

Module Overview

This module introduces the basic architecture and architectural components of an Oracle 9i Server. The primary focus is to introduce the components of an Oracle 9i Server, networking utilizing Oracle Net, SQL processing concepts, and the concept of tablespaces. The intent of this module is to briefly introduce the Oracle architecture to the participant in this class and not provide an in-depth presentation of the Oracle Server.

Completion Time

Estimated time to complete this module is $\frac{3}{4}$ hour for presentation and $\frac{1}{4}$ hour for the lab exercise.

Location of Presentations, Labs, & Examples

All presentations are located on the *Oracle Database Administration Certified Professional Training* CD in the directories and file names as follows.

DBAOCP\IntroOracle9iSQL\PPTS\	PowerPoint Presentations
DBAOCP\IntroOracle9iSQL\Docs\	This documentation

Note: No PowerPoint presentation examples will be provided in this module.

Note: No electronic lab examples will be provided for this module since the labs consist of only questions.

Objectives

- Discuss the Features of an Oracle Server
- Identify the Architectural Components of an Oracle Server
 - Describe the Database
 - Describe the Instance
- Illustrate the Startup and Shutdown Process
- Identify the Typical Client Server Environment
- Determine Where Objects Are Stored in the Database
- Show the Steps in SQL PL/SQL Processing

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- Discuss the features of an *Oracle 9i Server*.
- Identify the architectural components of an *Oracle 9i Server* including the two basic components;
 - Describing the database
 - Describing the instance
- Briefly, illustrate the startup and shutdown process of an *Oracle 9i Server*.
- Identify the typical two-tier client server environment present in most industries today.
- Determine where objects are stored in the database when created and data inserted into objects.
- Show the steps in SQL PL/SQL processing. This includes the basic concepts of how SQL is transmitted over the network via *Oracle Net* and processed by the *Oracle 9i Server*.

Objectives

Features of an Oracle Database

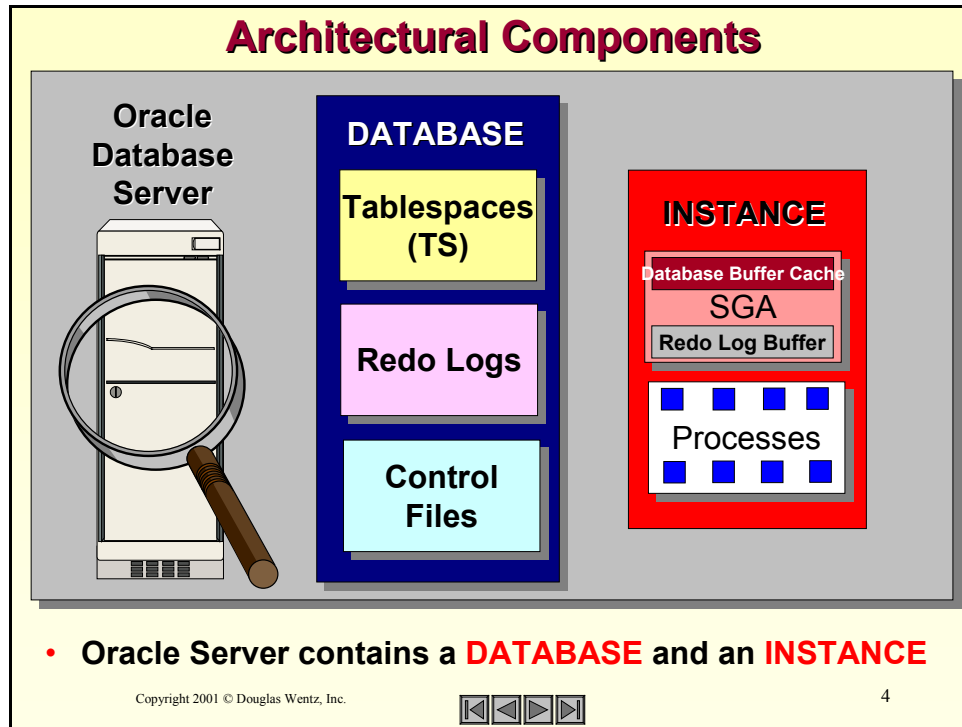
- **The Oracle Server Provides the Following Features**
 - **Reliable Management of Large Amounts of Data**
 - **Provides Concurrency of Data**
 - **Delivers a High Level of Security**
 - **Allows Database Enforced Integrity**
 - **Provides a High Level of Availability and Recoverability**
 - **Allows Database Administration Functions**
 - **Provides for Networked Distributed Systems**

