Controlling LED from an IoT Server using NodeMCU, PHP, MySQL

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•Create DataBase (iotDb – *user defined*)

•Create Table (iot_led – *user defined*) to store the desired State of the LED

•Create a Web Portal (Web Page) to Control LED (led_update.php – *user defined*)

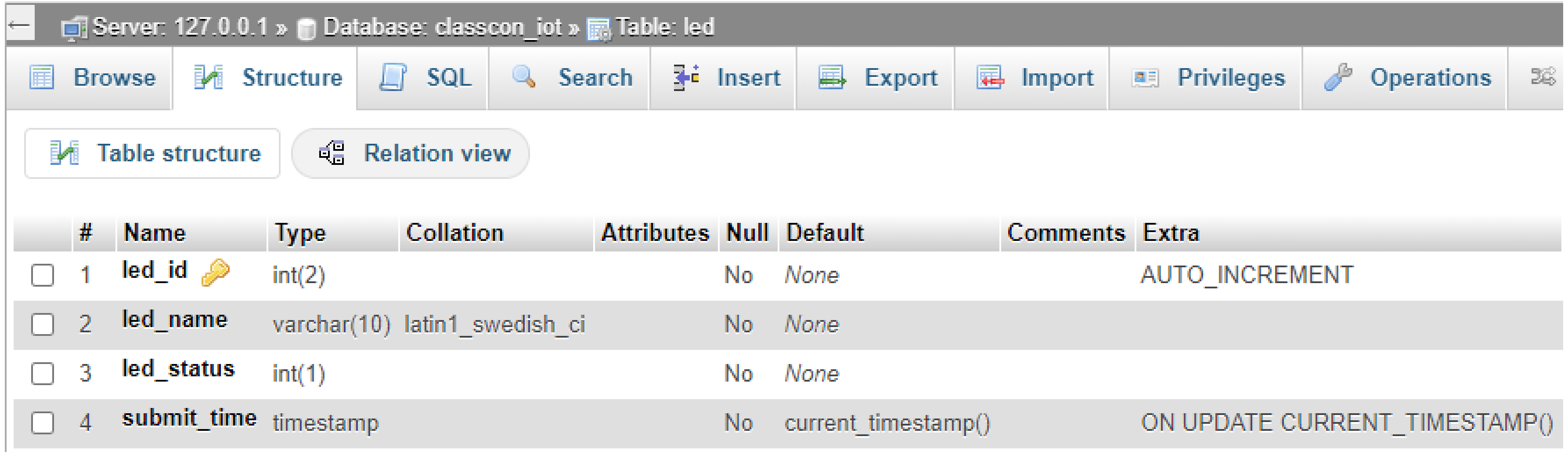
•Create an Server Side API (led_status.php – *user defined*) to get Desired State of LED to send Json Response to the Client (NodeMCU).

•Develop an Arduino Code to send API request and use Jason response to update the state of the LED (Home Appliance).

1. Create DataBase

Open **cPanel** of your domain or open **phpMyAdmin** in XAMPP/WAMP and create database.

2. Create SQL Table



	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	led_id	int(2)			No	*None*		AUTO_INCREMENT
☐	2	led_name	varchar(10)	latin1_swedish_ci		No	*None*		
☐	3	led_status	int(1)			No	*None*		
☐	4	submit_time	timestamp			No	current_timestamp()		ON UPDATE CURRENT_TIMESTAMP()

3. Create a Web Portal (Web Page) to Control LED

```html
<head>
<title>Class Connect IoT Dashboard </title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css">
</head>
<div class="jumbotron"><h1>ClassConnect - IoT Application </h1></div>
<div class="container">
<h3 align="center">Controlling LED</h3>
<form action="led_update.php" method="post">
<div class="card-group">
<div class="card bg-secondary text-white">
<div class="card-body">
<input type="submit" style="font-size: 50;" class="btn btn-secondary btn-block" name="ledOn" value="Switch On LED"/>
</div>
</div>
<div class="card bg-info text-white">
<div class="card-body">
<input type="submit" style="font-size: 50;" class="btn btn-info btn-block" name="ledOff" value="Switch Off LED"/>
</div>
</div>
</div>
</form>
</div>
```

