NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

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About Moxa

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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1. Introduction

The NPort IA5000A-I/O and NPort IAW5000A-I/O serial device servers, which have built-in digital I/Os, provide maximum flexibility when you need to integrate serial equipment in the field with an Ethernet network or cloud platform. From Firmware Version 2.0 onwards, they support communications with IIoT applications, using generic MQTT or third-party cloud services, such as Azure and Alibaba Cloud.

This document demonstrates how to use the NPort IA5000A-I/O or NPort IAW5000A-I/O serial device connecting to AWS IoT. We also demonstrate how to publish serial or I/O data messages to AWS IoT and subscribe messages from AWS IoT.

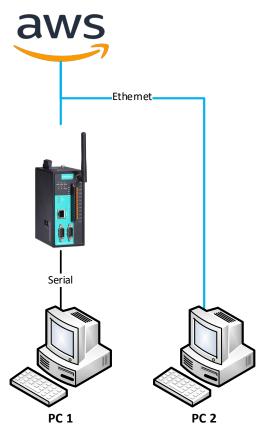
2. System Topology

Figure 1 illustrates the system topology. PC1 runs PComm Lite to act as a serial device. It connects to Port 1 of the NPort IA5000A-I/O or NPort IAW5000A-I/O serial device. The NPort IA5000A-I/O or NPort IAW5000A-I/O serial device acts as a MQTT Broker and connects to AWS IoT. PC2 runs MQTT.fx MQTT Client. The MQTT.fx published messages to AWS IoT and subscribes topics from AWS IoT.



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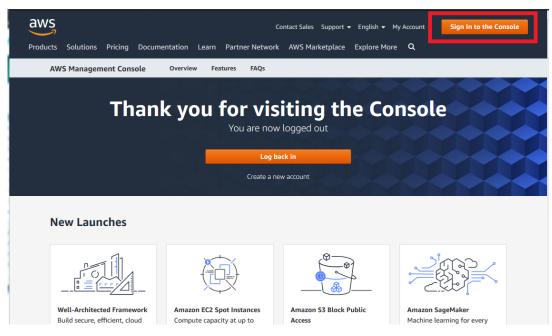
< Figure 1. System Topology >



2.1 Create AWS IoT and Thing

 Use AWS user account to log in to AWS Console. Website: <u>https://aws.amazon.com/console/</u>

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 Fill in "iot core" key word under Find Services, or find "Internet Of Things → IoT Core" under the All services section:

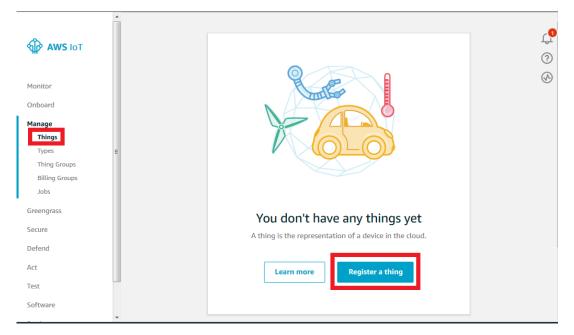
AWS services		Access resources on the go
Find Services You can enter names, keywords or acro	nyms.	Access the Management Console using the AWS Console Mobile App. Learn more [2]
loT Core		
Connect Devices to the Cloud Recently visited services		Explore AWS
IoT Core	Key Management Service	
Support	Billing	Open Distro for Elasticsearch A 100% open-source, community driven
All services		distribution of Elasticsearch with enterprise-grade security and alerting features Learn more [2]
Compute	S Machine Learning	
EC2 Lightsail 🛃	Amazon SageMaker Amazon Comprehend	Amazon SageMaker
ECR	AWS DeepLens	Machine learning for every developer and
ECS EKS	Amazon Lex Machine Learning	data scientist. Learn more 🔼
Lambda	Amazon Polly	
Batch	Rekognition	AWS Marketplace
Elastic Beanstalk	Amazon Transcribe	
Serverless Application Repository	Amazon Translate Amazon Personalize	Find, buy, and deploy popular software products that run on AWS. Learn more 🗹



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3. To register a thing:

On the menu, select **Manage** \rightarrow **Things**, and click the **Register a thing** button.



On the Creating AWS IoT things page, click Create a single thing.

Creating AWS IoT things	
An IoT thing is a representation and record of your phyisical device in the cloud. Any physical device needs a thing record in order to work with AWS IoT. Learn more.	
Register a single AWS IoT thing Create a thing in your registry	Create a single thing
Bulk register many AWS IoT things	
Create things in your registry for a large number of devices already using AWS IoT, or register devices so they are ready to connect to AWS IoT.	Create many things
Cancel	Create a single thing

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For the first step, on the **Add your device to the thing registry** page, fill in "NPort" under **Name** and click **Next**.

Th:		
Name	in the thing registry and a thing shadow for your device.	
NPort		
Apply a type to this t	hing	
Using a thing type simplifi	es device management by providing consistent registry data for things that share a type. Types provic	le things with a
5 5 5 7	-	le things with a

For step 2, on the Add a certificate for your thing page, click Create certificate.

