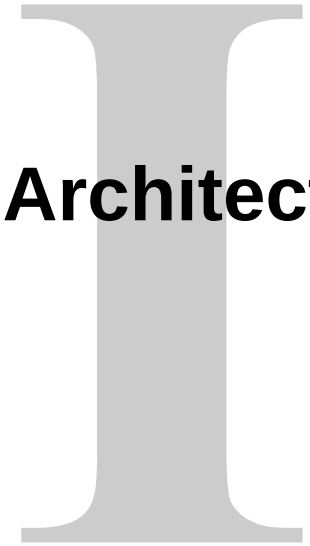
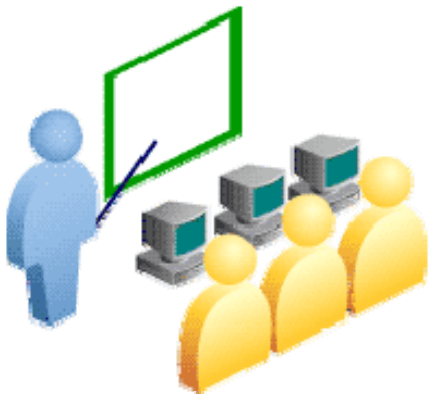
Oracle Database Architectural Components



Objectives

After completing this appendix, you should be able to do the following:

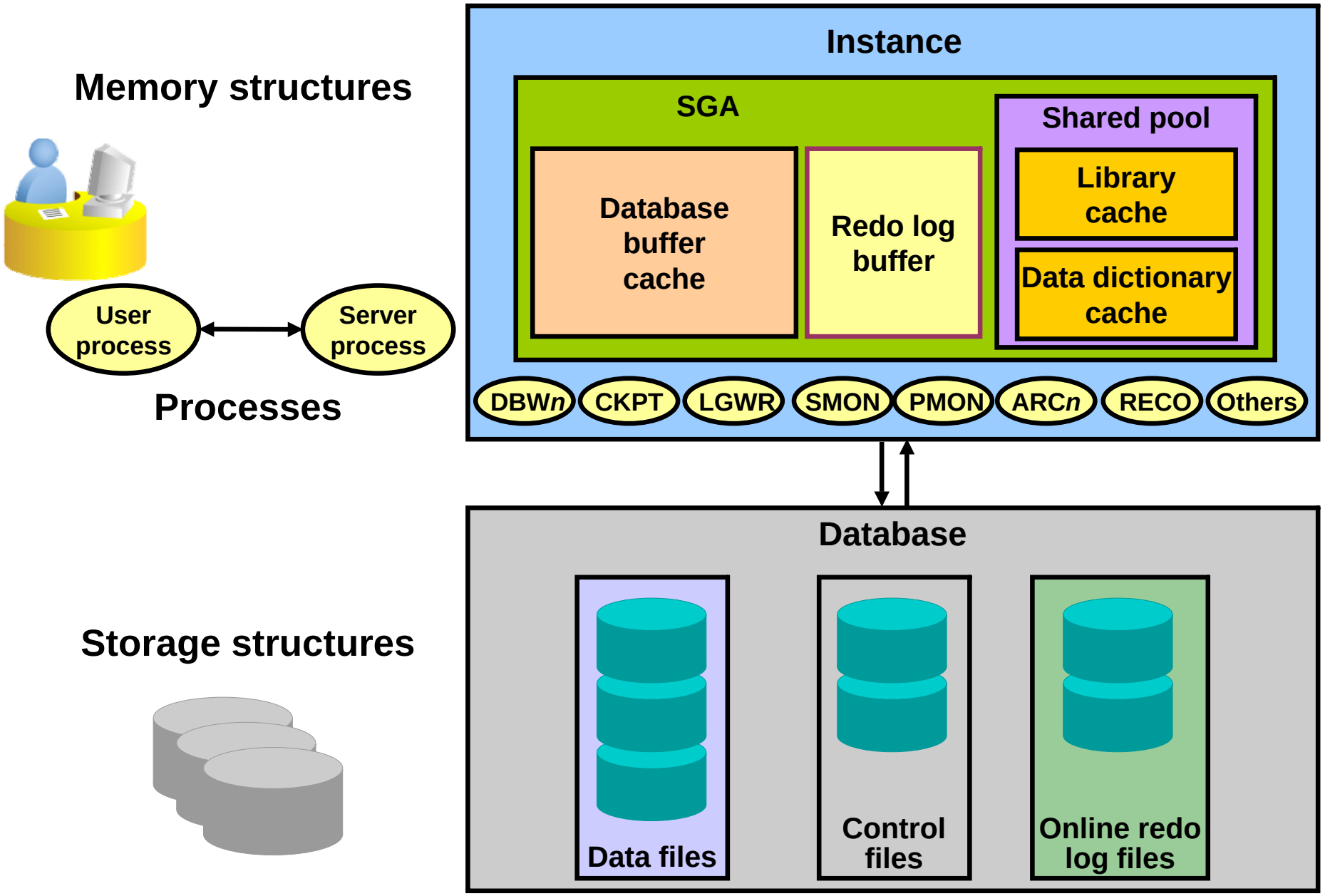
- List the major database architectural components
- Describe the background processes
- Explain the memory structures
- Correlate the logical and physical storage structures



Oracle Database Architecture: Overview

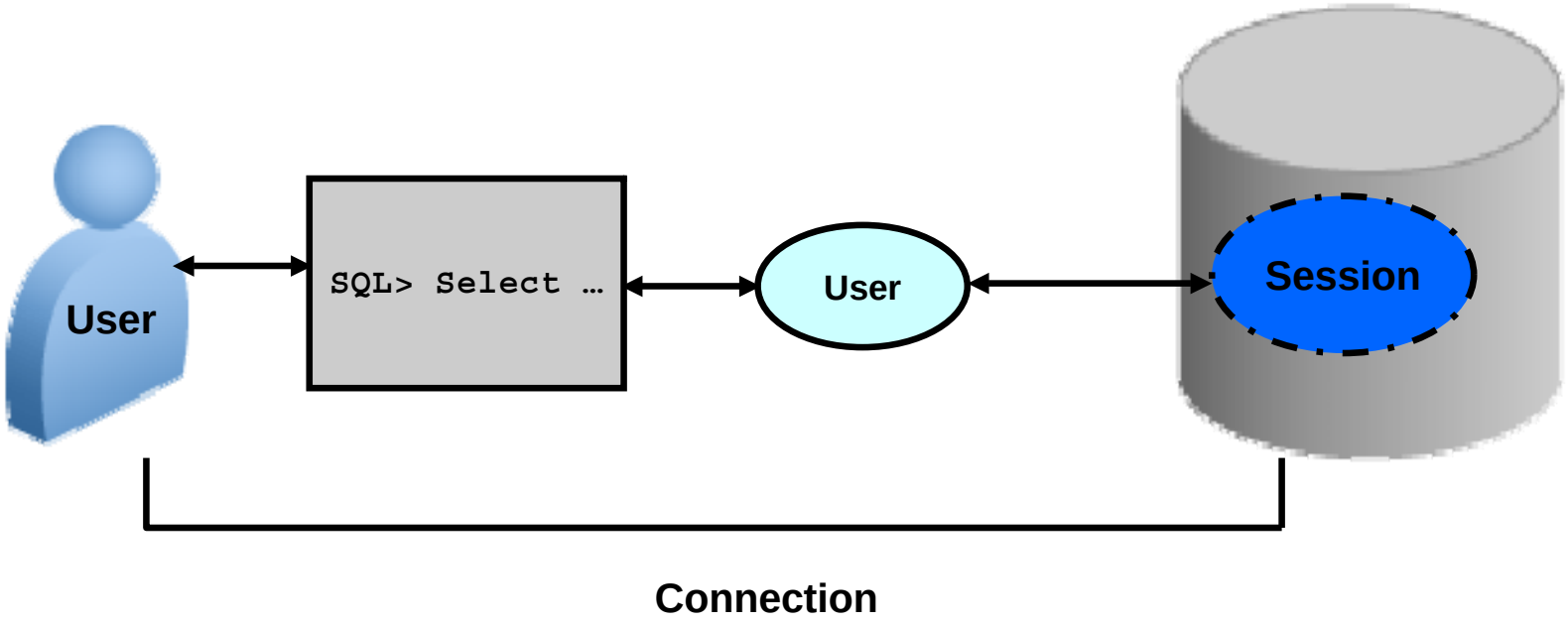
The Oracle Relational Database Management System (RDBMS) is a database management system that provides an open, comprehensive, integrated approach to information management.

