

UNIT 6

Configure the Oracle Network Environment

(5 Hours) — Database Administration (CACS405)

*Note: These notes are prepared for study purposes and **may contain errors or omissions**. Syntax, file paths and screen names differ between Oracle versions and operating systems (examples here follow Oracle 19c on Linux). Please verify important points with your textbook, class notes and the official Oracle documentation, and test commands on a practice database, never on a production system.*

6.1 Overview of Network Configuration

Oracle Net Services lets client applications connect to Oracle databases over a network. It works with the TCP/IP protocol (and TCP/IP with SSL) and hides network details from the application. The main pieces are a **listener** on the server, **connect descriptors / net service names** on the client, and configuration files.

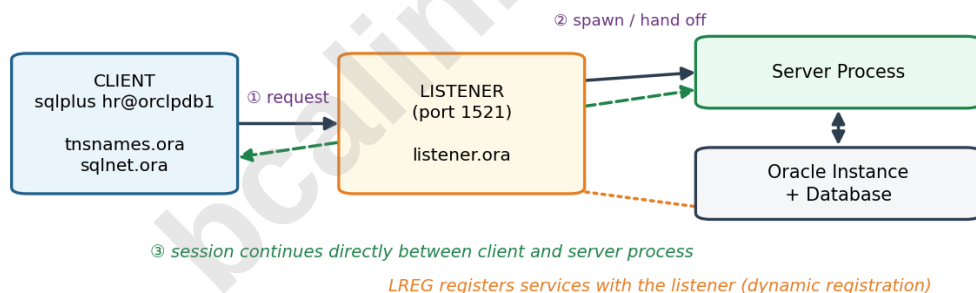


Figure 6.1: How a client connects through the Oracle Net listener

File	Located on	Purpose
listener.ora	Server	Defines the listener: name, protocol addresses (host, port) and optional static service registration.
tnsnames.ora	Client (and server)	Maps net service names (aliases) to connect descriptors.
sqlnet.ora	Client and server	Profile settings: naming method order, timeouts, tracing, encryption, etc.
ldap.ora	Client	Directory server details when directory naming is used.

These files are in `$ORACLE_HOME/network/admin` by default, or in the directory named by the environment variable `TNS_ADMIN`.

A **connect descriptor** contains the address of the listener (protocol, host, port) and the name of the database **service** (`SERVICE_NAME`). A **service** is a logical name for the database (or PDB). Modern configurations use service names; the older `SID` method is only for special cases. The default listener port is **1521**.

Tool	Type	Purpose
Net Configuration Assistant (<code>netca</code>)	GUI / silent	Creates the listener, naming methods and net service names.
Oracle Net Manager (<code>netmgr</code>)	GUI	Edits <code>sqlnet.ora</code> , <code>tnsnames.ora</code> and <code>listener.ora</code> through a graphical interface.
Listener Control (<code>lsnrctl</code>)	Command line	Starts, stops and monitors the listener.
<code>tnsping</code>	Command line	Tests whether a net service name can be resolved and its listener reached.
Enterprise Manager	Web	Manages listeners and net services from a browser.

6.2 Oracle Net Listener Configuration and Management

The **listener** is a separate process on the database server that waits for connection requests on a port. When a request arrives, the listener (1) checks that the requested service is registered, (2) starts or selects a server process (in **dedicated server** mode) or passes the request to a **dispatcher** (in **shared server** mode), and (3) steps out of the way: the client then communicates directly with the server process.

6.2.1 Service Registration

- **Dynamic registration:** the instance (LREG process; PMON in older versions) automatically registers its services with the listener at startup and every few seconds. Works with the default listener on port 1521 or when `LOCAL_LISTENER` is set. This is the normal method and needs no `SID_LIST` entry.
- **Static registration:** services are listed manually in `listener.ora` using `SID_LIST_LISTENER`. Required for some tools (e.g. connecting while the database is down, Data Guard, Enterprise Manager).

```
# listener.ora (server)
LISTENER =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP) (HOST = dbserver.example.com) (PORT = 1521))
    )
  )

# optional static registration
SID_LIST_LISTENER =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = orcl.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/19.0.0/dbhome_1)
      (SID_NAME = ORCL)
    )
  )
)
```

Listing 6.1: A sample listener.ora

The database parameter `LOCAL_LISTENER` tells the instance where the listener is when it uses a non-default port or name; `ALTER SYSTEM REGISTER;` forces immediate registration.

