Introduction

◆About ISYS1055/1057

◆The world of databases

◆Database management systems

Reading: Chapter 1 of the textbook.

ISYS1055/1057: Weekly schedule

◆ Two hours of lecture.

  ◆ Ask questions.

◆ Two hours of tute/lab classes.

  ◆ Prepare beforehand.

  ◆ Participate discussions.

◆ Read the textbook (details on the next slide).

ISYS1055/1057: Reading

◆ Main text: J. Ullman and J. Widom. *A First Course in Database Systems*. 3rd. Ed. Pearson Education. 2008.

  ◆ Everyone should have a copy of the textbook.

◆ References:

  ◆ Elmasri and Navathe. *Fundamentals of Database Systems*. 5th Ed. Addison Wesley. 2004.

  ◆ N. Shah. *Database Systems using Oracle*. 2nd. Ed. 2005. Pearson Education. 2005.

ISYS1055/1057: Communication

◆Homepage:

   http://www.rmit.edu.au/learninghub/

- ◆ Announcements
- ◆ Discussion forum
- ◆ Lecture and tute/lab notes
- ◆ Assignments

◆Email:

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- ◆ e62892@ems.rmit.edu.au (Ian)

ISYS1055/1057: Assessment

◆ Component 1: Final exam (60%).

◆ Component 2: Two assignments (40%).

  ◆ Assignment 1, available in week 2, due in week 5, and result in week 7.

  ◆ Assignment 2 available in week 7, due in week 11, and result in week 13.

◆ Each component is a hurdle for passing the course.

ISYS1055/1057: Content

◆ Basic concepts

◆ Design of databases.

- ◆ ER model, relational model,

◆ Database programming.

- ◆ SQL

◆ Database applications rather than DBMS implementation (COSC 2406/2407 Database Systems).

The world of databases

All the largest sources of data, with many new ideas.

- ◆ Web search.
- ◆ Data mining.
- ◆ Scientific and medical databases.
- ◆ Integrating information.

The world of databases ...

◆ Databases are behind almost everything you do on the Web.

- ◆ Google

http://google.com.au/

- ◆ Amazon

http://www.amazon.com/

More Interesting Stuff

◆ Database programming language SQL is declarative --- you tell the system what problem to solve.

- Short programs.
- System optimization.

◆ Most other programming languages are procedural --- you tell the system how to solve the problem.

- Long programs.
- User optimization.

And More

Given a list of records for students (student ID, name, address...) enrolled in ISYS1055/1057, calculate how many students are there in total?

◆In C: read files, data structure, loop structure, output.

◆In SQL:

- ◆ select count(studentID) from Student;

A database is more than a collection of data

A database is a collection of data managed by a Database Management System (DBMS).

◆Schema/model

◆Programming language for applications

◆Transactions and concurrency control.

Database Schema/Model?

◆ A description of data in the database. The description can be at different levels.

   ◆ Entity Relationship (ER) model.

   ◆ Relational model.

◆ Constraints.

The Schema/Model -- example

◆ Real world:

  ◆ Information: Student records should have student ID, name, contact phone number, and address.

  ◆ Constraints:

    • Each student should be identified by Student No – Each student record must have the student No information.

    • No two students can have the same student ID ---Each student should a unique student ID.