Oracle Database Server Structures

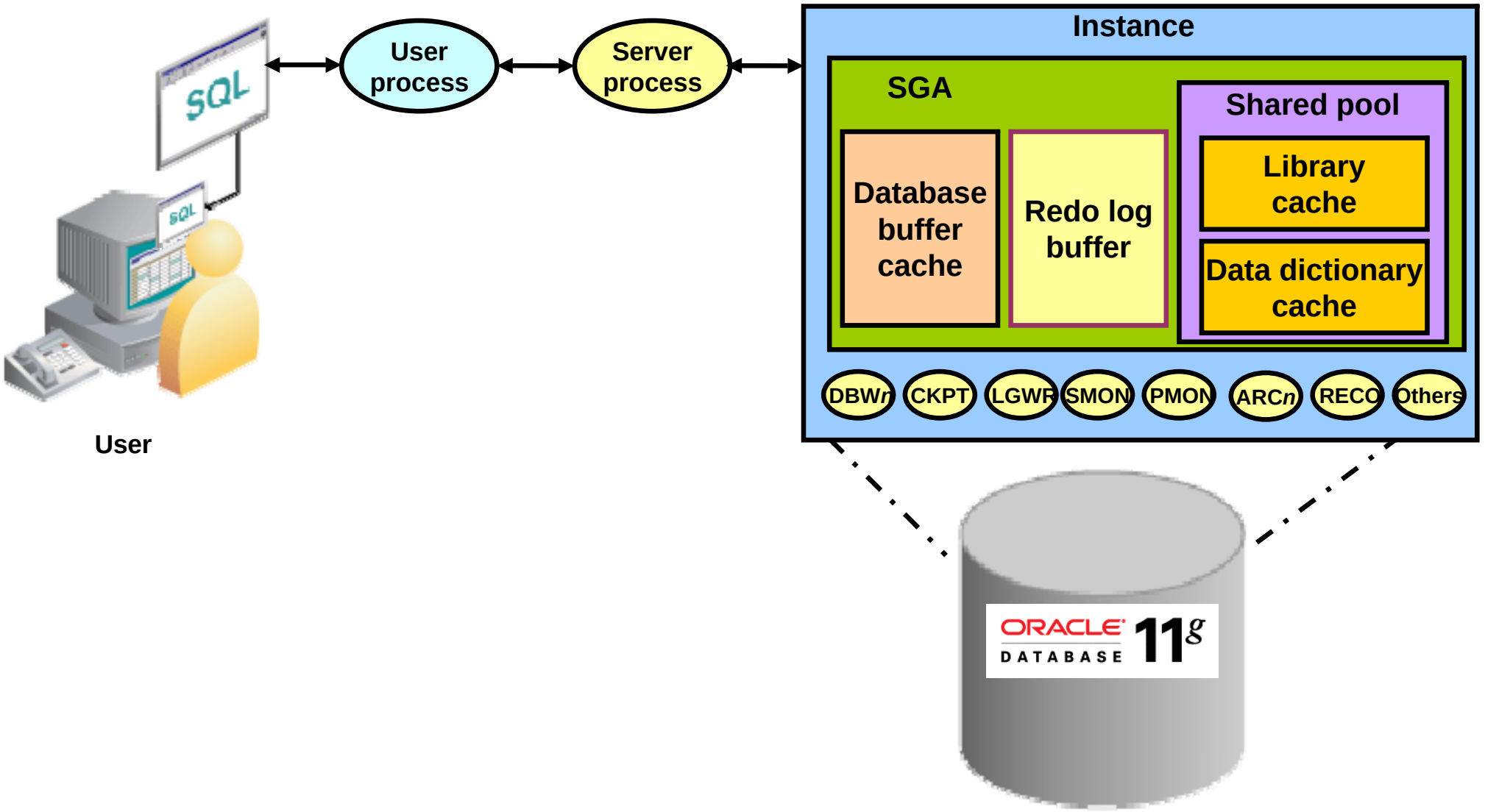


Connecting to the Database

- Connection: Communication pathway between a user process and a database instance
- Session: A specific connection of a user to a database instance through a user process

