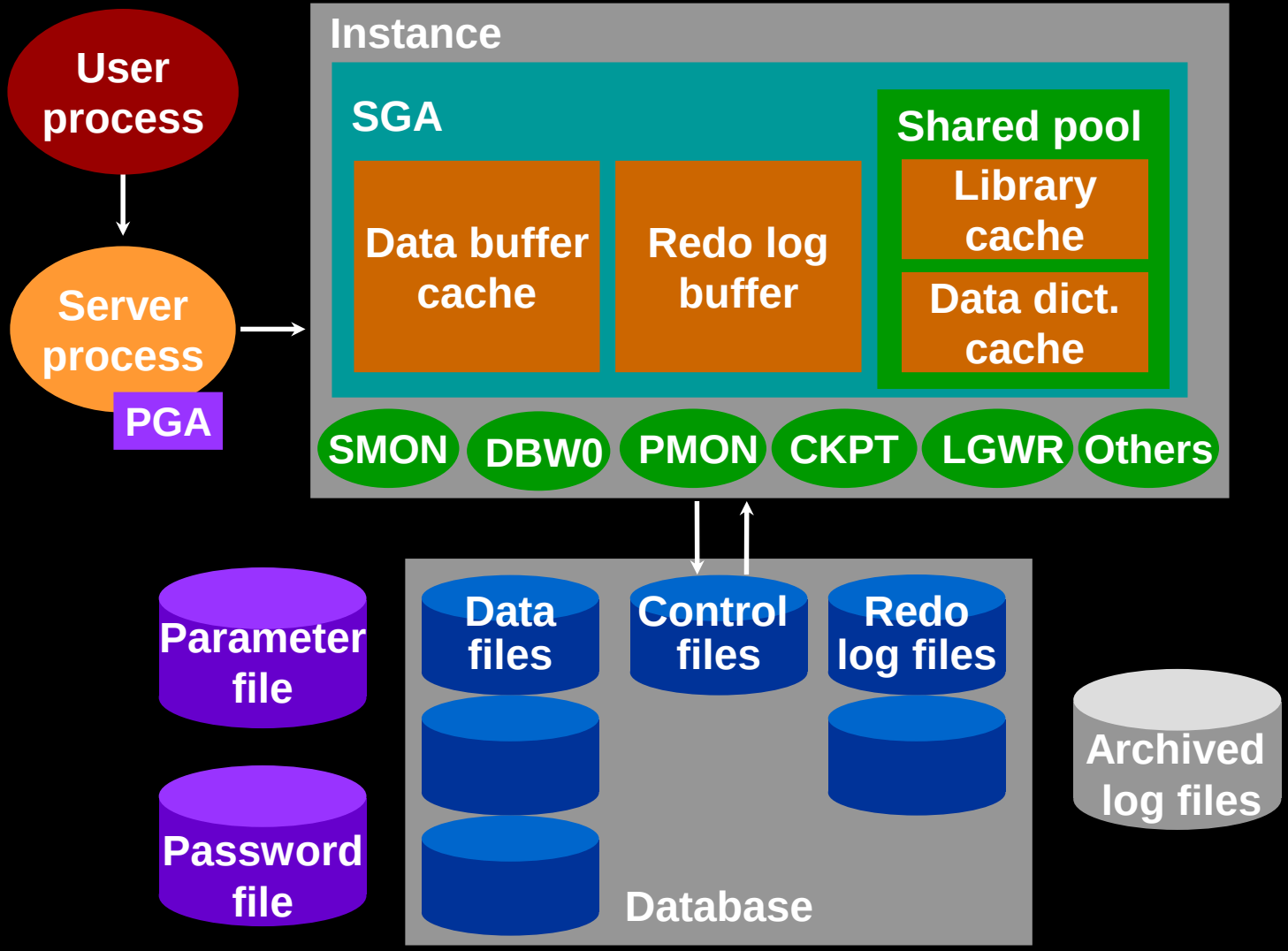
Oracle Architectural Components

Objectives

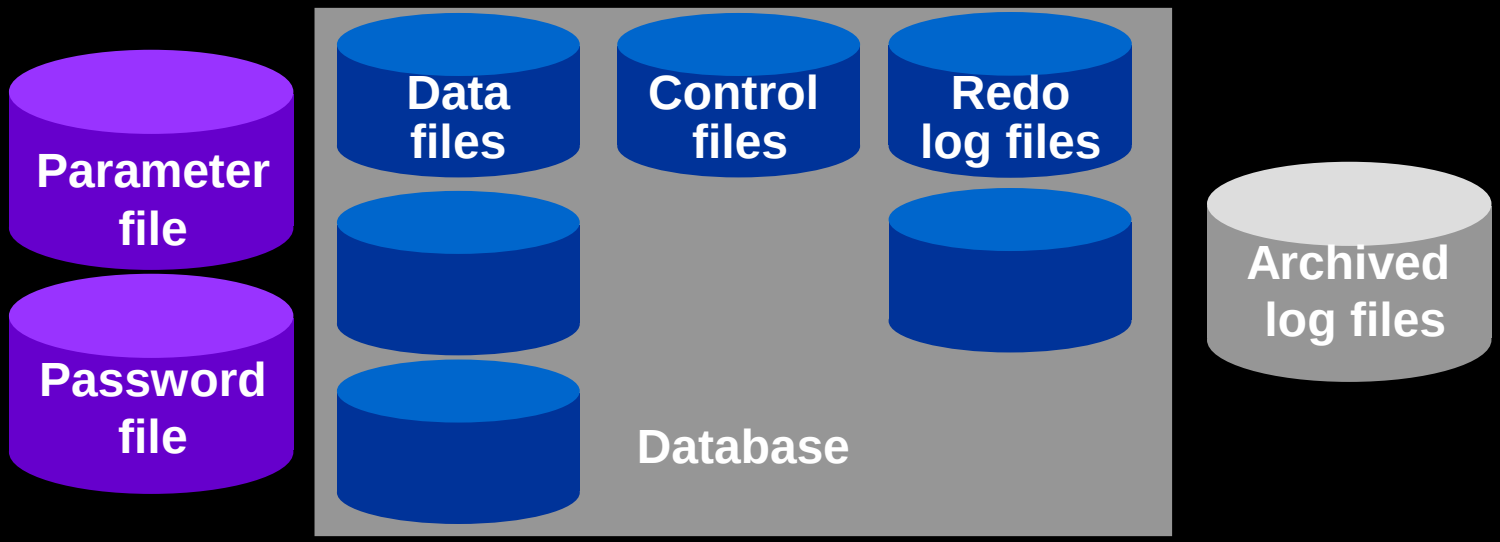
After completing this appendix, you should be able to do the following:

- Describe the Oracle Server architecture and its main components
- List the structures involved in connecting a user to an Oracle instance
- List the stages in processing:
  - Queries
  - DML statements
  - Commits

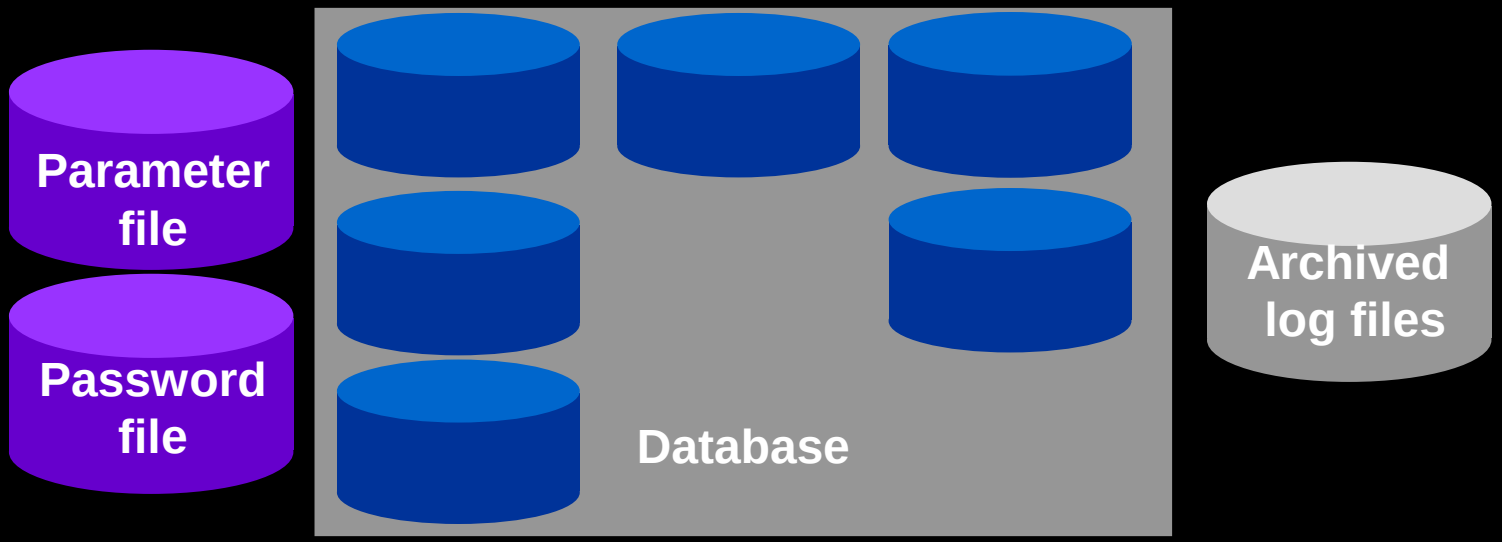
Overview



Oracle Database Files



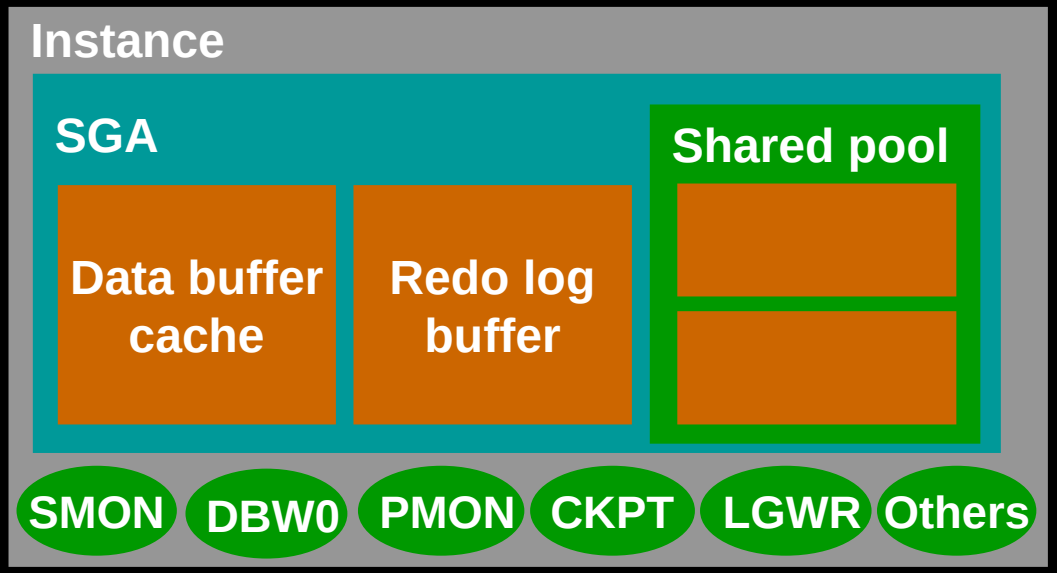
Other Key Physical Structures



