ORACLE DATABASE MANAGEMENT SYSTEM

420-983-VA Introduction to Databases using Oracle Adrian Onet

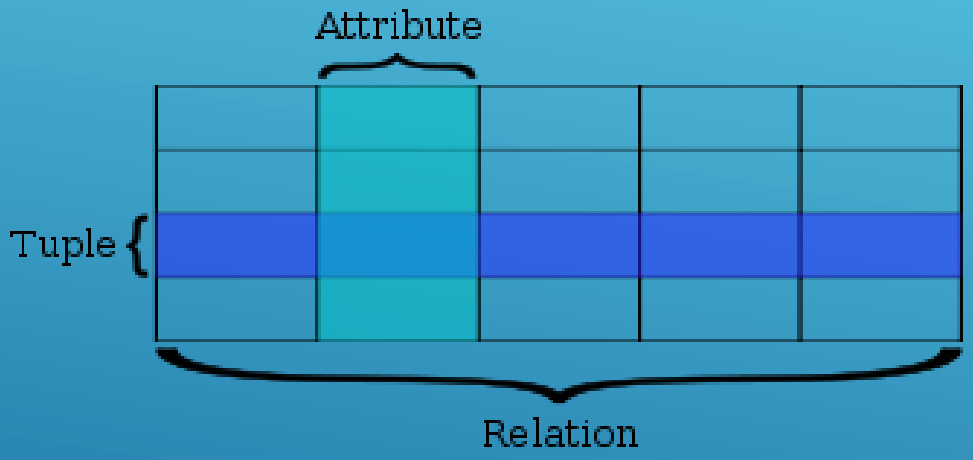
WHAT IS ORACLE DATABASE?

RDBMS - **R**elational **D**atabase **M**anagement **S**ystem.

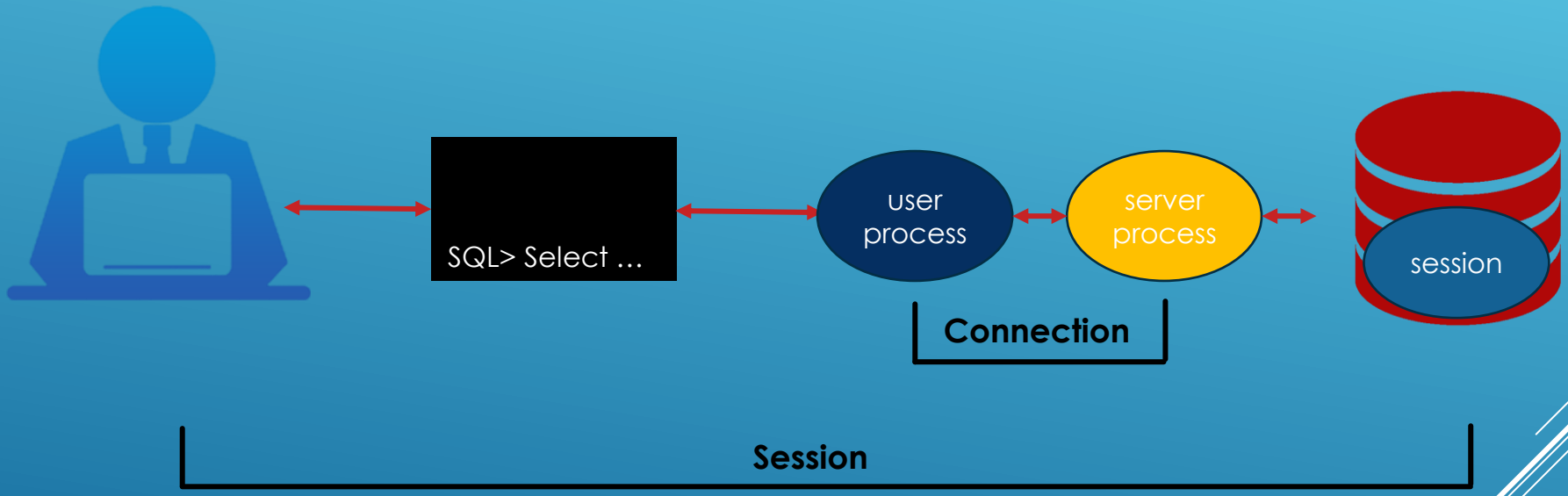
VERSIONS

Oracle 2	1979
Oracle 3	1983
Oracle 4	1984
Oracle 5	1985
Oracle 6	1988
Oracle 7	1992
Oracle 8	1997
Oracle 8i	1998
Oracle 9i	2001
Oracle 10g	2005
Oracle 11g	2007
Oracle 12c	2013
Oracle 18c	2018
Oracle 19c	2019