6.2.2 Controlling the Listener with lsnrctl

Command	Meaning
<code>lsnrctl start [name]</code>	Start the listener (default name LISTENER).
<code>lsnrctl stop [name]</code>	Stop the listener. Existing connections continue; new ones fail.
<code>lsnrctl status [name]</code>	Show listener status, start time, log location and the services it knows.
<code>lsnrctl services [name]</code>	Show services and handlers, with connection counts.
<code>lsnrctl reload [name]</code>	Re-read <code>listener.ora</code> without stopping.
<code>lsnrctl show / set</code>	View or change parameters of a running listener.

```
$ lsnrctl start
$ lsnrctl status
LSNRCTL for Linux: Version 19.0.0.0.0
Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=dbserver) (PORT=1521)))
STATUS of the LISTENER
-----
Alias                     LISTENER
Listener Log File         .../diag/tnslsnr/dbserver/listener/alert/log.xml
Listening Endpoints Summary...
Services Summary...
Service "orcl.example.com" has 1 instance(s).
  Instance "ORCL", status READY, has 1 handler(s) for this service...
The command completed successfully
$ lsnrctl stop
```

Listing 6.2: Viewing listener configuration and status (output shortened)

The **status** of a service should be **READY** (accepting connections). **BLOCKED** or **UNKNOWN** status indicates a problem or a static-only entry. The listener log (`log.xml` and trace files in the ADR) records connection attempts and errors.

6.3 Oracle Net Naming Methods

A **naming method** is the way a client resolves a name entered in a connect string (such as `orclpdb1`) into a full connect descriptor. The order of methods is set in `sqlnet.ora`:

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

Listing 6.3: sqlnet.ora naming order

Method	Description	Advantage / limitation
Local naming (TNSNAMES)	Aliases stored in a local <code>tnsnames.ora</code> file.	Simple; must be maintained on every client.
Easy Connect (EZCONNECT)	Client supplies host, port and service directly: <code>host:port/service</code> .	No configuration file needed; good for quick connections.
Directory naming (LDAP)	Names are stored in a central LDAP directory.	Central administration for many clients; needs a directory server.
External naming	Uses a third-party naming service (e.g. NIS).	Rarely used.

```
# tnsnames.ora (client)
ORCLPDB1 =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST = dbserver.example.com) (PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = orclpdb1.example.com)
    )
  )
```

Listing 6.4: A net service name in tnsnames.ora

```
$ sqlplus hr/hr_pwd@orclpdb1 -- local naming
$ sqlplus hr/hr_pwd@//dbserver.example.com:1521/orclpdb1 -- Easy Connect
```

Listing 6.5: Using the two most common methods

Note: Easy Connect in 19c also supports extra options ("Easy Connect Plus"), for example a protocol or timeout in the connect string.

6.4 Net Configuration Assistant, Net Manager and Enterprise Manager

6.4.1 Net Configuration Assistant (NETCA)

NETCA (`netca`) is a wizard that configures the basic network files. Its main options are:

- **Listener configuration** — add, reconfigure, delete or rename a listener (name, protocol, port).
- **Naming methods configuration** — choose which naming methods clients will use.
- **Local Net Service Name configuration** — add, modify, delete, rename or *test* net service names in `tnsnames.ora`.
- **Directory Usage configuration** — set up LDAP directory access.

It can also be run in silent mode with a response file: `netca -silent -responsefile netca.rsp`.

6.4.2 Configuring Client Connections with Oracle Net Manager

Oracle Net Manager (`netmgr`) is a graphical tool with a tree of **Profile** (`sqlnet.ora`), **Service Naming** (`tnsnames.ora`) and **Listeners** (`listener.ora`). Steps to create a net service name:

- Start `netmgr`; expand **Local** → **Service Naming**.
- Click the **+** (Create) button and enter a net service name, e.g. `ORCLPDB1`.
- Select the protocol **TCP/IP**; enter the host name and port number.
- Enter the **service name** of the database and the connection type (Database Default / Dedicated).
- Use **Test** to check the connection; then choose **File** → **Save Network Configuration**.

