Oracle Database Architecture

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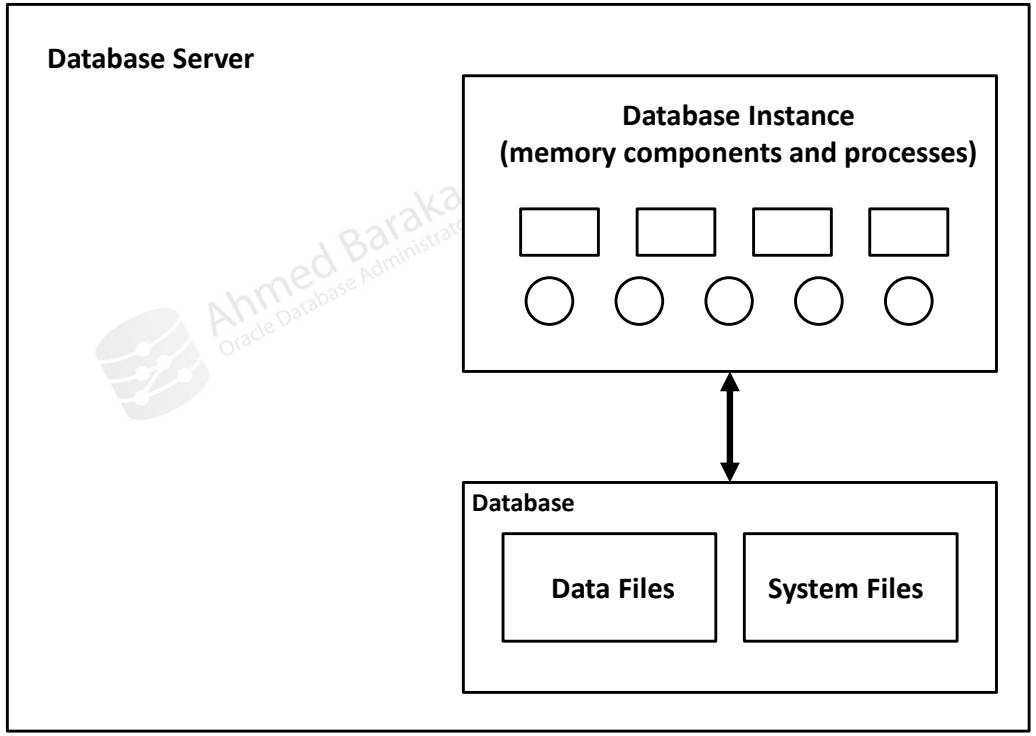
Objectives

