MySQL and PHP Basics

Data Manipulation with SQL, Working with PHP

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CONNECTING DATABASE FROM PHP

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PHP and Databases

- PHP supports about 20 RDBM servers
  - Including MySQL, Oracle, MS SQL, DB2, Firebird and Paradox
  - Supports connection over ODBC driver
  - Provided different sets of functions for accessing the different RDBMS
    - Each function starts with prefix – the DB server type
      Example: `mysql_connect`, `mssql_query`, etc

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Connecting MySQL

- `mysql_connect` – function to connect to MySQL server
  - Parameters: `$server, $username, $password, $new_link, $client_flags`
  - Returns resource result, identifying the new link (link identifier)
    - The result is used as parameter to other `mysql_` functions

```
mysql_connect("localhost", "user", "userpassword");
```

Connecting MySQL{2}

- Once connected a database must be selected to perform queries upon
  - In some cases it is not required – `show databases` query for instance
  - `mysql_select_db ($dbname, $link)` – selects database from the server
    - Returns true if successful

```
$dblink = mysql_connect("local host", "user", "userpassword");

mysql_select_db("mydb", $dblink);
```

SENDING QUERY

Executing Query

- `mysql_query ($query, $link)` – execute query on database
  - `$query` is string – the query to be executed
  - `$link` is database link identifier
  - The returned result depends on the query
    - If query is select, show, describe, explain – returns resource or false on error
    - Otherwise true if successful, false on error

```
mysql_query("select * from users", $dblink);
```

  - The link parameter can be omitted in all `mysql_` functions if working with only one database
    - Only one call to `msql_connect` in the script

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Select Query Results

- PHP provides several functions for working with MySQL select query results
  - `mysql_query` returns resource when performing select query that holds the data
  - The result is accessed row-per-row from first towards last with internal pointer
- Additional functions to get number of affected rows on update/delete or auto-generated id of inserted row

FETCHING DATA

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Fetch Row From Result

- `mysql_fetch_row` – returns numerical array, containing the current row from the result and moves the pointer to the next row
  - Returns false if there are no more rows

```
$res = mysql_query ("select id, name from people");
$row = mysql_fetch_row($res);
if ($row)
        print_r($row); // 0->id, 1->name
else
        echo "No results!";
```

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Fetching Row From Result (2)

- `mysql_fetch_assoc` – returns associative array containing the current row in result and moved the pointer to the next one
  - The field names are keys in the array
  - Returns false if no more rows

```
$res = mysql_query ("select id, name from people");
$row = mysql_fetch_assoc($res);
if ($row)
        echo "Name: ".$row['name'];
```

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Fetching Single Value

- `mysql_result ($result, $row, $field)` – return the value or single cell In MySQL query result
  - `$field` is either field index or name
  - Returns false on failure
  - Must NOT be mixed with other functions for reading query result
  - Much slower than fetching data row-per-row

```
$res = mysql_query ("select count(*) from people");
echo mysql_result($res, 0, 0);
```

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Number of Rows

- `mysql_num_rows ($result)` – returns the number of rows in the result set
  - Does not work with unbuffered queries (`mysql_unbuffered_query`)

```
$res = mysql_query ("select id, name from people");
$count = mysql_num_rows($res);
echo $count;
```

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Executed Query Result

- `mysql_insert_id($link)` – get the auto generated ID of previous insert/replace query
  - Returns 0 if no ID was generated, false on error
  - Works only for `AUTO_INCREMENT` columns
  - `$link` can be omitted if only one link established

```
mysql_query ("insert into people ("name", "age") values
("To6ko", "30");
echo mysql_insert_id();
```

Executed Query Result (2)

- `mysql_affected_rows($link)` – returns number of affected rows in most recent insert/update/delete/replace query
  - As with all `mysql_` functions `$link` can be omitted if only one link established
  - Returns -1 if last query failed

```
mysql_query ("update people set age+1 where age < 20");
echo mysql_insert_id();
```

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Error Handling

- `mysql_errno ($link)` - returns the error code from the last query
  - Returns 0 if no error occurred
- `mysql_error ($link)` – returns the error text from the last query
  - Returns empty string if no error occurred

```
mysql_query ("insert into nosuchtable");
echo mysql_errno().": ".mysql_error();
```

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Closing and Freeing

- `mysql_free_result($resource)` – clears the memory occupied by select query result
- `mysql_close($link)` – closes connection to mysql server
- When PHP script ends all resources are freed automatically and all connections – closed
  - Freeing is not necessary
  - Closing is needed only when using persistent connections

PERSISTENT CONNECTIONS

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Persistent Connections

- Persistent connections are connections that are kept open after script ends
  - Allows reusing
  - Saves time for next script to connect
  - Very useful for slow-login databases (MS SQL, Firebird, etc)
  - When performing persistent connect PHP searches for already opened connection and reuses it
- `mysql_pconnect` – similar to `mysql_connect` but checks for previous persistent connection with same parameters and reuses it

