Red Hat Directory Server 12

Managing access control

Configuring permissions using access control instructions

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Legal Notice

Abstract

In Red Hat Directory Server, access control instructions (ACI) define which user can perform which actions on suffixes and entries. The documentation describes the different ACI types and use cases, bind rules, and how to check access rights on entries.

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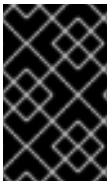
CHAPTER 1. MANAGING ACCESS CONTROL INSTRUCTIONS

When Directory Server receives a request, it uses the authentication information provided by the user in the bind operation and the access control instructions (ACI) defined in the directory to allow or deny access to the requested entry or attribute. The server can allow or deny permissions for actions, such as **read**, **write**, **search**, and **compare**. The permission level granted to a user depends on the authentication information provided.

Access control in Directory Server enables you to set precise rules on when the ACIs are applicable:

- For the entire directory, a subtree, or specific entries
- For a specific user, all users belonging to a specific group or role, or all users in the directory
- For a specific location, such as an IP address, an IP range, or a DNS name.
  Note that load balancers can affect location-specific rules.



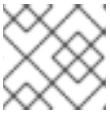
IMPORTANT

Complex ACIs are difficult to read and understand. Instead of one complex ACI, you can write multiple simple rules to achieve the same effect. However, a higher number of ACIs also increases the costs of ACI processing.

1.1. ACI PLACEMENT

Directory Server stores access control instruction (ACI) in the multi-valued **aci** operational attribute in directory entries. To set an ACI, add the **aci** attribute to the corresponding directory entry.
Directory Server applies the ACIs:

- Only to the entry that contains the ACI, if it does not have any child entries. For example, if a client requires access to the **uid=user_name,ou=People,dc=example,dc=com** object, and an ACI is only set on **dc=example,dc=com** and not on any child entries, only this ACI is applied.

  NOTE

  ACIs with **add** permissions also apply to child entries created in future.

- To the entry that contains the ACI and to all entries below it, if it has child entries. As a direct consequence, when the server evaluates access permissions to any given entry, it verifies the ACIs for every entry between the one requested and the directory suffix, as well as the ACIs on the entry itself.
  For example, ACIs are set on the **dc=example,dc=com** and the **ou=People,dc=example,dc=com** entry: If a client wants to access the **uid=user_name,ou=People,dc=example,dc=com** object, which has no ACI set, Directory Server first validates the ACI on the **ou=People,dc=example,dc=com** entry. If this ACI grants access, evaluation stops and grants access. If not, Directory Server verifies the ACI on **ou=People,dc=example,dc=com**. If this ACI successfully authorizes the client, it can access the object.

NOTE

ACIs set in the **rootDSE** entry apply only to this entry.

An ACI created on an entry can be set not to apply directly to that entry but rather to some or all of the entries in the subtree below. The advantage of this approach is that general ACIs can be placed higher in the directory tree to have effect on entries located lower in the tree. For example, an ACI that targets entries that include the **inetOrgPerson** object class can be created at the level of an **organizationalUnit** entry or a locality entry.

NOTE

Minimize the number of ACIs in the directory tree by placing general rules at high level branch points. To limit the scope of more specific rules, place them to leaf entries as closely as possible.

1.2. THE STRUCTURE OF AN ACI

The **aci** attribute uses the following syntax:

(*target_rule*) (version 3.0; acl "*ACL_name*"; *permission_rule bind_rules*;)

- **target_rule** specifies the entry, attributes, or set of entries and attributes for which to control access.
- **version 3.0** is a required string which identifies the access control instructions (ACI) version.
- **acl "*ACL name*"** sets a name or string that describes the ACI.
- **permission_rule** sets what rights, such as **read** or **write**, are allowed or denied.
- **bind_rules** specifies which rules must match during the bind to allow or deny access.

The permission and the bind rule pair are called an access control rule.

To efficiently set multiple access controls for a given target, you can set multiple access control rules for each target:

(*target_rule*)(version 3.0; acl "*ACL_name*"; *permission_rule bind_rules*; *permission_rule bind_rules*; ... ;)

1.3. ACI EVALUATION

To evaluate the access rights to a particular entry, the server creates a list of the access control instructions (ACI) present on the entry itself and on the parent entries back up to the top level entry stored in Directory Server. ACIs are evaluated across all databases for a particular instance but not across different instances.

Directory Server evaluates this list of ACIs based on the semantics of the ACIs, not on their placement in the directory tree. This means that ACIs that are close to the root of the directory tree do not take precedence over ACIs that are closer to the leaves of the directory tree.

In Directory Server, the **deny** permission in ACIs take precedence over the **allow** permission. For example, if you deny write permission at the directory's root level, none of the users can write to the directory, regardless if an other ACI grants this permission. To grant a specific user write permissions to the directory, you have to add an exception to the original denying rule to allow the user to write in that directory.

NOTE

For improved ACIs, use fine-grained **allow** rules instead of **deny** rules.

1.4. LIMITATIONS OF ACIS

When you set access control instructions (ACI), the following restrictions apply:

- If your directory database is distributed over multiple servers, the following restrictions apply to the keywords you can use in ACIs:
  - ACIs depending on group entries using the **groupdn** keyword must be located on the same server as the group entry.
    If the group is dynamic, all members of the group must have an entry on the server. Member entries of static groups can be located on the remote server.
  - ACIs depending on role definitions using the **roledn** keyword, must be located on the same server as the role definition entry. Every entry that is intended to have the role must also be located on the same server.

  However, you can match values stored in the target entry with values stored in the entry of the bind user by, for example, using the **userattr** keyword. In this case, access is evaluated normally even if the bind user does not have an entry on the server that stores the ACI.
- You cannot use virtual attributes, such as Class of Service (CoS) attributes, in the following ACI keywords:
  - **targetfilter**
  - **targattrfilters**
  - **userattr**
- Access control rules are evaluated only on the local server. For example, if you specify the host name of a server in LDAP URLs in ACI keywords, the URL will be ignored.

1.5. HOW DIRECTORY SERVER HANDLES ACIS IN A REPLICATION TOPOLOGY

Access control instructions (ACI) are stored in **aci** attributes of entries. Therefore, if an entry containing ACIs is part of a replicated database, the ACIs are replicated.

ACIs are always evaluated on the server that resolves the incoming LDAP requests. When a consumer server receives an update request, it returns a referral to the supplier server before evaluating whether the request can be serviced on the supplier.

1.6. DISPLAYING, ADDING, DELETING, AND UPDATING ACIS

You can use the **ldapsearch** utility to search, and the **ldapmodify** utility to add, delete, and update Access Control Instructions (ACI).

Displaying ACIs:

For example, to display the ACIs set on **dc=example,dc=com** and sub-entries, enter:

```
# ldapsearch -D "cn=Directory Manager" -W -H ldap://server.example.com -x -b
"dc=example,dc=com" -s sub '(aci=*)' aci
```

Adding an ACI

For example, to add an ACI to the **ou=People,dc=example,dc=com** entry, enter:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="userPassword") (version 3.0; acl
  "Allow users updating their password";
  allow (write) userdn= "ldap:///self";)
```

Deleting an ACI

To delete an ACI:

- If only one **aci** attribute is set on the entry or you want to remove all ACIs from the entry:

  ```
  # ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

  dn: ou=People,dc=example,dc=com
  changetype: delete
  delete: aci
  ```

- If multiple ACIs exist on the entry and you want to delete a specific ACI, specify the exact ACI:

  ```
  # ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

  dn: ou=People,dc=example,dc=com
  changetype: modify
  delete: aci
  aci: (targetattr="userPassword") (version 3.0; acl "Allow users
    updating their password"; allow (write) userdn= "ldap:///self";)
  ```

Updating an ACI

To update an ACI:

- Delete the existing ACI.
- Add a new ACI with the updated settings.

1.7. DEFINING ACI TARGETS

Target rules in an access control instruction (ACI) define to which entries Directory Server applies the ACI. If you do not set a target, the ACI applies to the entry containing the **aci** attribute and to entries below.

In an ACI, the following highlighted part is the target rule:

```
(target_rule)(version 3.0; acl "ACL_name"; permission_rule bind_rules;)
```

For complex ACIs, Directory Server supports multiple target rules with different keywords in an ACI:

> (***target_rule_1***)(***target_rule_2***)(...)(version 3.0; acl "*ACL_name*"; *permission_rule bind_rules*;)

If you specify multiple target rules, the order is not relevant. Note that you can use each of the following keywords only once in an ACI:

- **target**
- **targetattr**
- **targetattrfilters**
- **targetfilter**
- **target_from**
- **target_to**

1.7.1. The syntax of target rules

The general syntax of a target rule is:

> (*keyword comparison_operator* "*expression*")

- **keyword**: Sets the type of the target.
- **comparison_operator**: Valid values are **=** and **!=** and indicate whether or not the target is the object specified in the expression.

WARNING

For security reasons, Red Hat recommends not using the **!=** operator, because it allows the specified operation on all other entries or attributes. For example:

