

NPort IA5000A-I/O or NPort IAW5000A-I/O to Mosquitto Alibaba

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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 www.moxa.com.

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1. Introduction

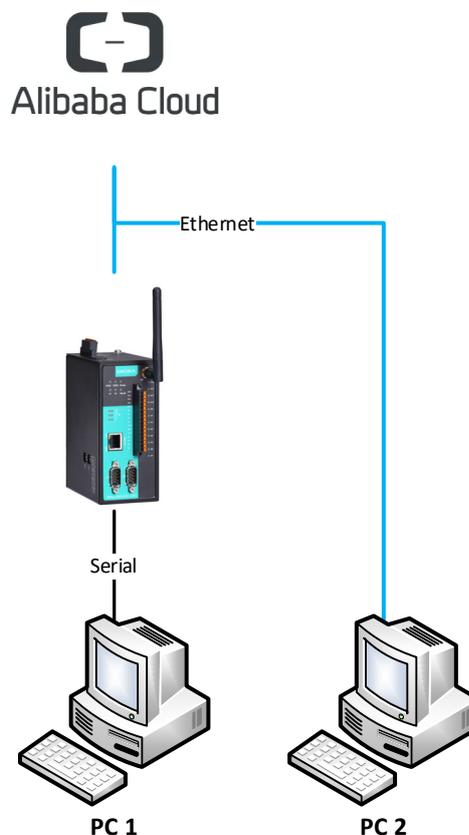
The NPort IA5000A-I/O and NPort IAW5000A-I/O serial device servers, which have built-in digital I/Os, provide maximum flexibility when you need to integrate serial equipment in the field with an Ethernet network or cloud platform. From Firmware Version 2.0 onwards, they support communications with IIoT 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 to connect to Alibaba Cloud IoT Platform. We also demonstrate how to publish serial or I/O data messages to the cloud and subscribe messages from the cloud.

2. System Topology

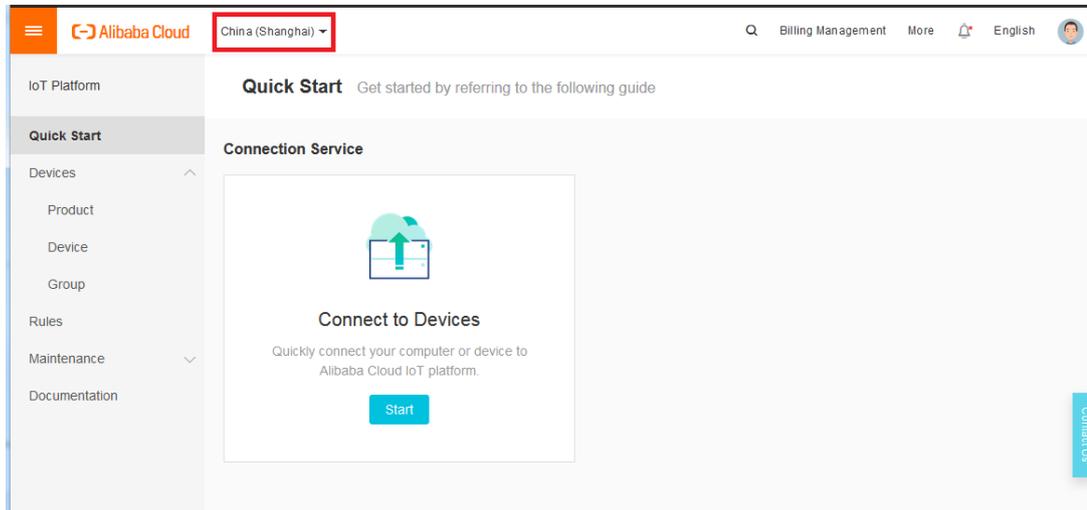
Figure 1 illustrates the system topology. PC1 runs PComm Lite to act as a serial device. It connects to Port 1 of the NPort IA5000A-I/O or NPort IAW5000A-I/O serial device. The NPort IA5000A-I/O or NPort IAW5000A-I/O acts as an Alibaba Cloud device and connects to Alibaba IOT Platform. PC2 accesses Alibaba Cloud Console.

< Figure 1. System Topology >

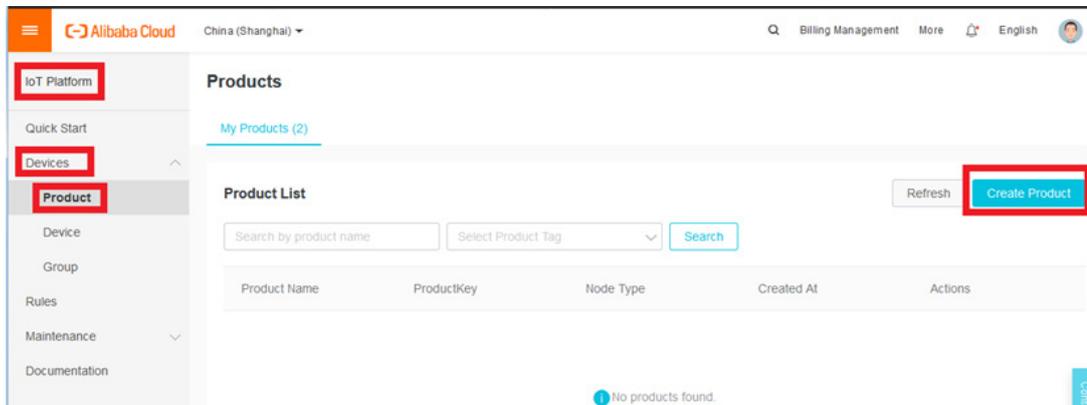


2.1 Creating a Product and Device on Alibaba

1. Use Alibaba user account to log in to Alibaba Cloud Console.
Website: <https://www.alibabacloud.com/>
2. Select the region you want.



3. Create a new IoT Platform Product: **IoT Platform** → **Devices** → **Product** → **Create Product**.



Set the product's settings as below. Click the **OK** button at the bottom.

- Product Name: MOXA_NPorts
- Node Type: Device
- Connect to Gateway: No
- Network Connection Method: Ethernet
- Data Type: Do not parse/Custom

The screenshot shows the 'Create Product' form with the following fields highlighted in red:

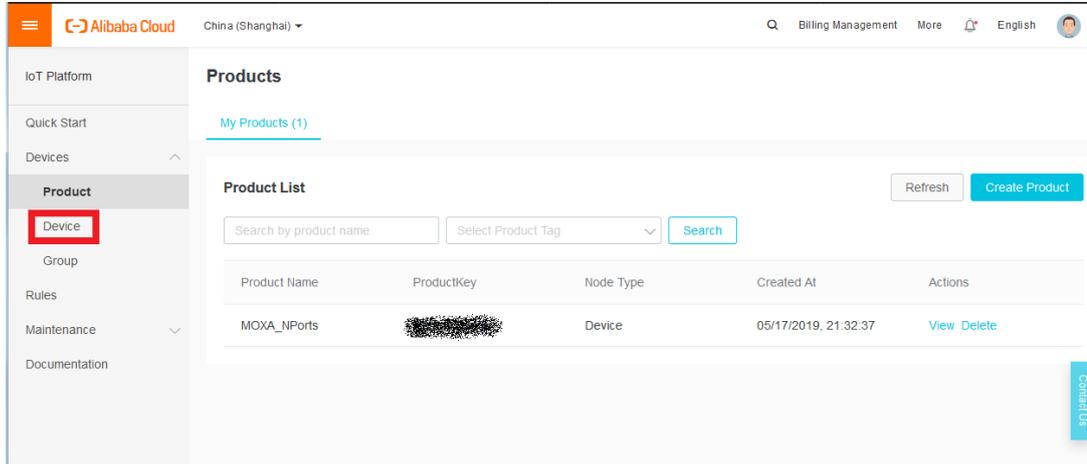
- Product Name:** MOXA_NPorts
- Node Type:** Device (selected)
- Connect to Gateway:** No (selected)
- Network Connection Method:** Ethernet
- Data Type:** Do not parse/Custom

After completing the above steps, the product name "MOXA_NPorts" will appear in **Product List**.

