PEOPLE COME FIRST
INFORMATIKAI SZAKÉRTŐK EGYESÜLETE

Oracle Junior Program
2021/22 őszi félév

IT rendszerek és architektúrák üzemeltetése

Féléves tematika

2021.09.09. Az adatbázisok architektúrája

2021.09.16. Az adatbáziskezelő rendszerek kötelezően elvárt, illetve opcionális képességei

2021.09.23. Vállalati informatikai rendszerek architektúrájának az áttekintése

2021.09.30. Middleware

2021.10.07. Alkalmazásinfrastruktúra

2021.10.14. Identity management

2021.10.21. Virtualizáció és cloud

2021.10.28. Őszi szünet

2021.11.04. Monitorozás, rendszerfelügyelet, hibaelhárítás

2021.11.11. Docker & Kubernetes

2021.11.18. Automatizált infrastruktúra

2021.11.25. Big data és elosztott adattárolás

2021.12.02. Elosztott adatfeldolgozás és adatbázisok

2021.12.09. Ismétlés, kitekintés az IT piacra

Tudnivalók

A tantárgy a félév során online, zoom konferencia keretén belül zajlik csütörtökönként 18:00 órától!

- **A tárgy teljesítéséhez:**
  - Jelentkezés a kurzusra és a vizsgára a **login.pcf.hu** oldalon, kredites hallgatóknak is
  - Év végi vizsgát teljesíteni
- **Vizsga:**
  - 4 vizsgaalkalom
  - Online vizsgázás

Online vizsgaalkalmak:

1. December 16.
2. 2022. január 6.
3. 2022. január 13.
4. 2022. január 20.

Bevezető

- Egy nagyvállalat megannyi rendszert (programot) üzemeltet
- A célszoftverek, vagyis alkalmazások lehetnek:
  - egy ügyfél számára fejlesztett programok,
  - egy általános szoftver testreszabása,
  - egy applikáció módosítás nélküli használata
- Az applikációs szoftverek működésének feltétele, hogy a gépeken alapból bizonyos rendszerszoftverek működjenek. Ilyenek pl. az:
  - Operációs rendszerek
  - Adatbáziskezelő rendszerek
  - Applikációs szerverek
  - Identity Management rendszerek
  - Messaging rendszerek
  - Sok-sok egyéb

Miről szól ez a tárgy/előadássorozat?

- Az operációs rendszereket elég jól megtanítják az egyetemi oktatásban
- Az adatbáziskezelőkről már jóval kevesebb ismerettel rendelkeznek a friss diplomások
- A többi rendszerszoftvert lényegében nem oktatják.
- Célunk bemutatni ezeket
- Mivel az előadássorozatot az Oracle Corporation támogatja, ezért a gyakorlati példákat többnyire az Oracle termékeiből választjuk

Miről fogunk beszélni a szemeszter folyamán?

- Adatbázisok architektúrája és funkcionalitása
- Alkalmazásszerverek
- Identity management rendszerek
- IT rendszerek monitorozása/rendszerfelügyelet
- Virtualizáció és Cloud
- Docker és Kubernetes
- Automatizált infrastruktúra
- Big Data és Hadoop
- NoSQL

Miért érdemes erről tudnotok?

- A rendszergazdai és DevOps feladatok izgalmasak, kihívóak
- Nagy a hiány az ilyen szakértőkből
- Minden informatikusnak hasznos az ilyen alapismeret
- Téves az a vélemény, hogy az ilyen szakértők munkája nem elég kreatív

- A People Come First (PCF) egyesület úgy érzi, hogy hozzá kell járulnia e szakma népszerűsítéséhez
- Aki mélyebben szeretne ebben elmerülni, az keresse fel a PCF egyesület ZeroToHero honlapját ☺

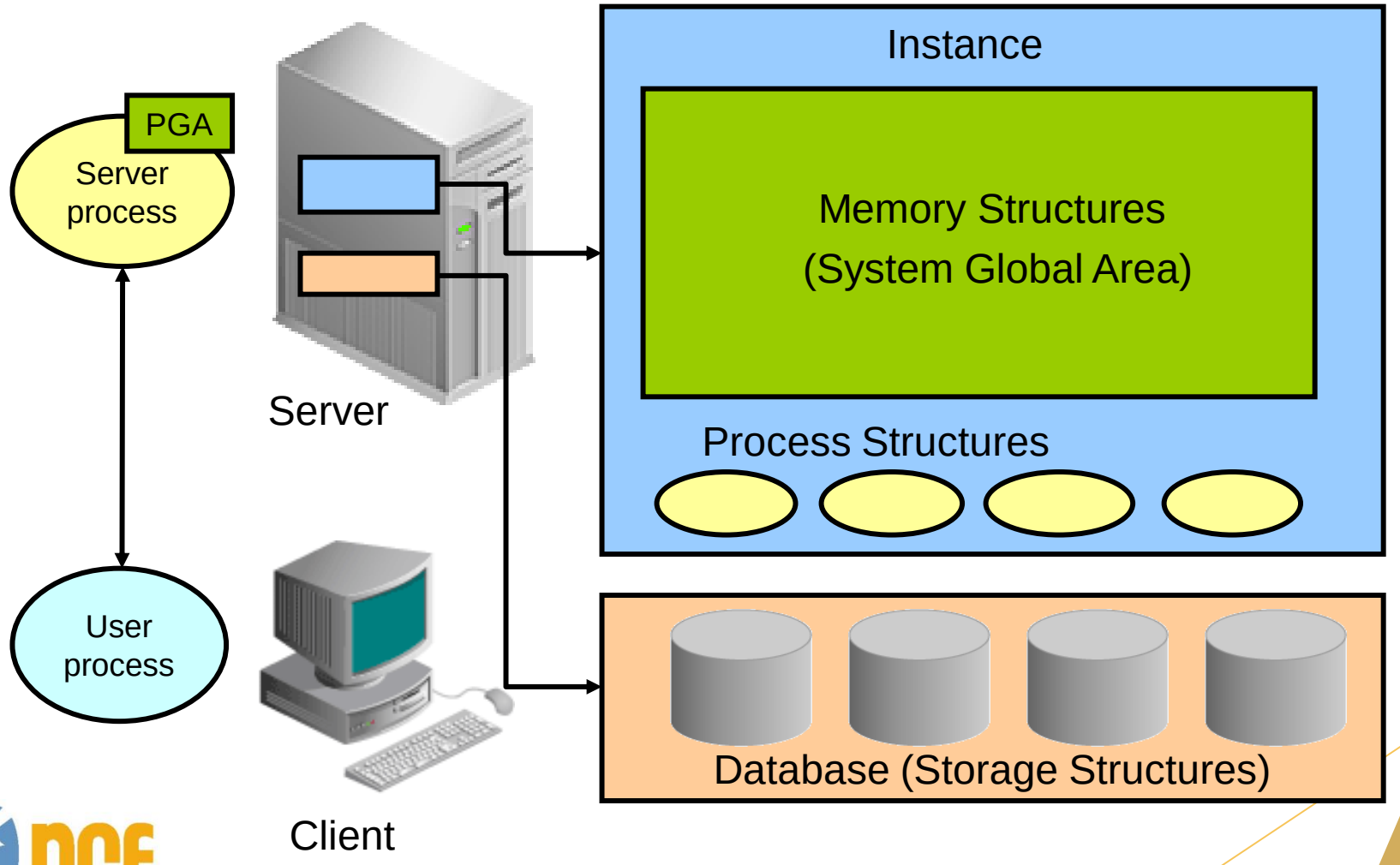
Először az adatbázisokról beszélünk

- Ezen az előadáson egy tipikus adatbáziskezelő rendszer architektúrája következik
- A következő előadás az adatbáziskezelő rendszerek kötelezően elvárt és opcionális képességeiről szól majd

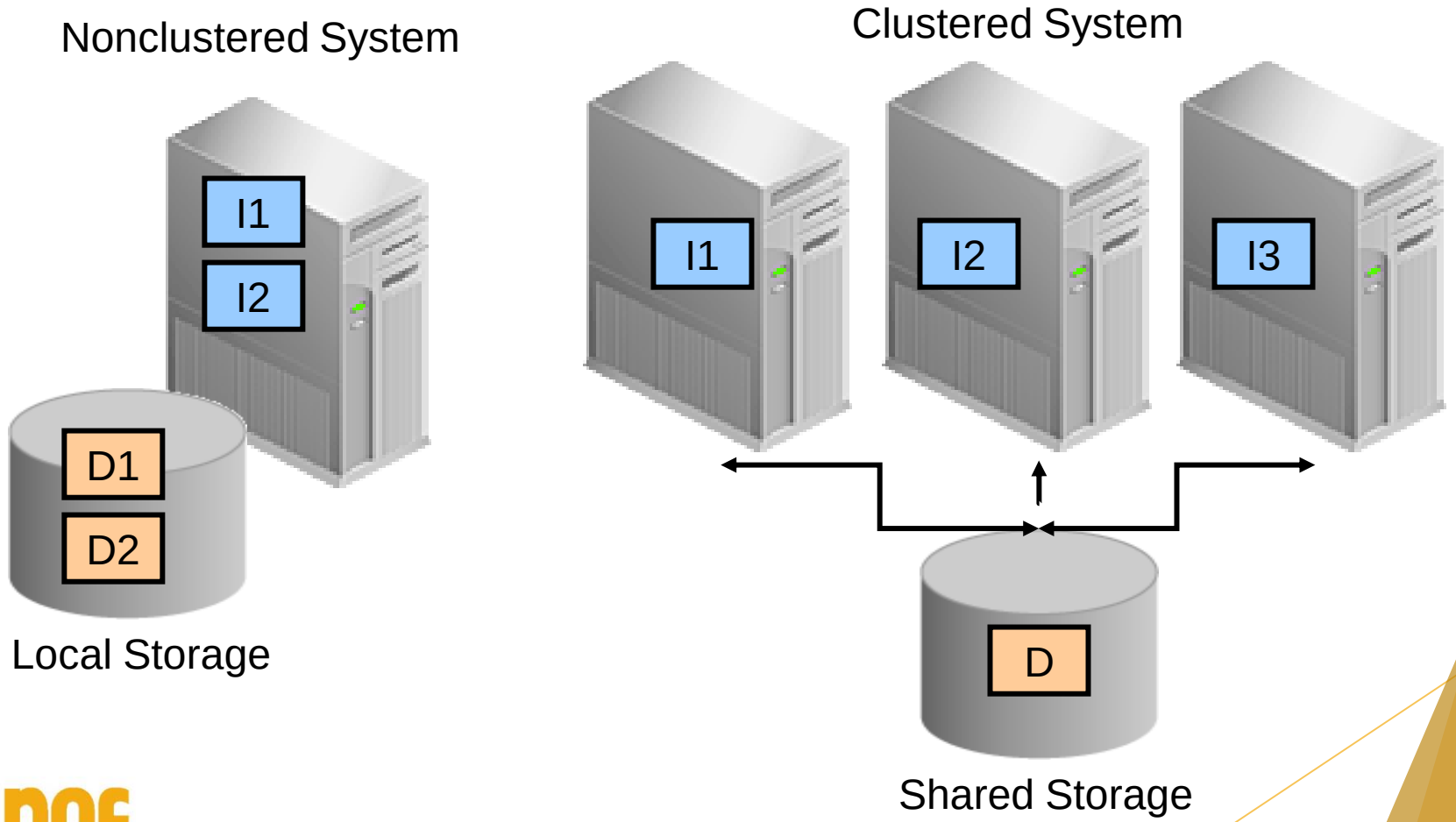
- Előadó: Kerepes Tamás, ügyvezető igazgató, Webváltó Kft.

