

CSCI317 Database Performance Tuning

Architecture of Relational Database Server

Dr Janusz R. Getta

School of Computing and Information Technology -
University of Wollongong

Architecture of Relational Database Server

Outline

"Birdseye" view

What is where ?

Data buffer cache

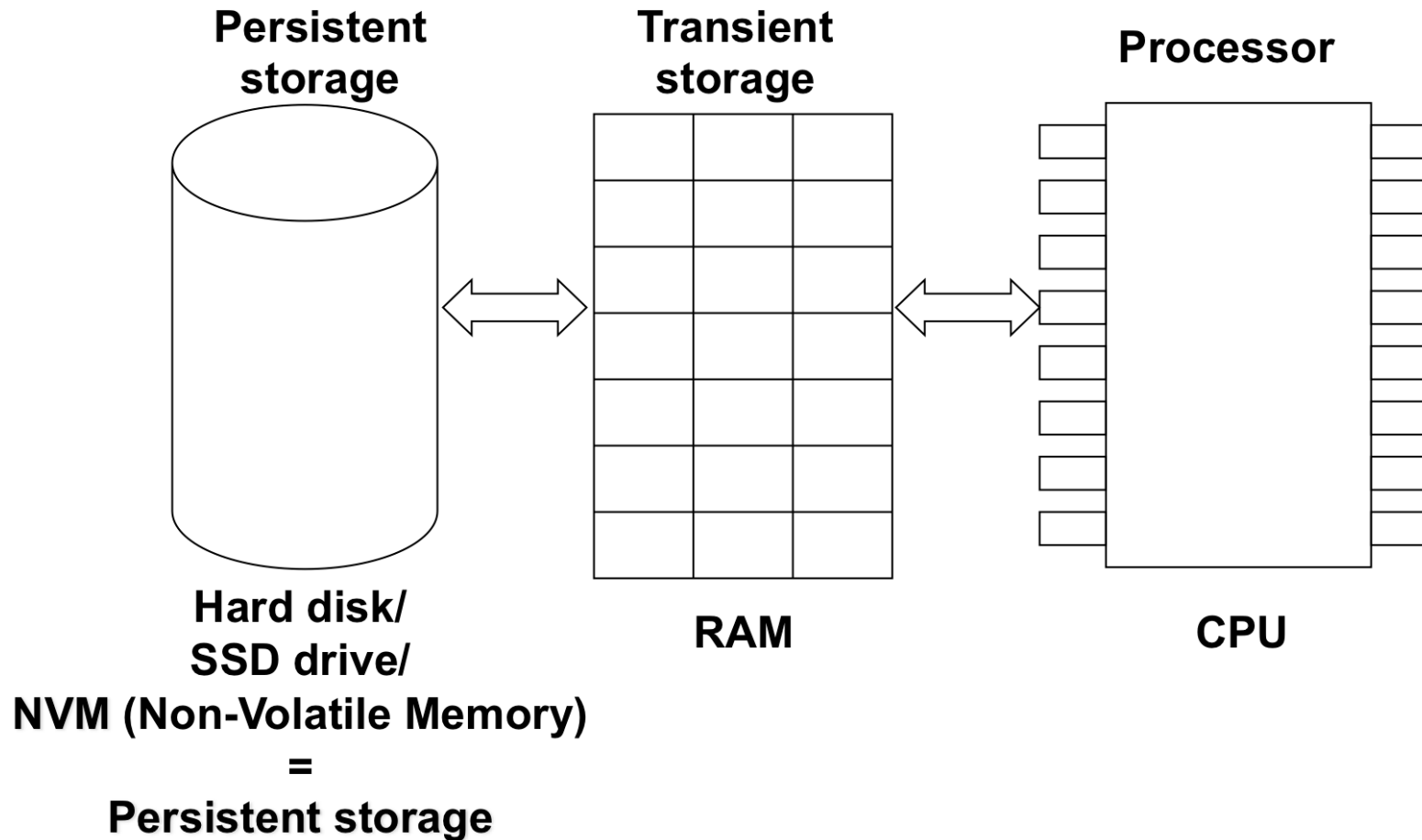
Log buffer and log file

