Cisco Expressway Authenticating Accounts Using LDAP

Deployment Guide

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Cisco Expressway X8.7

Introduction

This document describes how to configure the Cisco Expressway (Expressway) to authenticate and authorize login accounts over a centrally managed LDAP-accessible server.

LDAP authentication and authorization can be used for web login to the Expressway's administrator accounts. Instead of looking up the username and password in its own internal database, the Expressway contacts the LDAP accessible server to both authenticate the user and also to check whether that authenticated user belongs to a group that is authorized to access the Expressway.

Using a central login credential database allows an enterprise to define policies for passwords, such as the replacement interval, level of complexity and so on, and be sure that it applies to passwords for all systems.

Currently, Windows Active Directory is the only LDAP accessible server supported by the Expressway.

Note that other logins, including serial and SSH continue to use the admin account configured on the Expressway

Process Summary

As an administrator you will need to:

- have users, together with passwords, configured in the LDAP accessible server
- configure groups in the LDAP accessible server which define capabilities of the users
- associate users with groups in the LDAP accessible server
- configure Expressway for LDAP operation

A user, logging in to the Expressway will be authenticated using credentials stored on the LDAP server.

Both the username and password are case sensitive.

LDAP Accessible Authentication Server Configuration

Define Groups in the Authentication Server

Defining groups in the authentication server is usually carried out by the IT department; use copies of the example requisition form (see IT Requisition for Access to Authentication Server, page 12) to request your IT department to set up the relevant groups and assign users to those groups.

You are likely to want to set up the following groups:

- Read-write administrator (for example, group exp_admin_rw)
- Read-only administrator (for example, group exp_admin_ro)
- Auditor administrator (for example, group exp_auditor)

Expressway Configuration

Configure DNS Server

Ensure one or more DNS server addresses are set up on the Expressway (**System > DNS**). DNS is required for:

- Finding the IP address of the LDAP server if the server is defined by name rather than IP address.
- If SASL is enabled, part of the security process is to perform an IP address to name check – a reverse DNS lookup for that LDAP server. If SASL is enabled, the DNS servers must support reverse DNS lookup.

Configure LDAP Server Details on Expressway

1. Go to **Users > LDAP configuration**.
2. Configure the following fields so that the Expressway can connect to the LDAP server to authenticate login accounts and check group membership (you can use the questionnaire in to get the appropriate information from your IT department):

