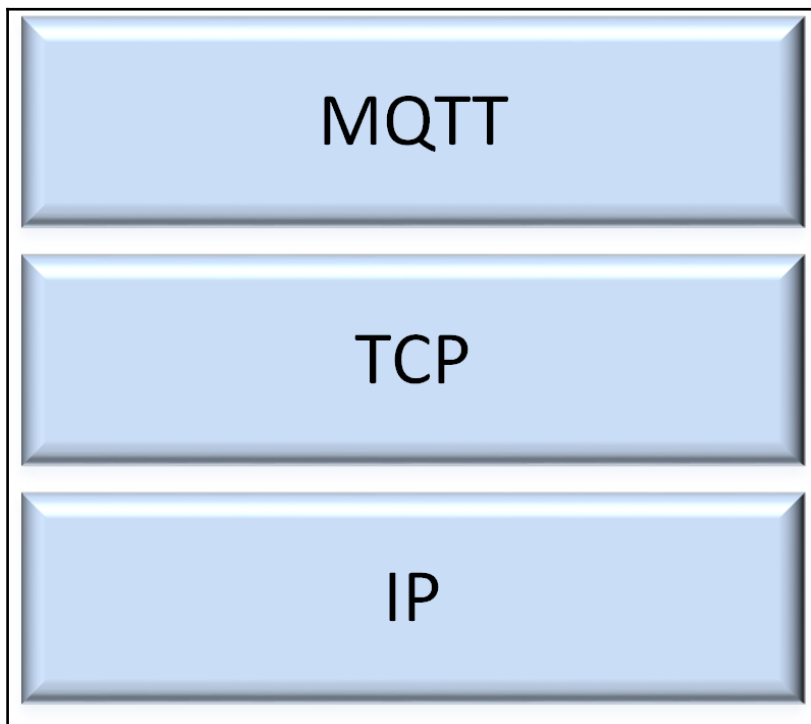
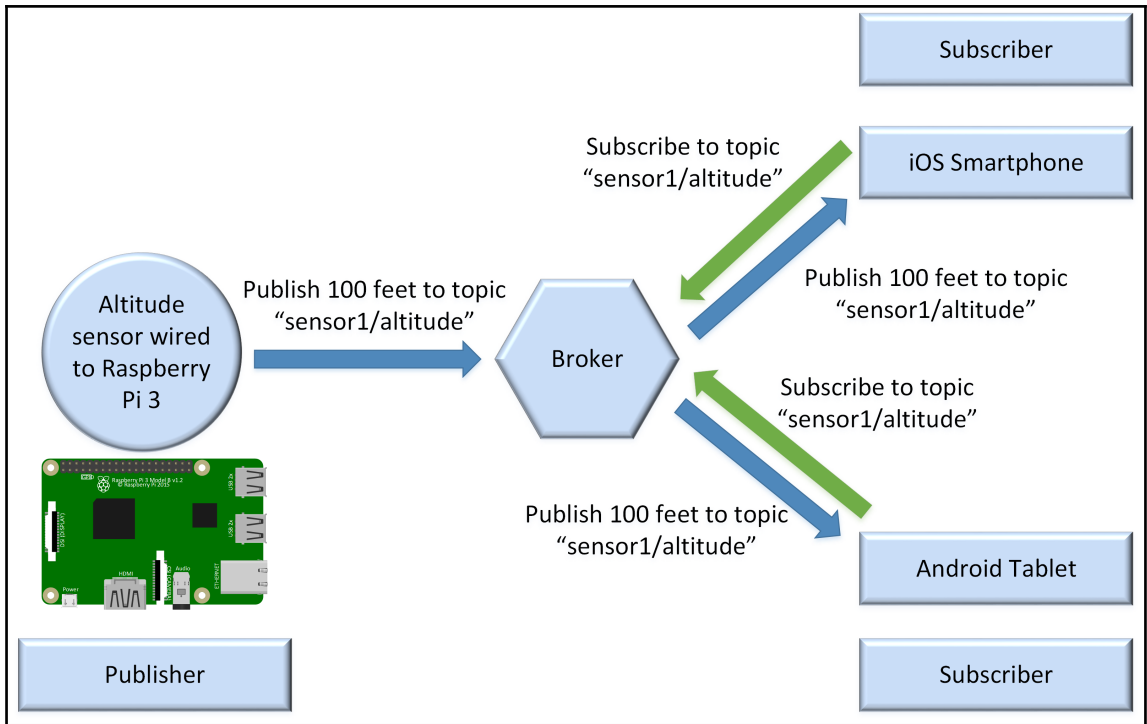
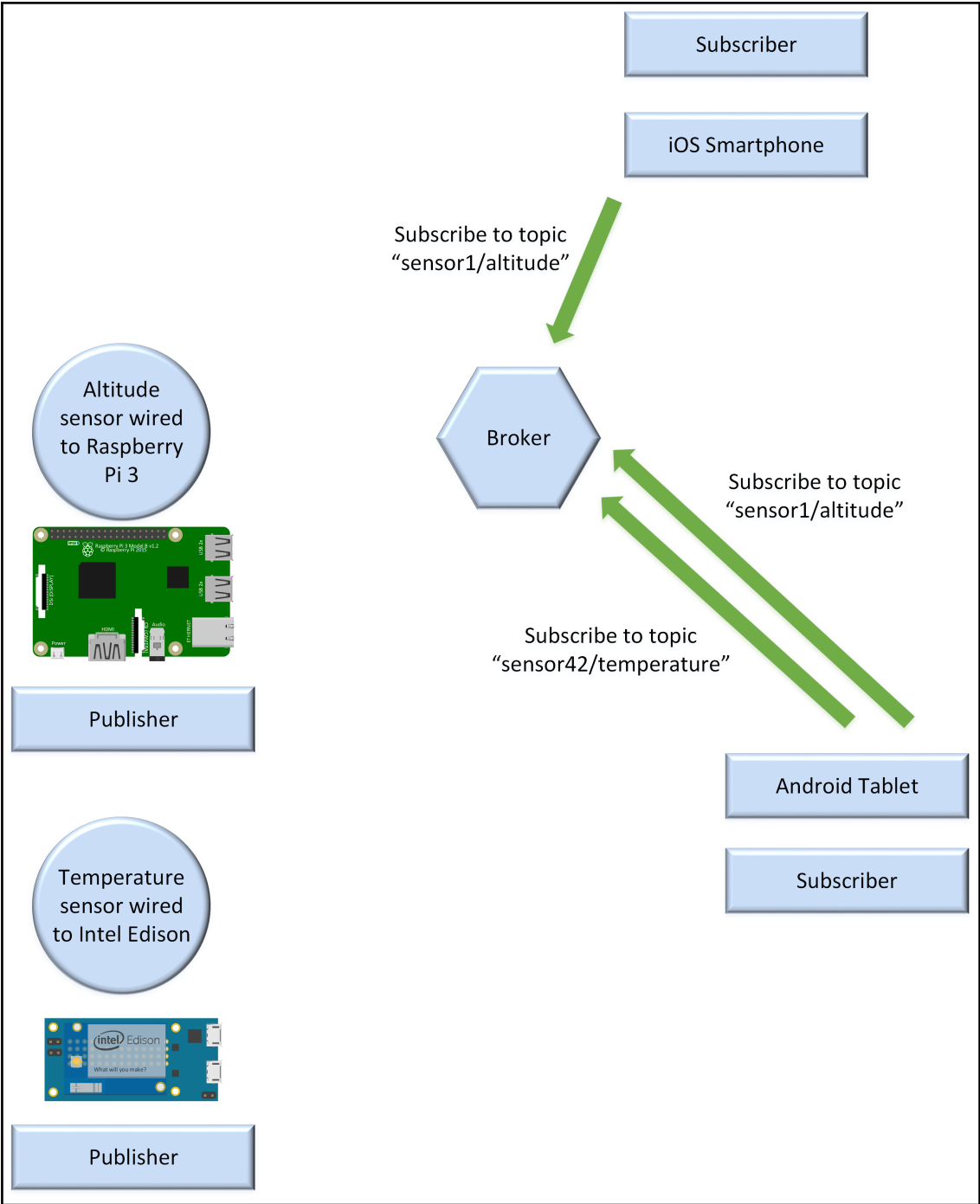


