ITC 250/CPET 499 Web Systems
Nov. 8, 2016
Lectures
Ch. 11 Managing MySQL Database

Topics

- **PHP Coding Examples (Procedural vs. Object-Oriented)**
  - **Connecting to a MySQL DB**
  - **Handling Connection Errors/Exceptions**
  - **Executing Query:**
    - **Returning Result Set**
    - **No Result Set**
    - **Prepare Statement**
  - **Integrating User Form Data**
    - **Sanitizing User Data**
  - **Processing the Query Results**
    - **Looping through the Result Set**
    - **Fetching into an Object**
  - **Freeing Resources and Closing Connection**
  - **Using database Transactions**

References

- MySQL Functions, http://php.net/manual/en/ref.mysql.php
- PHP Data Objects, http://php.net/manual/en/book.pdo.php
- The PDO Class, represents a connection between PHP and a database server, http://php.net/manual/en/class.pdo.php

Connecting to a database: Procedural vs. Object-oriented

```
<?php
//Listing11.03.php
// modify these variables for your installation
$host = "localhost";
$database = "bookcrm";
$user = "testuser";
$pass = "mypassword";
$connection = mysqli_connect($host, $user, $pass, $database);
?>
```

```
<?php
// Listing11.04.php
// modify these variables for your installation
$connectionString = "mysql:host=localhost;dbname=bookcrm";
$user = "testuser";
$pass = "mypassword";
$pdo = new PDO($connectionString, $user, $pass);
?>
```

Storing Connection Info

```
<?php
// Listing11.05.php
define('DBHOST', 'localhost');
define('DBNAME', 'bookcrm');
define('DBUSER', 'testuser');
define('DBPASS', 'mypassword');
?>
```

```
<?php
require_once('Listing10.05.php');//eqivalent for this distribution
//require_once('protected/config.php'); //original from text
$connection = mysqli_connect(DBHOST, DBUSER, DBPASS, DBNAME);
?>
```

Handling Connection Errors

```
<?php
//Listing11.07.php
$connection = mysqli_connect(DBHOST, DBUSER, DBPASS, DBNAME);
// mysqli_connect_error returns string description of the last
// connect error
$error = mysqli_connect_error();
if ($error != null) {
  $output = "<p>Unable to connect to database<p>" . $error;
  // Outputs a message and terminates the current script
  exit($output);
}
?>
```

```php
<?php
//Listing11.08.php
$connection = mysqli_connect(DBHOST, DBUSER, DBPASS, DBNAME);
// mysqli_connect_errno returns the last error code
if ( mysqli_connect_errno() ) {
  die( mysqli_connect_error() ); // die() is equivalent to exit()
}
?>
```

```php
<?php
//Listing11.09.php
//LISTING 11.9 Handling connection errors with PDO
try {
  $connString = "mysql:host=localhost;dbname=bookcrm";
  $user = "DBUSER";
  $pass = "DBPASS";
  $pdo = new PDO($connString, $user, $pass);
  //...
  }
catch (PDOException $e) {
  die( $e->getMessage() );
}
?>
```

Setting the PDO Exception Mode

```php
<?php
//Listing11.10.php
try {
  $connString = "mysql:host=localhost;dbname=bookcrm";
  $user = "DBUSER";
  $pass = "DBPASS";
  $pdo = new PDO($connString,$user,$pass);
  // useful during initial development and debugging
  $pdo->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  //...
  }
?>
```

Executing the Query

Make a Query: Result Set is returned

```
<?php
//Listing11.11.php
//Listing 11.11 Executing a SELECT query (mysqli)
$sql = "SELECT * FROM Categories ORDER BY CategoryName";
// returns a mysqli_result object
$result = mysqli_query($connection, $sql);
?>
```

```
<?php
//Listing11.12.php
//Listing 11.12 Executing a SELECT query (pdo)

$sql = "SELECT * FROM Categories ORDER BY CategoryName";
// returns a PDOStatement object
$result = $pdo->query($sql);
?>
```