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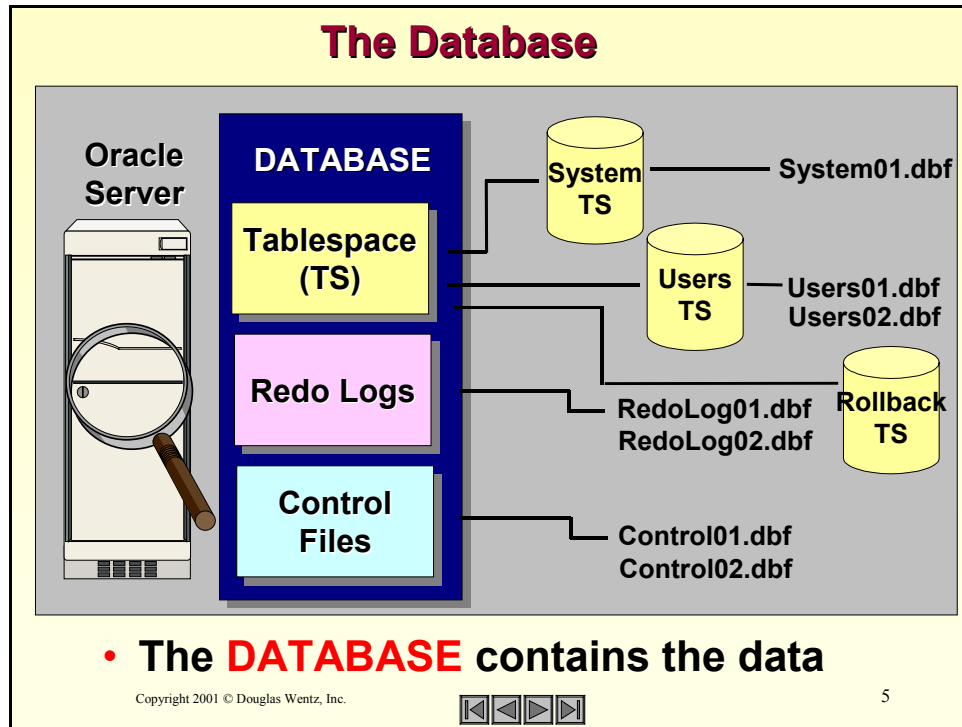


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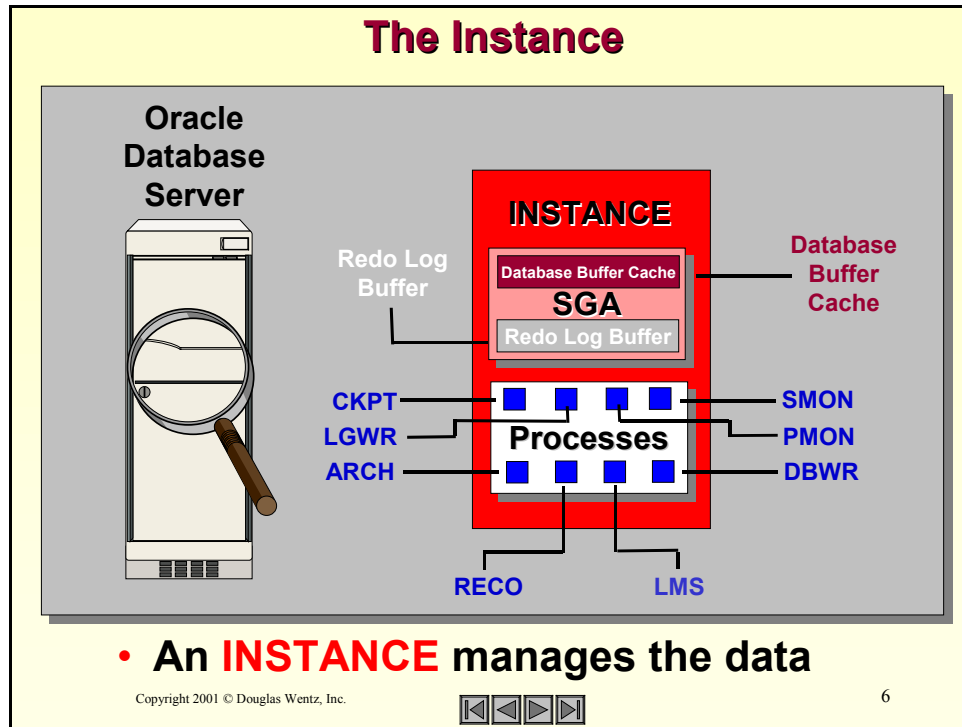
- Oracle can support very large databases containing tera bytes of data. Provisions for fine-grained space management are provided to conserve space and utilize maximum efficiency.
- Provisions for concurrency of data supporting unlimited number of users. Data contention is minimized and Oracle supports an unlimited number of apps and users accessing the same data.
- Oracle provides a very high level of security. Features are provided to limit and monitor the access of data.
- Oracle manages business rules at the server level. This practically eliminates the coding of security at the application.
- Provides a very high level of availability and recoverability. In many instances, database maintenance function can occur without shutting down the database. Transactions can practically never be lost.
- Oracle provides data administration tools to manage the database.
- Provides for networked distributed systems via *Oracle Net*.



