normative. All other sections and examples in this specification are informative.

1.1 Glossary

This document uses the following terms:

**AD-type server**: An LDAP server that returns an object identifier (OID) value of "1.2.840.113556.1.4.800" when it is queried for the supportedCapabilities LDAP attribute.

**ambiguous name resolution (ANR)**: A search algorithm that permits a client to search multiple naming-related attributes on objects by way of a single clause of the form "(anr=value)" in a Lightweight Directory Access Protocol (LDAP) search filter. This permits a client to query for an object when the client possesses some identifying material related to the object but does not know which attribute of the object contains that identifying material.

**Augmented Backus-Naur Form (ABNF)**: A modified version of Backus-Naur Form (BNF), commonly used by Internet specifications. ABNF notation balances compactness and simplicity with reasonable representational power. ABNF differs from standard BNF in its definitions and uses of naming rules, repetition, alternatives, order-independence, and value ranges. For more information, see [RFC5234].

**distinguished name (DN)**: In Lightweight Directory Access Protocol (LDAP), an LDAP distinguished Name, as described in [RFC2251] section 4.1.3. The DN of an object is the DN of its parent, preceded by the RDN of the object. For example: CN=David Thompson, OU=Users, DC=Microsoft, DC=COM. For definitions of CN and OU, see [RFC2256] sections 5.4 and 5.12, respectively.

**Lightweight Directory Access Protocol (LDAP)**: The primary access protocol for Active Directory. Lightweight Directory Access Protocol (LDAP) is an industry-standard protocol, established by the Internet Engineering Task Force (IETF), which allows users to query and update information in a directory service (DS), as described in [MS-ADTS]. The Lightweight Directory Access Protocol can be either version 2 [RFC1777] or version 3 [RFC3377].

**mailbox**: A message store that contains email, calendar items, and other Message objects for a single recipient.

**object identifier (OID)**: In the Lightweight Directory Access Protocol (LDAP), a sequence of numbers in a format described by [RFC1778]. In many LDAP directory implementations, an OID is the standard internal representation of an attribute. In the directory model used in this specification, the more familiar ldapDisplayName represents an attribute.

**public folder**: A Folder object that is stored in a location that is publicly available.

**recipient**: An entity that is in an address list, can receive email messages, and contains a set of attributes. Each attribute has a set of associated values.

**S/MIME (Secure/Multipurpose Internet Mail Extensions)**: A set of cryptographic security services, as described in [RFC5751].

**Simple Mail Transfer Protocol (SMTP)**: A member of the TCP/IP suite of protocols that is used to transport Internet messages, as described in [RFC5321].
MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as defined in [RFC2119]. All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

Links to a document in the Microsoft Open Specifications library point to the correct section in the most recently published version of the referenced document. However, because individual documents in the library are not updated at the same time, the section numbers in the documents may not match. You can confirm the correct section numbering by checking the Errata.

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information.


1.2.2 Informative References


1.3 Overview

LDAP, as described in [RFC4511] and [RFC4512], is an Internet protocol that is used for querying and modifying entries in a directory server. LDAP provides a general purpose directory for storing information about objects. The LDAP user schema, as described in [RFC4519], defines a set of attributes for objects contained in a directory server.

This extension defines a set of extensions to LDAP and the LDAP user schema that provides attributes and object types related to the operation of e-mail clients and servers. These attributes and object types include the following:

- New name attributes, organizational attributes, e-mail attributes, and telephone attributes.
- New values of the objectClass attribute that identify e-mail groups, remote addresses, and public folders.
- A new value of the supportedControl attribute that identifies an AD-type server.

1.4 Relationship to Other Protocols

This extension defines a set of extensions to LDAP, as described in [RFC4511] and [RFC4512], and the LDAP user schema, as described in [RFC4519].

For conceptual background information and overviews of the relationships and interactions between this and other protocols, see [MS-OXPROTO].

1.5 Prerequisites/Preconditions

None.

