

SFT.CM.06_Oracle

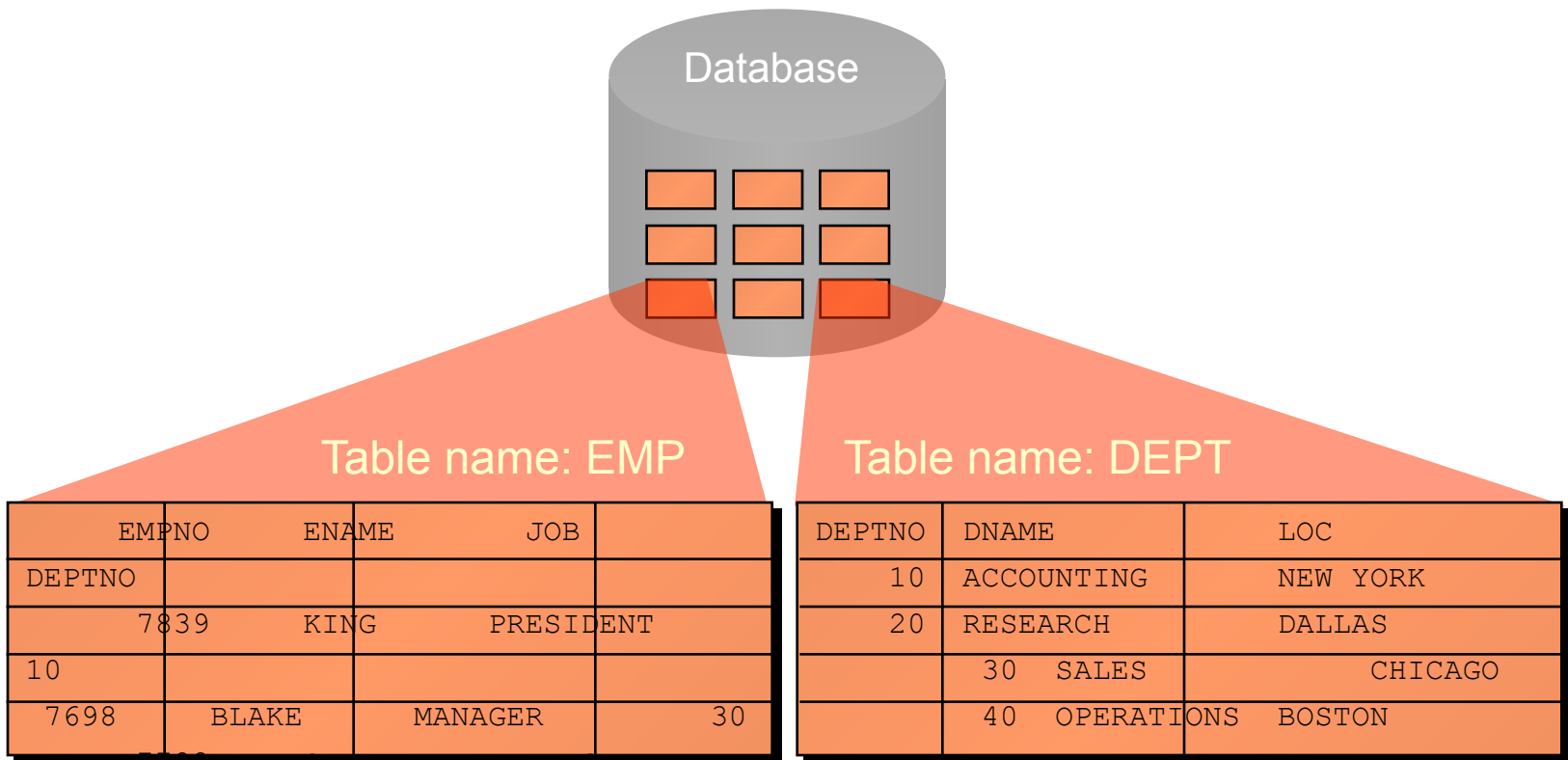
Oracle 11g
RDBMS introduction

Relational Database Concept

- **Dr. E.F. Codd formulated and proposed the relational model for database management in 1969.**
- **It is the basic for the relational database management system (RDBMS).**
- **The relational model includes following components:**
 - Collection of objects or relations
 - Set of operators to manipulate relations
 - Data integrity

Definition of a Relation Database

A relational database is a collection of relations or two-dimensional tables.