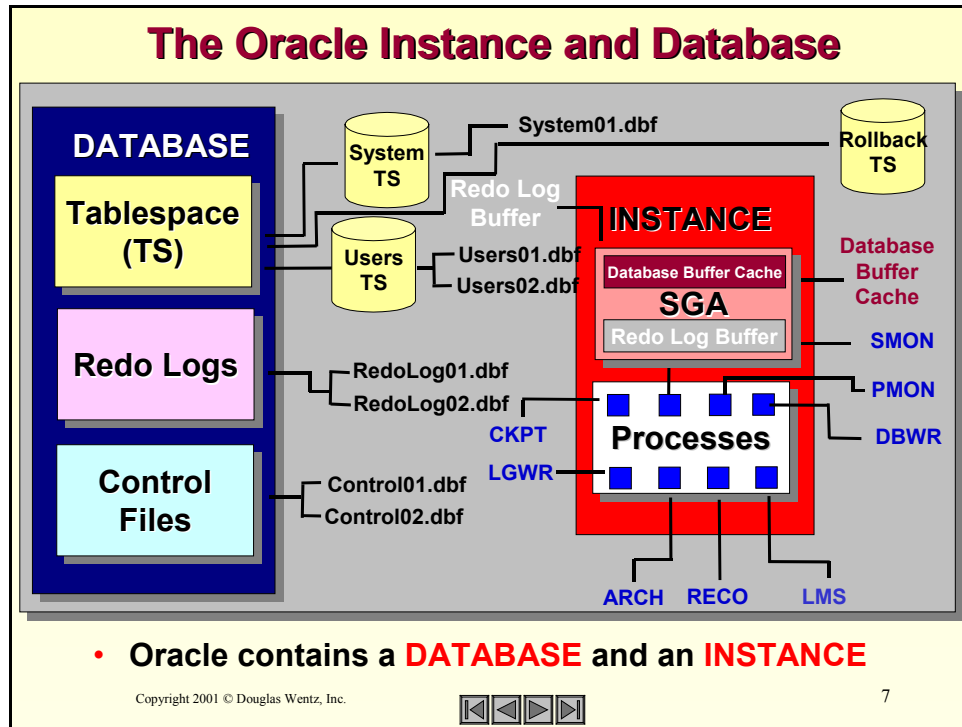
- The *Oracle 9i Server* architecture consists of two main components. These components are the **Database** and the **Instance**. The two together compose the Oracle 9i Server.
- The **Database** portion of the *Oracle 9i Server* consists of data files. These data files store information including user data and system data. Actually, whenever a table is created the data contained in the table and the table's definition is placed in the **Database** portion. An Oracle **database** is a collection of these data files that are treated as a unit.
- The **Database** portion contains physical structures and logical structures. An example of logical structures includes tablespace and objects created such as tables. The physical structures are the physical data files contained in the **Database**. The physical data files will be presented shortly.
- The **Instance** portion of the **Oracle 9i Server** consists of memory structures and not physical files as the **Database** portion. These memory structures include a **System Global Area (SGA)** and **Background Processes**.
- The **Instance** portion actually manages the **Database** portion of the **Oracle 9i Server**.



