

Oracle Database Architecture

Oracle 10g

Outline

■ Database vs. Instance

■ Database

- ❑ Logical Storage Structures
 - Tablespaces, Blocks, Extents, Segments
- ❑ Physical Storage Structures
 - Datafiles, Redo Log Files, Control Files, Archived Log Files, Initialization Parameter Files, Password Files

■ Instance

- ❑ Oracle Memory Structures
 - System Global Area , Program Global Area
- ❑ Oracle Back-Ground Processes

■ Grid

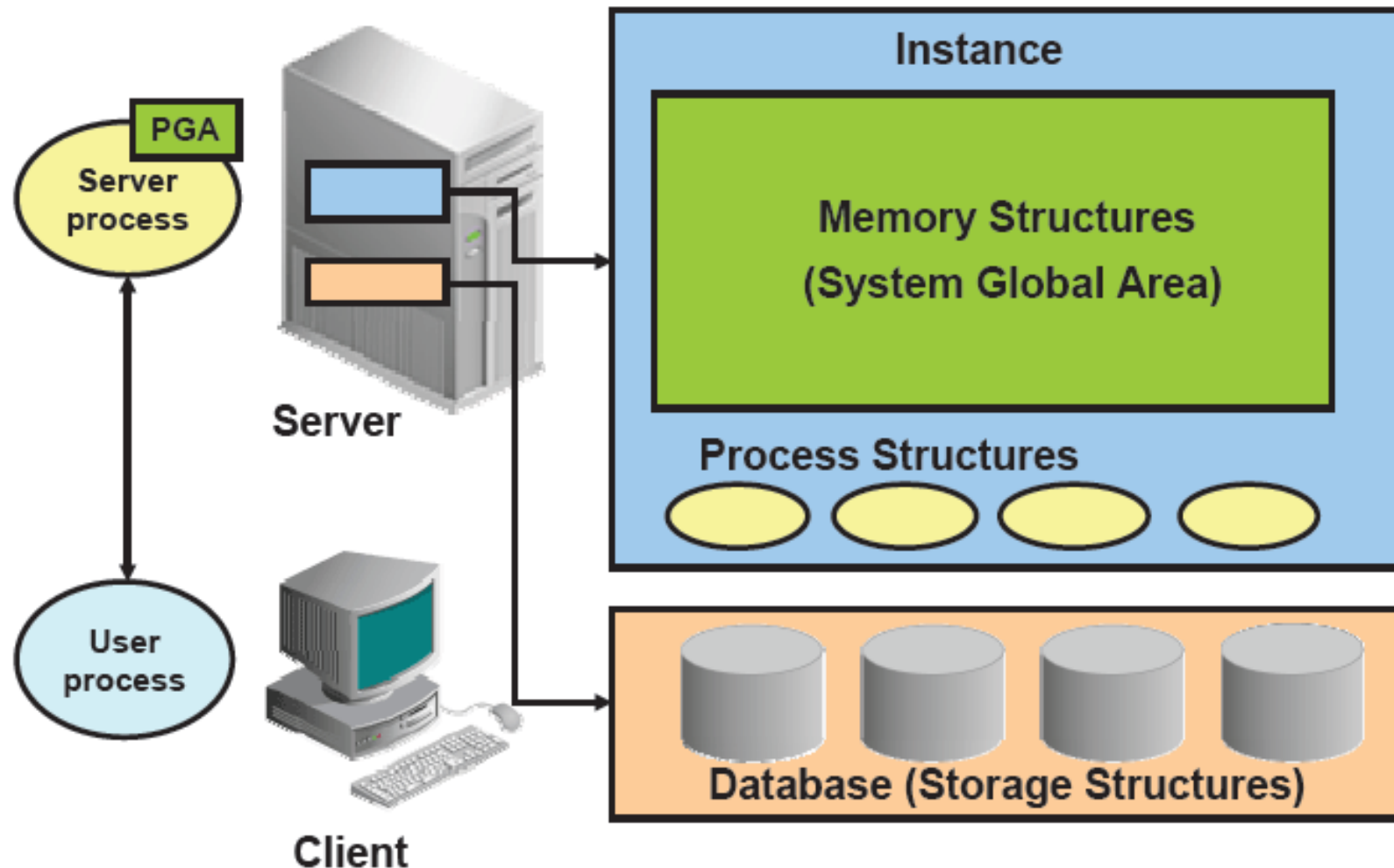
Connecting to a Server

- A database user can connect to an Oracle server in one of three ways:
 - ❑ Same machine
 - ❑ client/server
 - ❑ Multi-tier



Oracle Database Server Architecture

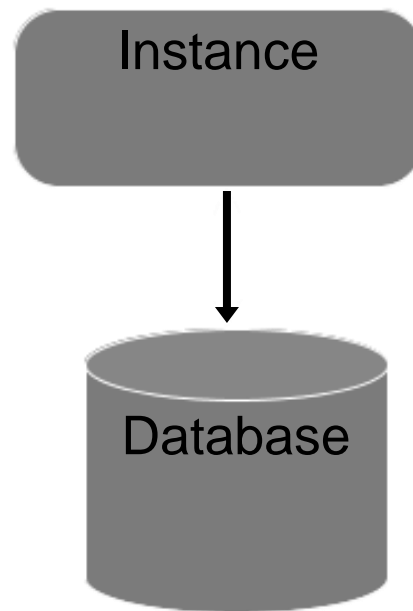
INSTANCE – Non-persistent, memory-based processes and structures



DATABASE – Persistent, disk-based data and control files

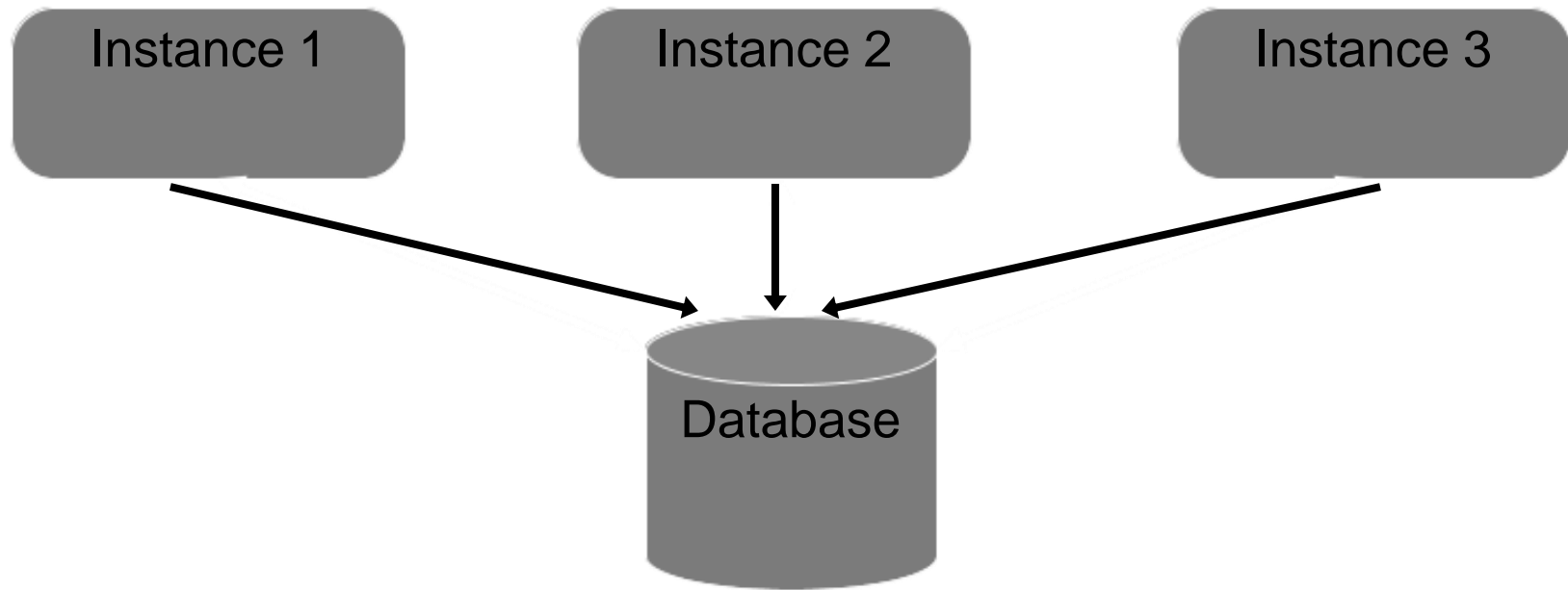
Single Instance

- Most Oracle installations consist of only a single “Instance” and single “Database”



