Introduction to Database storage

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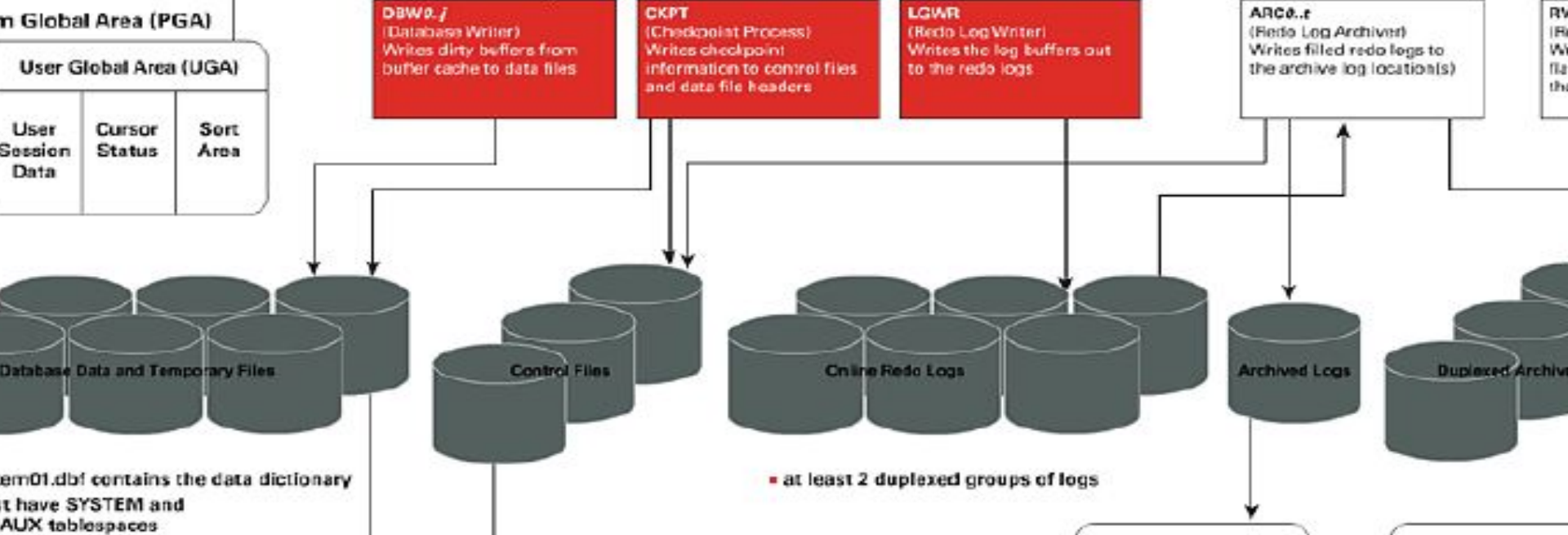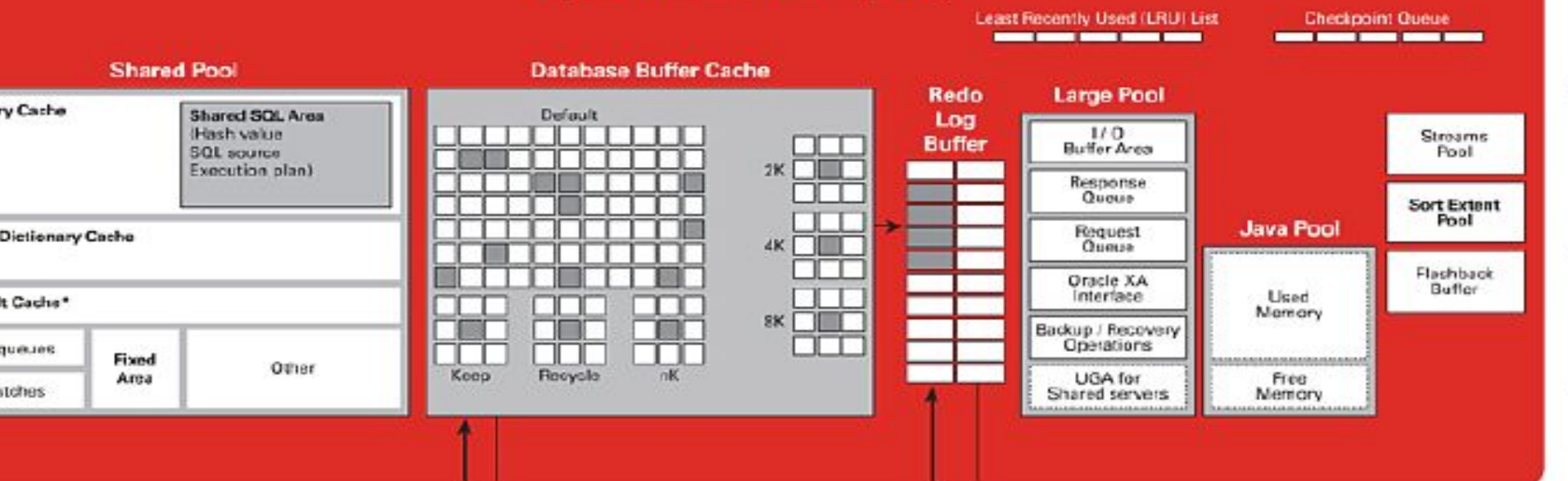
U1M2.Introduction to Database storage

