Enterprise DBA Part 3: Network Administration

Slides

30051GC10
Production 1.0
August 1999
M09127

ORACLE®

Author

Sharaaz Khan

Technical Contributors and Reviewers

Peter Kilpatrick

Bruce Ernst

Hanne Rasmussen

A. J. Vos

Mary Bryksa

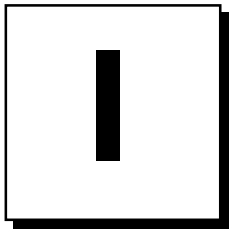
Joel Goodman

Andrew Philips

Alexander Hunold

Publisher

Tommy Cheung



Introduction

Objectives

At the end of this course, you should be able to do the following:

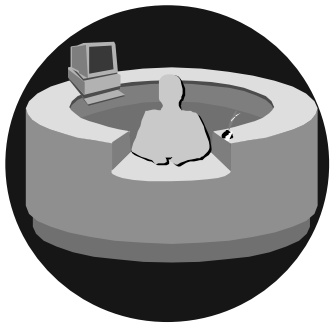
- **Identify network trends and problems, and provide solutions for them**
- **Define the Net8 architectural layers**
- **Configure a simple client and server, and establish a connection between them**
- **Configure and start a Names server and use it to resolve a service name**

Objectives

- Configure and start up a multithreaded server
- Configure the Connection Manager and use it for pooling connections and restricting clients from connecting
- Analyze and troubleshoot Net8 problems using log files, trace files, and Trace Assistant
- Identify network security risks and their solutions and configure data encryption using the Oracle Advanced Security option

Database Administrator Tasks

- Planning the network environment
- Enabling connectivity
- Managing the network
- Ensuring network security
- Troubleshooting the network



- Database administration
- Backup and recovery
- Database tuning

Suggested Course Schedule

Day	Start	End
1	Lesson 1	Lesson 5
2	Lesson 6	Lesson 10

1

Networking Overview

ORACLE®

Objectives

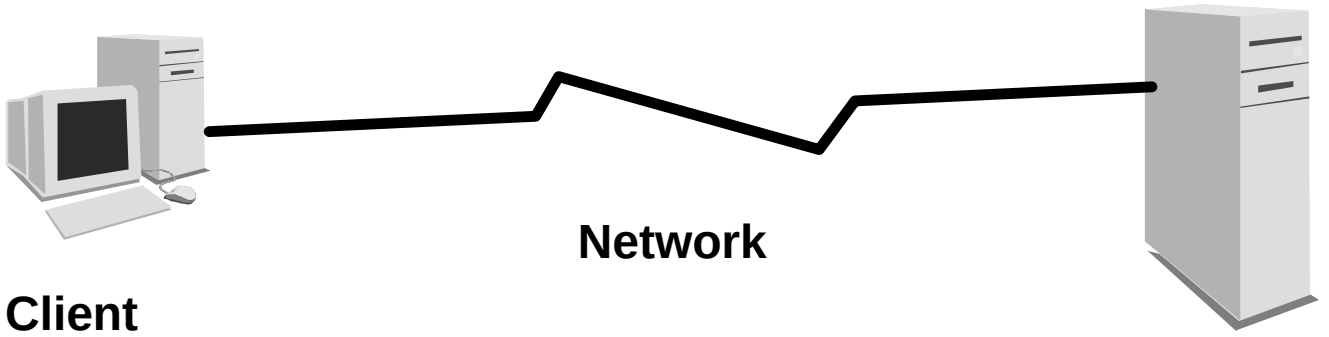
After completing this lesson, you should be able to do the following:

- **Identify networking business trends**
- **Describe Oracle networking solutions**

Network Environment Challenges

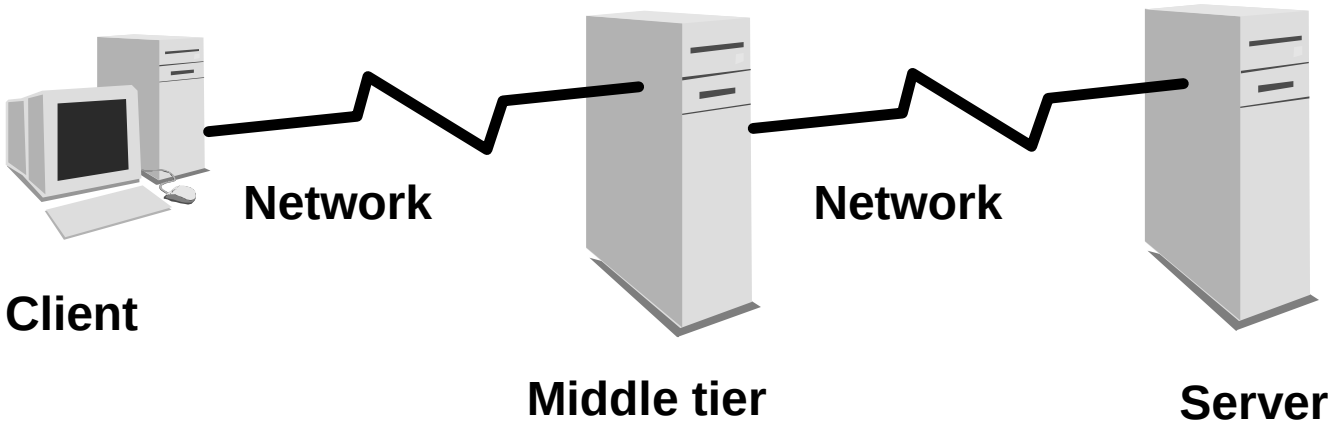
- Configuring the network environment
- Maintaining the network
- Tuning, troubleshooting, and monitoring the network
- Implementing security in the network
- Integrating legacy systems

Simple Network: Two-Tier



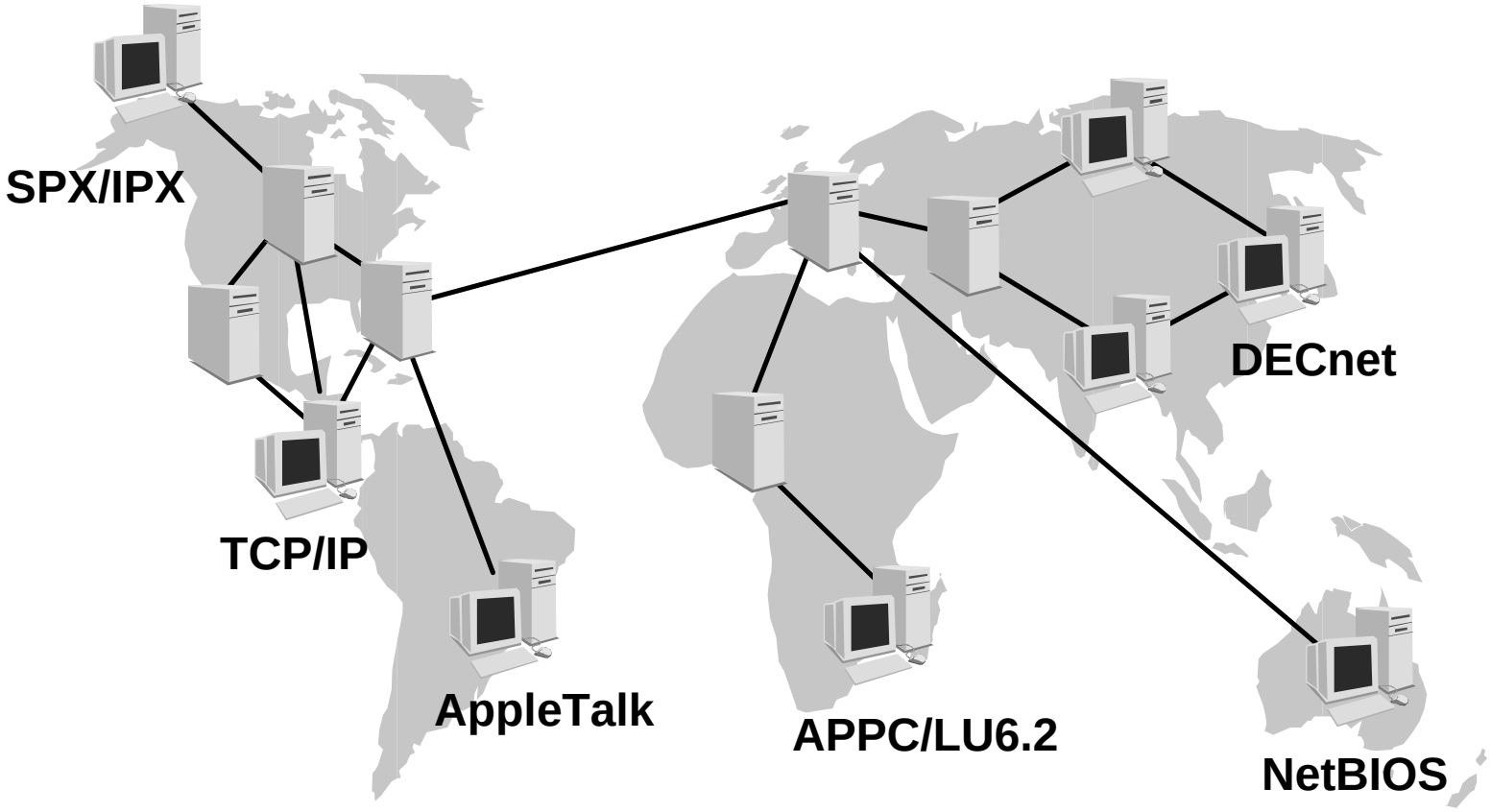
- Network connects client and server
- Client and server speak the same “language” or protocol

Simple to Complex Network: *N*-Tier



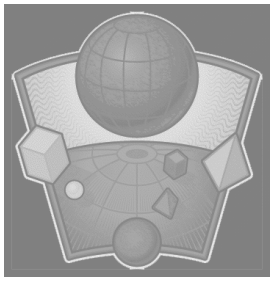
- Client can be a thin client or a PC
- Middle tier can contain applications and services
- Server holds actual data

Complex Network



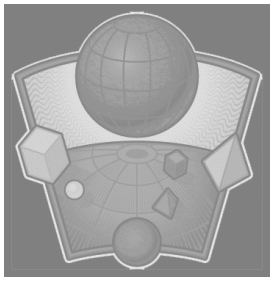
Oracle’s Solutions

- Net8
- Oracle Names server
- Connection Manager
- Advanced Security option
- Open Gateways

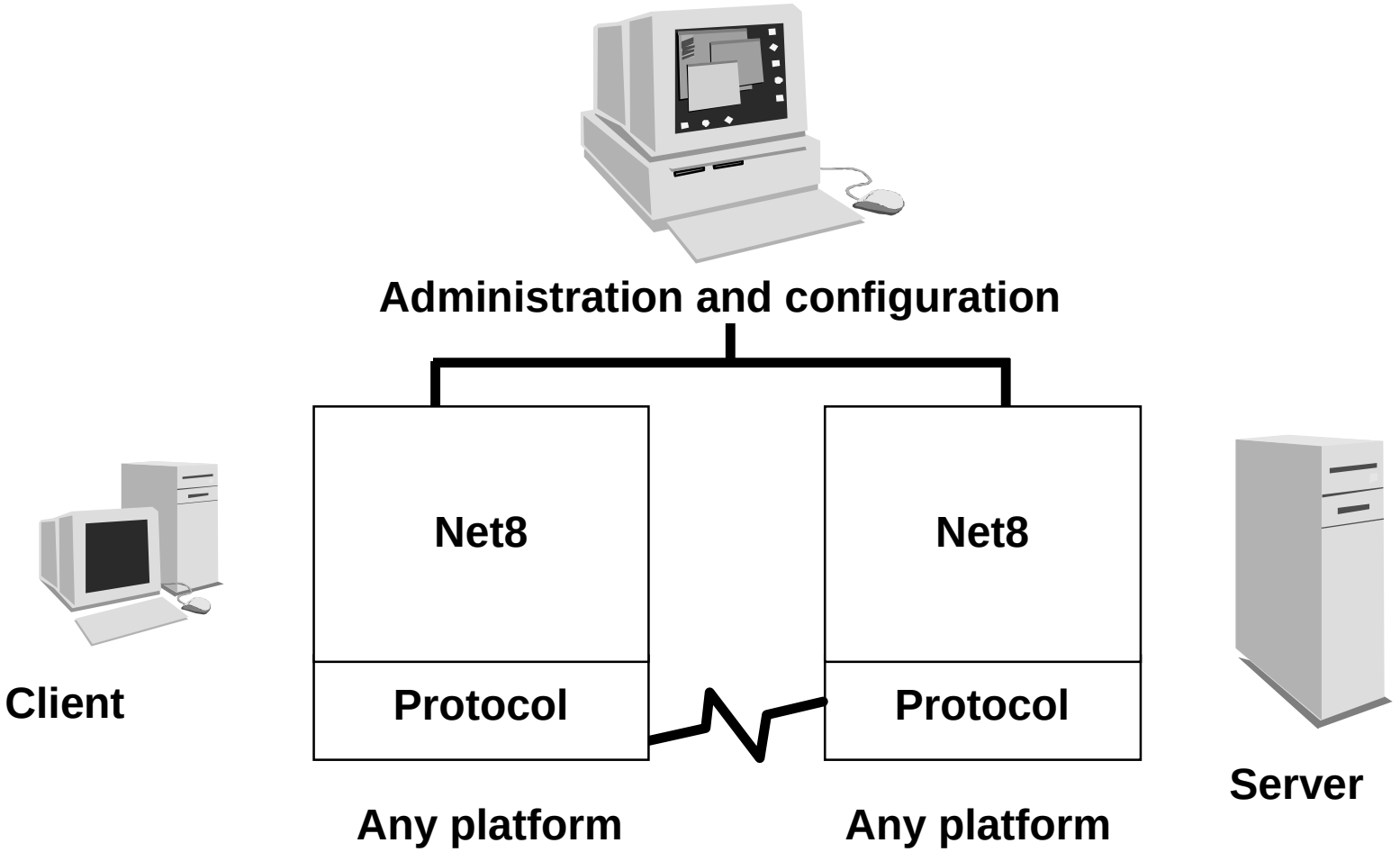


Oracle’s Solutions: Net8

- Protocol independence
- Comprehensive platform support
- Integrated GUI administration tools
- Multiple configuration options
- Tracing and diagnostic toolset
- Open API
- Basic security



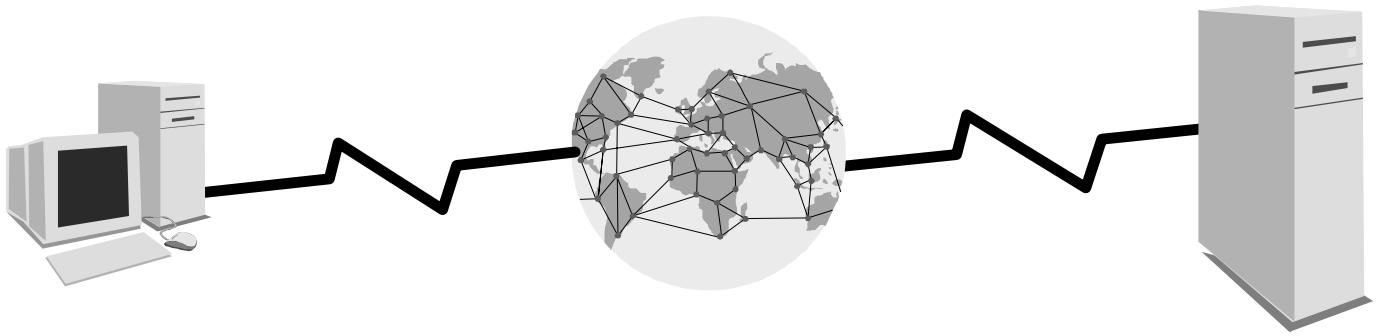
Oracle’s Solutions: Net8



Oracle's Solutions: Internet Database Connectivity

In Oracle8*i*, database connectivity can be achieved using the following additional protocols:

- **Internet Inter-ORB Protocol (IIOP)**
- **Hypertext Transfer Protocol (HTTP)**

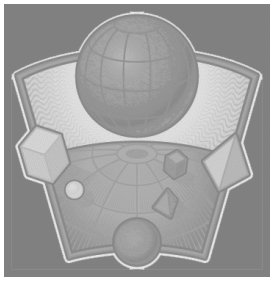


Web browser **IIOP, HTTP** **Oracle8*i***

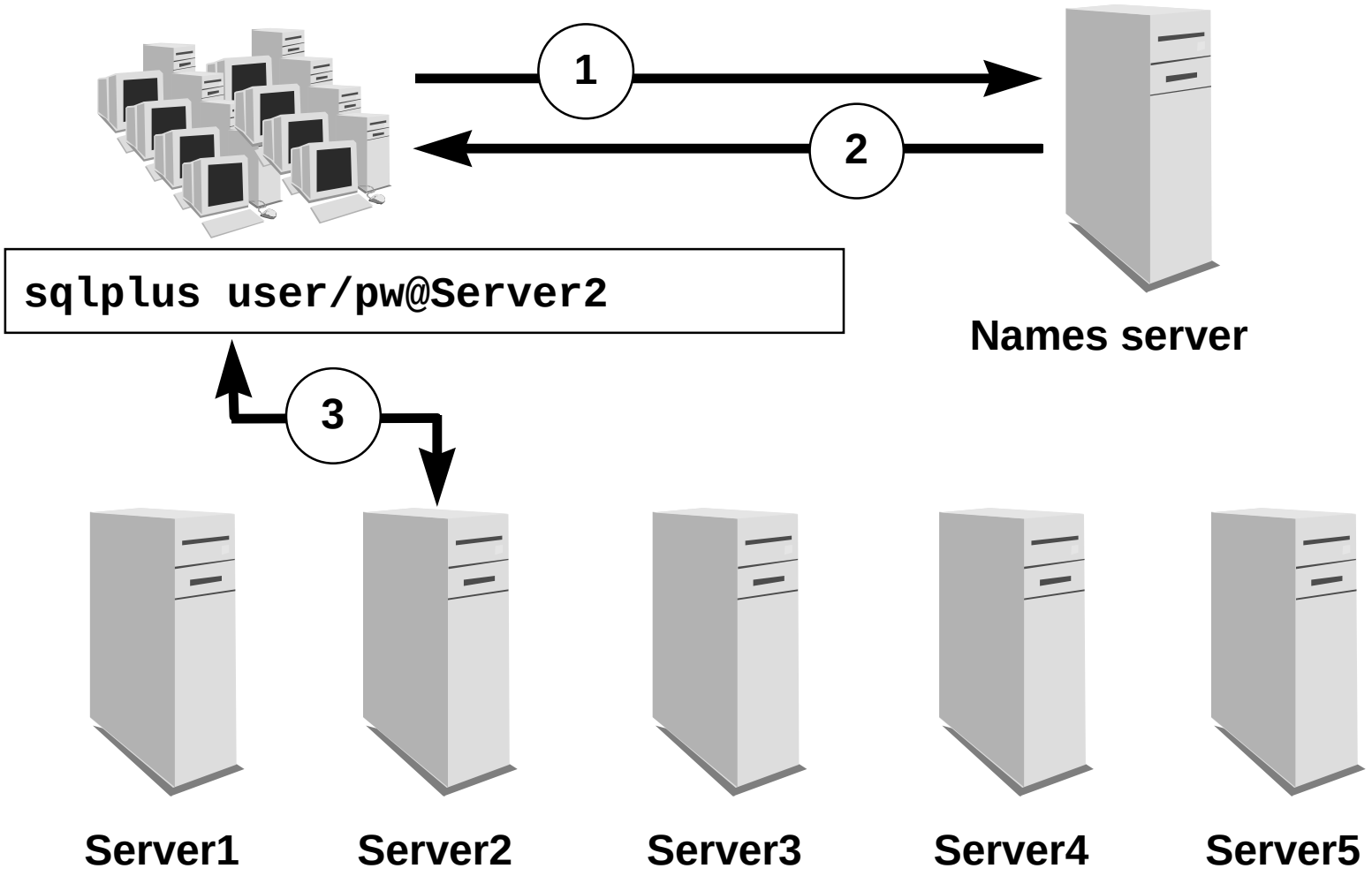
Oracle’s Solutions: Oracle Names

Oracle Names offers:

- **Centralized configuration**
- **Simplified network administration**



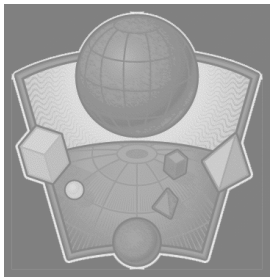
Oracle’s Solutions: Oracle Names



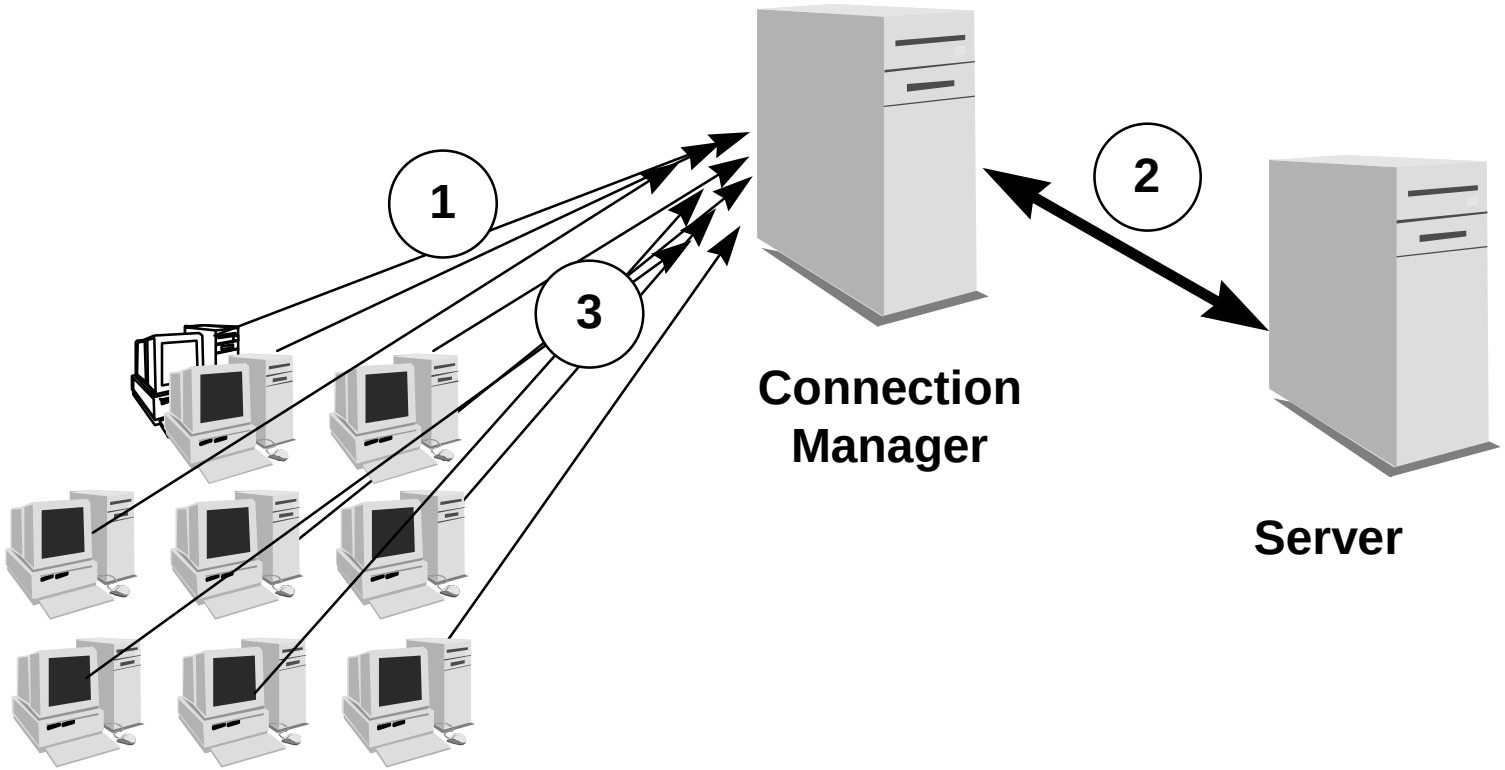
Oracle's Solutions: Connection Manager

Connection Manager offers:

- **Multiplexing of connections**
- **Cross-protocol connectivity**
- **Network access control**

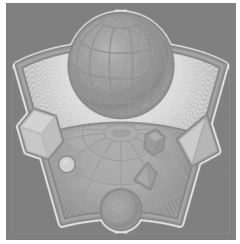


Oracle's Solutions: Connection Manager

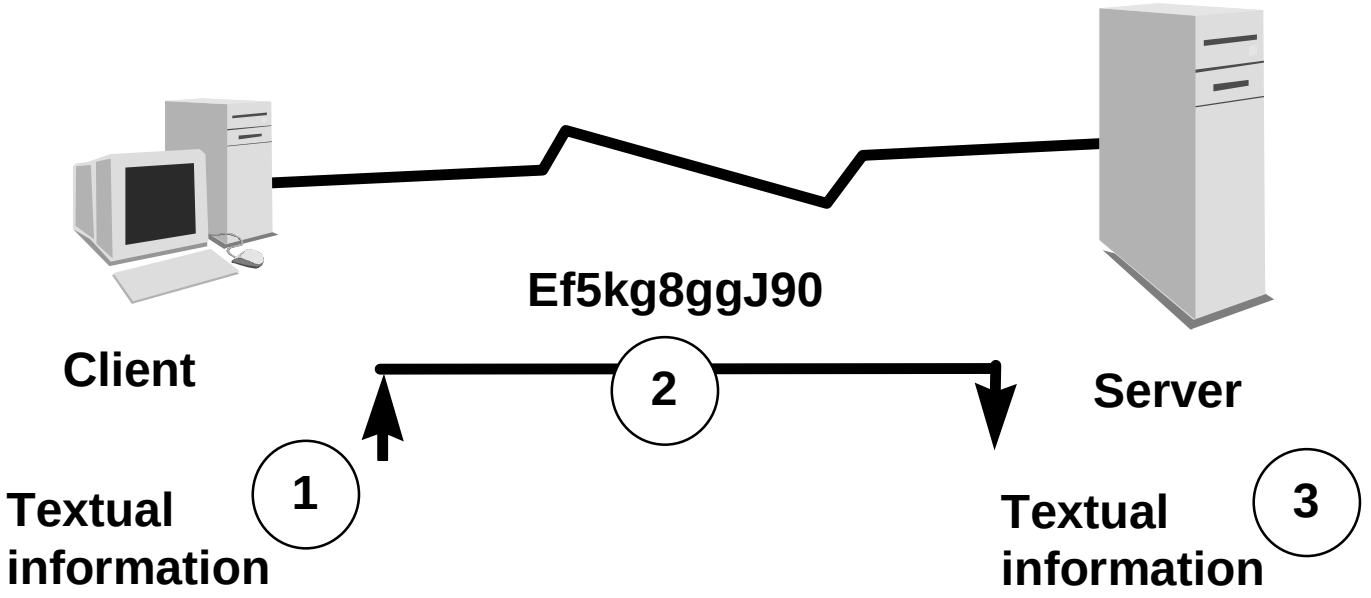


Oracle's Solutions: Advanced Security Option

- Network security using encryption
- Integration with third-party security servers
- DCE Integration

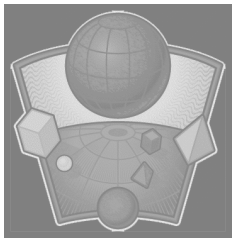


Oracle's Solutions: Advanced Security Option



Oracle's Solutions: Open Gateways

- **You can access legacy data as if it resides in a single, local relational database.**
- **Open Gateways offers:**
  - **Transparent gateways**
  - **Procedural gateways**



Summary

In this lesson, you should have learned:

- **Net8 includes:**
  - **Net8**
  - **IIOP and HTTP Connectivity**
  - **Oracle Names**
  - **Connection Manager**
- **Add-on products:**
  - **Advanced Security Option**
  - **Gateways**

2

Basic Net8 Architecture

ORACLE®

Objectives

After completing this lesson, you should be able to do the following:

- **Define the procedure by which Net8 establishes a server connection**
- **Identify the key components of Net8 architecture and their interaction**

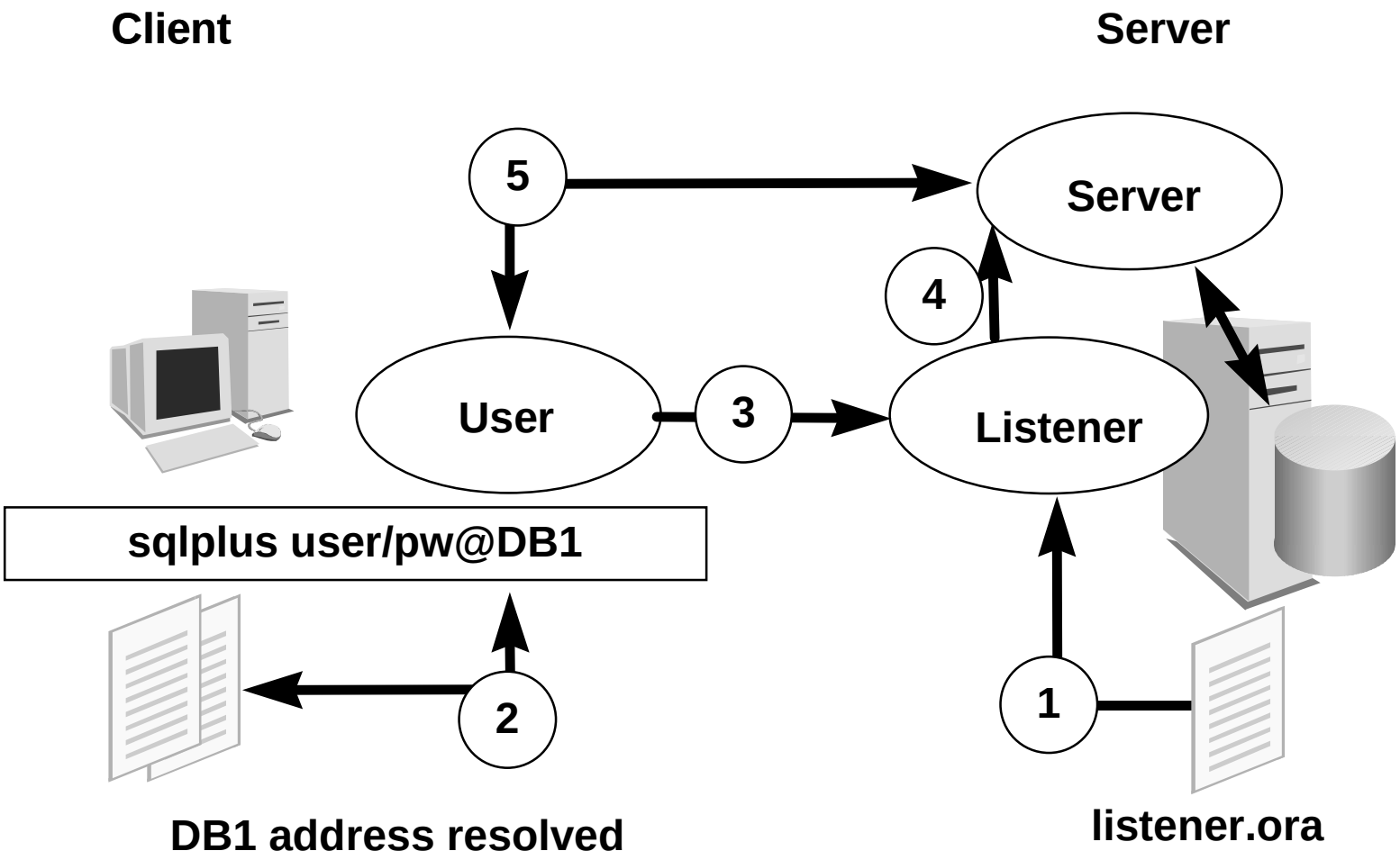
Overview

Net8 provides three basic functions:

- **Connect operations**
- **Data operations**
- **Exception operations**

The Net8 architecture comprises several layers, each of which has a unique responsibility in a networking session.

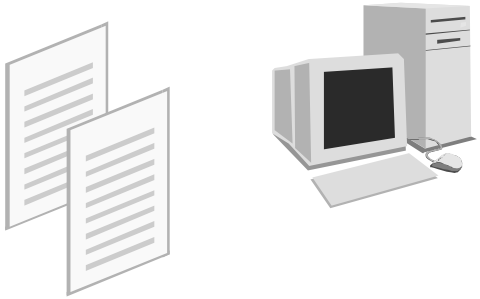
Connecting to Servers



Files and Locations

Default locations for files can be specified using the TNS_ADMIN environment variable.