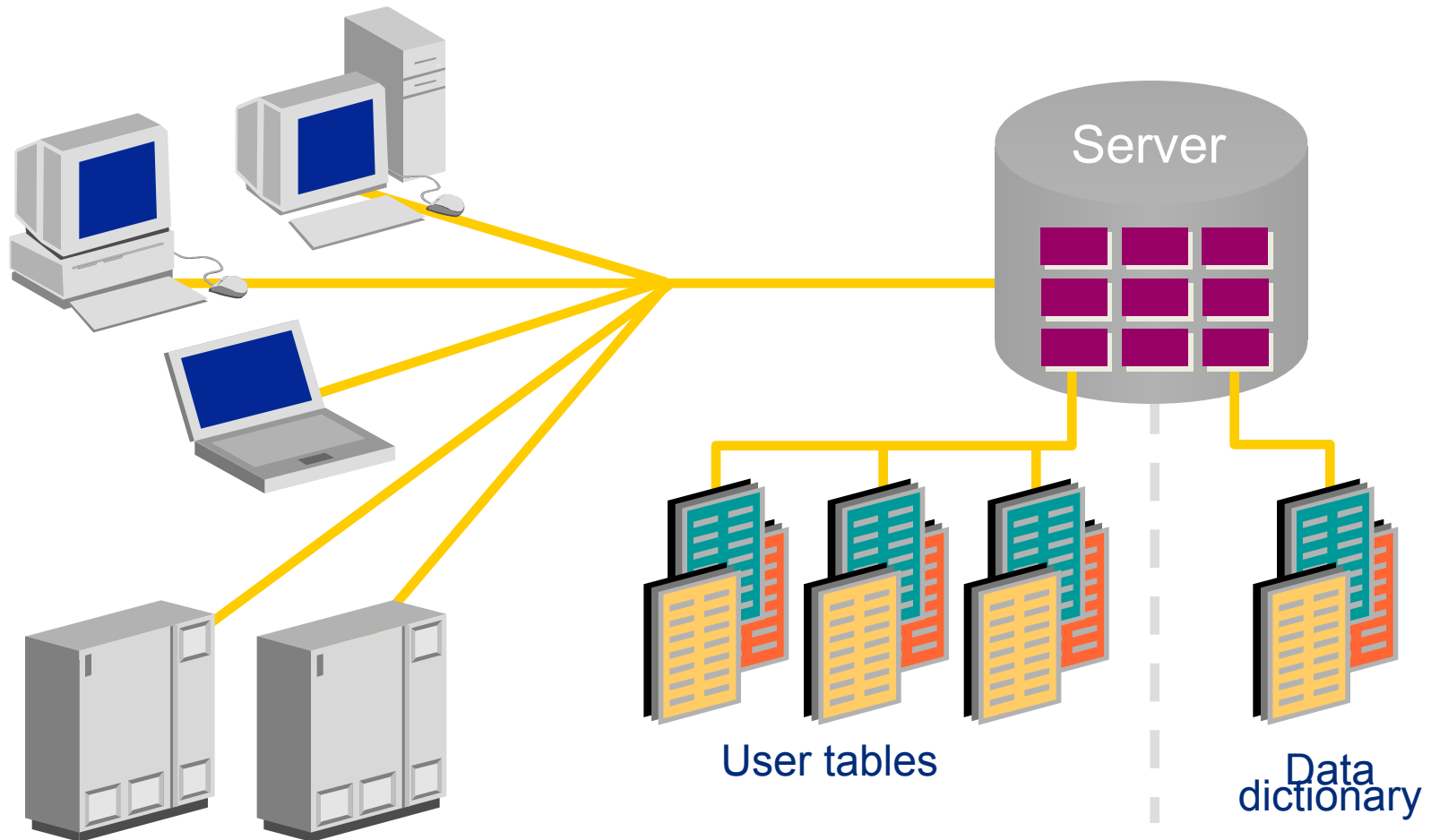
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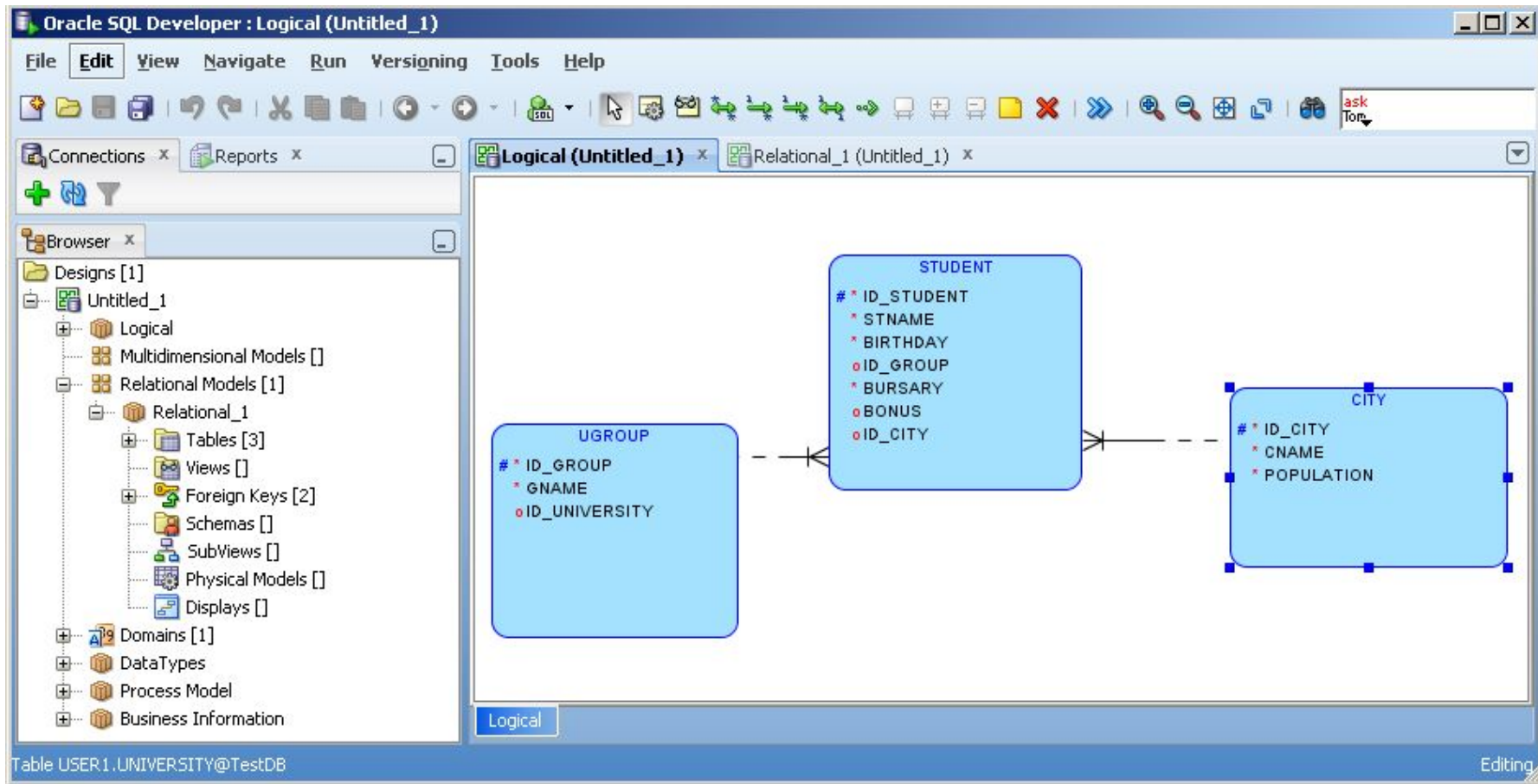
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Relation Database Management System (RDBMS)