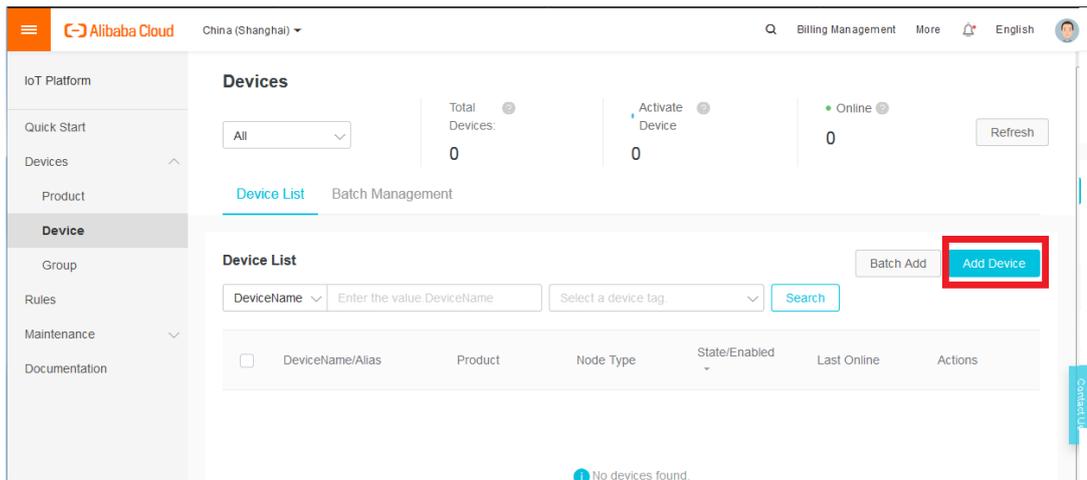
The screenshot shows the 'Products' page with the following table:

Product Name	ProductKey	Node Type	Created At	Actions
MOXA_NPorts	[REDACTED]	Device	05/17/2019, 21:32:37	View Delete

4. The next step is to add a new IoT Platform Device: **IoT Platform** → **Devices** → **Device**.



On the **Device** page, click **Add Device**.



On the pop-up page, select **MOXA_NPorts** in the drop-down menu under **Product**, and fill in "NPort" under **DeviceName**.

The screenshot shows a dialog box titled "Add Device" with a close button (X) in the top right corner. A light blue information box at the top contains the text: "Note: When the deviceName is left blank, Alibaba Cloud will assign a GUID as the deviceName." Below this, there is a red asterisk followed by the label "* Product :". A dropdown menu is open, showing "MOXA_NPorts" selected. Below the dropdown is the label "DeviceName :" followed by a text input field containing "NPort". Underneath is the label "Note name:" followed by a text input field containing "Enter an alias.". At the bottom right, there are two buttons: "OK" (highlighted with a red box) and "Cancel".

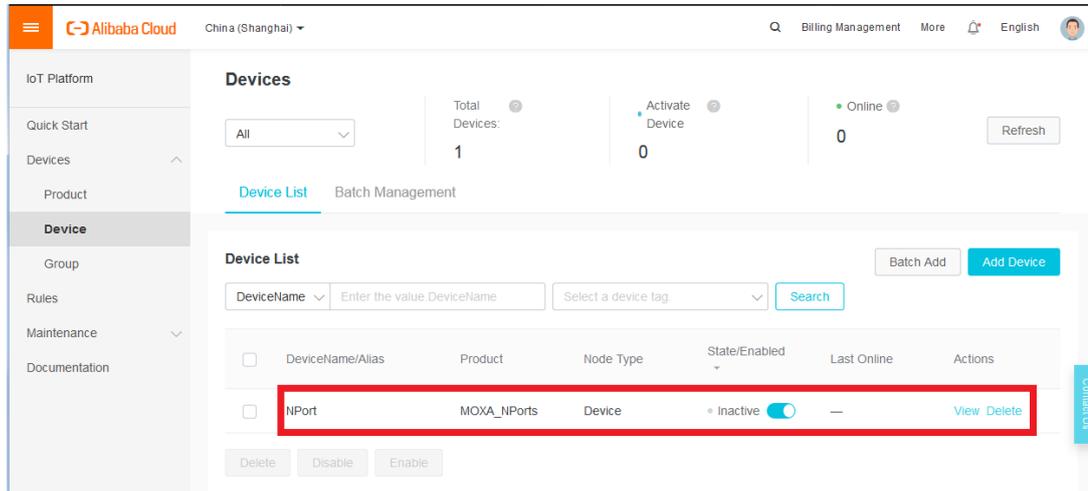
After clicking **OK**, the device certificate will appear. Click **Close** and exit this window.

The screenshot shows a dialog box titled "View Device Certificate" with a close button (X) in the top right corner. A light blue information box at the top contains the text: "Device certificate is used to authenticate devices connecting to the platform. Keep it in a safe place." Below this is a table with three rows:

ProductKey	[Redacted]	Copy
DeviceName	NPort	Copy
DeviceSecret	*****	Show

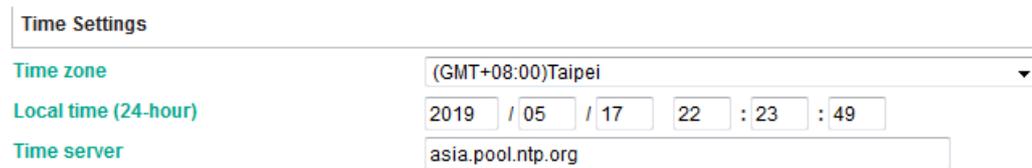
At the bottom right, there are two buttons: "Copy" and "Close" (highlighted with a red box).

Next, "NPort" will appear under **DeviceName/Alias** in the **Device List**.



