SWINBURNE UNIVERSITY OF TECHNOLOGY

Advanced Web Development: MySQL Databases with PHP

Week 8

Outline

- Accessing database with PHP
  - Connecting to MySQL from PHP and selecting databases
  - Handling MySQL errors
  - Executing SQL statements
  - Cleaning Up and closing connection
- Creating and deleting databases and tables
- Creating, updating, selecting and deleting records

Reading: Textbook Chapter 8
PHP mysqli
https://www.php.net/manual/en/book.mysqli.php

SWINBURNE UNIVERSITY OF TECHNOLOGY

ACCESSING DATABASE WITH PHP

Accessing Databases from PHP

- PHP has the ability to access and manipulate any database that is ODBC compliant

- PHP includes functionality that allows you to work *directly* with different types of databases, without going through ODBC

http://www.php.net/manual/en/refs.database.php

Accessing Databases from PHP

- There are three main options when considering connecting to a MySQL database server using PHP:
  - PHP's MySQL Extension
  - PHP's mysqli Extension
  - PHP Data Objects (PDO)

We will use mysqli

- The mysqli extension features a dual interface, supporting both procedural (functions) and object-oriented interfaces.
- These notes and examples use the ***procedural interface***.

http://www.php.net/manual/en/book.mysqli.php

Connecting to MySQL

- Open a connection to a MySQL database server with the `mysqli_connect()` function
- Returns an object presenting the connection if the connection is successful; false otherwise
- Assign the return value from the `mysqli_connect()` function to a variable that you can use to access the database in your script

Connecting to MySQL (continued)

- The syntax for the `mysqli_connect()` function is:

```
$connection = mysqli_connect("host"[,"user",
"password","database"])
```

  - The *host* argument specifies the host name where your MySQL database server is installed

    e.g. `feenix-mariadb.swin.edu.au`

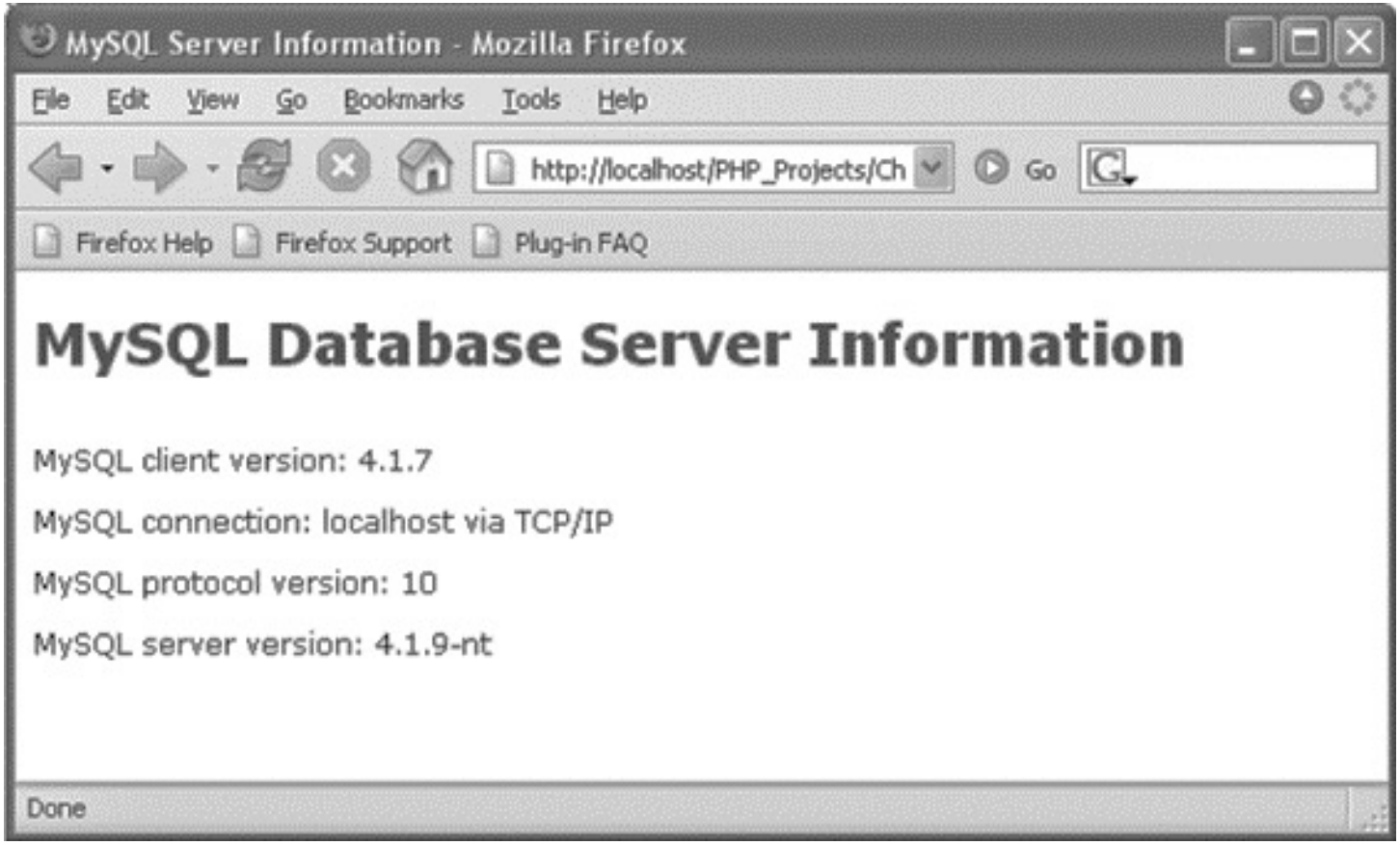
  - The *user* and *password* arguments specify a MySQL account name and password e.g. `s1234567 yourMySQLpassword`
  - The *database* argument specifies a database e.g. `s1234567_db`