Database Modeling: Oracle SQL Developer



What Is an Index?

An Index:

- Is a schema object
- Is used to speed up the retrieval of rows by using a pointer
- Is logically and physically independent of the data in the associated table

How Are Indexes Created?

- Automatically: A unique index is created automatically when you define a PRIMARY KEY or UNIQUE constraint in a table definition
- Manually: Users can create non-unique indexes on columns to speed up access to the rows

When to Create an index

You should create an index if

- A column contains a wide range of values.
- A column contains a large number of null values.
- One or more columns are frequently used in a WHERE clause or a join condition.
- The table is large and most queries are expected to retrieve less than 2 to 4% of the rows.
- Values in the column are relatively unique

Database normalization

Task:

Develop the structure and content of logically related tables for domain "Human Resources". Design tables to store employee information as well as department and position

Database normalization - 1NF

The first normal form (1NF or Minimal Form) :

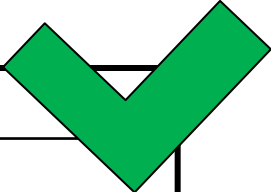
A relational database table that adheres to 1NF is one that meets a certain minimum set of criteria. These criteria are basically concerned with ensuring that the table is a faithful representation of a relation and that it is free of repeating groups.

More simply, to be in 1NF, each column must contain only a single value and each row must contain the same columns

...Ivanov, 15 department, chief...	
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Last Name	Position	Department N°
Ivanov	Chief	15

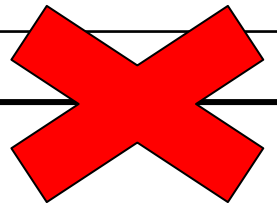


Database normalization - 2NF

The second normal form (2NF):

a 1NF table is in 2NF if and only if all its non-prime attributes are functionally dependent on the whole of every candidate key. (A non-prime attribute is one that does not belong to any candidate key.)

Department N°	Position	Department	Amount of people
15	Chief	Functional Department	1
15	Engineer	Functional Department	5
10	Chief	Sales Department	1
10	Manager	Sales Department	10

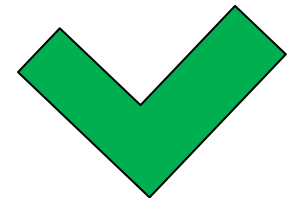


Database normalization - 2NF

Department №	Department Name
10	Functional Department
15	Sales Department

Department №	Position №	Amount of people
15	12	1
15	13	5
10	12	1
10	14	10

Position №	Position Name
12	Chief
13	Engineer
14	Manager

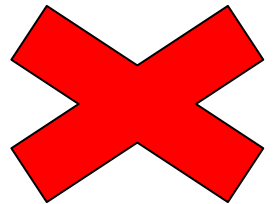


Database normalization - 3NF

The third normal form (3NF) :

The relation (table) is in second normal form (2NF). Every non-prime attribute is non-transitively dependent (i.e. directly dependent) on every candidate key in the table.

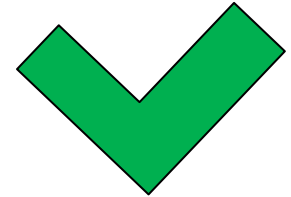
Employee №	Last Name	Salary	Department Name	Department №
1	Ivanov	400	Functional Department	15
2	Black	500	Functional Department	15
3	Smith	600	Sales Department	10



Database normalization - 3NF

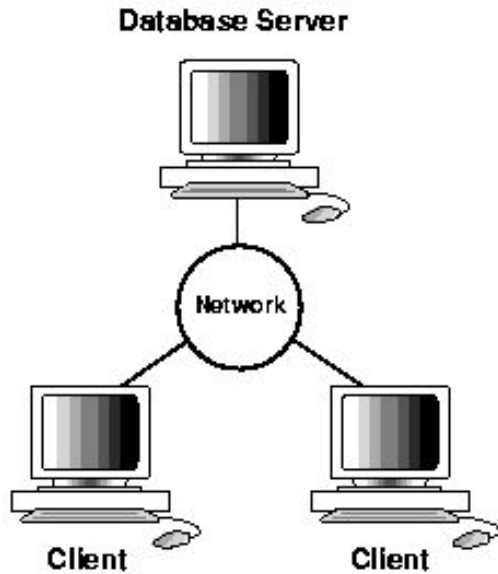
Employee №	Last Name	Salary	Department №
1	Ivanov	500	15
2	Petrov	400	15
3	Ivanov	600	10