1.6 Applicability Statement

This extension can be used to retrieve information related to the operation of e-mail clients and servers, such as a user's e-mail address or the mailbox server that hosts the user's mailbox, from an LDAP server.

1.7 Versioning and Capability Negotiation

This extension does not introduce any versioning constraints beyond those that exist in LDAP, as described in [RFC4511].

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.
2 Messages

2.1 Transport

This extension does not introduce any transport requirements beyond those that exist in LDAP, as specified in [RFC4511].

2.2 Message Syntax

This extension follows the LDAP standard for message syntax, as specified in [RFC4511]. According to the LDAP standard, an attribute list can contain implementation-specific attributes. The attributes specific to this extension are listed in this section.

The following table lists every LDAP attribute for which the client can query. In many cases, more than one LDAP attribute corresponds to a single field in the table below because different server implementations of LDAP use different attribute names to represent similar concepts (fields). In those cases, the attributes listed first in the table take precedence over the attributes listed later. For example, for the Last Name field, the sn attribute takes precedence over the surname attribute. The client only needs to query for one attribute name in each field.

The client SHOULD implement the LDAP user schema, as specified in [RFC4519], the COSINE LDAP/X.500 schema, as specified in [RFC4524], the inetOrgPerson LDAP Object Class, as specified in [RFC2798], and the LDAP X.509 schema, as specified in [RFC4523]. The client SHOULD support the attributes that are listed in the following table.

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<td>Last Name</td>
<td>sn ([RFC4519])</td>
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<td></td>
<td>surname ([RFC4519])</td>
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<td>Organizational attributes</td>
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<td>o&lt;1&gt; ([RFC4519])</td>
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<td></td>
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<td>Assistant Name</td>
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<td>Field</td>
<td>LDAP attribute</td>
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### 2.2.1 Extension-Specific Name Attributes

#### 2.2.1.1 Display Name

The `display-name` and `displayName` attributes SHOULD be used as the primary name to be shown to the user when displaying an LDAP entry. If the `display-name` attribute is empty or not user-readable, the client SHOULD construct a `display-name` attribute from other attributes. Applications use implementation-specific logic to construct a `display-name` attribute when needed.<3>

#### 2.2.2 Extension-Specific Organizational Attributes

##### 2.2.2.1 Organizational Unit

The `department` attribute is a multi-valued string attribute that contains the names of any departments or other organizational units to which an object belongs. The syntax of this attribute is the same as the `ou` or `organizationalUnitName` attributes, as specified in [RFC4519].

##### 2.2.2.2 Reports

The `reports` and `directReports` attributes are multi-valued string attributes containing the distinguished names (DNs) of any direct reports.

#### 2.2.3 Extension-Specific E-Mail Attributes

##### 2.2.3.1 Account

The `mailNickname` attribute is a multi-valued string attribute that contains login names associated with the object. The syntax of this attribute is the same as the `uid` attribute, as specified in [RFC4519].

##### 2.2.3.2 Exchange Distinguished Name

The `legacyExchangeDN` attribute represents a distinguished name (DN) of the entry. This DN MUST be formatted as specified in [MS-OXOABK] section 2.2.1.1. This value MAY<4> be used as a proxy address for an entry, with the following format.

```plaintext
proxyAddressFromExchangeDN ::= "EX:" <Exchange DN>
<Exchange DN> ::= ; The value of the LDAP attribute legacyExchangeDN
```

##### 2.2.3.3 Exchange Home Server

The `msExchHomeServerName` attribute MUST contain the DN of the `mailbox` server where mail is delivered for that user. For the client, this attribute has the same semantics as the `PidTagAddressBookHomeMessageDatabase` property, as specified in [MS-OXOABK] section 2.2.4.37.
2.2.3.4 Proxy Addresses

If multiple e-mail addresses are associated with an entry, they MUST be included in the proxyAddresses and otherMailbox attributes. These addresses can be used as alternate e-mail addresses to reach the user. Specific e-mail addresses can be retrieved from this value depending on the intended use. The semantics of proxy addresses are not constrained by this extension, and are specific to the protocol that creates the proxy addresses. This extension does not constrain how a client uses proxy addresses. For the client, these proxy addresses have the same semantics as the values of the PidTagAddressBookProxyAddresses property, as specified in [MS-OXOABK] section 2.2.3.23.