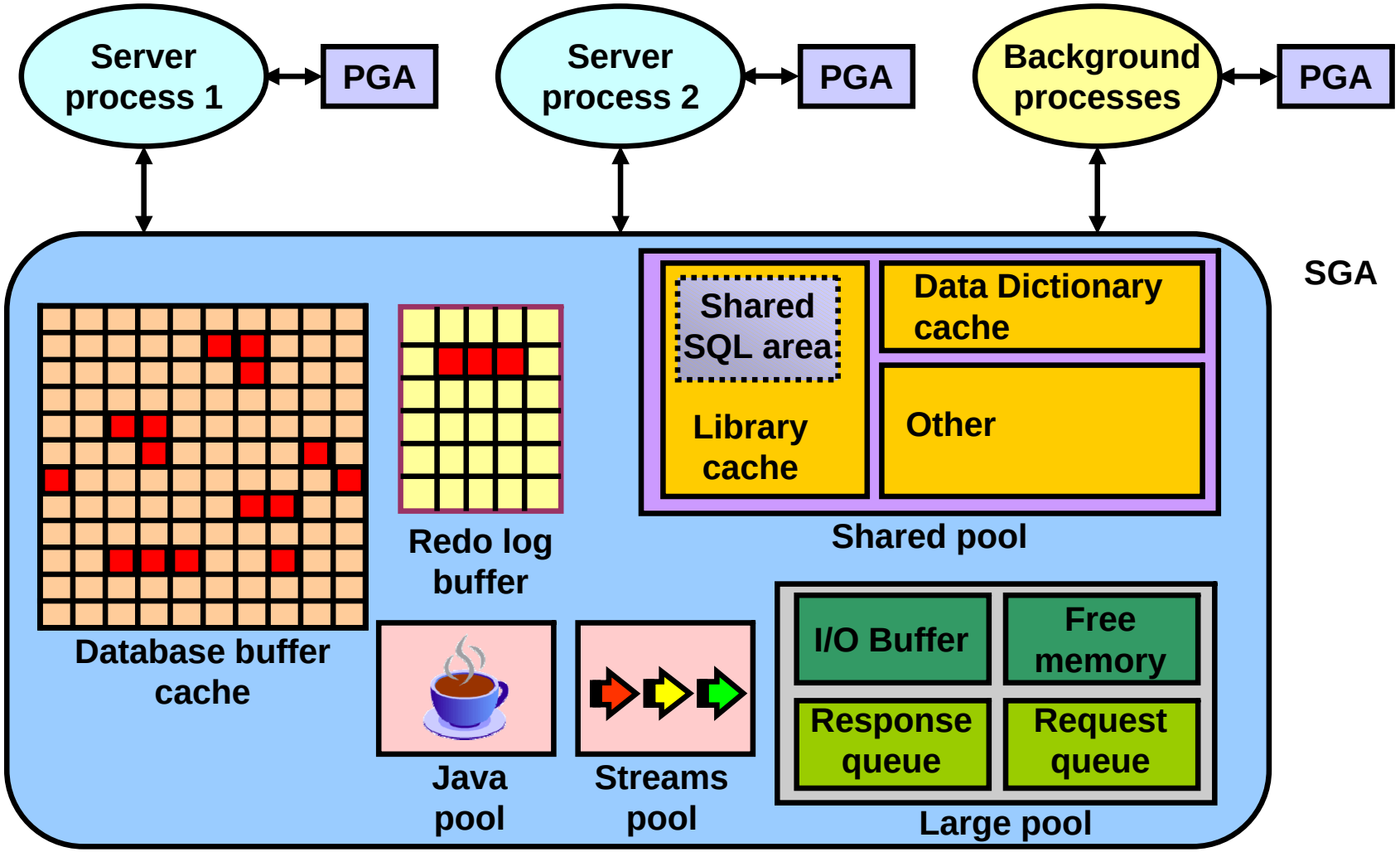


Interacting with an Oracle Database



Oracle Memory Architecture

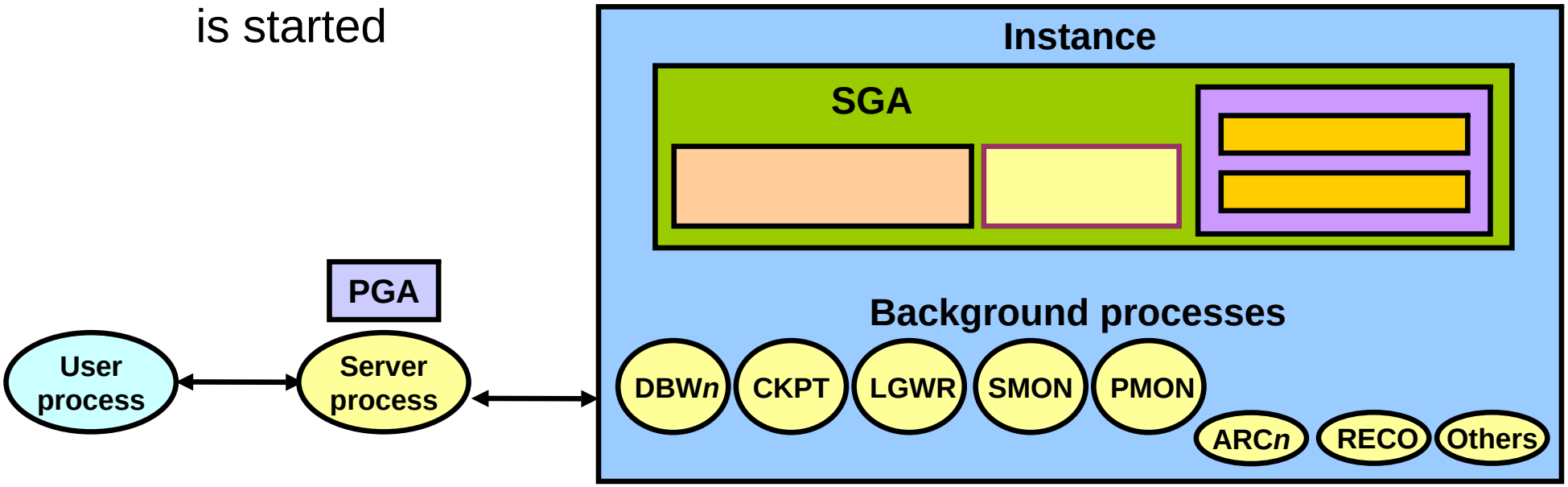
DB structures
→Memory
- Process
- Storage



Process Architecture

DB structures
- Memory
→ Process
- Storage

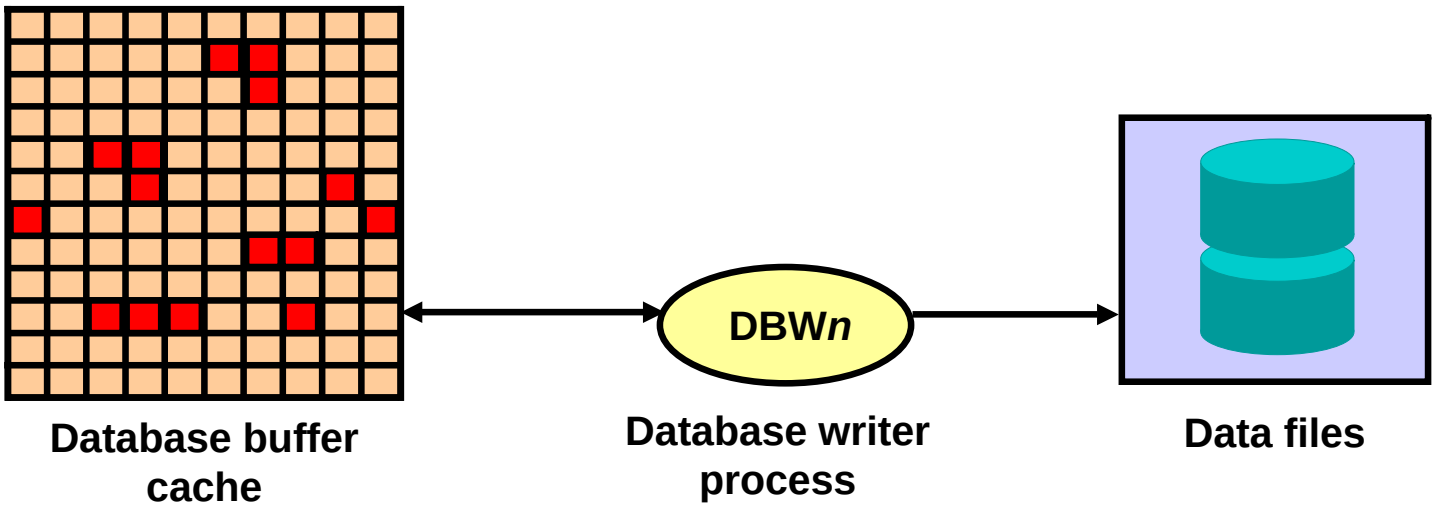
- User process:
  - Is started when a database user or a batch process connects to the Oracle Database
- Database processes:
  - Server process: Connects to the Oracle instance and is started when a user establishes a session
  - Background processes: Are started when an Oracle instance is started