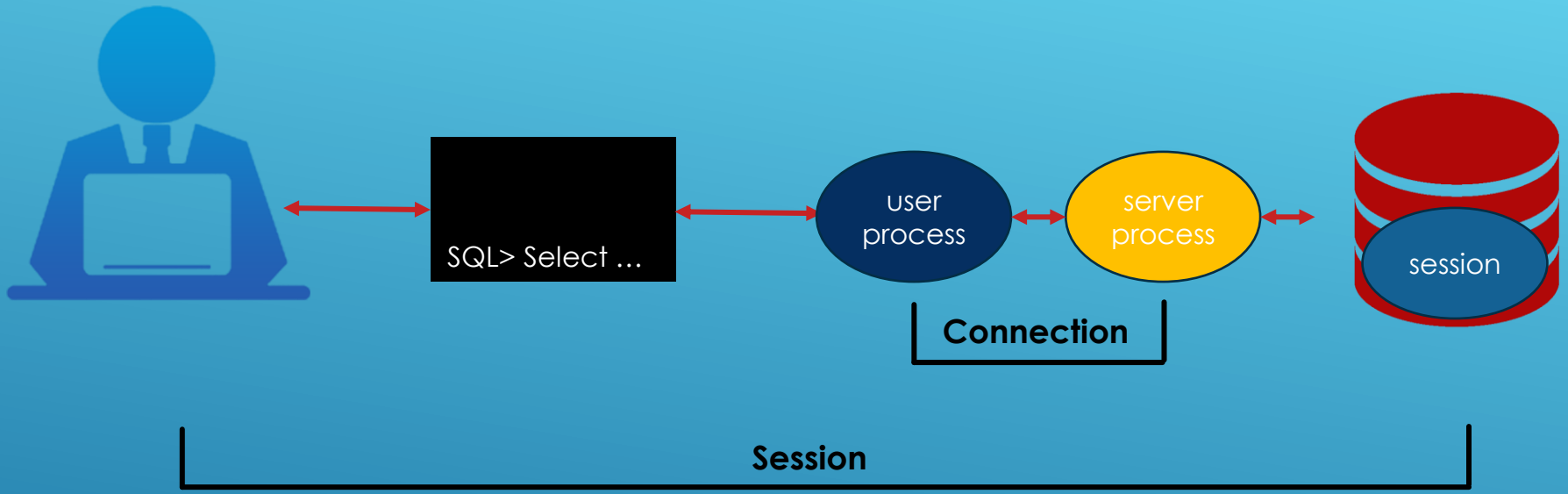
RELATIONAL DATABASE



CONNECTING TO A DATABASE INSTANCE

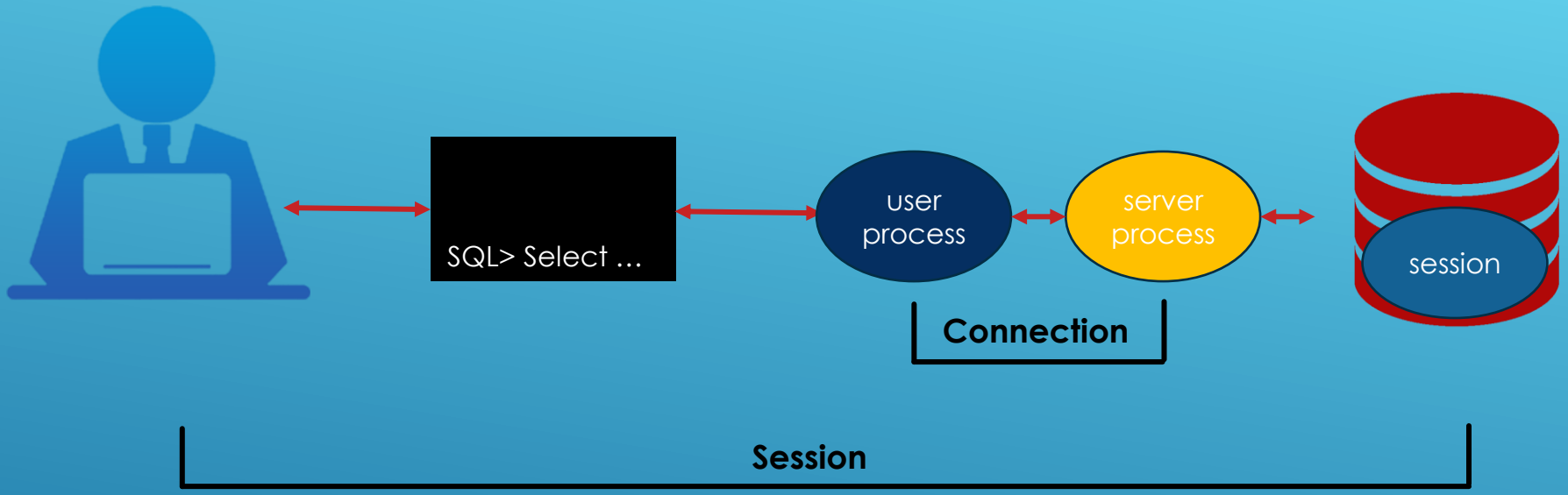


CONNECTING TO A DATABASE INSTANCE



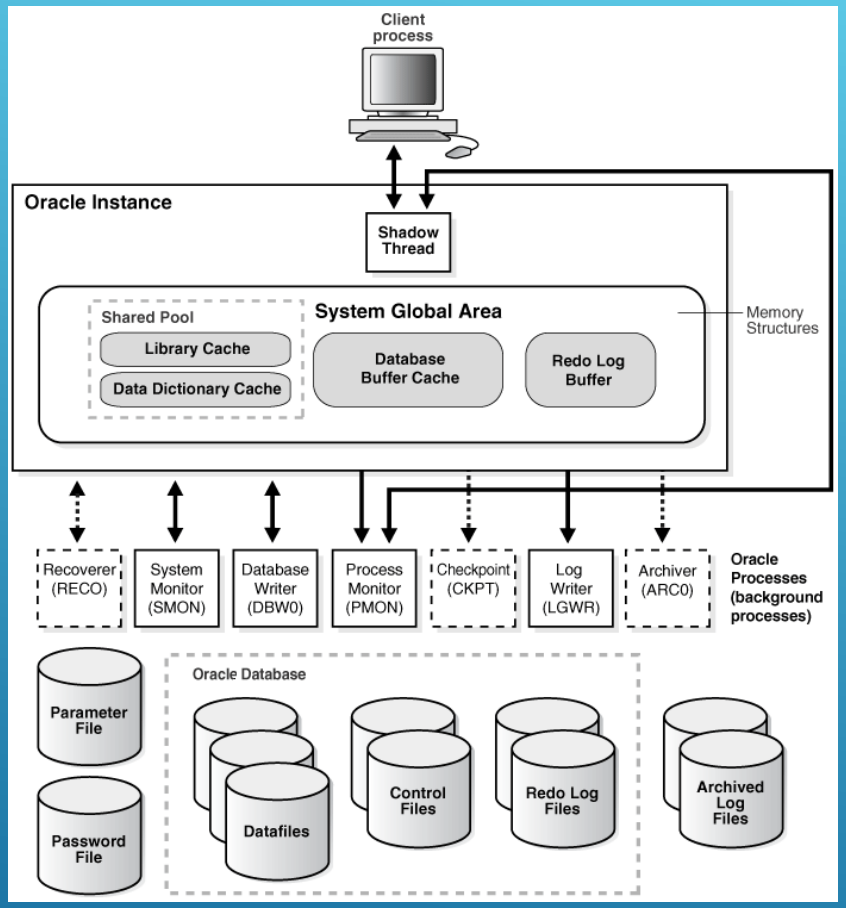
Connection is a communication pathway between a user process and an Oracle Database instance.

CONNECTING TO A DATABASE INSTANCE



Session represents the state of a current user login to the database instance. A single connection can have 0, 1 or more sessions established on it.

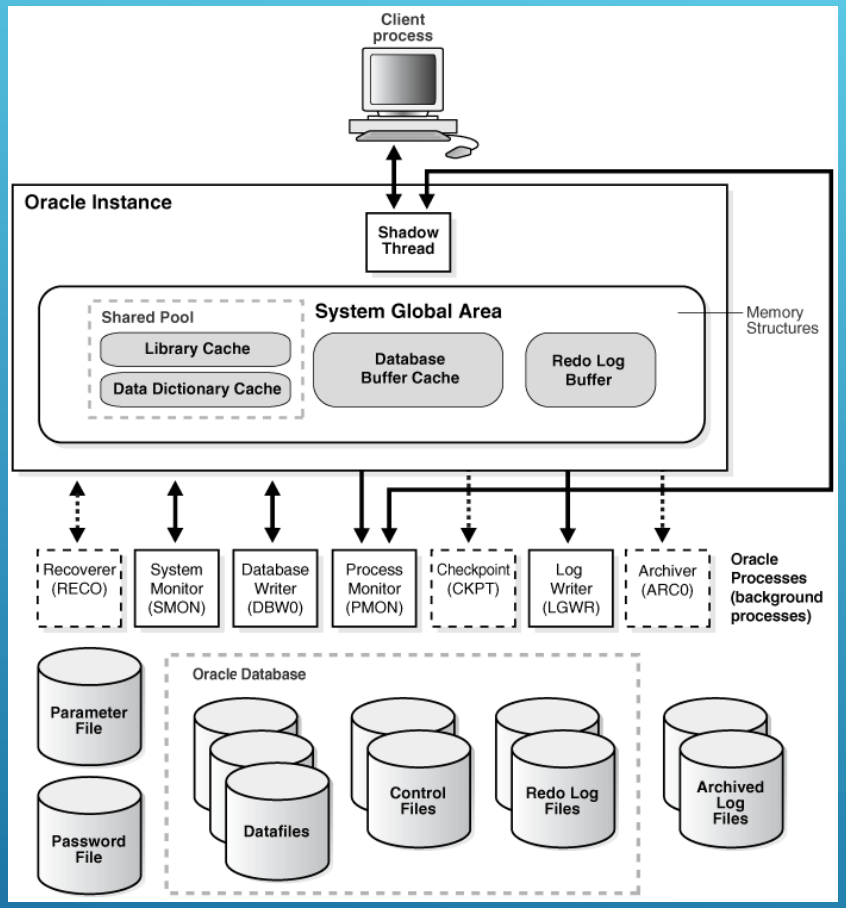
ORACLE DATABASE ARCHITECTURE



Oracle Instance is a background process registered with the Operating System.

https://docs.oracle.com/cd/B14117_01/win.101/b10113/architec.htm

ORACLE DATABASE ARCHITECTURE



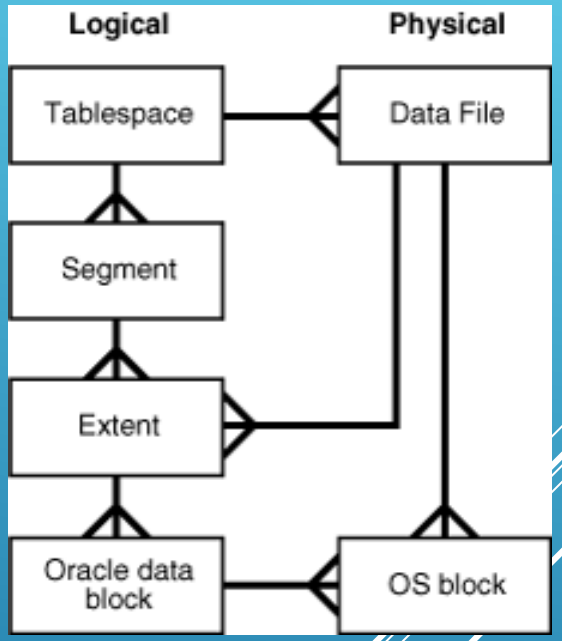
Oracle Database is a set of files: data, control and redo log files.

```
SQL> SELECT name FROM v$datafile;
SQL> SELECT * FROM dba_data_files;
```

https://docs.oracle.com/cd/B14117_01/win.101/b10113/architec.htm

ORACLE DATABASE STORAGE

Oracle Database is logically divided in on or more tablespaces.




```
CREATE TABLESPACE myTableSpace
DATAFILE
'C:\oracleDB\datafile1.dbf' SIZE 10M AUTOEXTEND ON NEXT
500K MAXSIZE 100M SEGMENT SPACE MANAGEMENT AUTO;
'C:\oracleDB\datafile2.dbf' SIZE 10M;
```

Default tablespaces:

- SYSTEM and SYSAUX - store system generated objects;
- USERS – used by ad-hoc users;
- UNDOTBS1 – stores the undo data;
- TEMP – used to store intermediate results of sorting, hashing, …

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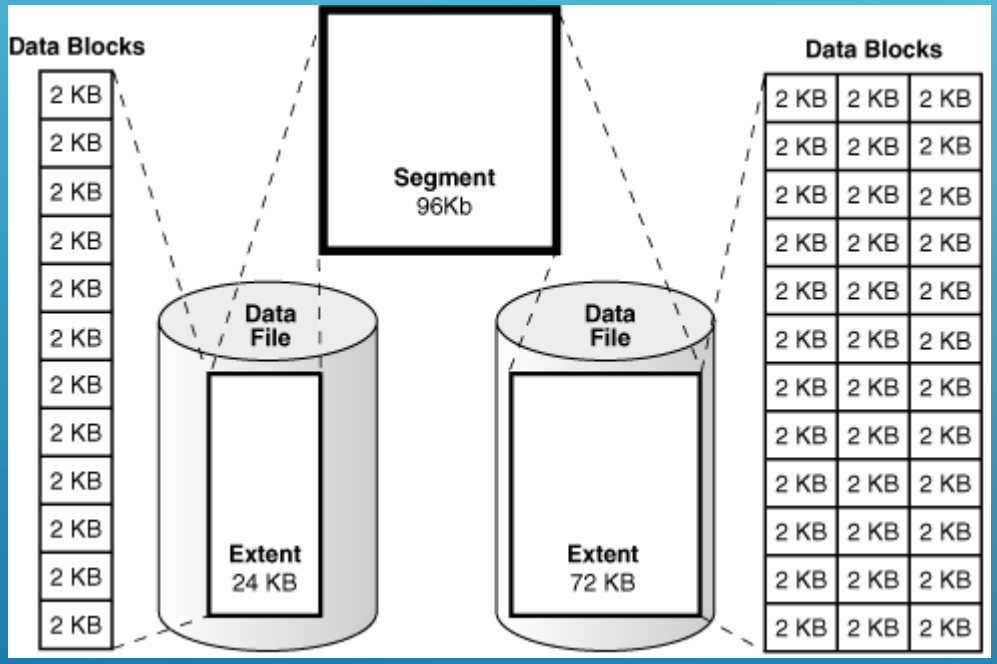
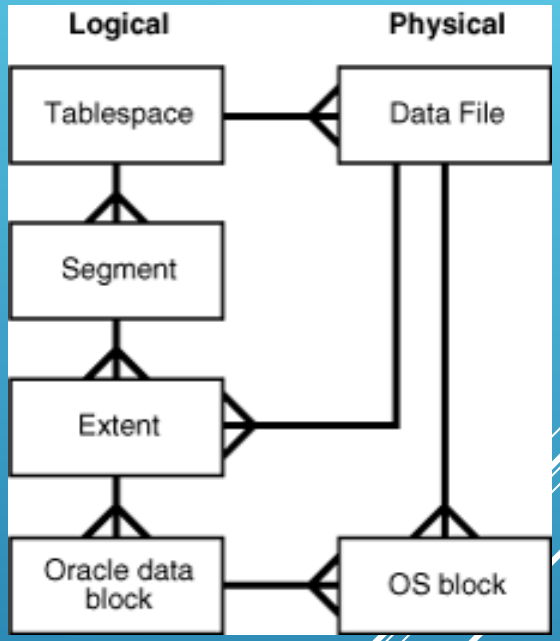
ORACLE DATABASE STORAGE





Data block – corresponds to a specific number of bytes of physical disk space (e.g. 2KB).