The format of each e-mail address MUST be as follows.

```
emailString = <emailType> ":" <emailAddress>
emailType = <a string indicating what type of e-mail it is. i.e. SMTP, x500, etc>
emailAddress = <a string representing the e-mail address>
```

For example, for a Simple Mail Transfer Protocol (SMTP) e-mail address of someone@example.com, the resulting value in the proxyAddresses or otherMailbox attributes would have the following format.

```
SMTP:someone@example.com
```

2.2.3.5 X.400 Address

The TextEncodedORAddress attribute is a string attribute that contains a text representation of an X.400 O/R address, as specified in [RFC1274].

2.2.4 Extension-Specific Telephone Attributes

2.2.4.1 Assistant Phone Number

The Telephone-Assistant attribute is a string attribute that contains a telephone number for the assistant to the user represented by the directory object.

2.2.4.2 Secondary Phone Number

The Telephone-Office2 attribute is a string attribute that contains a secondary telephone number for the user represented by the directory object.

2.2.5 Other Extension-Specific Attributes

2.2.5.1 Object Class

The client SHOULD support the following values for the objectClass attribute.

<table>
<thead>
<tr>
<th>Attribute value</th>
<th>Object type</th>
</tr>
</thead>
<tbody>
<tr>
<td>organizationalPerson</td>
<td>This value is specified in [RFC4519].</td>
</tr>
<tr>
<td>groupOfNames</td>
<td>The groupOfNames value is specified in [RFC4519].</td>
</tr>
<tr>
<td>group</td>
<td>The group value is specific to this extension and is used in the same way as the groupOfNames value.</td>
</tr>
<tr>
<td>Attribute value</td>
<td>Object type</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Remote-Address</td>
<td>This value is specific to this extension and represents a recipient that is known to be from a foreign or remote messaging system.</td>
</tr>
<tr>
<td>Public-Folder</td>
<td>This value is specific to this extension and represents a place where public discussions take place such as a bulletin board, public folder, or shared folder.</td>
</tr>
</tbody>
</table>

The client SHOULD use the value of the `objectClass` attribute to help distinguish between different types of directory entries when displaying entries to the user. For example, the client can display a different icon or make the item bold to make it easy for a user viewing the object to distinguish its type. If no `objectClass` attribute is returned for an entry, the client MUST treat it as a value of "organizationalPerson".

The value of the `objectClass` attribute is used to determine the value of the `PidTagDisplayType` property, as specified in [MS-OXOABK] section 2.2.3.11. The following `objectClass` attribute values correspond to the following `PidTagDisplayType` property values.

<table>
<thead>
<tr>
<th>objectClass attribute value</th>
<th>PidTagDisplayType property value</th>
</tr>
</thead>
<tbody>
<tr>
<td>organizationalPerson</td>
<td>DT_MAILUSER</td>
</tr>
<tr>
<td>groupOfNames</td>
<td>DT_DISTLIST</td>
</tr>
<tr>
<td>group</td>
<td></td>
</tr>
<tr>
<td>Remote-Address</td>
<td>DT_REMOTE_MAILUSER</td>
</tr>
<tr>
<td>Public-Folder</td>
<td>DT_FORUM</td>
</tr>
</tbody>
</table>

### 2.2.5.2 S/MIME Certificate

The `userSMIMECertificate` attribute contains certificates in the format specified in [RFC2798] or certificates in the format defined for the `PidTagUserX509Certificate` property, as specified in [MS-OXOABK] section 2.2.4.36. If available, this attribute SHOULD be preferred over the `userCertificate` attribute for S/MIME (Secure/Multipurpose Internet Mail Extensions) applications.
3 Protocol Details

3.1 Client Details

3.1.1 Abstract Data Model
None.

3.1.2 Timers
None.

3.1.3 Initialization
This extension conforms to the initialization defined by LDAP, as specified in [RFC4511]. In addition, this extension specifies two operations that SHOULD be performed upon connecting to an LDAP server:

- Querying for supported controls. For more details, see section 3.1.3.1.
- Querying for supported capabilities. For more details, see section 3.1.3.2.

