



**Northwestern
Polytechnic
University**

In the world of technology, mastering the art of true craftsmanship from relative ease of use to intricate robust hardware and robust software applications are increased in 80% core and peripheries.

This is the essence of work at this company without which we wouldn't have been here.



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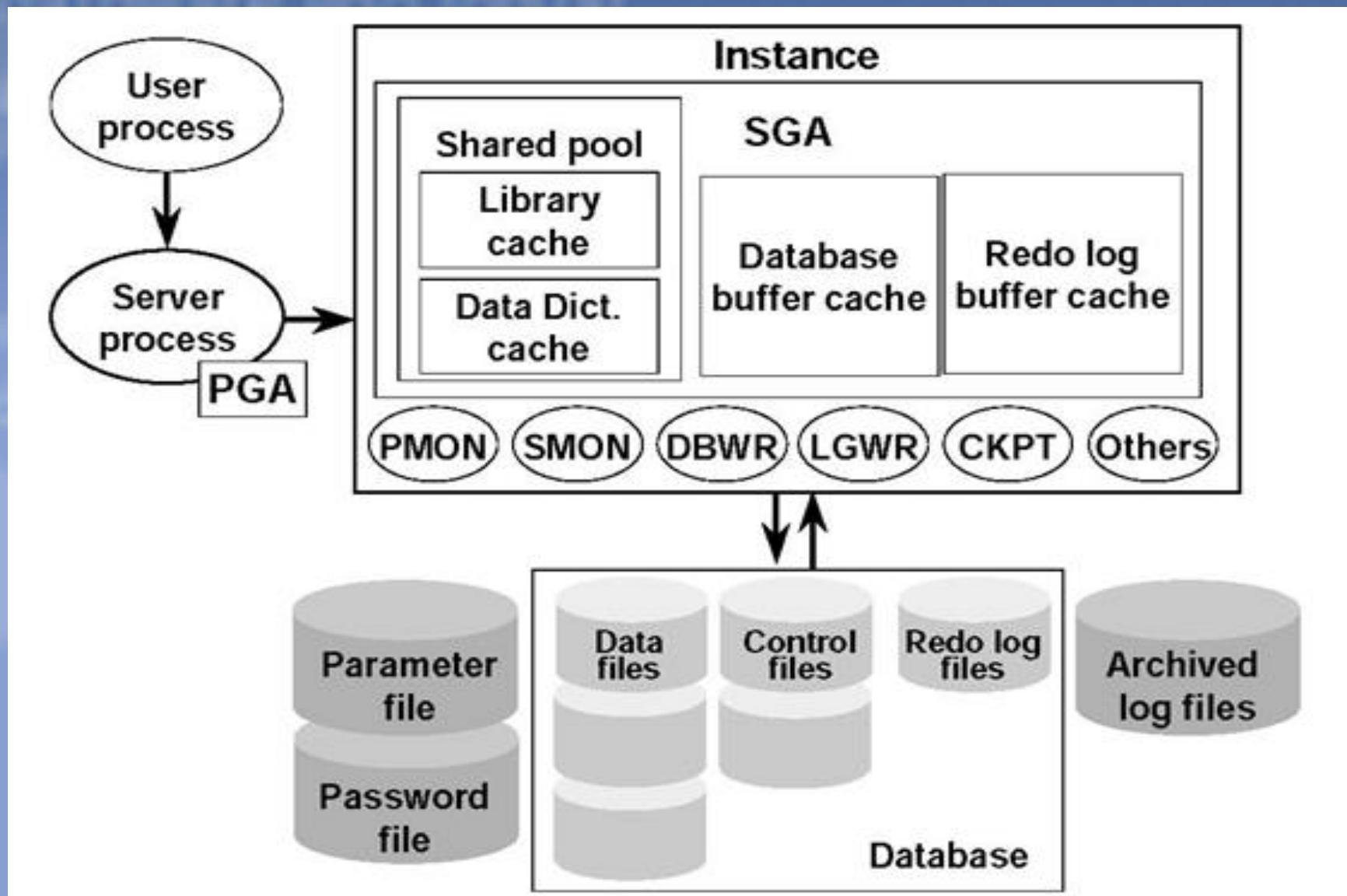
**Preparing Business and High-Tech
Professionals and the Leaders of Tomorrow**

Database Administration I

Database Administrator Tasks

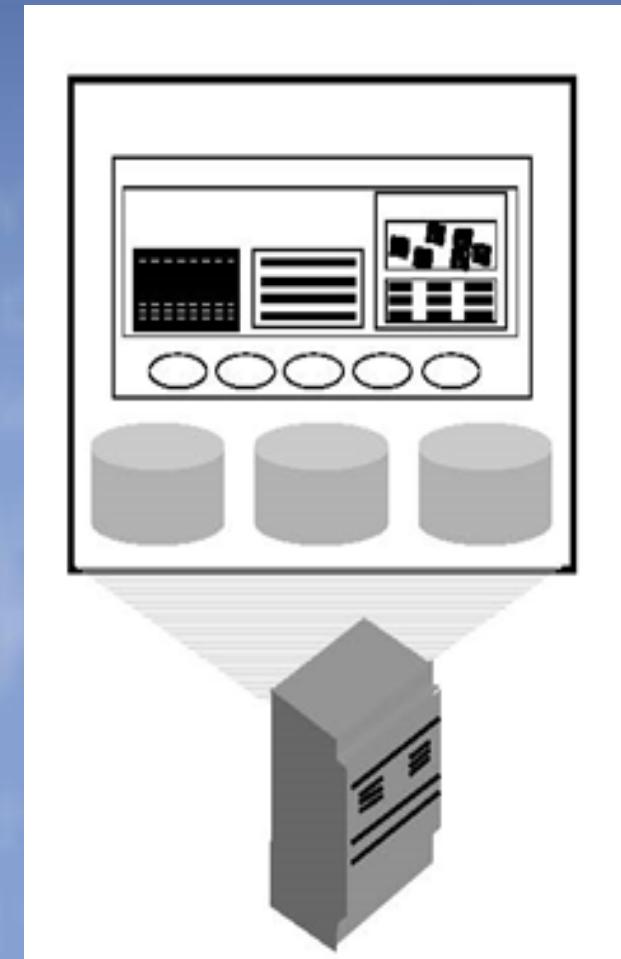
- Plan and create databases
- Manage database availability
- Manage physical and logical structures
- Manage storage based on design
- Manage security
- Network administration
- Backup and recovery
- Database tuning