```
(targetattr != "userPassword");(version 3.0; acl "example"); allow (write)
... );
```

The previous example allows users to set, update, or delete any attribute except the **userPassword** attribute under the Distinguished Name (DN) you set the ACI. However, also this enables users, for example, to add an additional **aci** attribute that allows write access to this attribute as well.

- **expression**: Sets the target and must be surrounded by quotation marks. The expression itself depends on the keyword you use.

1.7.2. Targeting a directory entry

To control access based on a Distinguished Name (DN) and the entries below it, use the **target** keyword in the access control instruction (ACI). A target rule which uses the **target** keyword takes a DN as expression:

```
(target comparison_operator "ldap:///distinguished_name")
```

NOTE

You must set the ACI with the **target** keyword on the DN you are targeting or a higher-level DN of it. For example, if you target ou=People,dc=example,dc=com, you must either set the ACI on ou=People,dc=example,dc=com or dc=example,dc=com.

Example 1.1. Using the target keyword

To enable users that are stored in the ou=People,dc=example,dc=com entry to search and display all attributes in their own entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (target = "ldap:///ou=People,dc=example,dc=com") (version 3.0;
 acl "Allow users to read and search attributes of own entry"; allow (search, read)
 (userdn = "ldap:///self");)
```

Using wildcards with the target keyword

You can use the * wildcard character target multiple entries.

The following target rule example matches all entries in **ou=People,dc=example,dc=com** whose uid attribute is set to a value that starts with the letter **a**:

```
(target = "ldap:///uid=a*,ou=People,dc=example,dc=com")
```

Depending on the position of the wildcard, the rule not only applies to attribute values, but also to the full DN. Therefore, you can use the wildcard as a substitute for portions of the DN.

Example 1.2. Targeting a directory entries using wildcards

The following rule targets all entries in the **dc=example,dc=com** tree with a matching **uid** attribute and not only entries which are stored in the **dc=example,dc=com** entry itself:

```
(target = "ldap:///uid=user_name*,dc=example,dc=com")
```

The previous target rule matches multiple entries, such as:

- **uid=user_name,dc=example,dc=com**
- **uid=user_name,ou=People,dc=example,dc=com**
- **uid=user_name2,dc=example,dc=com**

IMPORTANT

Directory Serverdoes not support wildcards in the suffix part of a DN. For example, if your directory's suffix is **dc=example,dc=com**, you cannot use a target with a wildcard in this suffix, such as **(target = "ldap:///dc=*.com")**.

1.7.3. Targeting attributes

To limit access in an access control instruction (ACI) to certain attributes, use the **targetattr** keyword. For example, this keyword defines:

- In a read operation, what attributes will be returned to a client
- In a search operation, what attributes will be searched
- In a write operation, what attributes can be written to an object
- In an add operation, what attributes can be added when creating a new object

In certain situations, you can use the **targetattr** keyword to secure ACIs by combining other target keywords with **targetattr**. See Advanced usage of target rules.

IMPORTANT

In **read** and **search** operations, the default targets no attribute. An ACI without a **targetattr** keyword is only useful for ACIs with rights affecting a complete entry, such as **add** or **delete**.

To separate multiple attributes in a target rule that uses the **targetattr** keyword, use ||:

(targetattr *comparison_operator* "*attribute_1* || *attribute_2* || ...")

The attributes set in the expression must be defined in the schema.

The attributes specified in the expression apply to the entry on which you create the ACI and to all entries below it if not restricted by further target rules.

Example 1.3. Using the targetattr keyword

To enable users stored in **dc=example,dc=com** and all subentries to update the **userPassword** attribute in their own entry, enter:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap::server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "userPassword") (version 3.0;
 acl "Allow users updating own userPassword";
 allow (write) (userdn = "ldap:///self");)
```

Using wildcards with the targetattr keyword

Using the * wildcard character, you can, for example, target all attributes:

```
(targetattr = "*")
```

WARNING

For security reasons, do not use wildcards with the **targetattr**, because it allows access to all attributes, including operational attributes. For example, if users can add or modify all attributes, users might create additional ACIs and increase their own permissions.

1.7.4. Targeting entries and attributes using LDAP filters

To target a group of entries that match a certain criteria, use the **targetfilter** keyword with an LDAP filter:

```
(targetfilter comparison_operator "LDAP_filter")
```

The filter expression is a standard LDAP search filter.

Example 1.4. Using the targetfilter keyword

To grant permissions to members of the **cn=Human Resources,dc=example,dc.com** group to modify all entries having the department attribute set to **Engineering** or **Sales**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetfilter = "(|(department=Engineering)(department=Sales)")
 (version 3.0; acl "Allow HR updating engineering and sales entries";
 allow (write) (groupdn = "ldap:///cn=Human Resources,dc=example,dc.com");)
```

The **targetfilter** keyword targets whole entries. If you combine it with the **targetattr** keyword, the access control instruction (ACI) applies only to a subset of attributes of the targeted entries. See Targeting certain attributes of entries matching a filter.

NOTE

Using LDAP filters is useful when targeting entries and attributes that are spread across the directory. However, the results are sometimes unpredictable because filters do not directly name the object for which you are managing access. The set of entries targeted by a filtered ACI is likely to change as attributes are added or deleted. Therefore, if you use LDAP filters in ACIs, verify that they target the correct entries and attributes by using the same filter, for example, in an **ldapsearch** operation.

Using wildcards with the targetfilter keyword

The **targetfilter** keyword supports wildcards similarly to standard LDAP filters. For example, to target all uid attributes whose value starts with **adm**, use:

```
(targetfilter = "(uid=adm*) ...)
```

1.7.5. Targeting attribute values using LDAP filters

You can use access control to target specific values of attributes. This means that you can grant or deny permissions on an attribute if that attribute's value meets the criteria that is defined in the access control instruction (ACI). An ACI that grants or denies access based on an attribute's value is called a value-based ACI. This applies only to **ADD** and **DEL** operations. You cannot limit search rights by specific values.

To create a value-based ACI, use the **targattrfilters** keyword with the following syntax:

- For one operation with one attribute and filter combination:

  ```
  (targattrfilters="operation=attribute:filter")
  ```

- For one operation with multiple attribute and filter combinations:

  ```
  (targattrfilters="operation=attribute_1:filter_1 && attribute_2:filter_2 ... &&
  attribute_m:filter_m")
  ```

- For two operations, each with multiple attribute and filter combinations:

  ```
  (targattrfilters="operation_1=attribute_1_1:filter_1_1 && attribute_1_2:filter_1_2 ... &&
  attribute_1_m:filter_1_m , operation_2=attribute_2_1:filter_2_1 && attribute_2_2:filter_2_2 ...
  & attribute_2_n:filter_2_n ")
  ```

In the previous syntax examples, you can set the operations either to **add** or **del**. The **attribute:filter** combination sets the filter and the attribute the filter is applied to.

The following describes how filter must match:

- When creating an entry and a filter applies to an attribute in the new entry, then each instance of that attribute must match the filter.
- When deleting an entry and a filter applies to an attribute in the entry, then each instance of that attribute must also match the filter.
- When modifying an entry and the operation adds an attribute, then the **add** filter that applies to that attribute must match.
- If the operation deletes an attribute, then the **del** filter that applies to that attribute must match. If the individual values of an attribute already present in the entry are replaced, then both the **add** and **del** filters must match.

Example 1.5. Using the targattrfilters keyword

To create an ACI that enables users to add any role to their own entry, except the **Admin** role, and to add the **telephone** attribute, as long as the value begins with the **123** prefix, enter:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap::server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targattrfilters="add=nsroledn:(!(nsroledn=cn=Admin)) &&
 telephoneNumber:(telephoneNumber=123*)") (version 3.0;
 acl "Allow adding roles and telephone";
 allow (add) (userdn = "ldap:///self");)
```

1.7.6. Targeting source and destination DNs

In certain situations, administrators want to allow users to move directory entries. Using the **target_from** and **target_to** keywords in an access control instruction (ACI), you can specify the source and destination of the operation, however, without enabling the user:

- To move entries from a different source as set in the ACI.
- To move entries to a different destination as set in the ACI.
- To delete existing entries from the source Distinguished Name (DN).
- To add new entries to the destination DN.

Example 1.6. Using the target_from and target_to keywords

To enable the **uid=user,dc=example,dc=com** account to move user accounts from the **cn=staging,dc=example,dc=com** entry to **cn=people,dc=example,dc=com**, enter:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap:server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (target_from="ldap:///uid=*,cn=staging,dc=example,dc=com")
 (target_to="ldap:///cn=People,dc=example,dc=com")
 (version 3.0; acl "MODDN from"; allow (moddn))
 userdn="ldap:///uid=user,dc=example,dc=com";)
```

ACIs apply only to the subtree where they are defined. In the previous example, the ACI is applied only to the **dc=example,dc=com** subtree.

