QUEZON CITY UNIVERSITY
COLLEGE OF COMPUTER STUDIES
INFORMATION TECHNOLOGY DEPARTMENT

WEEK 4
Introduction to Oracle

IM101 - Advanced Database Systems

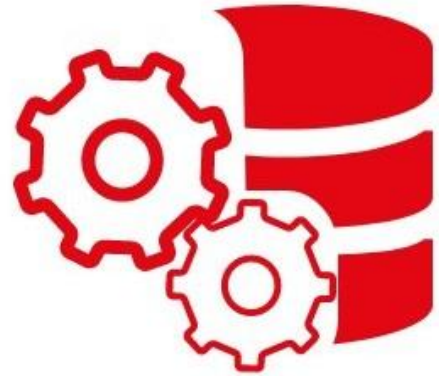
LEARNING OUTCOMES:

At the end of the session, the students should be able to:

1. Discuss the major architectural components of Oracle Database.
2. Understand how to install Oracle Database.

Overview of Oracle Database

- Oracle Database is a multi-model database management system.
- Used for enterprise applications due to reliability, security, and scalability.



ORACLE®

Database Server

- Information management encountered different problem the key solution is database server.
- It provide solution for failure recovery and prevent unauthorized access.

Oracle Relational Database Management System (RDBMS)

Key Features:

- **Data Integrity:** Enforces ACID (Atomicity, Consistency, Isolation, Durability) properties.
- **Security:** Role-based access control and encryption.
- **Scalability:** Supports large-scale, multi-user environments.
- **Concurrency Control:** Manages simultaneous access without conflicts.
- **Backup & Recovery:** Ensures data availability and disaster recovery.

Oracle Relational Data Model (RDM)

Key Concepts:

- **Tables:** Store data in structured row and column format.
- **Primary Keys:** Ensure unique identification of records.
- **Foreign Keys:** Maintain referential integrity between tables.
- **Normalization:** Process of organizing data to minimize redundancy.
- **Indexes:** Improve query performance by enabling faster lookups.

Oracle Database Architecture

Key Components:

1. **Database Structures**
   - Physical Storage Structures: Datafiles, Control Files, Redo Log Files.
   - Logical Storage Structures: Tablespaces, Segments, Extents, Blocks.
2. **Instance Components**
   - Memory Structures: System Global Area (SGA), Program Global Area (PGA).
   - Background Processes: DBWR, LGWR, CKPT, SMON, PMON.
3. **Server Processes**
   - User Processes, Server Processes, Background Processes.

Physical Storage Structures

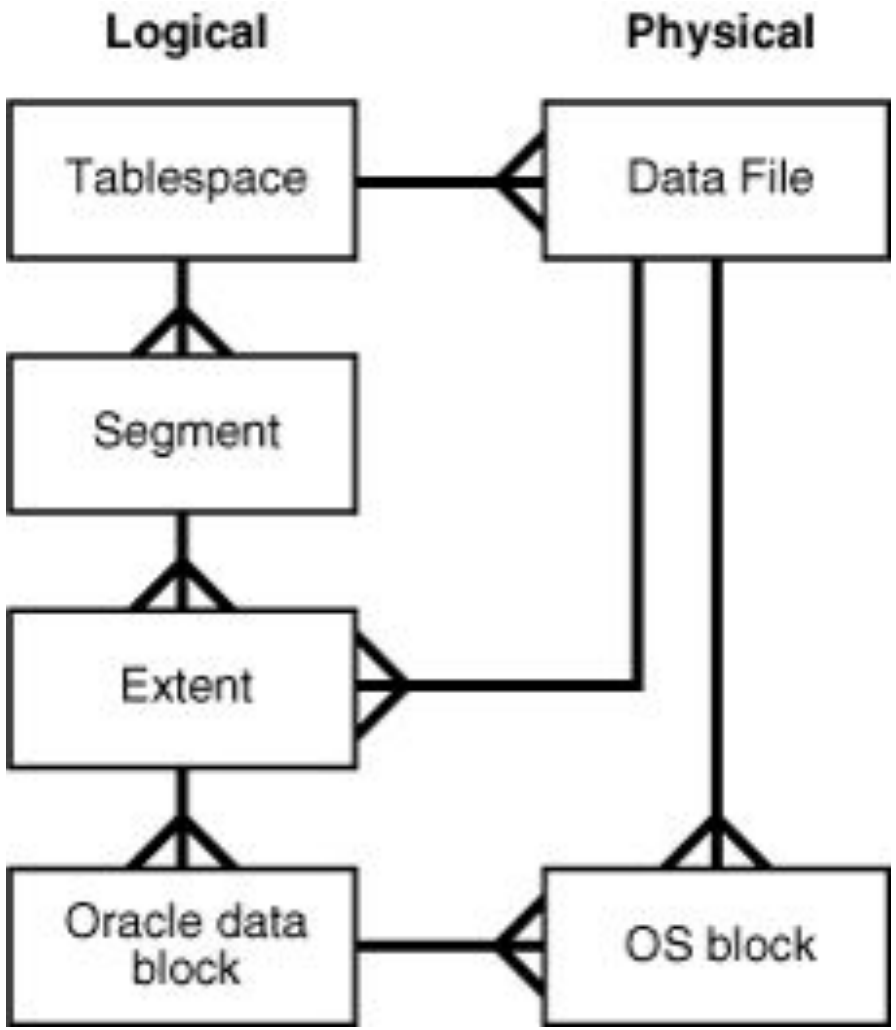
Components:

- **Datafiles:** Store actual database data.
  - physical file in persistent storage that was created by Oracle Database and contains data structures such as tables and indexes.
- **Control Files:** Maintain database structure metadata.
  - is a root file that tracks the physical components of the database.
- **Redo Log Files:** Store transaction logs for recovery.
- **Archive Log Files:** Preserve redo logs for backup and recovery.

Logical Storage Structures

Components:

- **Tablespaces:** Logical storage units containing database objects.
- **Segments:** Collections of extents used for a specific data type.
- **Extents:** Groups of contiguous data blocks allocated for a segment.
- **Blocks:** Smallest units of storage in Oracle Database.



Logical and Physical Storage Structure

This graphic depicts the relationship between logical and physical storage structures in crow's feet notation. In the Logical column on the left are Tablespace, Segment, Extent, and Oracle data block. Each type has a one-to-many relationship with the type below it. In the Physical column on the right are Datafile and OS block. Tablespace has a one-to-many relationship with Datafile. Oracle data block has a one-to-many relationship with OS block. Datafile has a one-to-many relationship with extent.

Memory Structures

Components:

- **System Global Area (SGA):**
  a. Shared Pool
  b. Database Buffer Cache
  c. Redo Log Buffer
  d. Java Pool
  e. Large Pool
- **Program Global Area (PGA):**
  a. Private memory region for session-specific information
  b. Stores runtime memory for operations like sorting and hash joins

