ENVIRONMENTAL MONITORING
PHASE -05

OBJECTIVES:

Creating a environmental monitoring system framework uses sensors for encompassing area moistness and temperature. these information could be used to animate transient conduct like gadget becoming hot or getting cool down and other long haul insight of the gadgets.

The device’s design emphasizes energy efficiency, utilizing low-power components and sleep modes to prolong battery life.

SOURCE CODE :

```
#include <JSONVar.h>
#include <Arduino_JSON.h>
#include <JSON.h>
#include <Wire.h>
#include "Adafruit_SGP30.h"
#include "MutichannelGasSensor.h"
#include <ESP8266WiFi.h>
#include <SoftwareSerial.h>
#include "SdsDustSensor.h"
#include "ThingSpeak.h"
#include <Arduino.h>
#include "sensirion_common.h"
#include <Adafruit_Sensor.h>
```

```
#include "DHT.h"
// Use this file to store all of the private credentials
// and connection details
#define SECRET_CH_ID1 864649 // replace 0000000 with your channel
number
#define SECRET_WRITE_APIKEY1 "D6WO0I37GORJEIV9" // replace
XYZ with your channel write API Key
#define SECRET_CH_ID2 864650 // replace 0000000 with your channel
number
#define SECRET_WRITE_APIKEY2 "DDEGP9X1V4WEGEFH" //
replace XYZ with your channel write API Key
#define SECRET_CH_ID3 864651 // replace 0000000 with your channel
number
#define SECRET_WRITE_APIKEY3 "MC5M1BZI4U9422XF" // replace
XYZ with your channel write API Key
#define SECRET_CH_ID4 864652 // replace 0000000 with your channel
number
#define SECRET_WRITE_APIKEY4 "1T9T3FK7NR422DJP" // replace
XYZ with your channel write API Key
//#define SECRET_CH_ID1 906528 // replace 0000000 with your
channel number
//#define SECRET_WRITE_APIKEY1 "LL4J2EL6WCIW3SKD" //
replace XYZ with your channel write API Key
//
//#define SECRET_CH_ID2 907653 // replace 0000000 with your
channel number
```

```
//#define SECRET_WRITE_APIKEY2 "JIT20STHHFLPYTBD" // replace
XYZ with your channel write API Key
//
//#define SECRET_CH_ID3 907654 // replace 0000000 with your
channel number
//#define SECRET_WRITE_APIKEY3 "XSP8H1C1CD9VDQ2K" //
replace XYZ with your channel write API Key
//
//#define SECRET_CH_ID4 907655 // replace 0000000 with your
channel number
//#define SECRET_WRITE_APIKEY4 "Z5HI2QGCMDXMTGQ0" //
replace XYZ with your channel write API Key
int rxPin = 14;
int txPin = 15;
SdsDustSensor sds(rxPin, txPin);
uint32_t delayMS;
int x;
// ###################### Update the Wifi SSID, Password and IP adress
of the server ##########
// WIFI params
char* WIFI_SSID = "JioFi_20FDE31";
char* WIFI_PSWD = "n5v406hr5d";
//char* WIFI_SSID = "WPS unavailable";
//char* WIFI_PSWD = "no game no life";
String CSE_IP = "onem2m.iiit.ac.in";
// ########################################################
```

```
int WIFI_DELAY = 100; //ms
// oneM2M : CSE params
int CSE_HTTP_PORT = 80;
String CSE_NAME = "in-name";
String CSE_M2M_ORIGIN = "admin:admin";
// oneM2M : resources' params
String DESC_CNT_NAME = "DESCRIPTOR";
String DATA_CNT_NAME = "DATA";
String CMND_CNT_NAME = "COMMAND";
int TY_AE = 2;
int TY_CNT = 3;
int TY_CI = 4;
int TY_SUB = 23;
// HTTP constants
int LOCAL_PORT = 9999;
char* HTTP_CREATED = "HTTP/1.1 201 Created";
char* HTTP_OK = "HTTP/1.1 200 OK\r\n";
int REQUEST_TIME_OUT = 5000; //ms
//MISC
//int LED_PIN = D1;/
int SERIAL_SPEED = 9600;
#define DEBUG
////////////////////////////////////////
//sensor variables
#define DHTPIN 0 // Digital pin connected to the DHT sensor
#define DHTTYPE DHT22 // DHT 22 (AM2302), AM2321
```

```
DHT dht(DHTPIN, DHTTYPE);
float dht_val[2];
Adafruit_SGP30 sgp;
////////////////////////////////////////
// Global variables
WiFiServer server(LOCAL_PORT); // HTTP Server (over WiFi). Binded
to listen on LOCAL_PORT contant
WiFiClient client;
String context = "";
String command = ""; // The received command
unsigned long myChannelNumber1 = SECRET_CH_ID1;
const char * myWriteAPIKey1 = SECRET_WRITE_APIKEY1;
unsigned long myChannelNumber2 = SECRET_CH_ID2;
const char * myWriteAPIKey2 = SECRET_WRITE_APIKEY2;