Department №	Department Name
10	Sales Department
15	Functional Department



Client/Server architecture

In the classic system environment the database application and the database are separated into two parts: a front-end or client portion, and a back-end or server portion - hence the term client/server architecture. The client runs the database application that accesses database information and interacts with a user through the keyboard, screen, and pointing device, such as a mouse. The server runs the RDBMS software and handles the functions required for concurrent, shared data



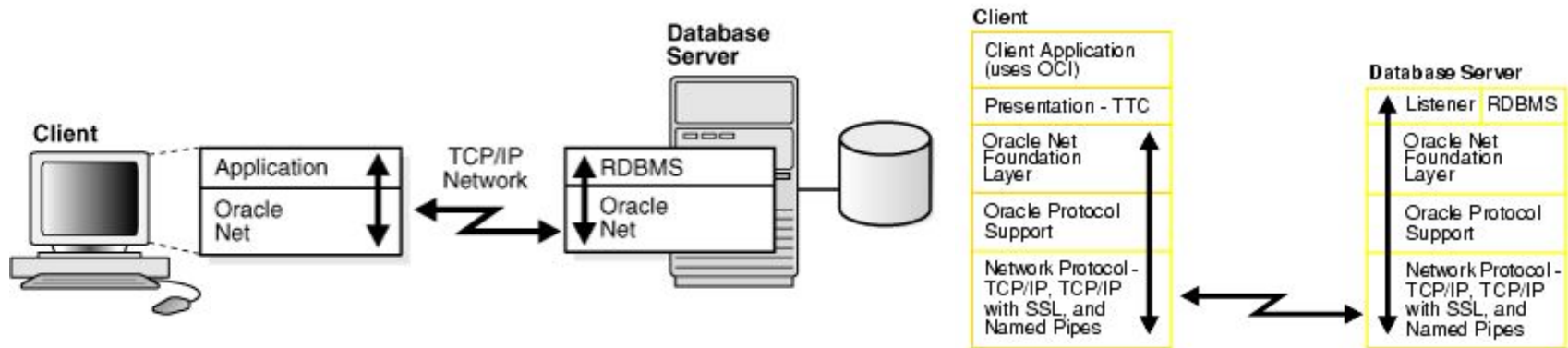
Client/server architecture benefits:

- Client applications are not dependent on the physical location of the data
- Client workstations can be optimized for the presentation of data, and the server can be optimized for the processing and storage of data
- Data is stored on the servers rather than on all computers in the system. This makes it easier and more efficient to manage concurrent access
- Network traffic is kept to a minimum, because only the requests and the results are shipped over the network

Oracle Net Architecture

Oracle Net enables a network connection between a client and a database server.

- Oracle Net is a software component that resides on both the client and the database server.
- Oracle Net is layered on top of a network protocol like TCP/IP
- Oracle Net components are different for the Server and Client

