

Database Access through the Web

Databases and Interfaces COMP1041

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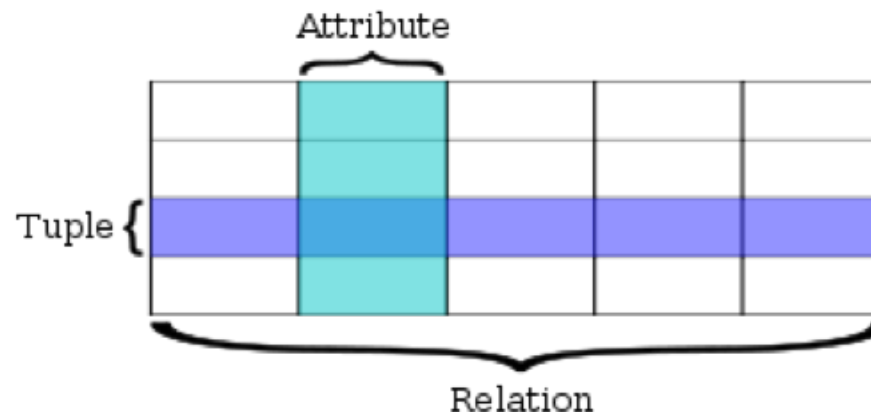
Outline

- Databases and relational databases
- Structured Query Language (SQL)
- Database access with PHP and MySQL
- SELECT, INSERT INTO, DELETE FROM, UPDATE



Database and Relational Database

- A database is a collection of data organised to allow relatively easy access for retrievals, additions, modifications, and deletions.
- A relational database is a collection of tables of data, where:
 - Each table can have any number of rows (tuples) and columns (attributes) of data.
 - Values that can uniquely identify the rows of the table are called primary keys.



Example #1: people Table

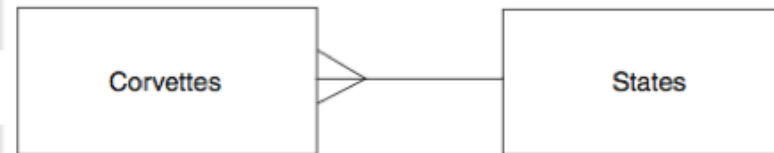
- Stores information about people i.e. `id`, `firstname`, `lastname`, `dob`, `telephone`.

id	firstname	lastname	dob	telephone
1	cox	apple	2020-03-01	1111111
2	egg	banana	2020-02-02	2222222
3	satsuma	orange	2020-02-19	3333333

Example #2: Corvettes and States

- To conserve memory, primary keys can be used as values in another table.

Vette_id	Body_style	Miles	Year	State
1	coupe	18.0	1997	4
2	hatchback	58.0	1996	7
3	convertible	13.5	2001	1
4	hatchback	19.0	1995	2
5	hatchback	25.0	1991	5
6	hardtop	15.0	2000	2
7	coupe	55.0	1979	10
8	convertible	17.0	1999	5
9	hardtop	17.0	2000	5
10	hatchback	50.0	1995	7



State_id	State
1	Alabama
2	Alaska
3	Arizona
4	Arkansas
5	California
6	Colorado
7	Connecticut
8	Delaware
9	Florida
10	Georgia

Structured Query Language (SQL)

- A standard language for specifying accesses and modifications to relational databases.
- SQL reserved words are not case sensitive i.e. SELECT, select and Select are all the same.
- BUT ... **the names of tables and table columns may or may not be case sensitive**, depending on the particular database software vendor.

The SELECT SQL Command

- `SELECT` column names `FROM` table names [`WHERE` condition];
- For example,

```
SELECT id,  firstname,  lastname FROM people;
```

id	firstname	lastname	dob	telephone
1	cox	apple	2020-03-01	1111111
2	egg	banana	2020-02-02	2222222
3	satsuma	orange	2020-02-19	3333333

Example: SELECT *

phpMyAdmin

Server: localhost:8889 » Database: DBI » Table: people

Browse Structure SQL Search Insert Export Import Privileges Operations Triggers

Showing rows 0 - 2 (3 total, Query took 0.0010 seconds.)

