

# Configuring Device Twin for AIG Series Using Azure Device Twin

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### About Moxa

Moxa is a leading provider of edge connectivity, industrial computing, and network infrastructure solutions for enabling connectivity for the Industrial Internet of Things. With 35 years of industry experience, Moxa has connected more than 82 million devices worldwide and has a distribution and service network that reaches customers in more than 80 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](http://www.moxa.com).

### How to Contact Moxa

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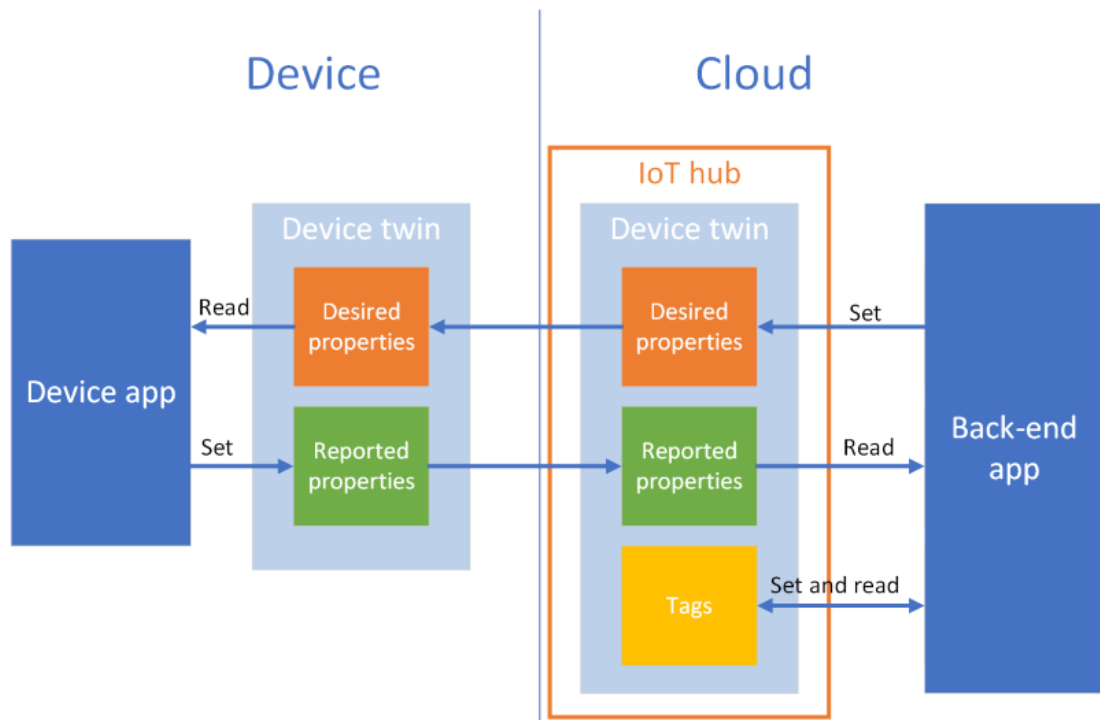


## 1 Azure Device Twin

Device twins are JSON documents that store device state information including metadata, configuration, and conditions. Azure IoT Hub maintains a device twin for each device that you connect to the IoT Hub and leverages it to synchronize device configuration and conditions.

The JSON content of a device twin includes:

- **Desired Properties:** Can be modified by back-end applications and are readable by the device application, i.e., ThingsPro Edge.
- **Reported Properties:** Set by the device application and are readable by back-end applications.
- **Tags:** Device metadata assessable by back-end applications.



## 2 Device Twin for AIG Series

The AIG Series integrates the Azure device-twin design, enabling the setting up of a device twin by back-end applications using the *desired properties*. The device state information is updated in the *reported properties* of the device twin and the properties are readable by back-end applications. For example, when a back-end application requests to install a new software version, AIG reports back with updates on the progress.

### 2.1 Eligible AIG Series

- AIG 300 Series
- AIG 500 Series

### 2.2 The Device Twin Reported Properties

The *reported properties* for the AIG device twin are described in the table below:

No.	Section	Description
1	<b>applications</b>	Lists all applications
		<pre>{   "applications": {     "list": {       "0": {         "description": "MOXA Modbus TCP Client (Master)",         "desiredState": "ready",         "displayName": "Modbus TCP Client (Master)",         "hardwares": {           "arraySize": 0         },         "health": "good",         "icon": "/app-icons/modbusmaster-tcp.png",         "id": "modbusmaster-tcp",         "name": "modbusmaster-tcp",         "state": "ready",         "version": "3.14.0-278"       },       "arraySize": 1     }   } }</pre>
2	<b>httpserver</b>	Displays the HTTP server settings and status.
		<pre>{   "httpserver": {     "certFileName": "default.crt",     "httpEnable": true,     "httpPort": 80,     "httpsEnable": true,     "httpsPort": 8443,     "keyFileName": "default.key"   } }</pre>