Overview

- Oracle Database 11g - Architecture

- Connection to Oracle

- Oracle Database Data Files - Storage Example

- The Memory Structures Oracle Database

- I/O Process Oracle Database
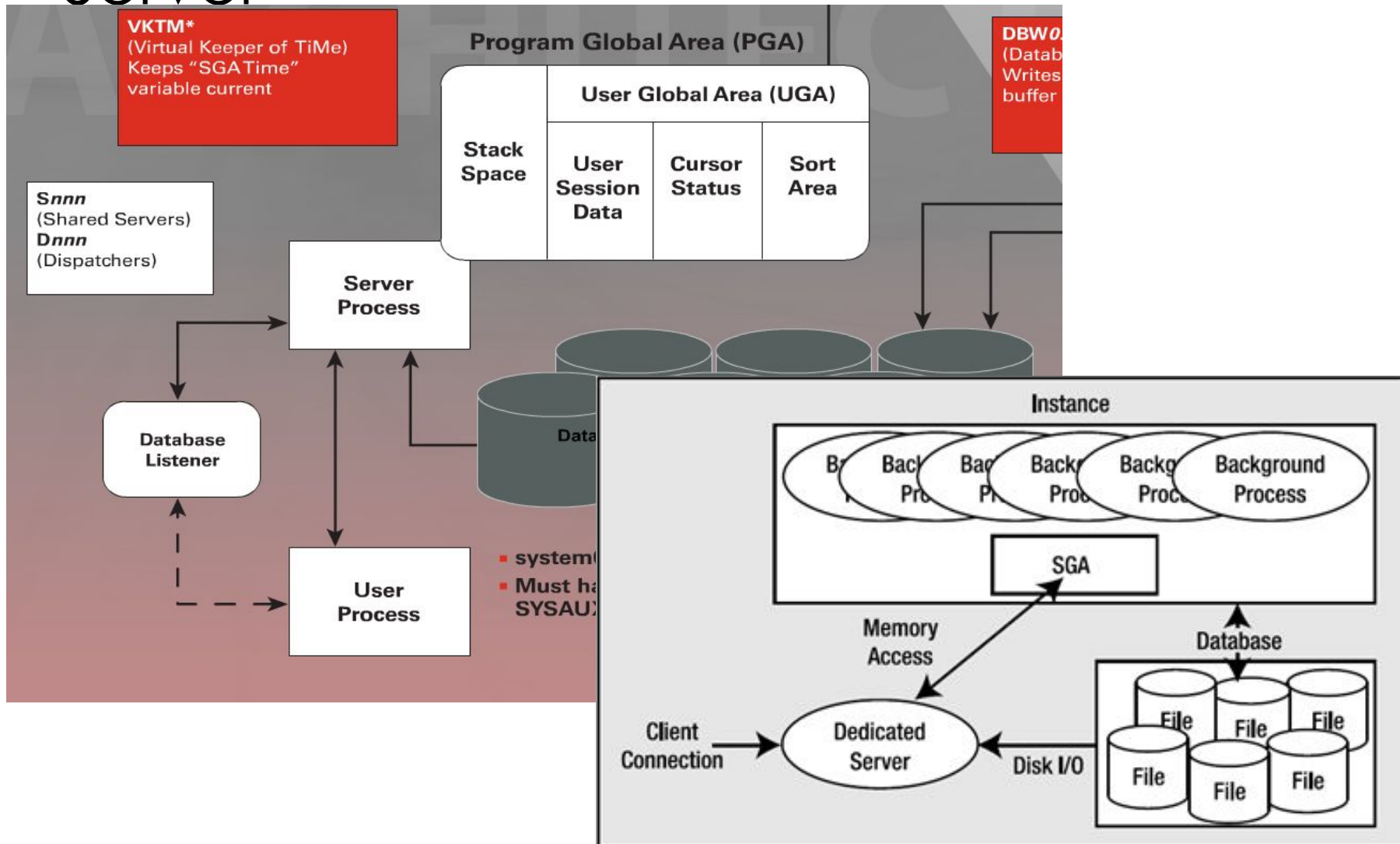
- Select, Update, Insert Operations