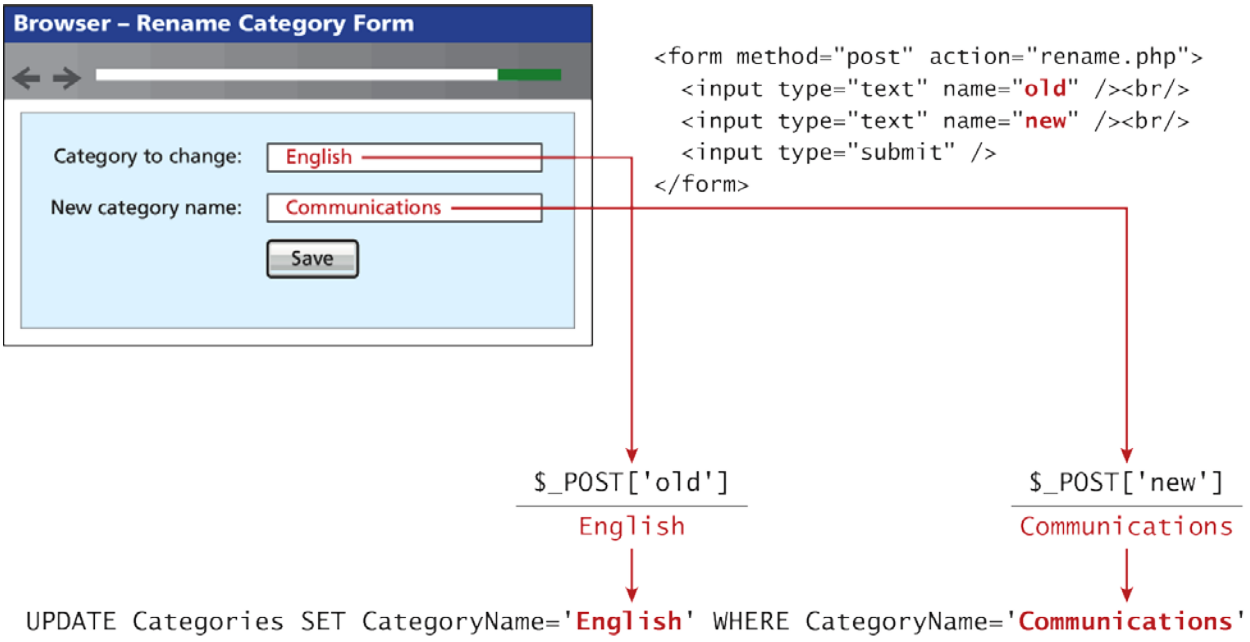
Make A Query (No Data Returned)

```
<?php
//Listing11.13.php
//Listing 11.13 Executing a query that doesn't return data (mysqli)
$sql = "UPDATE Categories SET CategoryName='Web' WHERE CategoryName='Business'";
if ( mysqli_query($connection, $sql) ) {
  $count = mysqli_affected_rows($connection);
  echo "<p>Updated " . $count . " rows</p>";
}
?>
```

```
<?php

//Listing 11.14 Executing a query that doesn't return data (PDO)
$sql = "UPDATE Categories SET CategoryName='Web' WHERE CategoryName='Business'";
$count = $pdo->exec($sql);
echo "<p>Updated " . $count . " rows</p>";
?>
```

Integrating User Data

```
<?php
//Listing.11.15.php
//Listing 11.15 Integrating user input into a query (first attempt)
$from = $_POST['old'];
$to = $_POST['new'];
$sql = "UPDATE Categories SET CategoryName='$to' WHERE CategoryName='$from'";
$count = $pdo->exec($sql);
?>
```



Sanitizing User Data

PDO::quote, http://php.net/manual/en/pdo.quote.php

- Quote a string for use in a query

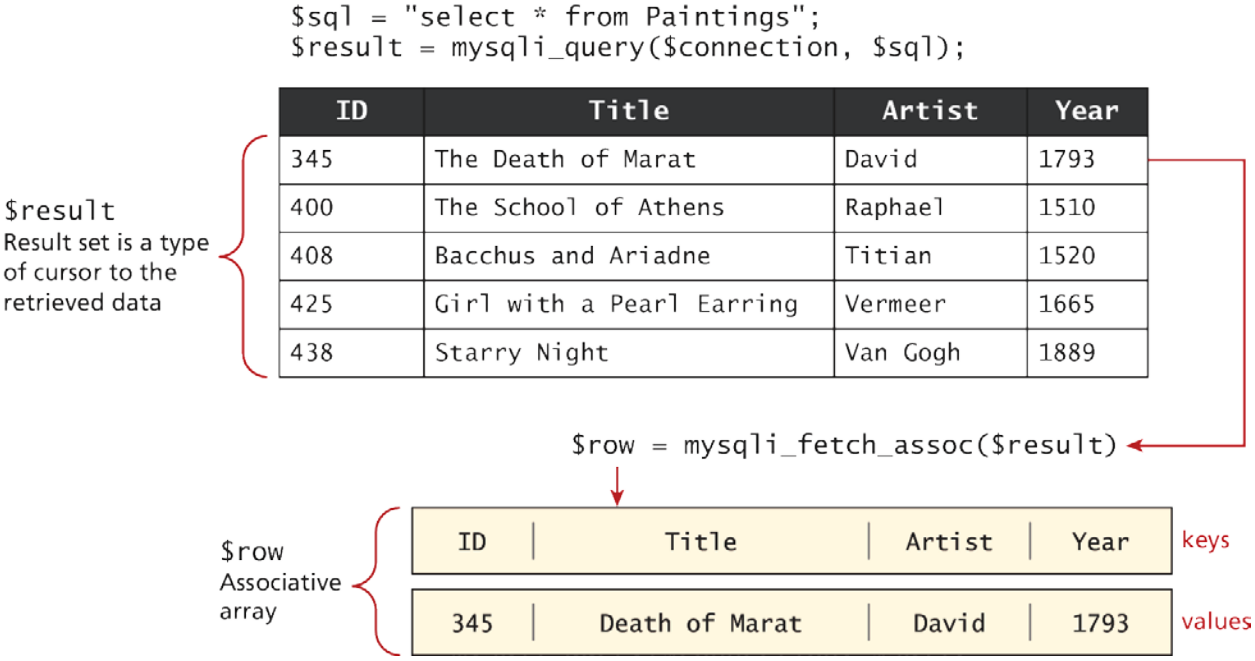
```
<?php
//Listing11.16.php
//Listing 11.16 Sanitizing user input before use in an SQL query
$from = $pdo->quote($from);
$to = $pdo->quote($to);
$sql = "UPDATE Categories SET CategoryName=$to WHERE CategoryName=$from";
$count = $pdo->exec($sql);
?>
```

