Manage Users and External Identity Sources

Cisco ISE Users

In this chapter, the term user refers to employees and contractors who access the network regularly as well as sponsor and guest users. A sponsor user is an employee or contractor of the organization who creates and manages guest-user accounts through the sponsor portal. A guest user is an external visitor who needs access to the organization’s network resources for a limited period of time.

You must create an account for any user to gain access to resources and services on the Cisco ISE network. Employees, contractors, and sponsor users are created from the Admin portal.

User Identity

User identity is like a container that holds information about a user and forms their network access credentials. Each user’s identity is defined by data and includes: a username, e-mail address, password, account description, associated administrative group, user group, and role.

User Groups

User groups are a collection of individual users who share a common set of privileges that allow them to access a specific set of Cisco ISE services and functions.

User Identity Groups

A user's group identity is composed of elements that identify and describe a specific group of users that belong to the same group. A group name is a description of the functional role that the members of this group have. A group is a listing of the users that belong to this group.

Default User Identity Groups

Cisco ISE comes with the following predefined user identity groups:

- Employee—Employees of your organization belong to this group.
- SponsorAllAccount—Sponsor users who can suspend or reinstate all guest accounts in the Cisco ISE network.
- SponsorGroupAccounts—Sponsor users who can suspend guest accounts created by sponsor users from the same sponsor user group.
- SponsorOwnAccounts—Sponsor users who can only suspend the guest accounts that they have created.
- Guest—A visitor who needs temporary access to resources in the network.
- ActivatedGuest—A guest user whose account is enabled and active.

User Role

A user role is a set of permissions that determine what tasks a user can perform and what services they can access on the Cisco ISE network. A user role is associated with a user group. For example, a network access user.

User Account Custom Attributes and Password Policies

Cisco ISE allows you to restrict a user's network access based on user attributes. Cisco ISE comes with a set of predefined user attributes and also allows you to create custom attributes. Both types of attributes can be used in conditions that define the authentication policy. You can also define a password policy for user accounts so that passwords meet specified criteria.

Custom User Attributes

On the User Custom Attributes Setting page, you can use the Custom Attributes pane to define additional user-account attributes. Cisco ISE provides a list of predefined attributes that are not configurable. However, you can define custom attributes by configuring the following:

- Attribute name

- Data type

User Password Policy Settings

You can define the criteria that user-account passwords must meet in the User Password Policy page. Choose **Administration** > **Identity Management** > **Settings** > **User Password Policy**.

The following table describes the fields in the User Password Policy page.

Table 1: User Password Policy Settings

Setting	Description
Minimum length	Sets the minimum length of the password (in characters)
Username	Restricts the use of the username or its characters in reverse order
Cisco	Restricts the use of "cisco" or its characters in reverse order
Special characters	Restricts the use of special characters that you define in reverse order
Repeated characters	Restricts the use of characters repeated four or more times consecutively
Required characters	Requires that the password include at least one of each of the following types: • Lowercase alphabetic characters • Uppercase alphabetic characters • Numeric characters • Non-alphanumeric characters If a user-password policy requires upper or lowercase characters and the user's language does not support these characters, the user cannot set a password. For the user password field to support UTF-8 characters, you must uncheck the following check box options: • Lowercase alphabetic characters • Uppercase alphabetic characters
Password History	Specifies the number of previous versions from which the password must be different to prevent repeated use of the same password

Setting	Description
Password Lifetime	Sets the following options to force users to change passwords after a specified time period: • Time (in days) before the user account is disabled if the password is not changed • Reminder (in days) before the user account is disabled

Add Users

Cisco ISE allows you to view, create, modify, duplicate, delete, change the status, import, export, or search for attributes of Cisco ISE users.

If you are using a Cisco ISE internal database, you must create an account for any new user who needs access to resources or services on a Cisco ISE network.

Step 1 Choose **Administration** > **Identity Management** > **Identities** > **Users**.

Step 2 Click **Add (+)** to create a new user.

Step 3 Enter values for the fields**.**
Do not include space, +, and * characters in the username. If you use the Cisco ISE Internal Certificate Authority (CA) for BYOD, the username that you provide here is used as the Common Name for the endpoint certificate. Cisco ISE Internal CA does not support "+" or "*" characters in the Common Name field.

Step 4 Click **Submit** to create a new user in the Cisco ISE internal database.

Export Cisco ISE User Data

You might have to export user data from the Cisco ISE internal database. Cisco ISE allows you to export user data in the form of a password-protected csv file.

Step 1 Choose **Administration** > **Identity Management** > **Identities** > **Users**.

Step 2 Check the check box that corresponds to the user(s) whose data you want to export.

Step 3 Click **Export Selected**.

Step 4 Enter a key for encrypting the password in the Key field.

Step 5 Click **Start Export** to create a users.csv file.

Step 6 Click **OK** to export the users.csv file.

Import Cisco ISE User Data

Instead of entering user accounts manually into Cisco ISE, you can import them. Cisco ISE allows you to import user data in the form of a csv file into its internal database.

Step 1 Choose **Administration** > **Identity Management** > **Identities** > **Users**.

Step 2 Click **Import** to import users from a comma-delimited text file.
If you do not have a comma-delimited text file, click **Generate a Template** to create this type of file.

Step 3 In the File text box, enter the filename containing the users to import, or click **Browse** and navigate to the location where the file resides.

Step 4 Check the **Create new user(s) and update existing user(s) with new data** check boxes if you want to both create new users and update existing users.

Step 5 Click **Save** to save your changes to the Cisco ISE internal database.

Note We recommend that you do not delete all the network access users at a time, because this may lead to CPU spike and the services to crash, especially if you are using a very large database.

Create a User Identity Group

You must create a user identity group before you can assign a user to it.

Step 1 Choose **Administration** > **Identity Management** > **Groups** > **Identity Groups** > **User Identity Groups** > **Add**.

Step 2 Enter values in the Name and Description fields. Supported characters for the Name field are space # $ & ‘ ( ) * + - . / @ _ .

Step 3 Click **Submit**.

Export User Identity Groups

Cisco ISE allows you to export locally configured user identity groups in the form of a csv file.

Step 1 Choose Administration > Identity Management > Groups > Identity Groups > **User Identity Groups**.

Step 2 Check the check box that corresponds to the user identity group that you want to export, and click Export.

Step 3 Click **OK**.

Import User Identity Groups

Cisco ISE allows you to import user identity groups in the form of a csv file.

Step 1 Choose **Administration** > **Identity Management** > **Groups** > **Identity Groups** > **User Identity Groups**.

Step 2 Click **Generate a Template** to get a template to use for the import file.

Step 3 Click Import to import network access users from a comma-delimited text file.

Step 4 Check the **Overwrite existing data with new data** check box if you want to both add a new user identity group and update existing user identity groups.

Step 5 Click **Import**.

Step 6 Click **Save** to save your changes to the Cisco ISE database.

Internal and External Identity Sources

Identity sources contain user information that Cisco ISE uses to validate credentials during user authentication, and to retrieve group information and other attributes that are associated with the user for use in authorization policies. They are databases that store user information in the form of records. You can add, edit, and delete user information from identity sources.

Cisco ISE supports internal and external identity sources. Both sources can be used as an authentication source for sponsor-user and guest-user authentication.

Internal Identity Sources

Cisco ISE has an internal user database that you can use to store user information. Users in the internal user database are called internal users. Cisco ISE also has an internal endpoint database that stores information about all the devices and endpoints that connect to it.

External Identity Sources

Cisco ISE allows you to configure the external identity source that contains user information. Cisco ISE connects to an external identity source to obtain user information for authentication. External identity sources also include certificate information for the Cisco ISE server and certificate authentication profiles. Cisco ISE uses authentication protocols to communicate with external identity sources. The following table lists authentication protocols and the external identity sources that they support.

Table 2: Authentication Protocols and Supported External Identity Sources

Protocol (Authentication Type)	Internal Database	Active Directory	LDAP	RADIUS Token Server or RSA
EAP-GTC, PAP (plain text password)	Yes	Yes	Yes	Yes

Protocol (Authentication Type)	Internal Database	Active Directory	LDAP	RADIUS Token Server or RSA
MS-CHAP password hash: MSCHAPv1/v2 EAP-MSCHAPv2 (as inner method of PEAP or EAP-FAST) LEAP	Yes	Yes	No	No
EAP-MD5 CHAP	Yes	No	No	No
EAP-TLS PEAP-TLS (certificate retrieval) **Note** For TLS authentications (EAP-TLS and PEAP-TLS), identity sources are not required but can optionally be added for authorization policy conditions.	No	Yes	Yes	No

Create an External Identity Source

Cisco ISE can connect with external identity sources such as Active Directory, LDAP, RADIUS Token, and RSA SecurID servers to obtain user information for authentication and authorization. External identity sources also includes certificate authentication profiles that you need for certificate-based authentications.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources**.

Step 2 Choose one of these options:

- **Certificate Authentication Profile** for certificate-based authentications.
- **Active Directory** to connect to an Active Directory as an external identity source (see Active Directory as an External Identity Source, on page 9 for more details).
- **LDAP** to add an LDAP identity source (see LDAP, on page 41 for more details).
- **RADIUS Token** to add a RADIUS Token server (see RADIUS Token Identity Sources, on page 49 for more details).
- **RSA SecurID** to add an RSA SecurID server (see RSA Identity Sources, on page 53 for more details).
- **SAML Id Providers** to add an identity provider (IdP), such as Oracle Access Manager (see SAMLv2 Identity Provider as an External Identity Source, on page 58 for more details).

Certificate Authentication Profiles

For each profile, you must specify the certificate field that should be used as the principal username and whether you want a binary comparison of the certificates.

Add a Certificate Authentication Profile

You must create a certificate authentication profile if you want to use the Extensible Authentication Protocol-Transport Layer Security (EAP-TLS) certificate-based authentication method. Instead of authenticating via the traditional username and password method, Cisco ISE compares a certificate received from a client with one in the server to verify the authenticity of a user.

Before You Begin

You must be a Super Admin or System Admin.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Certificate Authentication Profile** > **Add**.

Step 2 Enter the name and an optional description for the certificate authentication profile.

Step 3 Select an identity store from the drop-down list.
Basic certificate checking does not require an identity source. If you want binary comparison checking for the certificates, you must select an identity source. If you select Active Directory as an identity source, subject and common name and subject alternative name (all values) can be used to look up a user.

Step 4 Select the use of identity from **Certificate Attribute** or**Any Subject or Alternative Name Attributes in the Certificate**. This will be used in logs and for lookups.
If you choose**Any Subject or Alternative Name Attributes in the Certificate**, Active Directory UPN will be used as the username for logs and all subject names and alternative names in a certificate will be tried to look up a user. This option is available only if you choose Active Directory as the identity source.

Step 5 Choose when you want to **Match Client Certificate Against Certificate In Identity Store**. For this you must select an identity source (LDAP or Active Directory.) If you select Active Directory, you can choose to match certificates only to resolve identity ambiguity.

- Never—This option never performs a binary comparison.
- Only to resolve identity ambiguity—This option performs the binary comparison of client certificate to certificate on account in Active Directory only if ambiguity is encountered. For example, several Active Directory accounts matching to identity names from certificate are found.
- Always perform binary comparison—This option always performs the binary comparison of client certificate to certificate on account in identity store (Active Directory or LDAP).

Step 6 Click **Submit** to add the certificate authentication profile or save the changes.

Active Directory as an External Identity Source

Cisco ISE uses Microsoft Active Directory as an external identity source to access resources such as users, machines, groups, and attributes. User and machine authentication in Active Directory allows network access only to users and devices that are listed in Active Directory.

Active Directory Supported Authentication Protocols and Features

Active Directory supports features such as user and machine authentications, changing Active Directory user passwords with some protocols. The following table lists the authentication protocols and the respective features that are supported by Active Directory.

Table 3: Authentication Protocols Supported by Active Directory

Authentication Protocols	Features
EAP-FAST and password based Protected Extensible Authentication Protocol (PEAP)	User and machine authentication with the ability to change passwords using EAP-FAST and PEAP with an inner method of MS-CHAPv2 and EAP-GTC
Password Authentication Protocol (PAP)	User and machine authentication
Microsoft Challenge Handshake Authentication Protocol Version 1 (MS-CHAPv1)	User and machine authentication
Microsoft Challenge Handshake Authentication Protocol Version 2 (MS-CHAPv2)	User and machine authentication
Extensible Authentication Protocol-Generic Token Card (EAP-GTC)	User and machine authentication
Extensible Authentication Protocol-Transport Layer Security (EAP-TLS)	• User and machine authentication • Groups and attributes retrieval • Binary certificate comparison
Extensible Authentication Protocol- Flexible Authentication via Secure Tunneling-Transport Layer Security (EAP-FAST-TLS)	• User and machine authentication • Groups and attributes retrieval • Binary certificate comparison
Protected Extensible Authentication Protocol-Transport Layer Security (PEAP-TLS)	• User and machine authentication • Groups and attributes retrieval • Binary certificate comparison

Authentication Protocols	Features
Lightweight Extensible Authentication Protocol (LEAP)	User authentication

Active Directory Attribute and Group Retrieval for Use in Authorization Policies

Cisco ISE retrieves user or machine attributes and groups from Active Directory for use in authorization policy rules. These attributes can be used in Cisco ISE policies and determine the authorization level for a user or machine. Cisco ISE retrieves user and machine Active Directory attributes after successful authentication and can also retrieve attributes for an authorization that is independent of authentication.

Cisco ISE may use groups in external identity stores to assign permissions to users or computers; for example, to map users to sponsor groups. You should note the following restrictions on group memberships in Active Directory:

- Policy rule conditions may reference any of the following: a user's or computer's primary group, the groups of which a user or computer is a direct member, or indirect (nested) groups.
- Domain local groups outside a user's or computer's account domain are not supported.

Attributes and groups are retrieved and managed per join point. They are used in authorization policy (by selecting first the join point and then the attribute). You cannot define attributes or groups per scope for authorization, but you can use scopes for authentication policy. When you use a scope in authentication policy, it is possible that a user is authenticated via one join point, but attributes and/or groups are retrieved via another join point that has a trust path to the user's account domain. You can use authentication domains to ensure that no two join points in one scope have any overlap in authentication domains.

Note See Microsoft-imposed limits on the maximum number of usable Active Directory groups: http://technet.microsoft.com/en-us/library/active-directory-maximum-limits-scalability(v=WS.10).aspx

An authorization policy fails if the rule contains an Active Directory group name with special characters such as /, !, @, \, #, $, %, ^, &, *, (,), _, +, or ~.

Active Directory Certificate Retrieval for Certificate-Based Authentication

Cisco ISE supports certificate retrieval for user and machine authentication that uses the EAP-TLS protocol. The user or machine record on Active Directory includes a certificate attribute of the binary data type. This certificate attribute can contain one or more certificates. Cisco ISE identifies this attribute as userCertificate and does not allow you to configure any other name for this attribute. Cisco ISE retrieves this certificate and uses it to perform binary comparison.

The certificate authentication profile determines the field where the username is taken from in order to lookup the user in Active Directory to be used for retrieving certificates, for example, Subject Alternative Name (SAN) or Common Name. After Cisco ISE retrieves the certificate, it performs a binary comparison of this certificate with the client certificate. When multiple certificates are received, Cisco ISE compares the certificates to check for one that matches. When a match is found, the user or machine authentication is passed.

Active Directory User Authentication Process Flow

When authenticating or querying a user, Cisco ISE checks the following:

- MS-CHAP and PAP authentications check if the user is disabled, locked out, expired or out of logon hours and the authentication fails if some of these conditions are true.
- EAP-TLS authentications checks if the user is disabled or locked out and the authentication fails if some of these conditions is met.