Extent – continuous data blocks allocated for storing a specific type of information.

Segment – a set of extents allocated for a specific database object.

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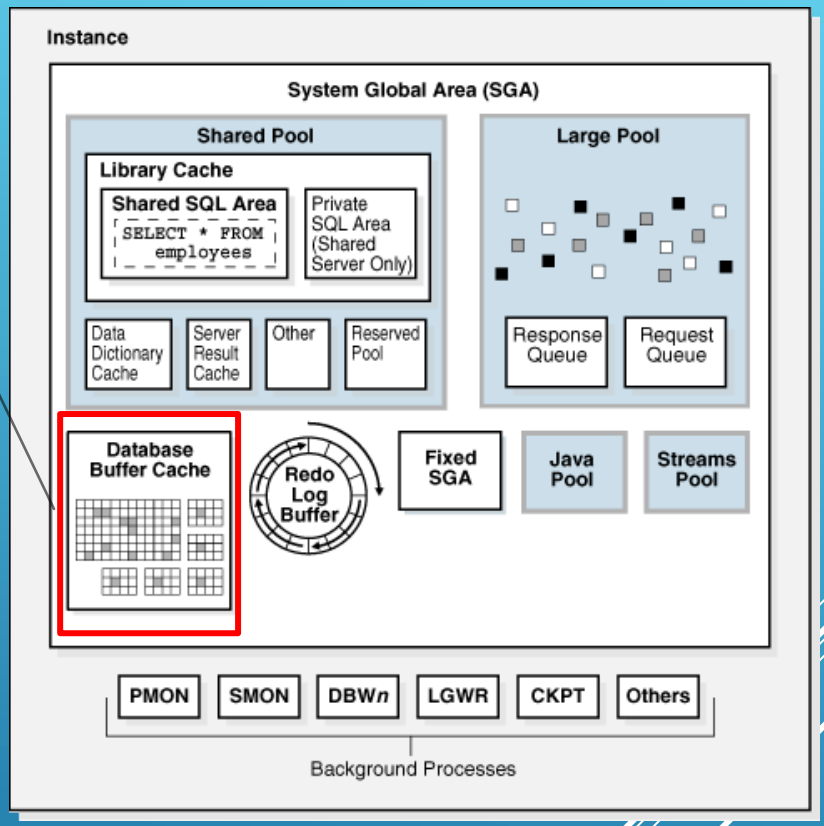
ORACLE INSTANCE

Buffer Cache stores copies of data blocks read from data files.

- optimize physical I/O
- keeps frequently accessed blocks in the buffer.

Buffers can be in one of these states:

- Unused
- Clean - read-consistent version of the block
- Dirty – modified data not written yet to disk. Needs to checkpoint the block before reusing it.



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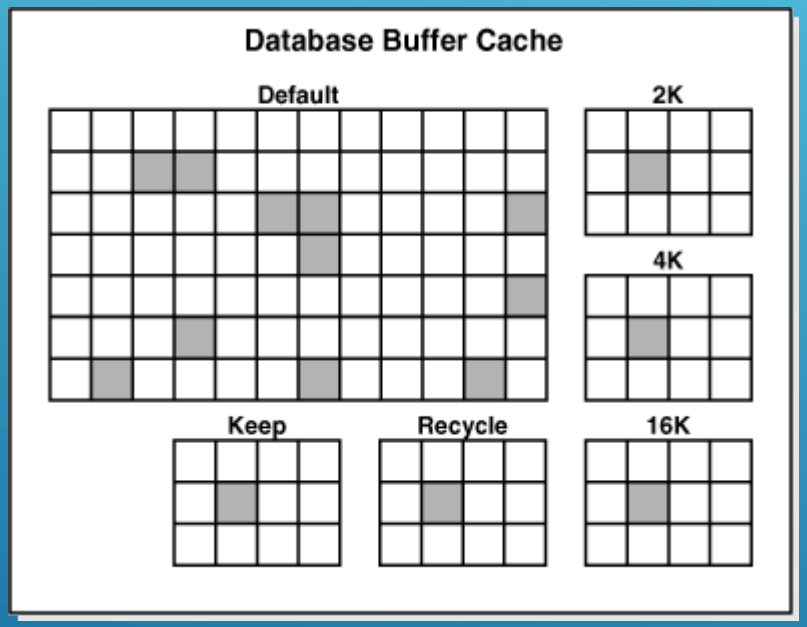
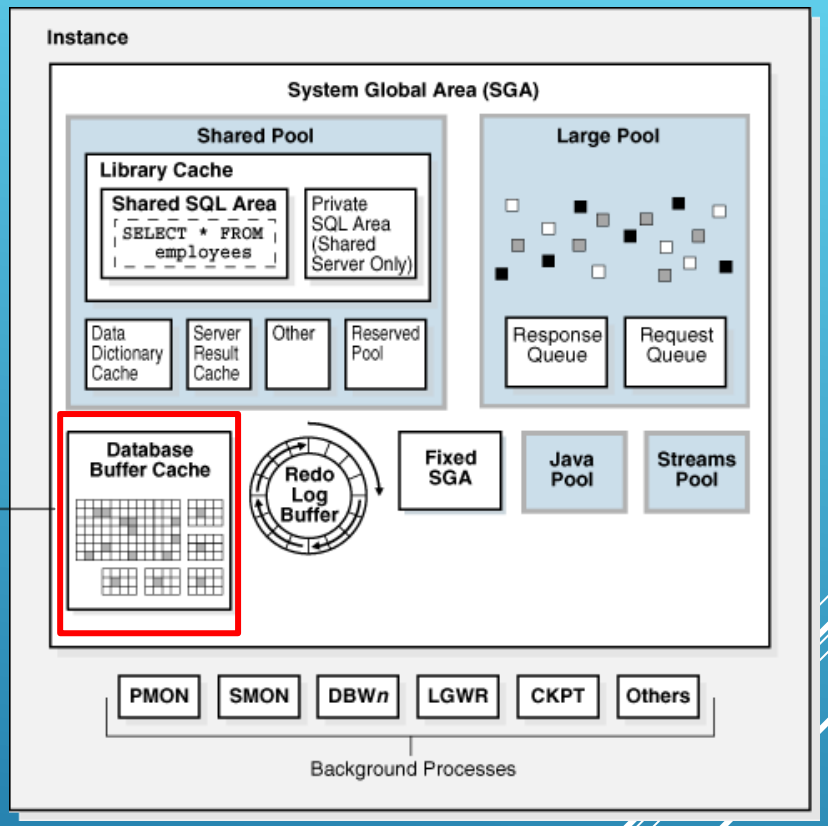
ORACLE INSTANCE

Buffer Pools



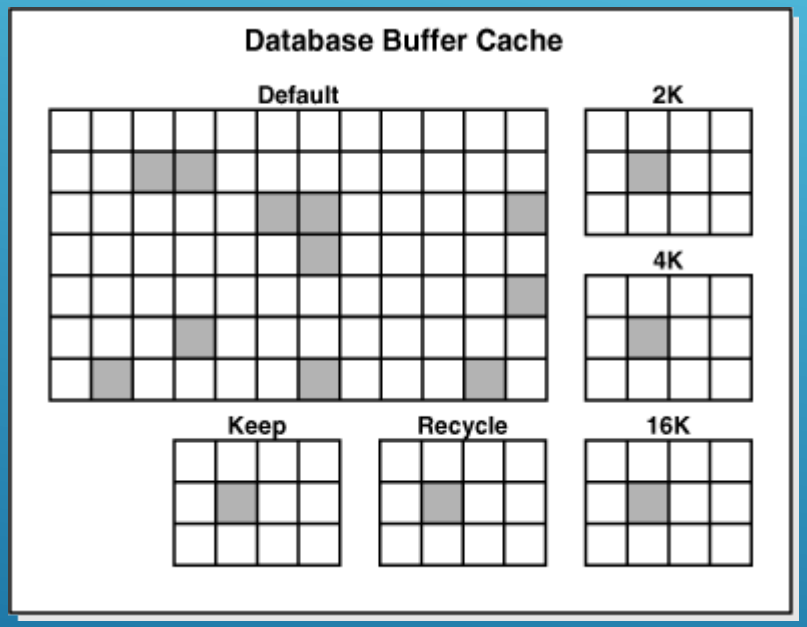


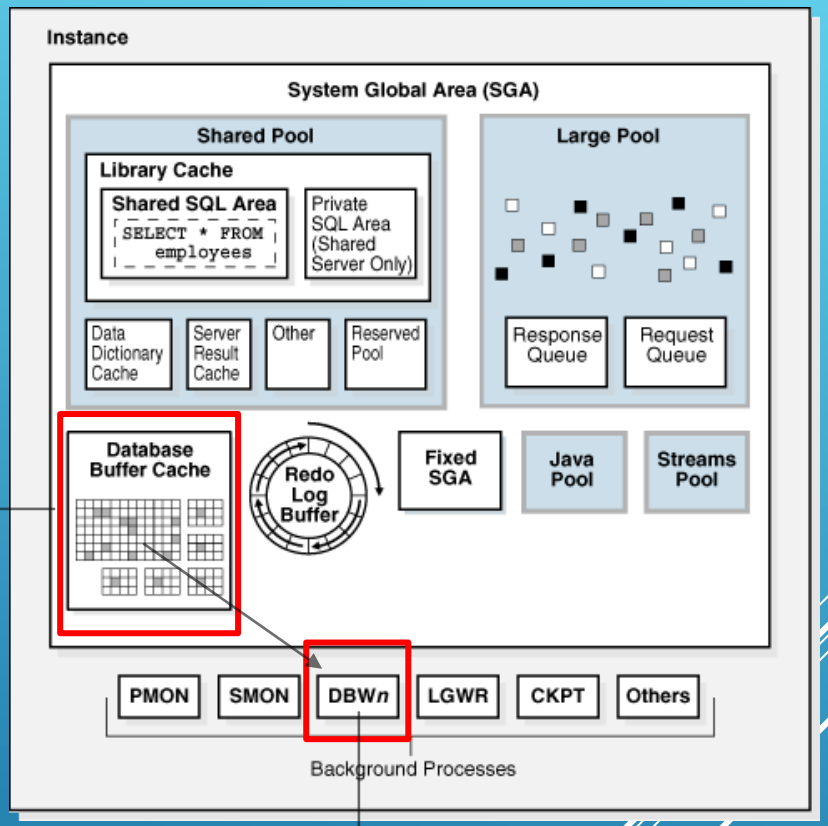
Default – location where blocks are normally cached;
Keep – blocks that are accessed frequently;
Recycle – objects used infrequently;
2KB, 4KB, 16KB – nonstandard block sizes (in this case default block is 8KB).

https://docs.oracle.com/cd/B14117_01/win.101/b10113/architec.htm

ORACLE INSTANCE

Buffer Pools





Periodically writes buffer data to data files.