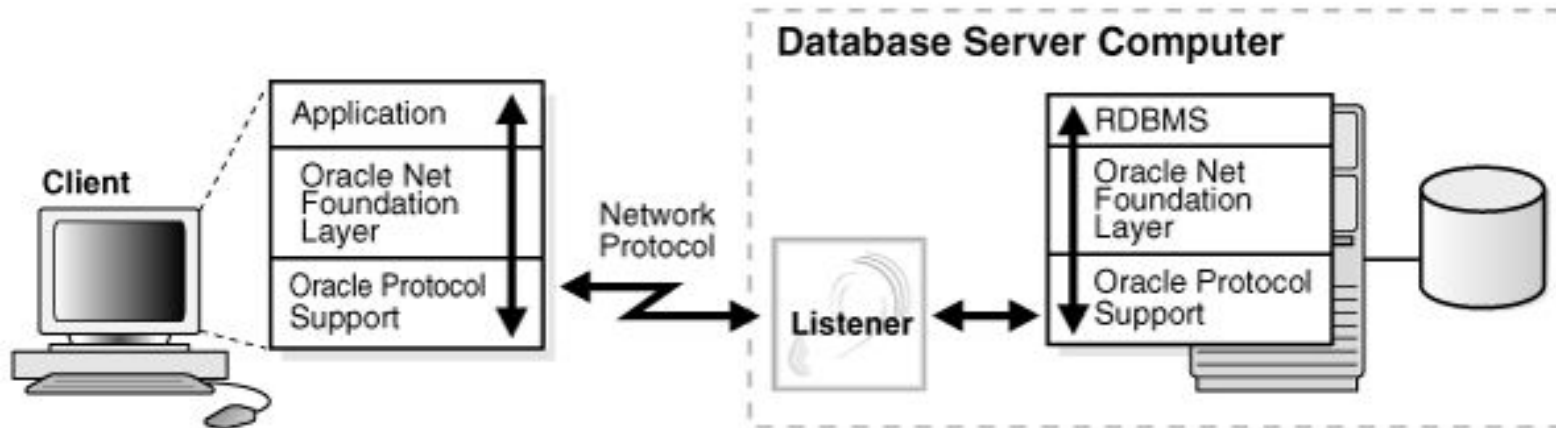


Oracle listener

Oracle listener

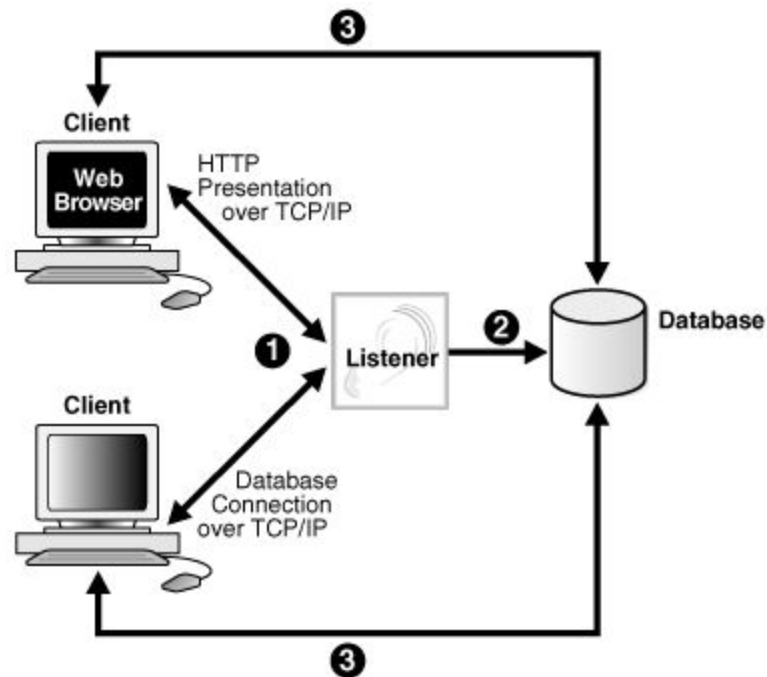
Oracle listener is the process run on the Database server. It is responsible for initiating communication between the client and RDBMS. When connection established client and Oracle database server communicate directly with one another

Listener process has to be started as daemon on Unix platform or run as service on Windows NT. Many listeners can be run on the same server, but for performance reasons it is better to have one listener for all the server databases