Exploring Oracle Database Architecture

Oracle Database Server Architecture: Overview

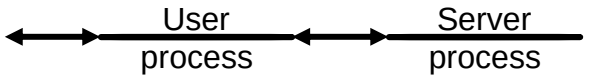


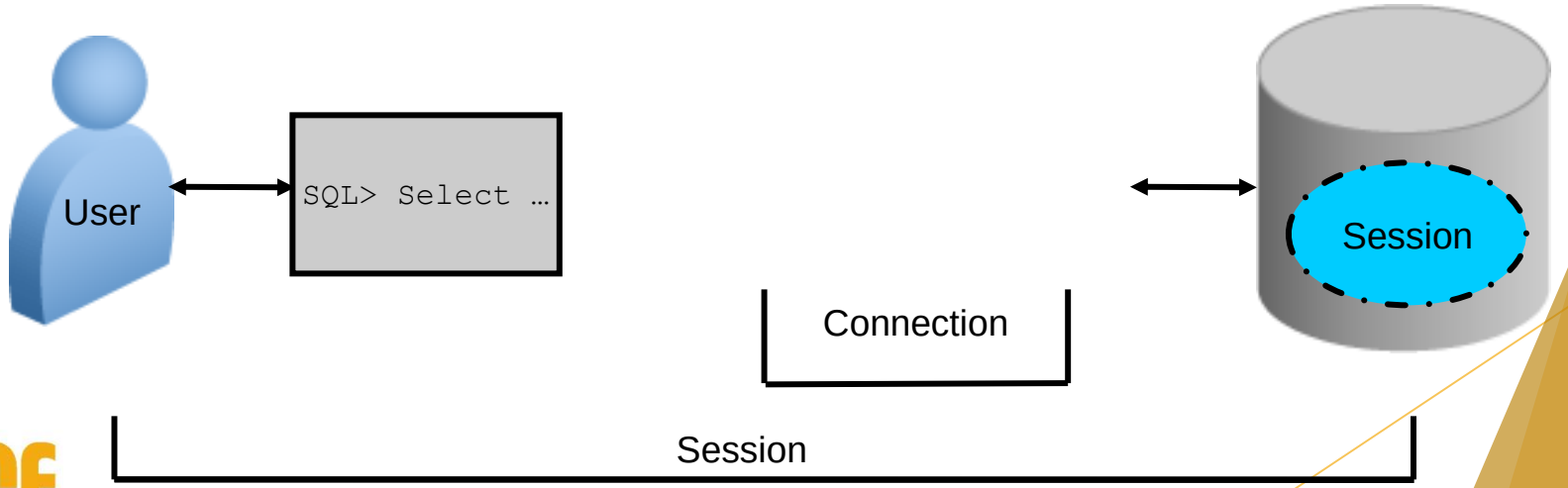
Oracle Database Instance Configurations



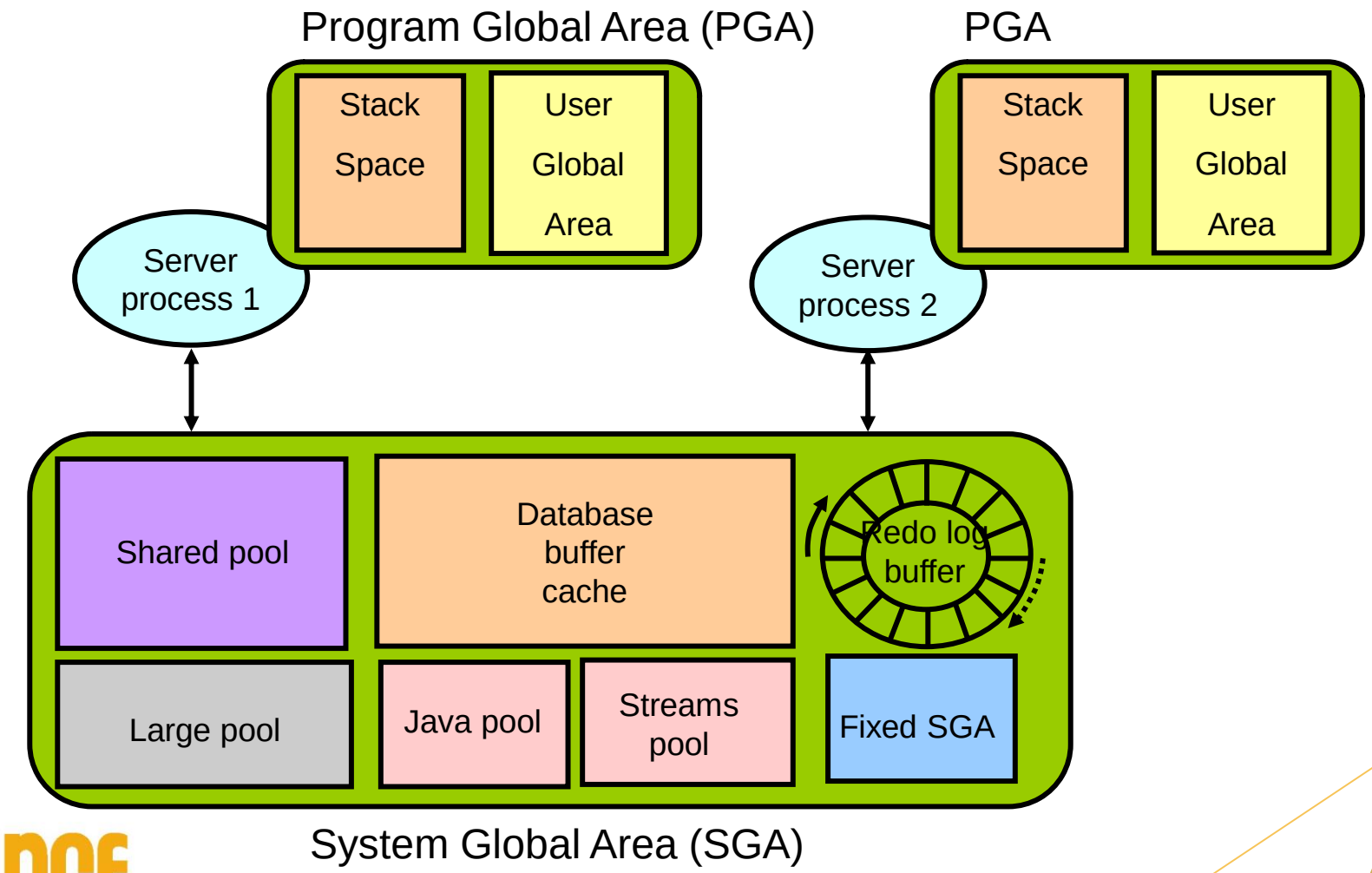
Connecting to the Database Instance

- Connection: Communication between a user process and an instance
- Session: Specific connection of a user to an instance through a user process



