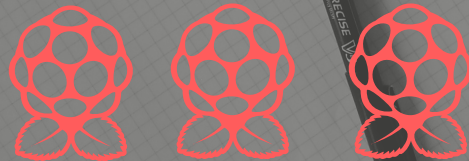


RASPBERRY PI: PROGRAMMING INTRODUCTION, THE VERY FIRST APP



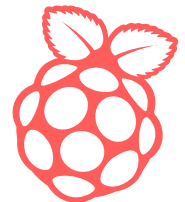
SEMINARIUM: IOT

RASPBERRY PI GET STARTED

- Understanding Raspberry Pi 3
- Features of Raspberry Pi 3
- Setting up Raspberry Pi 3

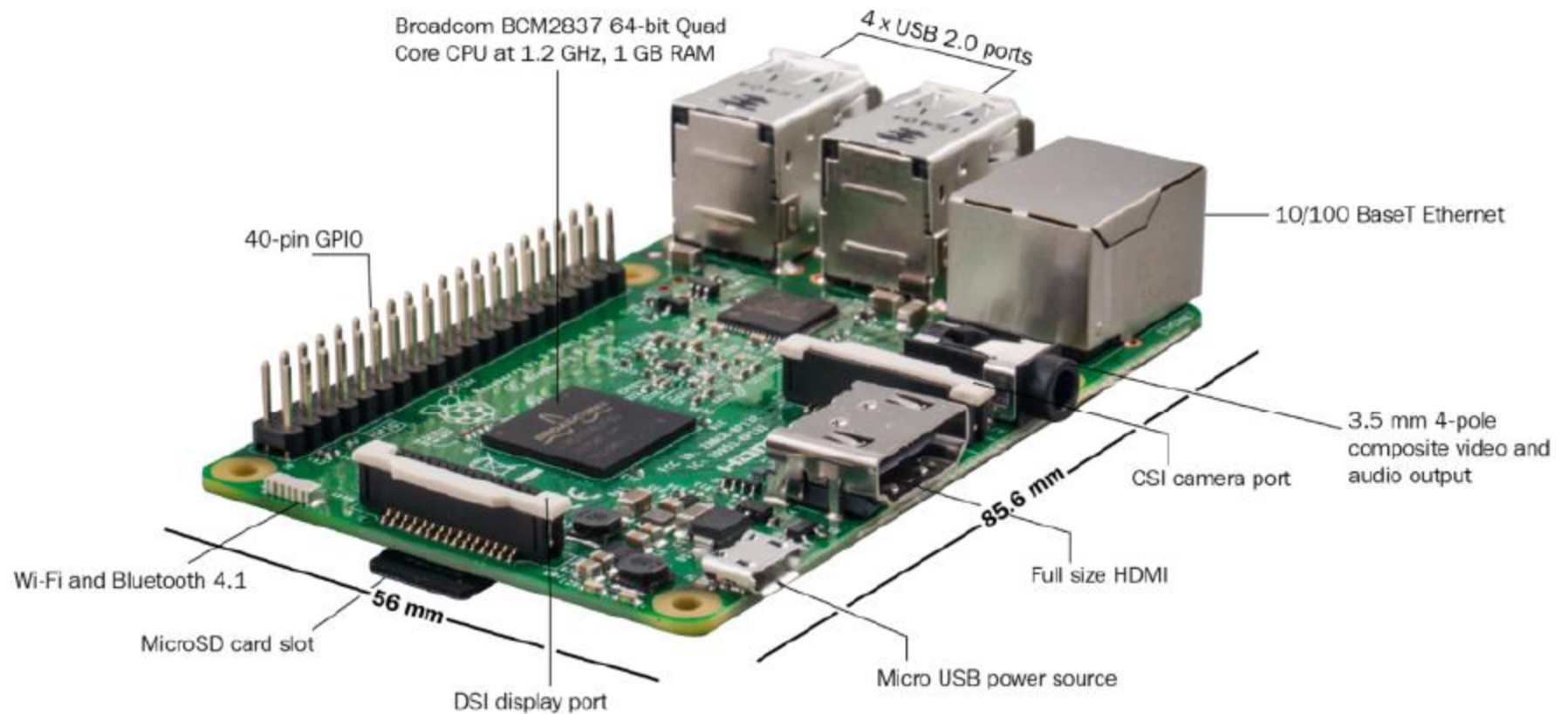
169173

Nokia's 3310 would weight the same as all of the Pis



SOURCE: WWW.WIRED.COM





















UNDERSTANDING RASPBERRY PI 3



UNDERSTANDING RASPBERRY PI 3

a miniature computer

Raspberry Pi is one of the most widely used boards for IoT projects due to its small size, general purpose input/output pins, Wi-Fi, and Bluetooth

Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1 , I ² C)		DC Power 5v	04