2.2 Set Up NPort IA5000A-I/O and NPort IAW5000A-I/O to Connect to Alibaba Cloud IoT Platform

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



2. Under **Main Menu → IoT Management → IoT Mode**, set **IoT platform** as "Alibaba Cloud IoT Platform".

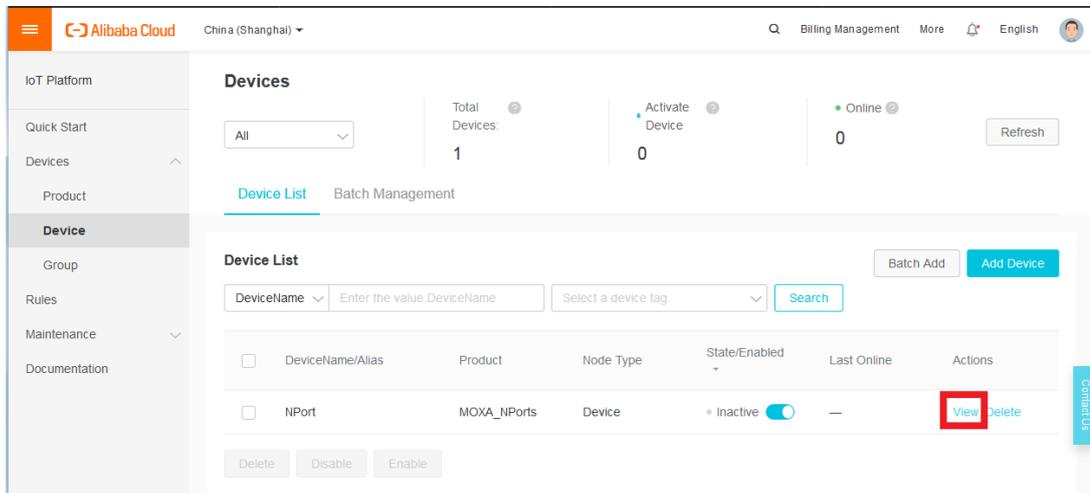
IoT Mode



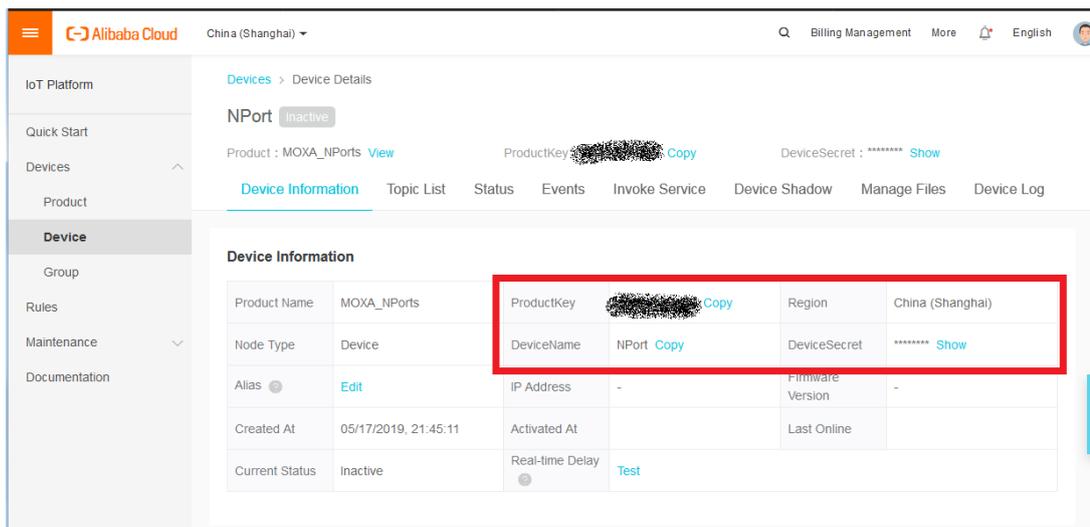
The IoT Mode is running with Alibaba Cloud IoT Platform; it will show more settings about the platform as below:



- Go back to Alibaba Cloud Console. Information about the device certificate, you can find under **IoT Platform** → **Devices** → **Device** → **Device List** → **NPort** → **View**.



Under Alibaba Cloud IoT Platform settings, there are several connectivity information fields. They can be found under **Device** on the Alibaba Cloud Platform as below:



Set as below:

Alibaba Cloud IoT Platform Settings

Server domain (Region)

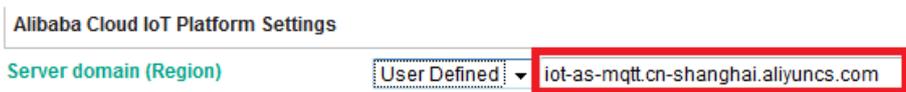
Product key

Device name

Device secret

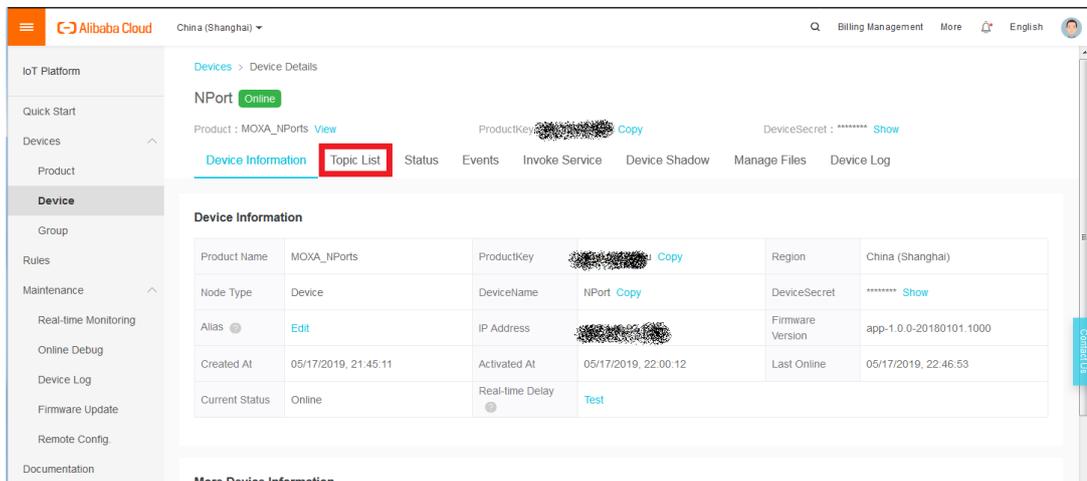
Keep alive (60 - 180 sec.)

If your region is not included in the drop-down menu, choose "User Defined" and fill in the region domain address.

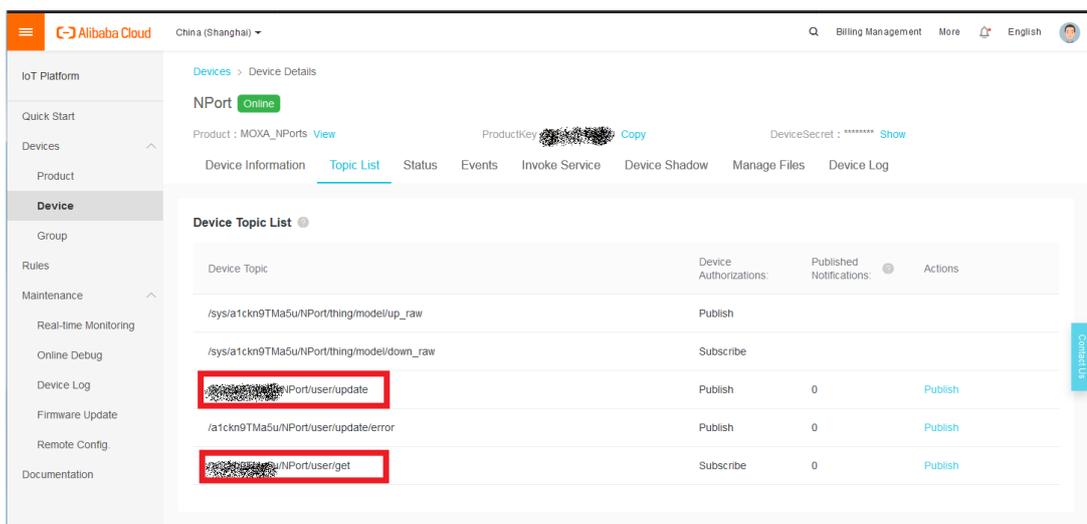


The region domain address format is `iot-as-mqtt.${region}.aliyuncs.com`. In this format, the variable `${region}` indicates the region's ID of region's IoT Platform service. For region IDs, see <https://www.aliyuncs.com/help/doc-detail/40654.htm?spm=a2c63.p38356.a3.10.73a95f07Czw8z8>

4. Go back to Alibaba Cloud and click **Topic List**.



You will find two topics: `/ ${ProductKey}/${DeviceName}/user/*`. One is a publish topic; the other is a subscribe topic.