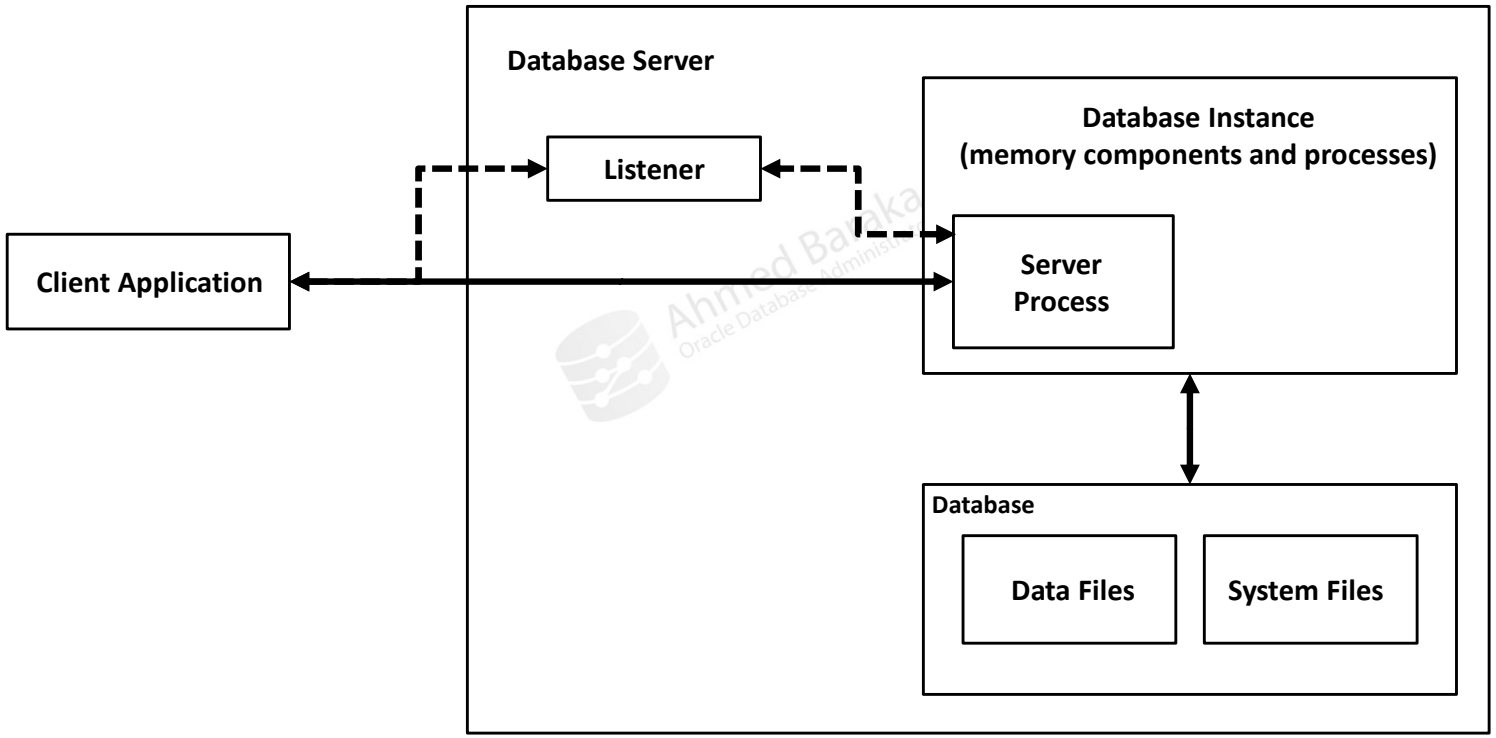
In this lecture, you will learn how to perform the following:

- List and describe the major components of the database instance
- List and describe the major Oracle database files