If the **target_from** or **target_to** keyword is not set, the ACI matches any source or destination.

1.8. ADVANCED USAGE OF TARGET RULES

By combining multiple keywords, you can create complex target rules. This section provides examples of the advanced usage of target rules.

1.8.1. Delegating permissions to create and maintain groups

In certain situations, administrators want to delegate permissions to other accounts or groups. By combining target keywords, you can create secure access control instructions (ACI) that solve this request.

Example 1.7. Delegating permissions to create and maintain groups

To enable the uid=user,ou=People,dc=example,dc=com" account to create and update groups in the ou=groups,dc=example,dc=com entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (target = "ldap:///cn=*,ou=Groups,dc=example,dc=com")
 (targattrfilters="add=objectclass:(|(objectclas=top)(objectclass=groupOfUniqueNames)))
 (targetattr="cn || uniqueMember || objectClass")
 (version 3.0; acl "example"; allow (read, search, write, add)
 (userdn = "ldap:///uid=test,ou=People,dc=example,dc=com");)
```

For security reasons, the previous example adds certain limitations. The **uid=test,ou=People,dc=example,dc=com** user:

- Can create objects that must contain the **top** and **groupOfUniqueNames** object classes.
- Cannot add additional object classes, such as **account**. For example, this prevents if you use Directory Server accounts for local authentication, to create new users with an invalid user ID, such as **0** for the **root** user.

The **targetfilter** rule ensures that the ACI entry applies only to entries with the **groupofuniquenames** object class and the **targetattrfilter** rule ensures that no other object class can be added.

1.8.2. Targeting both an entry and attributes

The **target** controls access based on a distinguished name (DN). However, if you use it in combination with a wildcard and the **targetattr** keyword, you can target both entries and attributes.

Example 1.8. Targeting both an entry and attributes

To enable the **uid=user,ou=People,dc=example,dc.com** user to read and search members of groups in all organizational units in the **dc=example,dc=com** subtree:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (target="ldap:///cn=*,dc=example,dc=com")(targetattr="member" || "cn") (version 3.0;
 acl "Allow uid=user to search and read members of groups";
 allow (read, search) (userdn = "ldap:///uid=user,ou=People,dc=example,dc.com");)
```

1.8.3. Targeting certain attributes of entries matching a filter

If you combine the **targetattr** and **targetfilter** keywords in two target rules, you can target certain attributes in entries that match a filter.

Example 1.9. Targeting certain attributes of entries matching a filter

To allow members of the **cn=Engineering Admins,dc=example,dc=com** group to modify the **jpegPhoto** and **manager** attributes of all entries having the **department** attribute set to **Engineering**, enter:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "jpegPhoto || manager")
 (targetfilter = "(department=Engineering)") (version 3.0;
 acl "Allow engineering admins updating jpegPhoto and manager of department members";
 allow (write) (groupdn = "ldap:///cn=Engineering Admins,dc=example,dc=com");)
```

1.8.4. Targeting a single directory entry

To target a single directory entry, combine the **targetattr** and **targetfilter** keywords.

Example 1.10. Targeting a single directory entry

To enable the uid=user,ou=People,dc=example,dc=com user to read and search the ou and cn attributes in the ou=Engineering,dc=example,dc=com entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=Engineering,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "ou || cn")
 (targetfilter = "(ou=Engineering)") (version 3.0;
 acl "Allow uid=user to search and read engineering attributes";
 allow (read, search) (userdn = "ldap:///uid=user,ou=People,dc=example,dc=com");)
```

To enable the previous example to target only the **ou=Engineering,dc=example,dc=com** entry, sub-entries in **ou=Engineering,dc=example,dc=com** must not have the **ou** attribute set to **Engineering**.

IMPORTANT

These kinds of ACIs can fail if the structure of your directory changes.

Alternatively, you can create a bind rule that matches the user input in the bind request with an attribute value that is stored in the targeted entry. See Defining access based on value matching .

1.9. DEFINING ACI PERMISSIONS

Permission rules define the rights that are associated with the access control instruction (ACI) and whether access is allowed or denied.

In an ACI, the following highlighted part is the permission rule:

> (*target_rule*) (version 3.0; acl "*ACL_name*"; ***permission_rule*** *bind_rules*;)

1.9.1. The syntax of permission rules

The general syntax of a permission rule is:

> *permission* (*rights*)

- **permission**: Sets if the access control instruction (ACI) allows or denies permission.
- **rights**: Sets the rights which the ACI allows or denies. See User rights in permission rules .

Example 1.11. Defining permissions

To enable users stored in the **ou=People,dc=example,dc=com** entry to search and display all attributes in their own entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (target = "ldap:///ou=People,dc=example,dc=com") (version 3.0;
 acl "Allow users to read and search attributes of own entry"; allow (search, read)
 (userdn = "ldap:///self");)
```

1.9.2. User rights in permission rules

The rights in a permission rule define what operations are granted or denied. In an ACI, you can set one or multiple of the following rights:

Table 1.1. User rights

Right	Description
read	Sets whether users can read directory data. This permission applies only to search operations in LDAP.
write	Sets whether users can modify an entry by adding, modifying, or deleting attributes. This permission applies to the **modify** and **modrdn** operations in LDAP.
add	Sets whether users can create an entry. This permission applies only to the **add** operation in LDAP.

Right	Description
delete	Sets whether users can delete an entry. This permission applies only to the **delete** operation in LDAP.
search	Sets whether users can search for directory data. To view data returned as part of a search result, assign **search** and **read** rights. This permission applies only to search operations in LDAP.
compare	Sets whether the users can compare data they supply with data stored in the directory. With **compare** rights, the directory returns a success or failure message in response to an inquiry, but the user cannot see the value of the entry or attribute. This permission applies only to the compare operation in LDAP.
selfwrite	Sets whether users can add or delete their own distinguished name (DN) from a group. This right is used only for group management.
proxy	Sets whether the specified DN can access the target with the rights of another entry. The **proxy** right is granted within the scope of the ACL, and the user or group who as the right granted can run commands as any Directory Server user. You cannot restrict the **proxy** rights to certain users. For security reasons, set ACIs that use the proxy right at the most targeted level of the directory.
all	Sets all of the rights, except **proxy**.

1.9.3. Rights required for LDAP operations

This section describes the rights you must grant to users depending on the type of LDAP operation you want to authorize them to perform.

- Adding an entry:
  - Grant **add** permission on the entry that you want to add.
  - Grant **write** permission on the value of each attribute in the entry. This right is granted by default but can be restricted using the **targattrfilters** keyword.
- Deleting an entry:
  - Grant **delete** permission on the entry that you want to delete.
  - Grant **write** permission on the value of each attribute in the entry. This right is granted by default but can be restricted using the **targattrfilters** keyword.
- Modifying an attribute in an entry:
  - Grant **write** permission on the attribute type.
  - Grant **write** permission on the value of each attribute type. This right is granted by default but can be restricted using the **targattrfilters** keyword.
- Modifying the RDN of an entry:

    - Grant **write** permission on the entry.
    - Grant **write** permission on the attribute type that is used in the new RDN.
    - Grant **write** permission on the attribute type that is used in the old RDN, if you want to grant the right to delete the old RDN.
    - Grant **write** permission on the value of attribute type that is used in the new RDN. This right is granted by default but can be restricted using the **targattrfilters** keyword.

- Comparing the value of an attribute:
    - Grant **compare** permission on the attribute type.
- Searching for entries:
    - Grant **search** permission on each attribute type used in the search filter.
    - Grant **read** permission on attribute types used in the entry.

1.10. DEFINING ACI BIND RULES

The bind rules in an access control instruction (ACI) define the required bind parameters that must meet so that Directory Server applies the ACI. For example, you can set bind rules based on:

- DNs
- Group memberships or assigned roles
- Locations from which an entry must bind
- Types of authentication that must be in use during the bind
- Times or days on which the bind occurs

In an ACI, the following highlighted part is the bind rule:

> (*target_rule*) (version 3.0; acl "*ACL_name*"; *permission_rule* ***bind_rules***;)

1.10.1. The syntax of bind rules

The general syntax of a bind rule is:

> *keyword comparison_operator* "*expression*"

- **keyword**: Sets the type of the bind operation.
- **comparison_operator**: Valid values are **=** and **!=** and indicate whether or not the target is the object specified in the expression. If a keyword supports additional comparison operators, it is mentioned in the corresponding section.
- **expression**: Sets the expression and must be surrounded by quotation marks. The expression itself depends on the keyword you use.

1.10.2. Defining user-based access

The **userdn** keyword enables you to grant or deny access based on one or multiple DNs and uses the following syntax:

```
userdn comparison_operator "ldap:///distinguished_name || ldap:///distinguished_name || ..."
```

Set the DN in the expression to:

- A DN: See Using a DN with the userdn keyword .
- An LDAP filter: See Using the userdn keyword with an LDAP filter .
- The **anyone** alias: See Granting anonymous access.
- The **all** alias: See Granting access to authenticated users .
- The **self** alias: See Enabling users to access their own entries .
- The **parent** alias: See Setting access for child entries of a user .

NOTE

Do not specify a host name or port number within the LDAP URL. The URL always applies to the local server.

Using a DN with the userdn keyword

Set the **userdn** keyword to a distinguished name (DN) to apply the ACI only to the matching entry. To match multiple entries, use the * wildcard in the DN.

Using the **userdn** keyword with a DN must match the following syntax:

```
userdn comparison_operator ldap:///distinguished_name
```

Example 1.12. Using a DN with the userdn keyword

To enable the **uid=admin,ou=People,dc=example,dc=com** user to read the **manager** attribute of all other users in the **ou=People,dc=example,dc=com** entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="manager") (version 3.0; acl "Allow uid=admin reading manager attribute";
 allow (search, read) userdn = "ldap:///uid=admin,ou=People,dc=example,dc=com";)
```

Using the userdn keyword with an LDAP filter

If you want to dynamically allow or deny permissions to users, use the **userdn** keyword with an LDAP filter:

```
userdn comparison_operator "ldap:///distinguished_name??scope?(filter)"
```

NOTE

The LDAP filter supports the * wildcard.

Example 1.13. Using the userdn keyword with an LDAP filter

To enable users who have the **department** attribute set to **Human Resources** to update the **homePostalAddress** attribute of users in the **ou=People,dc=example,dc=com** entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="homePostalAddress") (version 3.0;
 acl "Allow HR setting homePostalAddress"; allow (write)
 userdn = "ldap:///ou=People,dc=example,dc=com??sub?(department=Human Resources)";)
```

Granting anonymous access

In certain situations, administrators want to configure anonymous access to data in the directory. Anonymous access means that it is possible to bind to the directory by providing:

- No bind DN and password
- A valid bind DN and password

To configure anonymous access, use the **ldap:///anyone** expression with the **userdn** keyword in a bind rule:

```
userdn comparison_operator "ldap:///anyone"
```

Example 1.14. Granting anonymous access

To enable anyone without authentication to read and search the **sn**, **givenName**, and **telephoneNumber** attributes in the **ou=People,dc=example,dc=com** entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H __ldap://server.example.com -x`
dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="sn" || targetattr="givenName" || targetattr = "telephoneNumber")
 (version 3.0; acl "Anonymous read, search for names and phone numbers";
 allow (read, search) userdn = "ldap:///anyone")
```

Granting access to authenticated users

In certain situations, administrators want to grant permission to any user who is able to successfully bind to Directory Server, except anonymous binds. To configure this feature, use the **ldap:///all** expression with the **userdn** keyword in a bind rule:

userdn *comparison_operator* "ldap:///all"

Example 1.15. Granting access to authenticated users

To enable authenticated users to add and remove themselves as a member to or from the **ou=example,ou=groups,dc=example,dc=com** group:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=example,ou=Groups,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="member") (version 3.0;
 acl "Allow users to add/remove themselves from example group";
 allow (selfwrite) userdn = "ldap:///all")
```

Enabling users to access their own entries

To set ACI which allow or deny access to users to their own entry, use the **ldap:///self** expression with the **userdn** keyword in a bind rule:

userdn *comparison_operator* "ldap:///self"

Example 1.16. Enabling users to access their own entries

To enable users in the **ou=People,dc=example,dc=com** entry to update their own **userPassword** attribute:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="userPassword") (version 3.0;
 acl "Allow users updating their password";
 allow (write) userdn = "ldap:///self")
```

Setting access for child entries of a user

To specify that users are granted or denied access to an entry only if their bind DN is the parent of the targeted entry, use the **self:///parent** expression with the **userdn** keyword in a bind rule:

userdn *comparison_operator* "ldap:///parent"

Example 1.17. Setting access for child entries of a user

To enable the **cn=user,ou=People,dc=example,dc=com** user to update the **manager** attribute of its own sub-entries, such as **cn=example,cn=user,ou=People,dc=example,dc=com**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x
```

```
dn: cn=user,ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="manager") (version 3.0;
 acl "Allow cn=user to update manager attributes";
 allow (write) userdn = "ldap:///parent")
```

1.10.3. Defining group-based access

Group-based access control instructions (ACI) enable you to manage access by adding or removing users to or from a group. To configure an ACI that is based on a group membership, use the **groupdn** keyword. If the user is a member of one or multiple of the specified groups, the ACI matches.

When using the **groupdn** keyword, Directory Server verifies the group membership based on the following attributes:

- member
- uniqueMember
- memberURL
- memberCertificateDescription

Bind rules with the **groupdn** keyword use the following syntax:

```
groupdn comparison_operator "ldap:///distinguished_name || ldap:///distinguished_name || ..."
```

Set the distinguished name (DN) in the expression to:

- A DN. See Using a DN with the groupdn keyword .
- An LDAP filter. See Using the groupdn keyword with an LDAP filter

If you set multiple DNs in one bind rule, Directory Server applies the ACI if the authenticated user is a member of one of these groups. To set the user as a member of multiple groups, use multiple **groupdn** keywords and combine them using the Boolean **and** operator. For details, see Combining Bind Rules Using Boolean Operators.

NOTE

Do not specify a host name or port number within the LDAP URL. The URL always applies to the local server.

Using a DN with the groupdn keyword

To apply an ACI to members of a group, set the **groupdn** keyword to the group's DN.

The **groupdn** keyword set to a DN uses the following syntax:

```
groupdn comparison_operator ldap:///distinguished_name
```

Example 1.18. Using a DN with the groupdn Keyword

To enable members of the **cn=example,ou=Groups,dc=example,dc=com** group to search and read the manager attribute of entries in **ou=People,dc=example,dc=com**:

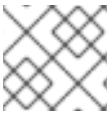
```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="manager") (version 3.0;
 acl "Allow example group to read manager attribute";
 allow (search, read) groupdn = "ldap:///cn=example,ou=Groups,dc=example,dc=com";)
```

Using The groupdn keyword with an LDAP filter

Using an LDAP filter with the **groupdn** keyword, you can define that the authenticated user must be a member of at least one of the groups that the filter search returns, to match the ACI.

The **groupdn** keyword with an LDAP filter uses the following syntax:

```
groupdn comparison_operator "ldap:///distinguished_name??scope?(filter)"
```



NOTE

The LDAP filter supports the * wildcard.

Example 1.19. Using the groupdn keyword with an LDAP filter

To enable members of groups in **dc=example,dc=com** and subtrees, which have the **manager** attribute set to **example**, update the **homePostalAddress** of entries in **ou=People,dc=example,dc=com**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x
dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="homePostalAddress") (version 3.0;
 acl "Allow manager=example setting homePostalAddress"; allow (write)
 userdn = "ldap:///dc=example,dc=com??sub?(manager=example)";)
```

1.10.4. Defining access based on value matching

Use the **userattr** keyword in a bind rule to specify which attribute must match between the entry used to bind to the directory and the targeted entry.

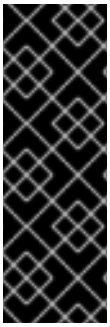
The **userattr** keyword uses the following syntax:

```
userattr comparison_operator "attribute_name#bind_type_or_attribute_value
```

For further details, see:

- Using the USERDN bind type

- Using the GROUPDN bind type
- Using the ROLEDN bind type
- Using the SELFDN bind type
- Using the LDAPURL bind type
- Using the userattr keyword with inheritance



IMPORTANT

By default, Directory Server evaluates access rights on the entry they are created. However, to prevent user objects on the same level, Directory Server does not grant **add** permissions to the entry where you set the access control instructions (ACI), when using the **userattr** keyword. To configure this behavior, use the **userattr** keyword in conjunction with the **parent** keyword and grant the permission additionally on level 0.

For details about inheritance, see Defining access based on value matching .

Using the USERDN bind type

To apply an ACI when the binding user distinguished name (DN) matches the DN stored in an attribute, use the **USERDN** bind type.

