CS 445
Introduction to Database Systems

MWF 1:00 – 2:05

Chadd Williams

Office Hours   MW   2:30-3:30pm
                  Thur   1-3pm

Overview

- Practical introduction to databases

    - theory + hands on projects

- Topics

    - Relational Model

        - Relational Algebra/Calculus

    - Database Design

        - ER Diagrams

    - Structured Query Language (SQL)

    - Web accessible databases / Architecture / Model-View-Controller

    - Non-structured Data (NoSQL)

    - Cloud computing

- There will be a number of lab days for hands on work

    - approximately 6
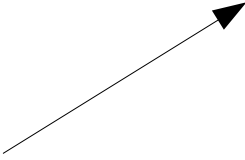
What did I do over summer vacation?

http://opensourcebridge.org/events/2011/schedule

Syllabus

- *Database Management Systems* (3rd), Ramakrishnan & Gehrke

- Grades:

Midterm 1	15%
Midterm 2	15%
Final	20%
Homework/Quizzes	15%
Database Projects	35%

First DB Assignment	Design Docs	8 pts
	MySQL DB	12 pts
Big DB Assignment	Design Docs	25 pts
	MySQL DB	30 pts
	Web Interface	15 pts
	Presentations	10 pts

- Quizzes: frequent, unannounced, open-note quizzes will be given

- Late Policy: No late assignments accepted

- Grade Complaints: one paragraph summary of why the grade is wrong, **within one week of receiving the graded material**

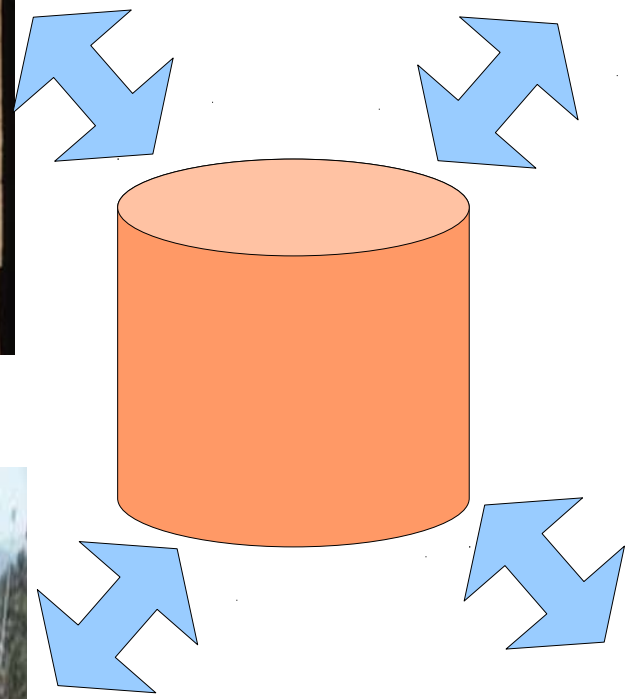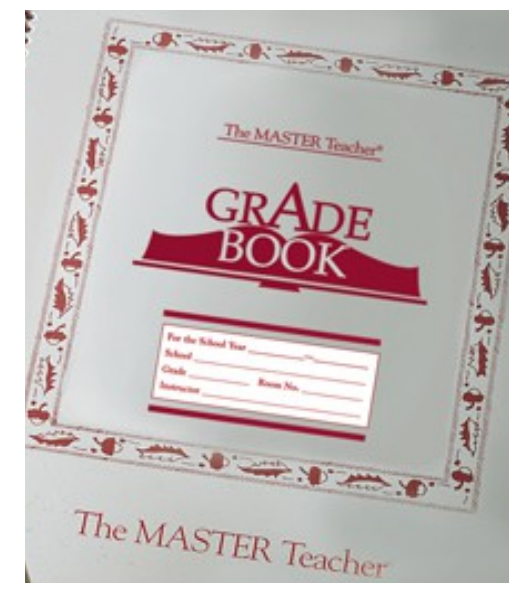- All projects are *individual* projects

- http://zeus.cs.pacificu.edu/chadd/cs445f11

Database Projects

- All database projects are to be done using MySQL 5.5 Community Server

  - http://dev.mysql.com/downloads/mysql/

  - http://www.apachefriends.org/en/index.html (XAMPP)

- First DB Assignment

  - Learn to use MySQL & SQL

  - Build graphical front end (Web/MS Access/OpenOffice)

- Big Database Project

  - You design, document, and implement a database

    - I have topics ideas but you are free to come up with your own

  - Build a web-based front end

    - We will discuss how to do this using PHP and the Apache webserver

  - 5 minute presentation of your design

  - 7-10 minute presentation of your final design and implementation

Introduction to Databases

- Read Chapter 1

  - homework: page 23: 1.2, 1.6 (Due Sept 9)

- What's a database?