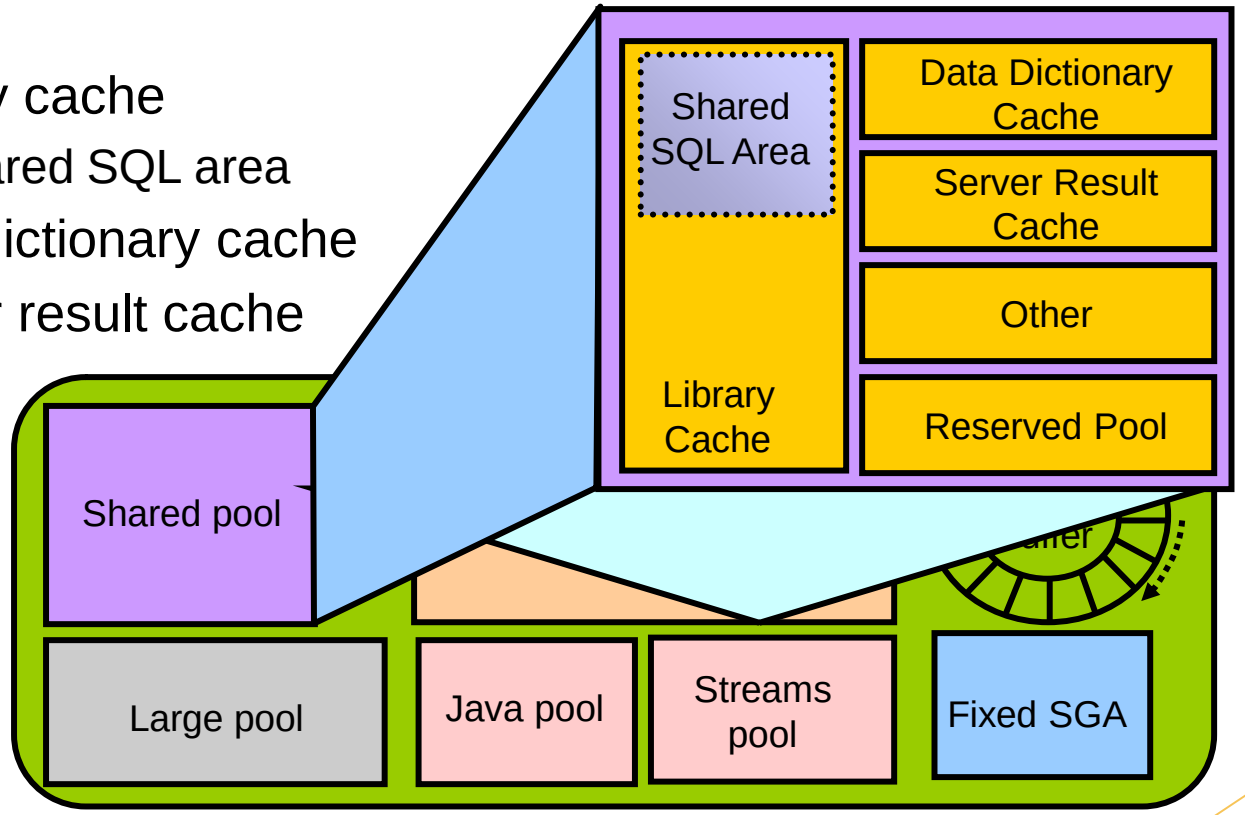


Oracle Database Memory Structures



Shared Pool

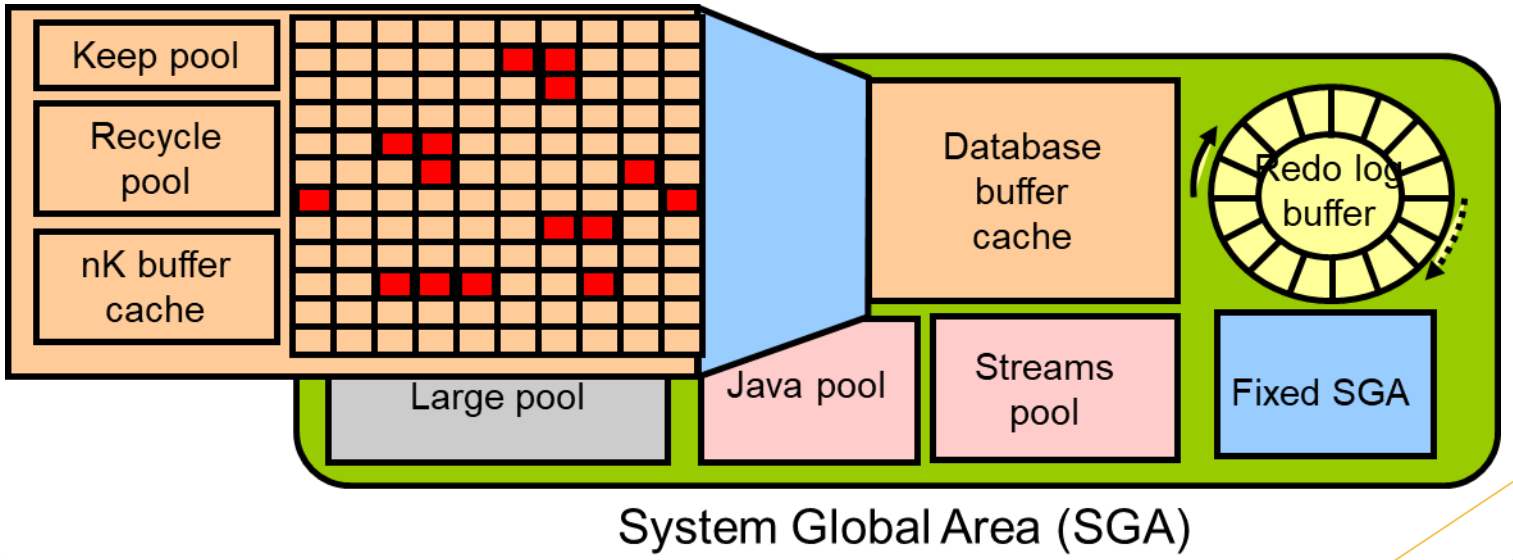
- Is a portion of the SGA
- Contains:
  - Library cache
    - Shared SQL area
  - Data dictionary cache
  - Server result cache



System Global Area (SGA)

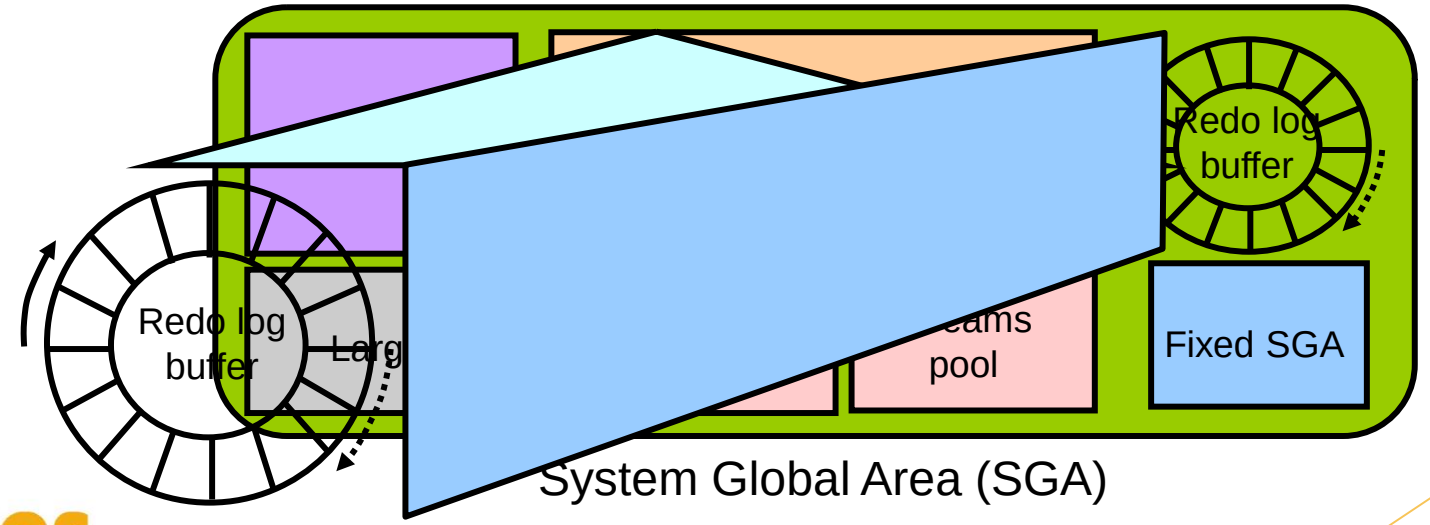
Database Buffer Cache

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



Redo Log Buffer

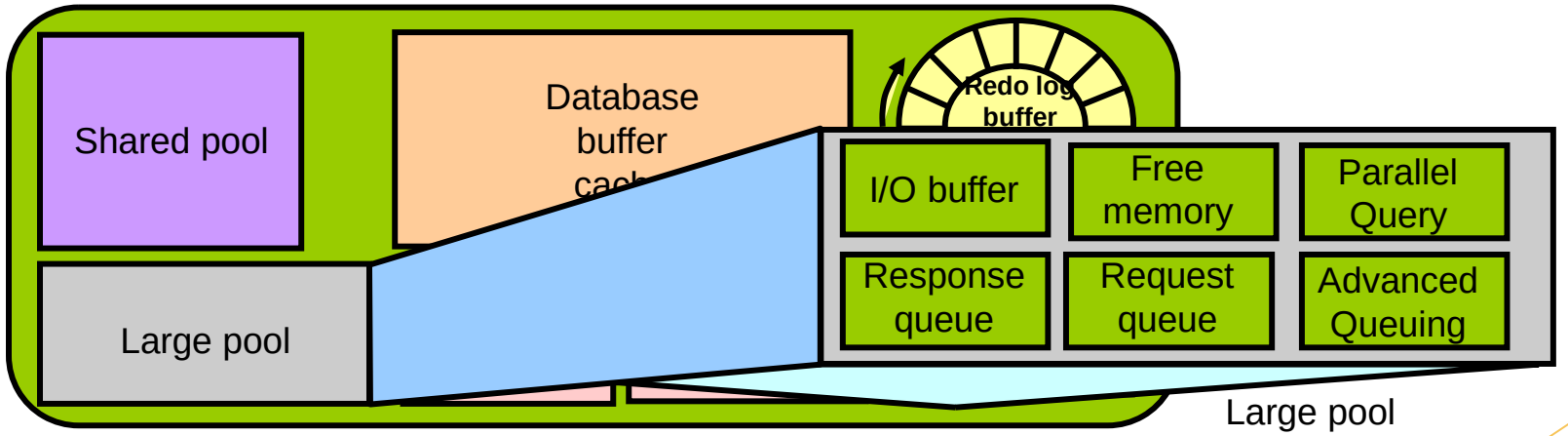
- Is a circular buffer in the SGA
- Holds information about changes made to the database
- Contains redo entries that have the information to redo changes made by operations such as DML and DDL



Large Pool

Provides large memory allocations for:

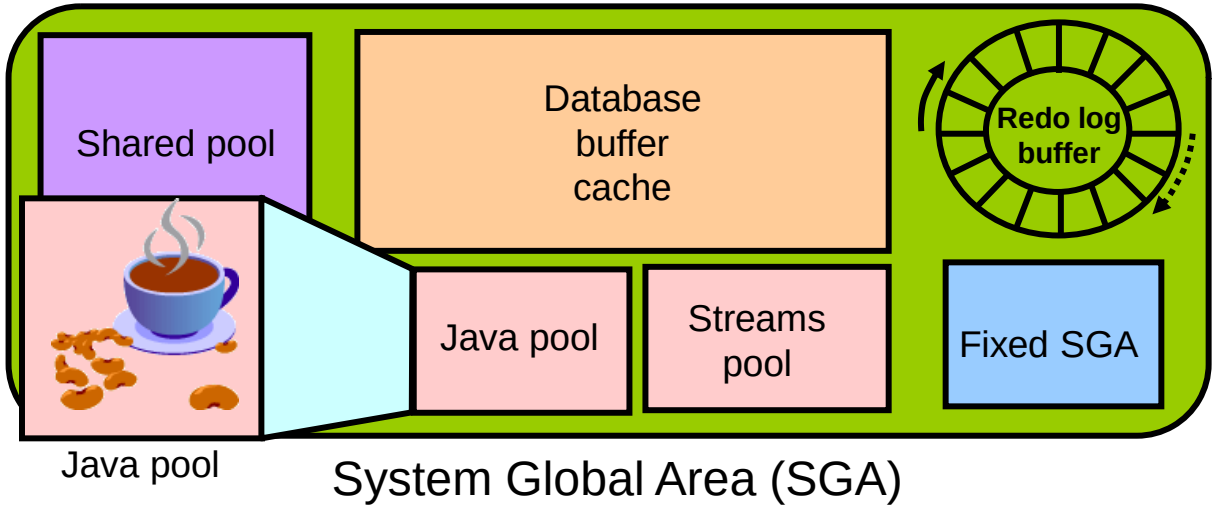
- Session memory for the shared server and the Oracle XA interface
- I/O server processes
- Oracle Database backup and restore operations



System Global Area (SGA)

Java Pool

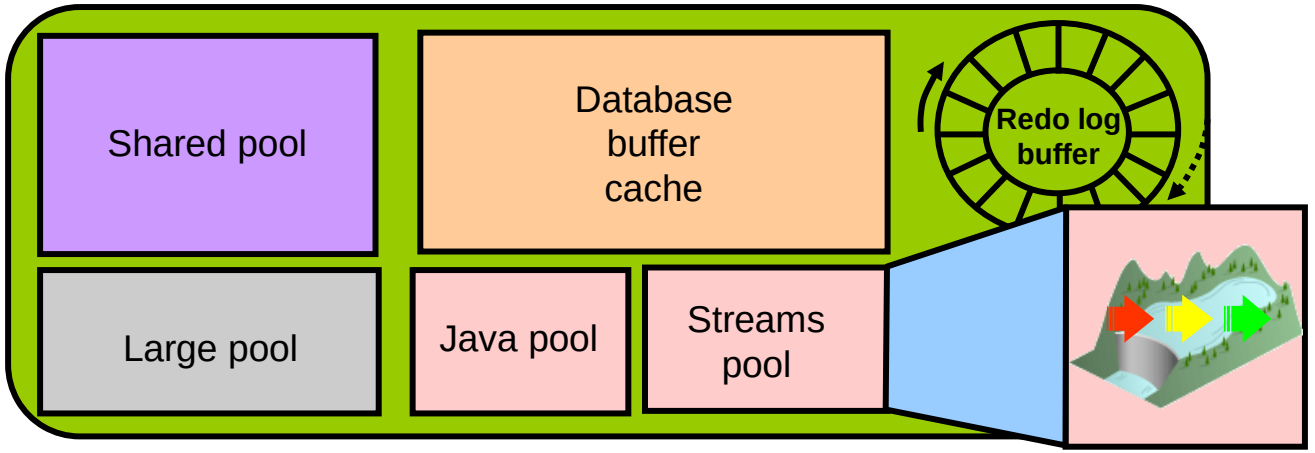
Java pool memory is used to store all session-specific Java code and data in the JVM.