Additionally, you can can set the IdentityAccessRestricted attribute if conditions mentioned above (for example, user disabled) are met. IdentityAccessRestricted attribute is set in order to support legacy policies and is not required in Cisco ISE 1.31.4 because authentication fails if such conditions (for example, user disabled) are met.

Support for Active Directory Multidomain Forests

Cisco ISE supports Active Directory with multidomain forests. Within each forest, Cisco ISE connects to a single domain, but can access resources from the other domains in the Active Directory forest if trust relationships are established between the domain to which Cisco ISE is connected and the other domains.

Refer to Release Notes for Cisco Identity Services Engine for a list of Windows Server Operating Systems that support Active Directory services.

Note Cisco ISE does not support Microsoft Active Directory servers that reside behind a network address translator and have a Network Address Translation (NAT) address.

Prerequisites for Integrating Active Directory and Cisco ISE

The following are the prerequisites to integrate Active Directory with Cisco ISE.

- Use the Network Time Protocol (NTP) server settings to synchronize the time between the Cisco ISE server and Active Directory. You can configure NTP settings from Cisco ISE CLI.
- If your Active Directory structure has multidomain forest or is divided into multiple forests, ensure that trust relationships exist between the domain to which Cisco ISE is connected and the other domains that have user and machine information to which you need access. For more information on establishing trust relationships, refer to Microsoft Active Directory documentation.
- You must have at least one global catalog server operational and accessible by Cisco ISE, in the domain to which you are joining Cisco ISE.

Active Directory Account Permissions Required for Performing Various Operations

Join Operations	Leave Operations	Cisco ISE Machine Accounts
For the account that is used to perform the join operation, the following permissions are required: • Search Active Directory (to see if a Cisco ISE machine account already exists) • Create Cisco ISE machine account to domain (if the machine account does not already exist) • Set attributes on the new machine account (for example, Cisco ISE machine account password, SPN, dnsHostname) It is not mandatory to be a domain administrator to perform a join operation.	For the account that is used to perform the leave operation, the following permissions are required: • Search Active Directory (to see if a Cisco ISE machine account already exists) • Remove Cisco ISE machine account from domain If you perform a force leave (leave without the password), it will not remove the machine account from the domain.	For the newly created Cisco ISE machine account that is used to communicate to the Active Directory connection, the following permissions are required: • Ability to change own password • Read the user/machine objects corresponding to users/machines being authenticated • Query some parts of the Active Directory to learn about required information (for example, trusted domains, alternative UPN suffixes and so on.) • Ability to read tokenGroups attribute You can precreate the machine account in Active Directory, and if the SAM name matches the Cisco ISE appliance hostname, it should be located during the join operation and re-used. If multiple join operations are performed, multiple machine accounts are maintained inside Cisco ISE, one for each join.

Note The credentials used for the join or leave operation are not stored in Cisco ISE. Only the newly created Cisco ISE machine account credentials are stored.

Network Ports That Must Be Open for Communication

Protocol	Port (remote-local)	Target	Authenticated	Notes
DNS (TCP/UDP)	Random number greater than or equal to 49152	DNS Servers/AD Domain Controllers	No	—
MSRPC	445	Domain Controllers	Yes	—
Kerberos (TCP/UDP)	88	Domain Controllers	Yes (Kerberos)	MS AD/KDC
LDAP (TCP/UDP)	389	Domain Controllers	Yes	—
LDAP (GC)	3268	Global Catalog Servers	Yes	—
NTP	123	NTP Servers/Domain Controllers	No	—
IPC	80	Other ISE Nodes in the Deployment	Yes (Using RBAC credentials)	—

DNS Server

While configuring your DNS server, make sure that you take care of the following:

- All DNS servers configured in Cisco ISE must be able to resolve all forward and reverse DNS queries for all domains you wish to use.
- All DNS server must be able to answer SRV queries for DCs, GCs, and KDCs with or without additional Site information.
- We recommend that you add the server IP addresses to SRV responses to improve performance.
- Avoid using DNS serversthat query the public Internet. They can cause delays and leak information about your network when an unknown name has to be resolved

Configure Active Directory as an External Identity Source

Before you configure Active Directory as an External Identity Source, make sure that:

- Cisco ISE hostnames are 15 characters or less in length. Active Directory does not allow hostnames larger than 15 characters.
- The Microsoft Active Directory server does not reside behind a network address translator and does not have a Network Address Translation (NAT) address.

- The Microsoft Active Directory account intended for the join operation is valid and is not configured with the Change Password on Next Login.
- You have the privileges of a Super Admin or System Admin in ISE.

Note If you see operational issues when Cisco ISE is connected to Active Directory, see the AD Connector Report under **Operations** > **Reports**.

You must perform the following tasks to configure Active Directory as an external identity source.

1. Add an Active Directory Join Point and Join Cisco ISE Node to the Join Point, on page 14
2. Configure Authentication Domains, on page 16
3. Configure Active Directory User Groups, on page 17
4. Configure Active Directory User and Machine Attributes, on page 18
5. (Optional) Modify Password Changes, Machine Authentications, and Machine Access Restriction Settings, on page 18

Add an Active Directory Join Point and Join Cisco ISE Node to the Join Point

Before You Begin

Make sure that the Cisco ISE node can communicate with the networks where the NTP servers, DNS servers, domain controllers, and global catalog servers are located. You can check these parameters by running the Domain Diagnostic tool.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click **Add** and enter the domain name and identity store name.

Step 3 Click **Submit**.
A pop-up appears asking if you want to join the newly created join point to the domain. Click **Yes** if you want to join immediately.

Saving the configuration saves the Active Directory domain configuration globally (in the primary and secondary policy service nodes), but none of the Cisco ISE nodes are joined to the domain yet.

Step 4 Check the check box next to the new Active Directory join point that you created and click **Edit**, or click on the new Active Directory join point from the navigation pane on the left. The deployment join/leave table is displayed with all the Cisco ISE nodes, the node roles, and their status.

Step 5 Check the check box next to the relevant Cisco ISE nodes and click **Join** to join the Cisco ISE node to the Active Directory domain.
You must do this explicitly even though you saved the configuration. To join multiple Cisco ISE nodes to a domain in a single operation, the username and password of the account to be used must be the same for all join operations. If different username and passwords are required to join each Cisco ISE node, the join operation should be performed individually for each Cisco ISE node.

Step 6 Enter the Active Directory username and password.

The user used for the join operation should exist in the domain itself. If it exists in a different domain or subdomain, the username should be noted in a UPN notation, such as jdoe@acme.com.

Step 7 (Optional) Check the **Specify Organizational Unit** check box.
You should check this check box in case the Cisco ISE node machine account is to be located in a specific Organizational Unit other than CN=Computers,DC=someDomain,DC=someTLD. Cisco ISE creates the machine account under the specified organizational unit or moves it to this location if the machine account already exists. If the organizational unit is not specified, Cisco ISE uses the default location. The value should be specified in ful distinguished name (DN) format. The syntax must conform to the Microsoft guidelines. Special reserved characters, such as /'+,;=<> line feed, space, and carriage return must be escaped by a backslash (\). For example, OU=Cisco ISE\,US,OU=IT Servers,OU=Servers\, and Workstations,DC=someDomain,DC=someTLD. If the machine account is already created, you need not check this check box. You can also change the location of the machine account after you join to the Active Directory domain.

Step 8 Click **OK**.
You can select more than one node to join to the Active Directory domain.

If the join operation is not successful, a failure message appears. Click the failure message for each node to view detailed logs for that node.

Note When the join is complete, Cisco ISE checks whether any group SIDS are still in the old format. If so, Cisco ISE automatically starts the SID update process. You must ensure that this process is allowed to complete.

Note You might not be able to join Cisco ISE with an Active Directory domain if the DNS SRV records are missing (the domain controllers are not advertising their SRV records for the domain that you are trying to join to). Refer to the following Microsoft Active Directory documentation for troubleshooting information:

- http://support.microsoft.com/kb/816587
- http://technet.microsoft.com/en-us/library/bb727055.aspx

What to Do Next

Configure authentication domains.

Leave the Active Directory Domain

If you no longer need to authenticate users or machines from an Active Directory domain or from this join point, you can leave the Active Directory domain.

When you reset the Cisco ISE application configuration from the command-line interface or restore configuration after a backup or upgrade, it performs a leave operation, disconnecting the Cisco ISE node from the Active Directory domain, if it is already joined. However, the Cisco ISE node account is not removed from the Active Directory domain. We recommend that you perform a leave operation from the Admin portal with the Active Directory credentials because it also removes the node account from the Active Directory domain. This is also recommended when you change the Cisco ISE hostname.

Before You Begin

If you leave the Active Directory domain, but still use Active Directory as an identity source for authentication (either directly or as part of an identity source sequence), authentications may fail.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Check the check box next to the Cisco ISE node and click **Leave**.

Step 3 Enter the Active Directory username and password, and click **OK** to leave the domain and remove the machine account from the Cisco ISE database.
If you enter the Active Directory credentials, the Cisco ISE node leaves the Active Directory domain and deletes the Cisco ISE machine account from the Active Directory database.

Note To delete the Cisco ISE machine account from the Active Directory database, the Active Directory credentials that you provide here must have the permission to remove machine account from domain.

Step 4 If you do not have the Active Directory credentials, check the **No Credentials Available** check box, and click **OK**.
If you check the **Leave domain without credentials** check box, the primary Cisco ISE node leaves the Active Directory domain. The Active Directory administrator must manually remove the machine account that was created in Active Directory during the time of the join.

Configure Authentication Domains

The domain to which Cisco ISE is joined to has visibility to other domains with which it has a trust relationship. By default, Cisco ISE is set to permit authentication against all those trusted domains. You can restrict interaction with the Active Directory deployment to a subset of authentication domains. Configuring authentication domains enables you to select specific domains for each join point so that the authentications are performed against the selected domains only. Authentication domains improves security because they instruct Cisco ISE to authenticate users only from selected domains and not from all domains trusted from join point. Authentication domains also improve performance and latency of authentication request processing because authentication domains limit the search area (that is, where accounts matching to incoming username or identity will be searched). It is especially important when incoming username or identity does not contain domain markup (prefix or suffix). Due to these reasons, configuring authentication domains is a best practice, and we highly recommended it.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Authentication Domains** tab.
A table appears with a list of your trusted domains. By default, Cisco ISE permits authentication against all trusted domains.

Step 3 To allow only specified domains, uncheck **Use all Active Directory domains for authentication** check box.

Step 4 Check the check box next to the domains for which you want to allow authentication, and click **Enable Selected**. In the **Authenticate** column, the status of this domain changes to Yes.
You can also disable selected domains.

Step 5 Click **Show Unusable Domains** to view a list of domains that cannot be used. Unusable domains are domains that Cisco ISE cannot use for authentication due to reasons such as one-way trust, selective authentication and so on.

What to Do Next

Configure Active Directory user groups.

Configure Active Directory User Groups

You must configure Active Directory user groups for them to be available for use in authorization policies. Internally, Cisco ISE uses security identifiers (SIDs) to help resolve group name ambiguity issues and to enhance group mappings. SID provides accurate group assignment matching.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Groups** tab.

Step 3 Do one of the following:

a) Choose **Add** > **Select Groups From Directory** to choose an existing group.
b) Choose **Add** > **Add Group** to manually add a group. You can either provide both group name and SID or provide only the group name and press **Fetch SID**.

Do not use double quotes (”) in the group name for the user interface login.

Step 4 If you are manually selecting a group, you can search for them using a filter. For example, enter **admin*** as the filter criteria and click **Retrieve Groups** to view user groups that begin with admin. You can also enter the asterisk (*) wildcard character to filter the results. You can retrieve only 500 groups at a time.

Step 5 Check the check boxes next to the groups that you want to be available for use in authorization policies and click **OK**.

Step 6 If you choose to manually add a group, enter a name and SID for the new group.

Step 7 Click **OK**.

Step 8 Click **Save**.

Note If you delete a group and create a new group with the same name as original, you must click **Update SID Values** to assign new SID to the newly created group. After an upgrade, the SIDs are automatically updated after the first join.

What to Do Next

Configure Active Directory user attributes.

Configure Active Directory User and Machine Attributes

You must configure Active Directory user and machine attributes to be able to use them in conditions in authorization policies.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Attributes** tab.

Step 3 Choose **Add** > **Add Attribute** to manually add a attribute, or choose **Add** > **Select Attributes From Directory** to choose a list of attributes from the directory.

Step 4 If you choose to add attributes from the directory, enter the name of a user in the **Sample User or Machine Account** field, and click **Retrieve Attributes** to obtain a list of attributes for users. For example, enter **administrator** to obtain a list of administrator attributes. You can also enter the asterisk (*) wildcard character to filter the results.

Note When you enter an example username, ensure that you choose a user from the Active Directory domain to which the Cisco ISE is connected. When you choose an example machine to obtain machine attributes, be sure to prefix the machine name with “host/” or use the SAM$ format. For example, you might use host/myhost. The example value displayed when you retrieve attributes are provided for illustration only and are not stored.

Step 5 Check the check boxes next to the attributes from Active Directory that you want to select, and click **OK**.

Step 6 If you choose to manually add an attribute, enter a name for the new attribute.

Step 7 Click **Save**.

Modify Password Changes, Machine Authentications, and Machine Access Restriction Settings

Before You Begin

You must join Cisco ISE to the Active Directory domain.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Advanced Settings** tab.

Step 3 Modify as required, the Password Change, Machine Authentication, and Machine Access Restrictions (MARs) settings. These option are enabled by default.

Step 4 Check the **Use Kerberos for Plain Text Authentications** check box if you want to use Kerberos for plain-text authentications. The default and recommended option is MS-RPC. Kerberos is used in ISE 1.2.

Support for Active Directory Multi-Join Configuration

Cisco ISE supports multiple joins to Active Directory domains. Cisco ISE supports up to 50 Active Directory joins. Cisco ISE can connect with multiple Active Directory domains that do not have a two-way trust or have zero trust between them. Active Directory multi-domain join comprises a set of distinct Active Directory domains with their own groups, attributes, and authorization policies for each join.

You can join the same forest more than once, that is, you can join more than one domain in the same forest, if necessary.

Cisco ISE now allows to join domains with one-way trust. This option helps bypass the permission issues caused by a one-way trust. You can join either of the trusted domains and hence be able to see both domains.

- Join Point—In Cisco ISE, each independent join to an Active Directory domain is called a join point. The Active Directory join point is an Cisco ISE identity store and can be used in authentication policy. It has an associated dictionary for attributes and groups, which can be used in authorization conditions.
- Scope—A subset of Active Directory join points grouped together is called a scope. You can use scopes in authentication policy in place of a single join point and as authentication results. Scopes are used to authenticate users against multiple join points. Instead of having multiple rules for each join point, if you use a scope, you can create the same policy with a single rule and save the time that Cisco ISE takes to process a request and help improve performance. A join point can be present in multiple scopes. A scope can be included in an identity source sequence. You cannot use scopes in an authorization policy condition because scopes do not have any associated dictionaries.

  When you perform a fresh Cisco ISE install, by default no scopes exist. This is called the no scope mode. When you add a scope, Cisco ISE enters multi-scope mode. If you want, you can return to no scope mode. All the join points will be moved to the Active Directory folder.

