Prática 03:
Programando ESP32 para Comunicação MQTT

Disciplina: **Introdução à Internet das Coisas - IMD0902**

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Aula:

Prática 03: Programando ESP32 para Comunicação MQTT

Tópicos

- Experimento 01: Conexão com a rede WiFi
- Conhecer o broker HiveMQ
- Experimento 02: Publicar no broker público MQTT Hivemq
- Experimento 03: Assinar tópico no broker público MQTT Hivemq

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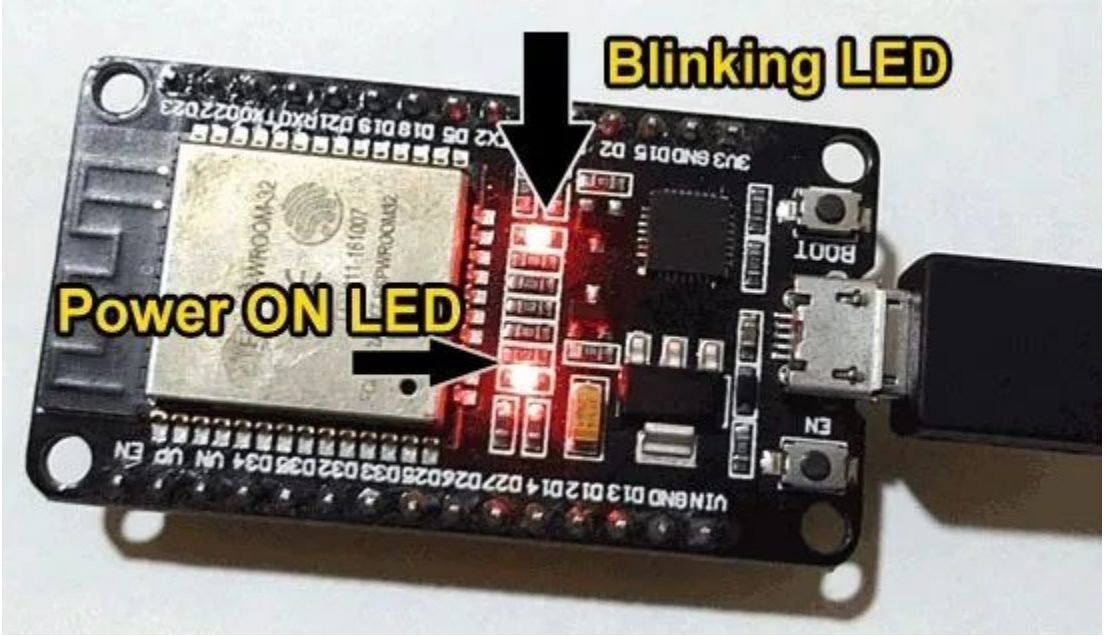
Experimento da Prática 01

- Objetivo: Acionar um LED a partir do pino GPIO2 do ESP32.



Experimento 01: Conexão com a rede WiFi

- Objetivo: Conectar o ESP32 à rede WiFi
- Requisitos funcionais:
  - Configurar o ESP32 para acessar a rede aberta “UFRN”;
  - Usar as bibliotecas:
    - WiFi.h : https://www.arduino.cc/reference/en/libraries/wifi/

```
#include <WiFi.h>
```

    - Comandos:

```
WiFi.mode()
WiFi.begin()
```

Experimento 01: Conexão com a rede WiFi

WiFi - WiFi.begin()

Description

Initializes the WiFi library's network settings and provides the current status.