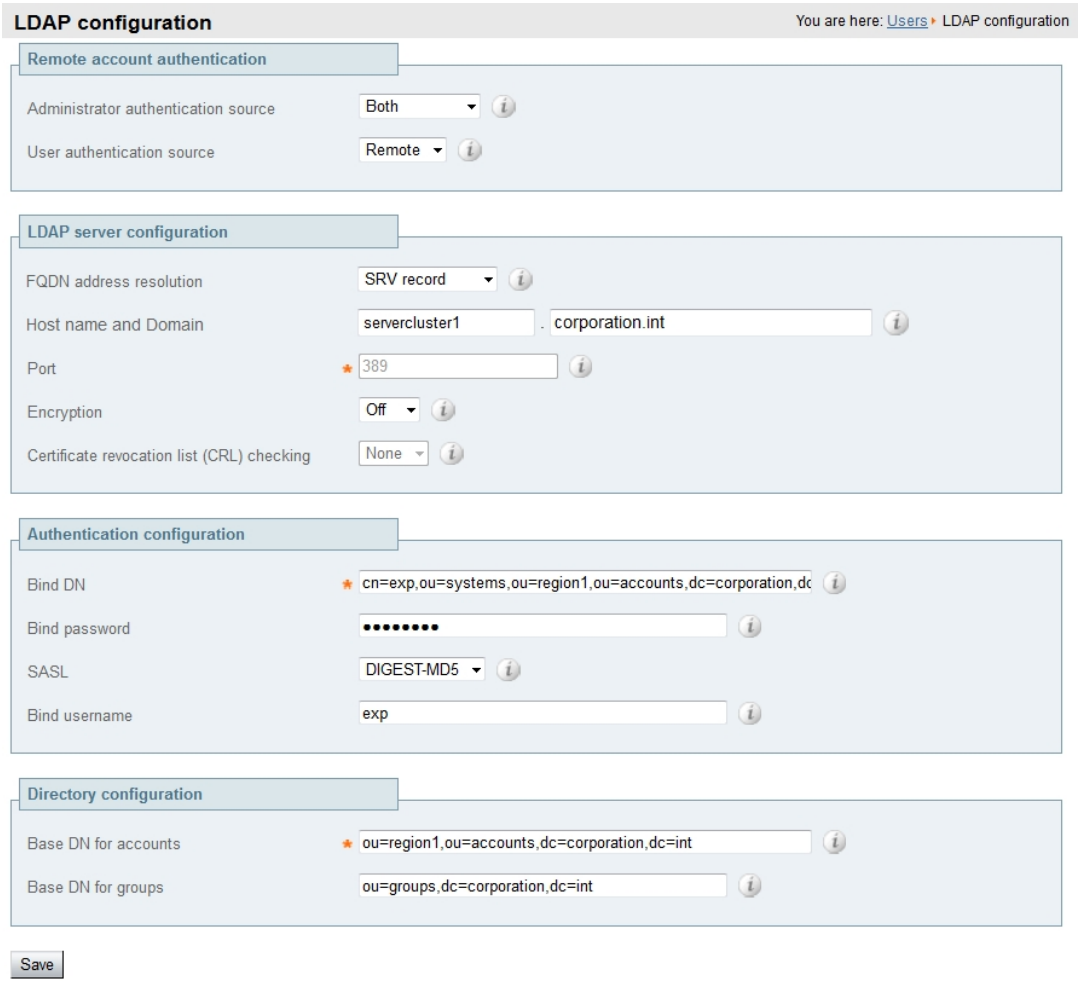
Field	Description	Usage tips
Administrator authentication source	Select *Both*.	*Both* allows you to continue to use locally-defined accounts. This is useful while troubleshooting any connection or authorization issues with the LDAP server. You cannot log in using a locally-configured administrator account, including the default **admin** account, if *Remote only* authentication is in use. Note: do not use *Remote only* if Expressway is managed by Cisco TMS.

Field	Description	Usage tips
FQDN address resolution	Defines how the LDAP server address is resolved. *SRV record*: DNS SRV record lookup. *Address record*: DNS A or AAAA record lookup. *IP address*: entered directly as an IP address. **Note:** if you use SRV records, ensure that the records use the standard ports for LDAP. `_ldap._tcp.<domain>` must use 389 and `_ldaps._tcp.<domain>` must use 636. The Expressway does not support other port numbers for LDAP.	The SRV lookup is for either _ldap._tcp or _ldaps._tcp records, depending on whether **Encryption** is enabled. If multiple servers are returned, the priority and weight of each SRV record determines the order in which the servers are used.
Host name and **Domain** or **Server address**	The way in which the server address is specified depends on the **FQDN address resolution** setting: *SRV record*: only the **Domain** portion of the server address is required. *Address record*: enter the **Host name** and **Domain**. These are then combined to provide the full server address for the DNS address record lookup. *IP address*: the **Server address** is entered directly as an IP address.	If using TLS, the address entered here must match the CN (common name) contained within the certificate presented by the LDAP server.
Port	The IP port to use on the LDAP server.	Non-secure connections use *389* and secure connections use *636*.
Encryption	Determines whether the connection to the LDAP server is encrypted using Transport Layer Security (TLS). *TLS*: uses TLS encryption for the connection to the LDAP server. *Off*: no encryption is used.	When TLS is enabled, the LDAP server's certificate must be signed by an authority within the Expressway's trusted CA certificates file. Click **Upload a CA certificate file for TLS** (in the **Related tasks** section) to go to the **Trusted CA certificate** page.
Certificate revocation list (CRL) checking	Specifies whether certificate revocation lists (CRLs) are checked when forming a TLS connection with the LDAP server. *None*: no CRL checking is performed. *Peer*: only the CRL associated with the CA that issued the LDAP server's certificate is checked. *All*: all CRLs in the trusted certificate chain of the CA that issued the LDAP server's certificate are checked.	If you are using revocation lists, any required CRL data must also be included within the CA certificate file.