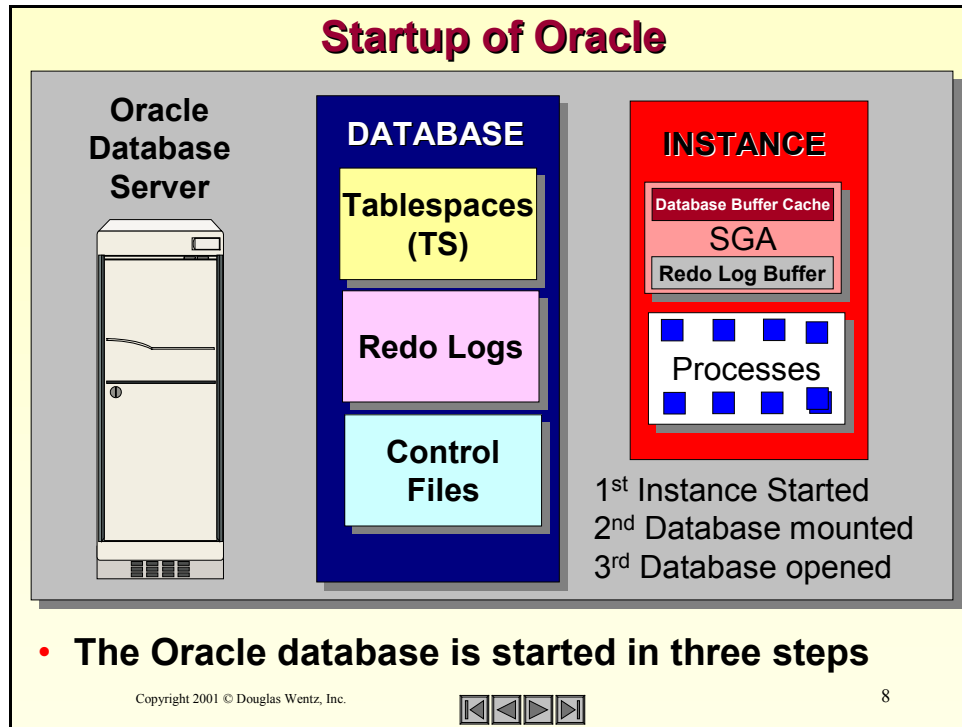
- The **Tablespace (TS)** portion of the **Database** is an example of a logical structure. **Tablespaces** contain data including system data and user created data such as tables.
- **Tablespaces** are named and have data files associated with them. In the example above the **Tablespace** named *Users* has two data files associated with it. Whenever space is consumed in a **Tablespace** your DBA will add another data file to the tablespace or expand the existing data files.
- Every database must have at least a **System Tablespace**. The **System Tablespace** contains system related information about users, permissions, and objects created in the **Database**.
- Every Oracle database has a set of two or more **Redo Log Files**. The function of the **Redo Logs** is to record changes made to data. If a failure prevents modified data from being permanently written to the data files, the changes are in the **Redo Log Files**.
- Every Oracle database has a **Control File**. A **Control File** contains entries that specify the physical structure of the database.