3.1.3.1 Querying for Supported Controls
Upon connecting to the LDAP server, the client SHOULD query the server for the supportedControl attribute, as specified in [RFC4512]. The OID values returned by the server indicate what controls the server supports and makes available to the client. If the client supports browsing the server, it SHOULD recognize the following OID values.

<table>
<thead>
<tr>
<th>OID value</th>
<th>Supported control</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.16.840.1.113730.3.4.9</td>
<td>Virtual list support</td>
</tr>
<tr>
<td>1.2.840.113556.1.4.319</td>
<td>Paged results support</td>
</tr>
<tr>
<td>1.2.840.113556.1.4.473</td>
<td>Server sort support</td>
</tr>
</tbody>
</table>

3.1.3.2 Querying for Supported Capabilities
Upon connecting to the LDAP server, the client SHOULD query the server for the supportedCapabilities custom attribute, as specified in [MS-ADTS], and MUST recognize the OID value for an AD-type server: "1.2.840.113556.1.4.800".

If the client does not query for this capability, or the server does not return the OID value for an AD-type server, the client MUST treat the server as a non-AD-type server.

When sorting, the protocol client SHOULD use the displayName attribute instead of the CN attribute on AD-type servers.

3.1.4 Higher-Layer Triggered Events
None.
3.1.5 Message Processing Events and Sequencing Rules

3.1.5.1 Issuing a Search Request

All search requests issued by the client MUST follow the search request definition specified in [RFC4511] section 4.5.1, with the following options specified.

<table>
<thead>
<tr>
<th>Search request parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>baseObject</td>
<td>See section 3.1.5.1.1.</td>
</tr>
<tr>
<td>Scope</td>
<td>wholeSubtree</td>
</tr>
<tr>
<td>derefAliases</td>
<td>derefAlways</td>
</tr>
<tr>
<td>typesOnly</td>
<td>FALSE</td>
</tr>
<tr>
<td>sizeLimit</td>
<td>Specified by the user.</td>
</tr>
<tr>
<td>timeLimit</td>
<td>Specified by the user.</td>
</tr>
<tr>
<td>AttributeSelection</td>
<td>CN, commonName, mail, roleOccupant, display-name, displayName, sn, surname, c, organizationName, o, givenName, legacyExchangeDN, objectClass, uid, mailNickname, title, company, physicalDeliveryOfficeName, telephoneNumber</td>
</tr>
<tr>
<td>Filter</td>
<td>Depends on the type of search (sections 3.1.5.1.2, 3.1.5.1.3, and 3.1.5.1.4).</td>
</tr>
</tbody>
</table>

3.1.5.1.1 Retrieving a Search Base

A search base is a string representing the DN of the base object entry relative to which a search is to be performed. This value is used as the value of the baseObject parameter of a search request, as specified in [RFC4511].

The client can use a user-provided string as the search base. If the user-provided string is an empty string, the client MAY query the server for the defaultNamingContext attribute and use the returned value for the search base instead of an empty string. If the user has not specified a search base, the client SHOULD query the server for the defaultNamingContext attribute and use the returned value for the search base.

To query the server for the defaultNamingContext attribute, the client SHOULD send a search request to the server, as specified in [RFC4511] section 4.5.1, with the following options specified.

