

<https://www.upsite.com/blog/sealing-rack-need/>

MODULE 2d

Centralized Temperature & Humidity Monitoring System for Server Racks

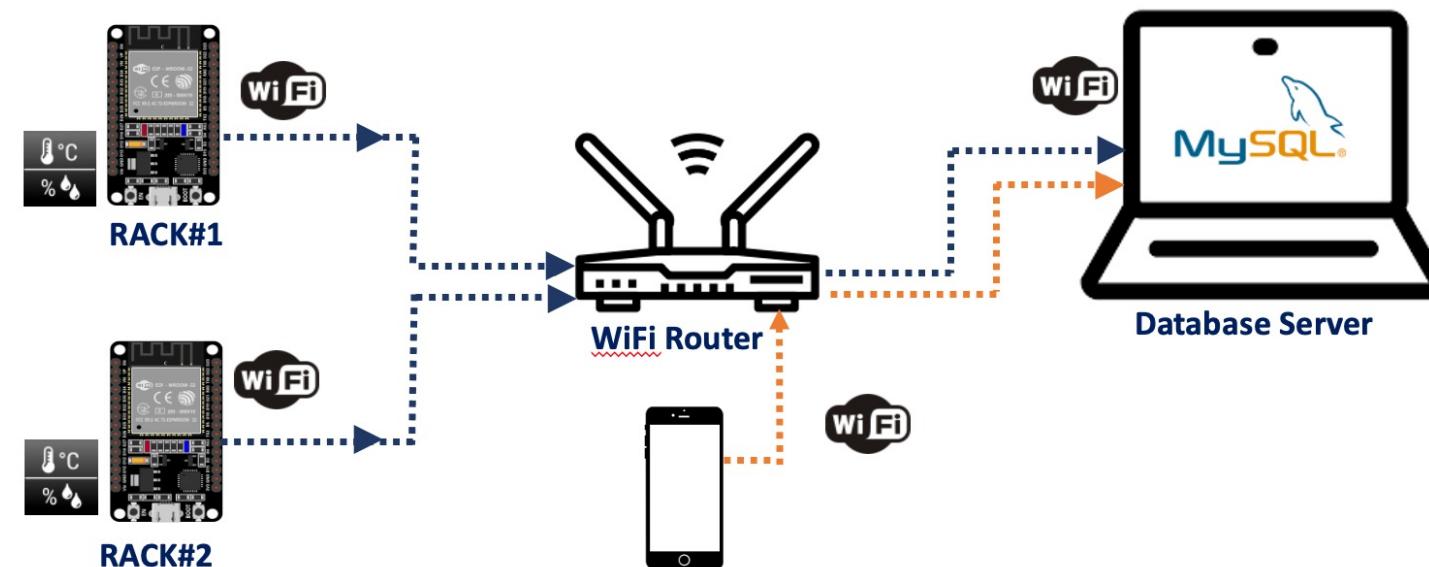
safyzan salim
019 622 0575

Project Overview

This tutorial will teach how to save data from ESP32s (or any ethernet microcontrollers) into MySQL.

Scenario:

You are required to monitor 2 server racks in a data center; i.e., **Rack#1** & **Rack#2** by using 2 ESP32s and 2 DHT11 sensors. Both readings need to be saved into a single table. The temperature & humidity of both rooms can be monitored thru webpage.

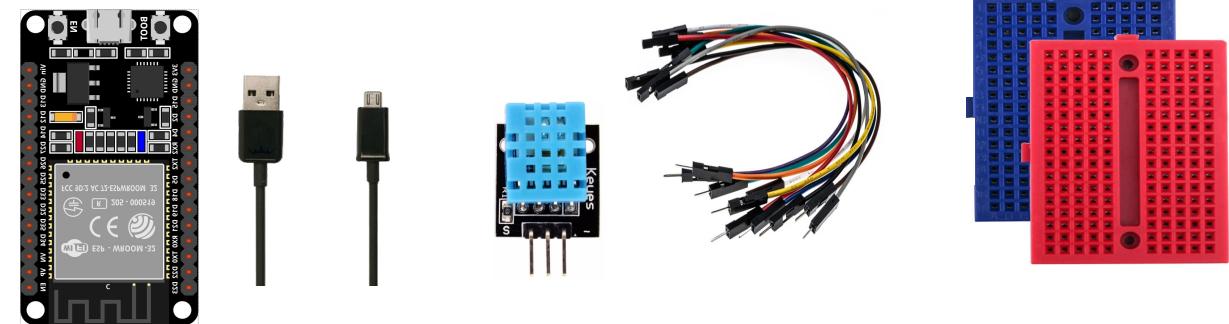


ZXZXZ

Components

Hardware:

- 1 x ESP-32 Wifi+Bluetooth 2-In-1 Development Board for Arduino (30 pin) + Cable.
- 1 x Temperature & Humidity Sensor, DHT11.
- Jumpers (male to female).
- 2 x Mini Breadboard.



Software:

- XAMPP ver 8.0.1(PHP 8.0.1) for Windows / OS X.



What is XAMPP?

XAMPP is the most popular PHP development environment

XAMPP is a completely free, easy to install Apache distribution containing MariaDB, PHP, and Perl. The XAMPP open source package has been set up to be incredibly easy to install and to use.

Solution

→ Step 1: Propose block diagram & flowcharts

A story board of the whole project which will give clear picture what you need to do.

→ Step 2: Install Apache Web Server

- i. Install XAMPP (once), start web server service
- ii. Start XAMPP service
- iii. Test XAMPP page & PHPMyAdmin page

→ Step 3: Creating MySQL Database

- i. Create database + test
- ii. Create a PHP file for medium of transferring information from ESP32 to MySQL + Test
**Test with dummy data / manually inject data to database

→ Step 4: Preparing PHP script to insert data to MySQL database

- i. Configure *.php scripts.
- ii. PHP script to display database.
- iii. HTTP GET & HTTP POST.

Solution

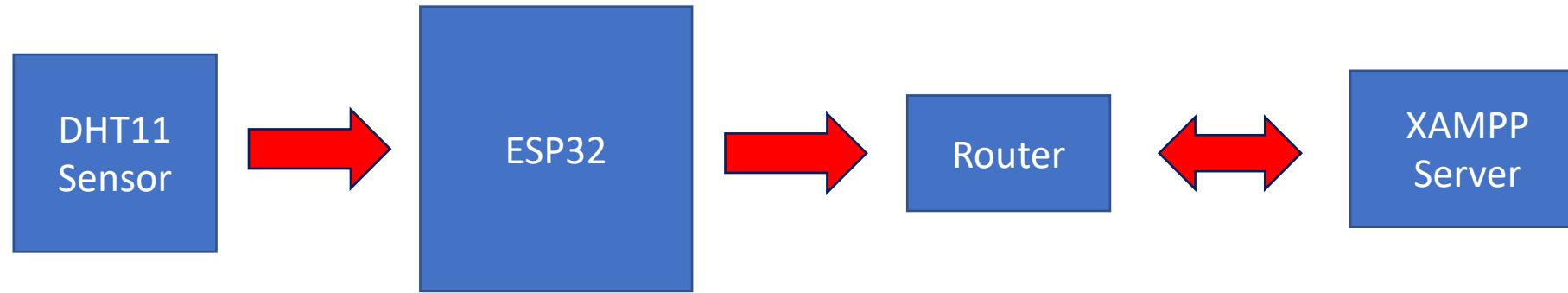
→ Step 5: Upload sketch to ESP32

- i. Connect DHT11 to ESP32.
- ii. Configure ***sketch-vii_esp32-dht11-http-post.ino***.

Solution: Step 1

PROPOSED BLOCK DIAGRAM & FLOWCHART

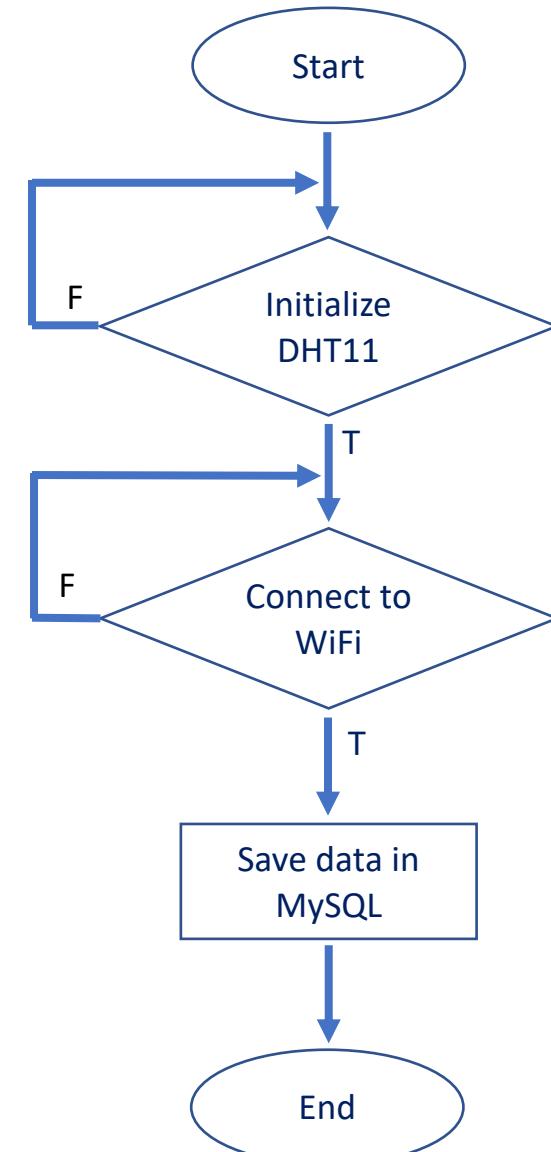
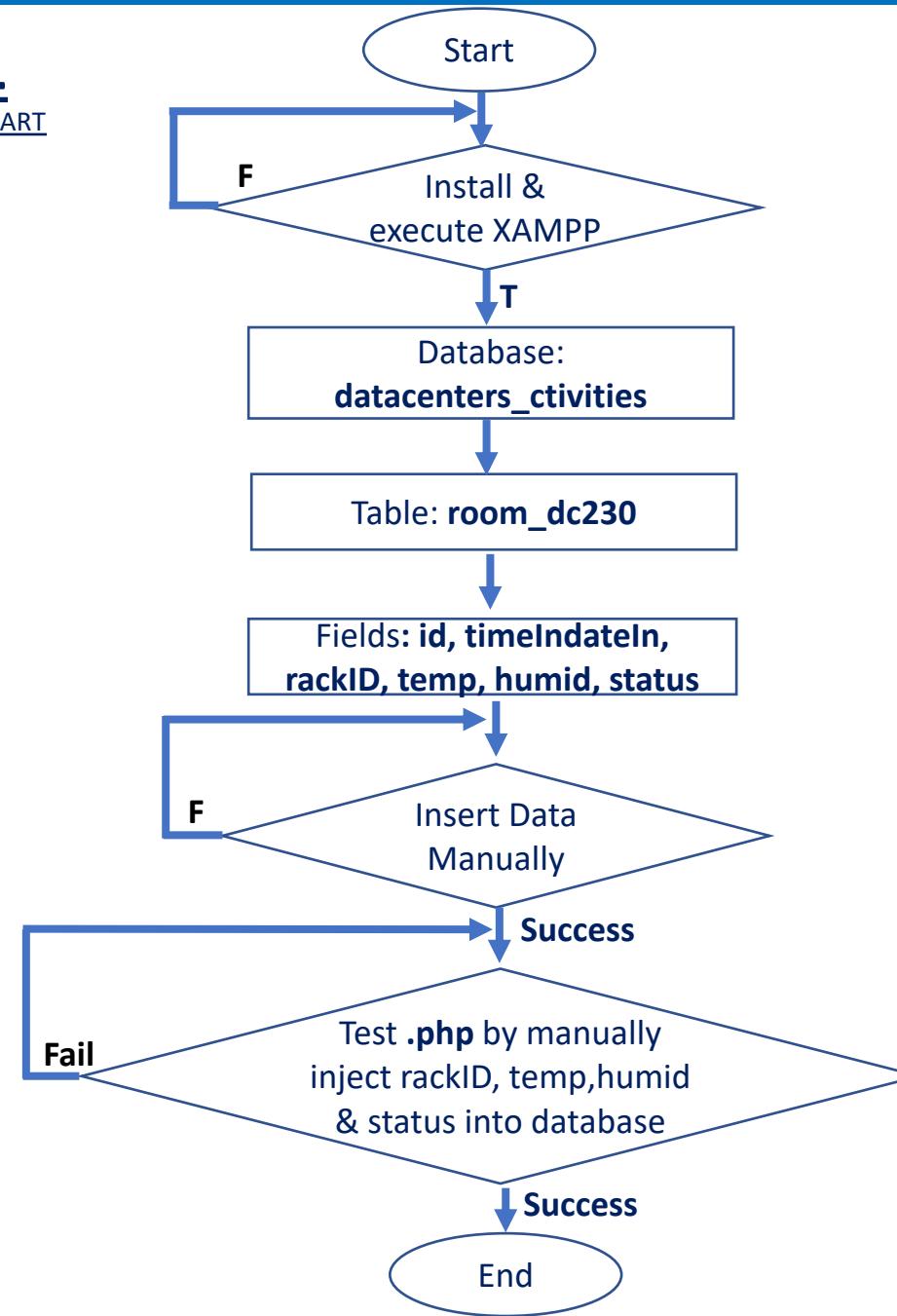
Project Block Diagram