`SELECT * FROM `people``

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

+ Options

				Id	firstname	lastname	dob	telephone
<input type="checkbox"/>	Edit	Copy	Delete	1	cox	apple	2020-03-01	1111111
<input type="checkbox"/>	Edit	Copy	Delete	2	egg	banana	2020-02-02	2222222
<input type="checkbox"/>	Edit	Copy	Delete	3	satsuma	orange	2020-02-19	3333333

Check all With selected: Edit Copy Delete Export

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

Query results operations

Print Copy to clipboard Export Display chart Create view

The INSERT SQL Command

- `INSERT INTO table name (column_name_1, column_name_2, ...)
VALUES (value_1, value_2, ...)`

- For example,

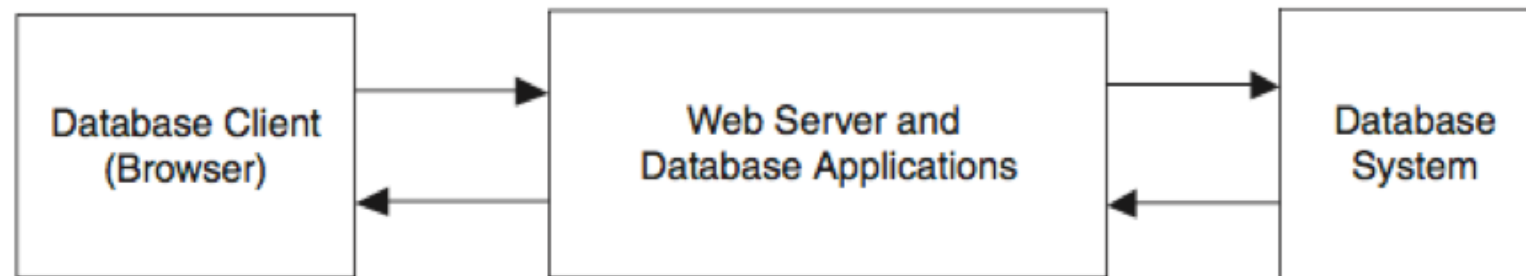
```
INSERT INTO people (id, firstname, lastname, ...)  
VALUES (1, cox, apple, ...)
```

Example: INSERT

The screenshot shows the phpMyAdmin web interface. On the left is a sidebar with a tree view of databases: 'DBI' (selected), 'information_schema', 'mysql', 'performance_schema', and 'sys'. Under 'DBI', there are 'New' and 'people' (selected). The main panel at the top shows the breadcrumb 'Server: localhost:8889 » Database: DBI » Table: people'. Below this is a toolbar with buttons: 'Browse', 'Structure', 'SQL' (active), 'Search', 'Insert', 'Export', 'Import', 'Privileges', 'Operations', and 'Triggers'. A green status bar at the top of the main panel says '1 row inserted.' Below it, the executed SQL query is displayed: `INSERT INTO `people` (`id`, `firstname`, `lastname`, `dob`, `telephone`) VALUES ('1', 'cox', 'apple', '2020-03-01', '1111111');`. To the right of the query are links: '[Edit inline]', '[Edit]', and '[Create PHP code]'. The main area is titled 'Run SQL query/queries on table DBI.people:'. It contains a text area with the same SQL query. Below the text area are buttons: 'SELECT *', 'SELECT', 'INSERT' (highlighted), 'UPDATE', 'DELETE', 'Clear', 'Format', and 'Get auto-saved query'. There is also a checkbox for 'Bind parameters'. To the right of the text area is a 'Columns' list: 'id', 'firstname', 'lastname', 'dob', and 'telephone'. At the bottom, there is a row of checkboxes: '[Delimiter ;]', 'Show this query here again' (checked), 'Retain query box', 'Rollback when finished', 'Enable foreign key checks' (checked), and a 'Go' button.

