Lecture #10
MQTT

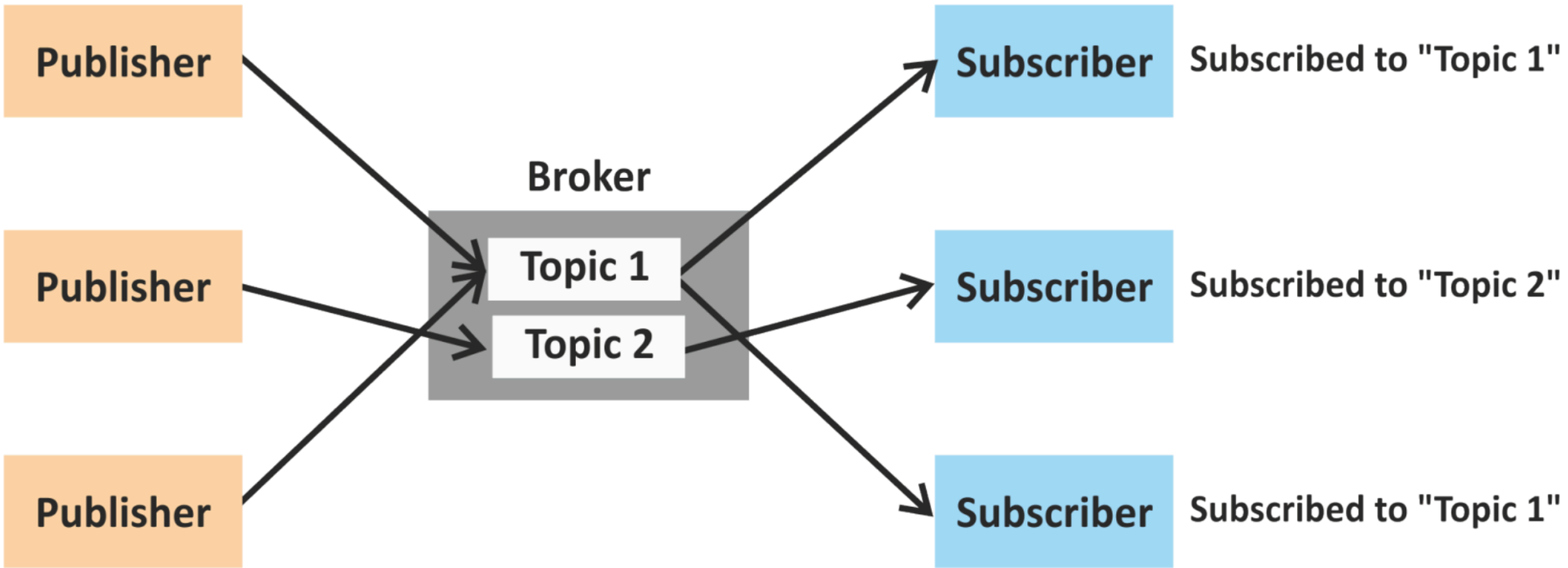
Android Things 2020

MQTT

Message Queue Telemetry Transport

- Publish-subscribe.
- A message **broker** is required.
- Standard: ISO/IEC PRF 20922.
- Developed in 1999 (and released royalty free in 2010).
- Small code footprint.
- Limited network bandwidth / constrained environments.
- Data agnostic.