No.	Section	Description
		} }
3	<b>sshserver</b>	Displays SSH server status and settings
		{ "sshserver": { "enable": true, "port": 22 } }
4	<b>discovery</b>	Status of the discovery service: enable/disable
		{ "discovery": { "enable": true } }
5	<b>serialconsole</b>	Serial console status: enable/disable
		{ "serialconsole": { "enable": true } }
6	<b>wan</b>	Displays information on the WAN interface
		{ "wan": { "displayName": "LAN1", "dns": { "0": "10.128.8.5", "arraySize": 1 }, "gateway": "10.144.51.254", "ip": "10.144.48.128", "name": "eth0", "netmask": "255.255.252.0", "type": "wan" } }
7	<b>route</b>	Lists routing priority of network interfaces
		{ "route": { "priorityList": { "0": "Cellular1", "1": "LAN1", "arraySize": 2 } } }

No.	Section	Description
		<pre> }, "type": "route" } </pre>
8	<b>dhcpcservers</b>	Displays DHCP server settings and status
		<pre> { "dhcpcservers": {   "0": {     "available": false,     "displayName": "LAN1",     "domainName": "",     "domainNameServers": {       "0": "8.8.8.8",       "1": "8.8.4.4",       "arraySize": 2     },     "enable": false,     "endIp": "192.168.3.250",     "id": 1,     "leaseTime": 3600,     "name": "eth0",     "netmask": "255.255.255.0",     "startIp": "192.168.3.200",     "status": false,     "type": "dhcpcservers"   },   "arraySize": 1 } } </pre>
9	<b>serials</b>	Lists the serial port configurations on the device
		<pre> { "serials": {   "0": {     "baudRate": 9600,     "dataBits": 8,     "device": "/dev/ttyM0",     "displayName": "PORT 1",     "flowControl": "none",     "id": 1,     "mode": "rs232",     "parity": "none",     "stopBits": 1,     "type": "serials"   },   "arraySize": 1 } } </pre>

No.	Section	Description
10	<b>time</b>	Displays system time zone and NTP settings
		<pre>{   "time": {     "ntp": {       "enable": false,       "interval": 7200,       "server": "pool.ntp.org"     },     "timezone": "Asia/Taipei",     "type": "time"   } }</pre>
11	<b>general</b>	Lists general device information such as CPU type, firmware version, and ThingsPro Edge version
		<pre>{   "general": {     "cpu": "ARMv7 Processor rev 2 (v7l)",     "description": "",     "deviceType": "gateway",     "firmwareVersion": "3.0",     "hostName": "Moxa",     "lastBootTime": "2019-11-13T11:42:51Z",     "lastRebootTime": "",     "memorySize": 524333056,     "modelName": "UC-8112-LX",     "serialNumber": "TAIAB1021075",     "thingsproVersion": "1.1.0-348",     "type": "general"   } }</pre>
12	<b>ethernets</b>	Lists the status and configuration of Ethernet interfaces on the device
		<pre>{   "ethernets": {     "0": {       "broadcast": "10.144.51.255",       "displayName": "LAN1",       "dns": {         "0": "10.128.8.5",         "arraySize": 1       },       "enable": true,       "enableDhcp": false,       "gateway": "10.144.51.254",       "id": 1,       "ip": "10.144.48.128",       "mac": "00:90:e8:77:06:61", </pre>

No.	Section	Description
		<pre> "name": "eth0", "netmask": "255.255.252.0", "status": "connected", "subnet": "10.144.48.0", "type": "ethernets", "wan": true }, "arraySize": 1 } </pre>
13	<b>gps</b>	Displays the GPS settings on the device
		<pre> { "gps": { "interface": "", "location": { "lat": 14, "lng": 15 }, "mode": "manual", "type": "gps" } } </pre>
14	<b>installations</b>	Displays information on the OTA upgrade progress and the results
		<pre> { "installations": { "completedTask": 0, "id": 3, "isDeleted": false, "jobID": 3, "lastState": "", "owner": "admin", "parameter": { "download": false, "install": true, "jobID": 2 }, "state": "created" } } </pre>
15	<b>wifi</b>	Display the Wi-Fi settings on the device
		<pre> { "wifi": { "0": { "ap": { "band": "band24", "broadcastSsid": true, "channel": 6, </pre>