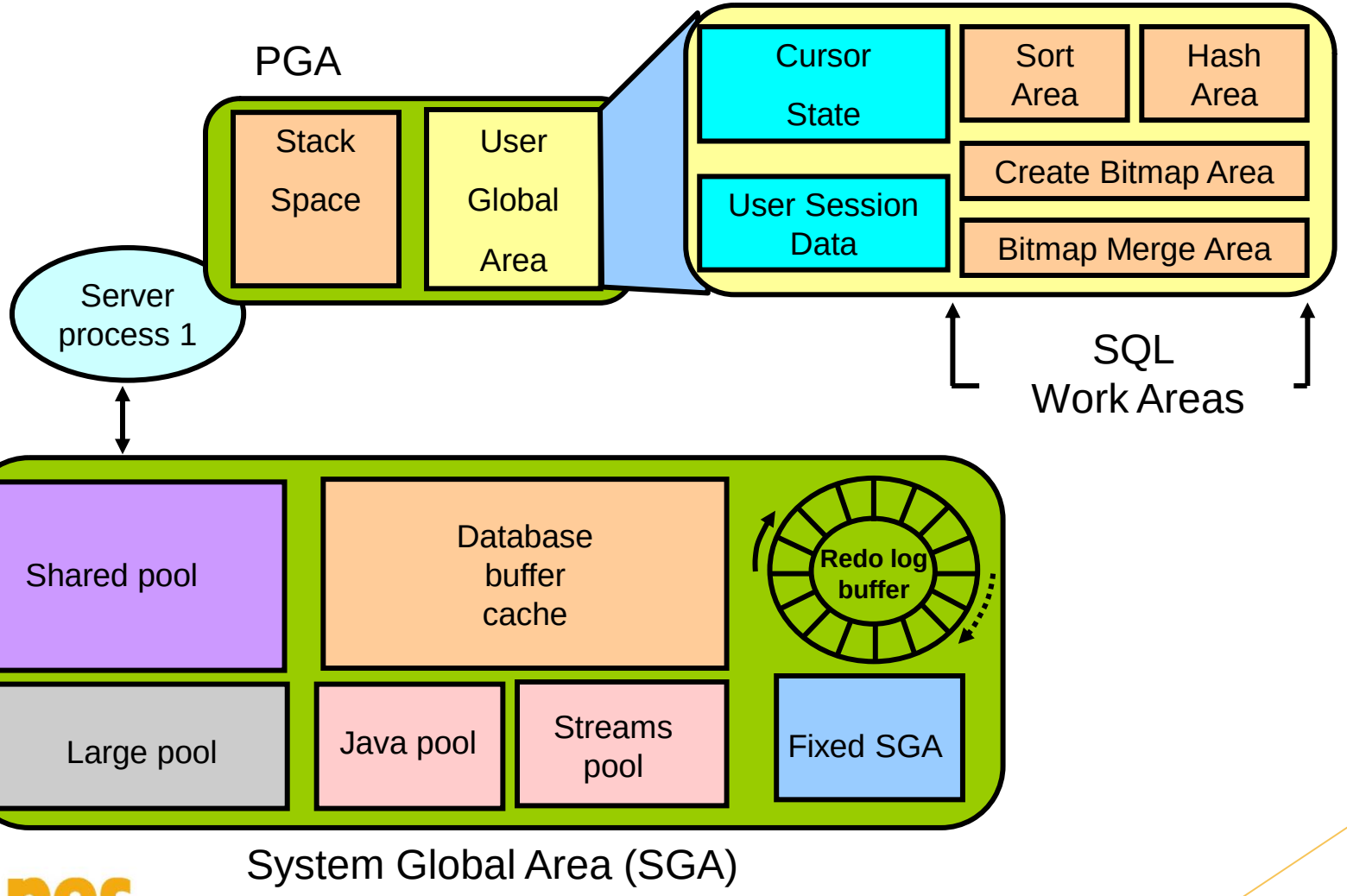
Streams Pool

Streams pool memory is used exclusively by Oracle Streams to:

- Store buffered queue messages
- Provide memory for Oracle Streams processes



Program Global Area (PGA)



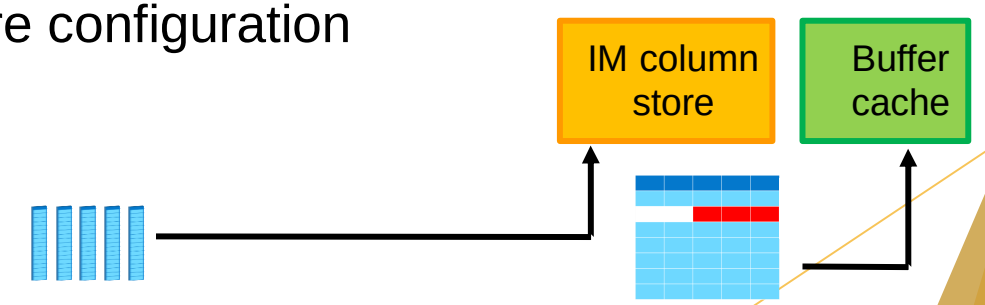
12.1.0.2

In-Memory Column Store: Introduction

- Instant query response:
  - Faster queries on very large tables on any columns (100x)
  - Use of scans, joins, and aggregates
  - Without indexes
  - Best suited for analytics: few columns, many rows
- Faster DML: Removal of most analytics indexes (3 to 4x)
- Full application transparency

ORACLE E-BUSINESS SUITE
ORACLE FUSION APPLICATIONS
ORACLE SIEBEL
ORACLE JD EDWARDS
ORACLE PEOPLESOFT

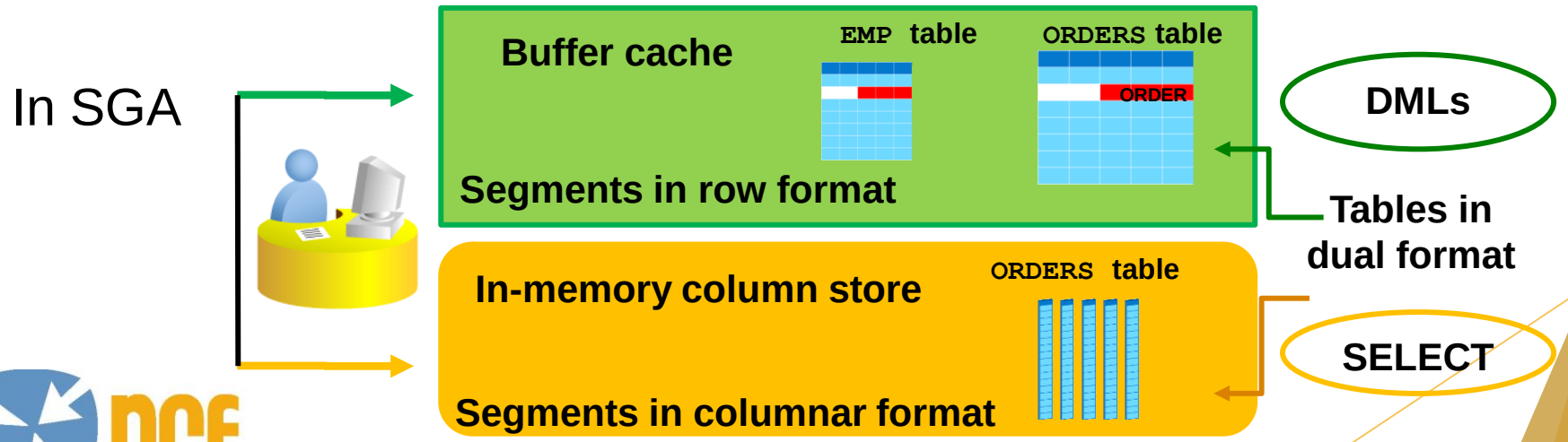
- Easy setup:
  - In-memory column store configuration
  - Segment attributes



PCF

In-Memory Column Store: Overview

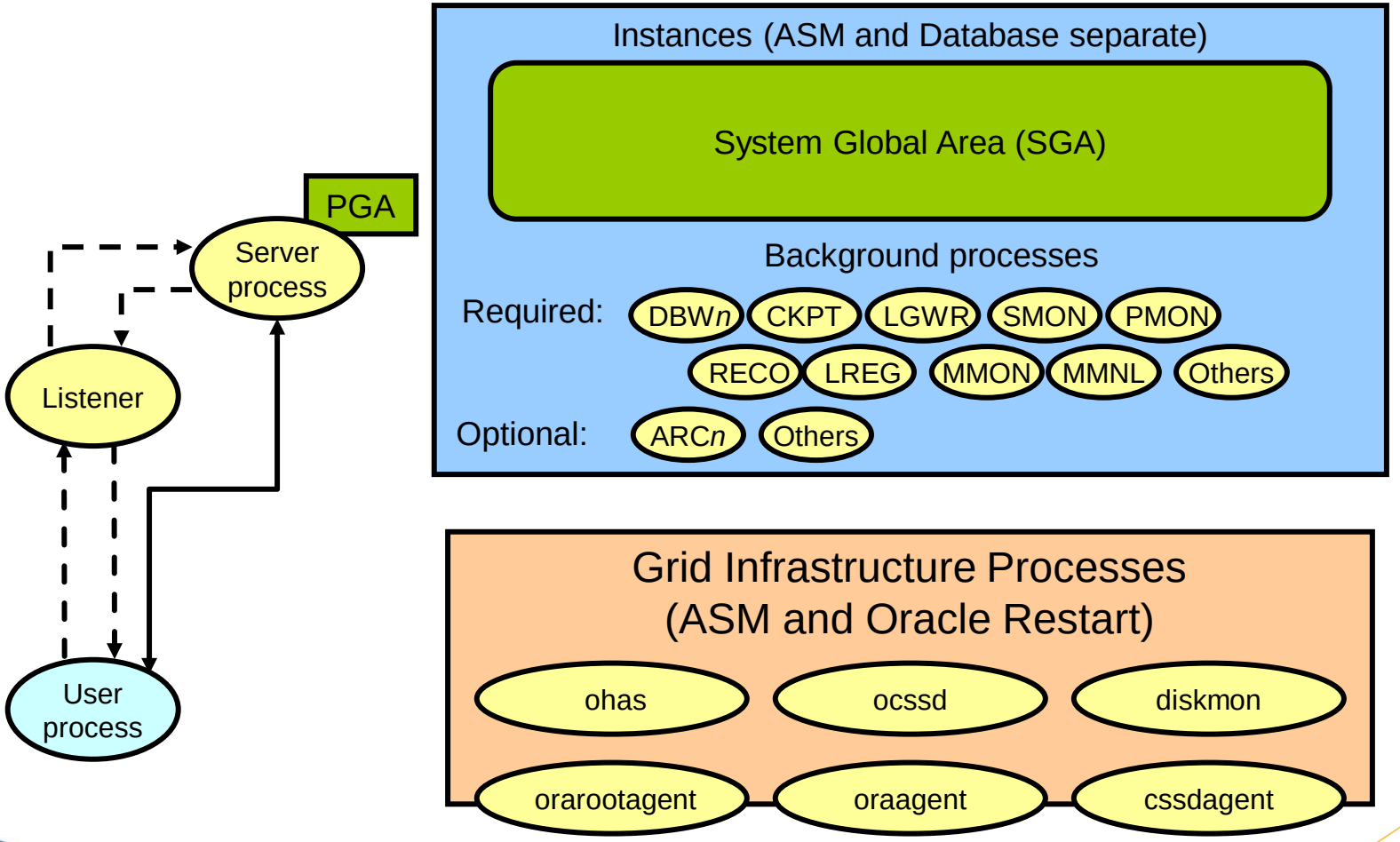
- A new pool in the SGA: In-Memory column store
  - Segments populated into the IM column store are converted into a columnar format.
  - In-Memory segments are transactionally consistent with the buffer cache.
- Only one segment on disk and in row format



