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**Memory structure and background processes**

**Memory Structure**

1. System Global Area (SGA):

* Shared memory region accessible to all database processes.
* Holds frequently accessed data and control information.
* Major components:
  + Database Buffer Cache: Stores copies of data blocks read from disk, reducing I/O operations.
  + Redo Log Buffer: Temporarily holds redo entries (changes to data), ensuring data recovery in case of failures.
  + Shared Pool: Caches various shared structures like parsed SQL statements, PL/SQL code, and data dictionary information.

2. Program Global Area (PGA):

* Private memory region for each server process (user session or background process).
* Holds data and control information specific to that process.
* Major components:
  + Sort Area: Used for sorting data during queries.
  + Session Memory: Stores session-specific information like bind variables and cursor state.

**Background Processes**

Background processes are non-user processes that perform essential maintenance tasks and manage database operations. Common examples include:

- Database Writer (DBWn): Writes modified data blocks from the buffer cache to disk.

* Log Writer (LGWR): Writes redo entries from the redo log buffer to the online redo log files.
* Checkpoint (CKPT): Updates data file headers and control files to synchronize database state.
* System Monitor (SMON): Performs instance recovery at startup and cleans up temporary segments.
* Process Monitor (PMON): Cleans up failed processes and releases resources.
* Archiver (ARCn): Copies online redo log files to archived log files (if archiving is enabled).
* Recoverer (RECO): Resolves distributed database inconsistencies.

These background processes work together to ensure database consistency, performance, and availability.

Additional Context

* Memory structures and background processes can vary between different DBMS vendors.
* Configuration and tuning of these components are essential for optimal database performance.
* Understanding these concepts is crucial for database administrators and developers.

**Oracle logical and physical storage**

**Logical Storage:**

* Abstract representation of data organization: Focuses on how data is accessed and organized from the user's perspective.
* Key structures:
  + Data blocks: The smallest unit of data management, typically 4KB in size.
  + Extents: Consecutive data blocks allocated to a specific segment.
  + Segments: Collections of extents holding related data (e.g., a table or index).
  + Tablespaces: Logical containers for segments, often grouped by function or performance needs.
* Advantages:
  + Independent of physical location: Tablespaces can be moved or spread across disks without affecting user access.
  + Easy management: Simplifies storage allocation, growth, and reorganization.
  + Improved performance: Optimizing tablespaces based on access patterns.

**Physical Storage:**

* Concrete implementation of data on physical media: Deals with the actual location and format of data files on disk.
* Key elements:
  + Data files: Operating system files containing database segments.
  + Redo logs: Files that track changes made to the database for recovery purposes.
  + Control files: Files storing critical metadata about the database structure.
  + Storage options: Operating system file systems or Oracle ASM (Automatic Storage Management).
* Considerations:
  + Performance: Disk type, RAID configuration, and data placement impact access speeds.
  + Backup and recovery: Efficient strategies depend on physical storage layout.
  + Security: Physical access to storage devices needs to be controlled.

Relationship between Logical and Physical Storage:

* Data dictionary: Maps logical structures (tablespaces, segments) to their physical counterparts (data files).
* Storage management tools: Allow administrators to configure and manage physical storage resources based on logical storage needs.