Prepared Statements

```
<?php
//Listing.11.17.php
//Listing 11.17 Using a prepared statement (mysqli)
// retrieve parameter value from query string
$id = $_GET['id'];
// construct parameterized query – notice the ? parameter
$sql = "SELECT Title, CopyrightYear FROM Books WHERE ID=?";
// create a prepared statement
if ($statement = mysqli_prepare($connection, $sql)) {
  // Bind parameters s - string, b - blob, i - int, etc
  mysqli_stmt_bindm($statement, 'i', $id);
  // execute query
  mysqli_stmt_execute($statement);
  // learn in next section how to access the returned data
  //...
}

?>

<?php
//Listing11.18.php
//Listing 11.18 Using a prepared statement (PDO)
// retrieve parameter value from query string
$id = $_GET['id'];
/* method 1 */
$sql = "SELECT Title, CopyrightYear FROM Books WHERE ID = ?";
$statement = $pdo->prepare($sql);
$statement->bindValue(1, $id);
$statement->execute();
/* method 2 */
$sql = "SELECT Title, CopyrightYear FROM Books WHERE ID = :id";
$statement = $pdo->prepare($sql);
$statement->bindValue(':id', $id);
$statement->execute();
?>
```

```
<?php
//Listing11.19.php
//Listing 11.19 Using named parameters (PDO)

/* technique 1 - question mark placeholders */
$sql = "INSERT INTO books (ISBN10, Title, CopyrightYear, ImprintId,
ProductionStatusId, TrimSize, Description) VALUES
(?,?,?,?,?,?,?)";
$statement = $pdo->prepare($sql);
$statement->bindValue(1, $_POST['isbn']);
$statement->bindValue(2, $_POST['title']);
$statement->bindValue(3, $_POST['year']);
$statement->bindValue(4, $_POST['imprint']);
$statement->bindValue(4, $_POST['status']);
$statement->bindValue(6, $_POST['size']);
$statement->bindValue(7, $_POST['desc']);
$statement->execute();
/* technique 2 - named parameters */
$sql = "INSERT INTO books (ISBN10, Title, CopyrightYear, ImprintId,
ProductionStatusId, TrimSize, Description) VALUES (:isbn,
:title, :year, :imprint, :status, :size, :desc) ";
$statement = $pdo->prepare($sql);
$statement->bindValue(':isbn', $_POST['isbn']);
$statement->bindValue(':title', $_POST['title']);
$statement->bindValue(':year', $_POST['year']);
$statement->bindValue(':imprint', $_POST['imprint']);
$statement->bindValue(':status', $_POST['status']);
$statement->bindValue(':size', $_POST['size']);
$statement->bindValue(':desc', $_POST['desc']);
$statement->execute();
?>
```

Processing the Query Results




```
<?php
//Listing11.20.php
//Listing 11.20 Looping through the result set (mysqli—not prepared statements)

$sql = "select * from Categories order by CategoryName";
// run the query
if ($result = mysqli_query($connection, $sql)) {
 // fetch a record from result set into an associative array
 while($row = mysqli_fetch_assoc($result))
  {
   // the keys match the field names from the table
   echo $row['ID'] . " - " . $row['CategoryName'] ;
   echo "<br/>";
  }
}

?>
```

MySQL Funtions (partial list)