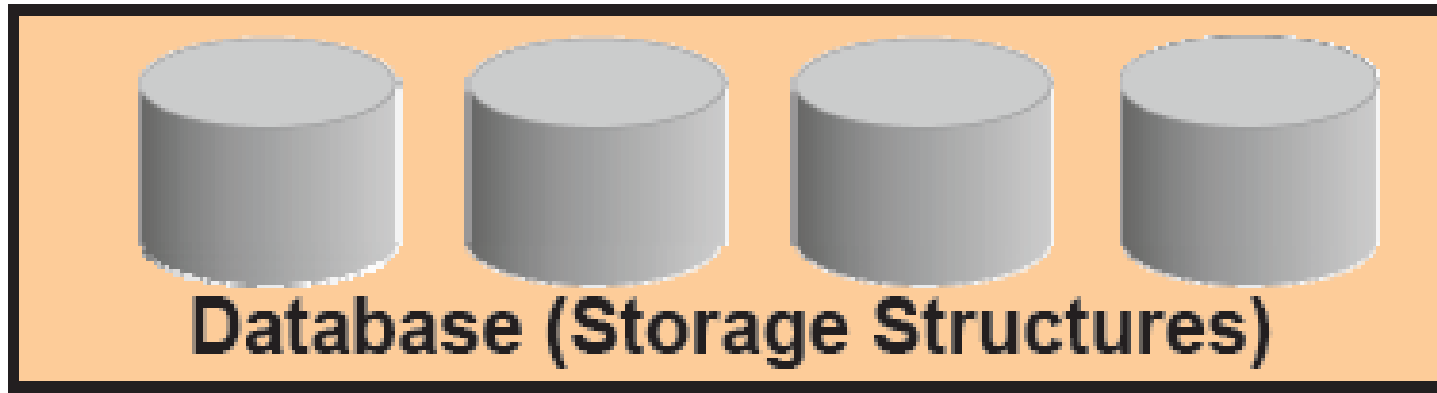
Oracle RAC

- Oracle “Real Application Clusters” allow multiple “Instances” to interact with a single “Database” to provide high availability



“Database” a Little Closer

- An Oracle Database...
 - Is a collection of data that is treated as a unit
 - Consists of different file types



Database Storage Architecture



Control files



Data files



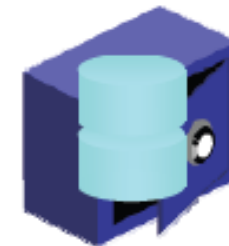
Online redo log files



Parameter file



Backup files



Archived redo log files

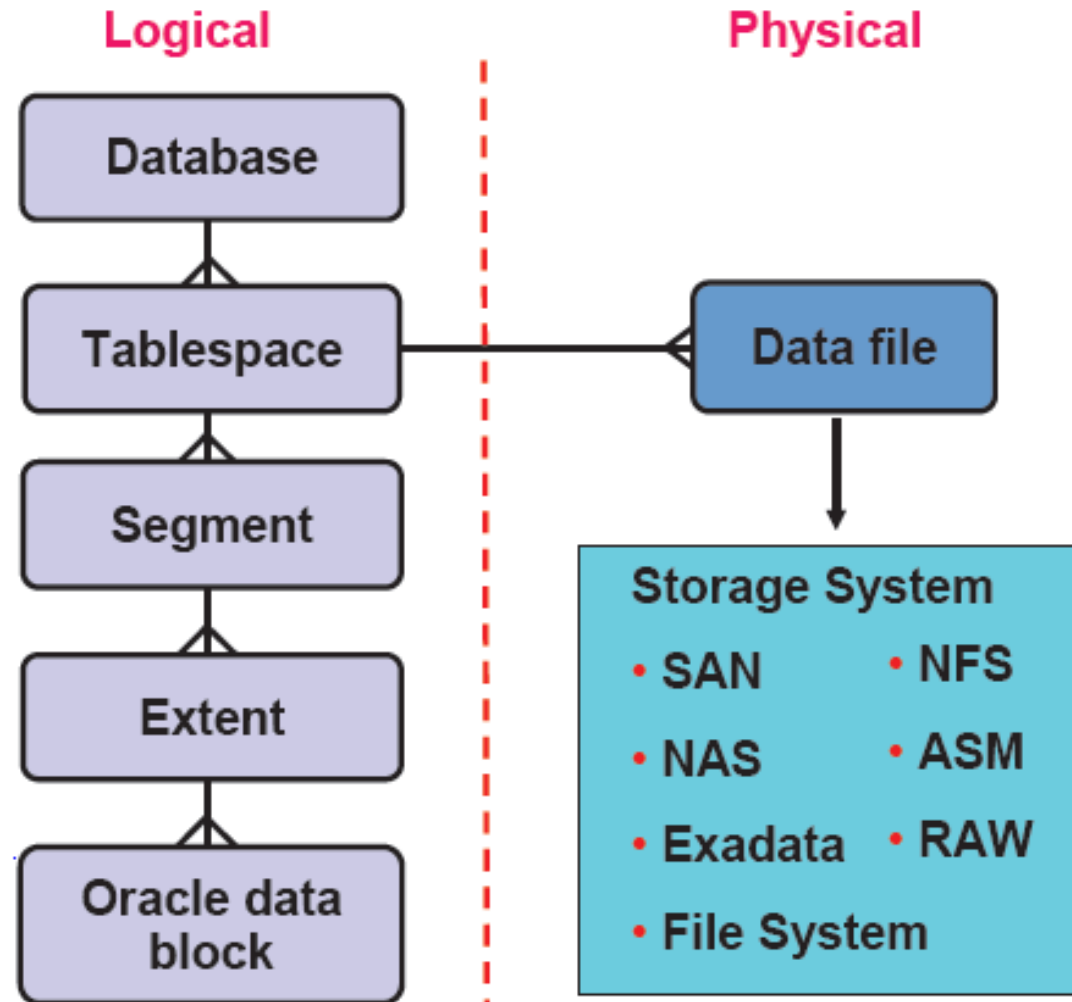


Password file



Alert log and trace files

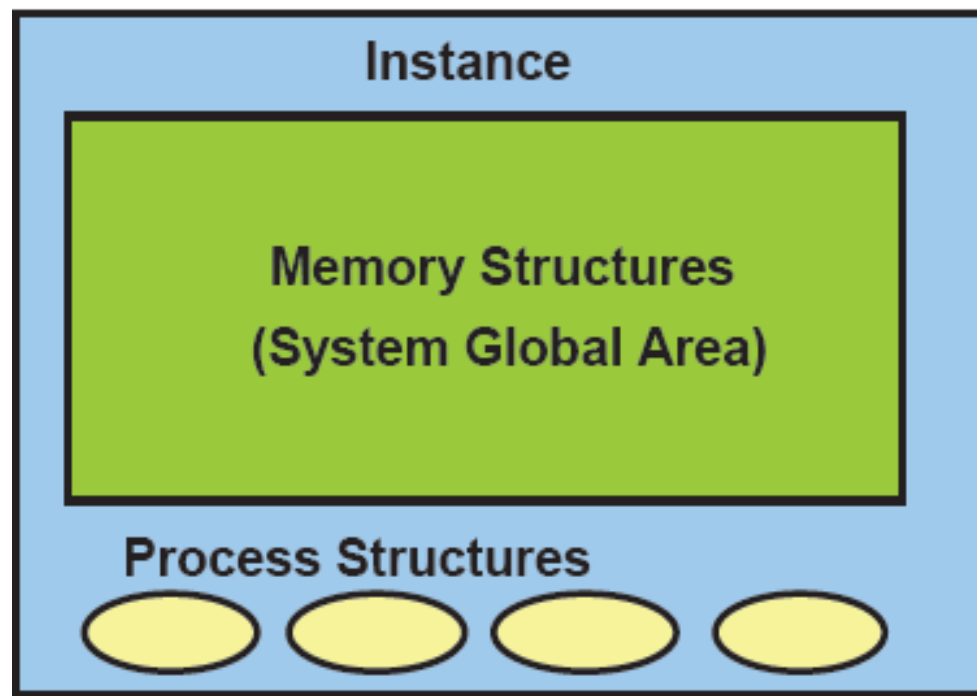
Logical and Physical Database Structures