Field	Description	Usage tips
Bind DN	The distinguished name (case insensitive) used by the Expressway when binding to the LDAP server. It is important to specify the DN in the order cn=, then ou=, then dc=	Any special characters within a name must be escaped with a backslash as per the LDAP standard (*RFC 4514*). Do not escape the separator character between names. The bind account is usually a read-only account with no special privileges.
Bind password	The password (case sensitive) used by the Expressway when binding to the LDAP server.	The maximum plaintext length is 60 characters, which is then encrypted.
SASL	The SASL (Simple Authentication and Security Layer) mechanism to use when binding to the LDAP server. *None*: no mechanism is used. *DIGEST-MD5*: the DIGEST-MD5 mechanism is used.	Enable Simple Authentication and Security Layer if it is company policy to do so.
Bind username	Username of the account that the Expressway will use to log in to the LDAP server (case sensitive). Only required if SASL is enabled.	Configure this to be the sAMAccountName; Security Access Manager Account Name (in AD this is the account's user logon name).
Base DN for accounts	The ou= and dc= definition of the Distinguished Name where a search for user accounts should start in the database structure (case insensitive). It is important to specify the DN in the order ou=, then dc=	The Base DN for accounts and groups must be at or below the dc level (include all dc= values and ou= values if necessary). LDAP authentication does not look into sub dc accounts, only lower ou= and cn= levels.
Base DN for groups	The ou= and dc= definition of the Distinguished Name where a search for groups should start in the database structure (case insensitive). It is important to specify the DN in the order ou=, then dc=	If no **Base DN for groups** is specified, then the Base DN for accounts will be used for both groups and accounts.

3. Click **Save**.

For example, using the values from Appendix 3: Example Active Directory Structure, page 14:



Connection Status

The status of the connection to LDAP server is displayed at the bottom of the page.

State = Active

No error messages are displayed.

State = Failed

The following error messages may be displayed:

Error message	Reason / resolution
DNS unable to do reverse lookup	Reverse DNS lookup is required for SASL authentication.
DNS unable to resolve LDAP server address	Check that a valid DNS server is configured, and check the spelling of the LDAP server address.
Failed to connect to LDAP server. Check server address and port	Check that the LDAP server details are correct.
Failed to setup TLS connection. Check your CA certificate	CA certificate, private key and server certificate are required for TLS.

Error message	Reason / resolution
Failure connecting to server. Returned code<return code>	Other non-specific problem.
Invalid Base DN for accounts	Check **Base DN for accounts**; the current value does not describe a valid part of the LDAP directory.
Invalid server name or DNS failure	DNS resolution of the LDAP server name is failing.
Invalid bind credentials	Check **Bind DN** and **Bind password**, this error can also be displayed if SASL is set to *DIGEST-MD5* when it should be set to *None*.
Invalid bind DN	Check **Bind DN**; the current value does not describe a valid account in the LDAP director. This failed state may be wrongly reported if the **Bind DN** is 74 or more characters in length. To check whether there is a real failure or not, set up an administrator group on the Expressway using a valid group name. If Expressway reports “saved” then there is not a problem (the Expressway checks that it can find the group specified). If it reports that the group cannot be found then either the **Bind DN** is wrong, the group is wrong or one of the other configuration items may be wrong.
There is no CA certificate installed	CA certificate, private key and server certificate are required for TLS.
Unable to get configuration	LDAP server information may be missing or incorrect.