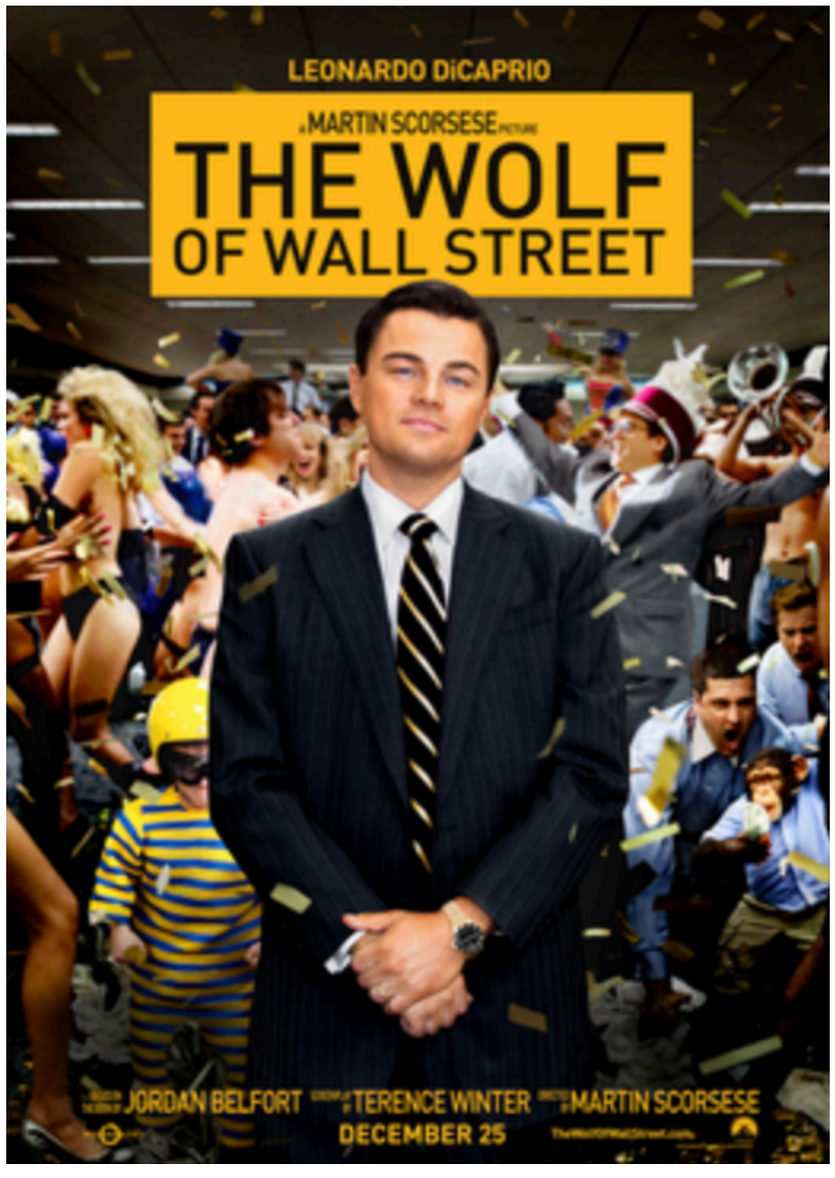
Model


Publisher
Publisher
Publisher
Broker
Topic 1
Topic 2
Subscriber
Subscribed to "Topic 1"
Subscriber
Subscribed to "Topic 2"
Subscriber
Subscribed to "Topic 1"

Broker Benefits

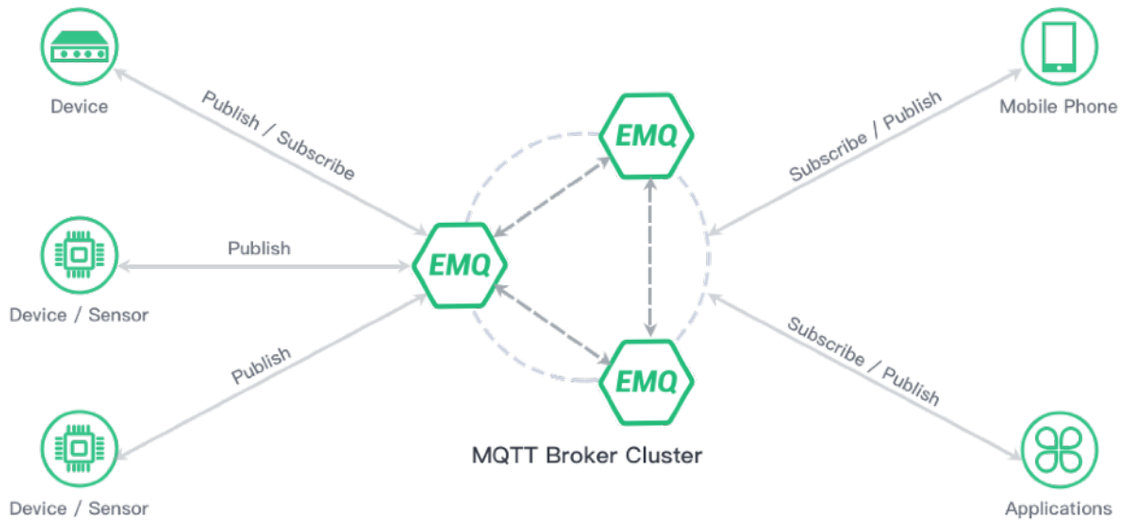
- Eliminates insecure connections.
- Easily scales.
- Manages client connect states.
- Reduce network strain.