Add a certificate for your thing	STEP 2/3 V
A certificate is used to authenticate your device's connection to AWS IoT.	
One-click certificate creation (recommended) This will generate a certificate, public key, and private key using AWS IoT's certificate authority.	Create certificate
Create with CSR Upload your own certificate signing request (CSR) based on a private key you own.	▲ Create with CSR
Use my certificate Register your CA certificate and use your own certificates for one or many devices.	Get started
Skip certificate and create thing	

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For the last step, on the **Certificate created!** page, download the files below:

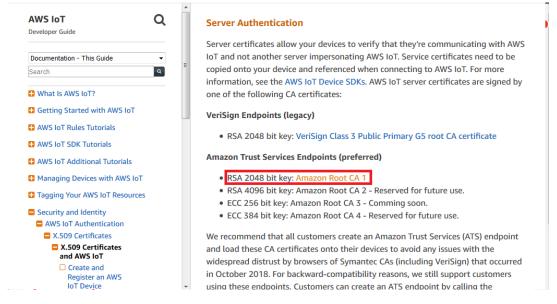
- A certificate for this thing
- A public key
- A private key
- A root CA for AWS IoT

Then, click the **Activate** button, which will change to **Deactivate**; lastly, click **Attach a policy**.

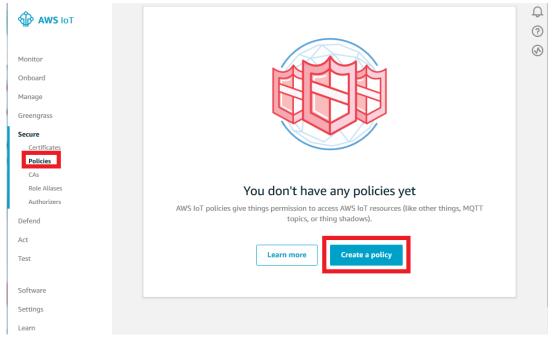
Certificate crea	ted!		Successfully deactivated certificate.	× <mark>4</mark> ?
Download these files and after you close this page.	save them in a safe place. Certificates	can be retrieved a	any time, but the private and public keys cannot be retrieved	J
In order to connect a dev	rice, you need to download the follow	/ing:		
A certificate for this thing	Cert.pem	Download		
A public key	public.key	Download		
A private key	fine private.key	Download		
You also need to downlo A root CA for AWS IoT Dov Activate	ad a root CA for AWS loT: wnload			
Cancel			Done Attach a policy	

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When you download a root CA file, a new web page (as below) will pop up for you to download a root CA file. In this demonstration, we use Amazon Root CA 1 (RSA 2048 bit key).



4. To create a policy, select **Secure** → **Policies**, and click the **Create a policy** button.



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On the **Create a policy** page, set the following settings as below and click the **Create** button:

- Name: MOXA_IoT_Policy
- Action: iot:*
- Resource ARN: *
- Effect: Allow

create a policy to define a set of du	thorized actions. You can authorize actions on one or more reso	urces (things, topics, topic filters). To learn
	WS IoT Policies documentation page.	
Name MOXA_IoT_Policy		
Add statements	of actions that can be performed by a resource.	Advanced mode
oncy statements denne the types o	s actions that can be performed by a resource.	
Action		
iot:*		
Resource ARN		

Now, you have a new policy, namely MOXA_IoT_Policy.

	Policies	Successfully created a policy.	× . ?
Monitor	Search policies C	λ	Card 👻 🐼
Onboard			
Manage	MOXA_IoT_Policy		
Greengrass			
Secure			
Certificates			
Policies			
CAs			
Role Aliases			
Authorizers			

After clicking **OK**, it will show "Device Certificate". We can now click **Close** to close the window.

Next, in the Device List, the device name will appear as "NPort".

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

 To attach the Device Certificate to an AWS IoT Policy and a thing: Select Secure → Certificates and left-click the ellipsis (...).

🖗 AWS ІОТ	Certificates	Create 🖓
Monitor	Search certificates Q	Card 🗸 🐼
Onboard		
Manage	ACTIVE	
Greengrass		
Secure		
Certificates		
Policies CAs		
CAS Role Aliases		
Authorizers		
Defend		
Act		
Test		
Software		
Settings		
Learn		

In the drop-down menu, click **Attach policy**.

💮 AWS IOT	Certificate	S	
Monitor	Search certifica	ites	Q
Onboard		•••	
Manage	ACTIVE	Activate	
Greengrass	ACTIVE	Deactivate	
Secure		Revoke	
		Accept transfer	
Certificates		Reject transfer	
Policies		Revoke transfer	
CAs		Start transfer	
Role Aliases			
Authorizers		Attach policy	
Defend		Attach thing Download	
Act		Delete	

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

In the **Attach policies to certificate(s)** dialog box, check "MOXA_IoT_Policy", and then click **Attach**.

