➢ Code Implementation for Iot based patient monitoring system

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Code:

```
//ESP8266 Based Patient Health Monitoring System

#include <ESP8266WebServer.h>

#include <Wire.h>

#include "MAX30100_PulseOximeter.h"

#include <OneWire.h>

#include <DallasTemperature.h>

#include "DHT.h"



#define DHTTYPE DHT22

#define DHTPIN 14 //D5 pin= GPIO pin 14

#define DS18B20 2 //D4 pin= GPIO pin 2

#define REPORTING_PERIOD_MS     1000


float temperature, humidity, BPM, SpO2, bodytemperature;


/*Put your SSID & Password*/

const char* ssid = "Alsan Air WiFi 1";  // Enter SSID here

const char* password = "";  //Enter Password here


DHT dht(DHTPIN, DHTTYPE);; //--> Initialize DHT sensor, DHT dht(Pin_used, Type_of_DHT_Sensor);

PulseOximeter pox;

uint32_t tsLastReport = 0;

OneWire oneWire(DS18B20);
```

```
DallasTemperature sensors(&oneWire);


ESP8266WebServer server(80);


void setup() {
  Serial.begin(115200);
  pinMode(16, OUTPUT);
  delay(100);
  Serial.println(F("DHTxx test!"));
  dht.begin();
  Serial.println("Connecting to ");
  Serial.println(ssid);


  //connect to your local wi-fi network
  WiFi.begin(ssid, password);


  //check wi-fi is connected to wi-fi network
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected..!");
  Serial.print("Got IP: ");  Serial.println(WiFi.localIP());


  server.on("/", handle_OnConnect);
  server.onNotFound(handle_NotFound);


  server.begin();
  Serial.println("HTTP server started");
```

```
  Serial.print("Initializing pulse oximeter..");


  if (!pox.begin()) {
    Serial.println("FAILED");
    for (;;);
  } else {
    Serial.println("SUCCESS");
  }


}
void loop() {
  server.handleClient();
  pox.update();
  sensors.requestTemperatures();
  if (millis() - tsLastReport > REPORTING_PERIOD_MS) {
    float t = dht.readTemperature();
    String Temperature_Value = String(t);
    float h = dht.readHumidity();
    String Humidity_Value = String(h);
    bodytemperature = sensors.getTempCByIndex(0);


    temperature = t;
    humidity = h;
    BPM = pox.getHeartRate();
    SpO2 = pox.getSpO2();



    Serial.print("Room Temperature: ");
    Serial.print(t);
```

```
    Serial.println("°C");


    Serial.print("Room Humidity: ");
    Serial.print(h);
    Serial.println("%");


    Serial.print("BPM: ");
    Serial.println(BPM);


    Serial.print("SpO2: ");
    Serial.print(SpO2);
    Serial.println("%");


    Serial.print("Body Temperature: ");
    Serial.print(bodytemperature);
    Serial.println("°C");


    Serial.println("********************************");
    Serial.println();
    tsLastReport = millis();
  }



}


void handle_OnConnect() {


  server.send(200, "text/html", SendHTML(temperature, humidity, BPM, SpO2, bodytemperature));
}
```

```
void handle_NotFound() {

  server.send(404, "text/plain", "Not found");

}



String SendHTML(float temperature, float humidity, float BPM, float SpO2, float bodytemperature)
{

String html = "<!DOCTYPE html>";

html += "<html>";

html += "<head>";

html += "<title>Patient Health Monitoring</title>";

html += "<meta name='viewport' content='width=device-width, initial-scale=1.0'>";

html += "<link rel='stylesheet' href='https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/5.7.2/css/all.min.css'>";

html += "<link rel='stylesheet' type='text/css' href='styles.css'>";

html += "<style>";

html += "body { background-color: #fff; font-family: sans-serif; color: #333333; font: 14px
Helvetica, sans-serif box-sizing: border-box;}";

html += "#page { margin: 20px; background-color: #fff;}";

html += ".container { height: inherit; padding-bottom: 20px;}";

html += ".header { padding: 20px;}";

html += ".header h1 { padding-bottom: 0.3em; color: #008080; font-size: 45px; font-weight: bold;