Client-server Architecture

- Web access to a database is provided by a client-server architecture.
- The client machines provide a way for users to input requests to a database that is resident on a computer that runs a database server.
- Results of requests to the server are returned to the client.



Database Access with PHP and MySQL

- PHP access to a database is often done with two HTML documents:
 - One to collect a user request for a database access and
 - Another to host the PHP code to process the request and generate the returned HTML document.

```
<!DOCTYPE html>
<html>
  <head>
    <title>PHP Test</title>
  </head>
  <body>
    <?php include($_SERVER["DOCUMENT_ROOT"]."/myphp.php"); ?>
  </body>
</html>
```

index.php

myphp.php

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "DBI";

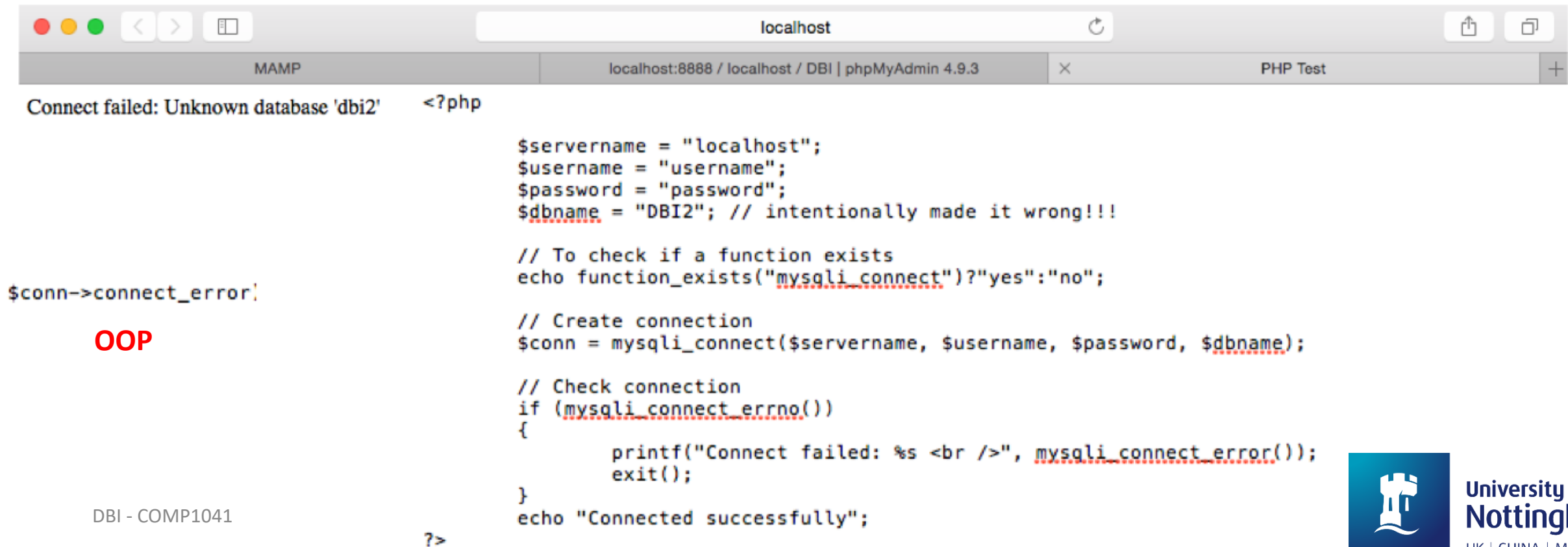
// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error)
{
    die("Connection failed: " . $conn->connect_error);
}
echo "Connected successfully";

?>
```

Procedural PHP

- PHP was initially developed as procedural language but later extended to objected oriented programming.



```

Connect failed: Unknown database 'dbi2'    <?php

$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "DBI2"; // intentionally made it wrong!!!