Overview of Primary Components



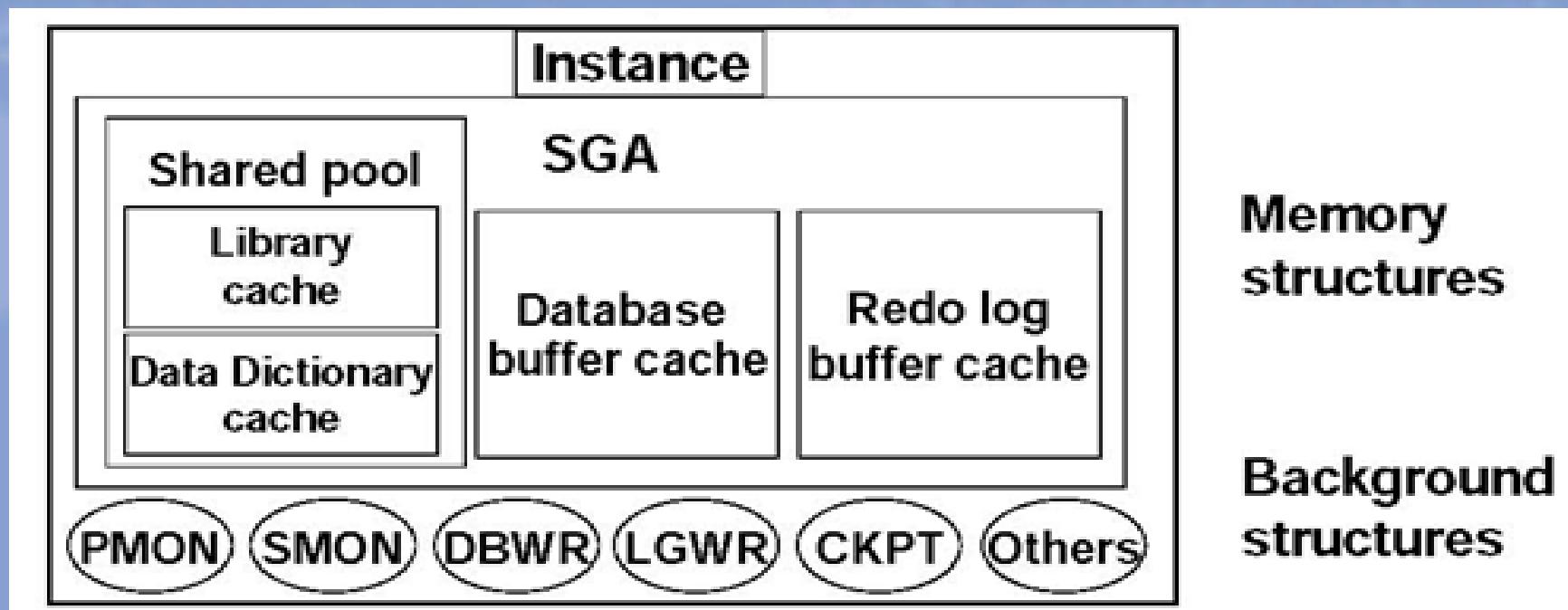
DBMS Server

- A DBMS server:
 - Is a database management system that provides an open, comprehensive, integrated approach to information management
 - Consists of a instance and a database



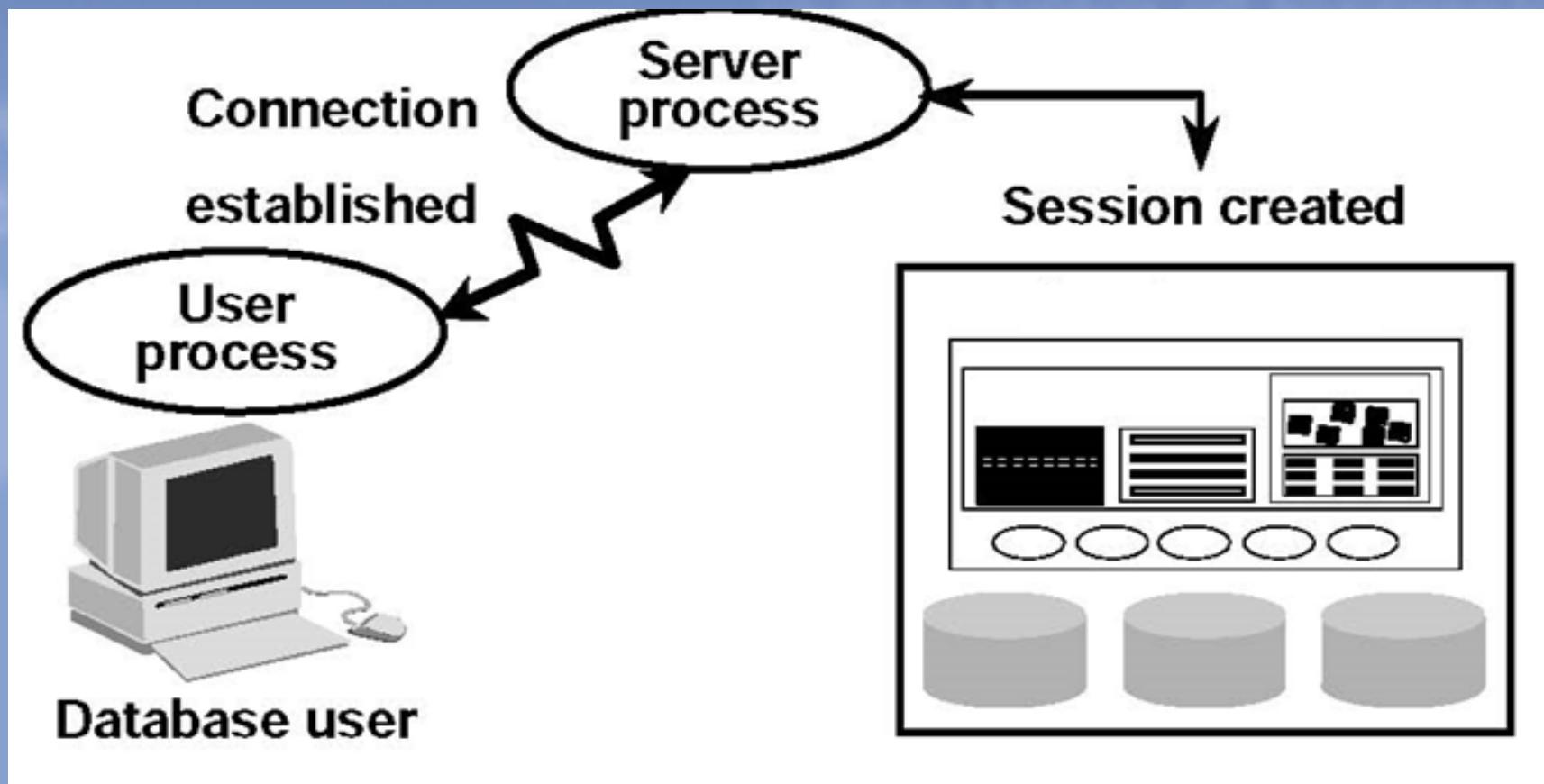
DBMS Instance

- A DBMS instance:
 - Is a means to access a database
 - Always opens one and only one database
 - Consists of memory and process structures



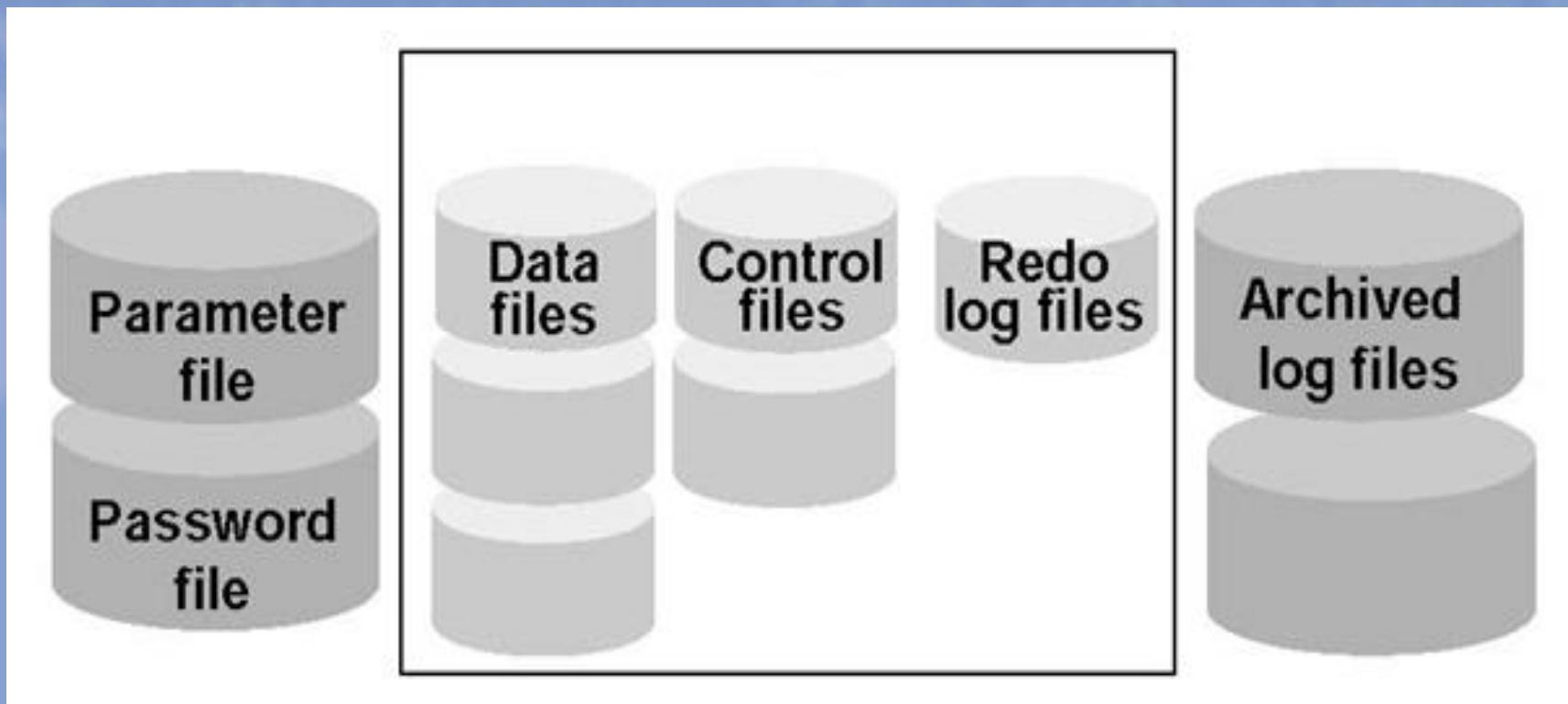
Establishing a Connection and Creating a Session

- Connecting to an DBMS instance consists of establishing a user connection and creating a session.