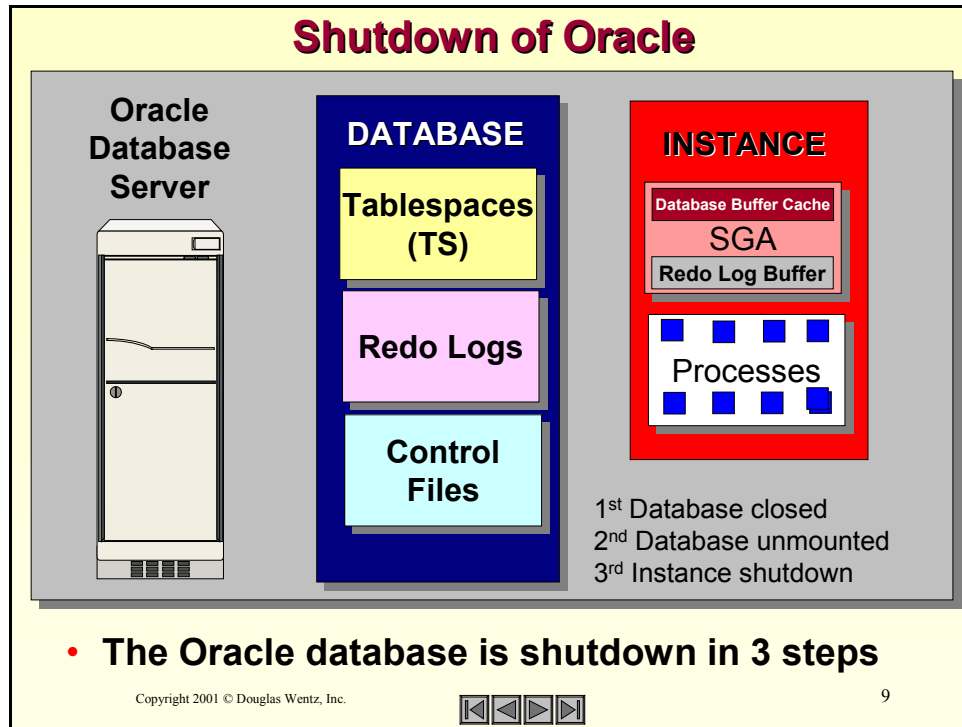
- The purpose of the **Instance** is to manage the **Database**.
- The **Instance** contains *Memory Structures* and *Processes*. These *Memory Structures* and *Processes* consume memory and not disk space as is consumed by the **Database**.
- The **System Global Area** illustrated above is a *Memory Structure*. The **System Global Area (SGA)** is a shared memory region that contains data and control information for one Oracle **Instance**. Two major portions of the SGA include;
 - The **Database Buffer Cache** contains blocks of data retrieved from the **Database** by SQL.
 - The **Redo Log Buffer** contains blocks of changed data for recovery purposes
- Oracle creates a set of **Processes** for each instance. Think of these **Processes** a small program and each program has a separate function in managing the database. For example, the **DBWR** has the function of writing blocks of data back to the **Database** from the **Database Buffer Cache** in the **SGA**. These Processes include CKPT, LGWR, ARCH, RECO, LMS, SMON, PMON and DBW.



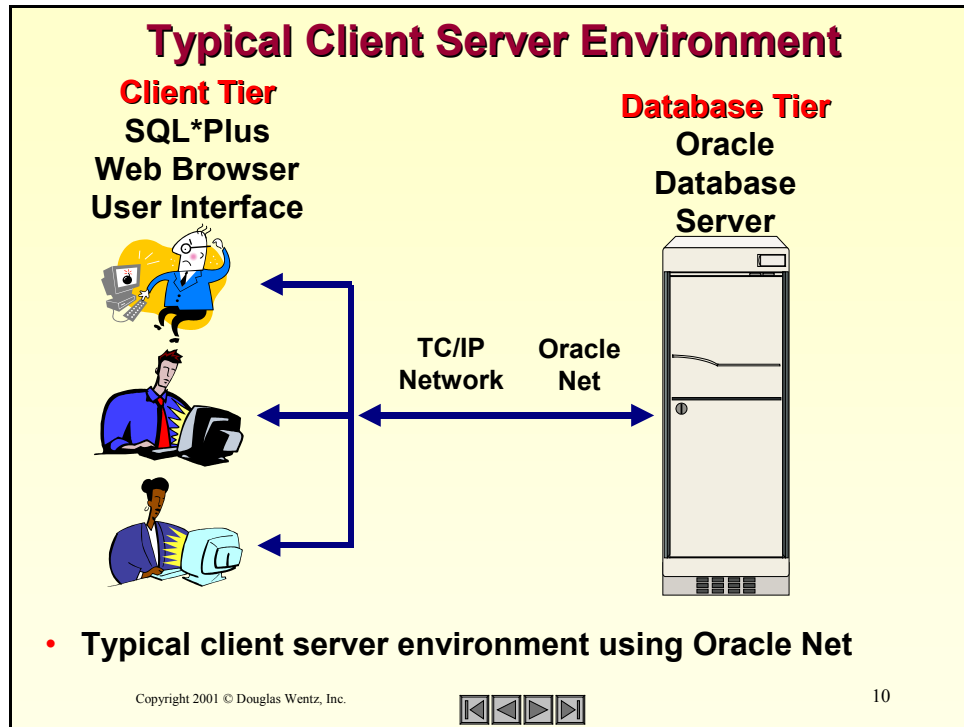
- The *Oracle 9i Server* contains a **Instance** and a **Database** in most industry configurations
- In most installations, the relationship is one to one. One computer / server contains one **Instance** that manages one **Database**. However, it is possible to have slightly different configurations.
- *Oracle 9i Server* with Real Application Clusters can run multiple **Instances** that share a single physical **Database**. In most applications, Real Application Clusters enable access to a single database by the users on multiple machines with increased performance.