Oracle Instance

An Oracle instance:

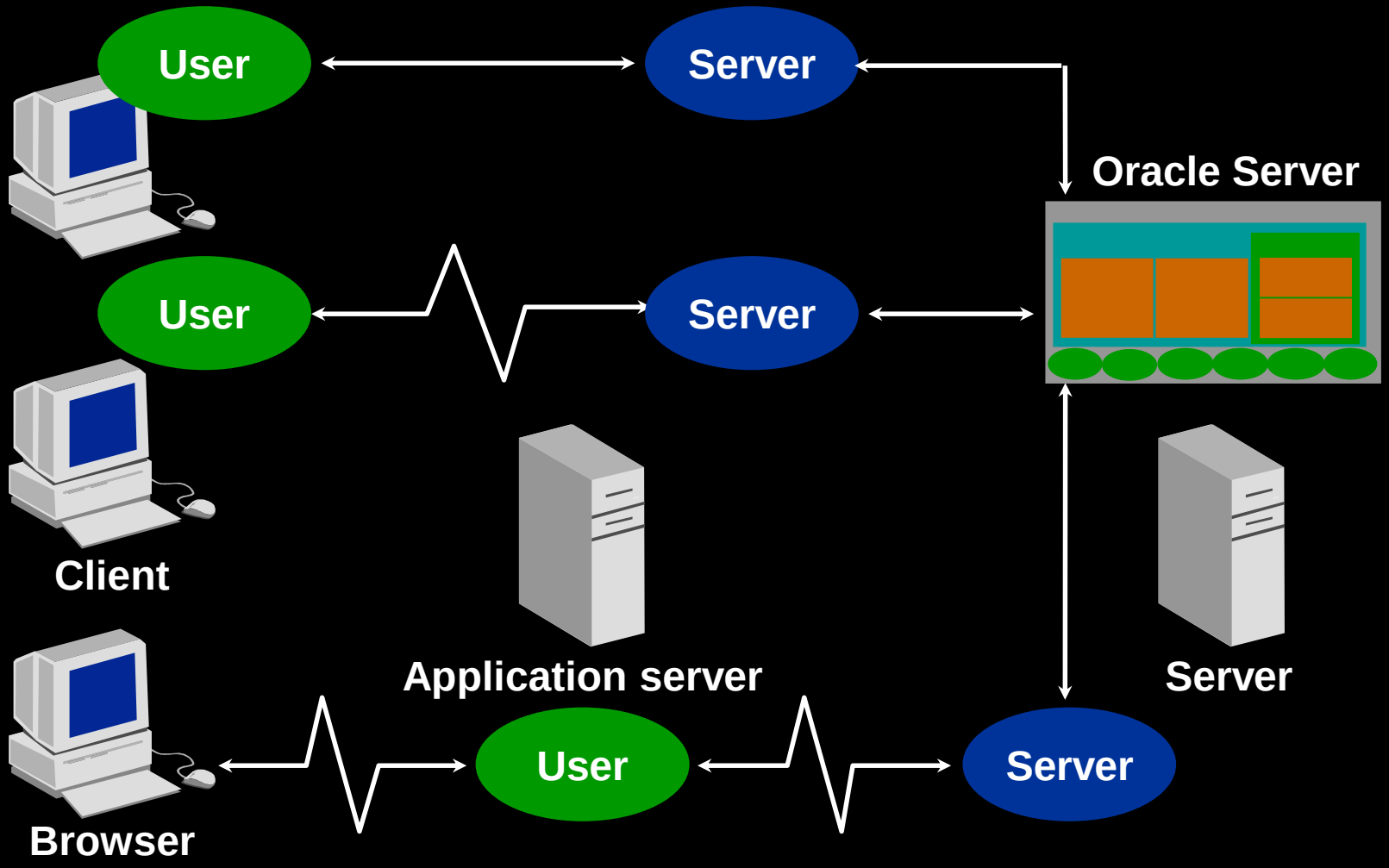
- Is a means to access an Oracle database
- Always opens one and only one database



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
  - DML statements log changes
  - Commit ensures transaction recovery
- Some Oracle Server components do not participate in SQL statement processing.