# Oracle Database 11g Architecture

System Global Area (SGA)

Least Recently Used (LRU) List

Checkpoint Queue

Shared Pool

...ry Cache

Shared SQL Area
(Hash value
SQL source
Execution plan)

...Dictionary Cache

...t Cache*

...queues | Fixed Area | Other

...tches

Database Buffer Cache

Default

2K

4K

8K

Keep | Recycle | nK

Redo Log Buffer

Large Pool

I/O Buffer Area

Response Queue

Request Queue

Oracle XA Interface

Backup / Recovery Operations

UGA for Shared servers

Java Pool

Used Memory

Free Memory

Streams Pool

Sort Extent Pool

Flashback Buffer

...m Global Area (PGA)

User Global Area (UGA)

User Session Data | Cursor Status | Sort Area

DBW0..j
(Database Writer)
Writes dirty buffers from
buffer cache to data files

CKPT
(Checkpoint Process)
Writes checkpoint
information to control files
and data file headers

LGWR
(Redo Log Writer)
Writes the log buffers out
to the redo logs

ARC0..r
(Redo Log Archiver)
Writes filled redo logs to
the archive log location(s)

RW
(R
W
fla
the

Database Data and Temporary Files

Control Files

Online Redo Logs

Archived Logs

Duplexed Archive

...em01.dbf contains the data dictionary
...t have SYSTEM and
...AUX tablespaces

- at least 2 duplexed groups of logs

Connection to Oracle

Connection to Oracle – Dedicated Server

Connection to Oracle – Shared Server
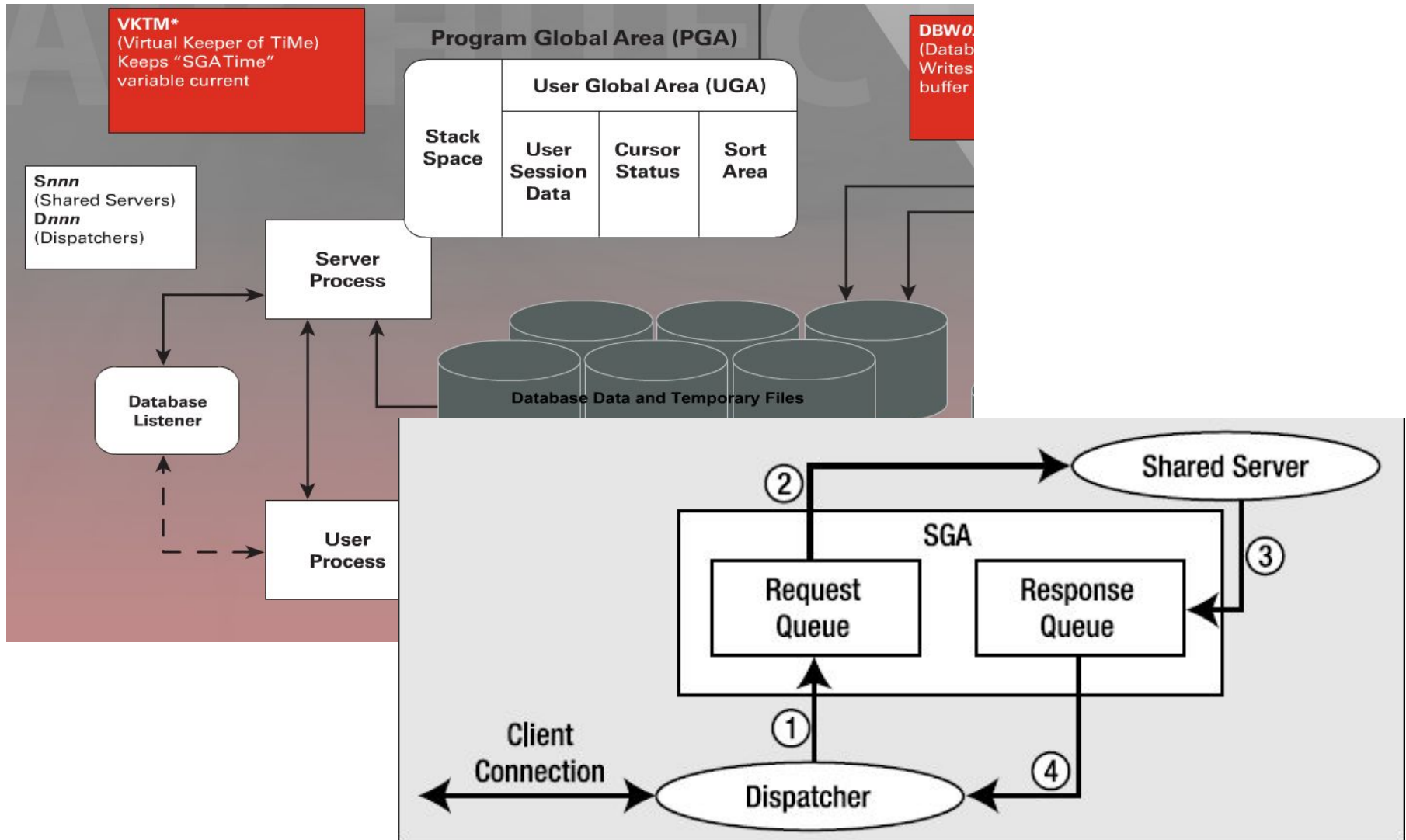
Oracle Database Data Files - Storage

A Brief Review of File System Mechanisms

- **"Cooked" operating system (OS) file systems**: You can use simple OS utilities such as xcopy on Windows or cp on UNIX to move them around. Cooked OS files are historically the most popular method for storing data in Oracle, but I see that changing with the introduction of ASM (more on that in a moment).