Copy the publish topic to Alibaba IoT Publish topic for all serial ports and I/O topics, and copy the subscribe topic to Alibaba IoT Subscribe topic for all serial ports and I/O topics. Set as below:

5. Click **Submit**. The NPort IA5000A-I/O or NPort IAW5000A-I/O will connect to Alibaba Cloud IoT Platform, and you can check that **Connection status** reads “Connected” under **Alibaba IoT Connection Monitoring** as below:

Also, you will see that the device is online, as shown below:

3. Upload/Download Serial Pattern and I/O Status With Cloud

In this section, we will instruct you how the NPort IA5000A-I/O and NPort IAW5000A-I/O (in the section belows, referred to 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 publish 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. For this demonstration, we use JSON format. For **Serial Message format**, select "JSON", and for **I/O publish trigger mode**, select "Specific I/O change" along with "DI-00".

The screenshot shows the configuration interface for Alibaba IoT settings. It is divided into several sections:

- Serial and I/O Message Format Settings:**
 - Serial message format: JSON (dropdown)
 - Serial JSON message definition: Serial JSON (button)
 - I/O JSON message definition: I/O JSON (button)
 - I/O publish trigger mode: Specific I/O change (dropdown) and DI-00 (dropdown)
- Alibaba IoT Publish:**
 - Serial port 1: Topic: [redacted] /NPort/user/update, QoS: 1 (dropdown)
 - Serial port 2: Topic: [redacted] /NPort/user/update, QoS: 1 (dropdown)
 - I/O: Topic: [redacted] /NPort/user/update, QoS: 1 (dropdown)
- Alibaba IoT Subscribe:**
 - Serial port 1: Topic: [redacted] /NPort/user/get, QoS: 1 (dropdown)
 - Serial port 2: Topic: [redacted] /NPort/user/get, QoS: 1 (dropdown)
 - I/O: Topic: [redacted] /NPort/user/get, QoS: 1 (dropdown)

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 special characters. If needed, set **Encode/Decode for serial data**. For more about JSON format rules, please reference <http://json.org/>

Serial JSON Message Definition

Publish JSON Message

```

{
  "msgVer"      :      "1.0",
  "gwID"       :      "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"
}

```

port 1 port 2 (devID is referred to Alias in Ser
 enable
 enable
 enable Base64 Encode/Decode for serial data

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

Serial Parameter

* Modifying "Serial Parameter" settings will cause the serial ports to restart connections.

Port	Alias	Alias code	Baud rate	Parity	Data bit	Stop bit	Flow control	FIFO	Interface
1	SerialPort1	p1	115200	None	8	1	RTS/CTS	Enable	RS-232
2	SerialPort2	p2	115200	None	8	1	RTS/CTS	Enable	RS-232

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



3.1 Send Serial Pattern From the Device to the Cloud

In this section, we will instruct you on how to send serial data to the cloud. We will send a serial pattern from PC 1 through the NPort to the cloud so that Alibaba Cloud can receive a message from the NPort.

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

Operation Mode

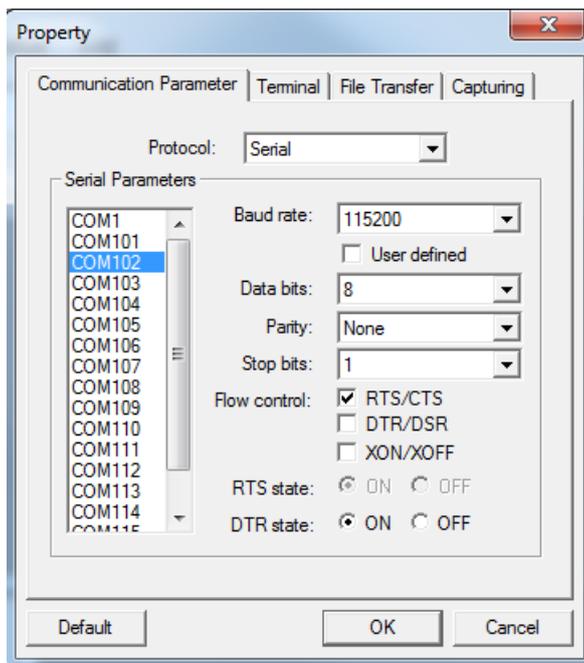
Port Settings	
Port	1
Operation mode	<input type="text" value="IoT"/>
Sniffer mode	<input type="checkbox"/> Enable (Subscribed messages will be dropped)
Data Packing	
Packet length	<input type="text" value="0"/> (0 - 2880)
Delimiter 1	<input type="text" value="00"/> (HEX) <input type="checkbox"/> Enable
Delimiter 2	<input type="text" value="00"/> (HEX) <input type="checkbox"/> Enable
Delimiter process	<input type="text" value="Do Nothing"/> (Processed only when the packet length is 0)
Force transmit	<input type="text" value="500"/> (0 - 65535 ms)
<input type="checkbox"/> Apply the above settings to all serial ports	

Click **Submit** to activate the new settings.

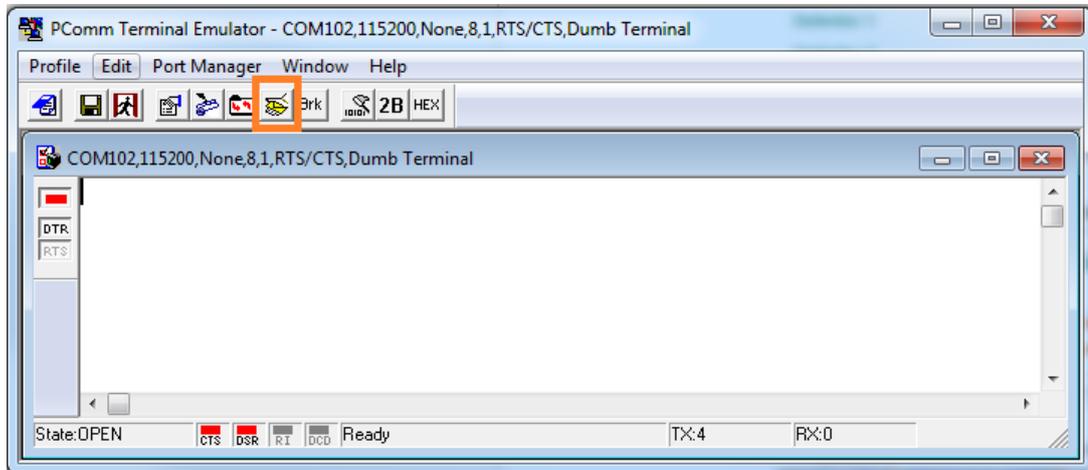
Operation Mode

Port	Operating mode	Packet length	Delimiter 1	Delimiter 2	Delimiter process	Force transmit
1	IoT	0	00 (Disable)	00 (Disable)	Do Nothing	500
2	Real COM	0	00 (Disable)	00 (Disable)	Do Nothing	0
		Max connection:	1			

