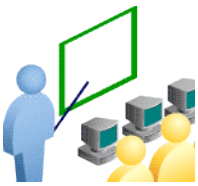
Exploring the Oracle Database Architecture

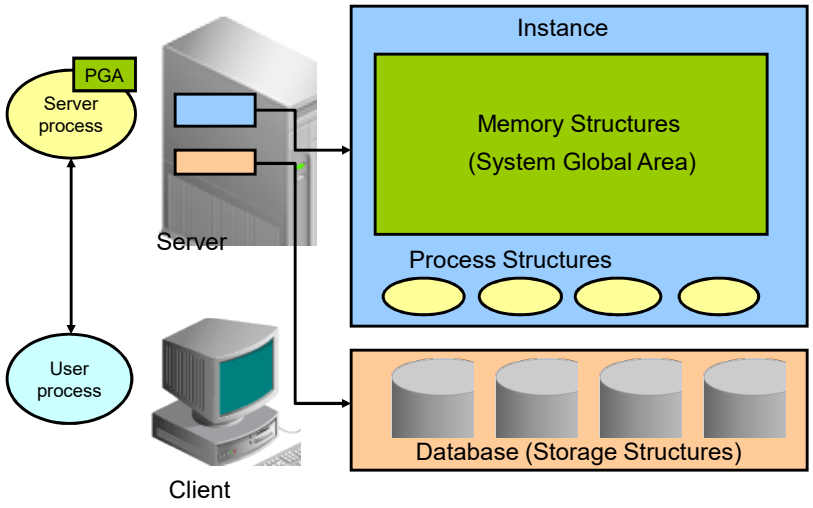
Objectives

After completing this lesson, you should be able to:

- List the major architectural components of Oracle Database
- Explain memory structures
- Describe background processes
- Correlate logical and physical storage structures
- Describe pluggable databases
- Describe ASM storage components



Oracle Database Server Architecture: Overview



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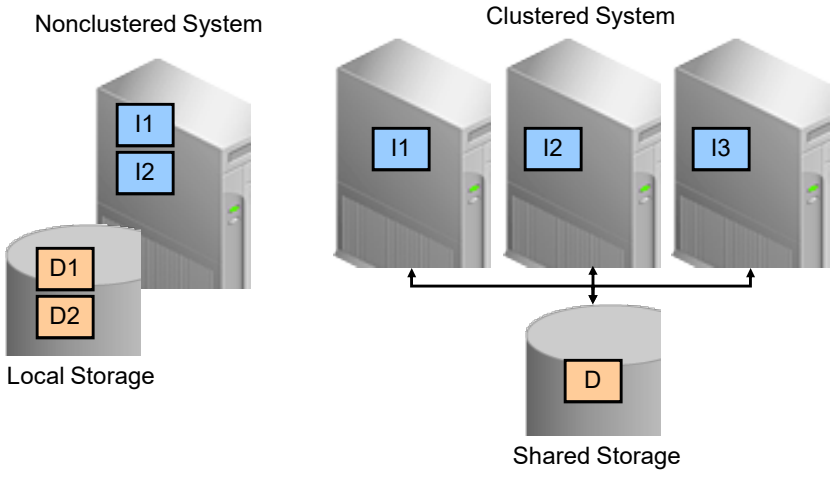
Oracle Database Instance Configurations



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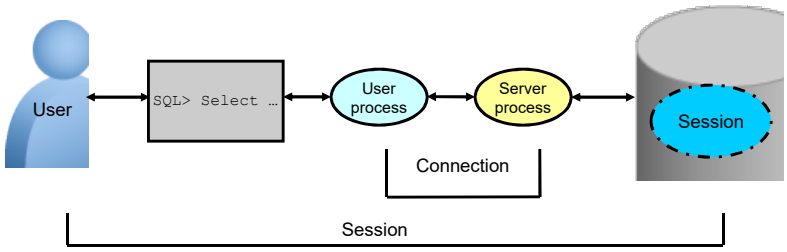
Connecting to the Database Instance

- Connection: Communication between a user process and an instance
- Session: Specific connection of a user to an instance through a user process