Library cache

Transient structures

Database server processes

"Birdseye" view



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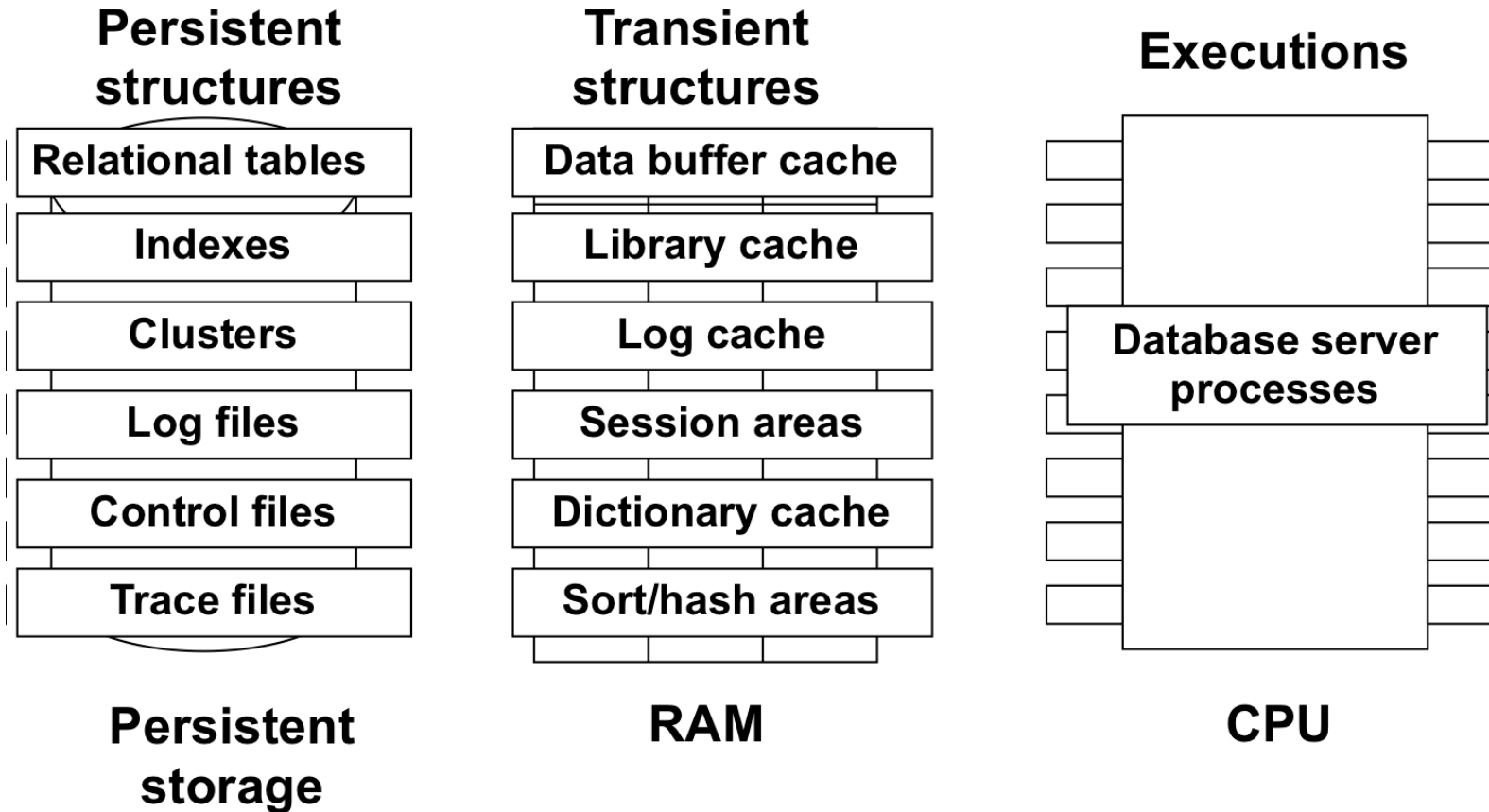
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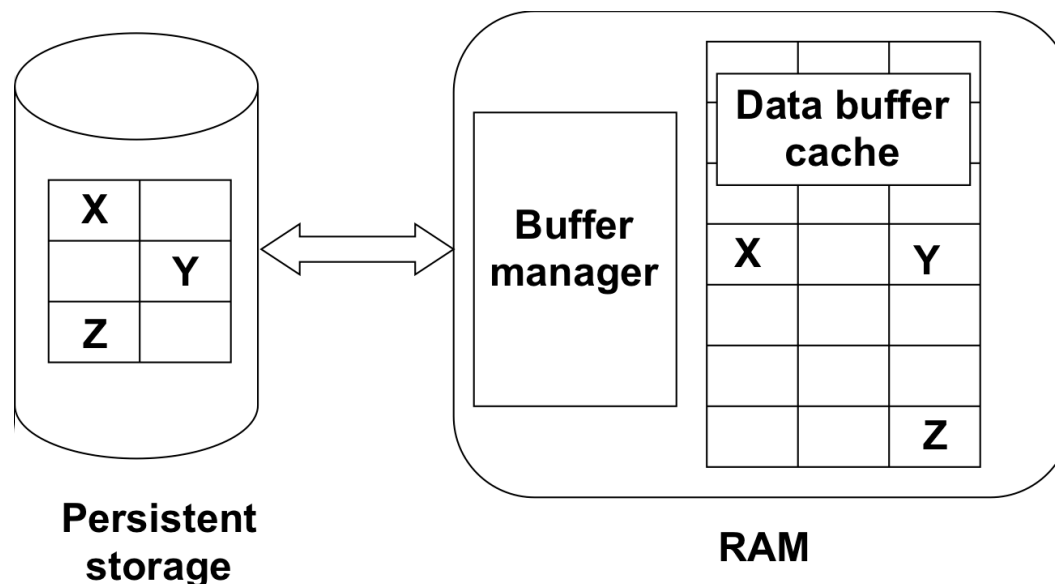
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Performance related observations:

A size of data buffer cache has an important impact on performance

A block replacement algorithm in data buffer cache has an important impact on performance

An order in which data blocks are accessed by a database application has an important impact on performance

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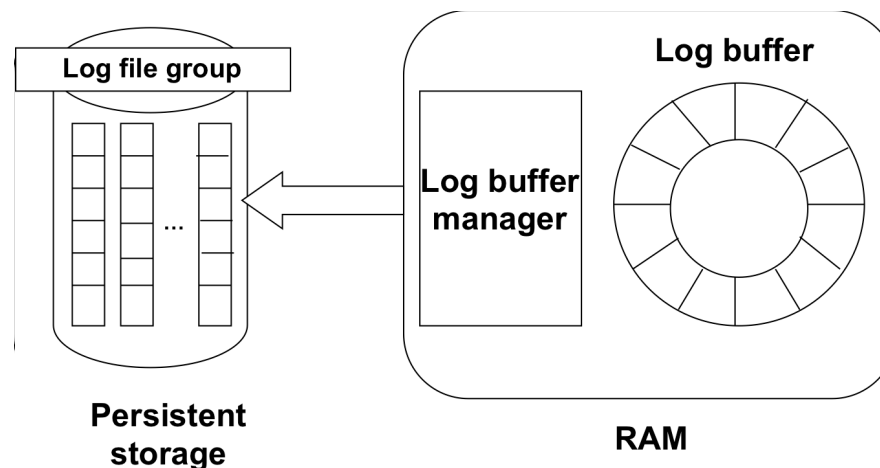
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Log buffer and log file



Log file is a permanent archive, which register the various actions performed by the database transactions

Log is like "Arianna's thread" used by Theseus to find his way out of the Minotaur's palace; by rewinding the log Theseus could undo the path has taken

In a case of system failure log file is used to either redo the committed and not permanently recorded transactions or undo partially recorded and not committed transactions

Log buffer and log file

Performance related observations:

Location of logfile groups on persistent storage devices may have an impact on performance of database systems

Logfile groups must be located on different storage devices

A size of log buffer may have an impact on performance

A bigger log file buffer provide better performance, however the improvements are minimal from a certain size of log buffer

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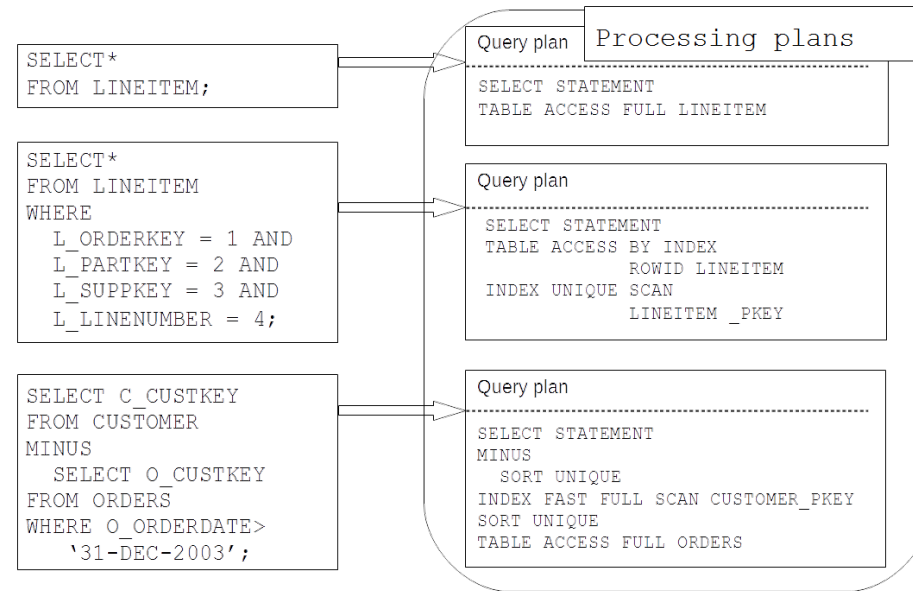
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Performance related observations:

Library cache improves performance when complex **SELECT** statements are frequently processed by database applications

It is important to remember that DDL statements invalidate the query processing plans in Library cache

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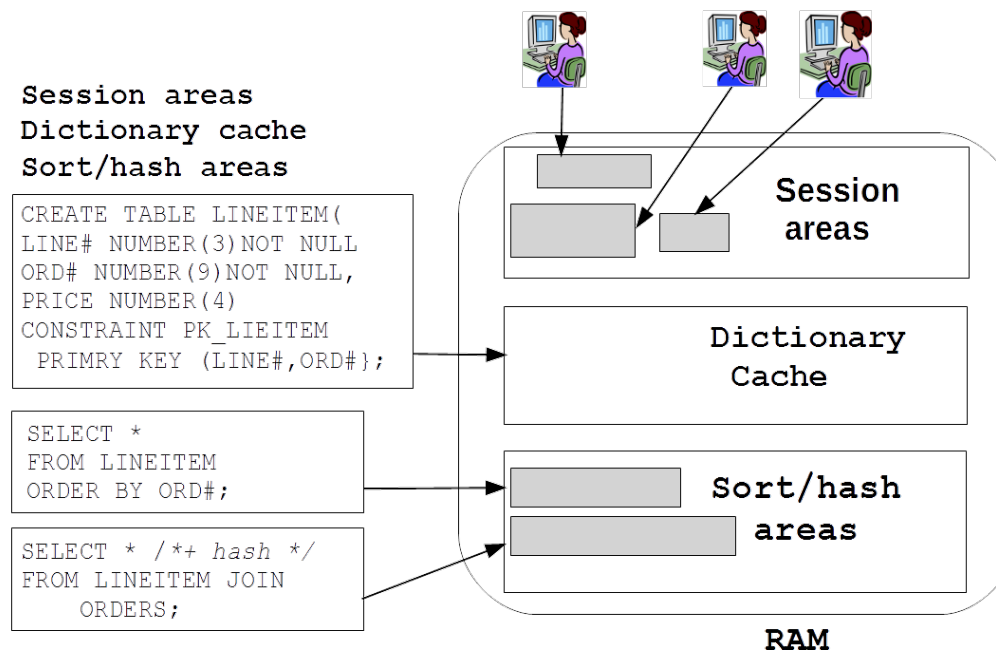
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Performance related observations:

Dictionary cache should be large enough to accommodate information about frequently processed relational tables, indexes, etc

A size of sort/hash areas has an impact on performance, however above certain value the improvements are minimal

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Database server processes

Database writer

- Database writer transfers the modified data blocks in transient memory into persistent memory

Log writer

- Log writer processes (LGWR) periodically transfers the contents of the redo log buffers into the redo log files

Checkpoint process

- Checkpoint process updates the data file headers and control files to record a checkpoint event

Lock manager

- Lock manager process performs locking/unlocking of data items and deadlock detection

Database server processes

Archiver

- Archiver processes transfer the contents of redo log files into the archived redo log files

Process monitor

- Process monitor process performs the "supervision" of user processes. Process monitor frees the resources used by a failed user process, releases the locks and makes unlocked resources available to the users

System monitor

- System monitor process is responsible for database recovery, elimination of "lost" transactions

References

[Cookbook, How to shut down and start up Oracle database server, how to find and how to change the values of system initialization parameters, how to investigate System Global Area \(SGA\), data buffer, redo log buffer, shared pool, and large pool in Oracle database server ?](#)

[Cookbook, How to investigate Process Global Area \(PGA\), background processes, control files, redo log files, alert log files, trace files, and database files of Oracle database server ?](#)

R. Ramakrishnan and J. Gehrke Database Management Systems, 3rd ed., McGraw-Hill, 2003, chapter 18