Attach policies to certificate(s)					
Policies will be attached to the following certificate					
Choose one or more policies					
Q Search policies					
MOXA_IoT_Policy	View				
	1 policy selected Cancel Attach				

Go back to the drop-down menu and select **Attach thing**.

💮 AWS IOT	Certificates				
Monitor	Search certificates	Q			
Onboard					
Manage	Activate				
Greengrass	Deactivate				
Secure	Revoke Accept transfer				
Certificates	Reject transfer				
Policies	Revoke transfer				
CAs	Start transfer				
Role Aliases					
Authorizers	Attach policy				
Defend	Attach thing Download				
Act	Delete				

In the Attach things to certificate(s) dialog box, check "NPort" and click Attach.

Attach things to certificate(s)
Things will be attached to the following certificate(s):
Choose one or more things
Q Search things
☑ NPort
1 thing selected Cancel Attach

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

2.2 Set Up the NPort IA5000A-I/O and NPort IAW5000A-I/O to Connect to AWS IoT Via MQTT Broker

 Log in to the NPort IA5000A-I/O or NPort IAW5000A-I/O's web console and set the correct time setting on the **Basic Settings** page. Also, you can fill in **Time server** to correct the NPort's time-on period. You will find the NTP service at https://www.pool.ntp.org/zone/@

Time Settings		
Time zone	(GMT+08:00)Taipei	•
Local time (24-hour)	2019 / 05 / 17 22 : 23 : 49	
Time server	asia.pool.ntp.org	

 Click Main Menu → IoT Management → IoT Mode to set IoT platform as "MQTT Broker".

• IoT M	ode	
Basic Settings		

10	Γn	lati	foi	m
10	ı p	au		

MQTT Broker 🗸 🗸

The IoT Mode is running with MQTT Broker. It will show more settings regarding MQTT as below:

MQTT Connection Settings		
Host address		
Host port	1883	
Username		
Password		
Client ID		Generate
Keep alive	60 (1 - 65535 sec.)	
Clean session	enable 📃	
TLS (Transport Layer Security)		
TLS mode	Disable 👻	

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

 Under the MQTT Connection Settings → Host address string, fill in the HTTPS link, and "8883" for Host port.

Client ID identifies the MQTT session; it must be unique. Broker doesn't accept the same **Client ID** connection twice. You can fill in an identifiable ID or click **Generate** to generate a random ID.

•IoT Mode

Basic Settings	
IoT platform	MQTT Broker 👻
MQTT Connection Settings	
Host address	myq3-ats.iot.us-west-2.amazonaws.com
Host port	8883
Username	
Password	
Client ID	fad08b22-a1a4-48fd-8e1b-73d5406832! Generate
Keep alive	60 (1 - 65535 sec.)
Clean session	enable

You can follow the following steps to find the HTTPS link:

Go back to **IoT core** on the AWS Console. Select **Manage** \rightarrow **Things** and left-lick to show the details.

AWS IOT	Things		Create Q
Monitor	Search things	Q Configure fleet indexing ③	Card 👻 🐼
Onboard	000		
Manage Things	NPort NO TYPE		
Types			
Thing Groups			
Billing Groups			
Jobs			
Greengrass			
Secure			
Defend			
Act			
Test			

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> NPort		
HING NPort 10 TYPE		Actions
etails	This thing already appears to be connected.	t a device
ecurity		
hing Groups	HTTPS	
lling Groups	Update your Thing Shadow using this Rest API Endpoint. Learn more	
hadow Iteract	Contraction and the second	
ctivity	MQTT	
bs	Use topics to enable applications and things to get, update, or delete the state information for a Thing (Thing S	Shadow)
iolations	Learn more	
efender metrics	Update to this thing shadow	
	\$aws/things/NPort/shadow/update	
	Update to this thing shadow was accepted	

Under **Thing**, select **Interact** in order to reveal the HTTP link.

4. To enable a TLS transmission, set **TLS mode** as "TLS v1.2". We need to upload CA certificate, client certificate, and client key file before you can download ("Register a Thing" step). The certificates and key file must be PEM encoded. If your key file has a passphrase, fill in the correct passphrase when uploading a key file as below:

TLS (Transport Layer Security)			
TLS mode	TLS v1.2 🔻		
CA file	AmazonRootCA1.pem	Browse No file selected.	Upload Delete
Client certificate file	certificate.pem.crt.1	Browse No file selected.	Upload Delete
Client key file	ti key private.pem.key	Browse No file selected.	Upload Delete
Client key password			

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 Uncheck Retain under MQTT Publish so that AWS IoT does not support retain messages. For more detailed information, please reference AWS Documentation » AWS IoT » Developer Guide » Message Broker for AWS IoT » Protocols » MQTT

(https://docs.aws.amazon.com/iot/latest/developerguide/mqtt.html)

MQTT Publish	
Serial port 1	Topic NPortIO/JSON/SPort1/Pub/Data QoS 1 🚽 Retain 📄
Serial port 2	Topic NPortIO/JSON/SPort2/Pub/Data QoS 1 👻 Retain 📄
I/O	Topic NPortIO/JSON/DIO/Pub QoS 1 🗸 Retain 🗌
MQTT Subscribe	
Serial port 1	Topic NPortIO/JSON/SPort1/Sub/Data QoS 1 -
Serial port 2	Topic NPortIO/JSON/SPort2/Sub/Data QoS 1 -

After clicking the **Submit** button, the NPort IA5000A-I/O or NPort IAW5000A-I/O will connect to AWS IoT, and you can check whether connection status states **Connected** under **IoT Connection Monitoring** as below:

:•IoT Connection Monitoring

MQTT Client Connection Inf	ormation
Target	.iot.us-west-2.amazonaws.com
Connection status	Connected
Diagnostics log	2019/05/24 21:18:58 Connecting 2019/05/24 21:18:59 Connected successfully!

