



Oracle Server Architecture



3 P's

➤ **Purpose :**

- To learn basic concepts of Oracle Server Architecture

➤ **Product :**

- » Learn to understand the components of Architecture
- » Learn Physical and Logical Database Structure
- » Learn more about SQL statement Processing

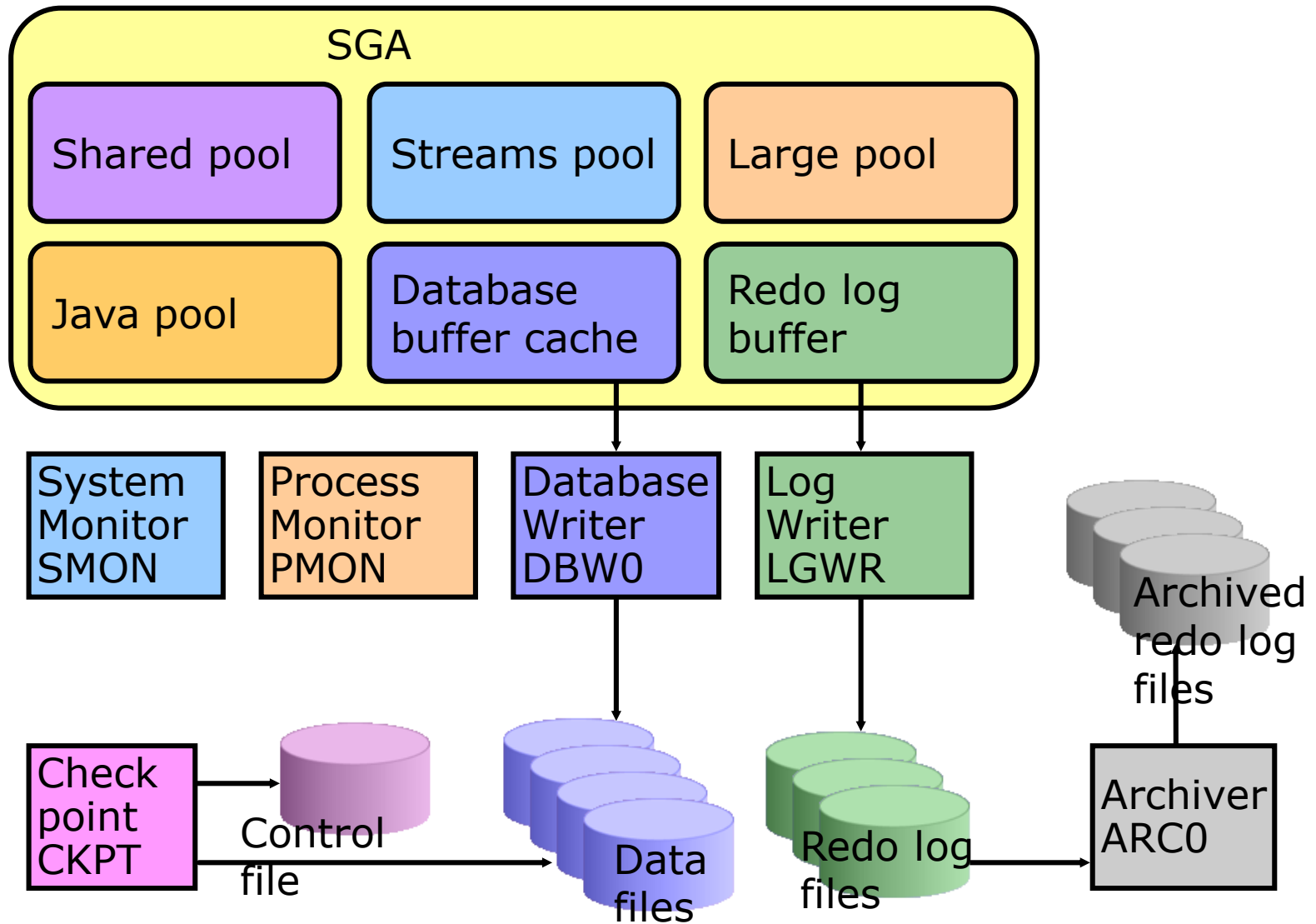
➤ **Process:**

- Instructor led training with practical experience



Oracle Database Architecture: Overview

- The Oracle Database consists of two main components:
 - The database: physical structures
 - The instance: memory structures
- The size and structure of these components impact performance.