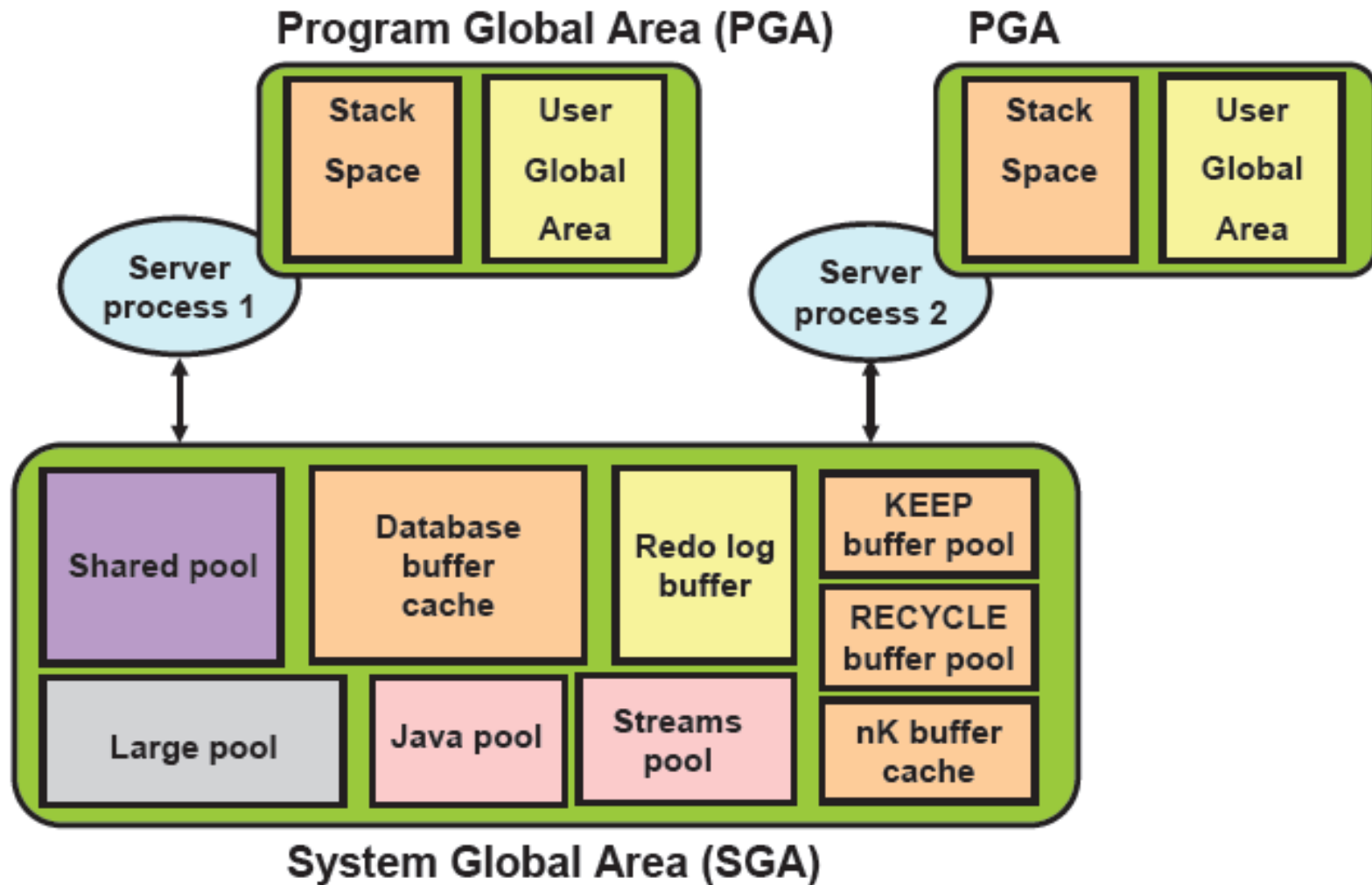
“Instance” a Little Closer

■ An Oracle Instance...

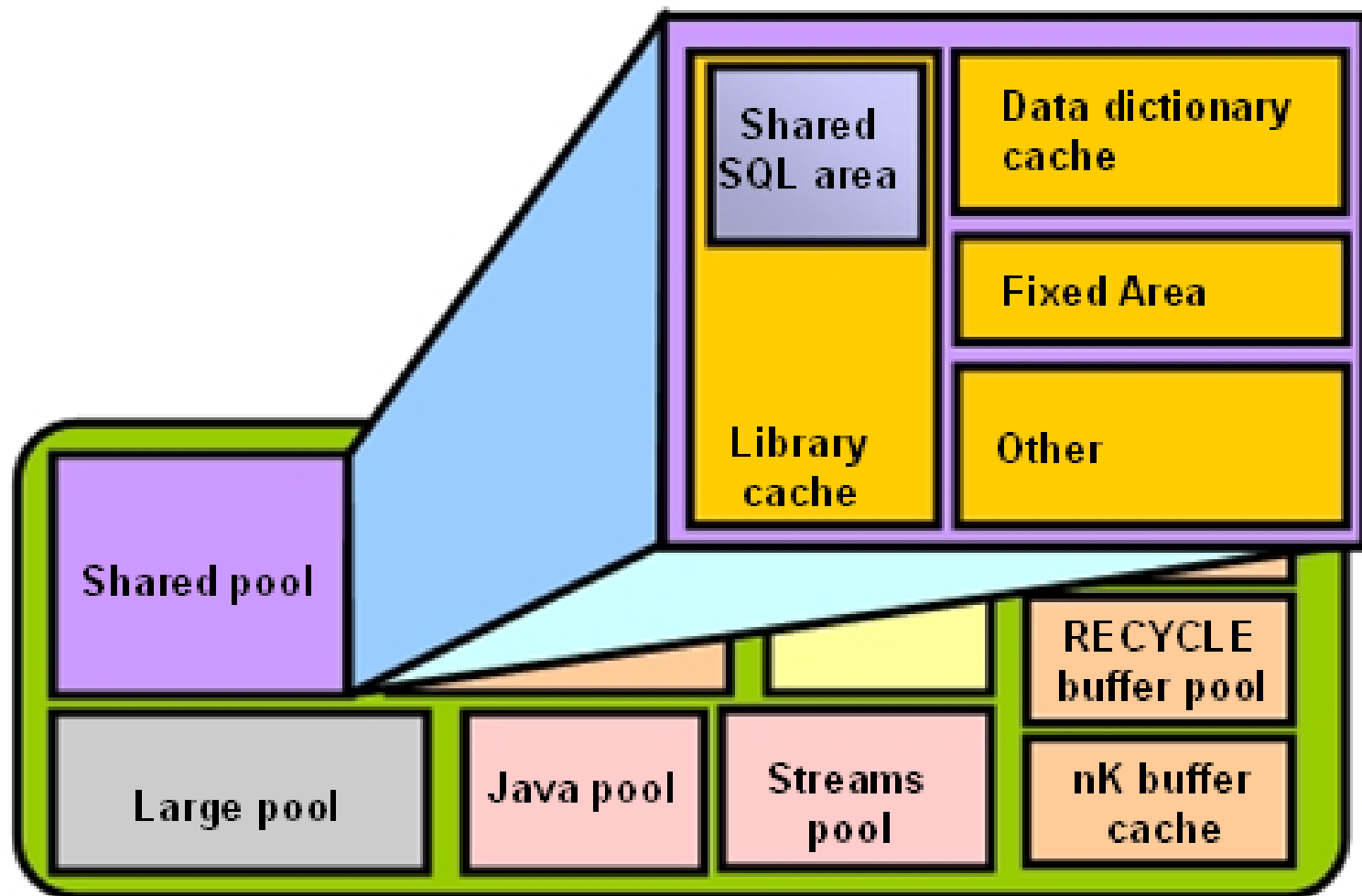
- Is a means to access an Oracle Database
- Always opens one and only one Database
- Consists of memory and background process structures