<table>
<thead>
<tr>
<th>Search request parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>baseObject</td>
<td>Empty string (that is, a zero-length string).</td>
</tr>
<tr>
<td>Scope</td>
<td>baseObject</td>
</tr>
<tr>
<td>derefAliases</td>
<td>neverDerefAliases</td>
</tr>
<tr>
<td>typesOnly</td>
<td>FALSE</td>
</tr>
<tr>
<td>sizeLimit</td>
<td>0</td>
</tr>
<tr>
<td>timeLimit</td>
<td>0</td>
</tr>
<tr>
<td>Filter</td>
<td>(objectClass=*).</td>
</tr>
</tbody>
</table>
### 3.1.5.1.2 Basic Search Filter

When performing a basic search, the client SHOULD use the following filter as the search filter.

This search filter is specified in [Augmented Backus-Naur Form (ABNF)], as specified in [RFC5234].

```plaintext
basicSearchFilter = "(&(|(mail=" <search-string> ") (cn=" <search-string> ") (sn=" <search-string> ") (givenName=" <search-string> ") (displayName=" <search-string> "))" search-string = <a user specified search string>
```

### 3.1.5.1.3 Advanced Search Filter

The client SHOULD provide a way to search on one or more LDAP attributes. The client SHOULD use strings provided by the user to construct the LDAP filter.

This search filter is specified in [ABNF], as specified in [RFC5234].

```plaintext
advancedFilter = "(&(|" *<individualAttribute> "))

individualAttribute = "(" <attributeName> "=" <attributeValue> ")"

attributeName = displayName / display-name / cn / physicalDeliveryOfficeName / roomNumber / uid / mailNickname / givenName / sn / telephoneNumber / l / title / department / mail

attributeValue = [<containsORbegins>] <userSpecifiedValue> "*

containsORbegins = "*"; include if searching for a substring, exclude if looking for a string beginning with a substring

userSpecifiedValue = <a user specified value for that field>
```

For each search field requested by the user, the client MUST add all `<attributeValue>` entries specified in the following table.

<table>
<thead>
<tr>
<th>Search field</th>
<th>attributeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Name</td>
<td>displayName (for AD-type servers only)</td>
</tr>
<tr>
<td></td>
<td>display-name (for AD-type servers only)</td>
</tr>
<tr>
<td></td>
<td>CN (for non-AD-type servers only)</td>
</tr>
<tr>
<td>Office Location</td>
<td>physicalDeliveryOfficeName</td>
</tr>
<tr>
<td></td>
<td>roomNumber</td>
</tr>
<tr>
<td>Account</td>
<td>uid</td>
</tr>
<tr>
<td></td>
<td>mailNickname</td>
</tr>
<tr>
<td>First Name</td>
<td>givenName</td>
</tr>
<tr>
<td>Last Name</td>
<td>sn</td>
</tr>
<tr>
<td>Telephone Number</td>
<td>telephoneNumber</td>
</tr>
<tr>
<td>Search field</td>
<td>attributeValue</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Locality / City</td>
<td>l</td>
</tr>
<tr>
<td>Title</td>
<td>title</td>
</tr>
<tr>
<td>Department</td>
<td>department</td>
</tr>
<tr>
<td>E-mail Address</td>
<td>mail</td>
</tr>
</tbody>
</table>

### 3.1.5.1.4 ANR Search Filter

When the client performs an **ambiguous name resolution (ANR)** search, it SHOULD use the following query.

This search query is specified in **ABNF**, as specified in [RFC5234].

\[
\text{ANRFilter} = "((\text{mail=*)(cn=}\text{search-string} \text{*)(sn=}\text{search-string} \text{*)(givenName=}\text{search-string}) (\text{displayName=}\text{search-string}))" \text{search-string = <a user specified search string>}
\]

### 3.1.5.1.5 Virtual List View Search Filter

If the server indicates support for virtual lists by returning the **OID** value specified in section 3.1.3.1, clients can generate a Virtual List View, as specified in [LDAP-EXSVB]. Clients SHOULD use the following search filter.

\[
\text{VLVFilter} = "((\text{mail=*)(CN=*)})"
\]

### 3.1.6 Timer Events

None.

### 3.1.7 Other Local Events

None.