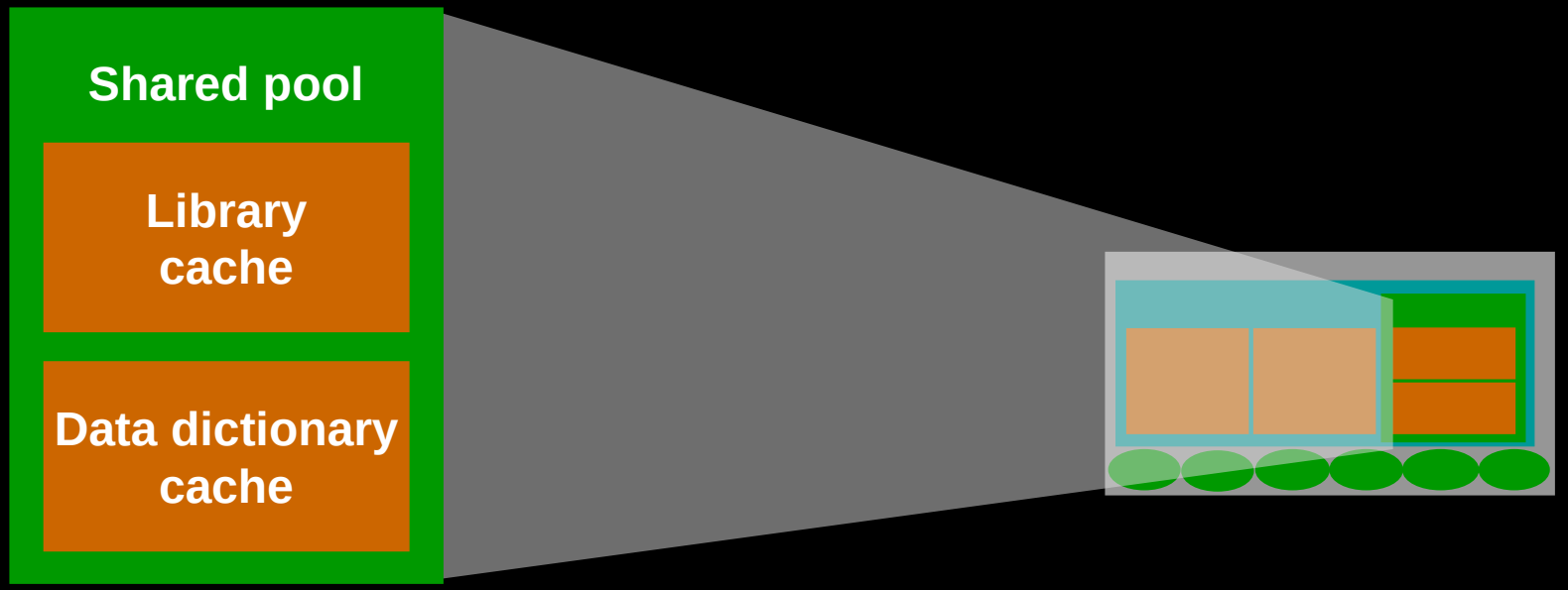
Connecting to an Instance



Processing a Query

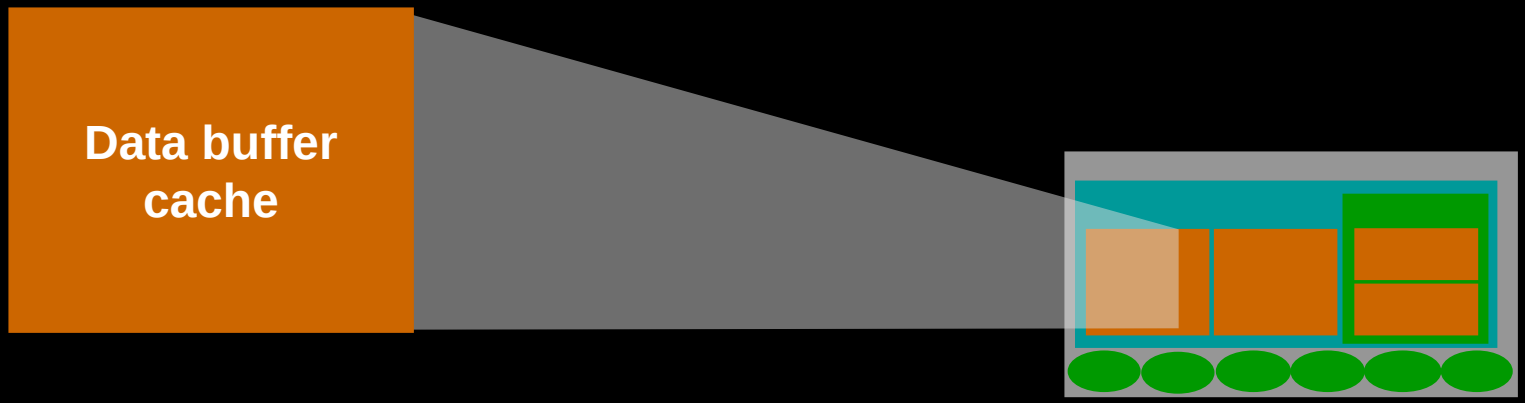
- **Parse:**
  - **Search for identical statement**
  - **Check syntax, object names, and privileges**
  - **Lock objects used during parse**
  - **Create and store execution plan**
- **Execute: Identify rows selected**
- **Fetch: Return rows to user process**

The 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`.