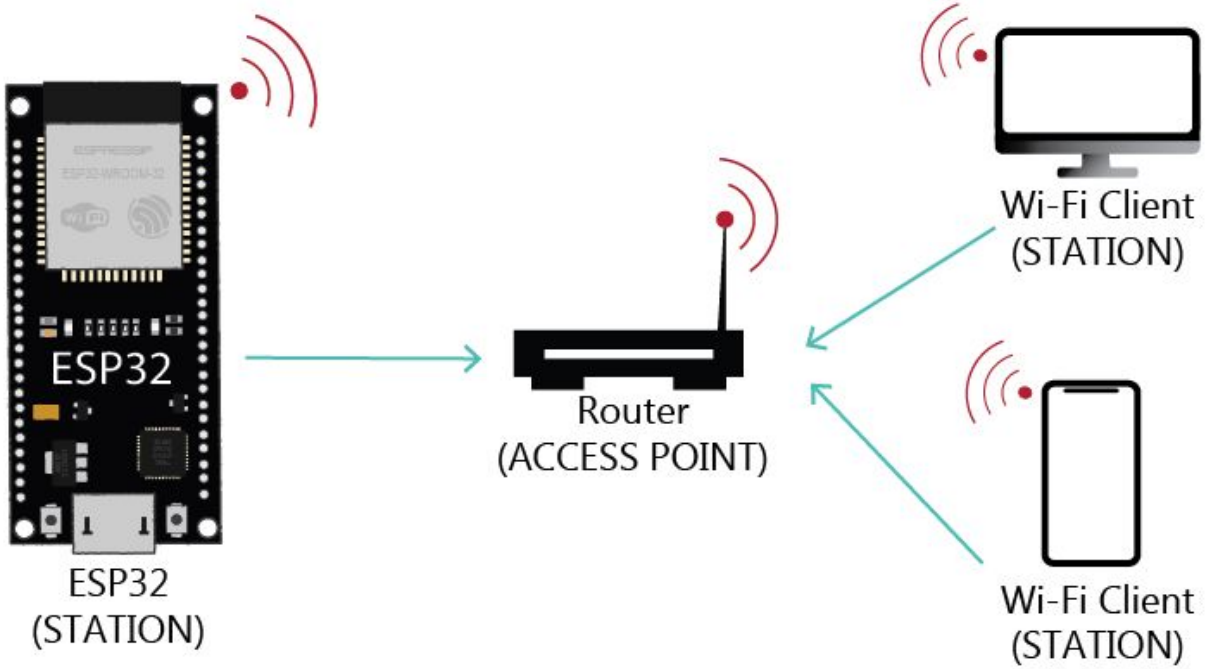
Syntax

```
WiFi.begin();
WiFi.begin(ssid);
WiFi.begin(ssid, pass);
```

`WiFi.mode(WIFI_STA)`	station mode: the ESP32 connects to an access point
`WiFi.mode(WIFI_AP)`	access point mode: stations can connect to the ESP32
`WiFi.mode(WIFI_STA_AP)`	access point and a station connected to another access point