Solution: Step 1

PROPOSED BLOCK DIAGRAM & FLOWCHART

Flowchart

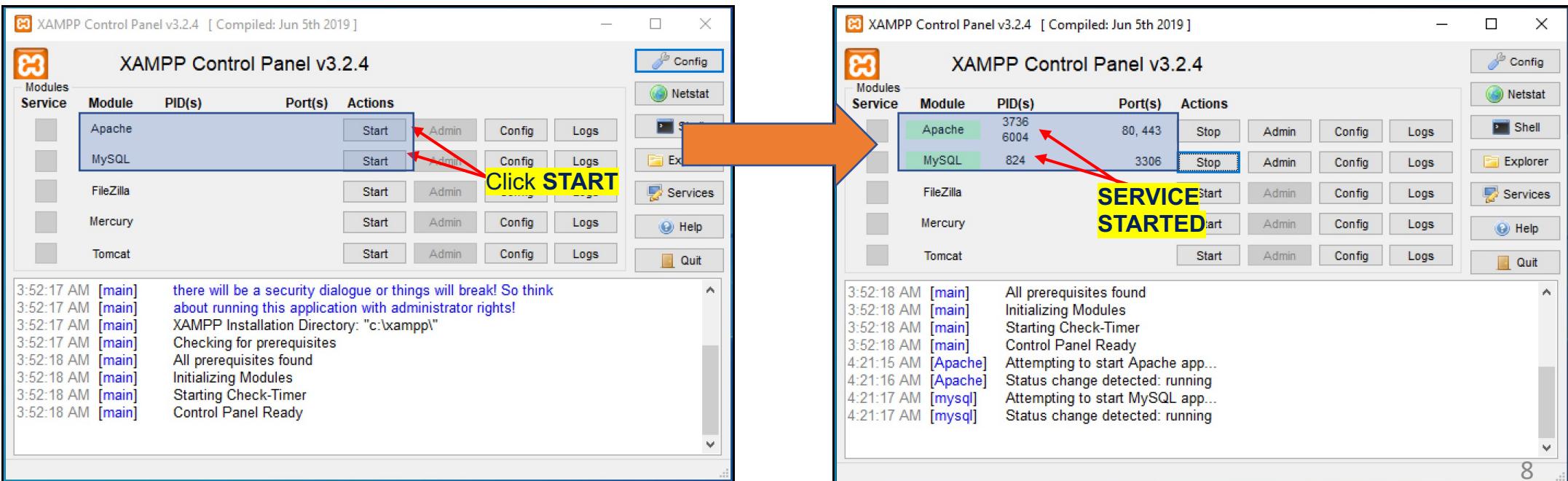


Solution: Step 2 INSTALL, START & TEST XAMPP SERVICES

- Download and install latest version of XAMPP from <https://www.apachefriends.org/download.html>
- This link shows full tutorial on installing XAMPP on windows <https://blog.templatetoaster.com/install-xampp-on-windows/>
- Once installed, launch XAMMP Control Panel (7.3.26)

For Windows (v7.3.26):

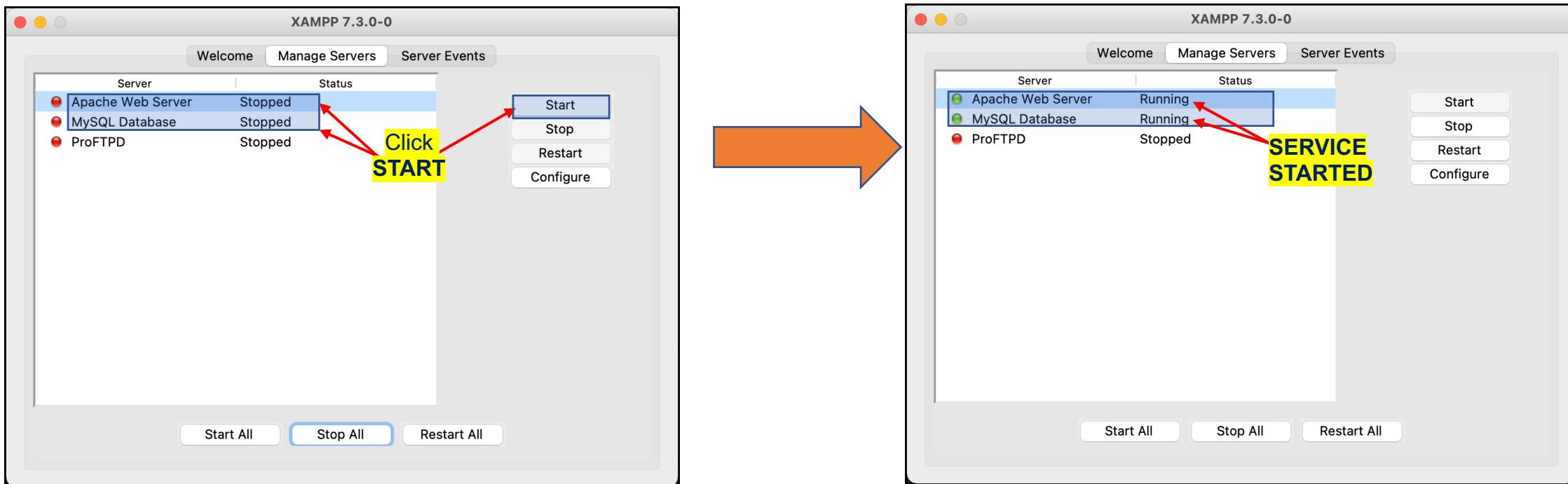
- to run, go to **c://xampp/control-control.exe** → Start **MySQL Database & Apache Web Service**
- open your browser and type <http://localhost/>



Solution: Step 2 INSTALL, START & TEST XAMPP SERVICES

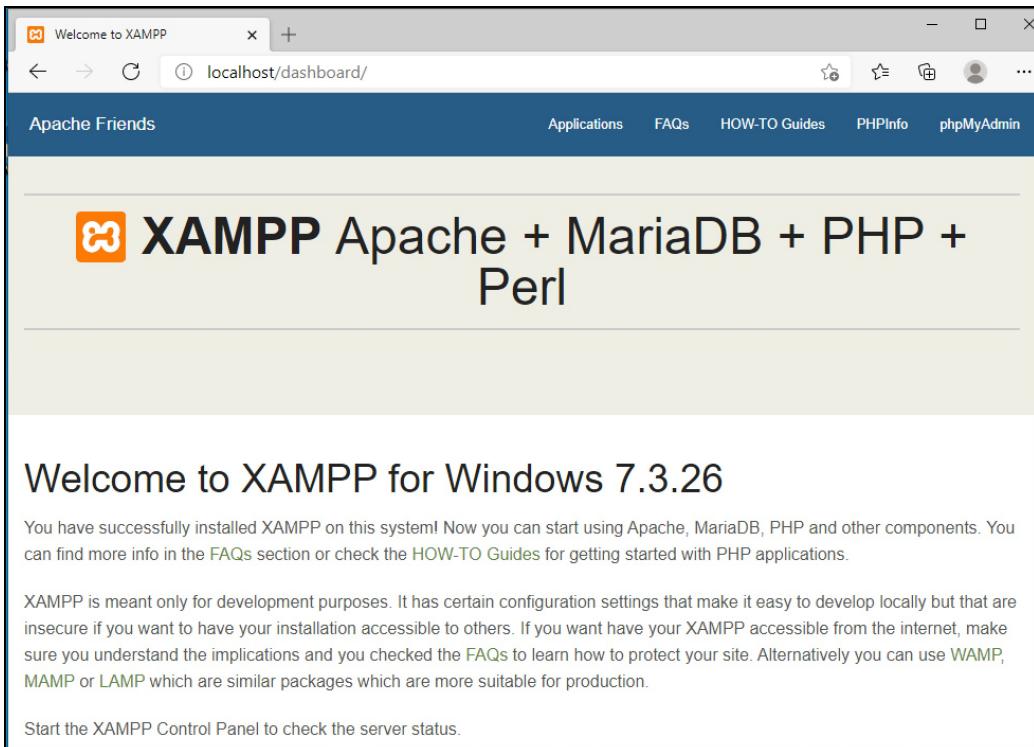
For OS X (v7.3.0):

- go to **Applications>XAMPP>manager-osx** → Start **MySQL Database & Apache Web Service**
- open your browser and type <http://localhost/>