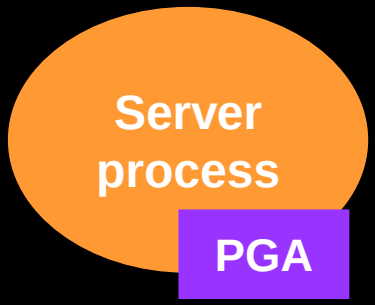
Database Buffer Cache



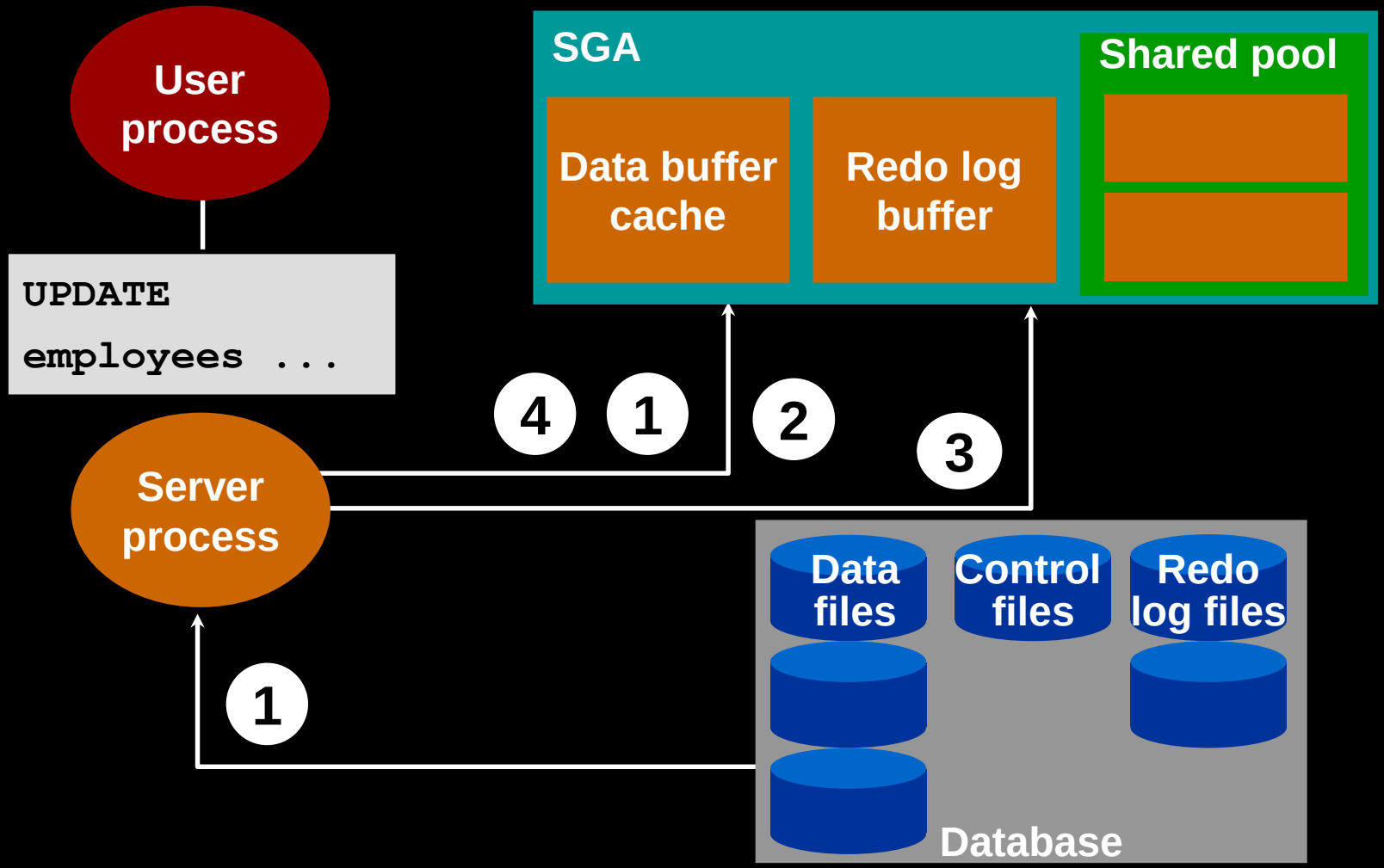
- Stores the most recently used blocks
- Size of a buffer based on `DB_BLOCK_SIZE`
- Number of buffers defined by `DB_BLOCK_BUFFERS`

Program Global Area (PGA)

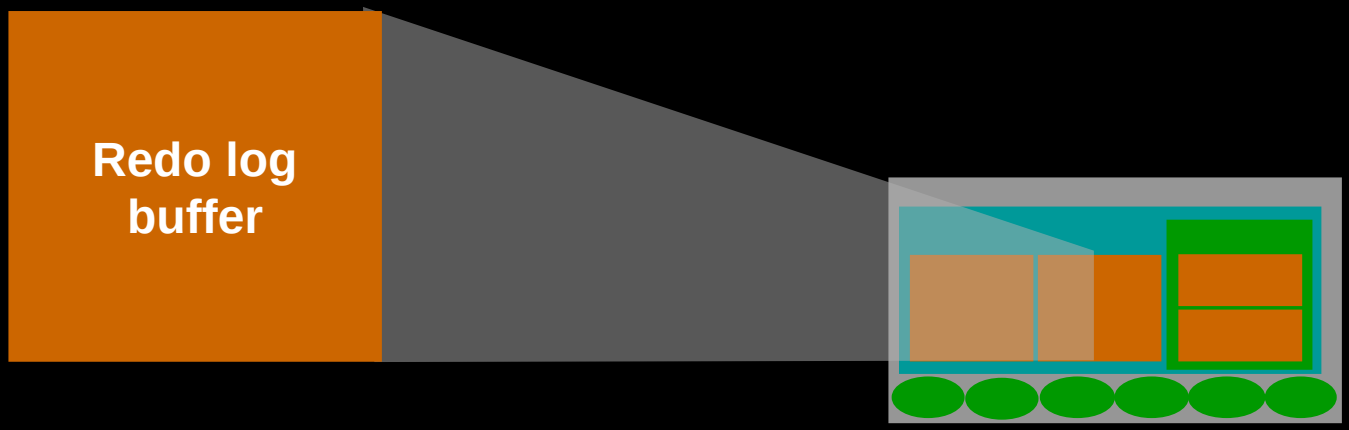
- Not shared
- Writable only by the server process
- Contains:
  - Sort area
  - Session information
  - Cursor state
  - Stack space



