Client - Broker Connection with MQTT

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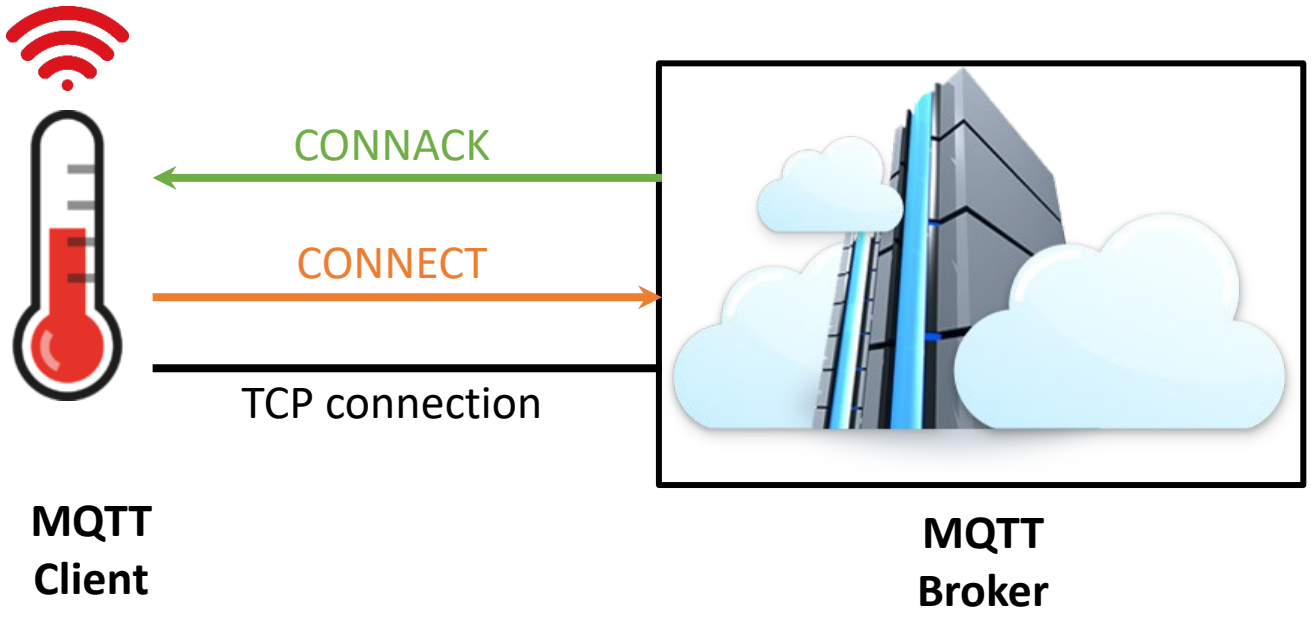
Three Types of Participants

1. Broker
2. Publisher
3. Subscriber

Hierarchical Organization of Data

1. Topics
2. Sub-Topics
3. Messages
4. Data Structure/Type

Connection Flow



CONNECT PACKET

MQTT CONNECT PACKET	
Contains	Example
clientId	“machine-1”
cleanSession	True
username (optional)	“machineID”
password (optional)	“mysecretpwd”
lastWillTopic (optional)	“/machine1/temperature
lastWillQos (optional)	2
lastWillMessage (optional)	“unexpected exit”
lastWillRetain (optional)	False
keepAlive (optional)	60

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CONNACK RESPONSE PACKET

MQTT CONNACK	
Contains	Example
sessionPresent	True
returnCode	0

Return Code	Return Code Response
0	Connection accepted
1	Connection refused, unacceptable protocol version
2	Connection refused, identifier rejected
3	Connection refused, server unavailable
4	Connection refused, bad user name or password
5	Connection refused, not authorized

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PUBLISH PACKET

MQTT PUBLISH	
Contains	Example
packetID	5468
topicName	“machine1/sensor”
qos	1
retainFlag	False
payload	“temperature: 120C”
dupFlat	false

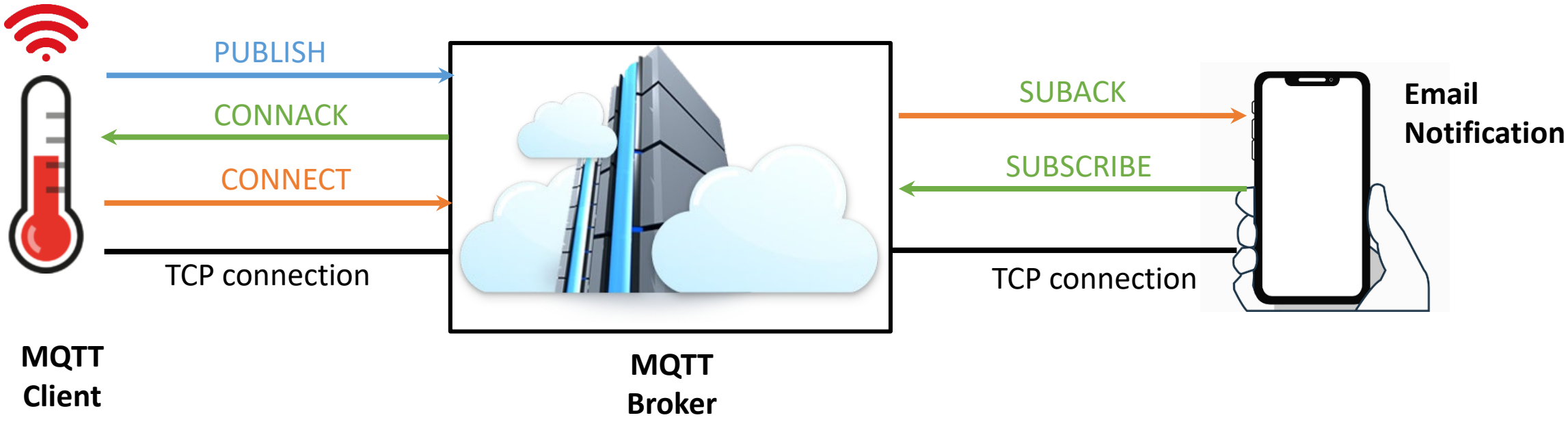
1. Data Queue
2. Message is in payload
3. Multiple Publishers to the topic at the Broker
4. FIFO not guaranteed

SUBSCRIBE PACKET

MQTT SUBSCRIBE	
Contains	Example
packetID	5468
qos1	1
Topic1	“machine1/sensor”
qos2	0
topic2	“machine1/alarm”
….	…..

1. Receives message from a topic
2. Multiple subscribers per topic
3. Post-Processing of Messages
4. FIFO not guaranteed
5. Asynchronous
6. Data Buffer at the Broker

Connection Flow



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Message

```
{
“data”: “sensor temperature”,
“attributes”:
    {
        “id”: 300302,
        “timestamp”: 2025-01-20 23:23:32.404,
        “value”: 120
    }
}
```

1. Data element/record in the topic
2. Only and As sent by Publishers
3. Received as is by Subscribers
4. Contains data and optional attributes
5. Secure Transport
6. Max Size : 268435455 bytes

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Topic & Sub-Topics

machine1/sensor/pump/temperature

machine1/sensor/+/temperature

machine1/sensor/pump/#

1. Topic Names are Unique
2. UTF-8 Formatted String
3. Topic Levels are separated by a forward slash ‘/’
4. Topic names allow ‘space’ but are case sensitive
5. Wildcards can be used to subscribe to all sub-topics under a topic “+” or “#”

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Question

Subscribers are interested in obtaining data on all pressure gauge sensors within machines in the factory floor? How might the topic hierarchy look like?