# How to Use MQTT to Connect to the ioThinx 4510 Series

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Moxa is a leading provider of edge connectivity, industrial networking, and network infrastructure solutions for enabling connectivity for the Industrial Internet of Things. With over 30 years of industry experience, Moxa has connected more than 50 million devices worldwide and has a distribution and service network that reaches customers in more than 70 countries. Moxa delivers lasting business value by empowering industry with reliable networks and sincere service for industrial communications infrastructures. Information about Moxa's solutions is available at <u>www.moxa.com</u>.

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# How to Use MQTT to Connect to the ioThinx 4510 Series

In this tutorial, you will learn how to use MQTT to configure a client as a publisher or subscriber. We demonstrate two scenarios: the ioThinx 4510 as a subscriber and the ioThinx 4510 as a publisher.

# **Prepare the Following Items**

- ioThinx IIoT Starter Kit (ioThinx 4510, 45MR-1601, 45MR-2600, and 45MR-3800)
- Software: Mosquitto (1.5.8), MQTTlens, ioThinx 4510 (with firmware v1.1 installed)

# **Broker Settings on the Computer**

# **Introduction to Mosquitto**

For information about Eclipse Mosquitto, please refer to the following web page: <a href="https://mosquitto.org/">https://mosquitto.org/</a>. Mosquitto can be used to implement versions 5.0, 3.1.1, and 3.1 of the MQTT protocol.



IP address: 192.168.127.200

Moxa ioThinx 4510 IP address: 192.168.127.254

# **Install Mosquitto**

Download **Mosquitto** from the following website and install it: <a href="https://mosquitto.org/download/">https://mosquitto.org/download/</a>

# How to Use MQTT to Connect to the ioThinx 4510 Series

# Enable port 1883 on the firewall

1. Here we use Windows 10 as an example. First, open the **Windows Firewall**.

← Settings	- 0	×
	Status MHQ-NB MoxaGroup	
Network & Internet	You're connected to the Internet	
Status	If you have a limited data plan, you can make this network a metered connection or change other properties.	
<i>i</i> ∕a, Wi-Fi	Change connection properties	
臣 Ethernet	Show available networks	
ි Dial-up	Change your network settings	
% VPN	Change adapter options View network adapters and change connection settings.	
r∯ Airplane mode	Sharing options For the networks you connect to, decide what you want to share.	
(iji) Mobile hotspot	A Network traublache ater	
🕑 Data usage	Diagnose and fix network problems.	
Proxy	Windows Firewall	

#### 2. Select Advanced settings.

Wind	lows Defender Security Center		_	×
				<u> </u>
=		<sup>(</sup> Կ <sup>)</sup> Firewall & network protection		
ŵ	Home	View network connections, specify Windows Defender Firewall settings,		
0	Virus & threat protection	and troubleshoot network and Internet problems.		
8	Account protection	Domain network		
(q))	Firewall & network protection	No actions needed.		
	App & browser control			
旦	Device security	Se Private network		
ø	Device performance & health	No actions needed.		
ቋ፟	Family options	Sections needed.		
		Allow an app through firewall		
		Network and Internet troubleshooter		
		Firewall notification settings		
		Advanced settings		

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3. Select **Inbound Rules** and create a **New Rule**.

File Action View Help								
🗢 🏟 🙍 📷 🗟 🚺								
Windows Defender Firewall witl	Inbound Rules					Act	ions	
Inbound Rules	Name	Group	Profile	Enabled	Acti ^	Inb	ound Rules	<b></b>
Connection Security Rules	🔮 etcp		Domain	Yes	Allo	1	New Rule	
> 툃 Monitoring	🔮 etcp		Domain	Yes	Allo	7	Filter by Profile	•
	Firefox (C:\Program Files\Mozilla Firefox)		Private	Yes	Allo		Filter by State	•
	Google Chrome		Private	Yes	Allo		Filter by Group	•
	Google Chrome		Public	Yes	Allo	Ŀ	View	
	Google Chrome		Public	Yes	Allo		view	
	🧭 Google Chrome		Domain	Yes	Allo		Refresh	
	🔮 Google Chrome		Private	Yes	Allo		Export List	
	Google Chrome		Private	Yes	Allo	?	Help	
	V I/O Event Logger		Domain	Yes	Allo			
	W I/O Event Logger		Domain	res	All0			

# Select **Port** in the **Rule Type**. New Inbound Rule Wizard

×

Steps:		
a Rule Type	What type of rule would you like to create?	
<ul> <li>Protocol and Ports</li> <li>Action</li> <li>Profile</li> <li>Name</li> </ul>	<ul> <li>Program Rule that controls connections for a program.</li> <li>Port Rule that controls connections for a TCP or UDP port.</li> <li>Predefined:</li> </ul>	
	AllJoyn Router Rule that controls connections for a Windows experience. Custom Custom rule.	