unsigned long myChannelNumber3 = SECRET_CH_ID3;
const char * myWriteAPIKey3 = SECRET_WRITE_APIKEY3;
unsigned long myChannelNumber4 = SECRET_CH_ID4;
const char * myWriteAPIKey4 = SECRET_WRITE_APIKEY4;
String myStatus = "";
// Method for creating an HTTP POST with preconfigured oneM2M headers
// param : url --> the url path of the targted oneM2M resource on the remote
CSE
// param : ty --> content-type being sent over this POST request (2 for ae, 3
for cnt, etc.)
// param : rep --> the representaton of the resource in JSON format
String doPOST(String url, int ty, String rep) {
```

```
String postRequest = String() + "POST " + url + " HTTP/1.1\r\n" +
"Host: " + CSE_IP + ":" + CSE_HTTP_PORT + "\r\n" +
"X-M2M-Origin: " + CSE_M2M_ORIGIN + "\r\n" +
"Content-Type: application/json;ty=" + ty + "\r\n" +
"Content-Length: " + rep.length() + "\r\n"
"Connection: close\r\n\n" +
rep;
// Connect to the CSE address
Serial.println("connecting to " + CSE_IP + ":" + CSE_HTTP_PORT + "
...");
// Get a client
WiFiClient client;
if (!client.connect(CSE_IP, CSE_HTTP_PORT)) {
Serial.println("Connection failed !");
return "error";
}
// if connection succeeds, we show the request to be send
#ifdef DEBUG
Serial.println(postRequest);
#endif
// Send the HTTP POST request
client.print(postRequest);
// Manage a timeout
unsigned long startTime = millis();
while (client.available() == 0) {
if (millis() - startTime > REQUEST_TIME_OUT) {
```

```
Serial.println("Client Timeout");
client.stop();
return "error";
}
}
// If success, Read the HTTP response
String result = "";
if (client.available()) {
result = client.readStringUntil('\r');
// Serial.println(result);
}
while (client.available()) {
String line = client.readStringUntil('\r');
Serial.print(line);
}
Serial.println();
Serial.println("closing connection...");
return result;
}
// Method for creating an ApplicationEntity(AE) resource on the remote CSE
(this is done by sending a POST request)
// param : ae --> the AE name (should be unique under the remote CSE)
String createAE(String ae) {
String aeRepresentation =
"{\"m2m:ae\": {"
"\"rn\":\"" + ae + "\","
```

```
 "\"api\":\"org.demo." + ae + "\","
 "\"rr\":\"true\","
 "\"poa\":[\"http://" + WiFi.localIP().toString() + ":" + LOCAL_PORT +
"/" + ae + "\"]"
 "}}";
#ifdef DEBUG
 Serial.println(aeRepresentation);
#endif
 return doPOST("/" + CSE_NAME, TY_AE, aeRepresentation);
}
// Method for creating an Container(CNT) resource on the remote CSE under
a specific AE (this is done by sending a POST request)
// param : ae --> the targeted AE name (should be unique under the remote
CSE)
// param : cnt --> the CNT name to be created under this AE (should be
unique under this AE)
String createCNT(String ae, String cnt) {
 String cntRepresentation =
 "{\"m2m:cnt\": {"
 "\"rn\":\"" + cnt + "\","
 "\"min\":\"" + -1 + "\""
 "}}";
 return doPOST("/" + CSE_NAME + "/" + ae, TY_CNT,
cntRepresentation);
}
// Method for creating an ContentInstance(CI) resource on the remote CSE
```

```
under a specific CNT (this is done by sending a POST request)
// param : ae --> the targted AE name (should be unique under the remote
CSE)
// param : cnt --> the targeted CNT name (should be unique under this AE)
// param : ciContent --> the CI content (not the name, we don't give a name
for ContentInstances)
String createCI(String ae, String cnt, String ciContent) {
 String ciRepresentation =
 "{\"m2m:cin\": {"
 "\"con\":\"" + ciContent + "\""
 "}}";
 return doPOST("/" + CSE_NAME + "/" + ae + "/" + cnt, TY_CI,
ciRepresentation);
}
// Method for creating an Subscription (SUB) resource on the remote CSE
(this is done by sending a POST request)
// param : ae --> The AE name under which the SUB will be created .(should
be unique under the remote CSE)
// The SUB resource will be created under the COMMAND container
more precisely.
String createSUB(String ae) {
 String subRepresentation =
 "{\"m2m:sub\": {"
 "\"rn\":\"SUB_" + ae + "\","
 "\"nu\":[\"" + CSE_NAME + "/" + ae + "\"], "
 "\"nct\":1"
```