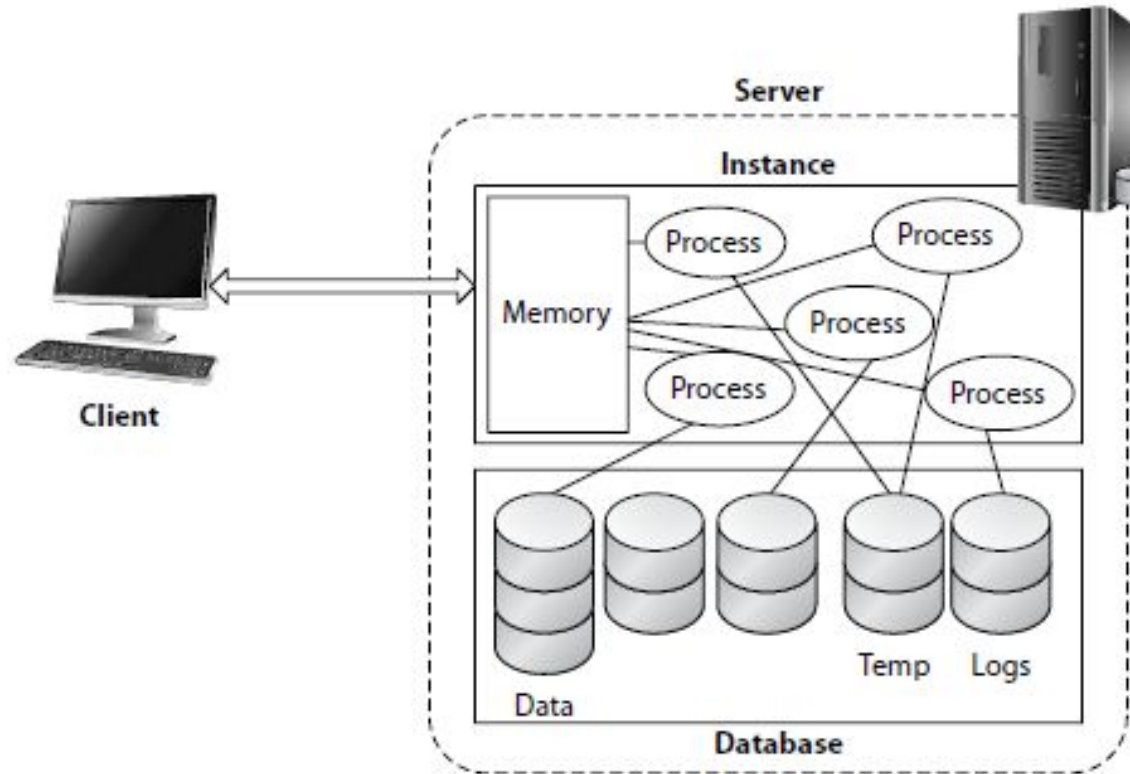


Oracle listener

1. The client sends a connection request to the listener.
2. The listener parses the client request and forwards it to the service handler for the database service requested.
3. The client connects to the database.



Database architecture

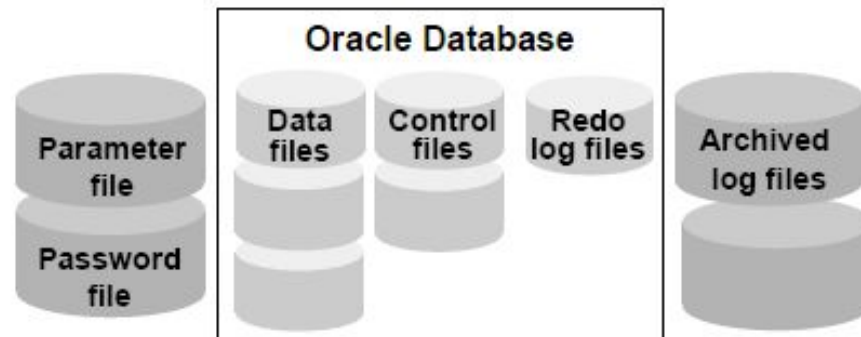


Oracle Database

Oracle Database

An Oracle database:

- Is a collection of data that is treated as a unit
- Consists of three file types