The **userattr** keyword with the **USERDN** bind type requires the following syntax:

```
userattr comparison_operator "attribute_name#USERDN"
```

Example 1.20. Using the USERDN bind type

To grant a manager all permissions to the **telephoneNumber** attribute of its own associates:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "telephoneNumber")
 (version 3.0; acl "Manager: telephoneNumber";
 allow (all) userattr = "manager#USERDN";)
```

The previous ACI is evaluated to be true if the DN of the user who performs the operation on an entry in **ou=People,dc=example,dc=com**, matches the DN stored in the **manager** attribute of this entry.

Using the GROUPDN bind type

To apply an ACI when the binding user DN is a member of a group set in an attribute, use the **GROUPDN** bind type.

The **userattr** keyword with the **GROUPDN** bind type requires the following syntax:

```
userattr comparison_operator "attribute_name#GROUPDN"
```

Example 1.21. Using the GROUPDN bind type

To grant users the permission to delete a group entry which they own under the **ou=Social Committee,ou=Groups,dc=example,dc=com** entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=Social Committee,ou=Groups,dc=example,dc=com
changetype: modify
add: aci
aci: (target="ou=Social Committee,ou=Groups,dc=example,dc=com)
 (targattrfilters="del=objectClass:(objectClass=groupOfNames)")
 (version 3.0; acl "Delete Group";
 allow (delete) userattr = "owner#GROUPDN";)
```

The previous ACI is evaluated to be true if the DN of the user who performs the operation is a member of the group specified in the **owner** attribute.

The specified group can be a dynamic group, and the DN of the group can be under any suffix in the database. However, the evaluation of this type of ACI by the server is very resource-intensive.

If you are using static groups that are under the same suffix as the targeted entry, use the following expression for better performance:

```
userattr comparison_operator "ldap:///distinguished_name?attribute_name#GROUPDN"
```

Using the ROLEDN bind type

To apply an ACI when the binding user belongs to a role specified in an attribute, use the **ROLEDN** bind type.

The **userattr** keyword with the **ROLEDN** bind type requires the following syntax:

```
userattr comparison_operator "attribute_name#ROLEDN"
```

Example 1.22. Using the ROLEDN bind type

To enable users with the **cn=Administrators,dc=example,dc=com** role to search and read the **manager** attribute of entries in **ou=People,dc=example,dc=com**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (version 3.0; acl "Allow example role owners to read manager attribute";
 allow (search, read) userattr = manager#ROLEDN;)
```

The specified role can be under any suffix in the database. If you are also using filtered roles, the evaluation of this type of ACI uses a lot of resources on the server.

If you are using a static role definition and the role entry is under the same suffix as the targeted entry, use the following expression for better performance:

Using the SELFDN bind type

The **SELFDN** bind type enables you to grant permissions, when the bound user's DN is set in a single-value attribute of the entry.

The **userattr** keyword with the **SELFDN** bind type requires the following syntax:

```
userattr comparison_operator "attribute_name#SELFDN"
```

Example 1.23. Using the SELFDN bind type

To enable a user to add **ipatokenuniqueid=*,cn=otp,dc=example,dc=com** entries that have the bind user's DN set in the **ipatokenOwner** attribute:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=otp,dc=example,dc=com
changetype: modify
add: aci
aci: (target = "ldap:///ipatokenuniqueid=*,cn=otp,dc=example,dc=com")
 (targetfilter = "(objectClass=ipaToken)")(version 3.0;
 acl "token-add-delete"; allow (add) userattr = "ipatokenOwner#SELFDN";)
```

Using the LDAPURL bind type

To apply an ACL when the bind DN matches the filter specified in an attribute of the targeted entry, use the **LDAPURL** bind type.

The **userattr** keyword with the **LDAPURL** bind type requires the following syntax:

```
userattr comparison_operator "attribute_name#LDAPURL"
```

Example 1.24. Using the LDAPURL bind type

To grant read and search permissions to user objects which contain the **aciurl** attribute set to **ldap:///ou=People,dc=example,dc=com??one?(uid=user*)**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x
dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "*")
 (version 3.0; acl "Allow read,search "; allow (read,search)
 (userattr = "aciurl#LDAPURL);)
```

Using the userattr keyword with inheritance

When you use the **userattr** keyword to associate the entry used to bind with the target entry, the ACI applies only to the target specified and not to the entries below it. In certain situations, administrators want to extend the application of the ACI several levels below the targeted entry. This is possible by

using the **parent** keyword and specifying the number of levels below the target that should inherit the ACI.

When using the **userattr** keyword with the **parent** keyword, the syntax is as follows:

```
userattr comparison_operator
"parent[inheritance_level].attribute_name#bind_type_or_attribute_value
```

- **inheritance_level**: Comma-separated list that indicates how many levels below the target inherit the ACI. You can include five levels (**0**, **1**, **2**, **3**, **4**) below the targeted entry. Zero (**0**) indicates the targeted entry.
- **attribute_name**: The attribute targeted by the **userattr** or **groupattr** keyword.
- **bind_type_or_attribute_value**: Sets the attribute value or a bind type, such as **USERDN**.

For example:

```
userattr = "parent[0,1].manager#USERDN"
```

This bind rule is evaluated to be true if the bind DN matches the manager attribute of the targeted entry. The permissions granted when the bind rule is evaluated to be true apply to the target entry and to all entries immediately below it.

Example 1.25. Using the userattr keyword with inheritance

To enable a user to read and search the **cn=Profiles,dc=example,dc=com** entry where the user's DN is set in the **owner** attribute, as well as the first level of child entries which includes **cn=mail,cn=Profiles,dc=example,dc=com** and **cn=news,cn=Profiles,dc=example,dc=com**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x`

dn: cn=Profiles,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="*") (version 3.0; acl "Profile access",
 allow (read,search) userattr="parent[0,1].owner#USERDN" ;)
```

1.10.5. Defining access from specific IP addresses or ranges

The **ip** keyword in a bind rule enables you to grant or deny access from a specific IP address or a range of IP addresses.

Bind rules with the **ip** keyword use the following syntax:

```
ip comparison_operator "IP_address_or_range"
```

Example 1.26. Using IPv4 address ranges in bind rules

To deny access from the **192.0.2.0/24** network to the **dc=example,dc=com** entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x
```

```
dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "*") (version 3.0;acl "Deny 192.0.2.0/24"; deny (all)
 (userdn = "ldap:///anyone") and (ip != "192.0.2.");)
```

Example 1.27. Using IPv6 address ranges in bind rules

To deny access from the **2001:db8::/64** network to the **dc=example,dc=com** entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "*") (version 3.0;acl "Deny 2001:db8::/64"; deny (all)
 (userdn = "ldap:///anyone") and (ip != "2001:db8::");)
```

1.10.6. Defining access from a specific host or domain

The **dns** keyword in a bind rule enables you to grant or deny access from a specific host or domain.

WARNING

If Directory Server cannot resolve a connecting IP address to its fully qualified domain name (FQDN) using DNS, the server does not apply access control instructions (ACI) with the **dns** bind rule for this client.

If client IP addresses are not resolvable using DNS, use the **ip** keyword and IP addresses instead. See Defining access from specific IP addresses or ranges .

Bind rules with the **dns** keyword use the following syntax:

```
dns comparison_operator "host_name_or_domain_name"
```

Example 1.28. Defining access from a specific host

To deny access from the client.example.com host to the dc=example,dc=com entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
```

```
add: aci
aci: (targetattr = "*") (version 3.0;acl "Deny client.example.com"; deny (all)
 (userdn = "ldap:///anyone") and (dns != "client.example.com");)
```

Example 1.29. Defining access from a specific domain

To deny access from all hosts within the example.com domain to the dc=example,dc=com entry:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "") (version 3.0;acl "Deny example.com"; deny (all) (userdn =
"ldap:///anyone") and (dns != ".example.com");)
```

1.10.7. Requiring a certain level of security in connections

The security of a connection is determined by its security strength factor (SSF), which sets the minimum key strength required to process operations. Using the **ssf** keyword in a bind rule, you can set that a connection must use a certain level of security. This enables you to force operations, for example password changes, to be performed over an encrypted connection.

The value for the SSF for any operation is the higher of the values between a TLS connection and a SASL bind. This means that if a server is configured to run over TLS and a replication agreement is configured for SASL/GSSAPI, the SSF for the operation is whichever available encryption type is more secure.

Bind rules with the **ssf** keyword use the following syntax:

```
ssf comparison_operator key_strength
```

You can use the following comparison operators:

- **=** (equal to)
- **!** (not equal to)
- **<** (less than)
- **>** (greater than)
- **⇐** (less than or equal to)
- **>=** (greater than or equal to)

If the **key_strength** parameter is set to **0**, no secure operation is required for the LDAP operation.

Example 1.30. Requiring a certain level of security in connections

To configure that users in the dc=example,dc=com entry can only update their userPassword attribute when the SSF is 128 or higher:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr = "userPassword") (version 3.0;
 acl "Allow users updating own userPassword";
 allow (write) (userdn = "ldap:///self") and (ssf >= "128");)
```

1.10.8. Defining access at a specific day of the week

The **dayofweek** keyword in a bind rule enables you to grant or deny access based on the day of the week.

NOTE

Directory Server uses the time on the server to evaluate the access control instruction (ACI); not the time on the client.

Bind rules with the **dayofweek** keyword use the following syntax:

```
dayofweek comparison_operator "comma-separated_list_of_days"
```

Example 1.31. Granting access on specific days of the week

To deny access for the **uid=user,ou=People,dc=example,dc=com** user entry to bind to the server on Saturdays and Sundays:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (version 3.0; acl "Deny access on Saturdays and Sundays";
 deny (all)
 (userdn = "ldap:///uid=user,ou=People,dc=example,dc=com") and
 (dayofweek = "Sun,Sat");)
```

1.10.9. Defining access at a specific time of day

The **timeofday** keyword in a bind rule enables you to grant or deny access based on the time of day.