// To check if a function exists
echo function_exists("mysqli_connect")?"yes":"no";

// Create connection
$conn = mysqli_connect($servername, $username, $password, $dbname);

// Check connection
if (mysqli_connect_errno())
{
    printf("Connect failed: %s <br />", mysqli_connect_error());
    exit();
}
echo "Connected successfully";

$conn->connect_error;
  
```

OOP

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?>



Example: SELECT

- You will learn more about SQL and databases after PHP.

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "DBI";

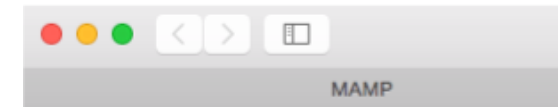
// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error)
{
    die("Connection failed: " . $conn->connect_error);
}
echo "Connected successfully <br />";

$sql = "SELECT id, firstname, lastname FROM people";
$result = $conn->query($sql);

$fields = $result->field_count;
$rows = $result->num_rows;
echo "There are " . $fields . " fields, and " . $rows . " rows in the
results<br />";
```

```
if ($rows > 0)
{
    // output data of each row
    while($row = $result->fetch_assoc())
    // fetch_assoc() returns false if there is no more rows
    {
        $keys = array_keys($row);
        $vals = array_values($row);
        echo "<br />";
        foreach($keys as $temp)
        {
            echo $temp . " ";
        }
        echo "<br />";
        foreach($vals as $temp)
        {
            echo $temp . " ";
        }
        echo "<br />";
        echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " -
        Lastname: " . $row["lastname"]. "<br>";
    }
}
else
{
    echo "0 results";
}
$conn->close();
?>
```



Connected successfully
There are 3 fields, and 3 rows in the results

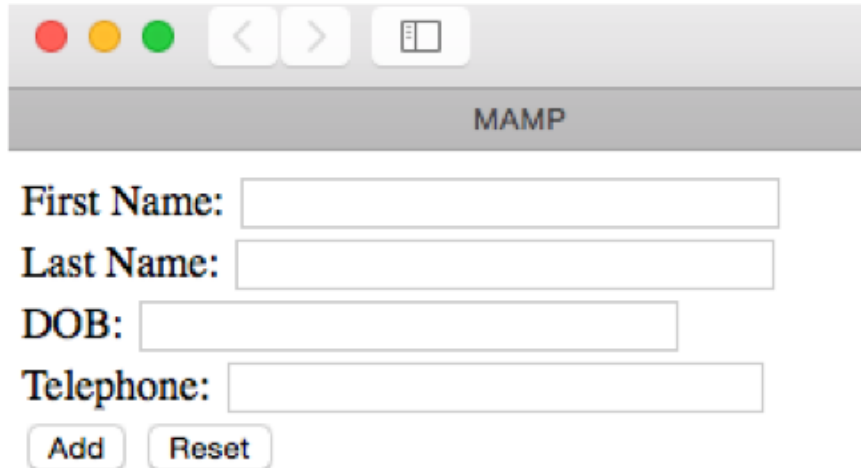
id firstname lastname
1 cox apple
id: 1 - Name: cox - Lastname: apple

id firstname lastname
2 egg banana
id: 2 - Name: egg - Lastname: banana

id firstname lastname
6 satsumas oranges
id: 6 - Name: satsumas - Lastname: oranges



Example: INSERT INTO



First Name:

Last Name:

DOB:

Telephone:

```
<!DOCTYPE html>
<html>
  <head>
    <title>PHP Test</title>
  </head>
  <body>
    <form action = "myphp.php" method = "post">
      First Name: <input type = "text" name = "firstname" size = "30" />
      Last Name: <input type = "text" name = "lastname" size = "30" />
      DOB: <input type = "text" name = "dob" size = "30" /><br />
      Telephone: <input type = "text" name = "tel" size = "30" /><br />
      <input type = "submit" value = "Add" />
      <input type = "reset" value = "Reset" />
    </form>
  </body>
</html>
```

index2.php

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Connected successfully
New record created successfully

```
<?php
$firstname = $_POST["firstname"];
$lastname = $_POST["lastname"];
$dob = $_POST["dob"];
$tel = $_POST["tel"];

$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "DBI";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error)
{
    die("Connection failed: " . $conn->connect_error);
}
echo "Connected successfully <br />";

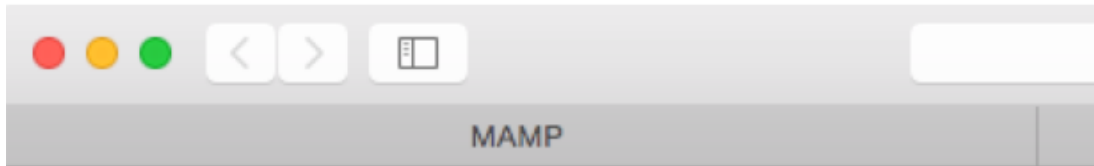
$sql = "INSERT INTO people (firstname, lastname, dob, telephone) VALUES
('$firstname', '$lastname', '$dob', '$tel')";

if($conn->query($sql) === true)
{
    echo "New record created successfully";
}
else
{
    echo "Error: " . $sql . "<br>" . $conn->error;
}

$conn->close();

?>
```


Example: DELETE FROM



First Name:



Connected successfully
Record deleted successfully



Connected successfully
id: 1 - Name: cox - Lastname: apple - DOB: 2020-03-01 - Telephone: 1111111
id: 2 - Name: egg - Lastname: banana - DOB: 2020-02-02 - Telephone: 2222222
id: 6 - Name: satsumas - Lastname: oranges - DOB: 2020-02-01 - Telephone: 3333331

DBI - COMP1041

```
<?php
```

```
$firstname = $_POST["firstname"];
```

```
$servername = "localhost";
```

```
$username = "username";
```

```
$password = "password";
```

```
$dbname = "DBI";
```

```
// Create connection
```

```
$conn = new mysqli($servername, $username, $password, $dbname);
```

```
// Check connection
```

```
if ($conn->connect_error)
```

```
{
```

```
    die("Connection failed: " . $conn->connect_error);
```

```
}
```

```
echo "Connected successfully <br />";
```

```
$sql = "DELETE FROM people WHERE firstname = '$firstname'";
```

```
if($conn->query($sql) === true)
```

```
{
```

```
    echo "Record deleted successfully";
```

```
}
```

```
else
```

```
{
```

```
    echo "Error: " . $sql . "<br>" . $conn->error;
```

```
}
```

```
$conn->close();
```

```
header("Location: myphp2.php");
```

```
?>
```


Example: Search and Display on form

<?php

```

$id = $_POST["id"];

$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "DBI";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error)
{
    die("Connection failed: " . $conn->connect_error);
}
echo "Connected successfully <br />";

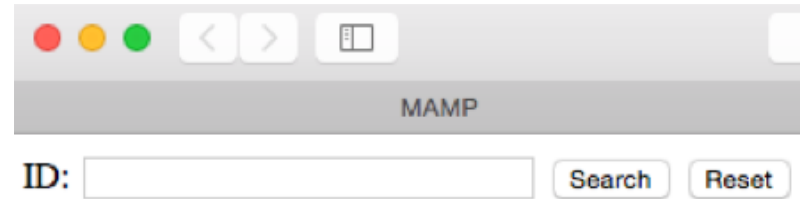
$sql = "SELECT * FROM people WHERE id = $id";

$result = $conn->query($sql);
$numrow = $result->num_rows;

if ($numrow > 0)
{
    // output data of each row
    while($row = $result->fetch_assoc())
    // fetch_assoc() returns false if there is no more rows
    {
        $firstname = $row["firstname"];
        $lastname = $row["lastname"];
        $dob = $row["dob"];
        $telephone = $row["telephone"];
    }
}
else
{
    echo "0 results";
}

$conn->close();