This script establishes the connection with server.

```
<?php
$servername = "localhost"; //Host Name
$username = "root"; // Database User Name
$password = ""; // Database User Password
$db="classcon_iot"; // Database Name
// Create connection
$conn = new mysqli($servername, $username, $password, $db);
// Check connection and terminate the code if failed
if($conn->connect_error)die("Connection failed: " . $conn->connect_error);
?>
```

Now we can write php script to connect to server and process the request submitted through the HTML form. We have two common options to do it. One, insert the script in the same HTML or two, to create a separate file to process the server side processing. To begin with, we will go for first option but switch to other options for SSP using jQuery/AJAX.

```
<?php
require_once("dbIoT.php");
if(isset($_POST['ledOn']))$sql="update led set led_status='1' where led_id='1'";
elseif(isset($_POST['ledOff']))$sql="update led set led_status='2' where led_id='1'";
if(isset($_POST['ledOn']) || isset($_POST['ledOff']))$result=$conn->query($sql);
?>
```

The important php function used in the script is **isset**(*variable*) function. The **isset**(*variable*) returns **true** if the variable is not NULL and is set (defined) or exists, otherwise it returns **false**. Using **isset()** with $_POST check whether we have submitted a post request or not and returns **true** if post request is submitted. When we submit a form by pressing either of two buttons created (for On and Off), the status of LED is updated. In this example we are using one one LED but for generalized projects we use ***led_id*** for a specific LED. In this project the desired state is On for ***led_status=1*** and desired state is Off if ***led_status=2***.

The above block of code to be inserted after the closing head tag (</head>). Though, for this particular example we can conveniently place this anywhere in the code. May be at the start or even at the end. The output will remain same.

We have included another php script (dbIoT.php) in the above script. This script establishes the connection with server.

```
<?php
$servername = "localhost"; //Host Name
$username = "root"; // Database User Name
$password = ""; // Database User Password
$db="classcon_iot"; // Database Name
// Create connection
$conn = new mysqli($servername, $username, $password, $db);
// Check connection and terminate the code if failed
if($conn->connect_error)die("Connection failed: " . $conn->connect_error);
?>
```

Create a Server Side API

```php
<?php
//Creating an array with name 'data' for JSON response
$data = array();
require_once("dbIoT.php");
if(isset($_GET['id']))
{
$id=$_GET['id'];
$sql="SELECT * FROM led where led_id='$id'";
$result=$conn->query($sql);
if($result->num_rows==0)
{
$data["success"] = 0;
$data["message"] = "No data on led found.";
echo json_encode($data);
}
else
{
$row=$result->fetch_assoc();
$data["ID"] = $row["led_id"];
$data["STATUS"] = $row["led_status"];
echo json_encode($data); // Show JSON response
}
}
else
{
$data["success"] = 0;
$data["message"] = $conn->error;
echo json_encode($data);
}
?>
```

Arduino Code to send API request

```
#include <ESP8266WiFi.h>
#include <ArduinoJson.h>
const char* ssid = "vijayonline";
const char* password = "******";
const char* host = "iot.classconnect.in"; //replace it with your webhost url
int ledPin;
void setup() {
Serial.begin(115200);
delay(100);
pinMode(D1, OUTPUT);
Serial.print("Connecting to ");
Serial.println(ssid);
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED) {
delay(500);
Serial.print(".");
}
}
```

```
void loop()
{
WiFiClient client;
const int httpPort = 80;
if (!client.connect(host, httpPort))
{
Serial.println("connection failed");
return;
}
String url;
url = "/led_status.php?id=1";
//Serial.print("Requesting URL: ");
//Serial.println(url);
client.print(String("GET ") + url + " HTTP/1.1\r\n" +
"Host: " + host + "\r\n" +
"Connection: close\r\n\r\n");
unsigned long timeout = millis();
while (client.available() == 0)
{
if (millis() - timeout > 5000)
{
Serial.println(">>> Client Timeout !");
client.stop();
return;
}
}
while (client.available())
{
String line = client.readStringUntil('\r');
// Serial.print(line);
String code = line.substring(12, 18);
String led = line.substring(21, 22);
int s = led.toInt();
if (code == "STATUS" && s == 1) digitalWrite(D1, HIGH);
if (code == "STATUS" && s == 2) digitalWrite(D1, LOW);
}
}
```