No.	Section	Description
		<pre> "region": "TW", "security": {   "mode": "wpa2",   "password": "",   "encryption": "aes" }, "ssid": "moxa-sample-ap" }, "enable": true, "id": 1, "type": "wifi", "name": "wlan0", "mode": "ap" }, "arraySize": 1 } </pre>
16	cellular	Lists the cellular interface status and configuration
		<pre> { "cellulars": {   "0": {     "autoDetect": false,     "available": true,     "capabilities": {       "sim": 1     },     "currentProfileId": 0,     "displayName": "Cellular1",     "enable": false,     "iccid": "",     "id": 1,     "imei": "",     "imsi": "",     "keepalive": {       "enable": false,       "intervalSec": 120,       "targetHost": "8.8.8.8"     },     "mac": "02:01:02:18:00:0b",     "module": "u-blox TOBY-L2 series",     "name": "usb0",     "operatorName": "",     "pinRetryRemain": 0,     "profileTimeout": 140,     "profiles": {       "0": {         "id": 1,         "init": {           "0": "sim:1", </pre>



No.	Section	Description
		<pre>"arraySize": 1 }, "name": "SIM1", "pdpContext": {   "apn": "internet",   "auth": {     "password": "",     "protocol": "none",     "username": ""   },   "id": 1,   "static": true,   "type": "ipv4" }, "pinCode": "0000" }, "arraySize": 1 }, "rat": "", "status": "disconnected", "type": "cellular", "wan": true }, "arraySize": 1 }</pre>

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**Note** Moxa reserves the right to determine the scope of reported properties. For more information about reported properties, see [Online User Manual](#)

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## 2.3 The Device Twin Desired Properties

The ThingsPro Edge *desired properties* use the following two common keys:

- **id**: A device can have multiple interfaces of the same kind such as Ethernet. This key is used to specify the interface and start counting from **1**.
- **arraySize**: An array is encoded in an object containing sub objects and an `arraySize` key is used to index the sub objects. The value of `arraySize` should be equal to the number of sub objects; otherwise, the remaining sub objects will be discarded.

The *desired properties* in ThingsPro Edge device twins are described in the table below:

No.	Section	Description
1	<b>httpserver</b>	Used to enable/disable the HTTP(S) service and change the HTTP(S) port
		<pre>{   "desired": {     "httpserver": {       "httpEnable": true,       "httpPort": 80,       "httpsEnable": true,       "httpsPort": 8443     }   } }</pre>
2	<b>sshserver</b>	Used to enable/disable the SSH service and change the port
		<pre>{   "desired": {     "sshserver": {       "enable": true,       "port": 22     }   } }</pre>
3	<b>discovery</b>	Used to enable/disable device discovery service
		<pre>{   "desired": {     "discovery": {       "enable": true     }   } }</pre>
4	<b>serialconsole</b>	Used to enable/disable the serial console port
		<pre>{   "desired": {     "serialconsole": {       "enable": true     }   } }</pre>
5	<b>dhcpservers</b>	Used to set up the DHCP servers
		<pre>{   "desired": {     "dhcpservers": {</pre>

No.	Section	Description
		<pre> "0": {   "id": 1,   "enable": true,   "startIp": "192.168.3.100",   "endIp": "192.168.3.200",   "netmask": "255.255.255.0",   "domainNameServers": {     "0": "8.8.8.8",     "arraySize": 1   },   "domainName": "example.com",   "leaseTime": 2592000 }, "arraySize": 1 } } </pre>
6	<b>serials</b>	Used to set up the serial ports
		<pre> {   "desired": {     "serials": {       "0": {         "id": 1,         "mode": "rs232",         "displayName": "PORT 1",         "baudRate": 115200,         "parity": "none",         "dataBits": 8,         "stopBits": 1,         "flowControl": "software"       },       "arraySize": 1     }   } } </pre>
7	<b>time</b>	Used to set up a time zone and set up / enable / disable the NTP server
	<u>Updating NTP Settings</u>	<pre> {   "desired": {     "time": {       "ntp": {         "enable": true,         "interval": 6000,         "server": "tock.stdtime.gov.tw"       }     }   } } </pre>

No.	Section	Description
	<pre> } } </pre>	<p><u>Updating the Time Zone</u></p> <pre> {   "desired": {     "time": {       "timezone": "Asia/Taipei"     }   } } </pre>
8	<b>ethernets</b>	Used to configure the Ethernet interfaces
		<p><u>Updating an Ethernet Interface for Dynamic IP</u></p> <pre> {   "desired": {     "ethernets": {       "0": {         "id": 1,         "enable": true,         "enableDhcp": true,         "wan": true       },       "arraySize": 1     }   } } </pre>
		<p><u>Updating an Ethernet Interface for Static IP</u></p> <pre> {   "desired": {     "ethernets": {       "0": {         "id": 1,         "dns": {           "0": "1.2.3.4",           "arraySize": 1         },         "enable": true,         "enableDhcp": false,         "gateway": "1.2.3.5",         "ip": "1.2.3.6",         "netmask": "255.255.255.0", </pre>