Oracle Database Memory Structures



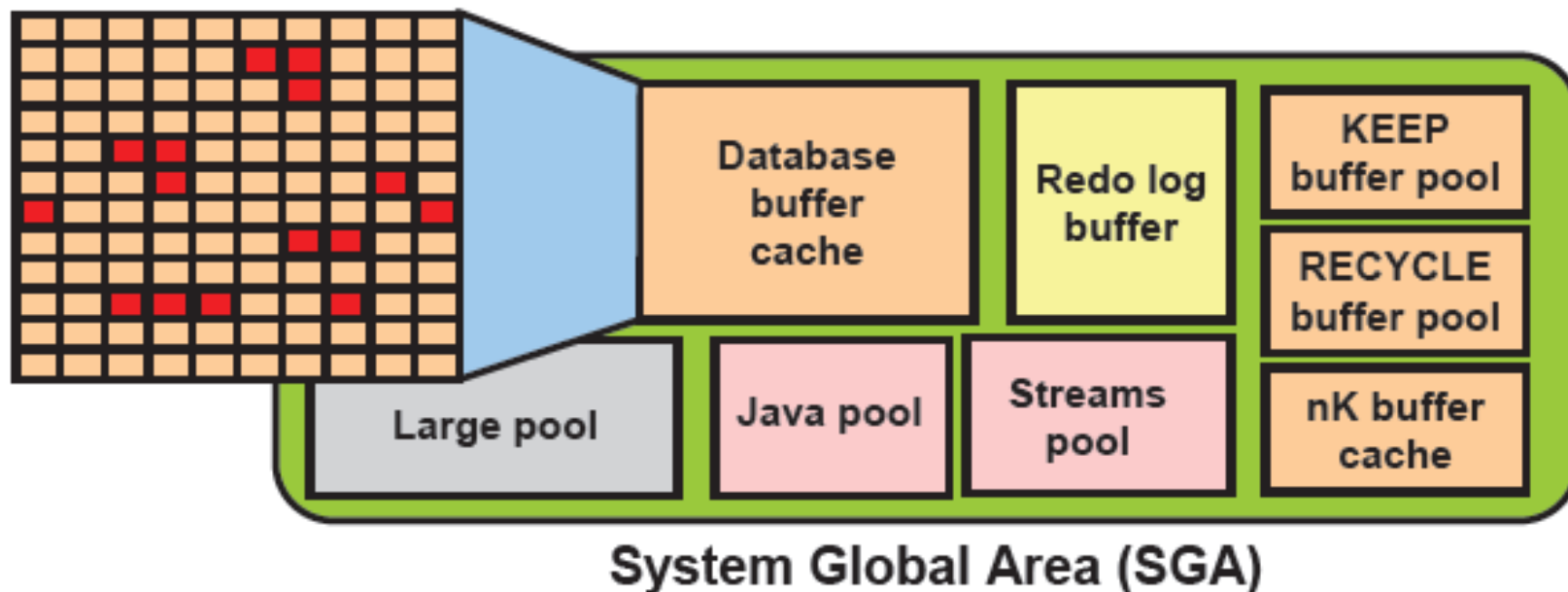
SGA: Shared Pool



System Global Area (SGA)

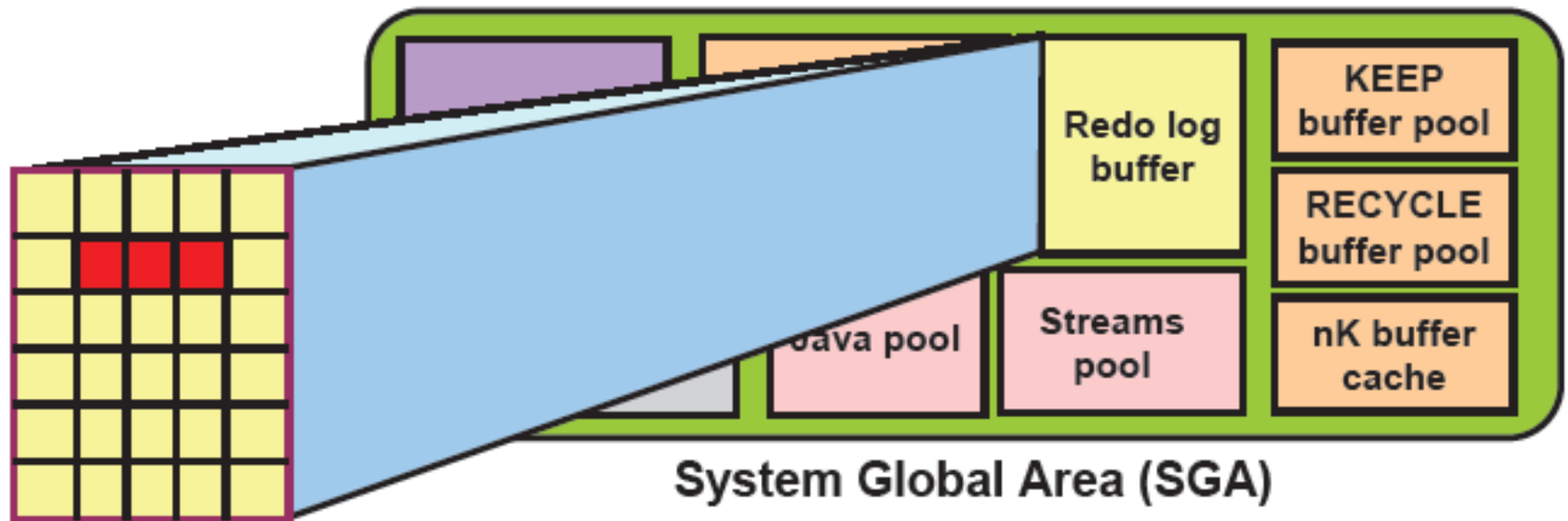
SGA: Database Buffer Cache

- Holds copies of data blocks that are read from data files
- Is shared by all concurrent users