Database

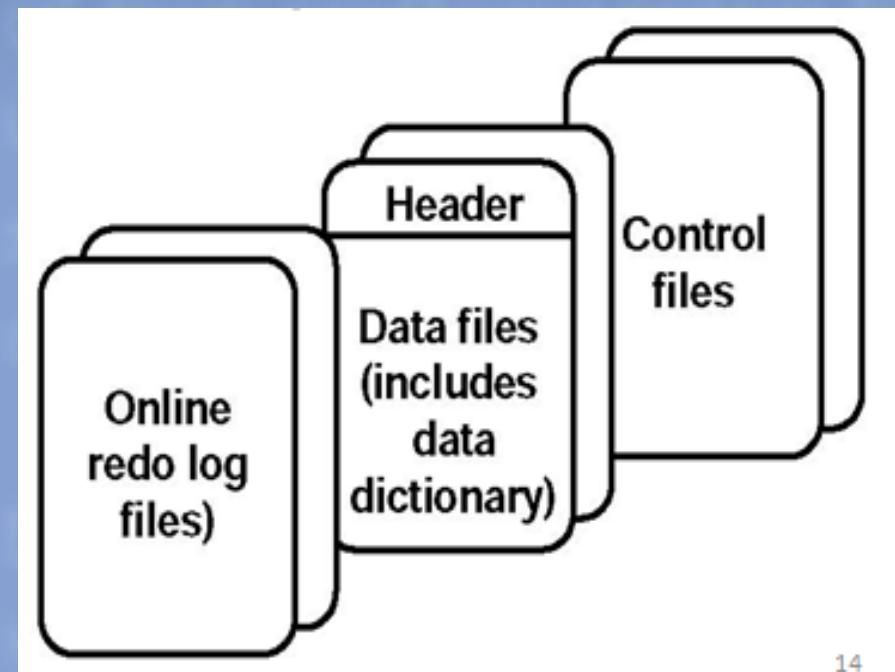
- A database:
 - Is a collection of data that is treated as a unit
 - Consists of three file types



Physical Structure

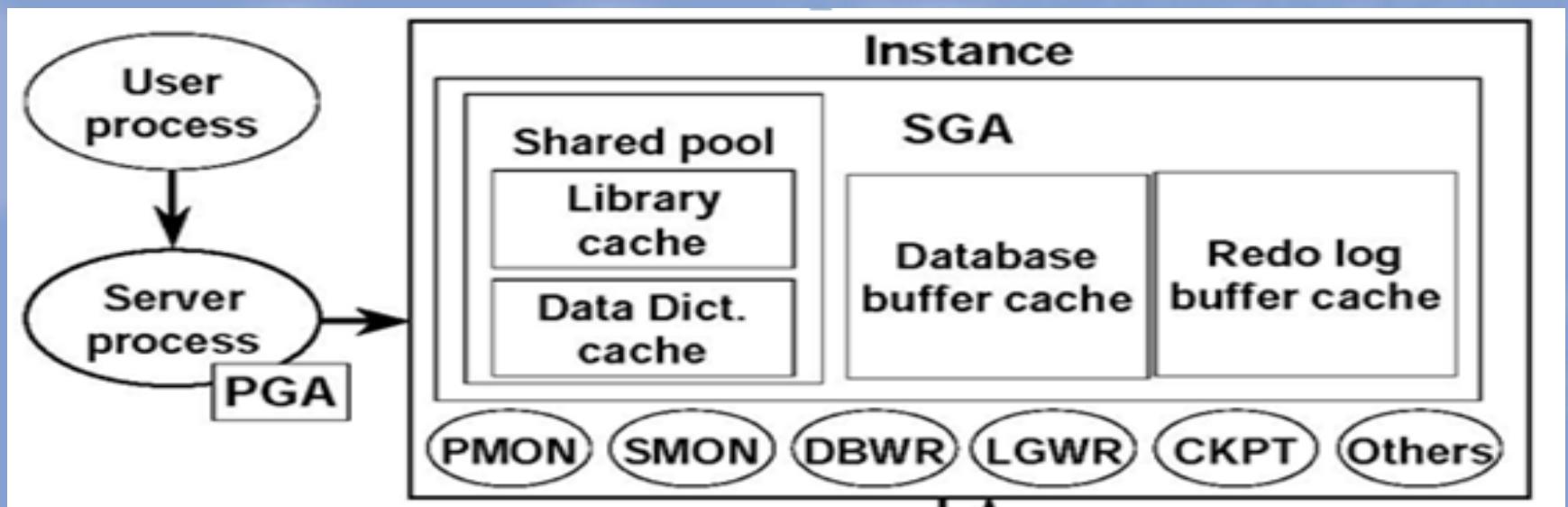
- The physical structure of a database is determined by the operating system files that provide the actual physical storage for database information

- Control files
- Data files
- Redo log files



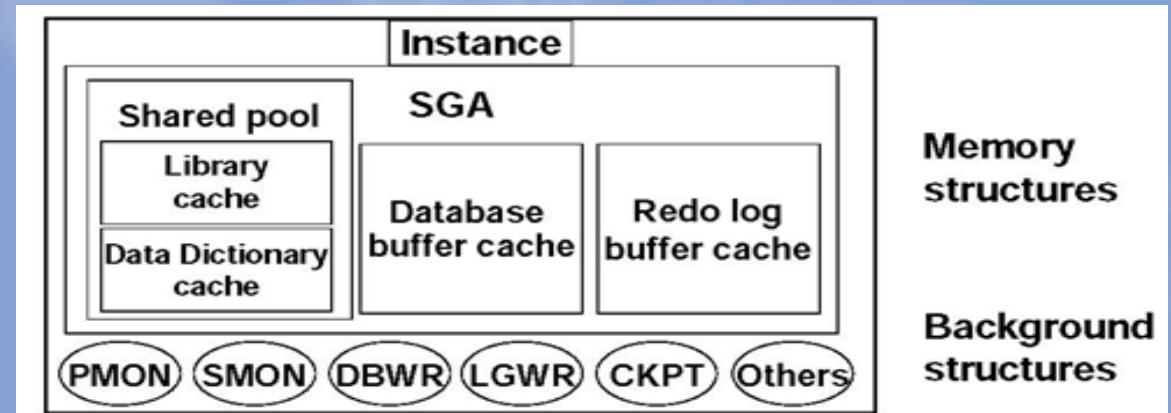
Memory Structure

- DBMS's memory structure consists of two memory areas known as:
 - System Global Area(SGA):Allocated at instance startup ,and is a fundamental component of a instance
 - Program Global Area(PGA):Allocated when the server process is started