05	GPIO03 (SCL1 , I ² C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)		Ground	20
21	GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I ² C ID EEPROM)		(I ² C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40

IMPORTANT FEATURES OF RASPBERRY PI 3 MODEL B

- Power
- USB
- GPIO
- I2C
- UART
- SPI
- PWM

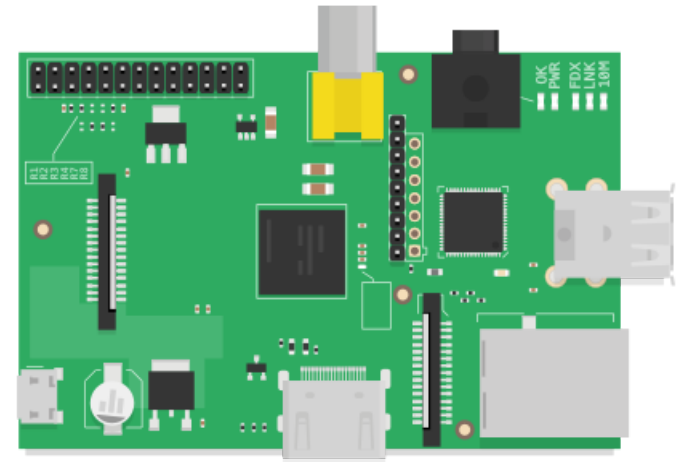


RPI MODEL B PORTS:

AUDIO/VIDEO | HDMI | CSI CAMERA | DSI DISPLAY | WIFI | BLUETOOTH | MEMORYCARD

SETTING UP RASPBERRY PI

- Connect RPI to 2.5A micro USB power adapter
- Install MicroSD card with at least 8GB
- Download the Raspbian Lite OS
- Write it to the SD card using a laptop/desktop
- Create an empty file with the name ssh without any extension
- Take out the SD card and insert it into Raspberry Pi



NOW, WE ARE GOOD TO GO FURTHER AND EXPLORE!