Database Writer Process

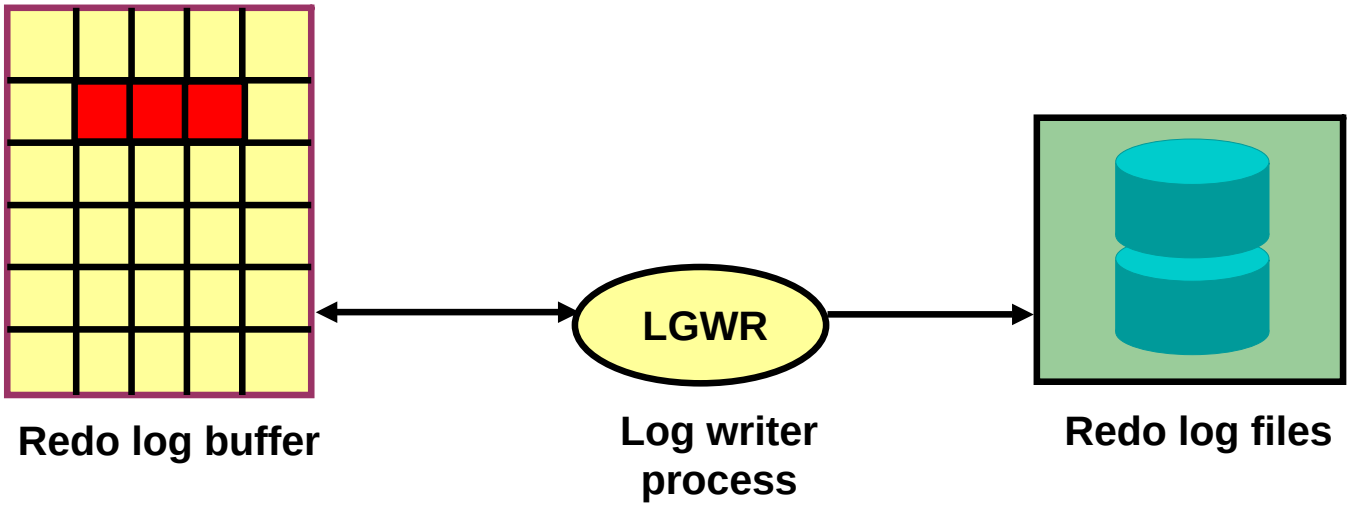
Writes modified (dirty) buffers in the database buffer cache to disk:

- Asynchronously while performing other processing
- Periodically to advance the checkpoint



Log Writer Process

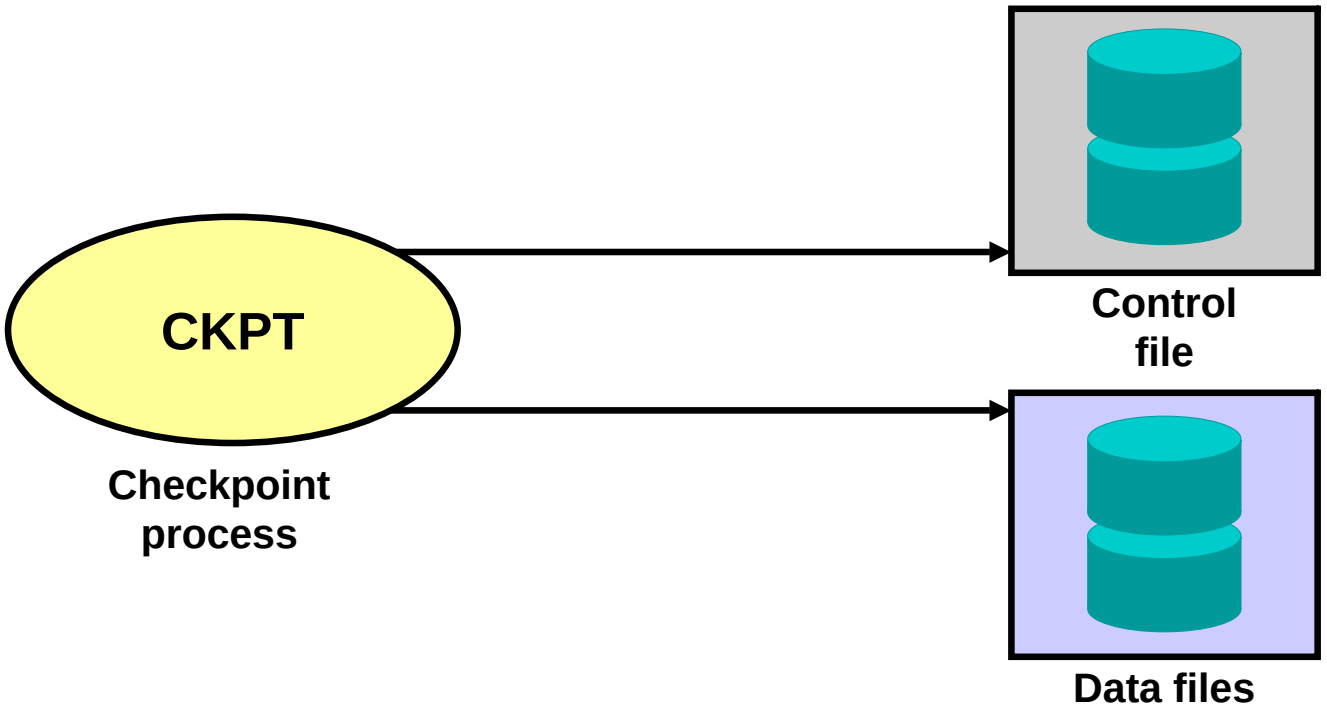
- Writes the redo log buffer to a redo log file on disk
- LGWR writes:
  - A process commits a transaction
  - When the redo log buffer is one-third full
  - Before a DBW*n* process writes modified buffers to disk



