Lecture 16

Introduction to Databases
with MAMP/LAMP/WAMP
thrown in!

* Course logo spider web photograph from Morguefile openstock photograph by Gabor Karpati, Hungary.
Why a Database?

- Consider handling lots of data!
Database Taxonomy - Flat

- Hardly a database
- Typically ...
  - Row = record.
  - Column = field.
- Common Example
  - A Spreadsheet.
- Upside
  - Trivial
- Downside
  - Rigid

First Name Frequency from U.S. Census Bureau.
Taxonomy Hierarchical

- Root Data Structure is a tree.
- May follow a uniform pattern, or ...
- Highly flexible.
The relational model for database management is a database model based on predicate logic and set theory. It was first formulated and proposed in 1969 by Edgar Codd with aims that ...” (Beginning of Wikipedia entry)

Rather than approach this topic in general, let us proceed with learning MySQL.
Backend Database Overview

- Behind (almost) all good websites stands a loyal database.

A back-end database is a database that is accessed by users indirectly through an external application rather than by application programming stored within the database itself or by low level manipulation of the data (e.g. through SQL commands). A back-end database stores data but does not include end-user application elements such as stored queries, forms, macros or reports.

Enterprise database systems

The term back-end database is not widely used among developers using larger or enterprise database systems. This is because enterprise database systems enforce the use of the client–server model and do not have the option to include the application programming within their databases. All such databases are used as back-end databases and so the term is redundant.
MySQL and SQLite

- We will begin with full MySQL intro..
- But then, move to simpler SQLite
MySQL – By Itself

- Open Source
- Common Platforms
- You need not install it for CT 310.
- But some of you may choose to play.
Architecture Review

➢ Where is persistent user specific info?

Client Computer ➔ Web Server (Apache) ➔ Static Files (index.html)
Architecture – Now Where?

Client Computer

Web Server (Apache)

File System /cgi-bin

Client Side (JavaScript)

Server Side
cgi, Perl, PHP, ...

Native Code (enter.exe)
Architecture – Data Server

Client Computer

Web Server (Apache) + PHP Interpreter

File System (enter.php)

MySQL Database

*
Always Ask – Where?

- As in, where is the data?
- On a separate machine?
- On the same machine?
- In a form you can read externally?
- Will it move when you move the site?
- How do you make copies?
- What are the points of failure?
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Want to Try at Home
(Optional for CT 310)

XAMPP Apache + MySQL + PHP + Perl

What is XAMPP?
XAMPP is the most popular PHP development environment.
XAMPP is a completely free, easy to install Apache distribution containing MySQL, PHP, and Perl. The XAMPP open source package has been set up to be incredibly easy to install and to use.

MAMP & MAMP PRO
Manage your websites locally.

MAMP: My Apache with MySQL with PHP
For OS X and Windows
MAMP Preferences Overview

When starting MAMP:
- Start servers
- Check for MAMP PRO
- Open WebStart page

When quitting MAMP:
- Stop servers

My favorite link: [Link]

Apache Port: 8888
Nginx Port: 7888
MySQL Port: 8889

Set MAMP ports to default
Set Web & MySQL ports to 80 & 3306

Standard Version: 5.6.10
Cache: off
Note port number on URL
Localhost:8888

Also, port number for MySQL server 8889
Command Line MySQL

- Real Workflows: WYSIG Database Support.
- Getting Started: stay close to basics,
  - understand command line level control.

Using MySQL command line

To use the MySQL command line, perform the following steps:

1. Start MAMP
2. Start the servers
3. Open Terminal.app (Applications -> Utilities)
4. Type in: (one line)

   /Applications/MAMP/Library/bin/mysql --host=localhost -uroot -proot

Now you can use the MySQL command line. For example to show all your databases with show databases;
Danger Danger

Perhaps the most common mistake!

MySQL 5.7 Reference Manual / ... / How to Reset the Root Password

B.5.3.2 How to Reset the Root Password

If you have never assigned a root password for MySQL, the server does not require a password at all for connecting as root. However, this is insecure. For instructions on assigning a password, see Section 2.10.4, “Securing the Initial MySQL Accounts”.

Read the fine print:
... the server does not require a password at all ...
Just How Open is MySQL
Out of the Box!

A user with no name!

Remember the password (you saw it!)

Ok – Some Protection
Reset Root Password!

Why am I teaching you this first?!
Create A User

➢ Avoid the trap of doing routine work as ‘root’. Build users with purpose.

```
[ dhcpP195: MAMP /Library / bin ] ross% mysql -u root -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \ g.
Your MySQL connection id is 14
Server version: 5.5.42 Source distribution

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Type ' help ' ; or '\' for help. Type '\' c ' to clear the current input statement.

mysql> GRANT ALL PRIVILEGES ON * . * TO ' ross '@' localhost ' IDENTIFIED BY ' ross ' WITH GRANT OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql> SET PASSWORD FOR ' ross '@' localhost ' = PASSWORD (' monkey ');
Query OK, 0 rows affected (0.00 sec)

mysql> 
```
Now Try It Out

Interaction is typically in the form of a query, in this case ‘select’ the function ‘now’ and retrieve the current date and time.
Closing Thoughts

Big Iron - MySQL
Upside
Lots of data,
Relational data

Downside
Hard to transport
No ‘pages’ to fix
Hired staff

KISS – User Files
Upside
Trivial to transport
‘pages’ are obvious’
Templates in open

Downside
Won’t scale up
Data model limited

Right Down the Middle
SQLite