  - DBMS?

- Why do we use one?

- Who uses one?

- How do we model the data?

DATA!

Where it the data?
How do we model it?

Basic Database Usage Scenario

Webserver   PHP   The Database

User

More Complicated Database Usage Scenario

User

Webserver

PHP

Application Server

The Database

CakePHP
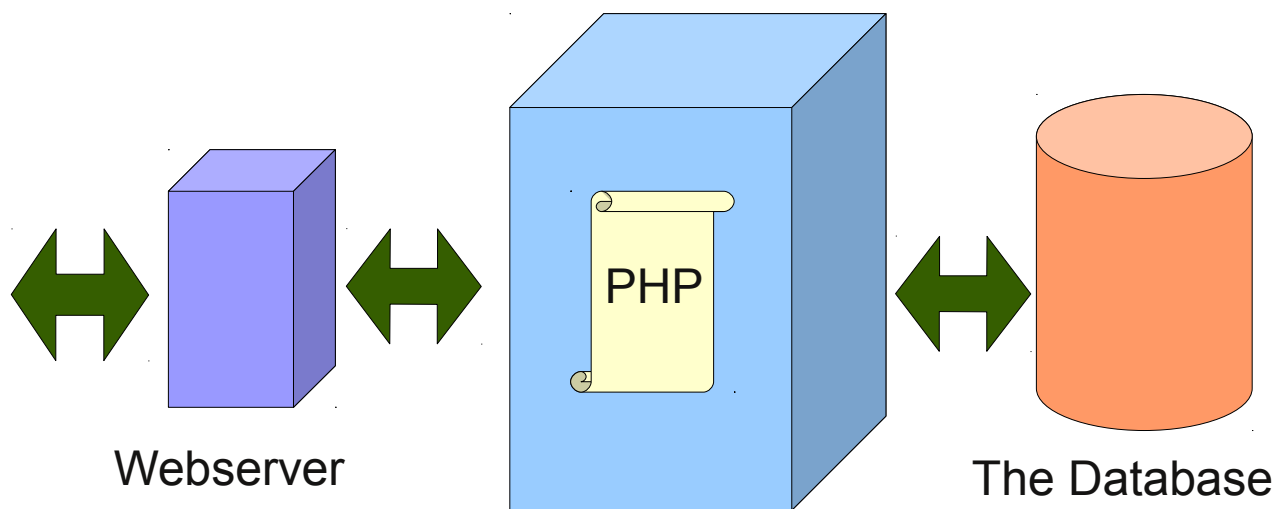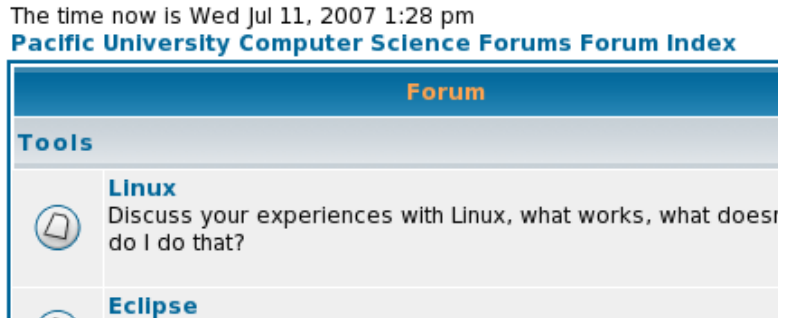
Why not just use a text file/file system/XML?

- Data Independence

- Efficient Data Access

- Data Integrity and Security

- Data Administration

- Concurrent Access/Crash Recovery

- Reduced Application Development Time

(page 9)

Storing data in the DB

- Data Models

- Semantic Data Model (high level)

  – Entity-Relationship (ER) Model

    - Entity:

    - Relationship:

- Relational Data Model (low level)

- Schema

- Constraints/Integrity

Relational Databases

- Well defined structure of data
    - schema

- Flexible queries

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What's inside a Relational database?

- Tables

- Indexes/Keys

- Data

How do we access the data?

- Query Language
  - Structured Query Language (SQL)
  - What types of queries can we run?

What about multiple users?

- Transactions

- Concurrency

Dirty Details

- Figure 1.3
  page 20

Unsophisticated users (customers, travel agents, etc.)