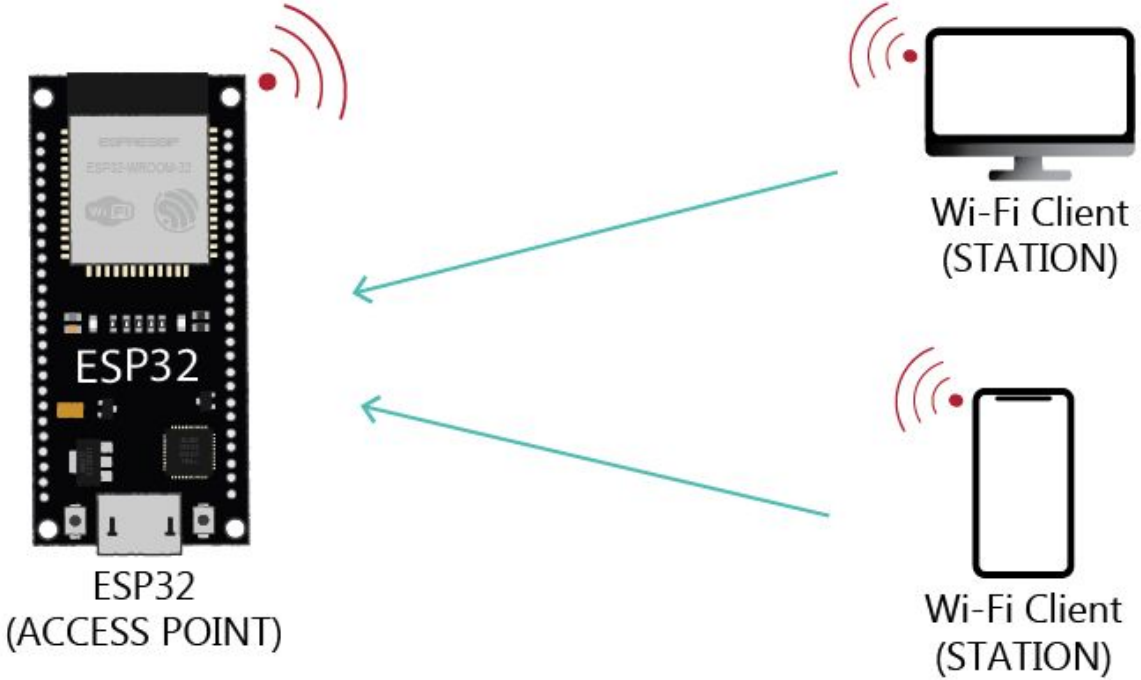
Experimento 01: Conexão com a rede WiFi

`WiFi.mode(WIFI_STA)`	station mode: the ESP32 connects to an access point



Experimento 01: Conexão com a rede WiFi

`WiFi.mode(WIFI_AP)`	access point mode: stations can connect to the ESP32



Experimento 01: Conexão com a rede WiFi

```
#include <WiFi.h>

const char* wifi_ssid = "UFRN";
const char* wifi_password = "";
int wifi_timeout = 200000;
```

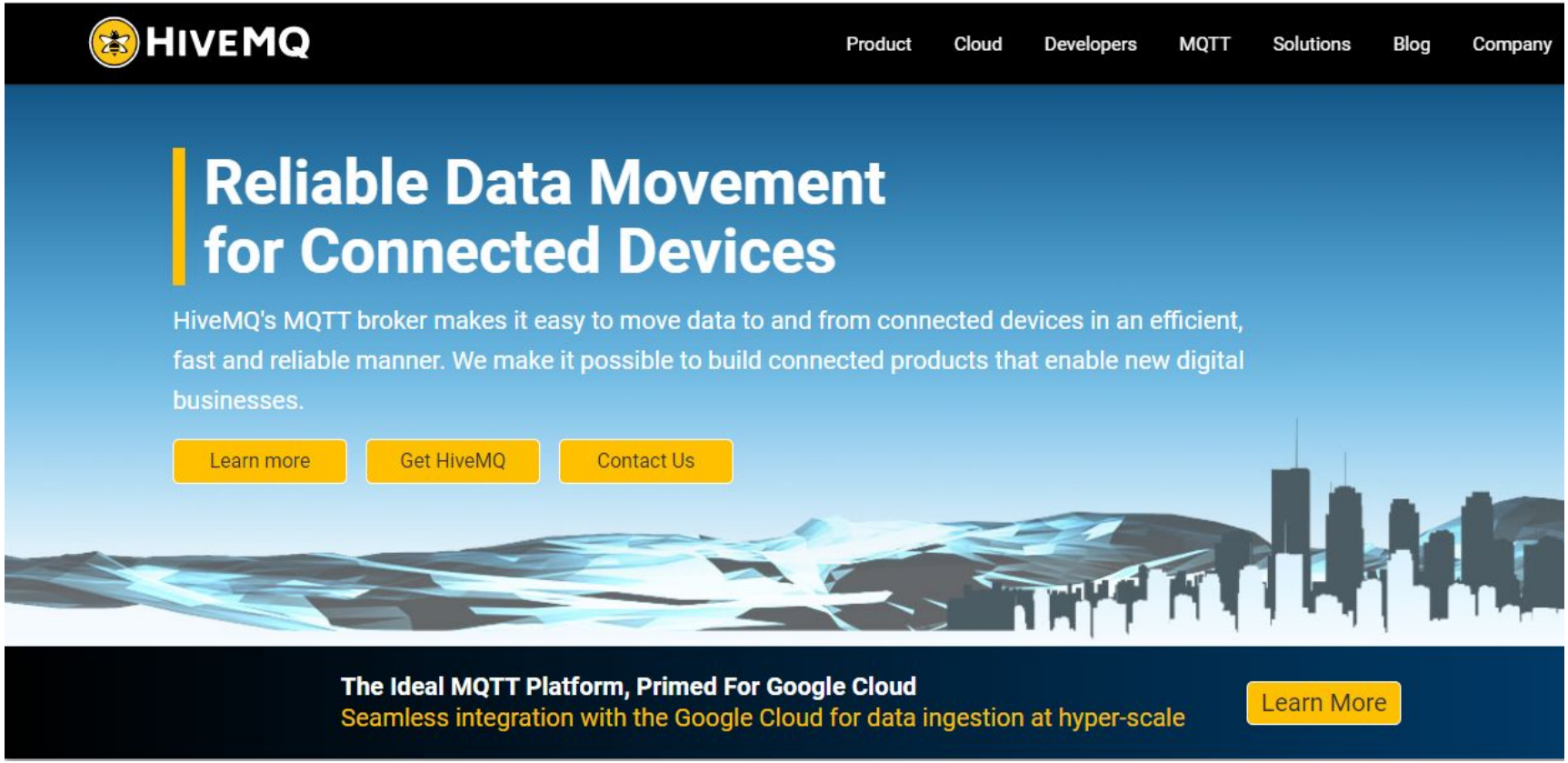
```
void conecteWiFi(){
  WiFi.mode(WIFI_STA); //"station mode": permite o ESP32 ser um cliente da rede WiFi
  WiFi.begin(wifi_ssid, wifi_password);
  Serial.print("Conectando à rede WiFi .. ");

  unsigned long startTime = millis();

  while(WiFi.status() != WL_CONNECTED && (millis() - startTime < wifi_timeout)){
    Serial.print(".");
    delay(100);
  }
  Serial.println();

  if(WiFi.status() != WL_CONNECTED){
    Serial.println("Falhou!");
  } else{
    Serial.print("Conectado com o IP: ");
    Serial.println(WiFi.localIP());
  }
}
```