PDO PREPARED STATEMENTS

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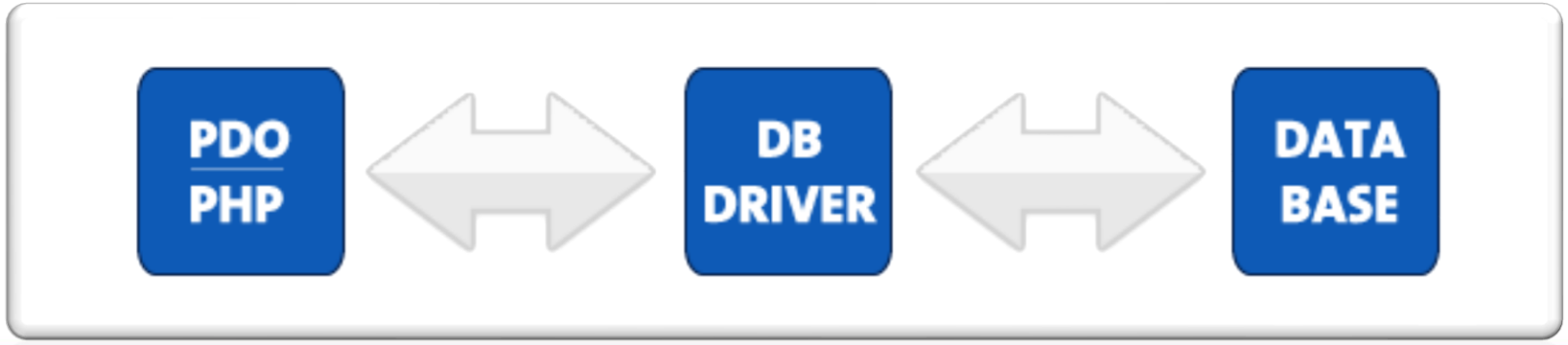
PDO: What?

- PDO - PHP Data Object
- An interface for accessing databases in PHP
- Provides a data-access abstraction layer
  - Same functions are used across DBMSs
- Object-oriented



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PDO: Why?

- Portability
- Speed
  - Pre-compiled SQL statements that accept zero or more parameters
- Security
  - Supports prepared statements
    - Prevents SQL injection by using placeholders for data

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Get connected

- This creates a database object called $dbh

```
try {
    //Instantiate a database object
    $dbh = new PDO("mysql:host=$hostname;
         dbname=myDB", $username, $password);
    echo 'Connected to database';
}
catch(PDOException $e) {
     echo $e->getMessage();
}
```

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Steps

- Define the query
  - `$sql = "…";`
- Execute the query
  - Queries that don't return a result set (e.g. INSERT)
    - `$dbh->exec($sql);`
  - Queries that do return a result set (SELECT)
    - `$dbh->query($sql);`
- Process the result

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A SELECT Query: Multiple Rows

- query() returns a result set

```
//Define the query
$sql = "SELECT * FROM animals";

//execute the query
$result = $dbh->query($sql);

//process the result
foreach($result as $row) {
        print $row['animal_type'] .
        ' - '. $row['animal_name'];
}
```

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A SELECT Query: Multiple Rows

- `fetch()` returns a single row

```
//Define the query
$sql = "SELECT * FROM animals
        WHERE animal_id = 3";

//query() returns the result
$result = $dbh->query($sql);

//fetch() returns the first row
$row = $result->fetch();
print $row['animal_type'] .
        ' - '. $row['animal_name'];
```

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A SELECT Query: Multiple Rows

- set `exec()` returns the number of rows affected
- `lastInsertId()` returns the ID of the last inserted row

```
$sql = "INSERT INTO animals(animal_type, animal_name)
        VALUES ('kangaroo', 'troy')";
$dbh->exec($sql);

//Get the ID of the last inserted row
$id = $dbh->lastInsertId();
```

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Prepared Statements

- A *prepared statement* is a pre-compiled SQL statement
- Can be reused
- Executes more quickly
- Prevents SQL injection

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Prepared Statements: Steps

- Define the query
  - `$sql = "…";`
- Prepare the statement
  - `$statement = $dbh->prepare($sql);`
- Bind the parameters
  - `$statement->bindParam(param_name, value, type);`
- Execute
  - `$statement->execute();`
- Process the result

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An Insert Query Example

```
//Define the query
$sql = "INSERT INTO animals(animal_type, animal_name)
         VALUES (:type, :name)";

//Prepare the statement
$statement = $dbh->prepare($sql);

//Bind the parameters
$type = 'kangaroo';
$name = 'Joey';
$statement->bindParam(':type', $type, PDO::PARAM_STR);
$statement->bindParam(':name', $name, PDO::PARAM_STR);

//Execute
$statement->execute();
```