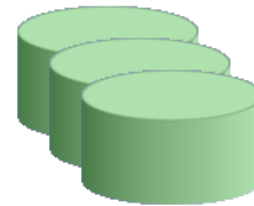




Control files



➤ Data files



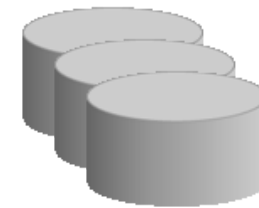
Online redo log files



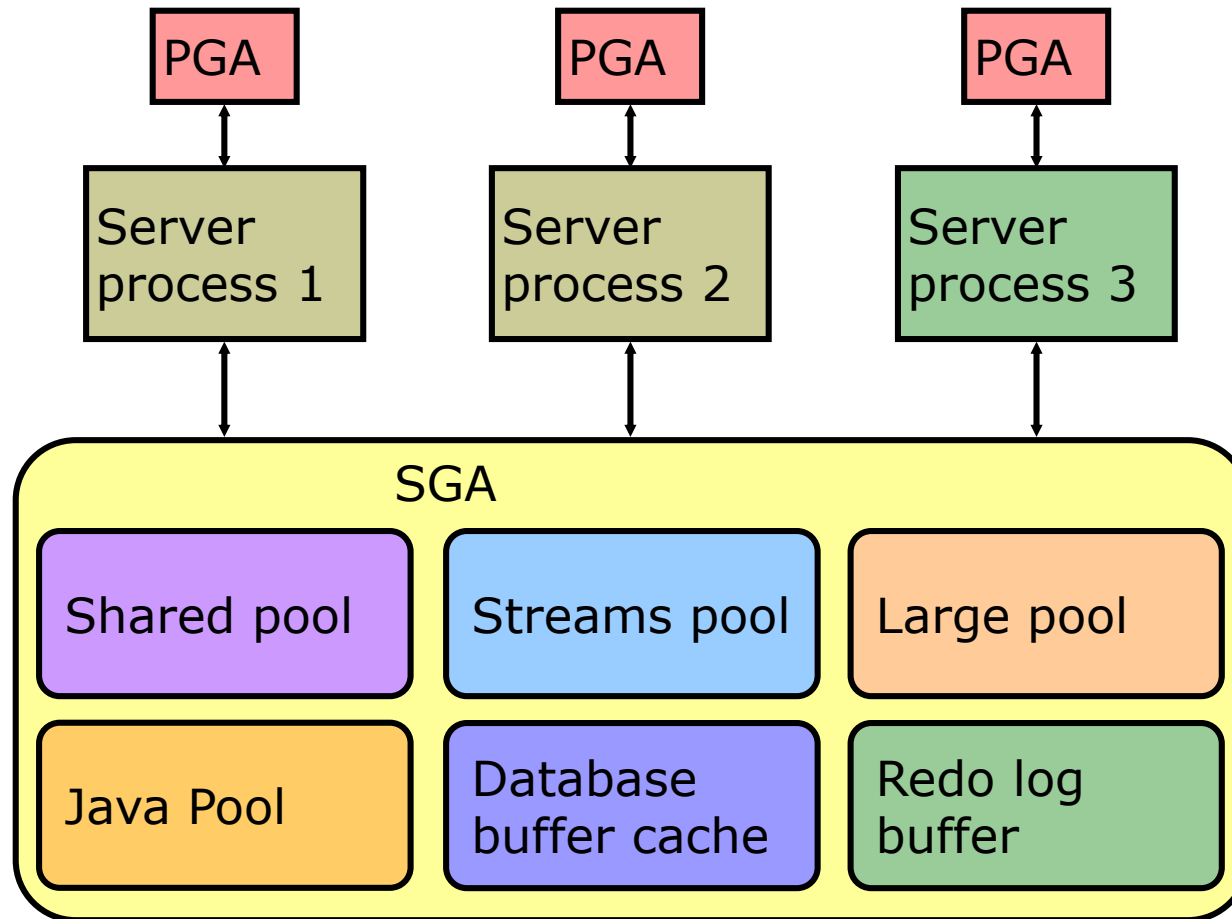
Parameter
file

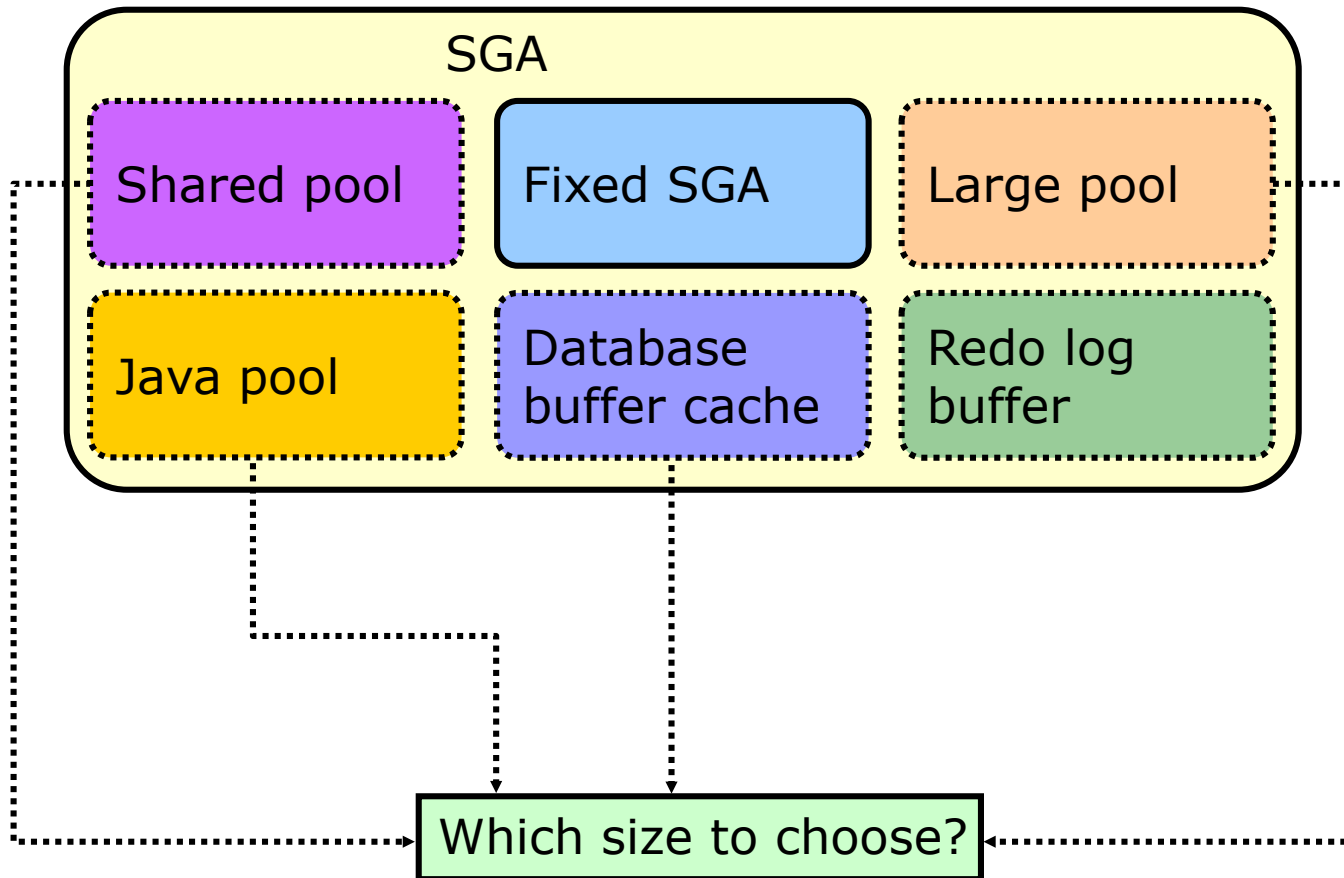


Password file