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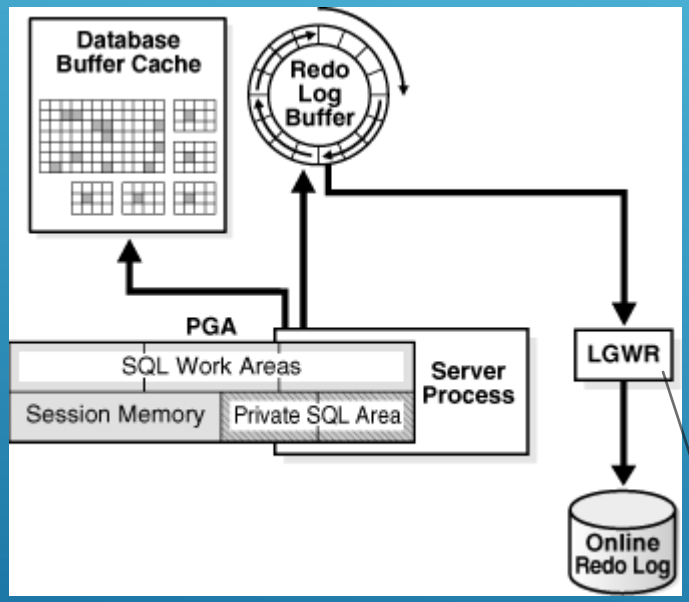
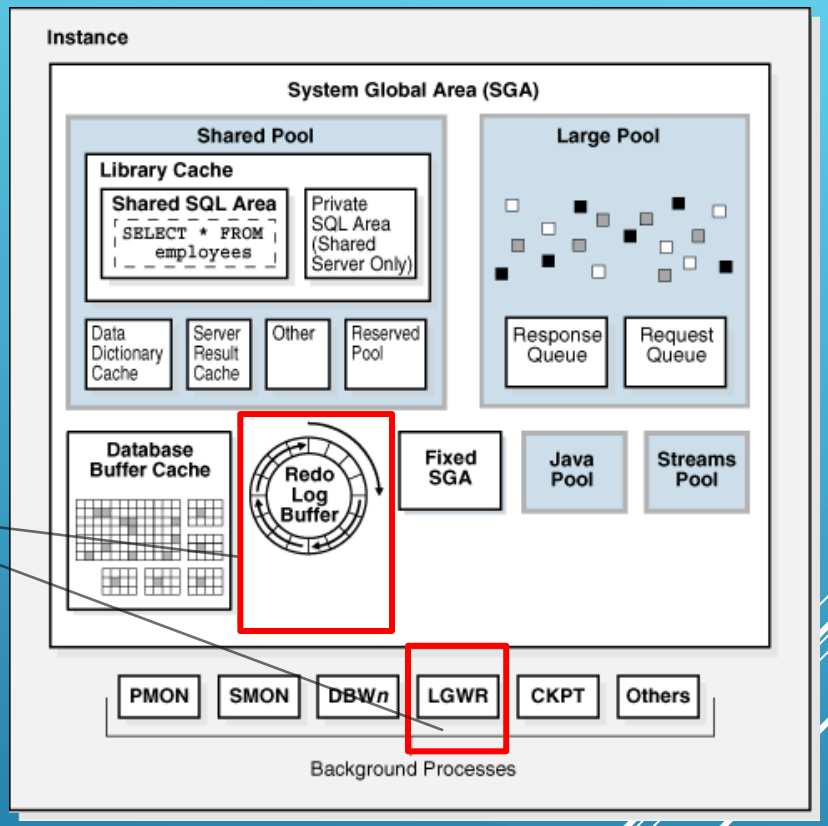
ORACLE INSTANCE

Redo Log Buffer

Stores redo entries describing changes made to the database.





Log Writer.

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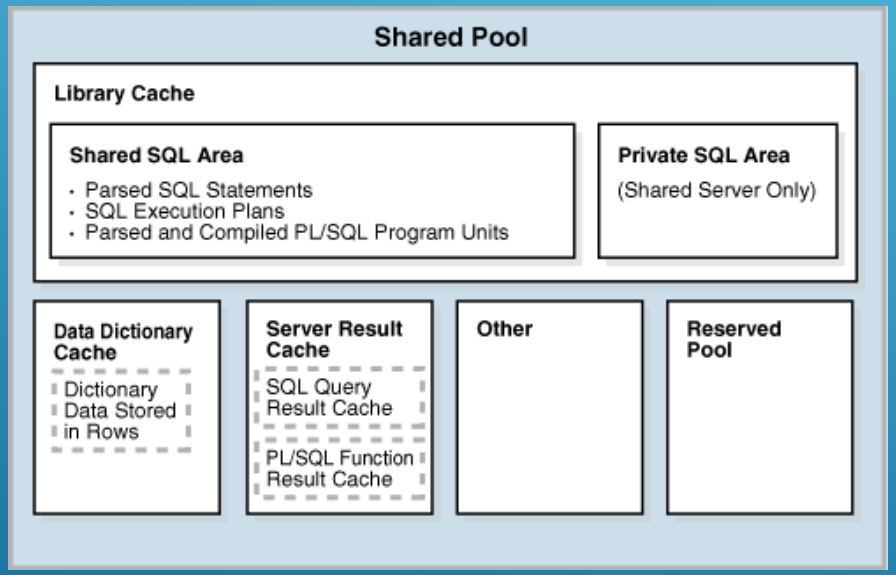
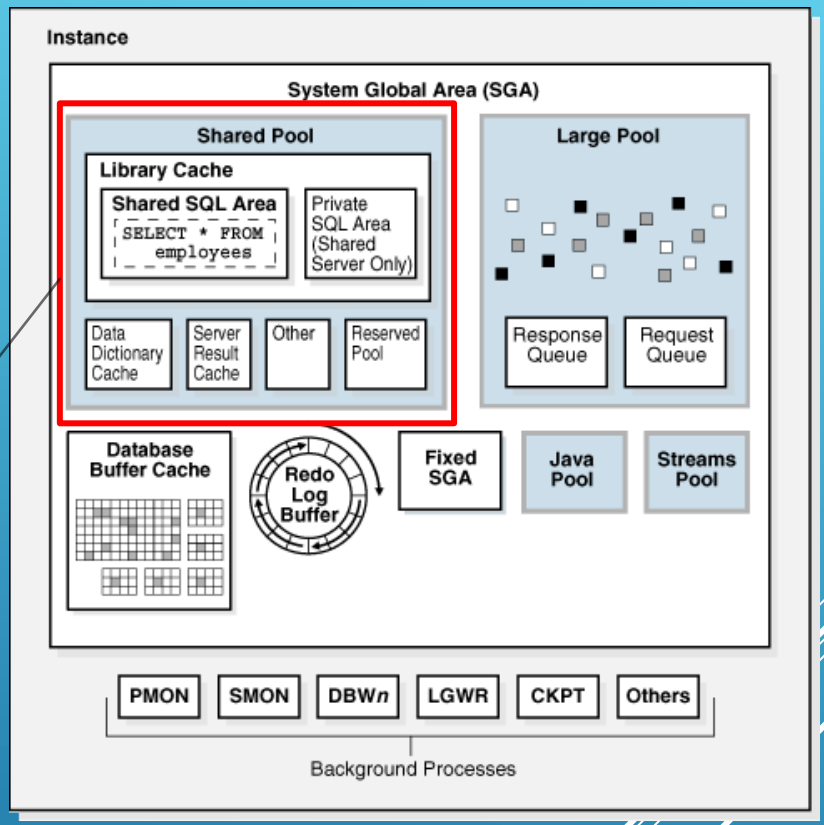
ORACLE INSTANCE

Shared Pool

Caches various types of program data. For example, compiled SQL, system parameters, and data dictionary information.





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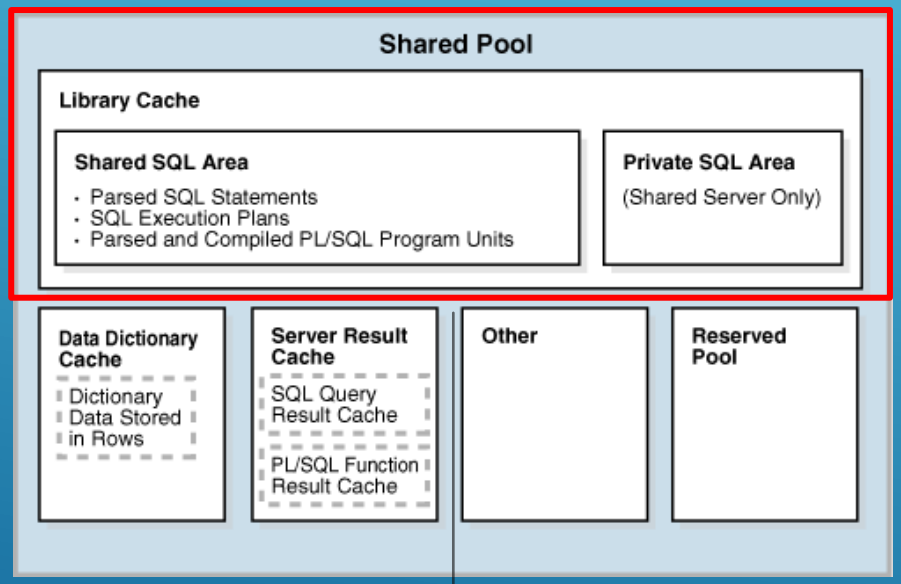