Client



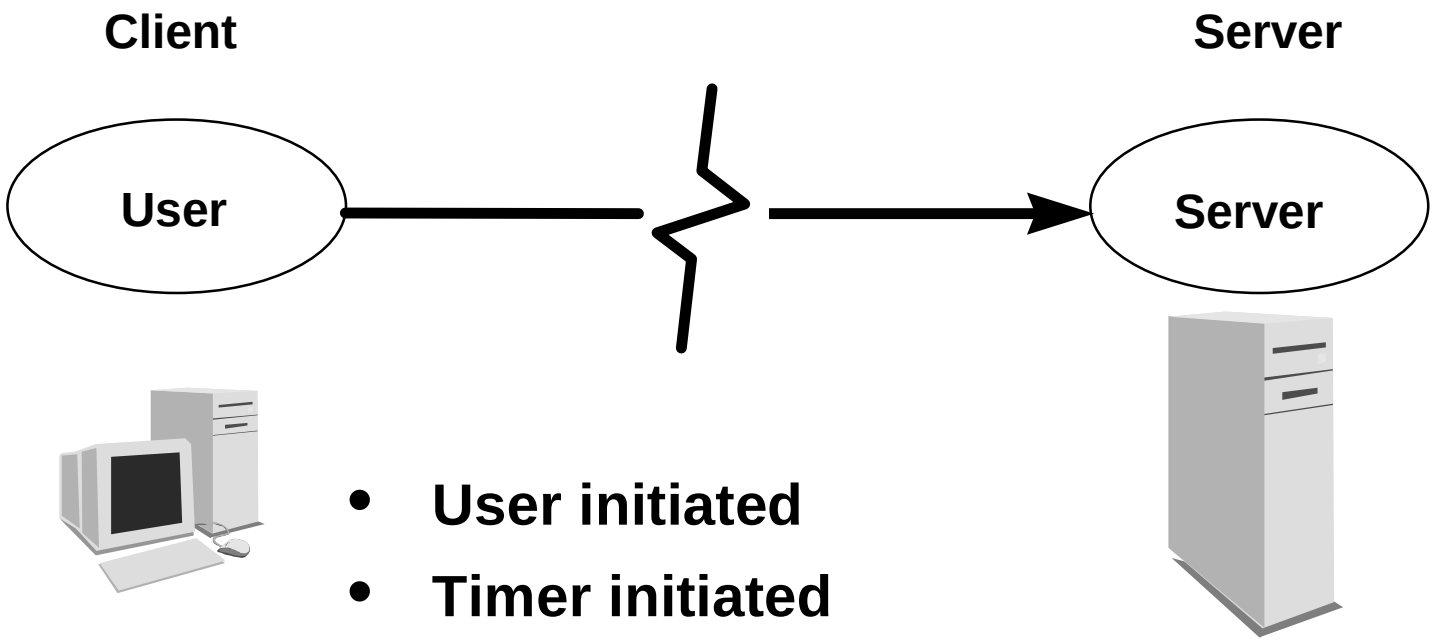
`tnsnames.ora`

`sqlnet.ora`

Server

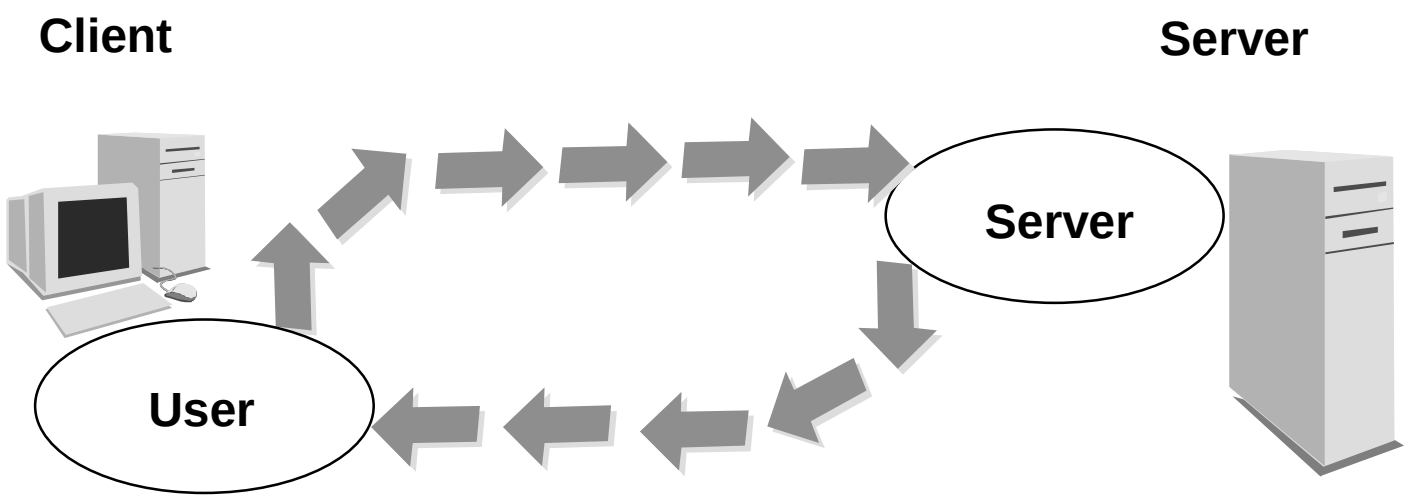
`listener.ora`

Disconnecting from Servers

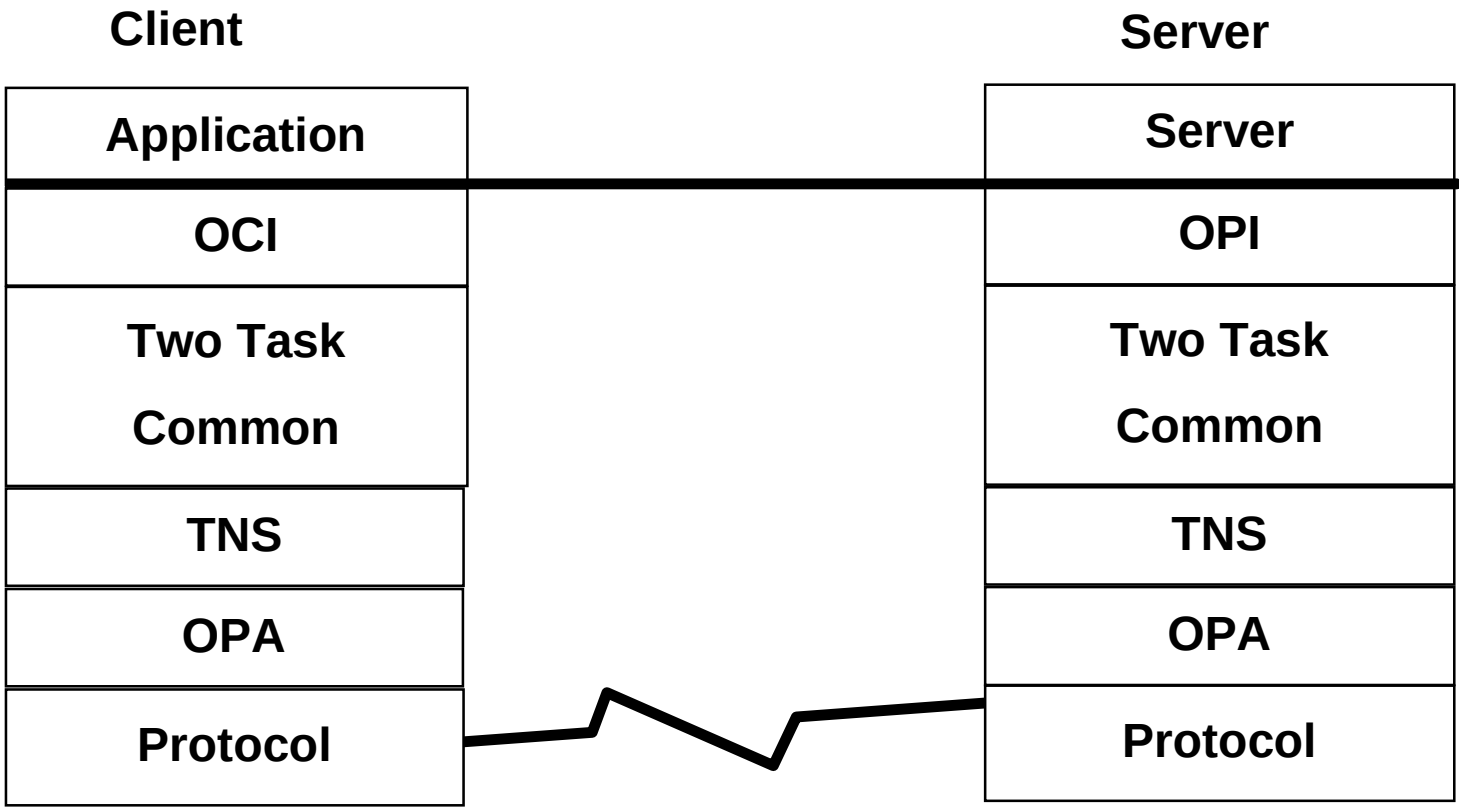


- User initiated
- Timer initiated
- Abnormal termination

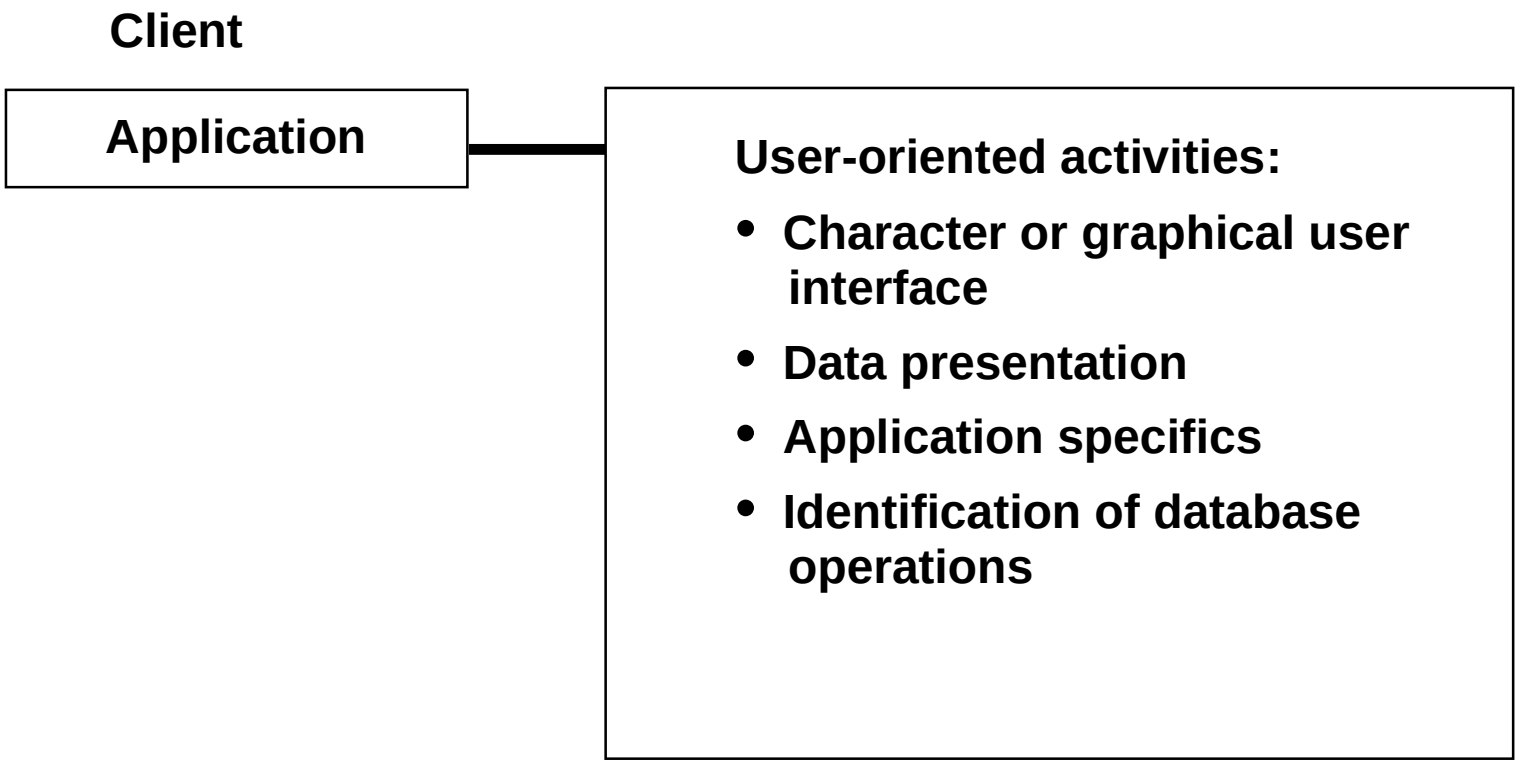
Data and Exceptions Operations



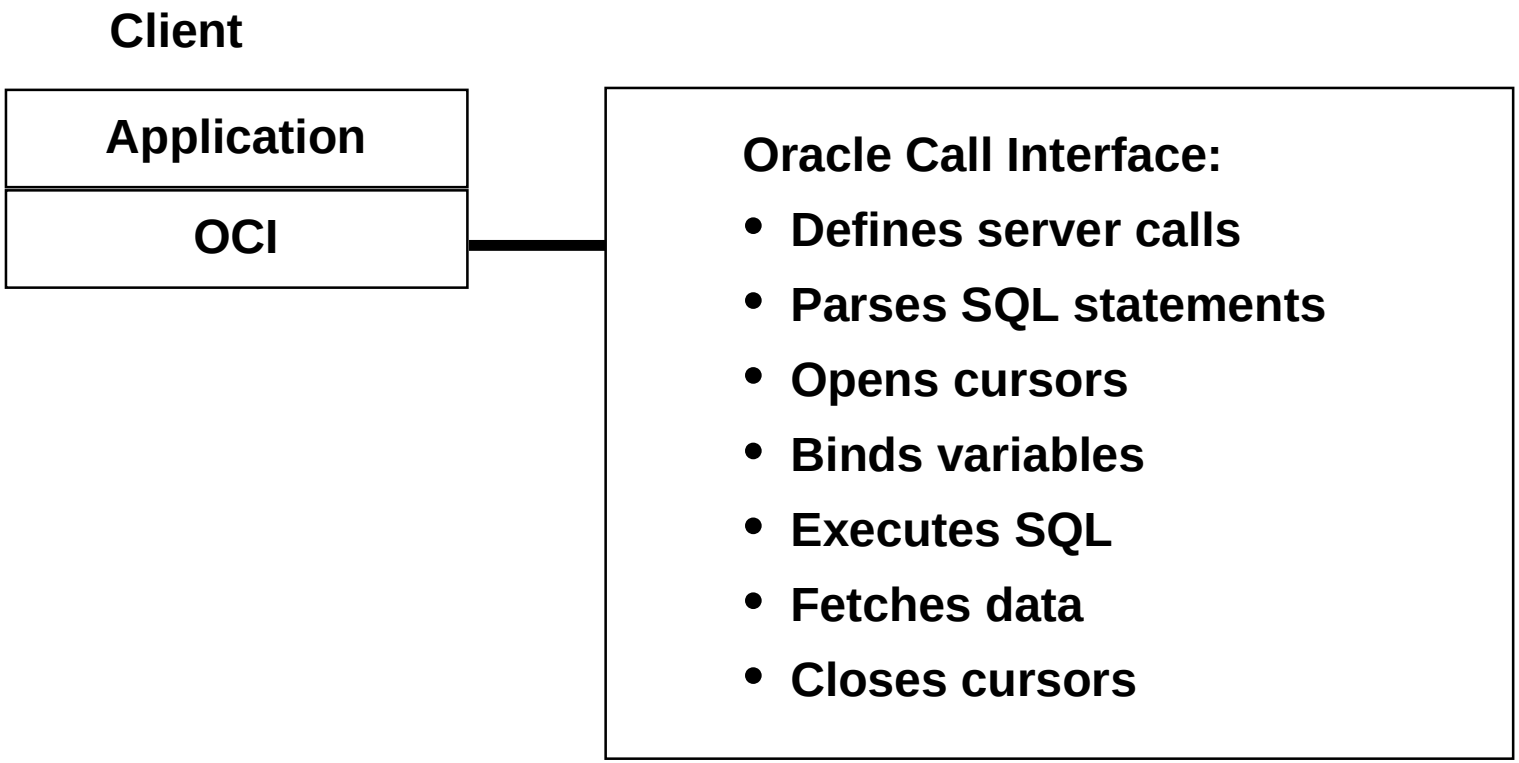
Net8 Architecture



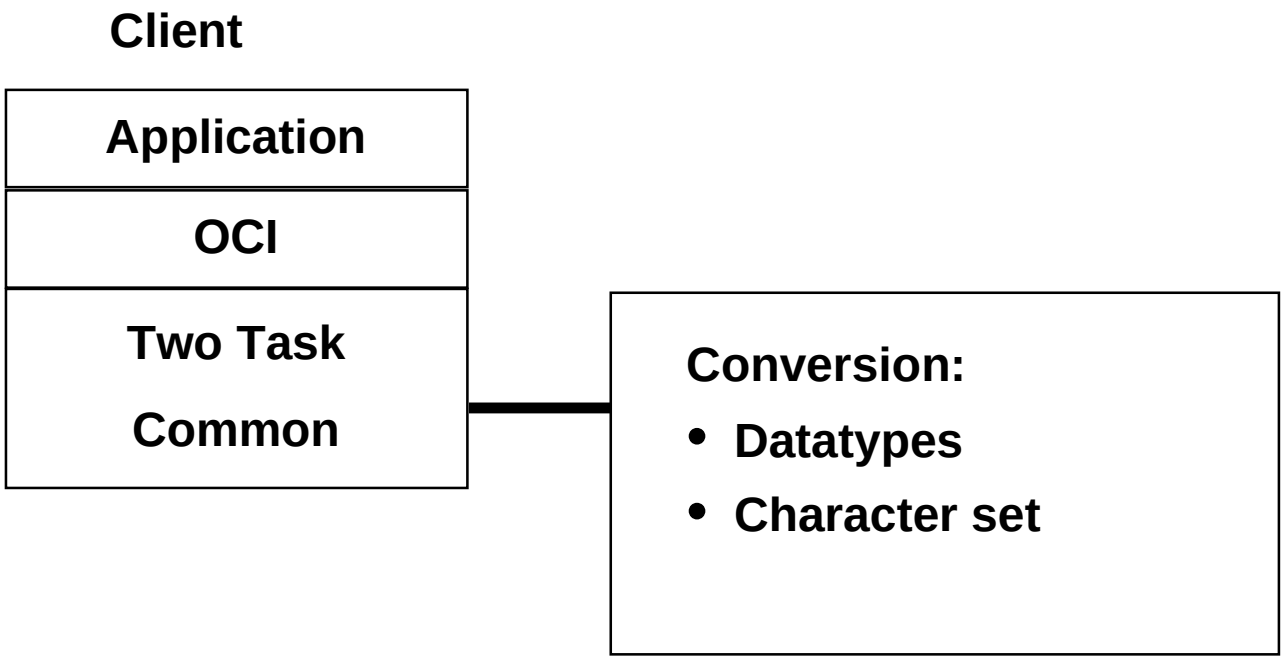
Application Layer



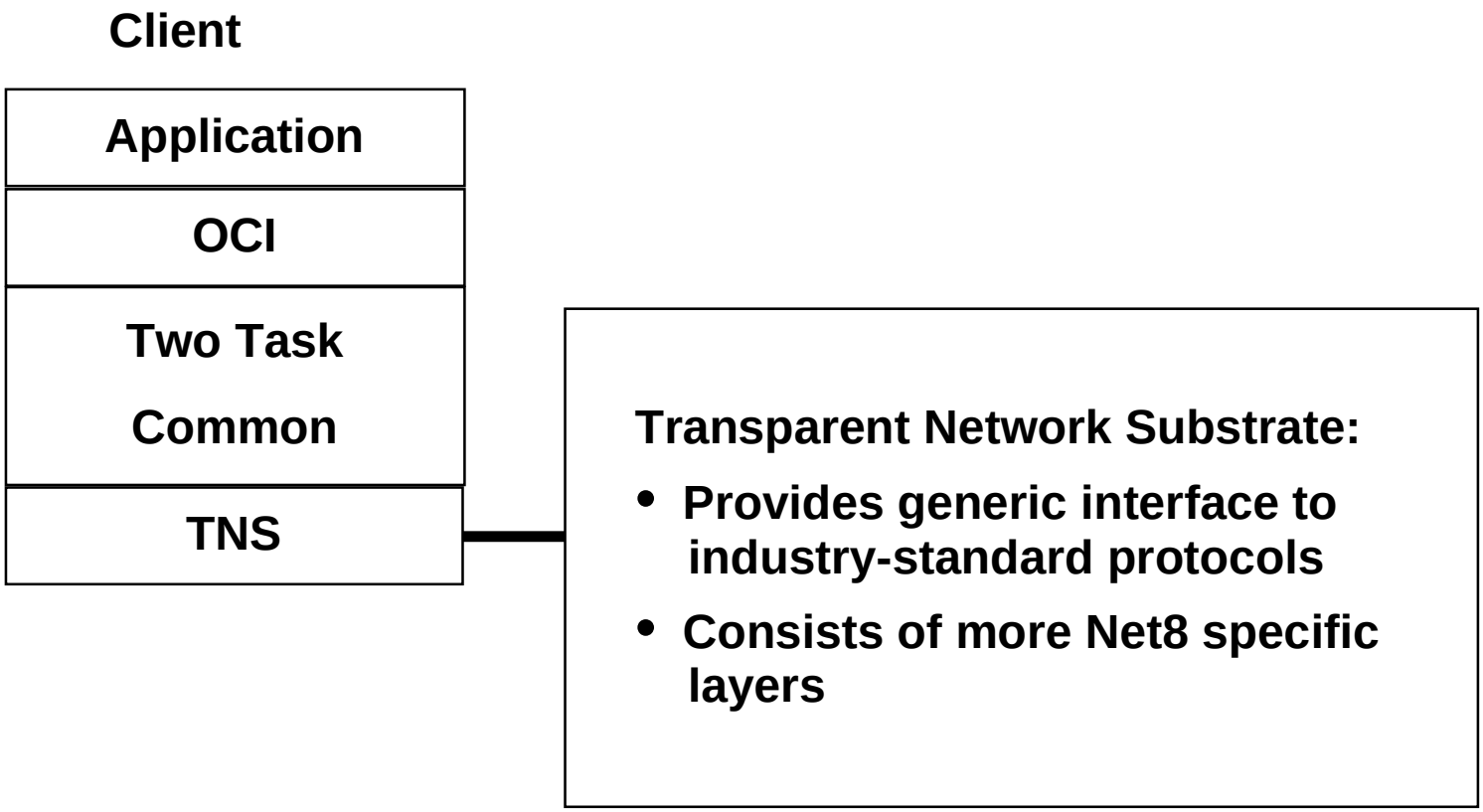
OCI Layer



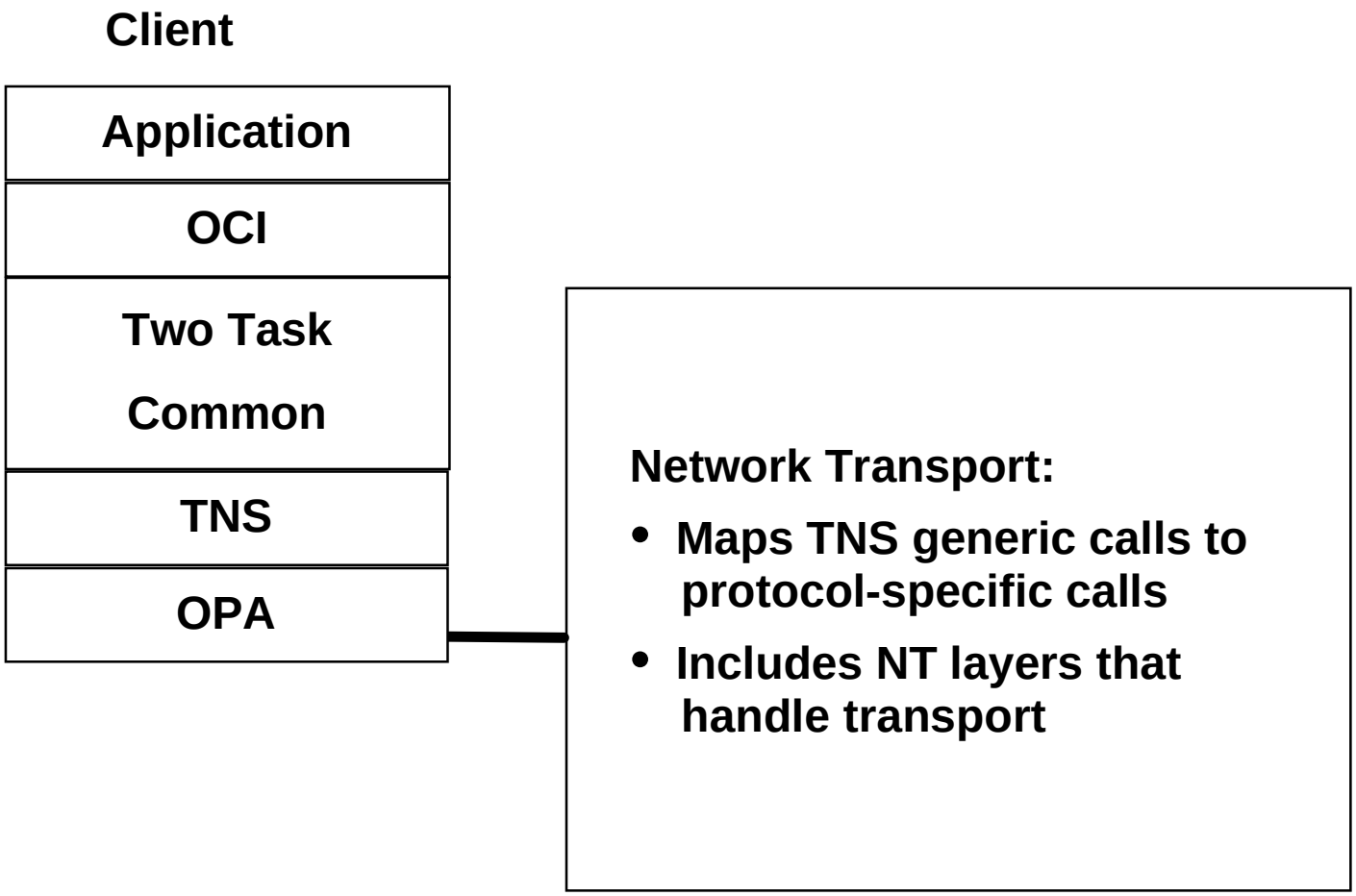
Two Task Common Layer



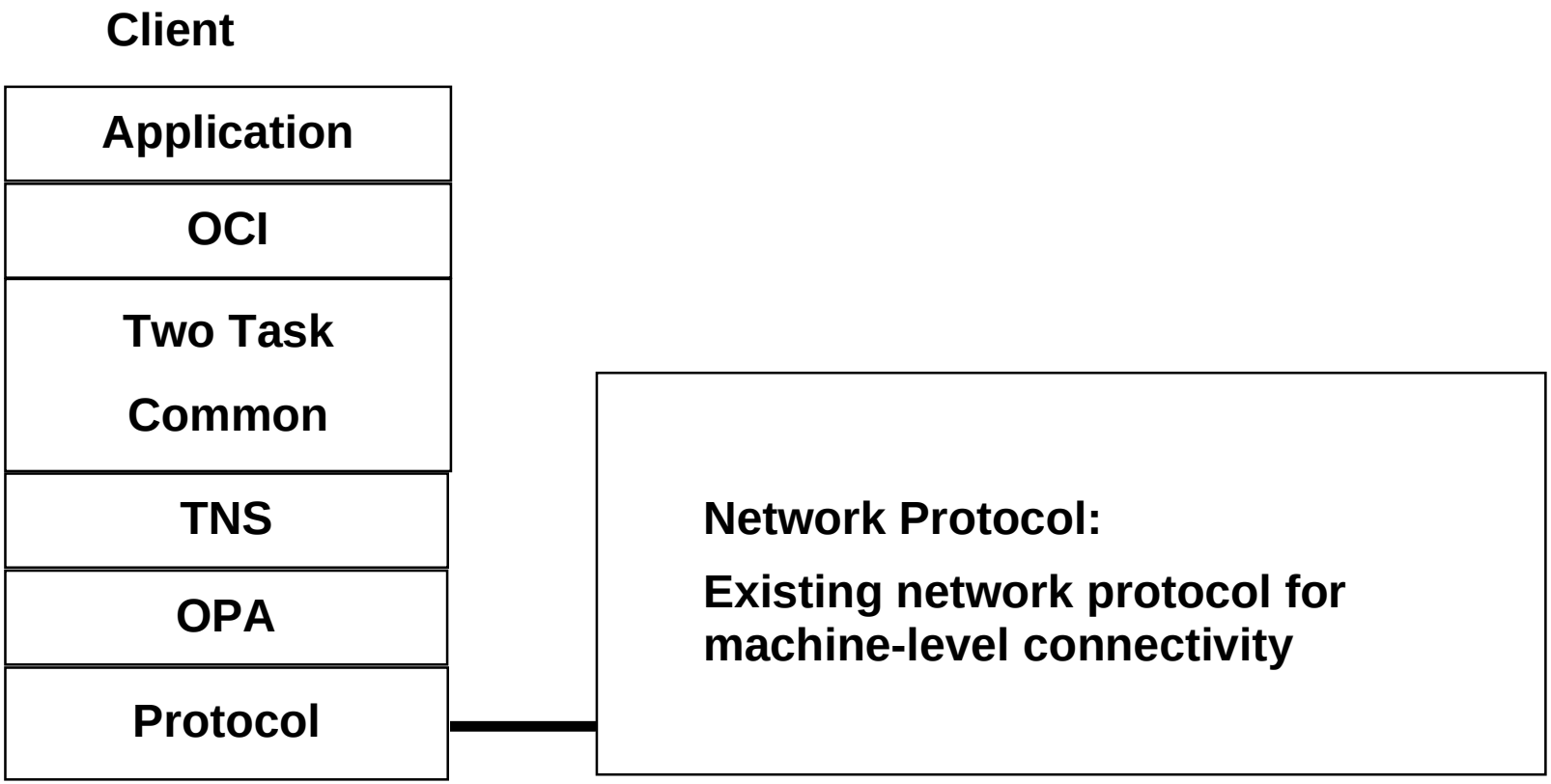
TNS Layer



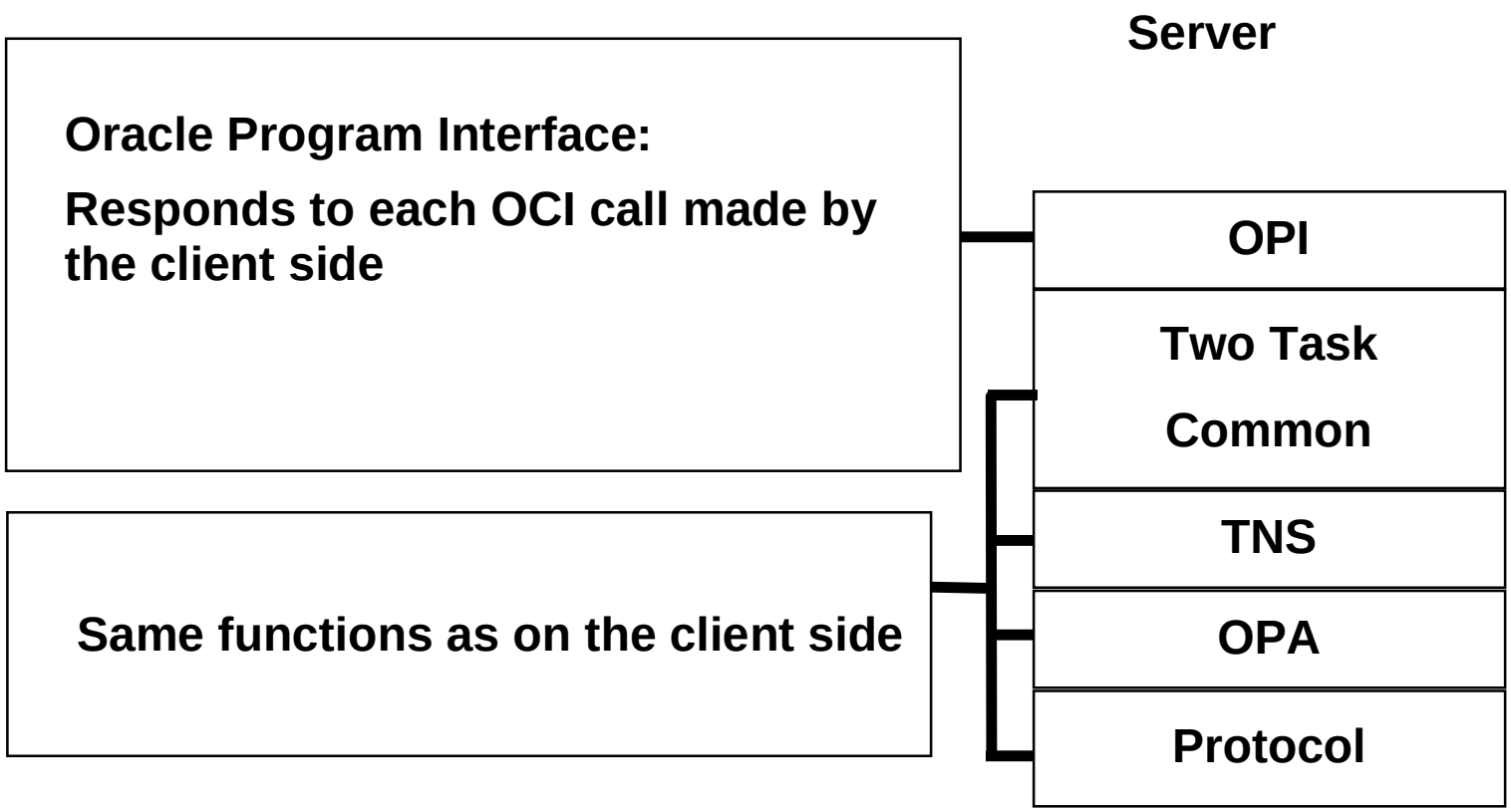
OPA and NT Layers



Protocol



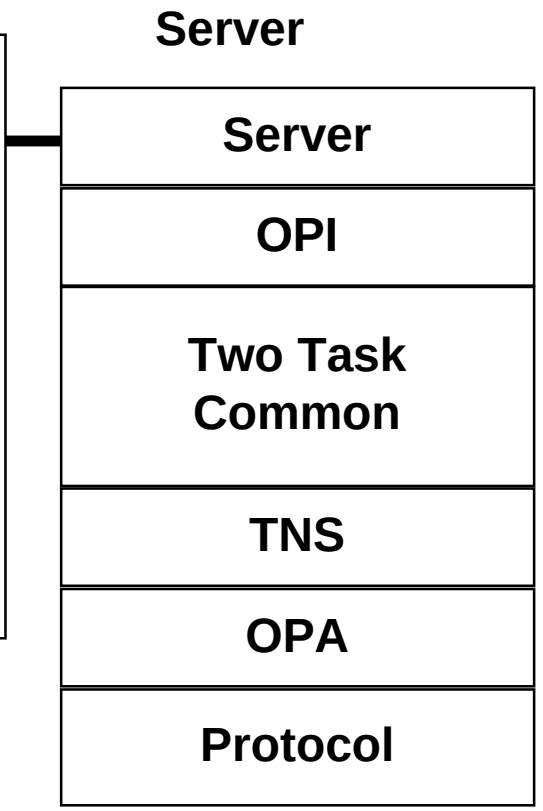
OPI Layer



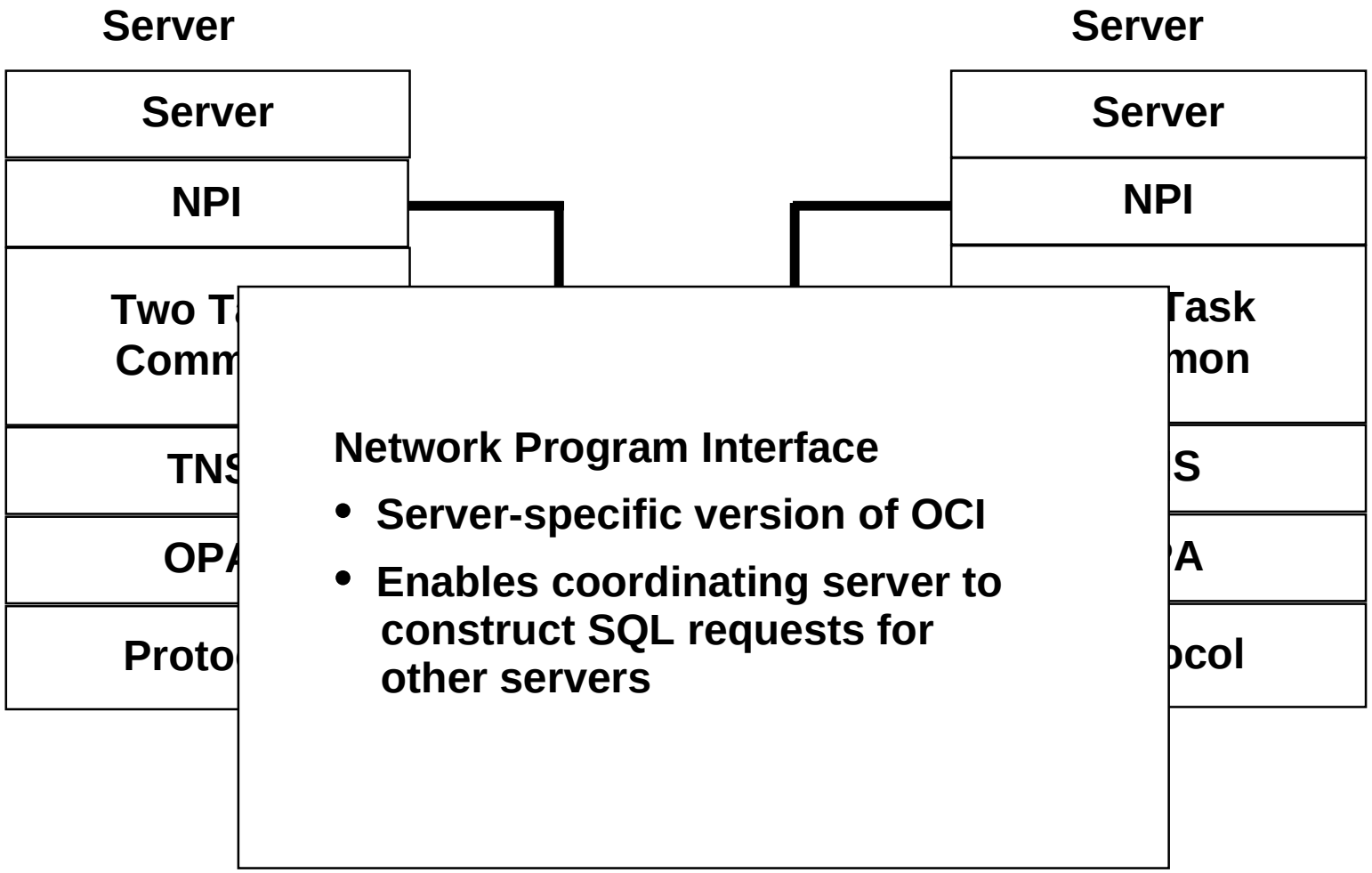
Server Layer

Oracle Server:

Responsible for receiving OCI calls from the client and resolving SQL statements on behalf of the client



Server-Server NPI Layer



Summary

In this lesson, you should have learned:

- **In the Net8 stack, each layer has a specific task.**
- **Users must install the appropriate protocol adapter in order for a client to communicate with a server using Net8 software.**

3

Basic Net8 Server-Side Configuration

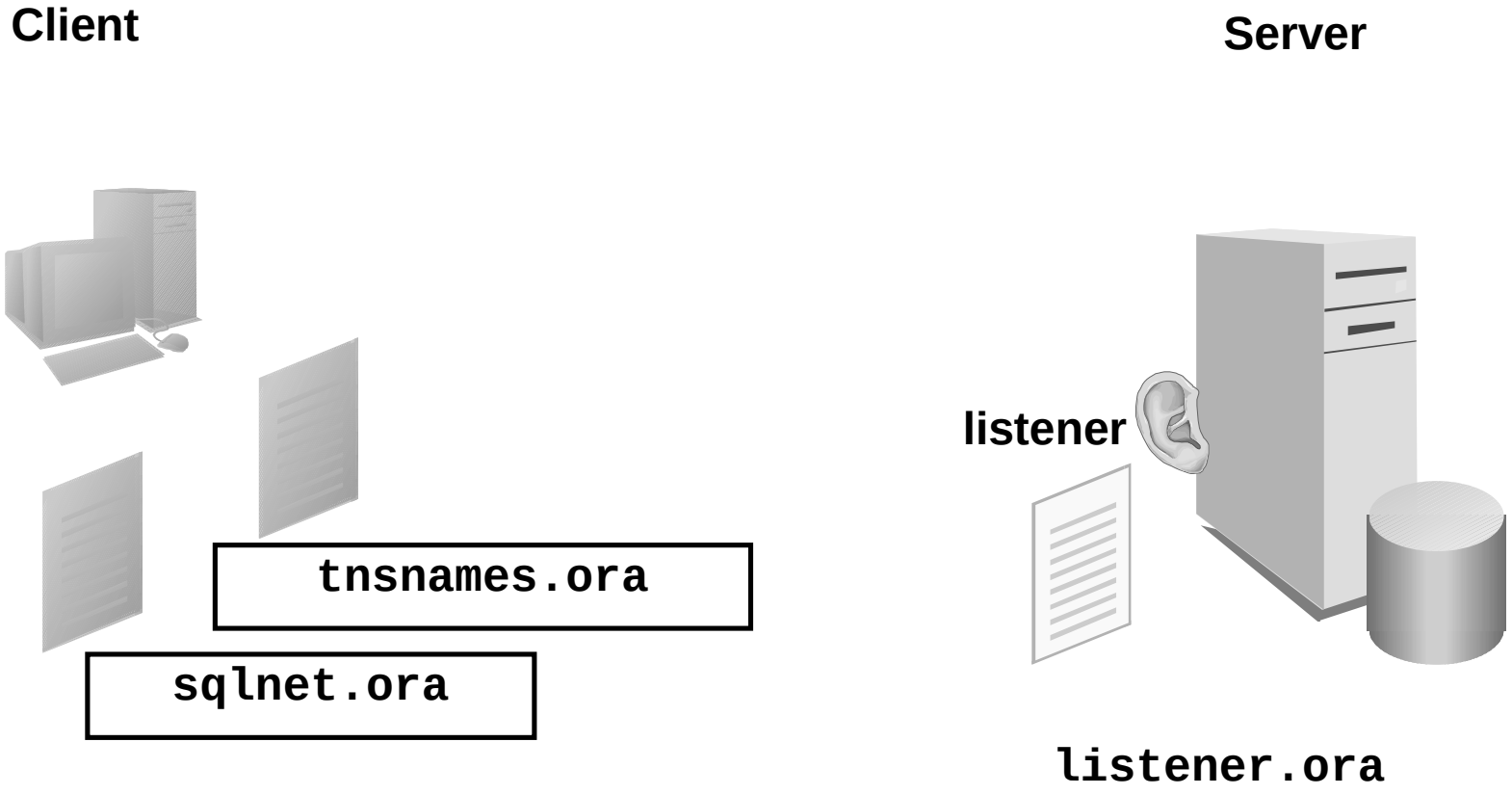
ORACLE®

Objectives

After completing this lesson, you should be able to do the following:

- **Configure the listener using the Net8 Assistant**
- **Start the Net8 listener using the Listener Control utility (LSNRCTL)**
- **Stop the Net8 listener using LSNRCTL**
- **Identify additional LSNRCTL commands**

Overview: The Listener Process

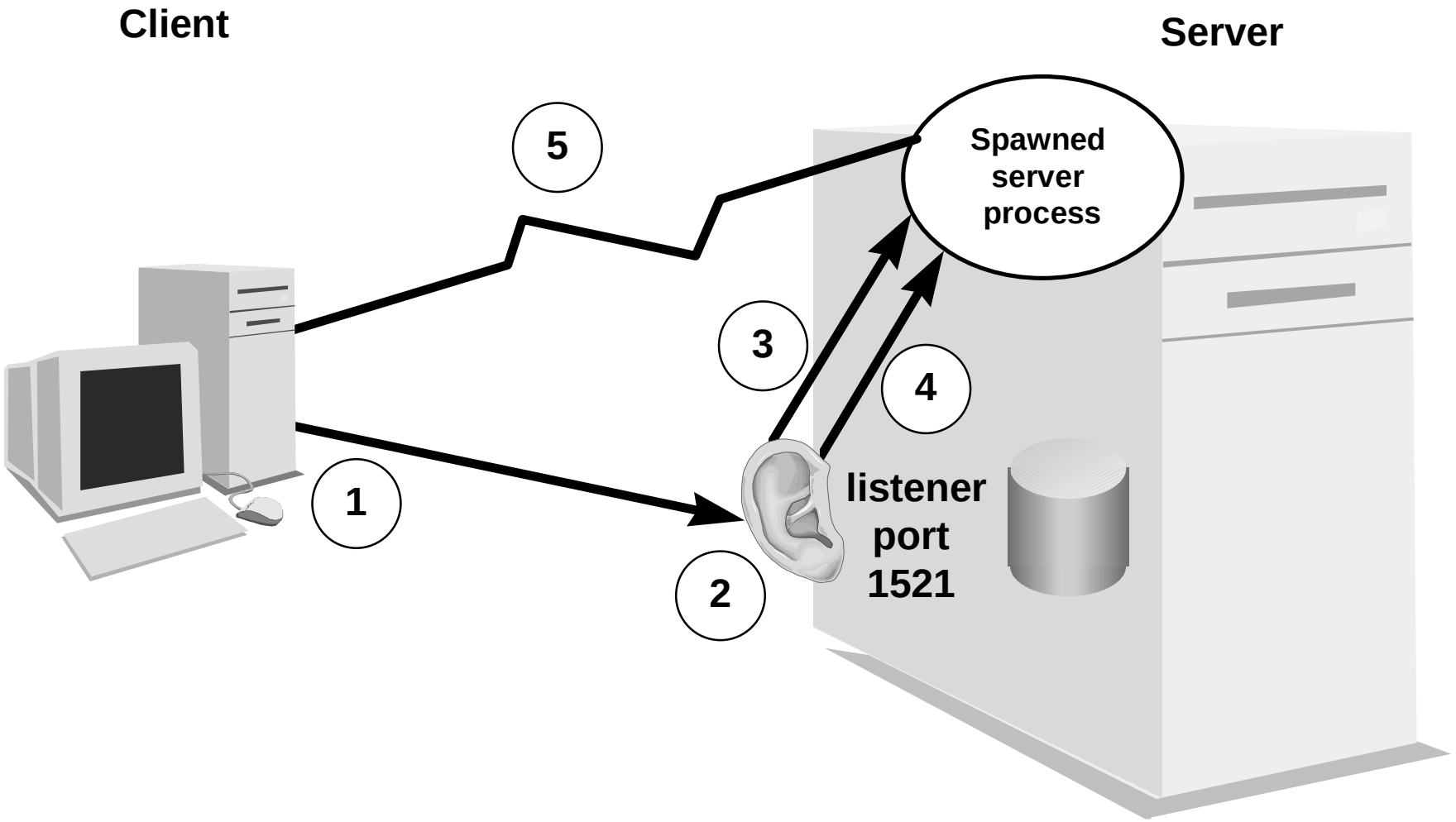


The Listener Responses

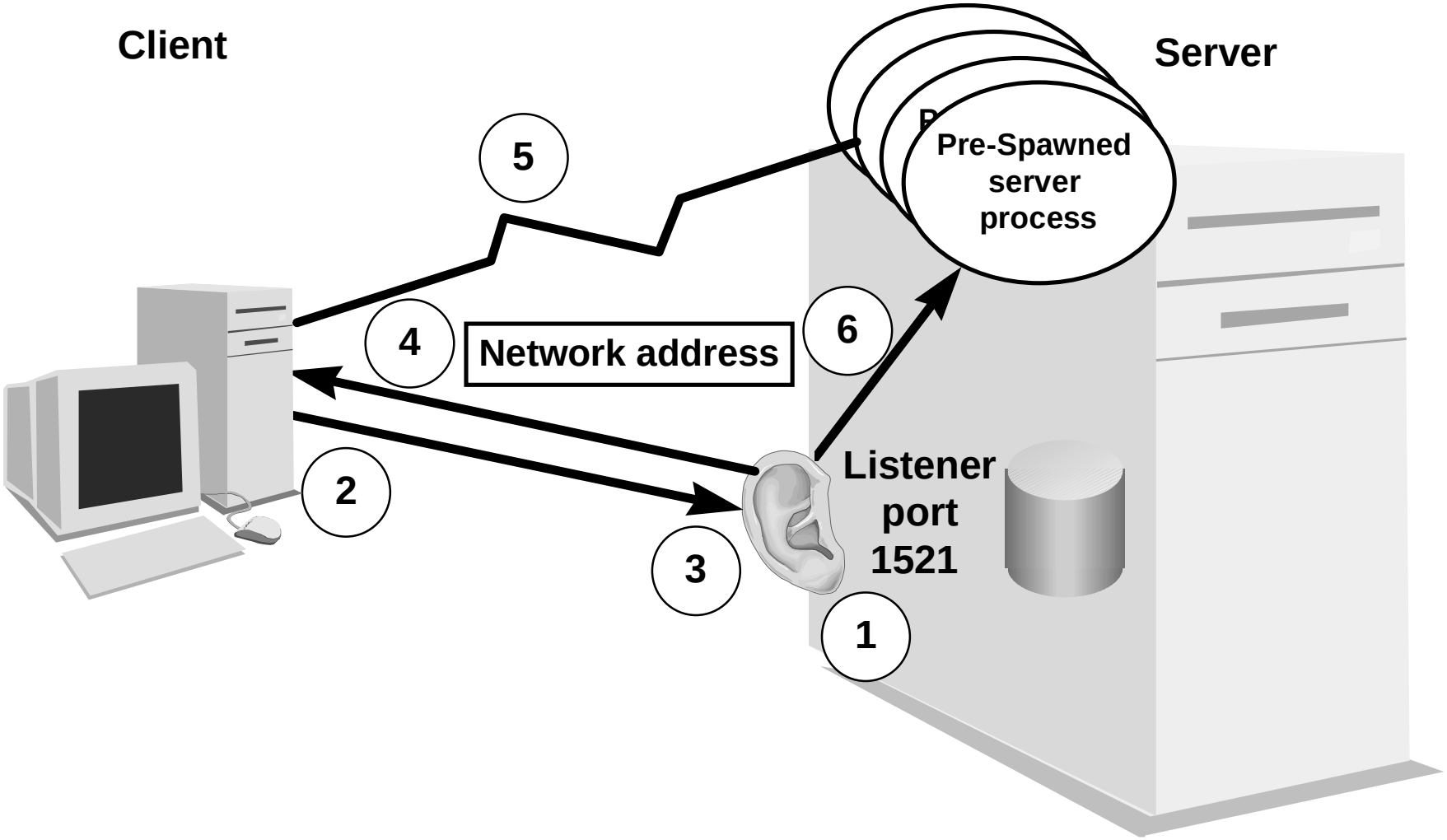
When a connection request is made by a client to a server, the listener performs one of the following:

- **Spawns a process and bequeaths (passes) the connection**
- **Redirects the connection to an existing process**

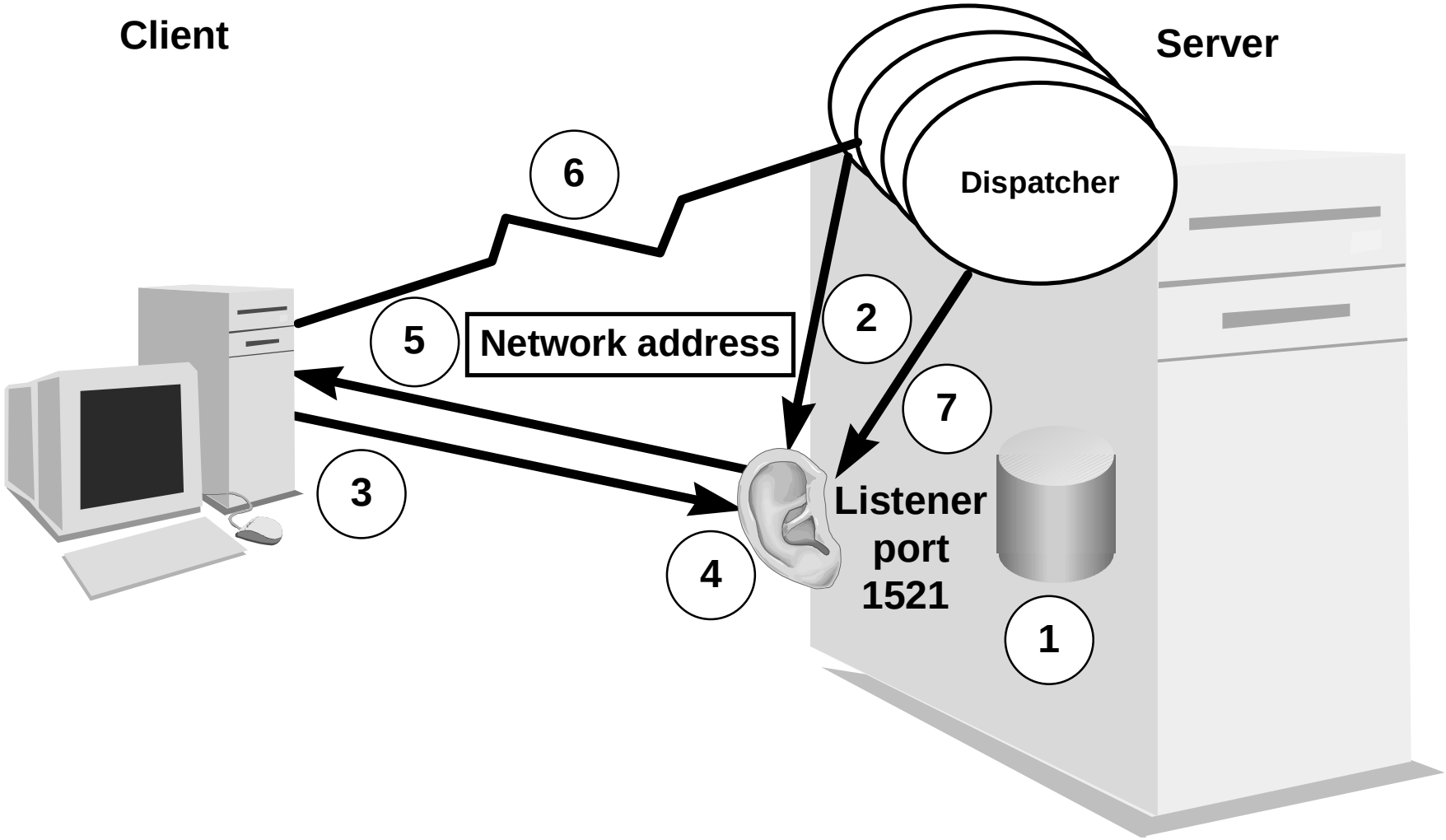
Bequeath Session



Redirect Session (Dedicated)



Redirect Session (Dispatcher)



The LISTENER.ORA File

When the Oracle software is installed, the LISTENER.ORA file is created for the starter database with the following default settings:

- **Listener name** — **LISTENER**
- **Port** — **1521**
- **Protocols** — **TCP/IP and IPC**
- **SID name** — **Default instance**
- **Host name** — **Default host name**

The LISTENER.ORA File

```
1.  LISTENER =
2.    (ADDRESS_LIST =
3.      (ADDRESS= (PROTOCOL= IPC)(KEY= ORCL))
        (ADDRESS= (PROTOCOL= IPC)(KEY= PNPKEY))
4.      (ADDRESS= (PROTOCOL= TCP)(Host= WWED103-SUN)(Port= 1521))
      )
5.  SID_LIST_LISTENER =
6.    (SID_LIST =
7.      (SID_DESC =
8.          (ORACLE_HOME= /home/oracle)
9.          (SID_NAME = ORCL)
        )

10.     ...sample additional SID description ...
      )
11.     STARTUP_WAIT_TIME_LISTENER = 0
12.     CONNECT_TIMEOUT_LISTENER = 10
13.     TRACE_LEVEL_LISTENER = OFF
```

LISTENER.ORA File Parameters

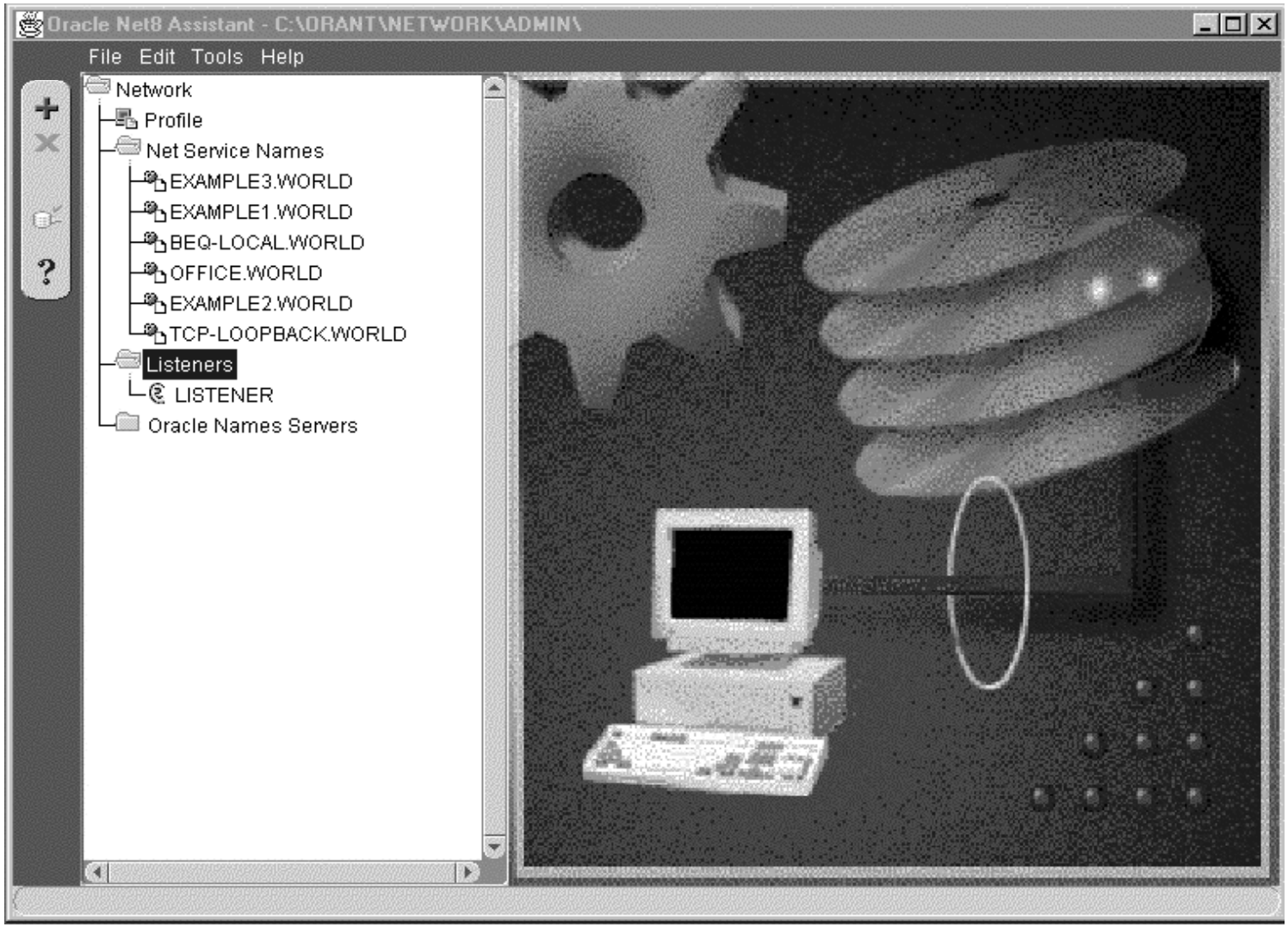
The following parameters are used to define other functions of the listener:

CONNECT_TIMEOUT_*listener_name*
LISTENER_address
LOG_DIRECTORY_*listener_name*
LOG_FILE_*listener_name*
LOGGING_*listener_name*
PASSWORDS_*listener_name*
SAVE_CONFIG_ON_STOP_*listener_name*

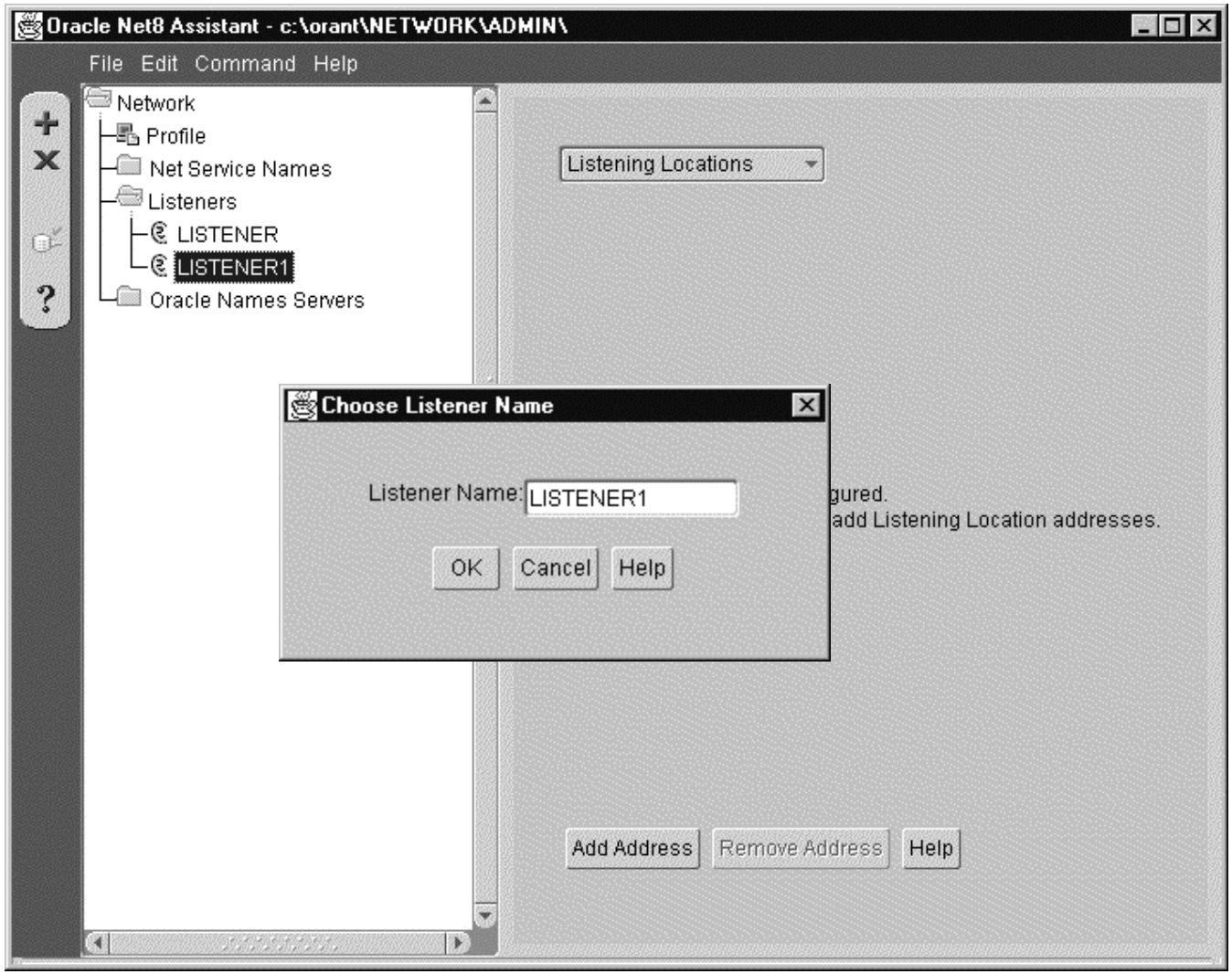
LISTENER.ORA File Parameters

SERVICE_LIST_*listener_name*
SID_LIST_*listener_name*
STARTUP_WAIT_TIME_*listener_name*
TRACE_DIRECTORY_*listener_name*
TRACE_FILE_*listener_name*
TRACE_LEVEL_*listener_name*
USE_PLUG_AND_PLAY_*listener_name*

Listener Configuration: Creation



Listener Configuration: Services



Listener Control Utility (LSNRCTL)

The Listener Control utility is the tool used to control the listener.
Commands from the Listener Control utility can be issued from the command line or from the LSNRCTL prompt.

- **UNIX command line syntax:**

```
$ LSNRCTL command
```

- **Prompt syntax:**

```
LSNRCTL> command
```

LSNRCTL Commands

The following functions are mostly used to control the listener:

- **Starting a listener**
- **Stopping the listener**

Additional LSNRCTL Commands

CHANGE_PASSWORD	**SAVE_CONFIG**
EXIT	**SERVICES**
HELP	**SET *command***
QUIT	**SHOW *command***
RELOAD	

LSNRCTL SET and SHOW Modifiers

The SET modifier is used to change listener parameters in the Listener Control utility environment.

```
LSNRCTL> SET trc_level ADMIN
```

The SHOW modifier is used to display the values of the parameters set for the listener.

```
LSNRCTL> SHOW connect_timeout
```

Automatic Instance Registration

With Oracle8*i*, instances register themselves to the listener when they are started.
Database instance registration is composed of the following:

- **Service registration provides the listener with instance information.**
- **MTS dispatcher registration provides dispatcher information to the listener.**

Automatic Instance Registration: Parameters

The `INIT`*`SID`*`.ORA` parameters used to configure instance registration are as follows:

- **INSTANCE_NAME**
- **SERVICE_NAMES**

Troubleshooting the Listener

The following error codes are related to problems with the listener:

```
ORA-12154: No Listener
ORA-12224: TNS: no listener
ORA-12500: TNS: listener failed to start a
           dedicated server process
ORA-12545: TNS: name lookup failure
TNS-01169: The listener has not recognized the
           password
```

Summary

In this lesson, you should have learned:

- **The listener process listens for incoming connections and services a connection either by passing it to a server process or redirecting it.**
- **The `listener.ora` file is the configuration file for the listener.**
- **The Listener Control utility controls the functions of the listener.**
- **The `listener.ora` file can be configured for more than one listener.**

4

Basic Net8 Client-Side Configuration

ORACLE®

Objectives

After completing this lesson, you should be able to do the following:

- **Establish a connection from the Net8 client side using the host naming method**
- **Configure Net8 client-side files and connect using the local naming method**
- **Use Net8 Assistant to define preferences on the client side**
- **Configure the Net8 client to use the client load balancing and failover feature**

Overview

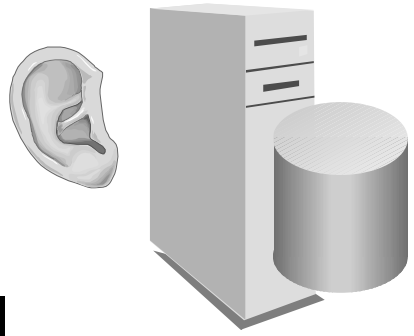
- **The host naming method requires minimal configuration; however, some requirements must be met.**
- **The local naming method requires configuration using Net8 Assistant, a GUI tool.**

Host Naming Client Side

Client

Server

TCP/IP

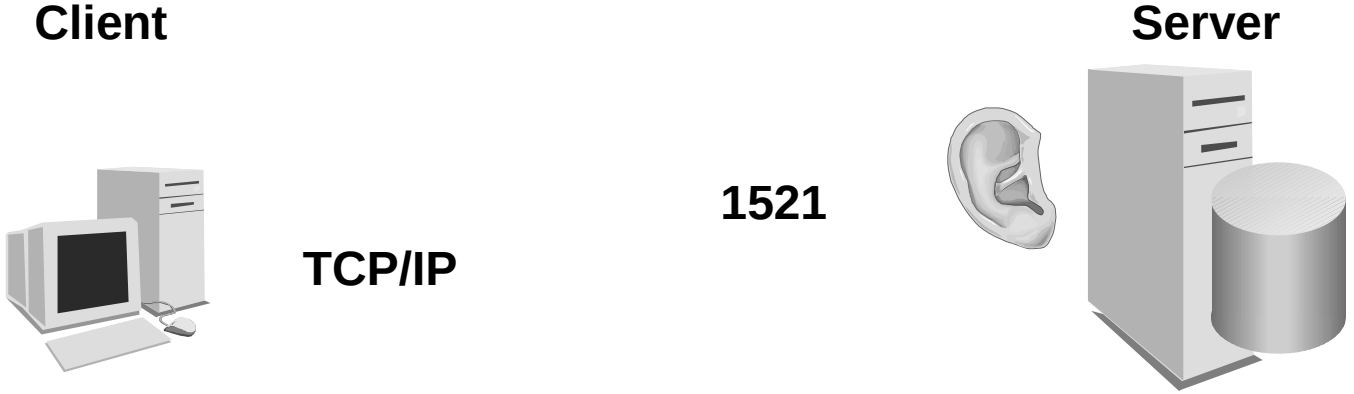


```
TRACE_LEVEL_CLIENT = OFF
sqlnet.authentication_services = (NTS)
names.directory_path = (TNSNAMES, HOSTNAME)
names.default_domain = world
name.default_zone = world
automatic_ipc = off
```