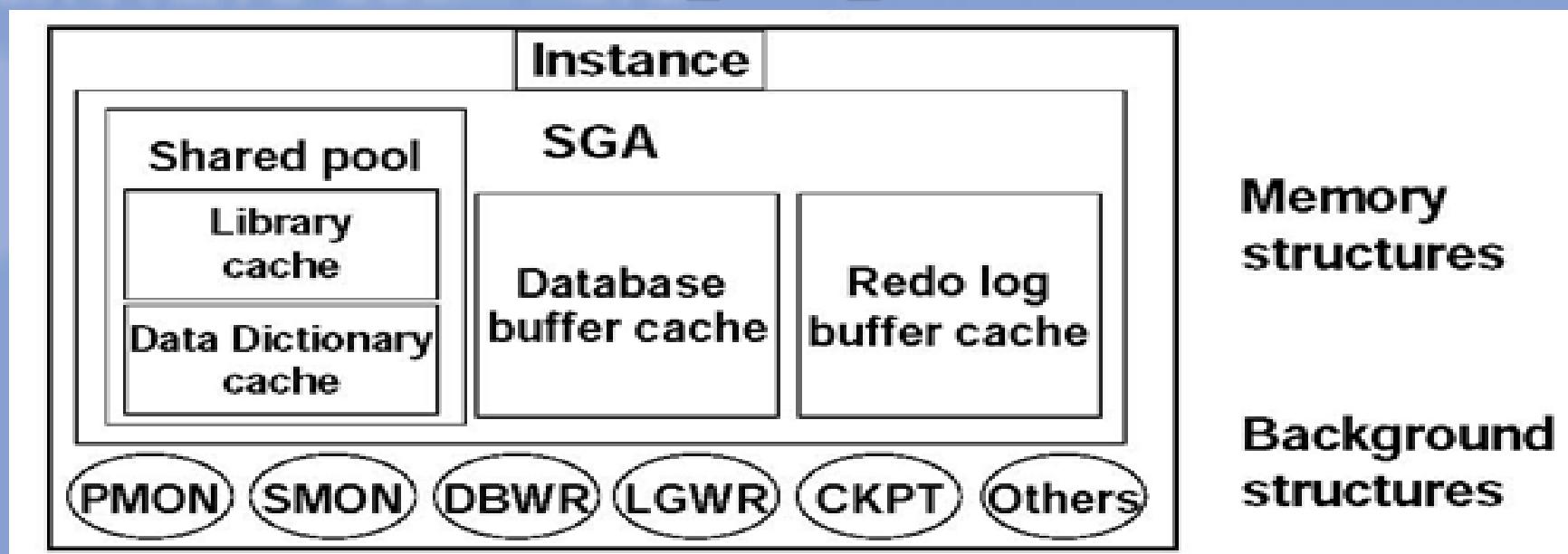
System Global Area (SGA)

- The SGA consists of server memory structures:
 - Shared pool
 - Database buffer cache
 - Redo log buffer
 - Other structures (e.g. lock and latch management ,statistical data)
- There are two optional memory structures that can be configured within the SGA
 - Large pool
 - Java pool



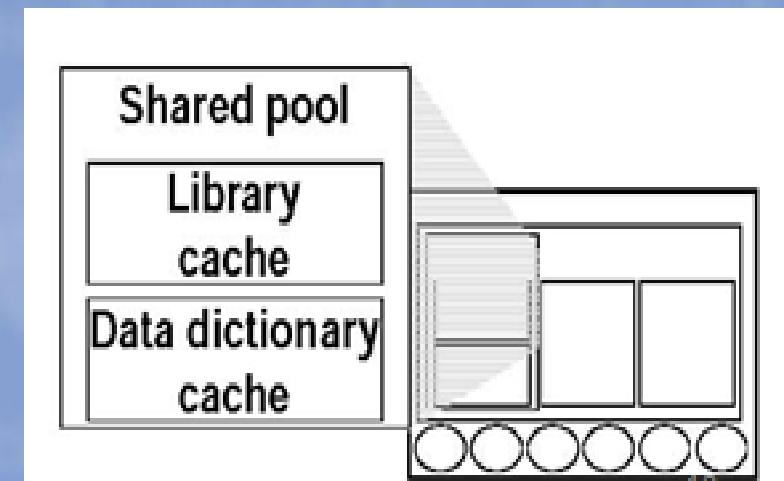
System Global Area (SGA)

- SGA is dynamic and sized using **SGA_MAX_SIZE**.
- SGA memory allocated and tracked in granules by SGA components
 - Contiguous virtual memory allocation
 - Size based on **SGA_MAX_SIZE**



Shared Pool

- The shared pool is used to store the most recently executed SQL statements and the most recently used data definitions.
- It consists of two key performance-related memory structures:
 - Library cache
 - Data dictionary cache
- Sized by the parameter
`SHARED_POOL_SIZE`

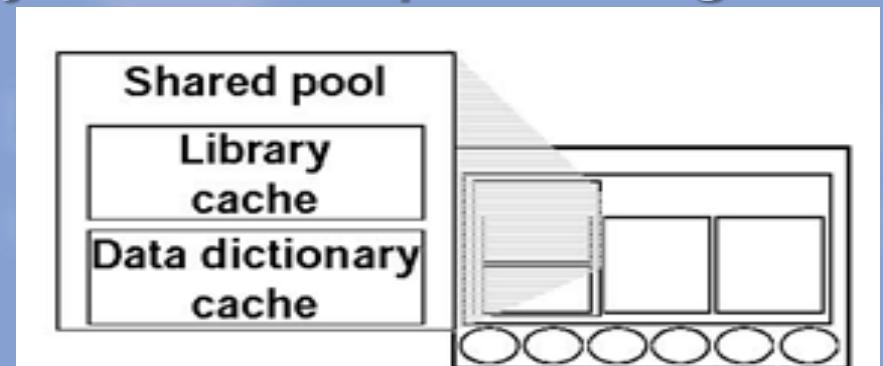


**ALTER SYSTEM SET
SHARED_POOL_SIZE = 64M;**

Library Cache

The library cache stores information about the most recently used SQL and PL/SQL statements. The library cache:

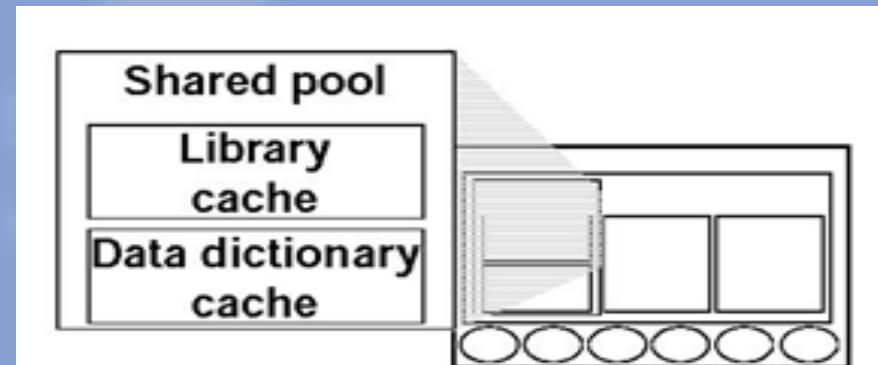
- Enables the sharing of commonly used statements
- Is managed by a least recently used (LRU) algorithm
- Consists of structures:
 - shared SQL area
 - shared PL/SQL area
- Has its size determined by the shared pool sizing



Data Dictionary Cache

The data dictionary cache is a collection of the most recently used definitions in the database

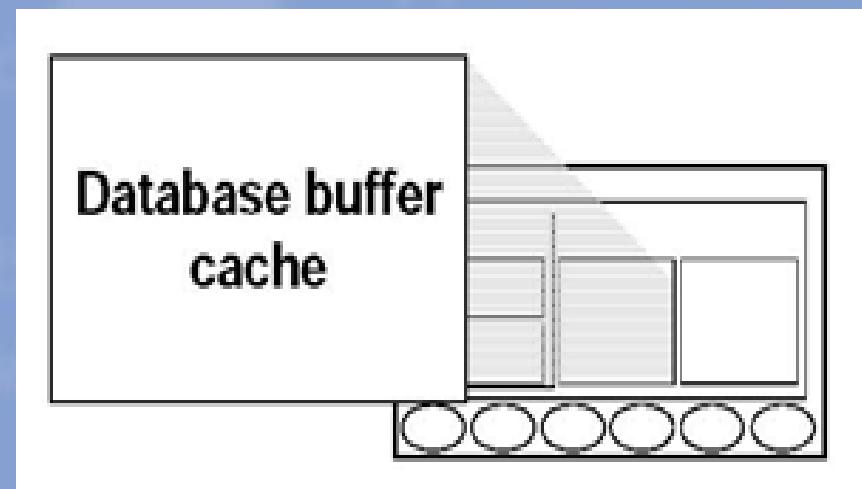
- It includes information about database files , tables , indexes , columns , users , privileges and other database objects
- During the parse phase , the server process looks at the data dictionary for information to resolve object names and validate access
- Caching the data dictionary information into memory improves response time on queries
- Size is determined by the shared pool sizing



Database Buffer Cache

The database buffer cache stores copies of data blocks that have been retrieved from the data files.

- It enables great performance gains when you obtain and update data.
- It is managed through a least recently used (LRU) algorithm
- DB_BLOCK_SIZE determines the primary block size.