2.3 Set Up MQTT.fx(client) Connect to AWS IoT

MQTT.fx is a MQTT Client written in Java based on Eclipse Paho. It is published under Apache License, Version 2.0.

- Download MQTT.fx and install it on PC 2, which can be download from <u>https://mqttfx.jensd.de/</u>
- To launch MQTT.fx and configuration profile with MQTT Broker default settings, click the "gear" icon, or on the toolbar, select Extras → Edit Connection Profile to modify the profile settings.

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The Edit Connetion Profile window will pop up.

Profile Name Profile Type	New Profile MQTT Broker	
MQTT Broker Profile Settings		
Broker Address	127.0.0.1]
Broker Port	1883	
Client ID	MQTT_FX_Client	Generate

To configure the AWS IoT Profile Settings session, set "AWS IoT" as the **Profile Name** and "MQTT Broker" as the **Profile Type**. For **Broker Address**, fill in the HTTPS link registered for "thing", and for **Broker Port** fill in "8883". The **Client ID** identifies the MQTT session; it must be unique. Broker doesn't accept the same **Client ID** connection twice. You can fill in an identifiable ID or click **Generate** to generate a random ID.

Profile Name	AWS IOT	
Profile Type	MQTT Broker	
MQTT Broker Profile Settings		
Broker Address	-ats.iot.us-west-2.amazonaws	
Broker Port	8883	-
Client ID	e5ad93df88ca40f2b6f3abab1a99466f	Generate

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

Select the **SSL/TLS** tab and set the settings as below:

- Enable SSL/TLS: Check
- Protocol: TLSv1.2
- Select **Self signed certificates** to upload the CA certificate, client certificate, and client key file before you can download ("Register a thing" step). If your key file has a passphrase, fill in the correct passphrase.
- PEM Formatted: Check

General User Credentials SSL/TLS Proxy LWT	
Enable SSL/TLS V Protocol TLSv1.2	
CA signed server certificate	
CA certificate file	
CA certificate keystore	
Self signed certificates	
CA File	
Client Certificate File	
Client Key File	
Client Key Password	
PEM Formatted V	
 Self signed certificates in keystores 	

Click **OK** to confirm and close the window.

3. Select **AWS IoT** for the profile name and then click the **Connect** button.

MQTT.fx - 1.7.1	A Read of the second se	
File Extras Help		
AWS IoT	Connect Disconnect	•
Publish Subscribe Scripts	Broker Status Log	
	Subscribe	QoS 0 QoS 1 QoS 2 Autoscroll 05-
	1	

After clicking **Connect**, the lamp icon will change to green if the connection has been successfully established.

MQTT.fx - 1.7.1	the second se	
File Extras Help		
AWS IoT	Connect Disconnect	A O
Publish Subscribe Scripts	Broker Status Log	
	Subscribe	QoSO QoS1 QoS2 Autoscroll OST

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

3. Upload/Download Serial Patterns and I/O Status With

the Cloud

In this section, we will instruct you on how the NPort IA5000A-I/O and NPort IAW5000A-I/O (in the following chapters, referenced as NPort or NPorts) send serial patterns to the cloud and receive patterns from the cloud. If a DI is triggered, the NPorts will publish the I/O status to the cloud, and receive a message from the cloud to the NPorts to change the I/O status. The NPorts support three types of message formats: JSON, RAW with header, and RAW. In this demonstration, we use the JSON format. For **Message format**, we select JSON, and for **I/O publish trigger mode**, we select "Specific I/O change" along with "DI-00".

Serial and I/O Message Format Settings		
Message format	<mark>⊚ JSON</mark> ⊚ Raw	
Serial and I/O JSON message definition	Serial JSON I/O JSON	
I/O publish trigger mode	Specific I/O change 👻 DI-00 👻	
MQTT Publish		
Serial port 1	Topic NPortIO/JSON/SPort1/Pub/Data	QoS 1 👻 Retain 📃
Serial port 2	Topic NPortIO/JSON/SPort2/Pub/Data	QoS 1 - Retain
1/0	Topic NPortIO/JSON/DIO/Pub	QoS 1 - Retain
MQTT Subscribe		
Serial port 1	Topic NPortIO/JSON/SPort1/Sub/Data	QoS 1 👻
Serial port 2	Topic NPortIO/JSON/SPort2/Sub/Data	QoS 1 👻
I/O	Topic NPortIO/JSON/DIO/Sub	QoS 1 -

