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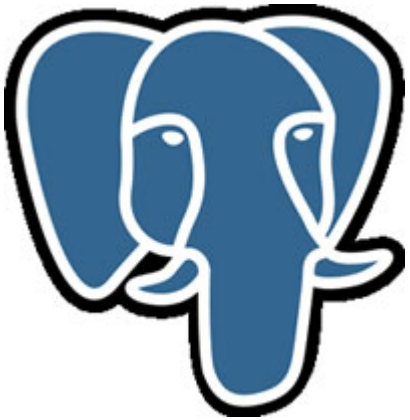
COMP9315 21T1
DBMS Implementation

(Data structures and algorithms inside relational DBMSs)



Lecturer: *John Shepherd*

Web Site: http://www.cse.unsw.edu.au/~cs9315/
(If WebCMS unavailable, use http://www.cse.unsw.edu.au/~cs9315/21T1/)

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❖ Lecturer

Name:	John Shepherd
Office:	K17-410 (turn right from lift)
Email:	cs9315@cse.unsw.edu.au
Online:	Tuesday 2-4, Thursday 2-4
Research:	Information Extraction/Integration Information Retrieval/Web Search e-Learning Technologies Multimedia Databases Query Processing

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❖ Services

Email cs9315@cse.unsw.edu.au

- Technical issues (e.g. problems compiling PostgreSQL)
- Detailed assignment questions (shared-screen debugging)

Special consideration:

- https://student.unsw.edu.au/special-consideration

Educational Adjustments:

- https://student.unsw.edu.au/els

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❖ Course Goals

Introduce you to:

- architecture of relational DBMSs (e.g. PostgreSQL)
- algorithms/data-structures for data-intensive computing
- representation of relational database objects
- representation of relational operators (sel,proj,join)
- techniques for processing SQL queries
- techniques for managing concurrent transactions
- concepts in distributed and non-relational databases

Develop skills in:

- analysing the performance of data-intensive algorithms
- the use of C to implement data-intensive algorithms

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❖ Pre-requisites

We assume that you are already familiar with

- the C language and programming in C
  (e.g. completed ⩾ 1 programming course in C)
- developing applications on RDBMSs
  (SQL, [relational algebra] e.g. an intro DB course)
- basic ideas about file organisation and file manipulation
  (Unix **`open, close, lseek, read, write, flock`**)
- sorting algorithms, data structures for searching
  (sorting, trees, hashing e.g. a data structures course)

If you don't know this material very well, don't take this course

PostgreSQL, Assignments and Exam all involve C programming.

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❖ Learning/Teaching

What's available for you:

- Textbooks: describe some syllabus topics in detail
- Course Notes: describe syllabus topics in some detail
- Content videos: short videos covering one topic (4-5 / week)
- Slides: from Content Videos
- Readings: research papers on selected topics
- Online: live Q&A and problem-solving sessions (like a tute)

The onus is on you to make use of this material.

Online sessions are on Bb Collaborate (via Moodle), Tue 2-4, Thu 2-4

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❖ Learning/Teaching (cont)

Things that you need to **do**:

- Exercises: tutorial-like questions
- Prac work: lab-class-like exercises
- Assignments: large/important practical exercises
- On-line quizzes: for self-assessment

Dependencies:

- Exercises → Exam (theory part)
- Prac work → Assignments → Exam (prac part)

There are **no** tute/lab classes; use Forum, Email, Consults

- debugging is best done in person (can see full context)

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❖ Rough Schedule

Week 01	relational algebra, catalogs
Week 02	storage: disks, buffers, pages, tuples
Week 03	RA ops: scan, sort, projection
Week 04	selection: heaps, hashing, indexes
Week 05	selection: N-d matching, similarity
Week 06	*no new content, no online sessions*
Week 07	joins: naive, sort-merge, hash join
Week 08	query processing, optimisation
Week 09	transactions: concurrency, recovery
Week 10	database trends (guest lecture)

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❖ Textbooks

No official text book; several are suitable ...

