Databases

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Introduction

Database systems 2

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"Data bases 2"
Academic Year 2018/2019

- Teacher: Prof. **Sara Comai**
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  @Dipartimento di Elettronica Informazione e Bioingegneria, 1st floor

- Exercise sessions:
  Prof. Daniele Braga, Pietro Pinoli, Arif Çanakoğlu

Time:

Monday	8:30-10:00
Tuesday	8:30-10:00

Textbooks

IN ITALIAN:

P. Atzeni, S. Ceri, P. Fraternali, S. Paraboschi, R. Torlone
"*Basi di dati: Architetture e linee di evoluzione*" (2003)

P. Atzeni, S. Ceri, P. Fraternali, S. Paraboschi, R. Torlone
"*Basi di dati*" (2018)

IN ENGLISH:

P. Atzeni, S. Ceri, S. Paraboschi, R. Torlone
"*Database systems*" - McGraw-Hill (1999)

NOW DOWNLOADABLE (http://dbbook.dia.uniroma3.it/)
Compared to the last Italian version some chapters are missing

Teaching material

- Material is available on the Beep portal

http://beep.metid.polimi.it

under "**Data bases 2**"

- Materials include slides of the lectures, exercise sessions, forum, etc.

- If your study plan has not been approved yet, you can subscribe to the course. Please specify the motivation!

App for iOS

- App to solve/check the classification of the schedules (VSR, CSR, 2PL etc.).
- Available on the App Store

"DBSA" (Data Base Schedule Analyzer)

https://itunes.apple.com/us/app/data-base-schedule-analyzer/id619821068?l=it&ls=1&mt=8

- Of course you cannot use it during the **exams: mobile devices** will be **forbidden** also to check the time.

Prerequisites

- Basics of Database systems
  - Relational model
  - SQL (SQL-92)
  - Relational algebra

  - **BOOK: http://dbbook.dia.uniroma3.it/**

Program

Two main streams:

- (Relational) Database architectures
- Advanced database systems

Study of "inside" DB technology: why?

- DBMSs provide "transparent" services:
  - So transparent that it is perfectly normal to use them ignoring many implementation details
  - So far, we have seen DBMSs as a "black box"

- So… why should we open the box?
  - Knowing how it works may help to use it better
  - Some services are provided separately

DataBase Management System — DBMS

A system (software product) capable of managing data collections that are:

- **large** ((much) larger than the central memory available on the computers that run the software)
- **persistent** (with a lifetime which is independent of single executions of the programs that access them)
- **shared** (in use by several applications at a time)

guaranteeing **reliability** (i.e. tolerance to hardware and software failures) and **privacy** (by disciplining and controlling all accesses).

Technology of DBMSs - topics

- Concurrency control
- Buffer and secondary memory management
- Reliability control
- Physical data structures and access structures
- Query management ("optimization")
- Distributed architectures

DB Evolution

Since the 70's: relational databases + SQL

Some revolutions in the 90's:

- SQL'92
- SQL'99 (triggers, object-oriented features)

And more recently:

- SQL:2003 (XML-related features)
- SQL:2006 (XQuery)
- SQL:2011 (Temporal DB)
- SQL:2016 (row pattern matching, JSON)

- Since 2005: NoSQL DBMS (no standard!)

- A single application may involve different kinds of data → diverse data models and query languages for a single application