Checkpoint Process

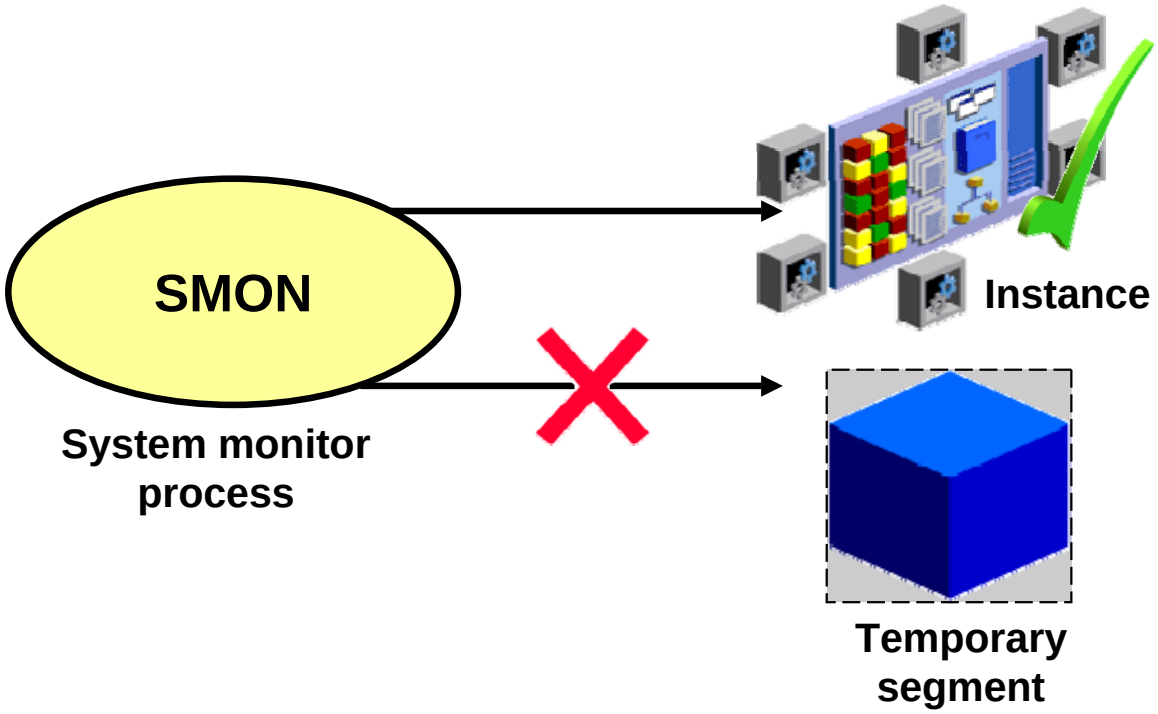
Records checkpoint information in:

- The control file
- Each datafile header



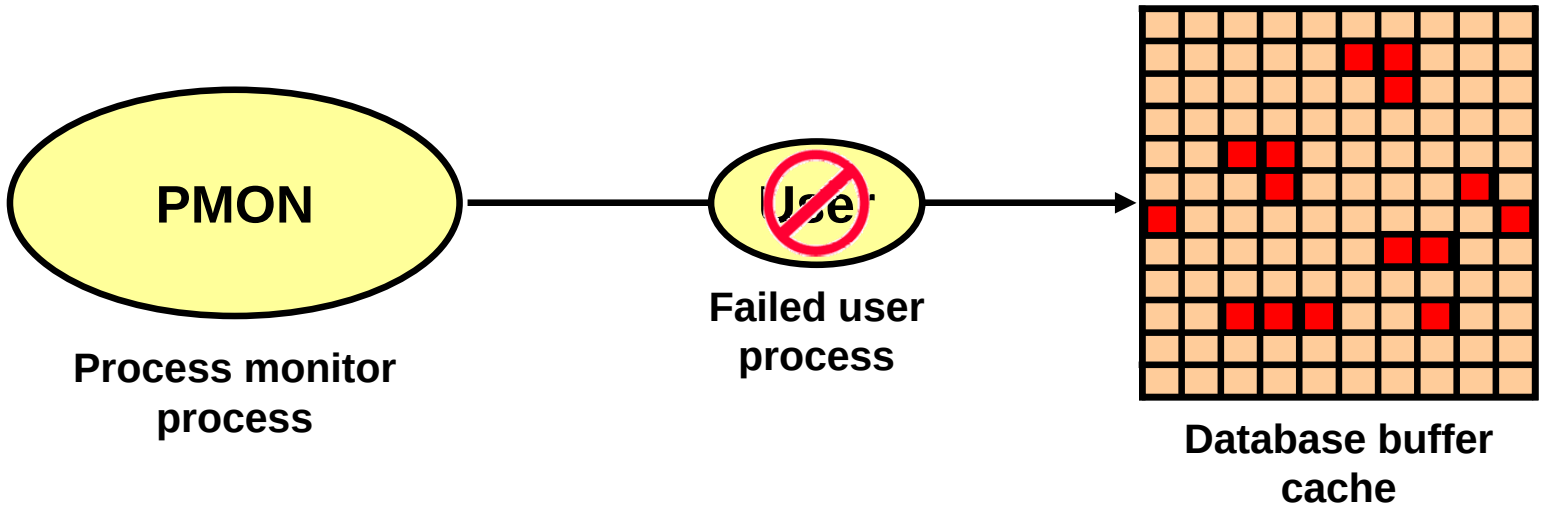
System Monitor Process

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



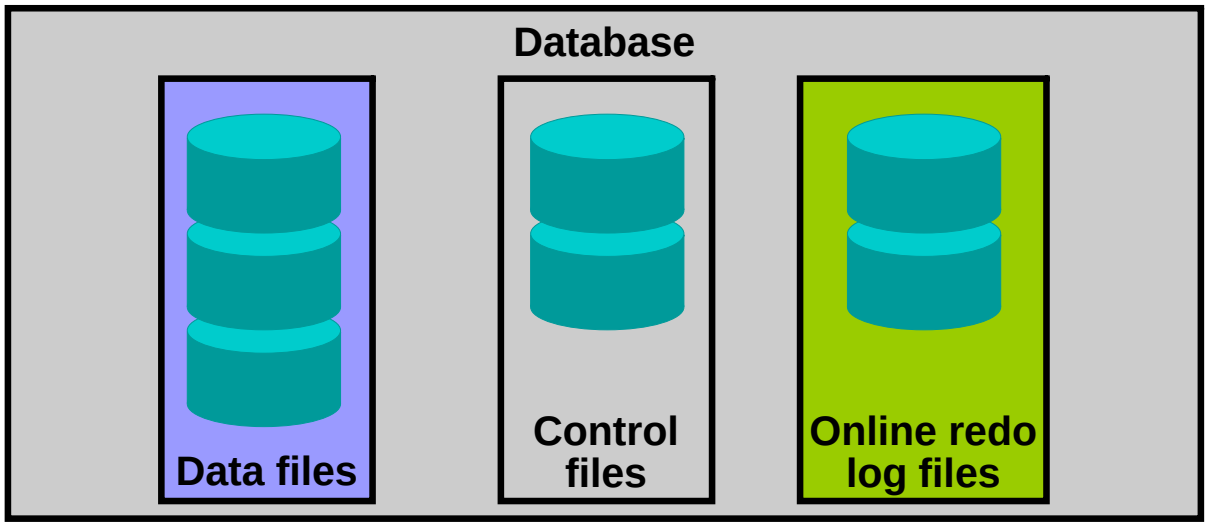
Process Monitor Process

- Performs process recovery when a user process fails:
  - Cleans up the database buffer cache
  - Frees resources used by the user process
- Monitors sessions for idle session timeout
- Dynamically registers database services with listeners

