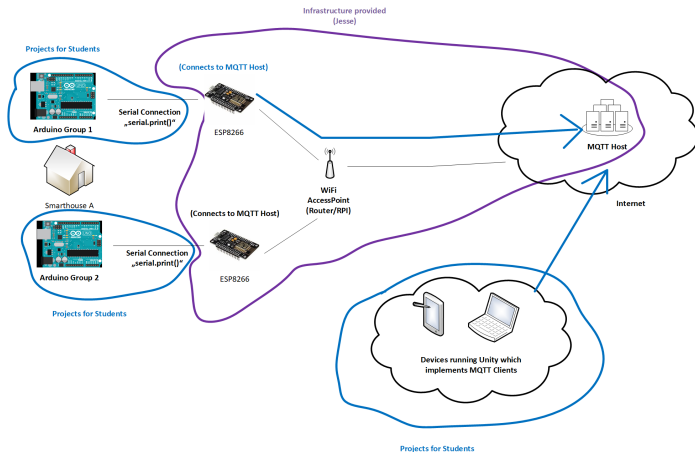# System Structure - Communication Between Devices

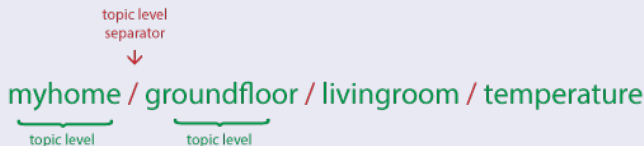## MQTT - Communication Between Devices

MQTT (Message Queue Telemetry Transport)

- Machine to machine protocoll (m2m)
- Publish-subscribe pattern
- Clients subscribe to topics, server sends them updates
- Messages consists of topic and message content

MQTT - Communication Between Devices

Topic

- To create a topic: simply publish a message or subscribe
- Wildcard: # subscribe to all topics below like groupA/Values/#

topic level separator
↓

myhome / groundfloor / livingroom / temperature

topic level   topic level

Source: hivemq.com, MQTT Essentials Part 5: MQTT Topics & Best Practices

Send MQTT Messages

Procedure

- Connect physical to NodeMCU
- Use Serial.print("[Topic][Message]");

```
void setup() {
        Serial1.begin(57600);
}
void loop() {
        String send = "[GroupX/topic][message]";
        Serial1.println(send);
}
```
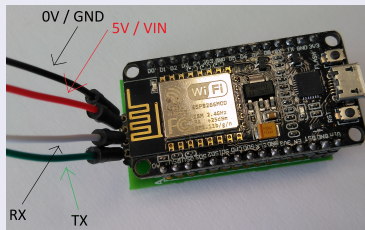
Receive MQTT Messages

Procedure

```
while (Serial1.available()) {
    if (Serial1.available() >0) {
      char c = Serial1.read();
      readString += c;
    }
  }
```

Gateway Details

NodeMCU 1.0 (ESP8266)

- Powered by VIN
- Communication via Serial.print() or SoftwareSerial
- Keeps list of subscribed topics (currently 10)

Gateway Details

Commands your boards can send

- **time** get current time (example answer: Time:13:34:53)
- **+topic** (e.g. "+test/topic"), subscribes to new topic
- **-topic** end subscription
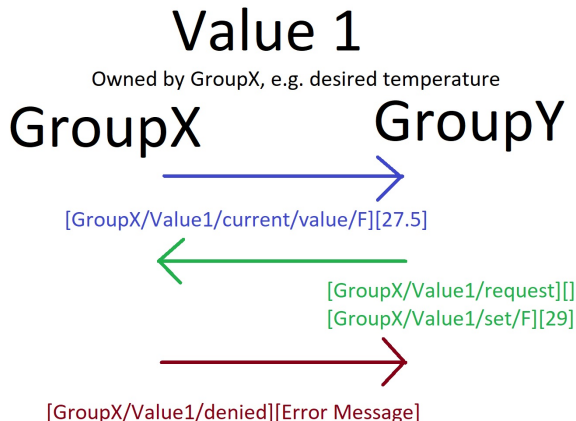- **[Topic][Message]** publish a message (no subscription necessary)

Gateway Details

Commands your boards might receive

- **[Topic][Message]** (receive a message)
- **Time:hh:mm:ss**
- **MQTT connected** (connection was lost)
- **WiFi connected** (during boot)
- internal debug messages or unintentionally send messages from other teams

Gateway Details

Possible Message Layout

Value 1

Owned by GroupX, e.g. desired temperature

GroupX   GroupY

[GroupX/Value1/current/value/F][27.5]

[GroupX/Value1/request][]
[GroupX/Value1/set/F][29]

[GroupX/Value1/denied][Error Message]

Gateway Details

Possible Message Layout - Multiple Values

- Example: List of possible values
  [GroupX/ListOfValues][Value1;Value2;Value3]
- Example: List of multiple values
  [GroupX/Value1/lasthour]
  [minute:value;minute:value;minute:value;. . .]