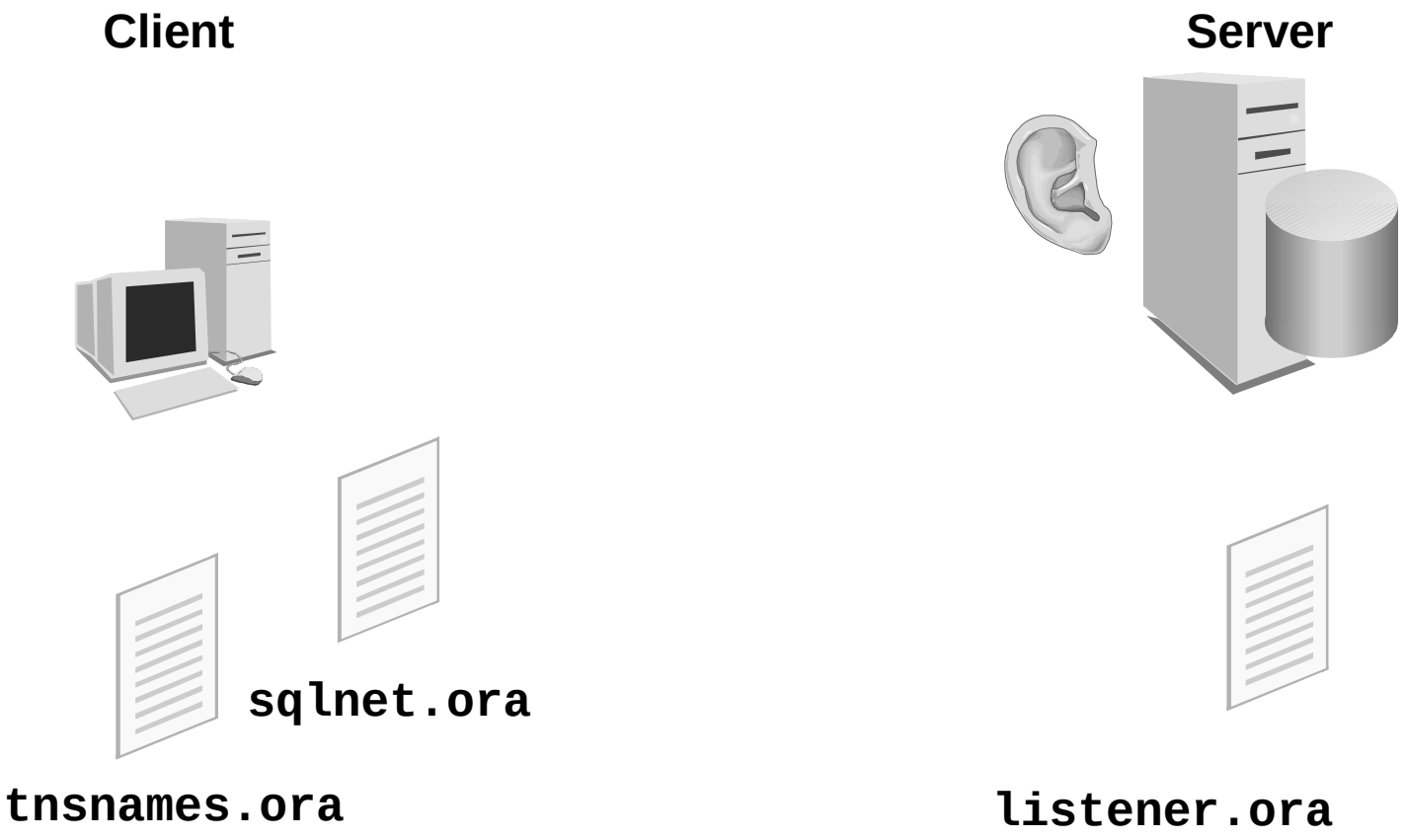
sqlnet.ora

listener.ora

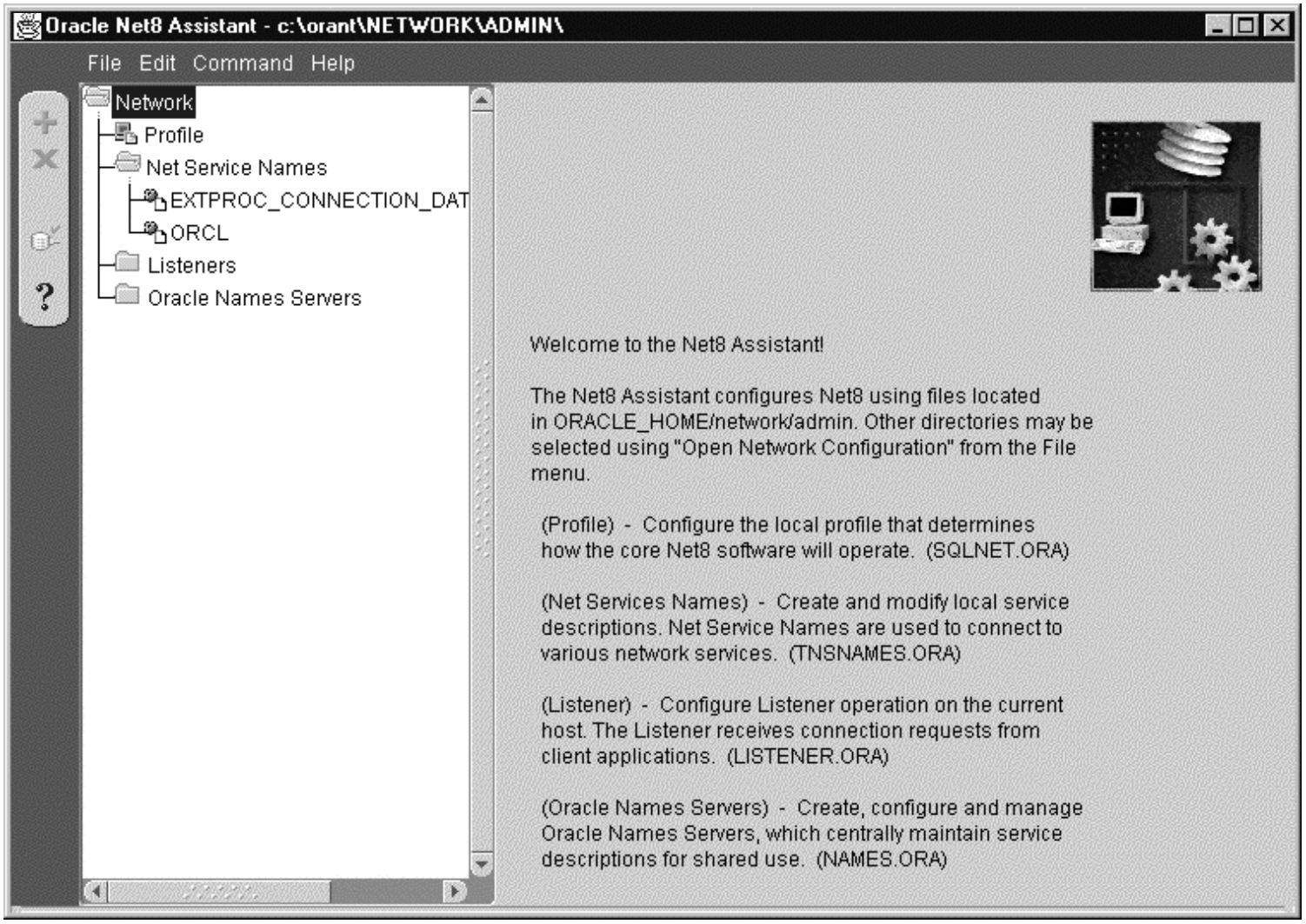
Host Naming Server Side



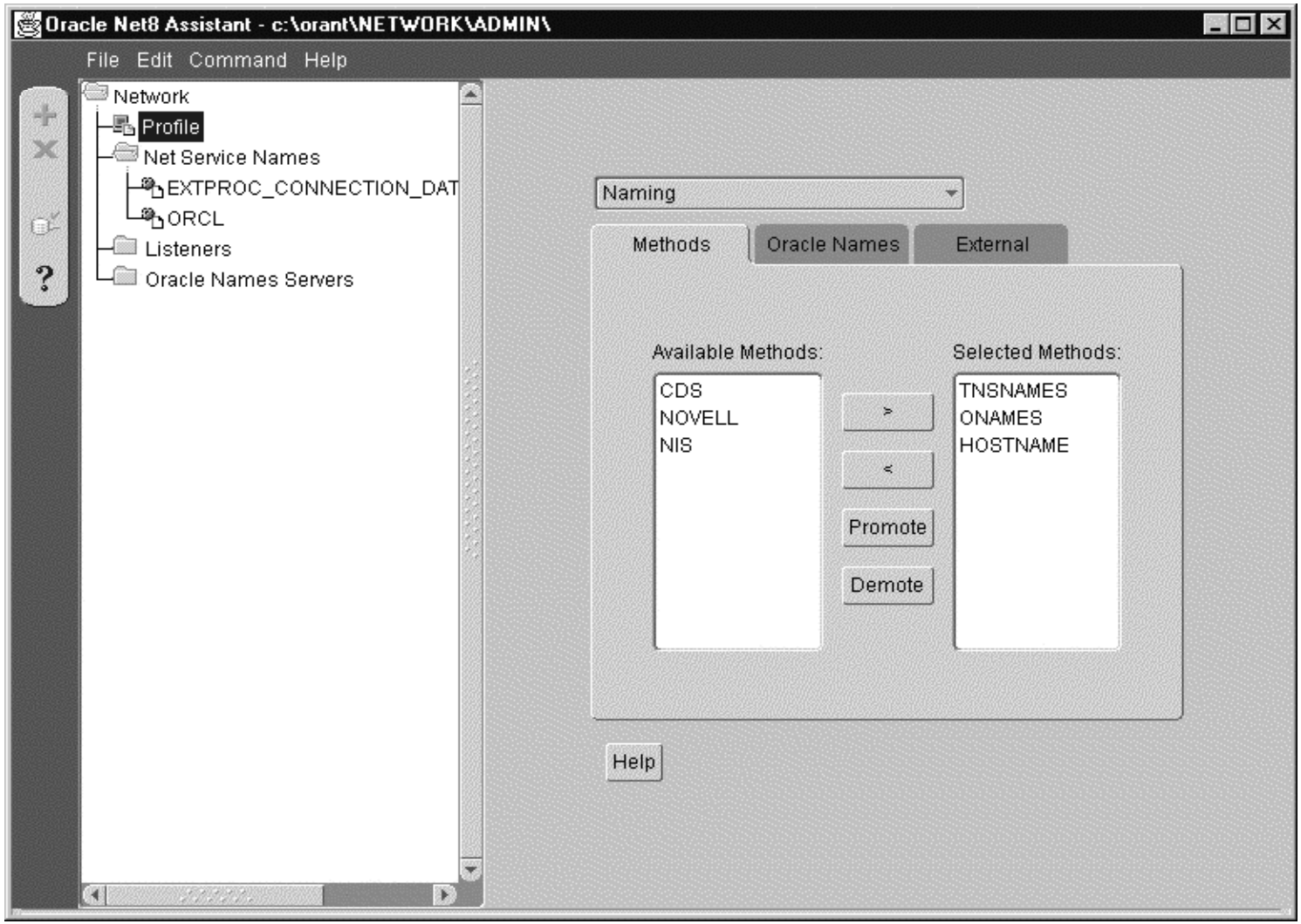
Local Naming



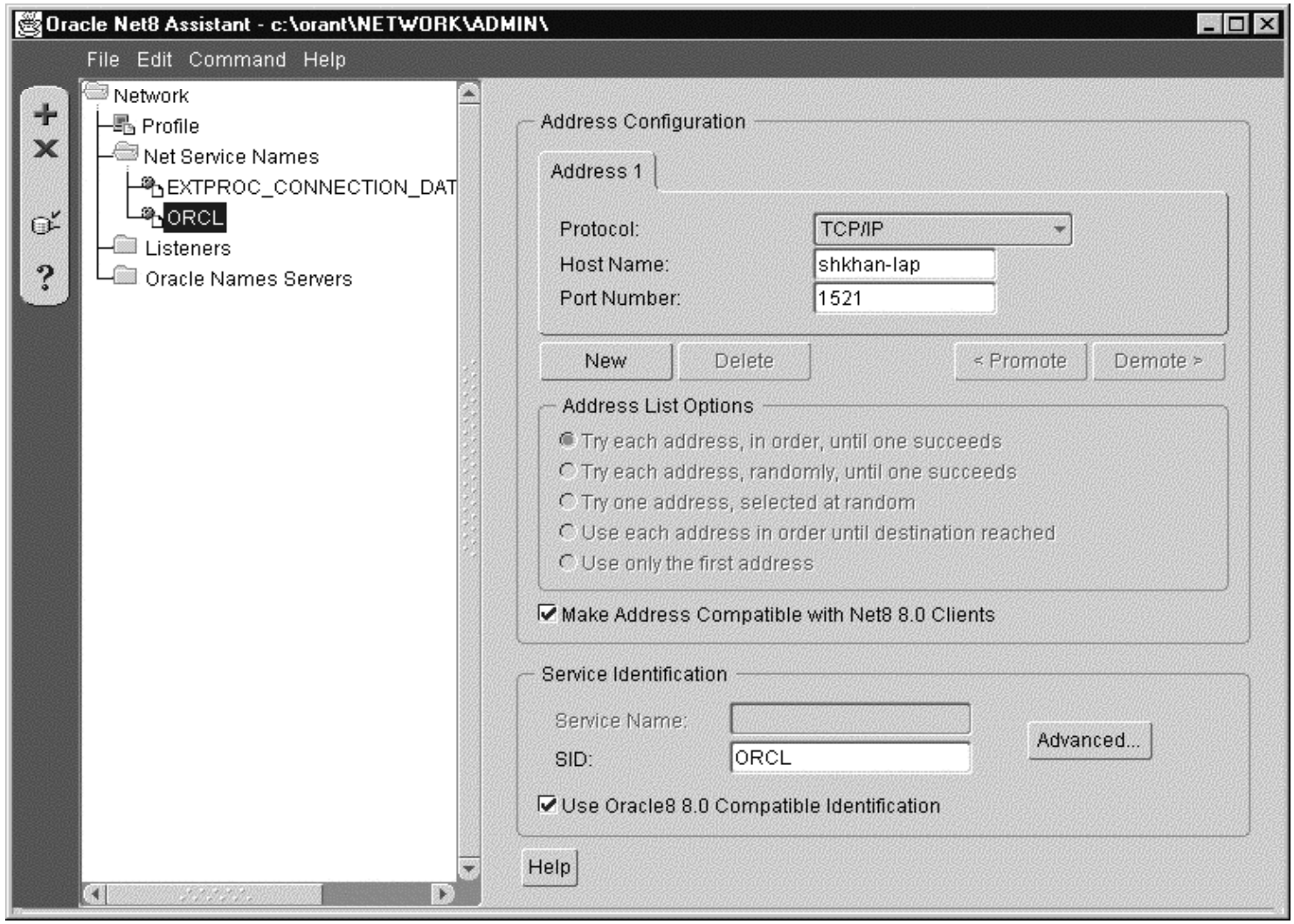
Net8 Assistant



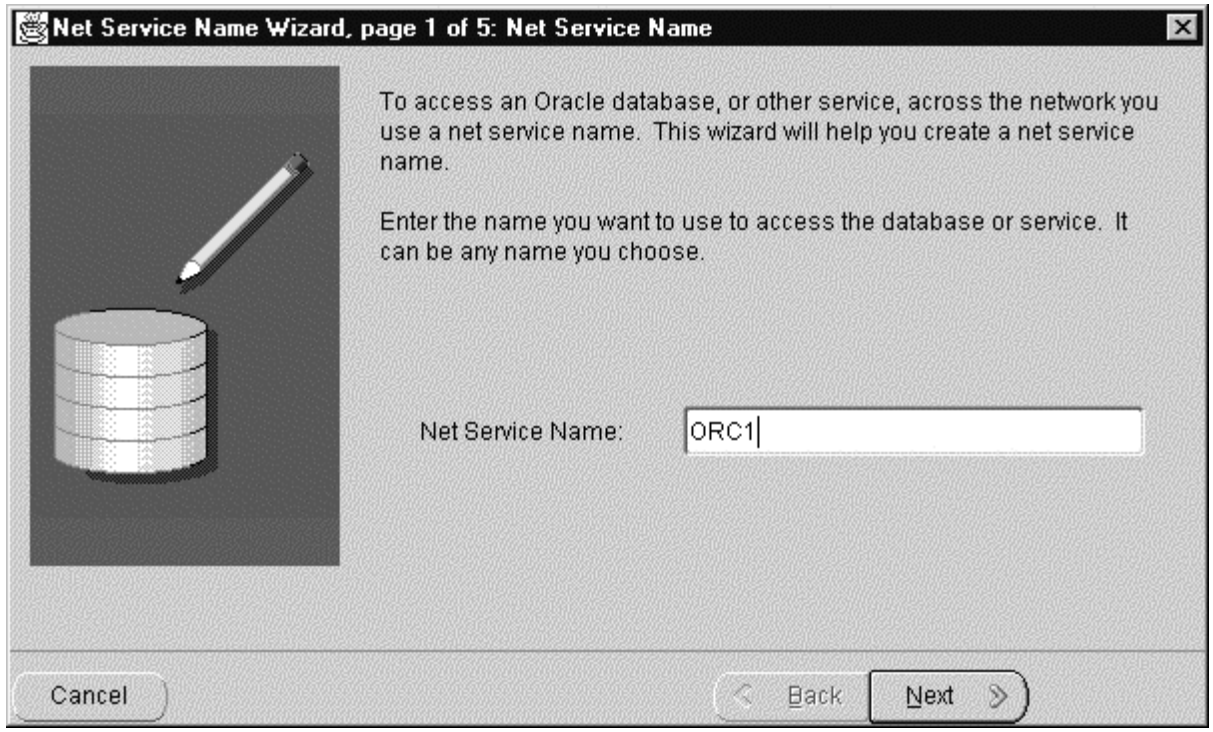
Net8 Assistant: Profile



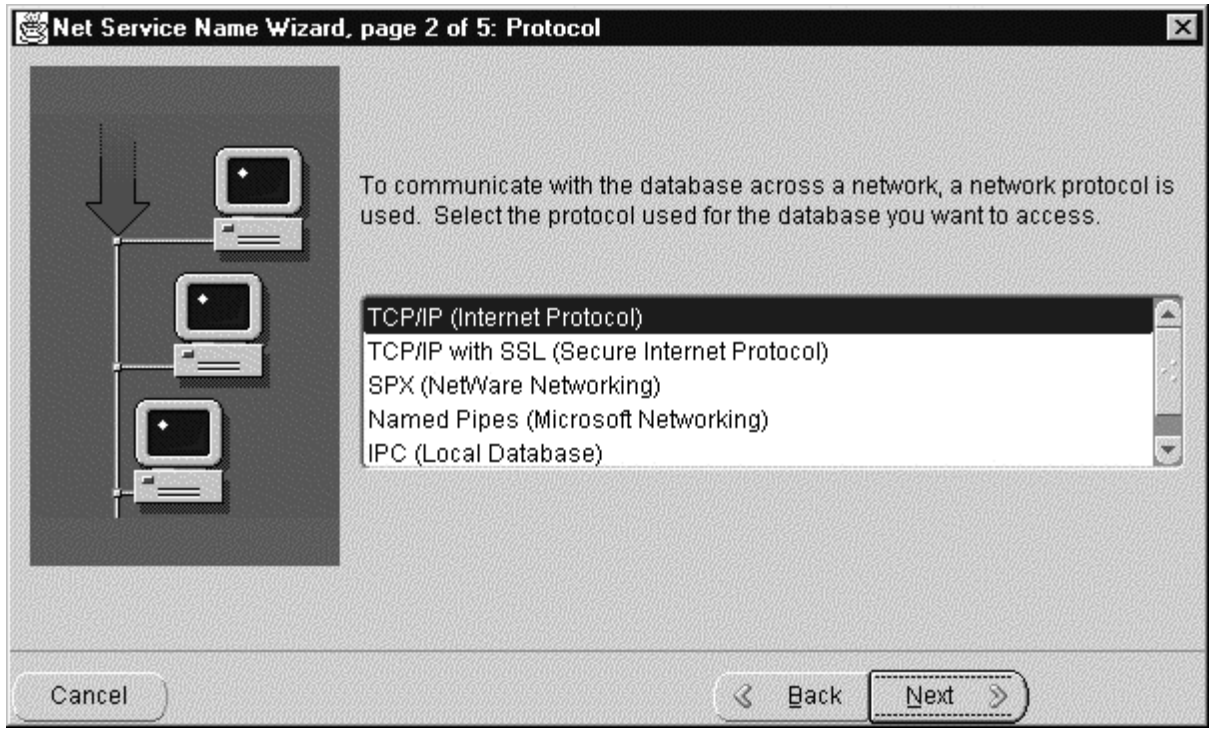
Net8 Assistant: Service Names



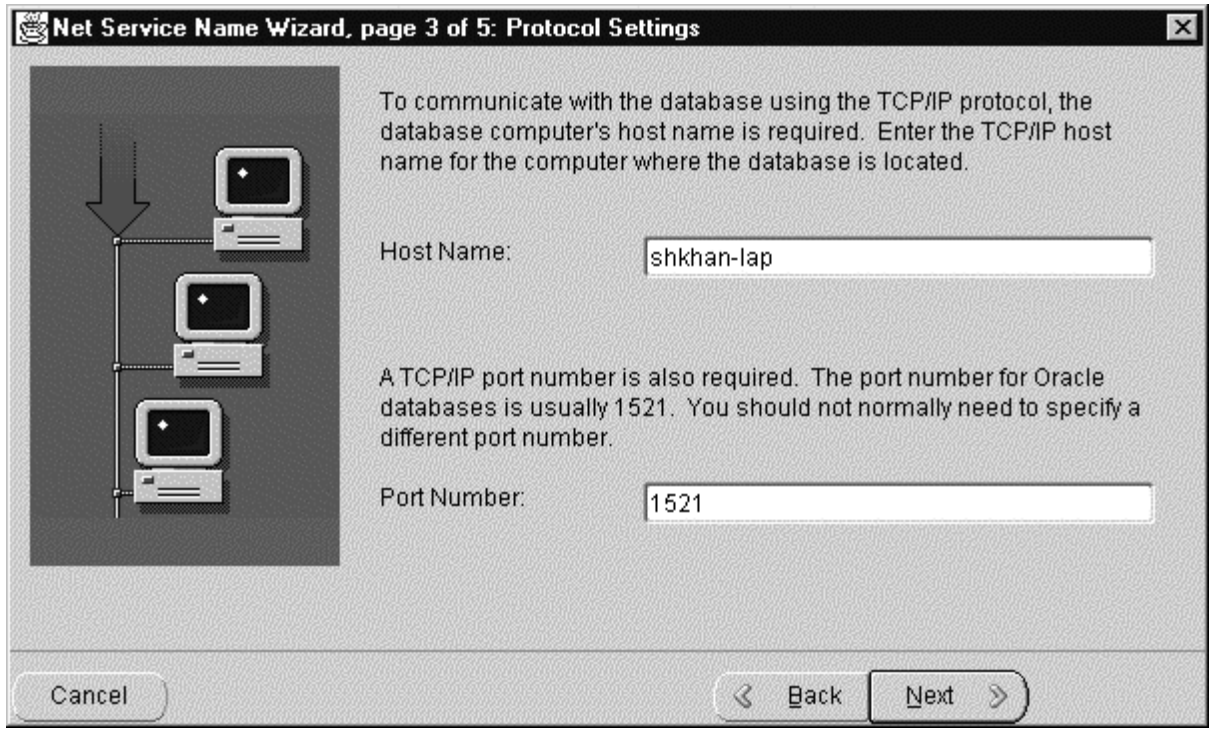
Net8 Assistant: Service Names



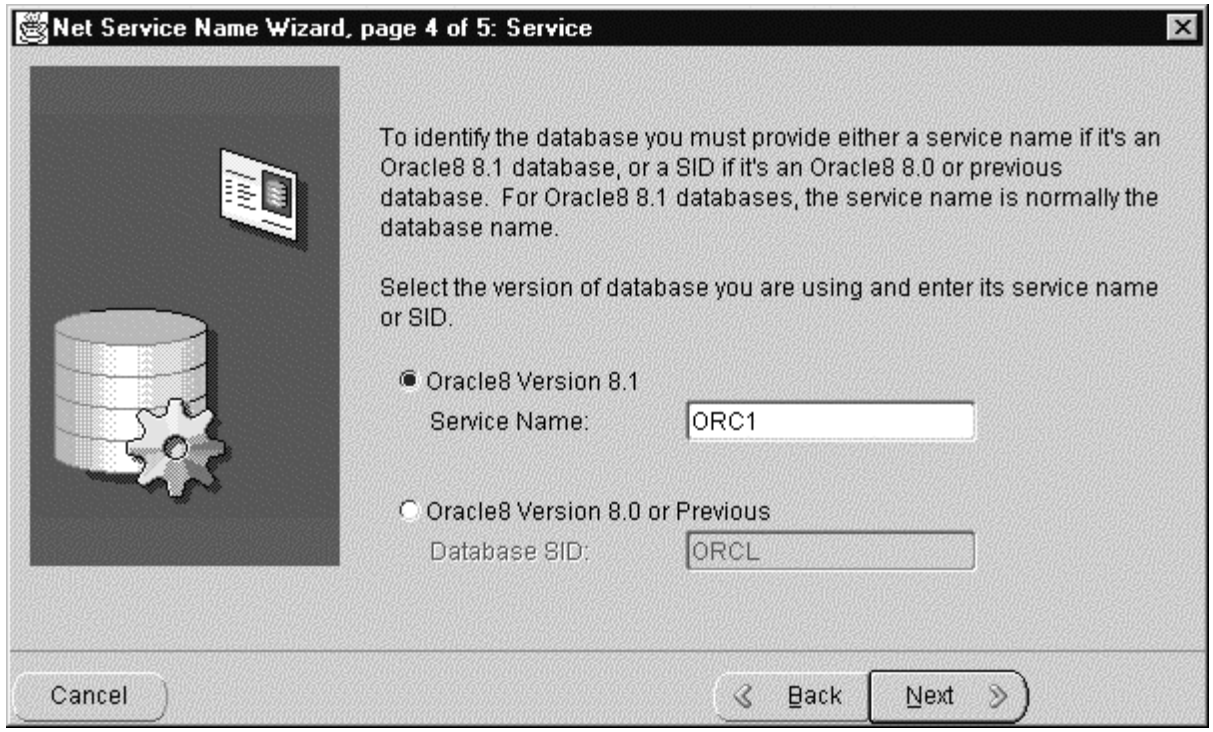
Net8 Assistant: Protocol



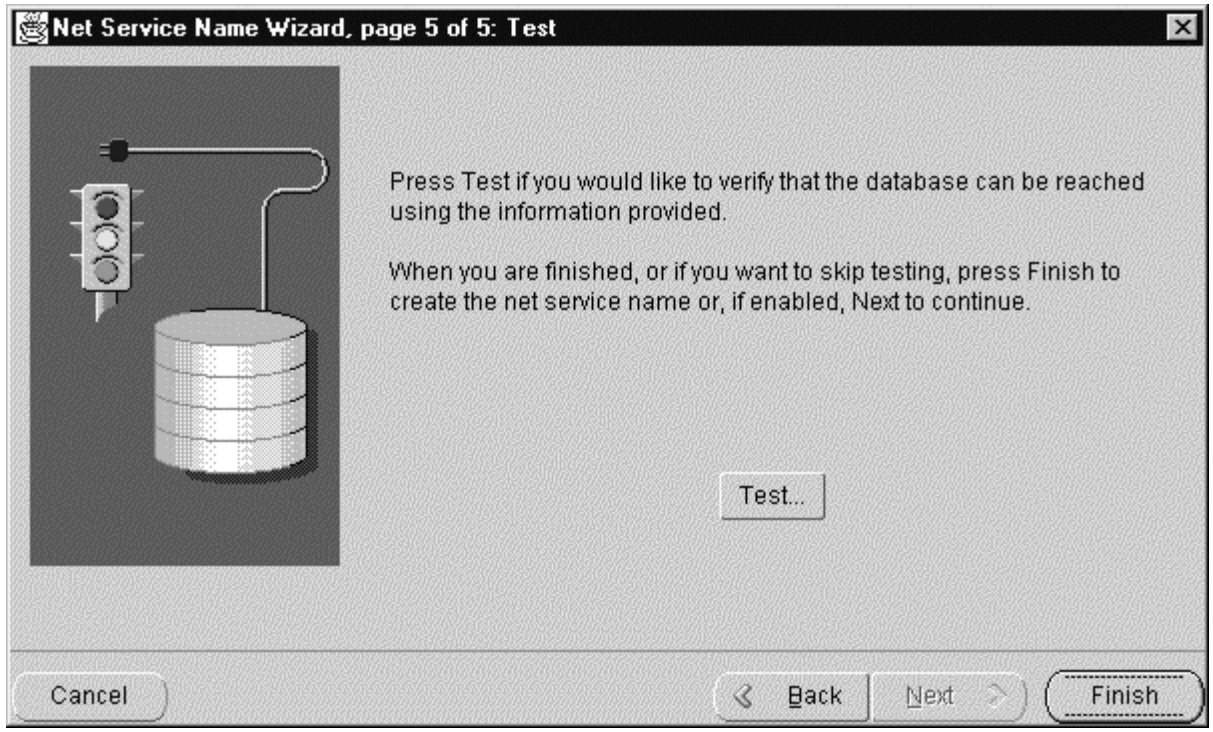
Net8 Assistant: Host Name and Port



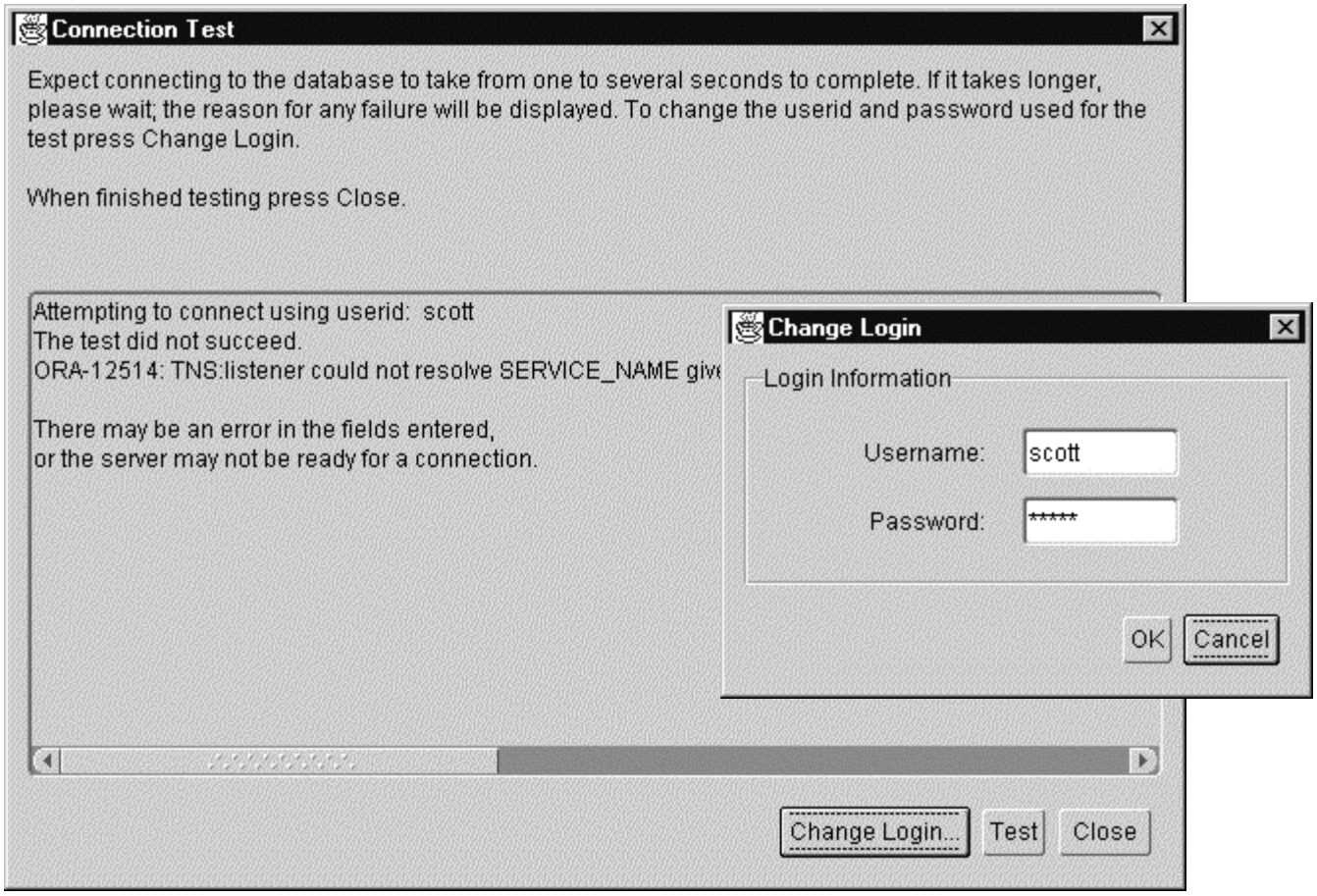
Net8 Assistant: Database SID



Net8 Assistant: Test Service



Net8 Assistant: Connection Test



TNSNAMES.ORA

```
# TNSNAMES.ORA Configuration file:
C:\ORANT8\NET80\ADMIN\tnsnames.ora
# Generated by Oracle Net8 Assistant

TST8.world =
  (DESCRIPTION =
    (ADDRESS =
        (PROTOCOL = TCP)(HOST = wwed151-sun)(PORT = 1521)
    )
    (CONNECT_DATA = (SID = TST8)
    )
  )
```

SQLNET.ORA

```
# C:\ORANT8\NET80\ADMIN\SQLNET.ORA Configuration
File:C:\ORANT8\NET80\ADMIN\sqlnet.ora
# Generated by Oracle Net8 Assistant

NAME.DEFAULT_ZONE=world
NAMES.DEFAULT_DOMAIN=world
SQLNET.AUTHENTICATION_SERVICES= (NTS)
SQLNET.EXPIRE_TIME=0
SQLNET.ENCRYPTION_SERVER=requested
SQLNET.ENCRYPTION_CLIENT=requested
NAMES.DIRECTORY_PATH= (TNSNAMES, HOSTNAME)
```

```
sqlplus system/manager@TST8
```

New TNSNAMES.ORA Parameters

- Prior to Net8 release 8.1, the SID of the database had to be specified in the CONNECT_DATA section of the TNSNAMES.ORA file.
- In release 8.1, a service can include multiple services provided by a single database and services that span multiple instances. SID has been replaced by the new parameters SERVICE_NAME and INSTANCE_NAME.

New TNSNAMES.ORA Parameters

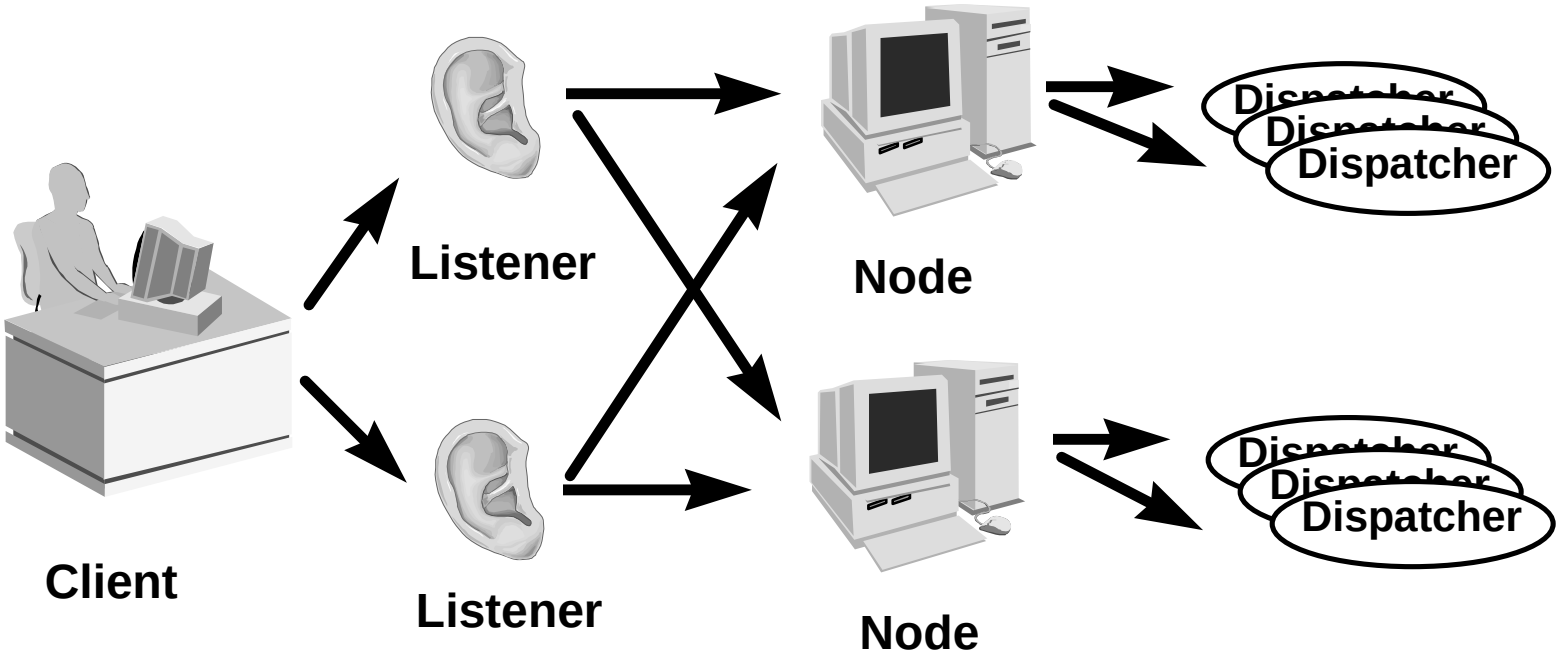
```
# TNSNAMES.ORA Configuration file:
C:\ORANT\NETWORK\ADMIN\tnsnames.ora
# Generated by Oracle Net8 Assistant

tst8.us.oracle.com=
(DESCRIPTION=
        (ADDRESS=
                (PROTOCOL=tcp)
                (HOST=wwed_testsun)
                (PORT=1521)
        )
    (CONNECT_DATA=
        (SERVICE_NAME=sales1.us.oracle.com)
        (INSTANCE_NAME=op1)
    )
 )
```

Connection Load Balancing

Connection load balancing balances the following:

- **The number of active connections among various instances**
- **Dispatchers for the same service**

Connection Load Balancing



1. Client randomly chooses from available listeners
2. Node with least CPU usage identified
3. Dispatcher with least number of connections used

Client Load Balancing and Failover: Example

Enabling load balancing and failover in the `TNSNAMES.ORA` file

```
TST8 = (DESCRIPTION=
                    (FAILOVER=on)
                    (LOAD_BALANCE=on)
                    (ADDRESS =  (PROTOCOL=tcp)
                                (HOST=host1)
                                (PORT=1521))
                    (ADDRESS =  (PROTOCOL=tcp)
                                (HOST=host2)
                                (PORT=1521))
                    (CONNECT_DATA=(SERVICE_NAME=sales))
        )
```

Troubleshooting the Client Side

The following error codes are related to problems on the client side:

```
ORA-12154 “TNS:could not resolve service
name”
ORA-12198 “TNS:could not find path to
destination”
ORA-12203 “TNS:unable to connect to
destination”
ORA-12533 “TNS:illegal ADDRESS parameters”
ORA-12545 “TNS:name lookup failure”
```

Summary

In this lesson, you should have learned:

- **The host naming method requires no setup in a TCP/IP environment if defaults are acceptable.**
- **The local naming method uses the `tnsnames.ora` file.**

5

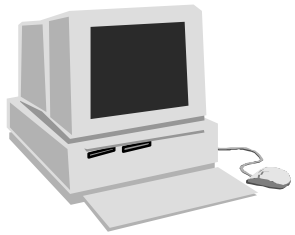
Centralized Naming Concepts

Objectives

After completing this lesson, you should be able to do the following:

- **Define the Names server concept**
- **Identify the various names resolution methods**
- **Identify the benefits of a Names server**
- **Define the administration objects used in a Names server environment**
- **Define the naming models**

What Is a Service Name

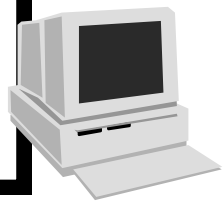


FINANCE

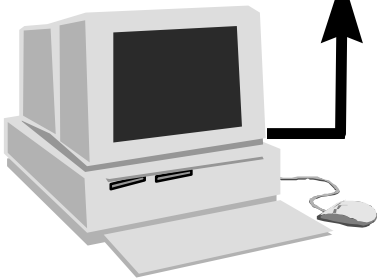
HR

TNSNAMES.ORA

```
SALES= ...
SALES1= ...
HR = ...
FINANCE= ...
...
```



Client



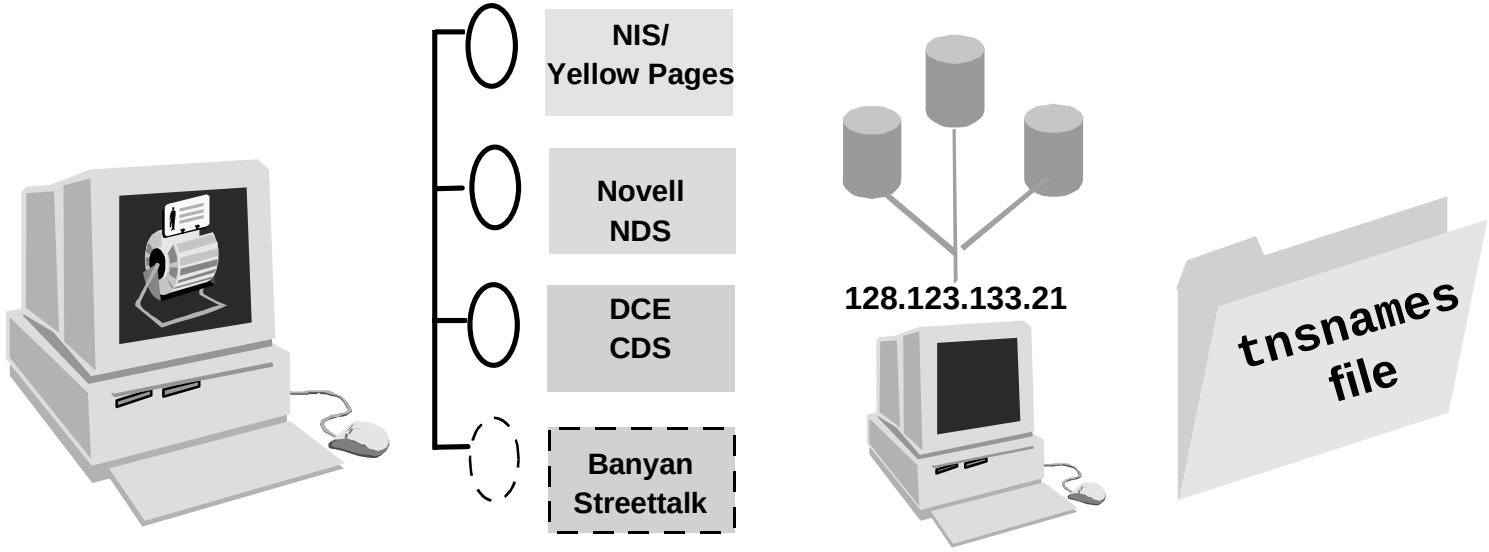
SALES

SALES3
SALES2
SALES1

```
SQL> connect system/password@SALES1
```


ORACLE

Service Names Resolution Methods



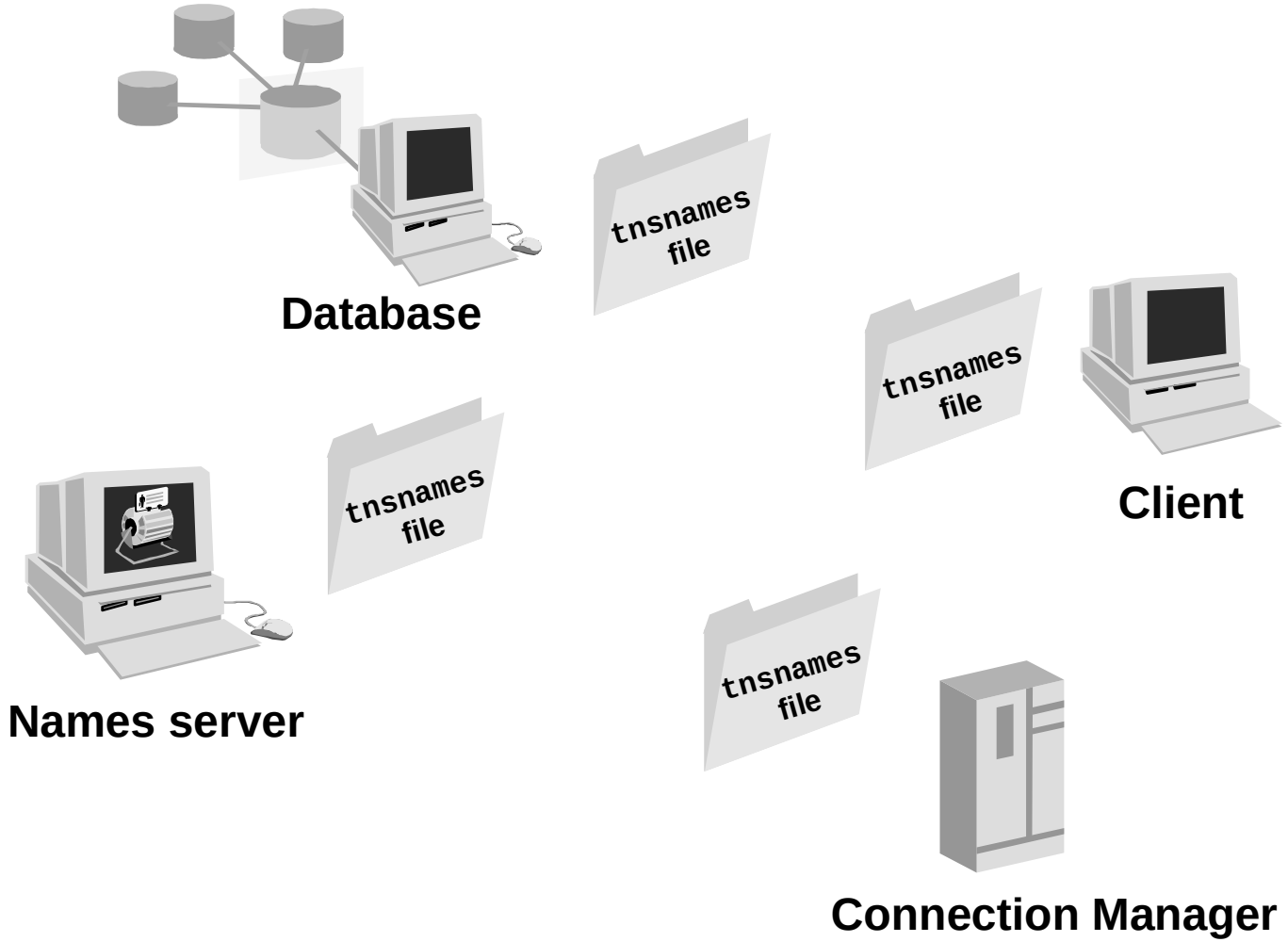
Centralized naming (Names)

External naming

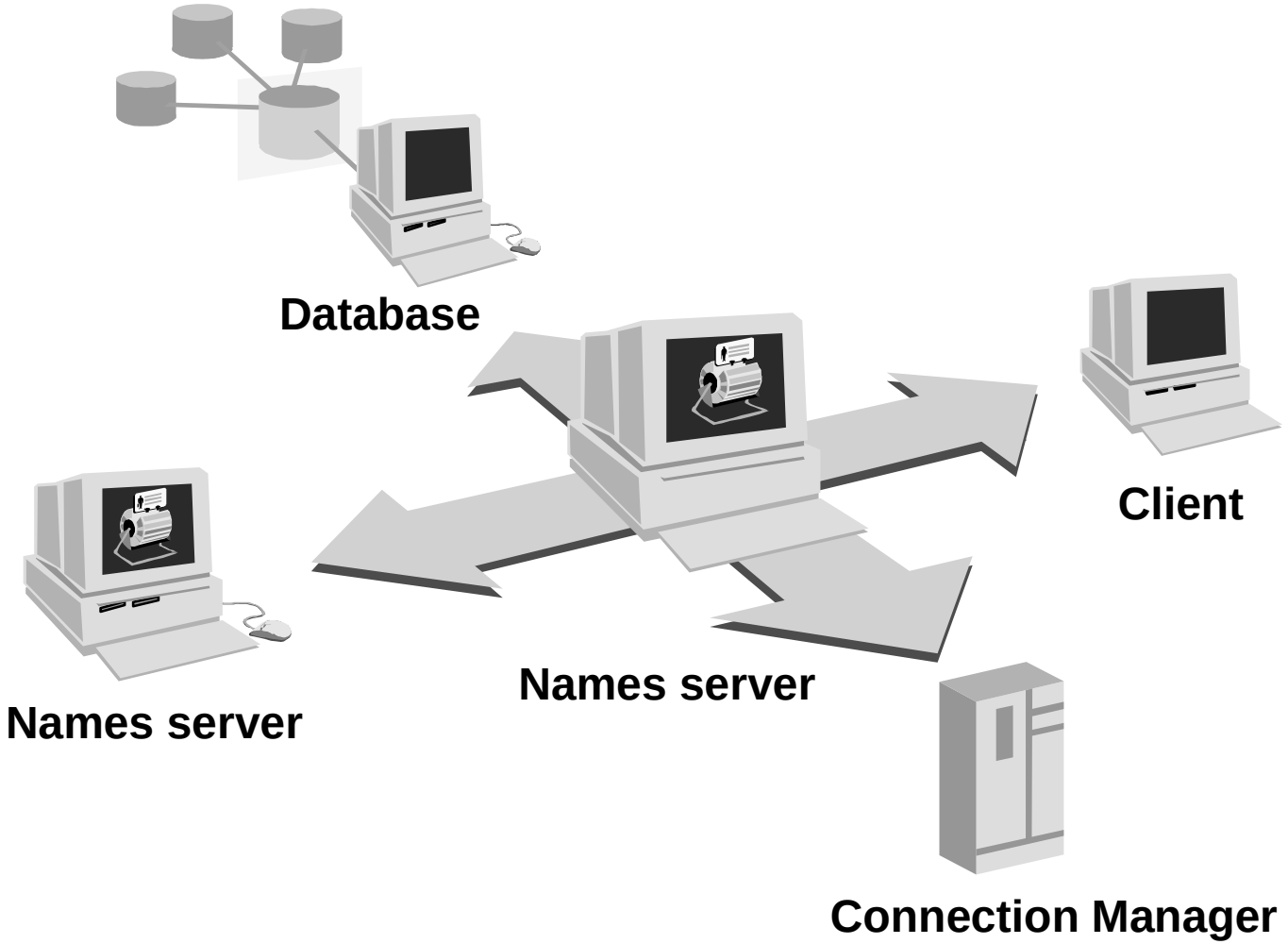
Host naming

Local naming

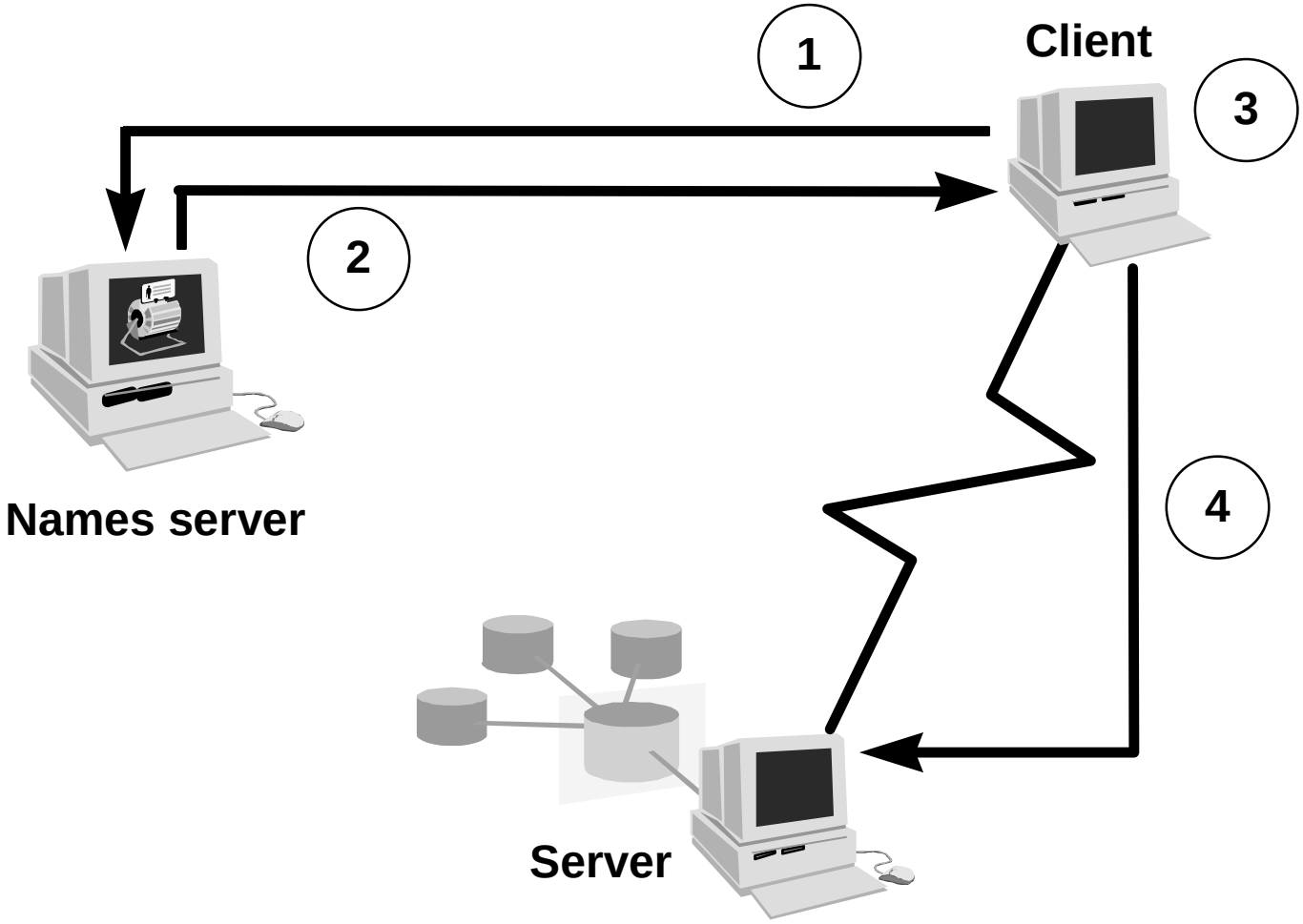
Resolution with Local Naming



Resolution with Centralized Naming



Centralized Naming Using a Names Server



When to Use a Names Server

It is recommended to use a Names server in one or more the following cases:

- **An enterprise wide network that spans multiple geographic regions**
- **Several local area networks (LANs), each with a few servers and a few hundred clients.**
- **An expanding or downsizing network in which you anticipate a fair amount of server relocation.**

Names Directory Objects

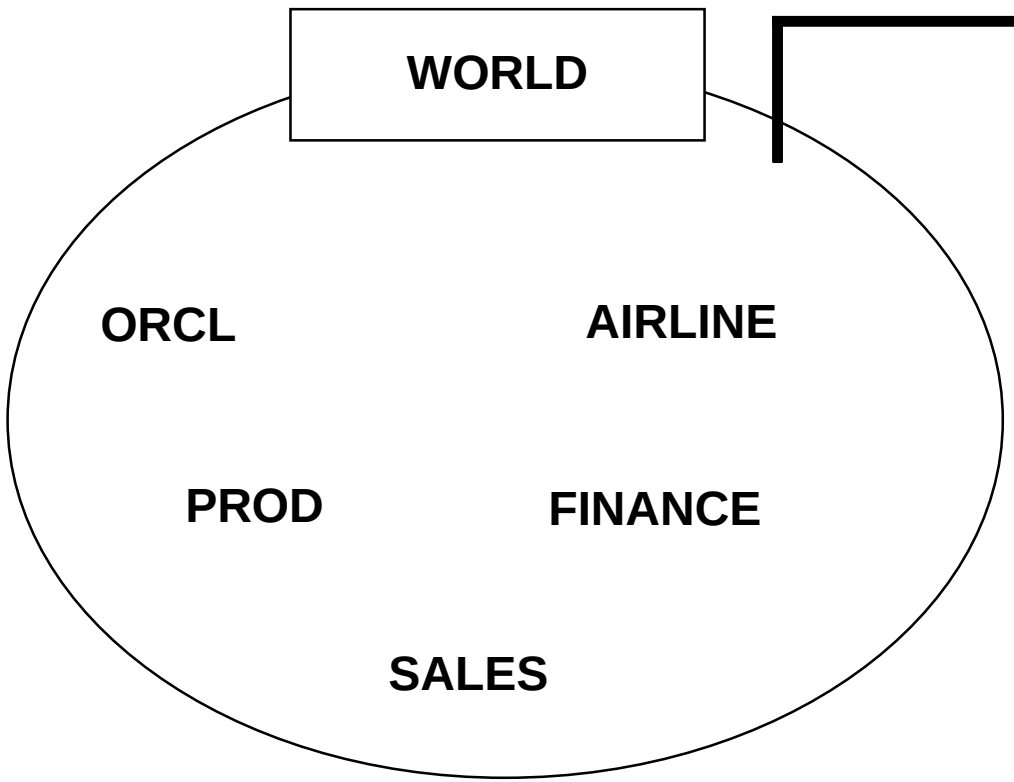
- **Domain**

  A group of unique network objects such as databases

- **Administration region**
  - **One or more domains**
  - **One or more Names servers**
- **Community**