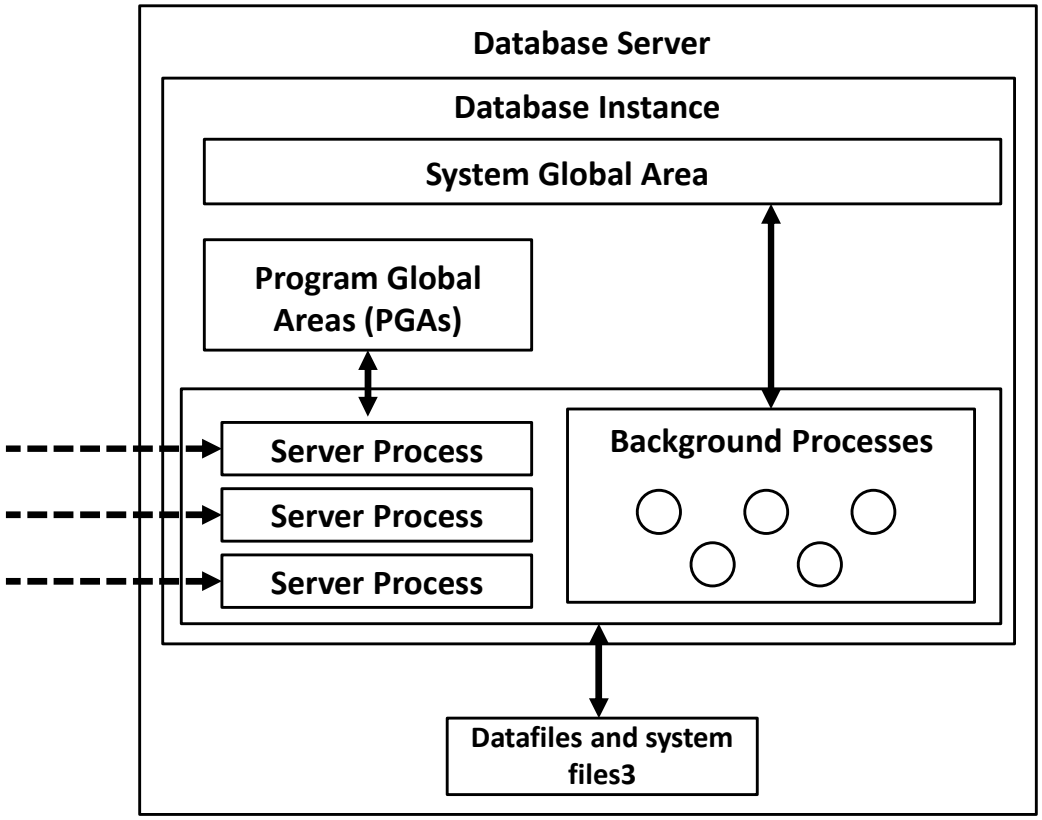
Oracle Database Server Architecture



Oracle Database Server Architecture



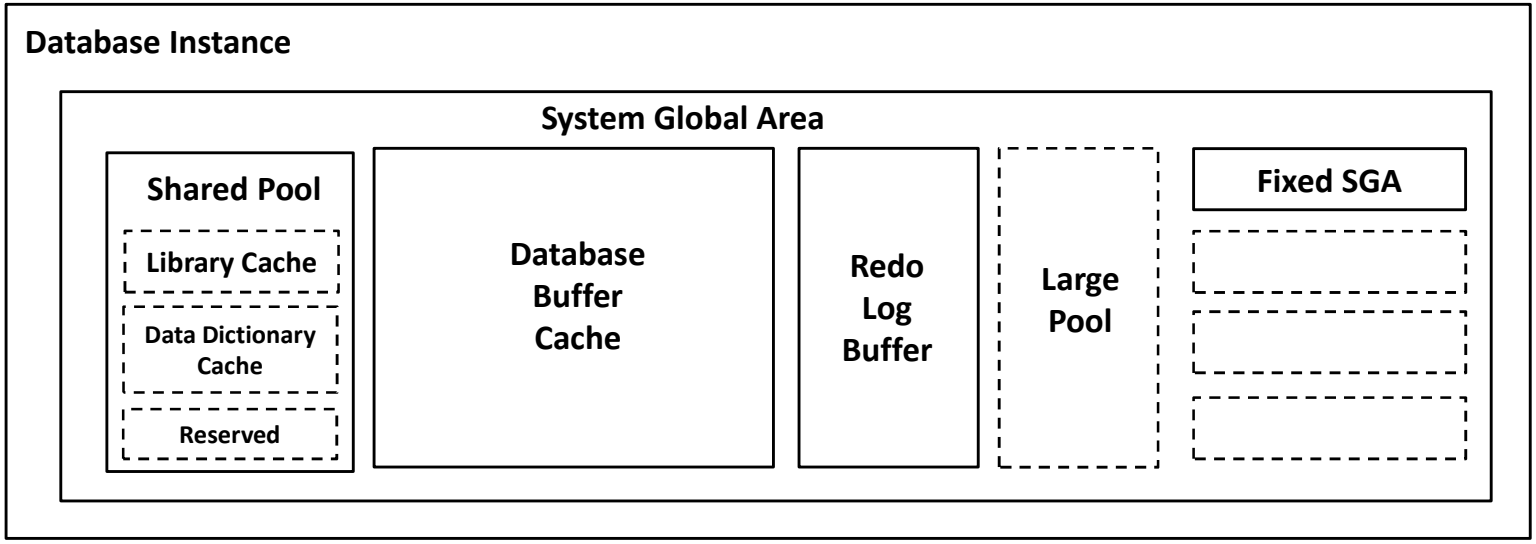
Oracle Database Instance Architecture



Oracle Database Instance Basic Architecture

- An Oracle database server consists of at least one database **instance** and a **database**.
  - A database is a set of files, located on disk, that store data.
  - An instance is a set of memory structures and processes that manage the database files.
- An instance consists of a **shared** memory area, called the **system global area (SGA)**, and a set of background processes.
- For each user connection to the instance, there is a client process. Each client process is associated with its own **server process**. The server process has its own **private** session memory, known as the **program global area (PGA)**.