Database Buffer Cache

- Consists of independent sub-caches:
 - DB_CACHE_SIZE
 - DB_KEEP_CACHE_SIZE
 - DB_RECYCLE_CACHE_SIZE
- Database buffer cache can be dynamically resized to grow or shrink using ALTER SYSTEM

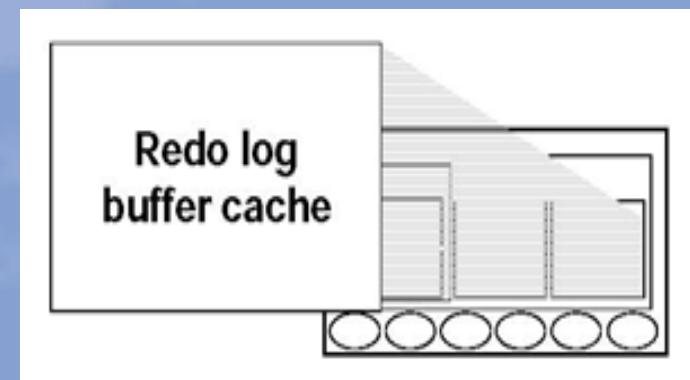
ALTER SYSTEM SET DB_CACHE_SIZE = 96M;

- DB_CACHE_ADVICE can be set to gather statistics for predicting different cache size behavior

Redo Log Buffer Cache

The redo log buffer cache records all changes made to the database data blocks

- Its primary purpose is memory
- Changes recorded within are called redo entries
- Redo entries contain information to reconstruct or redo changes
- Size is defined by LOG_BUFFER



Large Pool

The large pool is an optional area of memory in the SGA configured only in a shared server environment

- It relieves the burden placed on the shared pool
- This configured memory area is used for session memory (UGA),I/O slaves, and restore operations.
- Unlike the shared pool, the large pool does not use an LRU list
- Sized by LARGE_POOL_SIZE

ALTER SYS SET LARGE_POOL_SIZE = 64M;

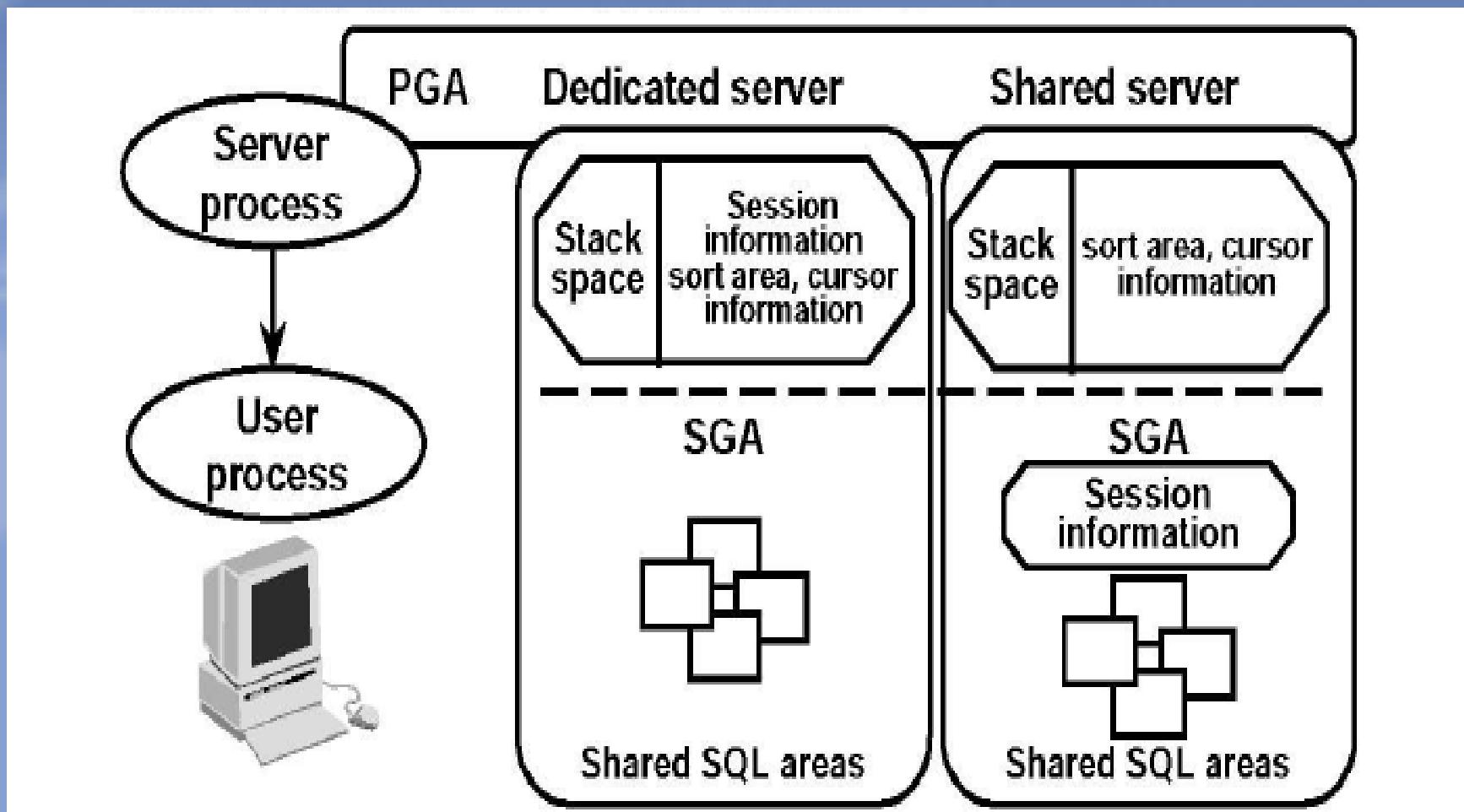
Java Pool

The Java pool services the parsing requirements for Java commands

- Required if installing and using Java
- It is stored much the same way as PL/SQL in database tables
- It is sized by the JAVA_POOL_SIZE parameter

Program Global Area (PGA)

The PGA is memory reserved for each user process that connects to a database



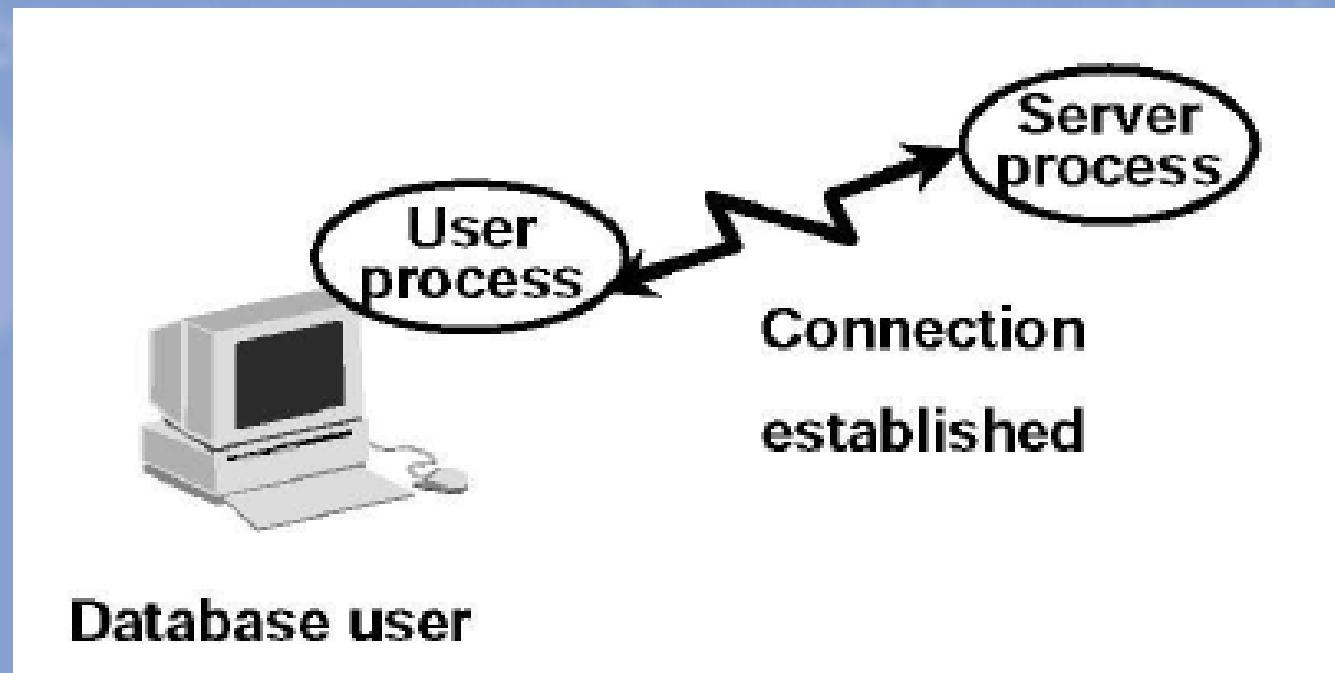
Process Structure

- A DBMS process is a program that depending on its type can request information, execute a series of steps, or perform a specific task.
- DBMS takes advantage of various types of processes:
 - User process: Started at the time a database user requests connection to the DBMS server
 - Server process: Connects to the DBMS Instance and is started when a user establishes a session
 - Background process: Available when a DBMS instance is started