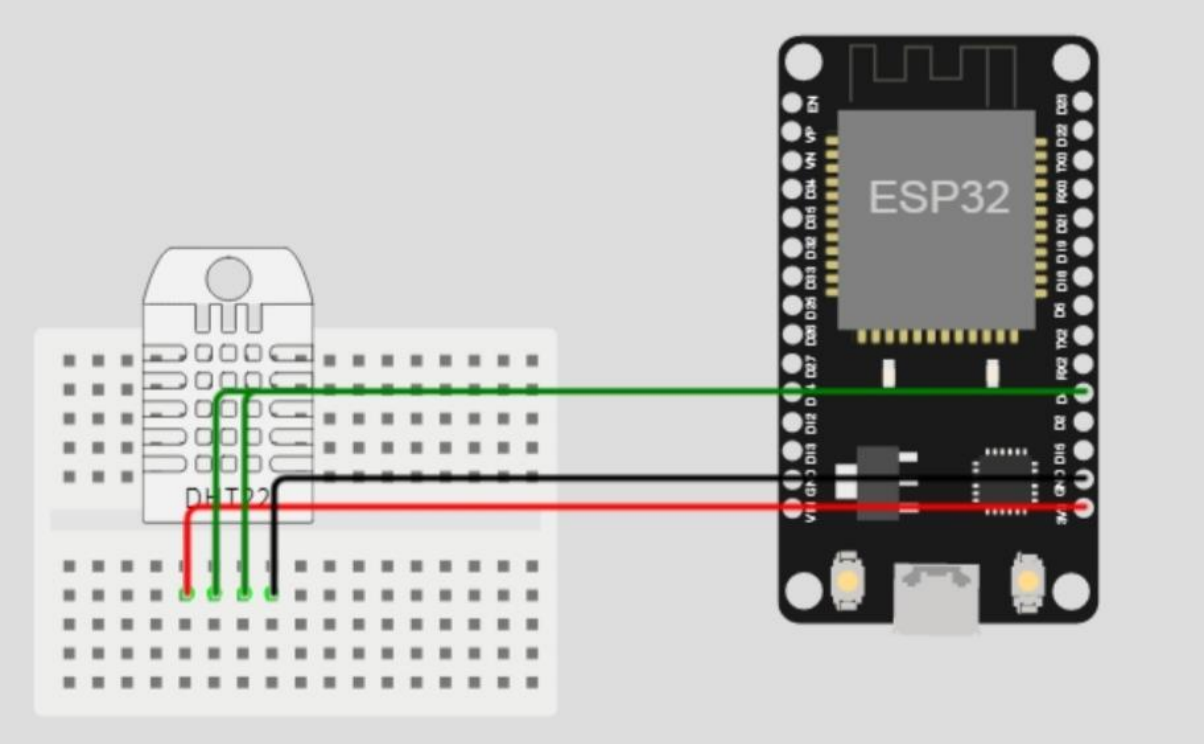
```
 "}}";
 return doPOST("/" + CSE_NAME + "/" + ae + "/" + CMND_CNT_NAME,
TY_SUB, subRepresentation);
}
// Method to register a module (i.e. sensor or actuator) on a remote oneM2M
CSE
void registerModule(String module, bool isActuator, String
intialDescription, String initialData) {
 if (WiFi.status() == WL_CONNECTED) {
 String result;
 // 1. Create the ApplicationEntity (AE) for this sensor
 result = createAE(module);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("AE " + module + " created !");
#endif
 // 2. Create a first container (CNT) to store the description(s) of the
sensor
 result = createCNT(module, DESC_CNT_NAME);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("CNT " + module + "/" + DESC_CNT_NAME + "
created !");
#endif
 // Create a first description under this container in the form of a
ContentInstance (CI)
```

```
 result = createCI(module, DESC_CNT_NAME, intialDescription);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("CI " + module + "/" + DESC_CNT_NAME +
"/{initial_description} created !");
#endif
 }
 }
 // 3. Create a second container (CNT) to store the data of the sensor
 result = createCNT(module, DATA_CNT_NAME);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("CNT " + module + "/" + DATA_CNT_NAME + "
created !");
#endif
 // Create a first data value under this container in the form of a
ContentInstance (CI)
 result = createCI(module, DATA_CNT_NAME, initialData);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("CI " + module + "/" + DATA_CNT_NAME +
"/{initial_aata} created !");
#endif
 }
 }
 // 3. if the module is an actuator, create a third container (CNT) to store
```

```
the received commands
 if (isActuator) {
 result = createCNT(module, CMND_CNT_NAME);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("CNT " + module + "/" + CMND_CNT_NAME + "
created !");
#endif
 // subscribe to any ne command put in this container
 result = createSUB(module);
 if (result == HTTP_CREATED) {
#ifdef DEBUG
 Serial.println("SUB " + module + "/" + CMND_CNT_NAME +
"/SUB_" + module + " created !");
#endif
 }
 }
 }
 }
 }
}
void init_WiFi() {
 Serial.println("Connecting to " + String(WIFI_SSID) + " ...");
 WiFi.persistent(false);
 WiFi.begin(WIFI_SSID, WIFI_PSWD);
 // wait until the device is connected to the wifi network
```

```
 while (WiFi.status() != WL_CONNECTED) {
 delay(WIFI_DELAY);
 Serial.print(".");
 }
 // Connected, show the obtained ip address
 Serial.println("WiFi Connected ==> IP Address = " +
WiFi.localIP().toString());
}
void init_HTTPServer() {
 server.begin();
 Serial.println("Local HTTP Server started !");
}
void task_HTTPServer() {
 // Check if a client is connected
 client = server.available();
 if (!client)
 return;
 // Wait until the client sends some data
 Serial.println("New client connected. Receiving request... ");
 while (!client.available()) {
#ifdef DEBUG_MODE
 Serial.print(".");
#endif
 delay(5);
 }
```