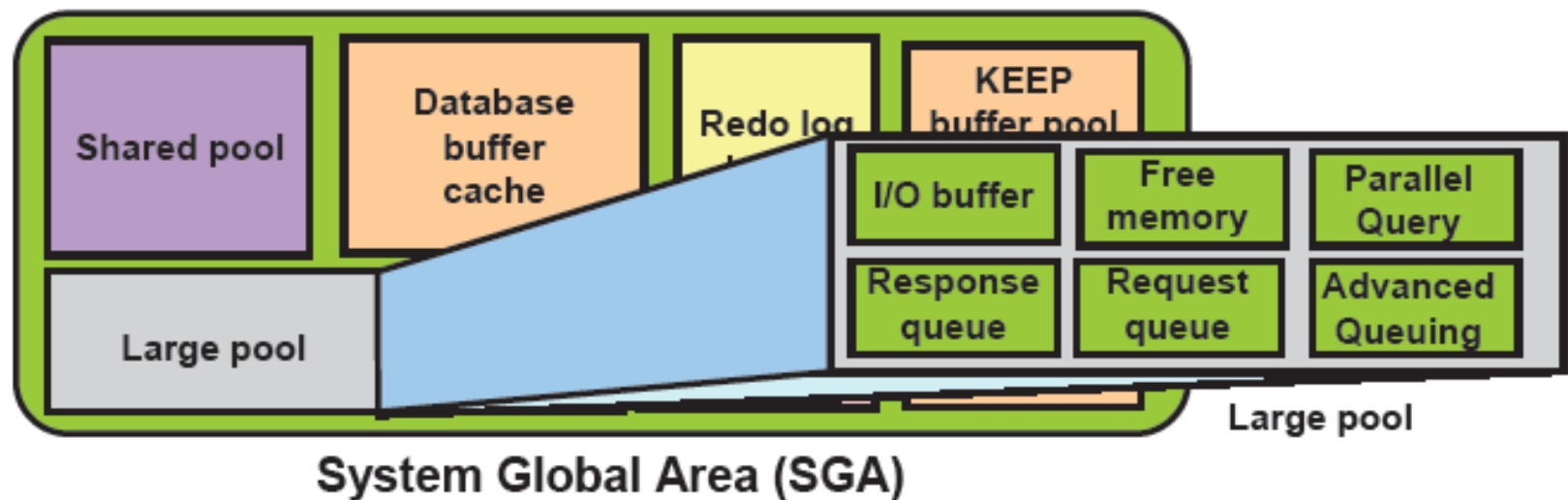
SGA: Redo Log Buffer

- Is a circular buffer in the SGA
- Holds information about changes made to the database
- Contains redo entries that have the information to redo
- changes made by operations such as DML and DDL



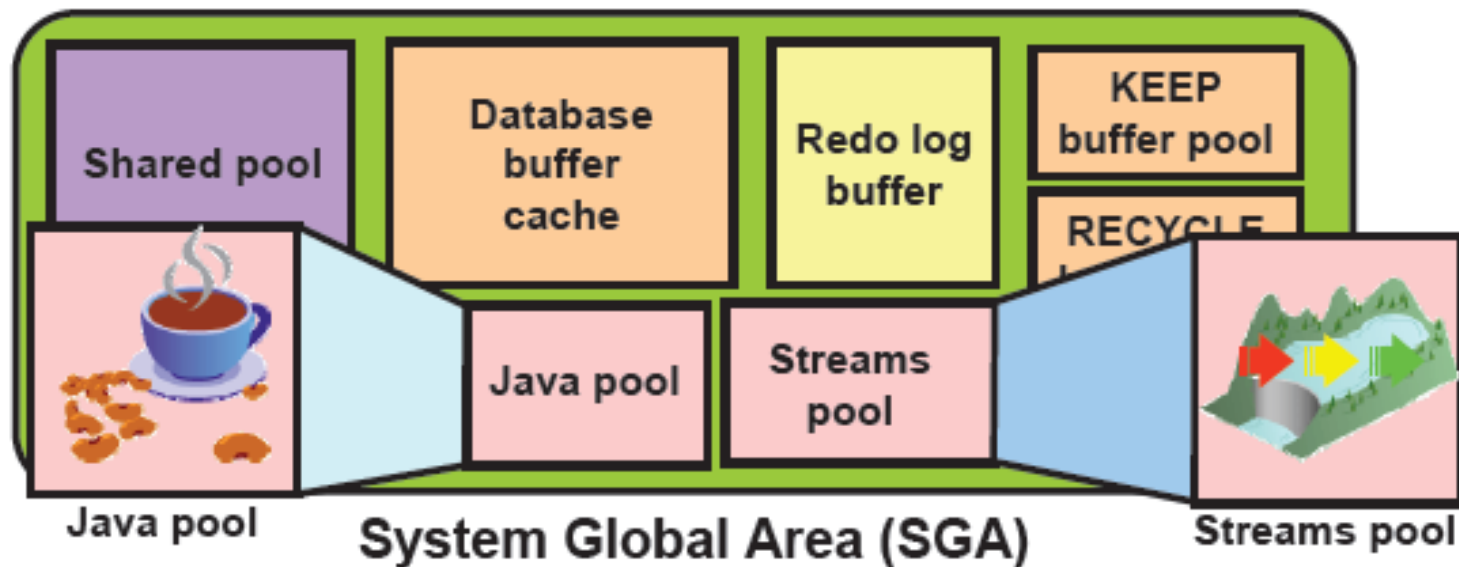
SGA: Large Pool

- Provides large memory allocations for:
 - ❑ Session memory for the shared server and the Oracle XA interface
 - ❑ I/O server processes
 - ❑ Oracle Database backup and restore operations

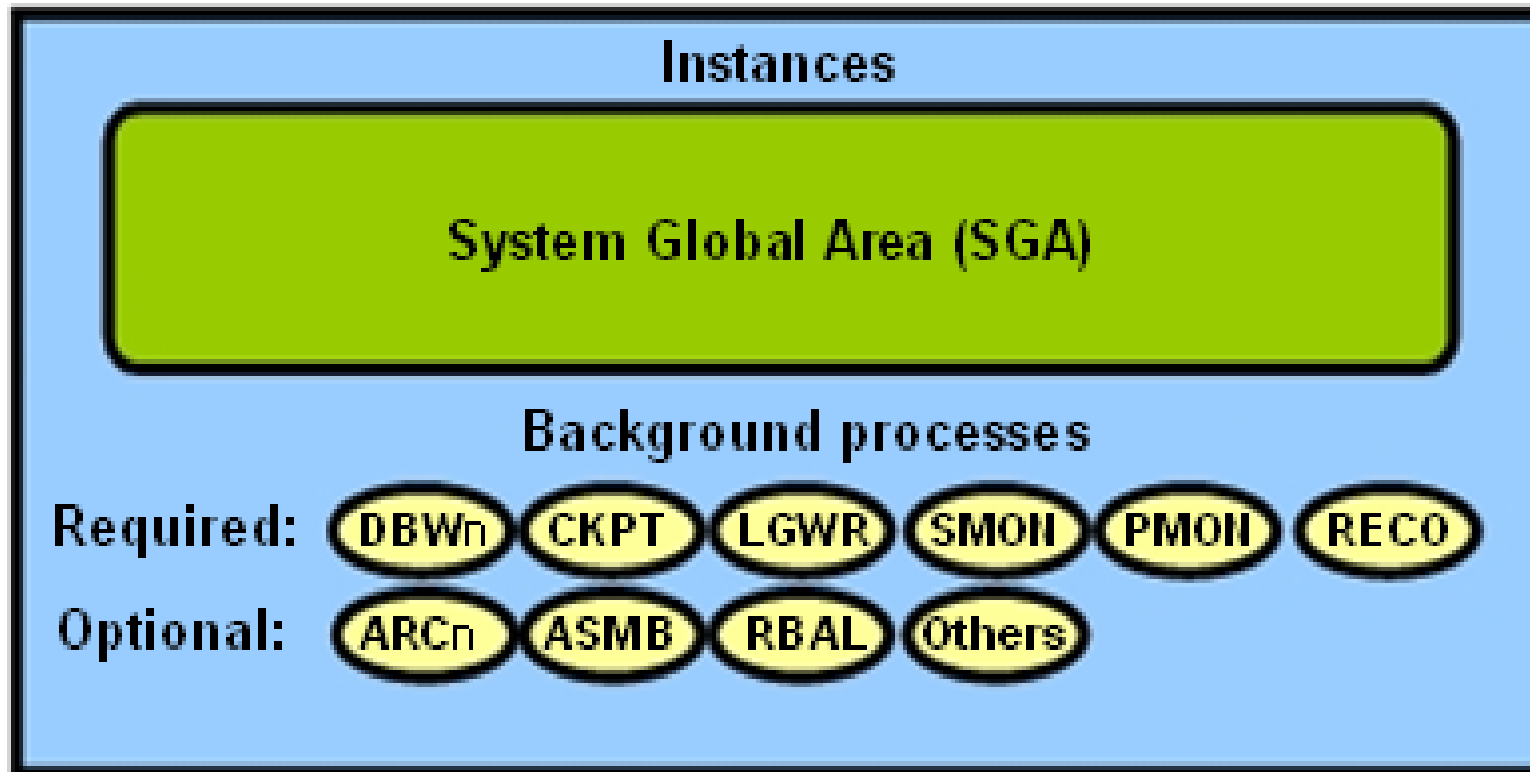


SGA: Java Pool and Streams Pool

- Java pool memory is used to store all session-specific Java code and data in the JVM.
- Streams pool memory is used exclusively by Oracle Streams to:
 - ❑ Store buffered queue messages
 - ❑ Provide memory for Oracle Streams processes