Define Groups on Expressway

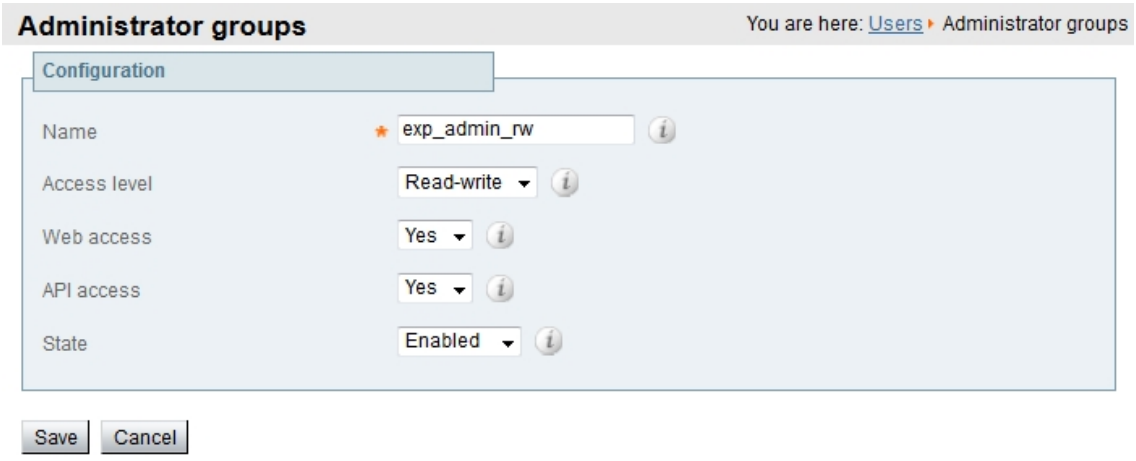
In the LDAP accessible database, groups are assigned to users to give them specific capabilities. The same groups must be defined on the Expressway and configured with the required authorization levels for Expressway access.

1. Go to **Users > Administrator groups**.
2. Click **New**.

3. Configure the fields as follows:

Name	Enter the group name to be used for the type of account required, for example: exp_admin_rw – for writeable access exp_admin_ro – for read-only access exp_auditor – for auditor access Note: the group name entered here must EXACTLY match (case sensitive) the group name entered in the AD or other authentication server.
Access level	Select the appropriate entry: *Read-write*: if writeable access is required. *Read-only*: if read-only access is required. *Auditor*: if access only to the Overview page and Log pages is to be allowed.
Web access	Select *Yes*.
API access	This controls access to the XML and REST APIs by systems such as Cisco TMS. Select *Yes* if members of this group need to access the system's APIs.
State	Select *Enabled*.

4. Click **Save**.



Access levels are prioritized so that if an administrator user is found in more than one group, it is assigned the highest level permission for each of the access settings across all of its groups.

A warning is displayed at the top of the **Administrator groups** page if a group name cannot be found.

When configured and operating, the user name that must be used to log into the Expressway is the sAMAccountName; Security Access Manager Account Name (in AD the account's user logon name).

Appendix 1: Troubleshooting

Viewing / Searching LDAP Database

Windows

LDAP database viewers, such as the graphical "Softerra LDAP Administrator" package, let you look at the LDAP database contents.

Using the login credentials provided for the Expressway, the LDAP viewer allows you to browse around to find users and groups.

You can check that users and groups are in appropriate paths by selecting the user or group and looking at its DN (distinguished name): the DN of a user should be a superset of the Base DN for accounts; the DN of a group should be a superset of the Base DN for groups.

Unix / Linux

ldapsearch (a program that is part of the openldap suite) can be used to query ldap databases, for example

```
ldapsearch -v -x -W -D "cn=exp,ou=systems,ou=region1,ou=useraccounts,dc=corporation,dc=int" -b
cn=p.brown,ou=it,ou=region1,ou=useraccounts,dc=corporation,dc=int
-h server.corporation.int
```

will bind to the ldap server "server.corporation.int" as "exp" and returns the directory information stored for the "p.brown" account (which would show information such as group membership).