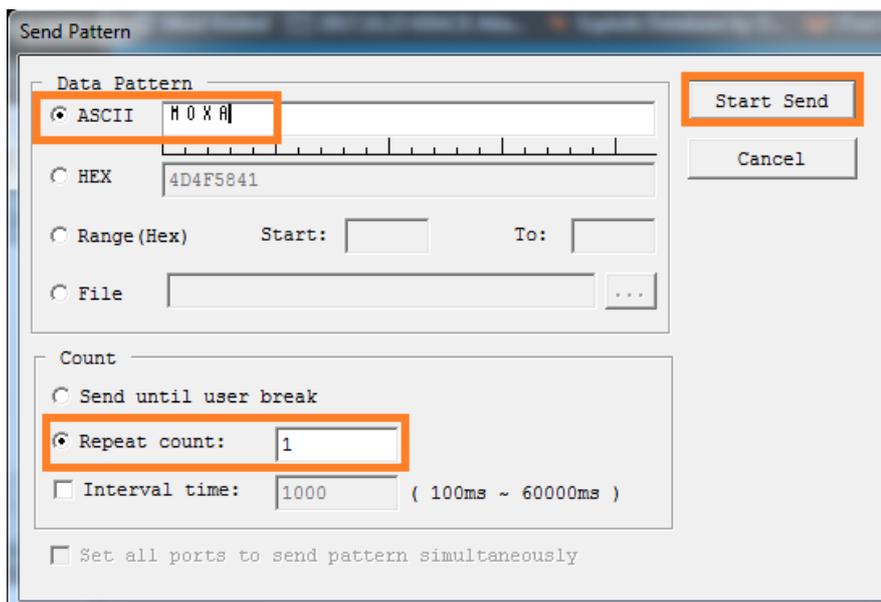
- Launch PComm Terminal Emulator on PC 1 and open COM Port with the NPort's serial default settings as below:
 - Port number: PC 1's native COM port connecting to the NPort's Port 1
 - Baud rate: 115200
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: RTS/CTS



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



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

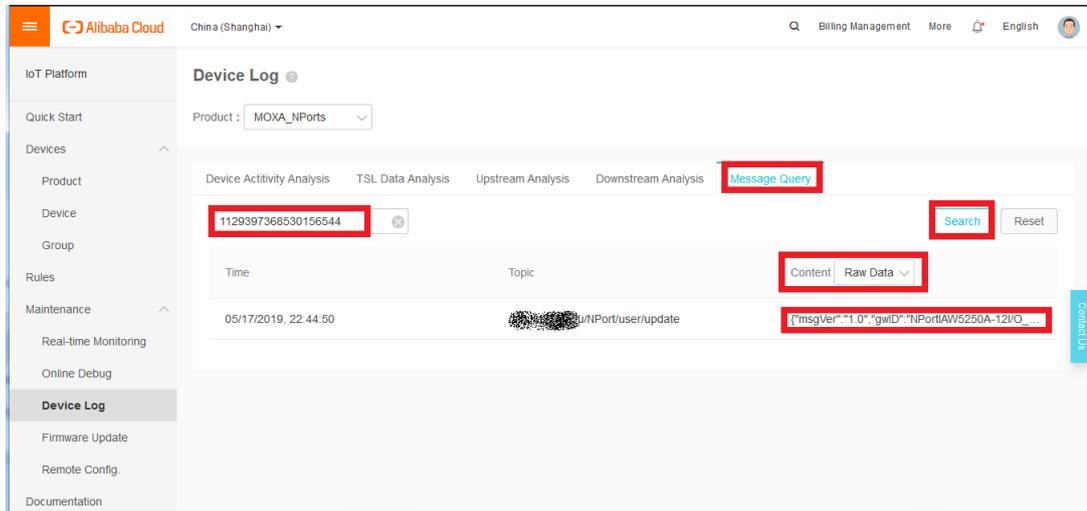


On Alibaba Cloud, you can check the message on **Device Log > Upstream Analysis**. Find the latest message and copy the MessageID. You can check the topic on **Content(All)**, which is an Alibaba IoT Publish topic.

The screenshot shows the Alibaba Cloud IoT Platform interface. The left sidebar contains a menu with 'Device Log' highlighted. The main content area is titled 'Device Log' and shows a 'Product' dropdown set to 'MOXA_NPorts'. Below this are tabs for 'Device Activity Analysis', 'TSL Data Analysis', 'Upstream Analysis' (highlighted), 'Downstream Analysis', and 'Message Query'. Search filters include 'Enter a DeviceName', 'Enter a MessageID', 'All' (dropdown), and '1Hour' (dropdown), with 'Search' and 'Reset' buttons. A table of log entries is displayed with columns: Time, MessageID, DeviceName, Status, Content..., and Cause. The first row's MessageID is highlighted in red.

Time	MessageID	DeviceName	Status	Content...	Cause
2019/05/17 22:44:50.505	1129397368530156544	NPort	Successful	Publish ...	
2019/05/17 22:44:43.497	1129397339144863233	NPort	Successful	Publish ...	
2019/05/17 22:44:43.596	1129397339560114688	NPort	Successful	Publish ...	
2019/05/17 22:44:43.597	1129397339555921408	NPort	Successful	Publish ...	
2019/05/17 22:43:24.989	1129397009845863424	NPort	Failed	Publish ...	No authoriz...

Select the **Message Query** tab, paste the MessageID, and click **Search**. The content of MessageID will then be shown. Under **Content**, select "Raw Data" to allow the NPort's message to be readable.



Move the cursor of your mouse over the message, and you will find the serial data pattern filled in the msgFrame.



3.2 Send 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 Alibaba Cloud Console to send an IoT message to the NPort's Serial Port 1.

1. Click **Serial JSON**.

IoT Mode

Basic Settings

IoT platform

Alibaba Cloud IoT Platform Settings

Server domain (Region)

Product key

Device name

Device secret

Keep alive (60 - 180 sec.)