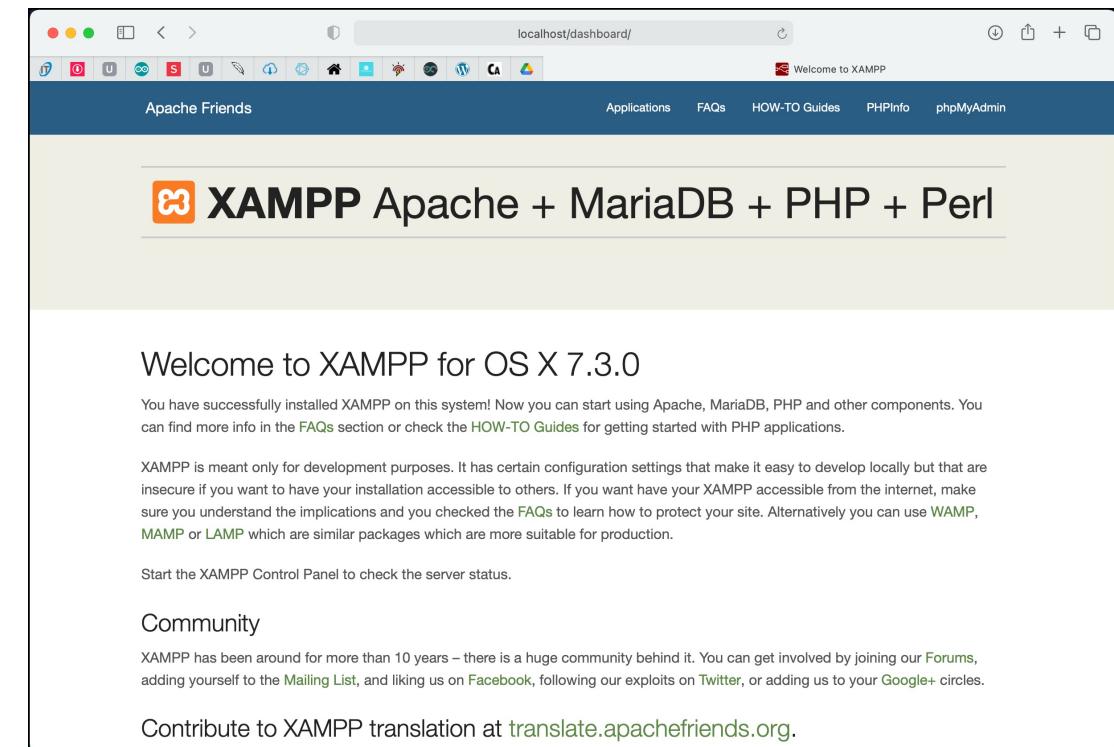


Solution: Step 2 INSTALL, START & TEST XAMPP SERVICES

→ XAMPP landing page can be found at <http://localhost/>



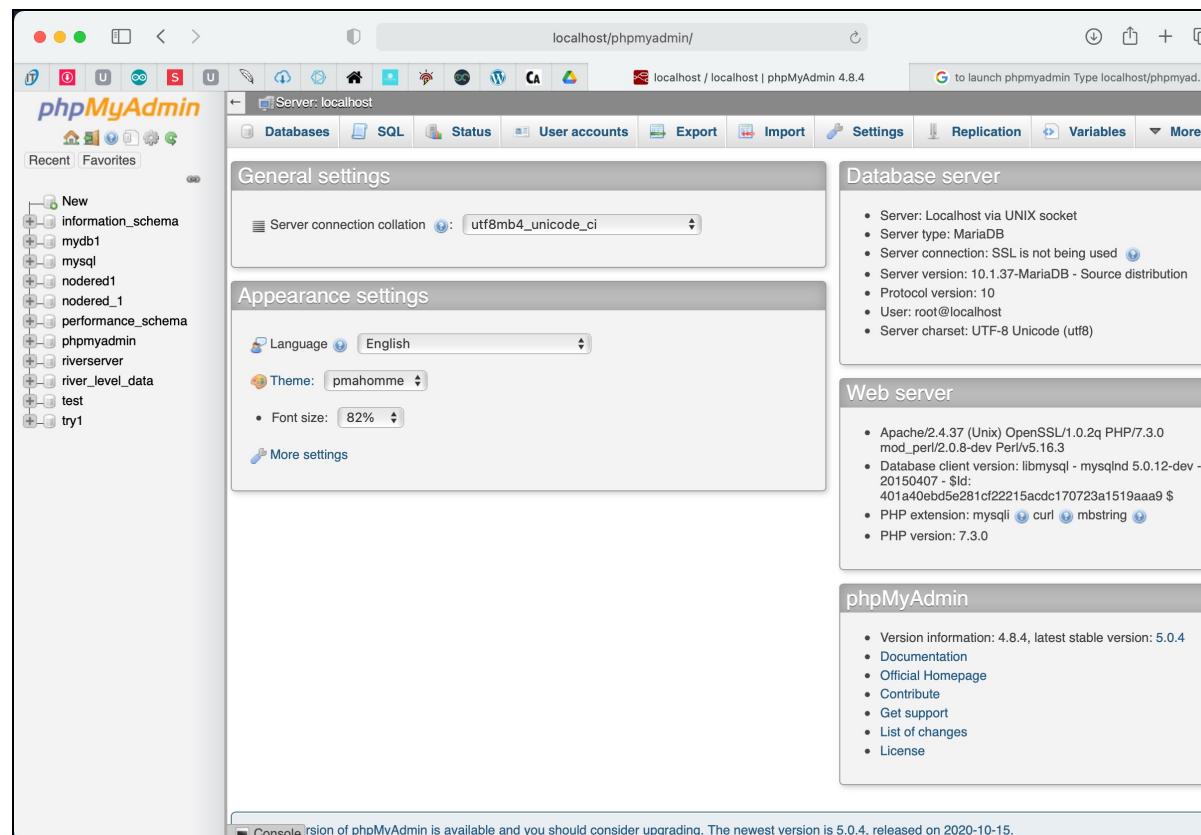
Windows system



OS X system

Solution: Step 2 INSTALL, START & TEST XAMPP SERVICES

- To use MySQL database, point your browser to <http://localhost/phpmyadmin>
- You can also click phpMyAdmin link at XAMPP dashboard.
- PHPMyAdmin is a third party tool to manage data inside the database.



Solution: Step 3 CREATING MySQL DATABASE

→ Set up database with the following properties:

Database Name: **datacenter_activities**

Table Name: **room_dc230**

Columns: **6**

- The number of characters used should be equal to or less than 64.
- The name should comprise of letters, numbers and underscore.
- The DB name should not start with a number.
- It should be relevant to the topic for which it is being created.

<https://www.javatpoint.com/creating-mysql-database-with-xampp>

NAME	TYPE	LENGTH	ADDITIONAL SETTING
id	INT	11	Index: PRIMARY AI: YES
logDateTime	DATETIME	-	Default: CURRENT_TIMESTAMP
rackID	VARCHAR	255	-
tempValue	VARCHAR	255	-
humidValue	VARCHAR	255	-
rackStatus	VARCHAR	255	-

AI = Auto Increment

- = empty

#use appropriate name for variables (dbname, tablename...) that reflect with the task/activity

Solution: Step 3 CREATING MySQL DATABASE

→ Database Name: **datacenter_activities**

5

6

The screenshot shows the phpMyAdmin interface for creating a new database. A red arrow labeled '1' points from the 'New' button in the sidebar to the 'Create database' input field. Another red arrow labeled '2' points from the input field to the 'Create' button. A third red arrow labeled '3' points from the 'Create' button to the newly created database entry in the list.

Existing databases

localhost/phpmyadmin/server_databases.php?server=1

localhost / localhost | phpMyAdmin 4.8.4

Databases

Create database

datacenters_activities latin1_swedish_ci Create

Filters

Containing the word:

Database	Collation	Action
information_schema	utf8_general_ci	<input type="button" value="Check privileges"/>
mydb1	latin1_swedish_ci	<input type="button" value="Check privileges"/>
mysql	latin1_swedish_ci	<input type="button" value="Check privileges"/>
nodered1	latin1_swedish_ci	<input type="button" value="Check privileges"/>
nodered_1	latin1_swedish_ci	<input type="button" value="Check privileges"/>
performance_schema	utf8_general_ci	<input type="button" value="Check privileges"/>
phpmyadmin	utf8_general_ci	<input type="button" value="Check privileges"/>
riverserver	utf8_general_ci	<input type="button" value="Check privileges"/>
river_level_data	utf8_general_ci	<input type="button" value="Check privileges"/>
test	utf8_general_ci	<input type="button" value="Check privileges"/>
try1	utf8_general_ci	<input type="button" value="Check privileges"/>
Console	admin	<input type="button" value="Check privileges"/>

Solution: Step 3 CREATING MySQL DATABASE

→ Table Name: **room_ds230** Number of columns: **6**

The screenshot shows the phpMyAdmin interface for a database named 'datacenters_activities'. On the left sidebar, under the 'New' section, there is a message 'Just created' next to the 'datacenters_activities' database. The main area displays a 'Create table' form. The 'Name:' field contains 'room_dc230'. To the right of the name, there is a dropdown menu labeled 'Number of columns:' with the value '6'. A red arrow points from the number '4' to the dropdown, indicating it was changed from 4 to 6. Another red arrow points from the number '5' to the same dropdown, indicating it was changed from 5 to 6. A final red arrow points from the number '6' to the 'Go' button, which is highlighted in orange. The 'Go' button is located at the bottom right of the form.

Solution: Step 3 CREATING MySQL DATABASE

→ Table Name: room_ds230 Number of columns: 6

localhost / localhost / datacenters_activities / room_dc230 | phpMyAdmin 4.8.4

Table name: room_dc230

Add 1 column(s)

Name **Type** **Length/Values** **Default** **Collation** **Attributes** **Null** **Index** **A_I** **Comments**

id	INT	11				PRIMARY	10	12	
logDateTime	DATETIME		CURRENT_TIME						
rackID	VARCHAR	255		None					
tempValue	VARCHAR	255		None					
humidValue	VARCHAR	255		None					
rackStatus	VARCHAR	255		None					

Add index

Index name: PRIMARY

Index choice: PRIMARY

+ Advanced Options

Column: id

Storage Engine: InnoDB

Partition definition:

Partition by: Expression or column list

Partitions:

Save 28

Solution: Step 3 CREATING MySQL DATABASE

→ What you should know on PHPMyAdmin panel (at least).

The screenshot shows the PHPMyAdmin interface with the following details:

- Server:** localhost
- Database:** datacenters_activities
- Table:** room_dc230
- Action Buttons:** Sum, a, b, c, d, e
- Table Structure:** 1 table, Sum, a, b, c, d, e
- Rows:** 0
- Type:** InnoDB
- Collation:** latin1_swedish_ci
- Size:** 16 KiB
- Overhead:** -

Create table: Name: [] Number of columns: 4

Browse → to view / edit / delete data stored in room_dc230, increment counter will proceed to next number.

Structure → to view / edit / delete / add table structure.

Insert → to manually insert data into room_dc230.

Empty → to empty room_dc230 database, any increment counter will start from 1.

Drop → will delete room_dc230 table.

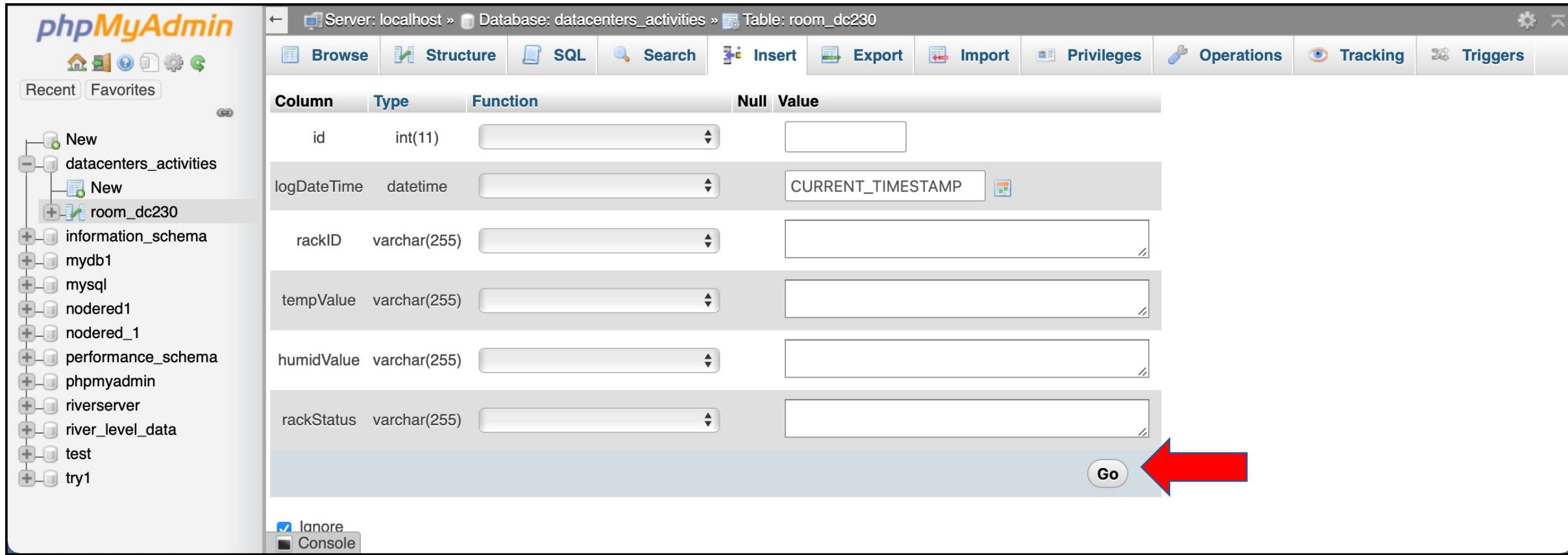
Solution: Step 3 CREATING MySQL DATABASE

→ Click **a** **Browse** to view room_dc230 database. It is empty since no data in it.