For more information on ldapsearch, on a system supporting ldapsearch type:

```
man ldapsearch
```

Unable to Log in After Switching to Remote Authentication

Even when remote authentication is selected, the admin login remains accessible using the password configured on Expressway.

Check that the LDAP and group settings on the Expressway are correct. In particular, check for typing mistakes and use of spaces – spaces are allowed in group names.

AD "Domain Users" Group Fails to Allow Login

Default Active Directory groups such as the "Domain Users" group are seen as empty groups over LDAP and so should not be used as groups to define access rights. If they are selected, Expressway treats them as groups with no users.

Although when browsing in AD the "Domain Users" group is seen to have members (automatically added), when an LDAP search is performed on it, no member list is provided. Expressway uses the LDAP member list to identify whether a user is a member of the group, and therefore whether that user should have the access rights of that group.

If a group does not provide access to the expected group of users, use an LDAP browser and check that there is a member list and that it contains the expected users.

Appendix 2: Additional Information

Certificates for TLS

For the Expressway to connect to the LDAP server over TLS, it must have a root CA certificate loaded that authorizes the LDAP server's server certificate.

In large organizations the IT department will be able to provide relevant certificate information. Details on how to process the supplied certificate, and how to create the root CA certificate using an OCS server are described in *Certificate Creation and Use with Expressway Deployment Guide*.

If a root CA certificate is already loaded that is required for other purposes, this new root CA certificate should be concatenated with the other root CA certificate (Trusted CA certificate) and the single file containing the two certificates uploaded to Expressway.

Note that the server address entered on the **LDAP configuration** page on the Expressway must match the CN (common name) contained within the certificate presented by the LDAP server.

Use with Expressway Clusters

All LDAP configuration is replicated across cluster peers, however the DNS server is configurable independently on each Expressway peer. Make sure each peer references a DNS server that can lookup the LDAP server and (if SASL is enabled) can perform a reverse lookup of the LDAP server IP address.

IT Requisition for Access to Authentication Server

To: IT Department

Please supply the following details so that the Expressway can be configured to access the LDAP server to authenticate and authorize login users.

For access authorization, Expressway will look for users in the groups:

- _____ to allow them Read / Write access for administrator login
- _____ to allow them Read Only access for administrator login

LDAP server's Fully Qualified Domain or IP address	
If FQDN is it an A / AAAA record or SRV record?	A or AAAA / SRV
Port: IP port for the LDAP server (typically 389 or 636)	
Encryption: use TLS encryption to access the LDAP server? Certificate location?	YES / NO Path to certificate file:
Certificate revocation list	No checking / check single CA / check all CAs in trust chain
Expressway bind DN: location of the Expressway account object, including all cn=,ou=,dc= fields	
Expressway bind password for the Expressway login account	
SASL: enable SASL with MD5 Digest authentication?	YES / NO
Expressway bind username: the username for the Expressway login account; the sAMAccountName; Security Access Manager Account Name (in AD the Account's user logon name)	
Base DN for accounts: starting search location for user accounts, including all ou=,dc= fields	
Base DN for groups: starting search location for groups, including all ou=,dc= fields	

IT Requisition for Group Configuration

To: IT Department

Please create a group called _____ in the user authentication server and assign the following users to this group:

1.
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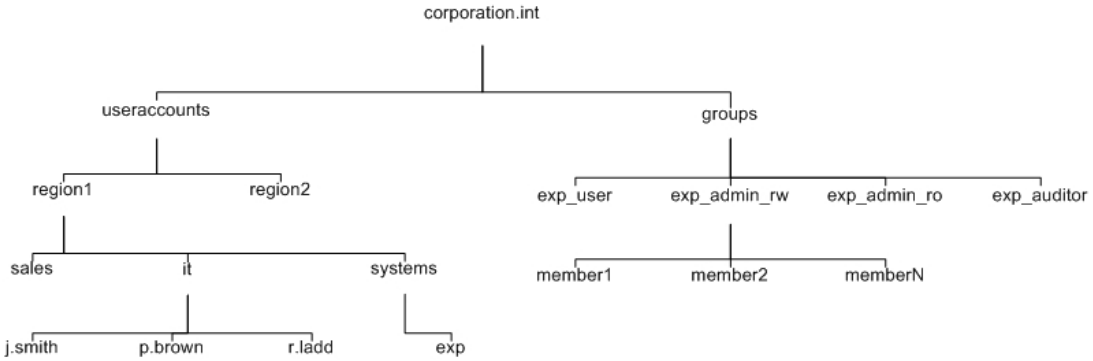
25.

Appendix 3: Example Active Directory Structure

The diagram below shows an example Active Directory tree structure for corporation.int:



Part of the Expressway configuration required for connecting to an LDAP server includes the specification of a set of distinguished names (DNs). DNs comprise the following elements:

- **cn** common name (leaves of the tree – usually, see Note below)
- **ou** organizational unit (branches)
- **dc** domain content (top of tree)

These elements are listed in a single line as comma separated values. No space should be placed immediately before or immediately after the comma, but spaces are valid within the common names, organizational unit names and domain content names.

Using this example Active Directory structure you would define the Expressway **Bind DN** as:

```
cn=vcs,ou=systems,ou=region1,ou=useraccounts,dc=corporation,dc=int
```

To support region 1 staff, the **Base DN for accounts** would be:

```
ou=region1,ou=useraccounts,dc=corporation,dc=int
```

To support worldwide staff, the **Base DN for accounts** would be:

```
ou=useraccounts,dc=corporation,dc=int
```

The **Base DN for groups** would be:

```
ou=groups,dc=corporation,dc=int
```

Note:

- Depending on how the database was initially set up, sometimes cn= is not reserved just for the 'leaves'. For example, by default Microsoft AD databases have the Users in a 'container' (cn=) not and organizational unit (ou=).
  When configuring the Expressway **Bind DN** and **Base DN** fields in Expressway, it is important to use the same dc, ou, cn tags and use them in the same order as specified in the database.

- The Expressway **Bind DN** is the directory structure to and including the object that specifies the account (in AD terminology the Active Directory "user" object). The account name used to login to the Expressway and the account name used for SASL is the sAMAccountName; Security Access Manager Account Name (in AD the account's user logon name).

- The **Base DN for accounts** and **Base DN for groups** must be at or below the dc level (include all dc= values and maybe ou= values too). Having a base DN of dc=int is not supported.

Appendix 4: Configuring Groups in Active Directory

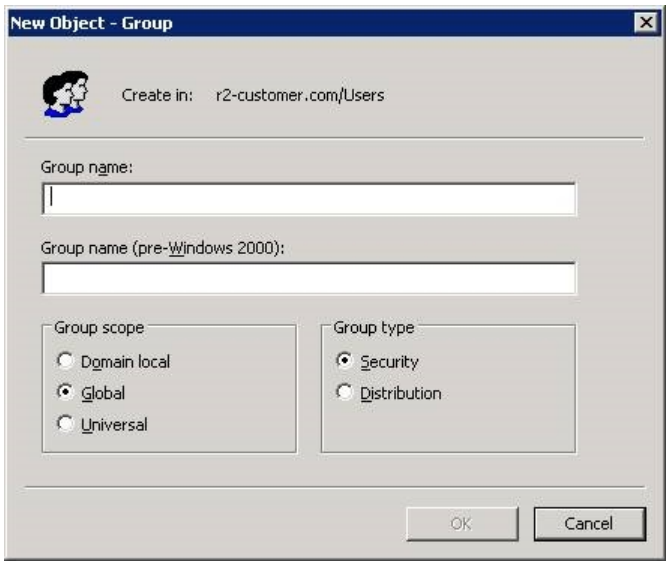
To allocate users to groups in Active Directory, you must create a Group object and then make the user a member of that group.