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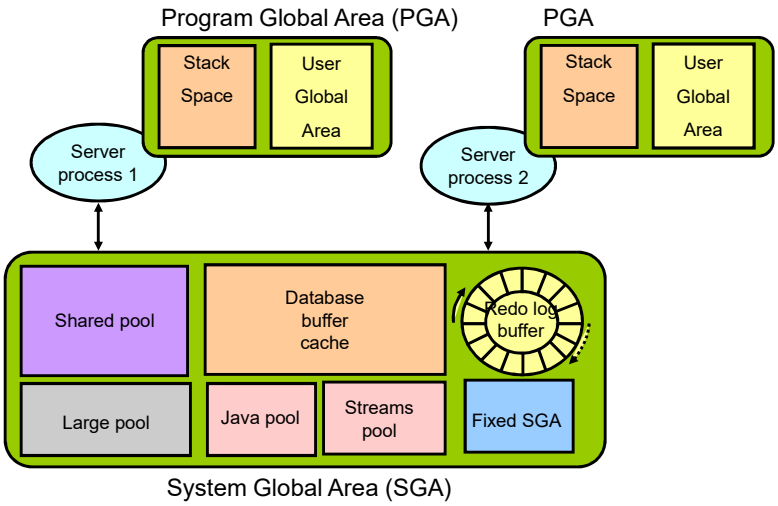
Oracle Database Memory Structures



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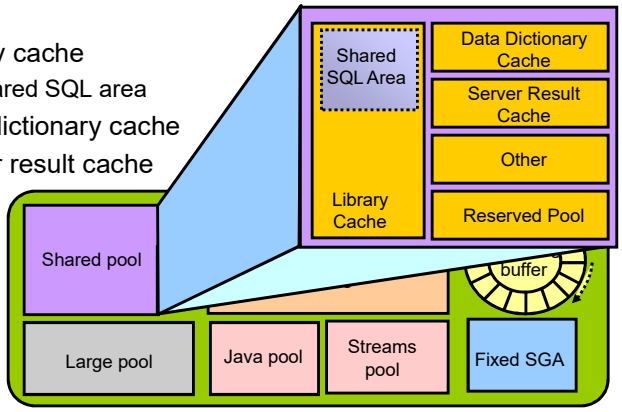
Shared Pool

- Is a portion of the SGA
- Contains:
  - Library cache
    - Shared SQL area
  - Data dictionary cache
  - Server result cache

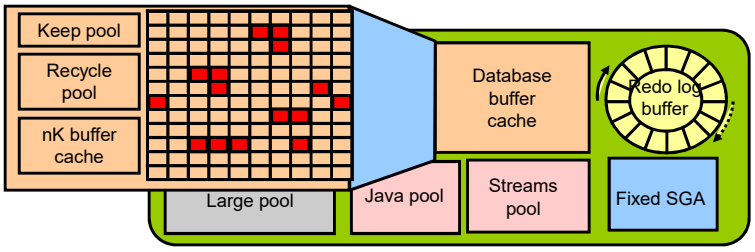


System Global Area (SGA)

1 - 7

Database Buffer Cache

- Is part of the SGA
- Holds copies of data blocks that are read from data files
- Is shared by all concurrent users



System Global Area (SGA)

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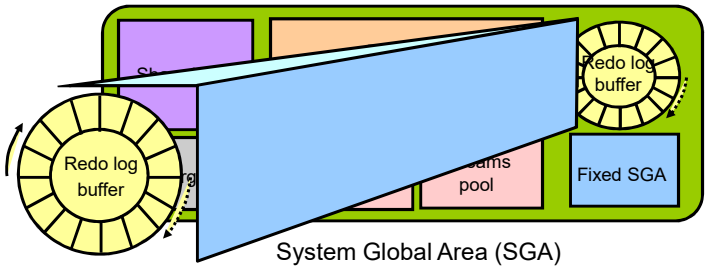
Redo Log Buffer

- Is a circular buffer in the SGA
- Holds information about changes made to the database
- Contains redo entries that have the information to redo changes made by operations such as DML and DDL



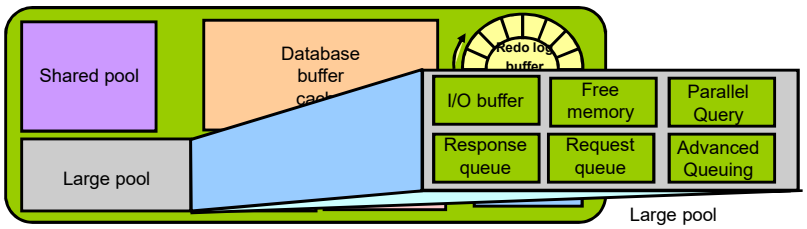
System Global Area (SGA)