### 3.2 Server Details

#### 3.2.1 Abstract Data Model

None.

#### 3.2.2 Timers

None.

#### 3.2.3 Initialization

This extension conforms to the initialization defined by **LDAP**, as specified in [RFC4511].
3.2.4 Higher-Layer Triggered Events
None.

3.2.5 Message Processing Events and Sequencing Rules

3.2.5.1 Handling a Query for the supportedControl Attribute
The server MUST respond to a query for the supportedControl attribute as specified in [RFC4512]. For each of the controls it supports, the server MUST return the corresponding OID value from the table in section 3.1.3.1.

The server SHOULD return other OID values if it provides support for more controls than the ones specified in this extension.

3.2.5.2 Handling a Query for the supportedCapabilities Attribute
The server MUST respond to a query for the supportedCapabilities custom attribute as specified in [MS-ADTS]. If the server supports AD-type server capabilities, as specified in this extension, it MUST return the OID value for an AD-type server: "1.2.840.113556.1.4.800".

The server SHOULD return other OID values if it provides support for more capabilities than the ones specified in this extension.

3.2.5.3 Handling Search Requests

3.2.5.3.1 Handling a Query for the defaultNamingContext Attribute
The server SHOULD respond to a query for the defaultNamingContext attribute as specified in section 3.1.5.1.1. If the server returns a value for the defaultNamingContext attribute, the server MUST return the DN of the base object.

3.2.5.3.2 Responding to Query Attributes
A server SHOULD support the attributes specified in section 2.2. The client can request more than one attribute representing the same conceptual data. A server is only required to return the value for one of the attributes corresponding to a piece of data requested by the client. For more details about which attributes the client can request, and the order of precedence used when handling return values, see section 2.2

If the server returned the OID value specified in section 3.2.5.2, indicating that it is an AD-type server, it MUST support queries for the displayName and display-name attributes.

3.2.6 Timer Events
None.

3.2.7 Other Local Events
None.
4 Protocol Examples

4.1 Simple Search Scenario

If the client is directed to search for a user named "Robin" in an AD-type server, the following sequence of events occurs:

- The client sends an LDAP Bind request to the server, as described in [RFC4511].

  BindRequest (0x00):
  
  Version: 3
  Name: Null
  authentication: Authentication type = sasl

- The LDAP server receives the request and returns a Bind response to the client, as described in [RFC4511].

  BindResponse (0x01):
  Status: Success
  MatchedDN: Null
  ErrorMessage: Null

- The client sends a search request to the server for the defaultNamingContext attribute, as described in section 3.1.5.1.1.

  SearchRequest (0x03):
  
  BaseObject: Null
  Scope: baseObject
  Alias: neverDerefAliases
  SizeLimit: 0 (no limit)
  TimeLimit: 0 (no limit)
  TypesOnly: False
  Filter: (objectClass=*)
  Attributes: (objectClass)(defaultNamingContext)

- The LDAP server returns the search base to the client in the defaultNamingContext attribute.

  SearchResultEntry (0x04):
  
  ObjectNames: Null
  Attributes Returned:
  defaultNamingContext: (DC=company,DC=corp,DC=contoso,DC=com)

  SearchResultDone(0x05):
  Status: Success
  MatchedDN: NULL
  ErrorMessage: NULL

- The client uses the search base and the simple query described in section 3.1.5.1.2 to send another search request to the server.

  Search Request (0x03):
  BaseObject: (DC=company,DC=corp,DC=contoso,DC=com)
  Scope: WholeSubtree
  Alias: derefAlways
The LDAP server returns results that match the query. The trace below represents one result that matched the query.