  A group of Net8 clients and servers that use the same network protocol

Domain Naming Models: Flat



Names within the WORLD Domain

ORCL.world

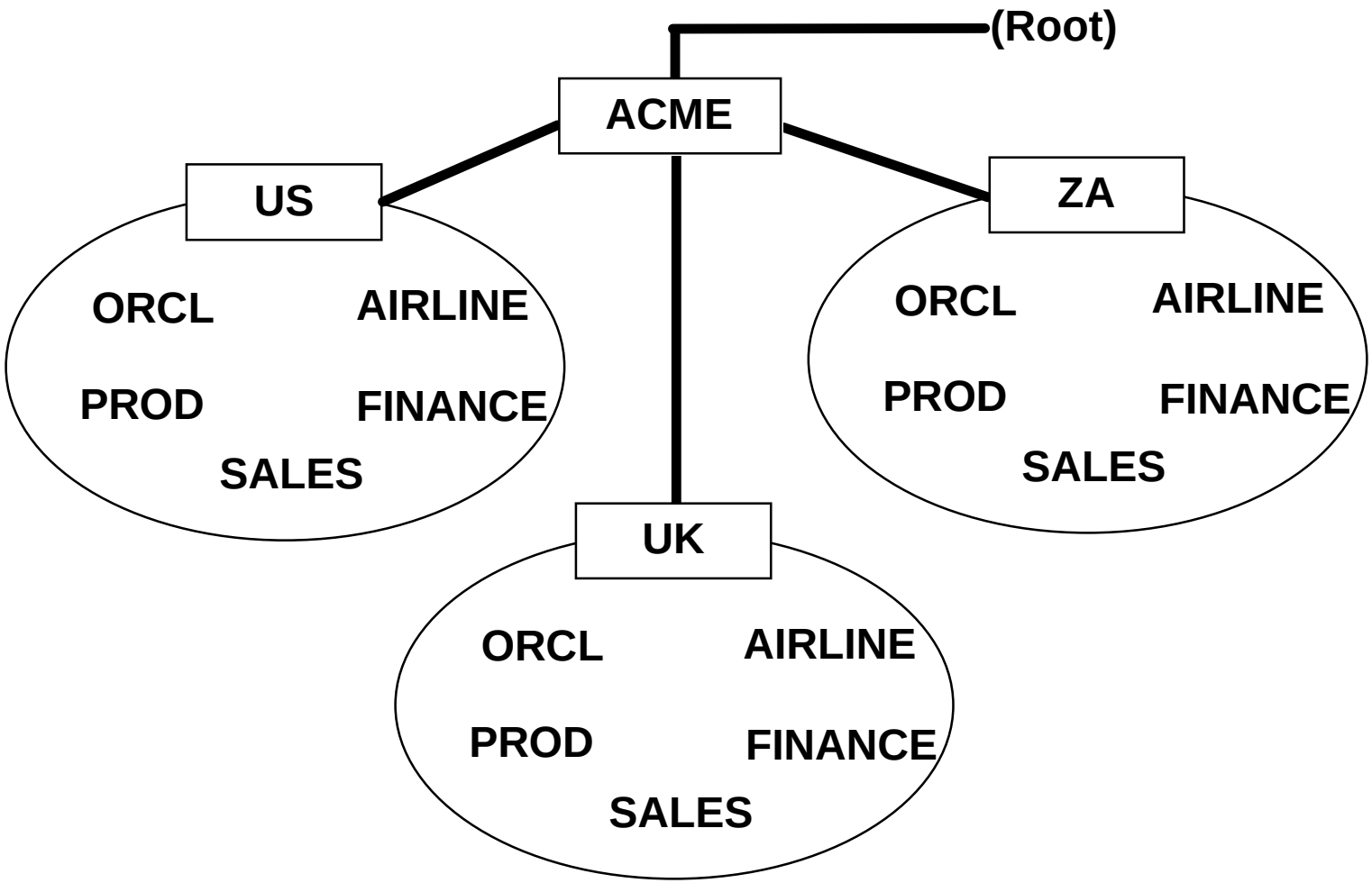
PROD.world

AIRLINE.world

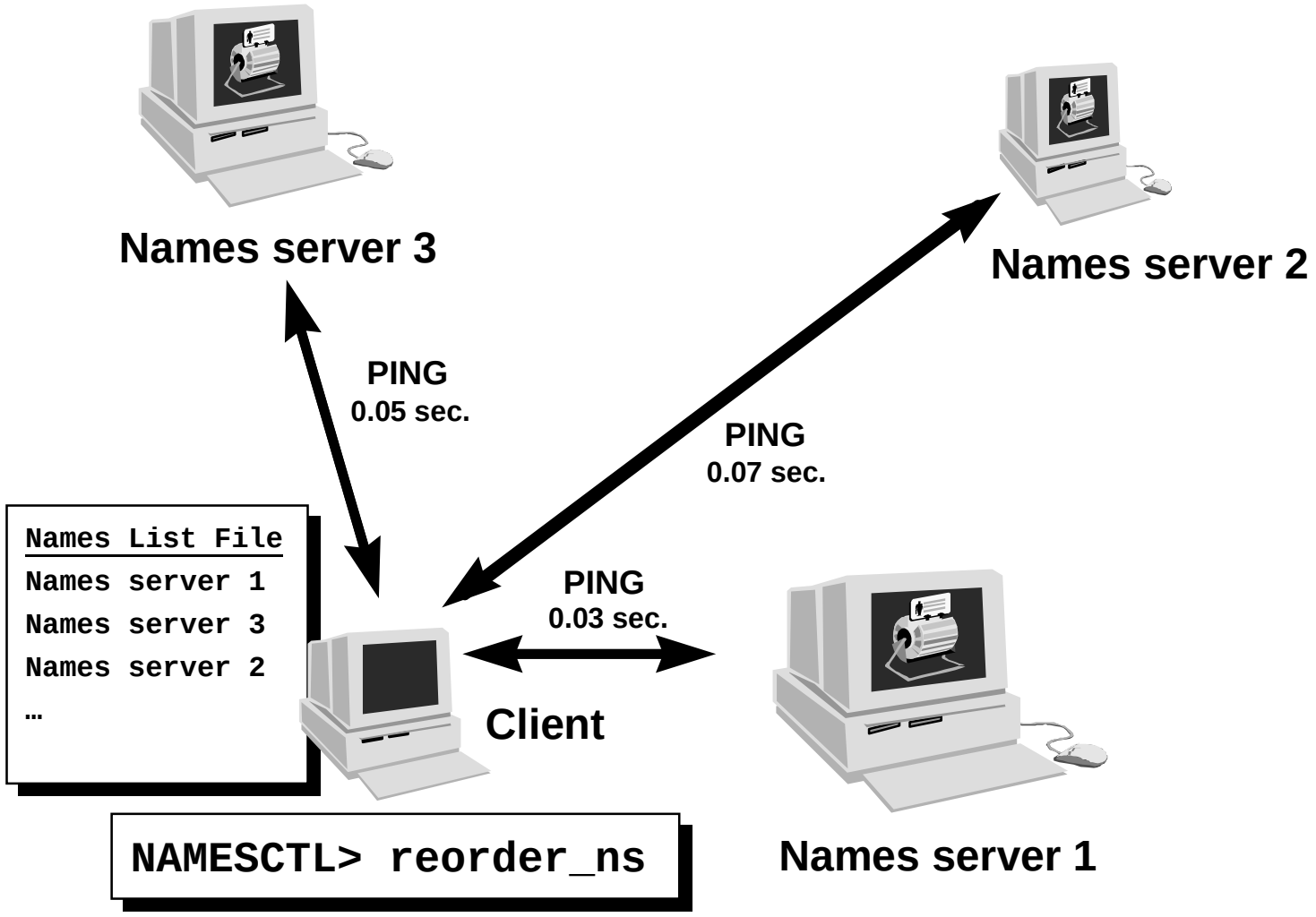
FINANCE.world

SALES.world

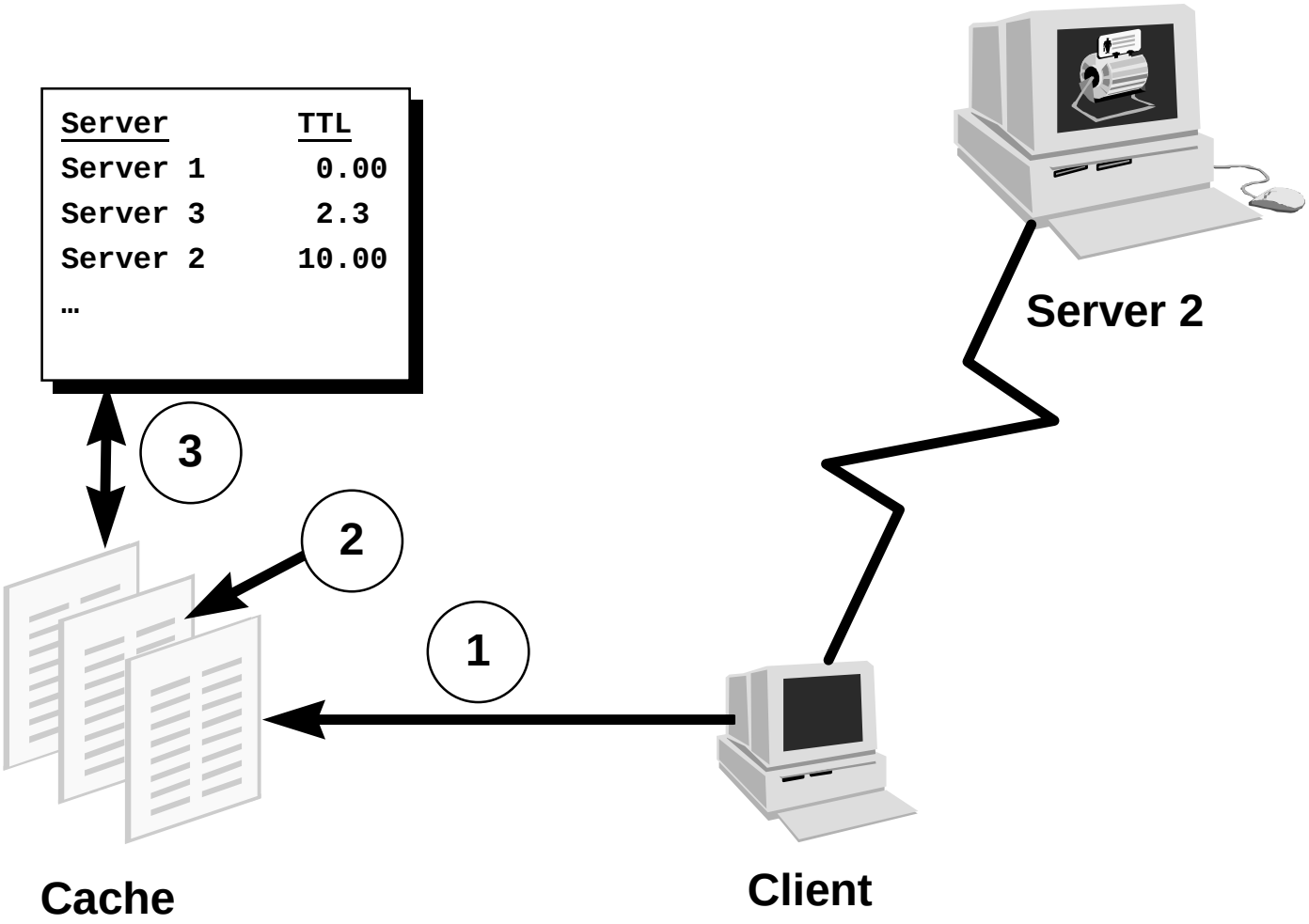
Domain Naming Models: Hierarchical



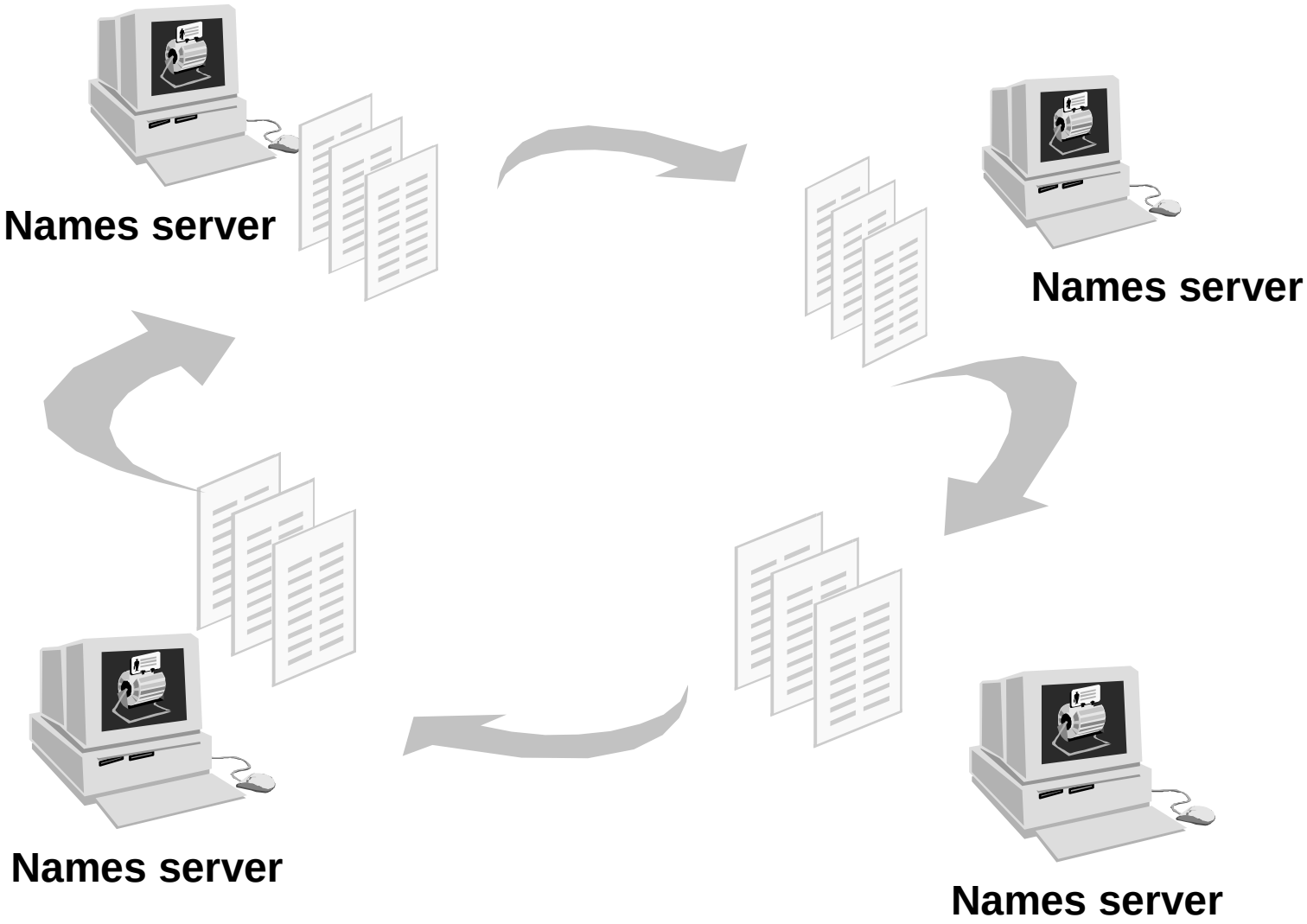
Names Server Discovery



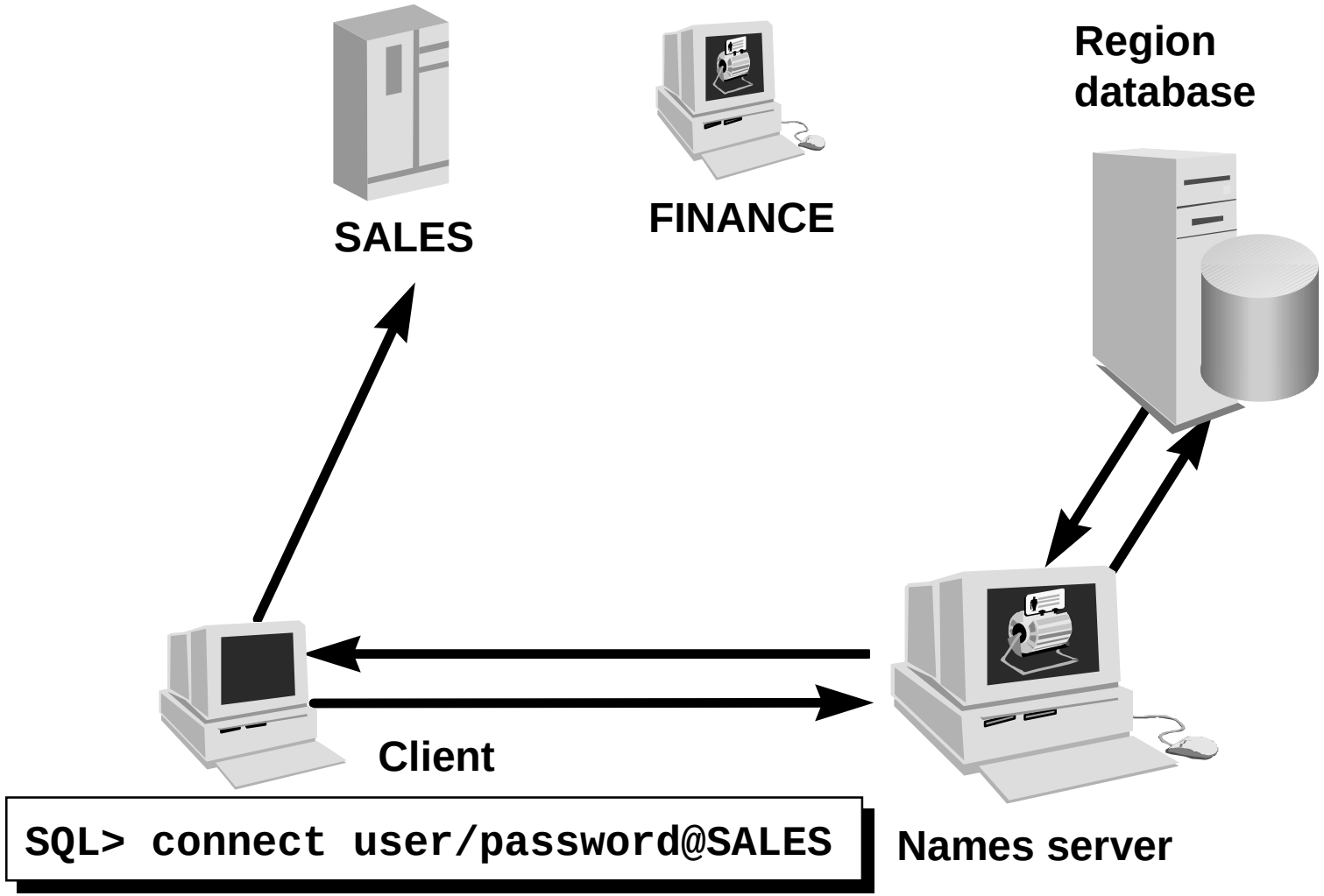
Client-Side Cache



Cache Replication



The Region Database



Summary

In this lesson, you should have learned:

- **Local naming uses the `TNSNAMES.ORA` file to resolve a service name.**
- **Host naming uses default system settings.**
- **Centralized naming uses the Names server to resolve service names.**
- **Use a Names server when the network environment is distributed and dynamic.**
- **A region database is used in conjunction with a Names server to store the service names.**

6

Oracle Names Usage and Configuration

Objectives

After completing this lesson, you should be able to do the following:

- **Configure centralized naming using Net8 Assistant**
- **Store the network configuration in the client cache**
- **Store the network configuration in a region database**
- **Start and stop the Names server using the Names Control utility**

Configuring Centralized Naming

To use centralized naming, the Names server and the client attempting to use the Names server must be configured.

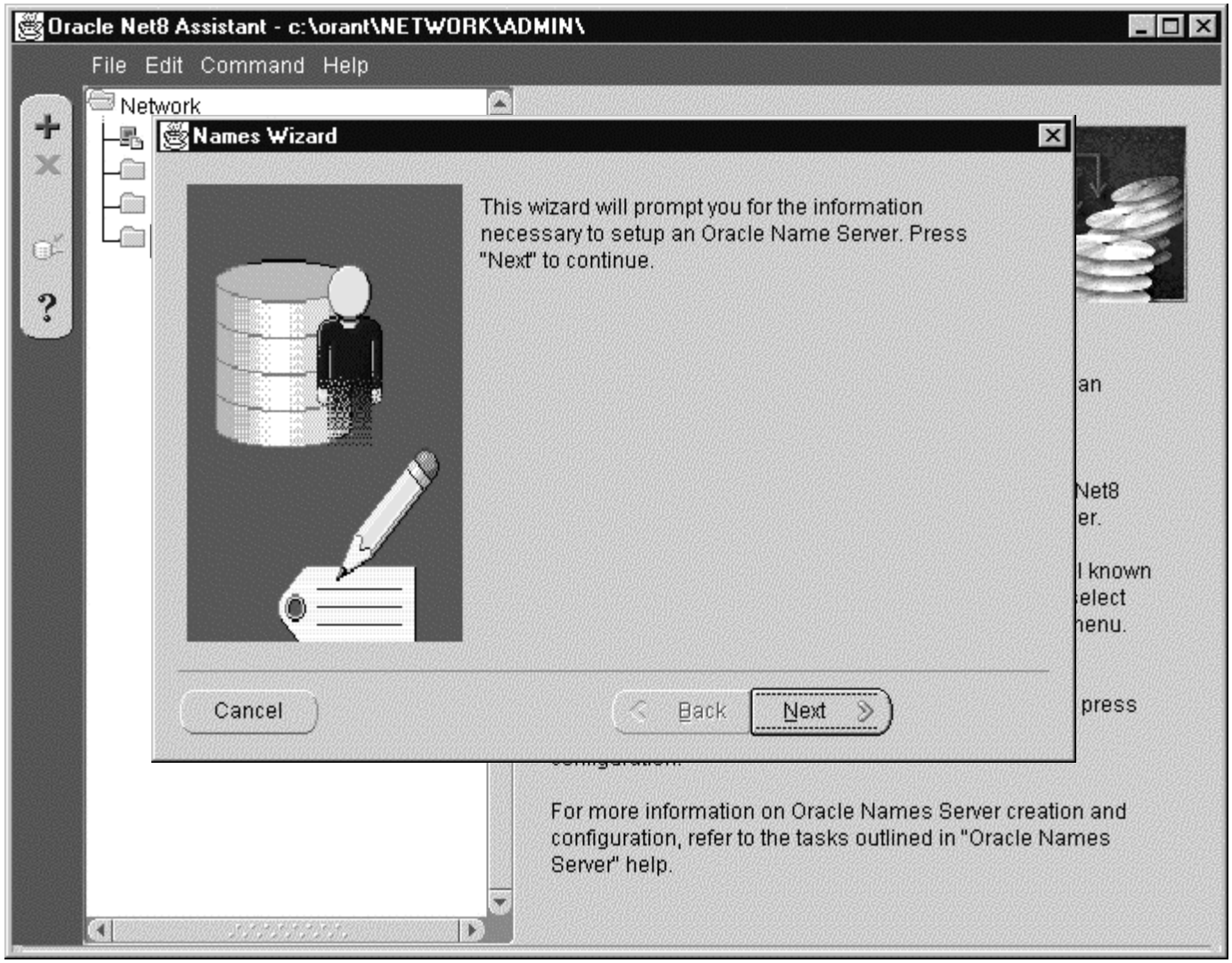
- **The Names server can be configured by using the Net8 Assistant or by manually editing the `names.ora` file.**
- **The Client Profile for the Names server can be configured by using the Net8 Assistant or by manually editing the `sqlnet.ora` file.**

Configuring Centralized Naming

The following steps summarize how to configure the Names server:

1. **Create and configure the Names server using the Names Wizard.**
2. **Start up the Names server.**
3. **Enter service names into the Names server.**

Configuring the Names Server (Cache)

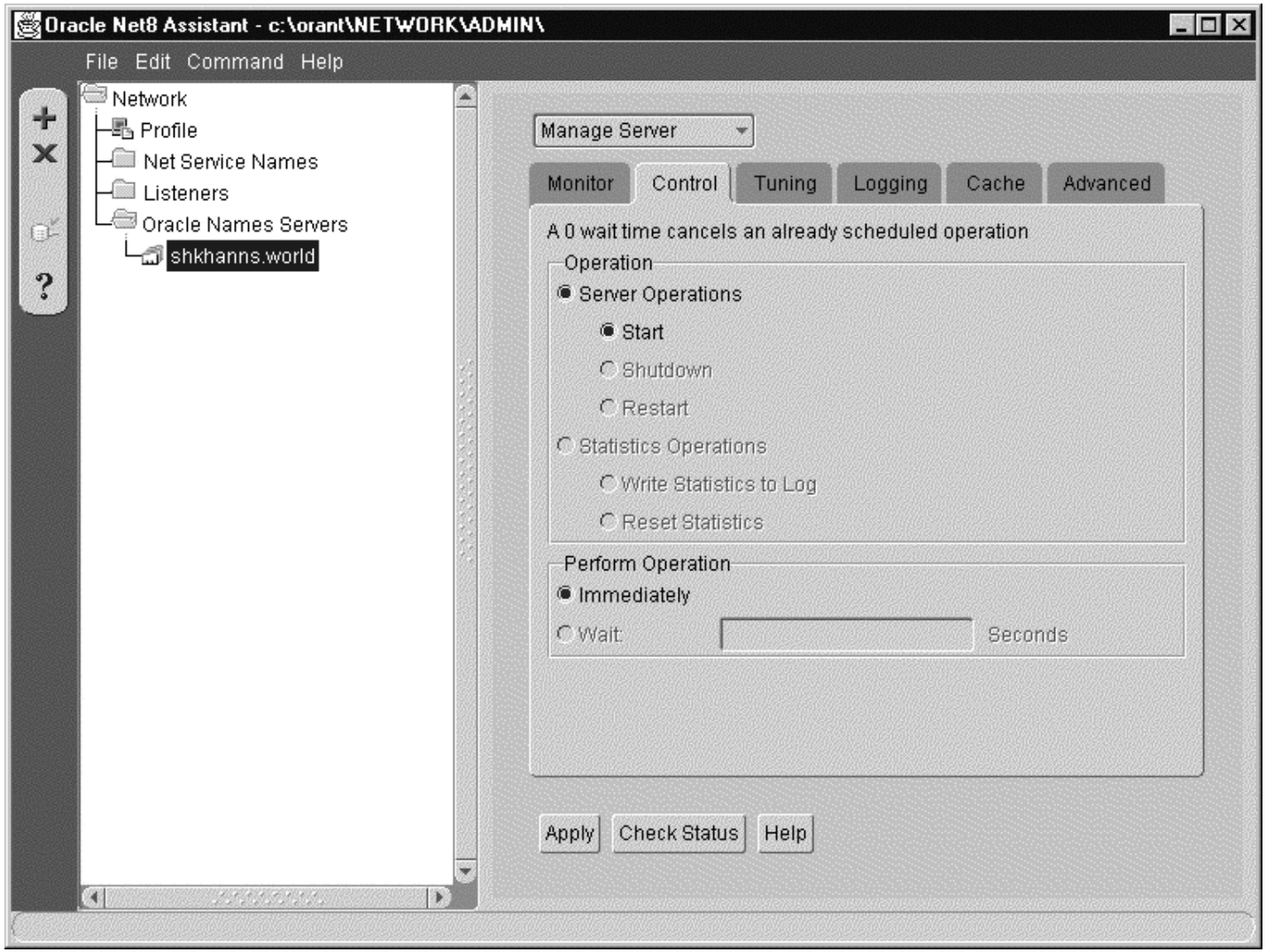


Configuring the Names Server (Cache)

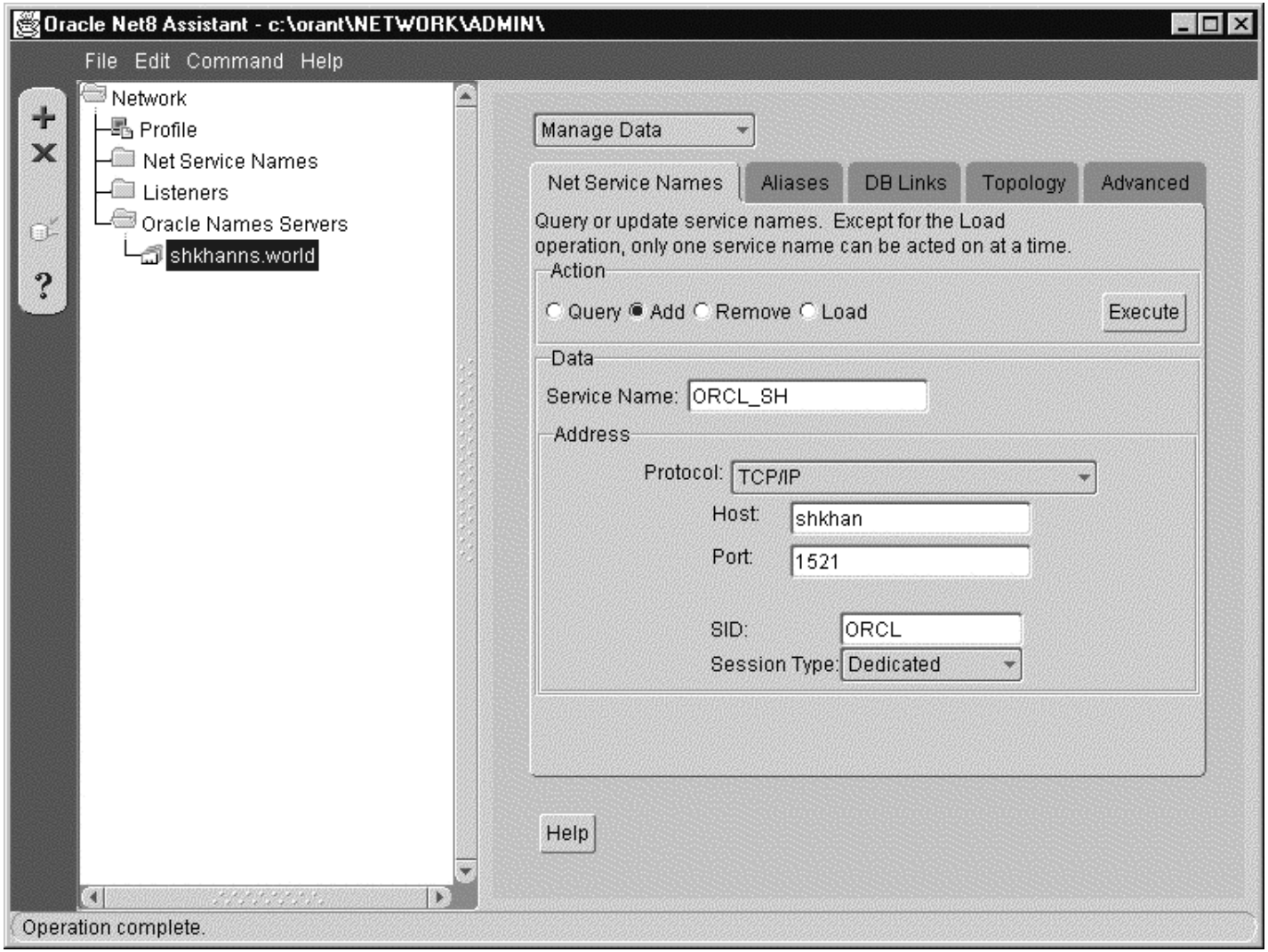
Contents of the `names.ora` file:

```
# C:\ORANT\NETWORK\ADMIN\NAMES.ORA Configuration
# File:c:\orant\NETWORK\ADMIN\names.ora
# Generated by Oracle Net8 Assistant

NAMES.SERVER_NAME = onames_wwed110-pc.world

NAMES.ADDRESSES =
  (ADDRESS =
     (PROTOCOL = TCP)
     (HOST = wwed110-pc)
     (PORT = 1621)
  )
```

Configuring the Names Server (Cache)



Configuring the Names Server (Cache)

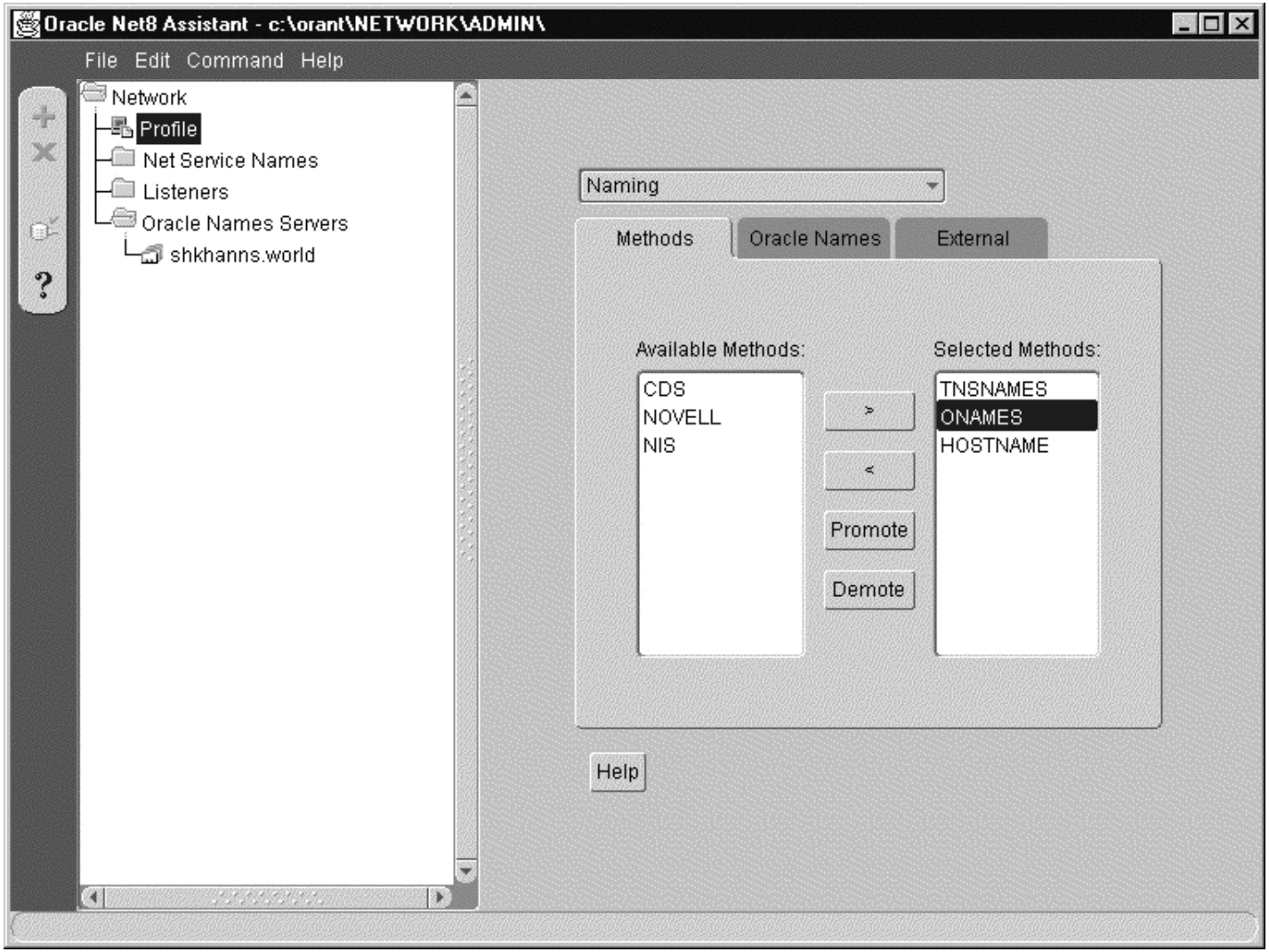


Configuring the Client Profile

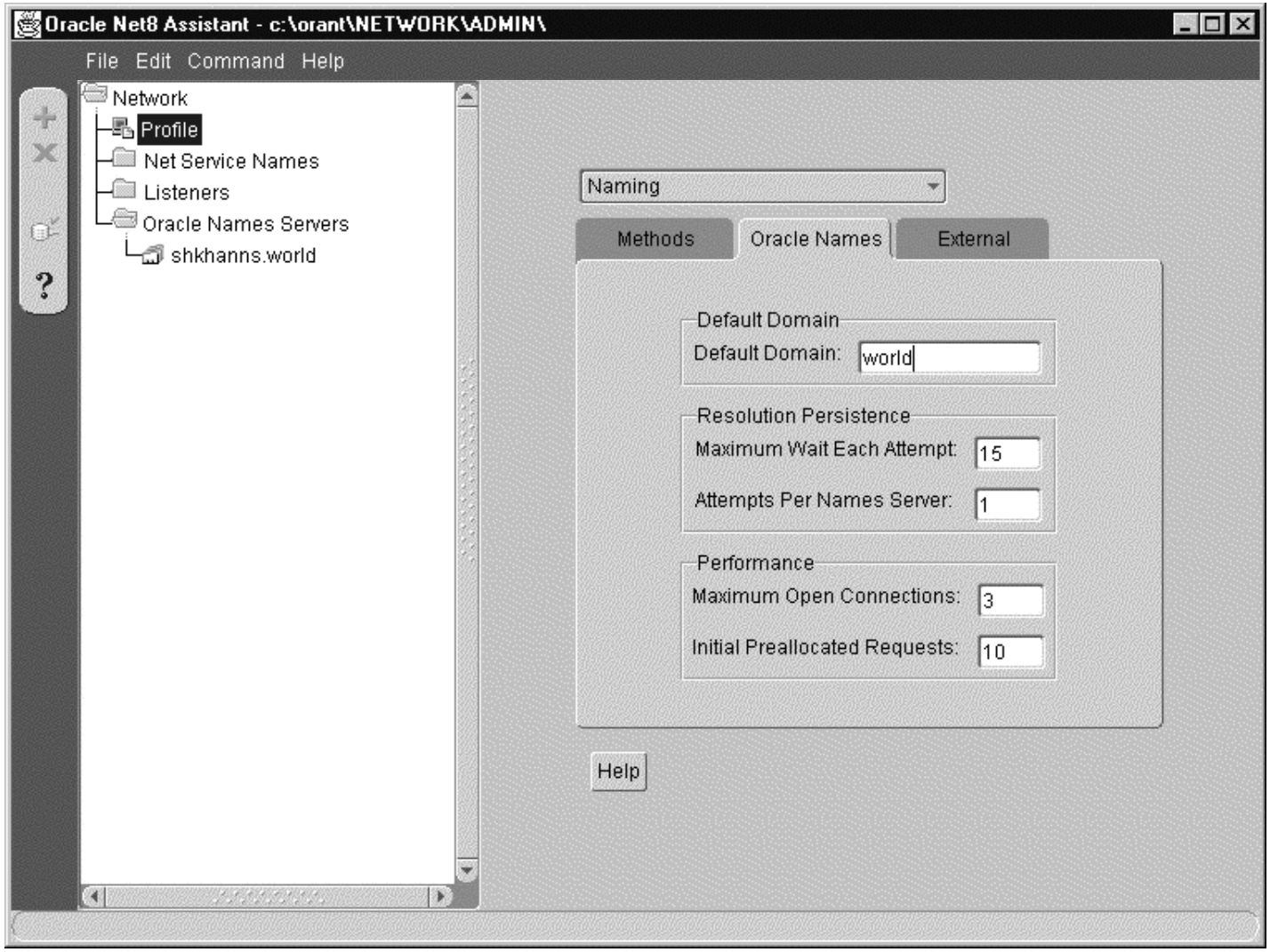
The following steps summarize how to configure the Oracle Names client profile (`sqlnet.ora`):

1. **Choose Names as the naming method.**
2. **Configure optional Names parameters in the client profile.**
3. **Specify the preferred Names servers.**

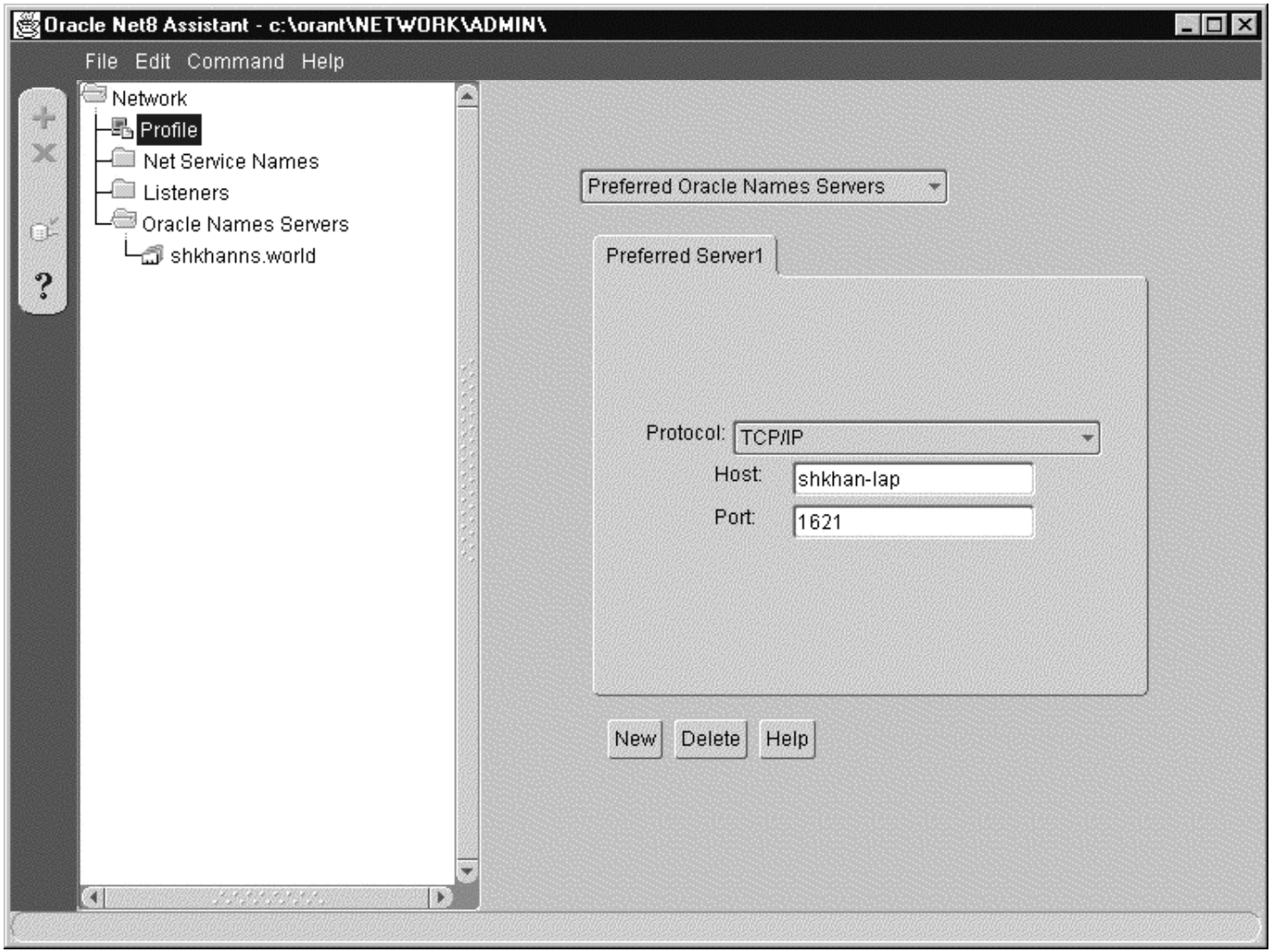
Configuring the Client Profile



Configuring the Client Profile



Configuring the Client Profile



Configuring the Client Profile

Contents of the `sqlnet.ora` file:

```
# C:\ORANT\NETWORK\ADMIN\SQLNET.ORA Configuration
# File:c:\orant\NETWORK\ADMIN\sqlnet.ora
# Generated by Oracle Net8 Assistant

NAMES.PREFERRED_SERVERS =
  (ADDRESS_LIST =
     (ADDRESS =
         (PROTOCOL = TCP)
         (HOST = shkhan-lap)
         (PORT = 1621)  ))
NAMES.DEFAULT_DOMAIN = world
NAMES.DIRECTORY_PATH= (ONAMES)
```

Testing the Names Server

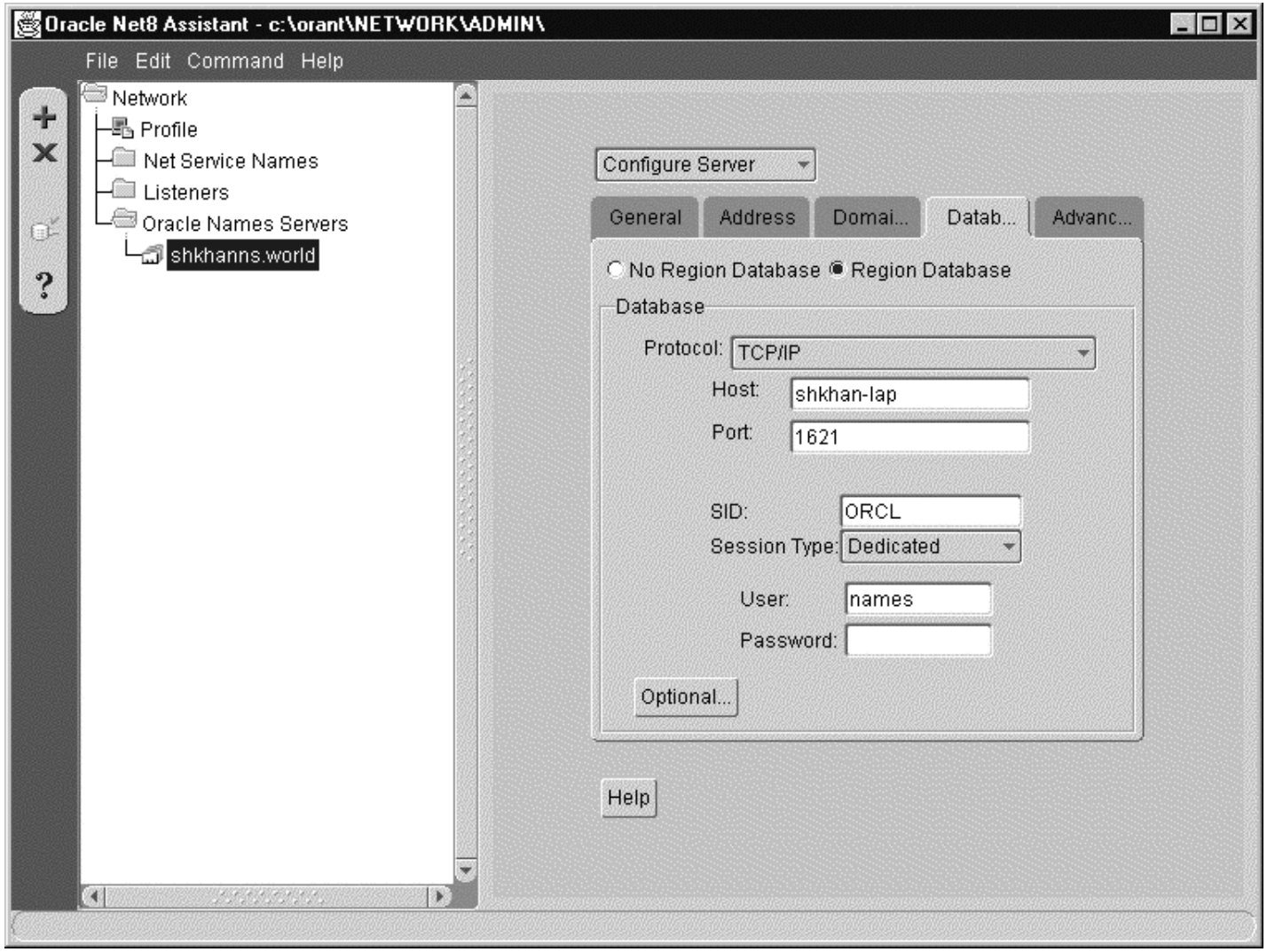
1. Click the Profile icon in Net8 Assistant.
2. Select Naming from the pull-down menu of Net8 Assistant.
3. Remove all other naming methods besides ONAMES.
4. Save the configuration.
5. Use SQL*Plus to connect to a service stored in the Names server.
6. Restart the Names server.