1 - 9

Large Pool

Provides large memory allocations for:

- Session memory for the shared server and the Oracle XA interface
- I/O server processes
- Oracle Database backup and restore operations



System Global Area (SGA)

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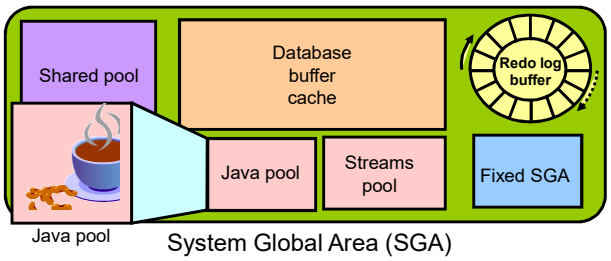
Java Pool

Java pool memory is used to store all session-specific Java code and data in the JVM.



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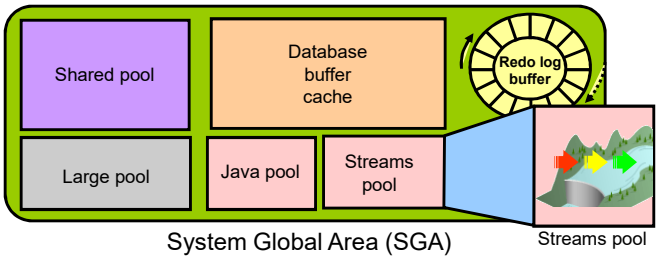
Streams Pool

Streams pool memory is used exclusively by Oracle Streams to:

- Store buffered queue messages
- Provide memory for Oracle Streams processes



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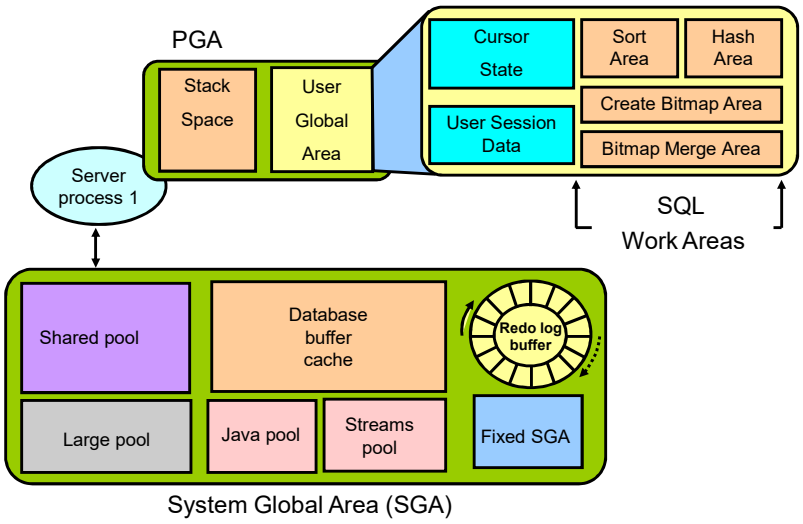
Program Global Area (PGA)



1 - 13

Process Architecture

- User process
  - Is the application or tool that connects to the Oracle database
- Database processes
  - Server process: Connects to the Oracle instance and is started when a user establishes a session
  - Background processes: Are started when an Oracle instance is started
- Daemon / Application processes
  - Networking listeners
  - Grid Infrastructure daemons