Serial and I/O Message Format Settings

Serial message format

Serial JSON message definition

I/O JSON message definition

I/O publish trigger mode

Copy **Subscribe JSON Message**:

Serial JSON Message Definition

Publish JSON Message

```
{  
  "msgVer"      :      "1.0",  
  "gwID"        :      "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"  
}
```

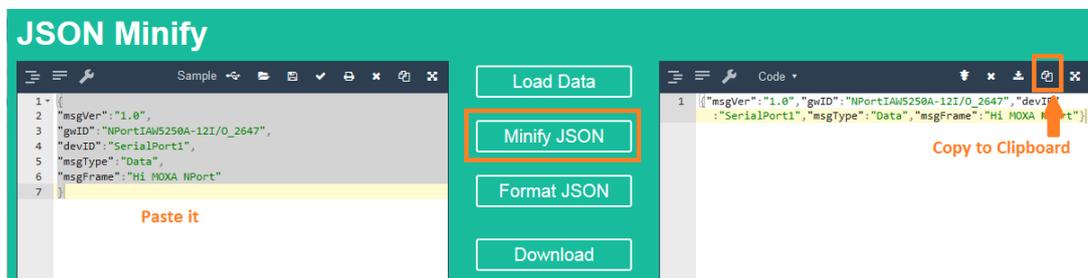
Subscribe JSON Message

```
{  
  "msgVer"      :      "1.0",  
  "gwID"        :      "NPortIAW5250A-12I/O_2647",  
  "devID"       :      "SerialPort1",  
  "msgType"     :      "Data",  
  "msgFrame"    :      "Raw data to serial port"  
}
```

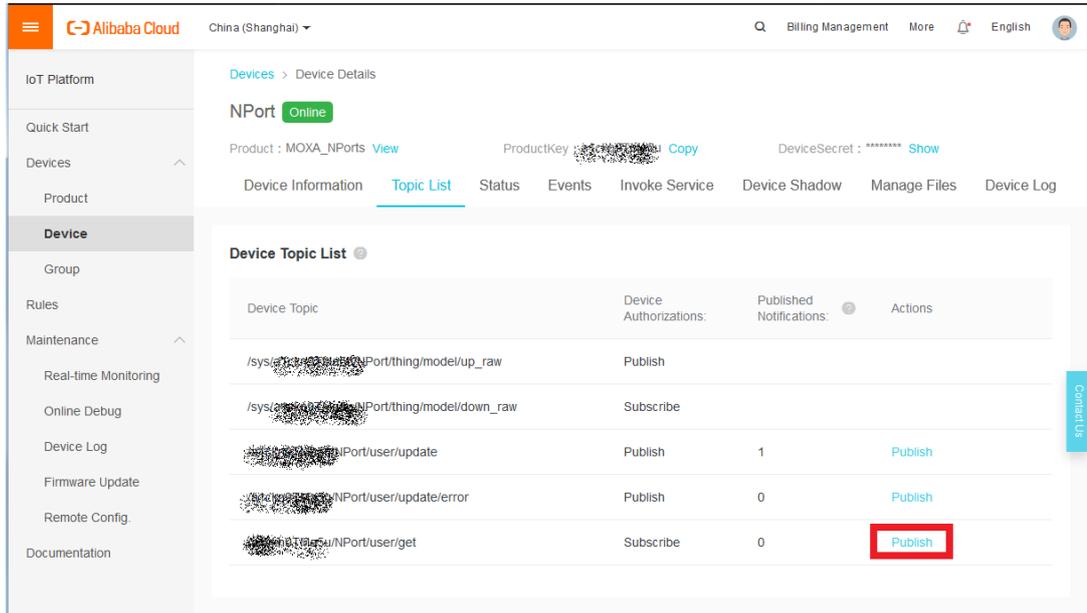
2. The copied message has a lot of space and line feed. We can use a tool to compact it. Below is a free online tool:

<https://jsonformatter.org/json-minify>

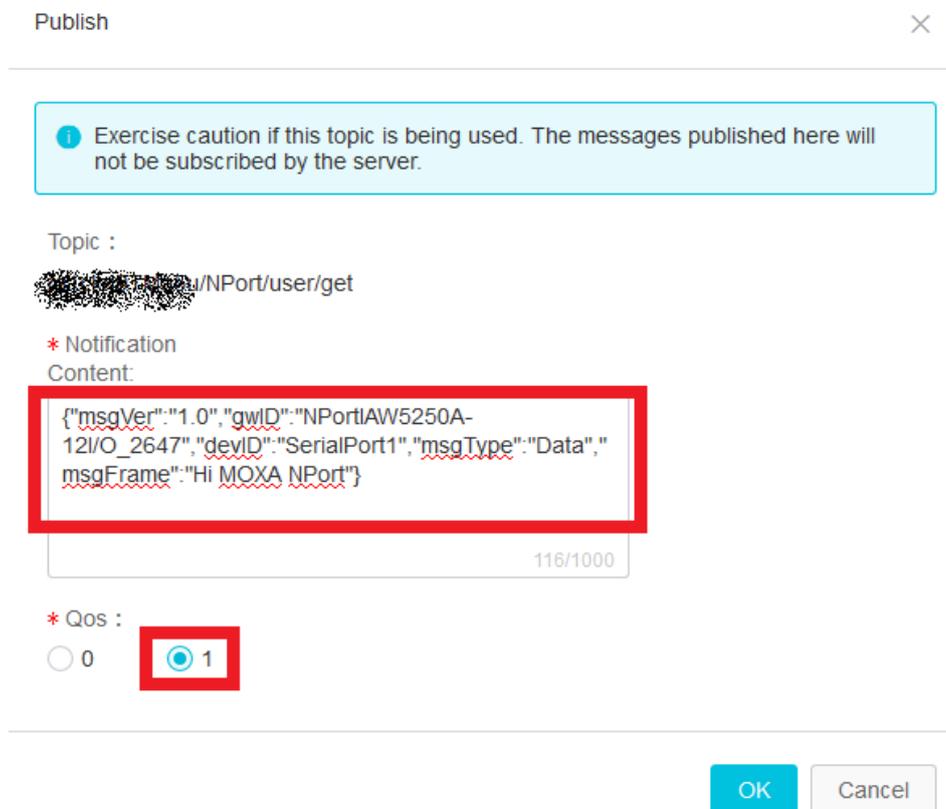
Paste the message in the column on the left and change the msgFrame stating "Raw data to serial port" to read:"Hi MOXA NPort", then click **Minify JSON**. It will show a compact JSON format message in the column on the right side. Click **Copy to Clipboard**.



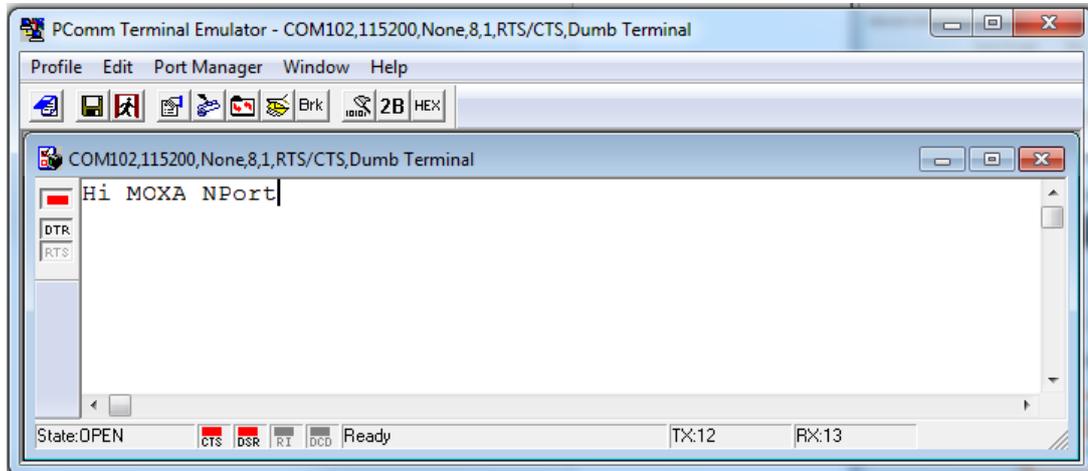
3. On Alibaba Cloud, click **Publish** next to the **Subscribe** topic.