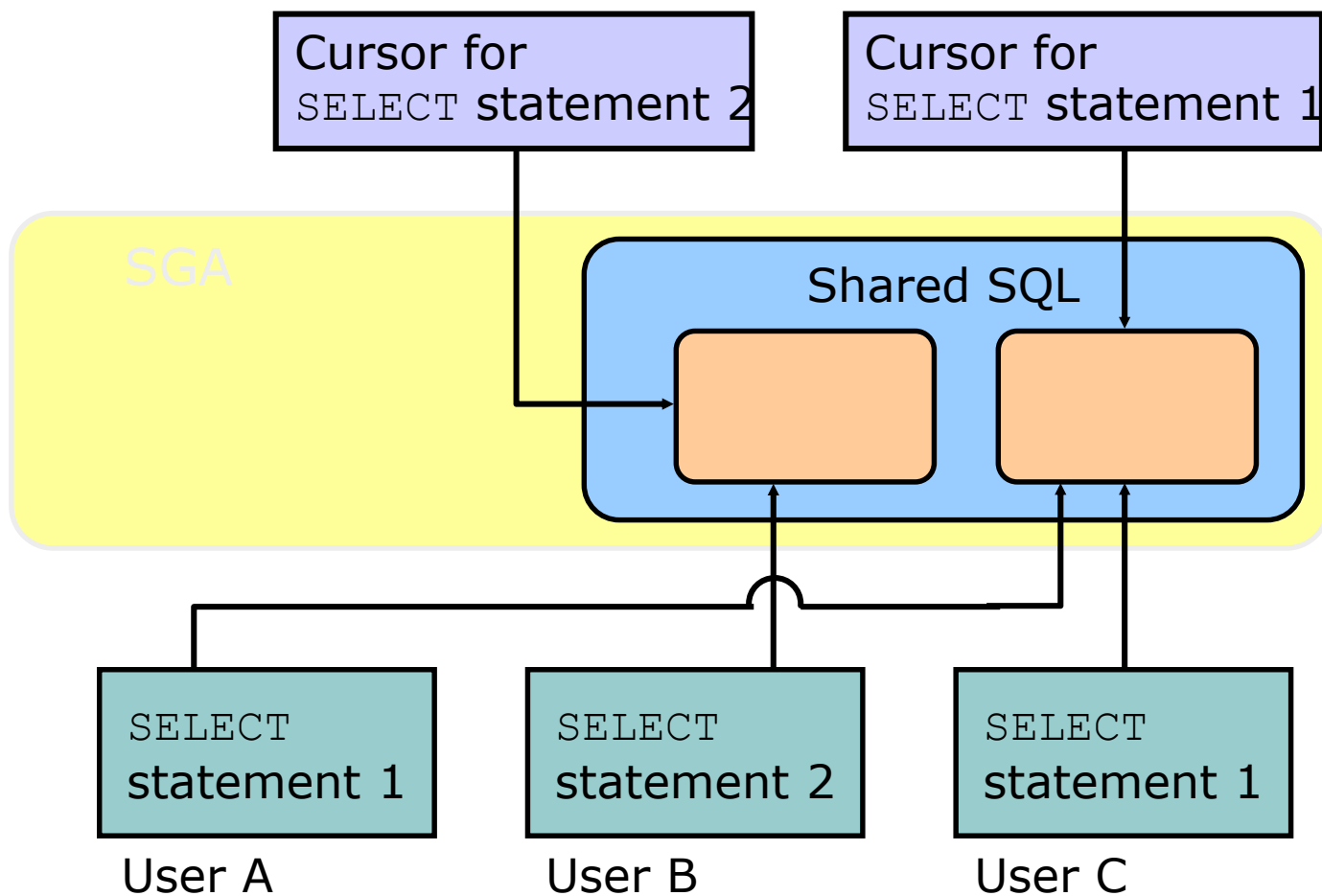
Archive log
files







- The shared pool consists of:
 - Data dictionary cache containing information on objects, storage, and privileges
 - Library cache containing information such as SQL statements, parsed or compiled PL/SQL blocks, and Java classes
- Appropriate sizing of the shared pool affects performance by:
 - Reducing disk reads
 - Allowing shareable SQL code
 - Reducing parsing, thereby saving CPU resources
 - Reducing latching overhead, thereby improving scalability





Program Global Area (PGA)