  - Initial_Scope is an implicit scope that is used to store the Active Directory join points that were added in no scope mode. When multi-scope mode is enabled, all the Active Directory join points move into the automatically created Initial_Scope. You can rename the Initial_Scope.
  - All_AD_Instances is a built-in pseudo scope that is not shown in the Active Directory configuration. It is only visible as an authentication result in policy and identity sequences. You can select this scope if you want to select all Active Directory join points configured in Cisco ISE.

Create a New Scope to Add Active Directory Join Points

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click **Scope Mode**.
A default scope called Initial_Scope is created, and all the current join points are placed under this scope.

Step 3 To create more scopes, click **Add**.

Step 4 Enter a name and a description for the new scope.

Step 5 Click **Submit**.

Identity Rewrite

Identity rewrite is an advanced feature that directs Cisco ISE to manipulate the identity before it is passed to the external Active Directory system. You can create rules to change the identity to a desired format that includes or excludes a domain prefix and/or suffix or other additional markup of your choice.

Identity rewrite rules are applied on the username or hostname received from the client, before being passed to Active Directory, for operations such as subject searches, authentication, and authorization queries. Cisco ISE will match the condition tokens and when the first one matches, Cisco ISE stops processing the policy and rewrites the identity string according to the result.

During the rewrite, everything enclosed in square bracket [ ] (such as [IDENTITY]) is a variable that is not evaluated on the evaluation side but instead added with the string that matches that location in the string. Everything without the brackets is evaluated as a fixed string on both the evaluation side and the rewrite side of the rule.

The following are some examples of identity rewrite, considering that the identity entered by the user is ACME\jdoe:

- If identity matches **ACME\[IDENTITY]**, rewrite as **[IDENTITY]**.

  The result would be jdoe. This rule instructs Cisco ISE to strip all usernames with the ACME prefix.

- If the identity matches **ACME\[IDENTITY]**, rewrite as **[IDENTITY]@ACME.com**.

  The result would be jdoe@ACME.com. This rule instructs Cisco ISE to change the format from prefix for suffix notation or from NetBIOS format to UPN formats.

- If the identity matches **ACME\[IDENTITY]**, rewrite as **ACME2\[IDENTITY]**.

  The result would be ACME2\jdoe. This rule instructs Cisco ISE to change all usernames with a certain prefix to an alternate prefix.

- If the identity matches **[ACME]\jdoe.USA**, rewrite as **[IDENTITY]@[ACME].com**.

  The result would be jdoe\ACME.com. This rule instructs Cisco ISE to strip the realm after the dot, in this case the country and replace it with the correct domain.

- If the identity matches **E=[IDENTITY]**, rewrite as **[IDENTITY]**.

  The result would be jdoe. This is an example rule that can be created when an identity is from a certificate, the field is an email address, and Active Directory is configured to search by Subject. This rule instructs Cisco ISE to remove ‘E=’.

- If the identity matches **E=[EMAIL],[DN]**, rewrite as **[DN]**.

  This rule will convert certificate subject from E=jdoe@acme.com, CN=jdoe, DC=acme, DC=com to pure DN, CN=jdoe, DC=acme, DC=com. This is an example rule that can be created when identity is taken from a certificate subject and Active Directory is configured to search user by DN . This rule instructs Cisco ISE to strip email prefix and generate DN.

The following are some common mistakes while writing the identity rewrite rules:

- If the identity matches **[DOMAIN]\[IDENTITY]**, rewrite as **[IDENTITY]@DOMAIN.com**.

  The result would be jdoe@DOMAIN.com. This rule does not have [DOMAIN] in square brackets [ ] on the rewrite side of the rule.

- If the identity matches **DOMAIN\[IDENTITY]**, rewrite as **[IDENTITY]@[DOMAIN].com**.

  Here again, the result would be jdoe@DOMAIN.com. This rule does not have [DOMAIN] in square brackets [ ] on the evaluation side of the rule.

Identity rewrite rules are always applied within the context of an Active Directory join point. Even if a scope is selected as the result of an authentication policy, the rewrite rules are applied for each Active Directory join point. These rewrite rules also applies for identities taken from certificates if EAP-TLS is being used.

Enable Identity Rewrite

Note This configuration task is optional. You can perform it to reduce authentication failures that can arise because of various reasons such as ambiguous identity errors.

Before You Begin

You must join Cisco ISE to the Active Directory domain.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Advanced Settings** tab.

Step 3 Under the **Identity Rewrite** section, choose whether you want to apply the rewrite rules to modify usernames.

Step 4 Enter the match conditions and the rewrite results. You can remove the default rule that appears and enter the rule according to your requirement. Cisco ISE processes the policy in order, and the first condition that matches the request username is applied. You can use the matching tokens (text contained in square brackets) to transfer elements of the original username to the result. If none of the rules match, the identity name remains unchanged. You can click the **Launch Test** button to preview the rewrite processing.

Identity Resolution Settings

Some type of identities include a domain markup, such as a prefix or a suffix. For example, in a NetBIOS identity such as ACME\jdoe, “ACME” is the domain markup prefix, similarly in a UPN identity such as jdoe@acme.com, “acme.com” is the domain markup suffix. Domain prefix should match to the NetBIOS (NTLM) name of the Active Directory domain in your organization and domain suffix should match to the DNS name of Active Directory domain or to the alternative UPN suffix in your organization. For example jdoe@gmail.com is treated as without domain markup because gmail.com is not a DNS name of Active Directory domain.

The identity resolution settings allows you to configure important settings to tune the security and performance balance to match your Active Directory deployment. You can use these settings to tune authentications for usernames and hostnames without domain markup. In cases when Cisco ISE is not aware of the user's domain, it can be configured to search the user in all the authentication domains. Even if the user is found in one domain, Cisco ISE will wait for all responses in order to ensure that there is no identity ambiguity. This might be a lengthy process, subject to the number of domains, latency in the network, load, and so on.

Avoid Identity Resolution Issues

It is highly recommended to use fully qualified names (that is, names with domain markup) for users and hosts during authentication. For example, UPNs and NetBIOS names for users and FQDN SPNs for hosts. This is especially important if you hit ambiguity errors frequently, such as, several Active Directory accounts match to the incoming username; for example, jdoe matches to jdoe@emea.acme.com and jdoe@amer.acme.com. In some cases, using fully qualified names is the only way to resolve issue. In others, it may be sufficient to guarantee that the users have unique passwords. So, it is more efficient and leads to less password lockout issues if unique identities are used initially.

Configure Identity Resolution Settings

Note This configuration task is optional. You can perform it to reduce authentication failures that can arise because of various reasons such as ambiguous identity errors.

Before You Begin

You must join Cisco ISE to the Active Directory domain.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Advanced Settings** tab.

Step 3 Define the following settings for identity resolution for usernames or machine names under the **Identity Resolution** section. This setting provides you advanced control for user search and authentication.
The first setting is for the identities without a markup. In such cases, you can select any of the following options:

- **Reject the request—**This option will fail the authentication for users who do not have any domain markups, such as a SAM name. This is useful in case of multi join domains where Cisco ISE will have to look up for the identity in all the joined global catalogs, which might not be very secure. This option forces the users to use names with domain markups.
- **Only search in the** "**Authentication Domains**" **from the joined forest—**This option will search for the identity only in the domains in the forest of the join point which are specified in the authentication domains section. This is the default option and identical to Cisco ISE 1.2 behavior for SAM account names.
- **Search in all the** "**Authentication Domains**" **sections—**This option will search for the identity in all authentication domains in all the trusted forests. This might increase latency and impact performance.

The selection is made based on how the authentication domains are configured in Cisco ISE. If only specific authentication domains are selected, only those domains will be searched (for both "joined forest" or "all forests" selections).

The second setting is used if Cisco ISE cannot communicate with all Global Catalogs (GCs) that it needs to in order to comply with the configuration specified in the "Authentication Domains" section. In such cases, you can select any of the following options:

- **Proceed with available domains—** This option will proceed with the authentication if it finds a match in any of the available domains.
- **Drop the request—** This option will drop the authentication request if the identity resolution encounters some unreachable or unavailable domain.

Test Users for Active Directory Authentication

Test User tool can be used to verify user authentication. You can also fetch groups and attributes and examine them. You can run the test for a single join point or for scopes.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Choose one of the following options:

- To run the test on all join points, choose **Advanced Tools** > **Test User for All Join Points**.
- To run the test for a specific join point, select the joint point and click **Edit**. Select the Cisco ISE node and click **Test User**.

Step 3 Enter the username and password of the user (or host) in Active Directory.

Step 4 Choose the authentication type. Password entry in Step 3 is not required if you choose the Lookup option.

Step 5 Select the Cisco ISE node on which you want to run this test, if you are running this test for all join points.

Step 6 Check the Retrieve Groups and Attributes check boxes if you want to retrieve the groups and attributes from Active Directory.

Step 7 Click **Test**.
The result and steps of the test operation are displayed. The steps can help to identify the failure reason and troubleshoot.

Delete Active Directory Configurations

You should delete Active Directory configurations if you are not going to use Active Directory as an external identity source. Do not delete the configuration if you want to join another Active Directory domain. You can leave the domain to which you are currently joined and join a new domain.

Before You Begin

Ensure that you have left the Active Directory domain.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Check the check box next to the configured Active Directory.

Step 3 Check and ensure that the Local Node status is listed as Not Joined.

Step 4 Click **Delete**.
You have removed the configuration from the Active Directory database. If you want to use Active Directory at a later point in time, you can resubmit a valid Active Directory configuration.

View Active Directory Joins for a Node

You can use the **Node View** button on the **Active Directory** page to view the status of all Active Directory join points for a given Cisco ISE node or a list of all join points on all Cisco ISE nodes.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Source** > **Active Directory**.

Step 2 Click **Node View**.

Step 3 Select a node from the **ISE Node** drop-down list.
The table lists the status of Active Directory by node. If there are multiple join points and multiple Cisco ISE nodes in a deployment, this table may take several minutes to update.

Step 4 Click the join point **Name** link to go to that Active Directory join point page and perform other specific actions.

Step 5 Click the **Diagnostic Summary** link to go to the **Diagnostic Tools** page to troubleshoot specific issues. The diagnostic tool displays the latest diagnostics results for each join point per node.

Diagnose Active Directory Problems

The Diagnostic Tool is a service that runs on every Cisco ISE node. It allows you to automatically test and diagnose the Active Directory deployment and execute a set of tests to detect issues that may cause functionality or performance failures when Cisco ISE uses Active Directory.

There are multiple reasons for which Cisco ISE might be unable to join or authenticate against Active Directory. This tool helps ensure that the prerequisites for connecting Cisco ISE to Active Directory are configured correctly. It helps detect problems with networking, firewall configurations, clock sync, user authentication, and so on. This tool works as a step-by-step guide and helps you fix problems with every layer in the middle, if needed .

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **Active Directory**.

Step 2 Click the **Advanced Tools** drop-down and choose **Diagnostic Tools**.

Step 3 Select a Cisco ISE node to run the diagnosis on.
If you do not select a Cisco ISE node then the test is run on all the nodes.

Step 4 Select a specific Active Directory join point.
If you do not select an Active Directory join point then the test is run on all the join points.

Step 5 Click **Run All Tests on Node** to start the test.

Step 6 Click **View Test Details** to view the details for tests with Warning or Failed status.
This table allows you to rerun specific tests, stop running tests, and view a report of specific tests.

Enable Active Directory Debug Logs

Active Directory debug logs are not logged by default. You must enable this option on the Cisco ISE node that has assumed the Policy Service persona in your deployment. Enabling Active Directory debug logs may affect ISE performance.

Step 1 Choose **Administration** > **System** > **Logging** > **Debug Log Configuration**.

Step 2 Click the radio button next to the Cisco ISE Policy Service node from which you want to obtain Active Directory debug information, and click **Edit**.

Step 3 Click the **Active Directory** radio button, and click **Edit**.

Step 4 Choose **DEBUG** from the drop-down list next to Active Directory. This will include errors, warnings, and verbose logs. To get full logs, choose **TRACE**.

Step 5 Click **Save**.

Obtain the Active Directory Log File for Troubleshooting

Download and view the Active Directory debug logs to troubleshoot issues you may have.

Before You Begin

Active Directory debug logging must be enabled.

Step 1 Choose **Operations** > **Troubleshoot** > **Download Logs**.

Step 2 Click the node from which you want to obtain the Active Directory debug log file.

Step 3 Click the **Debug Logs** tab.

Step 4 Scroll down this page to locate the ad_agent.log file. Click this file to download it.

Active Directory Alarms and Reports

Cisco ISE provides various alarms and reports to monitor and troubleshoot Active Directory related activities.

Alarms

The following alarms are triggered for Active Directory errors and issues:

- Configured nameserver not available
- Joined domain is unavailable
- Authentication domain is unavailable

- Active Directory forest is unavailable
- AD Connector had to be restarted
- AD: ISE account password update failed
- AD: Machine TGT refresh failed

Reports

You can monitor Active Directory related activities through the following two reports:

- RADIUS Authentications Report—This report shows detailed steps of the Active Directory authentication and authorization. You can find this report here: **Operations** > **Reports** > **Auth Services Status** > **RADIUS Authentications**.
- AD Connector Operations Report—The AD Connector Operations report provides a log of background operations performed by AD connector, such as Cisco ISE server password refresh, Kerberos ticket management, DNS queries, DC discovery, LDAP, and RPC connections management. If you encounter any Active Directory failures, you can review the details in this report to identify the possible causes. You can find this report here: **Operations** > **Reports** > **Auth Services Status** > **AD Connector Operations**.

Active Directory Advanced Tuning

The advanced tuning feature provides node-specific settings used for support action under the supervision of Cisco support personnel, to adjust the parameters deeper in the system. These settings are not intended for normal administration flow, and should be used only under guidance.

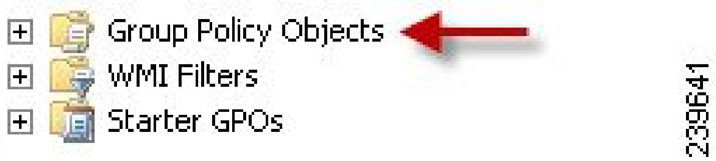
Supplemental Information for Setting Up Cisco ISE with Active Directory

For configuirng Cisco ISE with Active Directory, you must configure group policies, and configure a supplicant for machine authentication.

Configure Group Policies in Active Directory

For more information about how to access the Group Policy management editor, refer to the Microsoft Active Directory documentation.

Step 1 Open the Group Policy management editor as shown in the following illustration.