The Schema --- example

◆ER model:
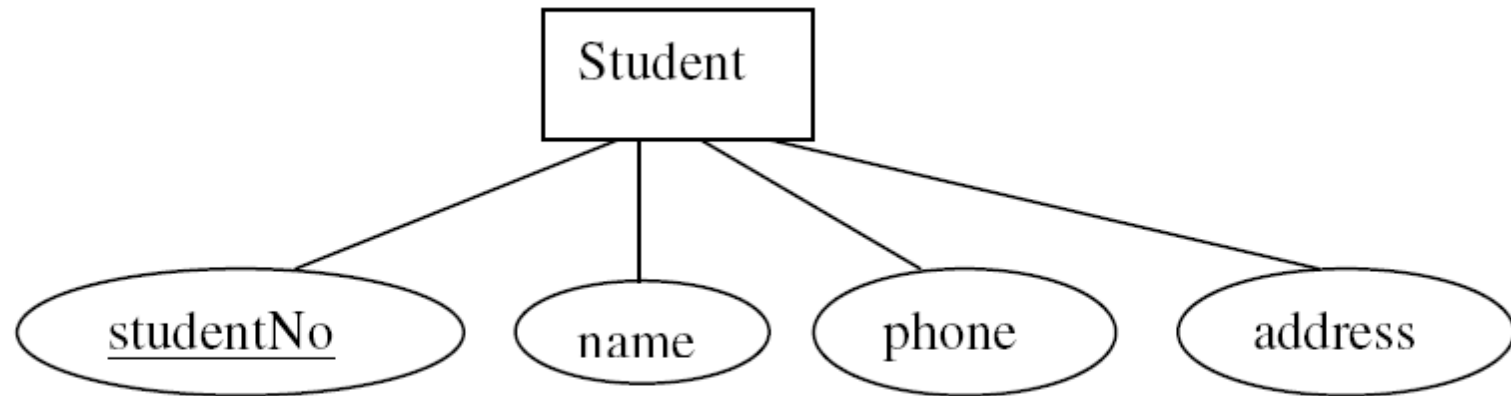
◆Relation schema:

Student(studentNo, name, phone, address)

Database programming Language --- SQL

◆ SQL -- Structured Query Language --- is not only a query language:

- Data Definition Language (DDL)
  - Define database schema
- Data Query Language (DQL)
  - Query the database to extract information
- Data Manipulation Language (DML)
  - Update the database – insertion/deletion/update.

Transactions and Concurrency Control

◆ Operations on databases (DDL/DML/DQL) are organized into transactions – an *atomic* unit that must finish in whole or nothing happens at all. No partial effect on the database.

◆ The execution of transactions should be durable --- the effect of any completed transaction is permanent, even if system failure happens.

  ◆ By way of logging.

◆ Concurrency control allows multiple users --- transactions from each user are executed in ``isolation''.