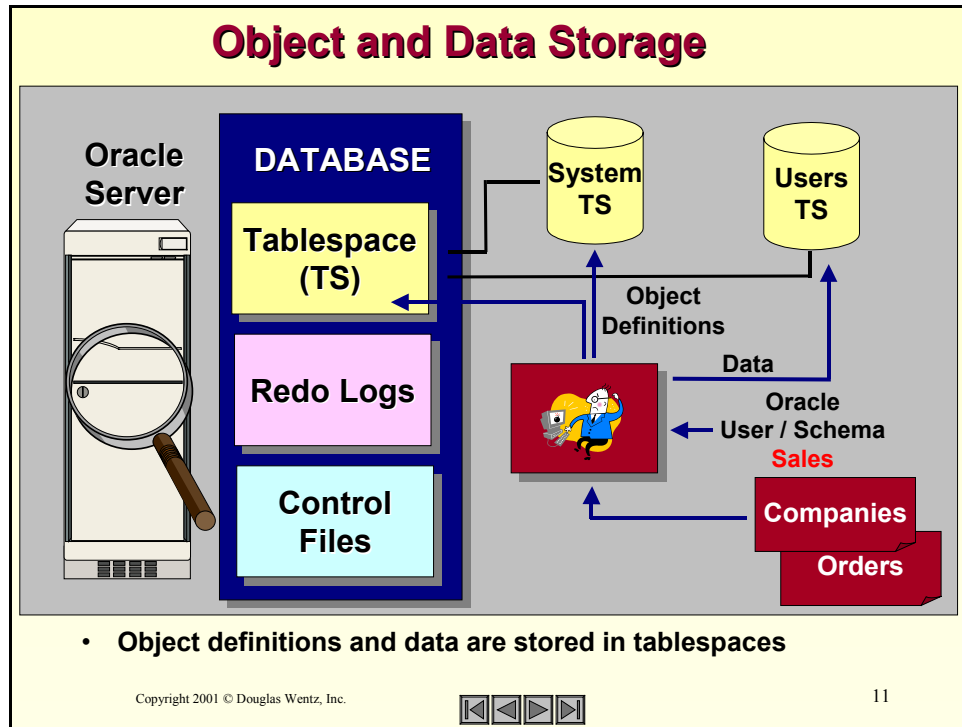
- The basic concepts of starting the **Oracle 9i Server** will only be presented in this module and class since it is the responsibility of the DBA. These concepts will be presented in detail in the Oracle DBA classes.
- The Oracle 9i Server is started in three steps including;
 - Start an **Instance** of the *Oracle 9i Server*. This includes creating the SGA in memory and starting all of the processes.
 - Mounting the **Database**. Oracle reads the **Control File** and determines if the files named in the **Control File** are available.
 - Open the **Database**. Oracle opens all of the associated database files.
- When the Oracle server starts up, it uses a parameter file that contains initialization parameters. These parameters specify the name of the database, the amount of memory to allocate, the names of **Control Files**, and various limits and other system parameters.