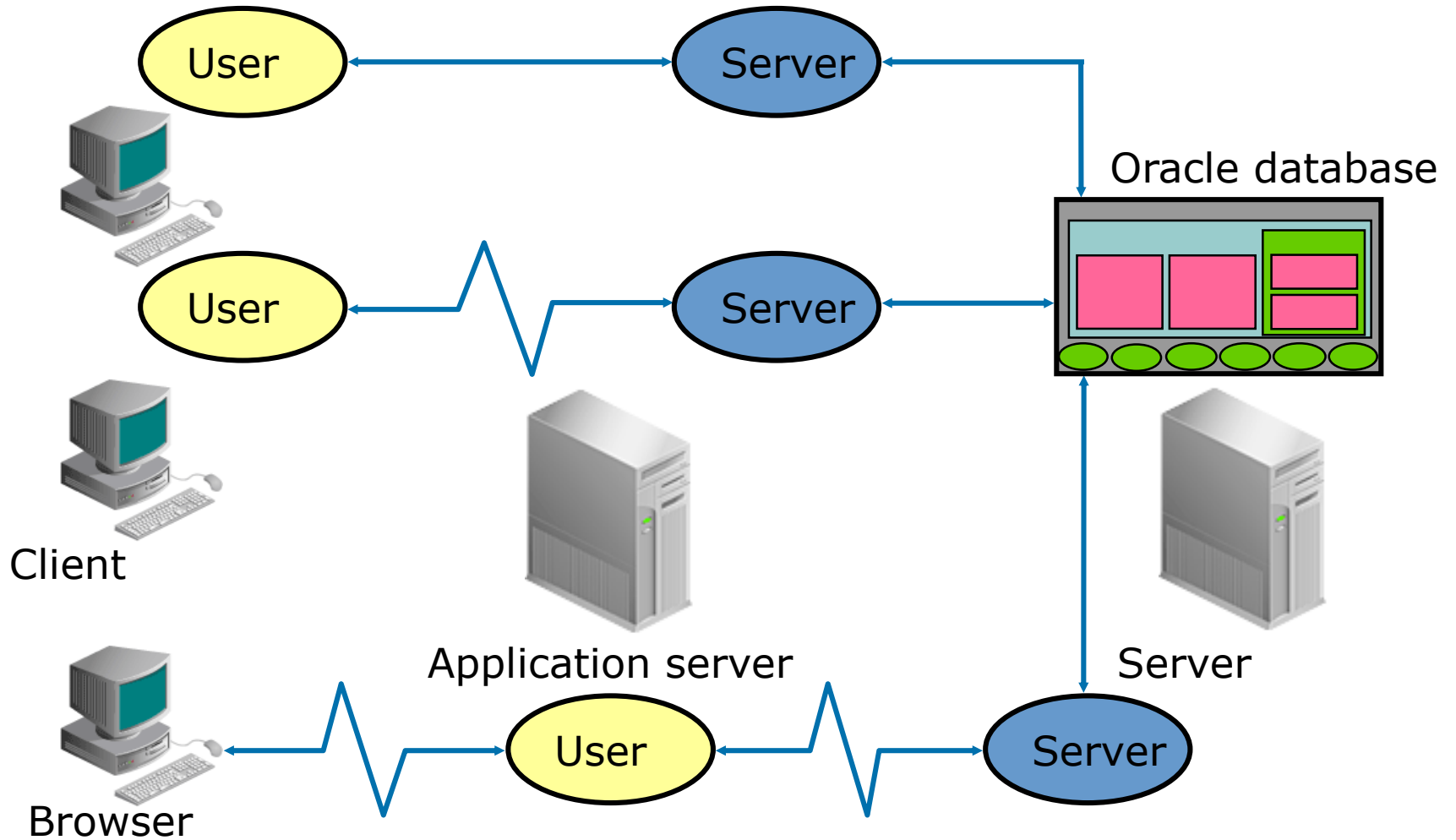
- PGA is a memory area that contains:
 - Session information
 - Cursor information
 - SQL execution work areas
 - Sort area
 - Hash join area
 - Bitmap merge area
 - Bitmap create area
- Work area size influences SQL performance.
- Work areas can be automatically or manually managed.