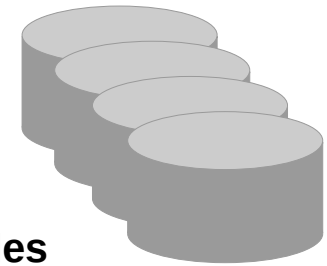


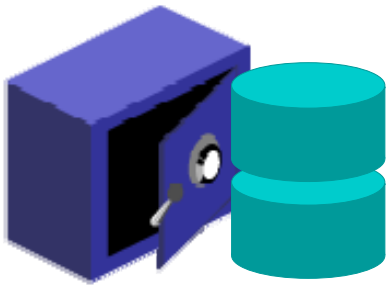
Oracle Database Storage Architecture

DB structures
- Memory
- Process
→ Storage

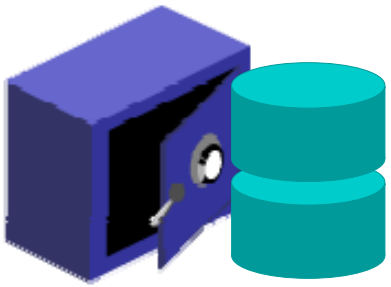


Parameter file
Password file
Network files
Alert and trace files



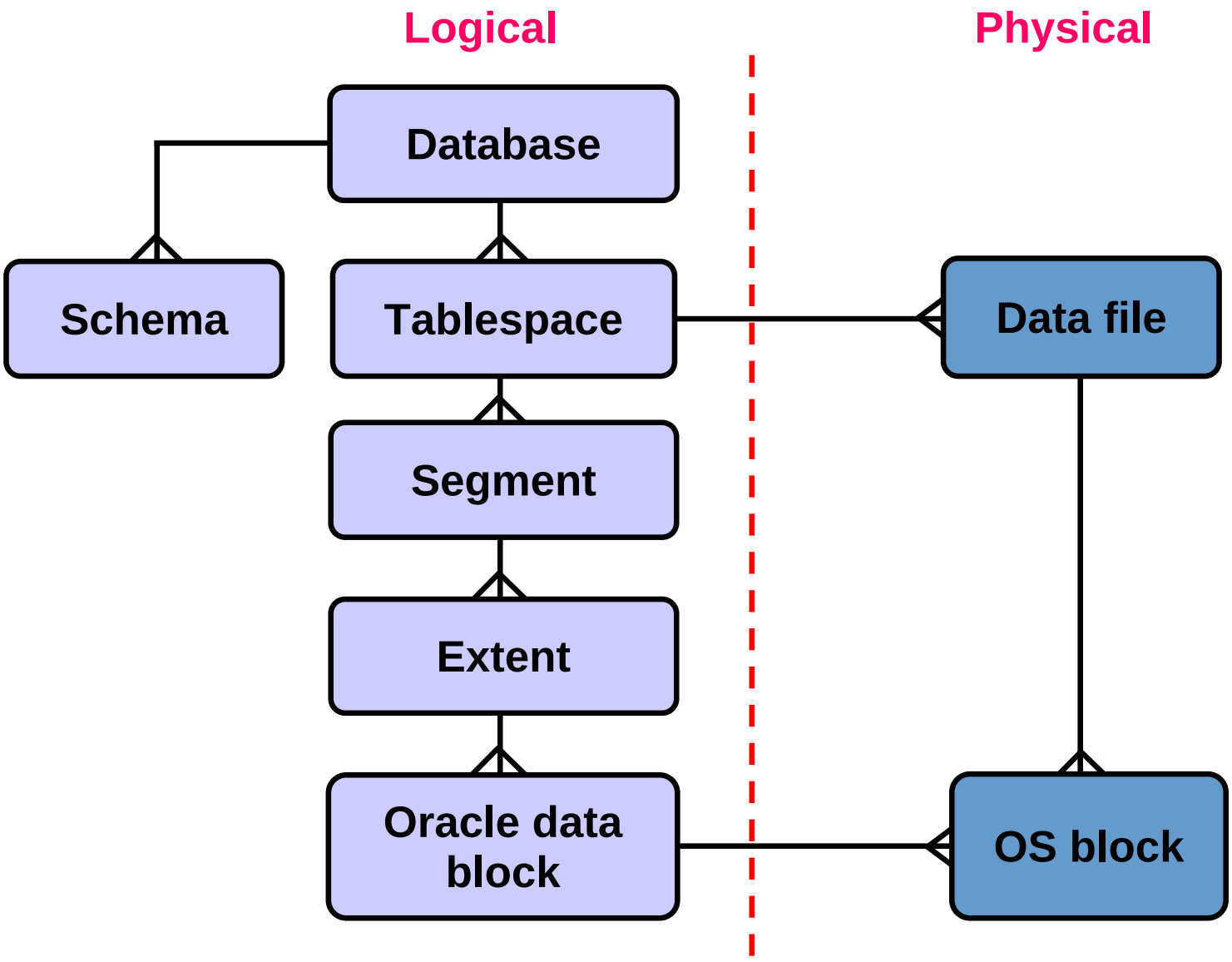


Backup files



Archived log files

Logical and Physical Database Structures



Processing a SQL Statement

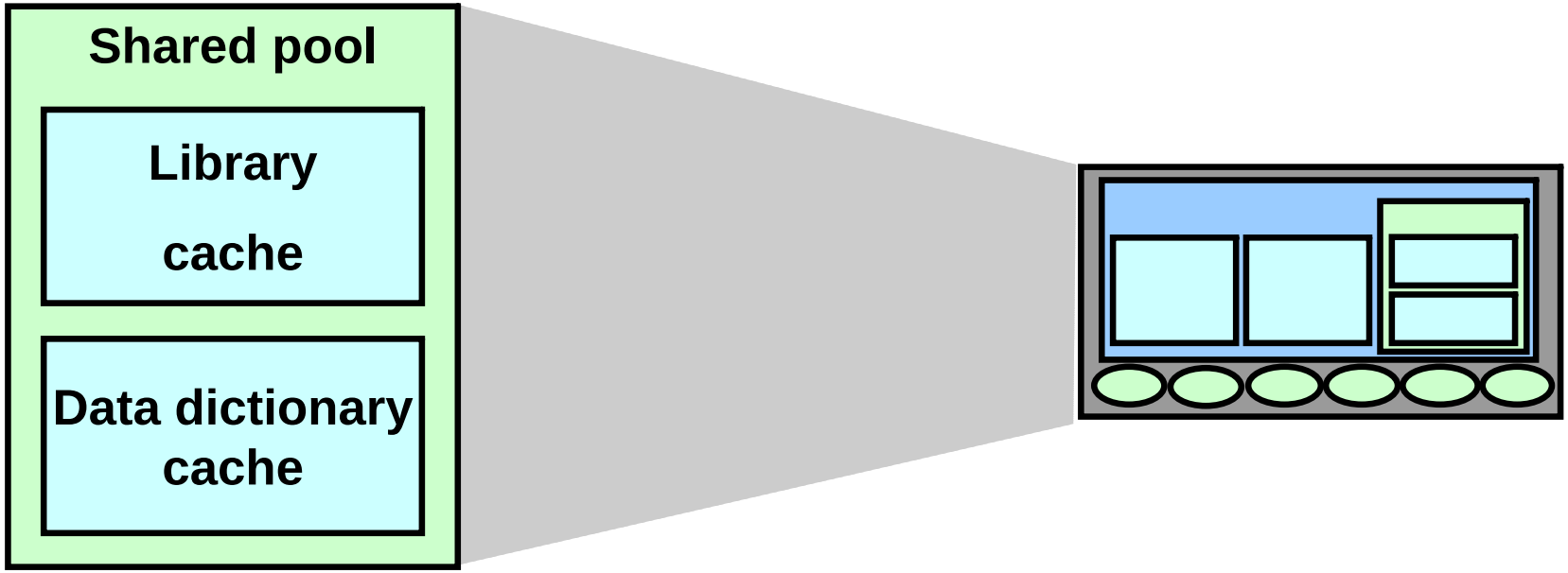
- Connect to an instance using:
  - The user process
  - The server process
- The Oracle server components that are used depend on the type of SQL statement:
  - Queries return rows.
  - Data manipulation language (DML) statements log changes.
  - Commit ensures transaction recovery.
- Some Oracle server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