Experimento 02: Publicar no broker público MQTT Hivemq

- Objetivo: Conectar-se ao broker público do Hivemq com o protocolo MQTT para publicar no tópico “/imd0902/pratica03/distancia”.

O que é o HiveMQ?

Experimento 02: Publicar no broker público MQTT Hivemq



Link: **https://www.hivemq.com/public-mqtt-broker/**

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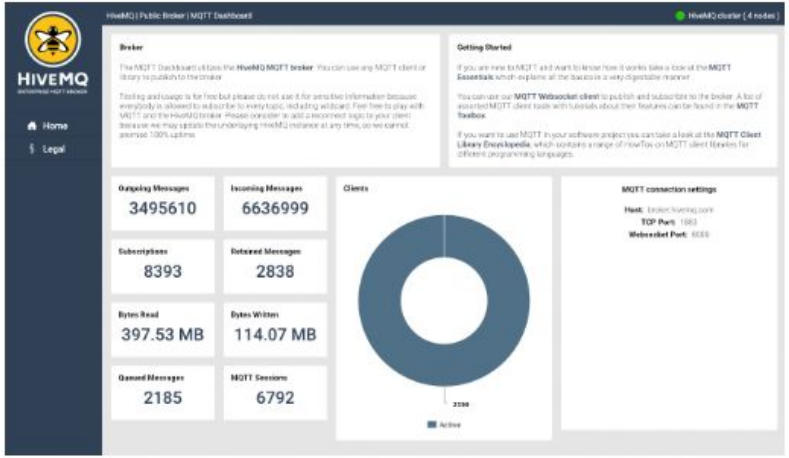
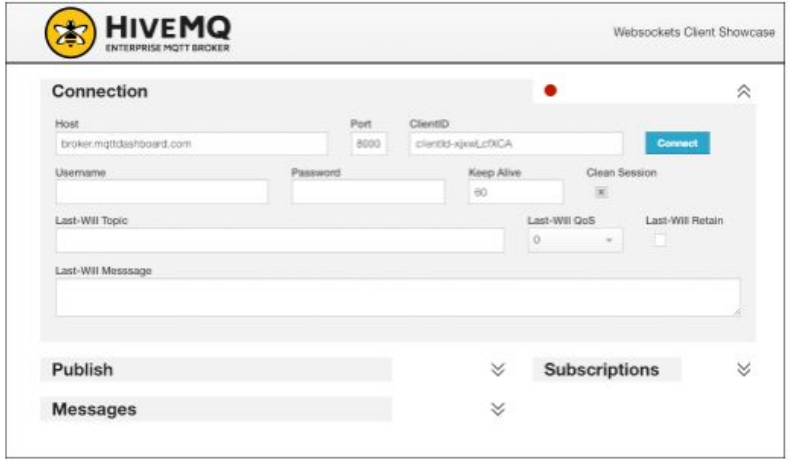
Public MQTT Broker



Our **Public HiveMQ MQTT broker** is open for anyone to use. Feel free to write an MQTT client that connects with this broker. We have a **dashboard** so you can see the amount of traffic on this broker. We also keep a list of **MQTT client libraries** that can be used to connect to HiveMQ.