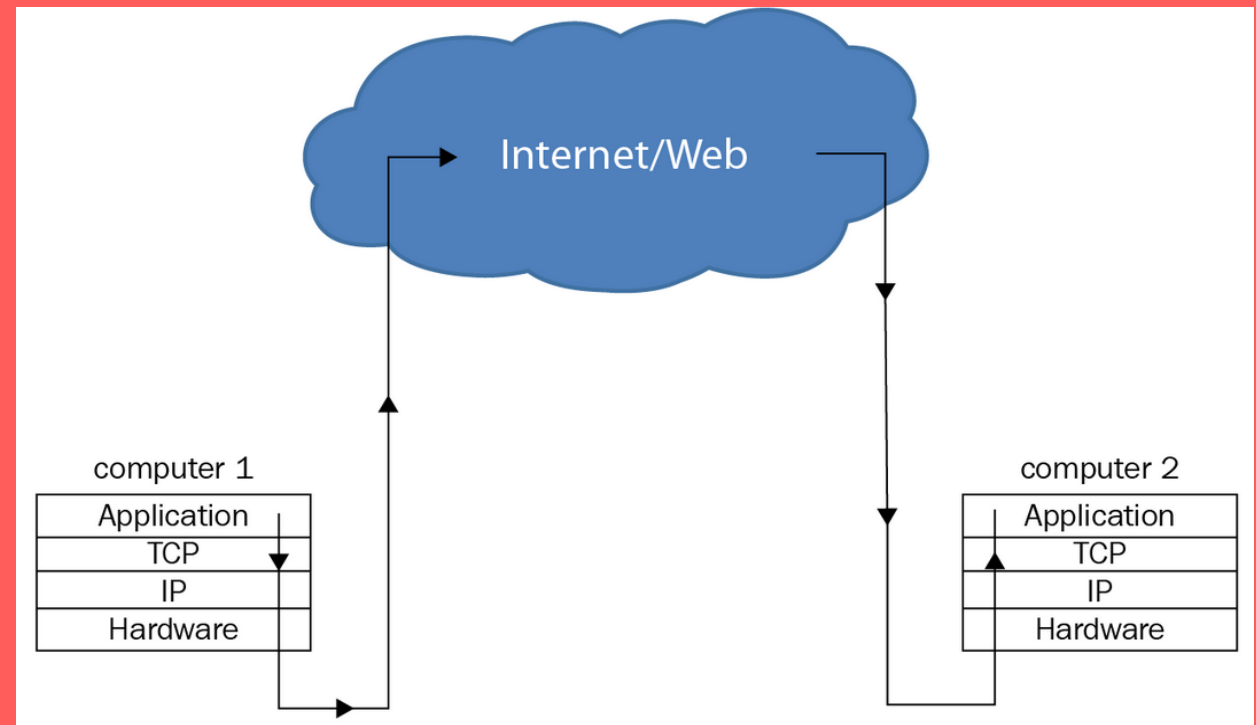
THE INTERNET TCP/IP

Transmission control protocol

Application Protocol

Internet protocol

Hardware



HOW THE INTERNET WORKS SINCE IT IS THE BACKBONE IN THE CONCEPT OF IOT

ADVANTAGES OF USING NODE.JS FOR IOT

Asynchronous and event-driven

Single threaded

No buffering

Open source

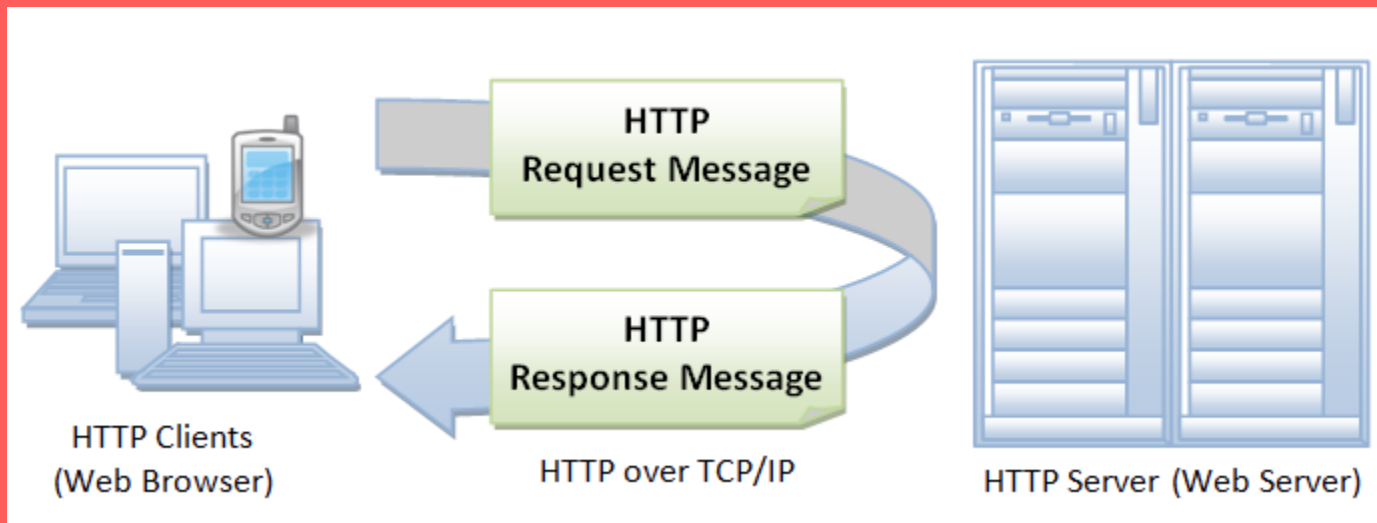
Fast



LET'S NOW UNDERSTAND THE DIFFERENT PROTOCOLS USED IN THE APPLICATION LAYER

HTTP

Hyper Text Transfer Protocol (HTTP)