Group Policy Objects selection

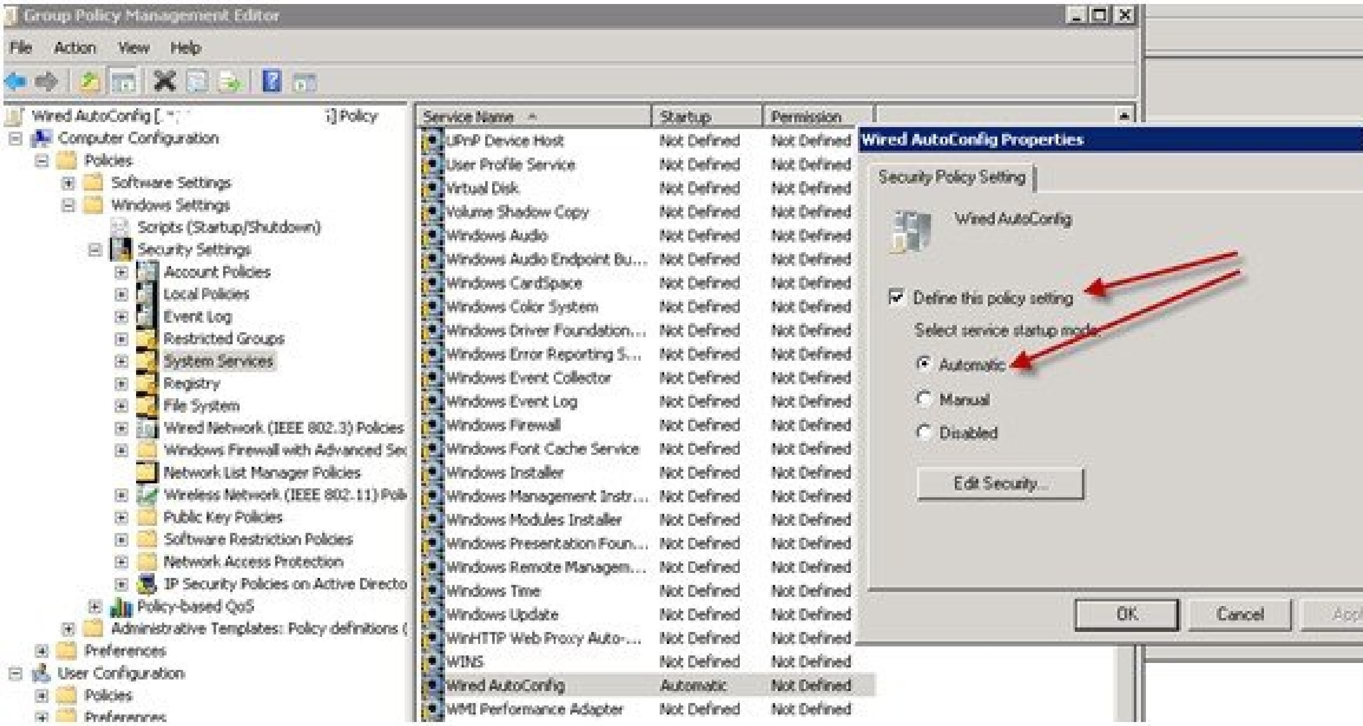
Step 2 Create a new policy and enter a descriptive name for it or add to an existing domain policy.

Example:

In example below, we used Wired Autoconfiguration for the policy name.

Step 3 Check the **Define this policy setting** check box, and click the **Automatic** radio button for the service startup mode as shown in the following illustration.

Policy Properties


Group Policy Management Editor
File
Action
View
Help
Wired AutoConfig [ ] Policy
Computer Configuration
Policies
Software Settings
Windows Settings
Scripts (Startup/Shutdown)
Security Settings
Account Policies
Local Policies
Event Log
Restricted Groups
System Services
Registry
File System
Wired Network (IEEE 802.3) Policies
Windows Firewall with Advanced Sec
Network List Manager Policies
Wireless Network (IEEE 802.11) Poli
Public Key Policies
Software Restriction Policies
Network Access Protection
IP Security Policies on Active Directo
Policy-based QoS
Administrative Templates: Policy definitions (
Preferences
User Configuration
Policies
Preferences
OK
Cancel
Appl

Service Name	Startup	Permission
UPnP Device Host	Not Defined	Not Defined
User Profile Service	Not Defined	Not Defined
Virtual Disk	Not Defined	Not Defined
Volume Shadow Copy	Not Defined	Not Defined
Windows Audio	Not Defined	Not Defined
Windows Audio Endpoint Bu...	Not Defined	Not Defined
Windows CardSpace	Not Defined	Not Defined
Windows Color System	Not Defined	Not Defined
Windows Driver Foundation...	Not Defined	Not Defined
Windows Error Reporting S...	Not Defined	Not Defined
Windows Event Collector	Not Defined	Not Defined
Windows Event Log	Not Defined	Not Defined
Windows Firewall	Not Defined	Not Defined
Windows Font Cache Service	Not Defined	Not Defined
Windows Installer	Not Defined	Not Defined
Windows Management Instr...	Not Defined	Not Defined
Windows Modules Installer	Not Defined	Not Defined
Windows Presentation Foun...	Not Defined	Not Defined
Windows Remote Managem...	Not Defined	Not Defined
Windows Time	Not Defined	Not Defined
Windows Update	Not Defined	Not Defined
WinHTTP Web Proxy Auto-...	Not Defined	Not Defined
WINS	Not Defined	Not Defined
Wired AutoConfig	Automatic	Not Defined
WMI Performance Adapter	Not Defined	Not Defined

Wired AutoConfig Properties

Security Policy Setting

Wired AutoConfig

☑ Define this policy setting

Select service startup mode:

● Automatic

○ Manual

○ Disabled

Edit Security...

Step 4 Apply the policy at the desired organizational unit or domain Active Directory level.
The computers will receive the policy when they reboot and this service will be turned on.

Configure Odyssey 5.X Supplicant for EAP-TLS Machine Authentications Against Active Directory

If you are using the Odyssey 5.x supplicant for EAP-TLS machine authentications against Active Directory, you must configure the following in the supplicant.

Step 1 Start Odyssey Access Client.

Step 2 Choose **Odyssey Access Client Administrator** from the Tools menu.

Step 3 Double-click the **Machine Account** icon.

Step 4 From the Machine Account page, you must configure a profile for EAP-TLS authentications:

a) Choose **Configuration** > **Profiles**.
b) Enter a name for the EAP-TLS profile.
c) On the Authentication tab, choose **EAP-TLS** as the authentication method.
d) On the Certificate tab, check the **Permit login using my certificate** check box, and choose a certificate for the supplicant machine.
e) On the User Info tab, check the **Use machine credentials** check box.
If this option is enabled, the Odyssey supplicant sends the machine name in the format host\<*machine_name*> and Active Directory identifies the request as coming from a machine and will look up computer objects to perform authentication. If this option is disabled, the Odyssey supplicant sends the machine name without the host\ prefix and Active Directory will look up user objects and the authentication fails.

AnyConnect Agent for Machine Authentication

When you configure AnyConnect Agent for machine authentication, you can do one of the following:

- Use the default machine hostname, which includes the prefix “host/.”
- Configure a new profile, in which case you must include the prefix “host/” and then the machine name.

ISE pxGrid Identity Mapping

Identity Mapping enables you to monitor users that are authenticated by a Domain Controller (DC) and not by Cisco ISE. In networks where Cisco ISE does not actively authenticate users for network access, it is possible to use Identity Mapping to collect user authentication information from the active directory (AD) Domain Controller. The Identity Mapping connects to Windows system using the MS WMI interface and queries logs from the Windows event messaging. Once a user logs into the network and is authenticated with an Active Directory, the Domain Controller generates an event log that includes the user name and IP address allocated for the user.

Identity mapping can also be activated even if Cisco ISE plays an active role for authentication. In such cases, the same session may be identified twice. The operational data has a session attribute that indicates the source. You can go to Operations > Authentications and click **Show Live Sessions** to check the Session Source.

The Identity Mapping component retrieves the user logins from the Domain Controller and imports them into the Cisco ISE session directory. So users authenticated with Active Directory (AD) are shown in the Cisco ISE live sessions view, and can be queried from the session directory using Cisco pxGrid interface by third-party applications. The known information is the user name, IP address, and the AD DC host name and the AD DC NetBios name.

The Cisco ISE plays only a passive role and does not perform the authentication. When Identity Mapping is active, Cisco ISE collects the login information from the AD and includes the data into the session directory.

Key Features

- Identity Mapping is configured from the Cisco ISE administration console. The configuration includes the following settings:
    - Definition of all the DCs from which Identity Mapping is to collect user authentication information. This also includes import and export of the DC list using *.csv files
    - DC connection characteristics such as authentication security protocol (NTLMv1 or NTLMv2) and user session aging time
    - Connection testing, to verify the DC is set correctly to initialize valid connection with Identity Mapping
- Identity Mapping report. This report provides information about the Identity Mapping component for troubleshooting
- Identity Mapping debug logs
- Cisco ISE session directory maintains the collected user information, so that customers can view it from the Live Sessions and query it from the pxGrid interface
- Using the CLI command **show application status** provides the health status of nodes that use Identity Mapping
- Supports High Availability

Configuring Identity Mapping

ID Mapping requires configuration in ISE, and the Active Directory Domain Server must have the right patches and configuration. For information about configuring the Active Directory domain controller for ISE, see Active Directory Requirements to Support Identity Mapping

Configure Identity Mapping

ISE must be able to establish a connection with an AD Domain Controller (DC).

Before You Begin

Enable pxGrid services to configure Identity Mapping. Choose **Administration** > **System** > **Deployment** to enable pxGrid services.

To add a new Domain Controller (DC) for Identity Mapping, you need the login credentials of that DC.

Make sure the Domain Controller is properly configured for ISE Identity Mapping, as described in Active Directory Requirements to Support Identity Mapping.

Step 1 Choose **Administration** > **pxGrid Identity Mapping** > **AD Domain Controller**.

Step 2 Click **General Settings**.

Step 3 The Active Directory General Settings pop-up is displayed. Set the required values and click **Save**.

- **History interval** is the time during which Identity Mapping reads user login information that already occurred. This is required upon startup or restart of Identity Mapping to catch up with events generated while it was unavailable.
- **User session aging time** is the amount of time the user can be logged in. Identity Mapping identifies new user login events from the DC, however the DC does not report when the user logs off. The aging time enables Cisco ISE to determine the time interval for which the user is logged in.
- You can select either **NTLMv1** or **NTLMv2** as the communications protocol between the ISE and the DC.

Step 4 Click **Add**.

Step 5 In the **General Settings** section, enter the **Display Name**, **Domain FQDN**, and **Host FQDN** of the DC.

Step 6 In the **Credentials** section, enter the Username and Password of the DC.

Step 7 (Optional) Test the connection to the specified domain by clicking **Verify DC Connection Settings**.
This test ensures that the connection to the DC is healthy. However it does not check whether Cisco ISE can fetch the user information upon login.

Step 8 Click **Submit**. An updated table is displayed with the newly-defined DC included in the list of DCs. The status column indicates the different states of DC.
You can also Import or Export the DC list.

Note While importing, you need to provide the password in the template. As the file contains password, the import template should be treated as sensitive. The Export option does not export the password.

Filter Identity Mapping

You can filter certain users, based on their name or IP address. You can add as many filters as needed. The “OR” logic operator applies between filters. If both the fields are specified in a single filter, the “AND” logic operator applies between these fields. The Monitoring live session shows Identity Mapping components that are not filtered out by the Mapping Filters.

Step 1 Choose **Administration** > **pxGrid Identity Mapping** > **Mapping Filters**.

Step 2 Click **Add**, enter the Username and or IP address of the user you want to filter and click **Submit**.

Step 3 To view the non-filtered users that are currently logged into the Monitoring session directory, choose **Operations** > **Authentications**.

Active Directory Requirements to Support Identity Mapping

Identity Mapping uses Active Directory login audit events generated by the Active Directory domain controller to gather user login information. The Active Directory server must be configured properly so the ISE user can connect and fetch the user logins information. The following sections show how configure the Active Directory domain controller to support ISE Identity Mapping .

Configure Active Directory for Identity Mapping

ISE Identity Mapping uses Active Directory login audit events generated by the Active Directory domain controller to gather user login information. ISE connects to Active Directory and fetches the user login information.

The following steps should be performed from the Active Directory domain controller:

Step 1 Make sure relevant Microsoft patches are installed on the Active Directory domain controllers.

a) The following patches for Windows Server 2008 are required:

- http://support.microsoft.com/kb/958124

  This patch fixes a memory leak in Microsoft's WMI, which prevents CDA to establish successful connection with the domain controller (CDA administrator can experience it in CDA Active Directory domain controller GUI page, where the status need to be "up" once the connection establishes successfully).

- http://support.microsoft.com/kb/973995

  This patch fixes different memory leak in Microsoft's WMI, which sporadically prevents the Active Directory domain controller from writing the necessary user login events to the Security Log of the domain controller. As result CDA may not get all user login events from this domain controller.

b) The following patches for Windows Server 2008 R2 are required (unless SP1 is installed):

- http://support.microsoft.com/kb/981314

  This patch fixes memory leak in Microsoft's WMI, which sporadically prevents the Active Directory domain controller from writing the necessary user login events to the Security Log of the domain controller. As result CDA may not get all user login events from this domain controller.

- http://support.microsoft.com/kb/2617858

  This patch fixes unexpectedly slow startup or logon process in Windows Server 2008 R2.

c) The patches listed at the following link, for WMI related issues on Windows platform are required:

- http://support.microsoft.com/kb/2591403

These hot fixes are associated with the operation and functionality of the WMI service and its related components.

Step 2 Make sure the Active Directory logs the user login events in the Windows Security Log.
Verify that the settings of the "Audit Policy" (part of the "Group Policy Management" settings) allows successful logons to generate the necessary events in the Windows Security Log (this is the default Windows setting, but you must explicitly ensure that this setting is correct). See Setting the Windows Audit Policy.

Step 3 You must have an Active Directory user with sufficient permissions for ISE to connect to the Active Directory. The following instructions show how to define permissions either for admin domain group user or none admin domain group user:

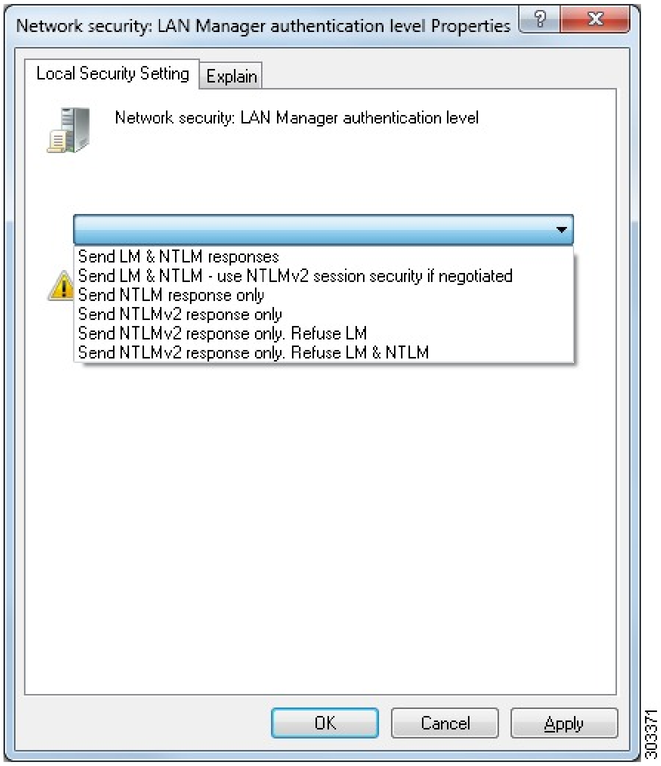
- Permissions Required when an Active Directory User is a Member of the Domain Admin Group, page 2-4
- Permissions Required when an Active Directory User is Not a Member of the Domain Admin Group, page 2-4

Step 4 The Active Directory user used by ISE can be authenticated either by NT Lan Manager (NTLM) v1 or v2. You need to verify that the Active Directory NTLM settings are aligned with ISE NTLM settings to ensure successful authenticated connection between ISE and the Active Directory Domain Controller. The following table shows all Microsoft NTLM options, and which ISE NTLM actions are supported. If ISE is set to NTLMv2, all six options described in are supported. If ISE is set to support NTLMv1, only the first five options are supported.