System Global Area Primary Components



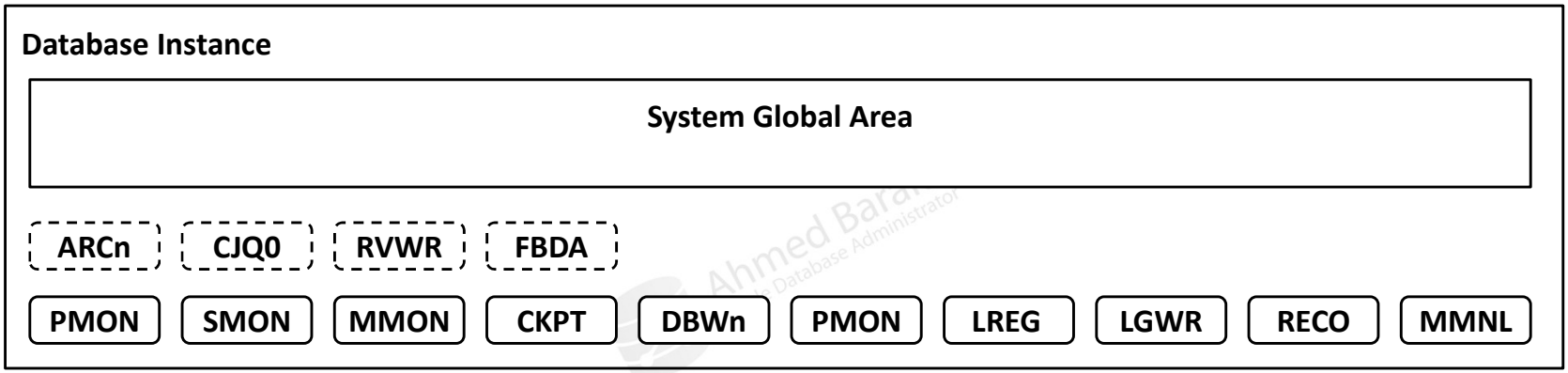
System Global Area (SGA) Components

- **Shared Pool**
  - **Library Cache**: stores executable SQL and PL/SQL code.
  - **Data Dictionary Cache**: holds info about accessed database objects
  - **Server Result Cache**: holds result sets (not data blocks). It contains the SQL query result cache and PL/SQL function result cache.
- **Database buffer cache:** the memory area that stores copies of data blocks read from data files to optimize physical I/O.
- **Large Pool**: (optional) large memory allocation for buffers for RMAN, buffers for deferred inserts, message buffers used parallel executions, and others.
- **Redo Log buffer**: used to save redo entries