You can access the MQTT broker securely at:

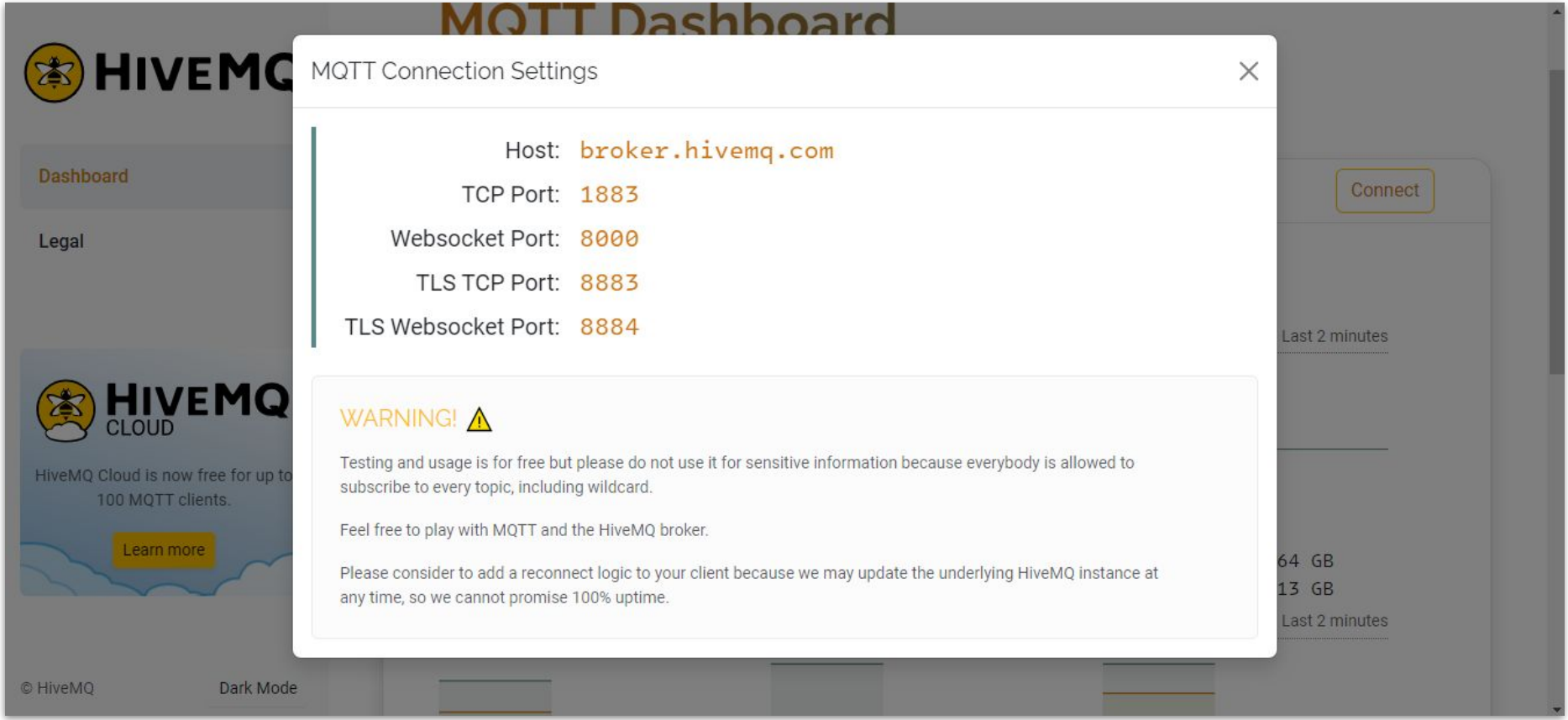
MQTT Browser Client



The HiveMQ MQTT Browser Client is an MQTT WebSocket client interface. Use any modern browser on any device as a full-fledged MQTT client and take full advantage of the MQTT protocol.

Try MQTT Browser Client

Experimento 02: Publicar no broker público MQTT Hivemq



MQTT Websocket Client

hivemq.com/demos/websocket-client/

HIVEMQ

Websockets Client Showcase

HIVEMQ CLOUD

Need a fully managed MQTT broker?
Get your own Cloud broker and connect up to 100 devices for free.