5. Select  $\ensuremath{\text{TCP}}$  and enter  $\ensuremath{\textbf{1883}}$  in the  $\ensuremath{\textbf{Specific local ports}}$  input box.

#### Protocol and Ports

Specify the protocols and ports to which this rule applies.

Steps:	
a Rule Type	Does this rule apply to TCP or UDP?
Protocol and Ports	• TCP
Action	OUDP
Profile	
Name	Does this rule apply to all local ports or specific local ports?
	◯ All local ports
	Specific local ports: 1883
	Example: 80, 443, 5000-5010

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6. Select **Allow the connection**.

#### Action

Specify the action to be taken when a connection matches the conditions specified in the rule.

Steps:	
Rule Type	What action should be taken when a connection matches the specified conditions?
Protocol and Ports	Allow the connection
Action	This includes connections that are protected with IPsec as well as those are not.
Profile	O Allow the connection if it is secure
Name	This includes only connections that have been authenticated by using IPsec. Connections will be secured using the settings in IPsec properties and rules in the Connection Security Rule node.
	Customize
	○ Block the connection

7. Select **Domain** and **Private**.

#### Profile

....

Specify the profiles for which this rule applies.

Steps:	
Rule Type	When does this rule apply?
Protocol and Ports	
Action	
Profile	Applies when a computer is connected to its corporate domain.
Name	Private Applies when a computer is connected to a private network location, such as a home or work place.
	Public     Applies when a computer is connected to a public network location.

# How to Use MQTT to Connect to the ioThinx 4510 Series

8. Enter the Name and Description (optional), and then click Finish.

specify the name and description	of this rule.
Steps:	
Rule Type	
Protocol and Ports	
Action	
Profile	Name:
Name	MQ11
	Description (optional):
	< Back Finish Cance

9. Run Mosquitto Broker from Task Manager.

Type **Ctrl + Alt + Delete** to open **Task Manager**, click the **mosquitto** row to select it, and then right click in the status column and select **Start**.

# Set Up MQTT on the ioThinx 4510

### **Enable MQTT Client Service**

1. Log in to the ioThinx 4510:

**Step 1:** Open your web browser and type the default IP address of the device: 192.168.127.254.

**Step 2:** On the login page, type the default username/password (admin/moxa) to log in to the Web Console.

# How to Use MQTT to Connect to the ioThinx 4510 Series

2. Click **Security** in the left menu. Select **Service Settings** at the top of the page and then select **MQTT Client**.

	oThinx 45	510				Save & Restart   Logou
Dashboard	Service	2 Settings	User Settings	Account Settings	Access Control	Certificate Settings
System	Service Set	tings				
Security						
Network		No.	Servi	ce	TCP/UDP	Port
Module		1	Web Service	via HTTP	TCP	80
Serial Port		2	Web Service	ria HTTPS	TCP	443
Internal Register		3	RESTful API	via HTTP	TCP	80
Protocol -		4	RESTful API v	ria HTTPS	TCP	443
Modbus		5	SNMP A	gent	UDP	161
SNMP		6	Modbus/TC	P Slave	TCP	502
MQTT		7	Modbus/RT	U Master		-
		8	MQTT C	lient	TCP	-
	×	9	IOxpress/MCC	Tool/MXIO	TCP/UDP	10124/4800

# **Connection and Topic Settings**

 Select MQTT in the left menu and then set the Broker IP (your host's IP) under Connection Settings.

MOXA	ioThinx 4510		Save & Restart   Logout
Dashboard	Connection Settings	Topic Settings	
System	Connection Sattings		
Security	Connection settings		
Network	Service Enabled		
Module	Note: enable/disable this service through <u>Security Service Settings</u>		
Serial Port	Broker IP		
1/0	192.168.127.200		
Internal Register	Broker Port	Device ID	
Protocol -	1883	moxa_io_0090e8eb3214	
Modbus	Keep Alive Interval		
SNMP	60		
MQTT	Retry Period	Retry Count	
	30	5	

# How to Use MQTT to Connect to the ioThinx 4510 Series

 Click Publisher and enable Topic#1 (DI-00), and then click Subscriber and enable Topic#1 (DO-00).