Sophisticated users, application programmers, DB administrators

Web Forms	Application Front Ends	SQL Interface

- - - - - - ▸
shows command flow

SQL COMMANDS

Plan Executor		Parser
Operator Evaluator		Optimizer

Query
Evaluation
Engine

shows interaction

Files and Access Methods

Transaction Manager

Buffer Manager

Recovery Manager

Lock Manager

Disk Space Manager

Concurrency Control
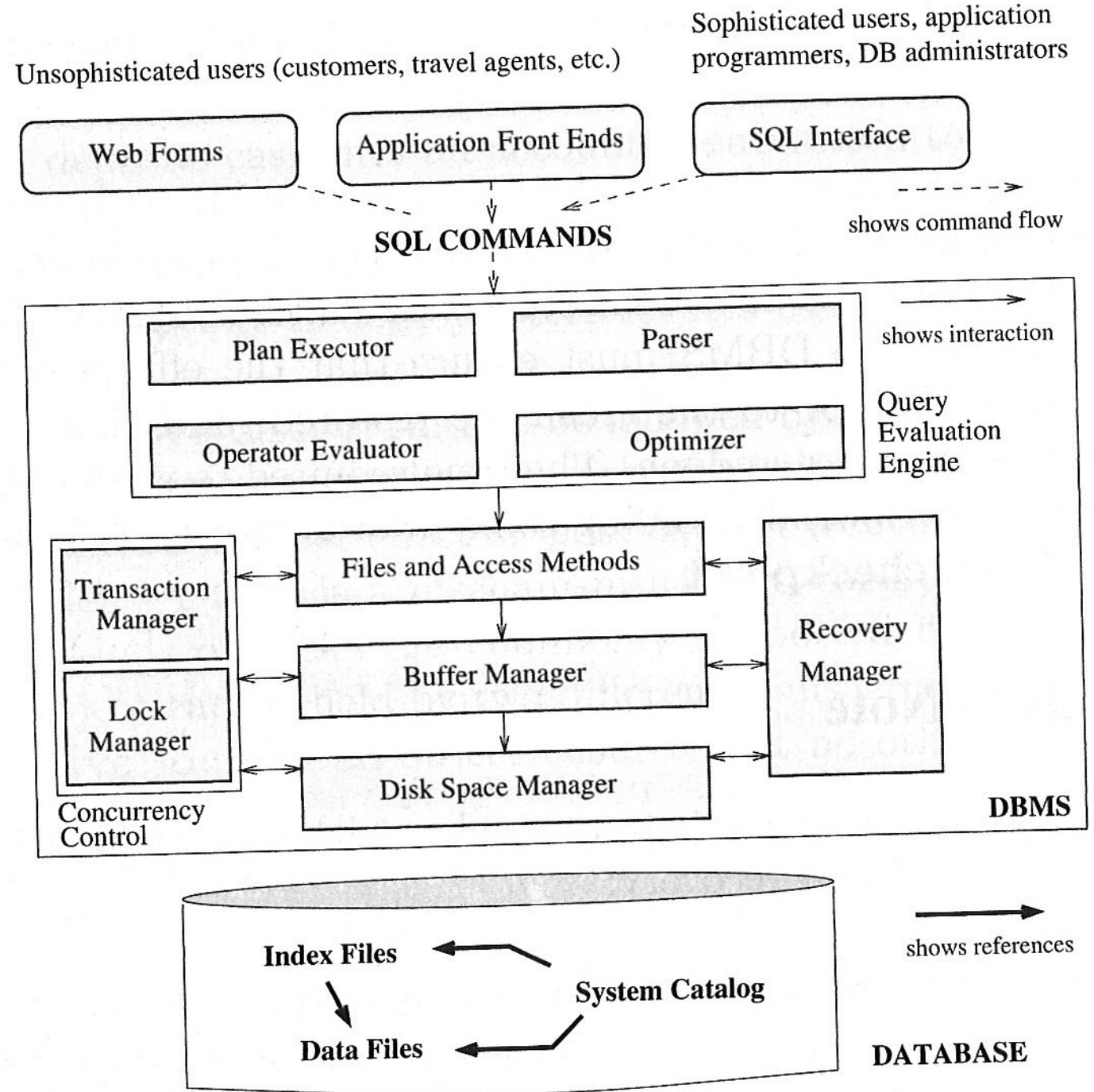
DBMS

Index Files

Data Files

System Catalog

shows references

DATABASE

Figure 1.3 Architecture of a DBMS