The screenshot shows the phpMyAdmin interface. On the left, the database tree is visible with the 'datacenters_activities' schema expanded, showing the 'room_dc230' table. The main area shows the 'Browse' tab selected (indicated by a red box labeled 'a'). A green message bar at the top states: 'MySQL returned an empty result set (i.e. zero rows). (Query took 0.0006 seconds.)'. Below this, a SQL query is shown: 'SELECT * FROM `room_dc230`'. The results table has columns: id, logDateTime, rackID, tempValue, humidValue, rackStatus. A yellow box highlights the text 'An empty database'. At the bottom, there are 'Query results operations' like 'Create view' and 'Bookmark this SQL query' (with a 'Label:' input field).

Solution: Step 3 CREATING MySQL DATABASE

- In order to insert data manually into room_dc230, select  **Insert**.
- For this time, leave **ALL** text box empty. Then click **Go** to save into room_dc230 database.



The screenshot shows the phpMyAdmin interface for the 'room_dc230' table. The left sidebar lists databases and tables, with 'room_dc230' selected. The main area shows the table structure with columns: id (int(11)), logDateTime (datetime), rackID (varchar(255)), tempValue (varchar(255)), humidValue (varchar(255)), and rackStatus (varchar(255)). The 'logDateTime' column has a default value of CURRENT_TIMESTAMP. The 'rackStatus' column is highlighted with a red arrow pointing to the 'Go' button at the bottom right. The 'Go' button is located at the bottom of the form.

Solution: Step 3 CREATING MySQL DATABASE

- Observe the red arrow. What do you think?
- **a** Click Browse link to view the input.

```
INSERT INTO `room_dc230` (`id`, `logDateTime`, `rackID`, `tempValue`, `humidValue`, `rackStatus`) VALUES (NULL, CURRENT_TIMESTAMP, '', '', '', ''');
```

The screenshot shows the phpMyAdmin interface for a database named 'datacenters_activities'. The 'room_dc230' table is selected. The 'Browse' tab is active, showing a success message: '1 row inserted. Inserted row id: 1'. Below it is the SQL query: `INSERT INTO `room_dc230` (`id`, `logDateTime`, `rackID`, `tempValue`, `humidValue`, `rackStatus`) VALUES (NULL, CURRENT_TIMESTAMP, '', '', '', '')`. A yellow box highlights this query, and a red arrow points from the text 'Blank data inserted into rackID, tempValue, humidValue & rackStatus' to the 'humidValue' field in the SQL code. The 'Run SQL query/queries on table datacenters_activities.room' button is also highlighted with a red arrow. The right panel displays the table's columns: id, logDateTime, rackID, tempValue, humidValue, and rackStatus. At the bottom, there are buttons for SELECT *, SELECT, INSERT, UPDATE, DELETE, Clear, and Format, with 'Console' selected.

Solution: Step 3 CREATING MySQL DATABASE

- Congrats! You managed to add your first data into room_dc230 database.
- Click **Edit** link if you wish to edit the data.
- **Delete** will not reset the ***id*** into **zero**. Next data entered will get the following running number.

The screenshot shows the phpMyAdmin interface for the 'room_dc230' table. The table structure includes columns: id, logDateTime, rackID, tempValue, humidValue, and rackStatus. A single row of data is displayed with the following values:

	Edit	Copy	Delete	id	logDateTime	rackID	tempValue	humidValue	rackStatus
				1	2021-02-09 01:21:19				

A red arrow points to the 'Delete' link in the row header. The left sidebar shows the database structure with 'datacenters_activities' expanded, revealing 'room_dc230' as a child table.

Solution: Step 3 CREATING MySQL DATABASE

→ Go to **Insert** link and add the information as show by red arrow & press **Go** to save the data.

The screenshot shows the phpMyAdmin interface for the 'room_dc230' table in the 'datacenters_activities' database. The 'Insert' tab is selected. The table structure is as follows:

Column	Type	Function	Null	Value
id	int(11)			
logDateTime	datetime			CURRENT_TIMESTAMP
rackID	varchar(255)			r1
tempValue	varchar(255)			24
humidValue	varchar(255)			70
rackStatus	varchar(255)			Normal

Red arrows numbered 1 through 5 highlight the following sequence: 1 points to the 'rackID' input field containing 'r1'; 2 points to the 'tempValue' input field containing '24'; 3 points to the 'humidValue' input field containing '70'; 4 points to the 'rackStatus' input field containing 'Normal'; 5 points to the 'Go' button at the bottom right.

Solution: Step 3 CREATING MySQL DATABASE

→ Red arrow shows the new data that have been entered.

The screenshot shows the phpMyAdmin interface for the 'room_dc230' table. The table structure includes columns: id, logDateTime, rackID, tempValue, humidValue, and rackStatus. There are two rows of data:

	1	2021-02-09 01:59:08			Normal
	2	2021-02-09 02:04:38	r1	24	70

A red arrow points to the second row of data, specifically to the 'rackStatus' column value 'Normal'.

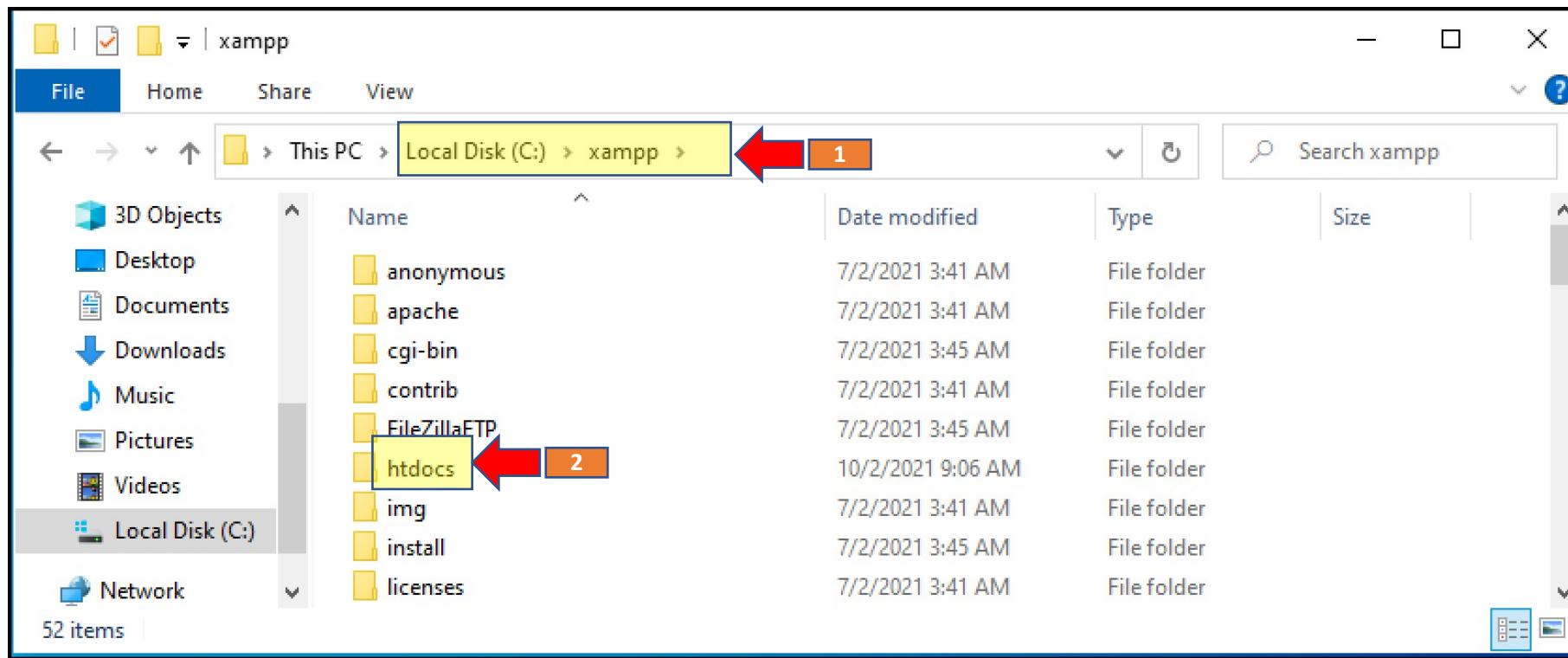
Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

→ Two PHP files are needed; esptodb.php & webview.php.



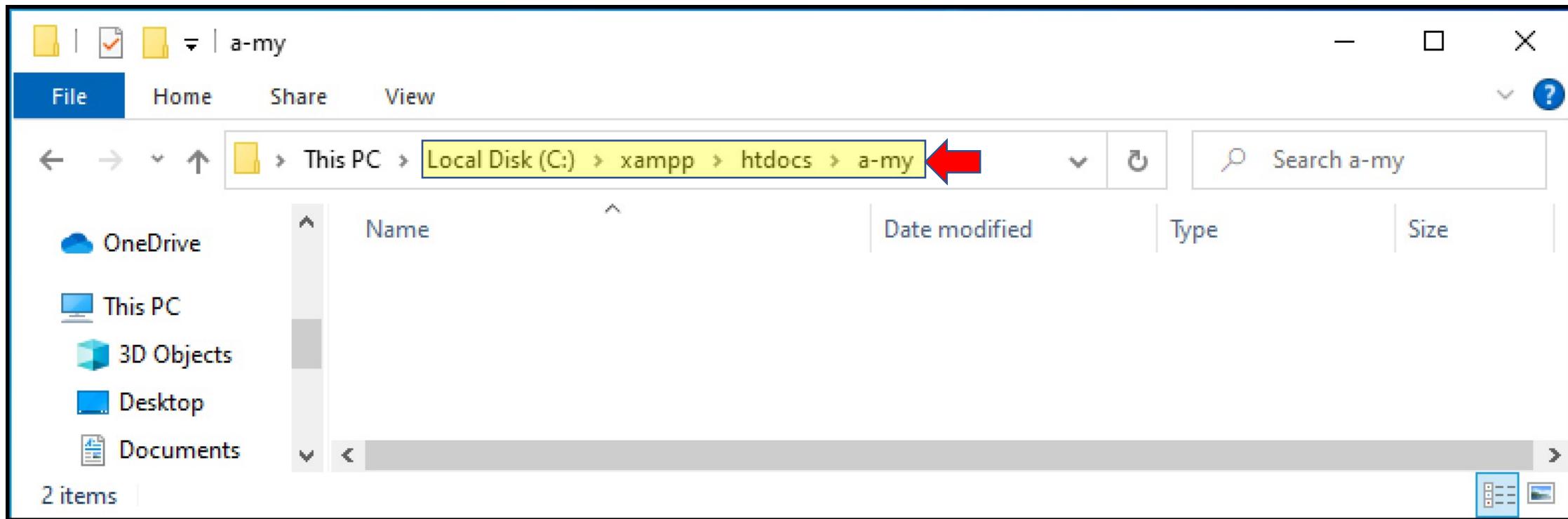
Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- In order to publish any website either PHP or HTML, you need to save the files in a **specific folder**, named **htdocs**. It can be found in XAMPP folder.
- It is advised that each project has its own folder. This may avoid you to override files that carries same filename.