For the purpose of this demonstration, we will show you the text content of the data we upload to the cloud platform. Click the **Serial JSON** button to uncheck the **enable Base64 Encode/Decode for serial data** checkbox. JSON format does not support any special characters. If needed, set **Encode/Decode for serial data**. For more about JSON format rules, please reference <u>http://json.org/</u>

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: Serial JSON Message Definition

Publish JSON Me	essage		
{			
"msgVer"	:	"1.0",	
"gwID"	:	"NPortIAW5250A-12I/O_2647",	
"devID"	:	"SerialPort1",	port 1 opt 2 (devID is referred to Alias in Ser
"dateTime"	:	"2018-08-27T15:43:14+08:00",	in enable
"msgNumber"	:	0-65535,	in enable
"msgType"	:	"Data",	
"msgFrame"	:	"Raw data from serial port"	🔲 enable Base64 Encode/Decode for serial data
}			

Note: You must fill in serial **alias name**, which is an identifiable ID for serial data on the **Serial Parameter** page.

	• Serial Par	rameter								
* Modifyi	ing "Serial Parameter" settir	ngs will cause the	e serial ports to restart connectio	ns.						
Port	Alias	Alias code	Baud rate	Parity	Data bit	Stop bit	Flow control	FIFO	Interface	
1	SerialPort1	p1	115200 🔻	None 🔻	8 🔻	1 🔻	RTS/CTS V	Enable •	RS-232	¥
2	SerialPort2	p2	115200 🔻	None •	8 🔻	1 🔻	RTS/CTS •	Enable •	RS-232	•
			Submit							

In this demonstration, we use the NPort's DO-00 to trigger DI-00 (connect DO-00 to DI-00 by wire).



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3.1 Sending Serial Patterns From the Device to the Cloud

In this section, we will instruct you on how to send serial data to the cloud. First, use MQTT.fx to subscribe to the topic of Serial Port 1 of the NPort from the cloud; second, send a serial pattern from PC 1 through the NPort to the cloud, and MQTT.fx can receive a message from the NPort.

 Log in to the NPorts' web console and change Serial Port 1's **Operation mode** to "IoT" and **Force transmit** to "500". The NPorts support several **Data Packing** combinations. In this demonstration, we use Force transmit. If needed, set the correct Data Packing method.

Port Settings	
Port	1
Operation mode	IOT -
Sniffer mode	Enable (Subscribed messages will be dropped)
Data Packing	
Packet length	0 (0 - 2880)
Delimiter 1	00 (HEX) Enable
Delimiter 2	00 (HEX) Enable
Delimiter process	Do Nothing
Force transmit	500 (0 - 65535 ms)

Deration Mode

Apply the above settings to all serial ports

Click **Submit** to activate configuration.

	:• Operati	on Mode				
Port	Operating mode	Packet length	Delimiter 1	Delimiter 2	Delimiter process	Force transmit
1	loT	0	00 (Disable)	00 (Disable)	Do Nothing	500
	Deci com	0	00 (Disable)	00 (Disable)	Do Nothing	0
2	Real COM	Max connection:	1			

2. In the **MQTT.fx** window, click the **Subscribe** tab.

MQTT.fx - 1.7.1	a second part and the second second second	
File Extras Help		
AWS IoT	Connect Disconnect	₽ ○
Publish Subscribe Scripts	Broker Status Log	
1	Subscribe	QoS 0 QoS 1 QoS 2 Autoscroll 😋

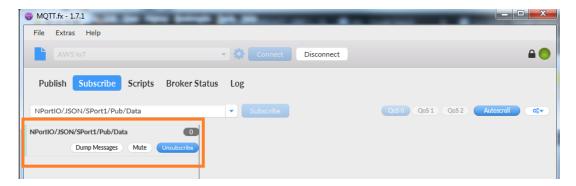
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 To subscribe a topic from the NPort's Serial Port 1, click the Subscribe tap, fill in the topic string as "NPortIO/JSON/SPort1/Pub/Data" in the drop-down field, and click the Subscribe button to the right.

WQTT.fx - 1.7.1	a second production of the second secon	
File Extras Help		
AWS IoT	Connect Disconnect	A 🔴
Publish Subscribe Scripts	Broker Status Log	
NPortIO/JSON/SPort1/Pub/Data	Subscribe	Qo50 Qo51 Qo52 Autoscroll OCT

Registered topics are listed in fill-in box to the left of the Subscribe tab and can be unsubscribed by clicking **Unsubscribe**.