To publish a topic to the NPort's Serial Port 1: in the **Publish** window, paste the clipboard message in the big text area, then select **1** under **Qos**, and click **OK**.



On the **PComm Terminal Emulator** page, you will receive a message from the cloud.



3.3 Send the NPort's DI and DO Status to the Cloud

In this section, we will instruct you on how to trigger the DI status to the cloud. We trigger the DI status to change. We will then receive an IoT message that is the NPort's DI and DO statuses on Alibaba Cloud Console.

1. 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

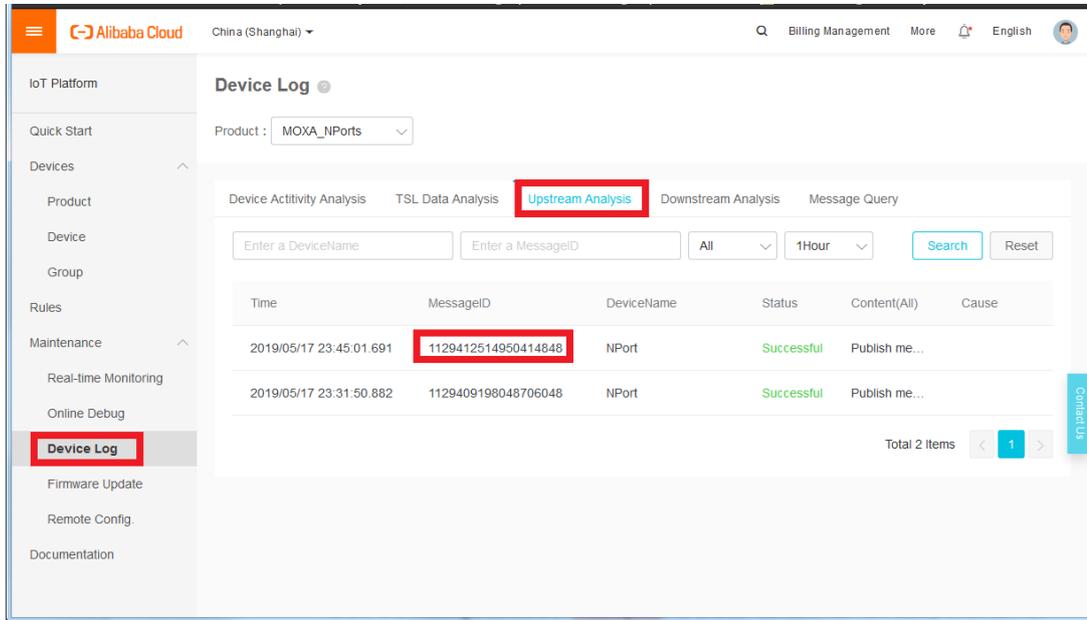


2. Change **DO Status** to "ON" on the **DO Channel 0 Settings** page.

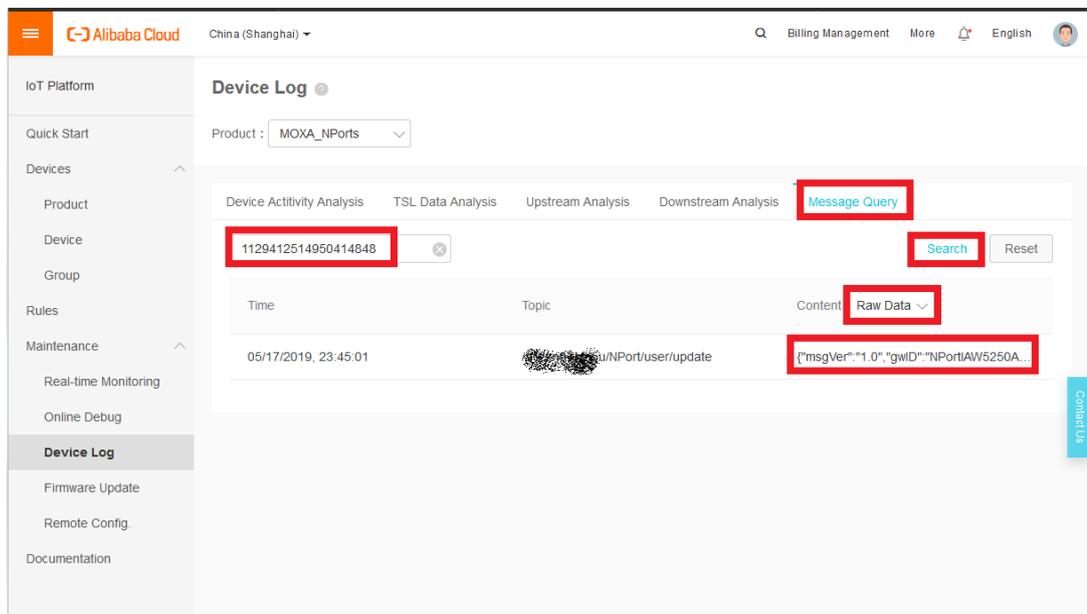
DO Channel 0 Settings

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					
<input type="checkbox"/> Apply to all DO channels					
4. Alias Name					
Alias name of channel					
DO-00					
Alias name of "OFF" status					
OFF					
Alias name of "ON" status					
ON					

- On Alibaba Cloud, you can check the message under **Device Log** → **Upstream Analysis**. Find the latest message, and copy the MessageID. You can check the topic on Content(All), which is an Alibaba IoT Publish topic.

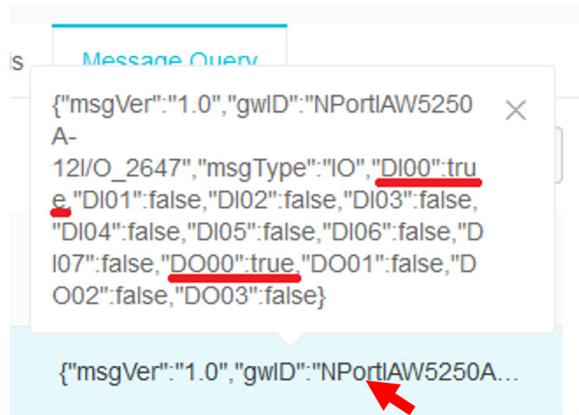


Select the **Message Query** tab, paste the MessageID, and click **Search**. The content of MessageID will then be shown. Under **Content**, select Raw Data to allow the NPort's message to show up.



Move the cursor of your mouse over the message, and you will find the DI and DO statuses filled in JSON message. The message shows both DI-00 and DO-00 statuses as

true.



3.4 Control NPorts' DO Status Through the Cloud

In this section, we will instruct you on how to change an NPort's DO status via the cloud. First, we use Alibaba Cloud Console to send an IoT message to the NPort's I/O topic; second, the NPort will receive an IoT message from the cloud to change the DO status; lastly, we will change the NPort's DO status on the web console.

