ICT & Business Intelligence & CRM
Introduction

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General Information

- **Andrea Vandin**
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- **Paolo Ferragina**
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- **Anna Monreale**
  - **Email:** anna.monreale@unipi.it

- **Learning Material**
  - Slides – github wiki
  - Databases essentials – Antonio Albano
    - Pdf available on github wiki
  - A First Course in Database Systems, Jeffrey D. Ullman and Jennifer Widom
  - Decision Support Database – Antonio Albano
    - Pdf available on github wiki

Exam

- Assignments to be handed-in during the course
  - Similar to exercises done in class
- Project Work: 3 people
- Final Mark:
  - 100% project

Overview of the course topics

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Topics

Part 1, Andrea Vandin

- **Databases**
  - What is a DBMS
  - Designing a DB
  - Querying a DB

Part 2, Anna Monreale

- **Business intelligence**
  - Decision Support Databases
  - Data warehouses
  - Designing a data warehouse
  - Querying a data warehouse

Part 3, Paolo Ferragina

- **Graph Databases**
  - Introduction to Graphs: definition, properties and implementation
  - Graph Data Bases (GDB): modeling, principles, and structure.
  - An example of GDB query language: Cypher
  - Hands-on with a Graph DB: Neo4J

Calendar of Part 1

Intro to DB, Structure of DB, Create a DB

- 17/02/25 09:00-11:00 2 Vandin Introduction to course, to DB, to DBeaver.
- 19/02/25 09:00-11:00 2 Vandin Conceptual model. Exercises conceptual model.
- 24/02/25 09:00-11:00 2 Vandin Complete ex. conc. model. Logical model (ex.?)
- 26/02/25 09:00-11:00 2 Vandin Complete exercises logical model

Query a DB

- 03/03/25 09:00-11:00 2 Vandin SQL1 with hands on examples
- 05/03/25 09:00-11:00 2 Vandin SQL2 with hands on examples
- 07/03/25 09:00-11:00 2 Vandin Exercises on SQL. Moved to 06/03/25 from 9 to 11

Query a DB and **Exercises on all topics**

- 10/03/24 09:00-13:00 2 Vandin SQL3. Ex. on conceptual & logical model & SQL
- 10/03/24 14:30-16:40 2 Vandin Ex. on conceptual & logical model & SQL