What is a broker

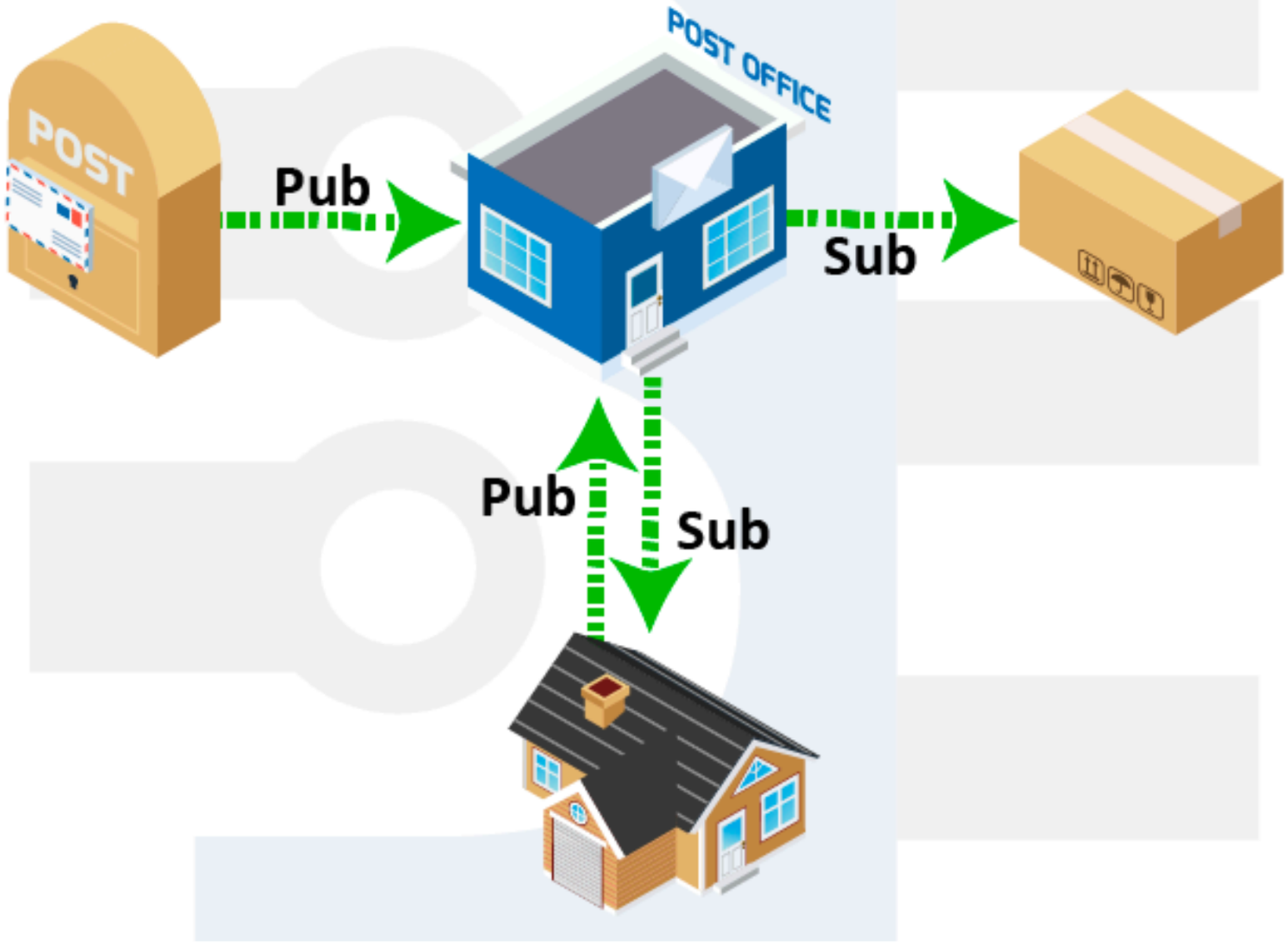


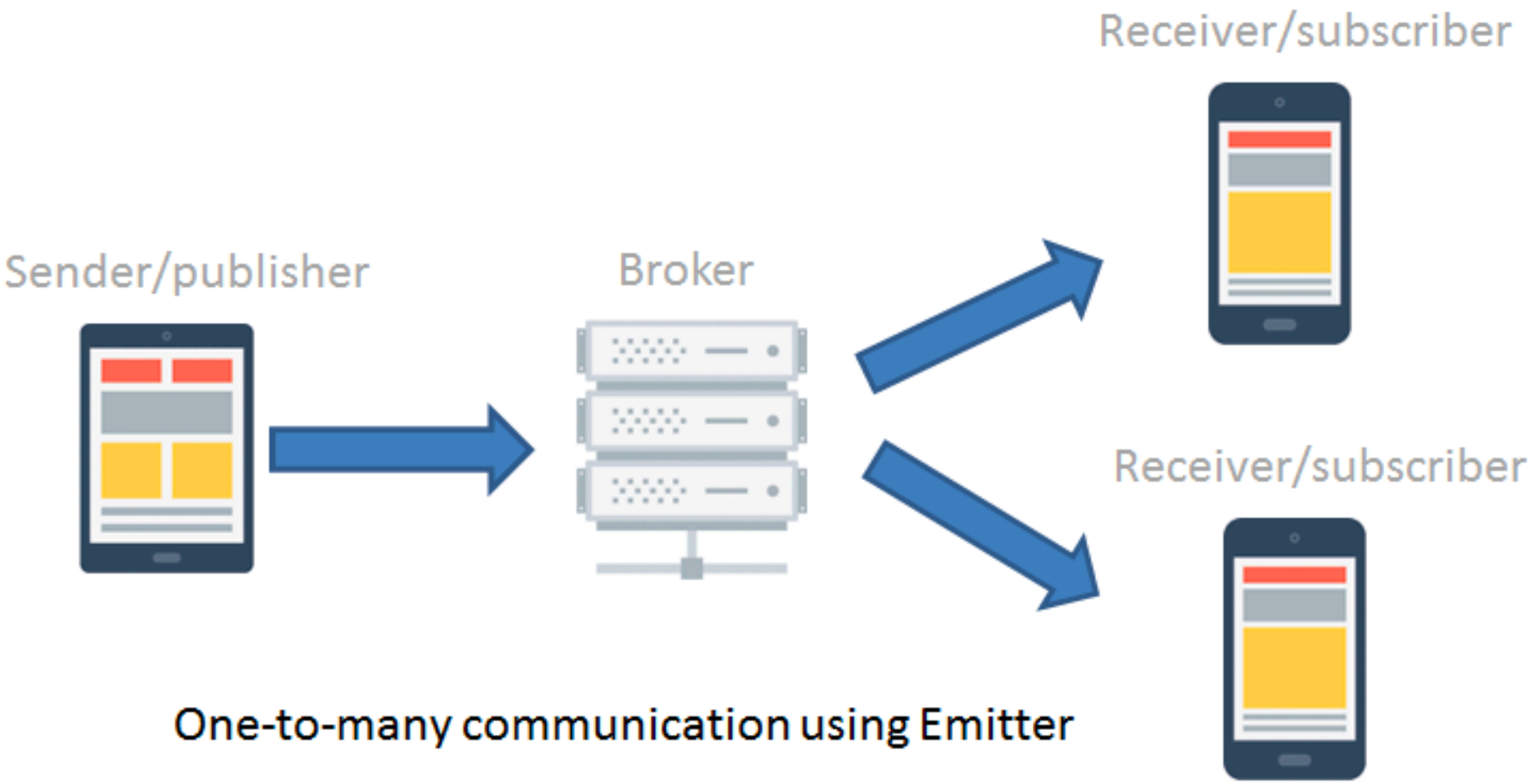
What is a broker

- Software running on a computer.
- Running on premise or on the cloud.
- Self-Built or 3rd party hosted.
- Open source or proprietary.