Configuring a Region Database

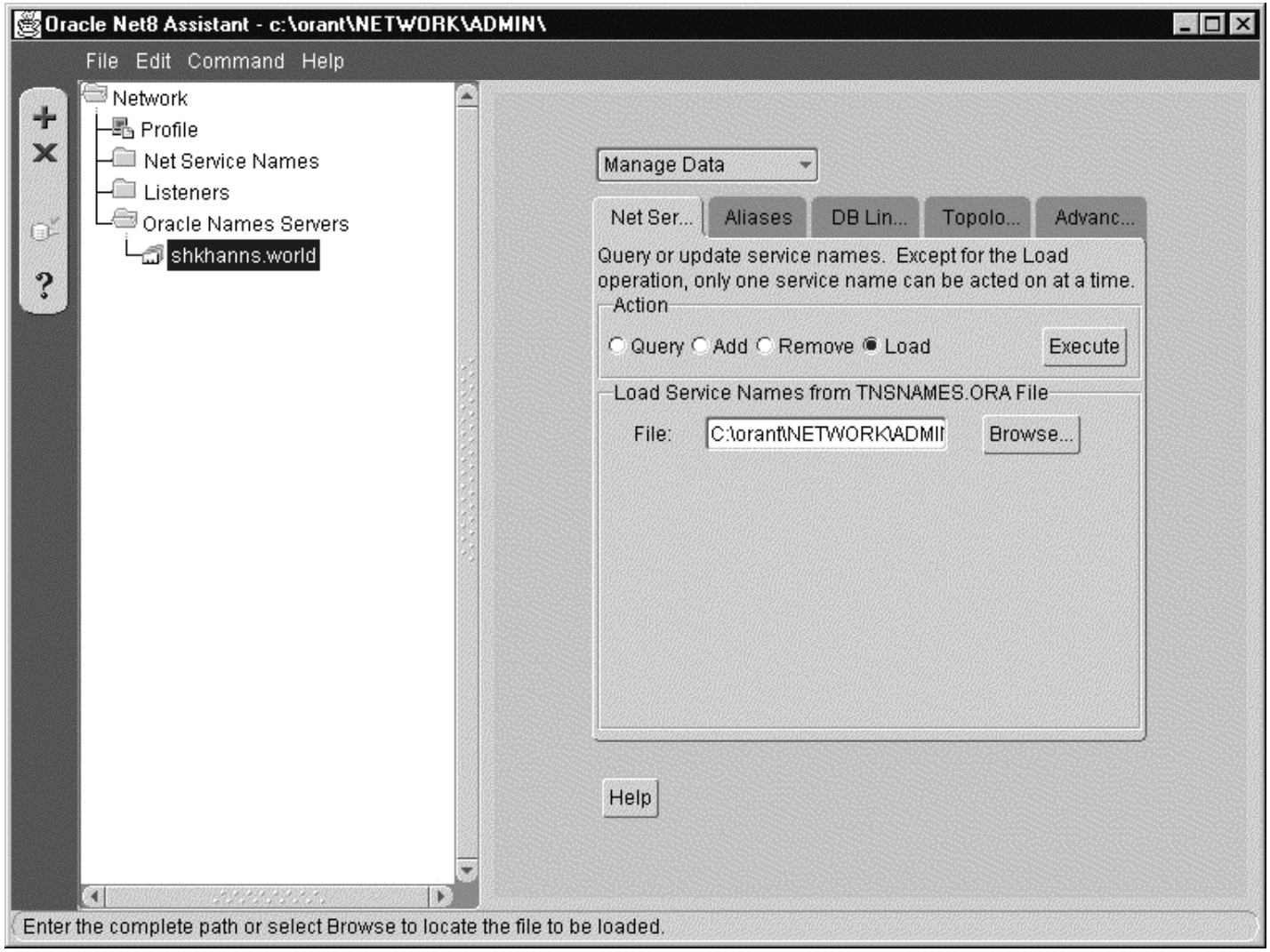
The following steps summarize how to configure a Names server with a region database:

1. **Start up the existing Names server.**
2. **Run the Names server initialization script.**
3. **Configure the region database parameters.**
4. **Add service names.**

Configuring a Region Database



Configuring a Region Database



Names Control Utility (NAMESCTL)

- The Names Control utility is the tool used to start and control the Names server.
- Commands from the Names Control utility can be issued from the command line or from the NAMESCTL prompt.

  UNIX command line syntax:

```
$ NAMESCTL command
```

- Prompt syntax:

```
NAMESCTL> command
```

NAMESCTL Commands

The following functions are available for the NAMESCTL utility:

- **Starting a Names server**
- **Stopping a Names server**
- **Viewing the status of a Names server**

NAMESCTL Commands

- **Testing a Names server**
- **Discovering Names servers**
- **Starting the client cache process**

Other NAMESCTL Commands

DELIGATE_DOMAIN	REGISTER
DOMAIN_HINT	RELOAD
EXIT	REPEAT
FLUSH	RESET_STATS
FLUSH_NAME	RESTART
HELP	TIMED_QUERY
LOG_STATS	UNREGISTER
PASSWORD	VERSION
QUIT	

NAMESCTL SET Modifier

The SET modifier is used to change Names server parameters from the Names Control utility.

For example, the following sequence sets the node control and changes its trace level:

```
NAMESCTL> set server server1.oracle.com
NAMESCTL> set trace_level admin
```

NAMESCTL SHOW Modifier

The SHOW modifier is used to view the Names server parameters in the Names Control utility environment.

For example, the following command displays the current default domain:

```
NAMESCTL> show default_domain
Current default domain is "world"
```

Summary

In this lesson, you should have learned:

- **A Names server is a centrally located service by which service names are resolved to connect strings.**
- **`names.ora` is the configuration file for the Names server.**
- **The Names server can be configured by either manually modifying the `names.ora` file or by using Net8 Assistant.**

Summary

- **NAMESCTL is the utility used to configure the Names server.**
- **A region database is a database repository of service names stored by the Names server.**
- **The NAMESCTL SET and SHOW modifiers are used to change and display the settings of the Names server, respectively.**

7

Multithreaded Server Usage and Configuration

ORACLE®

Objectives

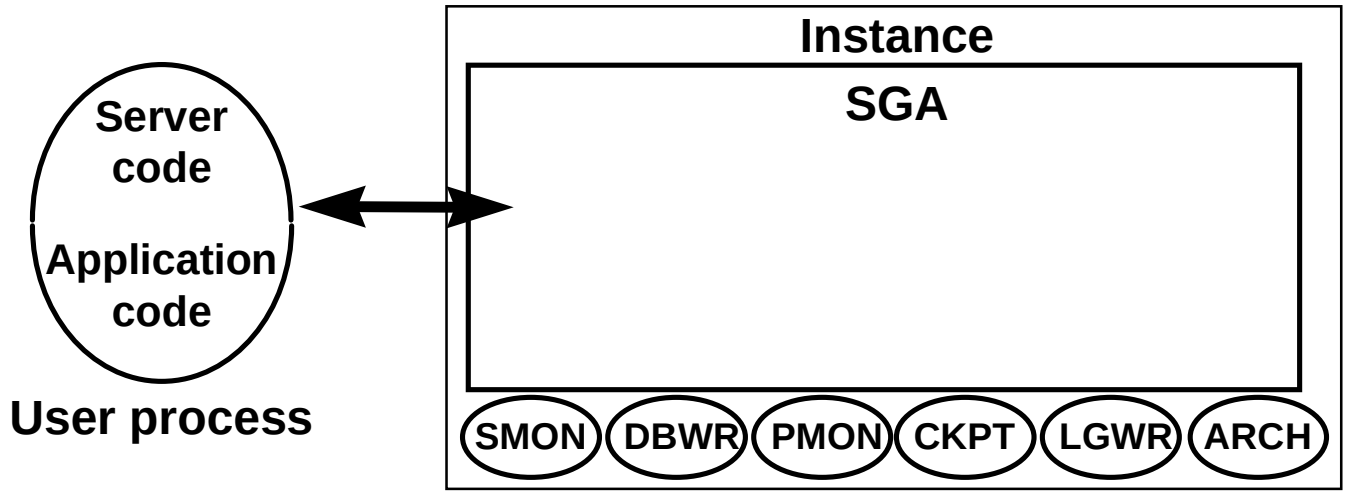
After completing this lesson, you should be able to do the following:

- **Identify the components of the multithreaded server (MTS)**
- **Configure dispatchers using `init.ora`**
- **Configure shared servers using `init.ora`**
- **Specify the listener address for multithreaded server**
- **Set up connection pooling using the multithreaded server**

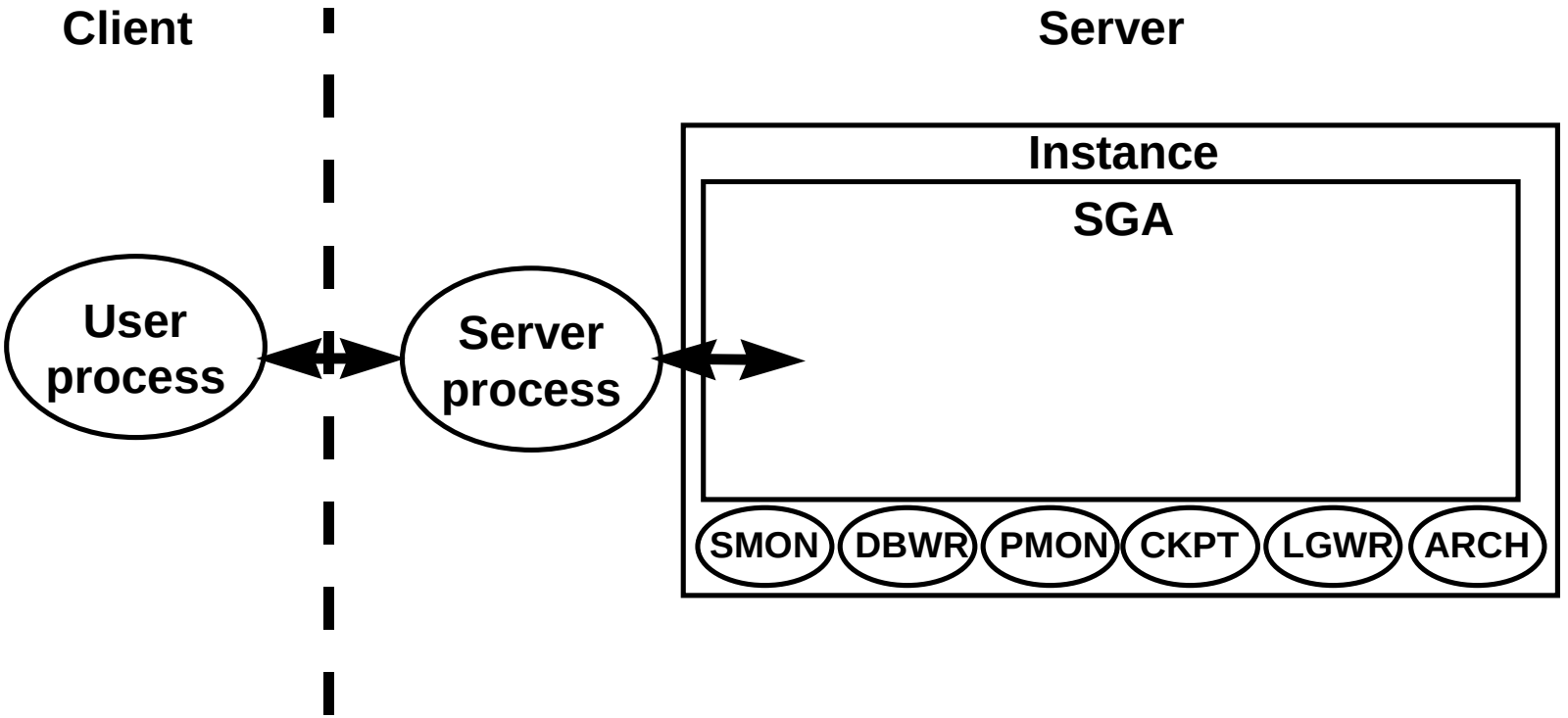
Server Configurations

- Combined user and server processes (single-task)
- Dedicated server (two-task)
- Multithreaded server

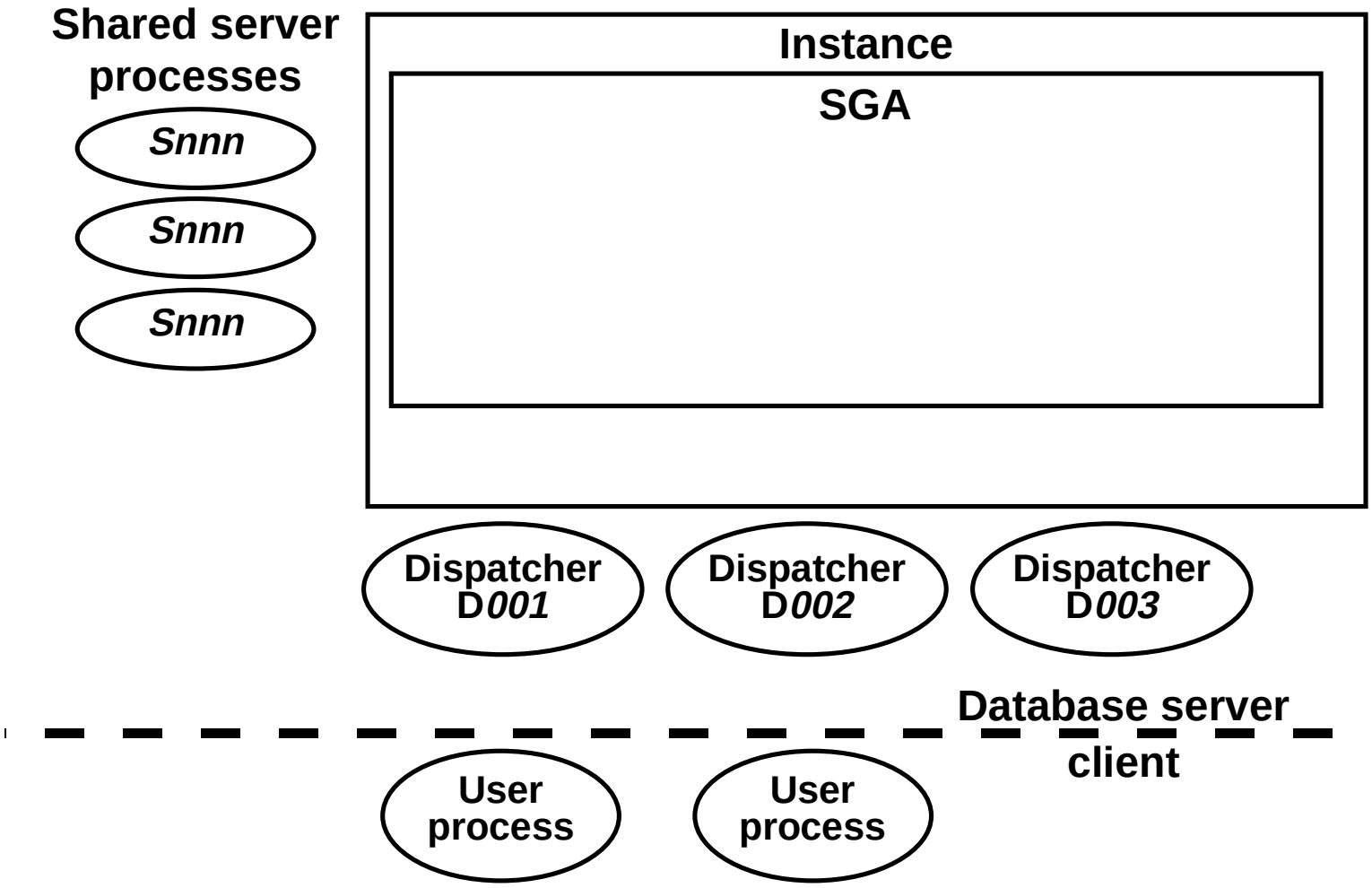
Combined User and Server Process (Single-Task)



Dedicated Server Processes (Two-Task)



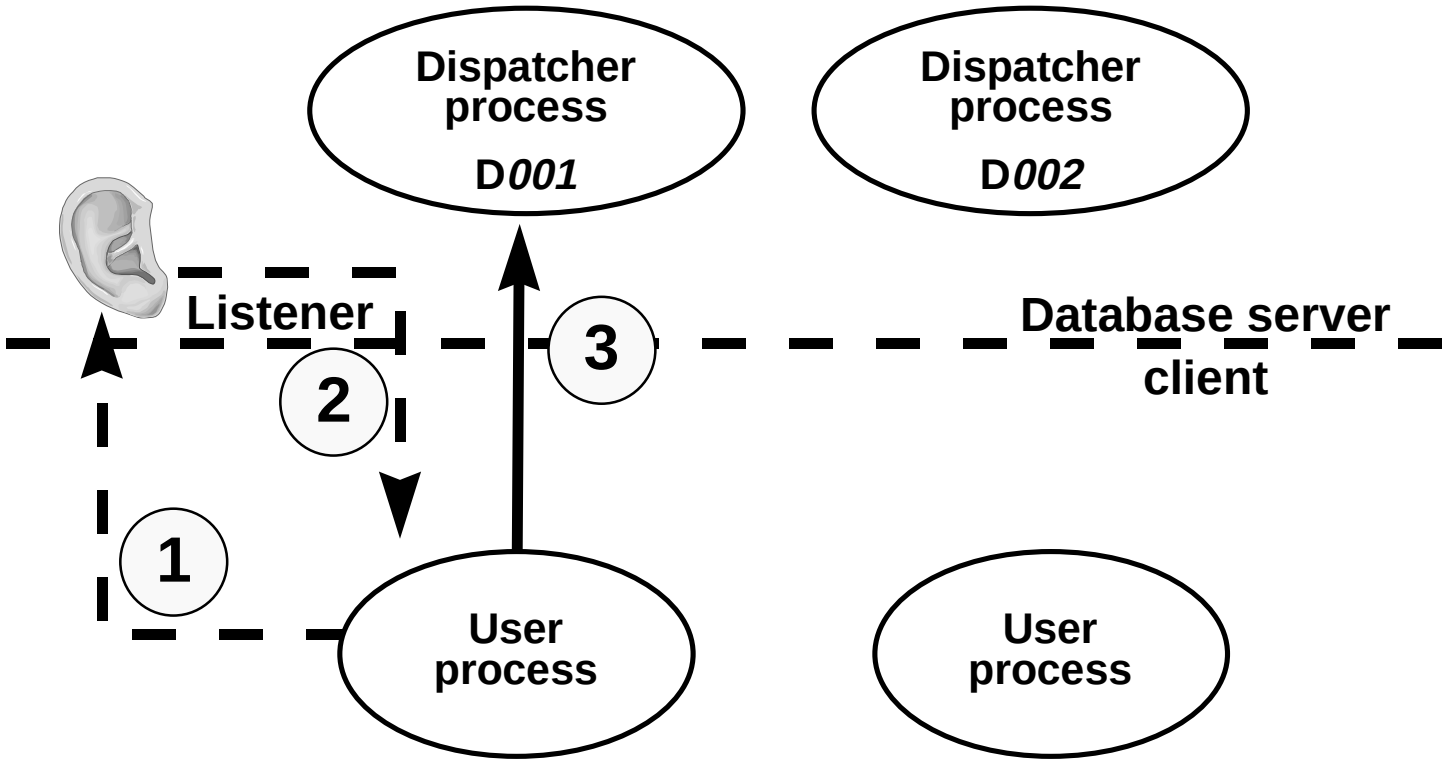
Multithreaded Server



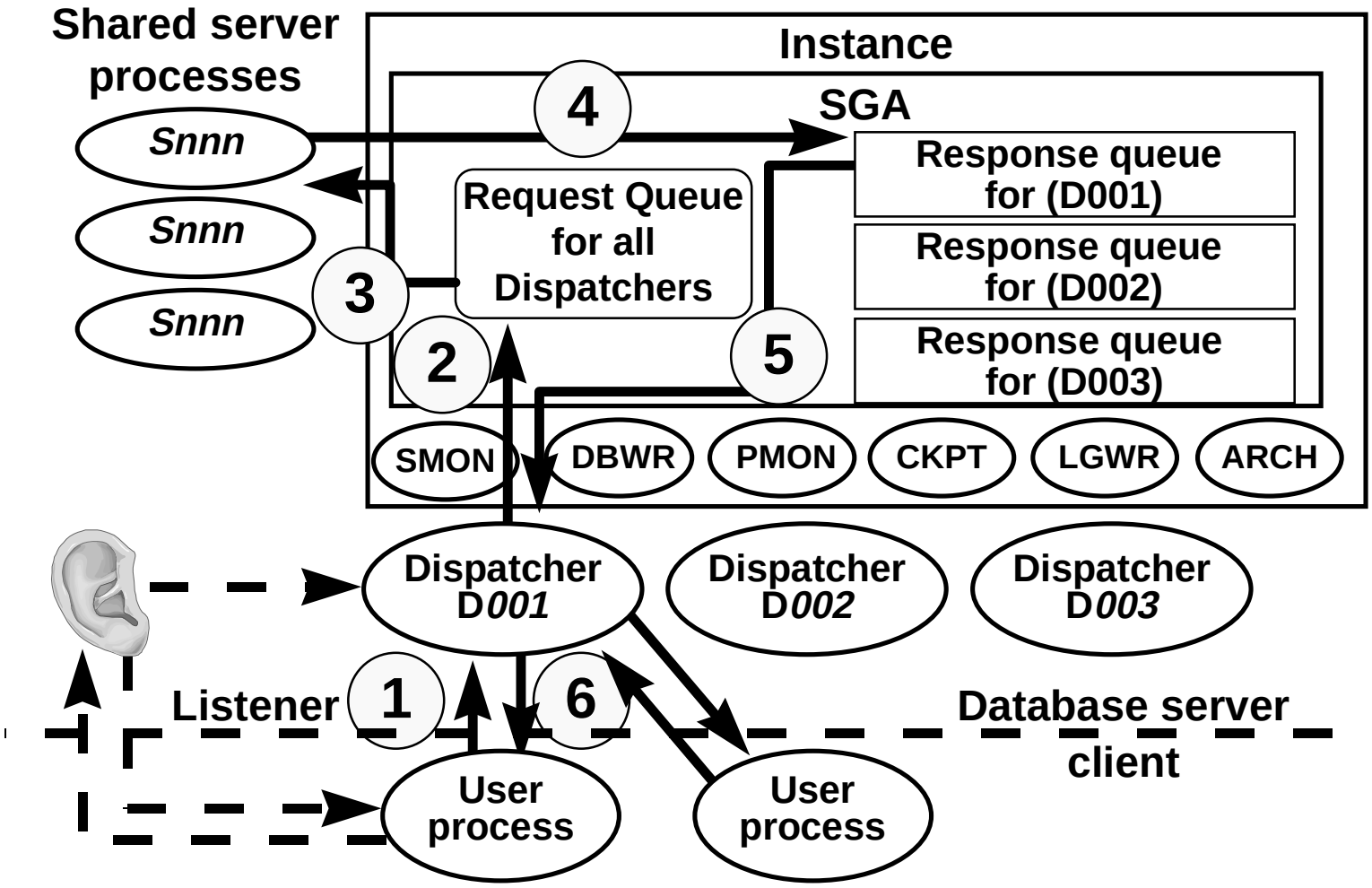
Multithreaded Server

- Reduces the number of processes against an instance
- Increases the number of possible users
- Achieves load balancing
- Reduces the number of idle server processes
- Reduces memory usage and system overhead

Connecting



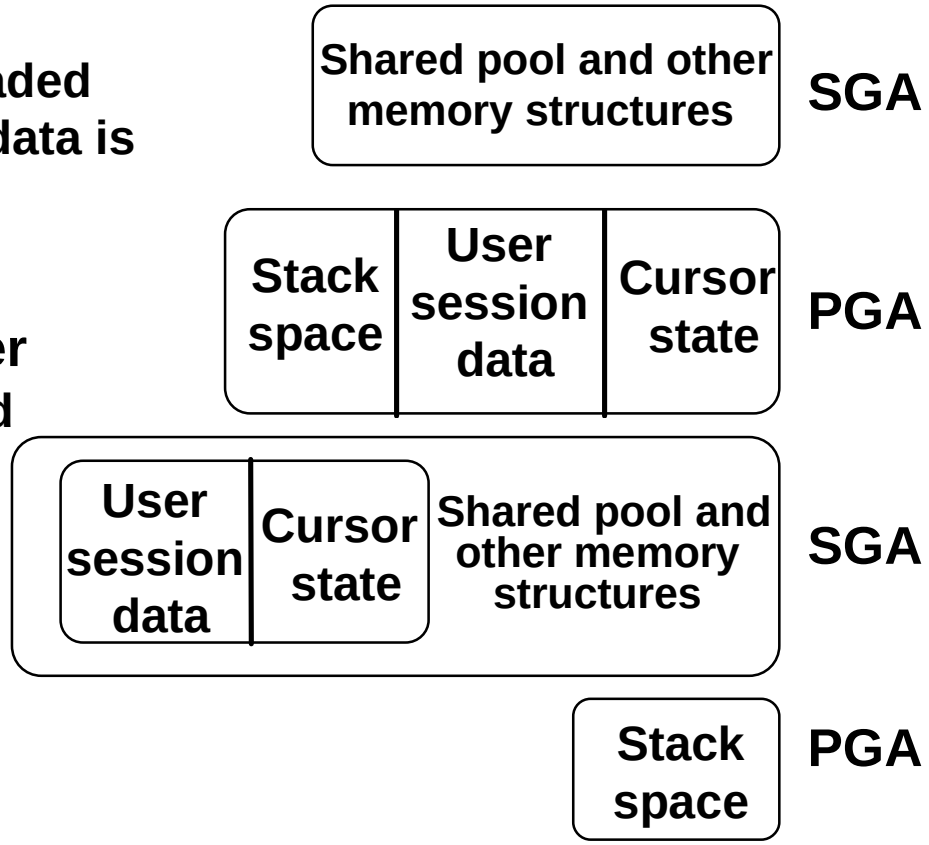
Processing a Request



SGA, PGA, and Multithreaded Server

Dedicated Server
without the multithreaded server, user session data is kept in the PGA.

Multithreaded Server
with the multithreaded server, data is held in the SGA.



Configuring the MTS

- **LOCAL_LISTENER (Oracle8 only)**
- **MTS_SERVICE**
- **MTS_DISPATCHERS**
- **MTS_MAX_DISPATCHERS**
- **MTS_SERVERS**
- **MTS_MAX_SERVERS**

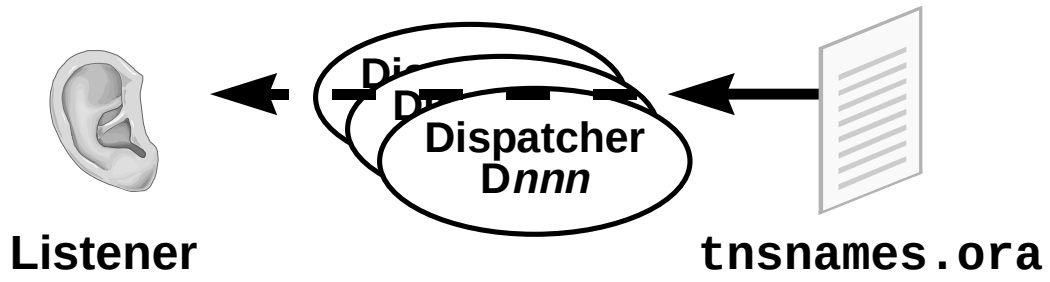
`init.ora`
parameters

LOCAL_LISTENER

In Oracle8 servers only, this parameter specifies service names for listeners with which dispatchers register their services.

`Init.ora` file

```
local_listener = list1
```

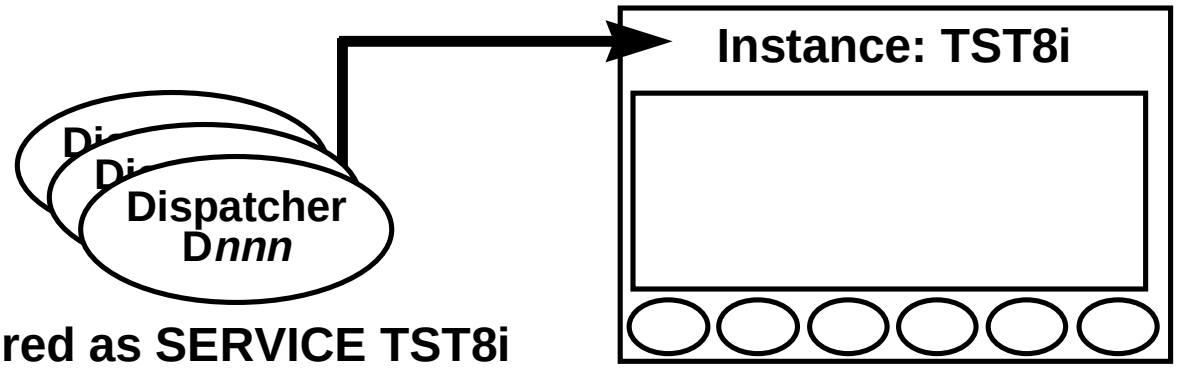


MTS_SERVICE

Establishes the name of the service for which the dispatchers of the MTS instance associate

`Init.ora` file

```
mts_service = TST8i
```



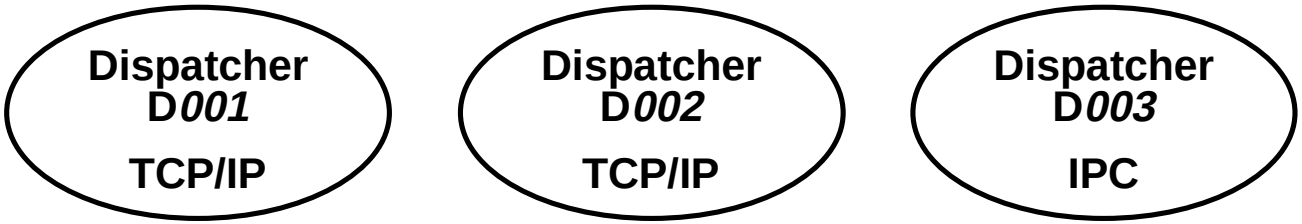
Registered as SERVICE TST8i

MTS_DISPATCHERS

Specifies the number of dispatchers initially started for a given protocol

`Init.ora` file

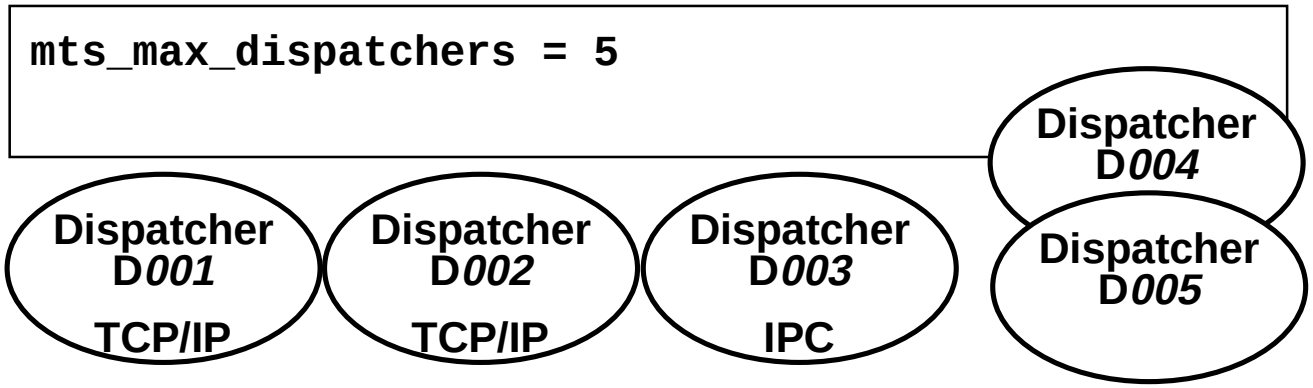
```
mts_dispatchers = "(PROTOCOL=TCP)(DISPATCHERS=2) \
                  (PROTOCOL=IPC)(DISPATCHERS=1)"
```



MTS_MAX_DISPATCHERS

- **Specifies the maximum number of dispatchers that can be started**
- **Needs ALTER SYSTEM command to add more dispatchers than initially started**

`Init.ora` file



MTS_SERVERS

Specifies number of shared servers initially started

`Init.ora` file

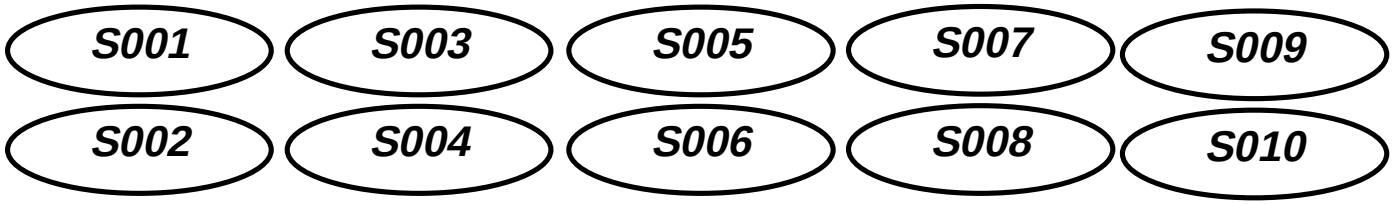
```
mts_servers = 6
```

MTS_MAX_SERVERS

- **Specifies the maximum number of shared servers that can be started**
- **Allocates shared servers dynamically if more than initially started are needed**

`Init.ora` file

```
mts_max_servers = 10
```



Verifying MTS Setup

- Verify that the dispatcher has registered with the listener when the database was started by issuing:

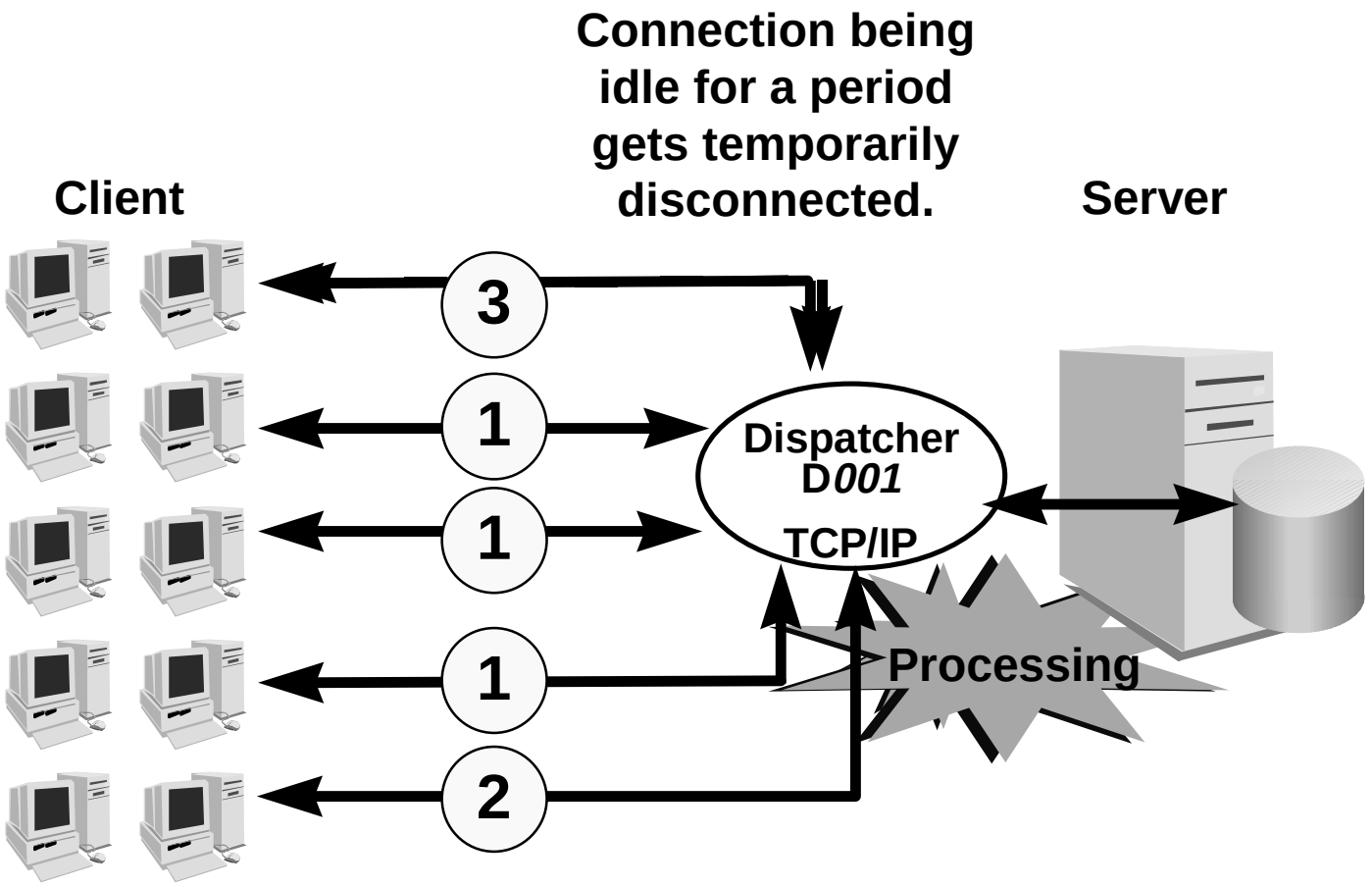
```
lsnrctl services
```

- Verify that you are connected using MTS by making a single connection. Query v$circuit, and that should show one entry per MTS connection.