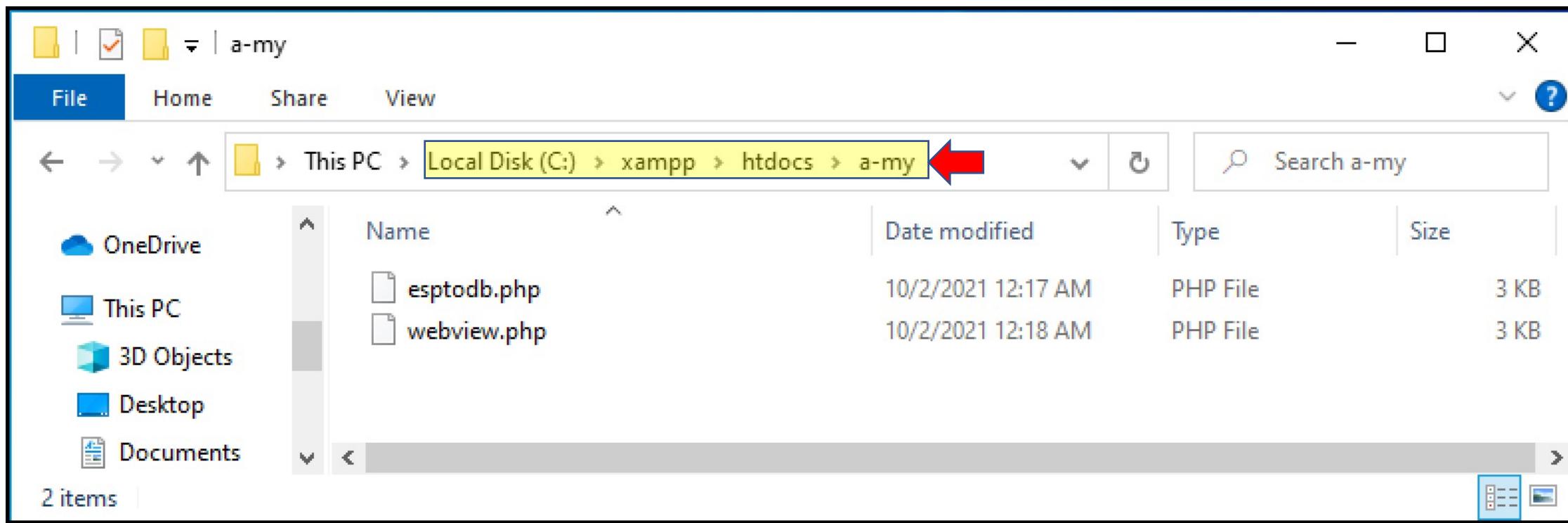
Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

→ Navigate to **htdocs** & create new folder named **a-my**.



Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- Download “**esptodb.php**” & “**webview.php**” from <http://bit.ly/3p2pmNd>.
- Extract & paste the files into **a-my** folder.
- ESP32 will use “**esptodb.php**” as a medium to save information into MySQL while client will use “**webview.php**” to view the information thru web browsers.



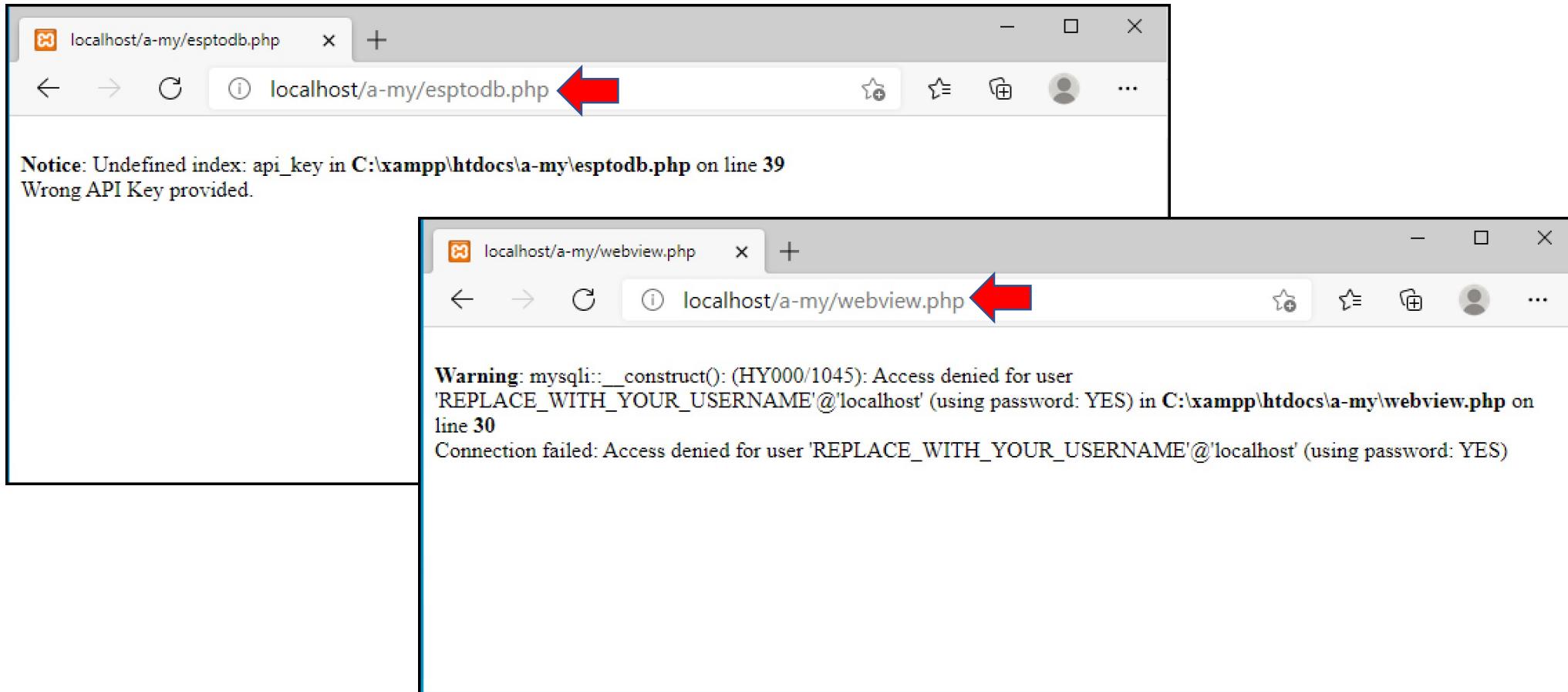
Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

→ Open up your web browser & type localhost/a-my/ in the address bar. You should get the similar output. If you failed to see this, go to your XAMPP C-Panel & check whether the server services has been deployed or not.



Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- Click at the file one at a time. There are errors/warnings since the files were not properly configured.
- You need a text editor to edit both files & we are going to use Sublime Text as the editor for PHP scripts. You may download it from the following link: <https://www.sublimetext.com/3>



Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- Open **webview.php** with **sublimetext** or any preferable text editor. The credentials are to establish connection to the database.
- By default, **\$servername** is “**localhost**” & **\$username** is “**root**”.

```

15 $servername = "localhost";
16
17 // REPLACE with your Database name
18 $dbname = "REPLACE_WITH_YOUR_DATABASE_NAME";
19
20 // REPLACE with table name
21 $tablename = "REPLACE_WITH_YOUR_TABLE_NAME";
22
23 // REPLACE with Database user
24 $username = "REPLACE_WITH_YOUR_USERNAME";
25
26 // REPLACE with Database user password
27 $password = "REPLACE_WITH_YOUR_PASSWORD";

```

→ Set up database with the following properties:

Database Name: [datacenter_activities](#)

Table Name: [room_dc230](#)



```

15 $servername = "localhost";
16
17 // REPLACE with your Database name
18 $dbname = "datacenters_activities";
19
20 // REPLACE with table name
21 $tablename = "room_dc230";
22
23 // REPLACE with Database user
24 $username = "root";
25
26 // REPLACE with Database user password
27 $password = "";

```

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- Before getting access to MySQL database, the client must establish a connection to the server as shown in **Line#30**. If any of the credentials incorrect, the client don't have the permission to access the server. The script stops & will display error message at the browser. (MySQLi = MySQL improved)
- **Line#36** indicates selection of 5 columns from **room_dc230** table with descending order of ***id***. The syntax is put into a variable called **\$sql**.

```
29 // Create connection
30 $conn = new mysqli($servername, $username, $password, $dbname);
31 // Check connection
32 if ($conn->connect_error) {
33     die("Connection failed: " . $conn->connect_error);
34 }
35
36 $sql = "SELECT logDateTime, rackID, tempValue, humidValue, rackStatus FROM $tablename ORDER BY id DESC";
37
```

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

→ A mix of PHP and HTML syntax in creating table.

```

38 echo '<table cellspacing="5" cellpadding="5">
39     <tr>
40         <td>Rack ID</td>
41         <td>Timestamp</td>
42         <td>Temparature (C)</td>
43         <td>Humidity (%)</td>
44         <td>Rack Status</td>
45     </tr>';

```

→ Line#47 – Line#69 is hosting asking, fetch data from database & display them in table manner.

→ "query()" is a function that fetch data that was assigned in ***\$sql*** variable. The results were put into a variable called ***\$results***.

→ each data from "***\$results***" will be split into an array form according to its respected field.

```

47 if ($result = $conn->query($sql)) {
48     while ($row = $result->fetch_assoc()) {
49         $row_id = $row["rackID"];
50         $row_log = $row["logDateTime"];
51         $row_temp = $row["tempValue"];
52         $row_humid = $row["humidValue"];
53         $row_stats = $row["rackStatus"];

```

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

→ Script to display the information fetched from database in table form. Each row represent 1 set data / reading. New row carries another set of reading/data.

```
60         echo '<tr>
61             <td>' . $row_id . '</td>
62             <td>' . $row_log . '</td>
63             <td>' . $row_temp . '</td>
64             <td>' . $row_humid . '</td>
65             <td>' . $row_stats . '</td>
66         </tr>';
67     }
```

- The fetched data in **\$result** are emptied, thus the variable carries no information.
- "**close()**" is a function that closes previously open database connection.
- End of HTML script.

```
68     $result->free();
69 }
70
71 $conn->close();
72 ?>
73 </table>
74 </body>
75 </html>
```

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- Open **esptodb.php** with **sublimetext** or any preferable text editor. Fill up with your database credentials.
- If **webview.php** is meant for client to view the temperature & humidity of the racks, **esptodb.php** is a script for EPS32 saving the racks data into the database.
- **\$api_key_value** is a kind of password to except information send from the **ESP32**. **ESP32** must send same key & the information will only be entertained when the key is matched. Otherwise, the information will be rejected.

```
28 // Keep this API Key value to be compatible with the ESP32 code provided in the project page.  
29 // If you change this value, the ESP32 sketch needs to match  
30 $api_key_value = "tPmAT5Ab3j7F9";  
31  
32 // empty the variables  
33 $api_key= $rackID = $tempVal = $humidVal = $rackStat = "";
```

- **Line#33** will empty the content of the handlers. The task of the handlers are to keep for information temporarily when received from the ESP32 thru HTTP POST or HTTP GET request.

```
32 // empty the variables  
33 $api_key= $rackID = $tempVal = $humidVal = $rackStat = "";
```

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- There are 2 types of Hyper Text Transfer Protocol (HTTP) request methods: **POST & GET**.
- What is HTTP? HTTP works as request-response protocol between a client & a server.
- **HTTP GET** is used to request data from a specified resource. It is often used to get values from APIs.