Connecting to MySQL (continued)

MySQL server information functions

Function	Description
`mysqli_get_client_info()`	Returns the MySQL client version
`mysqli_get_client_version()`	Returns the MySQL client version as an integer
`mysqli_get_host_info(connection)`	Returns the MySQL database server connection information
`mysqli_get_proto_info(connection)`	Returns the MySQL protocol version
`mysqli_get_server_info(connection)`	Returns the MySQL database server version
`mysqli_get_server_version(connection)`	Returns the MySQL database server version as an integer

Connecting to MySQL (continued)



Web browser output for example script MySQLInfo.php

Selecting a Database

- The statement for selecting a database with the MySQL Monitor, is the `use` *`database`* statement
- The function for selecting a database is `mysqli_select_db()`
- The syntax is:

  `mysqli_select_db(`*`connection`*`, `*`database`*`)`

- The function returns a value of `true` if it successfully selects a database or `false` if it does not

Connecting and Selecting

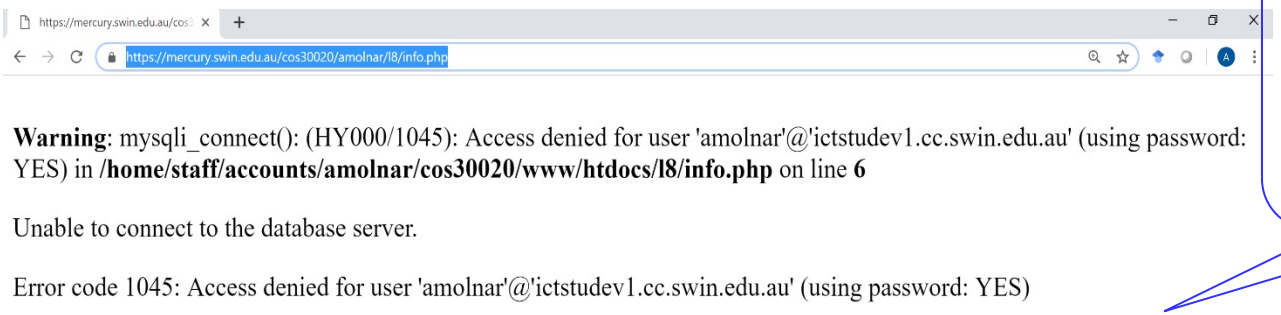
- The mysqli_connect also allows one to connect and select the database at once.

```
$connection = mysqli_connect(
  "feenix-mariadb.swin.edu.au",
  "s123456", " "ddmmyy", "s1234567_db")
```

Handling MySQL Errors

- Reasons for not connecting to a database server include:
  - The database server is not running
  - Insufficient privileges to access the data source
  - Invalid username and/or password

e.g. `if (!$dbConnect) ...`



We do not want users to see any database error messages !