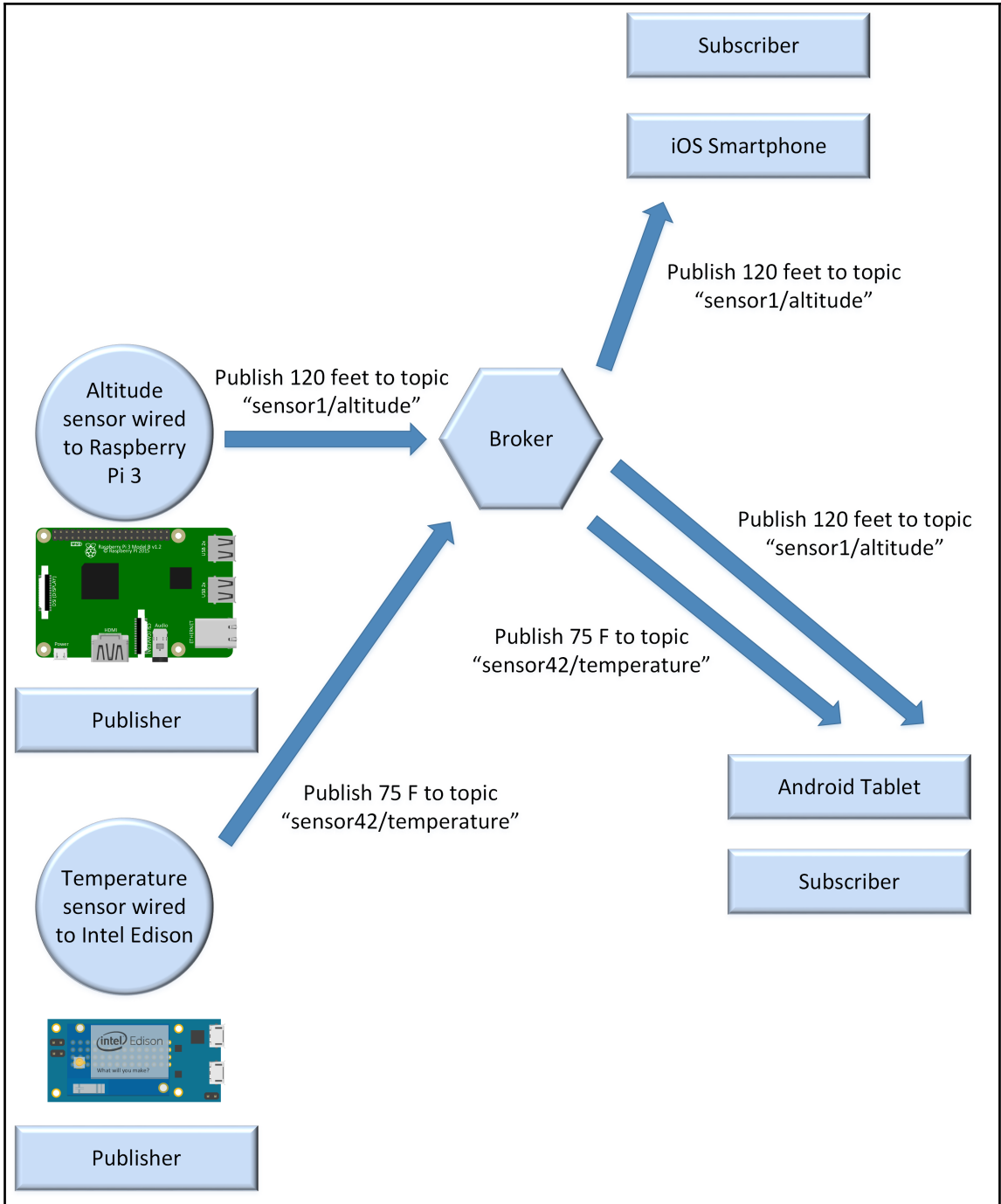
# Appendix

## Chapter 1: Lightweight Messaging with MQTT 3.1.1 and Mosquitto

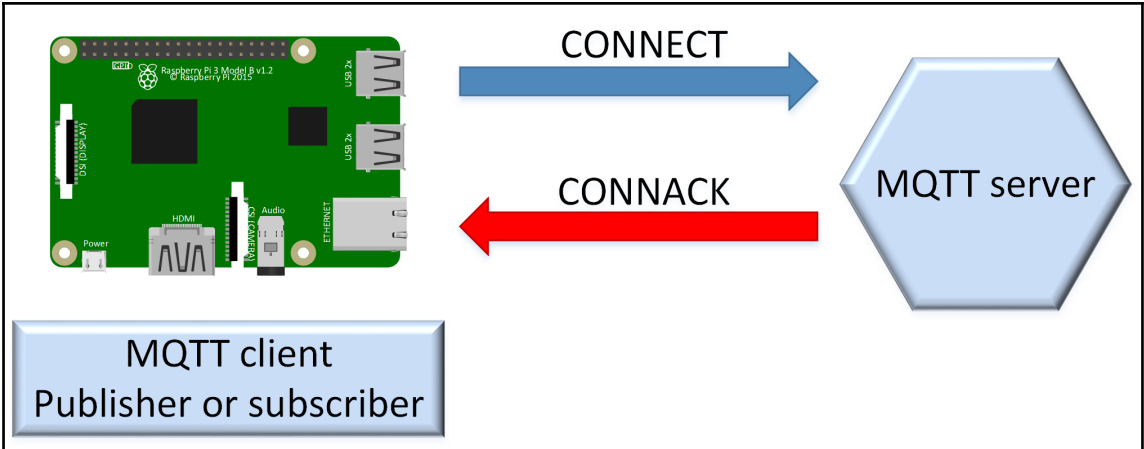


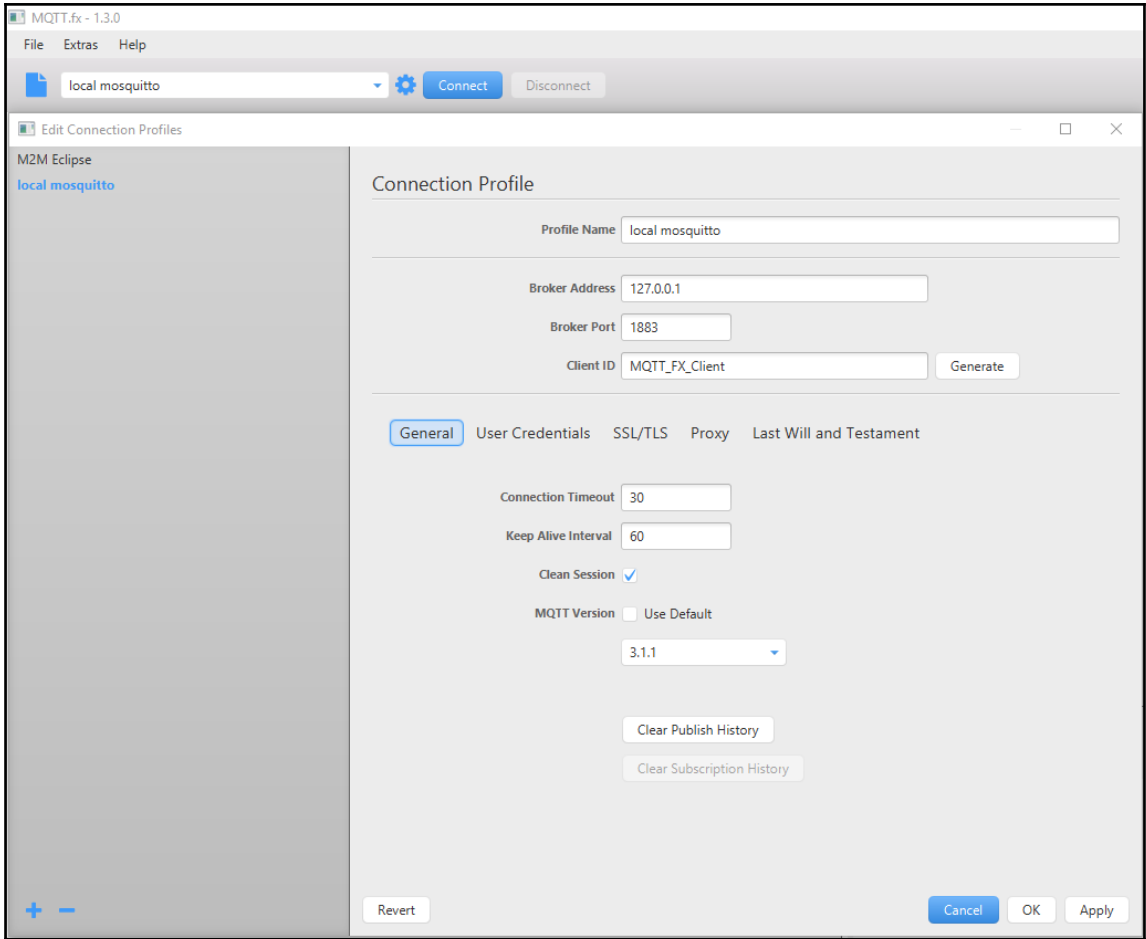


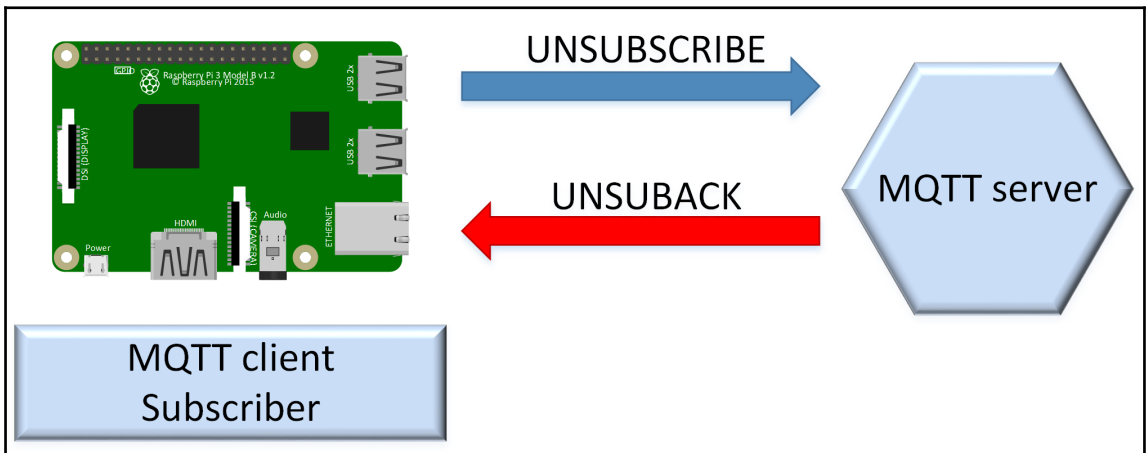
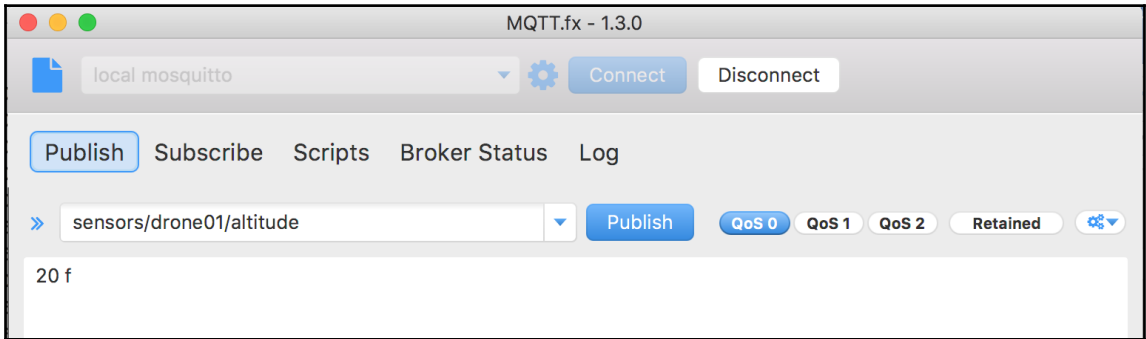
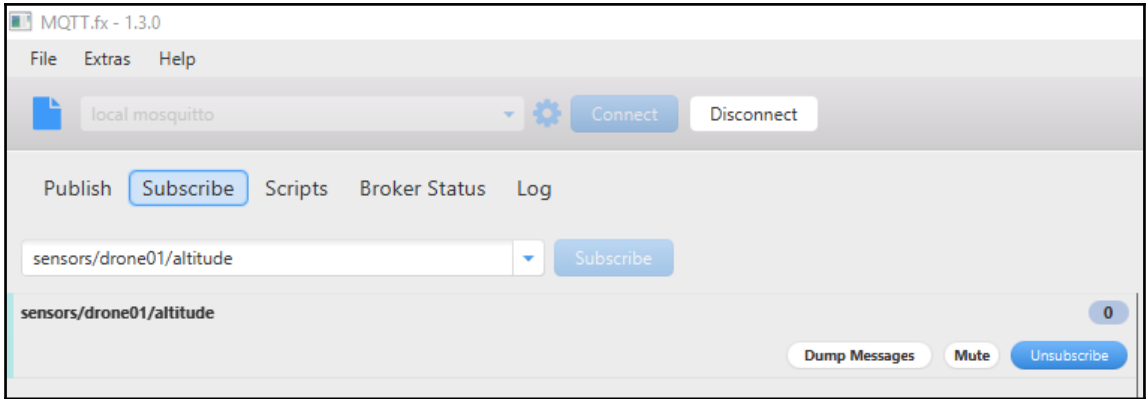


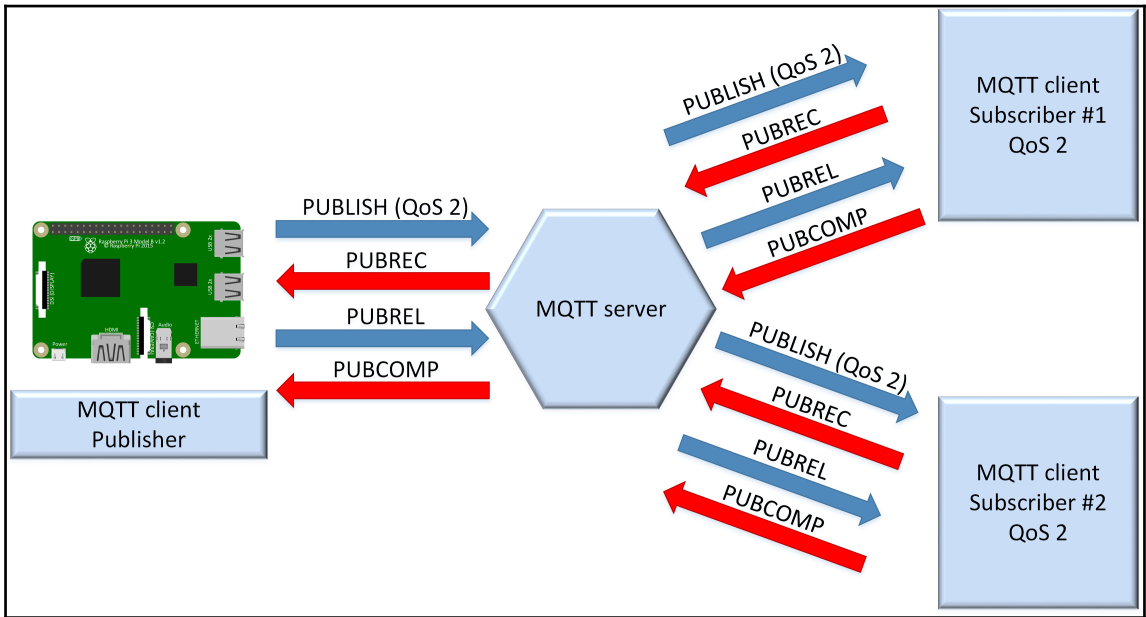
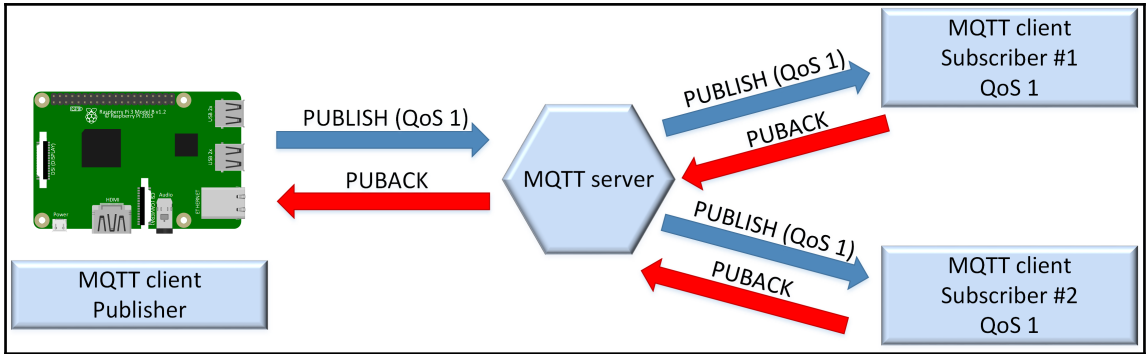