- eg., ***http://localhost/a-my/esptodb.php?key=tPmAT5Ab3jF9&temp=10***
- Name = **Key** & value = **tPmAT5Ab3jF9** + name = **temp** & value = **10** are send together in URL
- With HTTP GET, data is **visible** to everyone

- **HTTP POST** is used to send information to a server to create/update a resource.

- eg., publish sensor readings to a server
- The data sent to the server with POST is stored in the request body of the HTTP request
- ***String serverPath = serverName "?temperature=24.37"; // sample in sketch***
- With HTTP POST, data is ***not visible*** in the URL request. However, if it's not encrypted, it's still visible in the request body.

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

a

http://localhost/a-my/esptodatabase.php?api_key=tPmAT5Ab3j7F9&rID=v112&temp=22&humid=40¤tStat=NORMAL

```

55 // use POST for production
37 if ($_SERVER["REQUEST_METHOD"] == "GET") {
38     //echo "test";
39     $api_key = test_input($_GET["api_key"]); a
40     if($api_key == $api_key_value) {
41         $rackID = test_input($_GET["rID"]);
42         $tempVal = test_input($_GET["temp"]);
43         $humidVal = test_input($_GET["humid"]);
44         $rackStat = test_input($_GET["currentStat"]);
45
46         // Create connection
47         $conn = new mysqli($servername, $username, $password, $dbname);
48         // Check connection
49         if ($conn->connect_error) {
50             die("Connection failed: " . $conn->connect_error);
51         }
52
53         $sql = "INSERT INTO $tablename (rackID, tempValue, humidValue, rackStatus)
54             VALUES ('" . $rackID . "', '" . $tempVal . "', '" . $humidVal . "', '" . $rackStat . "')";
55
56         if ($conn->query($sql) === TRUE) {
57             echo "New record created successfully";
58         } else {
59             echo "Error: " . $sql . "<br>" . $conn->error;
60         }
61
62         $conn->close();
63     } else {
64         echo "Wrong API Key provided.";
65     }
66 }
67
68 }
69 else {
70     echo "No data posted with HTTP POST.";
71 }
72
73
74 function test_input($data) {
75     $data = trim($data); //remove whitespace
76     $data = stripslashes($data); //removes backslashes
77     $data = htmlspecialchars($data); //to converts special characters
78     //& (ampersand), " (double quote), ' (single quote), < (less than), > (greater than)
79     //to HTML entities ( i.e. & (ampersand) becomes &amp, ' (single quote) becomes &#039,
80     //< (less than) becomes &lt; (greater than) becomes &gt; ).
81     return $data;
82 }
```

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

- It is now the time to test both PHP scripts. Make sure that the database credentials have set accordingly.
- No information print out since the database is still empty.

The screenshot shows a Mac OS X desktop environment. In the foreground, a browser window is open at `localhost/a-my/webview.php`. The page displays a table with columns: Rack ID, Timestamp, Temperature (C), Humidity (%), and Rack Status. Below the table, there is a large empty white area. In the background, the phpMyAdmin interface is visible, connected to the 'datacenters_activities' database. A query has been run: `SELECT * FROM `room_dc230``, which returned zero rows. The phpMyAdmin interface includes tabs for Browse, Structure, SQL, Search, Insert, Export, Import, Privileges, Operations, Tracking, and Triggers.

Solution: Step 4 PHP SCRIPTS & HTDOCS & CODE EXPLANATION & RUN TEST

→ Open a browser, then copy & paste the following link & press enter.

http://localhost/a-my/esptodb.php?api_key=tPmAT5Ab3j7F9&rID=v112&temp=22&humid=40¤tStat=NORMAL

Rack ID	Timestamp	Temparature (C)	Humidity (%)	Rack Status
v112	2021-02-12 13:11:59	22	40	NORMAL
v112	2021-02-12 13:11:40	22	40	NORMAL
r1	2021-02-09 02:04:38	24	70	Normal
	2021-02-09 01:59:08			

Server: localhost » Database: datacenters_activities » Table: room_dc230						
	Browse	Structure	SQL	Search	Insert	Export
Show all	Number of rows: 25	Filter rows: Search this table	Sort by key: None			
<input type="checkbox"/> + Options <input type="checkbox"/> id <input type="checkbox"/> logDateTime <input type="checkbox"/> rackID <input type="checkbox"/> tempValue <input type="checkbox"/> humidValue <input type="checkbox"/> rackStatus <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete 1 2021-02-09 01:59:08 <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete 2 2021-02-09 02:04:38 r1 24 70 Normal <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete 4 2021-02-12 13:11:40 v112 22 40 NORMAL <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete 5 2021-02-12 13:11:59 v112 22 40 NORMAL <input type="checkbox"/> Check all With selected: <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete <input type="checkbox"/> Export <input type="checkbox"/> Console Number of rows: 25 Filter rows: Search this table Sort by key: None						

→ Try this:

1- <http://localhost/a-my/>

2- [http://localhost/a-my/esptodb.php?api_key=tPmAT5Ab3j7F9&rID=v111&temp=22.4&humid=40%¤tStat="NORMAL"](http://localhost/a-my/esptodb.php?api_key=tPmAT5Ab3j7F9&rID=v111&temp=22.4&humid=40%¤tStat='NORMAL')

Solution: Step 5 ESP32 POST INFORMATION TO DBASE: SKETCH WALKTHROUGH

→ Open **sketch-vii_esp32-dht11-http-post.ino** from <http://bit.ly/3p2pmNd> downloaded in Step 4. Do not upload the sketch since you need to make some changes.

→ This will inform the compiler to compile the correct library no matter if what board you are currently uploading into. In this case, either ESP32 or NodeMCU & ESP8266.

```
13 #ifdef ESP32
14 // this will compile for ESP32 board
15 #include <WiFi.h>
16 #include <HTTPClient.h>
17 #else
18 // this will compile for ESP8266, NodeMCU boards
19 #include <ESP8266WiFi.h>
20 #include <ESP8266HTTPClient.h>
21 #include <WiFiClient.h>
22#endif
```

Solution: Step 5 ESP32 POST INFORMATION TO DBASE: SKETCH WALKTHROUGH

→ Set the followings to the WiFi network connection.

```
24 // Replace with your network credentials
25 const char* ssid      = "REPLACE_WITH_YOUR_SSID";
26 const char* password = "REPLACE_WITH_YOUR_PASSWORD";
```

→ Change the “**192.168.1.102**” with your server’s IP address. How to find IP address of your system ☺?

→ The file path “**/a-my/esptodb.php**” reflects the “**drive/xampp/htdocs/**” & set in STEP xx.

```
28 // REPLACE with your Domain name and URL path or server's IP address with path
29 const char* serverName = "http://192.168.1.102/a-my/esptodb.php";
```

→ Both ESP32 has the same API key with esptodb.php to avoid fake request. If not match, the information will not save into database. The API key is manually generated by the developer/user.

```
31 // Keep this API Key value to be compatible with the PHP code provided in the project page.
32 // If you change the apiKeyValue value, the PHP file "/esptodb.php" also needs to have the same key
33 String apiKeyValue = "tPmAT5Ab3j7F9";
```

→ Set the sensorID accordingly – e.g. rackID. This ID must be different from one another & must be documented, easier to detect & locate.

```
35 String sensorID = "a1";
```

Solution: Step 5 ESP32 POST INFORMATION TO DBASE: SKETCH WALKTHROUGH

→ The board will connect to the WiFi router. If any of the SSID or Password is incorrect, the board will not join the network. Open Serial Monitor to view the process. IP address will be published if the board connected to the router.

```
40 void setup() {  
41   Serial.begin(115200);  
42  
43   WiFi.begin(ssid, password);  
44   Serial.println("Connecting");  
45   while(WiFi.status() != WL_CONNECTED) {  
46     delay(500);  
47     Serial.print(".");  
48   }  
49   Serial.println("");  
50   Serial.print("Connected to WiFi network with IP Address: ");  
51   Serial.println(WiFi.localIP());  
52 }
```

→ Fail to connect to router.