Process Architecture

- User process
  - Is the application or tool that 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
- Daemon / Application processes
  - Networking listeners
  - Grid Infrastructure daemons

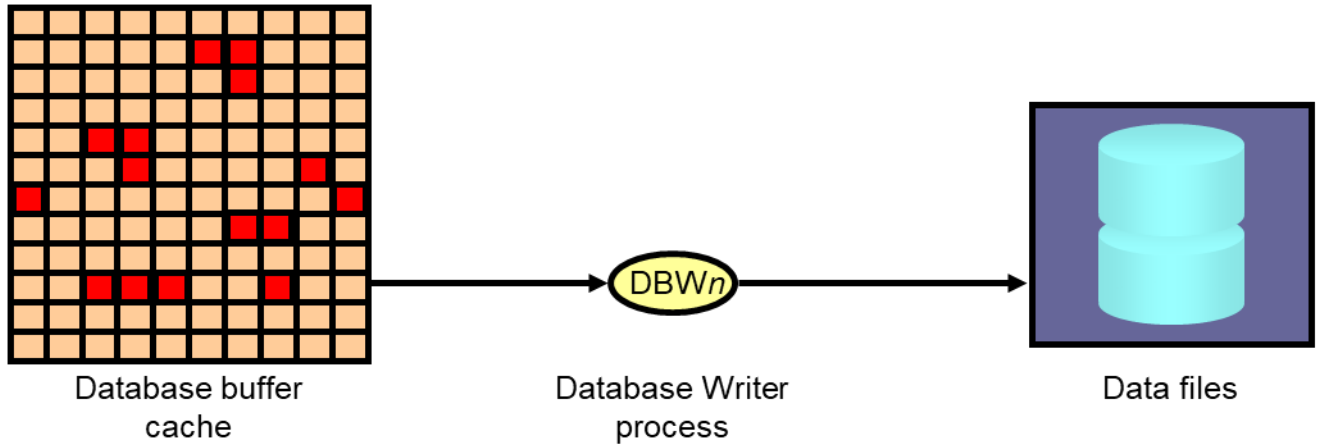
Process Structures



Database Writer Process (DBWn)

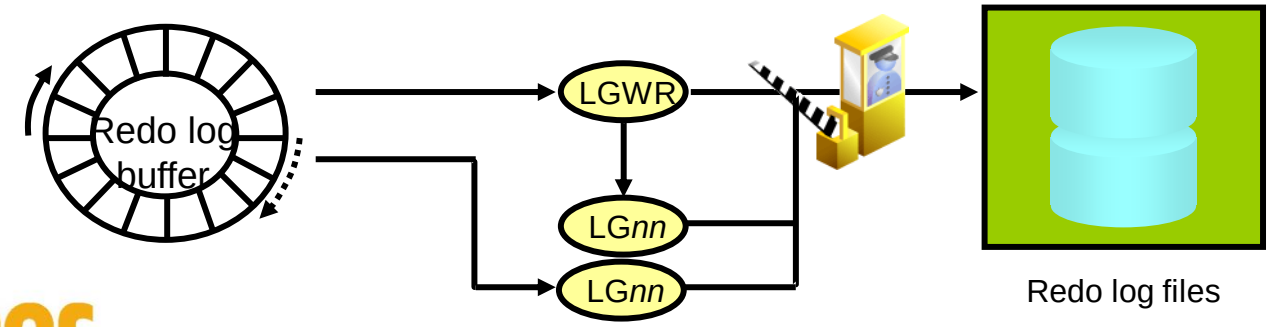
Writes modified (dirty) buffers in the database buffer cache to disk:

- Asynchronously while performing other processing
- To advance the checkpoint



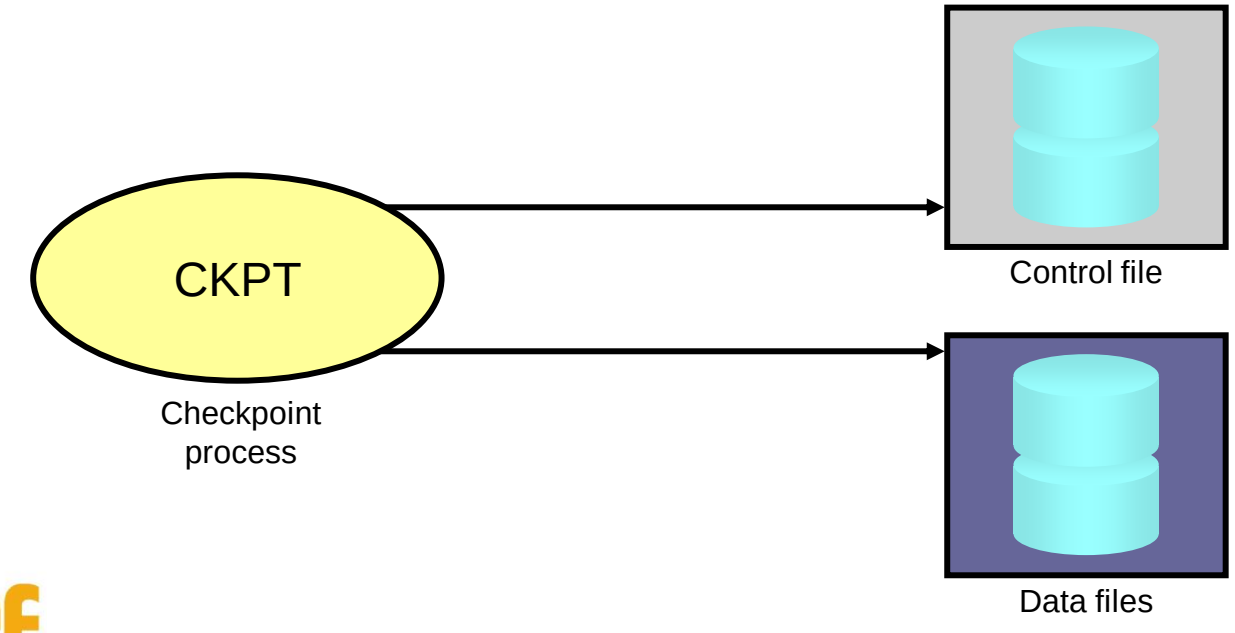
Log Writer Process (LGWR)

- Writes the redo log buffer to a redo log file on disk
  - When a user process commits a transaction
  - When an online redo log switch occurs
  - When the redo log buffer is one-third full or contains 1 MB of buffered data
  - Before a DBW*n* process writes modified buffers to disk
  - When three seconds have passed since the last write
- Serves as coordinator of LG*nn* processes and ensures correct order for operations that must be ordered



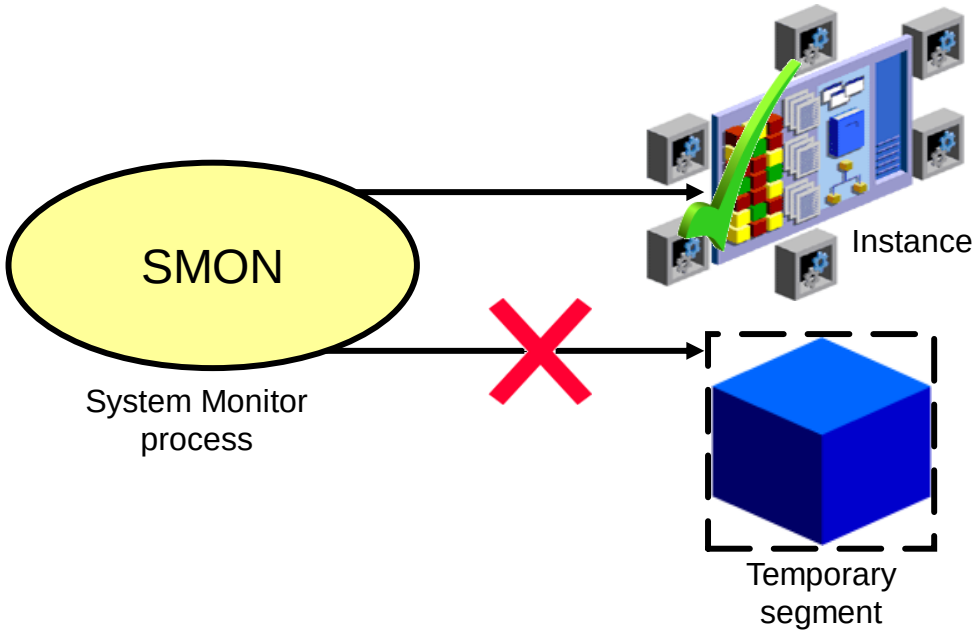
Checkpoint Process (CKPT)

- Records checkpoint information in
  - Control file
  - Each data file header
- Signals DBW*n* to write blocks to disk