DBMS: a summary
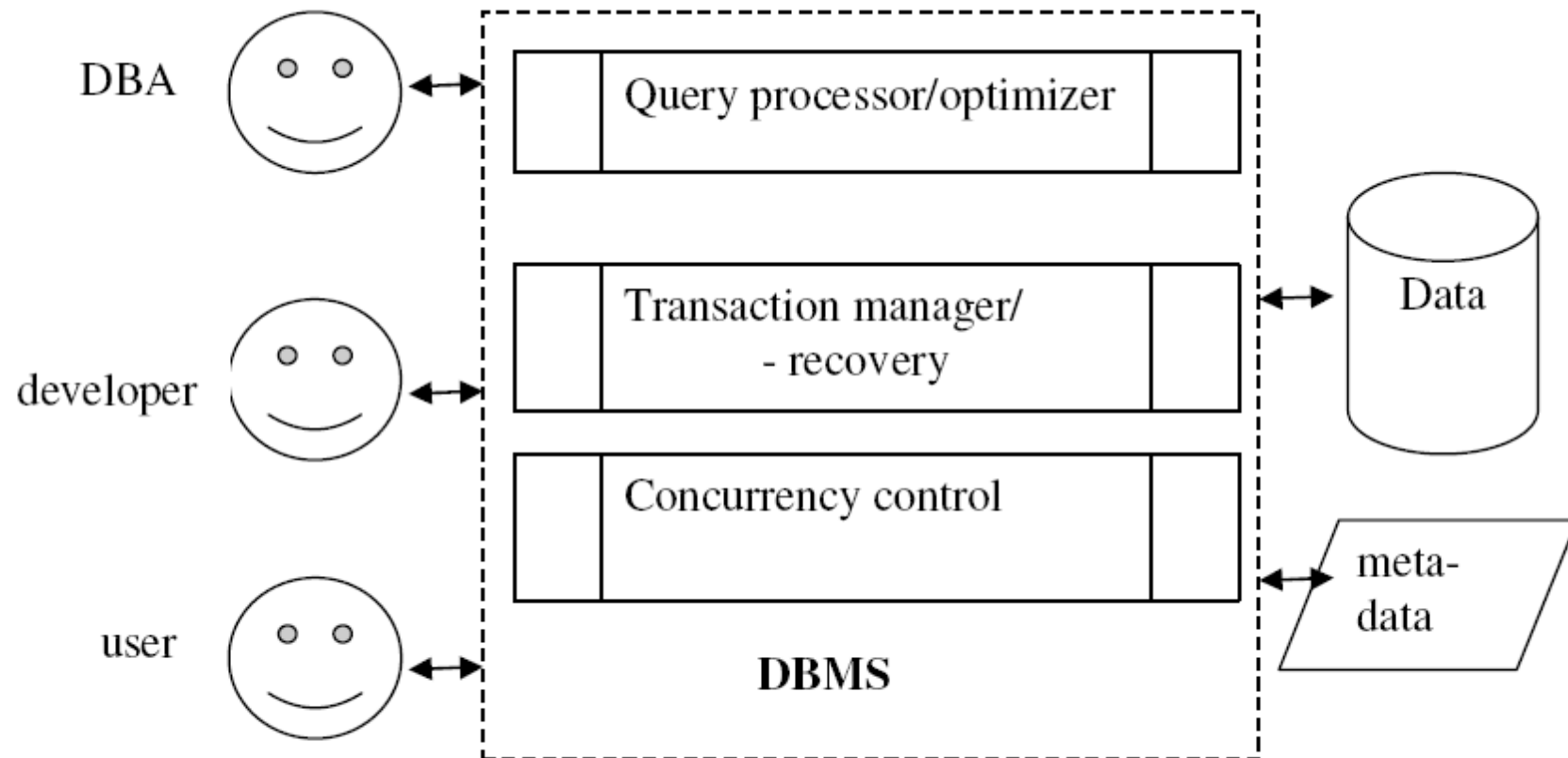
DBMS: Users

◆There are multiple users of the DBMS and they have different privileges:

- ◆ Database Administrator (DBA): full control of the database --- create and define database schemas, grant privileges to other users.

- ◆ Database application developer: usually control his/her own database.