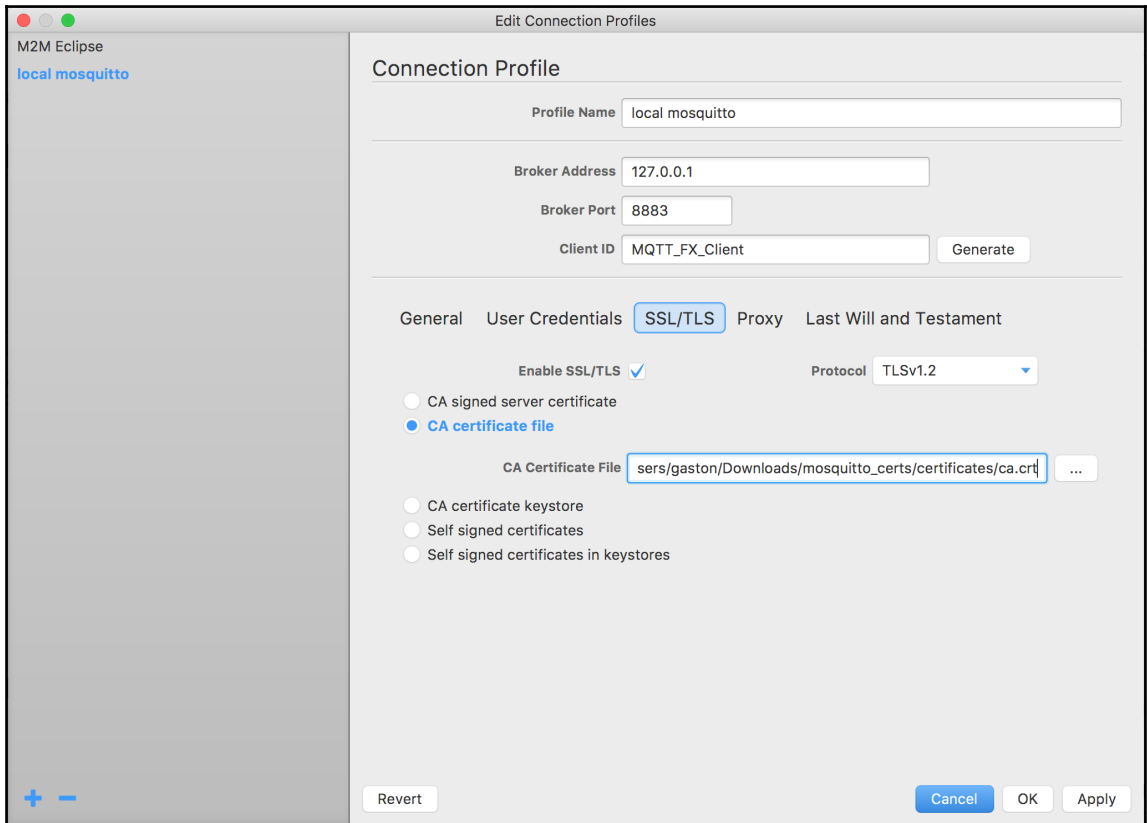


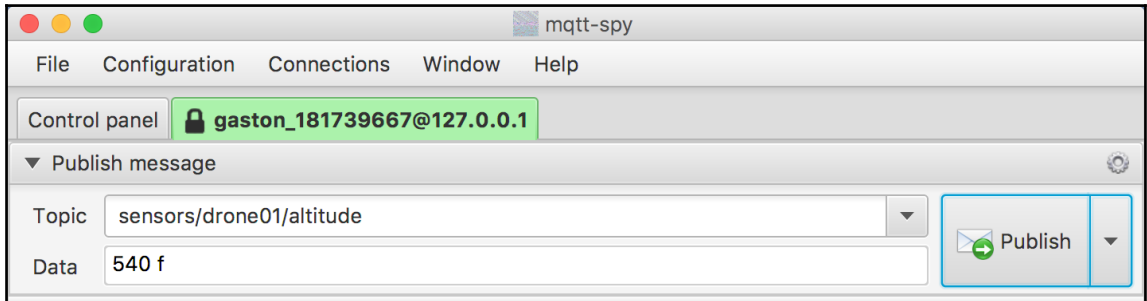
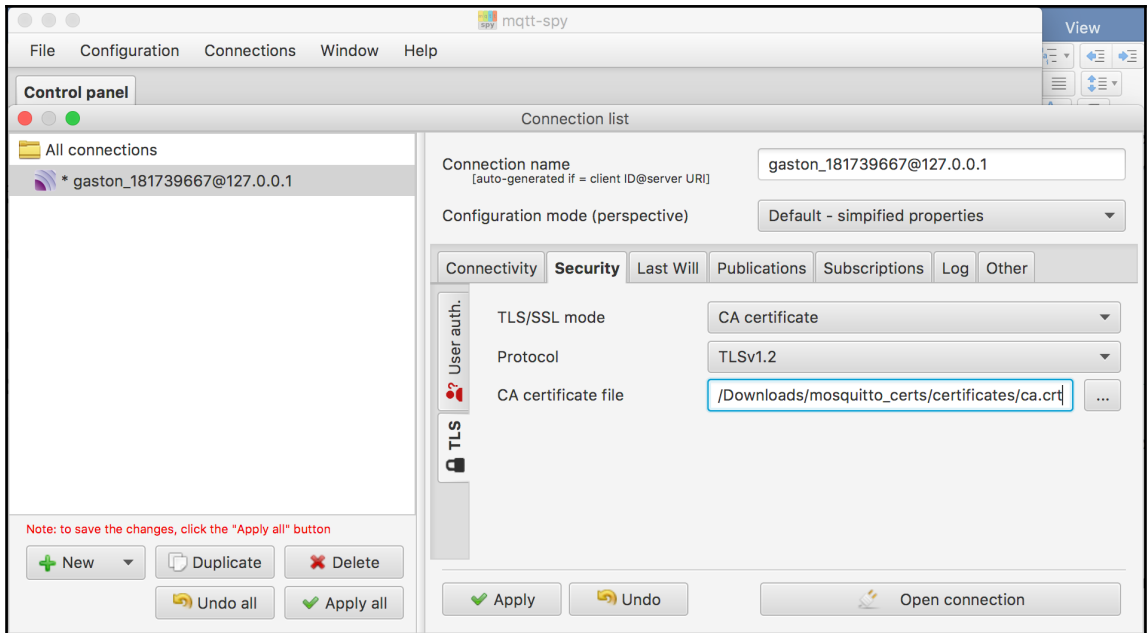


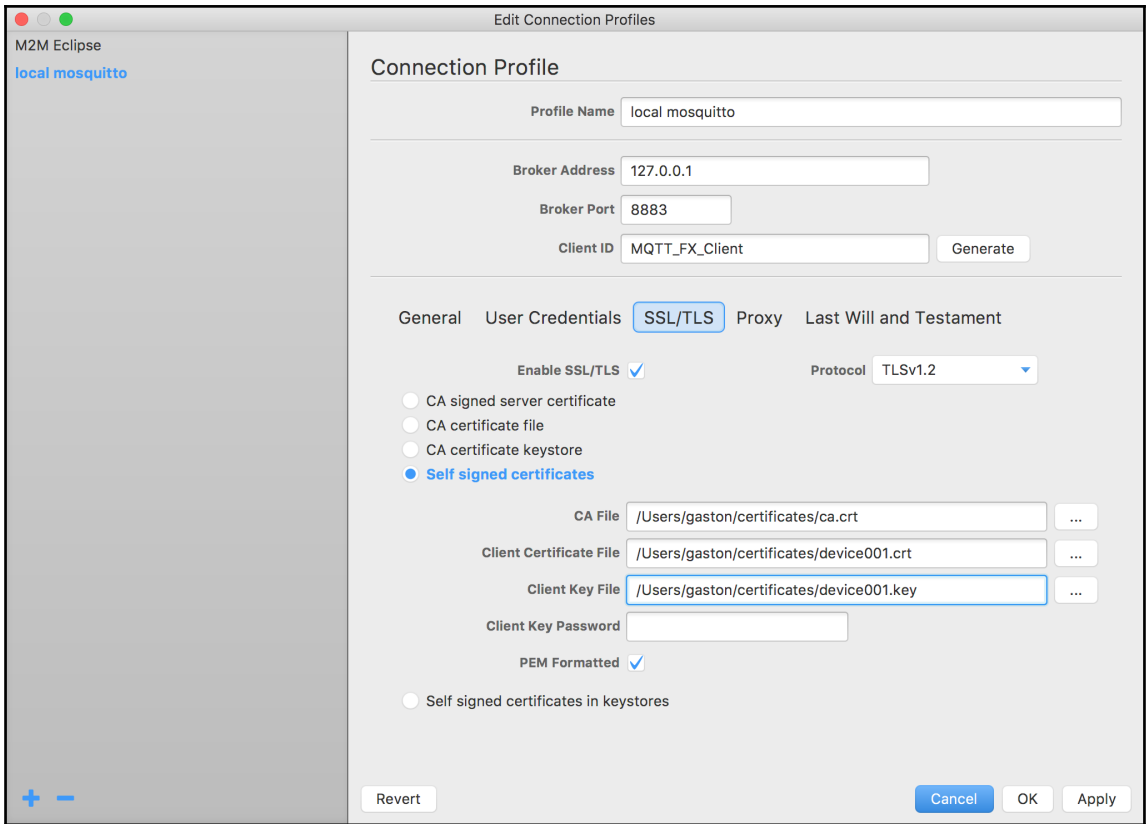


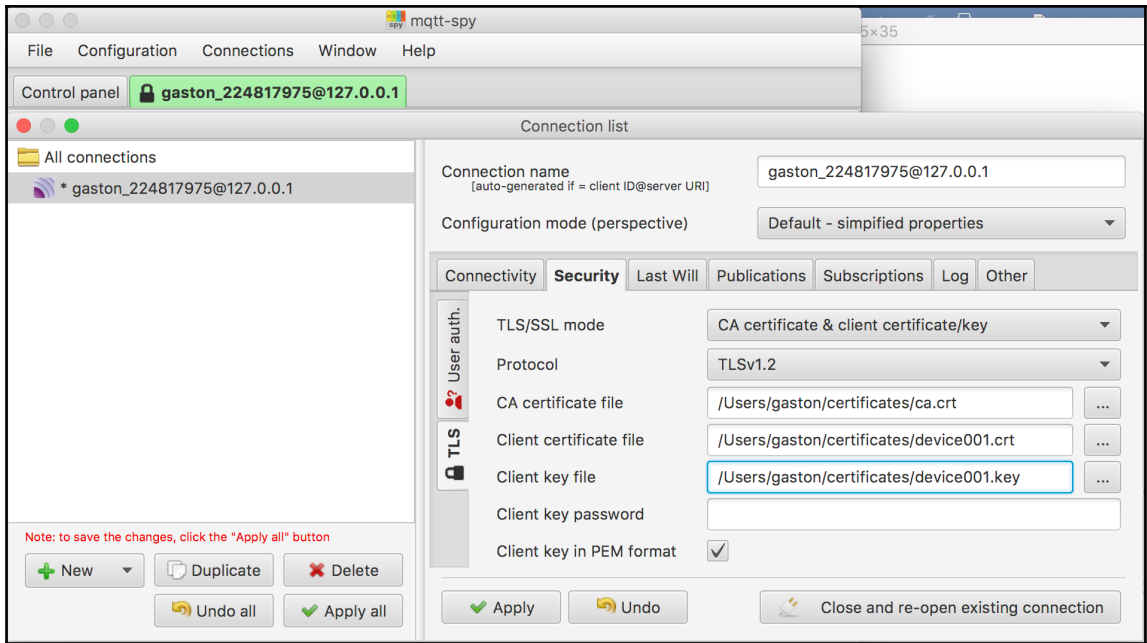


# Chapter 2: Securing an MQTT Mosquitto Server











# Chapter 3: Controlling a Drone with Python

This screenshot shows a MQTT client interface with the following elements:

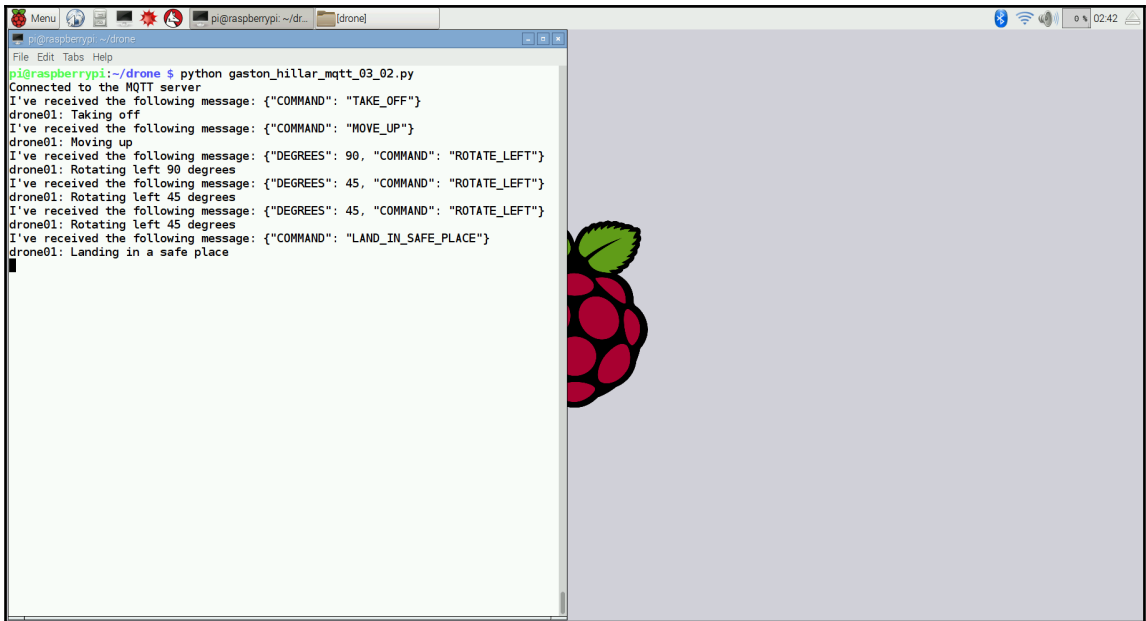
- Navigation tabs: Publish, **Subscribe**, Scripts, Broker Status, Log
- Topic: processedcommands/drone01
- Buttons: Subscribe, QoS 0, QoS 1, QoS 2, Autoscroll, and a refresh icon.
- Message list: A single message is shown with a count of 2 on the left and 1 on the right.
- Message details: A timestamp of 25-01-2017 14:24:41.51881912 and a JSON payload: {"SUCCESSFULLY\_PROCESSED\_COMMAND": "SET\_MAX\_ALTITUDE"}
- Format options: Plain (selected), JSON, Hex, Base64

This screenshot shows the MQTT client interface after receiving a sequence of 8 messages:

- Navigation tabs: Publish, **Subscribe**, Scripts, Broker Status, Log
- Topic: processedcommands/drone01
- Buttons: Subscribe, QoS 0, QoS 1, QoS 2, Autoscroll, and a refresh icon.
- Message list: Eight messages are shown, each with a count of 8 on the left and 1 on the right. The eighth message is highlighted.
- Message details: A timestamp of 25-01-2017 14:56:05.537658... and a JSON payload: {"SUCCESSFULLY\_PROCESSED\_COMMAND": "LAND"}
- Format options: Plain (selected), JSON, Hex, Base64

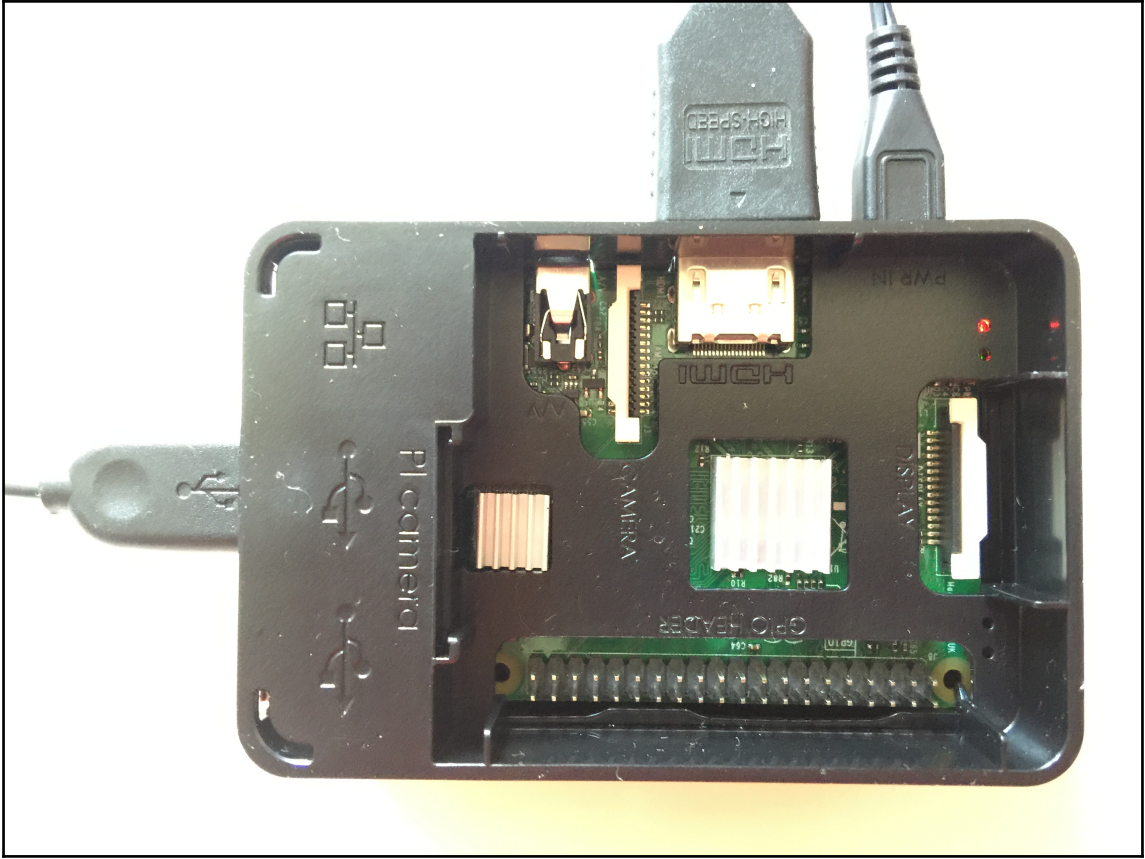
```
Terminal Shell Edit View Window Help
Chapter03 -- -bash -- 59x44
Connect result: Connection Accepted.
Subscribed with QoS: 0
{"SUCCESSFULLY_PROCESSED_COMMAND": "TAKE_OFF"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "MOVE_UP"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "ROTATE_LEFT"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "ROTATE_LEFT"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "LAND_IN_SAFE_PLACE"}
Gastons-MacBook-Pro:Chapter03 gaston$

*
mosquitto_certs -- mosquitto -c /usr/local/etc/mosquitto/mosquitto.conf -v -- 69x41
1485398446: Received PUBLISH from paho/4F07D57DF9FDC39319 (Mid: 4)
1485398446: Sending PUBREL to paho/4F07D57DF9FDC39319 (Mid: 4)
1485398447: Received PUBREC from paho/4F07D57DF9FDC39319 (Mid: 5)
1485398447: Sending PUBREL to paho/4F07D57DF9FDC39319 (Mid: 5)
1485398447: Received PUBLISH from paho/4F07D57DF9FDC39319 (d0, q0, r0
, m0, 'processedcommands/drone01', ... (46 bytes))
1485398447: Sending PUBLISH to paho/18C27D0DCCF6DCD3DA (d0, q0, r0, m
0, 'processedcommands/drone01', ... (46 bytes))
1485398447: Received PUBCOMP from paho/4F07D57DF9FDC39319 (Mid: 1)
1485398447: Received PUBREC from paho/4F07D57DF9FDC39319 (Mid: 6)
1485398447: Sending PUBREL to paho/4F07D57DF9FDC39319 (Mid: 6)
1485398447: Received PUBLISH from paho/4F07D57DF9FDC39319 (d0, q0, r0
, m0, 'processedcommands/drone01', ... (45 bytes))
1485398447: Sending PUBLISH to paho/18C27D0DCCF6DCD3DA (d0, q0, r0, m
0, 'processedcommands/drone01', ... (45 bytes))
1485398447: Received PUBCOMP from paho/4F07D57DF9FDC39319 (Mid: 2)
1485398448: Received PUBLISH from paho/4F07D57DF9FDC39319 (d0, q0, r0
, m0, 'processedcommands/drone01', ... (49 bytes))
1485398448: Sending PUBLISH to paho/18C27D0DCCF6DCD3DA (d0, q0, r0, m
0, 'processedcommands/drone01', ... (49 bytes))
1485398448: Received PUBCOMP from paho/4F07D57DF9FDC39319 (Mid: 3)
1485398448: Received PUBLISH from paho/4F07D57DF9FDC39319 (d0, q0, r0
, m0, 'processedcommands/drone01', ... (49 bytes))
1485398448: Sending PUBLISH to paho/18C27D0DCCF6DCD3DA (d0, q0, r0, m
0, 'processedcommands/drone01', ... (49 bytes))
1485398448: Received PUBCOMP from paho/4F07D57DF9FDC39319 (Mid: 4)
1485398448: Received PUBLISH from paho/4F07D57DF9FDC39319 (d0, q0, r0
, m0, 'processedcommands/drone01', ... (49 bytes))
1485398448: Sending PUBLISH to paho/18C27D0DCCF6DCD3DA (d0, q0, r0, m
0, 'processedcommands/drone01', ... (49 bytes))
1485398448: Received PUBCOMP from paho/4F07D57DF9FDC39319 (Mid: 5)
1485398448: Received PUBLISH from paho/4F07D57DF9FDC39319 (d0, q0, r0
, m0, 'processedcommands/drone01', ... (56 bytes))
1485398448: Sending PUBLISH to paho/18C27D0DCCF6DCD3DA (d0, q0, r0, m
0, 'processedcommands/drone01', ... (56 bytes))
1485398448: Received PUBCOMP from paho/4F07D57DF9FDC39319 (Mid: 6)
1485398454: Received DISCONNECT from paho/18C27D0DCCF6DCD3DA
1485398454: Client paho/18C27D0DCCF6DCD3DA disconnected.
```



The image shows a terminal window on a Raspberry Pi. The window title is "pi@raspberrypi: ~/drone". The terminal output shows the execution of a Python script that receives MQTT messages and sends drone commands. The messages are: "TAKE\_OFF", "MOVE\_UP", "ROTATE\_LEFT" (90, 45, 45 degrees), and "LAND\_IN\_SAFE\_PLACE". The drone's responses are: "Taking off", "Moving up", "Rotating left 90 degrees", "Rotating left 45 degrees", "Rotating left 45 degrees", and "Landing in a safe place". A Raspberry Pi logo is visible on the right side of the terminal window.

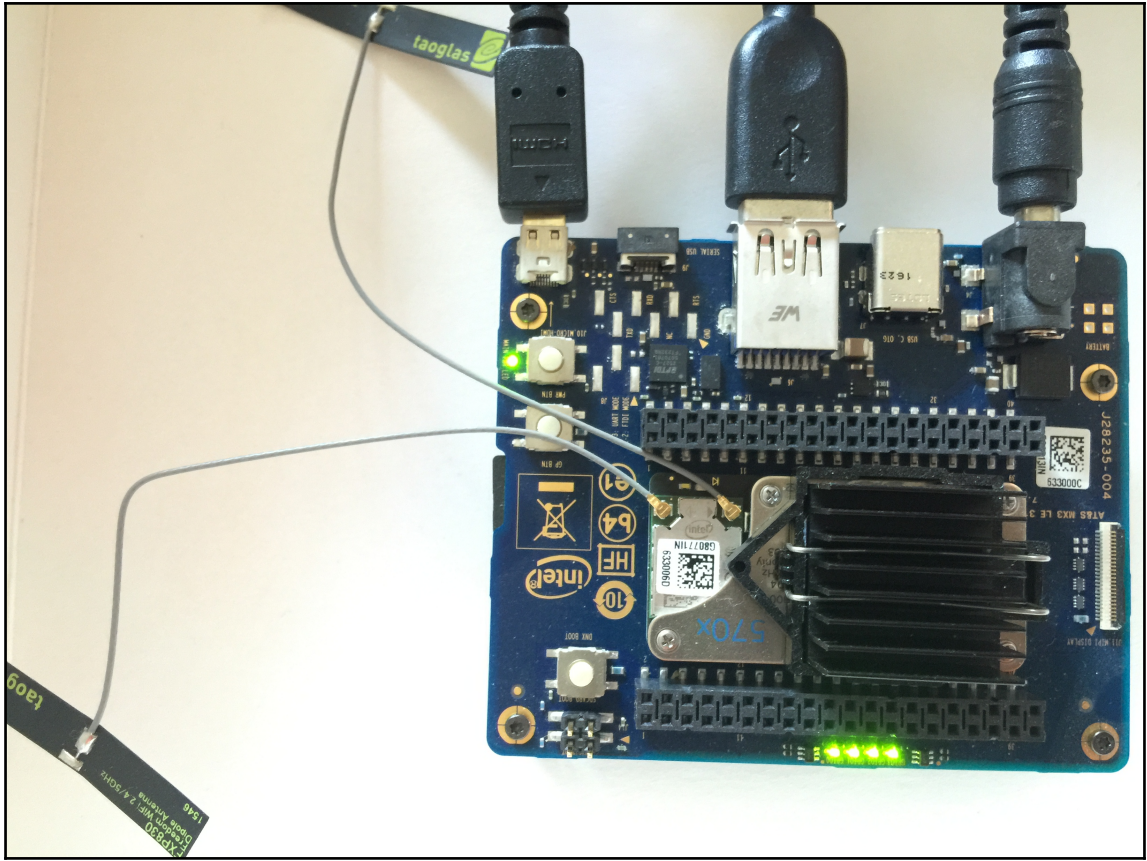
```
pi@raspberrypi:~/drone
File Edit Tabs Help
pi@raspberrypi:~/drone $ python gaston_hillar_mqtt_03_02.py
Connected to the MQTT server
I've received the following message: {"COMMAND": "TAKE_OFF"}
drone01: Taking off
I've received the following message: {"COMMAND": "MOVE_UP"}
drone01: Moving up
I've received the following message: {"DEGREES": 90, "COMMAND": "ROTATE_LEFT"}
drone01: Rotating left 90 degrees
I've received the following message: {"DEGREES": 45, "COMMAND": "ROTATE_LEFT"}
drone01: Rotating left 45 degrees
I've received the following message: {"DEGREES": 45, "COMMAND": "ROTATE_LEFT"}
drone01: Rotating left 45 degrees
I've received the following message: {"COMMAND": "LAND_IN_SAFE_PLACE"}
drone01: Landing in a safe place
```