NOTE

Directory Server uses the time on the server to evaluate the access control instructions (ACI); not the time on the client.

Bind rules with the **timeofday** keyword use the following syntax:

```
timeofday comparison_operator "time"
```

You can use the following comparison operators:

- **=** (equal to)
- **!** (not equal to)
- **<** (less than)
- **>** (greater than)
- **⇐** (less than or equal to)
- **>=** (greater than or equal to)

IMPORTANT

The **timeofday** keyword requires that you specify the time in 24-hour format.

Example 1.32. Defining access at a specific time of a day

To deny access for the **uid=user,ou=People,dc=example,dc=com** user entry to bind to the server between 6pm and 0am:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
 aci: (version 3.0; acl "Deny access between 6pm and 0am";
 deny (all)
 (userdn = "ldap:///uid=user,ou=People,dc=example,dc=com") and
 (timeofday >= "1800" and timeofday < "2400");)
```

1.10.10. Defining access based on the authentication method

The **authmethod** keyword in a bind rule sets what authentication method a client must use when connecting to the server, to apply the access control instruction (ACI).

Bind rules with the **authmethod** keyword use the following syntax:

```
authmethod comparison_operator "authentication_method"
```

You can set the following authentication methods:

- **none**: Authentication is not required and represents anonymous access. This is the default.
- **simple**: The client must provide a user name and password to bind to the directory.
- **SSL**: The client must bind to the directory using a TLS certificate either in a database, smart card, or other device. For details about certificate-based authentication, see Defining access based on the authentication method.

- **SASL**: The client must bind to the directory over a Simple Authentication and Security Layer (SASL) connection. When you use this authentication method in a bind rule, additionally specify the SASL mechanism, such as **EXTERNAL**.

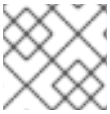
Example 1.33. Enabling access only for connections using the EXTERNAL SASL authentication method

To deny access to the server if the connection does not use a certificate-based authentication method or SASL:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x`

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (version 3.0; acl "Deny all access without certificate"; deny (all)
 (authmethod = "none" or authmethod = "simple");)
```

1.10.11. Defining access based on roles

The **roledn** keyword in a bind rule enables you to grant or deny access to users having one or multiple role sets.



NOTE

Red Hat recommends using groups instead of roles.

Bind rules with the **roledn** keyword use the following syntax:

```
roledn comparison_operator "ldap:///distinguished_name || ldap:///distinguished_name || ..."
```

If a distinguished name (DN) contains a comma, escape the comma with a backslash.

Example 1.34. Defining access based on roles

To enable users that have the **cn=Human Resources,ou=People,dc=example,dc=com** role set in the **nsRole** attribute to search and read the **manager** attribute of entries in **ou=People,dc=example,dc=com**:

```
# ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: ou=People,dc=example,dc=com
changetype: modify
add: aci
aci: (targetattr="manager") (version 3.0;
 acl "Allow manager role to update manager attribute";
 allow (search, read) roledn = "ldap:///cn=Human Resources,ou=People,dc=example,dc=com";)
```

1.10.12. Combining bind rules using Boolean operators

When creating complex bind rules, the **AND**, **OR**, and **NOT** Boolean operators enable you to combine multiple keywords.

Bind rules combined with Boolean operators have the following syntax:

> *bind_rule_1 boolean_operator bind_rule_2...*

> **Example 1.35. Combining bind rules using Boolean operators**
>
> To configure that users which are member of both the **cn=Administrators,ou=Groups,dc=example,com** and **cn=Operators,ou=Groups,dc=example,com] group can [command]`read**, **search**, **add**, **update**, and **delete** entries in **ou=People,dc=example,dc=com**:
>
> ```
> # ldapmodify -D "cn=Directory Manager" -W -H ldap://server.example.com -x
>
> dn: ou=People,dc=example,dc=com
> changetype: modify
> add: aci
> aci: (target="ldap:///ou=People,dc=example,dc=com") (version 3.0;
>  acl "Allow members of administrators and operators group to manage users";
>  allow (read, search, add, write, delete)
>  groupdn = "ldap:///cn=Administrators,ou=Groups,dc=example,com" AND
>  groupdn = "ldap:///cn=Operators,ou=Groups,dc=example,com";)
> ```

How Directory Server evaluates boolean operators

Directory Server evaluates Boolean operators by using the following rules:

- All expressions from left to right.
  In the following example, **bind_rule_1** is evaluated first:

  > (*bind_rule_1*) OR (*bind_rule_2*)

- From innermost to outermost parenthetical expressions first.
  In the following example, **bind_rule_2** is evaluated first and **bind_rule_3** second:

  > (*bind_rule_1*) OR ((*bind_rule_2*) AND (*bind_rule_3*))

- **NOT** before **AND** or **OR** operators.
  In the following example, *bind_rule_2* is evaluated first:

  > (*bind_rule_1*) AND NOT (*bind_rule_2*)

  The **AND** and **OR** operators have no order of precedence.

CHAPTER 2. CONFIGURING A PASSWORD-BASED ACCOUNT LOCKOUT POLICY

A password-based account lockout policy prevents attackers from repeatedly trying to guess a user's password. You can configure the account lockout policy to lock a user account after a specified number of failed attempts to bind.

If a password-based account lockout policy is configured, Directory Server maintains the lockout information in the following attributes of the user entries:

- **passwordRetryCount**: Stores the number of failed bind attempts. Directory Server resets the value if the user successfully binds to the directory later than the time in **retryCountResetTime**. This attribute is present after a user fails to bind for the first time.
- **retryCountResetTime**: Stores the time after which the **passwordRetryCount** attribute is reset. This attribute is present after a user fails to bind for the first time.
- **accountUnlockTime**: Stores the time after which the user account is unlocked. This attribute is present after the account was locked for the first time.

2.1. CONFIGURING WHETHER TO LOCK ACCOUNTS WHEN REACHING OR EXCEEDING THE CONFIGURED MAXIMUM ATTEMPTS

Administrators can configure one of the following behaviors when Directory Server locks accounts on failed login attempts:

- The server locks accounts if the limit has been exceeded. For example, if the limit is set to 3 attempts, the lockout happens after the fourth failed attempt (**n+1**). This also means that, if the fourth attempt succeeds, Directory Server does not lock the account.
  By default, Directory Server uses this legacy password policy that is often expected by traditional LDAP clients.
- The server locks accounts if the limit has been reached. For example, if the limit is set to 3 attempts, the server locks the account after the third failed attempt (**n**).
  Modern LDAP clients often expect this behavior.

This procedure describes how to disable the legacy password policy. After changing the policy, Directory Server blocks login attempts for a user that reached the configured limit.

Prerequisites

- You configured an account lockout policy.

Procedure

- To disable the legacy password policy and lock accounts if the limit has been reached, enter:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com config replace
passwordLegacyPolicy=off
```

Verification

1. Display the value of the **passwordmaxfailure** setting:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com pwpolicy get
passwordmaxfailure
passwordmaxfailure: 2
```

2. Attempt to bind using an invalid password one more time than the value set in **passwordmaxfailure**:

```
# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Constraint violation (19)
 additional info: Exceed password retry limit. Please try later.
```

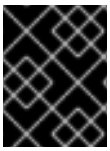
With legacy passwords disabled, Directory Server locked the account after the second attempt, and further tries are blocked with an **ldap_bind: Constraint violation (19)** error.

Additional resources

- Configuring a password-based account lockout policy using the command line

2.2. CONFIGURING A PASSWORD-BASED ACCOUNT LOCKOUT POLICY USING THE COMMAND LINE

To block login recurring bind attempts with invalid passwords, configure a password-based account lockout policy.



IMPORTANT

The behavior whether Directory Server locks accounts when reaching or exceeding the configured maximum attempts depends on the legacy password policy setting.