Create a Group Object

1. From the Start menu, select **Active Directory Users and Computers**.
2. In the left hand folder display, choose the relevant folder in which to make the new group.
3. Ensure that no entry is selected in the right hand panel, then go to **Action > New > Group**.
4. Configure the fields as follows:

Group name	The name for read-write account access to Expressway, for example exp_admin_rw
Group scope	As required, for example Global
Group type	As required, for example Distribution

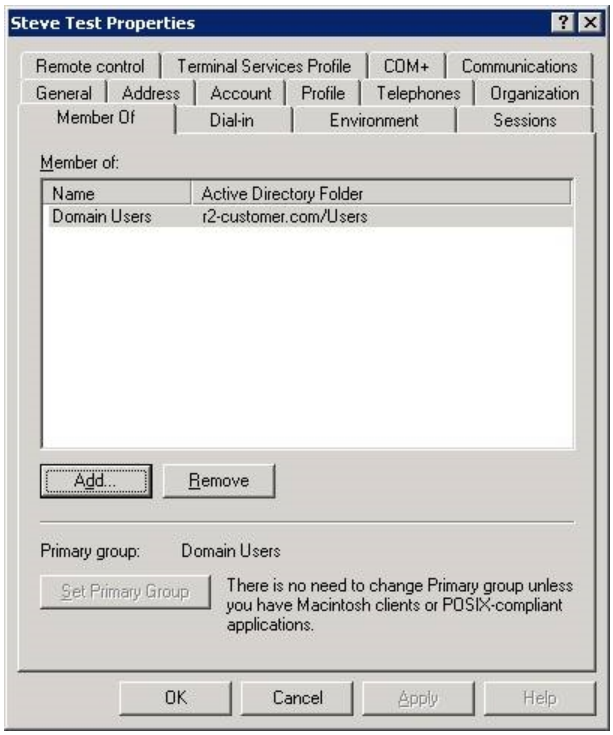
5. Create a second group for read-only access (for example, **Group name** = exp_admin_ro).
6. Create a third group for auditor access (for example, **Group name** = exp_auditor).



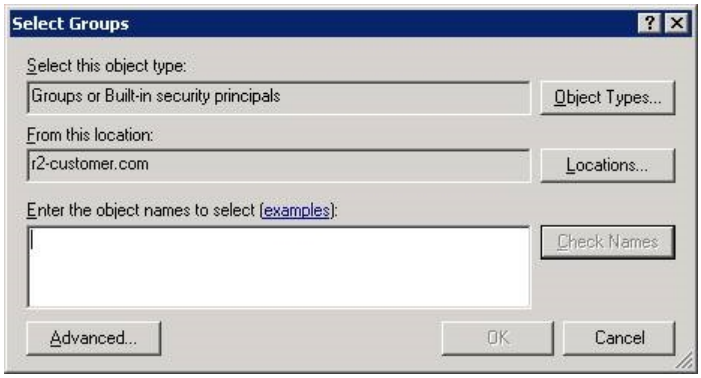
Make a User a Member of a Group

1. From the Start menu, select **Active Directory Users and Computers**.
2. In the left hand folder display choose the relevant folder which holds the users.
3. Double-click on the required user.

4. Select the **Member Of** tab.



5. Click **Add**.



6. Enter part or all of the group name to which this user is to become a member.
7. Click **Check Names**.
8. Select the desired entry from the one or more group names presented.
9. Click **OK** to confirm the group.
10. Click **OK** to close the user properties dialog.

To allocate multiple users to a group in one go, select the users (hold Ctrl and click on each user), then right-click and select **Add to a group...** then continue at step 6 above.

Document Revision History

The following table summarizes the changes that have been applied to this document.

Date	Description
November 2015	New template applied. Republished for X8.7.
December 2014	Republished for X8.5.
June 2014	Republished for X8.2.
December 2013	Initial release.

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