Database connection error message

SWINBURNE UNIVERSITY OF TECHNOLOGY

Handling MySQL Errors

Suppressing Errors with the Error Control Operator

- Writing code that anticipates and handles potential problems is often called **bulletproofing**
- Bulletproofing techniques include:
  - Validating submitted form data

    e.g. `if (isset($_GET['height']) ...`
  - Using the **error control operator (@)** to suppress error messages

    e.g.

```
$dbConnect = @mysqli_connect(...);
if (!$dbConnect) ...
```

Handling MySQL Errors

Terminating Script Execution

- The `die()` and `exit()` functions ***terminate*** script execution
- The `die()` version is usually used when attempting to access a data source
- Both functions accept a single string argument
- Call the `die()` and `exit()` functions as separate statements or by appending either function to an expression with the `or` operator

Note: When script is terminated, an *incomplete* html page is sent to the client. This is useful for error diagnostics, but poor in a production application.

Handling MySQL Errors (continued)

```
$dbConnect = @mysqli_connect("localhost", "root", "paris");
if (!$dbConnect)
      die("<p>The database server is not available.</p>");
echo "<p>Successfully connected to the database server.</p>";
$dbSelect = @mysqli_select_db($dbConnect, "flightlog");
if (!$dbSelect)
      die("<p>The database is not available.</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database
mysqli_close($dbConnect);
```

No `else` required here

Handling MySQL Errors(continued)

```
$dbConnect = @mysqli_connect("localhost", "root", "paris",
   "123456_db")
      or die("<p>The database server is not available.</p>");
// the above is one statement: connected OK or die
echo "<p>Successfully connected to the database server.</p>";
@mysqli_select_db($dbConnect, "flightlog")
      or die("<p>The database is not available.</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database server
mysqli_close($DBConnect);
```

No `if` required here

Handling MySQL Errors(continued)

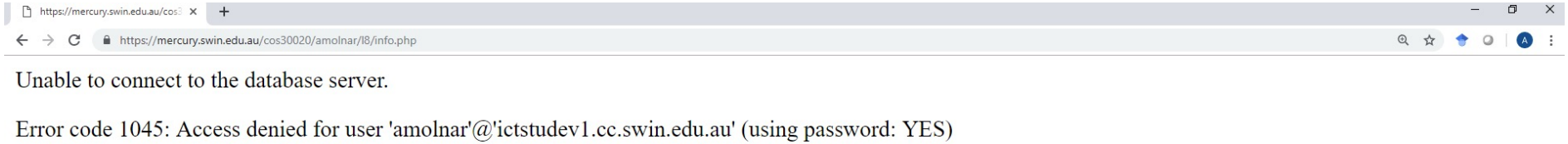
MySQL error reporting functions

Function	Description
`mysqli_connect_errno()`	Returns the error code from the last database connection attempt or zero if no error occurred
`mysqli_connect_error()`	Returns the error message from the last database connection attempt or an empty string if no error occurred
`mysqli_errno(connection)`	Returns the error code from the last attempted MySQL function call or zero if no error occurred
`mysqli_error(connection)`	Returns the error message from the last attempted MySQL function call or an empty string if no error occurred
`mysqli_sqlstate(connection)`	Returns a string of five characters representing an error code from the last MySQL operation or 00000 if no error occurred

Handling MySQL Errors(continued)

```
$user = $_GET["username"];
$password = $_GET["password"];
$database = $_GET["database"];
$dbConnect = @mysqli_connect("localhost", $user, $password,
   $database)
      or die("<p>Unable to connect to the database server.</p>"
      . "<p>Error code " . mysqli_connect_errno()
      . ": " . mysqli_connect_error() . "</p>");
echo "<p>Successfully connected to the database server.</p>";
@mysqli_select_db($dbConnect, "flightlog")
      or die("<p>The database is not available.</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database
mysqli_close($dbConnect);
```

Handling MySQL Errors(continued)