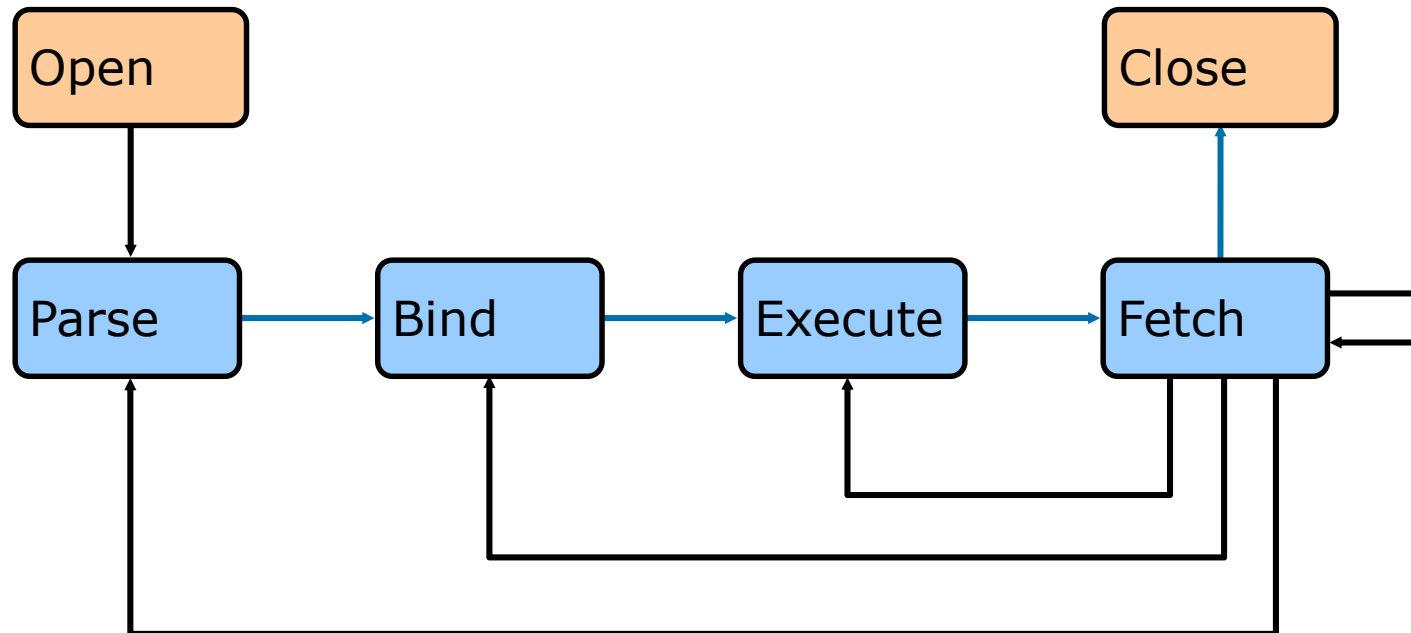
Automated SQL Execution Memory (PGA) Management

- Allocation and tuning of PGA memory is simplified and improved.
 - Efficient memory allocation for varying workloads
 - Queries optimized for both throughput and response times
- DBAs can use parameters to specify the policy for PGA sizing.

Connecting to an Instance



SQL Statement Processing Phases





SQL Statement Processing Phases: Parse

- Parse phase:
 - Searches for the statement in the shared pool
 - Checks syntax
 - Checks semantics and privileges
 - Merges view definitions and subqueries
 - Determines execution plan
- Minimize parsing as much as possible:
 - Parse calls are expensive
 - Avoid reparsing
 - Parse once, execute many times