- **Raw partitions:** These are not files—these are raw disks. You don't ls them; you don't review their contents in Windows Explorer. They are just big sections of disk without any sort of file system on them. The entire raw partition appears to Oracle as a single large file. This is in contrast to a cooked file system, where you might have many dozens or even hundreds of database data files

- **Automatic Storage Management (ASM):** This is a new feature of Oracle 10g Release 1. In releases prior to 11g Release 2, ASM is a file system designed exclusively for use by the database. ASM is designed to work in either a single machine or clustered environment. Since Oracle 11g Release 2, ASM provides not only this database file system but optionally a clustered file system as well, which is described next.

- **Clustered file system:** This is specifically for a RAC (clustered) environment and provides what looks like a cooked file system that is shared by many nodes (computers) in a clustered environment. A traditional cooked file system is usable by only one computer in a clustered environment.
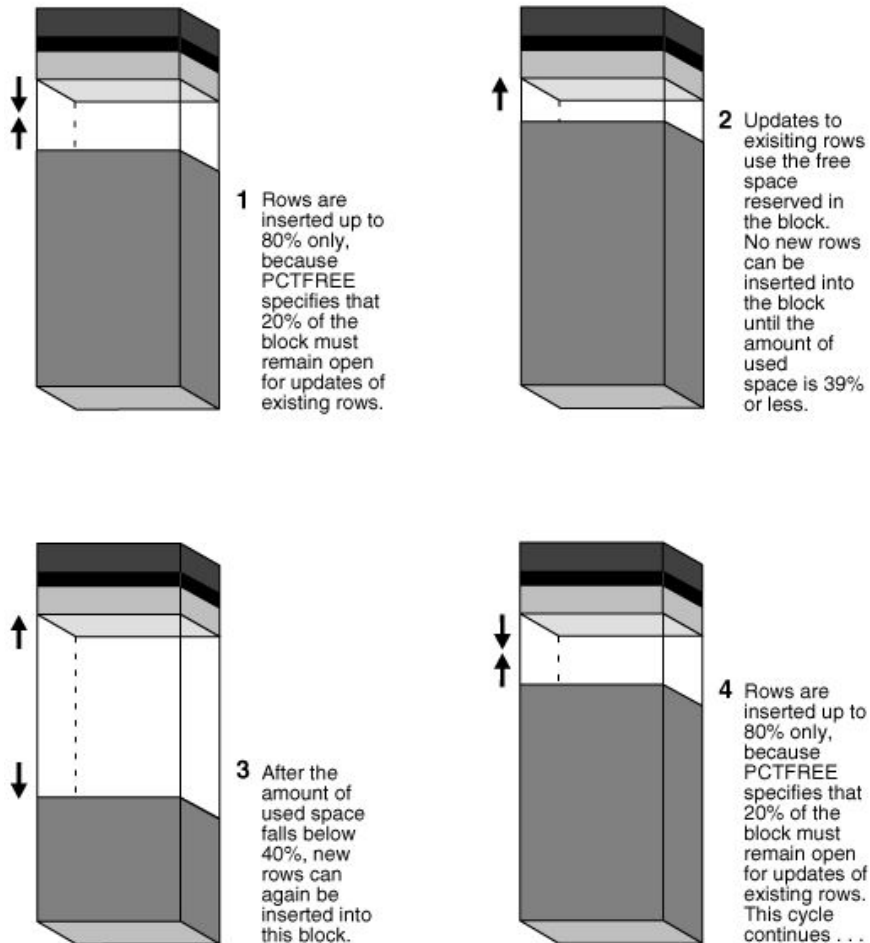
The Storage Hierarchy in an Oracle Database
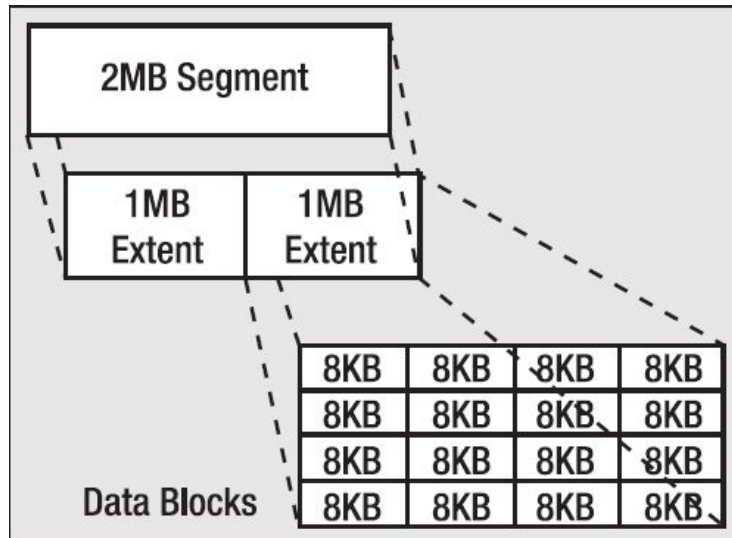
- *Segments* are the major organizational structure within a tablespace. Segments are simply your database objects that consume storage—typically objects such as tables, indexes, undo segments, and so on. Most times, when you create a table, you create a table segment.