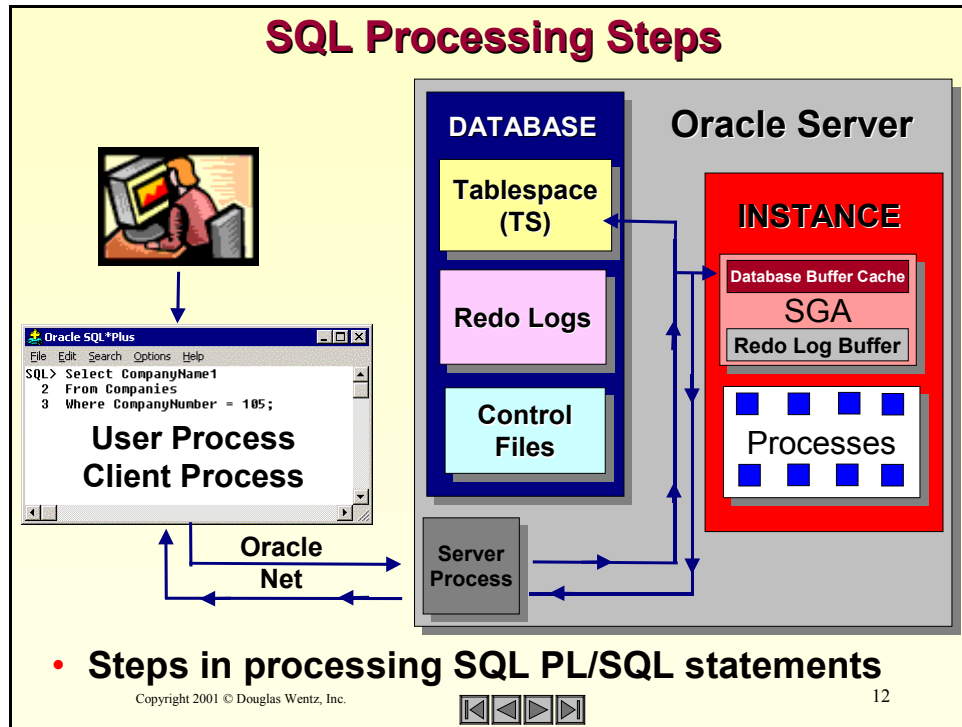
- The basic concepts of shutting down the *Oracle 9i Server* will only be presented in this module and class since it is the responsibility of the DBA. These concepts will be presented in detail in the Oracle DBA classes.
- The Oracle 9i Server is shutdown in three steps including;
 - Close the **Database**.
 - Unmount the **Database**.
 - Shutdown the **Instance** of the Oracle 9i Server.
- The DBA has several options whenever shutting down the Oracle 9i Server. If the DBA advises you that he / she is shutting down the Oracle 9i Server that you are accessing be sure to promptly exit any programs that is accessing that server.
- If the program is not shutdown whenever requested by the DBA he / she has the option to force a shutdown and terminate your session with the *Oracle 9i Server*.



- **Oracle Net** enables a network session from a client application to an *Oracle 9i Server*. The above illustration shows the traditional client/server connectivity to an *Oracle 9i Server*.
- **Oracle Net** resides on the client side and on the *Oracle 9i Server* side. It is responsible for establishing and maintaining the connection between the client application and the server.
- The client application could be *SQL*Plus*, *iSQL*Plus*, a web browser and many other user interfaces provided by independent vendors.
- **Oracle Net** communicates with the TCP/IP protocol to enable computer-level connectivity and data transfer between the client tier and the database server tier.
- **Oracle Net** is a component of Oracle Net Services. Oracle Net Services also provides the following services;
 - Web Client Application Services via Oracle's Application Web Server.
 - Java Application Services via Oracle's Application Java Server.



- Even from a development standpoint, it is a good idea to understand the basic concepts of **Tablespaces**. The concept of **Tablespaces** will be presented in great depth in the Oracle Database Administration classes.
- Whenever an Oracle user creates an object such as a table that table's definition resides in a **Tablespace** called *System*. The *System* Tablespace is reserved just for Oracle internal database management storage requirements. No user data is placed in the **System Tablespace** only Oracle internals.
- Additionally, after the table has been created the table's data is placed in a **Tablespace** assigned by the DBA. In our example above the data for the *Companies* table and *Orders* table will be placed in the **Users Tablespace**.
- If the **Users Tablespace** becomes full, the DBA simply adds another data file or expands the existing files associated with the **Users Tablespace**.
- Always remember that **Tablespaces** are logical. **Tablespaces** are assigned to outside data files. Data is placed logically in **Tablespaces** internally to Oracle. However externally data goes into data files that are assigned to the respective **Tablespace**.



- It is important for the user of any Oracle tool including SQL*Plus to understand the basic steps in the processing of a SQL statement. The following steps are performed beginning with the connection of SQL*Plus via *Oracle Net* to an *Oracle 9i Server*.
 1. The Oracle user brings up a SQL*Plus session on their client workstation. A connection is made to the *Oracle 9i Server* via TCP/IP and *Oracle Net*
 2. A **Server Process** is started for that user on the *Oracle 9i Server*. The **Server Process** only job function is to retrieve data from the Oracle database requested by that user via *SQL*Plus* and *Oracle Net*.
 3. The **Server Process** looks in the **Database Buffer Cache** of the **Instance** to see if the data is there. If the data is not in the **Database Buffer Cache**, the **Server Process** gets the data from the appropriate **Tablespace** that contains the data. The data is placed in the **Database Buffer Cache** and returned to the user.
 4. If the user exits the SQL*Plus session the **Server Process** on the *Oracle 9i Server* is removed.