SQL Statement Processing Phases: Bind

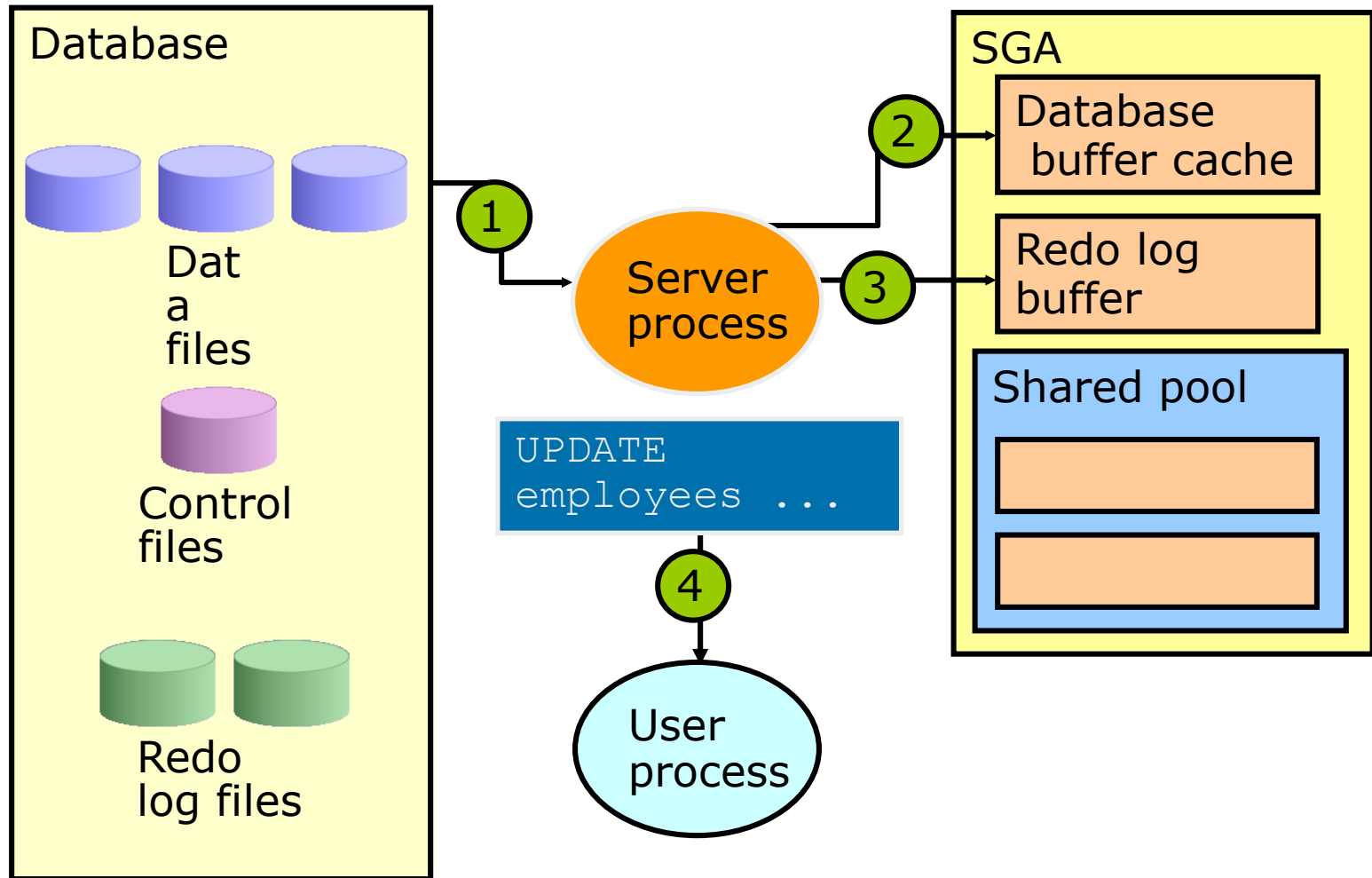
- Bind phase:
 - Checks the statement for bind variables
 - Assigns or reassigns a value to the bind variable
- Bind variables impact performance when:
 - They are not used, and your statement would benefit from a shared cursor
 - They are used, and your statement would benefit from a different execution plan