1. Click **I/O JSON**.

IoT Mode

The screenshot shows the 'IoT Mode' configuration page. It is divided into several sections:

- Basic Settings**: IoT platform is set to 'Alibaba Cloud IoT Platform'.
- Alibaba Cloud IoT Platform Settings**:
 - Server domain (Region): Shanghai
 - Product key: [Redacted]
 - Device name: NPort
 - Device secret: [Redacted]
 - Keep alive: 60 (60 - 180 sec.)
- Serial and I/O Message Format Settings**:
 - Serial message format: JSON
 - Serial JSON message definition: Serial JSON
 - I/O JSON message definition: I/O JSON** (highlighted with a red box)
 - I/O publish trigger mode: Specific I/O change, DI-00

Copy **Subscribe JSON Message**:

The 'Subscribe JSON Message' dialog box contains the following text:

The following DI and DO key-values are all optional

```
{
  "msgVer"      : "1.0",
  "gwID"        : "NPortIAW5250A-12/I/O_2647",
  "msgType"     : "IO",
  "DO00"       : true/false,
  "DO01"       : true/false,
  "DO02"       : true/false,
  "DO03"       : true/false
}
```

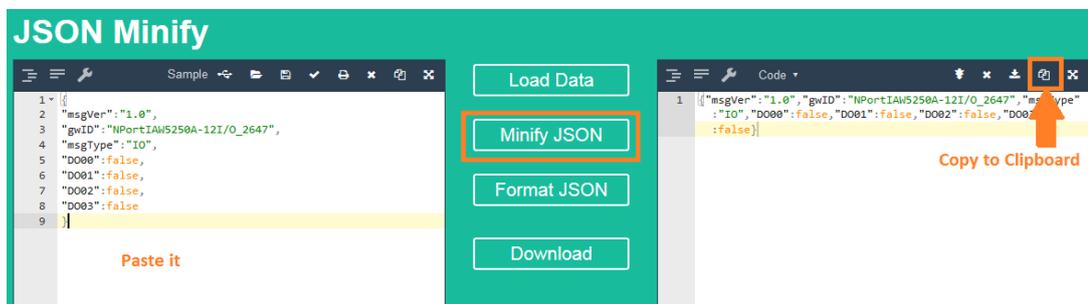
- The copied message has a lot of space and line feed. We can use tool to compact it.
Below is a free online tool:

<https://jsonformatter.org/json-minify>

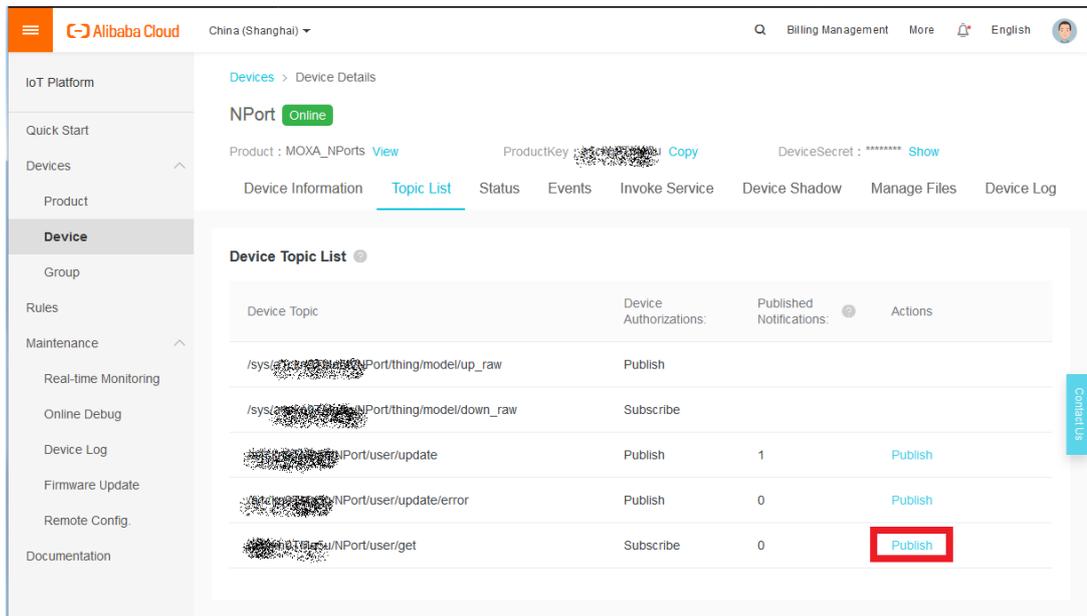
Paste the message in the column on the left side and change all of the DO status to false.



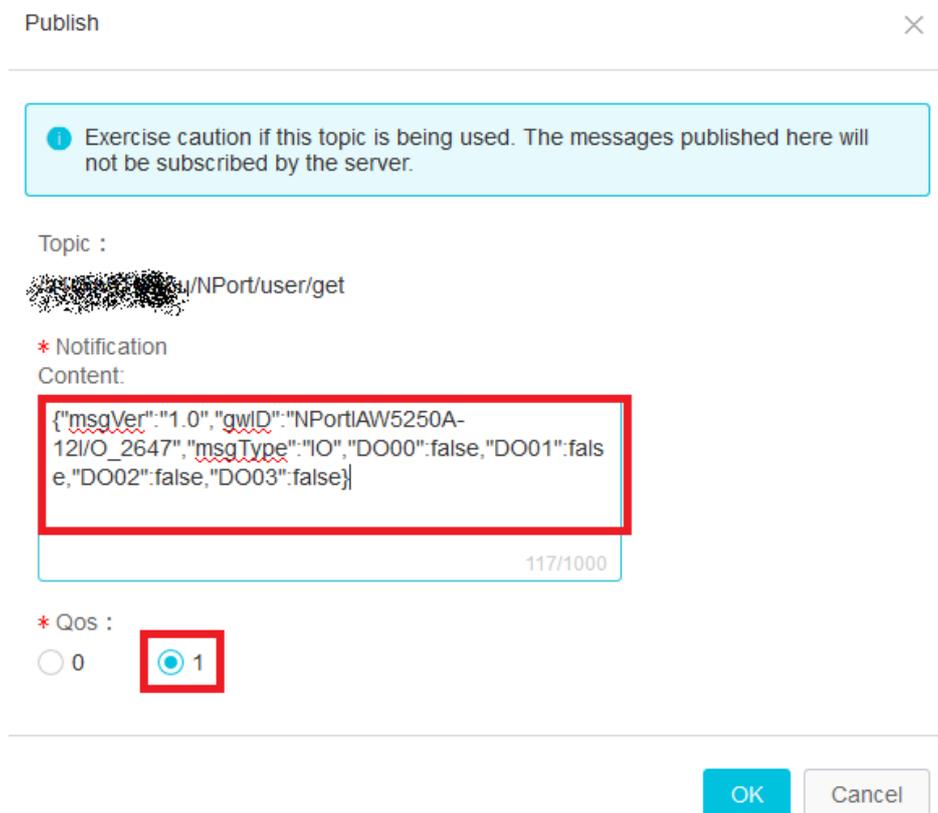
Click **Minify JSON**. It will show a compact JSON format message in the column on the right. Click **Copy to Clipboard**.



3. On Alibaba Cloud, click **Publish** next to the **Subscribe** topic.



To publish a topic to NPort's I/O: on the **Publish** window, paste the clipboard message in the big text area, select **1** under **QoS**, and click **OK**.



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	--	--

You can also find new MessageID under Upstream Analysis on Alibaba Cloud, because we connect DO-00 to DI-00. The new message shows both DI-00 and DO-00 statuses as false.