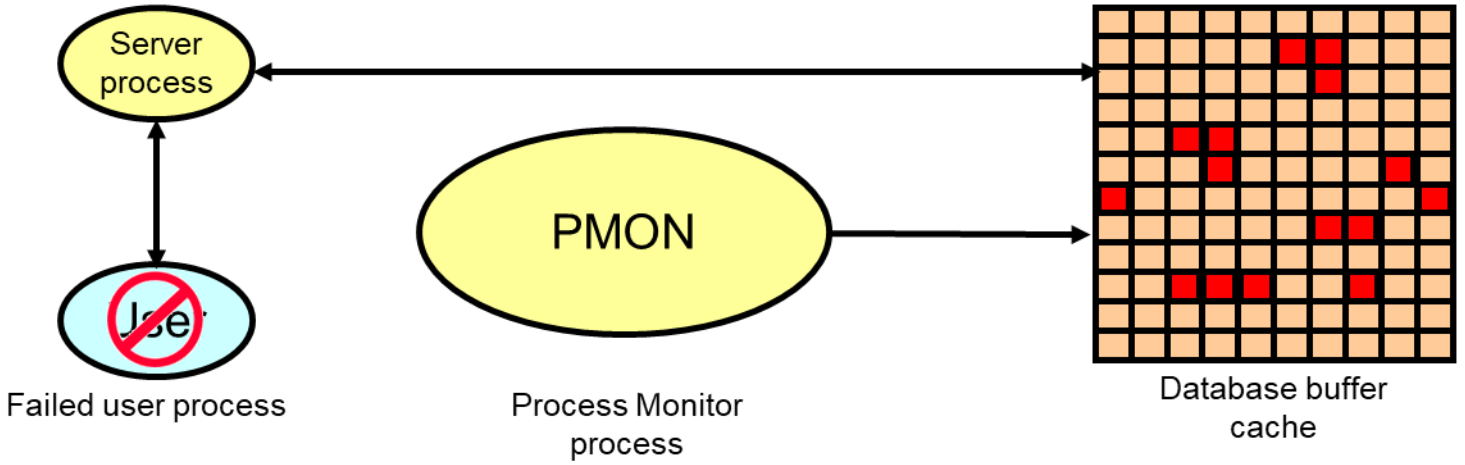
System Monitor Process (SMON)

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



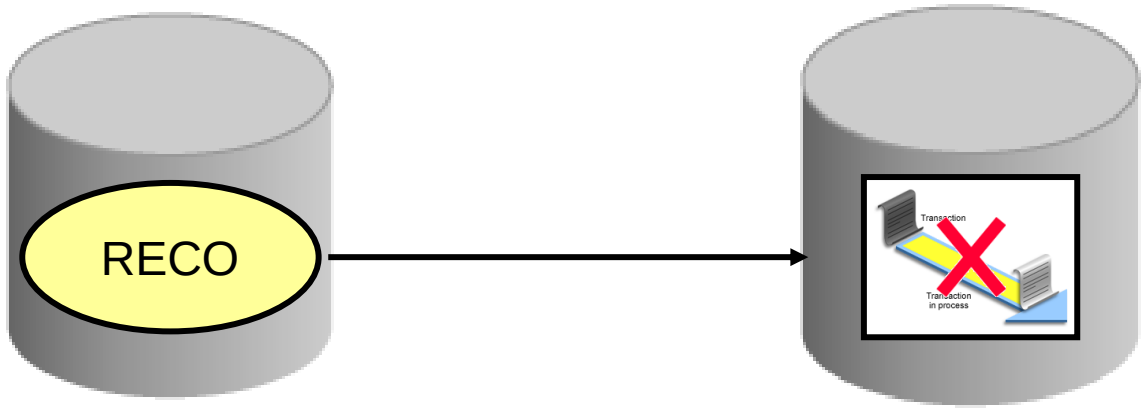
Process Monitor Process (PMON)

- 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



Recoverer Process (RECO)

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

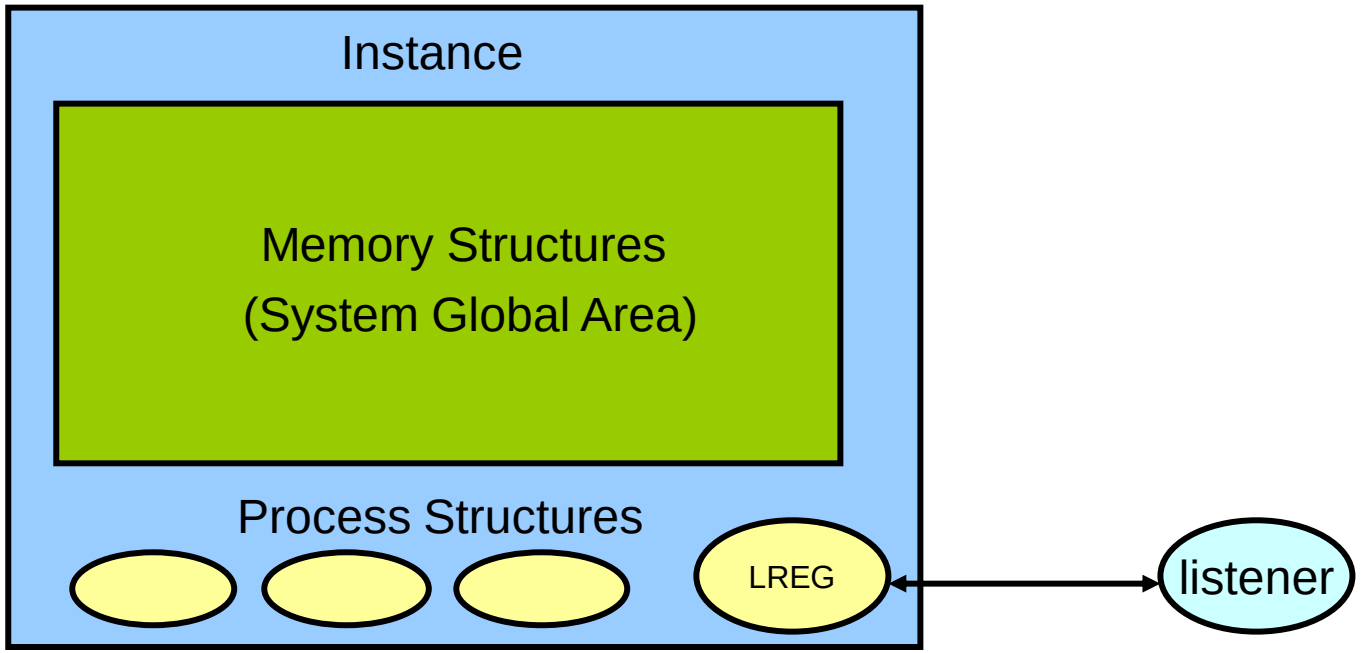


Recoverer process in database A

In-doubt transaction in database B

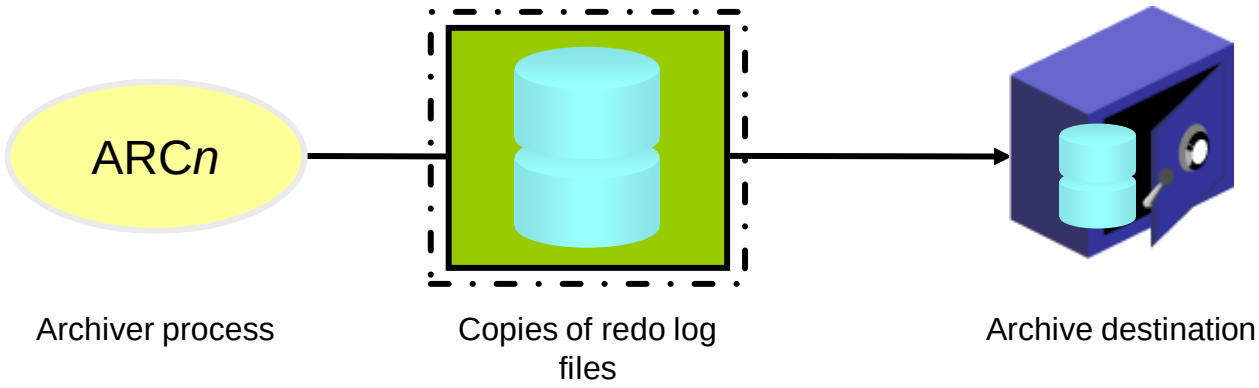
Listener Registration Process (LREG)

Registers information about the database instance and dispatcher processes with the Oracle Net Listener

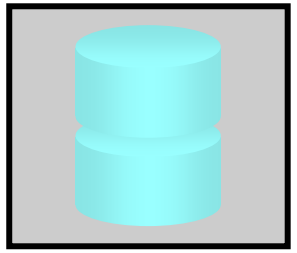


Archiver Processes (ARC*n*)

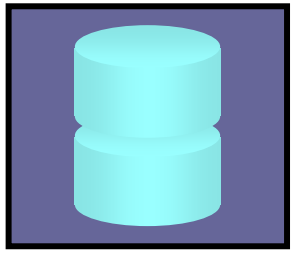
- Copy redo log files to a designated storage device after a log switch has occurred
- Can collect transaction redo data and transmit that data to standby destinations