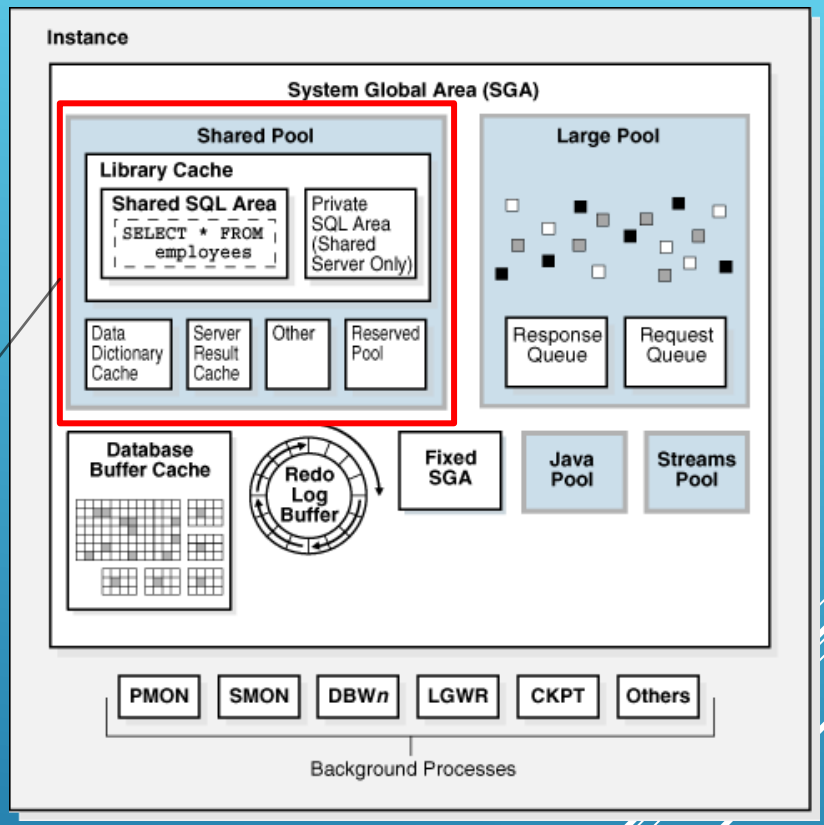

shared pool memory structure that stores executable SQL and PL/SQL code.

Shared Area – contains the statement parse tree and execution plan.
Private Area – Each session issuing a SQL statement has a private SQL area.

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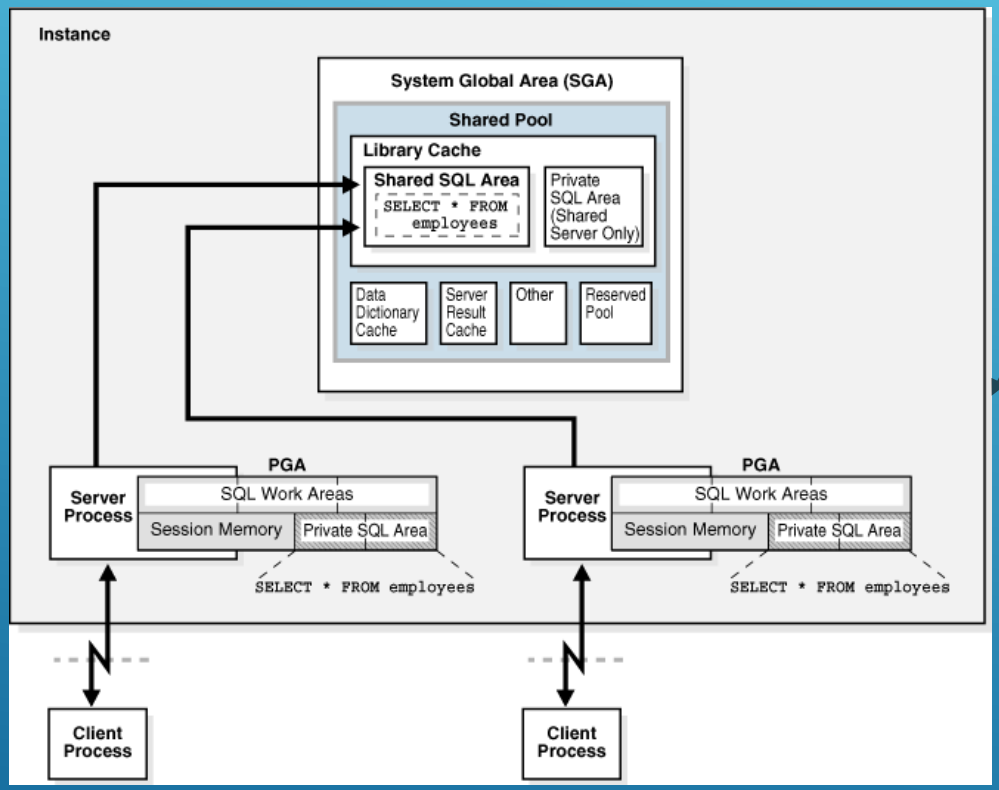
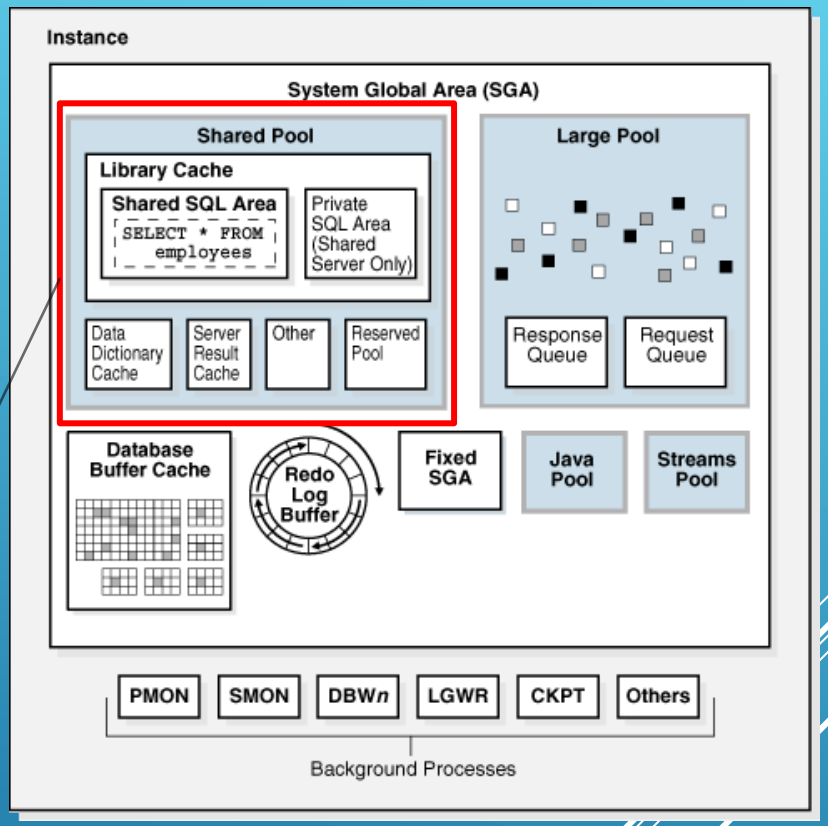
ORACLE INSTANCE

Shared Pool





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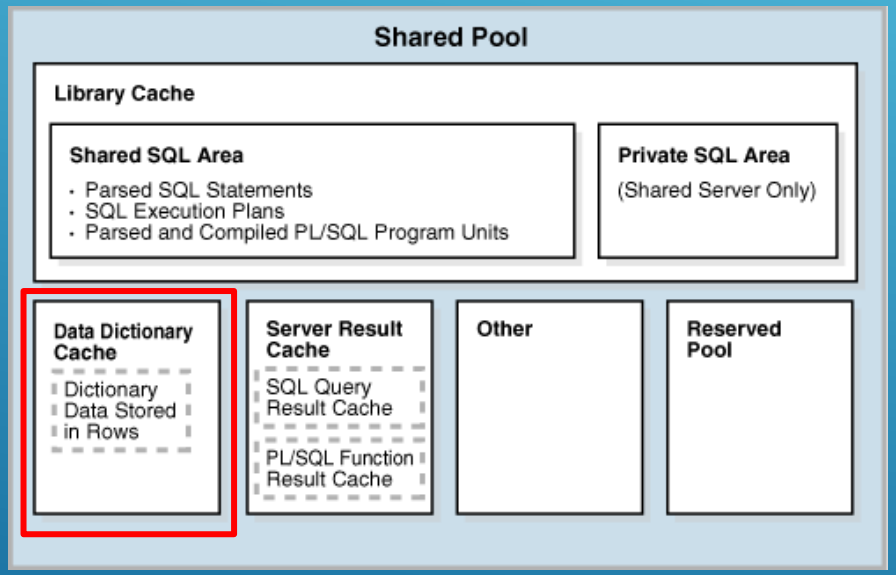
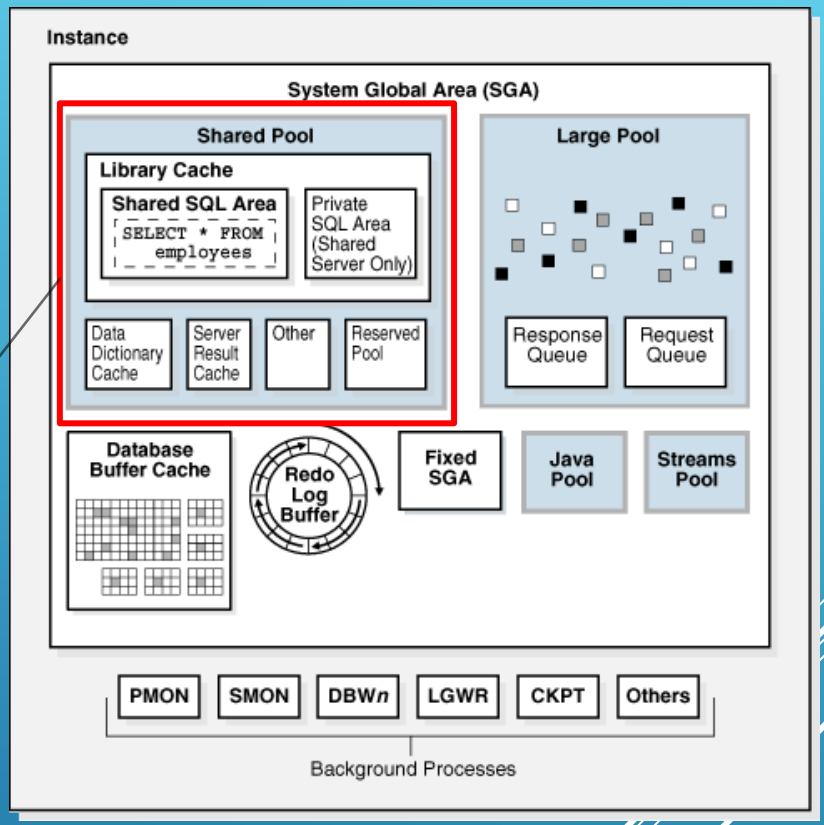
ORACLE INSTANCE

Data Dictionary Cache

A collection of database tables and views containing reference information about the database, its structures, and its users.