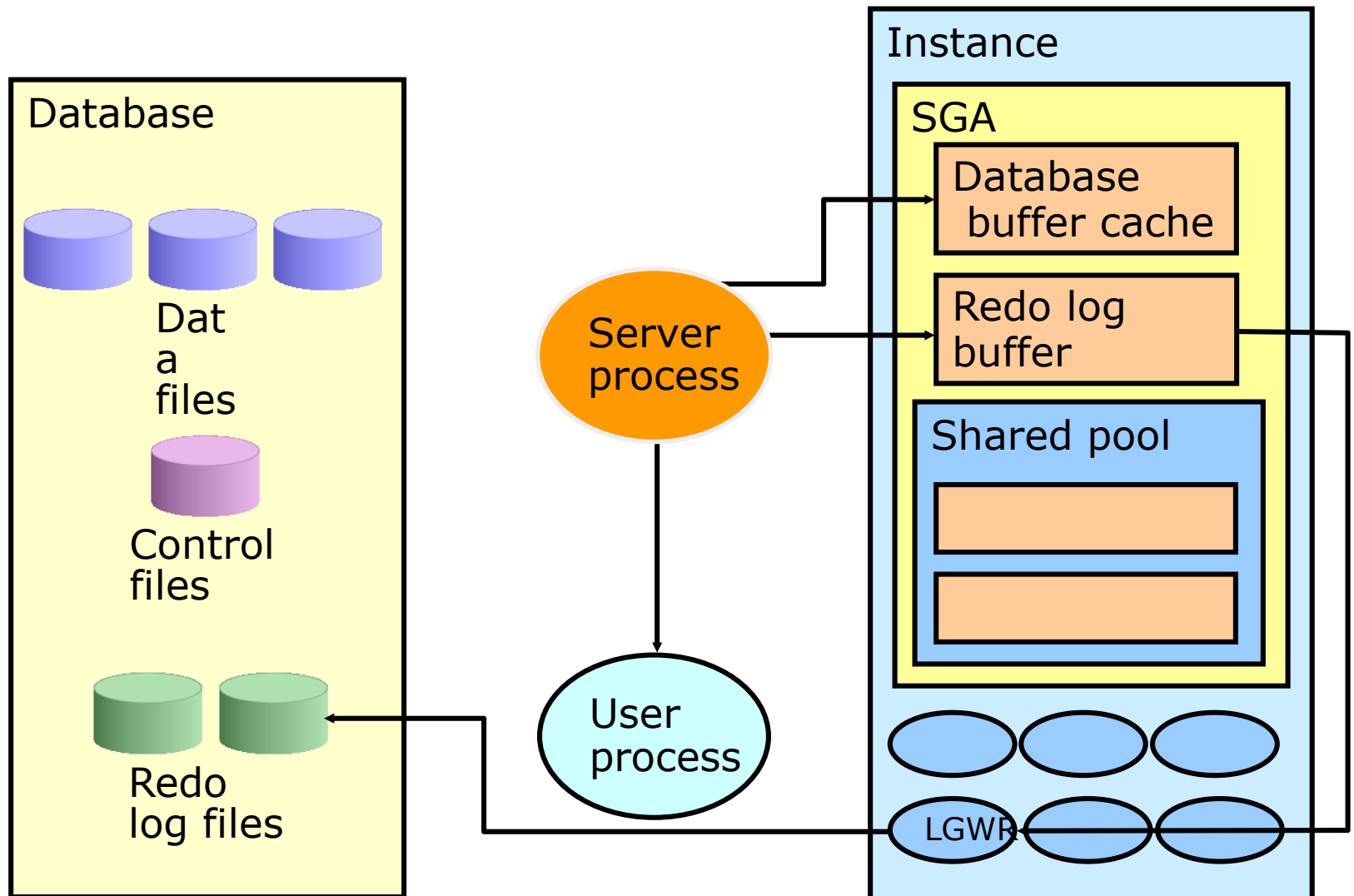


SQL Statement Processing Phases: Execute and Fetch

- Execute phase:
 - Executes the SQL statement
 - Performs necessary I/O and sorts for data manipulation language (DML) statements
- Fetch phase:
 - Retrieves rows for a query
 - Sorts for queries when needed
 - Uses an array fetch mechanism

Processing a DML Statement







Functions of the Oracle Query Optimizer

- The Oracle query optimizer determines the most efficient execution plan and is the most important step in the processing of any SQL statement.
- The optimizer:
 - Evaluates expressions and conditions
 - Uses object and system statistics
 - Decides how to access the data
 - Decides how to join tables
 - Decides which path is most efficient



Top Database Performance Issues

- Bad connection management
- Poor use of cursors and the shared pool
- Bad SQL
- Nonstandard initialization parameters
- I/O issues
- Long full-table scans
- In-disk sorts
- High amounts of recursive SQL
- Schema errors and optimizer problems

SUMMARY

- In this lesson, you should have learned about the Oracle Database architecture and various components that require tuning.