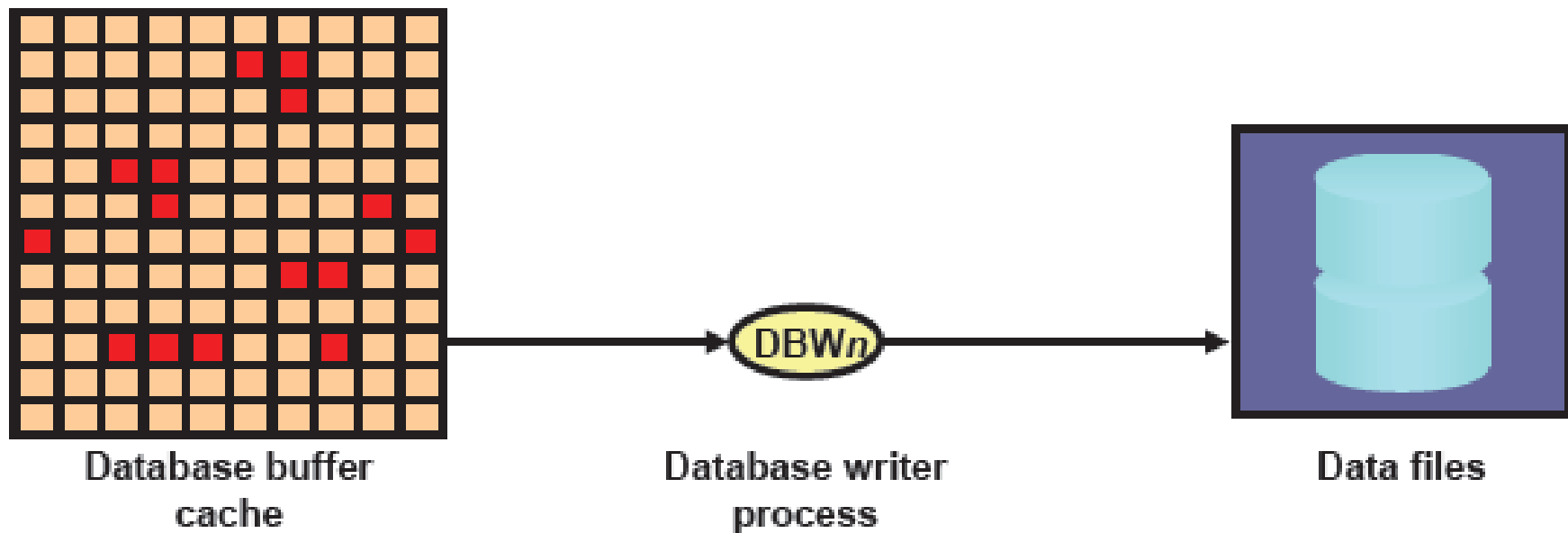


Oracle Database Background Processes



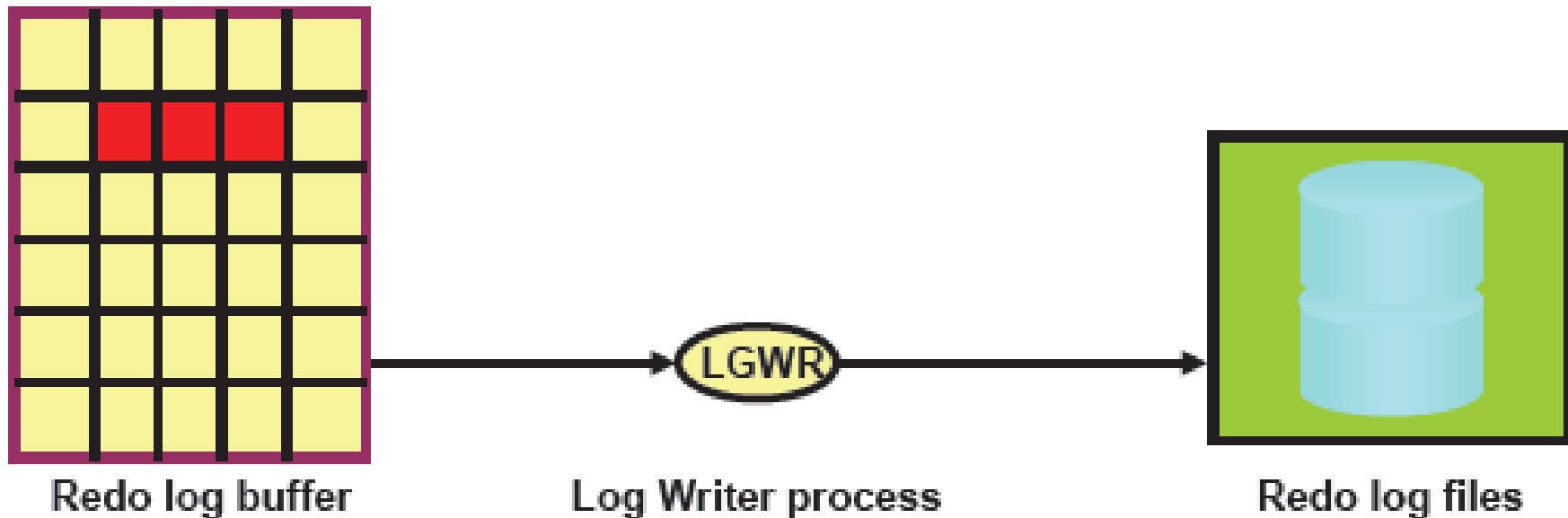
BP: Database Writer Process (DBWn)

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



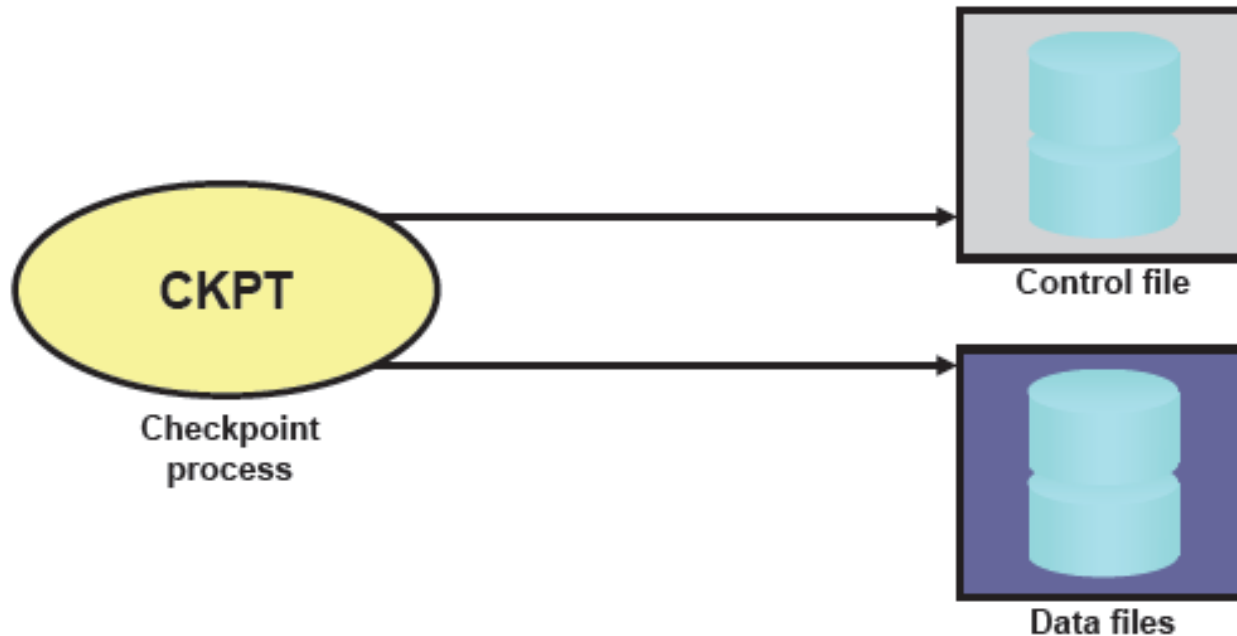
BP: Log Writer Process (LGWR)