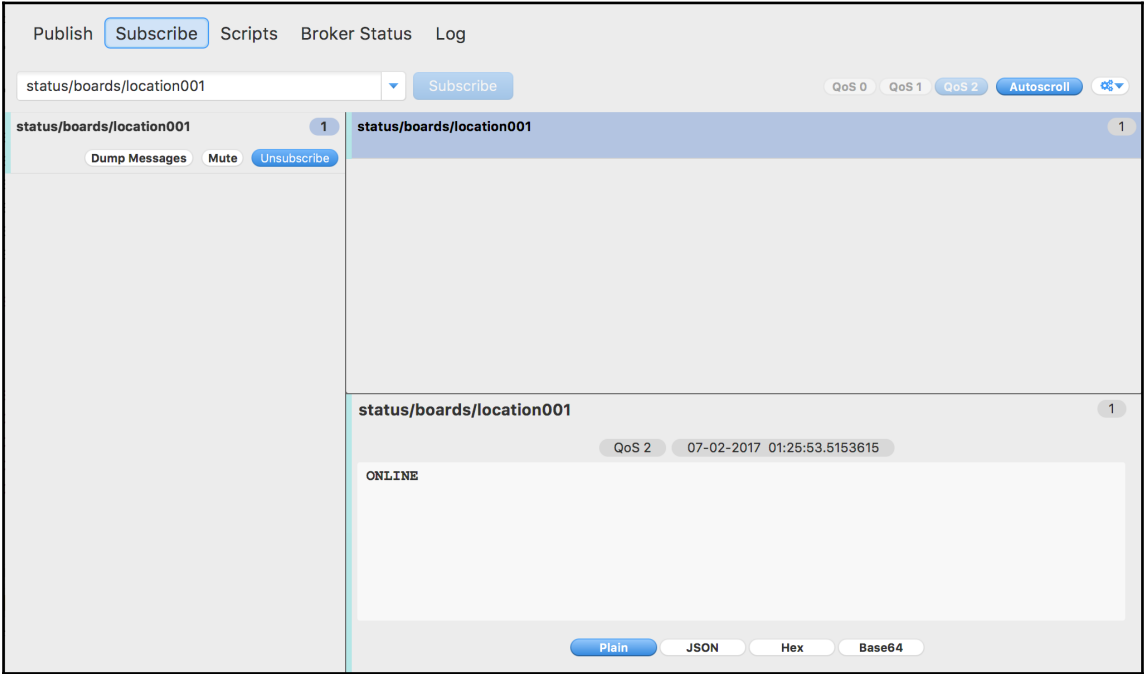
```
gaston — ssh root@192.168.1.108 — 79x21
root@intel-corei7-64:~/drone# echo 'Running code on Intel Joule board'
Running code on Intel Joule board
root@intel-corei7-64:~/drone# python gaston_hillar_mqtt_03_02.py
Connected to the MQTT server
I've received the following message: {"COMMAND": "TAKE_OFF"}
drone01: Taking off
I've received the following message: {"COMMAND": "MOVE_UP"}
drone01: Moving up
I've received the following message: {"DEGREES": 90, "COMMAND": "ROTATE_LEFT"}
drone01: Rotating left 90 degrees
I've received the following message: {"DEGREES": 45, "COMMAND": "ROTATE_LEFT"}
drone01: Rotating left 45 degrees
I've received the following message: {"DEGREES": 45, "COMMAND": "ROTATE_LEFT"}
drone01: Rotating left 45 degrees
I've received the following message: {"COMMAND": "LAND_IN_SAFE_PLACE"}
drone01: Landing in a safe place

mosquitto_certs — mosquitto -c /usr/local/etc/mosquitto/mos...
d: 6)
485447731: Received PUBLISH from paho/7817AFDF6D4F497A7
: (d0, q0, r0, m0, 'processedcommands/drone01', ... (45 bytes))
485447731: Sending PUBLISH to paho/770922680999450328 (
0, q0, r0, m0, 'processedcommands/drone01', ... (45 byte
s))
485447731: Received PUBCOMP from paho/7817AFDF6D4F497A7
: (Mid: 2)
485447732: Received PUBLISH from paho/7817AFDF6D4F497A7
: (d0, q0, r0, m0, 'processedcommands/drone01', ... (49 bytes))
485447732: Sending PUBLISH to paho/770922680999450328 (
0, q0, r0, m0, 'processedcommands/drone01', ... (49 byte
s))
485447732: Received PUBCOMP from paho/7817AFDF6D4F497A7
: (Mid: 3)
485447732: Received PUBLISH from paho/7817AFDF6D4F497A7
: (d0, q0, r0, m0, 'processedcommands/drone01', ... (49 bytes))
485447732: Sending PUBLISH to paho/770922680999450328 (
0, q0, r0, m0, 'processedcommands/drone01', ... (49 byte
s))
485447732: Received PUBCOMP from paho/7817AFDF6D4F497A7
: (Mid: 4)
485447732: Received PUBLISH from paho/7817AFDF6D4F497A7
: (d0, q0, r0, m0, 'processedcommands/drone01', ... (49 bytes))
485447732: Sending PUBLISH to paho/770922680999450328 (
0, q0, r0, m0, 'processedcommands/drone01', ... (49 byte
s))
485447732: Received PUBCOMP from paho/7817AFDF6D4F497A7
: (Mid: 5)
485447732: Received PUBLISH from paho/7817AFDF6D4F497A7
: (d0, q0, r0, m0, 'processedcommands/drone01', ... (56 bytes))
485447732: Sending PUBLISH to paho/770922680999450328 (
0, q0, r0, m0, 'processedcommands/drone01', ... (56 byte
s))
485447732: Received PUBCOMP from paho/7817AFDF6D4F497A7
: (Mid: 6)
485447737: Received DISCONNECT from paho/77092268099945328
485447737: Client paho/770922680999450328 disconnected.
```

```
Chapter03 — -bash — 79x14
Gastons-MacBook-Pro:chapter03 gaston$ python gaston_hillar_mqtt_03_03.py
Connect result: Connection Accepted.
Subscribed with QoS: 0
{"SUCCESSFULLY_PROCESSED_COMMAND": "TAKE_OFF"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "MOVE_UP"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "ROTATE_LEFT"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "ROTATE_LEFT"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "ROTATE_LEFT"}
{"SUCCESSFULLY_PROCESSED_COMMAND": "LAND_IN_SAFE_PLACE"}
Gastons-MacBook-Pro:chapter03 gaston$
```



# Chapter 4: Interacting with Sensors in Java



Publish **Subscribe** Scripts Broker Status Log

data/boards/location001/#

**Subscribe**

QoS 0

QoS 1

QoS 2

**Autoscroll**



**data/boards/location001/#**

1679

Dump Messages

Mute

**Unsubscribe**

**status/boards/location001**

1

Dump Messages

Mute

**Unsubscribe**

**data/boards/location001/sunlight/visiblelight**

1674

data/boards/location001/#

**data/boards/location001/sunlight/ir**

1675

data/boards/location001/#

**data/boards/location001/sunlight/uv**

1676

data/boards/location001/#

**data/boards/location001/earthhumidity**

1677

data/boards/location001/#

**data/boards/location001/sunlight/visiblelight**

1678

data/boards/location001/#

**data/boards/location001/sunlight/ir**

1679

data/boards/location001/#

**data/boards/location001/sunlight/uv**

1680

data/boards/location001/#

**data/boards/location001/sunlight/uv**

1680

data/boards/location001/#

QoS 0

07-02-2017 01:52:34.6754183

5 UV Index

**Plain**

JSON

Hex

Base64



Publish **Subscribe** Scripts Broker Status Log

data/boards/location001/#

Subscribe

QoS 0

QoS 1

QoS 2

Autoscroll



data/boards/location001/#

2545

Dump Messages

Mute

Unsubscribe

status/boards/location001

1

Dump Messages

Mute

Unsubscribe

data/boards/location001/earthhumidity

2540

data/boards/location001/#

data/boards/location001/earthhumidity

2541

data/boards/location001/#

data/boards/location001/earthhumidity

2542

data/boards/location001/#

data/boards/location001/earthhumidity

2543

data/boards/location001/#

data/boards/location001/earthhumidity

2544

data/boards/location001/#

data/boards/location001/earthhumidity

2545

data/boards/location001/#

data/boards/location001/earthhumidity

2546

data/boards/location001/#

data/boards/location001/earthhumidity

2546

data/boards/location001/#

QoS 0

07-02-2017 01:58:01.7081253

88 %

Plain

JSON

Hex

Base64

Publish **Subscribe** Scripts Broker Status Log

status/boards/location001

Subscribe

QoS 0

QoS 1

QoS 2

Autoscroll



data/boards/location001/#

2683

Dump Messages

Mute

Unsubscribe

status/boards/location001

2

Dump Messages

Mute

Unsubscribe

data/boards/location001/earthhumidity

2679

data/boards/location001/#

data/boards/location001/earthhumidity

2680

data/boards/location001/#

data/boards/location001/earthhumidity

2681

data/boards/location001/#

data/boards/location001/earthhumidity

2682

data/boards/location001/#

data/boards/location001/earthhumidity

2683

data/boards/location001/#

data/boards/location001/earthhumidity

2684

data/boards/location001/#

status/boards/location001

2685

status/boards/location001

2685

QoS 2

07-02-2017 02:00:20.7220346

OFFLINE

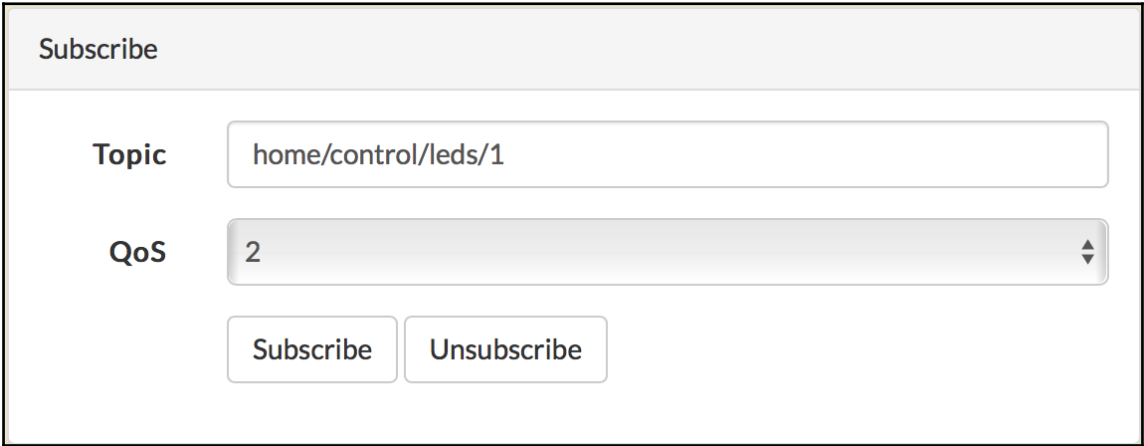
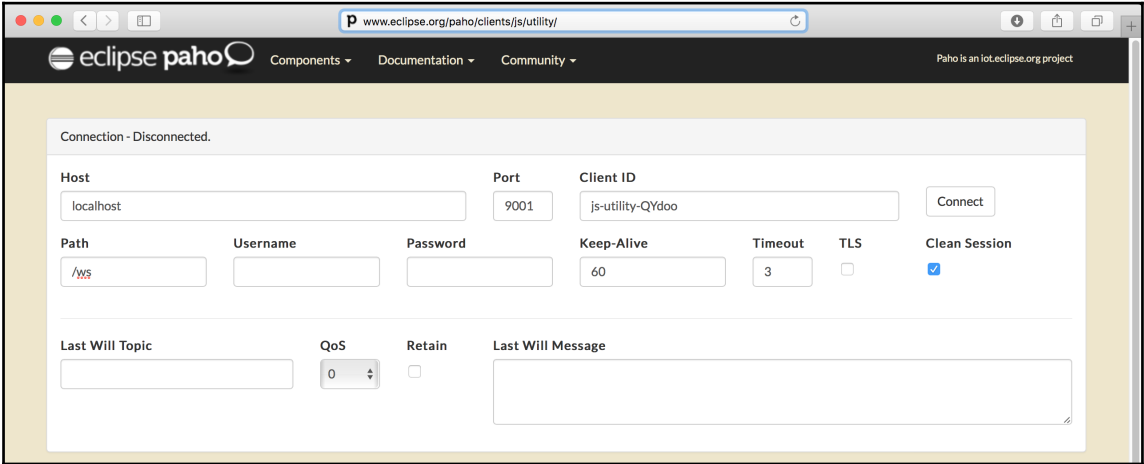
Plain