Table 4: Supported Authentication Types Based on ISE and AD NTLM Version Settings

ISE NTLM setting options / Active Directory (AD) NTLM setting options NTLMv1 NTLMv2	NTLMv1	NTLMv2
Send LM & NTLM responses connection is allowed connection is allowed	connection is allowed	connection is allowed
Send LM & NTLM - use NTLMv2 session security if negotiated connection is allowed connection is allowed	connection is allowed	connection is allowed
Send NTLM response only connection is allowed connection is allowed	connection is allowed	connection is allowed
Send NTLMv2 response only connection is allowed connection is allowed	connection is allowed	connection is allowed
Send NTLMv2 response only. Refuse LM connection is allowed connection is allowed	connection is allowed	connection is allowed
Send NTLMv2 response only. Refuse LM & NTLM connection is refused connection is allowed	connection is refused	connection is allowed

Figure 1: MS NTLM Authentication Type Options


Network security: LAN Manager authentication level Properties
Local Security Setting
Explain
Network security: LAN Manager authentication level
Send LM & NTLM responses
Send LM & NTLM - use NTLMv2 session security if negotiated
Send NTLM response only
Send NTLMv2 response only
Send NTLMv2 response only. Refuse LM
Send NTLMv2 response only. Refuse LM & NTLM
OK
Cancel
Apply
303371

Step 5 Make sure that you have created a firewall rule to allow traffic to `dllhost.exe` on Active Directory domain controllers. You can either turn the firewall off, or allow access on a specific IP (ISE IP address) to the following ports:

- TCP 135: General RPC Port. When doing asynchronous RPC calls, the service listening on this port tells the client which port the component servicing this request is using.
- UDP 137: Netbios Name Resolution
- UDP 138: Netbios Datagram Service
- TCP 139: Netbios Session Service
- TCP 445: SMB

Higher ports are assigned dynamically or you can configure them manually. We recommend that you add %SystemRoot%\System32\dllhost.exe as a target. This program manages ports dynamically.

All firewall rules can be assigned to specific IP (ISE IP).

Set the Windows Audit Policy

Ensure that the **Audit Policy** (part of the **Group Policy Management** settings) allows successful logons. This is required to generate the necessary events in the Windows Security Log of the AD domain controller machine. This is the default Windows setting, but you must verify that this setting is correct.

Step 1 Choose **Start** > **Programs** > **Administrative Tools** > **Group Policy Management**.

Step 2 Navigate under Domains to the relevant domain and expand the navigation tree.

Step 3 Choose **Default Domain Controller Policy**, right click and choose **Edit**.
The Group Policy Management Editor appears.

Step 4 Choose **Default Domain Controllers Policy** > **Computer Configuration** > **Policies** > **Windows Settings** > **Security Settings**.

- For Windows Server 2003 or Windows Server 2008 (non-R2), choose **Local Policies** > **Audit Policy**. For the two Policy items, **Audit Account Logon Events** and **Audit Logon Events**, ensure that the corresponding **Policy Setting** either directly or indirectly includes the **Success** condition. To include the Success condition indirectly, the **Policy Setting** must be set to **Not Defined**, indicating that the effective value will be inherited from a higher level domain, and the **Policy Setting** for that higher level domain must be configured to explicitly include the **Success** condition.
- For Windows Server 2008 R2 and Windows 2012, choose **Advanced Audit Policy Configuration** > **Audit Policies** > **Account Logon**. For the two Policy items, **Audit Kerberos Authentication Service** and **Audit Kerberos Service Ticket Operations**, ensure that the corresponding Policy Setting either directly or indirectly includes the Success condition, as described above.

Step 5 If any Audit Policy item settings have been changed, you should then run `gpupdate /force` to force the new settings to take effect.

Set Permissions When AD User in the Domain Admin Group

For Windows 2008 R2,Windows 2012, and Windows 2012 R2, the Domain Admin group does not have full control on certain registry keys in the Windows operating system by default. The Active Directory admin must give the Active Directory user Full Control permissions on the following registry keys:

- **HKEY_CLASSES_ROOT\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}**
- **HKLM\Software\Classes\Wow6432Node\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}**

No registry changes are required for the following Active Directory versions:

- Windows 2003
- Windows 2003R2
- Windows 2008

To grant full control, the Active Directory admin must first take ownership of the key, as shown below.

Step 1 Go to the Owner tab by right clicking the key.

Step 2 Click **Permissions**.

Step 3 Click **Advanced**.

Required Permissions When AD User Not in Domain Admin Group

For Windows 2012 R2, give the Active Directory user **Full Control** permissions on the following registry keys:

- `HKEY_CLASSES_ROOT\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}`
- `HKLM\Software\Classes\Wow6432Node\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}`

The following permissions also are required when an Active Directory user is not in the Domain Admin group, but is in the Domain Users group:

- Add Registry Keys to Allow ISE to Connect to the Domain Controller (see below)
- Permissions to Use DCOM on the Domain Controller
- Set Permissions for Access to WMI Root/CIMv2 Name Space
- Grant Access to the Security Event Log on the AD Domain Controller

These permissions are only required for the following Active Directory versions:

- Windows 2003
- Windows 2003R2
- Windows 2008
- Windows 2008 R2
- Windows 2012
- Windows 2012 R2

Add Registry Keys to Allow ISE to Connect to the Domain Controller

You must manually add some registry keys to the domain controller to allow ISE to connect as a Domain User, and retrieve login authentication events. An agent is not required on the domain controllers or on any machine in the domain.

The following registry script shows the keys to add. You can copy and paste this into a text file, save the file with a .reg extension, and double click the file to make the registry changes. To add registry keys, the user must be an owner of the root key.

```
Windows Registry Editor Version 5.00

[HKEY_CLASSES_ROOT\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}]
"AppID"="{76A64158-CB41-11D1-8B02-00600806D9B6}"
```

```
[HKEY_CLASSES_ROOT\AppID\{76A64158-CB41-11D1-8B02-00600806D9B6}]
"DllSurrogate"="  "

[HKEY_CLASSES_ROOT\Wow6432Node\AppID\{76A64158-CB41-11D1-8B02-00600806D9B6}]
"DllSurrogate"="  "
```

Make sure that you include two spaces in the value of the key **DllSurrogate**.

Keep the empty lines as shown in the script above, including an empty line at the end of the file.

Permissions to Use DCOM on the Domain Controller

The Active Directory user used for ISE ID Mapping must have permissions to use DCOM (remote COM) on the Domain Controller. You can configure permissions with the **dcomcnfg** command line tool.

Step 1 Run the **dcomcnfg** tool from the command line.

Step 2 Expand Component Services.

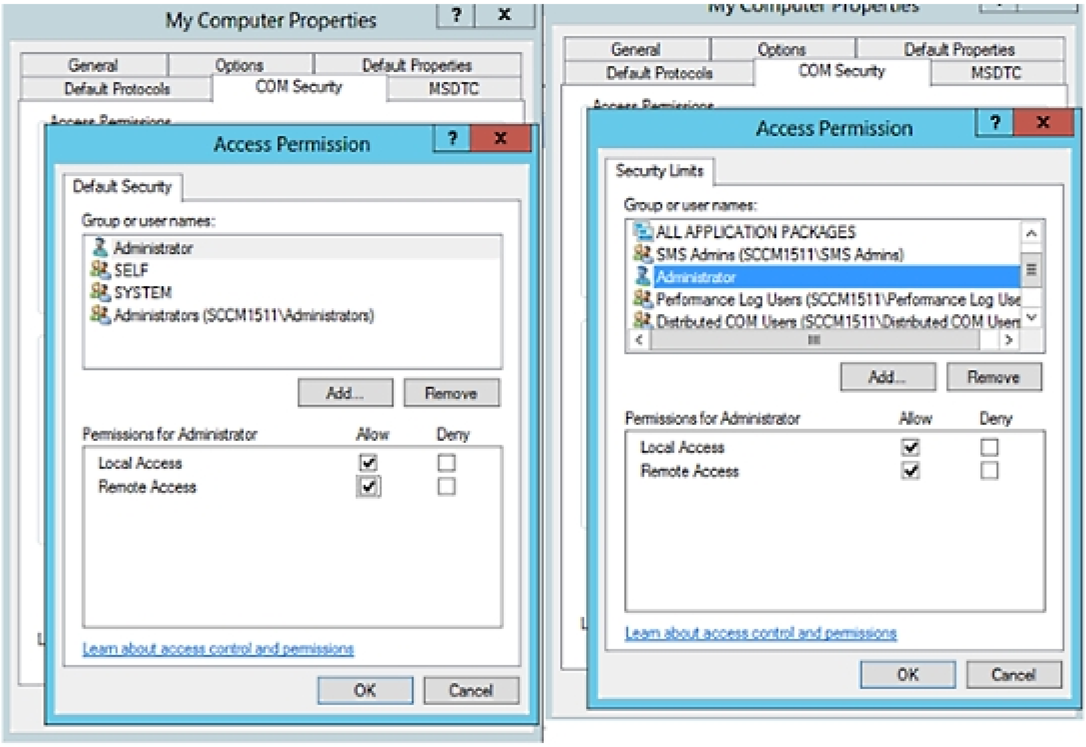
Step 3 Expand **Computers** > **My Computer**.

Step 4 Select Action from the menu bar, click **properties**, and click **COM Security**.

Step 5 Make sure that the account that ISE will use for both Access and Launch has Allow permissions. That Active Directory user should be added to all the four options (Edit Limits and Edit Default for both Access Permissions and Launch and Activation Permissions).

Step 6 Allow all Local and Remote access for both Access Permissions and Launch and Activation Permissions.

Figure 2: Local and Remote Access for Access Permissions



Access Permission — Default Security

Group or user names:
Administrator
SELF
SYSTEM
Administrators (SCCM1511\Administrators)

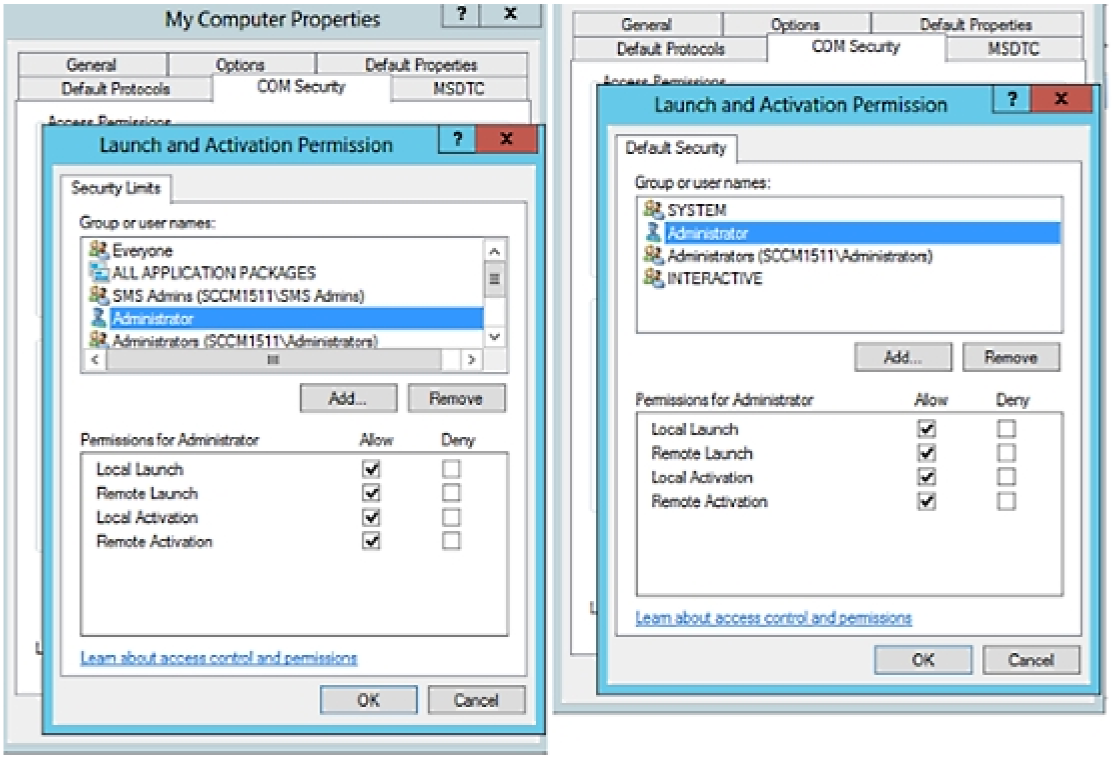
Permissions for Administrator	Allow	Deny
Local Access	☑	□
Remote Access	☑	□

Access Permission — Security Limits

Group or user names:
ALL APPLICATION PACKAGES
SMS Admins (SCCM1511\SMS Admins)
Administrator
Performance Log Users (SCCM1511\Performance Log Use
Distributed COM Users (SCCM1511\Distributed COM Users

Permissions for Administrator	Allow	Deny
Local Access	☑	□
Remote Access	☑	□

Figure 3: Local and Remote Access for Launch and Activation Permissions



Launch and Activation Permission

Security Limits

Group or user names:

- Everyone
- ALL APPLICATION PACKAGES
- SMS Admins (SCCM1511\SMS Admins)
- Administrator
- Administrators (SCCM1511\Administrators)

Permissions for Administrator	Allow	Deny
Local Launch	☑	□
Remote Launch	☑	□
Local Activation	☑	□
Remote Activation	☑	□

Launch and Activation Permission

Default Security

Group or user names:

- SYSTEM
- Administrator
- Administrators (SCCM1511\Administrators)
- INTERACTIVE

Permissions for Administrator	Allow	Deny
Local Launch	☑	□
Remote Launch	☑	□
Local Activation	☑	□
Remote Activation	☑	□

Set Permissions for Access to WMI Root/CIMv2 Name Space

By default, Active Directory users do not have permissions for the Execute Methods and Remote Enable. You can grant access using the wmimgmt.msc MMC console.

Step 1 Click Start > Run and type `wmimgmt.msc`.

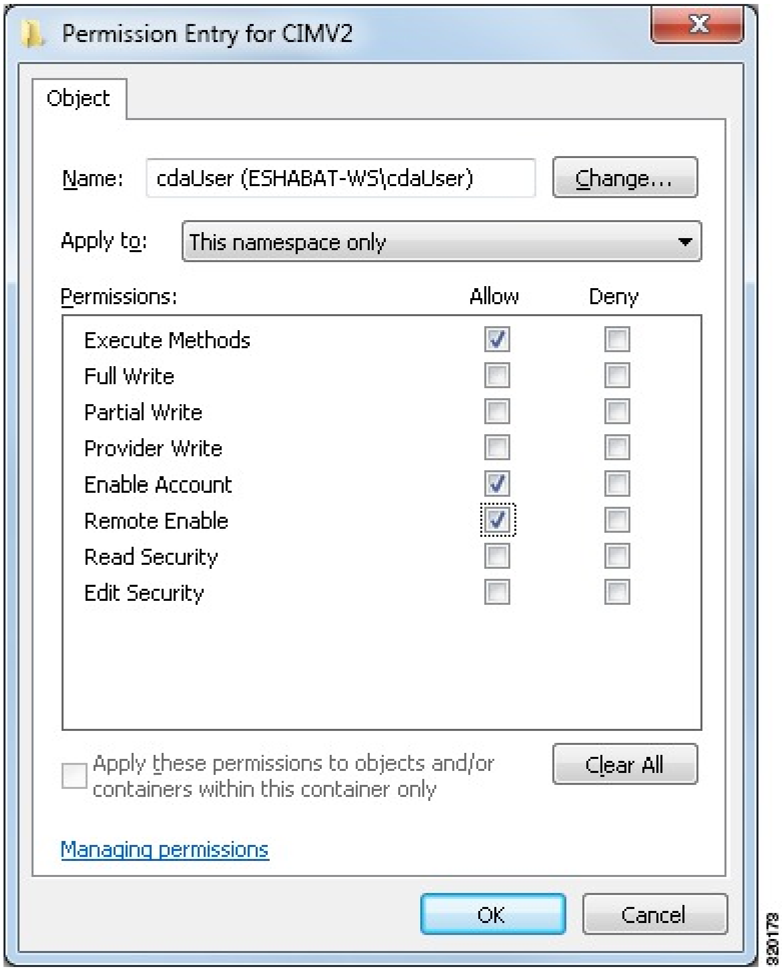
Step 2 Right-click WMI Control and click **Properties**.