Moved to Wed 12 from 9 to 11

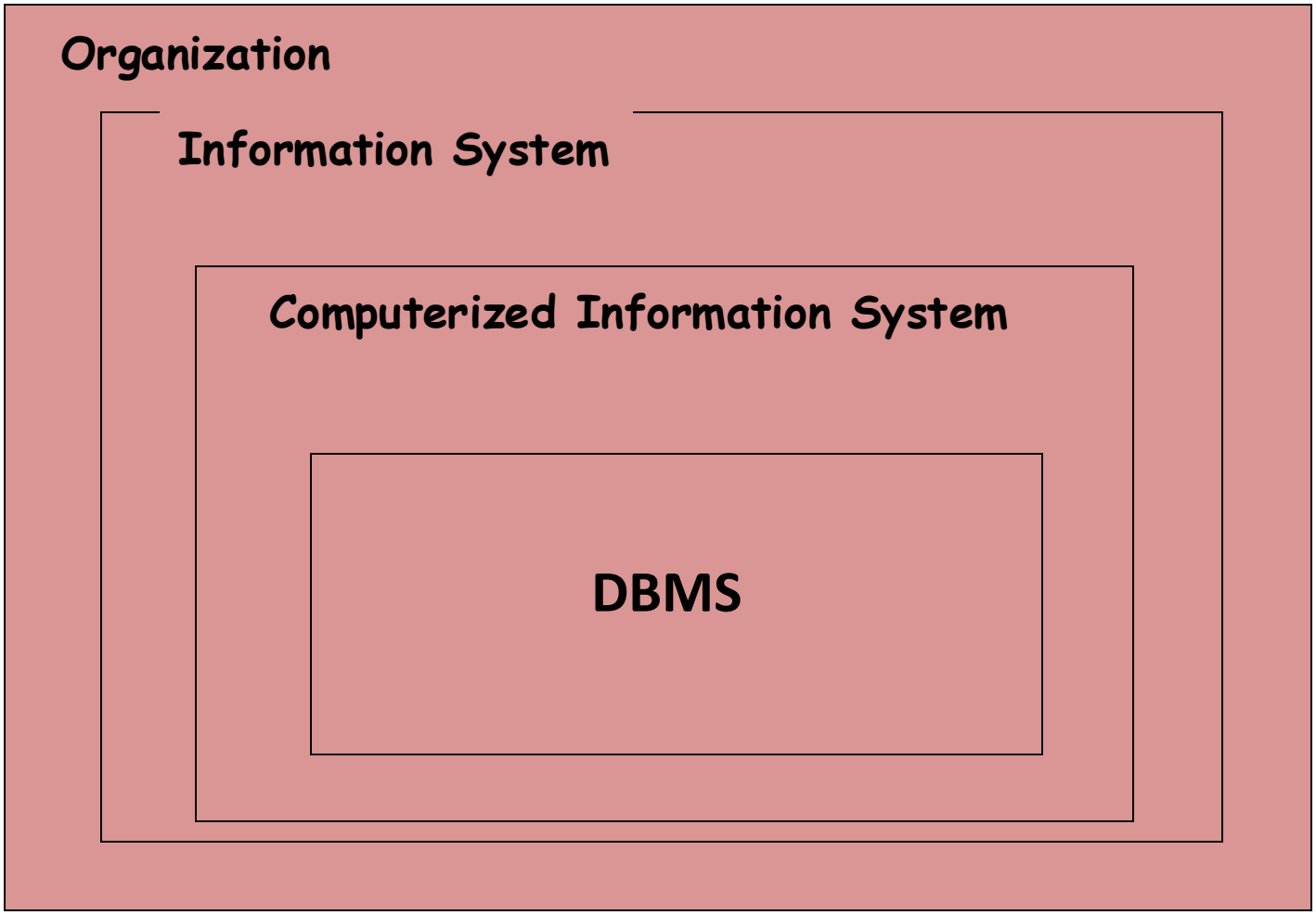
Calendar of Part 1

Weekly PLAN (SALA CONFERENZE - Palazzo Boyl)

	MON 10	TUS 11	WED 12	THU 13	FRI 14
09:00-09:45	ICT1: Business Intelligence & CRM	Innovation in Cost & Perf. Mgmt.	Here?	Here?	Innovation in Cost & Perf. Mgmt.
10:00-10:45	ICT1: Business Intelligence & CRM	Innovation in Cost & Perf. Mgmt.			Innovation in Cost & Perf. Mgmt.
11:00-11:45	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D
12:00-12:45	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D	Open Innovation Modelling & R&D
13:00-14:30					
14:30-15:15	ICT1: Business Intelligence & CRM	Innovation Lab	Innovation Lab	Innovation Lab	Innovation in Cost & Perf. Mgmt.
15:30-16:15	ICT1: Business Intelligence & CRM	Innovation Lab	Innovation Lab	Innovation Lab	Innovation in Cost & Perf. Mgmt.
16:30-17:15	Innovation Lab				
17:30-18:15	Innovation Lab				

Can we move it to Wed 12 or Thu 13 from 9 to 11?

We start with some terminology



Information as a Resource

- **Information** is one of the most important resources of any **organization**

- An intelligent management of the information can help the organization generating **new knowledge**

- It becomes more and more important to learn how to **represent**, **organize**, **manage** and **use** information

Organization

- **Organizations**
  - es: companies, banks, public administrations, ….
  - An organic collection of
    - **resources** (people, materials, **information**),
    - **tools**
    - **procedures**
  - Has the goal to create/offer products/services
    - a bank provides financial services
    - a hospital supplies medical services

Information System

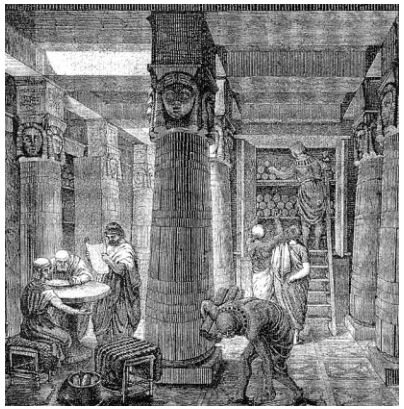
- Component of an organization finalized to **information management** for supporting the organization's activities
  - Collects, stores, processes and communicates the information

- Any organization has an Information System

Information System & Computerization

- **Information system** is indipendent of computerization

- Organizations as Libraries, Banks, etc … existed and managed information long before computerization...

