

# Configuring Oracle Database Clients for Microsoft Active Directory Naming

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Centralizing network names and addresses in Microsoft Active Directory

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### 1. Introduction

When applications connect to Oracle Database, they need to use a connect descriptor that contains information such as the host and service name of the database. The connect descriptor can be specified by the application in various ways. For example, it can be hard coded in the application connection request or the application can pass an identifier that is mapped to a connect descriptor stored in a `tnsnames.ora` configuration file. An alternative to using a `tnsnames.ora` file is for the connect descriptor to be looked up using an external mapping service. One of the available services is Directory Naming.

Directory Naming centralizes network names and addresses in a single place, facilitating easy administration of name changes and updates. This eliminates the need administrators to change connect descriptors stored in `tnsnames.ora` files. In large organizations there could be hundreds, or even thousands, of database applications and `tnsnames.ora` files.

This document describes configuration steps needed to achieve name resolution from Microsoft Active Directory (AD).

### 2. Extending the Active Directory Schema for Oracle Net Naming

The AD schema should be extended with Oracle Database Client naming specific schema attributes. This schema extension should be done only once per AD Domain or AD Domain Forest.

Windows client machines that are part of an AD Domain can be configured to use Directory Naming with native binding (i.e. using Operating system credentials for logging into AD).

To extend the AD schema:

1. Run the Oracle Net Configuration Assistant tool (“NetCA”) as the Active Directory administrator on one of the Windows Domain client machines or on the Active Directory server. The Oracle Database Client needs to be installed first.

Run NetCA by opening the “Start” menu and then, from “Configuration and Migration Tools”, selecting “Net Configuration Assistant”.

2. Open the “Active Directory in Directory Usage” configuration screen.
3. Choose the schema creation option.

Upon successful completion, AD can now be used to store Oracle Net naming objects and attributes.

### 3. Setting up clients for Active Directory Naming

Use NetCA to create the client configuration file to use Directory Naming. This tool allows you to select a naming context which will contain an OracleContext object. All Directory Naming objects will be created under the OracleContext.

To start configuration:

1. Invoke NetCA from the Start menu as described previously.
2. Select the “Directory Usage Configuration” option.
3. In the Directory Type dropdown, select “Active Directory” .
4. Enter the AD Server details.
5. Select a naming context.

On completion, NetCA creates a file ldap.ora in the Oracle home network\admin subdirectory.

An example ldap.ora file is:

```
DEFAULT_ADMIN_CONTEXT = "DC=example,DC=com"  
DIRECTORY_SERVER_TYPE = AD
```

Copy the ldap.ora file to all the client machines that will use directory naming, or alternatively run NetCA again on all those machines.

For reference, the Oracle Net Configuration Assistant documentation is [here](#).

### 4. Creating Entries in Directory Servers

To create and manage naming entries in your directory server you must first create one directory user. This user manages the naming entries stored in the OracleContext set up above. Follow the [directory server documentation](#) to create a user. The examples below assume the name is "mynaminguser".

You can then use the Oracle Net Manager tool (“NetManager”) or use command line tools to create and manage naming entries as shown in the next sections.

#### 4.1 Creating naming entries with Oracle Net Manager

Follow these steps:

1. Run NetManager by opening the “Start” menu and then from “Configuration and Migration Tools”, select “Net Manager”.

If the ldap.ora file created in section 3 is in place then NetManager will show a Directory icon in the tree navigator.

If there is still no Directory subtree, use the command line tools in section 4.2

2. Click and expand the Directory subtree.  
You will be prompted for a directory server user's credentials. Enter the credentials created at the start of section 4.
3. Select the Service Naming subtree.
4. Click the Green Plus icon on the left hand menu.
5. Follow the Net Service Name wizard prompts to create a net service name and descriptor in the directory server.

For more information, see the Oracle Net Manager [documentation](#).

## 4.2 Creating naming entries using command line tools

An alternative to Oracle Net Manager is to use LDAP command line tools like `ldapadd` and `ldapdelete`.

For example to add an alias "sales", create a file `sales.ldif` as shown below:

```
dn: cn=sales,cn=oraclecontext,dc=example,dc=com
objectclass: top
objectclass: orclNetService
orclnetdescstring:
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=databasehost)(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=mydbservice.us.example.com)))
cn: sales
```

This example assumes OracleContext is under "dc=example,dc=com". Adjust `orclnetdescstring` to use your Oracle Database host, port and service name.

Then run `ldapadd` using the syntax:

```
ldapadd -h <ldap host> -p <ssl port> -D <Bind DN> -U 2 -q \
-Q -W file:<wallet directory> -f <ldif file>
```

For example:

```
ldapadd -h mydirectoryserverhost -p 636 \
-D "cn=mynaminguser,dc=example,dc=com" -U 2 -q \
-Q -W file:C:\oracle\wallets -f sales.ldif
```

If you are using TLS 1.2 two-way authentication, then the option `-U 3` should be used instead.