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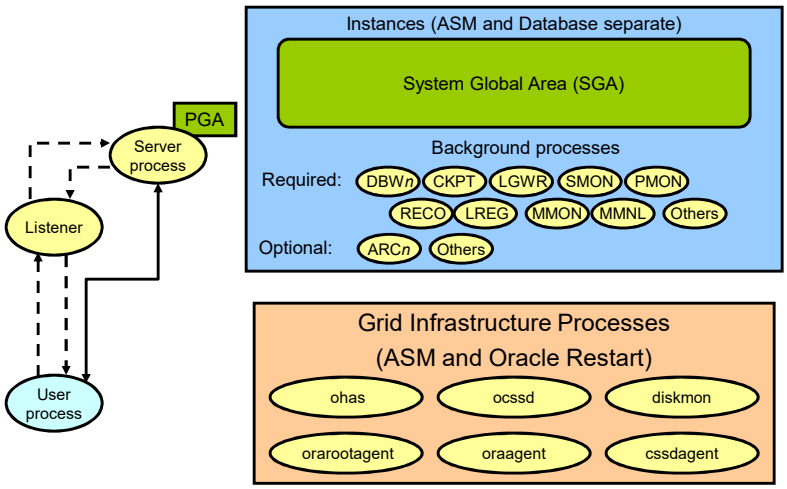
Process Structures



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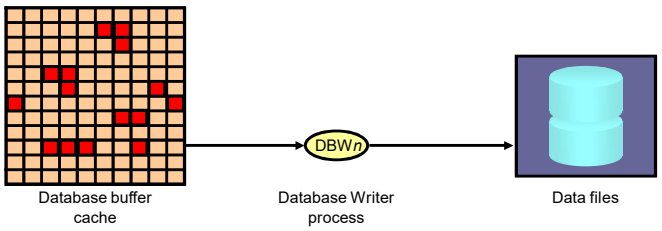
Database Writer Process (DBWn)

Writes modified (dirty) buffers in the database buffer cache to disk:

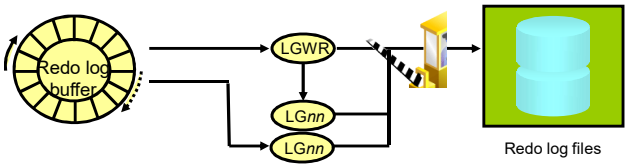
- Asynchronously while performing other processing
- To advance the checkpoint



1 - 16

Log Writer Process (LGWR)

- Writes the redo log buffer to a redo log file on disk
  - When a user process commits a transaction
  - When an online redo log switch occurs
  - When the redo log buffer is one-third full or contains 1 MB of buffered data
  - Before a DBW*n* process writes modified buffers to disk
  - When three seconds have passed since the last write
- Serves as coordinator of LG*nn* processes and ensures correct order for operations that must be ordered



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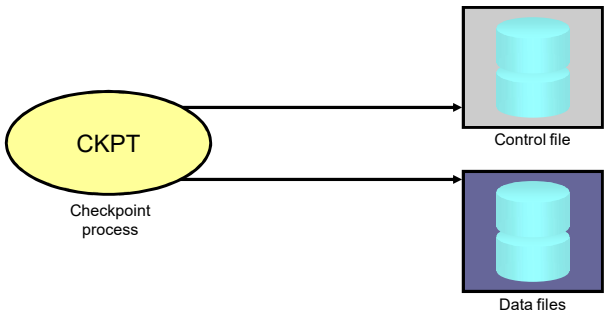
Checkpoint Process (CKPT)

- Records checkpoint information in
  - Control file
  - Each data file header
- Signals DBW*n* to write blocks to disk



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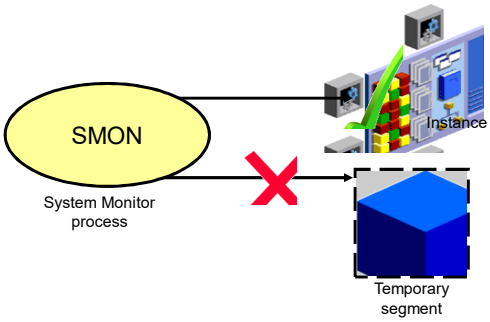
System Monitor Process (SMON)

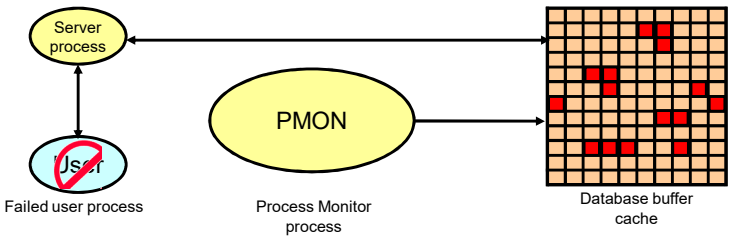
- Performs recovery at instance startup
- Cleans up unused temporary segments