- mysqli_fetch_all(), mysqli_fetch_row()
- mysqli_fetch_array(), mysqli_fectch_assoc()
- mysqli_fetch_field(), mysqli_fetch_fields()
- mysqli_fetch_object()

Looping through the Result Set

```
<?php
//Listing11.11.21.php
//Listing 11.21 Looping through the result set (mysqli—using prepared statements)

$sql = "SELECT Title, CopyrightYear FROM Books WHERE ID=?";
if ($statement = mysqli_prepare($connection, $sql)) {
  mysqli_stmt_bindm($statement, 'i', $id);
  mysqli_stmt_execute($statement);
  // bind result variables
  mysqli_stmt_bind_result($statement, $title, $year);
  // loop through the data
  while (mysqli_stmt_fetch($statement)) {
    echo $title . '-' . $year . '<br/>';
  }
}
?>

<?php
//Listing.11.22.php
//Listing 11.22 Looping through the result set (PDO)
$sql = "select * from Categories order by CategoryName";
$result = $pdo->query($sql);
while ( $row = $result->fetch() ) {
  echo $row['ID'] . " - " . $row['CategoryName'] . "<br/>";
}
?>
```

Fetching into an Object

```
class Book{
        public $id;
        public $title;
        public $copyrightYear;
        public $description;
}

<?php
//Listing11.23.php
//Listing 11.23 Populating an object from a result set (PDO)

$id = $_GET['id'];
$sql = "SELECT id, title, copyrightYear, description FROM Books WHERE id= ?";
$statement = $pdo->prepare($sql);
$statement->bindValue(1, $id);
$statement->execute();
$b = $statement->fetchObject('Book');
echo 'ID: ' . $b->id . '<br/>';
echo 'Title: ' . $b->title . '<br/>';
echo 'Year: ' . $b->copyrightYear . '<br/>';
echo 'Description: ' . $b->description . '<br/>';
?>

<?php
//Listing11.24.php
//Listing 11.24 Letting an object populate itself from a result set

class Book {
  public $id;
  public $title;
  public $copyrightYear;
  public $description;

function __construct($record)
  {
    // the references to the field names in associative array must
    // match the case in the table
    $this->id = $record['ID'];
    $this->title = $record['Title'];
    $this->copyrightYear = $record['CopyrightYear'];
    $this->description = $record['Description'];
  }
}
//...
// in some other page or class
$statement->execute();
// using the Book class
```

```
$b = new Book($statement->fetch());
echo 'ID: ' . $b->id . '<br/>';
echo 'Title: ' . $b->title . '<br/>';
echo 'Copyright Year: ' . $b->copyrightYear . '<br/>';
?>
```

Freeing Resources and Closing Connection

```
<?php

//Listing 11.25 Closing the connection

// mysqli approach
$connection = mysqli_connect($host, $user, $pass, $database);
//...
// release the memory used by the result set. This is necessary if
// you are going to run another query on this connection
mysqli_free_result($result);
//...
// close the database connection
mysqli_close($connection);

// PDO approach
$pdo = new PDO($connString,$user,$pass);
//...
// closes connection and frees the resources used by the PDO object
$pdo = null;

?>
```

Using Transactions

- Unnecessary when retrieving data
- Should be used for database writes

```
<?php
//Listing11.26.php
//Listing 11.26 Using transactions (mysqi extension)

$connection = mysqli_connect($host, $user, $pass, $database);
//...
/* set autocommit to off. If autocommit is on, then mysql will
commit (i.e., make the data change permanent) each command after
it is executed */

mysqli_autocommit($connection, FALSE);
/* insert some values */
$result1 = mysqli_query($connection,"INSERT INTO Categories (CategoryName) VALUES ('Philosophy')");
$result2 = mysqli_query($connection,"INSERT INTO Categories (CategoryName) VALUES ('Art')");

if ($result1 && $result2) {
  /* commit transaction */
  mysqli_commit($connection);
}
else {
  /* rollback transaction */
  mysqli_rollback($connection);
}

?>
```

```php
<?php
//Listing11.27.php
//Listing 11.27 Using transactions (PDO)

$pdo = new PDO($connString,$user,$pass);
// turn on exceptions so that exception is thrown if error occurs
$pdo->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
//...
try {
  // begin a transaction
  $pdo->beginTransaction();
  // a set of queries: if one fails, an exception will be thrown
  $pdo->query("INSERT INTO Categories (CategoryName) VALUES ('Philosophy')");
  $pdo->query("INSERT INTO Categories (CategoryName) VALUES ('Art')");
  // if we arrive here, it means that no exception was thrown
  // which means no query has failed, so we can commit the
  // transaction
  $pdo->commit();
} catch (Exception $e) {
  // we must rollback the transaction since an error occurred
  // with insert
  $pdo->rollback();
  }
?>
```