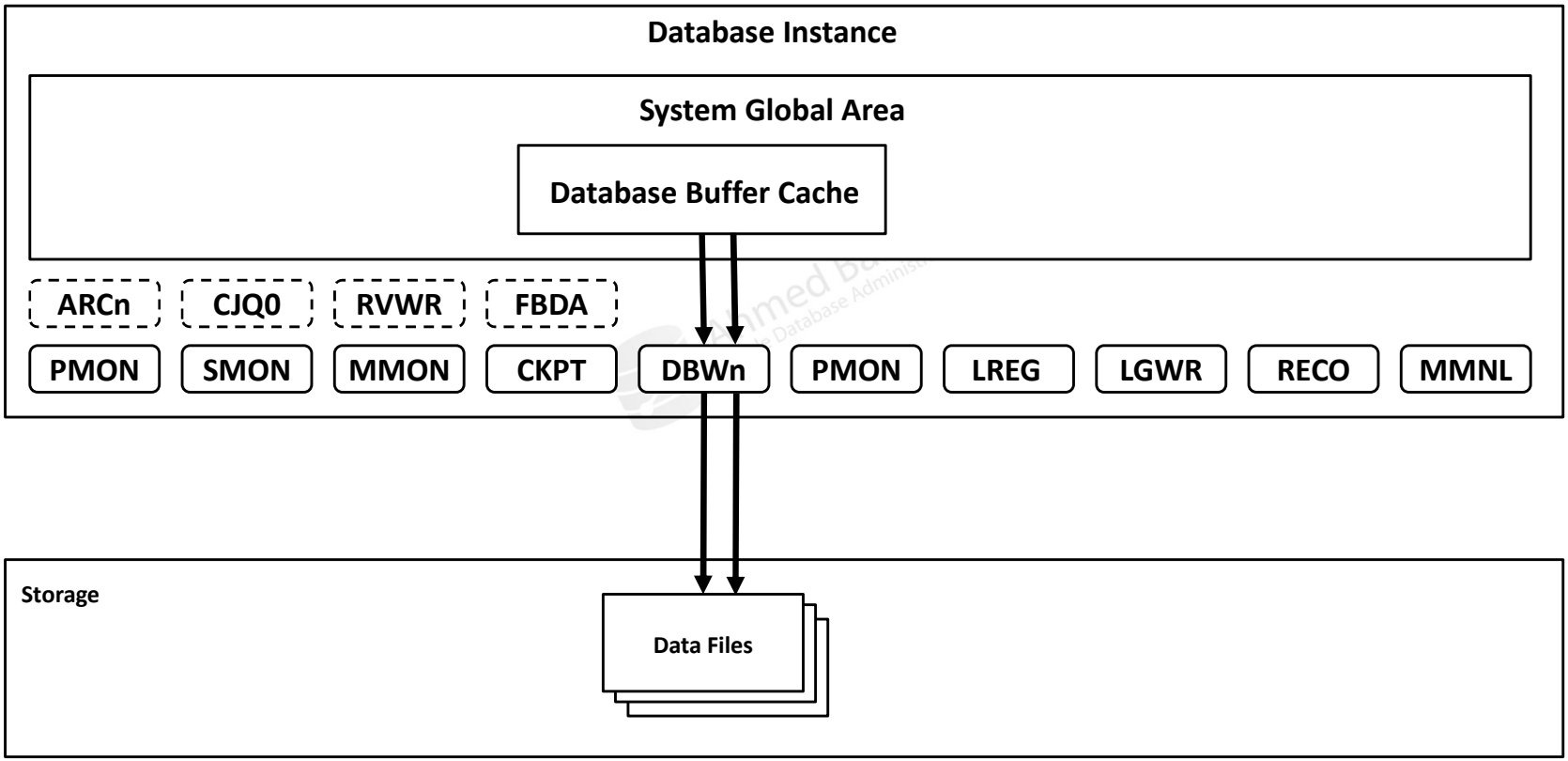
Buffer (Data Blocks) States

- A buffer can be in any of the following mutually exclusive states:
  - **Unused**: the buffer not been used or accessed
  - **Clean**: this buffer was used earlier and now contains a read-consistent version of a block as of a point in time.
  - **Dirty**: the buffer contain modified data that has not yet been written to disk.