Processing a DML Statement

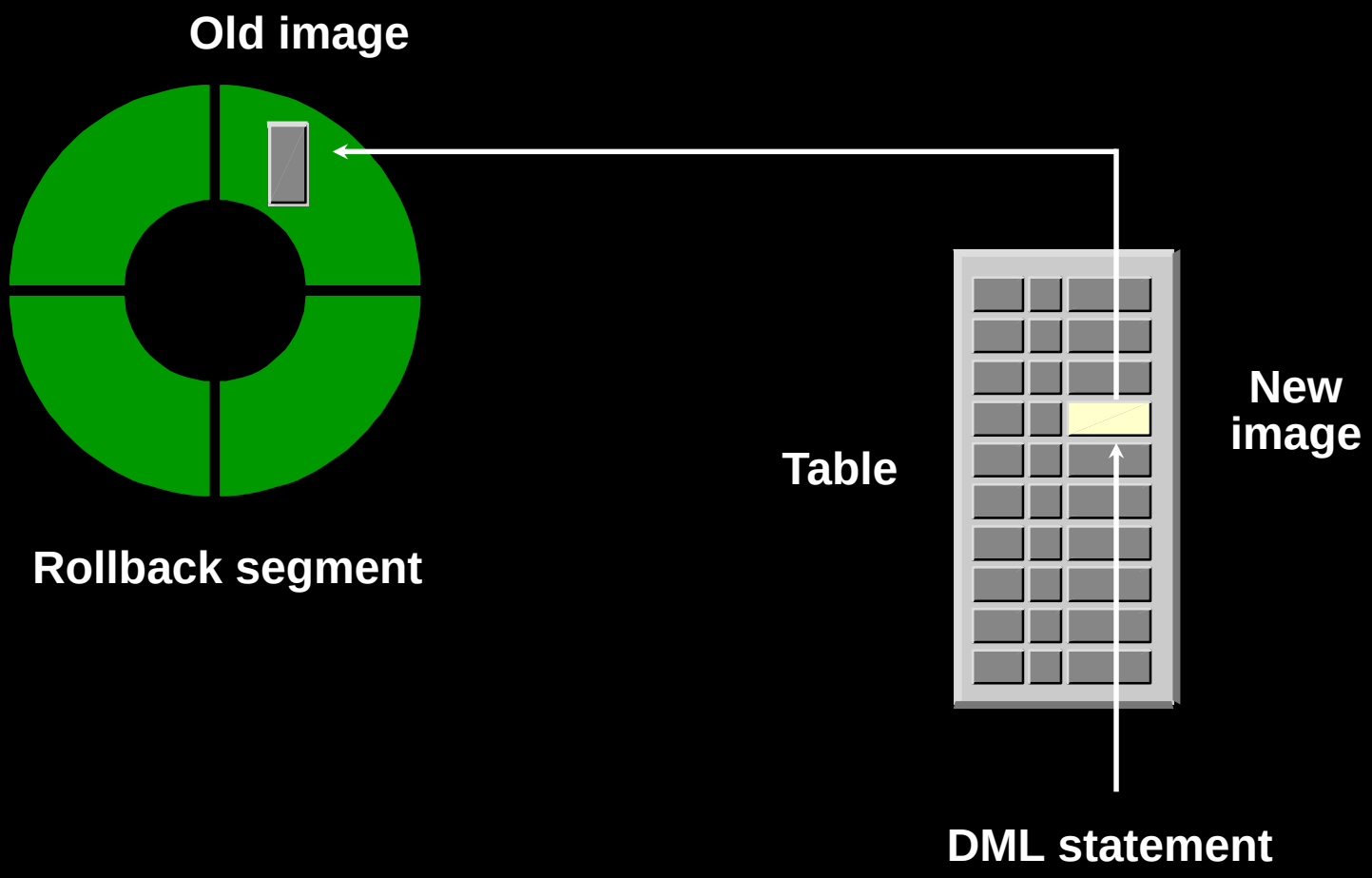


Redo Log Buffer

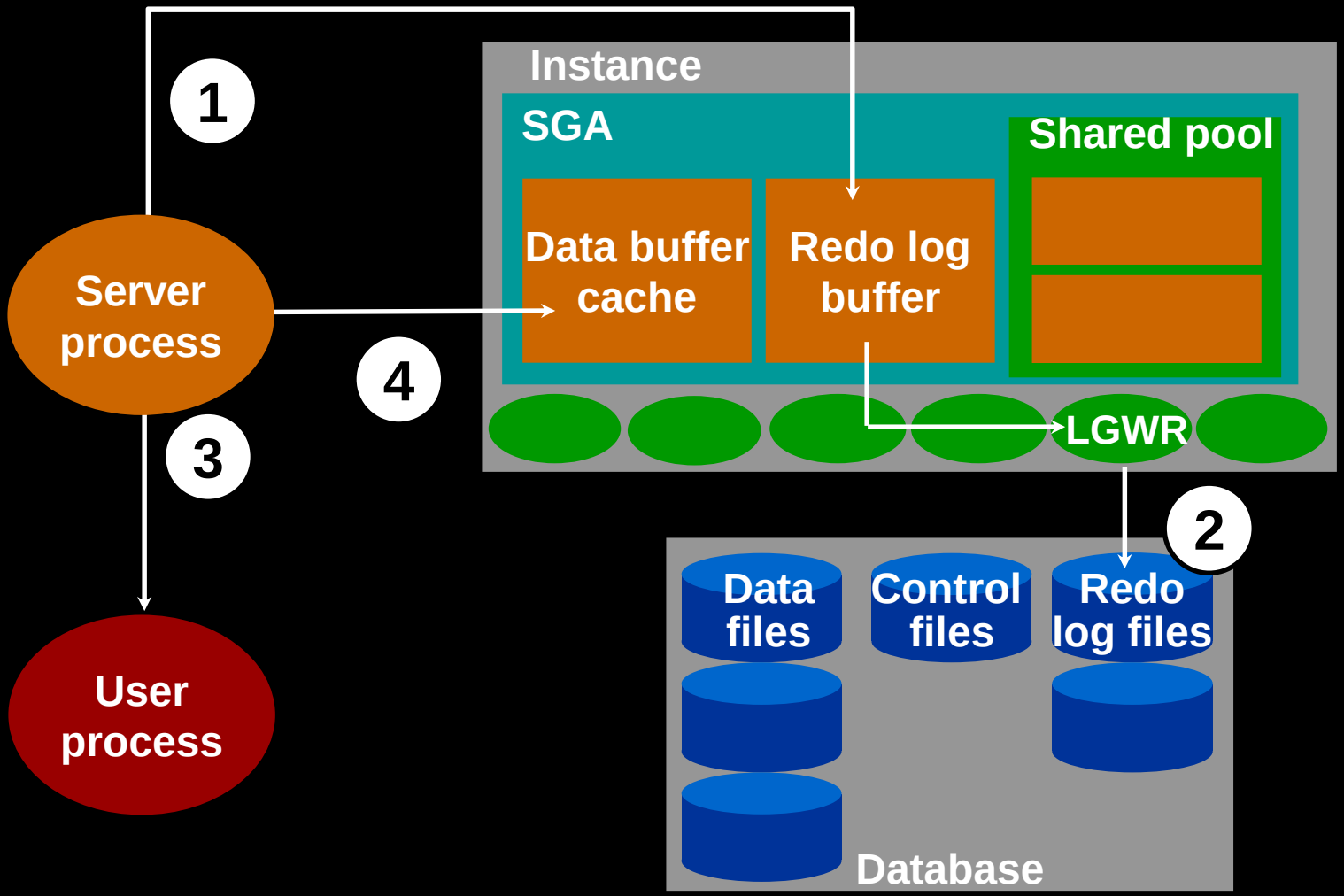


- Has its size defined by `LOG_BUFFER`
- Records changes made through the instance
- Is used sequentially
- Is a circular buffer