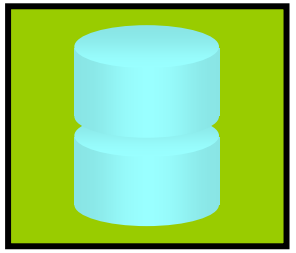
Database Storage Architecture



Control files

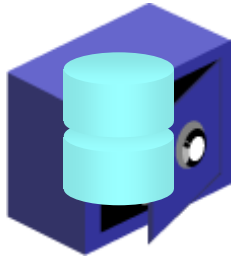


Data files

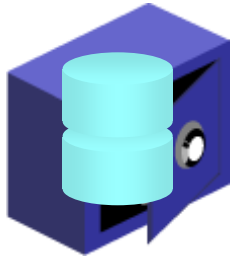


Online redo log files

Parameter file

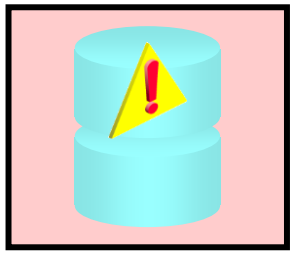


Backup files



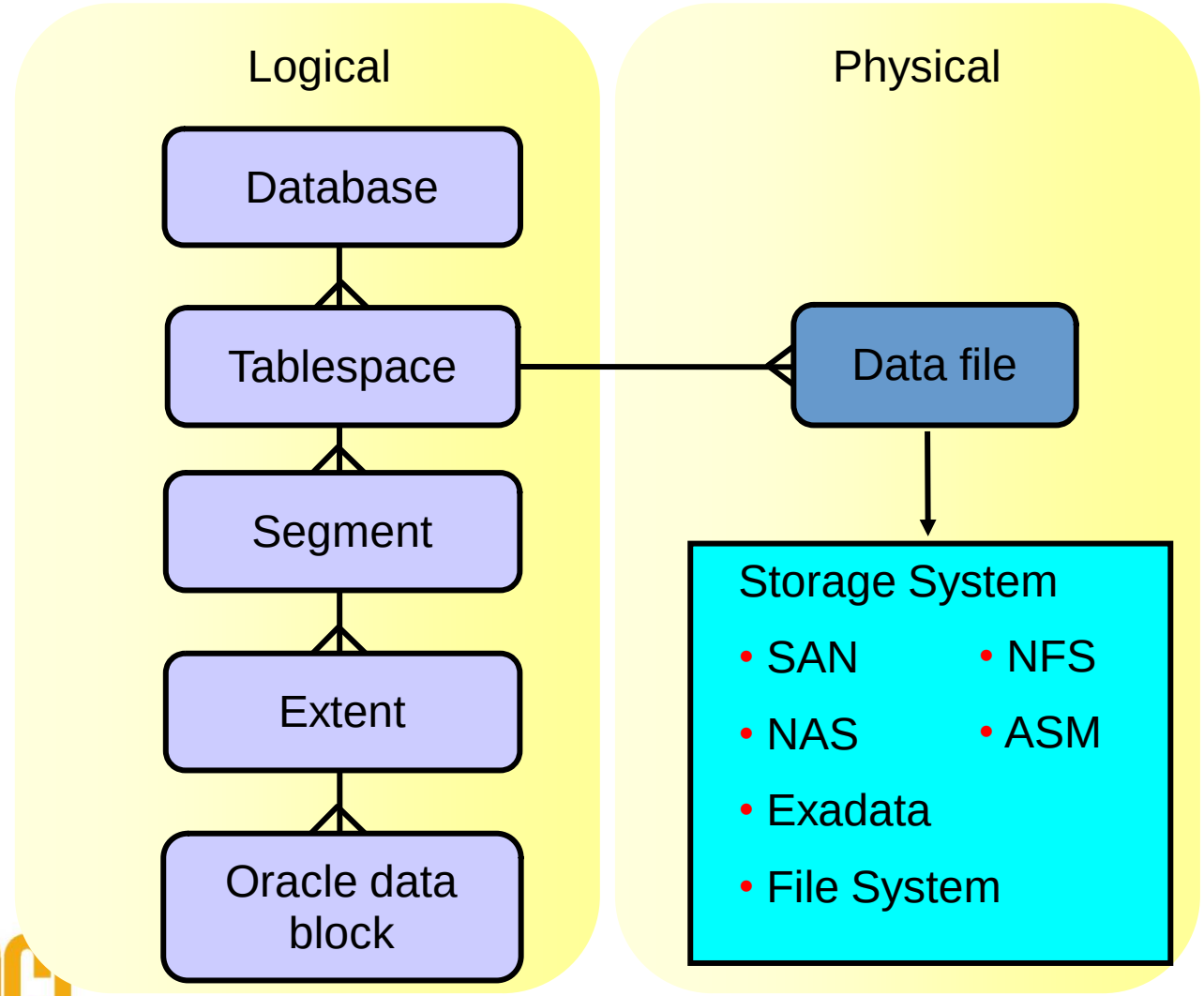
Archived redo log files

Password file



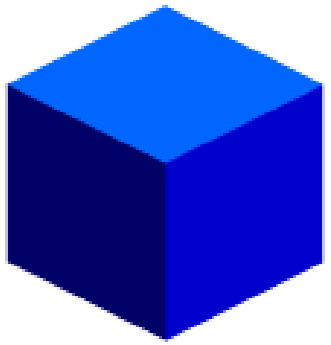
Alert log and trace files

Logical and Physical Database Structures



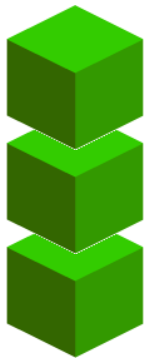
Segments, Extents, and Blocks

- Segments exist in a tablespace.
- Segments are collections of extents.
- Extents are collections of data blocks.
- Data blocks are mapped to disk blocks.



Segment

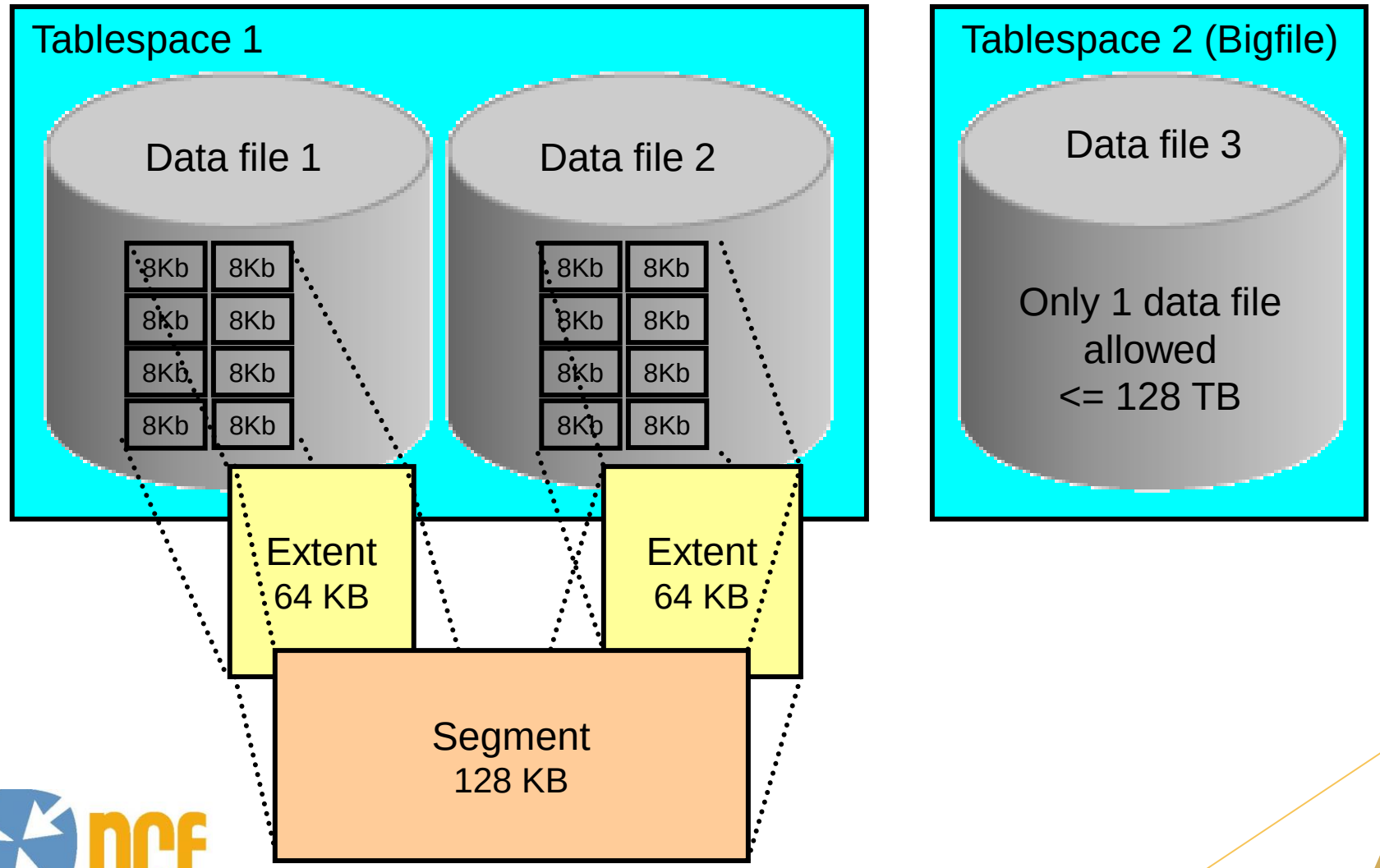
Extents



Data blocks

Disk blocks (File System Storage)

Tablespaces and Data Files



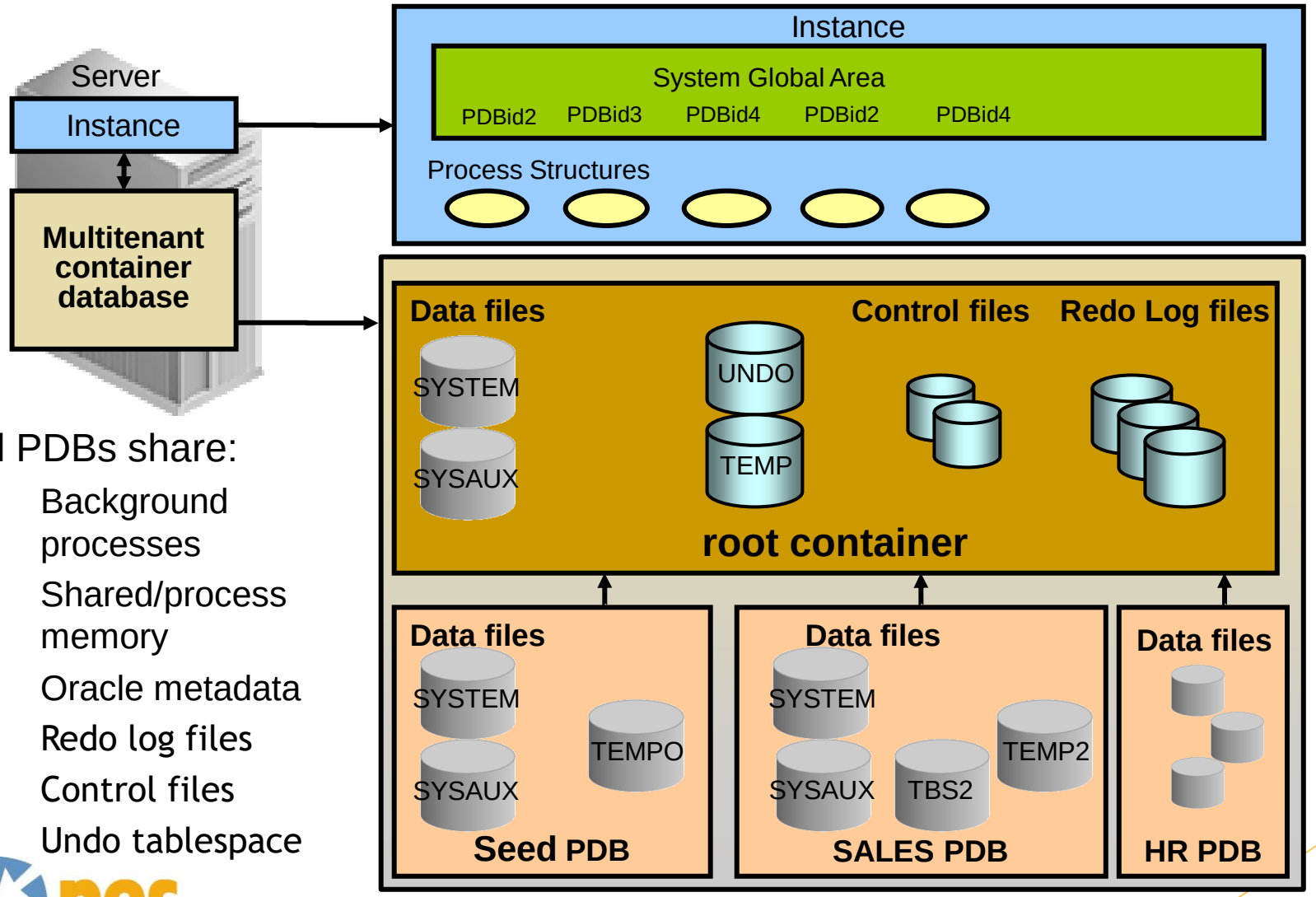
SYSTEM and SYSAUX Tablespaces

- The SYSTEM and SYSAUX tablespaces are mandatory tablespaces that are created at the time of database creation. They must be online.
- The SYSTEM tablespace is used for core functionality (for example, data dictionary tables).
- The auxiliary SYSAUX tablespace is used for additional database components.
- The SYSTEM and SYSAUX tablespaces should not be used for application data.