Get your free account

Connection

Host: mqtt-dashboard.com

Port: 8884

ClientID: clientId-2Q0SPJigc2

Connect

Username

Password

Keep Alive: 60

SSL

Clean Session

Last-Will Topic

Last-Will QoS: 0

Last-Will Retain

Last-Will Messsage

Publish

Subscriptions

Messages

MQTT Websocket Client

hivemq.com/demos/websocket-client/

HIVEMQ

Websockets Client Showcase

HIVEMQ CLOUD

Need a fully managed MQTT broker?
Get your own Cloud broker and connect up to 100 devices for free.

Get your free account

Connection

connected

Publish

Topic

testtopic/1

QoS

0

Retain

Publish

Message

Subscriptions

Add New Topic Subscription

Messages

Experimento HiveMQ:

Uso do Node-red para publicar e ler no broker do HiveMQ.

Experimento 02: Publicar no broker público MQTT Hivemq

- Objetivo: Conectar-se ao broker público do Hivemq com o protocolo MQTT para publicar no tópico “/imd0902/pratica03/variavel”

- Requisitos funcionais:

  - Configurar o ESP32 para acessar a rede aberta “UFRN”;
  - Abrir uma conexão com o broker na porta padrão 1883
    - Use o WiFiClient()
    - Endereço do broker: "broker.hivemq.com"
    - Porta MQTT do broker: 1883
  - Comunicar via MQTT com o broker
    - Use a biblioteca **PubSubClient.h**
  - Publicar no tópico

Experimento 02: Publicar no broker público MQTT Hivemq

Passos:

- Incluir bibliotecas;
- Definir objetos do WiFiClient e PubSubClient;
- Definir variáveis de credenciais da rede WiFi e do servidor broker MQTT;

sketch_pratica03_esp32-mqtt-hivemq1883-publish §

```
#include <WiFi.h>
#include <WiFiClient.h>
#include <PubSubClient.h>

WiFiClient ESPWiFiClient;
PubSubClient mqttClient(ESPWiFiClient);

const char* wifi_ssid = "UFRN";
const char* wifi_password = "";
int wifi_timeout = 100000;

const char* mqtt_broker = "broker.hivemq.com";
const int mqtt_port = 1883;
int mqtt_timeout = 10000;
```

Experimento 02: Publicar no broker público MQTT Hivemq

Passos: setup()

- Configurar Serial para debug do código;
- Configurar pino de saída do LED;
- Executar função de configurar WiFi;
- Configurar o servidor do broker.

```
void setup() {
  Serial.begin(115200);
  pinMode(led, OUTPUT);

  connectWiFi();
  if(WiFi.status() == WL_CONNECTED){
    Serial.println("Conectando ao broker MQTT ..");
    mqttClient.setServer(mqtt_broker, mqtt_port);
  }
}
```

Experimento 02: Publicar no broker público MQTT Hivemq

```
void connectWiFi(){
  WiFi.mode(WIFI_STA); //"station mode": permite o ESP32 ser um cliente da rede WiFi
  WiFi.begin(wifi_ssid, wifi_password);
  Serial.print("Conectando à rede WiFi .. ");

  unsigned long startTime = millis();
  while(WiFi.status() != WL_CONNECTED && (millis() - startTime < wifi_timeout)){
    Serial.print(".");
    delay(100);
  }
  Serial.println();

  if(WiFi.status() != WL_CONNECTED){
    Serial.println("Falhou!");
  } else{
    Serial.print("Conectado com o IP: ");
    Serial.println(WiFi.localIP());
  }
}
```

Experimento 02: Publicar no broker público MQTT Hivemq

```
void loop() {
  if (!mqtt_client.connected()){
    connectMQTT();
  }

  if (mqtt_client.connected()){
    mqtt_client.loop();

    variavel = random(1,100);

    mqtt_client.publish("/imd0902/pratica03/variavel", String(variavel).c_str(), true);
    delay(1000);
  }
}
```

Experimento 02: Publicar no broker público MQTT Hivemq

```
void connectMQTT() {
  Serial.print("Reconectando ao MQTT Broker..");

  unsigned long startTime = millis();
  while (!mqttClient.connected() && (millis() - startTime < mqtt_timeout)) {
      Serial.print(".");
      String clientId = "ESP32ClientHeitor-";
      clientId += String(random(0xffff), HEX);

      if (mqttClient.connect(clientId.c_str())) {
        Serial.println();
        Serial.print("Conectado ao broker MQTT!");
      }
      delay(100);
  }
  Serial.println();
}
```

Experimento 02: Publicar no broker público MQTT Hivemq

Implemente o código!

Dúvidas?

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