User Process

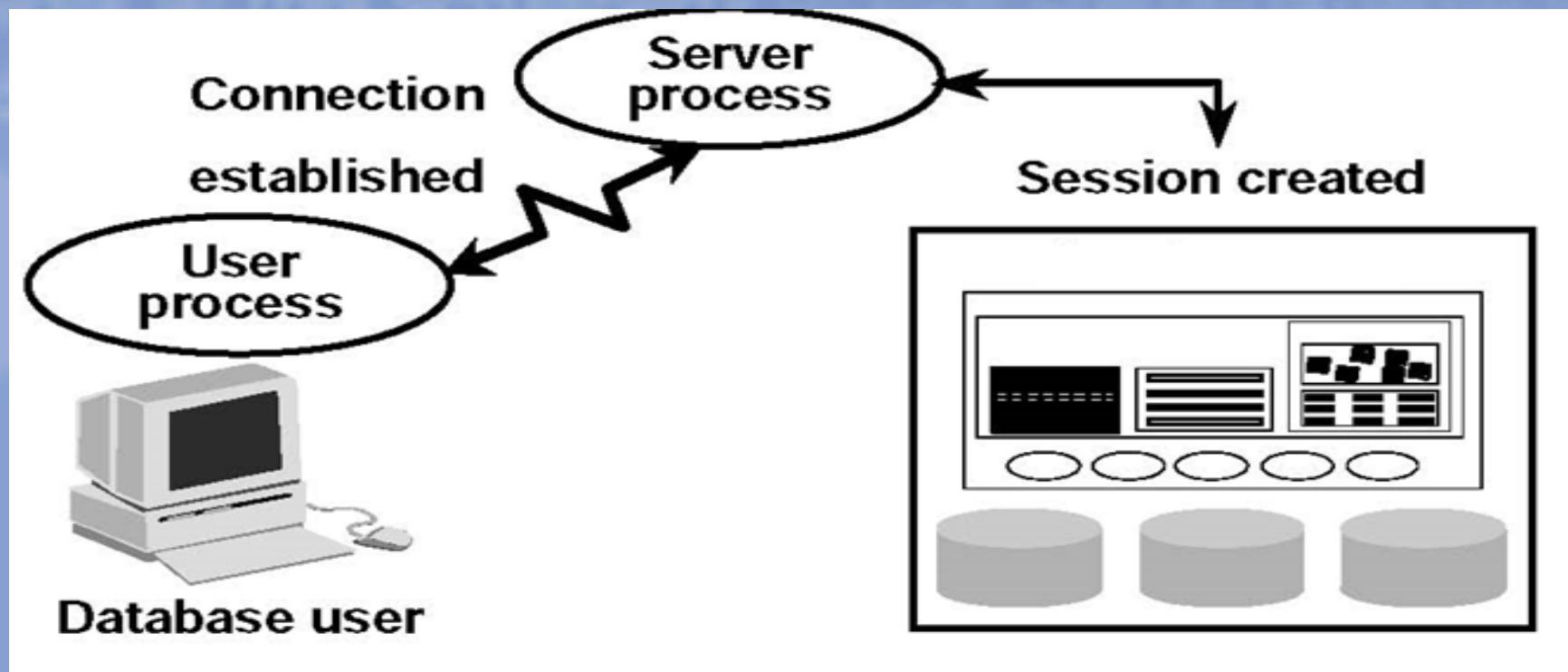
A user process is a program that requests interaction with the DBMS server

- It must first establish a connection
- It does not interact directly with the DBMS server



Server Process

- A server process is a program that directly interacts with the DBMS server
 - It fulfills calls generated and returns results
 - Can be dedicated or shared server



Background Process

The relationship between the physical and memory structures is maintained and enforced by DBMS's background processes.