Error number and message generated by an invalid username and password

Handling MySQL Errors(continued)

```
$user = $_GET["username"];
$password = $_GET["password"];
$dbConnect = @mysqli_connect("localhost", $user, $password)
     or die("<p>Unable to connect to the database
   server.</p>"
     . "<p>Error code " . mysqli_connect_errno()
     . ": " . mysqli_connect_error()) . "</p>";
echo "<p>Successfully connected to the database server.</p>";
@mysqli_select_db($dbConnect, "amolnar_d")
     or die("<p>Unable to select the database.</p>"
     . "<p>Error code " . mysqli_errno($dbConnect)
     . ": " . mysqli_error($dbConnect) . "</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database
mysqli_close($dbConnect);
```

Handling MySQL Errors(continued)

mercury.swin.edu.au/cos30020/amolnar/l8/info.php

Successfully connected to the database server.

Unable to select the database.

Error code 1044: Access denied for user 'amolnar'@'%.swin.edu.au' to database 'amolnar_d'

Error code and message generated when attempting to select a database that does not exist

SWINBURNE UNIVERSITY OF TECHNOLOGY

Executing SQL Statements

The `mysqli_query()` function returns one of three values:

- For SQL statements that do not return results (`CREATE DATABASE` and `CREATE TABLE` statements) they return a value of `true` if the statement executes successfully
- For SQL statements that return results (`SELECT` and `SHOW` statements) they return a *result pointer* that represents the query results
  - A **result pointer** is a special type of variable that refers to the currently selected row in a resultset
- For SQL statements that fail, `mysqli_query()` function returns a value of `false`, regardless of whether they return results

Cleaning Up

- When you are finished working with query results retrieved with the `mysqli_query()` function, use the `mysqli_free_result()` function to close the resultset
- To close the resultset, pass to the `mysqli_free_result()` function the variable containing the result pointer from the `mysqli_query()` function

eg `mysqli_free_result($QueryResult);`

Closing Connection

- Close a connection to a MySQL database server with the `mysqli_close()` function

  eg. `mysqli_close($connection);`

Accessing database with PHP

- Step 1 – **Open** a connection:
  - Connect to the Database Server, and select the Database,
- Step 2 – **Manipulate** the database:
  - Prepare SQL strings
  - Talk to the Database and executes SQL string
- Step 3 – **Close** the connection:
  - Clean-up, discard the “query” result objects, or other related objects (if any)
  - Close the connection to the Database and the Database Server

Accessing database with PHP

Open

```
// ## 1. open the connection
// Connect to mysql server
$conn = @mysqli_connect('sqlserver','user_name','password')
   or die('Failed to connect to server');
// Use database
@mysqli_select_db($conn, 'my_database')
   or die('Database not available');
```

Manipulate

```
// ## 2. set up SQL string and execute
// get data from user, escape it, trust no-one. :)
$pcode = mysqli_escape_string($conn, $_GET['pcode']);

$query = "SELECT * FROM postcode WHERE pcode='$pcode'";

$results = mysqli_query($conn, $query);
// … Now use data however we want …
```

Close

```
// ## 3. close the connection
mysqli_free_result($results);
mysqli_close($conn);
```

CREATING AND DELETING DATABASES AND TABLES

Creating and Deleting Databases

- Use the `CREATE DATABASE` statement with the `mysqli_query()` function to create a new database

```
$sqlString = "CREATE DATABASE real_estate";
$queryResult = @mysqli_query($dbConnect, $sqlString)
     or die("<p>Unable to execute the query.</p>"
     . "<p>Error code " . mysqli_errno($dbConnect)
     . ": " . mysqli_error($dbConnect)) . "</p>";
echo "<p>Successfully executed the query.</p>";
mysqli_close($dbConnect);
```

Creating and Deleting Databases (continued)

- Use the `mysqli_db_select()` function to check whether a database exists before you create or delete it
- To use a new database, you must select it by executing the `mysqli_select_db()` function
- Deleting a database is almost identical to creating one, except use the `DROP DATABASE` statement instead of the `CREATE DATABASE` statement with the `mysqli_query()` function