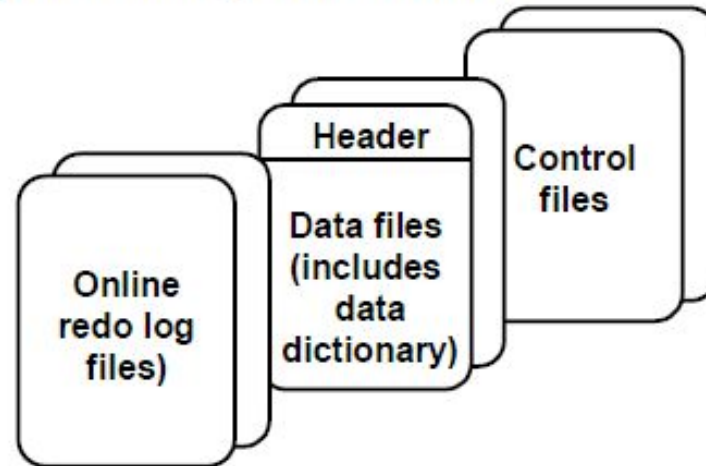


Oracle Physical Structure

Physical Structure

The physical structure of an Oracle database is determined by the operating system files that provide the actual physical storage for database information.

- Control files
- Data files
- Redo log files

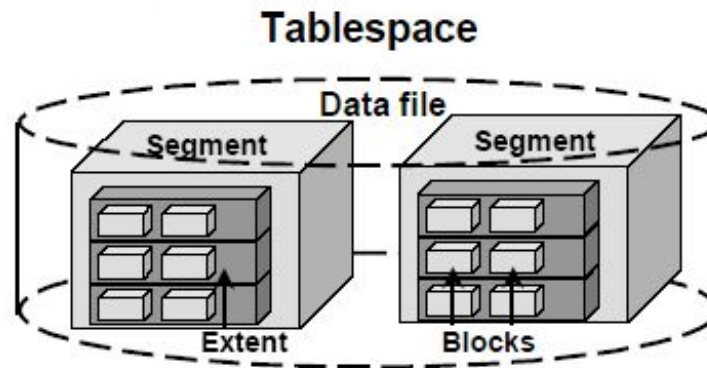


Oracle Logical Structure

Logical Structure

The logical structure of the Oracle architecture dictates how the physical space of a database is to be used.

A hierarchy exists in this structure that consists of tablespaces, segments, extents, and blocks.



Users and schemas

Database user

- A user (sometimes called a username) is a name defined in the database that can connect to and access objects.

Database schema

- A schema is a named collection of objects
- A user is created, and a corresponding schema is created
- User can be associated with only one schema
- User name and schema are often used interchangeably

Schema objects

Schema objects:

- Tables
- Triggers
- Constraints
- Indexes
- Views
- Sequences
- Stored program units
- Synonyms
- User-defined data types
- Database links

Backup

Backup and recovery in Oracle can be divided into three types:

- logical backup - made by means of a part of the Oracle exp Utilities, which allows you to export the entire database, schema, or table specified. In the case of export of the entire database is carried out so-called full export (with exports all database tables) or incremental (unloaded tables that have changed since the last export). For Oracle 10g XE, in which the amount of the base does not exceed 4 GB, you can use the full export;
- physical backup - is performed after stopping the base and involves copying the data files, control files, online redo log files and database init.ora settings;
- online backup - is carried out in the database operates in ARCHIVELOG. In this mode, redo log archiving operational and maintained a log of all transactions.

Users SYS and SYSTEM

SYS

When any database is created, the user SYS is automatically created and granted the DBA role. All of the base tables and views for the database's data dictionary are stored in the schema SYS. These base tables and views are critical for the operation of Oracle. To maintain the integrity of the data dictionary, tables in the SYS schema are manipulated only by Oracle. They should never be modified by any user or database administrator, and no one should create any tables in the schema of user SYS. (However, you can change the storage parameters of the data dictionary settings if necessary.)

SYSTEM

When a database is created, the user SYSTEM is also automatically created and granted the DBA role.

The SYSTEM username is used to create additional tables and views that display administrative information, and internal tables and views used by various Oracle options and tools. Never create in the SYSTEM schema tables of interest to individual users.

Pseudocolumns ROWID, ROWNUM

Pseudocolumns in Oracle are columns that do not exist in the tables explicitly, but can be used in queries. Most widely used and important one is the ROWID - pseudocolumn is a unique ID string. It is not just guaranteed to be unique within the table - in fact: it is unique within the database. From a physical point of view ROWID is kind of coordinate records in the database.

ROWNUM is specific for Oracle. ROWNUM contains the number of the query string.

Thanks for Your Attention

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