Step 3 Under the Security tab, expand Root and choose **CIMV2**.

Step 4 Click **Security**.

Step 5 Add the Active Directory user, and configure the required permissions as shown below.

Figure 4: Required Permissions for WMI Root\CIMv2 Name Space



Name: cdaUser (ESHABAT-WS\cdaUser)

Apply to: This namespace only

Permissions:	Allow	Deny
Execute Methods	☑	□
Full Write	□	□
Partial Write	□	□
Provider Write	□	□
Enable Account	☑	□
Remote Enable	☑	□
Read Security	□	□
Edit Security	□	□

□ Apply these permissions to objects and/or containers within this container only

Grant Access to the Security Event Log on the AD Domain Controller

On Windows 2008 and later, you can grant access to the AD Domain controller logs by adding the ISE ID Mapping user to a group called Event Log Readers.

On all older versions of Windows, you must edit a registry key, as shown below.

Step 1 To delegate access to the Security event logs, find the SID for the account .

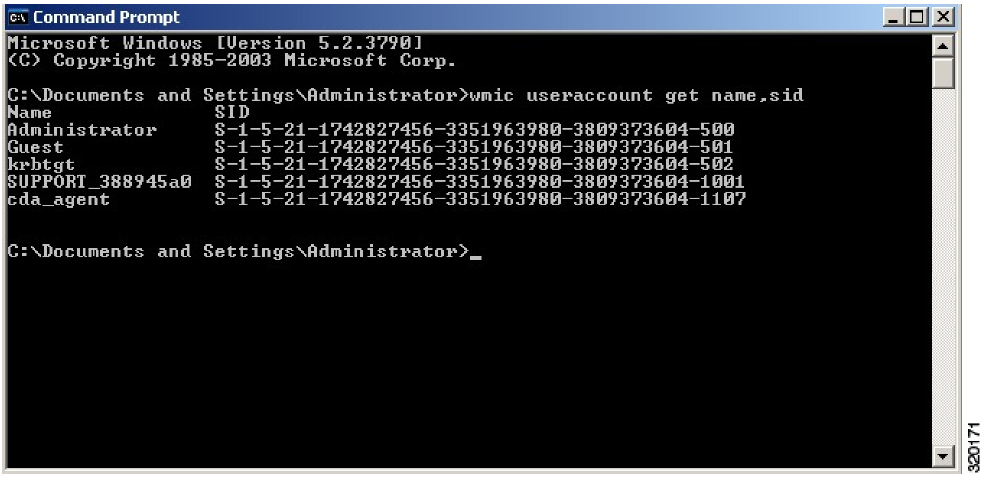
Step 2 Use the following command from the command line, also shown in the diagram below, to list all the SID accounts.

```
wmic useraccount get name,sid
```

You can also use the following command for a specific username and domain:

```
wmic useraccount where name=“cdaUser” get domain,name,sid
```

Figure 5: List All the SID Accounts



```
Microsoft Windows [Version 5.2.3790]
(C) Copyright 1985-2003 Microsoft Corp.

C:\Documents and Settings\Administrator>wmic useraccount get name,sid
Name                SID
Administrator       S-1-5-21-1742827456-3351963980-3809373604-500
Guest               S-1-5-21-1742827456-3351963980-3809373604-501
krbtgt              S-1-5-21-1742827456-3351963980-3809373604-502
SUPPORT_388945a0    S-1-5-21-1742827456-3351963980-3809373604-1001
cda_agent           S-1-5-21-1742827456-3351963980-3809373604-1107


C:\Documents and Settings\Administrator>_
```

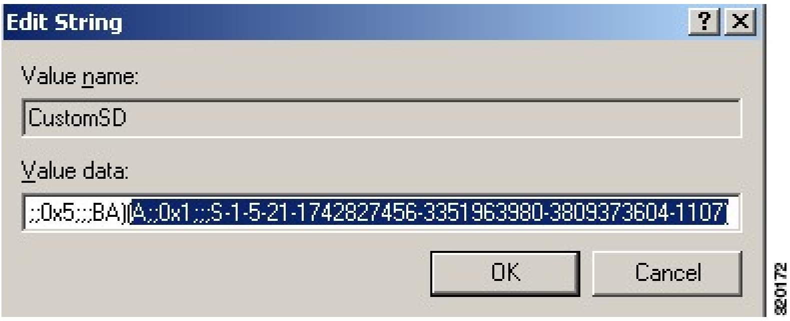
Step 3 Find the SID, open the Registry Editor, and browse to the following location:

```
HKEY_LOCAL_MACHINE/SYSTEM/CurrentControlSet/Services/Eventlog
```

Step 4 Click on **Security**, and double click **CustomSD**. See Figure 2-7

For example, to allow read access to the cda_agent account `(SID - S-1-5-21-1742827456-3351963980-3809373604-1107)`, enter `(A;;0x1;;;S-1-5-21-1742827456-3351963980-3809373604-1107)`.

Figure 6: Edit CustomSD String



Edit String

Value name: CustomSD

Value data: ;;0x5;;;BA)(A;;0x1;;;S-1-5-21-1742827456-3351963980-3809373604-1107)

Step 5 Restart the WMI service on the Domain Controller. You can restart the WMI services in the following two ways:

a) Run the following commands from the CLI:
net stop winmgmt

net start winmgmt

b) Run `Services.msc`, which opens the Windows Services Management tool. In the Windows Services Management window, locate the **Windows Management Instrumentation** service, right click, and select **Restart**.

LDAP

Lightweight Directory Access Protocol (LDAP) is a networking protocol defined by RFC 2251 for querying and modifying directory services that run on TCP/IP. LDAP is a lightweight mechanism for accessing an X.500-based directory server.

Cisco ISE integrates with an LDAP external database, which is also called an identity source, by using the LDAP protocol.

LDAP Directory Service

LDAP directory service is based on a client-server model. A client starts an LDAP session by connecting to an LDAP server and sending operation requests to the server. The server then sends its responses. One or more LDAP servers contain data from the LDAP directory tree or the LDAP backend database.

The directory service manages a directory, which is a database that holds information. Directory services use a distributed model for storing information, and that information is usually replicated between directory servers.

An LDAP directory is organized in a simple tree hierarchy and can be distributed among many servers. Each server can have a replicated version of the total directory, which is synchronized periodically.

An entry in the tree contains a set of attributes, where each attribute has a name (an attribute type or attribute description) and one or more values. The attributes are defined in a schema.

Each entry has a unique identifier: its distinguished name (DN). This name contains the relative distinguished name (RDN), which is constructed from attributes in the entry, followed by the DN of the parent entry. You can think of the DN as a full filename, and the RDN as a relative filename in a folder.

Multiple LDAP Instances

By creating more than one LDAP instance with different IP addresses or port settings, you can configure Cisco ISE to authenticate using different LDAP servers or different databases on the same LDAP server. Each primary server IP address and port configuration, along with the secondary server IP address and port configuration, forms an LDAP instance that corresponds to one Cisco ISE LDAP identity source instance.

Cisco ISE does not require that each LDAP instance correspond to a unique LDAP database. You can have more than one LDAP instance set to access the same database. This method is useful when your LDAP database contains more than one subtree for users or groups. Because each LDAP instance supports only one subtree directory for users and one subtree directory for groups, you must configure separate LDAP instances for each user directory and group directory subtree combination for which Cisco ISE submits authentication requests.

LDAP Failover

Cisco ISE supports failover between a primary LDAP server and a secondary LDAP server. A failover occurs when an authentication request fails because Cisco ISE could not connect to an LDAP server because it is down or is otherwise unreachable.

If you establish failover settings and the first LDAP server that Cisco ISE attempts to contact cannot be reached, Cisco ISE always attempts to contact a second LDAP server. If you want Cisco ISE to use the first LDAP server again, you must enter a value in the Failback Retry Delay text box.

Note Cisco ISE always uses the primary LDAP server to obtain groups and attributes for use in authorization policies from the Admin portal, so the primary LDAP server must be accessible when you configure these items. Cisco ISE uses the secondary LDAP server only for authentications and authorizations at run time, according to the failover configuration.

LDAP Connection Management

Cisco ISE supports multiple concurrent LDAP connections. Connections are opened on demand at the time of the first LDAP authentication. The maximum number of connections is configured for each LDAP server. Opening connections in advance shortens the authentication time. You can set the maximum number of connections to use for concurrent binding connections. The number of open connections can be different for each LDAP server (primary or secondary) and is determined based on the maximum number of administration connections configured for each server.

Cisco ISE retains a list of open LDAP connections (including the binding information) for each LDAP server that is configured in Cisco ISE. During the authentication process, the connection manager attempts to find an open connection from the pool. If an open connection does not exist, a new one is opened.

If the LDAP server closed the connection, the connection manager reports an error during the first call to search the directory, and tries to renew the connection. After the authentication process is complete, the connection manager releases the connection.

LDAP User Authentication

LDAP can be used as an external database for Cisco ISE user authentication. Cisco ISE supports plain password authentication. User authentication includes:

- Searching the LDAP server for an entry that matches the username in the request
- Checking the user password with the one that is found in the LDAP server
- Retrieving a group's membership information for use in policies
- Retrieving values for specified attributes for use in policies and authorization profiles

To authenticate a user, Cisco ISE sends a bind request to the LDAP server. The bind request contains the DN and password of the user in clear text. A user is authenticated when the DN and password of the user match the username and password in the LDAP directory.

We recommend that you protect the connection to the LDAP server using Secure Sockets Layer (SSL).

LDAP Group and Attribute Retrieval for Use in Authorization Policies

Cisco ISE can authenticate a subject (user or host) against an LDAP identity source by performing a bind operation on the directory server to find and authenticate the subject. After successful authentication, Cisco ISE can retrieve groups and attributes that belong to the subject whenever they are required. You can configure the attributes to be retrieved in the Cisco ISE Admin portal by choosing **Administration** > **Identity Management** > **External Identity Sources** > **LDAP**. These groups and attributes can be used by Cisco ISE to authorize the subject.

To authenticate a user or query the LDAP identity source, Cisco ISE connects to the LDAP server and maintains a connection pool.

You should note the following restrictions on group memberships when Active Directory is configured as an LDAP store:

- Users or computers must be direct members of the group defined in the policy conditions to match the policy rule.
- The defined group may not be a user's or computer's primary group. This restriction is applicable only when Active Directory is configured as an LDAP store.

LDAP Group Membership Information Retrieval

For user authentication, user lookup, and MAC address lookup, Cisco ISE must retrieve group membership information from LDAP databases. LDAP servers represent the association between a subject (a user or a host) and a group in one of the following ways:

- Groups Refer to Subjects—The group objects contain an attribute that specifies the subject. Identifiers for subjects can be sourced in the group as the following:

  - ◦ Distinguished names
  - ◦ Plain usernames

- Subjects Refer to Groups—The subject objects contain an attribute that specifies the group to which they belong.

LDAP identity sources contain the following parameters for group membership information retrieval:

- Reference direction—This parameter specifies the method to use when determining group membership (either groups to subjects or subjects to groups).
- Group map attribute—This parameter indicates the attribute that contains group membership information.
- Group object class—This parameter determines that certain objects are recognized as groups.
- Group search subtree—This parameter indicates the search base for group searches.
- Member type option—This parameter specifies how members are stored in the group member attribute (either as DNs or plain usernames).

LDAP Attributes Retrieval

For user authentication, user lookup, and MAC address lookup, Cisco ISE must retrieve the subject attributes from LDAP databases. For each instance of an LDAP identity source, an identity source dictionary is created. These dictionaries support attributes of the following data types:

- String
- Unsigned integer 32
- IPv4 address

For unsigned integers and IPv4 attributes, Cisco ISE converts the strings that it has retrieved to the corresponding data types. If conversion fails or if no values are retrieved for the attributes, Cisco ISE logs a debug message, but the authentication or lookup process does not fail.

You can optionally configure default values for the attributes that Cisco ISE can use when the conversion fails or when Cisco ISE does not retrieve any values for the attributes.

LDAP Certificate Retrieval

If you have configured certificate retrieval as part of user lookup, then Cisco ISE must retrieve the value of the certificate attribute from LDAP. To retrieve the value of the certificate attribute from LDAP, you must have previously configured the certificate attribute in the list of attributes to be accessed while configuring an LDAP identity source.

Errors Returned by the LDAP Server

The following errors can occur during the authentication process:

- Authentication Errors—Cisco ISE logs authentication errors in the Cisco ISE log files.

  Possible reasons for an LDAP server to return binding (authentication) errors include the following:

  - ◦ Parameter errors—Invalid parameters were entered
  - ◦ User account is restricted (disabled, locked out, expired, password expired, and so on)
  - ◦ Initialization Errors—Use the LDAP server timeout settings to configure the number of seconds that Cisco ISE should wait for a response from an LDAP server before determining that the connection or authentication on that server has failed.

    Possible reasons for an LDAP server to return an initialization error are:

    - ◦ LDAP is not supported.
    - ◦ The server is down.
    - ◦ The server is out of memory.
    - ◦ The user has no privileges.
    - ◦ Administrator credentials are configured incorrectly.

The following errors are logged as external resource errors, indicating a possible problem with the LDAP server:

- A connection error occurred
- The timeout expired
- The server is down
- The server is out of memory

The following error is logged as an Unknown User error:

- A user does not exist in the database

The following error is logged as an Invalid Password error, where the user exists, but the password sent is invalid:

- An invalid password was entered

LDAP User Lookup

Cisco ISE supports the user lookup feature with an LDAP server. This feature allows you to search for a user in the LDAP database and retrieve information without authentication. The user lookup process includes the following actions:

- Searching the LDAP server for an entry that matches the username in the request
- Retrieving a user's group membership information for use in policies
- Retrieving values for specified attributes for use in policies and authorization profiles

LDAP MAC Address Lookup

Cisco ISE supports the MAC address lookup feature. This feature allows you to search for a MAC address in the LDAP database and retrieve information without authentication. The MAC address lookup process includes the following actions:

- Searching the LDAP server for an entry that matches the MAC address of the device
- Retrieving a MAC Address group information for the device for use in policies
- Retrieving values for specified attributes for use in policies

Add LDAP Identity Sources

Before You Begin

- To perform the following task, you must be a Super Admin or System Admin.
- Cisco ISE always uses the primary LDAP server to obtain groups and attributes for use in authorization policies. Therefore, your primary LDAP server must be reachable when you configure these items.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **LDAP** > **Add**.

Step 2 Enter the values.

Step 3 Click **Submit** to create an LDAP instance.

Configure Primary and Secondary LDAP Servers

After you create an LDAP instance, you must configure the connection settings for the primary LDAP server. Configuring a secondary LDAP server is optional.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **LDAP**.

Step 2 Check the check box next to the LDAP instance that you want to edit and click **Edit**.

Step 3 Click the **Connection** tab to configure the primary and secondary servers.

Step 4 Enter the values as described in LDAP Identity Source Settings.

Step 5 Click **Submit** to save the connection parameters.