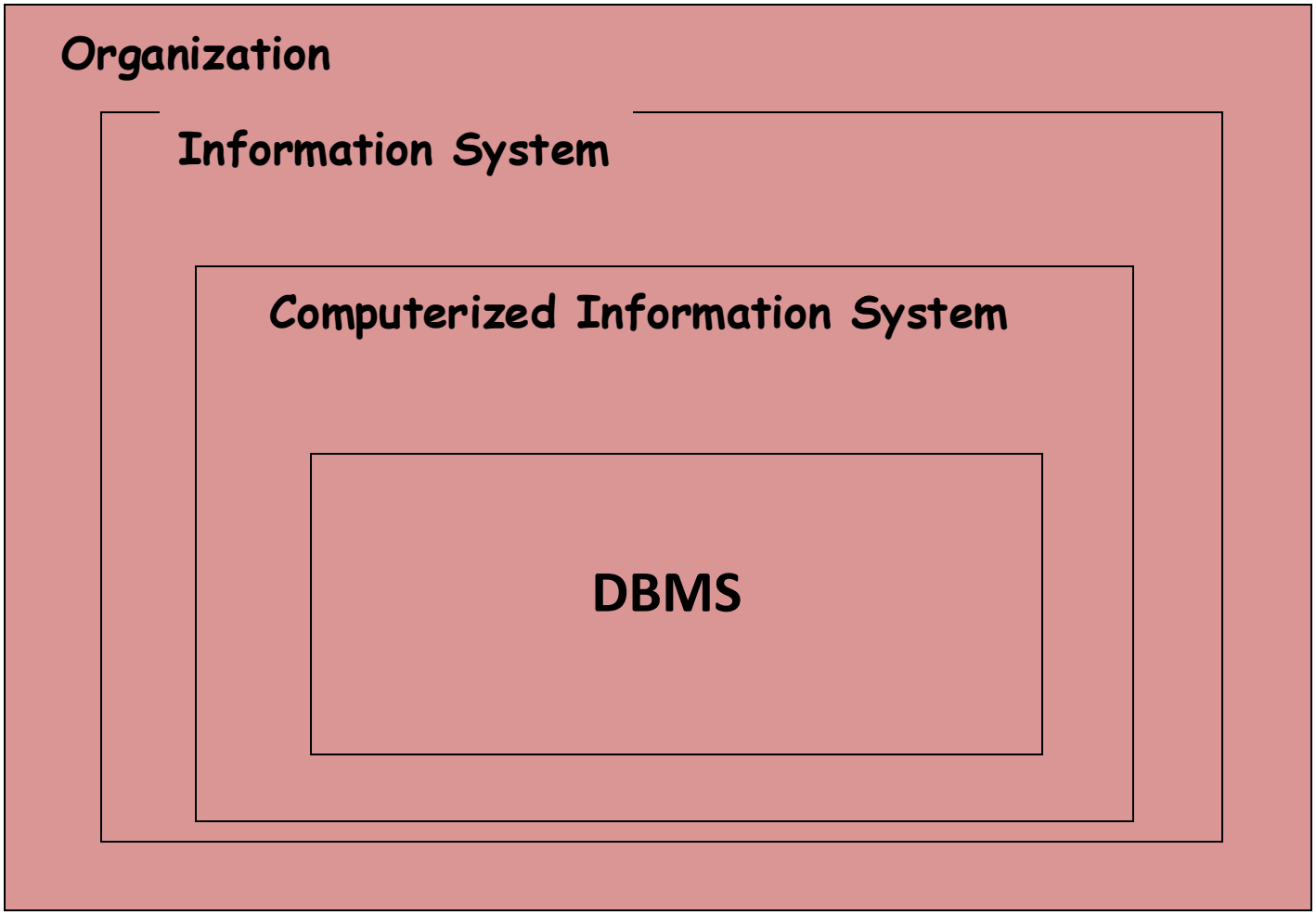


Library of Alexandria

Computerized Information System

- The hardware and sofware used for storing, retrieving, and processing the information which supports the functions of an organization
- In practice, in many cases:
  - **information system** is used as synonym of **computerized information system**
- Implemented by **database technology**
  - *operational database* and
  - a collection of application programs used to
    - access and update the data **efficiently**