To delete entries, use the `ldapdelete` command. The syntax is similar to `ldapadd` but you specify the alias to be deleted:

```
ldapdelete -h <ldap host> -p <ssl port> -D <Bind DN> -U 2 -q \
-Q -W file:<wallet directory> <alias DN>
```

For example:

```
ldapdelete -h mydirectoryserverhost -p 636 \
-D "cn=mynaminguser,dc=example,dc=com" -U 2 -q \
-Q -W file:C:\oracle\wallets sales
```

Again, `-U 3` can be used if you are using TLS 1.2 two-way authentication.

## 5. Client-side configuration for Directory Naming

Continue configuring the client machines.

### 5.1 Enabling the naming method lookup

On all machines that will use directory naming, create or edit a `sqlnet.ora` configuration file. This file should be in the same directory as your `ldap.ora` file from section 3.

In the `sqlnet.ora` file, add LDAP to the `NAMES.DIRECTORY_PATH` parameter. Application connection descriptors are evaluated in order of the given naming methods in that parameter. For example, to try LDAP first, and then fallback to using Easy Connect syntax, and finally look up the connection string in a `tnsnames.ora` file:

```
NAMES.DIRECTORY_PATH = (LDAP, EZCONNECT, TNSNAMES)
```

If you do not have a `NAMES.DIRECTORY_PATH` entry, LDAP will still be used but will not be considered first.

### 5.2 Directory Server Authentication

By default, directory naming does anonymous binding. However if the directory server has disabled anonymous binding, then you should configure authentication to the directory server in one of the two following ways.

#### 5.2.2 Active Directory Windows native authentication

With Active Directory, database clients can use Windows login credentials for directory authentication.

For example, add these lines to `sqlnet.ora`:

```
NAMES.DIRECTORY_PATH = (LDAP, TNSNAMES, EZCONNECT)
NAMES.LDAP_AUTHENTICATE_BIND = TRUE
```

#### 5.2.3 Username and password-based authentication

Alternatively, instead of using native authentication, you can use a username and password to access the AD server. This authentication method is also available to non-Microsoft Windows applications using AD. Applications must use Oracle Database 21c (or later) client libraries.

With this method, the directory server username and password are stored in a wallet. The client authenticates by passing these credentials over a one-way TLS connection to the directory server.

Edit your `sqlnet.ora` files to enable authenticated binding and set the bind method. For example, add these lines to the files:

```
NAMES.LDAP_AUTHENTICATE_BIND = TRUE
NAMES.LDAP_AUTHENTICATE_BIND_METHOD = LDAPS_SIMPLE_AUTH
WALLET_LOCATION =
  (SOURCE = (METHOD = FILE)
    (METHOD_DATA =
      (DIRECTORY = <wallet directory>)
    )
  )
```

Obtain the Directory Server certificate root CA certificate and store it in a wallet as shown below. The username and password will also need to be added.

1. Create a wallet, if you do not already have one:  

```
orapki wallet create \  
-wallet <directory to create the wallet in>
```
2. Add the certificate to the wallet:  

```
orapki wallet add -wallet <wallet directory> \  
-trusted_cert -cert <root CA certificate>
```
3. Add the username:  

```
mkstore -wrl <wallet directory> -createEntry \  
oracle.ldap.client.dn <DN of the user>
```

For example:

```
mkstore -wrl /app/wallet -createEntry \  
oracle.ldap.client.dn "cn=user1,dc=acme,dc=com"
```

With Active Directory, the DN user name can also be a User Principal Name or Down Level Logon Name (also known as an SAMAccountName).

For example, when foo is the domain name and user1 is the user name:

```
mkstore -wrl C:\oracle\wallets -createEntry \  
oracle.ldap.client.dn "foo\user1"
```

or

```
mkstore -wrl C:\oracle\wallets -createEntry \  
oracle.ldap.client.dn "user1@foo"
```
4. Add the password of the user:  

```
mkstore -wrl <wallet directory> -createEntry \  
oracle.ldap.client.password <password>
```
5. Make the wallet an auto-logon wallet:  

```
orapki wallet create -wallet <wallet directory> \  
-auto_login
```

## 6. Testing a connection

Configuration of the naming server is complete. You can verify connections by running SQL\*Plus from one of your configured client machines. Make sure the network configuration files are in a default location, or that you have set the environment variable TNS\_ADMIN to the directory that contains them. If you have a database user "scott" and have an alias "sales" in a sales.ldr file, you would connect like:

```
sqlplus scott@sales
```

## 7. Conclusion

This technical brief has shown how to configure Oracle Database clients for Microsoft Active Directory Naming.

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