SOURCE CODE DIAGRAM :



OUTPUT:

(POWERON_RESET), boot: 0x13 (SPI_FAST_FLASH_BOOT)

configsip: 0, SPIWP:0xee

clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00

mode:DIO, clock div:2

load:0x3fff0030,len:4728

load:0x40078000,len:14876

ho 0 tail 12 room 4

load:0x40080400,len:3368

entry 0x400805cc

Connecting to

WiFi.....

.....

.....

..... Connected!

Connecting to MQTT server... Connected!

Measuring weather conditions... Updated!

Reporting to MQTT topic wokwi-weather: {"humidity": 40.0, "temp": 24.0}

Measuring weather conditions... No change

Measuring weather conditions... No change

Measuring weather conditions... No change

Measuring weather conditions... No change

Measuring weather conditions... No change

Measuring weather conditions... Updated!

Reporting to MQTT topic wokwi-weather: {"humidity": 80.5, "temp": 48.8}

Measuring weather conditions... Updated!

Reporting to MQTT topic wokwi-weather: {"humidity": 80.5, "temp": -13.8}

Traceback (most recent call last):

File "main.py", line 62, in <module>

File "umqtt/simple.py", line 134, in publish

OSError: [Errno 104] ECONNRESET

MicroPython v1.21.0 on 2023-10-05; Generic ESP32 module with ESP32

Type "help ()" for more information