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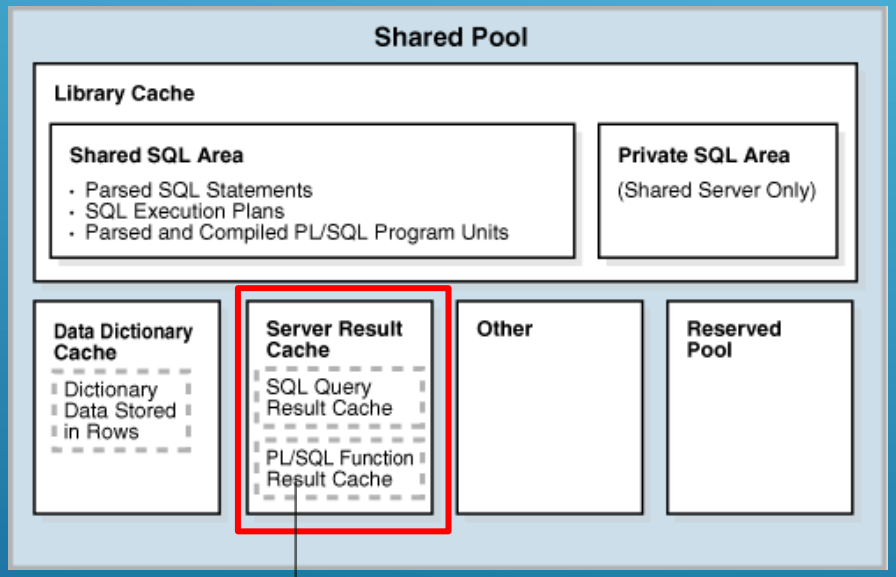
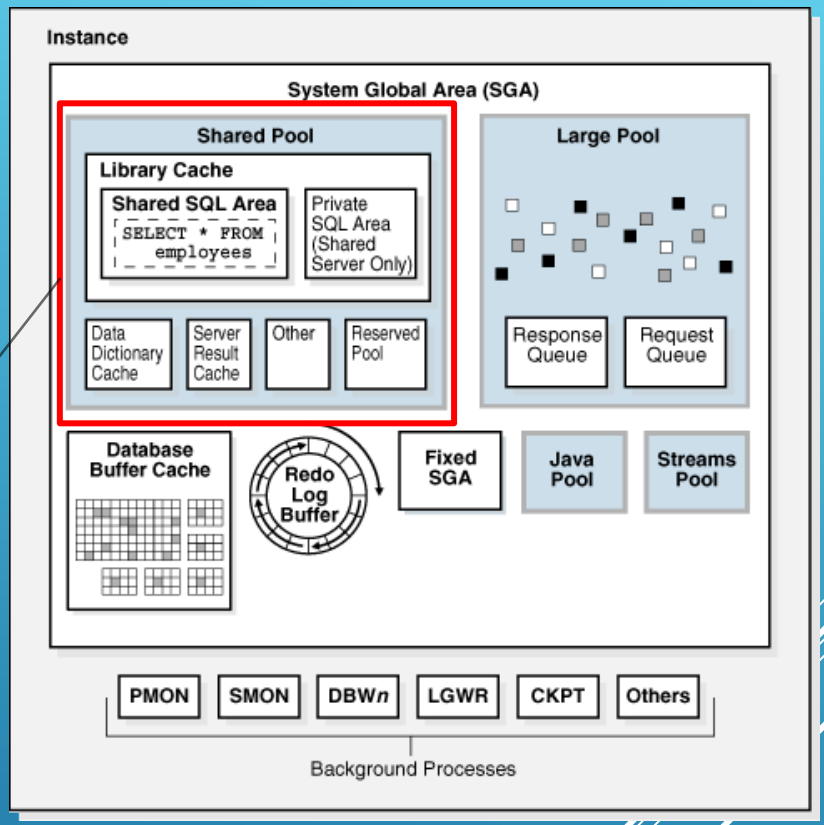
420-587-VA Developing Applications using Oracle 420-583-VA (oneta@vanierCollege.qc.ca)

ORACLE INSTANCE

Server Result Cache

Holds result sets for different queries, does not data blocks.





Stores function result sets, thus running same function for all rows may not need re-computation. (call with the same parameter)

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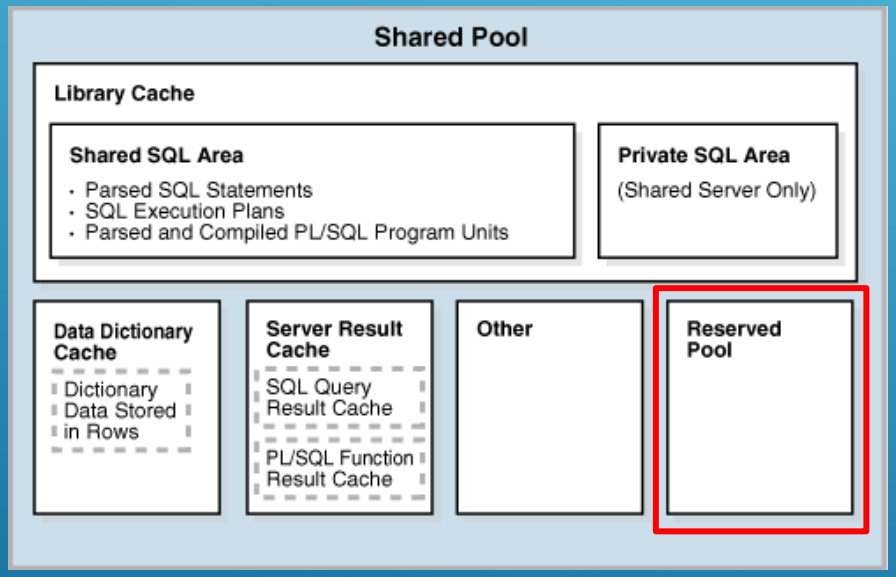
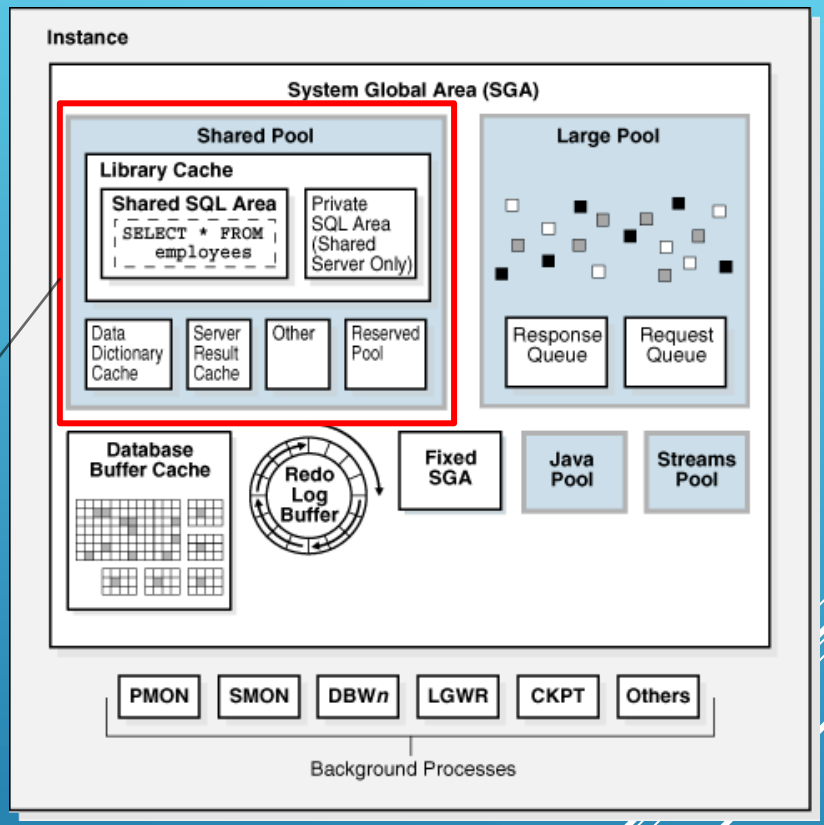
ORACLE INSTANCE

Reserved Pool

Used to allocate large contiguous chunks of memory .





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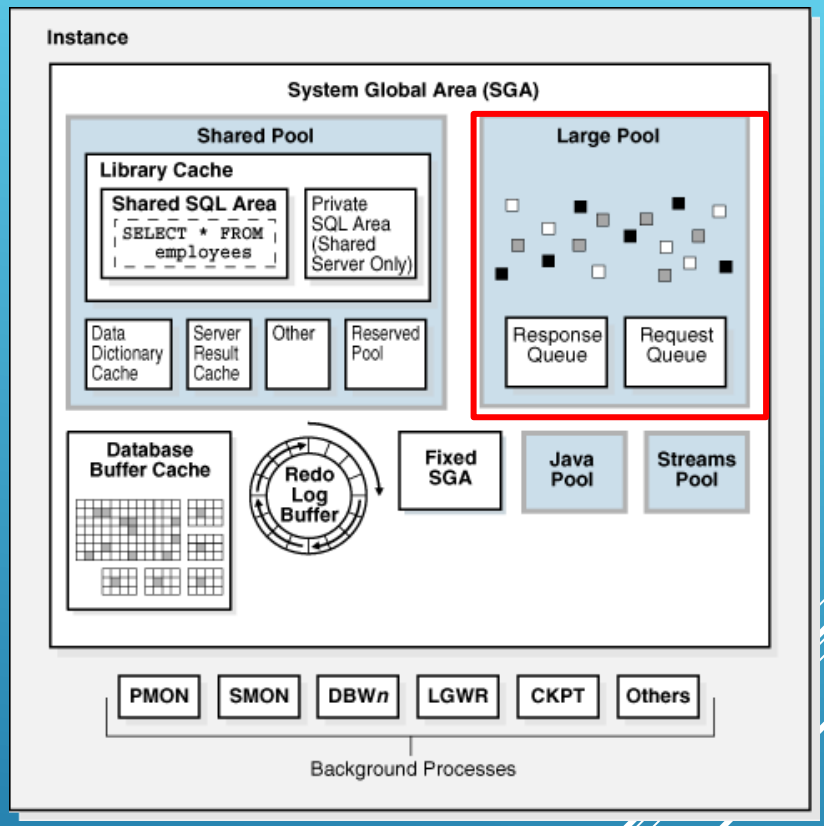
ORACLE INSTANCE

Large Pool

Optional memory intended for allocations that are larger than is appropriate for the shared pool. For example: message buffers used in parallel execution of statements.