SearchResultsEntry (0x04):
ObjectName: CN=Robin,OU=UsersOU,DC=company,DC=corp,DC=contoso,DC=com
Attributes:
objectClass: ( top ) ( person ) ( organizationalPerson ) ( user )
cn: Robin Wood
sn: Wood
title: Dr.
physicalDeliveryOfficeName: 36/2495
telephoneNumber: 1 (425) 555-0534
givenName: Robin
displayName: Robin Wood
company: contoso
mailNickname: robin
legacyExchangeDN: /o=contoso/ou=First Admin Group/cn=Recipents/cn=robin
mail: robin@contoso.com

SearchResultDone(0x05):
Status: Success
MatchedDN: NULL
ErrorMessage: NULL

The client sends an LDAP Unbind request to the server, as described in [RFC4511].

UnbindRequest (0x02)

The client uses the attributes returned by the server to display the search results to the user.
5 Security

5.1 Security Considerations for Implementers

There are no security considerations specific to this extension beyond those that exist in LDAP, as specified in [RFC4511].

5.2 Index of Security Parameters

None.
Appendix A: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include updates to those products.

- Microsoft Exchange Server 2003
- Microsoft Exchange Server 2007
- Microsoft Exchange Server 2010
- Microsoft Exchange Server 2013
- Microsoft Exchange Server 2016
- Microsoft Exchange Server 2019
- Microsoft Office Outlook 2003
- Microsoft Office Outlook 2007
- Microsoft Outlook 2010
- Microsoft Outlook 2013
- Microsoft Outlook 2016
- Microsoft Outlook 2019
- Microsoft Outlook 2021

Exceptions, if any, are noted in this section. If an update version, service pack or Knowledge Base (KB) number appears with a product name, the behavior changed in that update. The new behavior also applies to subsequent updates unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms "SHOULD" or "SHOULD NOT" implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term "MAY" implies that the product does not follow the prescription.

<1> Section 2.2: Office Outlook 2003, Office Outlook 2007, Outlook 2010, Outlook 2013, Outlook 2016, and Outlook 2019 query for the \text{o} attribute, but do not use the value received from the server.

<2> Section 2.2: Office Outlook 2003, Office Outlook 2007, Outlook 2010, Outlook 2013, Outlook 2016, and Outlook 2019 query for the \text{user-cert} attribute, but do not use the value received from the server.

<3> Section 2.2.1.1: Office Outlook 2003, Office Outlook 2007, and Outlook 2010 consider a \text{display-name} attribute to be not user-readable if it is exactly the same as one of the \text{E-Mail Address} attributes. Office Outlook 2003, Office Outlook 2007, and Outlook 2010 construct the \text{display-name} attribute in the following manner.

\[
\text{displayName ::= <common name> / <givenname> " "<surname> / <surname> / <company name> / <email address> ; }
\]

\text{NOTE: Priority is given to non-empty combinations listed first.}

\text{common name ::= ; Common Name LDAP attribute}
\text{givenname ::= ; First Name LDAP attribute}
\text{surname ::= ; Last name LDAP attribute}
\text{company name ::= ; Organization Name LDAP attribute}
email address ::= ; E-Mail Address LDAP attribute

<4> Section 2.2.3.2: Office Outlook 2003, Office Outlook 2007, and Outlook 2010 add a proxy address based on the value of the legacyExchangeDN attribute to the proxyAddresses and otherMailbox attributes if it is not present in those attributes on the server.

<5> Section 3.1.5.1.1: If the user-provided string is an empty string, Office Outlook 2003 queries the server for the defaultNamingContext attribute and uses the returned value for the search base.

<6> Section 3.1.5.1.2: Office Outlook 2003 does not implement basic search.

<7> Section 3.1.5.1.3: Office Outlook 2003 does not support E-Mail (LDAP attribute mail) in advanced searches.
7 Change Tracking

This section identifies changes that were made to this document since the last release. Changes are classified as Major, Minor, or None.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements.
- A document revision that captures changes to protocol functionality.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **None** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the relevant technical content is identical to the last released version.

The changes made to this document are listed in the following table. For more information, please contact dochelp@microsoft.com.

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Revision class</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Appendix A: Product Behavior</td>
<td>Updated list of supported products.</td>
<td>major</td>
</tr>
</tbody>
</table>
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