Server-side Web Programming

Lecture 12: Server-side Databases and Drivers

Databases and E-Commerce

- Long term information stored in <u>databases</u>
 - <u>Queries</u> used to produce lists of products
 - Never hardwired in!



- Updates used to store orders
 - · New record created for order in Order table
 - Customer information added to other tables
 - · Quantities updated in inventory tables

Databases and Web Programming

Updates to databases when orders placed



Database Servers

- Access to database controlled by <u>database server</u>
 - Constantly running (like web container)
 - Programs communicate with it
 - Server runs database queries and updates for databases it controls
 - Server handles security of database
 - Most are password-controlled
 - Examples:
 - MySQL (free)
 - Oracle
 - MS Server
 - <u>Not</u> Access!



Database Servers

- Programs create statement objects inside server
- Server executes them on the database
- Server stores <u>results</u> if <u>query</u> performed
- Program may then access those results



MySQL

MySQL :: The world's most popular of a second se Free database server Edit View Favorites Tools Help 🕞 Back 🝷 💮 👻 🗾 🛃 🏠 Search See page 715 for instructions Address 🗃 http://www.mysql.com/ - Go to www.mysql.com 🏶 Sun. MySQ Follow downloads tab⁻ - Go to MySQL Community Search Server Get Windows version Pick a mirror ls/ · You can skip registration MySQL Community Server Download and run Download » When it comes to using MySQL, you have ch which version best meets your needs.

Installing MySQL

- Run the Service Instance Configuration when prompted to do so
- Should accept default settings
 - Check "Include Bin Directory"
 - Choose "sesame" for the root password

MySQL Server Instance Configuration Wizard				
MySQL Server Instance Configuration Configure the MySQL Server 5.0 server instance.	MySQL Server Instance Configuration Wizard MySQL Server Instance Configuration Configure the MySQL Server 5.0 server instance.			
Please set the Windows options.	Please set the security options. Modify Security Settings New root password: ****** Enter the root password. Retyne the password			
Launch the MySQL Server automatically Include Bin Directory in Windows PATH Check this option to include the directory containing the server / client executables in the Windows PATH variable so they can be called from the command line. < Back	Create An Anonymous Account This option will create an anonymous account on this server. Please note that this can lead to an insecure system.			

SQL and Databases

Commands to database server use <u>SQL</u> (structured query language)

Common examples:

 <u>Query</u> for all records matching some condition: select <u>field</u> from <u>table</u> where <u>condition</u>

```
Example:
select * from books where price < 10
```

• <u>Delete</u> all records matching some condition: delete from <u>table</u> where <u>condition</u>

Example: delete from books where productCode = `0004'

SQL and Databases

• <u>Set</u> new field value for all records matching some condition: update <u>table</u> set <u>field</u> = <u>value</u> WHERE <u>condition</u>

Example: update books set price = 9.95 where productCode = `0004'

 <u>Insert</u> new record with given field values: insert into <u>table</u> (<u>field</u>, <u>field</u>, <u>field</u>...) values (<u>value</u>, <u>value</u>, <u>value</u>...) Example: insert into books (productCode, title, price) values (`0004', `Green Eggs and Ham', 9.95)



- Java Database Connectivity: Java classes for database manipulation
 - Create <u>connections</u> to database via server
 - Create <u>SQL statement</u> objects
 - Execute statements to manipulate databases
 - Get results of queries
 - In javax.sql.*
 package

catch (SQLException e) (\gg NO CONNECTION < \gg)

try (
 statement = connection.createStatement();
 books = statement.executeQuery("SELECT * FROM books");

catch (SQLException e) { %> BAD QUERY <% }
catch (NullPointerException e) { %> NO CONNECTION ESTABLISHED <% }</pre>

<**
while (books != null && books.next()) (
 String productCode = books.getString("productCode");
 String title = books.getString("title");
 double price = books.getDouble("price");
}
</pre>

Database Drivers

- Database server does not understand JDBC commands
- Only understands its own DBMS protocols
 - Each server has its own DBMS
- Need a database driver to perform translation
 - Obtain from database server provider
 - Install in Java libraries



MySQL Database Driver

- From downloads page at mysql.com
- Go to <u>MySQL Connector/J</u>
- Download and save

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/ server.	Upcoming Releases MySQL 5.1 — Release Candidate relea	Average Ave	:

MySQL Database Driver

- Extract the mysql-connector-java-5.1.6-bin.jar file
- /Copy to jre\lib\ext directory of your Java,
 - Same as you did with JSP/servlet libraries

🛢 TUGZip 3.5 - Y:\mysql-con	nector-java-5.1.6.ta	r.gz
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The MySQL Interface

- Command line interface to manipulate databases MySQL controls
 - Available from PROGRAMS menu
 - Will need to give password



Can <u>create new databases</u>
 create database databasename;



Creating Database Tables

- Must define field names and field types
- Some types:
 - varChar(n) : String of up to n characters
 - int(n) : integer up to n digits
 - double(n, d) : decimal number up to n digits and d after the decimal
- By default, first field is key field
 - Must declare it as not null so all records will have a key field
- SQL command: create table <u>tablename</u> (<u>keyfieldname type</u> not null, <u>fieldname type</u>, <u>fieldname type</u>, ...); ...);
 • C:\mysql\bin\mysql.exe mysql> use bookstore; Database changed mysql> create table books (-> productCode varChar(10) not null, -> title varChar(50), -> price double(5, 2) -> ;; Query OK, 0 rows affected (0.03 sec)

Databases and the MVC Paradigm

- Usually do not directly access database from JSPs/servlets
 - Requires both web programming and SQL knowledge
- Usually done in model classes
 - Cart object stores its content to database when commanded to
 - Cart object created from database query when need to retrieve the cart



Disaster Recovery

- Database server should be behind <u>firewall</u> to protect crucial data
 - May be on separate machine from web server!
- Database access may <u>fail</u>
 - Connection lost to database server, database server shuts down, etc.
- Need plan to back up any crucial data entered by user
 - Store to file if server not available



- Read file contents into database later