font-family: Garmond, 'sans-serif'; text-align: center;}";

html += "h2 { padding-bottom: 0.2em; border-bottom: 1px solid #eee; margin: 2px; text-align:
left;}";

html += ".header h3 { font-weight: bold; font-family: Arial, 'sans-serif'; font-size: 17px;
color: #b6b6b6; text-align: center;}";

html += ".box-full { padding: 20px; border 1px solid #ddd; border-radius: 1em 1em 1em 1em; box-
shadow: 1px 7px 7px 1px rgba(0,0,0,0.4); background: #fff; margin: 20px; width: 300px;}";

html += "@media (max-width: 494px) { #page { width: inherit; margin: 5px auto; } #content {
padding: 1px;} .box-full { margin: 8px 8px 12px 8px; padding: 10px; width: inherit;; float: none;
} }";

html += "@media (min-width: 494px) and (max-width: 980px) { #page { width: 465px; margin 0 auto;
} .box-full { width: 380px; } }";

html += "@media (min-width: 980px) { #page { width: 930px; margin: auto; } }";

html += ".sensor { margin: 12px 0px; font-size: 2.5rem;}";

html += ".sensor-labels { font-size: 1rem; vertical-align: middle; padding-bottom: 15px;}";
```

```
html += ".units { font-size: 1.2rem;}";

html += "hr { height: 1px; color: #eee; background-color: #eee; border: none;}";

html += "</style>";


//Ajax Code Start

  html += "<script>\n";

  html += "setInterval(loadDoc,1000);\n";

  html += "function loadDoc() {\n";

  html += "var xhttp = new XMLHttpRequest();\n";

  html += "xhttp.onreadystatechange = function() {\n";

  html += "if (this.readyState == 4 && this.status == 200) {\n";

  html += "document.body.innerHTML =this.responseText}\n";

  html += "};\n";

  html += "xhttp.open(\"GET\", \"/\", true);\n";

  html += "xhttp.send();\n";

  html += "}\n";

  html += "</script>\n";

  //Ajax Code END


html += "</head>";

html += "<body>";

html += "<div id='page'>";

html += "<div class='header'>";

html += "<h1>Health Monitoring System</h1>";

html += "<h3><a href='https://theiotprojects.com'>https://theiotprojects.com</a></h3>";

html += "</div>";

html += "<div id='content' align='center'>";

html += "<div class='box-full' align='left'>";

html += "<h2>Sensors Readings</h2>";

html += "<div class='sensors-container'>";
```

```
//For Temperature
html += "<div class='sensors'>";
html += "<p class='sensor'>";
html += "<i class='fas fa-thermometer-half' style='color:#0275d8'></i>";
html += "<span class='sensor-labels'> Room Temperature </span>";
html += (int)temperature;
html += "<sup class='units'>°C</sup>";
html += "</p>";
html += "<hr>";
html += "</div>";

//For Humidity
html += "<div class='sensors'>";
html += "<p class='sensor'>";
html += "<i class='fas fa-tint' style='color:#5bc0de'></i>";
html += "<span class='sensor-labels'> Room Humidity </span>";
html += (int)humidity;
html += "<sup class='units'>%</sup>";
html += "</p>";
html += "<hr>";

//For Heart Rate
html += "<p class='sensor'>";
html += "<i class='fas fa-heartbeat' style='color:#cc3300'></i>";
html += "<span class='sensor-labels'> Heart Rate </span>";
html += (int)BPM;
html += "<sup class='units'>BPM</sup>";
html += "</p>";
html += "<hr>";
```

```
//For Sp02

html += "<p class='sensor'>";

html += "<i class='fas fa-burn' style='color:#f7347a'></i>";

html += "<span class='sensor-labels'> Sp02 </span>";

html += (int)SpO2;

html += "<sup class='units'>%</sup>";

html += "</p>";

html += "<hr>";



//For Body Temperature

html += "<p class='sensor'>";

html += "<i class='fas fa-thermometer-full' style='color:#d9534f'></i>";

html += "<span class='sensor-labels'> Body Temperature </span>";

html += (int)bodytemperature;

html += "<sup class='units'>°C</sup>";

html += "</p>";

html += "</div>";

html += "</div>";

html += "</div>";

html += "</div>";

html += "</div>";

html += "</body>";

html += "</html>";

return html;

}
```