Computerized Information System

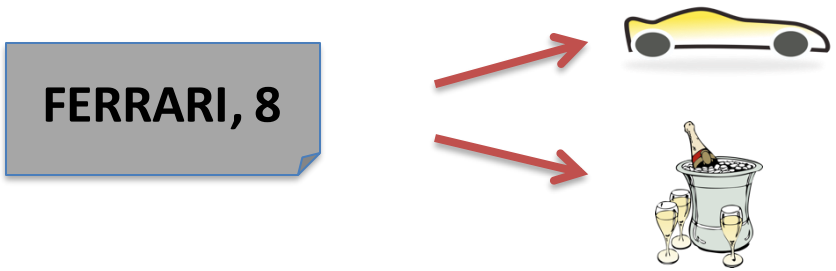


Goal of DBMS: processing data for getting information

Data vs Information

- In information systems
  - **information** is represented by **data**
- **Information** (def): news, or element enabling knowledge about facts and situations
- **Datum** (def): element of an information composed of symbols to be processed

Without interpretation datum is useless



Database

- Collection of permanent data representing facts
  - interesting for an organization (*data or istances*) and
  - related to the data organization *(metadata or schema)*

STUDENTS

ID	Surname	Name	BirthofDate
276545	Rossi	Maria	25/11/1991
485745	Neri	Anna	23/04/1992
200768	Verdi	Fabio	12/02/1992
587614	Rossi	Luca	10/10/1991
937653	Bruni	Mario	01/12/1991

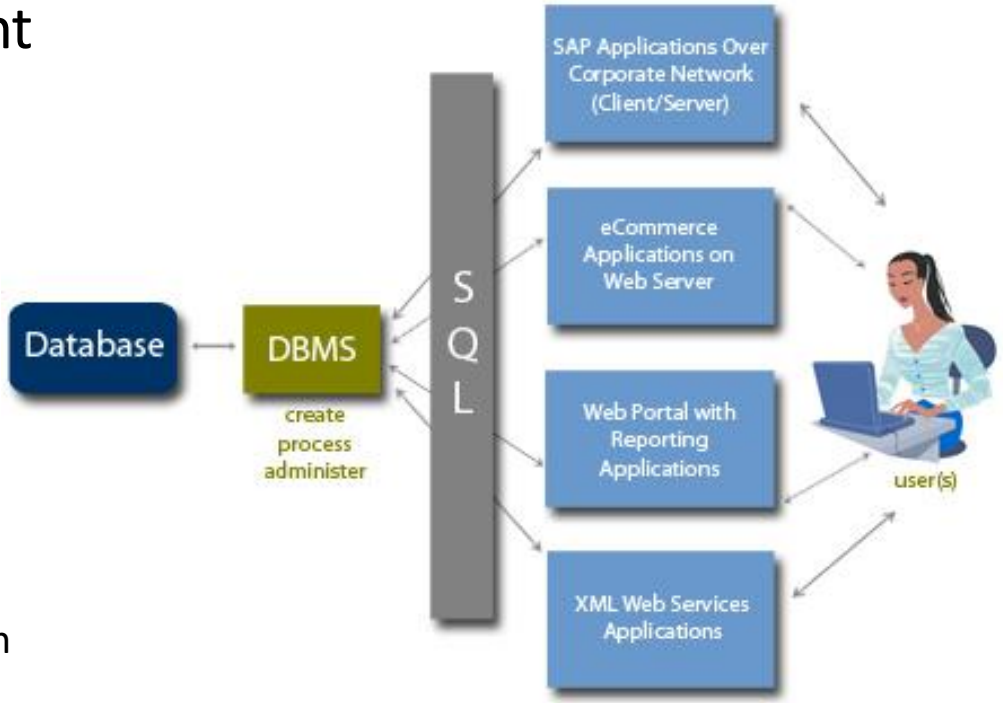
DBMS:
Database Management Systems

- A set of tools to manage homogeneous sets of structured data
  - Databases!

- Able to deal with
  - Huge amounts of data
  - Mission-critical data
  - Shared data
  - Queries and updates

Architecture based on DBMS

- DBMS **manages** huge amount of data shared
  - **Efficiently**:
    - optimization, parallelization
  - **Effectively**
- And guaranteeing:
  - **Sharing:** concurrency control
  - **Reliability:**
    - Failure resilience, data replication
  - **Security:**
    - authorizations, access control