Creating and Deleting Databases (continued)

```
$dbName = "real_estate";
...
if (@!mysqli_select_db($dbConnect, $dbName))
     echo "<p>The $dbName database does not exist!</p>";
else {
     $sqlString = "DROP DATABASE $dbName";
     $queryResult = @mysqli_query($dbConnect, $sqlString)
           or die("<p>Unable to execute the query.</p>"
           . "<p>Error code " . mysqli_errno($dbConnect)
           . ": " . mysqli_error($dbonnect)) . "</p>";
     echo "<p>Successfully deleted the database.</p>";
}
mysqli_close($dbConnect);
```

Creating and Deleting Tables

- To create a table, use the `CREATE TABLE` statement with the `mysqli_query()` function
- Execute the `mysqli_select_db()` function before executing the `CREATE TABLE` statement or the new table might be created in the wrong database
- To prevent code from attempting to create a table that already exists, use a `mysqli_query()` function that either attempts to `SELECT` records from the table, or attempts to '`SHOW TABLES LIKE`'

Creating and Deleting Tables (continued)

```
$dbName = "real_estate";
...
$sqlString = "CREATE TABLE commercial (
  city VARCHAR(25), state VARCHAR(25),
  sale_or_lease VARCHAR(25),
  type_of_use VARCHAR(40), Price INT, size INT)";
$queryResult = @mysqli_query($dbConnect, $sqlString)
    or die("<p>Unable to execute the query.</p>"
    . "<p>Error code " . mysqli_errno($dbConnect)
    . ": " . mysqli_error($dbConnect)) . "</p>";
echo "<p>Successfully created the table.</p>";
mysqli_close($dbConnect);
```

Creating and Deleting Tables (continued)

- To delete a table, use the `DROP TABLE` statement with the `mysqli_query()` function
- To prevent code from attempting to delete a table that does not exist, use a `mysqli_query()` function that either attempts to `SELECT` records from the table, or attempts to '`SHOW TABLES LIKE`'

CREATING, UPDATING, SELECTING AND DELETING RECORDS

Adding, Updating and Deleting Records

Note: Also refer to previous Chapter on SQL

To Add records to a table:

- Use the `INSERT` and `VALUES` keywords with the `mysqli_query()` function
- The values entered in the `VALUES` list must be in the same order that defined in the table fields
- Specify `NULL` in any fields that do not have a value e.g. for `AUTO_INCREMENT` field

To Add multiple records to a table:

Use the `LOAD DATA` statement and the `mysqli_query()` function with a local text file containing the records to be added.

Adding, Updating and Deleting Records

(continued)

To Update records in a table:

- Use the `UPDATE`, `SET`, and `WHERE` keywords with the `mysqli_query()` function
- The `UPDATE` keyword specifies the name of the table to update
- The `SET` keyword specifies the value to assign to the fields in the records that match the condition in the `WHERE` keyword

Using the `mysqli_affected_rows()` Function

- With queries that return results (`SELECT` queries), use the `mysqli_num_rows()` function to find the number of records returned from the query
- With queries that modify tables but do not return results (`INSERT`, `UPDATE`, and `DELETE` queries), use the `mysqli_affected_rows()` function to determine the number of affected rows by the query

Using the `mysqli_affected_rows()` Function (continued)

```
$sqlString = "UPDATE inventory SET price=368.20
      WHERE make='Fender' AND model='DG7'";
$queryResult = @mysqli_query($dbConnect, $sqlString)
      or die("<p>Unable to execute the query.</p>"
      . "<p>Error code " . mysqli_errno($dbConnect)
      . ": " . mysqli_error($dbConnect) . "</p>");
echo "<p>Successfully updated "
      . mysqli_affected_rows($dbConnect) . " record(s).</p>";
```

Using the `mysqli_affected_rows()` Function (continued)

Output of `mysqli_affected_rows()` function for an `UPDATE` query

Adding, Updating and Deleting Records

(continued)

To Delete records from a table:

- Use the `DELETE` and `WHERE` keywords with the `mysqli_query()` function
- The `WHERE` keyword determines which records to delete in the table
- Be careful, if no `WHERE` keyword, all records are deleted !!