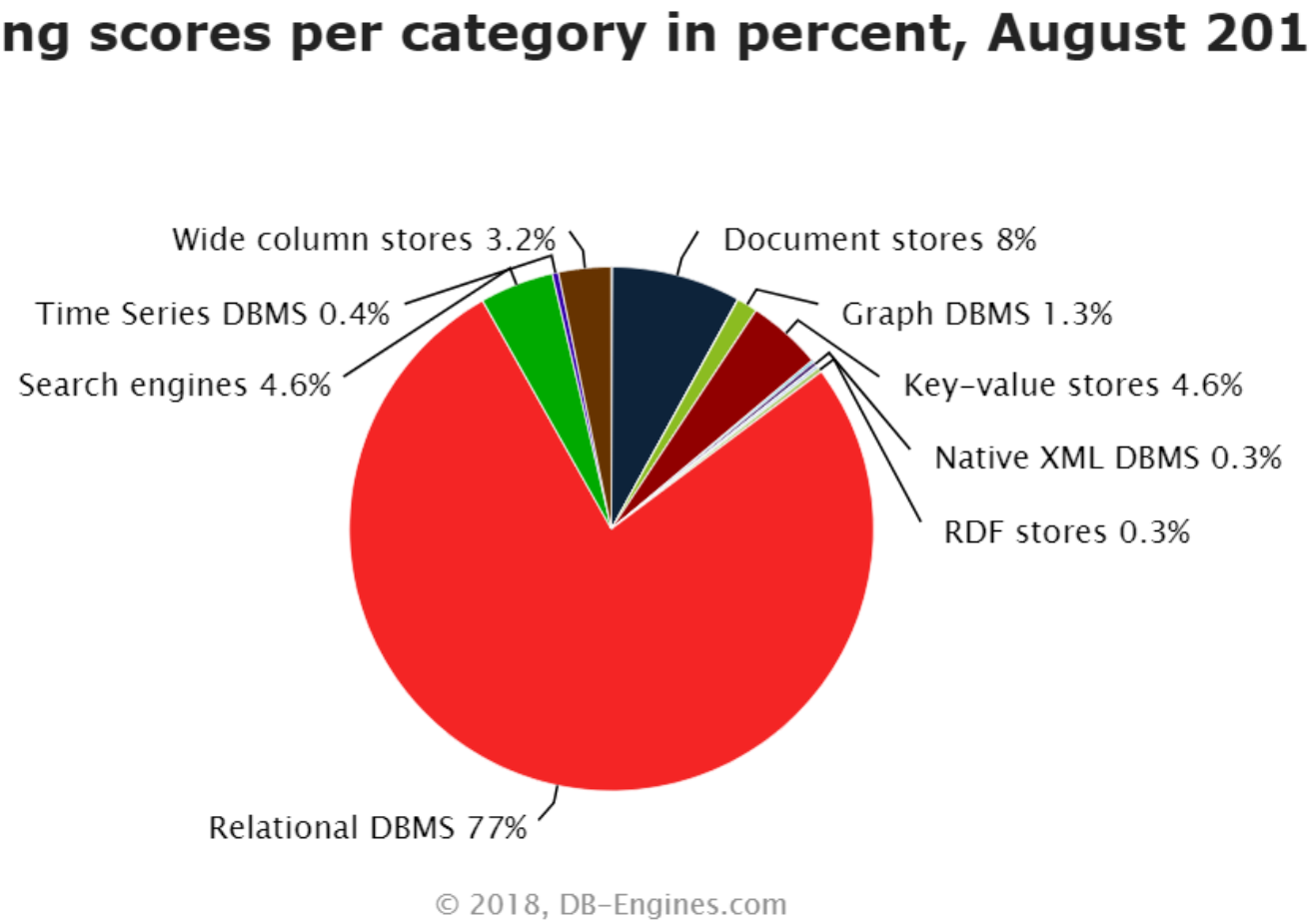
Popularity of the models

343 systems in ranking, August 2018

Rank Aug 2018	Rank Jul 2018	Rank Aug 2017	DBMS	Database Model	Score Aug 2018	Score Jul 2018	Score Aug 2017
1.	1.	1.	Oracle	Relational DBMS	1312.02	+34.24	-55.85
2.	2.	2.	MySQL	Relational DBMS	1206.81	+10.74	-133.49
3.	3.	3.	Microsoft SQL Server	Relational DBMS	1072.65	+19.24	-152.82
4.	4.	4.	PostgreSQL	Relational DBMS	417.50	+11.69	+47.74
5.	5.	5.	MongoDB	Document store	350.98	+0.65	+20.48
6.	6.	6.	DB2	Relational DBMS	181.84	-4.36	-15.62
7.	7.	↑ 9.	Redis	Key-value store	138.58	-1.34	+16.68
8.	8.	↑ 10.	Elasticsearch	Search engine	138.12	+1.90	+20.47
9.	9.	↓ 7.	Microsoft Access	Relational DBMS	129.10	-3.48	+2.07
10.	10.	↓ 8.	Cassandra	Wide column store	119.58	-1.48	-7.14
11.	11.	11.	SQLite	Relational DBMS	113.73	-1.55	+2.88
12.	12.	12.	Teradata	Relational DBMS	77.41	-0.82	-1.83

Ranking from http://db-engines.com/en/ranking

Popularity of the models



http://db-engines.com/en/ranking

Exam

- The exam consists in a written verification covering all the topics of the course
  - **Exercises on the whole program, possibly with related theoretical questions.**

Exam rules

- During the exam:
  - No books, notes, electronic devices are allowed
  - Cheating policies: it is forbidden to communicate with other students. Who is surprised to talk, is asked to leave the classroom. This applies to both "extremes" of communication: both speaker and listener.
- After the exam
  - No oral exams will be done

Exam rules

- Positive marks can be **rejected**
  - This can be done through the online system; usually there are 5 days after the insertion of the mark into the system to reject it
  - REMARK: when the exam is repeated (it is sufficient to sit down and see the text of the exam), the **previous mark is lost**!

Academic calendar and DB2 exams

- 1st semester: ends before Christmas

  1st examination session: 2 DB2 exams
  - January 9, 2019 – February 22, 2019

  2nd examination session: 2 DB2 exams
  - June 13, 2017 – July 31, 2017

  3rd examination session: 1 DB2 exam
  - Last week of August – first two weeks of September (calendar not available yet)

- **Do not leave during the examination sessions!!**
  - Requests for extra-exams will be rejected