Enable Cisco ISE to Obtain Attributes from the LDAP Server

For Cisco ISE to obtain user and group data from an LDAP server, you must configure LDAP directory details in Cisco ISE. For LDAP identity source, the following three searches are applicable:

- Search for all groups in group subtree for administration
- Search for user in subject subtree to locate user
- Search for groups in which the user is a member

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **LDAP**.

Step 2 Check the check box next to the LDAP instance that you want to edit and click **Edit**.

Step 3 Click the **Directory Organization** tab.

Step 4 Enter the values as described in LDAP Identity Source Settings.

Step 5 Click **Submit** to save the configuration.

Retrieve Group Membership Details from the LDAP Server

You can add new groups or select groups from the LDAP directory.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **LDAP**.

Step 2 Check the check box next to the LDAP instance that you want to edit and click **Edit**.

Step 3 Click the **Groups** tab.

Step 4 Choose **Add** > **Add Group** to add a new group or choose **Add** > **Select Groups From Directory** to select the groups from the LDAP directory.

a) If you choose to add a group, enter a name for the new group.

b) If you are selecting from the directory, enter the filter criteria, and click **Retrieve Groups**. Your search criteria can contain the asterisk (*) wildcard character.

Step 5 Check the check boxes next to the groups that you want to select and click **OK**.
The groups that you have selected will appear in the Groups page.

Step 6 Click **Submit** to save the group selection.

Note Active Directory built-in groups are not supported when Active Directory is configured as LDAP Identity Store in Cisco ISE.

Retrieve User Attributes From the LDAP Server

You can obtain user attributes from the LDAP server for use in authorization policies.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **LDAP**.

Step 2 Check the check box next to the LDAP instance that you want to edit and click **Edit**.

Step 3 Click the **Attributes** tab.

Step 4 Choose **Add** > **Add Attribute** to add a new attribute or choose **Add** > **Select Attributes From Directory** to select attributes from the LDAP server.

a) If you choose to add an attribute, enter a name for the new attribute.
b) If you are selecting from the directory, enter an example user and click **Retrieve Attributes** to retrieve the user's attributes. You can use the asterisk (*) wildcard character.

Step 5 Check the check boxes next to the attributes that you want to select, then click **OK**.

Step 6 Click **Submit** to save the attribute selections.

Enable Secure Authentication with LDAP Identity Source

When you choose the Secure Authentication option in the LDAP configuration page, Cisco ISE uses SSL to secure communication with the LDAP identity source. Secure connection to LDAP identity source is established using:

- SSL tunnel—Using SSL v3 or TLS v1 (the strongest version supported by the LDAP server)
- Server authentication (authentication of LDAP server)—Certificate based
- Client authentication (authentication of Cisco ISE)—None (Administrator bind is used inside the SSL tunnel)
- Cipher suites—All cipher suites supported by Cisco ISE

We recommend that you use TLS v1 with the strongest encryption and ciphers that Cisco ISE supports.

To enable Cisco ISE to communicate securely with the LDAP identity source:

Before You Begin

- Cisco ISE must be connected to an LDAP server
- TCP port 636 should be open

Step 1 Import the full Certificate Authority (CA) chain of the CA that issued the server certificate to the LDAP server in to Cisco ISE (**Administration** > **System** > **Certificates** > **Trusted Certificates**).
The full CA chain refers to the root CA and intermediate CA certificates; not the LDAP server certificate.

Step 2 Configure Cisco ISE to use secure authentication when communicating with the LDAP identity source (**Administration** > **Identity Management** > **External Identity Sources** > **LDAP**; be sure to check the Secure Authentication check box in the Connection Settings tab).

Step 3 Select the root CA certificate in the LDAP identity store.

RADIUS Token Identity Sources

A server that supports the RADIUS protocol and provides authentication, authorization, and accounting (AAA) services to users and devices is called a RADIUS server. A RADIUS identity source is simply an external identity source that contains a collection of subjects and their credentials and uses the RADIUS protocol for communication. For example, the Safeword token server is an identity source that can contain several users and their credentials as one-time passwords that provides an interface that you can query using the RADIUS protocol.

Cisco ISE supports any RADIUS RFC 2865-compliant server as an external identity source. Cisco ISE supports multiple RADIUS token server identities, for example the RSA SecurID server and the SafeWord server. RADIUS identity sources can work with any RADIUS token server that is used to authenticate a user. RADIUS identity sources use the User Datagram Protocol (UDP) port for authentication sessions. The same UDP port is used for all RADIUS communication.

RADIUS Token Server Supported Authentication Protocols

Cisco ISE supports the following authentication protocols for RADIUS identity sources:

- RADIUS PAP
- Protected Extensible Authentication Protocol (PEAP) with inner Extensible Authentication Protocol-Generic Token Card (EAP-GTC)
- EAP-FAST with inner EAP-GTC

Ports Used By the RADIUS Token Servers for Communication

RADIUS token servers use the UDP port for authentication sessions. This port is used for all RADIUS communication. For Cisco ISE to send RADIUS one-time password (OTP) messages to a RADIUS-enabled token server, you must ensure that the gateway devices between Cisco ISE and the RADIUS-enabled token server allow communication over the UDP port. You can configure the UDP port through the Admin portal.

RADIUS Shared Secret

You must provide a shared secret while configuring RADIUS identity sources in Cisco ISE. This shared secret should be the same as the shared secret that is configured on the RADIUS token server.

Failover in RADIUS Token Servers

Cisco ISE allows you to configure multiple RADIUS identity sources. Each RADIUS identity source can have primary and secondary RADIUS servers. When Cisco ISE is unable to connect to the primary server, it uses the secondary server.

Configurable Password Prompt in RADIUS Token Servers

RADIUS identity sources allow you to configure the password prompt. You can configure the password prompt through the Admin portal.

RADIUS Token Server User Authentication

Cisco ISE obtains the user credentials (username and passcode) and passes them to the RADIUS token server. Cisco ISE also relays the results of the RADIUS token server authentication processing to the user.

User Attribute Cache in RADIUS Token Servers

RADIUS token servers, by default, do not support user lookups. However, the user lookup functionality is essential for the following Cisco ISE features:

- PEAP session resume—This feature allows the PEAP session to resume after successful authentication during EAP session establishment.
- EAP/FAST fast reconnect—This feature allows fast reconnection after successful authentication during EAP session establishment.

Cisco ISE caches the results of successful authentications to process user lookup requests for these features. For every successful authentication, the name of the authenticated user and the retrieved attributes are cached. Failed authentications are not written to the cache.

The cache is available in the memory at runtime and is not replicated between Cisco ISE nodes in a distributed deployment. You can configure the Time to Live (TTL) limit for the cache through the Admin portal. You must enable the identity caching option and set the aging time in minutes. The cache is available in the memory for the specified amount of time.

RADIUS Identity Source in Identity Sequence

You can add the RADIUS identity source for authentication sequence in an identity source sequence. However, you cannot add the RADIUS identity source for attribute retrieval sequence because you cannot query the RADIUS identity source without authentication. Cisco ISE cannot distinguish among different errors while authenticating with a RADIUS server. RADIUS servers return an Access-Reject message for all errors. For example, when a user is not found in the RADIUS server, instead of returning a User Unknown status, the RADIUS server returns an Access-Reject message.

RADIUS Server Returns the Same Message for All Errors

When a user is not found in the RADIUS server, the RADIUS server returns an Access-Reject message. Cisco ISE provides an option to configure this message through the Admin portal as either an Authentication Failed or a User Not Found message. However, this option returns a User Not Found message not only for cases where the user is not known, but for all failure cases.

The following table lists the different failure cases that are possible with RADIUS identity servers.

Table 5: Error Handling

Failure Cases	Reasons for Failure
Authentication Failed	• User is unknown. • User attempts to log in with an incorrect passcode. • User login hours expired.
Process Failed	• RADIUS server is configured incorrectly in Cisco ISE. • RADIUS server is unavailable. • RADIUS packet is detected as malformed. • Problem during sending or receiving a packet from the RADIUS server. • Timeout.
Unknown User	Authentication failed and the Fail on Reject option is set to false.

Safeword Server Supports Special Username Format

The Safeword token server supports authentication with the following username format:

Username—Username, OTP

As soon as Cisco ISE receives the authentication request, it parses the username and converts it to the following username:

Username—Username

The SafeWord token servers support both of these formats. Cisco ISE works with various token servers. While configuring a SafeWord server, you must check the SafeWord Server check box in the Admin portal for Cisco ISE to parse the username and convert it to the specified format. This conversion is done in the RADIUS token server identity source before the request is sent to the RADIUS token server.

Authentication Request and Response in RADIUS Token Servers

When Cisco ISE forwards an authentication request to a RADIUS-enabled token server, the RADIUS authentication request contains the following attributes:

- User-Name (RADIUS attribute 1)
- User-Password (RADIUS attribute 2)
- NAS-IP-Address (RADIUS attribute 4)

Cisco ISE expects to receive any one of the following responses:

- Access-Accept—No attributes are required, however, the response can contain a variety of attributes based on the RADIUS token server configuration.
- Access-Reject—No attributes are required.
- Access-Challenge—The attributes that are required per RADIUS RFC are the following:
    - State (RADIUS attribute 24)
    - Reply-Message (RADIUS attribute 18)
    - One or more of the following attributes: Vendor-Specific, Idle-Timeout (RADIUS attribute 28), Session-Timeout (RADIUS attribute 27), Proxy-State (RADIUS attribute 33)

      No other attributes are allowed in Access-Challenge.

Add a RADIUS Token Server

Before You Begin

To perform the following task, you must be a Super Admin or System Admin.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RADIUS Token** > **Add**.

Step 2 Enter the values in the **General** and **Connection** tabs.

Step 3 Click the **Authentication** tab.
This tab allows you to control the responses to an Access-Reject message from the RADIUS token server. This response could either mean that the credentials are invalid or that the user is not known. Cisco ISE accepts one of the following responses: Failed authentication or User not found. This tab also allows you to enable identity caching and to set the aging time for the cache. You can also configure a prompt to request the password.

a) Click the **Treat Rejects as ‘authentication failed’** radio button if you want the Access-Reject response from the RADIUS token server to be treated as a failed authentication.
b) Click the **Treat Rejects as ‘user not found’** radio button if you want the Access-Reject response from the RADIUS token server to be treated as an unknown user failure.

Step 4 Click the **Authorization** tab.

This tab allows you to configure a name that will appear for this single attribute that is returned by the RADIUS token server while sending an Access-Accept response to Cisco ISE. This attribute can be used in authorization policy conditions. Enter a name for this attribute in the Attribute Name ACS field. The default value is CiscoSecure-Group-Id.

Step 5 Click **Submit** to save the RADIUS Token identity source.

Delete a RADIUS Token Server

Before You Begin

- To perform the following task, you must be a Super Admin or System Admin.
- Ensure that you do not select the RADIUS token servers that are part of an identity source sequence. If you select a RADIUS token server that is part of an identity source sequence for deletion, the delete operation fails.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RADIUS Token**.

Step 2 Check the check box next to the RADIUS token server or servers that you want to delete, then click **Delete**.

Step 3 Click **OK** to delete the RADIUS token server or servers that you have selected.
If you select multiple RADIUS token servers for deleting, and one of them is used in an identity source sequence, the delete operation fails and none of the RADIUS token servers are deleted.

RSA Identity Sources

Cisco ISE supports the RSA SecurID server as an external database. RSA SecurID two-factor authentication consists of the PIN of the user and an individually registered RSA SecurID token that generates single-use token codes based on a time code algorithm. A different token code is generated at fixed intervals (usually each at 30 or 60 seconds). The RSA SecurID server validates this dynamic authentication code. Each RSA SecurID token is unique, and it is not possible to predict the value of a future token based on past tokens. Thus, when a correct token code is supplied together with a PIN, there is a high degree of certainty that the person is a valid user. Therefore, RSA SecurID servers provide a more reliable authentication mechanism than conventional reusable passwords.

Cisco ISE supports the following RSA identity sources:

- RSA ACE/Server 6.x series
- RSA Authentication Manager 7.x and 8.0 series

You can integrate with RSA SecurID authentication technology in any one of the following ways:

- Using the RSA SecurID agent—Users are authenticated with their username and passcode through the RSA native protocol.

- Using the RADIUS protocol—Users are authenticated with their username and passcode through the RADIUS protocol.

The RSA SecurID token server in Cisco ISE connects with the RSA SecurID authentication technology by using the RSA SecurID Agent.

Cisco ISE supports only one RSA realm.

Cisco ISE and RSA SecurID Server Integration

These are the two administrative roles involved in connecting Cisco ISE with an RSA SecurID server:

- RSA Server Administrator—Configures and maintains RSA systems and integration
- Cisco ISE Administrator—Configures Cisco ISE to connect to the RSA SecurID server and maintains the configuration

This section describes the processes that are involved in connecting Cisco ISE with the RSA SecurID server as an external identity source. For more information on RSA servers, please refer to the RSA documentation.

RSA Configuration in Cisco ISE

The RSA administrative system generates an sdconf.rec file, which the RSA system administrator will provide to you. This file allows you to add Cisco ISE servers as RSA SecurID agents in the realm. You have to browse and add this file to Cisco ISE. By the process of replication, the primary Cisco ISE server distributes this file to all the secondary servers.

RSA Agent Authentication Against the RSA SecurID Server

After the sdconf.rec file is installed on all Cisco ISE servers, the RSA agent module initializes, and authentication with RSA-generated credentials proceeds on each of the Cisco ISE servers. After the agent on each of the Cisco ISE servers in a deployment has successfully authenticated, the RSA server and the agent module together download the securid file. This file resides in the Cisco ISE file system and is in a well-known place defined by the RSA agent.

RSA Identity Sources in a Distributed Cisco ISE Environment

Managing RSA identity sources in a distributed Cisco ISE environment involves the following:

- Distributing the sdconf.rec and sdopts.rec files from the primary server to the secondary servers.
- Deleting the securid and sdstatus.12 files.

RSA Server Updates in a Cisco ISE Deployment

After you have added the sdconf.rec file in Cisco ISE, the RSA SecurID administrator might update the sdconf.rec file in case of decommissioning an RSA server or adding a new RSA secondary server. The RSA SecurID administrator will provide you with an updated file. You can then reconfigure Cisco ISE with the updated file. The replication process in Cisco ISE distributes the updated file to the secondary Cisco ISE servers in the deployment. Cisco ISE first updates the file in the file system and coordinates with the RSA agent module to phase the restart process appropriately. When the sdconf.rec file is updated, the sdstatus.12 and securid files are reset (deleted).

Override Automatic RSA Routing

You can have more than one RSA server in a realm. The sdopts.rec file performs the role of a load balancer. Cisco ISE servers and RSA SecurID servers operate through the agent module. The agent module that resides on Cisco ISE maintains a cost-based routing table to make the best use of the RSA servers in the realm. You can, however, choose to override this routing with a manual configuration for each Cisco ISE server for the realm using a text file called sdopts.rec through the Admin portal. Refer to the RSA documentation for information on how to create this file.

RSA Node Secret Reset

The securid file is a secret node key file. When RSA is initially set up, it uses a secret to validate the agents. When the RSA agent that resides in Cisco ISE successfully authenticates against the RSA server for the first time, it creates a file on the client machine called securid and uses it to ensure that the data exchanged between the machines is valid. At times, you may have to delete the securid file from a specific Cisco ISE server or a group of servers in your deployment (for example, after a key reset on the RSA server). You can use the Cisco ISE Admin portal to delete this file from a Cisco ISE server for the realm. When the RSA agent in Cisco ISE authenticates successfully the next time, it creates a new securid file.