Procedure

1. Optional: Identify whether the legacy password policy is enabled or disabled:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com config get
passwordLegacyPolicy
passwordLegacyPolicy: on
```

2. Enable the password lockout policy and set the maximum number of failures to **2**:

```
# [command]`dsconf -D "cn=Directory Manager" ldap://server.example.com pwpolicy
set --pwdlockout on --pwdmaxfailures=2
```

With the legacy password policy enabled, Directory Server will lock accounts after the third failed attempt to bind (value of the **--pwdmaxfailures** parameter + 1).

The **dsconf pwpolicy set** command supports the following parameters:

- **--pwdlockout**: Enables or disables the account lockout feature. Default: **off**.
- **--pwdmaxfailures**: Sets the maximum number of allowed failed bind attempts before Directory Server locks the account. Default: **3**.
  Note that this lockout happens one attempt later if the legacy password policy setting is enabled. Default: **3**.
- **--pwdresetfailcount**: Sets the time in seconds before Directory Server resets the **passwordRetryCount** attribute in the user's entry. Default: **600** seconds (10 minutes).
- **--pwdlockoutduration**: Sets the time of accounts being locked in seconds. This parameter is ignored if you set the **--pwdunlock** parameter to **off**. Default: **3600** seconds (1 hour).
- **--pwdunlock**: Enables or disables whether locked accounts should be unlocked after a certain amount of time or stay disabled until an administrator manually unlocks them. Default: **on**.

Verification

- Attempt to bind using an invalid password two more times than the value you set in the **--pwdmaxfailures** parameter:

```
# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Constraint violation (19)
        additional info: Exceed password retry limit. Please try later.
```

With legacy passwords enabled, Directory Server locked the account after the limit has exceeded, and further tries are blocked with an **ldap_bind: Constraint violation (19)** error.

Additional resources

- Configuring the legacy password policy

2.3. CONFIGURING A PASSWORD-BASED ACCOUNT LOCKOUT POLICY USING THE WEB CONSOLE

To block login recurring bind attempts with invalid passwords, configure a password-based account lockout policy.

IMPORTANT

The behavior whether Directory Server locks accounts when reaching or exceeding the configured maximum attempts depends on the legacy password policy setting.

Prerequisites

- You are logged in to the instance in the web console.

Procedure

1. Optional: Identify whether the legacy password policy is enabled or disabled:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com config get
passwordLegacyPolicy
passwordLegacyPolicy: on
```

   This setting is not available in the web console.

2. Navigate to **Database → Password Policies → Global Policy → Account Lockout**.
3. Select **Enable Account Lockout**.
4. Configure the lockout settings:
   - **Number of Failed Logins That Locks out Account**: Sets the maximum number of allowed failed bind attempts before Directory Server locks the account.
   - **Time Until Failure Count Resets**: Sets the time in seconds before Directory Server resets the **passwordRetryCount** attribute in the user's entry.
   - **Time Until Account Unlocked**: Sets the time of accounts beging locked in seconds. This parameter is ignored if you disable **Do Not Lockout Account Forever**.
   - **Do Not Lockout Account Forever**: Enables or disables whether locked accounts should be unlocked after a certain amount of time or stay disabled until an administrator manually unlocks them.
5. Click **Save**.

Verification

- Attempt to bind using an invalid password two more times than the value you set in **Number of Failed Logins That Locks out Account**:

```
# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)
```

```
# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Invalid credentials (49)

# ldapsearch -H ldap://server.example.com -D
"uid=example,ou=People,dc=example,dc=com" -w invalid-password -b
"dc=example,dc=com" -x
ldap_bind: Constraint violation (19)
        additional info: Exceed password retry limit. Please try later.
```

With legacy passwords enabled, Directory Server locked the account after the limit has exceeded, and further tries are blocked with an **ldap_bind: Constraint violation (19)** error.

Additional resources

- Configuring the legacy password policy

CHAPTER 3. CONFIGURING TIME-BASED ACCOUNT LOCKOUT POLICIES

You can use the Account Policy plug-in to configure different time-based lockout policies, such as:

- Automatically disabling accounts a certain amount of time the last successful login
- Automatically disabling accounts a certain amount of time after you created them
- Automatically disabling accounts a certain amount of time after password expiry

3.1. AUTOMATICALLY DISABLING ACCOUNTS A CERTAIN AMOUNT OF TIME THE LAST SUCCESSFUL LOGIN

Follow this procedure to configure a time-based lockout policy that inactivates users under the **dc=example,dc=com** entry who do not log in for more than 21 days.

This the account inactivity feature to ensure, for example if an employee left the company and the administrator forgets to delete the account, that Directory Server inactivates the account after a certain amount of time.

Procedure

1. Enable the Account Policy plug-in:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy enable
```

2. Configure the plug-in configuration entry:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy config-entry set "cn=config,cn=Account Policy Plugin,cn=plugins,cn=config" --always-record-login yes --state-attr lastLoginTime --alt-state-attr 1.1 --spec-attr acctPolicySubentry --limit-attr accountInactivityLimit
```

This command uses the following options:

- **--always-record-login yes**: Enables logging of the login time. This is required to use Class of Service (CoS) or roles with account policies, even if it does not have the **acctPolicySubentry** attribute set.
- **--state-attr lastLoginTime**: Configures that the Account Policy plug-in stores the last login time in the **lastLoginTime** attribute of users.
- **--alt-state-attr 1.1**: Disables using an alternative attribute to check if the primary one does not exist. By default, Directory Server uses the **createTimestamp** attribute as alternative. However, this causes that Directory Server logs out existing users automatically if their account do not have the **lastLoginTime** attribute set and **createTimestamp** is older than the configured inactivity period. Disabling the alternative attribute causes that Directory Server automatically adds the **lastLoginTime** attribute to user entries when they log in the next time.

- **--spec-attr acctPolicySubentry**: Configures Directory Server to apply the policy to entries that have the **acctPolicySubentry** attribute set. You configure this attribute in the CoS entry.
- **--limit-attr accountInactivityLimit**: Configures that the **accountInactivityLimit** attribute in the account inactivation policy entry stores the inactivity time.

3. Restart the instance:

```
# dsctl instance_name restart
```

4. Create the account inactivation policy entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=Account Inactivation Policy,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectClass: extensibleObject
objectClass: accountpolicy
accountInactivityLimit: 1814400
cn: Account Inactivation Policy
```

The value in the **accountInactivityLimit** attribute configures that Directory Server inactivates accounts **1814400** seconds (21 days) after the last log in.

5. Create the CoS template entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=TemplateCoS,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectClass: extensibleObject
objectClass: cosTemplate
acctPolicySubentry: cn=Account Inactivation Policy,dc=example,dc=com
```

This template entry references the account inactivation policy.

6. Create the CoS definition entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=DefinitionCoS,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectclass: cosSuperDefinition
objectclass: cosPointerDefinition
cosTemplateDn: cn=TemplateCoS,dc=example,dc=com
cosAttribute: acctPolicySubentry default operational-default
```

This definition entry references the CoS template entry and causes that the **acctPolicySubentry** attribute appears in each user entry with a value set to **cn=Account Inactivation Policy,dc=example,dc=com**.

Verification

1. Set the **lastLoginTime** attribute of a user to a value that is older than the inactivity time you configured:

```
# ldapmodify -H ldap://server.example.com -x -D "cn=Directory Manager" -W

dn: uid=example,ou=People,dc=example,dc=com
changetype: modify
replace: lastLoginTime
lastLoginTime: 20210101000000Z
```

2. Try to connect to the directory as a this user:

```
# ldapsearch -H ldap://server.example.com -x -D
"uid=example,ou=People,dc=example,dc=com" -W -b "dc=example,dc=com"
ldap_bind: Constraint violation (19)
 additional info: Account inactivity limit exceeded. Contact system administrator to reset.
```

   If Directory Server denies access and returns this error, account inactivity works.

Additional resources

- Re-enabling accounts that reached the inactivity limit

3.2. AUTOMATICALLY DISABLING ACCOUNTS A CERTAIN AMOUNT OF TIME AFTER YOU CREATED THEM

Follow this procedure to configure that accounts in the **dc=example,dc=com** entry expire 60 days after the administrator created them.

Use the account expiration feature, for example, to ensure that accounts for external workers are locked a certain amount of time after they have been created.

Procedure

1. Enable the Account Policy plug-in:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy
enable
```

2. Configure the plug-in configuration entry:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy
config-entry set "cn=config,cn=Account Policy Plugin,cn=plugins,cn=config" --always-
record-login yes --state-attr lastLoginTime --alt-state-attr 1.1 --spec-attr
acctPolicySubentry --limit-attr accountInactivityLimit
```

   This command uses the following options:

   - **--always-record-login yes**: Enables logging of the login time. This is required to use Class of Service (CoS) or roles with account policies, even if it does not have the **acctPolicySubentry** attribute set.

- **--state-attr createTimestamp**: Configures that the Account Policy plug-in uses the value of the **createTimestamp** attribute to calculate whether an account is expired.
- **--alt-state-attr 1.1**: Disables using an alternative attribute to check if the primary one does not exist.
- **--spec-attr acctPolicySubentry**: Configures Directory Server to apply the policy to entries that have the **acctPolicySubentry** attribute set. You configure this attribute in the CoS entry.
- **--limit-attr accountInactivityLimit**: Configures that the **accountInactivityLimit** attribute in the account expiration policy entry stores the maximum age.

3. Restart the instance:

```
# dsctl instance_name restart
```

4. Create the account expiration policy entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=Account Expiration Policy,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectClass: extensibleObject
objectClass: accountpolicy
accountInactivityLimit: 5184000
cn: Account Expiration Policy
```

The value in the **accountInactivityLimit** attribute configures that accounts expire **5184000** seconds (60 days) after they have been created.