- Silberschatz, Korth, Sudarshan
  "Database System Concepts"
- Elmasri, Navathe
  "Database Systems: Models, languages, design ..."
- Kifer, Bernstein, Lewis
  "Database Systems: An algorithmic-oriented approach"
- Garcia-Molina, Ullman, Widom
  "Database Systems: The Complete Book"

but not all cover all topics in detail

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❖ Prac Work

In this course, we use PostgreSQL v12 (compulsory)

Prac Work requires you to compile PostgreSQL from source code

- instructions explain how to do this on Linux at CSE
- also works easily on Linux and MacOS at home
- PostgreSQL docs describe how to compile for Windows

Make sure you do the first Prac Exercise when it becomes available.

Sort out any problems ASAP (preferably at a consultation).

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❖ Prac Work (cont)

PostgreSQL is a large software system:

- > 2000 source code files in the core engine/clients
- > 1,500,000 lines of C code in the core

You won't be required to understand all of it :-)

You will need to learn to navigate this code effectively.

Will discuss relevant parts in lectures to help with this.

PostgreSQL books?

- tend to add little to the manual, and cost a lot

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❖ Assignments

Schedule of assignment work:

Ass	Description	Due	Marks
1	Storage Management	Week 5	15%
2	Query Processing	Week 9	20%

Assignments will be done individually

Assignments will require up-front code-reading (see Pracs).

Test cases available before submsission (extra tests after submission)

Ultimately, submission is via CSE's **`give`** system.

Late penalties apply; plagiarism checking will be used

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❖ Quizzes

Over the course of the semester ...

- five online quizzes
- taken in your own time (but there are deadlines)
- each quiz is worth a small number of marks

Quizzes are primarily a review tool to check progress.

But they contribute 15% of your overall mark for the course.

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❖ Exam

Three-hour** exam in the May exam period.

Exam is NOT held in CSE Labs; you do it at home (via ssh or vlab)

The exam is totally open-book ("open-web").

Things that we can't reasonably test in the exam:

- writing large programs, running major experiments

Everything else is potentially examinable.

Contains: descriptive questions, analysis, small programming exercises.

Exam contributes 50% of the overall mark for this course.

** 3-hours worth of work; 4-hours allowed to complete

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❖ Exam (cont)

If you cannot attend the final exam ...

- because of documented illness/misadventure

then you will be offered a Supplementary Exam.

You get one chance at passing the exam

- unsw's new fit-to-sit rule applies

Exam hurdle = 20/50 (which is only 40%)

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❖ Assessment Summary

Your final mark/grade is computed according to the following:

```
ass1   = mark for assignment 1       (out of 15)
ass2   = mark for assignment 2       (out of 20)
quiz   = mark for on-line quizzes    (out of 15)
exam   = mark for final exam         (out of 50)
okExam = exam > 20/50              (after scaling)

mark   = ass1 + ass2 + quiz + exam
grade  = HD|DN|CR|PS,  if mark ≥ 50 && okExam
       = FL,           if mark < 50 && okExam
       = UF,           if !okExam
```

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❖ Forum Etiquette

Webcms3 has a contextual forum

- posts form part of a comment thread on resource pages

Before posting: check that your query is not already answered

- main forum page has a search function
- single search keywords work best

To receive notification of posts

- each resource with Comments has a bookmark icon
- toggle it to dark to be notified of new posts on that resource

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❖ General Etiquette

The course website is a *workplace* platform

- make all communication professional and respectful

Any 9315-related discussion on external platforms

- is treated by UNSW the same as the course website

Summary: work hard and be nice to each other.

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❖ Course Outline

All of the above is described in detail in the Course Outline.

Read it.

It forms a contract between you and me on how this course will run.

Additional resources:

- The Nucleus, in the Library
- Forms for various requests: unsw.to/webforms
- Student Counselling: student.unsw.edu.au/counselling

Produced: 13 Feb 2021