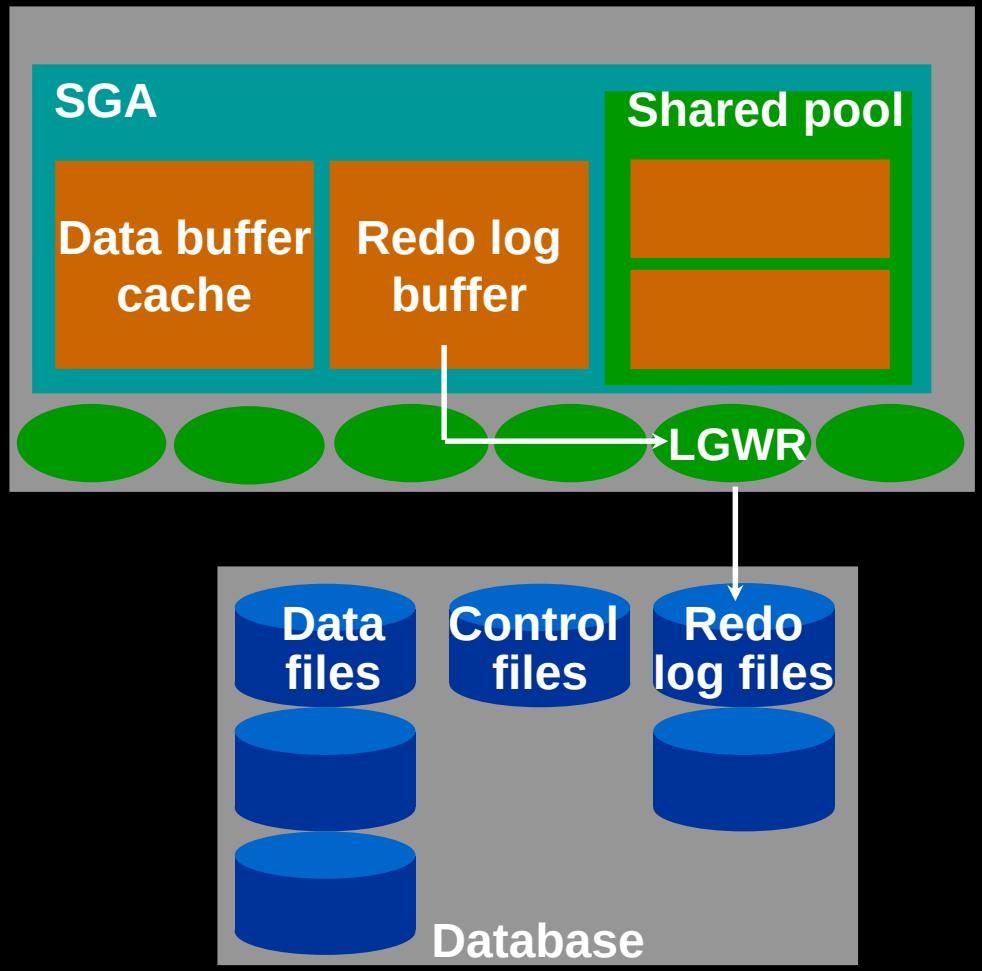
Rollback Segment



COMMIT Processing



Log Writer (LGWR)



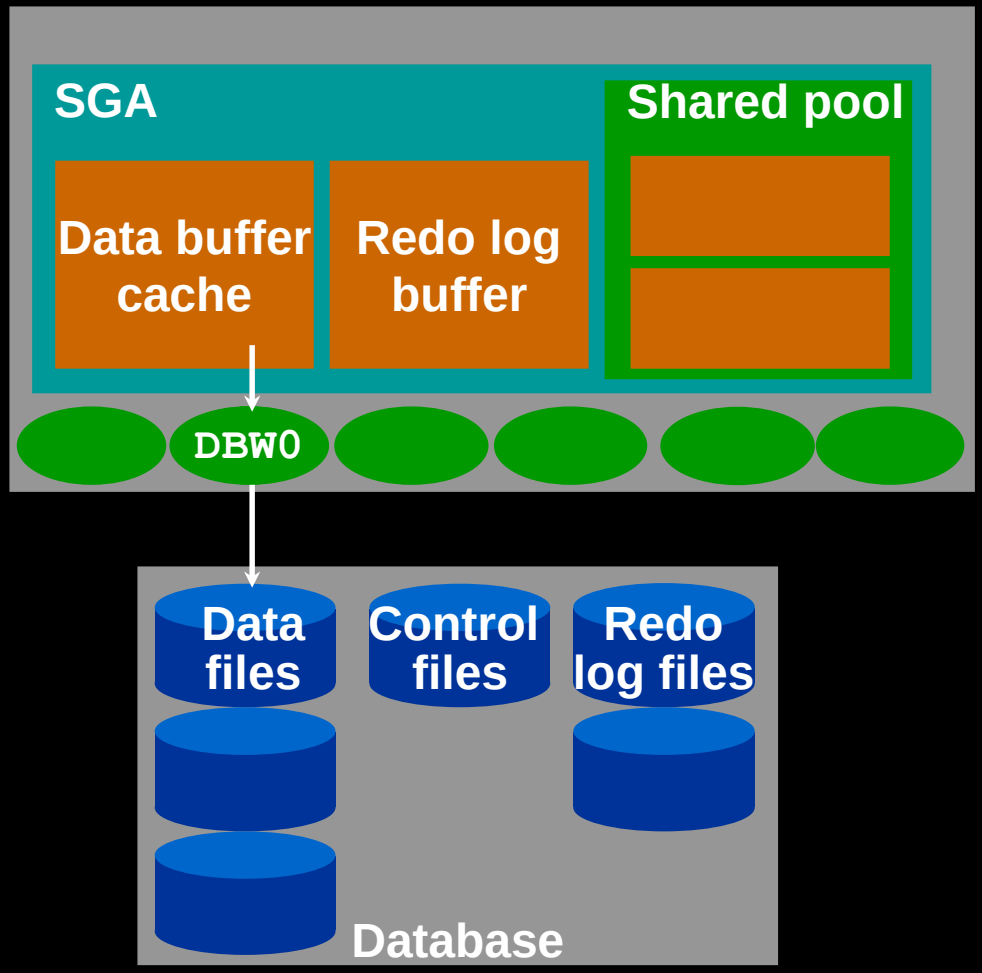
LGWR writes when:

- There is a COMMIT
- The redo buffer log is one-third full
- There is more than 1 MB of redo
- Before DBW0 writes

Other Instance Processes

- Other required processes:
  - Database Writer (DBW0)
  - Process Monitor (PMON)
  - System Monitor (SMON)
  - Checkpoint (CKPT)
- The archive process (ARC0) is usually created in a production database

Database Writer (DBW0)



DBW0 writes when:

- There are many dirty buffers
- There are few free buffers
- Timeout occurs
- Checkpoint occurs

SMON: System Monitor

- Automatically recovers the instance:
  - Rolls forward changes in the redo logs
  - Opens the database for user access
  - Rolls back uncommitted transactions
- Coalesces free space
- Deallocates temporary segments

PMON: Process Monitor

Cleans up after failed processes by:

- Rolling back the transaction
- Releasing locks
- Releasing other resources

Summary

In this appendix, you should have learned how to:

- Identify database files: data files, control files, online redo logs
- Describe SGA memory structures: DB buffer cache, shared SQL pool, and redo log buffer
- Explain primary background processes: `DBW0`, `LGWR`, `CKPT`, `PMON`, `SMON`, and `ARC0`
- List SQL processing steps: parse, execute, fetch

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