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- 4. Launch **PComm Terminal Emulator** on PC 1, and open COM Port with the NPort's serial default settings as below:
 - Port number: PC 1's native COM port connecting to the NPort's Port 1
 - Baud rate: 115200
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: RTS/CTS

Property					×
Communication	Para	meter Terminal	File Tran	nsfer Cap	pturing
Pr Serial Parame	rotoc eters	looner		•	
COM1 COM101	Â	Baud rate:	115200	r defined	•
COM102 COM103 COM104		Data bits:	8	luenneu	•
COM105 COM106 COM107	=	Parity: Stop bits:	None		<u>•</u>
COM108 COM109 COM110		Flow control:		/CTS /DSR	
COM111 COM112 COM113		RTS state:	C ON	XOFF	
COM114	Ŧ	DTR state:	€ ON	O OFF	
Default			ОК		Cancel

 Click the Send Pattern button, or on the toolbar select Port Manager → Send Pattern to send a serial pattern.

PComm Terminal Emulator - COM102,115200,None,8,1,RTS/CTS,Dumb Terminal		- • ×
Profile Edit Port Manager Window Help		
COM102,115200,None,8,1,RTS/CTS,Dumb Terminal		
		Â
DTR RTS		
		-
State:OPEN CTS DER RI CCO Ready TX:4	RX:0	•
	,	

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In the Send Pattern window, select **ASCII** and fill in "MOXA"; then, select **Repeat count** and enter "1". Click **Start Send** to send the pattern.

Send Pattern	
Data Pattern • ASCII H 0 X H · · ·	Start Send Cancel
C File	
Repeat count: 1 Interval time: 1000 (100ms ~ 60000ms)	
Set all ports to send pattern simultaneously	

 On the MQTT.fx page, you will receive a message from the cloud that was sent from the NPorts. For Payload decoded by select "JSON Pretty Format Decoder" to show the message.

Publish Subscribe Scripts Broker Stat	tus Log	
NPortIO/JSON/SPort1/Pub/Data	Subscribe Qo50 Qo51 Qo52 Autoscrol	0: •
NPortIO/JSON/SPort1/Pub/Data 1 Dump Messages Mute Unsubscribe	NPortIO/JSON/SPort1/Pub/Data	2 QoS 0
Topics Collector (0) Scan Stop Co	NPortIO/JSON/SPort1/Pub/Data 02-05-2019 16:48:54:60534565 { "msgVer" : "1.0", "msgType" : "Data", "devID" : "SerialPort1", "msgFrame" : "MOXA" } Payload decoded by JSON Pretty Fomat Decoded	2 QoS 0

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

The serial data pattern will be filled in the msgFrame.



3.2 Sending Serial Data From the Cloud to the Device

In this section, we will instruct you on how to send serial data to PC 1 from the cloud. We use MQTT.fx to publish the topic of Serial Port 1 of the NPort to the cloud. We will receive a serial pattern from PC 1 through the cloud to the NPort.

1. Click Serial JSON.

-IoT Mode

Basic Settings	
loT platform	MQTT Broker 👻
MQTT Connection Settings	
Host address	
Host port	8883
Username	
Password	
Client ID	1136d71d-ead0-4dde-ae64-bb8ef9986e Generate
Keep alive	60 (1 - 65535 sec.)
Clean session	in enable
TLS (Transport Layer Security)	
TLS mode	TLS v1.2 💌
CA file	AmazonRootCA1.pem Browse No file selected.
Client certificate file	Browse No file selected.
Client key file	Browse No file selected.
Client key password	
MQTT Will Message	
Enable Will message	enable
Serial and I/O Message Format Settings	
Message format	⊚ JSON _ Raw
Serial and I/O JSON message definition	Serial JSON I/O JSON
I/O publish trigger mode	Specific I/O change 👻 DI-00 👻

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

Copy Subscribe JSON Message:

	_		
"msgVer"	:	"1.0",	
"gwlD"	:	"NPortIAW5250A-12I/O_2647",	
"devID"	:	"SerialPort1",	
"dateTime"	:	"2018-08-27T15:43:14+08:00",	
"msgNumber"	:	0-65535,	
"msgType"	:	"Data",	
"msgFrame"	:	"Raw data from serial port"	
Subscribe JSON	Messag	je	
"msgVer"	:	"1.0",	
-	:	"1.0", "NPortIAW5250A-12I/O_2647",	
"gwlD"	:	· · · · ·	
"msgVer" "gwID" "devID" "msgType"	:	"NPortIAW5250A-12I/O_2647",	

2. The copied message has a lot of space and line feed. We can use a tool to compact it. Below is a free online tool:

https://jsonformatter.org/json-minify

Paste the message in the column on the left and change the msgFrame stating:"Raw data to serial port" to read: "Hi MOXA NPort"; then, click Minify JSON. It will show a compact JSON format message in the column on the right. Click Copy to Clipboard.





NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

3. On the **MQTT.fx** page, click the **Publish tab**.

File Extras Help		
AWS IoT	Connect Disconnect	₽ (
Publish Subscribe Scripts	Broker Status Log	
Subscribe Scripts I NPortIO/JSON/SPort1/Pub/Data I I I	Broker Status Log	Qo50 Qo51 Qo52 Autoscroll Qo

4. To publish a topic to the NPort's Serial Port 1, under the **Publish** tab, paste the clipboard message in the big textbox, fill in the topic string as "NPortIO/JSON/SPort1/Sub/Data" in the drop-down field, and click the **Publish** button.