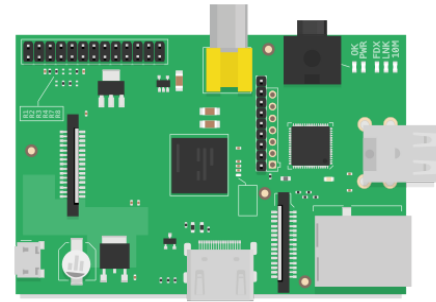


- The client sends a request to the server. A request consists of the HTTP version, HTTP method, URL, and arguments or the message body.
- The server receives and parses the request. Based on the port and path, it maps it to the correct resource and after performing the necessary computation, it prepares the response and sends it back to the client.

IMPLEMENTING HTTP

HTTP server (laptop)- `express.js`

HTTP client - `node-rest-client`



MQTT

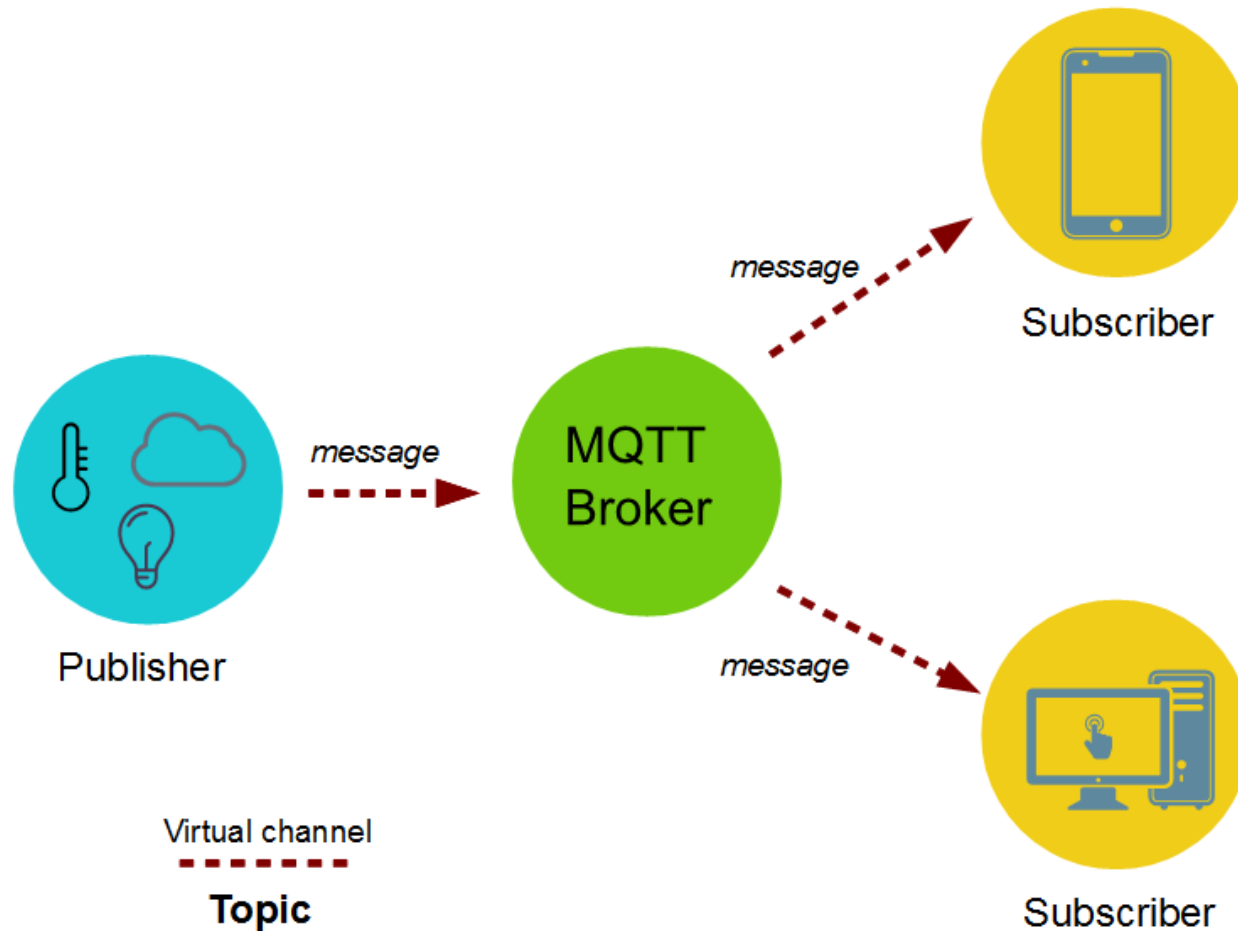
MESSAGE QUEUE TELEMETRY TRANSPORT

Developed by Dr. Andy Stanford Clark of IBM and Arlen Nipper of Arcom (now Eurotech) in 1999The server receives and parses the request.

- Minimizing the device's resource requirements
- Very high scalability
- Smaller code footprint
- Small network bandwidth consumption
- Ensures delivery of messages/signals

**MASSIVE NUMBERS OF CONSTRAINED DEVICES WITH LIMITED MEMORY,
NETWORK BANDWIDTH, AND LESS PROCESSING POWER.**

MQTT ARCHITECTURE



MQTT MESSAGE TYPES

Three types of message are mostly used:

- *CONNECT*: Used for clients to send connection requests to the broker
- *PUBLISH*: Used by the client/sender to publish messages to the broker
- *SUBSCRIBE*: Used by the client/receiver to receive messages from the broker