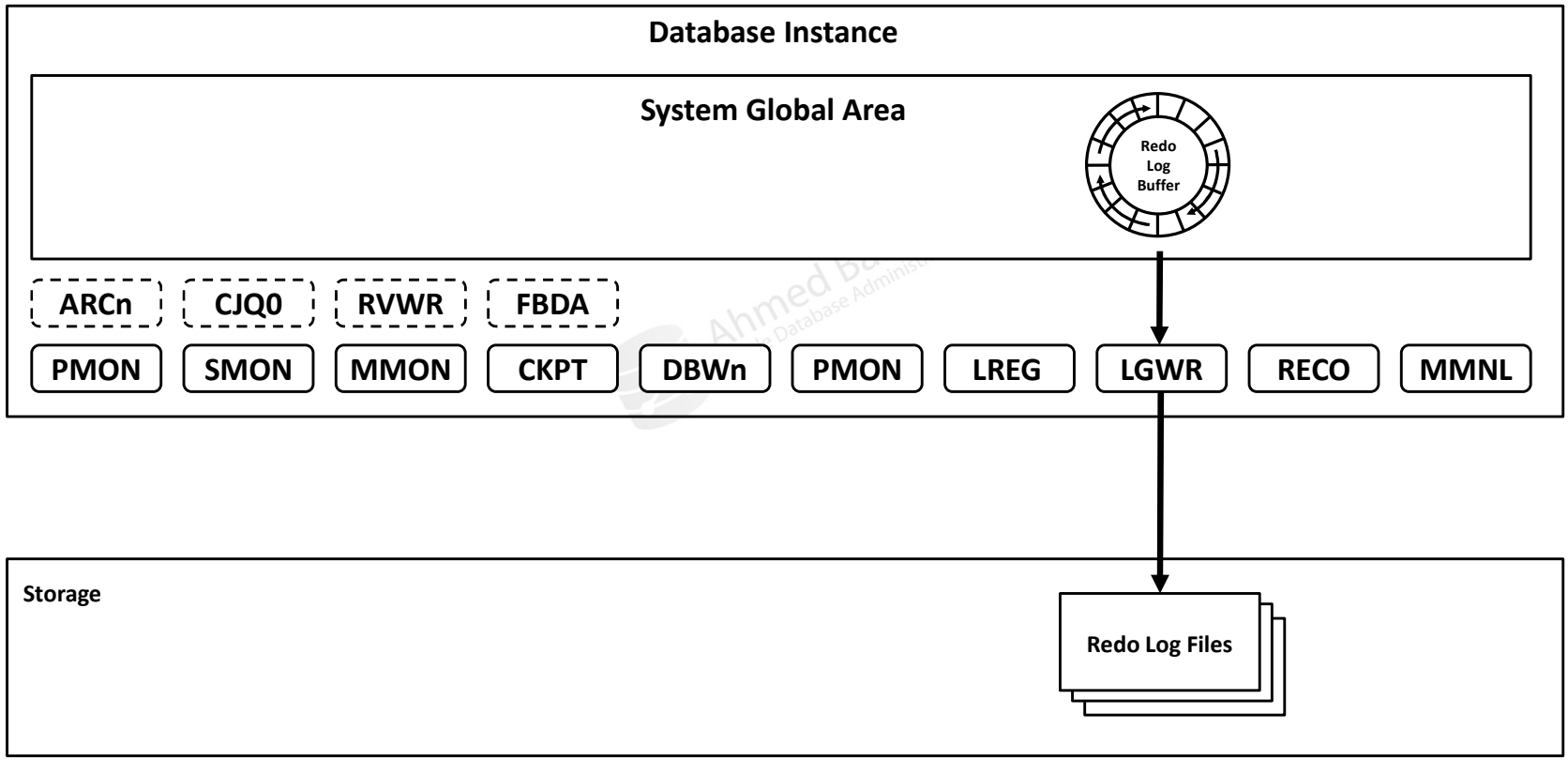
Background Processes