Data Dictionary Views

- V$CIRCUIT
- V$SHARED_SERVER
- V$DISPATCHER
- V$MTS
- V$QUEUE
- V$SESSION

Connection Pooling



Enabling Connection Pooling

To enable connection pooling, the `init.ora` parameter MTS_DISPATCHERS must be configured.

```
mts_dispatchers =
“(PRO=TCP)(CON=20)(DIS=2)(POO=ON)(TIC=4)(SESS=35)”
```

Summary

In this lesson, you should have learned that the multithreaded server:

- **Increases maximum users per node**
- **Reduces system overhead**
- **Eliminates need to modify existing applications**
- **Offers automatic load balancing**
- **Can be set up to support connection pooling**

8

Usage and Configuration of Connection Manager

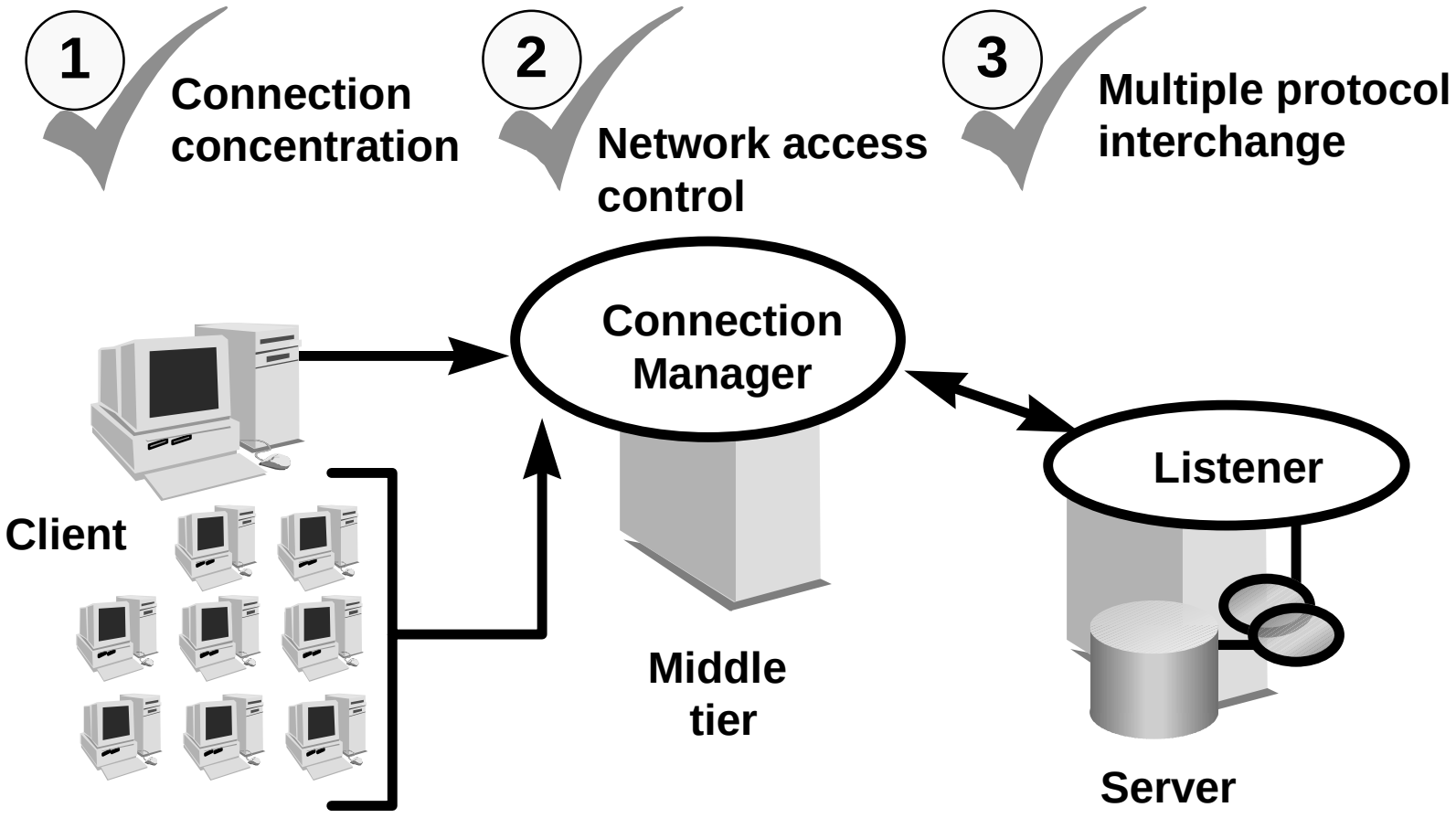
ORACLE®

Objectives

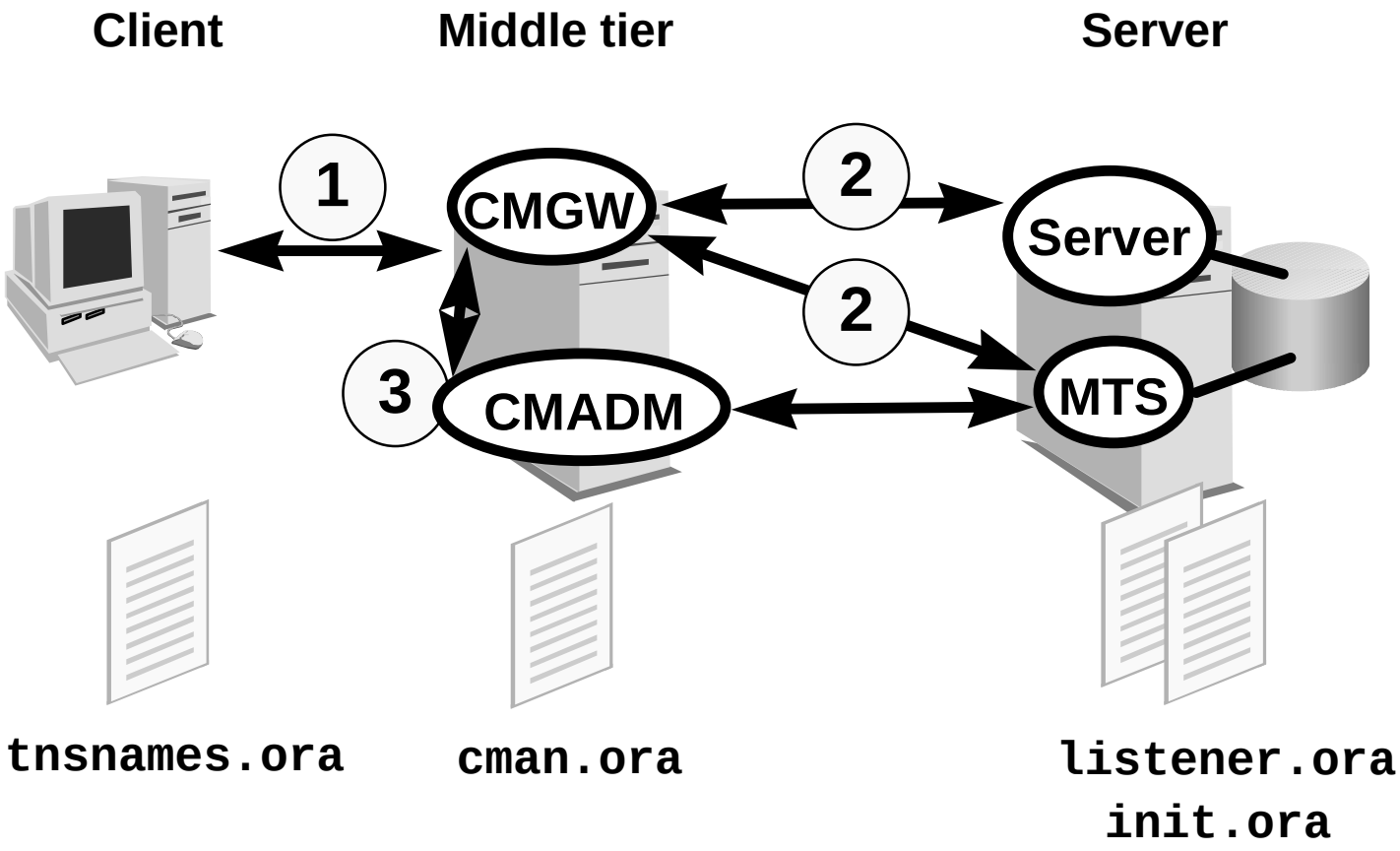
After completing this lesson, you should be able to do the following:

- **Identify the capabilities of Connection Manager**
- **Configure connection concentration**
- **Enable network access control**
- **Configure multiprotocol interchange**

Overview



Configuring Connection Manager



Configuring for Connection Concentration

TNSNAMES.ORA file

Client

```
TST8 =
  (DESCRIPTION =
   (ADDRESS_LIST =
    (ADDRESS =
          (PROTOCOL = TCP)
          (HOST = WWED-SERVERS)
          (PORT = 1610)
    )
    (ADDRESS =
          (PROTOCOL = TCP)
          (HOST = WWED151-SUN)
          (PORT = 1521)
    )
   )
    (CONNECT_DATA = (SID = TST8)
    (SOURCE_ROUTE = YES)
    )
  )
```

1

2

3

Configuring for Connection Concentration

Middle tier

CMAN.ORA file

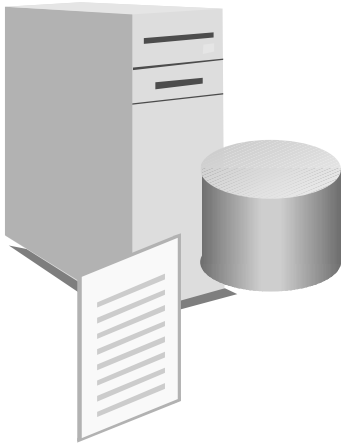
```
cman = (ADDRESS_LIST =
         (ADDRESS =
          (PROTOCOL = TCP)
          (HOST = WWED-SERVERS)
          (PORT = 1610)))
```

Configuring for Connection Concentration

INIT.ORA file

```
MTS_DISPATCHERS = “(PROTOCOL = TCP)(DIS = 3)(MUL = ON)”
```

Server



Configuring for Network Access Control

Middle tier

CMAN.ORA file

```
cman = (ADDRESS_LIST =
        (ADDRESS =
         (PROTOCOL = TCP)
         (HOST = WWED151-SUN)
         (PORT = 1610)))
cman_rules = (RULES_LIST =
              (RULE = (SRC = WWED15-PC)
                      (DST = WWED151-SUN)
                      (SRV = TST8)
                      (ACT = REJECT))
              )
```

1

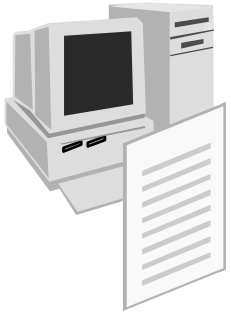
2

ORACLE

Configuring for Multiple Protocol Interchange

TNSNAMES.ORA file

Client



```
TST8 =
  (DESCRIPTION =
    (ADDRESS =
          (PROTOCOL = TCP)
          (HOST = WWED151-SUN)
          (PORT = 1610)
    )
    (ADDRESS =
          (PROTOCOL = SPX)
          (SERVICE = ORASRVC1)
    )
    (CONNECT_DATA = (SID = TST8)
    (SOURCE_ROUTE = YES)
    )
)
```

1

2

3

ORACLE

Optional Settings for Connection Manager

Middle tier

CMAN.ORA

```
cman_profile =
(PARAMETER_LIST =
   (MAXIMUM_RELAYS = 512)
   (LOG_LEVEL = 0)
   (TRACING = YES)
   (RELAY_STATISTICS = NO)
   (SHOW_TNS_INFO = YES)
   (USE_ASYNC_CALL = YES)
   (AUTHENTICATION_LEVEL = 1)
   (MAXIMUM_CONNECT_DATA = 2048)
   (ANSWER_TIMOUT = 5)
)
```

Starting and Stopping Connection Manager

UNIX and NT:

CMCTL Utility

```
$ cmctl
CMCTL >
```

CMCTL Arguments

```
CMCTL usage: [cmctl] <command> <process_name> [argument]
   where <command> is one of following:
   * start - start up process_name
   * stop - stop the process_name
   * status - get statistics from the process_name
   * log_on - ask process_name to turn logging on
   * log_off - ask process_name to turn logging off
   * trace_on - ask process name to turn tracing on
           NOTE:  the user MUST specify a trace level
                  (USER or ADMIN) in the argument field
   * trace_off - ask process name to turn tracing off
   * version - ask version number of CMCTL control program
   * exit  - quit the CMCTL control program
   process_name is one of cman, cm process or adm process
   * cman - will ask the Connection Manager (both cman and adm)
   * cm - will ask the Connection Manager process only
   * adm - will ask the Connection Manager Admin process only
   argument is only supplied trace_on
   * to trace_on - argument is considered the trace level
```

Using Connection Manager with Oracle Names

Connection Manager works with the Oracle Names server.

- **Connection Manager automatically updates addresses in the Names server.**
- **USE_CMAN in the `SQLNET.ORA` file specifies how a connection is established through an available Connection Manager.**

Troubleshooting Connection Manager

This is the most common error associated with Connection Manager:

```
ORA-12202: TNS:internal navigation error

1. Check that the CMGW process have been started

2. This may also be caused by CMAN_RULES set to
   reject the connection

3. Check that the tnsnames.ora has correct port
   number and server name specified
```

Summary

In this lesson, you should have learned that Connection Manager is a multipurpose networking service for Oracle environments. It facilitates:

- **Increased system scalability**
- **Client connection access control**
- **Multiprotocol connectivity**
- **These features save system resources, improve performance, extend flexibility in transport protocols, and improve system security**

9

Troubleshoot the Network Environment

ORACLE®

Objectives

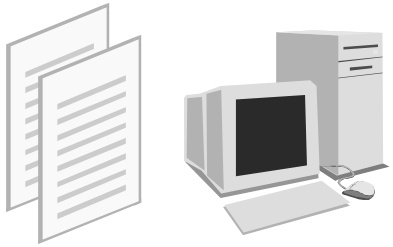
After completing this lesson, you should be able to do the following:

- **Set logging and tracing parameters**
- **Analyze and troubleshoot network problems using log and trace files**
- **Store audit trail information in the database**
- **Format trace files using Trace Assistant**

Overview

Tracing and logging can help troubleshoot networking problems.

Client

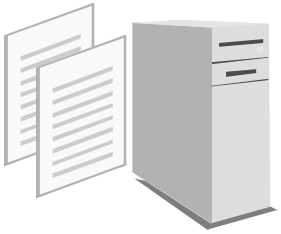


`sqlnet.ora`

`cli.trc`

`sqlnet.log`

Middle tier



`names.ora`

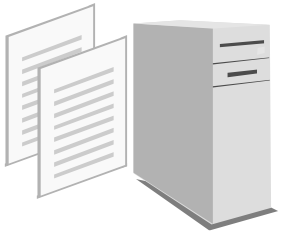
`names.trc`

`sqlnet.log`

`cman.ora`

`cman.trc`

Server



`sqlnet.ora`

`sqlnet.log`

`svr_xxx.trc`

`listener.ora`

`listener.log`

`listener.trc`

Troubleshooting Checklist

Troubleshooting checklist:

- **Can you connect from the client to the server without using an Oracle application?**
- **Can you make a local database connection?**
- **Is the relevant adapter installed on both the client and server?**

Troubleshooting Checklist

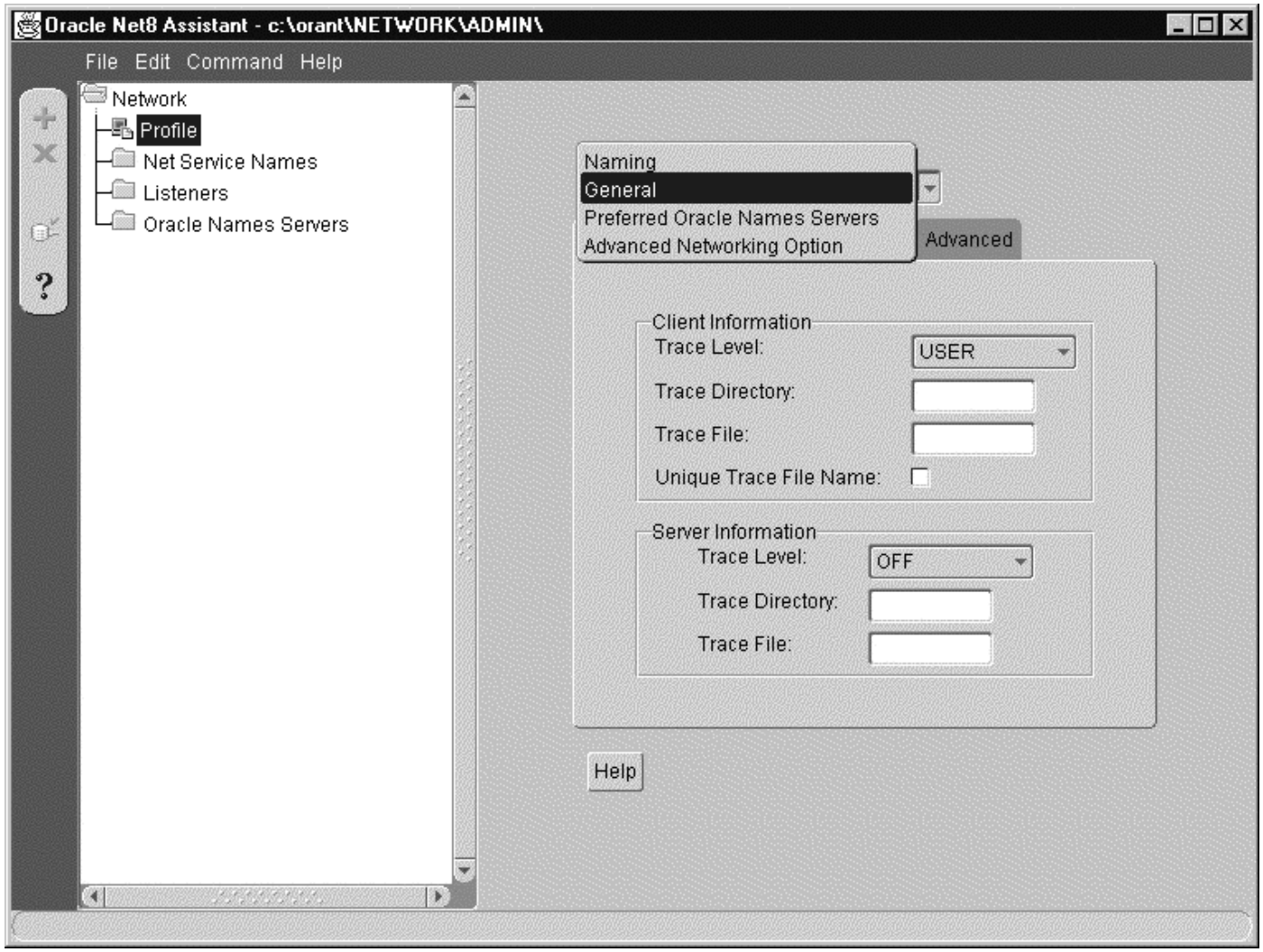
Troubleshooting checklist:

- **Is the listener configured for the database or SID, and is it running?**
- **Can you connect using Net8 Configuration Assistant or the TNSPING utility?**
- **Have you turned logging or tracing on for more detailed information?**

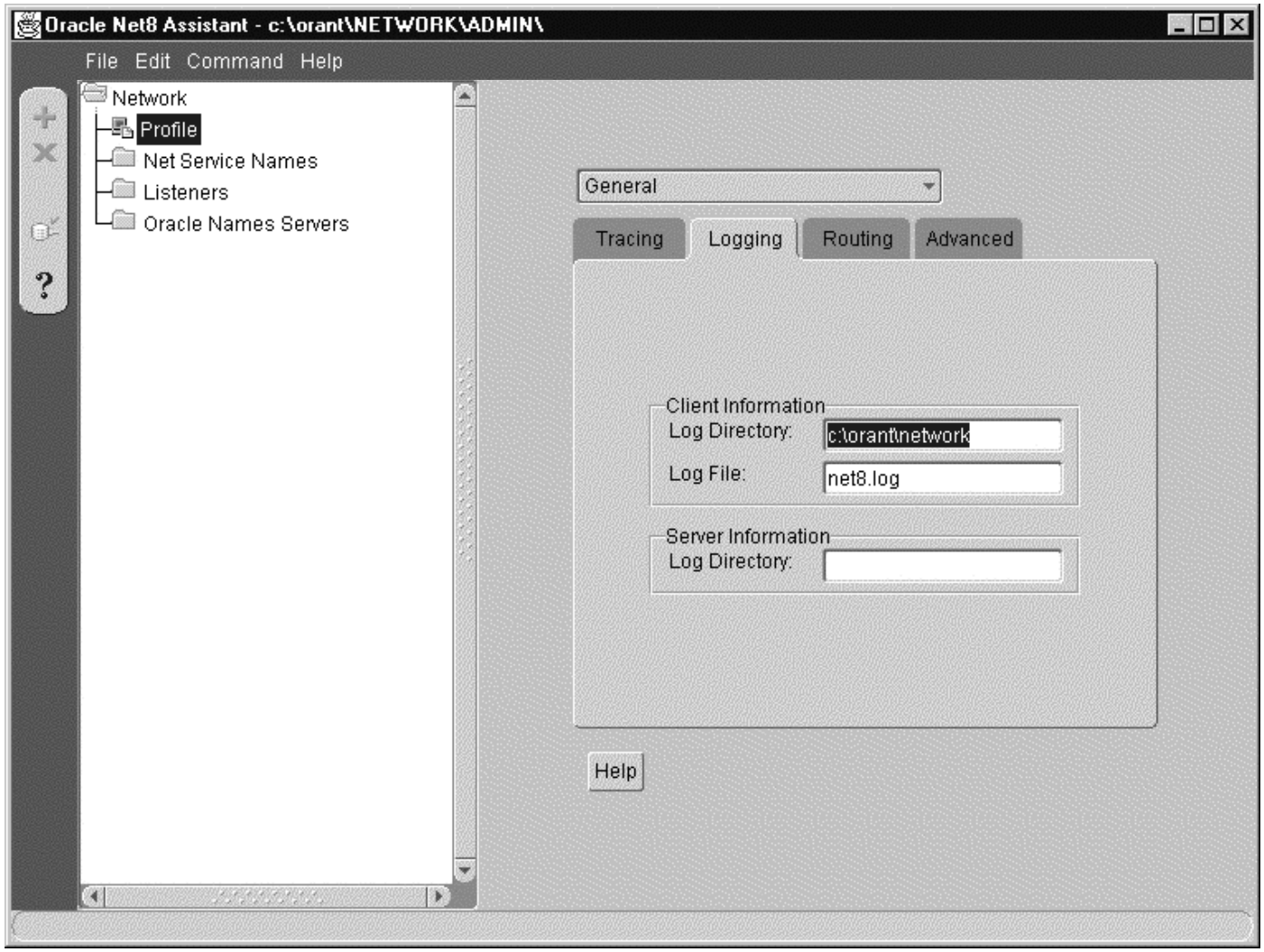
TNSPING Utility

```
Usage: tnsping <address> [<count>]

Example: tnsping ORCL 5

Copyright(c) Oracle Corp. 1998.All rights reserved.
Attempting to contact
(ADDRESS=(PROTOCOL=TCP)(HOST=shkhan-lp)(PORT=1521))
OK (290 msec)
OK (100 msec)
OK (70 msec)
OK (70 msec)
OK (60 msec)
```

Net8 Assistant: Profile General



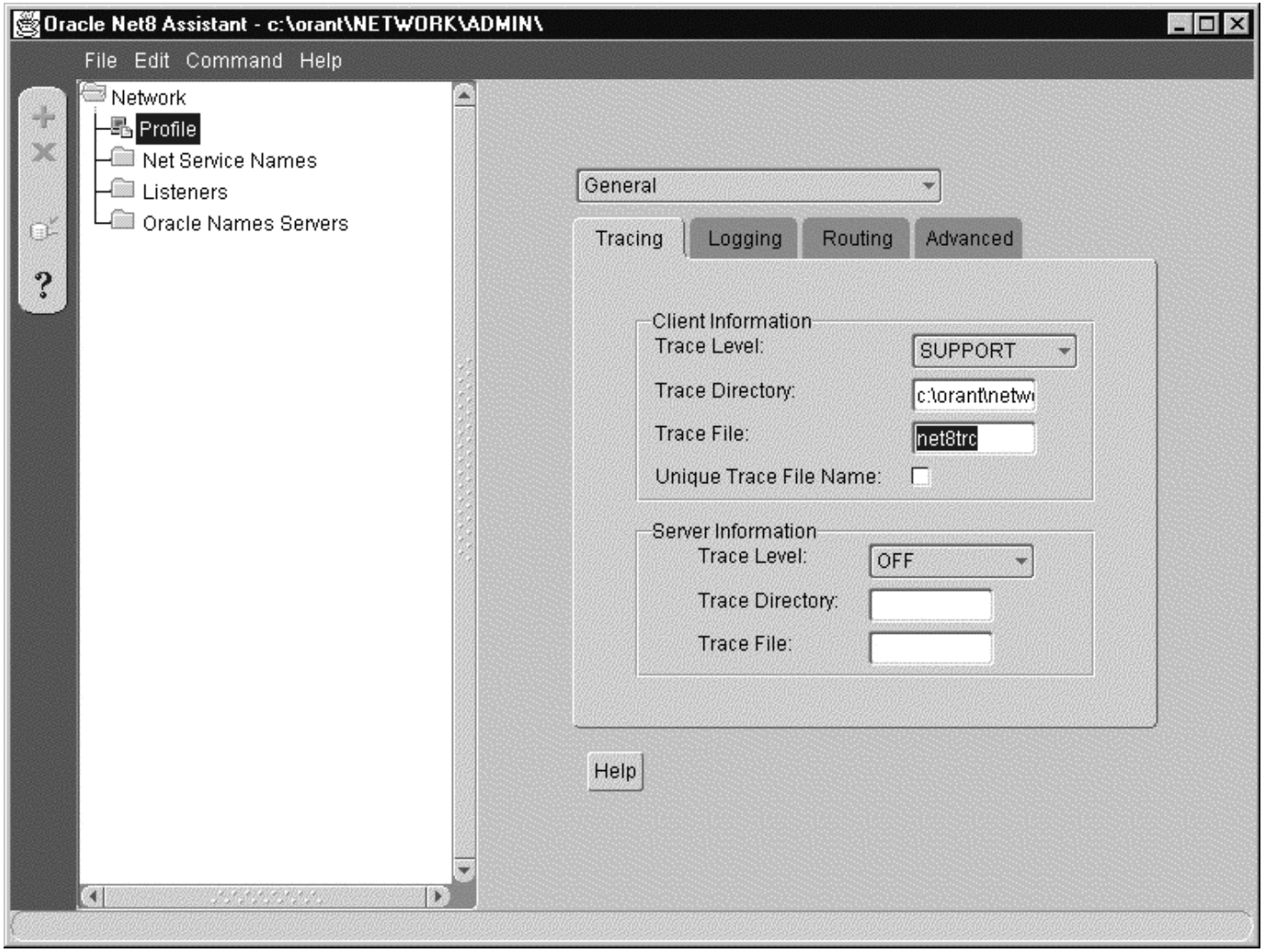
Net8 Assistant: Profile Logging



SQLNET.ORA: Logging

```
# C:\ORANT\NETWORK\ADMIN\SQLNET.ORA Configuration
# File:c:\orant\NETWORK\ADMIN\sqlnet.ora
# Generated by Oracle Net8 Assistant

LOG_FILE_CLIENT = net8.log

NAMES.PREFERRED_SERVERS =
  (ADDRESS_LIST =
    (ADDRESS = (PROTOCOL = TCP)(HOST = shkhan-lap)(PORT =
1621))
  )
NAMES.DEFAULT_DOMAIN = world

LOG_DIRECTORY_CLIENT = c:\orant\network
NAMES.DIRECTORY_PATH= (ONAMES)
```

Net8 Assistant: Profile Tracing



SQLNET.ORA: Tracing

```
# C:\ORANT\NETWORK\ADMIN\SQLNET.ORA Configuration
# File:c:\orant\NETWORK\ADMIN\sqlnet.ora
# Generated by Oracle Net8 Assistant

TRACE_DIRECTORY_CLIENT = c:\orant\network
TRACE_FILE_CLIENT = net8trc
TRACE_LEVEL_CLIENT = SUPPORT
TRACE_UNIQUE_CLIENT = on

LOG_FILE_CLIENT = net8.log
LOG_DIRECTORY_CLIENT = c:\orant\network
```

Listener Audit Trail

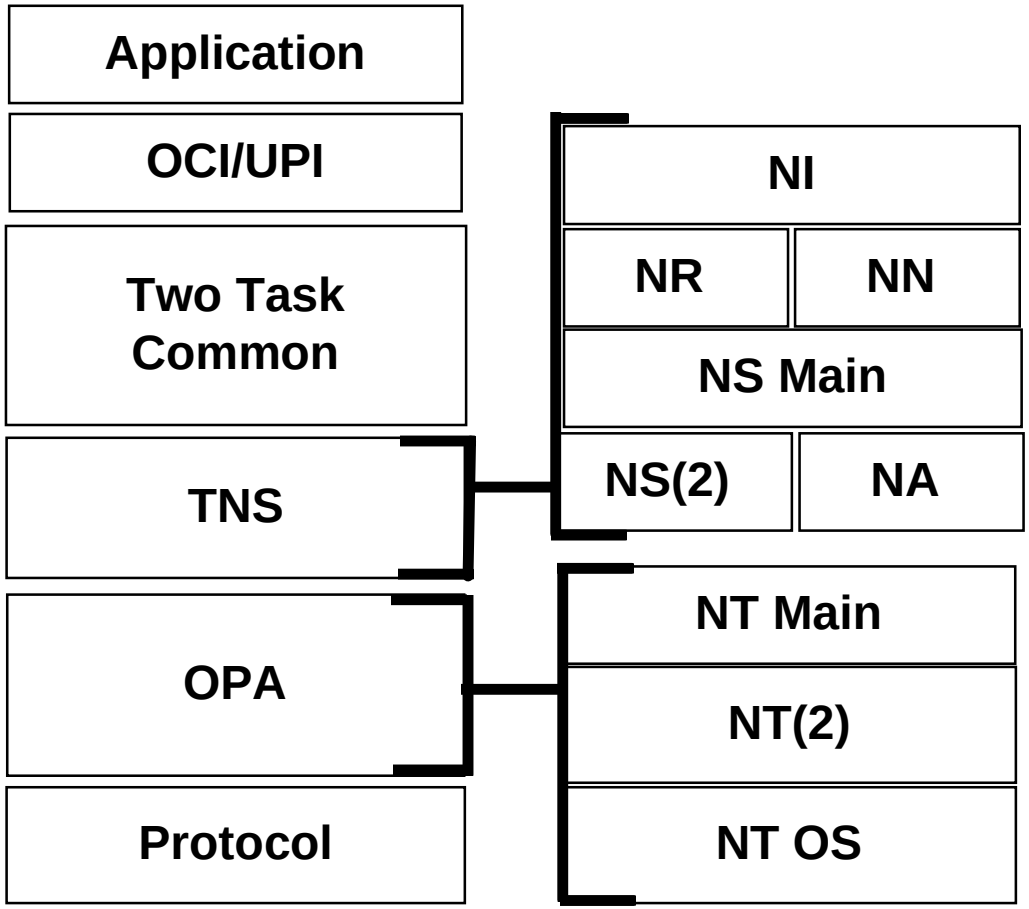
- **Successful reload request**

```
28-may-99 14:12:18 * (connect_data= (service=sales.com)
(cid=(program=)(host=sales=pc)(user=system))
(command=reload) (arguments=64) (service=listener)
(version=(version=135282688))* reload * 0
```

- **Successful connection request**

```
28-may-99 14:16:21 *
(connect_data=(service=sales.com)(cid=
(program=c:\orant\bin\sqlplus.exe)(host=windowspc)
(user=dsteiner))) * (address=(protocol=tcp)
(host=144.25.23.246)(port=3366))
* establish * sales.com * 0
```

Components of Logging and Tracing Information



A Log File Example

Example of client `sqlnet.log` file.

```
************************************************************
Fatal NI connect error 12224, connecting to:
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=WWED151-SUN)(PORT=1521))
(CONNECT_DATA=(SID=TST8)(CID=(PROGRAM=)(HOST=WWED151-SUN)(USER=oracle))))
VERSION INFORMATION:
TNS for Solaris: Version 8.1.5.0.0 - Production
TCP/IP NT Protocol Adapter for Solaris: Version 8.1.5.0.0 - Production
  Time: 18-JUN-99 18:21:51
  Tns error struct:
    nr err code: 12224
    TNS-12224: TNS:no listener
    ns main err code: 12541
    TNS-12541: TNS:no listener
    ns secondary err code: 12560
    nt main err code: 511
    TNS-00511: No listener
    nt secondary err code: 146
    nt OS err code: 0
```

Trace File Example

Example of a client trace file:

```
--- TRACE CONFIGURATION INFORMATION FOLLOWS ---
New trace stream is "/tmp/client/cli.trc"
New trace level is 16
--- TRACE CONFIGURATION INFORMATION ENDS ---
nigini: entry
nigini: Count in NI global area now: 3
nigini: Count in NI global area now: 1
nrigbi: entry
nrigbni: entry
nrigbni: Unable to get data from navigation file
tnsnav.ora
nrigbni: exit
nrigbi: exit
nigini: exit
niqname: Using nnfsn2a() to build connect descriptor for
(possibly remote) database.
```

Trace Assistant

The Trace Assistant utility will help you diagnose and troubleshoot network problems by giving you a better understanding of the following:

- **Flow of packets between network nodes**
- **Components at which Net8 is failing**
- **Error codes related to the problem**

Trace Assistant

```
Usage: trcasst [options] <filename>
               [options]  default values are: -odt -e -s
               <filename> is always the last argument
Options can be zero or more of the following:
-o   Enables display of SQL*Net and TTC information
  After the -o the following options can be used:
   c or d for summary or detailed SQL*Net information respectively
   u or t for summary or detailed TTC information respectively
   q displays SQL commands (used together with u)
-p   Enables application perfomance measurement (Internal Use)
-s   Enables display of statistical information
-e   Enables display of error information
     After the -e, zero or one error decoding level may follow:
       0 or nothing, translates NS error numbers
       1 displays NS error translation plus all other errors
       2 displays error number without translation
```

Tracing for Net8 Components

In addition to the client-side tracing, you can also enable tracing for the following:

- **Listener**
- **Names server**
- **Connection Manager**

Summary

In this lesson, you should have learned that, in special cases, you may be needed to troubleshoot a network problem.