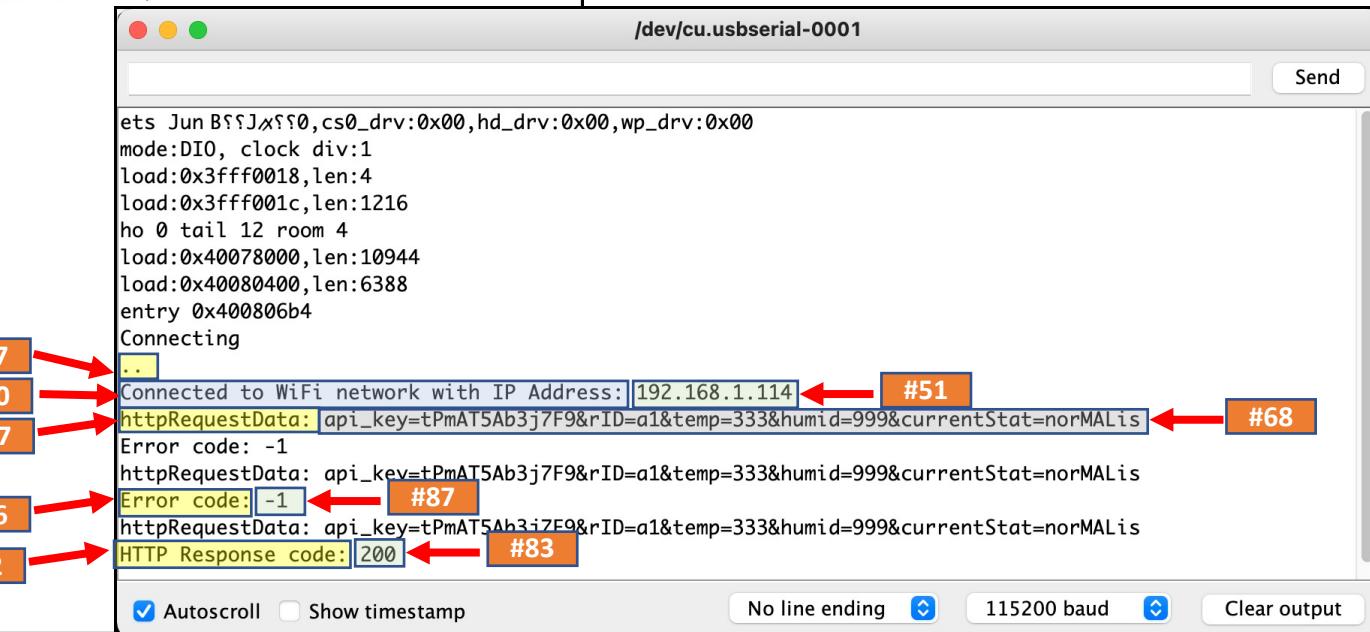
```
Connecting
```

Solution: Step 5 ESP32 POST INFORMATION TO DBASE: SKETCH WALKTHROUGH

```

54 void loop() {
55     //Check WiFi connection status
56     if(WiFi.status()== WL_CONNECTED){
57         HTTPClient http;
58
59         // Your Domain name with URL path or IP address with path
60         http.begin(serverName);
61
62         // Specify content-type header
63         http.addHeader("Content-Type", "application/x-www-form-urlencoded");
64
65         // Prepare your HTTP POST request data
66         String httpRequestData = "api_key=" + apiKeyValue + "&rID=" + sensorID + "&temp=" + 333 + "&humid=" + 999 + "&currentStat=" + "norMALis";
67         Serial.print("httpRequestData: ");
68         Serial.println(httpRequestData);
69
70         // You can comment the httpRequestData variable above
71         // then, use the httpRequestData variable below (for testing purposes without the DHT11 sensor) -->Similar with Line#66
72         //String httpRequestData = "api_key=tPmAT5Ab3j7F9&rID=abc&temp=123&humid=24.75&currentStat=norMALis";
73
74         // Send HTTP POST request
75         int httpResponseCode = http.POST(httpRequestData);
76
77         // If you need an HTTP request with a content type: text/plain
78         //http.addHeader("Content-Type", "text/plain");
79         //int httpResponseCode = http.POST("Hello, World!");
80
81         if (httpResponseCode>0) {
82             Serial.print("HTTP Response code: ");
83             Serial.println(httpResponseCode);
84         }
85         else {
86             Serial.print("Error code: ");
87             Serial.println(httpResponseCode);
88         }
89         // Free resources
90         http.end();
91     }
92     else {
93         Serial.println("WiFi Disconnected");
94     }
95     //Send an HTTP POST request every 30 seconds
96     delay(30000);
97 }
```

- #66: Test send data to esptodb.php (IP add at #29)
- #81: Success to communicate with server
- #85: Unable to communicate with server --> not in the same network
- #96: Update every 30 seconds

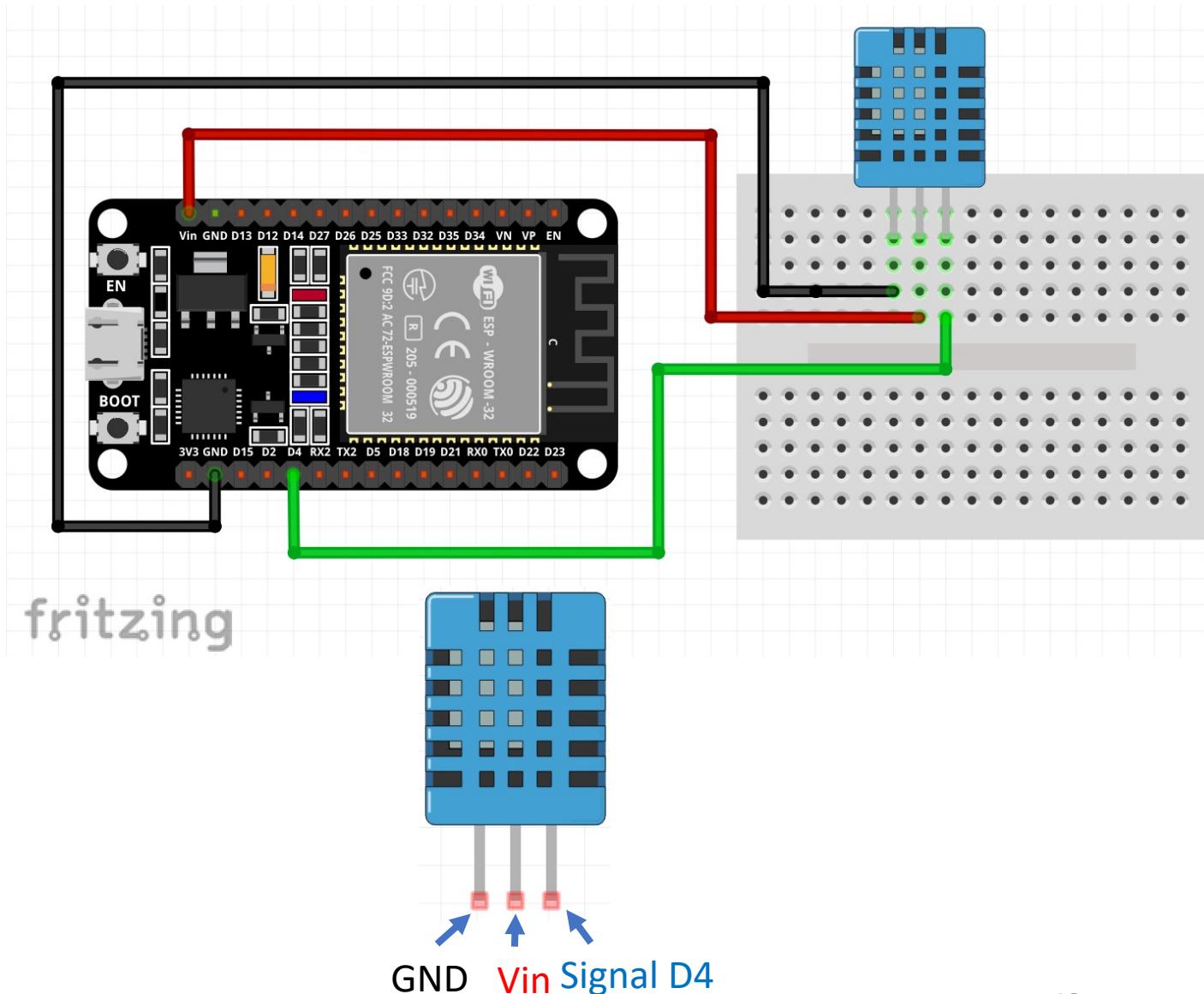


Solution: Step 6 SCHEMATIC DIAGRAM

→ After success tested the sketch, its time to combine the DHT part with ESP32.

→ Before we go any further, construct the circuit as in the figure.

→ Check a few times, the connections that have been made before plugging ESP32 to USB port. This might prevent short circuit to DHT11. Watch out on sensors' pin. Same type, doesn't mean same pin configurations.



Solution: Step 7 THE WORKING SKETCH

→ Open **sketch-vii_esp32-dht11-http-post.ino** from <http://bit.ly/3p2pmNd> downloaded in Step 4. Do not upload the sketch since you need to make some changes.

```
13 #ifdef ESP32
14 // this will compile for ESP32 board
15 #include <WiFi.h>
16 #include <HTTPClient.h>
17 #else
18 // this will compile for ESP8266, NodeMCU boards
19 #include <ESP8266WiFi.h>
20 #include <ESP8266HTTPClient.h>
21 #include <WiFiClient.h>
22 #endif
23
24 #include <dht11.h> ←
25 dht11 DHT;
26 #define DHT11_PIN 4
27
28 // Replace with your network credentials
29 const char* ssid      = "air24";//REPLACE_WITH_YOUR_SSID";
30 const char* password = "polis12345";//REPLACE_WITH_YOUR_PASSWORD";
31
32 // REPLACE with your Domain name and URL path or server's IP address with path
33 const char* serverName = "http://192.168.1.102/a-my/esptodb.php";
34
35 // Keep this API Key value to be compatible with the PHP code provided in the project page.
36 // If you change the apiKeyValue value, the PHP file "/esptodb.php" also needs to have the same key
37 String apiKeyValue = "tPmAT5Ab3j7F9";
38
39 String sensorID = "a1";
40 //// latihan
41 ////String sensorLocation = "Office";
```

Solution: Step 7 THE WORKING SKETCH

```
44 void setup() {  
45   Serial.begin(115200);  
46   WiFi.begin(ssid, password);  
47   Serial.println("Connecting");  
48   while(WiFi.status() != WL_CONNECTED) {  
49     delay(500);  
50     Serial.print(".");  
51   }  
52   Serial.println("");  
53   Serial.print("Connected to WiFi network with IP Address: ");  
54   Serial.println(WiFi.localIP());  
55 }
```