- **Extents:** Segments consist of one or more *extent*. An extent is a logically contiguous allocation of space in a file. Traditionally, every segment starts with at least one extent.

- **Blocks:** Extents, in turn, consist of *blocks*. A block is the smallest unit of space allocation in Oracle. Blocks are where your rows of data, or index entries, or temporary sort results are stored.

Data Block – PCTFREE , PCTUSED

Data Block
PCTFREE = 20, PCTUSED = 40

1 Rows are inserted up to 80% only, because PCTFREE specifies that 20% of the block must remain open for updates of existing rows.

2 Updates to exisiting rows use the free space reserved in the block. No new rows can be inserted into the block until the amount of used space is 39% or less.

3 After the amount of used space falls below 40%, new rows can again be inserted into this block.

4 Rows are inserted up to 80% only, because PCTFREE specifies that 20% of the block must remain open for updates of existing rows. This cycle continues . . .

- In many cases, the OLTP database might be using a small block size, such as 2KB or 4KB, whereas the DW would be using a much larger one (8KB or 16KB).

- Often for OLAP tables very important follow best practices with technical attributes PCTFREE and PCTUSED.

The Memory Structures Oracle Database

The Memory Structures Oracle Database
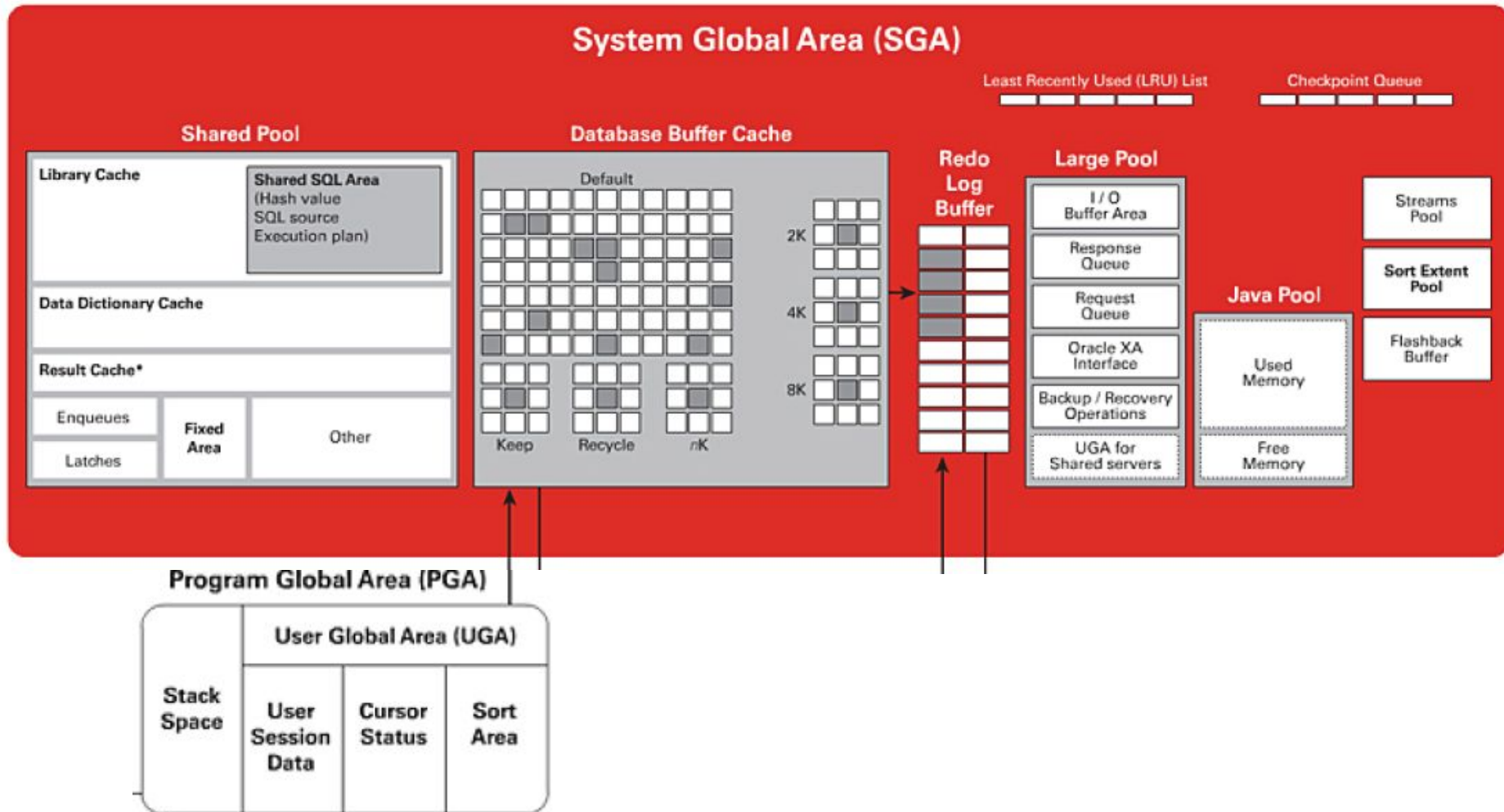
Select, Update, Insert Operations
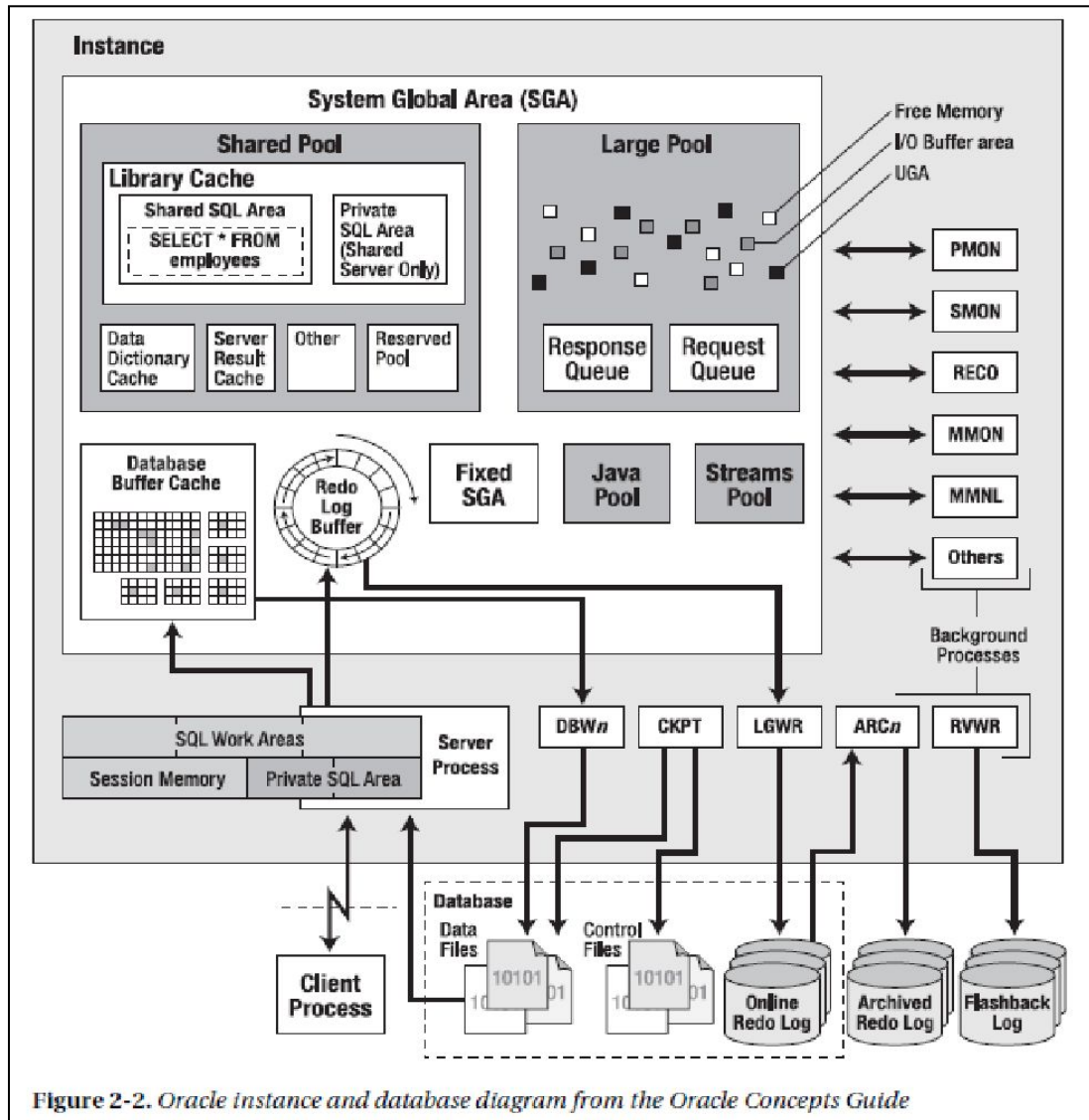
Select, Update, Insert Operations