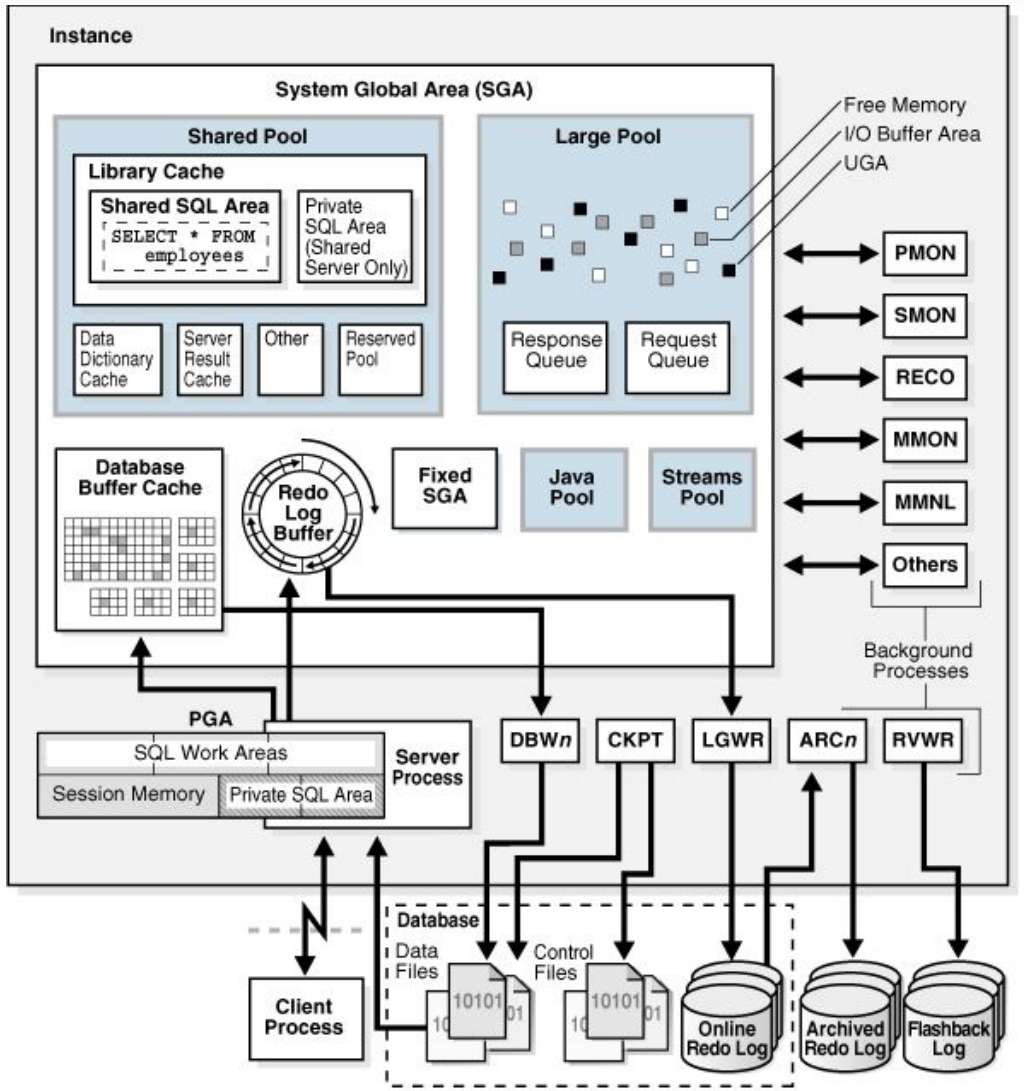
Background Processes

- **Database Writer (DBWR):** Writes modified data from memory to disk.
- **Log Writer (LGWR):** Writes redo log entries to the log files.
- **Checkpoint (CKPT):** Signals DBWR to write all dirty buffers to disk.
- **System Monitor (SMON):** Performs crash recovery and reclaims temporary space.
- **Process Monitor (PMON):** Cleans up failed processes and releases resources

Server Processes

Types of Server Processes:

- **Dedicated Server Process:** Handles requests for a single client connection.
- **Shared Server Process:** Handles multiple client requests to optimize resource usage.
- **Dispatcher Process (Dnnn):** Routes requests from user processes to shared server processes.



Database Instance and Database Files

The graphic is depicted in two halves: memory and disk. The database instance block is shown in the memory section. In the disk sections are icons depicting data files, control files, and the online redo log.

Installation

Pre-installation Requirements

Hardware and Software Requirements:

- CPU, RAM, Disk Space
- Operating System Compatibility
- Software Dependencies (Java, Libraries, Packages)

Steps to Install Oracle Database

1. **Download Oracle Database**
   a. Visit Oracle's official website
   b. Choose the appropriate version (Standard, Enterprise, or Express Edition)
2. **Installation Process**
   a. Run the Oracle Universal Installer (OUI)
   b. Choose Installation Type (Desktop/Classroom or Enterprise)
   c. Specify Configuration Options (DB Name, Admin Credentials, Storage Path)
   d. Perform Prerequisite Checks
   e. Start the Installation

Steps to Install Oracle Database

3. **Post-installation Steps**
    - Verify the Installation
    - Configure Environment Variables
    - Start and Test the Database
    - Connect using SQL*Plus or Oracle SQL Developer

Reference

- Oracle Database

  https://www.oracle.com/database/

- 11 Physical Storage Structures

  https://docs.oracle.com/en/database/oracle/oracle-database/19/cncpt/physical-storage-structures.html#GUID-FFA872E1-7F63-4DC5-8A35-F21394AB4595

- 14 Logical Storage Structures

  https://docs.oracle.com/en/database/oracle/oracle-database/21/cncpt/logical-storage-structures.html#GUID-DC561B64-67D9-43CC-A9BA-BE5B92A7B869

END OF PRESENTATION.
THANK YOU!