- Writes the redo log buffer to a redo log file on disk



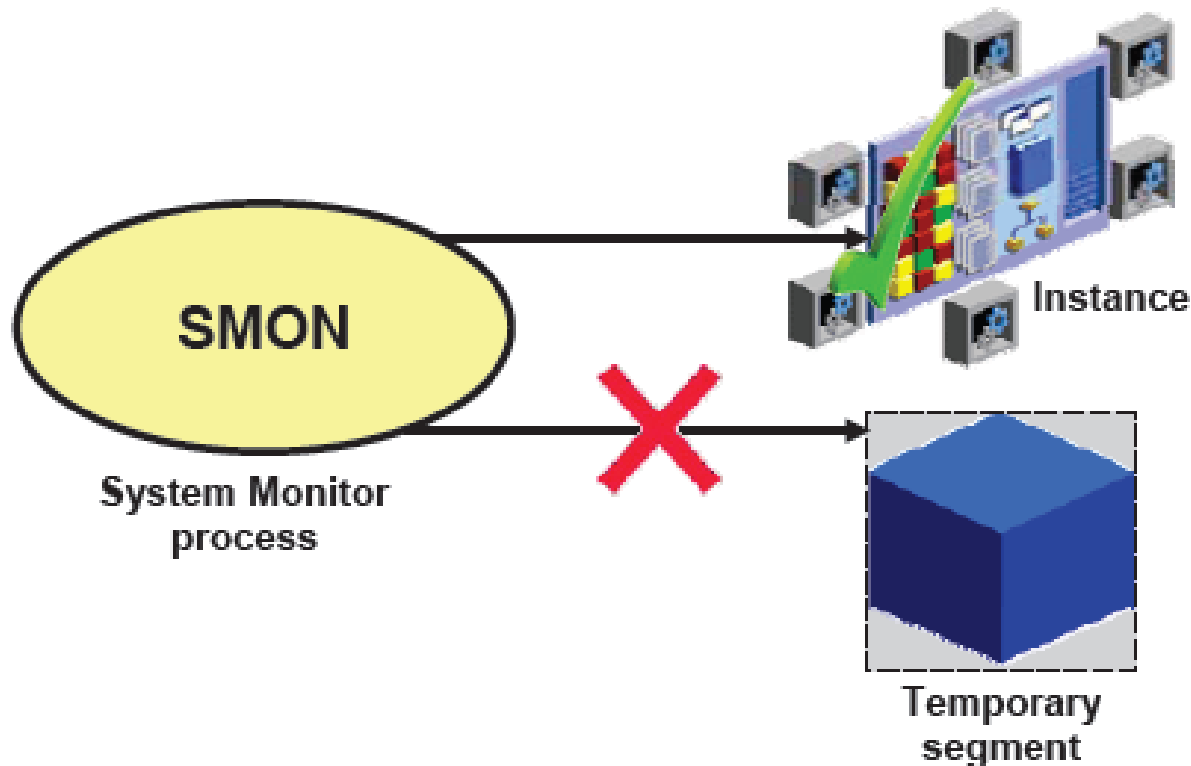
BP: Checkpoint Process (CKPT)

- Records checkpoint information in
 - ❑ Control file
 - ❑ Each data file header



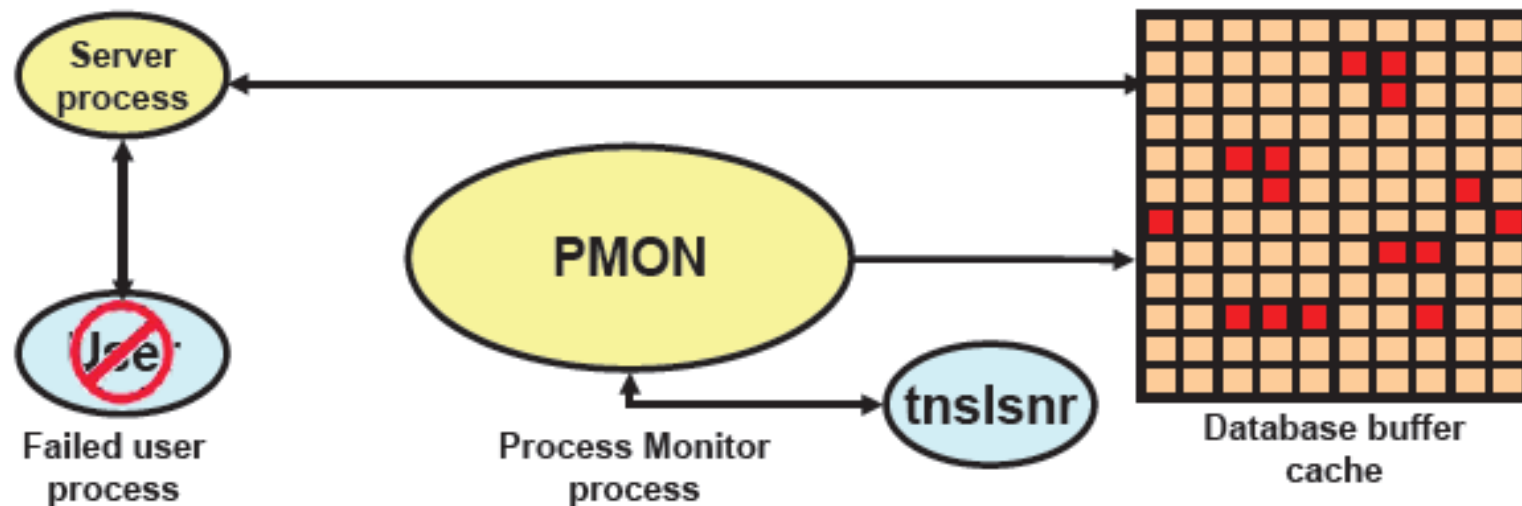
BP: System Monitor Process (SMON)