Processing a Query

- Parse:
  - Search for an identical statement.
  - Check the syntax, object names, and privileges.
  - Lock the objects used during parse.
  - Create and store the execution plan.
- Execute: Identify the rows selected.
- Fetch: Return the rows to the user process.

Shared Pool

- The library cache contains the SQL statement text, parsed code, and execution plan.
- The data dictionary cache contains table, column, and other object definitions and privileges.
- The shared pool is sized by `SHARED_POOL_SIZE`.

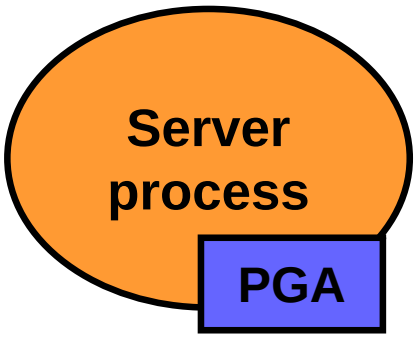


Database Buffer Cache

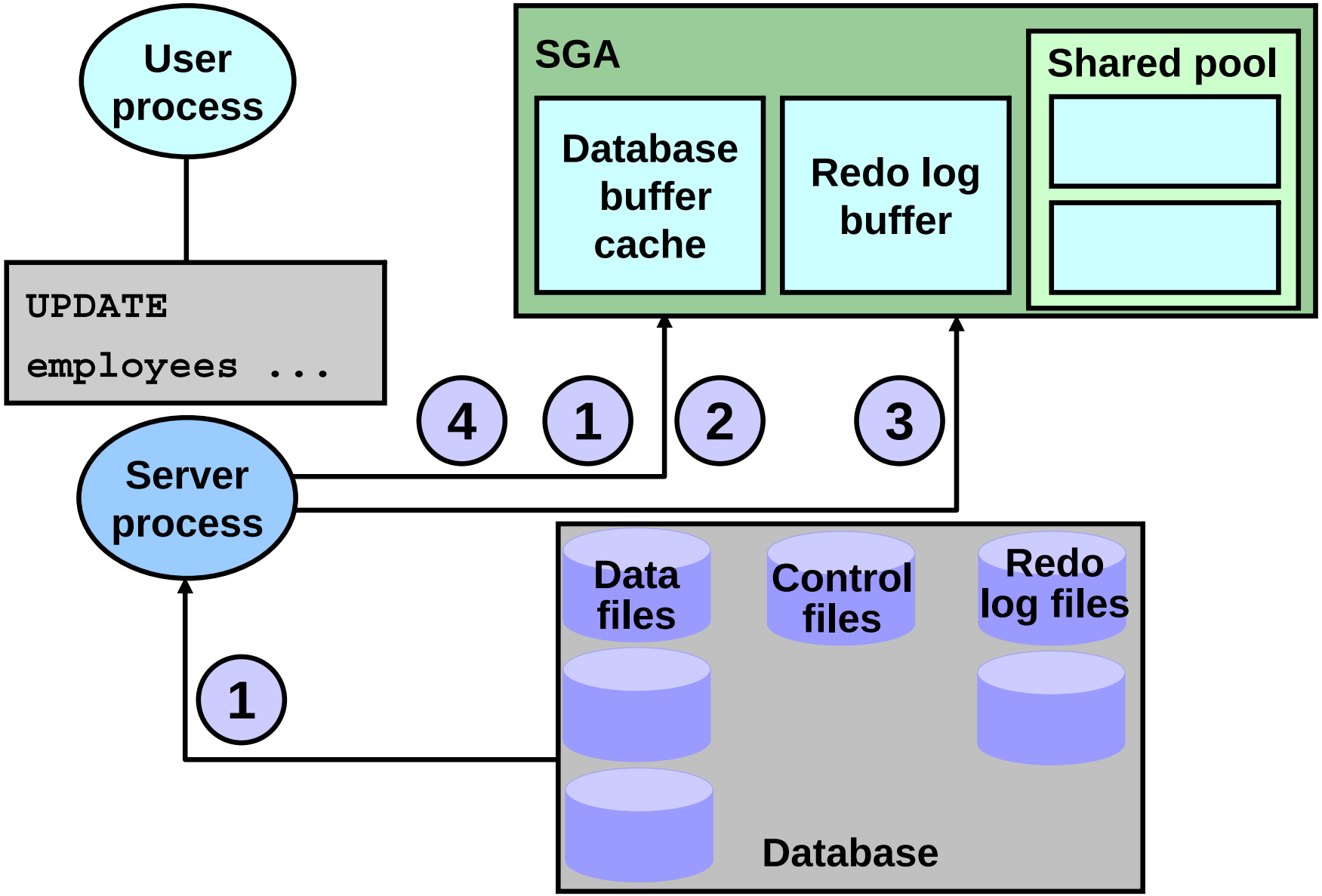
- The database buffer cache stores the most recently used blocks.
- The size of a buffer is based on `DB_BLOCK_SIZE`.
- The number of buffers is defined by `DB_BLOCK_BUFFERS`.