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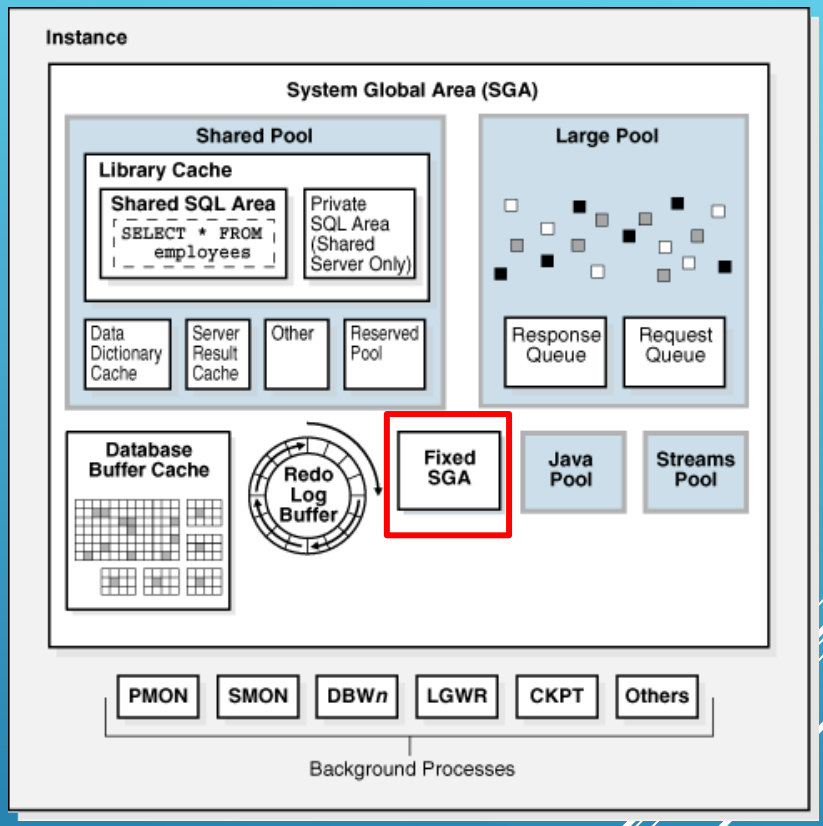
ORACLE INSTANCE

Fixed SGA

Internal housekeeping area. Contains: general information about the state of the database and instance; information communicated between processes, such as locks.



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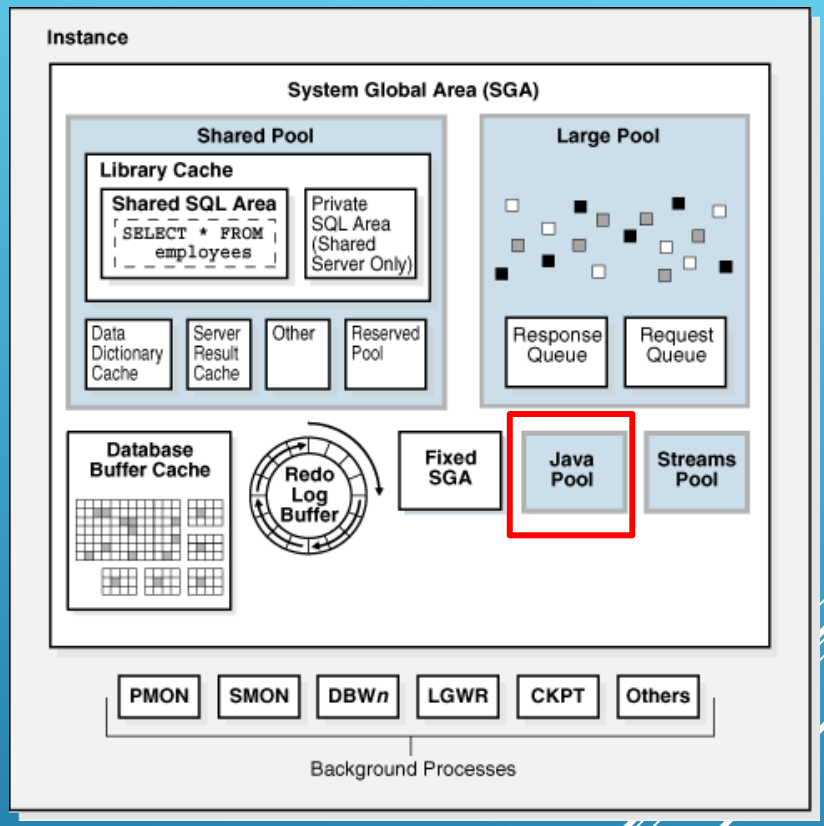
ORACLE INSTANCE

Java Pool

Contains all session specific Java code.



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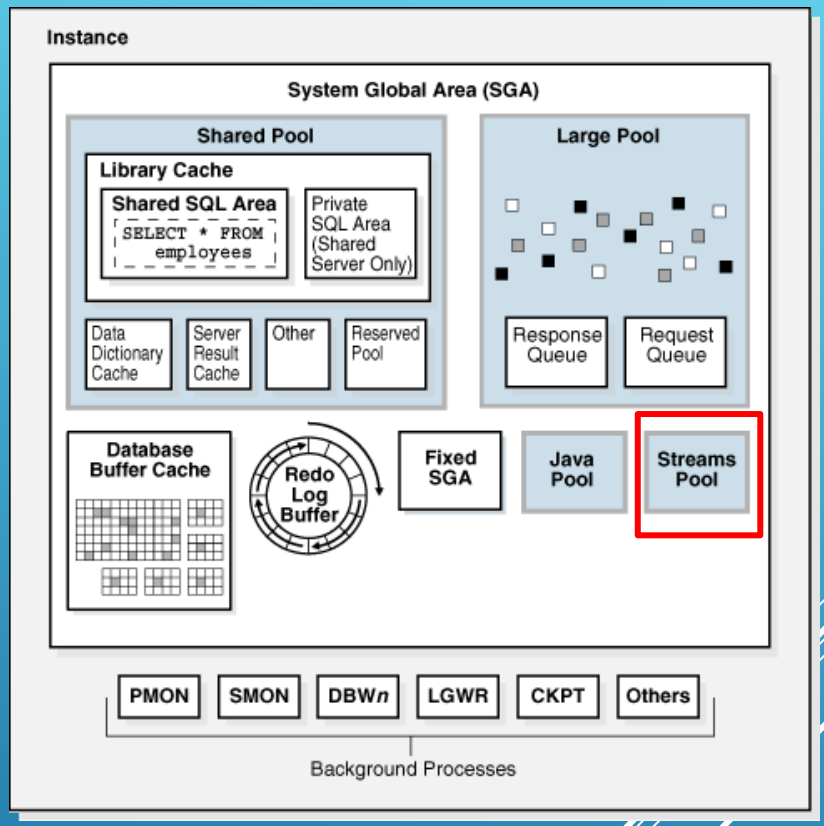
ORACLE INSTANCE

Streams Pool

Stores buffered queued messages. This is exclusively used by Oracle Streams.



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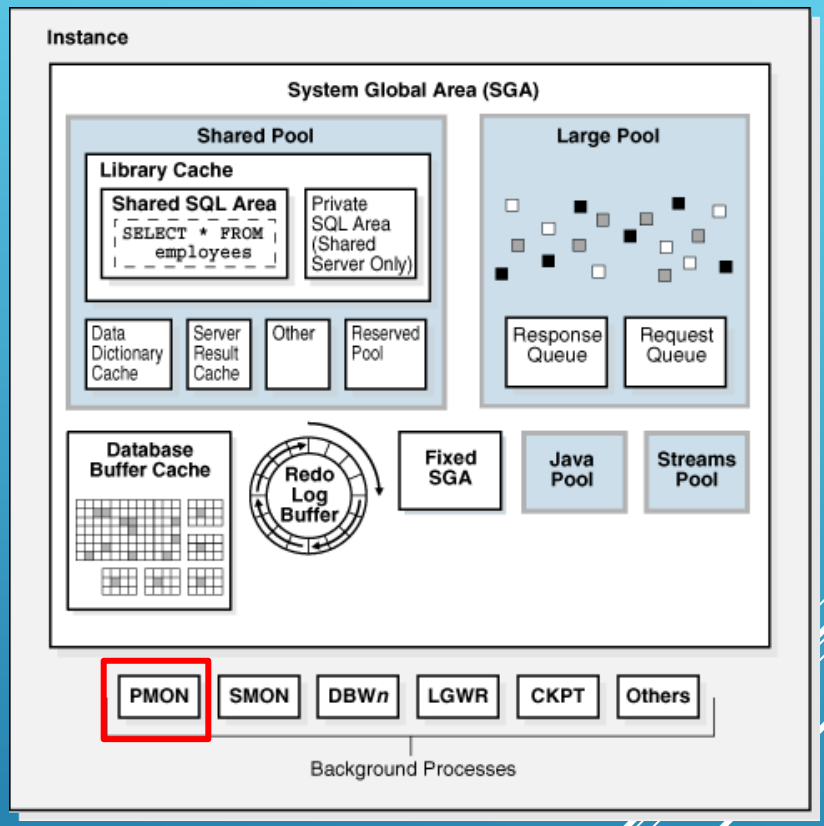
ORACLE INSTANCE

Process Monitor (PMON)

Is responsible to free up resources if a user process fails (e.g. release locks). PMON normally wakes up every 3 seconds to perform housekeeping activities.