MQTT.fx - 1.7.1		x
File Extras Help	2	
AWS IoT	Connect Disconnect	
Publish Subsc	cribe Scripts Broker Status Log	
	« NPortIO/JSON/SPort1/Sub/Data Publish Qo50 Qo51 Qo52 Retained Qo50	
	{"msgVer":"1.0","gwID":"NPortIAW5250A-12I/O_2647","devID":"SerialPort1","msgType":"Data","msgFrame":"Hi MOXA NPort"]	

In the **PComm Terminal Emulator** window, you will receive a message from the cloud that was sent from MQTT.fx.

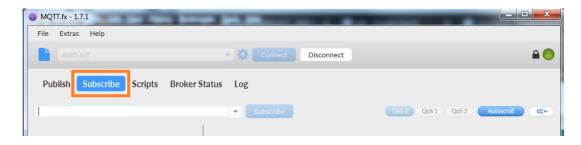
PComm Terminal Emulator - COM102,115200,None,8,1,RTS/CTS,Dumb Terminal	
Profile Edit Port Manager Window Help	
COM102,115200,None,8,1,RTS/CTS,Dumb Terminal	- • •
Hi MOXA NPort	<u>^</u>
DTR	
RTS	
	-
	•
State:OPEN CTS DSR RI DCD Ready TX:12 RX:13	

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

3.3 Sending the NPorts' DI and DO Status to the Cloud

In this section, we will instruct you on how to trigger the DI status to the cloud. First, we use MQTT.fx to subscribe the NPort's I/O topic; then, trigger the DI status to change; lastly, you will receive a message from the cloud regarding the NPort's DI and DO status.

1. In the **MQTT.fx** window, click the **Subscribe** tab.



2. To subscribe the NPort'ss I/O topic, fill in the topic string as

"NPortIO/JSON/DIO/Pub" in the drop-down field, and click the Subscribe button.

👦 MQTT.fx - 1.7.1	reserves. A light feature in the feature	
File Extras Help		
AWS IoT	Connect Disconnect	A 😑
Publish Subscribe Scripts	Broker Status Log	
NPortIO/JSON/DIO/Pub	Subscribe	QoS 0 QoS 1 QoS 2 Autoscroll OST

Registered topics are listed to the left of the **Subscribe** tab.

🕹 МQП.fx - 1.7.1	Wight Index (1). Where West	
File Extras Help		
AWS IOT	Connect Disconnect	₽ 😑
Publish Subscribe Scripts Broker Statu	s Log	
NPortIO/JSON/DIO/Pub	Subscribe	QoS 0 QoS 1 QoS 2 Autoscroll
NPortIO/JSON/DIO/Pub 0 Dump Messages Mute Unsubscribe		

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

3. Log in to NPort's web console and change **DI assess interface** to "IoT+Web+Modbus address mapping" on the **Remote I/O Access Interface** page.

***** Remote I/O Access Interface

DI Channels	
DI access interface	IoT + Web + Modbus address mapping 👻
DO Channels	
DO access interface	IoT + Web + Modbus address mapping

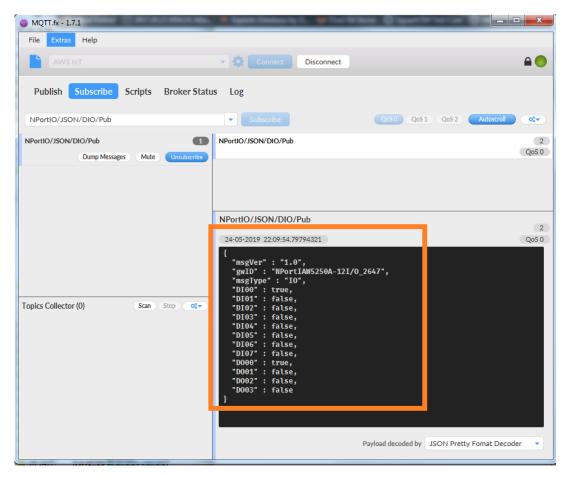
4. Change **DO Status** to "ON" on the **DO Channel 0 Settings** page.

DO Channel 0 Settings

Mode	DO Status	ON Width*	OFF Width*	Pulse Count	Pulse Start
1. Current Setting					
DO 👻	ON 👻				
2. Power On Setting					
	OFF 👻				
3. Safe Status Setting					
	OFF 👻				
Apply to all					
Apply to all DO channe	Is				
4. Alias Name					
Alias name of channel					
DO-00					
Alias name of "OFF" statu	S				
OFF					
Alias name of "ON" status	;				
ON					

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

5. On the **MQTT.fx** page, you will receive a message from the cloud that was sent from the NPort.



The DI and DO status will appear in JSON message format. The DI00 and DO00 status will read as "true".