1 - 19

Process Monitor Process (PMON)

- Performs process recovery when a user process fails
  - Cleans up the database buffer cache
  - Frees resources that are used by the user process
- Monitors sessions for idle session timeout



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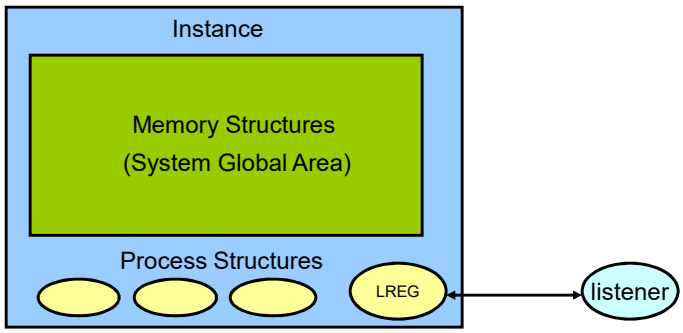
Listener Registration Process (LREG)

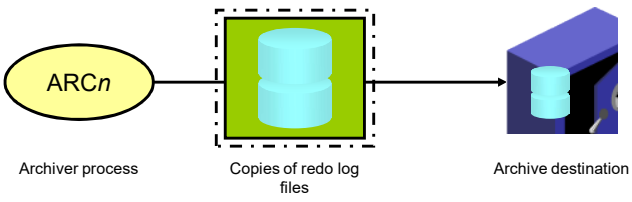
Registers information about the database instance and dispatcher processes with the Oracle Net Listener



1 - 21

Archiver Processes (ARC*n*)

- Copy redo log files to a designated storage device after a log switch has occurred
- Can collect transaction redo data and transmit that data to standby destinations



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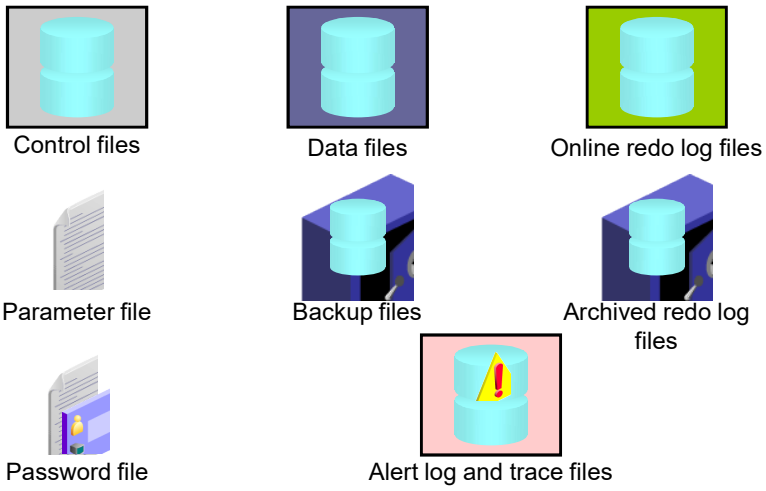
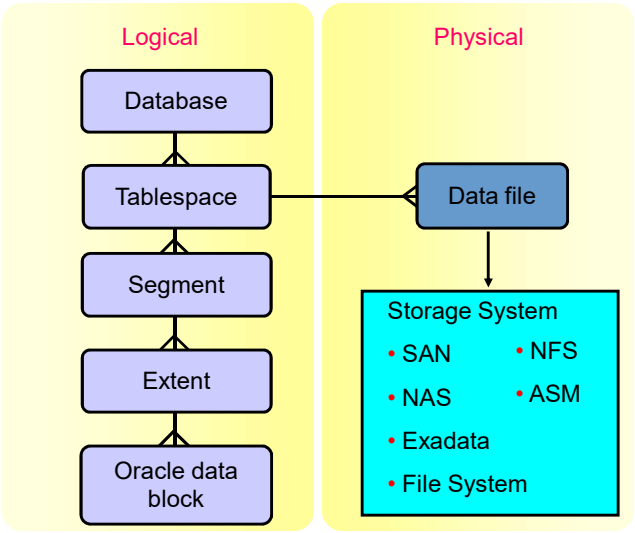
Database Storage Architecture