Note If authentications fail after upgrading to a latest release of Cisco ISE, reset the RSA secret.

RSA Automatic Availability Reset

The sdstatus.12 file provides information about the availability of RSA servers in the realm. For example, it provides information on which servers are active and which are down. The agent module works with the RSA servers in the realm to maintain this availability status. This information is serially listed in the sdstatus.12 file, which is sourced in a well-known location in the Cisco ISE file system. Sometimes this file becomes old and the current status is not reflected in this file. You must remove this file so that the current status can be recreated. You can use the Admin portal to delete the file from a specific Cisco ISE server for a specific realm. Cisco ISE coordinates with the RSA agent and ensures correct restart phasing.

The availability file sdstatus.12 is deleted whenever the securid file is reset, or the sdconf.rec or sdopts.rec files are updated.

Add RSA Identity Sources

To create an RSA identity source, you must import the RSA configuration file (sdconf.rec). You must obtain the sdconf.rec file from your RSA administrator. To perform this task, you must be a Super Admin or System Admin.

Adding an RSA identity source involves the following tasks:

Import the RSA Configuration File

You must import the RSA configuration file to add an RSA identity source in Cisco ISE.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RSA SecurID** > **Add**.

Step 2 Click **Browse** to choose the new or updated sdconf.rec file from the system that is running your client browser.
When you create the RSA identity source for the first time, the Import new sdconf.rec file field will be a mandatory field. From then on, you can replace the existing sdconf.rec file with an updated one, but replacing the existing file is optional.

Step 3 Enter the server timeout value in seconds. Cisco ISE will wait for a response from the RSA server for the amount of time specified before it times out. This value can be any integer from 1 to 199. The default value is 30 seconds.

Step 4 Check the **Reauthenticate on Change PIN** check box to force a reauthentication when the PIN is changed.

Step 5 Click **Save**.
Cisco ISE also supports the following scenarios:

- Configuring the Options File for a Cisco ISE Server and Resetting SecurID and sdstatus.12 Files.
- Configuring Authentication Control Options for RSA Identity Source.

Configure the Options File for a Cisco ISE Server and Resetting SecurID and sdstatus.12 Files

Step 1 Log into the Cisco ISE server.

Step 2 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RSA SecurID** > **Add**.

Step 3 Click the **RSA Instance Files** tab.
This page lists the sdopts.rec files for all the Cisco ISE servers in your deployment.

Step 4 Click the radio button next to the sdopts.rec file for a particular Cisco ISE server, and click **Update Options File**.
The existing file is displayed in the Current File region.

Step 5 Choose one of the following:

- Use the Automatic Load Balancing status maintained by the RSA agent—Choose this option if you want the RSA agent to automatically manage load balancing.
- Override the Automatic Load Balancing status with the sdopts.rec file selected below—Choose this option if you want to manually configure load balancing based on your specific needs. If you choose this option, you must click **Browse** and choose the new sdopts.rec file from the system that is running your client browser.

Step 6 Click **OK**.

Step 7 Click the row that corresponds to the Cisco ISE server to reset the securid and sdstatus.12 files for that server:

a) Click the drop-down arrow and choose **Remove on Submit** in the Reset securid File and Reset sdstatus.12 File columns.

Note The Reset sdstatus.12 File field is hidden from your view. Using the vertical and horizontal scroll bars in the innermost frame, scroll down and then to your right to view this field.

b) Click **Save** in this row to save the changes.

Step 8 Click **Save**.

Configure Authentication Control Options for RSA Identity Source

You can specify how Cisco ISE defines authentication failures and enable identity caching. The RSA identity source does not differentiate between "Authentication failed" and "User not found" errors and sends an Access-Reject response.

You can define how Cisco ISE should handle such failures while processing requests and reporting failures. Identity caching enables Cisco ISE to process requests that fail to authenticate against the Cisco ISE server a second time. The results and the attributes retrieved from the previous authentication are available in the cache.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RSA SecurID** > **Add**.

Step 2 Click the **Authentication Control** tab.

Step 3 Choose one of the following:

- Treat Rejects as "authentication failed"—Choose this option if you want the rejected requests to be treated as failed authentications.
- Treat Rejects as "user not found"—Choose this option if you want the rejected requests to be treated as user not found errors.

Step 4 Click **Save** to save the configuration.

Configure RSA Prompts

Cisco ISE allows you to configure RSA prompts that are presented to the user while processing requests sent to the RSA SecurID server.

Before You Begin

To perform the following task, you must be a Super Admin or System Admin.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RSA SecurID**.

Step 2 Click **Prompts**.

Step 3 Enter the values as described in RSA SecurID Identity Source Settings.

Step 4 Click **Submit**.

Configure RSA Messages

Cisco ISE allows you to configure messages that are presented to the user while processing requests sent to the RSA SecurID server.

Before You Begin

To perform the following task, you must be a Super Admin or System Admin.

Step 1 Choose **Administration** > **Identity Management** > **External Identity Sources** > **RSA SecurID**.

Step 2 Click **Prompts**.

Step 3 Click the **Messages** tab.

Step 4 Enter the values as described in RSA SecurID Identity Source Settings.

Step 5 Click **Submit**.

SAMLv2 Identity Provider as an External Identity Source

Security Assertion Markup Language (SAML) is an XML-based open standard data format that enables administrators to access a defined set of applications seamlessly after signing into one of those applications. SAML describes the exchange of security related information between trusted business partners. SAML enables exchange of security authentication information between an Identity Provider (IdP) and a service provider (in this case, ISE).

SAML Single Sign On (SSO) establishes a Circle of Trust (CoT) by exchanging metadata and certificates as part of the provisioning process between the IdP and the Service Provider. The Service Provider trusts the IdP's user information to provide access to the various services or applications.

Enabling SAML SSO results in several advantages:

- It reduces password fatigue by removing the need for entering different user name and password combinations.
- It improves productivity because you spend less time re-entering credentials for the same identity.
- It transfers the authentication from your system that hosts the applications to a third party system.
- It protects and secures authentication information. It provides encryption functions to protect authentication information passed between the IdP, service provider, and user. SAML SSO can also hide authentication messages passed between the IdP and the service provider from any external user.
- It reduces costs as fewer help desk calls are made for password reset, thereby leading to more savings.

The IdP is an authentication module that creates, maintains, and manages identity information for users, systems, or services. The IdP stores and validates the user credentials and generates a SAML response that allows the user to access the service provider protected resources.

Note You must be familiar with your IdP service, and ensure that it is currently installed and operational.

SAML SSO is supported for the following portals:

- Guest portal (sponsored and self-registered)
- Sponsor portal
- My Devices portal

You cannot select IdP as external identity source for BYOD portal, but you can select an IdP for a guest portal and enable BYOD flow.

Note SAML SSO feature is supported only for Oracle Access Manager (OAM) and Oracle Identity Federation (OIF).

The IdP cannot be added to an identity source sequence (see Identity Source Sequences, on page 62).

The SSO session will be terminated and Session Timeout error message will be displayed if there is no activity for the specified time (default is 5 minutes).

If you want to add the Sign On Again button in the Error page of the portal, add the following JavaScript in the Optional Content field in the Portal Error page:

```
<button class="cisco-ise" data-inline="true" data-mini="true" data-theme="b"
id="ui_aup_accept_button" onclick="location.href='PortalSetup.action?portal=<Portal ID>'"
type="button">SignOn Again</button>
```

Add a SAML Identity Provider

Before You Begin

To perform the following task, you must be a Super Admin or System Admin.

Step 1 Import the Certificate Authority (CA) certificate in to the Trusted Certificate Store, if the certificate is not self-signed by the IdP. Choose **Administration > System > Certificates > Trusted Certificates > Import** to import the CA certificate.

Step 2 Choose **Administration > Identity Management > External Identity Sources** .

Step 3 Click **SAML Id Providers**.

Step 4 Click **Add**.

Step 5 In the **SAML Identity Provider** page, enter the following details:

General tab	Id Provider Name—Enter a name for the IdP object. Description—(Optional) Enter the description for the IdP object.

Identity Provider Config tab	Browse—Click this button to import the metadata file of the IdP. Refer to the Identity Provider user documentation for information on how to export the metadata file. After the metadata file is imported into ISE, the following fields are auto-populated: **Note** All these fields are mandatory. The imported metadata file must contain valid values for all these fields. Provider Id—A unique identifier that identifies the IdP of the user. Logout URL—When a user logs out of the Sponsor or My Devices portal, the user is redirected to the Logout URL at the IdP to terminate the SSO session and then redirected back to the login page. Redirect Param Name—The redirect parameter is used to pass the URL of the login page to which the user must be redirected after logging out. The redirect parameter name may differ based on the IdP, for example, end_url or returnURL. This field is case sensitive. If logout does not work as expected, check the Identity Provider documentation for the Logout URL and Redirect Parameter Name. **Note** Standard SAML v2 logout method is not supported in Cisco ISE. Single Sign On URL—This is the fully-qualified URL of the Single Sign On (SSO) login page of the IdP. Signing Certificate—The IdP sends a public key certificate that service provider uses to verify that SAML responses have been transmitted securely and originate from the IdP.

Step 6 Click **Submit**.

Step 7 Go to the Portal Settings page (Guest, Sponsor, or My Devices portal) and select the IdP that you want to link to that portal in the **Authentication Method** field.

To access the Portal Settings page:

- Guest portal—Choose **Guest Access** > **Configure** > **Guest Portals** > **Create, Edit, or Duplicate** > **Portal Behavior and Flow Settings** > **Portal Settings** (see Portal Settings for Credentialed Guest Portals).
- Sponsor portal—Choose **Guest Access** > **Configure** > **Sponsor Portals** > **Create, Edit, or Duplicate** > **Portal Behavior and Flow Settings** > **Portal Settings** (see Portal Settings for Sponsor Portals).
- My Devices portal—Choose **Administration > Device Portal Management > My Devices > Create, Edit, or Duplicate > Portal Behavior and Flow Settings > Portal Settings** (see Portal Settings for My Devices Portals).

Note If you have enabled SAML SSO for a Sponsor portal, ensure that the Sponsor groups are linked to an external identity store, such as LDAP or Active Directory.

Step 8 Click **Save**.

Step 9 Choose **Administration > Identity Management > External Identity Sources > SAML Id Providers** . Select the IdP that is linked to that portal and click **Edit**.

Step 10 In the **Service Provider Info** tab, click **Export** to export the service provider metadata file.

Note You must re-export the service provider metadata, if there are any changes in the portal configuration, such as:

- A new ISE node is registered
- Hostname or IP address of a node is changed
- Fully qualified domain name (FQDN) of My Devices, Sponsor, or Certificate Provisioning portal is changed
- Port or interface settings are changed

If the updated metadata is not re-exported, user authentication may fail at the IdP side.

Step 11 Click **Browse** in the dialog box and save the compressed files locally. Unzip the metadata file folder. When you unzip the folder, you will get a metadata file with the name of the portal. The metadata file includes the Provider ID and Binding URI.

Step 12 Login as Admin user in IdP and import the service provider metadata file. Refer to the Identity Provider user documentation for information on how to import the service provider metadata file.

Note For the Attribute Mapping option, you must select the sp-attribute-profile to add a mapping attribute for the "username" attribute. For SAML SSO to work as expected, you must define attribute mapping for username attribute. This attribute is included in SAML Assertion and represents unique identifier for the user who logged in. Through this attribute, Cisco ISE identifies the identity of an authenticated user. If username attribute is not provided, the authentication is rejected by ISE.

Step 13 Click **Portal Test URL** in the ISE portal to confirm whether the IdP is configured properly.

Delete an Identity Provider

Before You Begin

To perform the following task, you must be a Super Admin or System Admin.

Ensure that the IdP that you want to delete is not linked to any portal. If the IdP is linked to any portal, the delete operation fails.

Step 1 Choose **Administration > Identity Management > External Identity Sources > SAML Id Providers** .

Step 2 Check the check box next to the IdP that you want to delete, and then click **Delete**.

Step 3 Click **OK** to delete the IdP that you have selected.

Authentication Failure Log

When authentication against SAML ID Store fails and the IdP redirects the user back to ISE portal (through SAML response), ISE will report a failure reason in the authentication log.

Authentication can fail due to the following reasons:

- SAML Response parse errors
- SAML Response validation errors (for example, Wrong Issuer)
- SAML Assertion validation errors (for example, Wrong Audience)
- SAML Response signature validation errors (for example, Wrong Signature)
- IdP signing certificate errors (for example, Certificate Revoked)

If the authentication fails, we recommend that you check the "DetailedInfo" attribute in the authentication log. This attribute provides additional information regarding the cause of failure.

Identity Source Sequences

Identity source sequences define the order in which Cisco ISE looks for user credentials in the different databases. Cisco ISE supports the following identity sources:

- Internal Users
- Guest Users
- Active Directory
- LDAP
- RSA
- RADIUS Token Servers
- Certificate Authentication Profiles

If you have user information in more than one of the databases that are connected to Cisco ISE, you can define the order in which you want Cisco ISE to look for information in these identity sources. Once a match is found, Cisco ISE does not look any further, but evaluates the credentials, and returns the result to the user. This policy is the first match policy.

Create Identity Source Sequences

Before You Begin

Ensure that you have configured your external identity sources in Cisco ISE.

To perform the following task, you must be a Super Admin or System Admin.

For allowing guest users to authenticate through Local WebAuth, you must configure both the Guest Portal authentication source and the identity source sequence to contain the same identity stores.

Step 1 Choose **Administration** > **Identity Management** > **Identity Source Sequences** > **Add**.

Step 2 Enter a name for the identity source sequence. You can also enter an optional description.

Step 3 Check the **Select Certificate Authentication Profile** check box and choose a certificate authentication profile for certificate-based authentication.

Step 4 Choose the database or databases that you want to include in the identity source sequence in the **Selected List** box.

Step 5 Rearrange the databases in the **Selected list** in the order in which you want Cisco ISE to search the databases.

Step 6 Choose one of the following options in the **Advanced Search List** area:

- **Do not access other stores in the sequence and set the AuthenticationStatus attribute to ProcessError —**If you want Cisco ISE to discontinue the search, if the user is not found in the first selected identity source.
- **Treat as if the user was not found and proceed to the next store in the sequence —**If you want Cisco ISE to continue searching the other selected identity sources in sequence, if the user is not found in the first selected identity source.

  While processing a request, Cisco ISE searches these identity sources in sequence. Ensure that you have the identity sources in the Selected list box listed in the order in which you want Cisco ISE to search them.

Step 7 Click **Submit** to create the identity source sequence that you can then use in policies.

Delete Identity Source Sequences

You can delete identity source sequences that you no longer use in policies.

Before You Begin

- Ensure that the identity source sequence that you are about to delete is not used in any authentication policy.
- To perform the following task, you must be a Super Admin or System Admin.

Step 1 Choose **Administration** > **Identity Management** > **Identity Source Sequences**.

Step 2 Check the check box next to the identity source sequence or sequences that you want to delete, then click **Delete**.

Step 3 Click **OK** to delete the identity source sequence or sequences.

Identity Source Details in Reports

Cisco ISE provides information about the identity sources through the Authentications dashlet and Identity Source reports.

Authentications Dashlet

From the Authentications dashlet, you can drill down to find more information including failure reasons.

Choose Operations > Authentications to view real-time authentication summary. For more information, see Recent RADIUS Authentications.

Identity Source Reports

Cisco ISE provides various reports that include information about identity sources. See the Available Reports section for a description of these reports.