MOXA	ioThinx 451	0								Save & Rest
Dashboard			Connectio	in Settings			Торіс	Settings		
System Security	Topic Setting	5								
Network	Ð			UNU	ISED 254					
Module						Filter Value	Attribute	Enable Disable	Keywords	48 result(s)
Serial Port	A Batch Edit									
I/O	Enable Ena	ble Disable Qo	S QoS 0 QoS	1 QoS 2 Retained ON OFF						
rotocol -	Trigger Inte	rval 5 (Unit	sec) On Chang	e 50 (Unit: %)						
Modbus			Pu	blisher			Subse	criber		
SNMP	# Ena	ble Slot	Channel	Торіс		QoS	Retained	Trigger	C	ondition
MQTT	1	R-01	DI-00	Tutorial/read/GET_Demo@Button/diStatus		0 •	OFF	On Change	•	(Unit: %)
	2	R-01	DI-01	Tutorial/read/GET_Demo@DI-01/diStatus		0 •	OFF	On Change	•	(Unit: %)



# How to Use MQTT to Connect to the ioThinx 4510 Series

Note: The content of the **Topic** is based on **Device Name**, **Module name**, and **I/O channel**. You can change these values in **Device Settings**, **Module Settings**, and **I/O Settings**.



In this demonstration, we changed our **Topic #1 (DI-00 and DO-00)** as below: Publisher **Topic#1**(DI-00):Tutorial/read/PUB\_Demo@Button/diStatus Subscriber **Topic#1**(DO-00):Tutorial/write/SUB\_Demo@Light/doStatus

# How to Use MQTT to Connect to the ioThinx 4510 Series

3. Click **Save & Restart** in the upper-right corner, and then click **Save and Restart** in the center of the page.

MOXA° ioThinx 4510	1 Save & Restart   Logout
Dashboard	
System	
Security	
Network	
Module	
Serial Port	
1/0	
Internal Register	
Protocol -	Configuration has been modified
Modbus	Do you want to save current setting to device?
SNMP	2 Save and Restart Cancel
MQTT	

# **Publisher and Subscriber Settings**

# **Introduction to MQTTlens**

MQTTLens is a chrome application that supports MQTT communications. MQTTLens can be used to simulate communicating with the ioThinx 4510 via MQTT.

# **Configuring MQTTlens**

#### 1. Install **MQTTlens**

You can download **MQTTIens** from the following link: <u>https://chrome.google.com/webstore/detail/mqttlens/hemojaaeigabkbcookmlgmdigohjobjm</u>

2. Add a new connection on MQTTlens

<b>P</b> MQTTlens	Version 0.0.14
Connections + <	

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3. Enter your **Connection name** and **Hostname** (broker IP) in the associated text input boxes.

Add a new Coni	nection		×
Connection Detail	ls		
Connection name		Connection color sc	heme
ioThinx 4510			
Hostname		Port	
tcp:// 🔻 192.1	68.127.200	1883	
Client ID			
lens_pv8M2k5881vl	UFgvyqb0oAoCKMy	Generate	a random ID
Session	Automatic Connection	Keep Alive	
Clean Session	Automatic Connection	120	seconds

# Scenario 1: Publish DI status to MQTTlens

- Publisher: ioThinx 4510
- Subscriber: MQTTlens
- 1. Copy the topic from the ioThinx 4510 **MQTT publisher** tab.

			Pu	blisher		Subscri	ber			
#	Enable	Slot	Channel	Торіс	QoS	Retained	Trigger		Condit	ion
1		R-01	DI-00	Tutorial/read/PUB_Demo@Button/diStatus	0 •	OFF	On Change	*	-	(Unit: %)

2. Paste the topic into the subscribe column of the **MQTTIens**, and then click subscribe.

	<		
I	Connection: ioThinx 4510		
l	Subscribe		^
	Tutorial/read/PUB_Demo@Button/diStatus	0 - at most once 🔻	SUBSCRIBE

3. Press the DI0 button on the starter kit to trigger the DI-00 channel; you should see the DI value change on your subscriber.

Topic: "Tutorial/read/PLIB_Demo@Butt	on/diStatus" Showing the last 5 messages - +	Messages: 0/2
Toplo. Tatoharroadin ob_bonno@bata		
# Time Topic G	oS	
0 10:31:43 B_Demo@Button/diStatus		
"value": 1		

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# Scenario 2: Turn on ioThinx 4510's DO channel

- Publisher: MQTTlens
- Subscriber: ioThinx 4510
- 1. Copy the topic from the ioThinx 4510 **MQTT subscriber** page.

Publisher					Subse	criber
#	Enable	Slot	Channel	Торіс		QoS
1		R-02	DO-00	Tutorial/write/SUB_Demo@L	Light/doStatus	0 *

- 2. Paste the **Topic** into the **MQTTlens** publish column.
- 3. Enter the following message:

Message	
{	
"value":1	
}	

4. Click **Publish**. The DO-00 channel should respond by turning the light on.

_	Publish	. 4
2	Tutorial/write/SUB_Demo@Light/doStatus	0 - at most once  Retained PUBLISH
8	Message	
	( value":1 )	