Program Global Area (PGA)

- Is not shared
- Is writable only by the server process
- Contains:
  - Sort area
  - Session information
  - Cursor state
  - Stack space



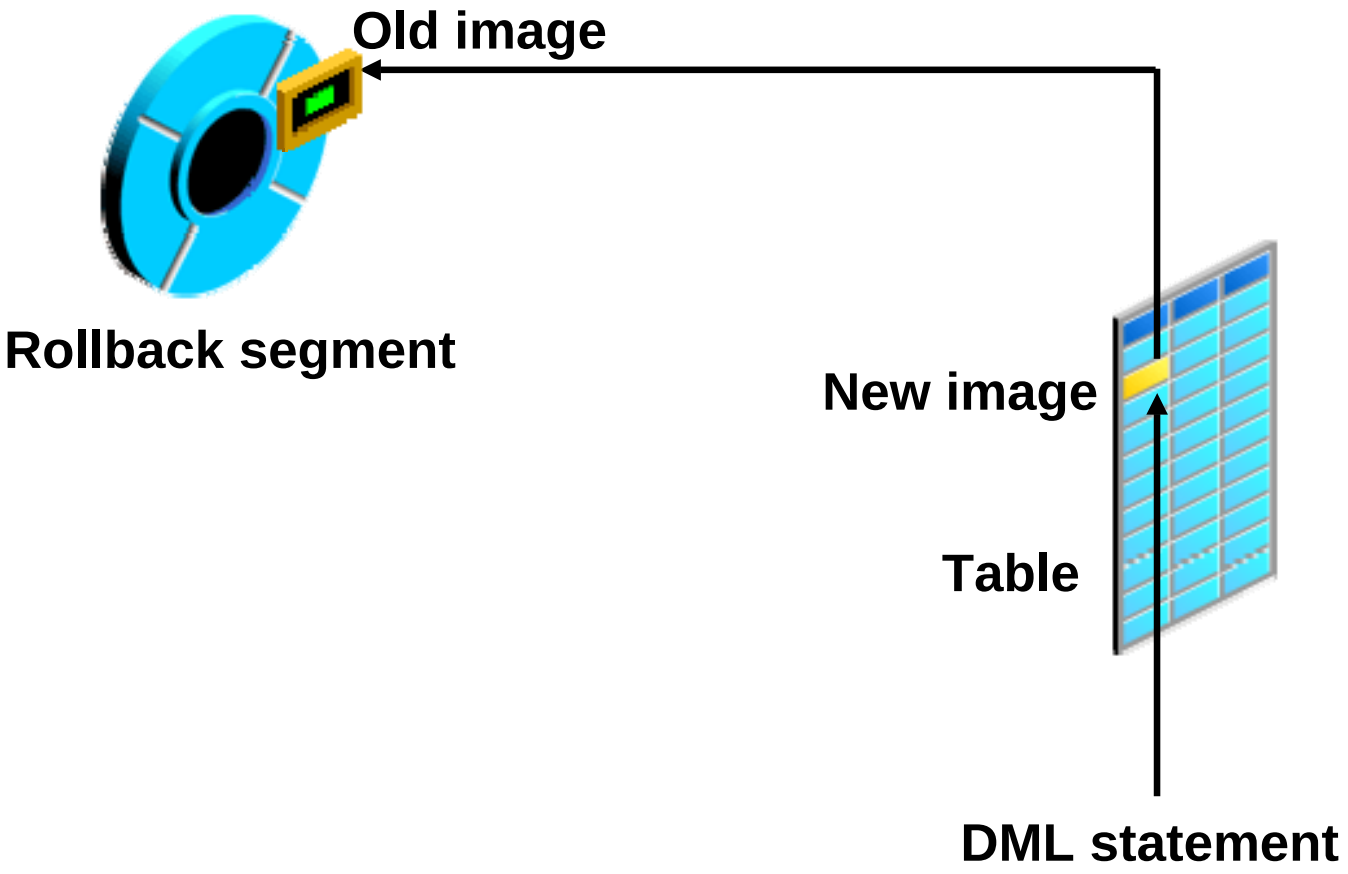
Processing a DML Statement



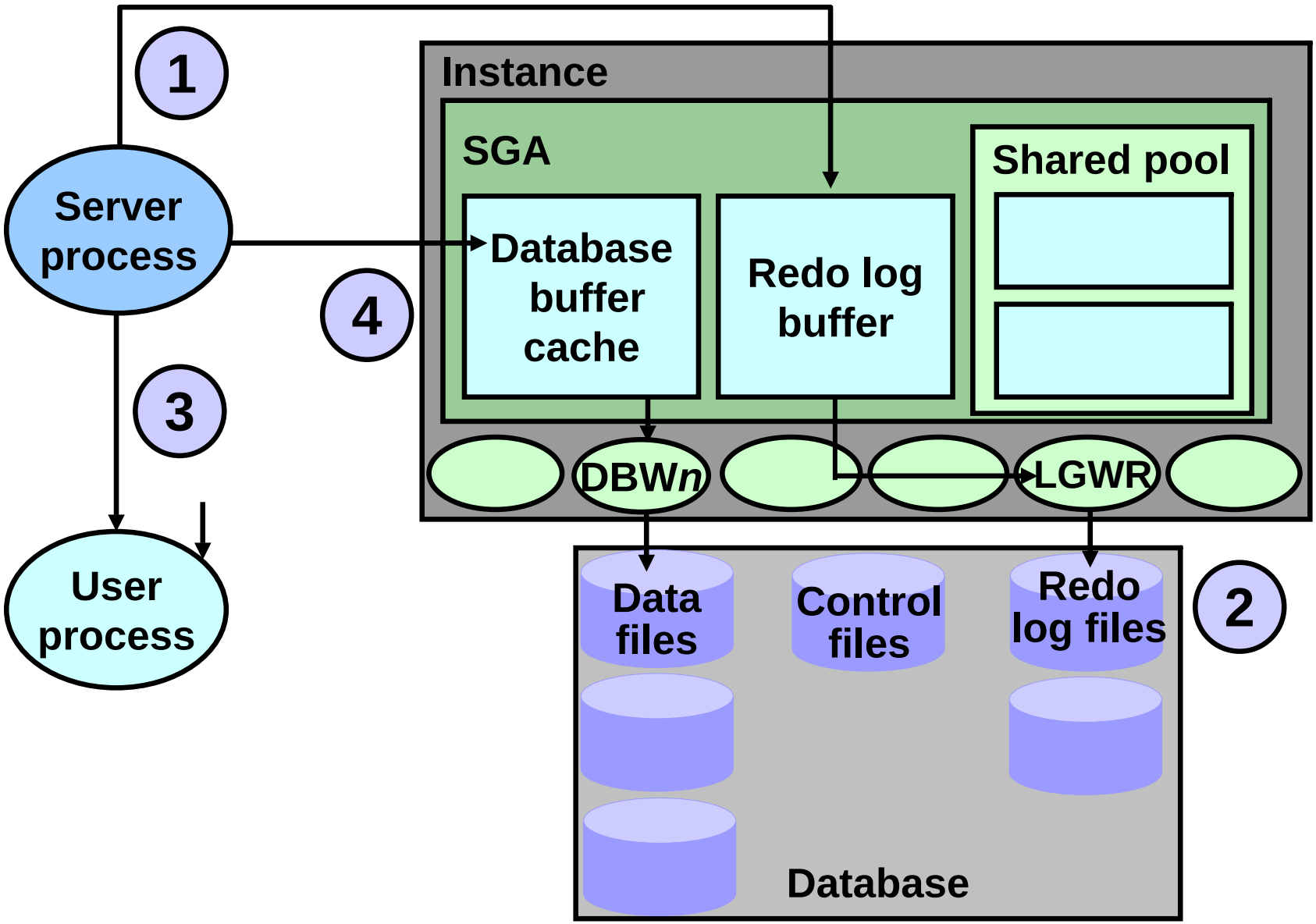
Redo Log Buffer

- Has its size defined by `LOG_BUFFER`
- Records changes made through the instance
- Is used sequentially
- Is a circular buffer

Rollback Segment



COMMIT Processing



Summary of the Oracle Database Architecture