6.4.3 Configuring Net Services with Enterprise Manager

In Oracle Enterprise Manager (Cloud Control) the listener is a monitored **target**. From the listener's home page an administrator can view its status and services, start or stop it, and change its configuration (addresses, logging, registration). Net service names for a client can also be managed from the database's administration menus. Menu names differ between EM versions, so check the documentation for your version. (EM Database Express in 19c is a lightweight tool with limited network features.)

6.5 Testing Connectivity: TNSPING and Connecting

`tnsping` checks whether the listener at the address for a given net service name can be reached. It does **not** check that the database is open, that the service exists, or that the user name and password are valid.

```
$ tnsping orclpdb1 3
TNS Ping Utility for Linux: Version 19.0.0.0.0
Used TNSNAMES adapter to resolve the alias
Attempting to contact (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=dbserver) ...
OK (10 msec)
OK (0 msec)
OK (10 msec)
```

Listing 6.6: TNSPING output (shortened)

```
$ sqlplus hr/hr_pwd@orclpdb1
SQL> SHOW USER
SQL> SELECT sys_context('USERENV','SERVICE_NAME') service,
           sys_context('USERENV','SERVER_HOST') host FROM dual;
```

Listing 6.7: Connecting to the database and checking the service

6.5.1 Common Connection Errors

Error	Likely cause	What to check
ORA-12154: TNS:could not resolve the connect identifier	Alias not found	Spelling; <code>tnsnames.ora</code> location and <code>TNS_ADMIN</code> ; <code>NAMES.DIRECTORY_PATH</code> .
ORA-12541: TNS:no listener	Listener is not running or wrong host/port	<code>lsnrctl status</code> ; firewall; port number.
ORA-12514: listener does not currently know of service requested	Service not registered	Service name spelling; database open; <code>ALTER SYSTEM REGISTER</code> ; <code>LOCAL_LISTENER</code> .
ORA-12505: listener does not currently know of SID	SID used instead of service, or not registered	Use <code>SERVICE_NAME</code> ; check <code>lsnrctl services</code> .
ORA-01017: invalid username/password	Connected but credentials are wrong	User name, password, case sensitivity, account status.
ORA-12170 / ORA-12535: connect timeout	Network or firewall blocking	Ping/route; firewall rules.

Example 6.1

A user reports ORA-12541 when connecting. `tnsping` also fails. What are the first steps?

Solution

ORA-12541 means nothing is listening at that host and port.

1. Log in to the server and run `lsnrctl status`; if the listener is down, run `lsnrctl start`.
2. Confirm host name and port in `tnsnames.ora` match `listener.ora`.
3. Check that the firewall allows the port. Then run `tnsping` again and retry the login.

6.6 Dedicated and Shared Server Connections

In **dedicated server** mode each session gets its own server process — the default and best for most systems. In **shared server** mode, sessions share a pool of server processes through **dispatchers**, saving memory when there are very many mostly idle connections. It is configured with parameters such as `DISPATCHERS` and `SHARED_SERVERS`, and a client can force a dedicated connection with `(SERVER = DEDICATED)` in `CONNECT_DATA`.

Key Takeaways

- ✓ Oracle Net uses **listener.ora** (server), **tnsnames.ora** and **sqlnet.ora** (client); default port is **1521**.
- ✓ The listener accepts requests, then the client talks directly to the server process; services register **dynamically** (LREG) or statically.
- ✓ `lsnrctl start | stop | status | services | reload` manage the listener.
- ✓ Naming methods: **local (tnsnames)**, **Easy Connect**, **directory (LDAP)**, external; order set by `NAMES.DIRECTORY_PATH`.
- ✓ Tools: **NETCA**, **Net Manager** and **Enterprise Manager** configure the network; **tnsping** tests listener reachability only.
- ✓ Know the common errors: ORA-12154 (resolve), ORA-12541 (no listener), ORA-12514 (service unknown), ORA-01017 (bad password).

Reminder: these notes may contain errors — cross-check with the official syllabus, your textbook and Oracle documentation.

— End of Unit 6 —