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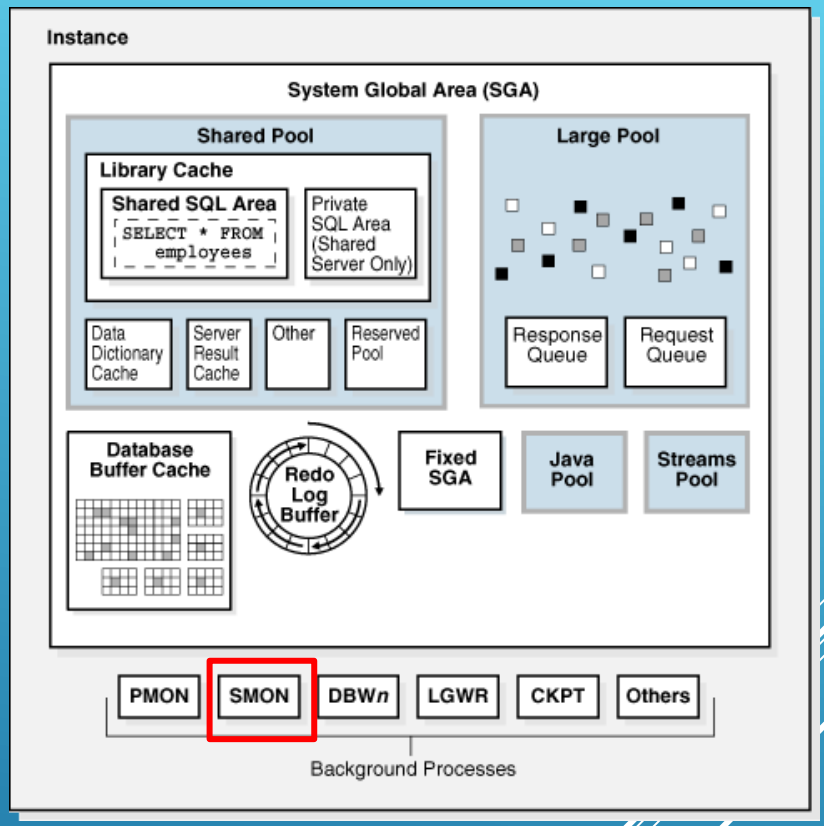
ORACLE INSTANCE

System Monitor (SMON)

Performs instance recovery, cleans up after dirty shutdowns and merges adjacent free extents into larger free extents. SMON normally wakes up every 5 minutes to perform housekeeping activities.



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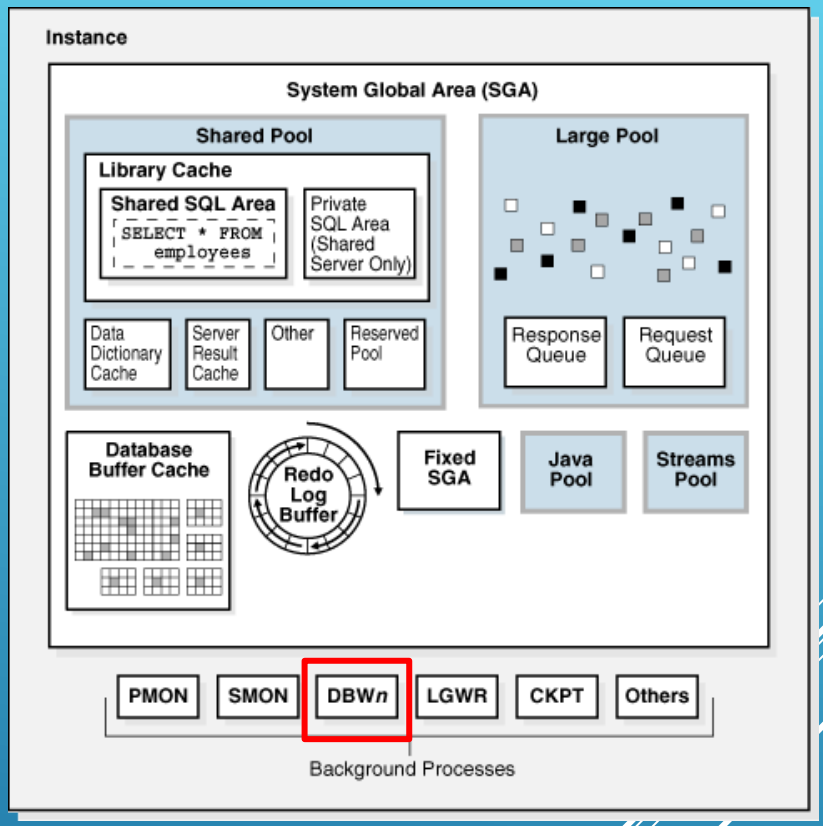
ORACLE INSTANCE

Database Writer (DBW)

Writes modified data from SGA into database files. When the SGA data buffer fills the DBWR process selects buffers using LRU algorithm and writes them to the disk. There can be multiple writer processes named DBWn.

The process of writing by DBW is considered a checkpoint.



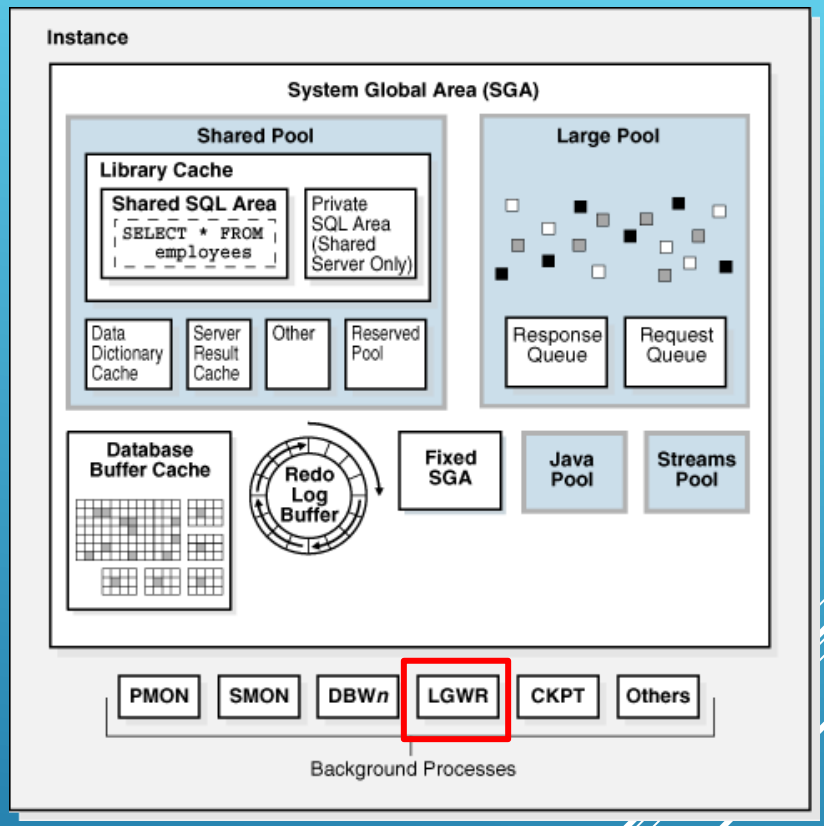

```
SQL> SHOW PARAMETERS db_writer

SQL> SELECT spid, pname, username, program, tracefile FROM v$process
     WHERE pname LIKE 'DBW%';
```

https://docs.oracle.com/cd/B14117_01/win.101/b10113/architec.htm

ORACLE INSTANCE

Log Writer (LGWR)

Writes redo log buffers to the redo log files.



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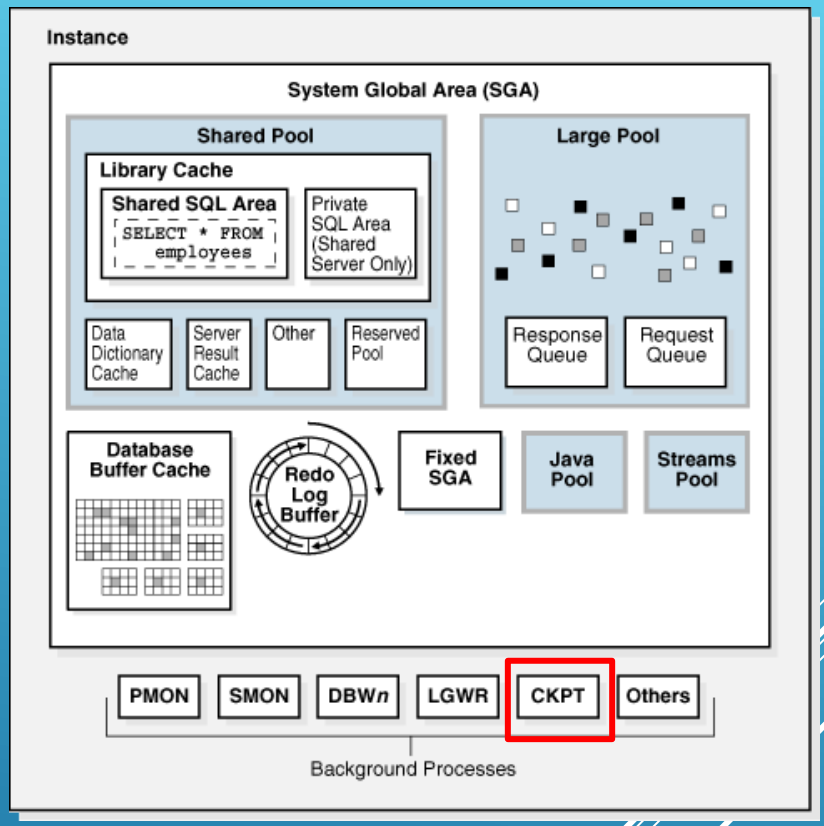
ORACLE INSTANCE

Checkpoint Process (CKPT)

Updates all datafiles and control files with the latest SCN (System Change Number) to indicate that a checkpoint occurred.



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