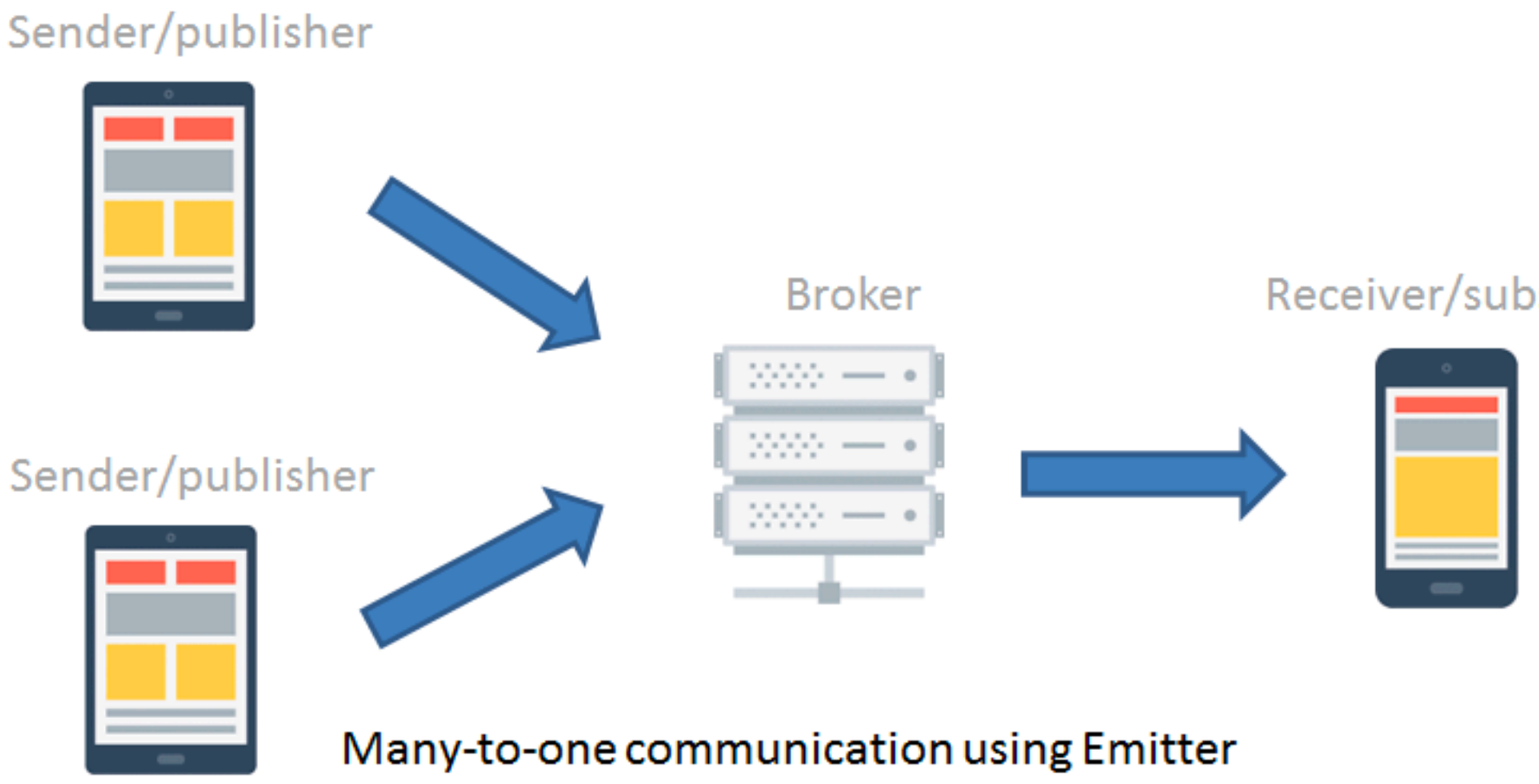


mqtt://broker/topic/message

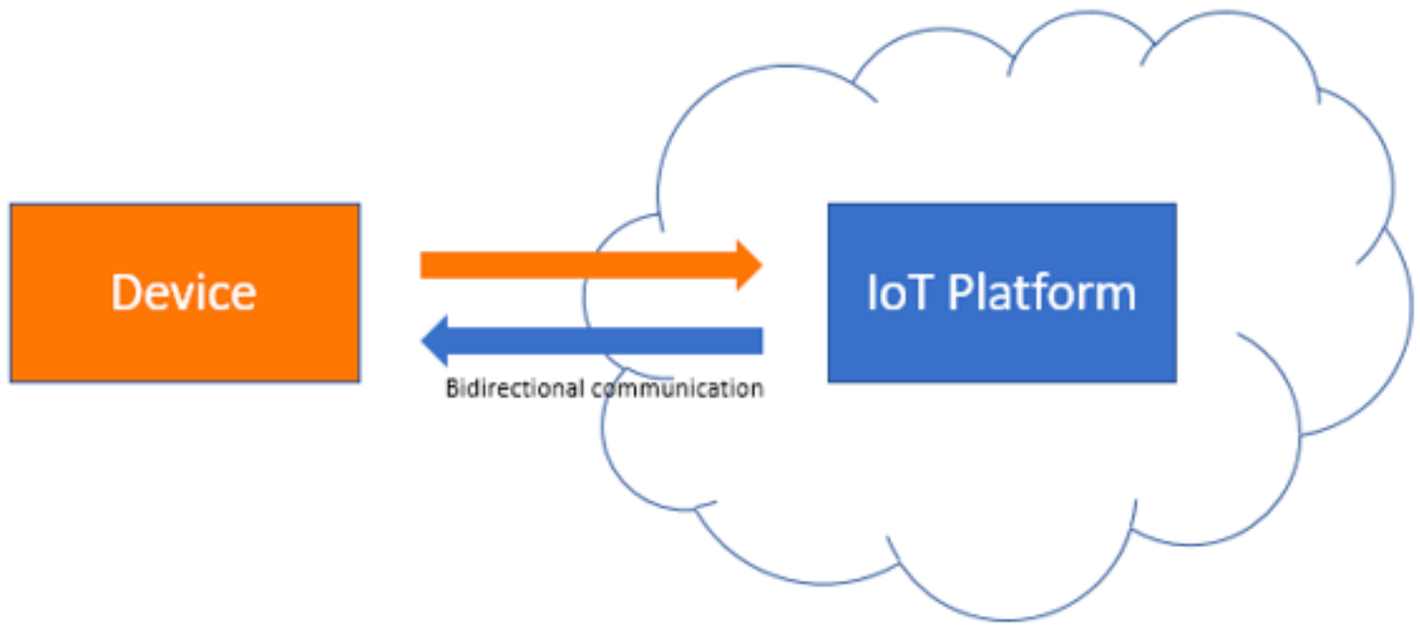




One-to-many communication using Emitter



Many-to-one communication using Emitter


Device
IoT Platform
Bidirectional communication

Connecting to the broker

Value	Return Code Response	Description
0	0x00 Connection Accepted	Connection accepted
1	0x01 Connection Refused, unacceptable protocol version	The Server does not support the level of the MQTT protocol requested by the Client
2	0x02 Connection Refused, identifier rejected	The Client identifier is correct UTF-8 but not allowed by the Server
3	0x03 Connection Refused, Server unavailable	The Network Connection has been made but the MQTT service is unavailable
4	0x04 Connection Refused, bad user name or password	The data in the user name or password is malformed
5	0x05 Connection Refused, not authorized	The Client is not authorized to connect
6-255		Reserved for future use

Publishing to a topic

MQTT-Packet:

PUBLISH

contains:	Example
packetId (always 0 for qos 0)	4314
topicName	"topic/1"
qos	1
retainFlag	false
payload	"temperature:32.5"
dupFlag	false

Subscribing to a topic

- Example:
  - Topic #1: home/groundfloor/kitchen/temperature
  - Topic #2: office/conferenceroom/luminance
- Wild cards
    - Single-level:
      - home/groundfloor/**+**/temperature (to subscribe to **all the temperature readings** in all the rooms of the ground floor)
    - Multi-level:
      - home/groundfloor/**#** (to subscribe to **all the readings** in all the rooms of the ground floor, **not only the temperature**)

Quality of Service

- **0**: The broker/client will deliver the message once, with no confirmation.

- **1**: The broker/client will deliver the message at least once, with confirmation required.

- **2**: The broker/client will deliver the message exactly once by using a four step handshake.

Last will and testament

MQTT-Packet:

CONNECT

contains:	Example
clientId	"client-1"
cleanSession	true
username (optional)	"hans"
password (optional)	"letmein"
lastWillTopic (optional)	"/hans/will"
lastWillQos (optional)	2
lastWillMessage (optional)	"unexpected exit"
keepAlive	60

Learn More

- Learn more: mqtt.org
- Software: mqtt.org/software
- Recommended broker (C): Mosquitto (mosquitto.org)
- Lots of good tutorials out there on Android Things, Python, Java and Mobile.

Lecture outcomes

- MQTT Protocol details.
- Create MQTT Raspbian and Android Things clients.
- How to control from a mobile app the IoT devices using MQTT.