```



```

<!DOCTYPE html>
<html>
    <head>

```

```

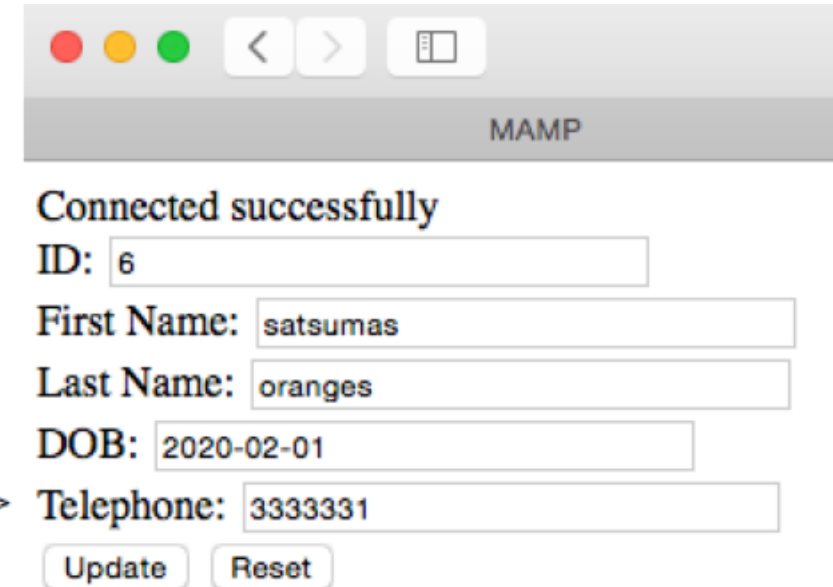
        <title>PHP Test</title>
    </head>
    <body>

```

```

        <form action = "myphp.php" method = "post">
            ID: <input type = "text" name = "id" size = "30" value="<?php echo
            $id;?>" /><br />
            First Name: <input type = "text" name = "firstname" size = "30"
            value="<?php echo $firstname;?>" /><br />
            Last Name: <input type = "text" name = "lastname" size = "30"
            value="<?php echo $lastname;?>" /><br />
            DOB: <input type = "text" name = "dob" size = "30" value="<?php
            echo $dob;?>" /><br />
            Telephone: <input type = "text" name = "telephone" size = "30"
            value="<?php echo $telephone;?>" /><br />
            <input type = "submit" value = "Update" />
            <input type = "reset" value = "Reset" />
        </form>
    </body>
</html>

```



?>

Example: UPDATE



6 satsuma orange 2020-02-02 3333333
Connected successfully
Record updated successfully

<?php

```
$id = $_POST["id"];
$firstname = $_POST["firstname"];
$lastname = $_POST["lastname"];
$dob = $_POST["dob"];
$telephone = $_POST["telephone"];

echo "$id $firstname $lastname $dob $telephone <br />";

$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "DBI";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error)
{
    die("Connection failed: " . $conn->connect_error);
}
echo "Connected successfully <br />";

$sql = "UPDATE people SET firstname = '$firstname', lastname = '$lastname', dob = '$dob', telephone = '$telephone' WHERE id = $id";

if($conn->query($sql) === true)
{
    echo "Record updated successfully";
}
else
{
    echo "Error: " . $sql . "<br>" . $conn->error;
}

$conn->close();

?>
```

Web Server Solution Stack

- On your local machine
 - XAMPP <https://www.apachefriends.org/index.html>
 - MAMP <https://www.mamp.info/en/>
- On cslinux web server (only works on campus or you can VDI from outside of campus network)
- <https://cslinux.nottingham.edu.cn/phpmyadmin>



Conclusions

- A database is a collection of data, and a relational database is a collection of tables.
- Web access is based on client-server architecture.
- OOP PHP.
- Using phpMyAdmin.
- Examples of SELECT, INSERT INTO, DELETE FROM, UPDATE.