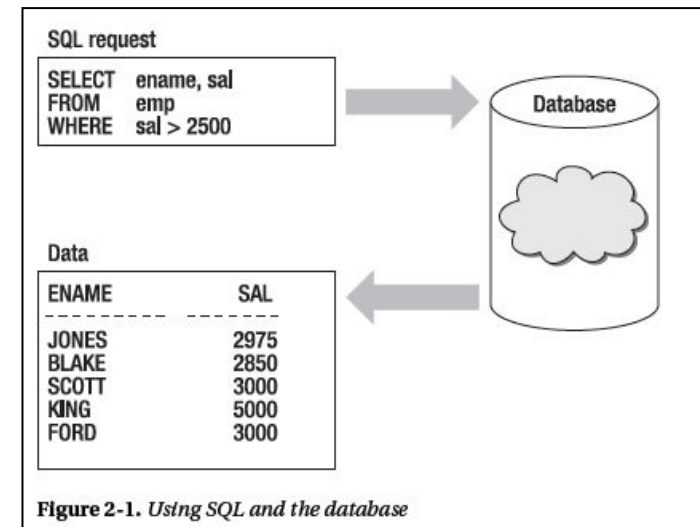Figure 2-2. *Oracle instance and database diagram from the Oracle Concepts Guide*

Figure 2-1. *Using SQL and the database*

Thank you
Time for questions

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DATAMOLA