- Mandatory background processes

DBWn

PMON

CKPT

LGWR

SMON

RECO

- Optional background processes

ARCn

LMON

Snnn

QMNn

LMDn

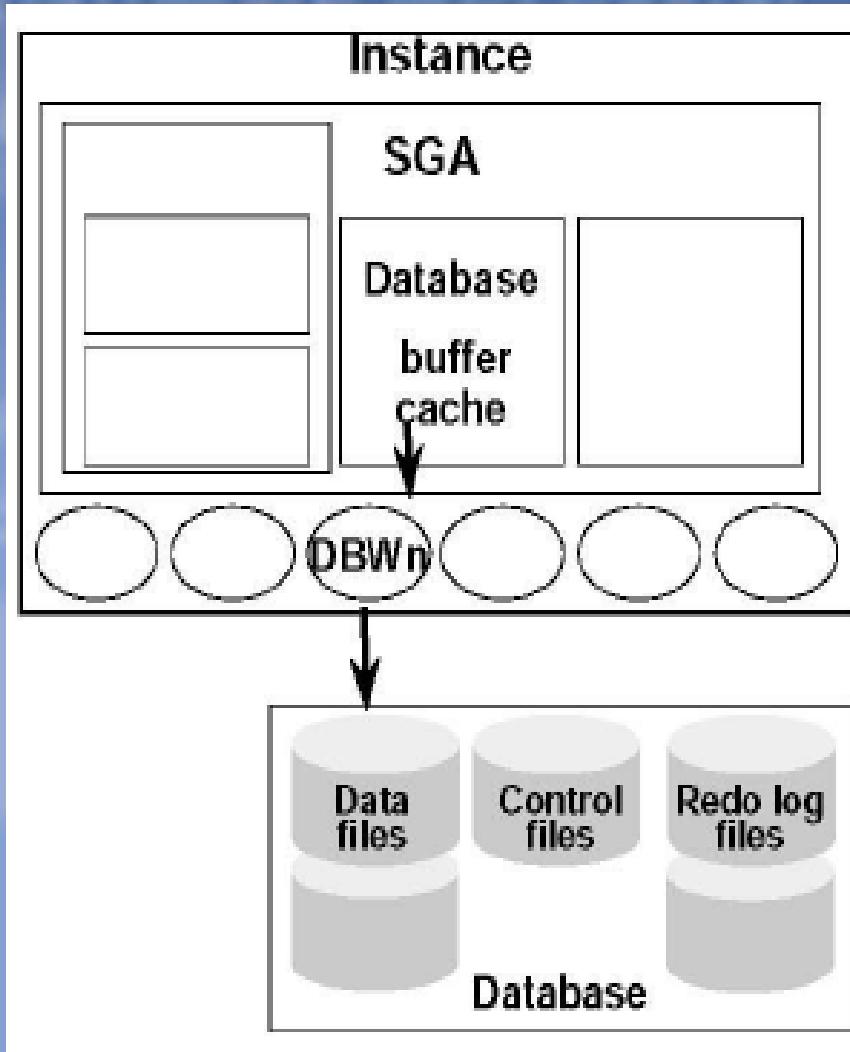
CJQ0

Pnnn

LCKn

Dnnn

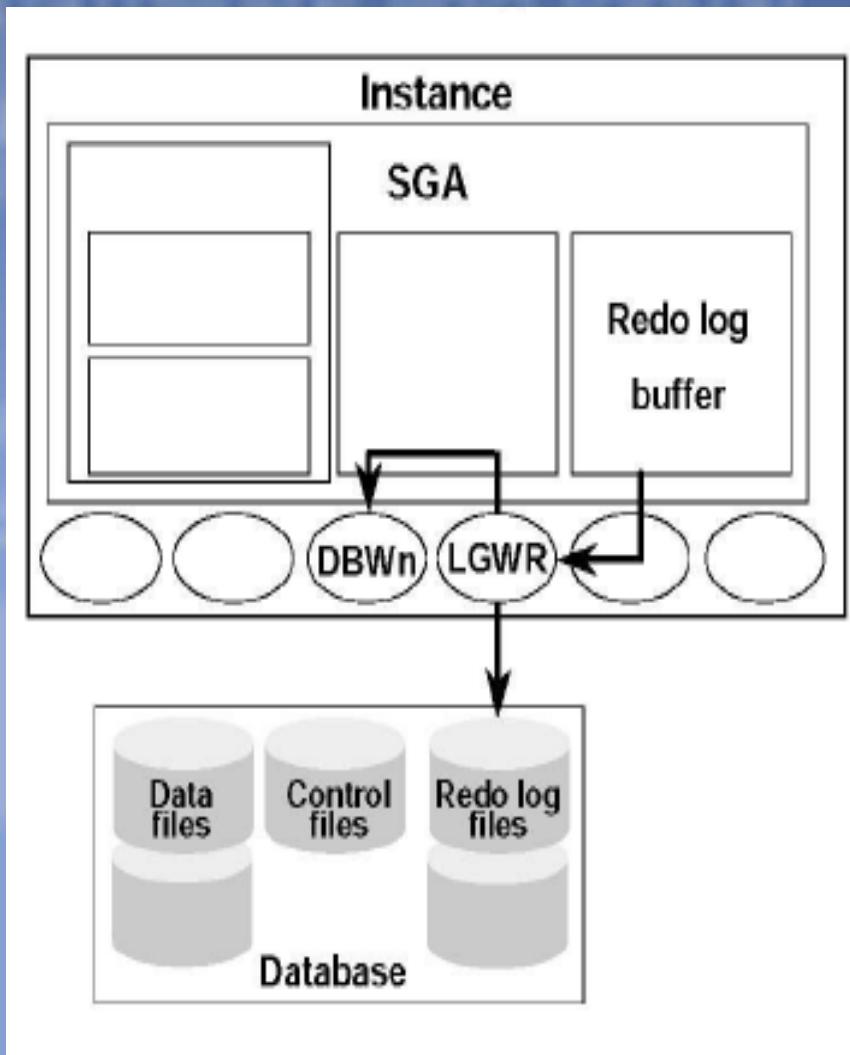
Database Writer (DBWn)



DBWn writes when:

- Checkpoint
- Dirty buffers threshold reached
- No free buffers
- Timeout
- RAC ping request
- Tablespace offline
- Tablespace read only
- Tablespace DROP or TRUNCATE
- Tablespace BEGIN BACKUP

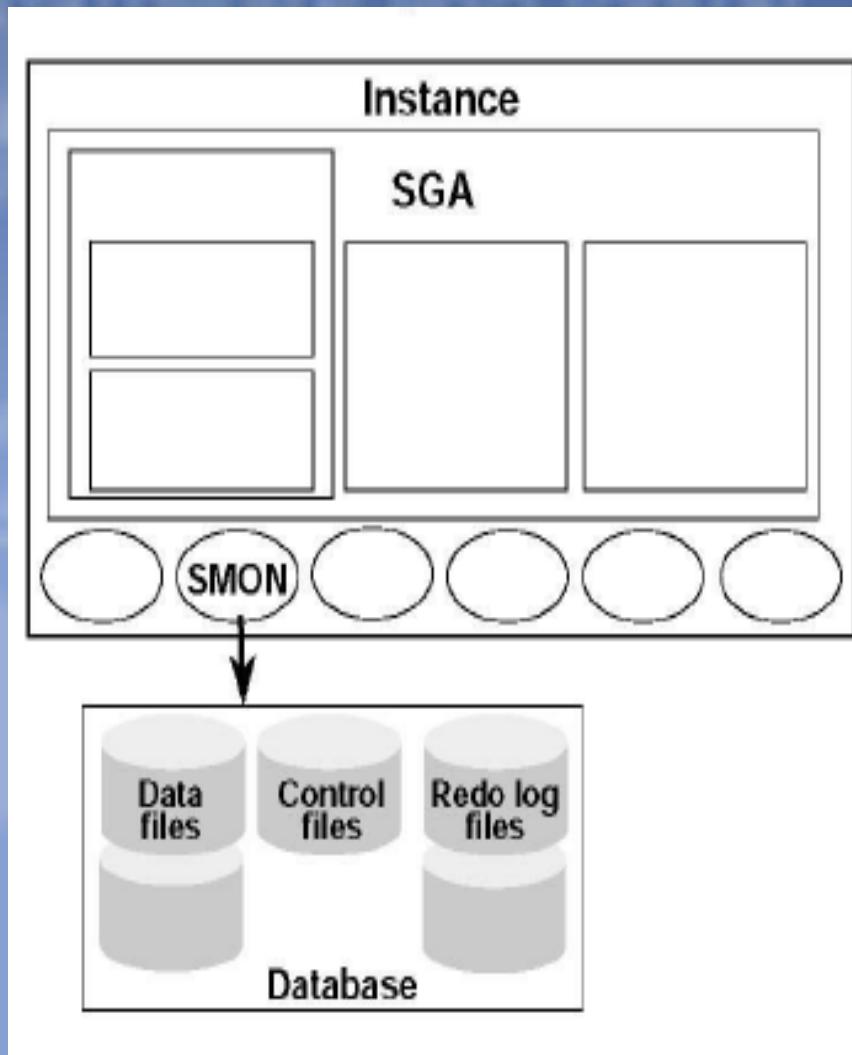
Log Writer (LGWR)



LGWR writes:

- At commit
- When one-third full
- When there is 1MB of redo
- Every 3 seconds
- Before DBWn writes

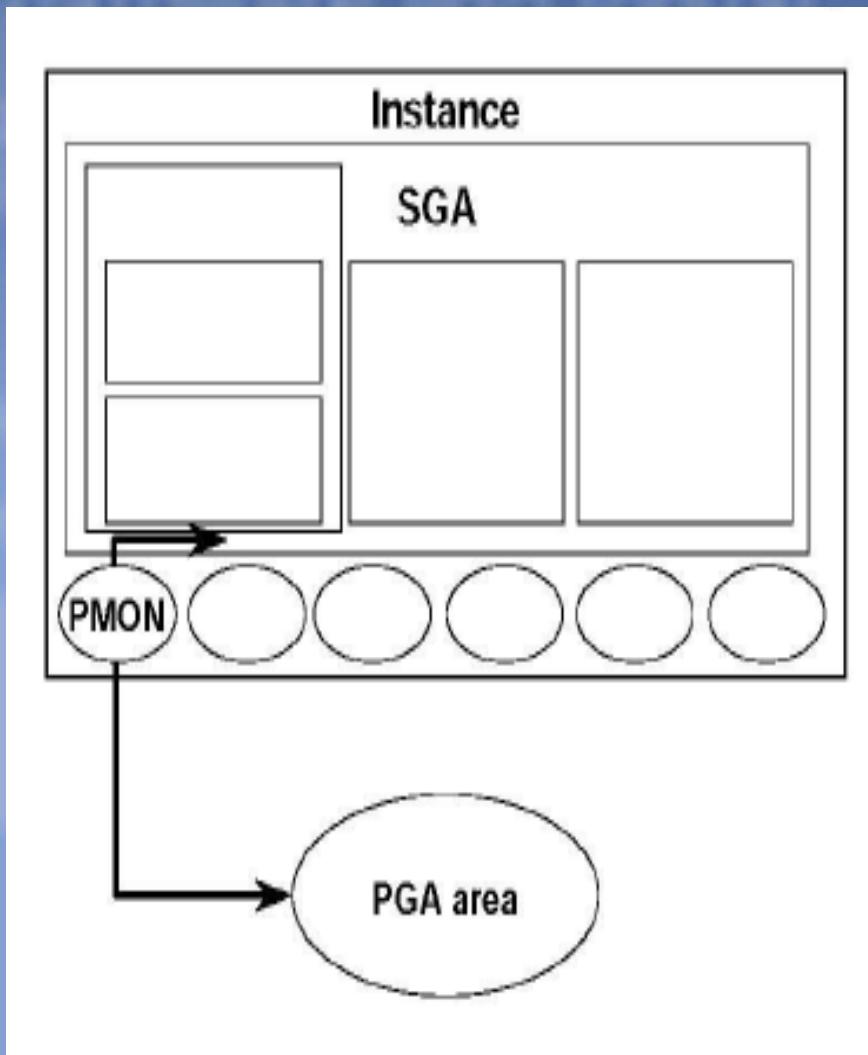
System Monitor (SMON)