1 - 23

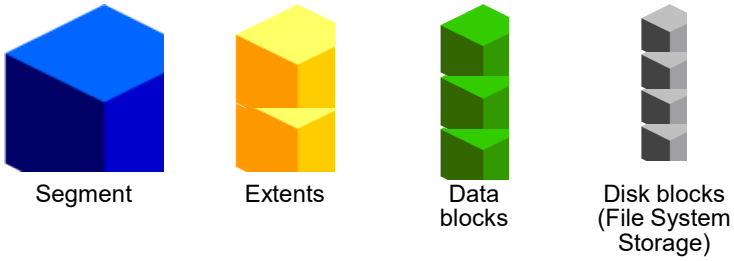
Logical and Physical Database Structures



1 - 24

Segments, Extents, and Blocks

- Segments exist in a tablespace.
- Segments are collections of extents.
- Extents are collections of data blocks.
- Data blocks are mapped to disk blocks.



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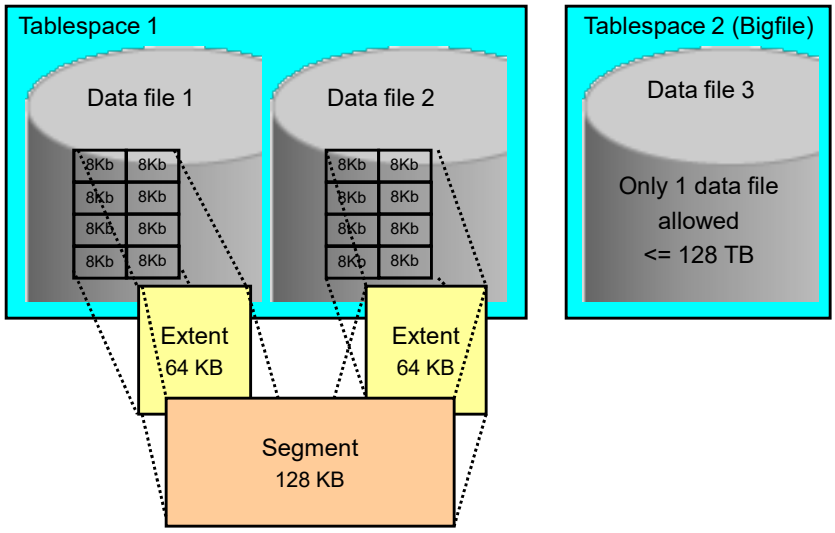
Tablespaces and Data Files



1 - 26

SYSTEM and SYSAUX Tablespaces

- The SYSTEM and SYSAUX tablespaces are mandatory tablespaces that are created at the time of database creation. They must be online.
- The SYSTEM tablespace is used for core functionality (for example, data dictionary tables).
- The auxiliary SYSAUX tablespace is used for additional database components.
- The SYSTEM and SYSAUX tablespaces should not be used for application data.

1 - 27

Oracle Container Database: Introduction

- *Pluggable database*: Is a set of database schemas that appears logically to users and applications as a separate database
- *Multitenant container database*: Has a database instance and database files at the physical level
- All pluggable databases share:
  - Background processes
  - Shared/process memory
  - Oracle metadata

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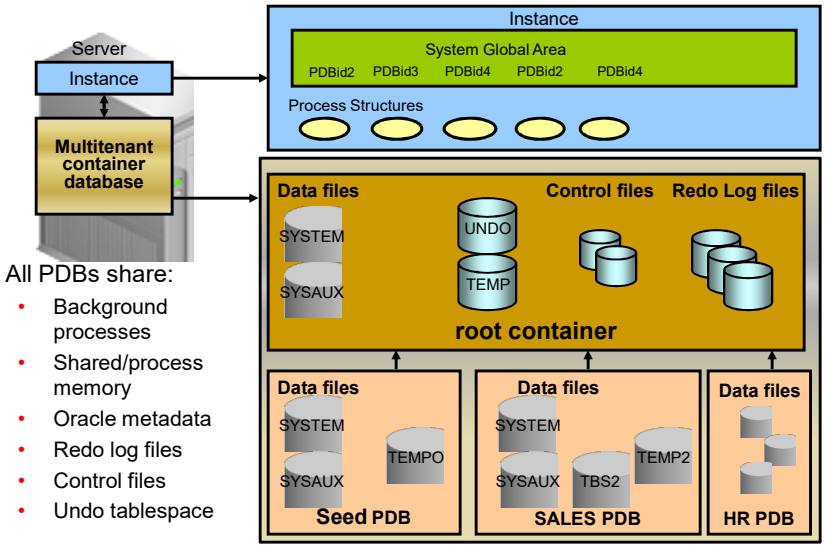
Multitenant Architecture