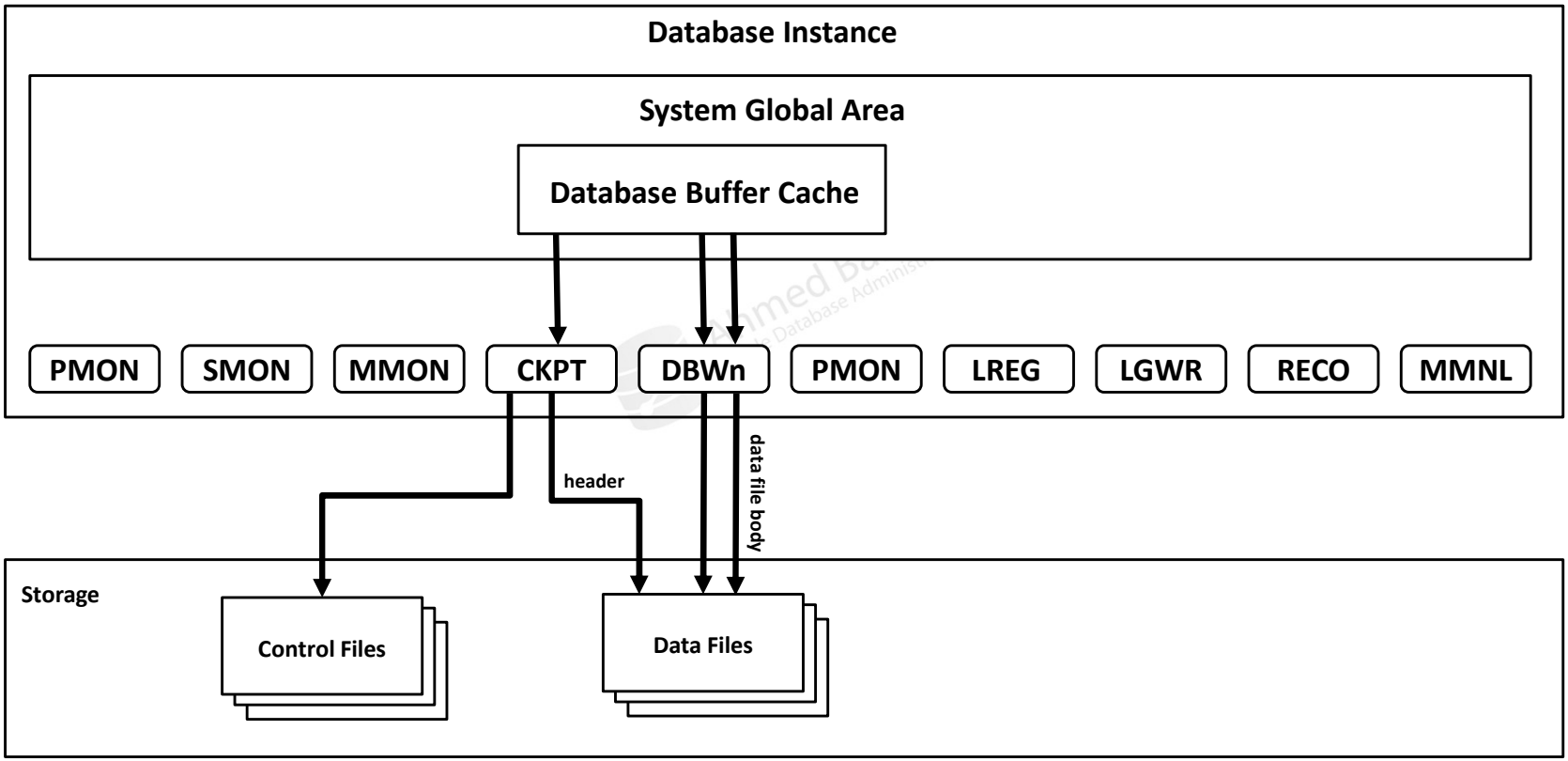
Database Writer Process (DBW)



Log Writer Process (LGWR)