Selecting Records

To select from a table:

- Use the `SELECT` and `WHERE` keywords with the `mysqli_query()` function
- The `WHERE` keyword determines which records to select in the table
- if no `WHERE` keyword, all records are selected

Selecting Records (continued)

- Use the `mysqli_query()` function to send SQL statements to MySQL
- The syntax for the `mysqli_query()` function is:

```
mysqli_query(connection, query)
```

Be careful when constructing query:

```
$make = "Holden";

$sqlString = "SELECT model, quantity FROM
    $dbTable WHERE model = $make";
```

Use:

```
$sqlString = "SELECT model, quantity FROM
    $dbTable WHERE model = '$make' ";
```

Selecting Records (continued)

Common PHP functions for accessing database results

Function	Description
`mysqli_data_seek($Result, position)`	Moves the result pointer to a specified row in the resultset
`mysqli_fetch_array($Result, MYSQLI_ASSOC | MYSQLI_NUM | MYSQLI_BOTH)`	Returns the fields in the current row of a resultset into an indexed array, associative array, or both and moves the result pointer to the next row
`mysqli_fetch_assoc($Result)`	Returns the fields in the current row of a resultset into an associative array and moves the result pointer to the next row
`mysqli_fetch_lengths($Result)`	Returns the field lengths for the current row in a resultset into an indexed array
`mysqli_fetch_row($Result)`	Returns the fields in the current row of a resultset into an indexed array and moves the result pointer to the next row

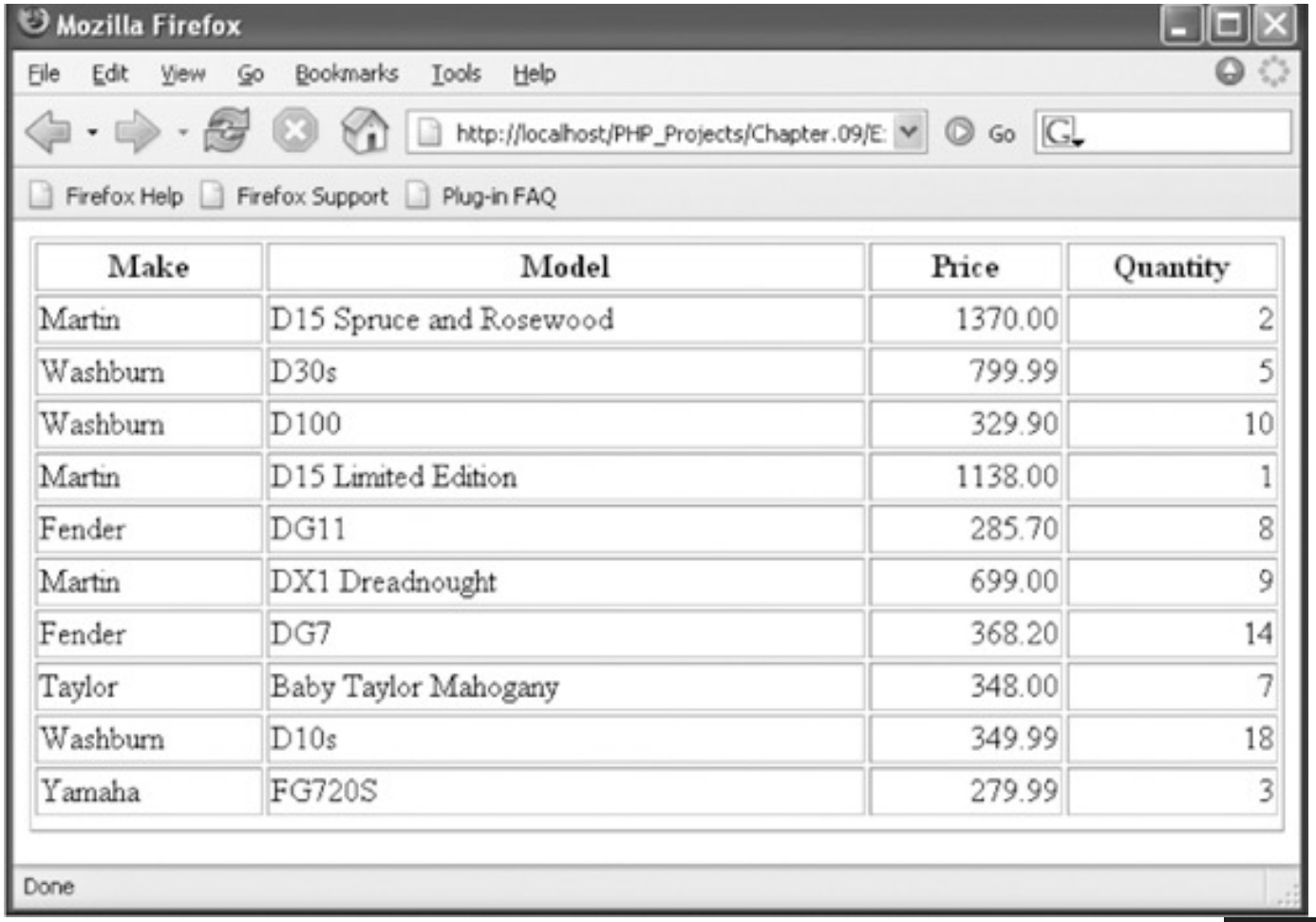
Selecting Records (continued)