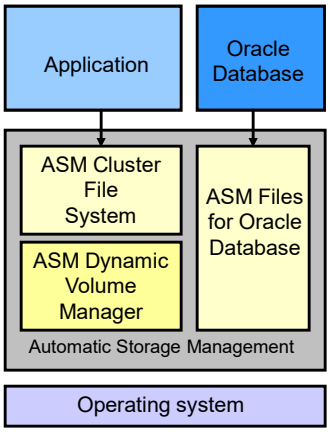
All PDBs share:

- Background processes
- Shared/process memory
- Oracle metadata
- Redo log files
- Control files
- Undo tablespace

1 - 29

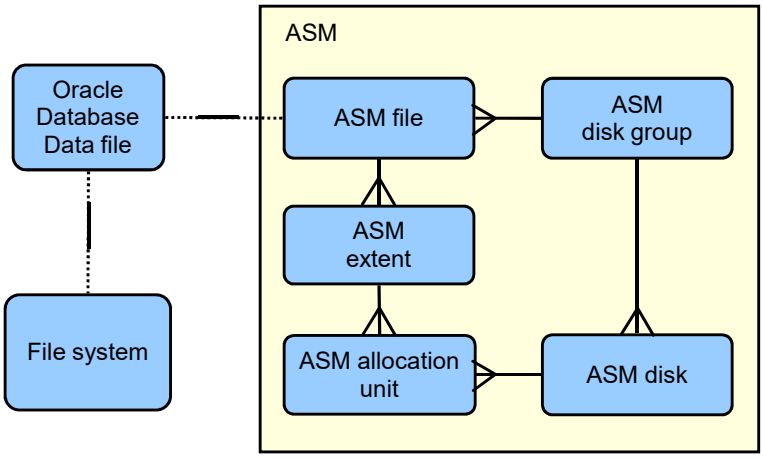
Automatic Storage Management

- Is a portable and high-performance cluster file system
- Manages Oracle database files
- Manages application files with ASM Cluster File System (ACFS)
- Spreads data across disks to balance load
- Mirrors data in case of failures
- Solves storage management challenges



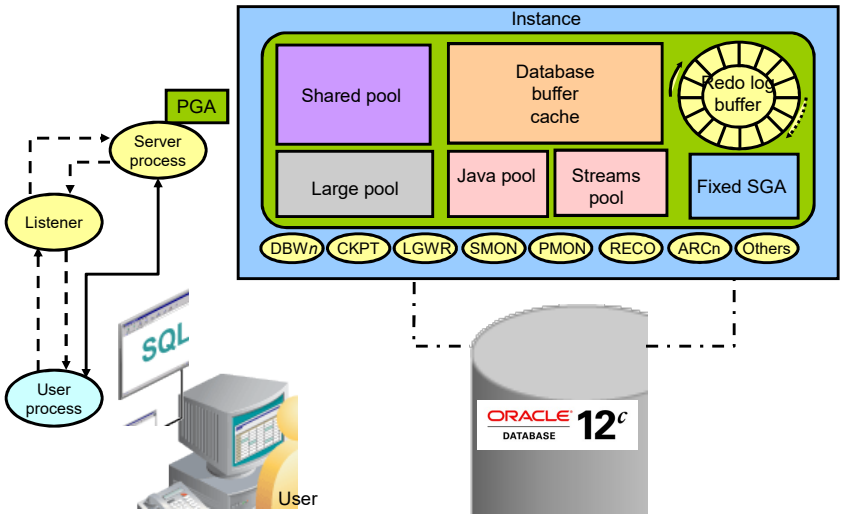
1 - 30

ASM Storage Components



1 - 31

Interacting with an Oracle Database: Memory, Processes, and Storage



1 - 32

Summary

In this lesson, you should have learned how to:

- List the major architectural components of Oracle Database
- Explain memory structures
- Describe background processes
- Correlate logical and physical storage structures
- Describe pluggable databases
- Describe ASM storage components