Responsibilities:

- **Instance recovery:**
 - Rolls forward changes in the redo logs
 - Opens the database for user access
- Rolls back uncommitted transactions
- Coalesces free space ever 3 sec
- De-allocates temporary segments

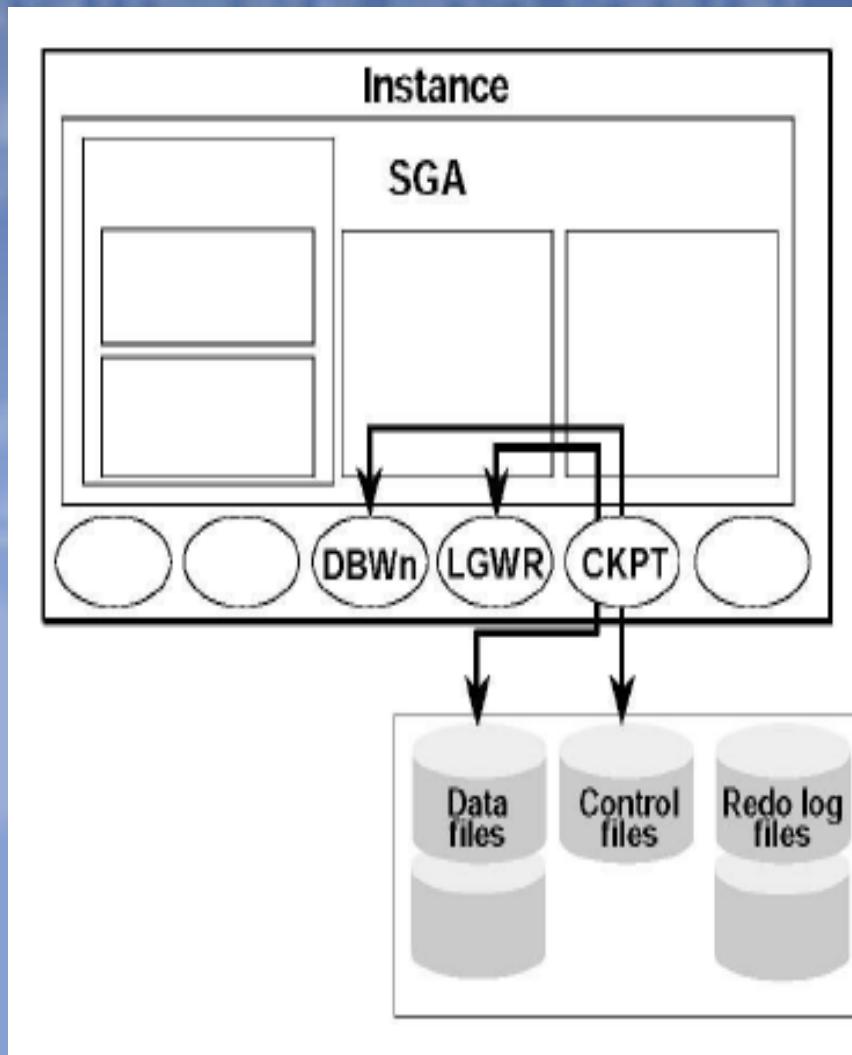
Process Monitor (PMON)



Cleans up after failed processes by:

- Rolling back the transaction
- Releasing locks
- Releasing other resources
- Restarts dead dispatchers

Checkpoint (CKPT)

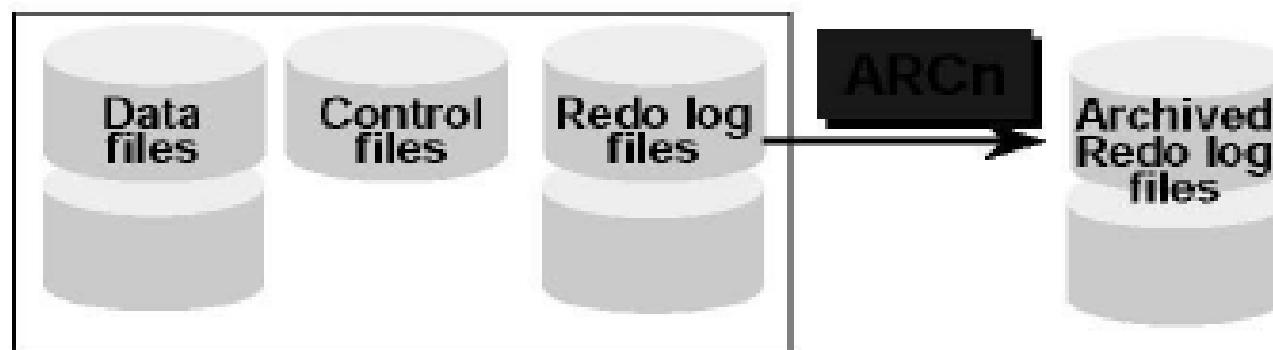


Responsible for:

- **Signalling DBWn at checkpoints**
- **Updating datafile headers with checkpoint information**
- **Updating control files with checkpoint information**

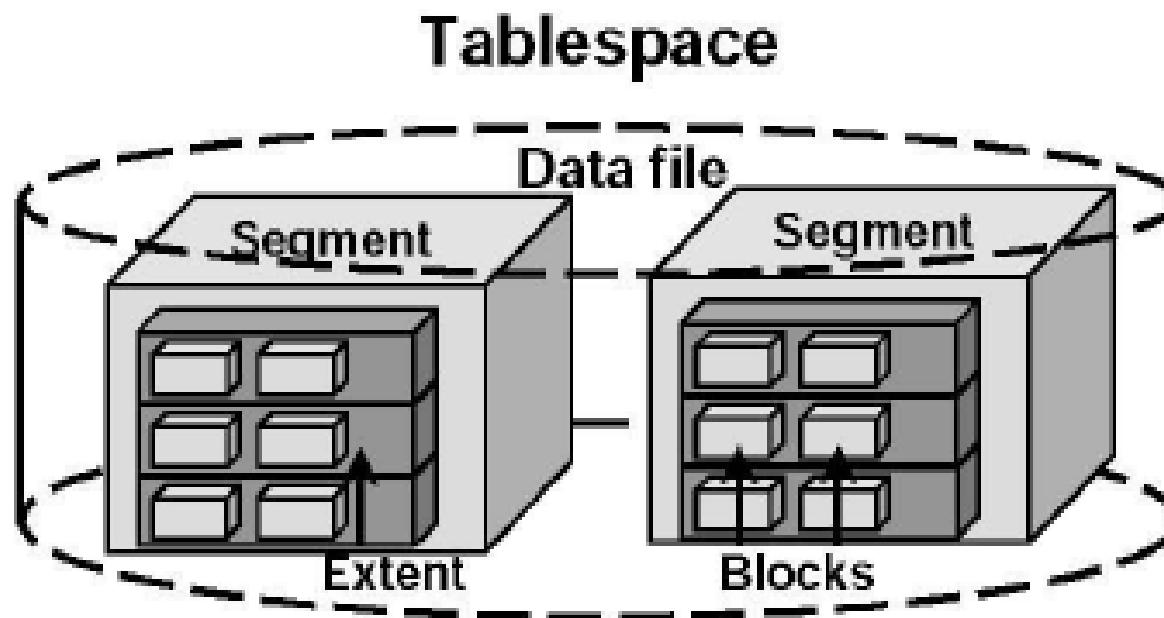
Archiver (ARCn)

- Optional background process
- Automatically archives online redo logs when ARCHIVELOG mode is set
- Preserves the record of all changes made to the database



Logical Structure

- The logical structure of the DBMS 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.



Processing a SQL Statement

- Connect to an instance using:
 - The user process
 - The server process
- The DBMS server components that are used depend on the type of SQL statement:
 - Queries return rows
 - DML statements log changes
 - Commit ensures transaction recovery
- Some DBMS server components do not participate in SQL statement processing