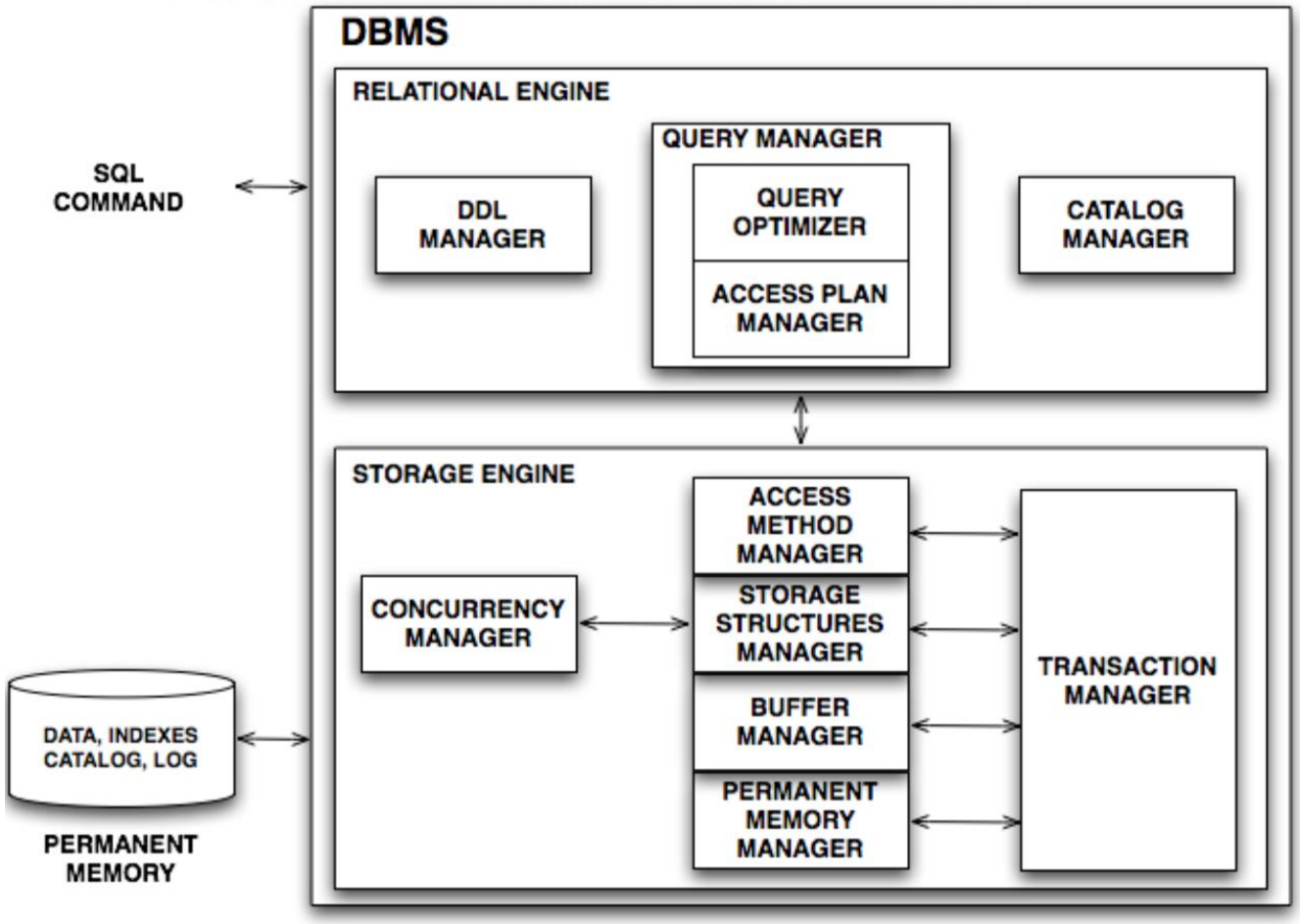
Some DBMS

- **Commercial**
  - IBM DB2, Oracle, **Microsoft SQL Server**, Sybase
  - Microsoft Access, FileMaker
- **Open Source**
  - MySQL (www.mysql.com)
  - PostgreSQL (www.postgresql.org)
  - **SQLite** (www.sqlite.org/index.html)

Users of DBMSs

- **Analyst**
  - defines a schema
    - the *structure* of the DB. We will see more on this
- **Programmer**
  - Writes applications
- **Data Base Administrator (DBA):**
  - Manages data structures
  - Manages user rights
- **Operator (final user):**
  - Uses applications
  - Uses query tools

DBMS Architecture



Transactions

- Transactional execution of a piece of code:
  - **Atomicity** in presence of failures (all or nothing)
    - *An atomic transaction is not a 'very strong' transaction :D*
    - It is an action that involves several steps. If any of these steps fails, all the performed steps are reverted
  - **Durability**: transaction effects can be recovered after a failure
  - **Serializability**: no interference by concurrent transactions