JSON

Hex

Base64

# Chapter 5: Controlling Home Automation in JavaScript



## Publish Message

### Topic

### QoS

### Retain

### Message

### Last Messages

Topic	Payload	Time	QoS
home/control/leds/1	{"Color": "FFA0A0"}	2017-02-23T04:52:25.244Z	2

### History

#### Clear History

Topic	Payload	Time	QoS
home/control/leds/1	{"Color": "FFA0A0"}	2017-02-23T04:52:25.244Z	2

MQTT over WebSockets Sampl x

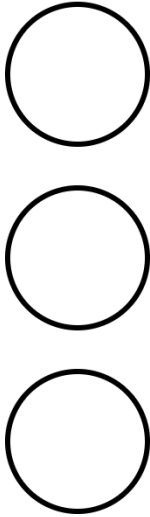
file:///Users/gaston/Documents/Packt/MQTT/Chapter05/home\_automation.html

Connected with the MQTT Server

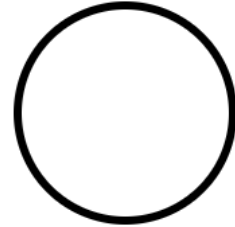
Select color for LED #1

Select color for LED #2

Select color for LED #3



Connected with the MQTT Server



Select color for LED #1



Select color for LED #2



Select color for LED #3

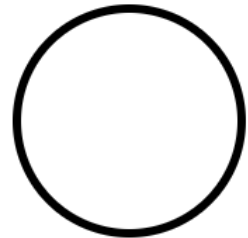
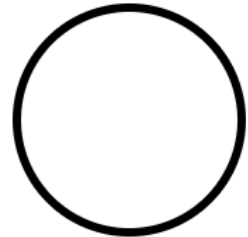
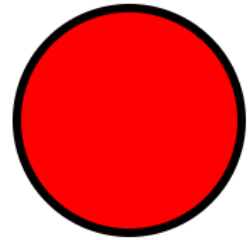
Connected with the MQTT Server

Select color for LED #1

LED's color set to #ff0000

Select color for LED #2

Select color for LED #3



Developer Tools - file:///Users/gaston/Documents/Packt/MQTT/Chapter05/home\_automation.html

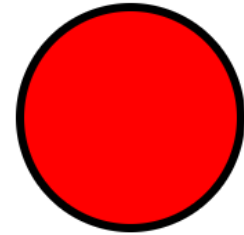
Elements Console Sources Network Timeline Profiles >>

top ▾  Preserve log

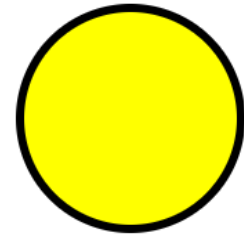
```
I will send ff0000 to LED #1 home\_automation.js:26  
Message arrived for topic: home/results/leds/1, home\_automation.js:45  
with the following payload: {"Color":"ff0000"}  
> |
```



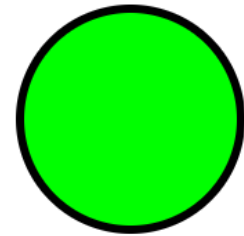
Connected with the MQTT Server



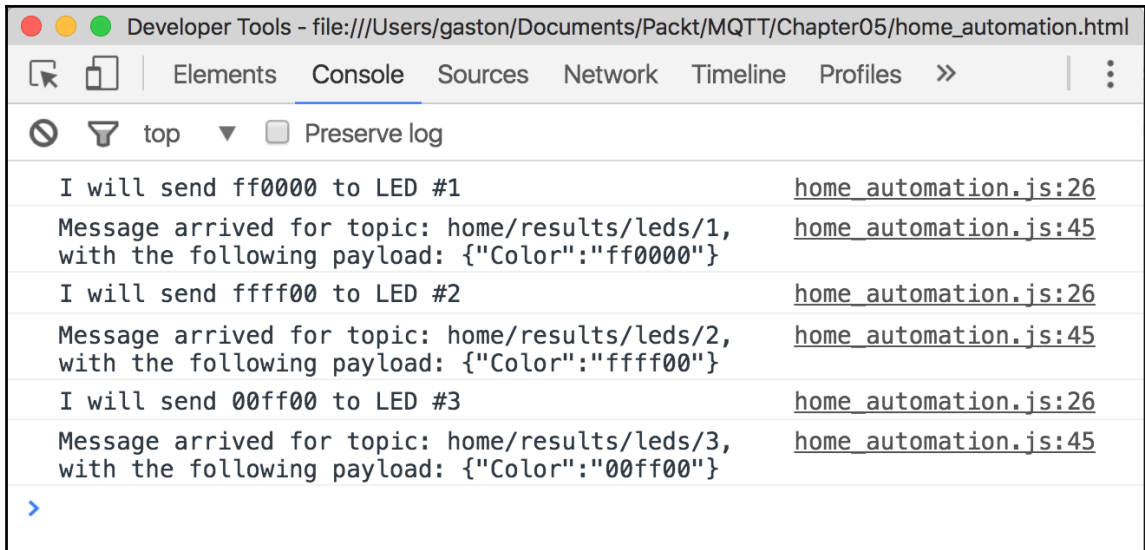
Select color for LED #1   
LED's color set to #ff0000




Select color for LED #2   
LED's color set to #ffff00



Select color for LED #3   
LED's color set to #00ff00



```
pi@raspberrypi:~/home_automation
File Edit Tabs Help
pi@raspberrypi:~/home_automation $ node leds_control.js
I'm connected to the MQTT server
Message arrived for topic: home/leds/1, with the following payload: {"Color": "ff0000"}
I've changed LED #1 to ff0000
Message arrived for topic: home/leds/2, with the following payload: {"Color": "00ff0b"}
I've changed LED #2 to 00ff0b
Message arrived for topic: home/leds/3, with the following payload: {"Color": "bc45ff"}
I've changed LED #3 to bc45ff
```



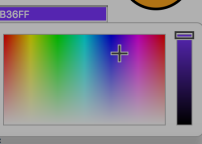
MQTT over WebSockets Samp: x

file:///Users/gaston/Documents/Packt/MQTT/Chapter05/home\_automation.html

Connected with the MQTT Server

Paused in debugger

Select color for LED #1  
LED's color set to #ffa71



Select color for LED #2  
LED's color set to #ff339e

Developer Tools - file:///Users/gaston/Documents/Packt/MQTT/Chapter05/home\_automation.html

```
home_automation.js x home_automation.html
44 onMessageArrived: function(message) { message = Message {}
45 console.log("Message arrived for topic: " + message.destinationName + ", with the following payload: "
46 if (!message.destinationName.startsWith(APP.HomeAutomation.Manager.ledResultBaseTopic)) {
47 return;
48 }
49 var ledNumber = message.destinationName.replace(APP.HomeAutomation.Manager.ledResultBaseTopic, "");
50 var payload = JSON.parse(message.payloadString);
51 if (ledNumber && payload.Color) {
52 // Update the status for the LED that has successfully changed its color
53 var statusLedDiv = document.getElementById("status-message-led-" + ledNumber);
54 //statusLedDiv.style.backgroundColor = "#" + payload.Color;
55 statusLedDiv.textContent = "LED's color set to #" + payload.Color;
56 var statusLedCircle = document.getElementById("status-circle-led-" + ledNumber);
57 statusLedCircle.style.fill = "#" + payload.Color;
58 }
59 },
60 },
61 onMessageDelivered: function(message) {
62 },
63 }
```

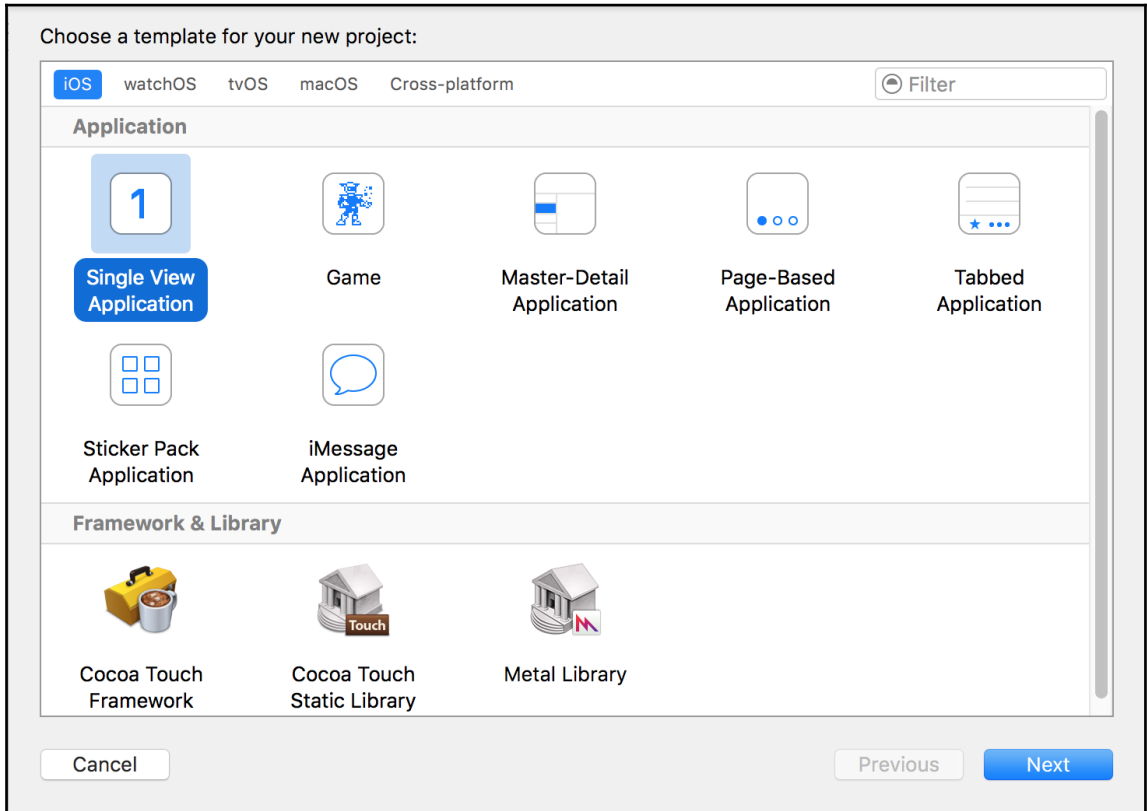
Scope

- (anonymous) mqttws31.js:157
- Local
  - ledNumber: undefined
  - message: Message
  - payload: undefined
  - statusLedCircle: undefined
  - statusLedDiv: undefined
  - this: ClientImpl
- Global
  - Window
- Breakpoints
  - home\_automation.js:45 console.log("Message arrived for...
  - XHR Breakpoints
  - DOM Breakpoints

Line 47, Column 20



# Chapter 6: Interacting with Actuators in Swift



Choose options for your new project:

Product Name:

Team:

Organization Name:

Organization Identifier:

Bundle Identifier:

Language:

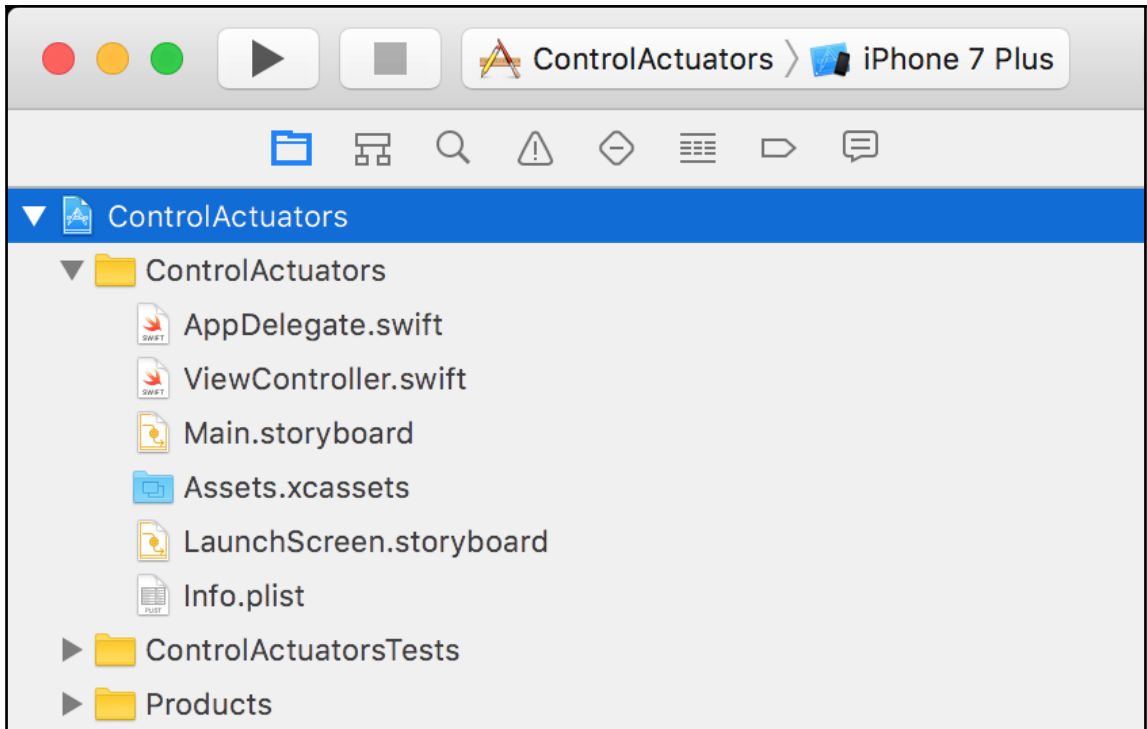
Devices:

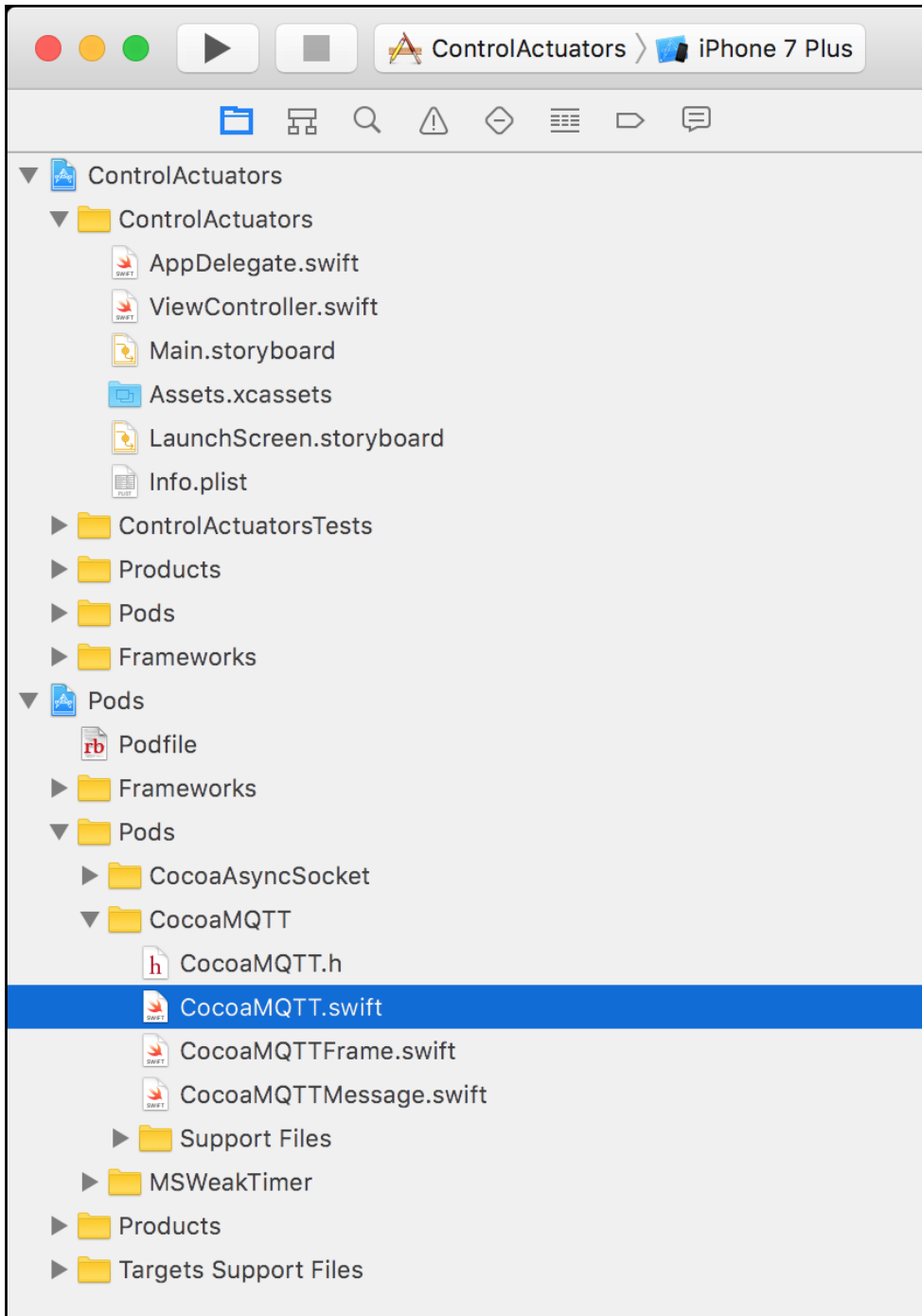
- Use Core Data
- Include Unit Tests
- Include UI Tests

Cancel

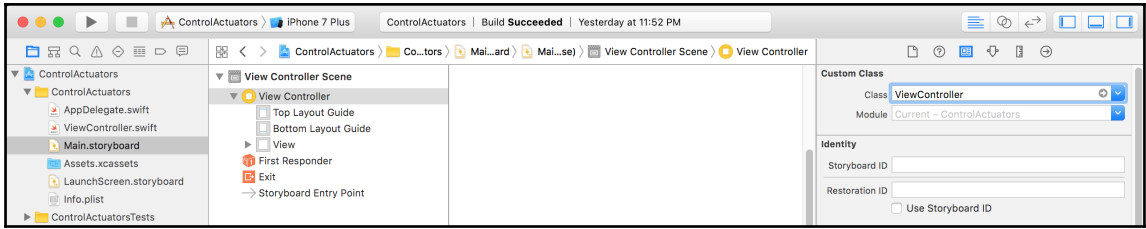
Previous

Next









## Document

Label Xcode Specific Label



Object ID UDI-oZ-PCd

Lock Inherited - (Nothing)

Notes



No Font



Comment For Localizer

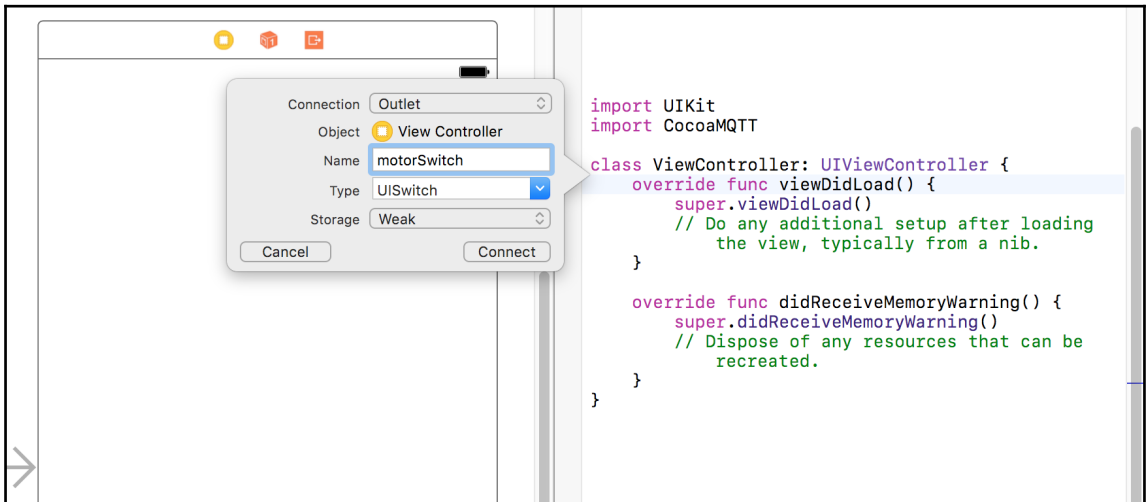
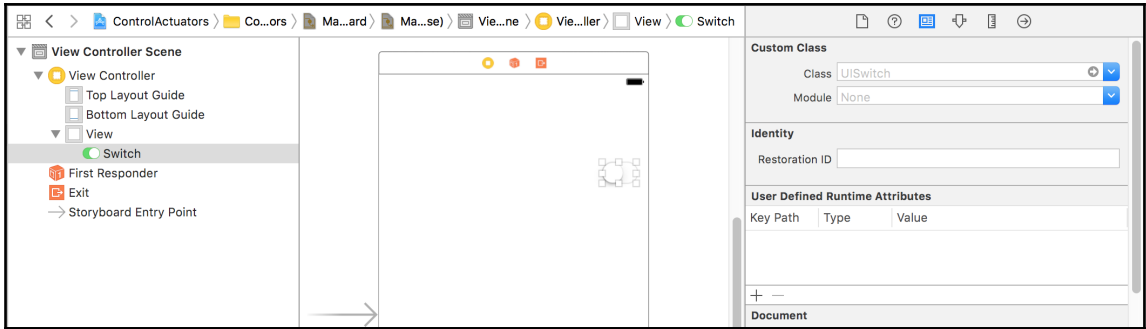


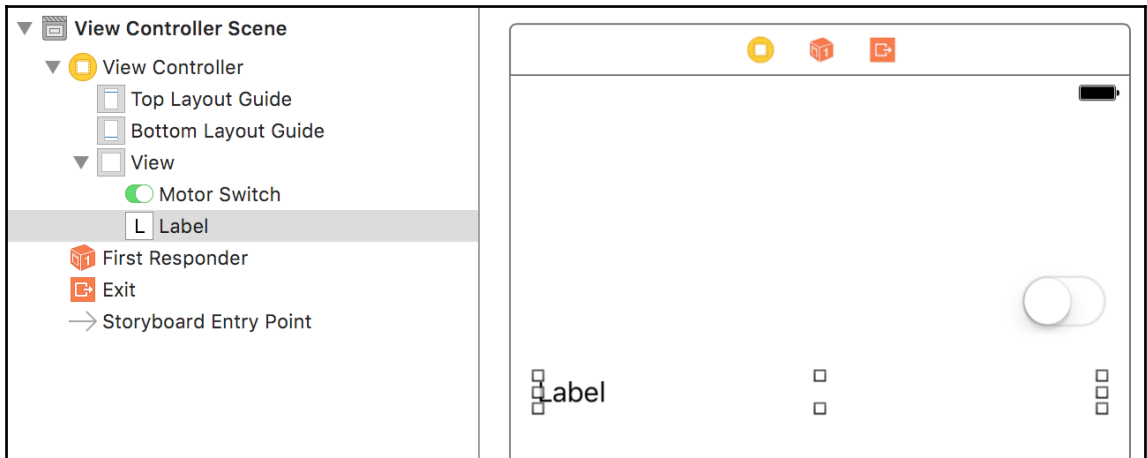
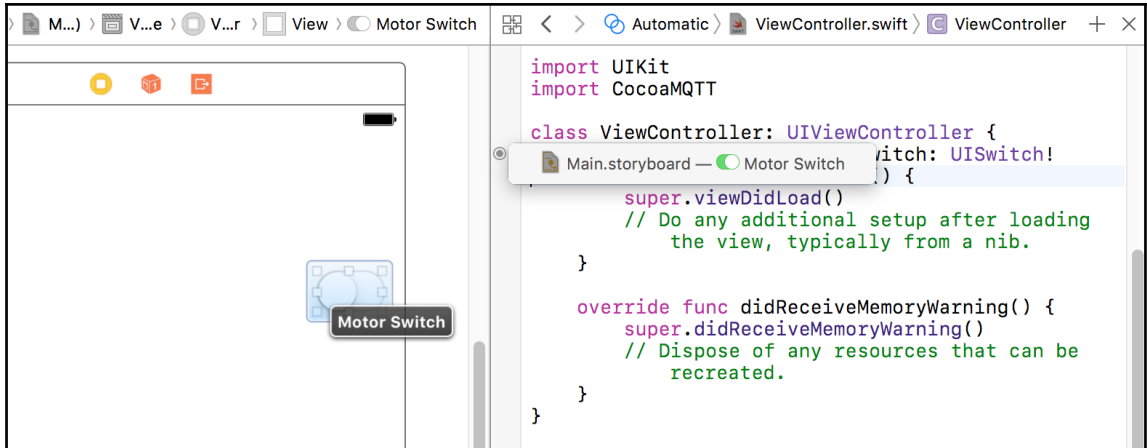
**Switch** - Displays an element showing the boolean state of a value. Allows tapping the control to toggle the value.