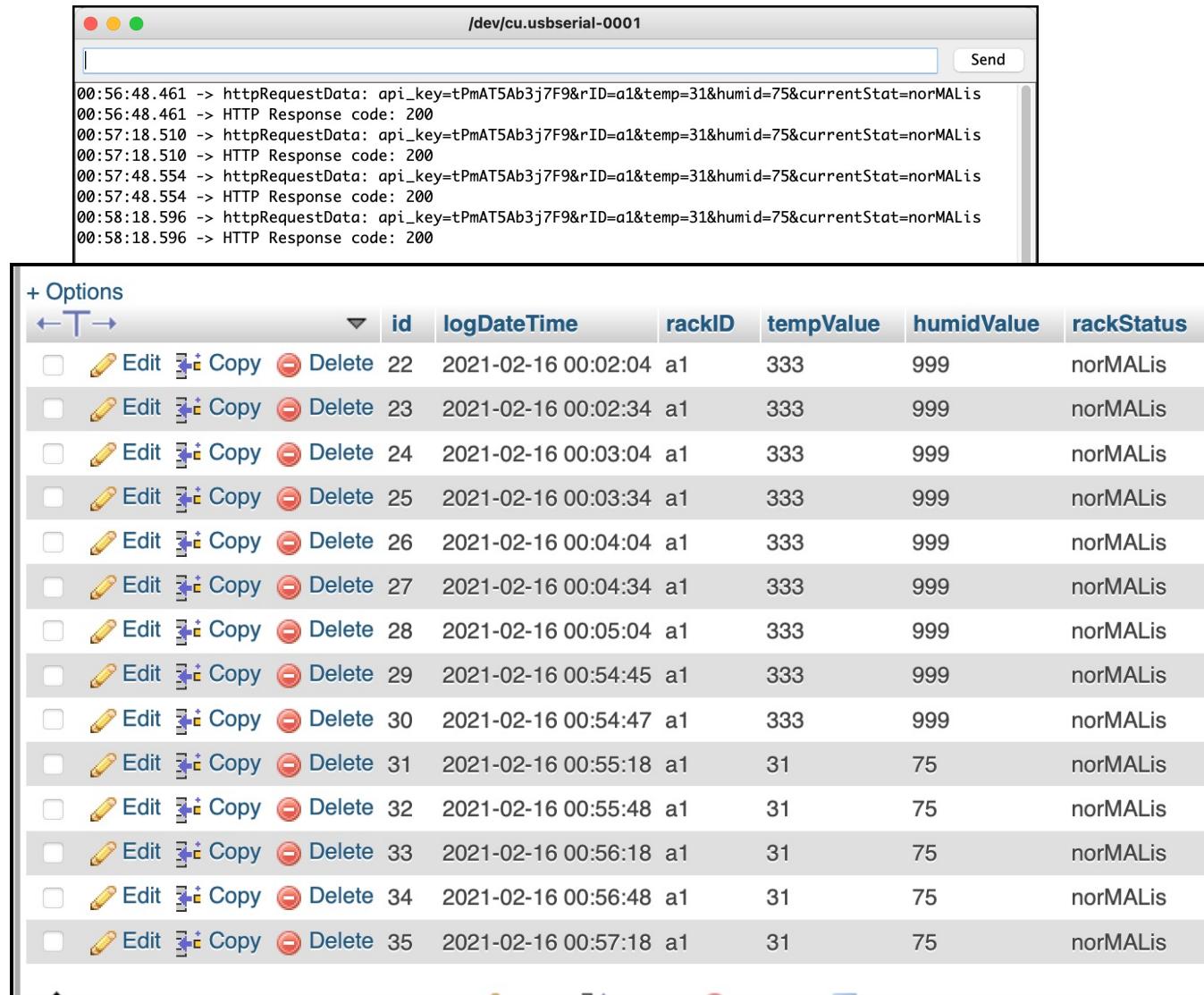
Solution: Step 7

THE WORKING SKETCH

```

57 void loop() {
58   int chk = DHT.read(DHT11_PIN); //Read humid & temp ←
59   //Check WiFi connection status
60   if(WiFi.status()== WL_CONNECTED){
61     HTTPClient http;
62
63     // Your Domain name with URL path or IP address with path
64     http.begin(serverName);
65
66     // Specify content-type header
67     http.addHeader("Content-Type", "application/x-www-form-urlencoded");
68
69     // Prepare your HTTP POST request data
70     String httpRequestData = "api_key=" + apiKeyValue + "&rID=" + sensorID
71       + "&temp=" + DHT.temperature + "&humid=" + DHT.humidity ←
72       + "&currentStat=" + "norMALis";
73     Serial.print("httpRequestData: ");
74     Serial.println(httpRequestData);
75
76     // You can comment the httpRequestData variable above
77     // then, use the httpRequestData variable below (for testing purposes without the DHT11 sensor) -->Similar with Line#66
78     //String httpRequestData = "api_key=tPmAT5Ab3j7F9&rID=abc&temp=123&humid=24.75&currentStat=norMALis";
79
80     // Send HTTP POST request
81     int httpResponseCode = http.POST(httpRequestData);
82
83     // If you need an HTTP request with a content type: text/plain
84     //http.addHeader("Content-Type", "text/plain");
85     //int httpResponseCode = http.POST("Hello, World!");
86     if (httpResponseCode>0) {
87       Serial.print("HTTP Response code: ");
88       Serial.println(httpResponseCode);
89     }
90     else {
91       Serial.print("Error code: ");
92       Serial.println(httpResponseCode);
93     }
94     // Free resources
95     http.end();
96   }
97   else {
98     Serial.println("WiFi Disconnected");
99   }
100  //Send an HTTP POST request every 30 seconds
101  delay(30000);
102 }
```

Solution: Step 7 THE WORKING SKETCH



The terminal window shows the following serial communication logs:

```

/dev/cu.usbserial-0001
Send

00:56:48.461 -> httpRequestData: api_key=tPmAT5Ab3j7F9&rID=a1&temp=31&humid=75&currentStat=norMALis
00:56:48.461 -> HTTP Response code: 200
00:57:18.510 -> httpRequestData: api_key=tPmAT5Ab3j7F9&rID=a1&temp=31&humid=75&currentStat=norMALis
00:57:18.510 -> HTTP Response code: 200
00:57:48.554 -> httpRequestData: api_key=tPmAT5Ab3j7F9&rID=a1&temp=31&humid=75&currentStat=norMALis
00:57:48.554 -> HTTP Response code: 200
00:58:18.596 -> httpRequestData: api_key=tPmAT5Ab3j7F9&rID=a1&temp=31&humid=75&currentStat=norMALis
00:58:18.596 -> HTTP Response code: 200
  
```

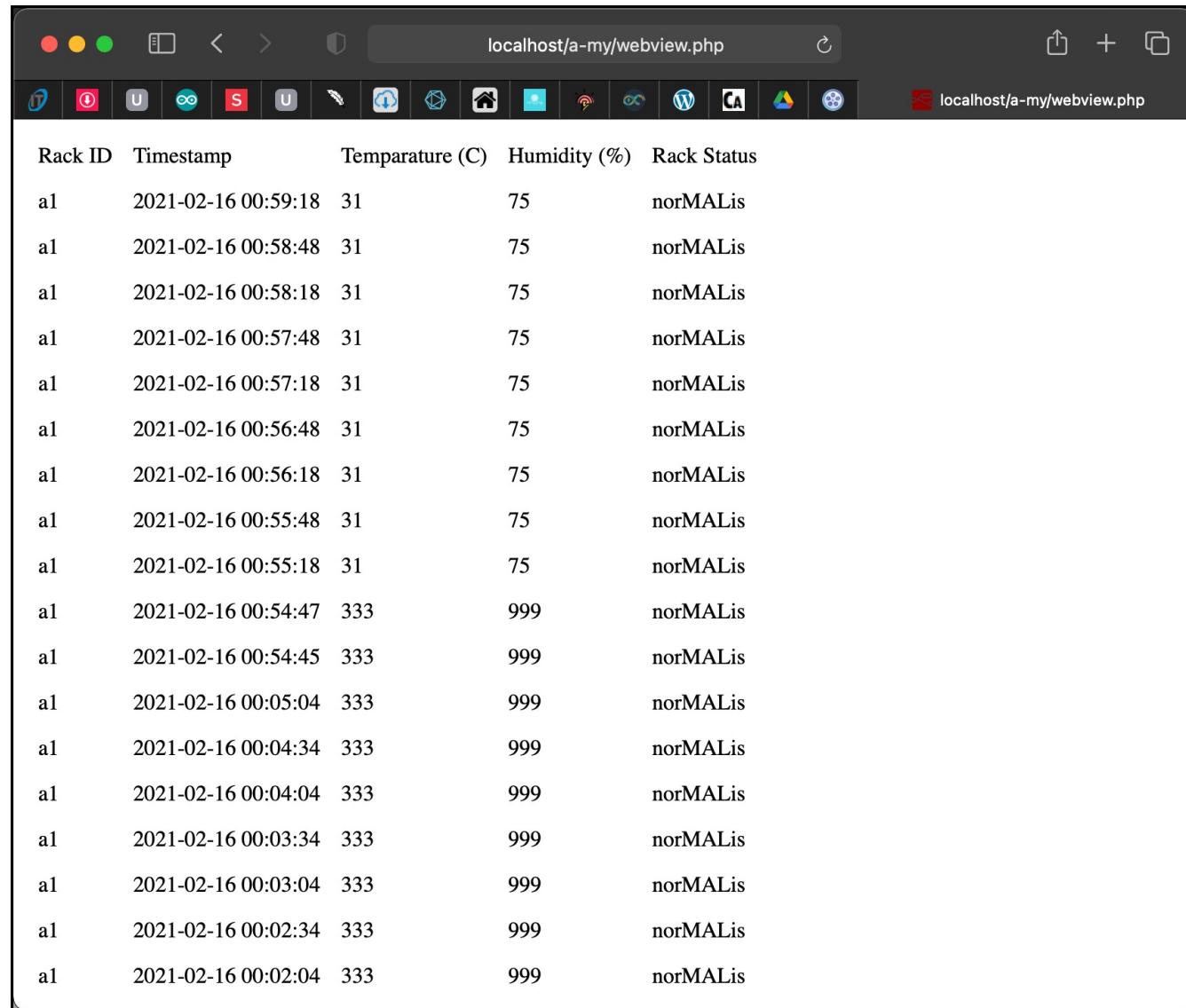
The MySQL database table contains the following data:

+ Options	<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	id	logDateTime	rackID	tempValue	humidValue	rackStatus
					22	2021-02-16 00:02:04	a1	333	999	norMALis
					23	2021-02-16 00:02:34	a1	333	999	norMALis
					24	2021-02-16 00:03:04	a1	333	999	norMALis
					25	2021-02-16 00:03:34	a1	333	999	norMALis
					26	2021-02-16 00:04:04	a1	333	999	norMALis
					27	2021-02-16 00:04:34	a1	333	999	norMALis
					28	2021-02-16 00:05:04	a1	333	999	norMALis
					29	2021-02-16 00:05:45	a1	333	999	norMALis
					30	2021-02-16 00:05:47	a1	333	999	norMALis
					31	2021-02-16 00:05:18	a1	31	75	norMALis
					32	2021-02-16 00:05:48	a1	31	75	norMALis
					33	2021-02-16 00:06:18	a1	31	75	norMALis
					34	2021-02-16 00:06:48	a1	31	75	norMALis
					35	2021-02-16 00:07:18	a1	31	75	norMALis

The browser window shows the following table of sensor data:

Rack ID	Timestamp	Temparature (C)	Humidity (%)	Rack Status
a1	2021-02-16 00:59:18	31	75	norMALis
a1	2021-02-16 00:58:48	31	75	norMALis
a1	2021-02-16 00:58:18	31	75	norMALis
a1	2021-02-16 00:57:48	31	75	norMALis
a1	2021-02-16 00:57:18	31	75	norMALis
a1	2021-02-16 00:56:48	31	75	norMALis
a1	2021-02-16 00:56:18	31	75	norMALis
a1	2021-02-16 00:55:48	31	75	norMALis
a1	2021-02-16 00:55:18	31	75	norMALis
a1	2021-02-16 00:54:47	333	999	norMALis
a1	2021-02-16 00:54:45	333	999	norMALis
a1	2021-02-16 00:05:04	333	999	norMALis
a1	2021-02-16 00:04:34	333	999	norMALis
a1	2021-02-16 00:04:04	333	999	norMALis
a1	2021-02-16 00:03:34	333	999	norMALis
a1	2021-02-16 00:03:04	333	999	norMALis
a1	2021-02-16 00:02:34	333	999	norMALis
a1	2021-02-16 00:02:04	333	999	norMALis

Solution: Step 7 THE WORKING SKETCH



A screenshot of a web browser window titled "localhost/a-my/webview.php". The browser has a dark theme with a toolbar at the top featuring various icons. The main content area displays a table with the following data:

Rack ID	Timestamp	Temparature (C)	Humidity (%)	Rack Status
a1	2021-02-16 00:59:18	31	75	norMALis
a1	2021-02-16 00:58:48	31	75	norMALis
a1	2021-02-16 00:58:18	31	75	norMALis
a1	2021-02-16 00:57:48	31	75	norMALis
a1	2021-02-16 00:57:18	31	75	norMALis
a1	2021-02-16 00:56:48	31	75	norMALis
a1	2021-02-16 00:56:18	31	75	norMALis
a1	2021-02-16 00:55:48	31	75	norMALis
a1	2021-02-16 00:55:18	31	75	norMALis
a1	2021-02-16 00:54:47	333	999	norMALis
a1	2021-02-16 00:54:45	333	999	norMALis
a1	2021-02-16 00:05:04	333	999	norMALis
a1	2021-02-16 00:04:34	333	999	norMALis
a1	2021-02-16 00:04:04	333	999	norMALis
a1	2021-02-16 00:03:34	333	999	norMALis
a1	2021-02-16 00:03:04	333	999	norMALis
a1	2021-02-16 00:02:34	333	999	norMALis
a1	2021-02-16 00:02:04	333	999	norMALis

QUESTIONS?

Questions?

EXERCISE

Modify this project by doing the followings:

- a. Add LED statement in ESP32 sketch – if connected to WiFi, built in led (GPIO2) will switch on.

- b. Write condition statements at PHP files:

- i. If $\text{temp} > 30^{\circ}\text{C}$ status is ALERT

- ii. If $\text{temp} > 40^{\circ}\text{C}$ status is DANGER

The status need to be saved in the database together with other information.

HINT: you need to omit the status information from ESP32 sketch.