Oracle Container Database: Introduction

- *Pluggable database*: Is a set of database schemas that appears logically to users and applications as a separate database
- *Multitenant container database*: Has a database instance and database files at the physical level
- All pluggable databases share:
  - Background processes
  - Shared/process memory
  - Oracle metadata

Multitenant Architecture

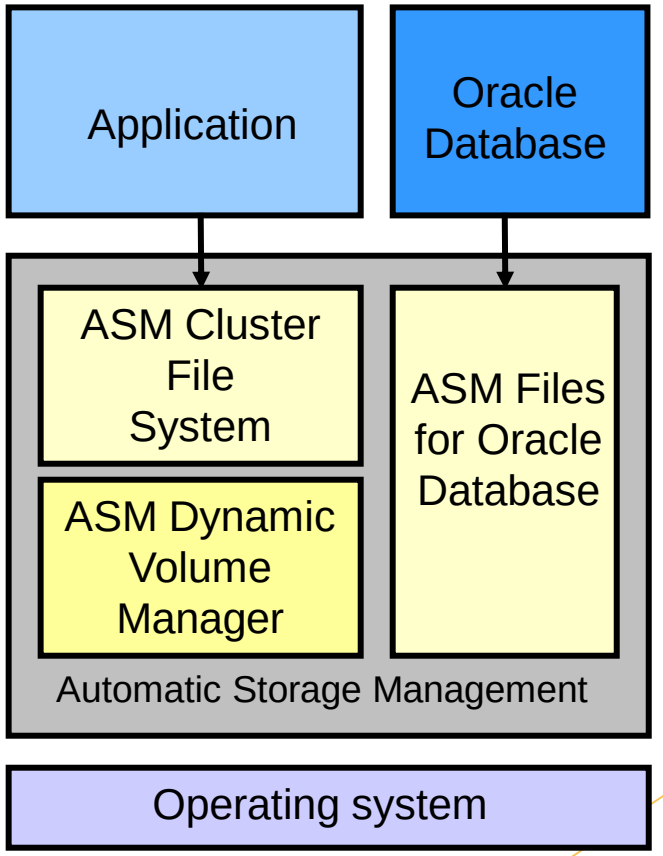


All PDBs share:

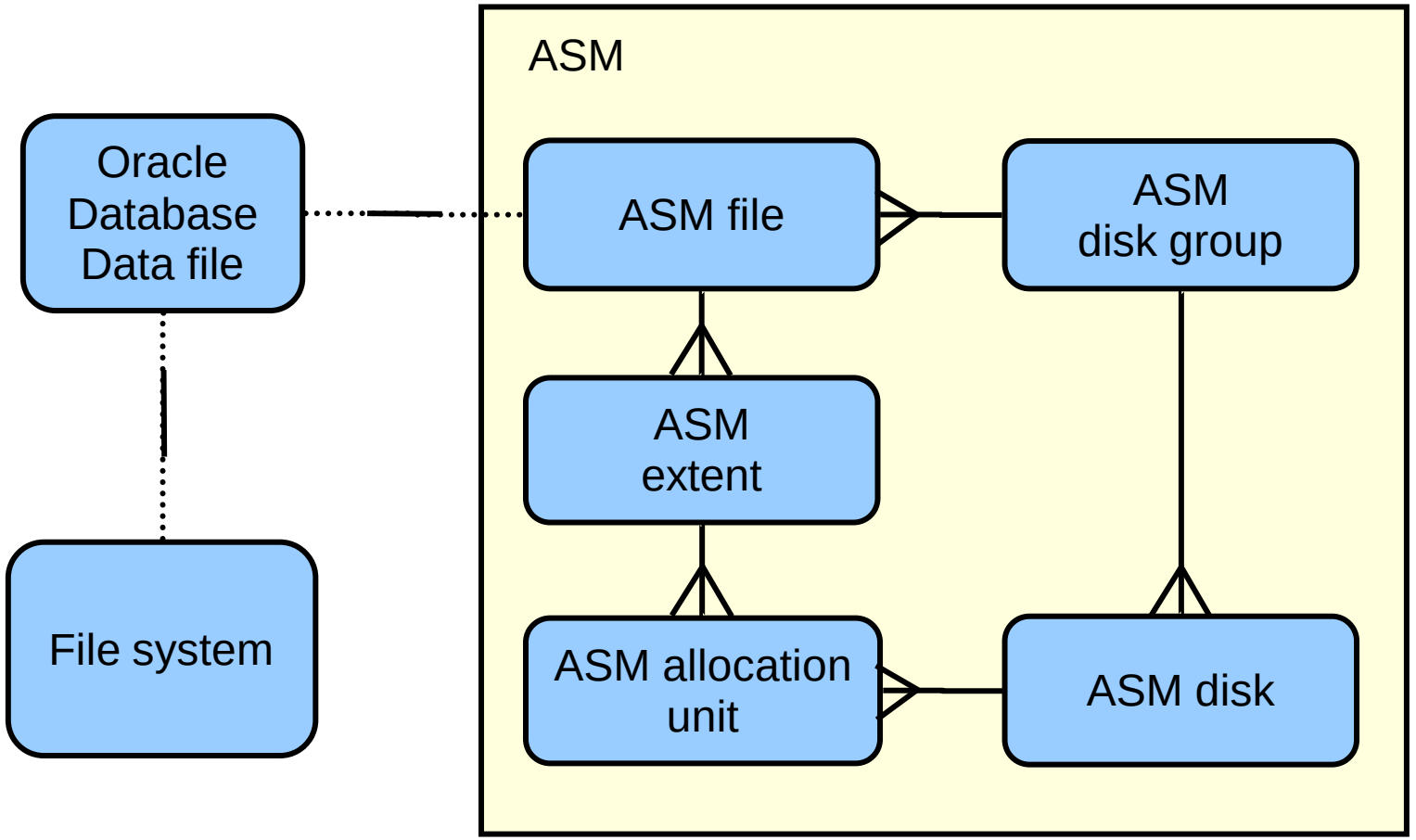
- Background processes
- Shared/process memory
- Oracle metadata
- Redo log files
- Control files
- Undo tablespace

Automatic Storage Management

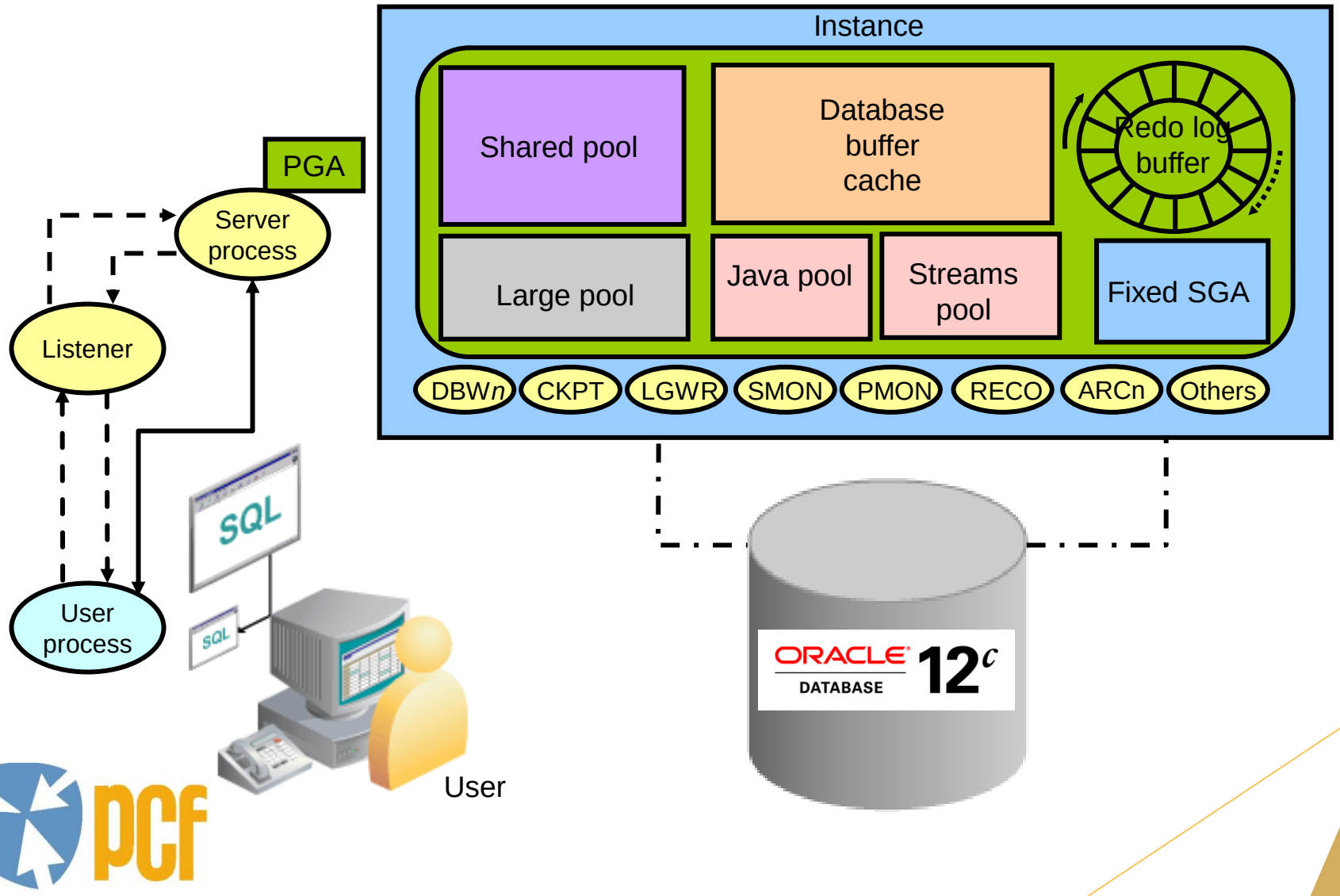
- Is a portable and high-performance cluster file system
- Manages Oracle database files
- Manages application files with ASM Cluster File System (ACFS)
- Spreads data across disks to balance load
- Mirrors data in case of failures
- Solves storage management challenges



ASM Storage Components



Interacting with an Oracle Database: Memory, Processes, and Storage



Summary

In this lesson, you should have learned how to:

- List the major architectural components of Oracle Database
- Explain memory structures
- Describe background processes
- Correlate logical and physical storage structures
- Describe pluggable databases
- Describe ASM storage components
- Describe Oracle Multitenant Container Database technology