Retrieving Records into an Indexed Array

- The `mysqli_fetch_row()` function returns the fields in the current row of a resultset into an indexed array and moves the result pointer to the next row

```
echo "<table width='100%' border='1'>";
echo "<tr><th>Make</th><th>Model</th>
      <th>Price</th><th>Quantity</th></tr>";
$row = mysqli_fetch_row($queryResult);
while ($row) {
      echo "<tr><td>{$row[0]}</td>";
      echo "<td>{$row[1]}</td>";
      echo "<td>{$row[2]}</td>";
      echo "<td>{$row[3]}</td></tr>";
      $row = mysqli_fetch_row($queryResult);
}
echo "</table>";
```

Selecting Records (continued)



Make	Model	Price	Quantity
Martin	D15 Spruce and Rosewood	1370.00	2
Washburn	D30s	799.99	5
Washburn	D100	329.90	10
Martin	D15 Limited Edition	1138.00	1
Fender	DG11	285.70	8
Martin	DX1 Dreadnought	699.00	9
Fender	DG7	368.20	14
Taylor	Baby Taylor Mahogany	348.00	7
Washburn	D10s	349.99	18
Yamaha	FG720S	279.99	3

Output of the inventory table in a Web browser

Selecting Records (continued)

Retrieving Records into an Associative Array

- The `mysqli_fetch_assoc()` function returns the fields in the current row of a resultset into an associative array and moves the result pointer to the next row
- The difference between `mysqli_fetch_assoc()` and `mysqli_fetch_row()` is that instead of returning the fields into an indexed array, `mysqli_fetch_assoc()` function returns the fields into an associate array and uses each field name as the array key

Selecting Records (continued)