- **To find the error codes related to your problem, first check the log files.**
- **If this does not give you the needed information, run through your checklist.**
- **If the checklist does not provide the solution, use tracing and investigate.**
- **If everything is still unclear, call support.**

10

Security in the Network Environment

ORACLE®

Objectives

After completing this lesson, you should be able to do the following:

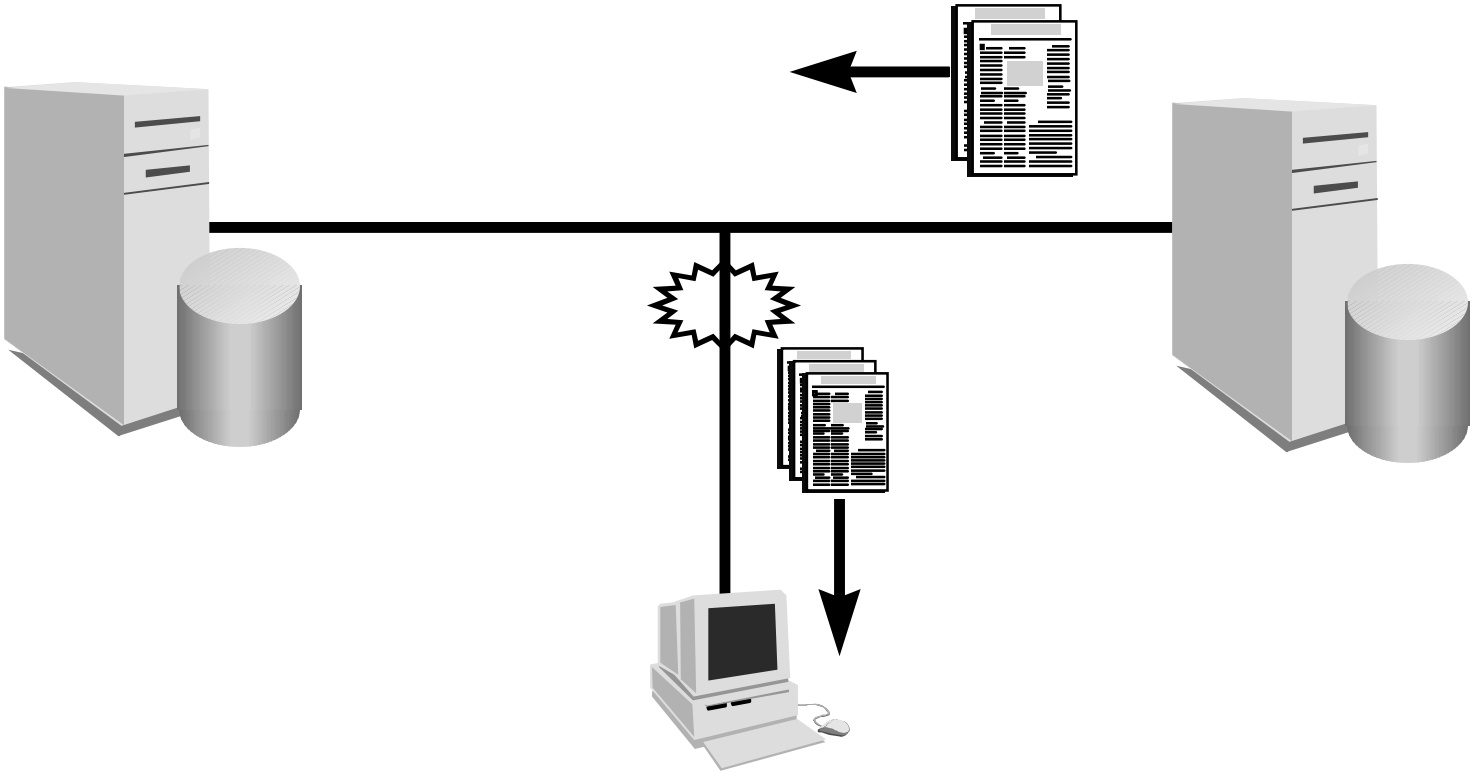
- **Identify network security risks during data transmission**
- **Identify security features in Oracle Networking products**
- **Identify the features of the Advanced Security option**
- **Configure the components of the Advanced Security option**

Overview: Network Security Risks

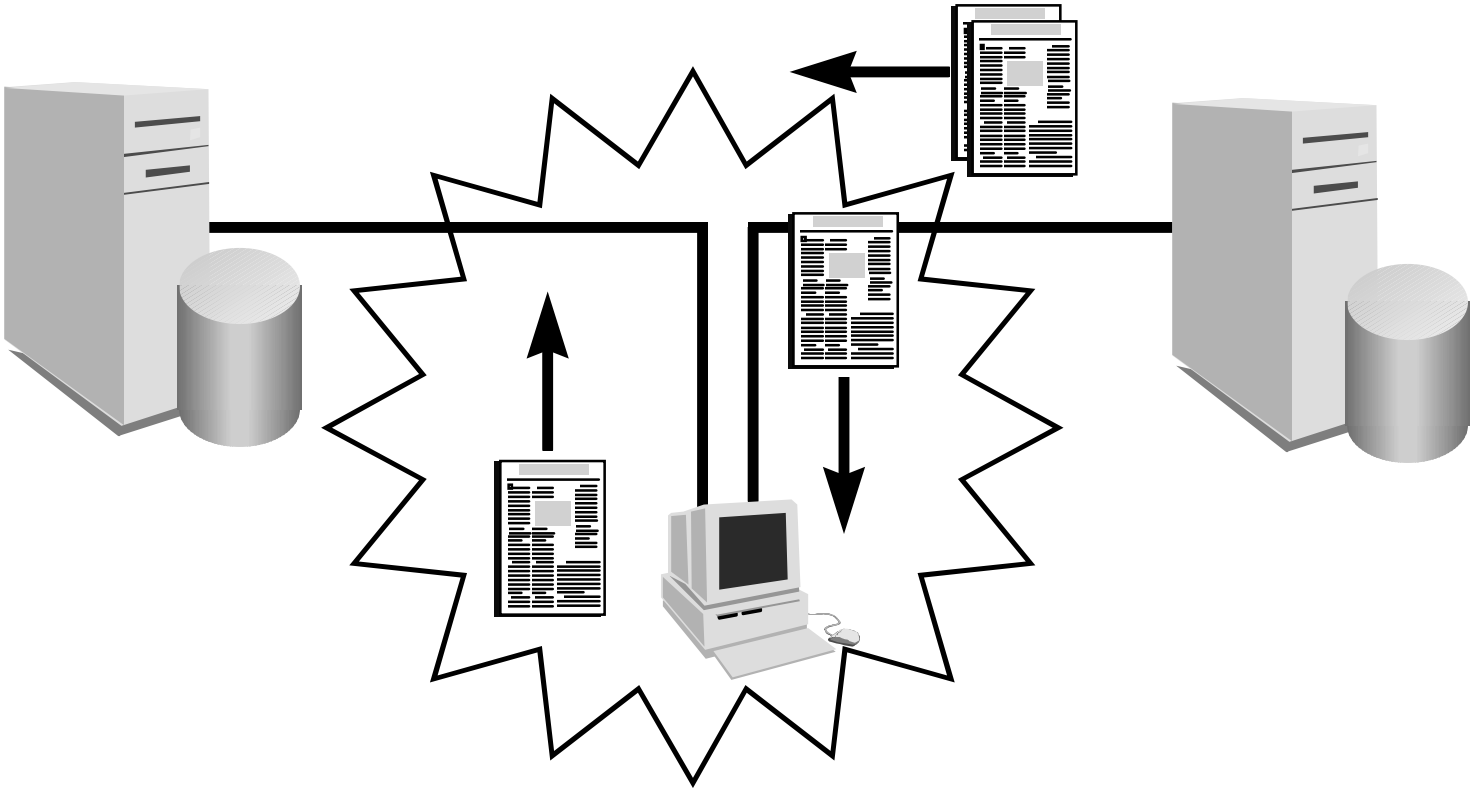
A sound network must have solid security capabilities to protect against the network intrusions that compromise the following:

- **Data privacy**
- **Data integrity**
- **Authentication**
- **Authorization**

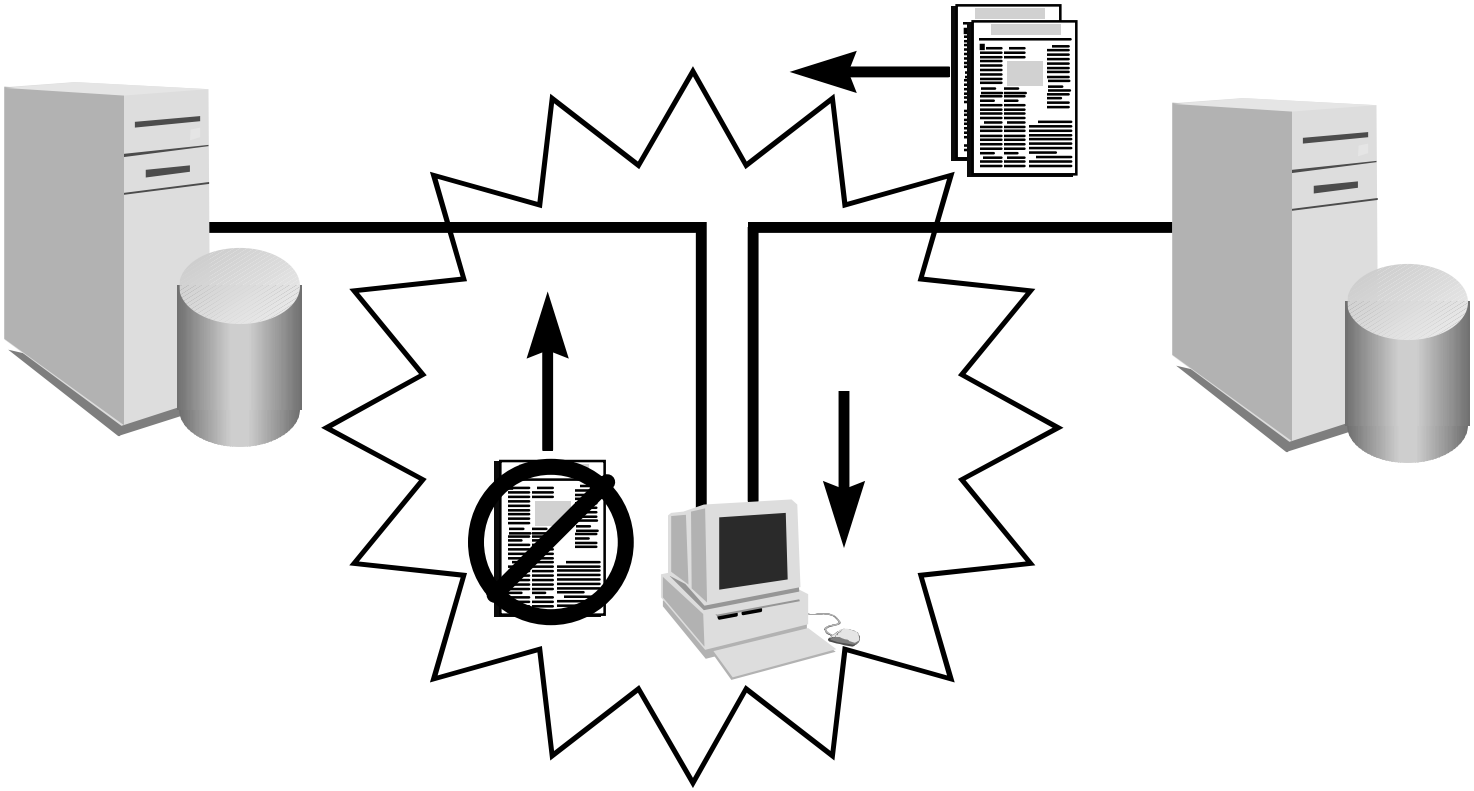
Data Privacy: Data Theft



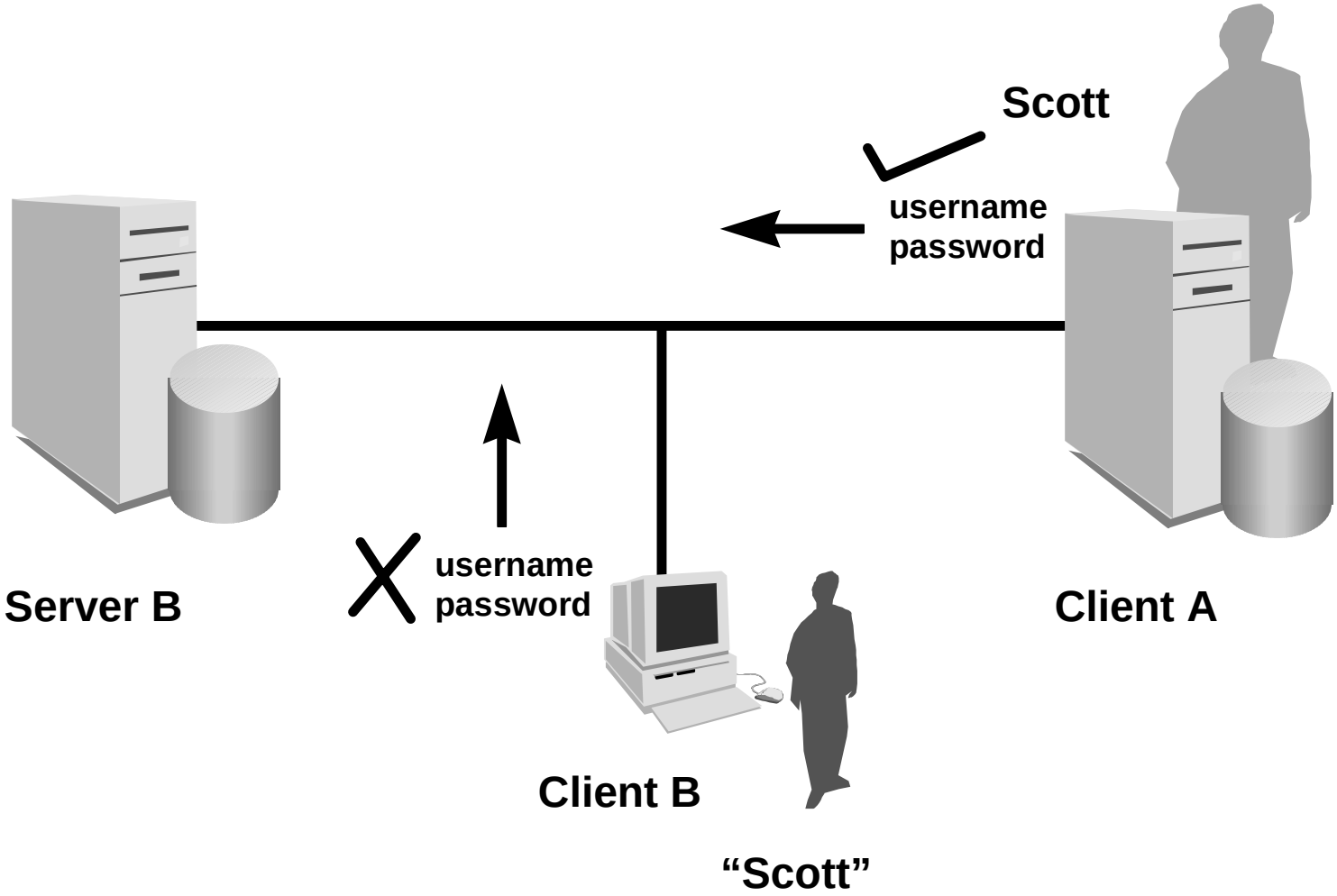
Data Integrity: Data Modification



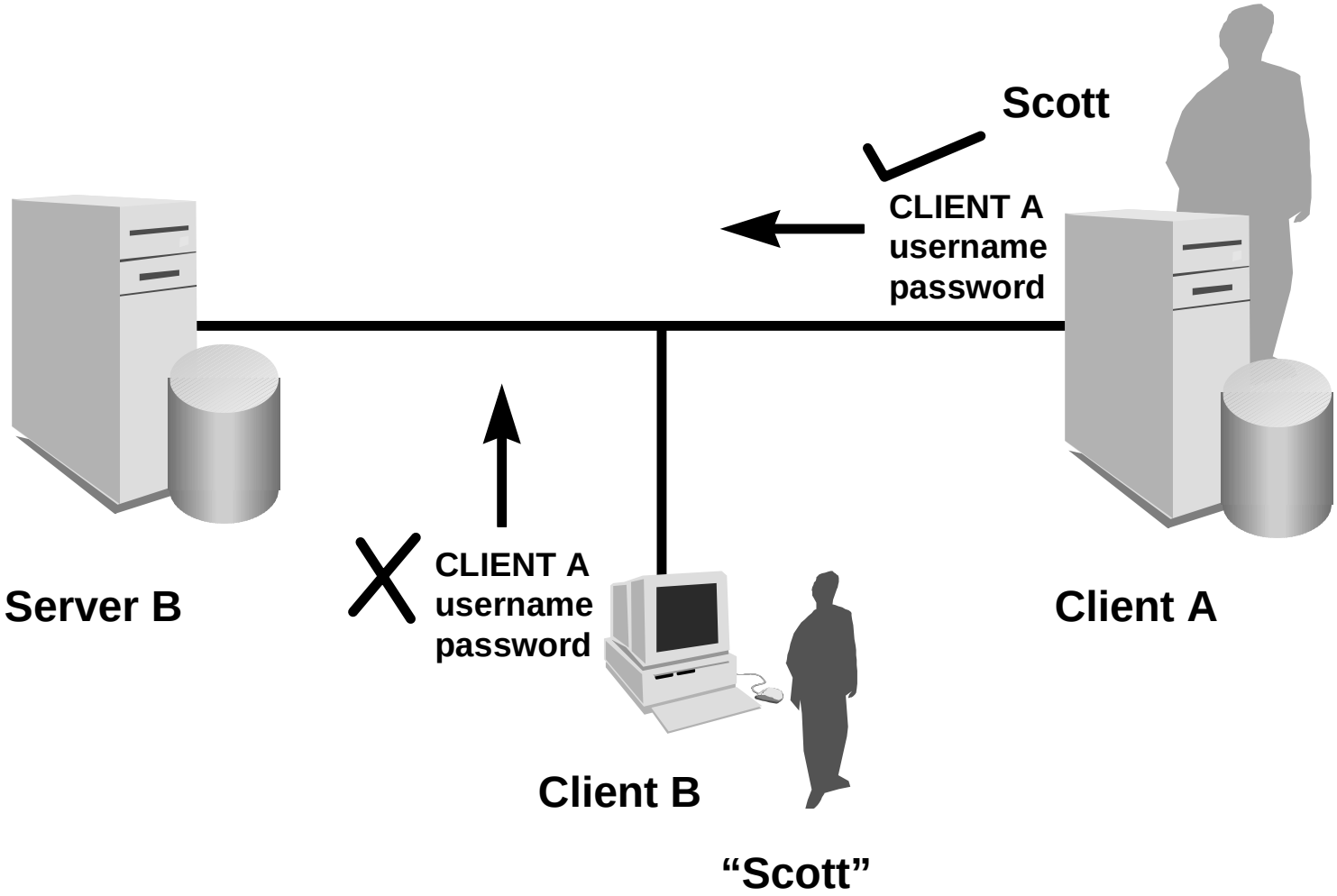
Data Integrity: Data Disruption



Compromised Authentication



Compromised Authorization

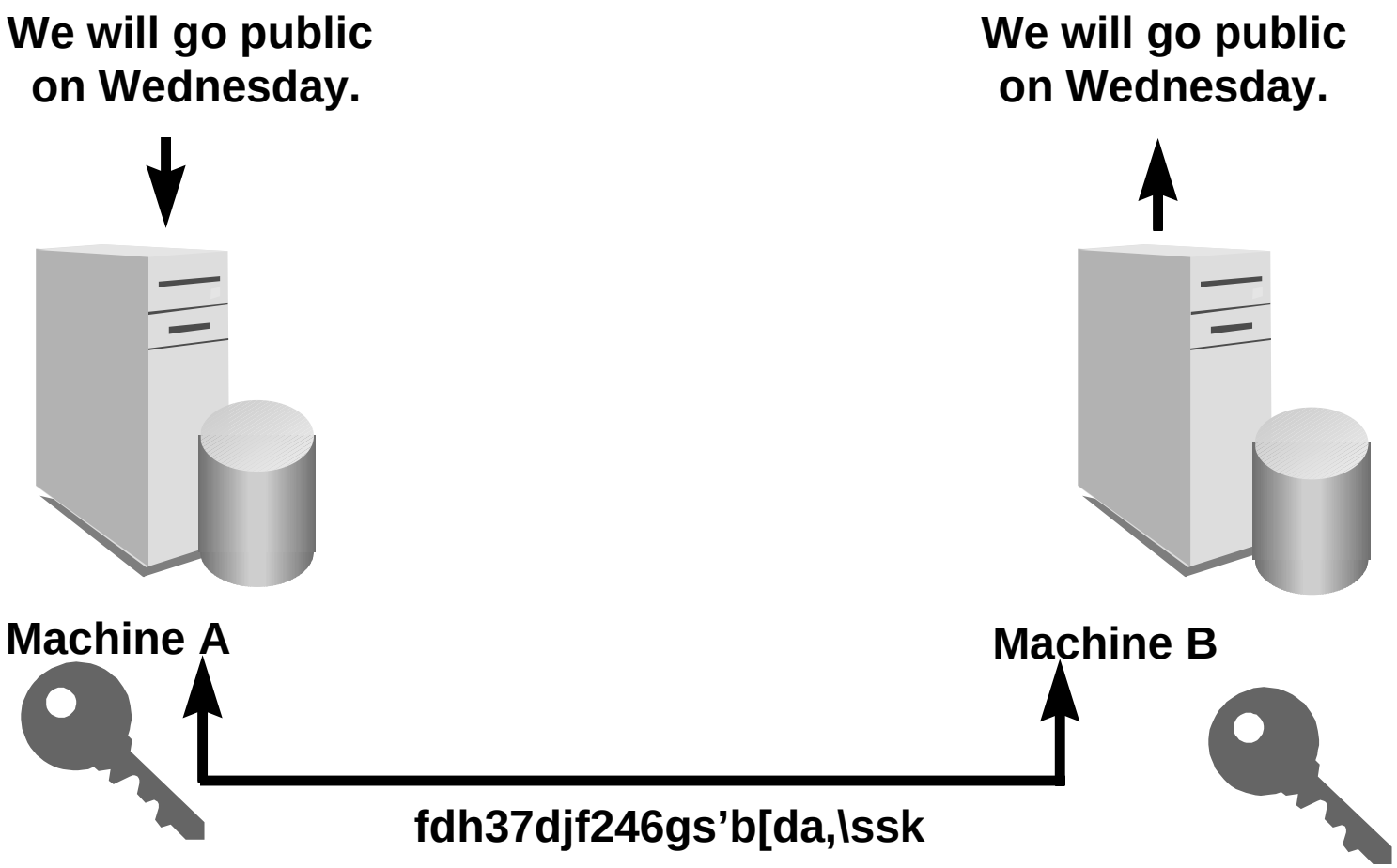


Network Security Solutions

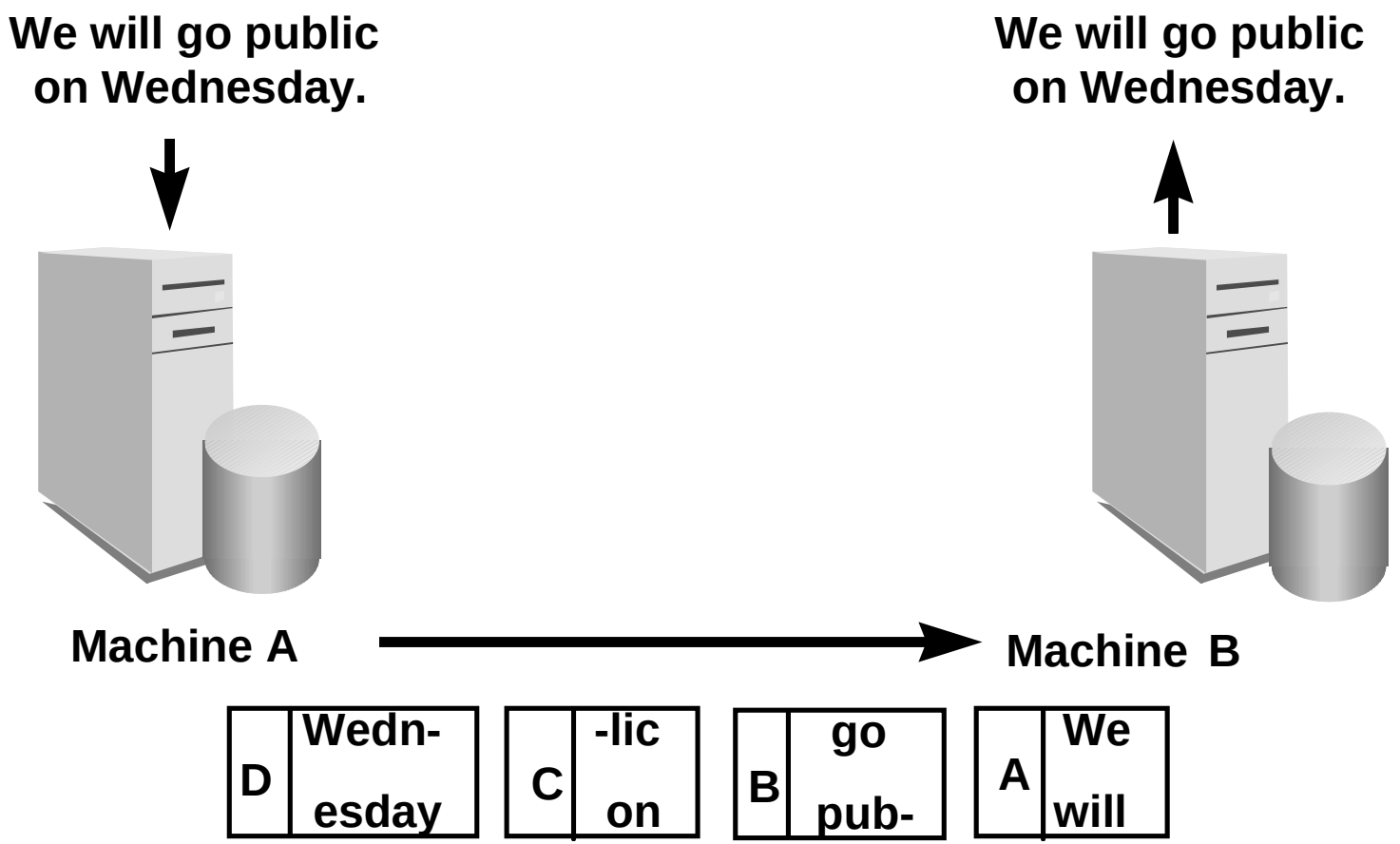
To counter network security risks, the Advanced Security option can be implemented. It enables the following network security solutions:

- **Data encryption and cryptographic checksumming**
- **Enhanced user authentication**
- **Single sign-on**
- **Secure Sockets Layer (SSL)**
- **DCE Integration: Security services**

Data Encryption



Cryptographic Checksumming



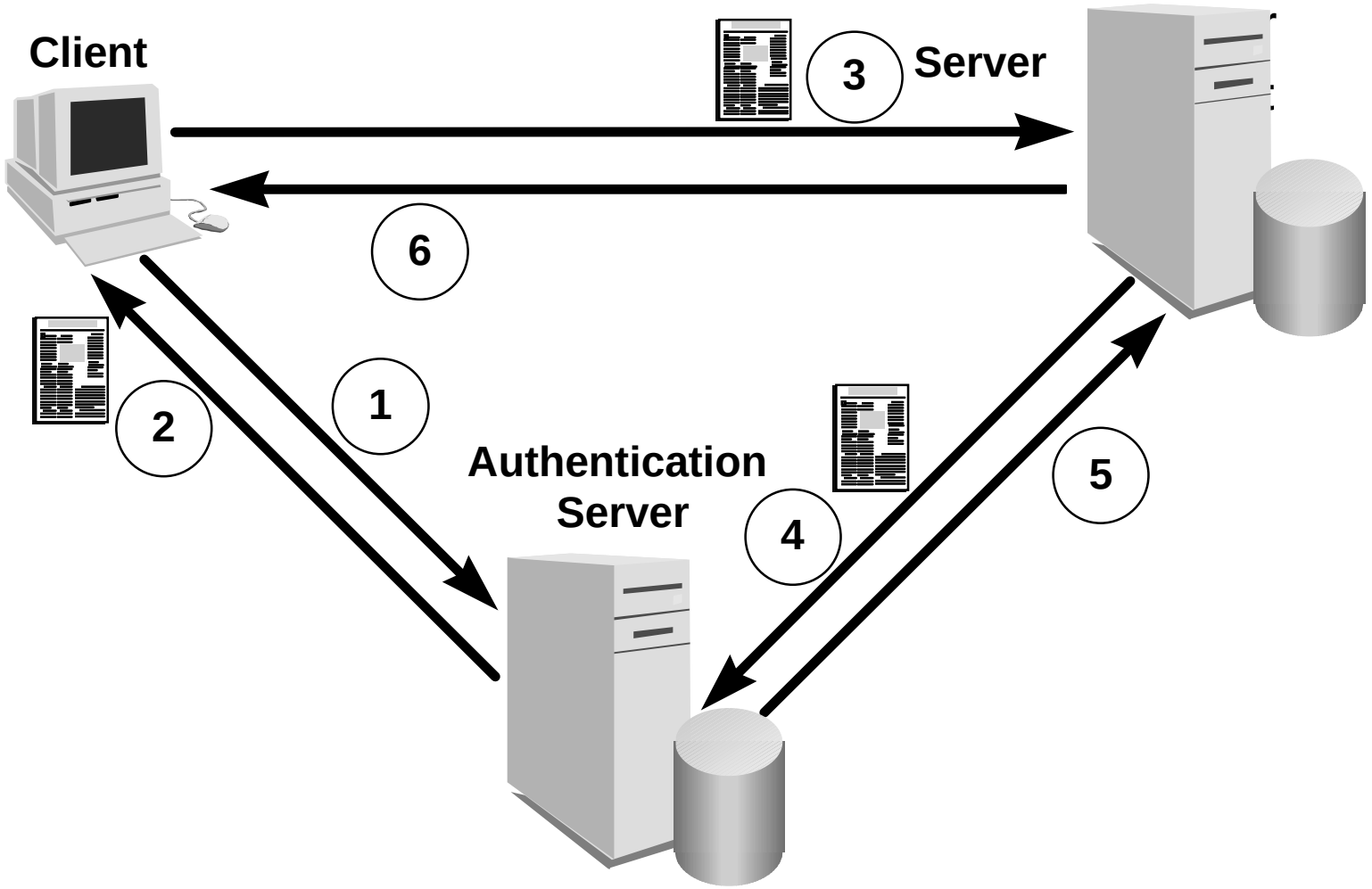
Configuring Encryption and Checksumming

```
sqlnet.crypto_seed = "-
kdje83KKEP39487dvmlqEPTbxXe702M73"
sqlnet.encryption_types_client = (RC4_40, DES40)
sqlnet.encryption_client =   requested|
                           required |
                           accepted |
                           rejected
sqlnet.crypto_checksum_types_server = MD5
sqlnet.crypto_checksum_server =  requested|
                              required |
                              accepted |
                              rejected
```

Encryption and Checksumming Modes

Server \ Client	Accepted	Rejected	Requested	Required
Accepted	OFF	OFF	ON	ON
Rejected	OFF	OFF	OFF	Connection fails
Requested	ON	OFF	ON	ON
Required	ON	Connection fails	ON	ON

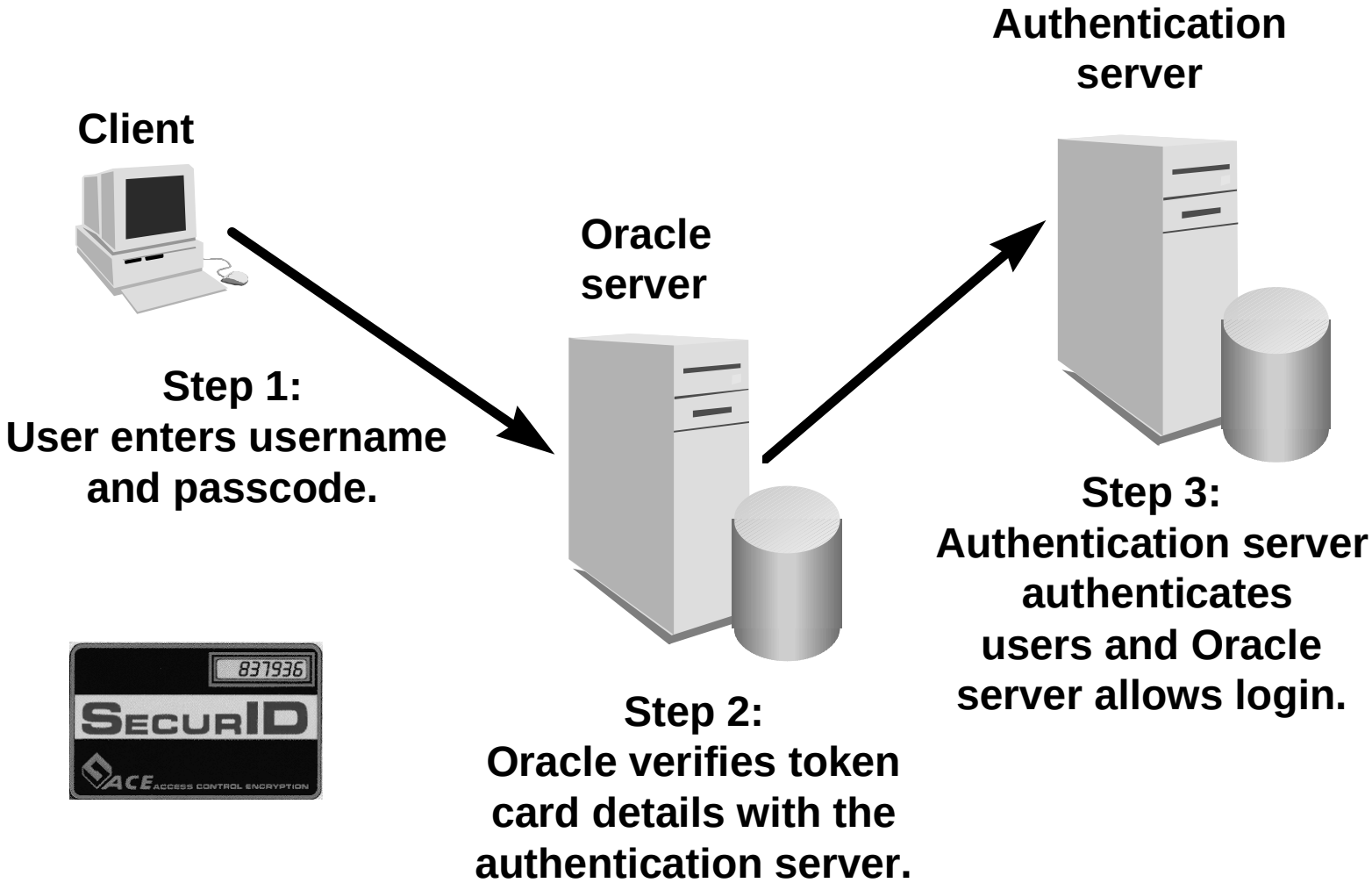
Authentication



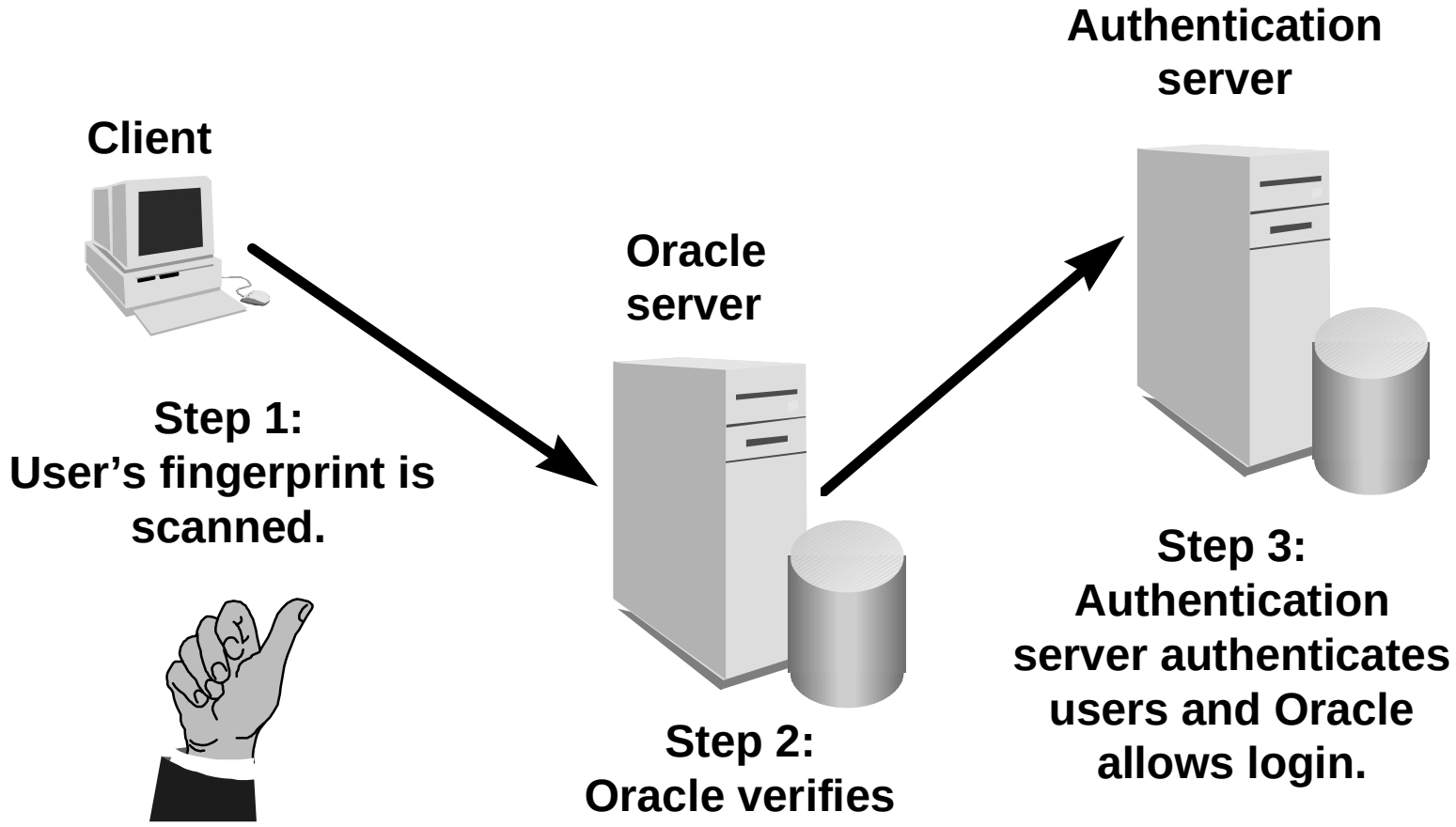
Enhanced User Authentication

- **Oracle Advanced Security option provides enhanced authentication through integrated technologies.**
- **The following authentication technologies are supported:**
  - **Token cards**
  - **Biometrics (such as fingerprints)**
  - **Kerberos**
  - **RADIUS (Oracle8*i* only)**

Token Cards



Biometric Authentication

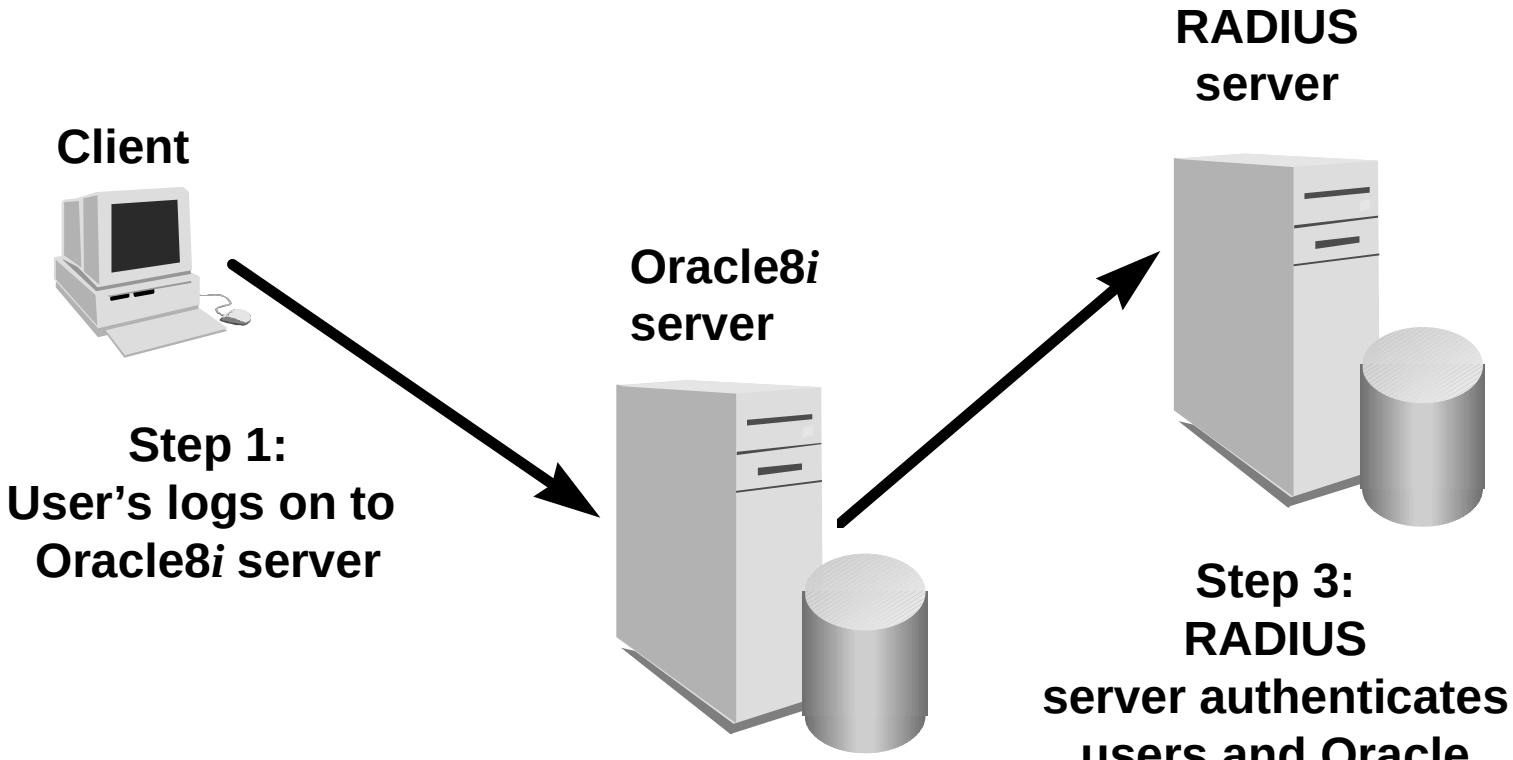


Kerberos Authentication

Kerberos is a trusted third-party authentication system that relies on shared secrets. It assumes that the third party is secure. It provides the following:

- **Single sign-on capabilities**
- **Centralized password storage**
- **Database link authentication**
- **Enhanced PC security**

RADIUS Authentication



Configuring Authentication

To configure authentication, the following parameter must be configured in the profile (`sqlnet.ora`):

```
SQLNET.AUTHENTICATION_SERVICES=(oracle_authent_adapter)
```

For example, to use the Kerberos authentication adapter:

```
SQLNET.AUTHENTICATION_SERVICES=(KERBEROS5)
```

Single Sign-On

With single sign-on, users get access to selected databases in the environment without having to provide a username and password multiple times. The following single sign-on services are supported:

- **Kerberos**
- **CyberSafe**
- **Oracle Security Server**

Secure Sockets Layer

- **Secure Sockets Layer (SSL) secures Net8 networks by providing encryption and authentication.**
- **Oracle servers can authenticate users by utilizing standard X.509 version 3 certificates.**
- **Only supported with Oracle8*i***

DCE Integration

Distributed Computing Environment (DCE) Integration transparently use and promote Oracle tools and applications to access Oracle servers in a DCE environment. DCE security provide the following services:

- **DCE authentication and single sign-on**
- **Authorization**
- **Data integrity and privacy**

Summary

In this lesson, you should have learned:

- **Data theft, modification, and disruption are increasing network risks.**
- **Encryption, checksumming, and authentication mechanisms are used to counter these risks.**
- **The Advanced Security option is implemented to provide encryption, checksumming, and authentication.**