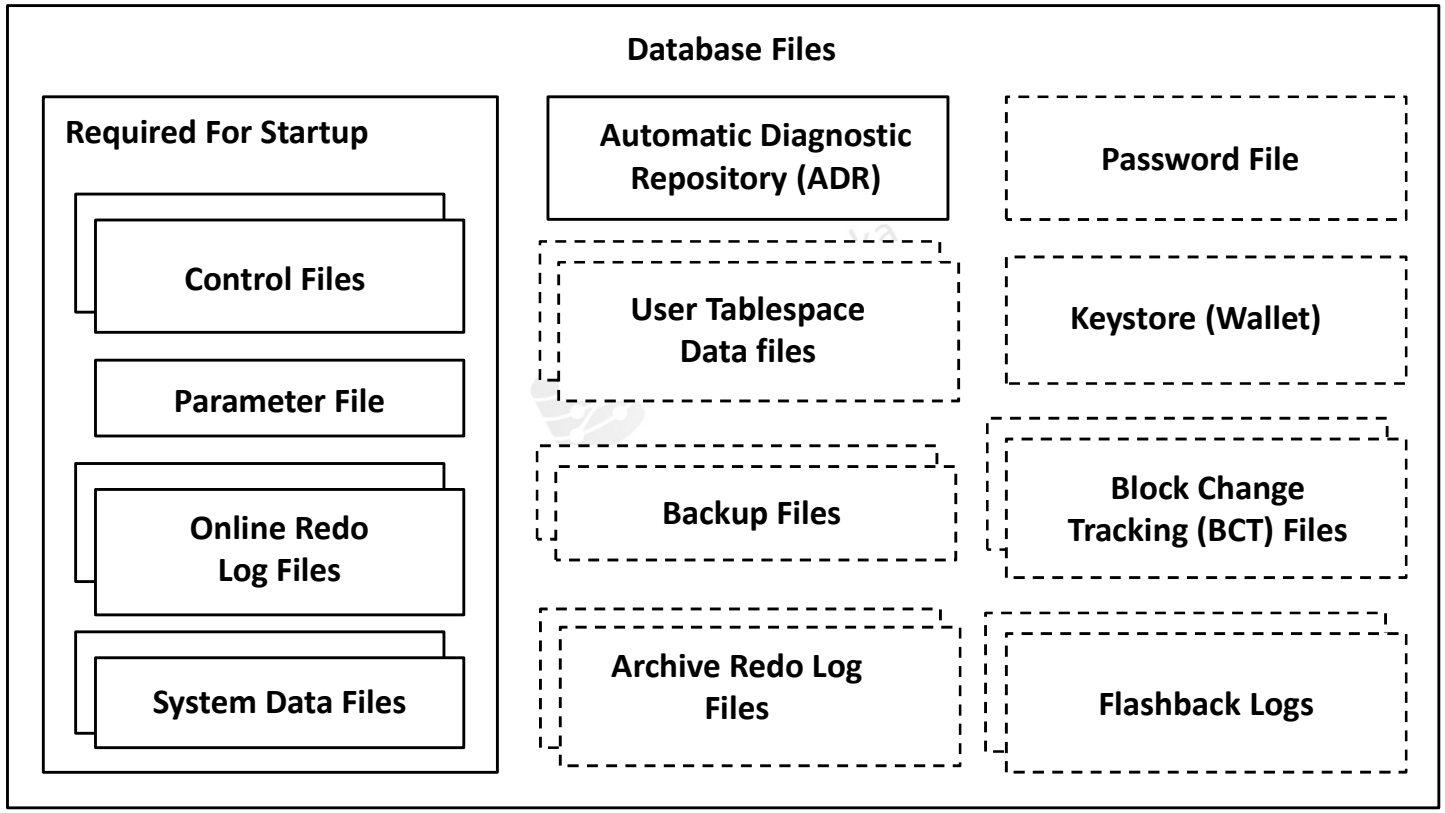
Checkpoint Process (CKPT)



Mandatory Background Processes

Process	Responsibility
Database Writer (**DBWR**)	Writes the modified buffers (dirty blocks) to datafiles Writing is performed in a lazy manner
Log Writer (**LOGWR**)	Write redo entries from redo log buffer to the online redo log Writing is so active and must be done when a transaction is committed Redo entries contain information to reconstruct the DML and DDL
System Monitor Process (**SMON**)	Is in charge of a variety of system-level cleanup duties: instance recovery, recovering terminated transactions, and others
Checkpoint Process (**CKPT**)	Updates the control file and data file headers with checkpoint information and signals DBW to write blocks to disk Checkpoint information is the information that tells the database engine up to what time the data changes have been saved in the storage.
Listener Registration Process (**LREG**)	Registers the database instance and dispatcher processes in the Listener
PMON group includes **PMON**, Cleanup Main Process (**CLMN**), and Cleanup Helper Processes (**CLnn**)	These processes are responsible for the monitoring and cleanup of other processes.

Database System Files



Database System Files

File Type	Description
Control Files	Used to save the database physical structure (database filenames and their locations), backup files, database basic information (like DBID, creation timestamp, last checkpoint).
Parameter File	A file to save the initialization parameters and their assigned non-default values. Initialization parameters are configuration parameters that affect the instance operation.
Online Redo Log files	Two or more pre-allocated files that store changes to the database as they occur. They are typically used for instance recovery, generating archived redo log files, replication, and Data Guard.
Archived Redo Log files (archivelogs)	Offline copies of online redo log files when they get filled by redo entries. They are not considered part of the database files.
Password file	A file to store the passwords of the database users with administrative privileges
Automatic Diagnostic Repository (ADR)	A file-based repository that stores database diagnostic data such as trace files, the alert log, DDL log, and Health Monitor reports.
Keystore (wallet) file	A file to store the encryption keys used by the database.


More to come
Throughout the course!

Summary

In this lecture, you should have learnt how to perform the following:

- List and describe the major components of the database instance
- List and describe the major Oracle database files