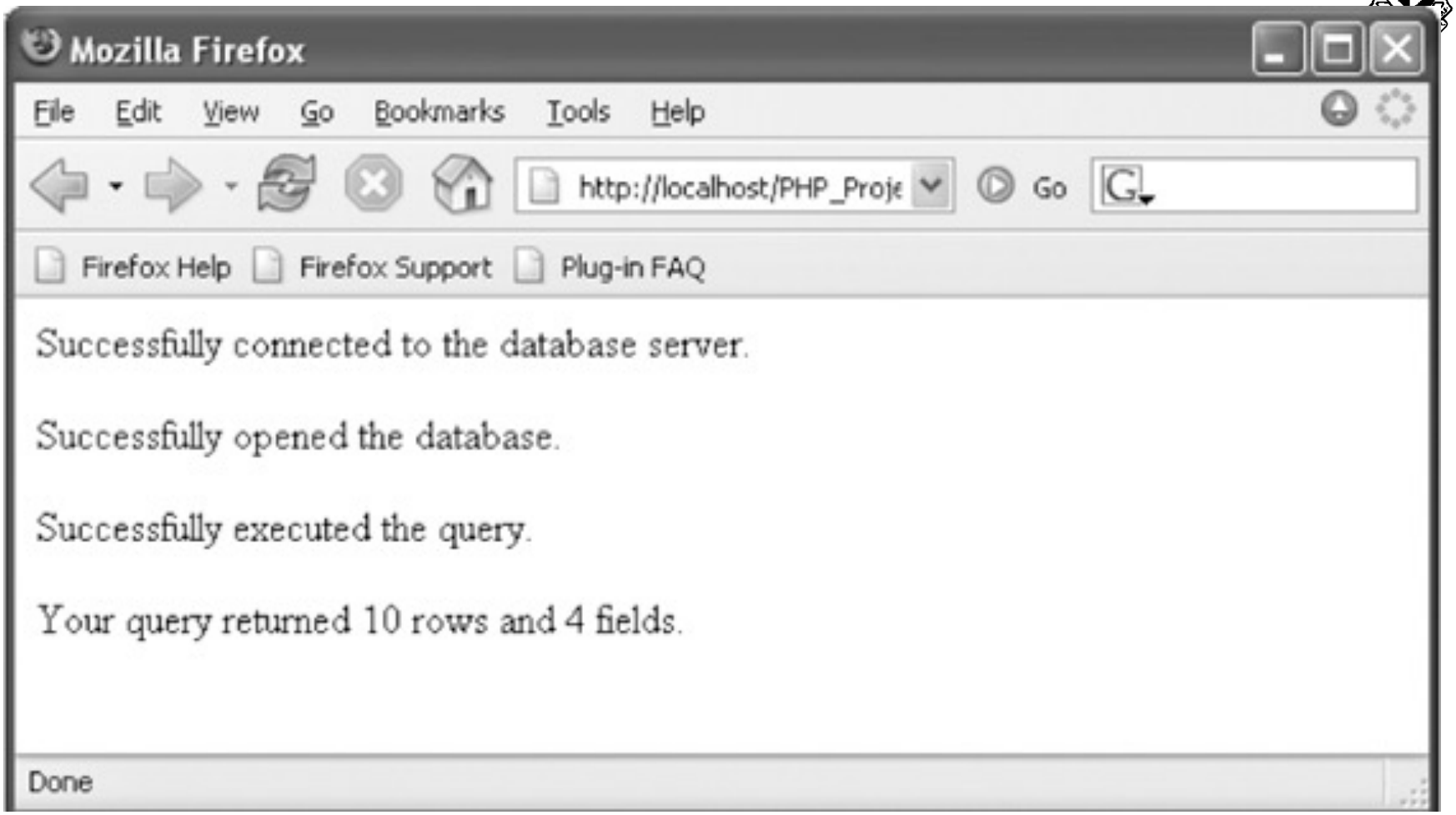
Accessing Query Result Information

- The `mysqli_num_rows()` function returns the number of rows in a query result
- The `mysqli_num_fields()` function returns the number of fields in a query result
- Both functions accept a database result variable, eg.a query result, as an argument

Selecting Records (continued)

```
$sqlString = "SELECT * FROM inventory";
$queryResult = @mysqli_query($dbConnect, $sqlString)
     or die("<p>Unable to execute the query.</p>"
     . "<p>Error code " . mysqli_errno($dbConnect)
     . ": " . mysqli_error($dbConnect) . "</p>");
echo "<p>Successfully executed the query.</p>";
$numRows = mysqli_num_rows($queryResult);
$numFields = mysqli_num_fields($queryResult);
if ($numRows != 0 && $numFields != 0) {
     echo "<p>Your query returned " , $numRows ,
               " rows and ", $numFields , " fields.</p>";
} else {
     echo "<p>Your query returned no results.</p>";
}
mysqli_close($dbConnect);
```

Selecting Records (continued)



Output of the number of rows and fields returned from a query

SWINBURNE UNIVERSITY OF TECHNOLOGY

Summary

- PHP includes functionality that allows you to work directly with different types of databases, without going through ODBC
- Writing code that anticipates and handles potential problems is often called **bulletproofing**
- The error control operator (@) suppresses error messages
- A result pointer is a special type of variable that refers to the currently selected row in a resultset

Summary (continued)

- Use the `mysqli_query()` function to send SQL statements to MySQL
- To identify a field as a primary key in MySQL, include the `PRIMARY KEY` keywords when you first define a field with the `CREATE TABLE` statement
- The `AUTO_INCREMENT` keyword is often used with a primary key to generate a unique ID for each new row in a table
- You use the `LOAD DATA` statement and the `mysqli_query()` function with a local text file to add multiple records to a database
- With queries that return results, such as `SELECT` queries, you can use the `mysqli_ num_rows()` function to find the number of records returned from the query