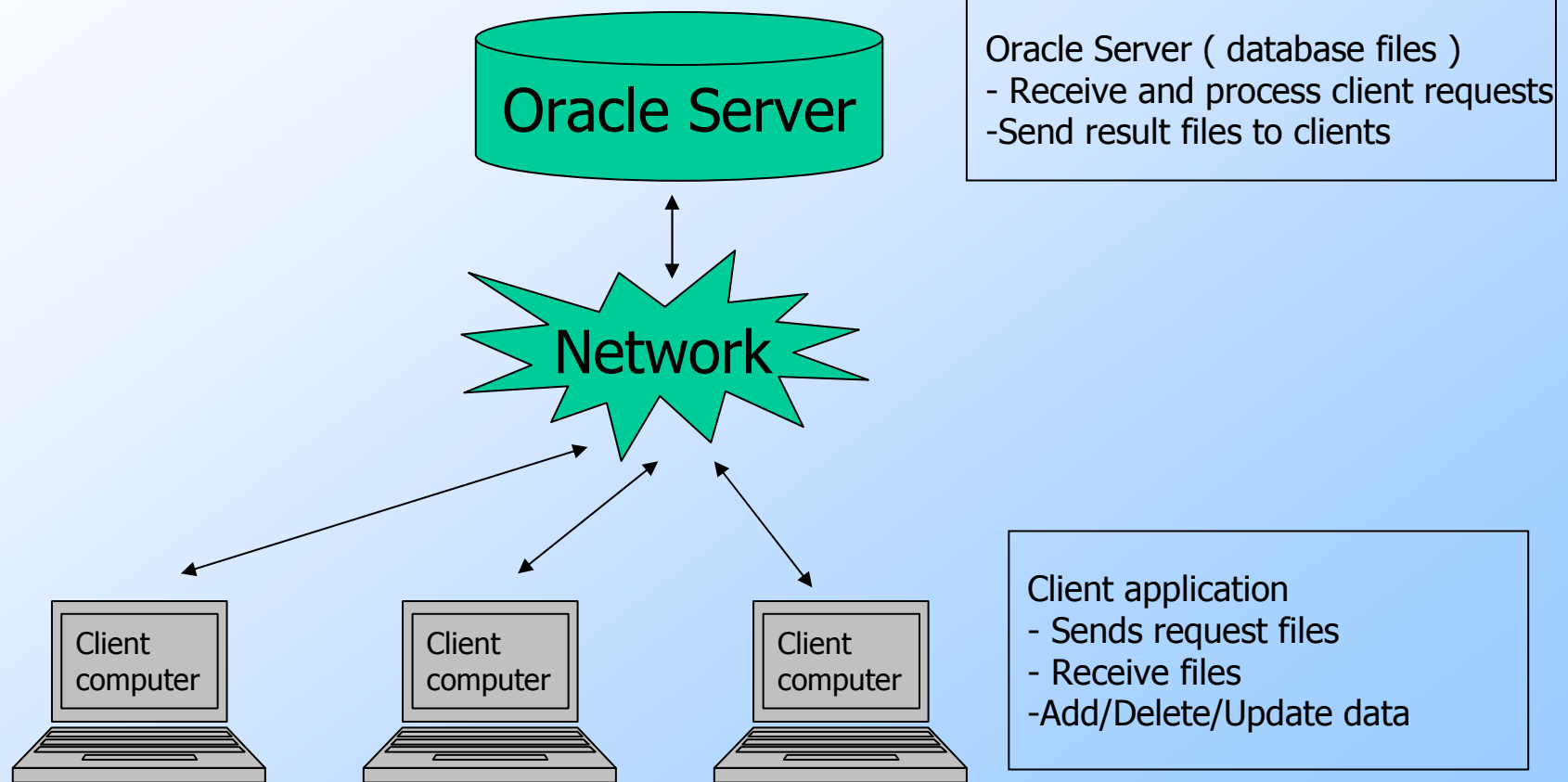- ◆ End users/data operators: only retrieve information from the database, but do not make any changes.

DBMS: Metadata

◆ Metadata (sometimes called data dictionary) is data describing the database, which may include:

- ◆ Schema definition
- ◆ Index – to speed up query processing
- ◆ Data types
- ◆ Constraints on data
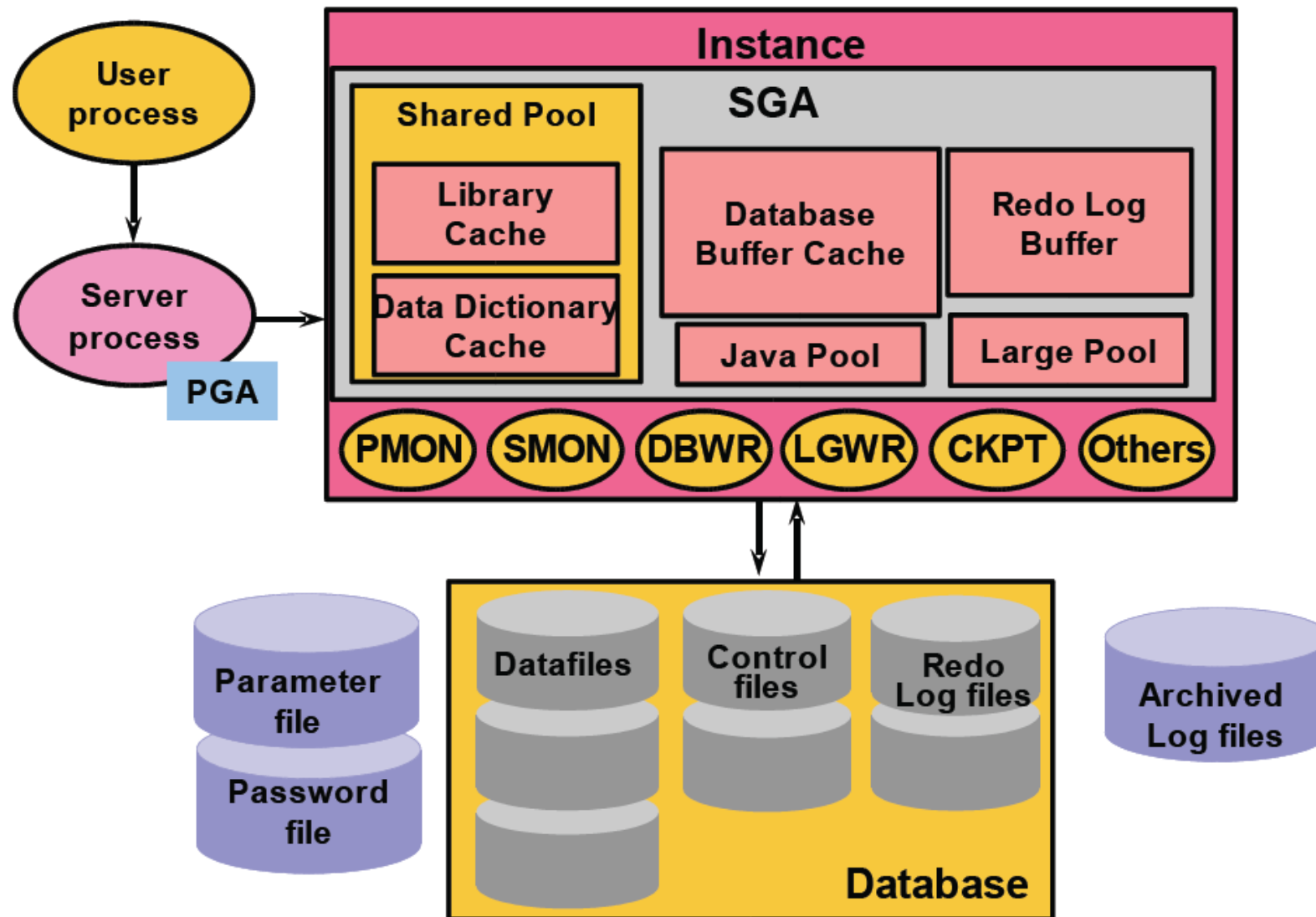- ◆ User information and privileges

The Oracle DBMS

◆ We will use Oracle system for practice throughout this semester.

- The Oracle DBMS is designed to allow simultaneous access to large amounts of stored information.

- The Oracle DBMS adopts a Client/Server architecture.

The Oracle DBMS: Client/Server Architecture

Oracle Server

Network

Oracle Server (database files)
- Receive and process client requests
-Send result files to clients

Client
computer

Client
computer

Client
computer

Client application
- Sends request files
- Receive files
-Add/Delete/Update data

The Oracle DBMS: Components
(http://www.oracle.com/technology/tech/migration/isv/docs/Oracle ArchitectureOverview.pdf)

The Oracle DBMS: Demo

yallara.cs.rmit.edu.au% sqlplus

SQL*Plus: Release 10.2.0.3.0 - Production on Mon Jul 20 14:27:55 2009

Copyright (c) 1982, 2006, Oracle. All Rights Reserved.

Enter user-name: zhang
Enter password:

Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - 64bit
    Production
With the Partitioning, OLAP and Data Mining options

SQL>

Revision

◆Reading: Chapter 1 of the textbook.

◆Terms:

 ◆ Database

 ◆ Data structure vs. database schema

 ◆ Files vs. databases

 ◆ Meta-data

 ◆ DBMS and DBA