MQTT BROKERS



Mosquitto

HiveMQ



Apache ActiveMQ

RabbitMQ

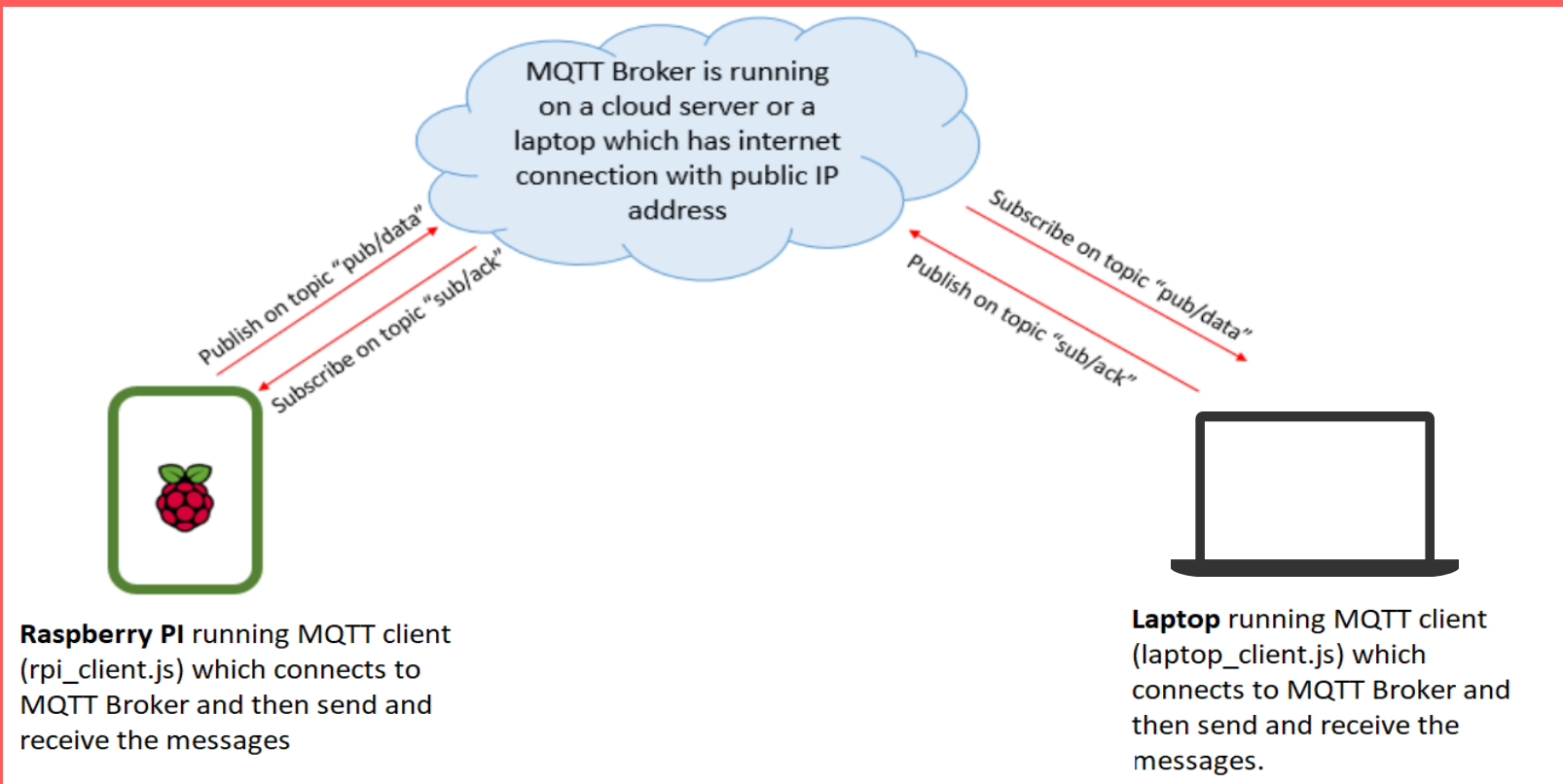


Erlang MQTT (EMQ)

WE WILL USE EMQ

MQTT IMPLEMENTATION

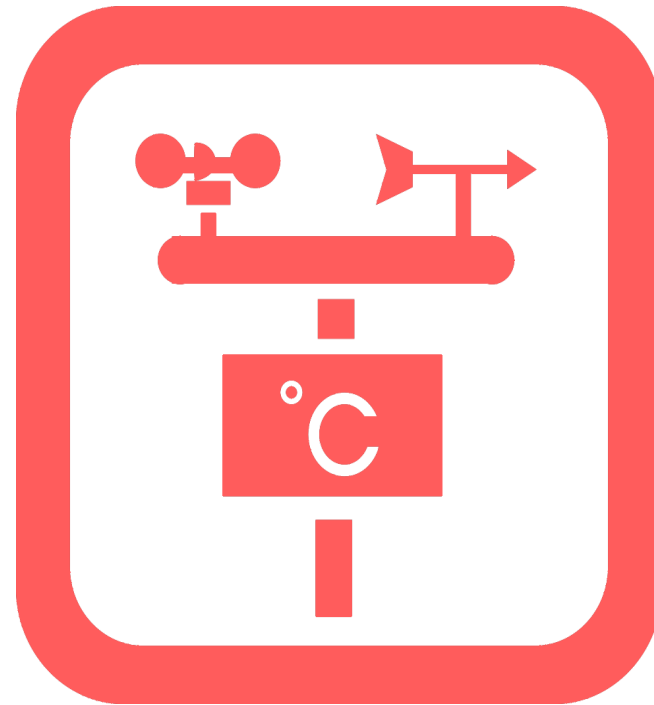
- *MQTT BROKER*: Laptop
- *MQTT CLIENT*: Raspberry PI 3 B



WEATHER STATION

Projects components:

- *Sensors*
- *Weather API*
- *Raspberry Pi 3*
Model B



THANK YOU FOR LISTENING!

Programming introduction to Raspberry Pi,
review of communication patterns and
protocols specific to IoT



SZYMON GABREK | ARTUR JURASZEK