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



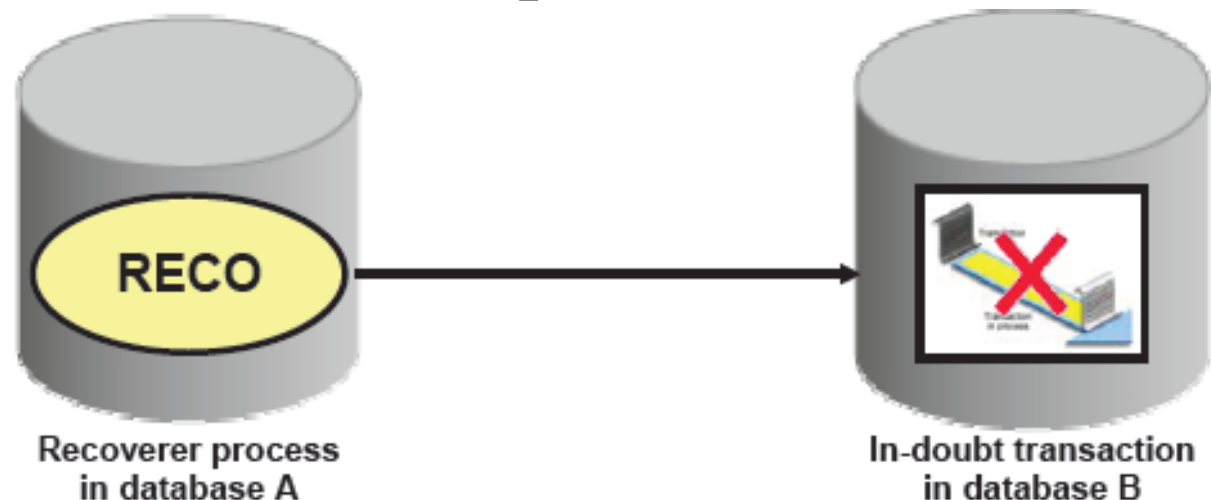
BP: Process Monitor Process (PMON)

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



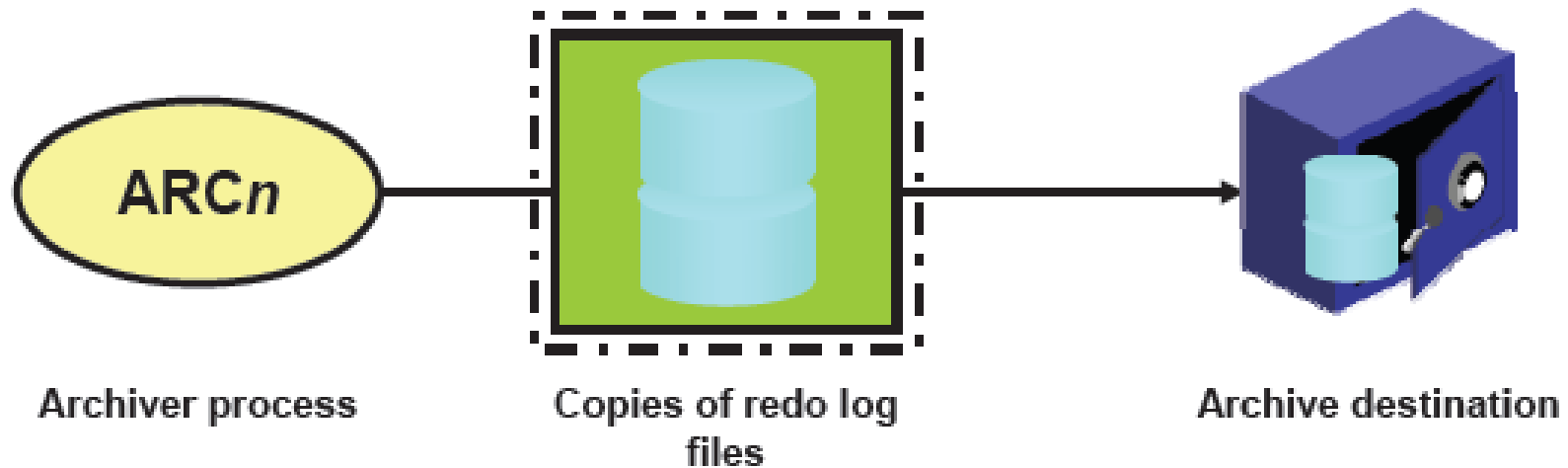
BP: Recoverer Process

- Used with the distributed database configuration
 - ❑ Automatically connects to other databases involved in distributed transactions failures
 - ❑ Automatically resolves all failed transactions
 - ❑ Removes any rows that correspond to failed transactions

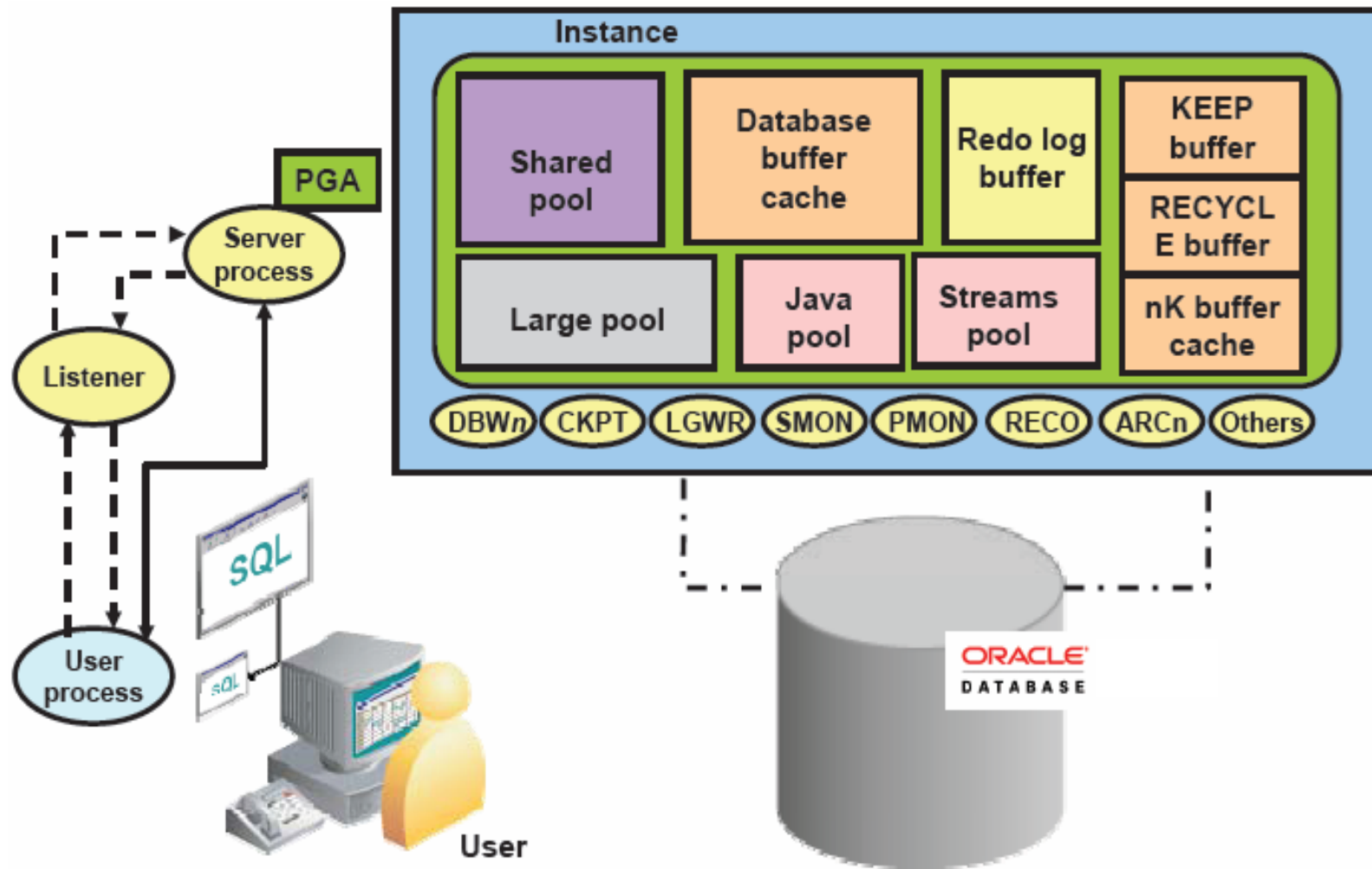


BP: Archiver Processes (ARCn)

- Copy redo log files to a designated storage device



Interacting with an Oracle Database



Memory, Processes and Storage

Reference

- Oracle Database 11g: Administration WorkshopI, student guide.