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

NPortIO/JSON/DIO/Pub
24-05-2019 22:09:54.79794321
{ "msgVer" : "1.0", "gwID" : "NPortIAW5250A-12I/0_2647",
"msgType" : "IO", "DI00" : true, "DI01" : false.
"DI02" : false, "DI03" : false,
"DI04" : false, "DI05" : false, "DI06" : false,
"DI00": false, "DI07": false, "D0000": true,
"D001" : false, "D002" : false, "D003" : false
}

3.4 Control the NPort's DO Status Through the Cloud

In this section, we will instruct you on how to change an NPort's DO status via cloud. First, we use MQTT.fx to publish the NPort'ss I/O topic; then, the NPort will receive an IoT message from the cloud to change the DO status; lastly, we will set the NPorts' DO status on the web console.

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

1. Click I/O JSON.

•IoT Mode

Basic Settings	
loT platform	MQTT Broker
MQTT Connection Settings	
Host address	ets.iot.us-west-2.amazc
Host port	8883
Username	
Password	
Client ID	1136d71d-ead0-4dde-ae64-bb8ef9986e Generate
Keep alive	60 (1 - 65535 sec.)
Clean session	enable
TLS (Transport Layer Security)	
TLS mode	TLS v1.2 👻
CA file	AmazonRootCA1.pem Browse No file selected.
Client certificate file	Browse No file selected.
Client key file	Browse No file selected.
Client key password	
MQTT Will Message	
Enable Will message	enable
Serial and I/O Message Format Settings	
Message format	⊚ JSON ⊚ Raw
Serial and I/O JSON message definition	Serial JSON I/O JSON
I/O publish trigger mode	Specific I/O change ▼ DI-00 ▼

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

Copy Subscribe JSON Message:

Subscribe JSO	N Messag	le
The following DI	and DO k	ey-values are all optional
{		
"msgVer"	:	"1.0",
"gwlD"	:	"NPortIAW5250A-12I/O_2647",
"msgType"	:	"IO",
"DO00"	:	true/false,
"DO01"	:	true/false,
"DO02"	:	true/false,
"DO03"	:	true/false
}		

2. The copied message has a lot of space and line feed. We can use a tool to compact it. Below is a free online tool:

https://jsonformatter.org/json-minify

Paste the message in the column on the left side and change all the DO statuses to false.



Click **Minify JSON**. It will show a compact JSON format message in the column on the right. Click **Copy to Clipboard**.

JSON Minify		
]= = 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴 𝒴	Load Data	
<pre>2 msgver:1.0, "gvU":NPortLM18250A-12I/O_2647", 4 "msgType":"IO", 5 "DO00":false, 6 "DO01":false, 7 "DO02":false, 7 "DO02":false,</pre>	Minify JSON Format JSON	(false)
8 "D003":false 9)		
Paste it	Download	



NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

3. On the **MQTT.fx** page, click the **Publish** tab.

File Extras Help			
AWS IOT	Connect Disconnect		A (
Publish Subscribe Scripts	Broker Status Log		
Publish Subscribe Scripts	Broker Status Log	Qo50 Qo51 Qo52	Autoscroll

4. To publish a topic to the NPort. Under the **Publish** tab, paste the clipboard message in the big textbox, fill in the topic string as "NPortIO/JSON/DIO/Sub" in the drop-down field, and click the **Publish** button.

@ MQTT.fx - 1.7.1	and a second
File Extras H	telp
AWS IoT	- 🔅 Connect Disconnect
Publish Sul	bscribe Scripts Broker Status Log
	NPortIO/JSON/DIO/Sub Publish QoS0 QoS1 QoS2 Retained Qos Qos1 Qos
	["msgVer":"1.0","gwID":"NPortIAW5250A-12I/O_2647","msgType":"IO","DO00":false,"DO01":false,"DO02":false,"DO03":false]

On the NPort's web console, check DO-00 status as OFF.

DO Channel Settings

DO Channel	Mode	Status	ON Width	OFF Width
DO-00	DO	OFF		
DO-01	DO	OFF		
DO-02	DO	OFF		
DO-03	DO	OFF		

NPort IA5000A-I/O or NPort IAW5000A-I/O to AWS via MQTT Broker

Also you can find the new message under the **Subscribe** tab of MQTT.fx, because we connect DO-00 to DI-00. The new message shows both DI-00 and DO-00 statuses as false.

Publish Subscribe Scripts Broker Status	; Log	
NPortIO/JSON/DIO/Pub	Subscribe QoS0 QoS1 QoS2 Autoscroll	• • • • • • • • • • • • • • • • • • •
NPortIO/JSON/DIO/Pub 2 Dump Messages Mute Unsubscribe	NPortIO/JSON/DIO/Pub	11 QoS 0
Dunip Hessages Hute Cristische	NPortIO/JSON/DIO/Pub	12 QoS 0
	NPortIO/JSON/DIO/Pub	12
	02-05-2019 18:47:45.67665334	QoS 0
Topics Collector (0) Scan Stop of v	<pre>{ "msgVer" : "1.0", "gwID" : "NPortIAN5250A-12I/0_2647", "msgType" : "IO", "DI00" : false, "DI02" : false, "DI02" : false, "DI04" : false, "DI05" : false, "DI06" : false, "DI06" : false, "D000" : f</pre>	