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An Update Query Example

```
//Define the query
$sql = "UPDATE animals SET animal_name = :new
         WHERE animal_name = :old";

//Prepare the statement
$statement = $dbh->prepare($sql);

//Bind the parameters
$old = 'Joey';
$new = 'Troy';
$statement->bindParam(':old', $old, PDO::PARAM_STR);
$statement->bindParam(':new', $new, PDO::PARAM_STR);

//Execute
$statement->execute();
```

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A Delete Query Example

```
//Define the query
$sql = "DELETE FROM animals
        WHERE animal_type = :type";

//Prepare the statement
$statement = $dbh->prepare($sql);

//Bind the parameters
$type = 'kangaroo';
$statement->bindParam(':type', $type, PDO::PARAM_STR);

//Execute
$statement->execute();
```

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A SELECT Query: a Single Row

- `fetch()` returns a single row

```
//Define the query
$sql = "SELECT animal_name, animal_type FROM animals
          WHERE animal_id = :id";
//Prepare the statement
$statement = $dbh->prepare($sql);
//Bind the parameters
$id = 3;
$statement->bindParam(':id', $id, PDO::PARAM_INT);
//Execute the statement
$statement->execute();
//Process the result
$row = $statement->fetch(PDO::FETCH_ASSOC);
echo $row['animal_name']." - ".$row['animal_type'];
```

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A SELECT Query: Multiple Rows Example

```
//Define the query
$sql = "SELECT animal_name, animal_type FROM animals";

//Prepare the statement
$statement = $dbh->prepare($sql);

//Execute the statement
$statement->execute();

//Process the result
$result = $statement->fetchAll(PDO::FETCH_ASSOC);
foreach ($result as $row) {
        echo $row['animal_type'] . ' - '   . $row['animal_name'];
}
```

MYSQLI_

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A SELECT Query: Multiple Rows

- The MySQLi Extension (MySQL Improved) is a relational database driver used in the PHP programming language to provide an interface with MySQL databases.
- The `mysqli` extension features a dual interface
  - Procedural
  - Object Oriented

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Connections Example

```
<?php
$mysqli = new mysqli("localhost", "user", "password",
"database");
if ($mysqli->connect_errno) {
    echo "Failed to connect to MySQL: (" .
       $mysqli->connect_errno . ") " .
       $mysqli->connect_error;
}
echo $mysqli->host_info . "\n";

?>
```

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Navigation through unbuffered results

```
<?php
$mysqli->real_query("SELECT id FROM test ORDER BY id
ASC");
$res = $mysqli->use_result();

echo "Result set order...\n";
while ($row = $res->fetch_assoc()) {
    echo " id = " . $row['id'] . "\n";
}
?>
```

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Select Example

```
$sql='SELECT col1, col2, col3 FROM table1 WHERE
condition';

$rs=$conn->query($sql);

if($rs === false) {
  trigger_error('Wrong SQL: ' . $sql . ' Error: ' .
$conn->error, E_USER_ERROR);
} else {
  $rows_returned = $rs->num_rows;
}
```

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Iterate Example

- Using column names – recommended

```
$rs->data_seek(0);
while($row = $rs->fetch_assoc()){
    echo $row['col1'] . '<br>';
}
```

- Using column index

```
$rs->data_seek(0);
while($row = $rs->fetch_row()){
    echo $row[0] . '<br>';
}
```

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Insert Example

```
$v1="'" . $conn->real_escape_string('col1_value') . "'";

$sql="INSERT INTO tbl (col1_varchar, col2_number) VALUES
($v1,10)";

if($conn->query($sql) === false) {
  trigger_error('Wrong SQL: ' . $sql . ' Error: ' .
$conn->error, E_USER_ERROR);
} else {
  $last_inserted_id = $conn->insert_id;
  $affected_rows = $conn->affected_rows;
}
```

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Update Example

```
$v1="'" . $conn->real_escape_string('col1_value') . "'";

$sql="UPDATE tbl SET col1_varchar=$v1, col2_number=1
WHERE id>10";

if($conn->query($sql) === false) {
  trigger_error('Wrong SQL: ' . $sql . ' Error: ' .
$conn->error, E_USER_ERROR);
} else {
  $affected_rows = $conn->affected_rows;
}
```

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Delete Example

- Use the following syntax:

```
$sql="DELETE FROM tbl WHERE id>10";

if($conn->query($sql) === false) {
  trigger_error('Wrong SQL: ' . $sql . ' Error: ' .
$conn->error, E_USER_ERROR);
} else {
  $affected_rows = $conn->affected_rows;
}
```