Switch







The image shows a screenshot of the Xcode IDE. On the left, a storyboard contains a UI element labeled "Label". A connection dialog box is open, showing the following configuration:

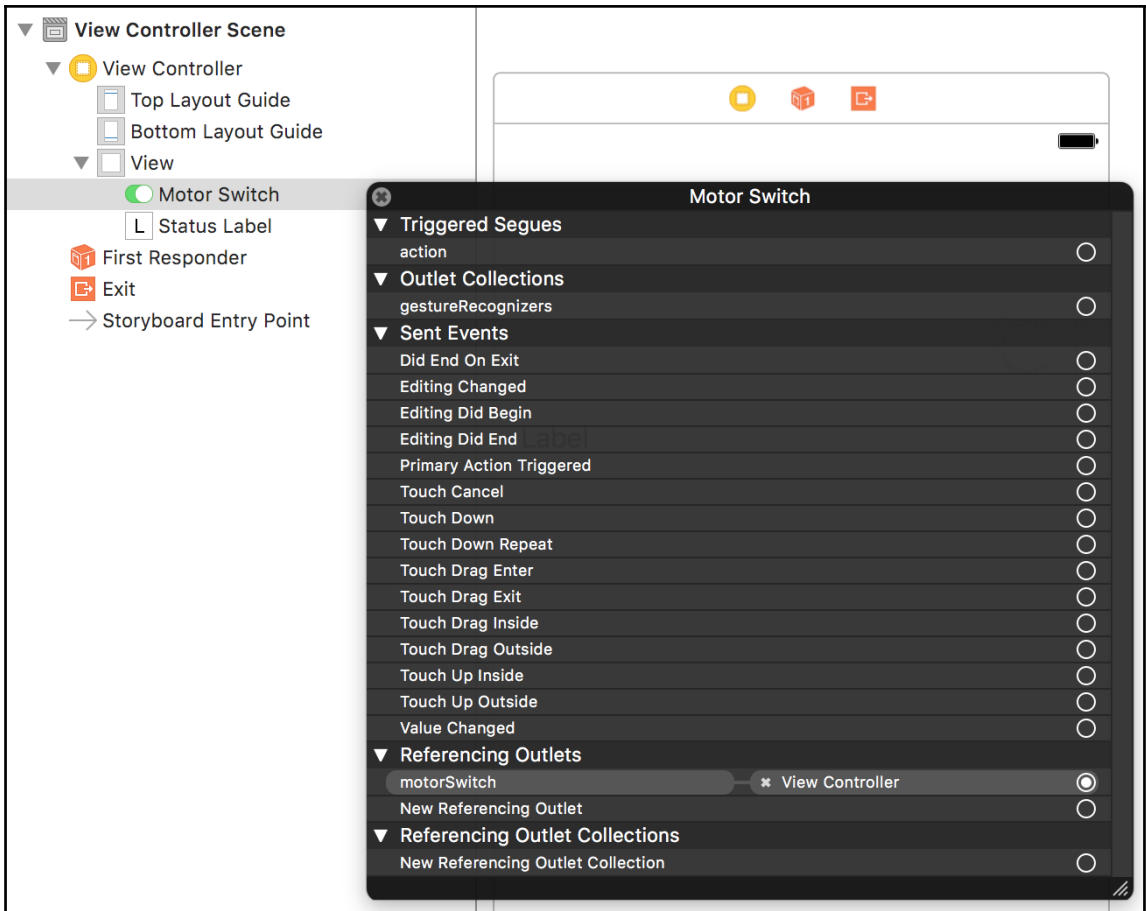
- Connection: Outlet
- Object: View Controller
- Name: statusLabel
- Type: UILabel
- Storage: Weak

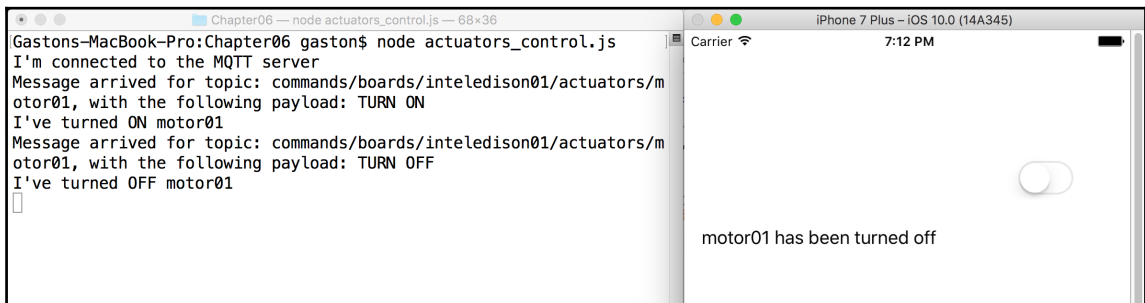
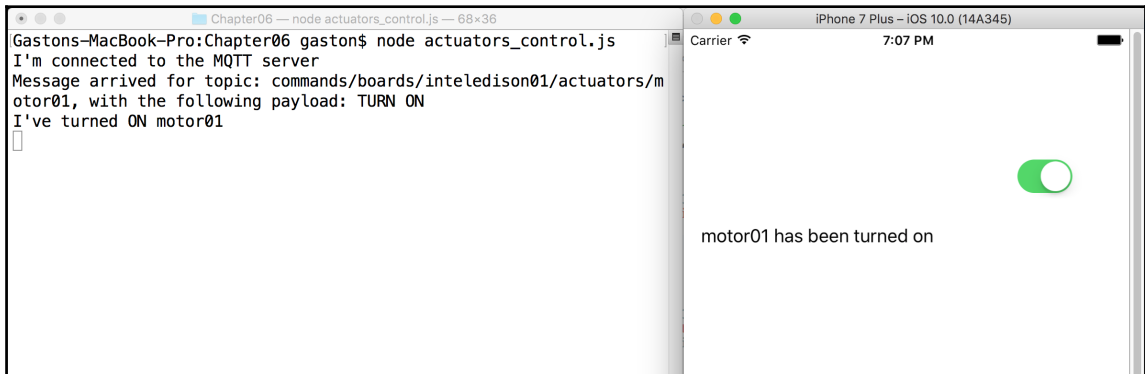
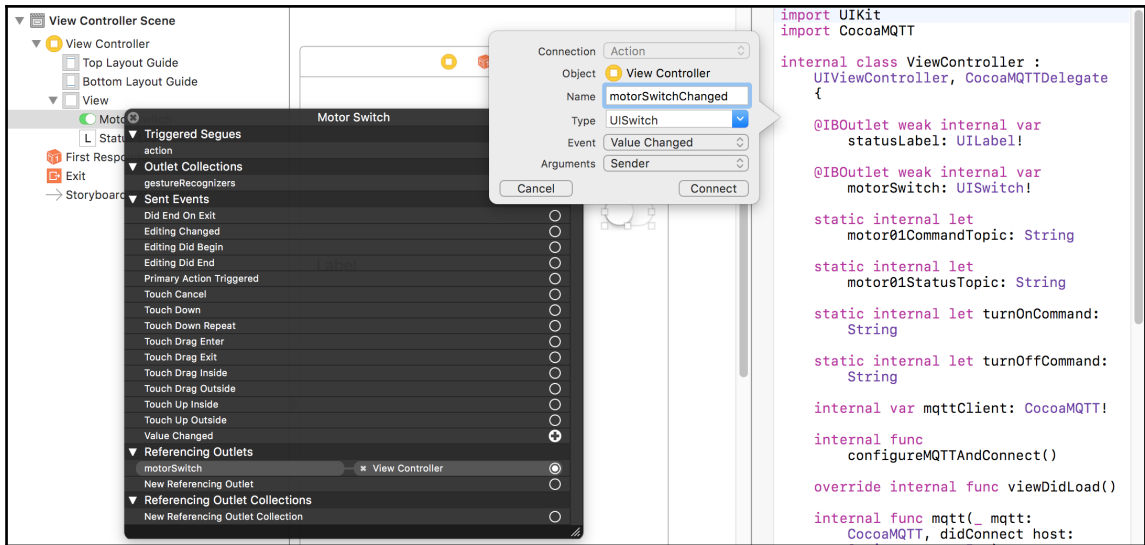
Buttons for "Cancel" and "Connect" are visible at the bottom of the dialog. On the right, a Swift code file is open, containing the following code:

```
import UIKit
import CocoaMQTT

class ViewController: UIViewController {
    @IBOutlet weak var motorSwitch: UISwitch!
    override func viewDidLoad() {
        super.viewDidLoad()
        // Do any additional setup after
        // loading the view, typically
        // from a nib.
    }

    override func
    didReceiveMemoryWarning() {
        super.didReceiveMemoryWarningWarning()
        // Dispose of any resources that
        // can be recreated.
    }
}
```





ControlActuators > ControlActuators > ViewController.swift > mqtt(\_:didReceiveMessage: id: UInt16)

```

func mqtt(_ mqtt: CocoaMQTT, didReceiveMessage message: CocoaMQTTMessage, id: UInt16) {
    print("Message received in topic \(message.topic) with payload \(message.string!)")
    if (message.topic == type(of: self).motor01StatusTopic) {
        titleLabel.text = "\(message.string!)"
    }
}

func mqtt(_ mqtt: CocoaMQTT, didSubscribeTopic topic: String) {
    print("Subscribed to \(topic)")
}

func mqtt(_ mqtt: CocoaMQTT, didUnsubscribeTopic topic: String) {
    print("Unsubscribed from \(topic)")
}

func mqttDidPing(_ mqtt: CocoaMQTT) {
}

func mqttDidReceivePong(_ mqtt: CocoaMQTT) {
}

```

Thread 1: breakpoint 1.1

---

ControlActuators > Thread 1 > 0 ViewController.mqtt(CocoaMQTT, didReceiveMessage : CocoaMQTTMessage, id : UInt16) -> ()

<ul style="list-style-type: none"> <li>▶ mqtt = (CocoaMQTT.CocoaMQTT) 0x00006000001b3780</li> <li>▼ message = (CocoaMQTT.CocoaMQTTMessage) 0x00006000000271200 <ul style="list-style-type: none"> <li>▶ ObjectiveC.NSObject (NSObject)</li> <li>qos = (CocoaMQTT.CocoaMQTTQoS) qos0</li> <li>▶ dup = (Bool) false</li> <li>▶ topic = (String) "status/boards/inteledison01"</li> <li>▶ payload = ((UInt8)) 26 values</li> <li>▶ retained = (Bool) false</li> <li>id = (UInt16) 0</li> <li>▶ self = (ControlActuators.ViewController) 0x00007fd801d0a520</li> </ul> </li> </ul>	<pre> default_ttl: 1, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize: 1, privacy_setting: 2, enable_private_data: 0 2017-03-07 19:02:58.060341 ControlActuators[7725:2236090] subsystem: com.apple.UIKit, category: Gesture, enable_level: 0, persist_level: 0, default_ttl: 1, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize: 1, privacy_setting: 2, enable_private_data: 0 2017-03-07 19:02:58.061509 ControlActuators[7725:2236090] subsystem: com.apple.UIKit, category: GestureEnvironment, enable_level: 0, persist_level: 0, default_ttl: 1, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize: 1, privacy_setting: 2, enable_private_data: 0 2017-03-07 19:02:58.062012 ControlActuators[7725:2236090] subsystem: com.apple.UIKit, category: GestureExclusion, enable_level: 0, persist_level: 0, default_ttl: 1, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize: 1, privacy_setting: 2, enable_private_data: 0 Message published to topic commands/boards/inteledison01/actuators/ motor01 with payload TURN ON Message received in topic status/boards/inteledison01 with payload motor01 has been turned on=Message published to topic commands/ boards/inteledison01/actuators/motor01 with payload TURN OFF Message received in topic status/boards/inteledison01 with payload motor01 has been turned off Message published to topic commands/boards/inteledison01/actuators/ motor01 with payload TURN ON (lldb) </pre>
--	--

Auto | Filter | All Output | Filter