5. Create the CoS template entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=TemplateCoS,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectClass: extensibleObject
objectClass: cosTemplate
acctPolicySubentry: cn=Account Expiration Policy,dc=example,dc=com
```

This template entry references the account expiration policy.

6. Create the CoS definition entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=DefinitionCoS,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectclass: cosSuperDefinition
```

```
objectclass: cosPointerDefinition
cosTemplateDn: cn=TemplateCoS,dc=example,dc=com
cosAttribute: acctPolicySubentry default operational-default
```

This definition entry references the CoS template entry and causes that the **acctPolicySubentry** attribute appears in each user entry with a value set to **cn=Account Expiration Policy,dc=example,dc=com**.

Verification

- Try to connect to the directory as a user stored in the **dc=example,dc=com** entry whose **createTimestamp** attribute is set to a value more than 60 days ago:

```
# ldapsearch -H ldap://server.example.com -x -D "uid=example,dc=example,dc=com" -W -b "dc=example,dc=com"
ldap_bind: Constraint violation (19)
 additional info: Account inactivity limit exceeded. Contact system administrator to reset.
```

If Directory Server denies access and returns this error, account expiration works.

Additional resources

- Re-enabling accounts that reached the inactivity limit

3.3. AUTOMATICALLY DISABLING ACCOUNTS A CERTAIN AMOUNT OF TIME AFTER PASSWORD EXPIRY

Follow this procedure to configure a time-based lockout policy that inactivates users under the **dc=example,dc=com** entry who do not change their password for more than 28 days.

Prerequisites

- Users must have the **passwordExpirationTime** attribute set in their entry.

Procedure

1. Enable the password expiration feature:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com config replace passwordExp=on
```

2. Enable the Account Policy plug-in:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy enable
```

3. Configure the plug-in configuration entry:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy config-entry set "cn=config,cn=Account Policy Plugin,cn=plugins,cn=config" --always-record-login yes --always-record-login-attr lastLoginTime --state-attr non_existent_attribute --alt-state-attr passwordExpirationTime --spec-attr acctPolicySubentry --limit-attr accountInactivityLimit
```

This command uses the following options:

- **--always-record-login yes**: Enables logging of the login time. This is required to use Class of Service (CoS) or roles with account policies, even if it does not have the **acctPolicySubentry** attribute set.
- **--always-record-login-attr lastLoginTime**: Configures that the Account Policy plug-in stores the last login time in the **lastLoginTime** attribute of users.
- **--state-attr *non_existent_attribute***: Sets the primary time attribute used to evaluate an account policy to a non-existent dummy attribute name.
- **--alt-state-attr `passwordExpirationTime**: Configures the plug-in to use the **passwordExpirationTime** attribute as the alternative attribute to check.
- **--spec-attr acctPolicySubentry**: Configures Directory Server to apply the policy to entries that have the **acctPolicySubentry** attribute set. You configure this attribute in the CoS entry.
- **--limit-attr accountInactivityLimit**: Configures that the **accountInactivityLimit** attribute in the account policy entry stores the time when accounts are inactivated after their last password change.

4. Restart the instance:

```
# dsctl instance_name restart
```

5. Create the account inactivation policy entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=Account Inactivation Policy,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectClass: extensibleObject
objectClass: accountpolicy
accountInactivityLimit: 2419200
cn: Account Inactivation Policy
```

The value in the **accountInactivityLimit** attribute configures that Directory Server inactivates accounts **2419200** seconds (28 days) after the password was changed.

6. Create the CoS template entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=TemplateCoS,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectClass: extensibleObject
objectClass: cosTemplate
acctPolicySubentry: cn=Account Inactivation Policy,dc=example,dc=com
```

This template entry references the account inactivation policy.

7. Create the CoS definition entry:

```
# ldapadd -D "cn=Directory Manager" -W -H ldap://server.example.com -x

dn: cn=DefinitionCoS,dc=example,dc=com
objectClass: top
objectClass: ldapsubentry
objectclass: cosSuperDefinition
objectclass: cosPointerDefinition
cosTemplateDn: cn=TemplateCoS,dc=example,dc=com
cosAttribute: acctPolicySubentry default operational-default
```

This definition entry references the CoS template entry and causes that the **acctPolicySubentry** attribute appears in each user entry with a value set to **cn=Account Inactivation Policy,dc=example,dc=com**.

Verification

1. Set the **passwordExpirationTime** attribute of a user to a value that is older than the inactivity time you configured:

```
# ldapmodify -H ldap://server.example.com -x -D "cn=Directory Manager" -W

dn: uid=example,ou=People,dc=example,dc=com
changetype: modify
replace: passwordExpirationTime
passwordExpirationTime: 20210101000000Z
```

2. Try to connect to the directory as a this user:

```
# ldapsearch -H ldap://server.example.com -x -D
"uid=example,ou=People,dc=example,dc=com" -W -b "dc=example,dc=com"
ldap_bind: Constraint violation (19)
 additional info: Account inactivity limit exceeded. Contact system administrator to reset.
```

If Directory Server denies access and returns this error, account inactivity works.

Additional resources

- Re-enabling accounts that reached the inactivity limit

CHAPTER 4. RE-ENABLING ACCOUNTS THAT REACHED THE INACTIVITY LIMIT

If Directory Server inactivated an account because it reached the inactivity limit, an administrator can re-enable the account.

4.1. RE-ENABLING ACCOUNTS INACTIVATED BY THE ACCOUNT POLICY PLUG-IN

You can re-enable accounts using the **dsconf account unlock** command or by manually updating the **lastLoginTime** attribute of the inactivated user.

Prerequisites

- An inactivated user account.

Procedure

- Reactivate the account using one of the following methods:
  - Using the **dsconf account unlock** command:

    ```
    # dsidm -D "cn=Directory manager" ldap://server.example.com -b
    "dc=example,dc=com" account unlock
    "uid=example,ou=People,dc=example,dc=com"
    ```

  - By setting the **lastLoginTime** attribute of the user to a recent time stamp:

    ```
    # ldapmodify -H ldap://server.example.com -x -D "cn=Directory Manager" -W

    dn: uid=example,ou=People,dc=example,dc=com
    changetype: modify
    replace: lastLoginTime
    lastLoginTime: 20210901000000Z
    ```

Verification

- Authenticate as the user that you have reactivated. For example, perform a search:

  ```
  # ldapsearch -H ldap://server.example.com -x -D
  "uid=example,ou=People,dc=example,dc=com" -W -b "dc=example,dc=com -s base"
  ```

  If the user can successfully authenticate, the account was reactivated.

CHAPTER 5. TRACKING THE LAST LOGIN TIME WITHOUT SETTING A LOCKOUT POLICY

You can use the Account Policy plug-in to track user login times without setting an expiration time or inactivity period. In this case, the plug-in adds the **lastLoginTime** attribute to user entries.

5.1. CONFIGURING THE ACCOUNT POLICY PLUG-IN TO RECORD THE LAST LOGIN TIME

Follow this procedure to record the last login time of users in the **lastLoginTime** attribute of user entries.

Procedure

1. Enable the Account Policy plug-in:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy enable
```

2. Create the plug-in configuration entry to record login times:

```
# dsconf -D "cn=Directory Manager" ldap://server.example.com plugin account-policy config-entry set "cn=config,cn=Account Policy Plugin,cn=plugins,cn=config" --always-record-login yes --state-attr lastLoginTime
```

   This command uses the following options:

   - **--always-record-login yes**: Enables logging of the log in time.
   - **--state-attr lastLoginTime**: Configures that the Account Policy plug-in stores the last log in time in the **lastLoginTime** attribute of users.

3. Restart the instance:

```
# dsctl instance_name restart
```

Verification

1. Log in to Directory Server as a user. For example, run a search:

```
# ldapsearch -H ldap://server.example.com -x -D "uid=example,ou=People,dc=example,dc=com" -W -b "dc=example,dc=com"
```

2. Display the **lastLoginTime** attribute of the user you used in the previous step:

```
# ldapsearch -H ldap://server.example.com -x -D "cn=Directory Manager" -W -b "uid=example,ou=people,dc=example,dc=com" lastLoginTime
...
dn: uid=example,ou=People,dc=example,dc=com
lastLoginTime: 20210913091435Z
```

If the **lastLoginTime** attribute exists and Directory Server updated its value, recording of the last login time works.