No.	Section	Description
		<pre> "wan": true     },     "arraySize": 1   } } </pre>
9	<b>general</b>	Used to update the device profile
		<p><u>Updating the Device Host Name</u></p> <pre> {   "desired": {     "general": {       "hostName": "MyHost"     }   } } </pre>
		<p><u>Updating the Device Description</u></p> <pre> {   "desired": {     "general": {       "description": "MyDevice"     }   } } </pre>
10	<b>gps</b>	Used to switch between the GPS modes: auto and manual
		<p><u>Updating the GPS lat and lng by the Manual Mode</u></p> <pre> {   "desired": {     "gps": {       "mode": "manual",       "location": {         "lat": 11,         "lng": 12       }     }   } } </pre>
		<p><u>Updating GPS by the Auto Mode</u></p> <pre> {   "desired": {     "gps": {       "mode": "auto",       "interface": "/dev/ttyUSB0"     }   } } </pre>

No.	Section	Description
11	wifi	Used to configure the Wi-Fi AP
		<pre>{   "desired": {     "wifi": {       "0": {         "ap": {           "band": "band24",           "broadcastSsid": true,           "channel": 6,           "region": "TW",           "security": {             "mode": "wpa2",             "password": "",             "encryption": "aes"           },           "ssid": "moxa-sample-ap"         },         "enable": true,         "id": 1,         "type": "wifi",         "name": "wlan0",         "mode": "ap"       },       "arraySize": 1     }   } }</pre>
12	cellulars	Used to configure the cellular interfaces
		<pre>{   "desired": {     "cellulars": {       "0": {         "autoDetect": false,         "available": true,         "capabilities": {           "sim": 1         },         "currentProfileId": 0,         "displayName": "Cellular1",         "enable": false,         "iccid": "",         "id": 1,         "imei": "358503060483337",         "imsi": "",         "keepalive": {           "enable": false,           "intervalSec": 120,           "targetHost": "8.8.8.8"         }       }     }   } }</pre>

No.	Section	Description
		<pre>}, "mac": "02:01:02:18:00:0b", "module": "u-blox TOBY-L2 series", "name": "usb0", "operatorName": "", "pinRetryRemain": 0, "profileTimeout": 140, "profiles": {   "0": {     "id": 1,     "init": {       "0": "sim:1",       "arraySize": 1     },     "name": "SIM1",     "pdpContext": {       "apn": "internet",       "auth": {         "password": "",         "protocol": "none",         "username": ""       },       "id": 1,       "static": true,       "type": "ipv4"     },     "pinCode": "0000"   },   "arraySize": 1 }, "rat": "", "signal": {   "csq": 0,   "ecio": 0,   "indicator": "",   "level": 0,   "rat": "",   "rscp": 0,   "rsrp": 0,   "rsrq": 0,   "rssi": 0,   "rxqual": 0 }, "status": "disconnected", "type": "cellulars", "wan": true }, "arraySize": 1 }</pre>

No.	Section	Description
	}	
	}	

**Note** Moxa reserves the right to determine the scope of reported properties. For more information about reported properties, see [Online User Manual](#)

The attributes and available values for serial port configuration are listed in the table below:

Attributes	Available Values
<b>mode</b>	rs232, rs422, rs4852w, rs4854w
<b>baudRate</b>	300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600
<b>parity</b>	none, even, space, mark
<b>dataBits</b>	5,6,7,8
<b>stopBits</b>	1,2,1.5
<b>flowControl</b>	none, hardware, software

### 3 Configuring the Desired Properties in Azure IoT Hub

Once you create an Azure IoT Hub and add a device to the identity registry, a device twin for the device is available in the **Device twin** tab.

To use the *desired properties* of the device twin, locate the key `desired` in the JSON file as shown in the code below:



The device twin for 'Alfred8112A' is shown below. You can add tags and desired properties to your device twin here. To remove a tag or desired property, set the value of the item to be removed to 'null'.

```

1  {
2    "deviceId": "Alfred8112A",
3    "etag": "AAAAAAAAAAk=",
4    "deviceEtag": "NTU10TMzNDU=",
5    "status": "enabled",
6    "statusUpdateTime": "0001-01-01T00:00:00Z",
7    "connectionState": "Connected",
8    "lastActivityTime": "2021-10-28T01:14:19.9049451Z",
9    "cloudToDeviceMessageCount": 0,
10   "authenticationType": "sas",
11   "x509Thumbprint": {
12     "primaryThumbprint": null,
13     "secondaryThumbprint": null
14   },
15   "modelId": "",
16   "version": 333,
17   "properties": {
18     "desired": {
19       "$metadata": {
20         "$lastUpdated": "2021-10-27T09:21:12.3944362Z",
21         "$lastUpdatedVersion": 9
22       },
23       "$version": 9
24     },
25     "reported": {
26       "gps": {
27         "interface": "",
28         "location": {
29           "lat": 24.984129,
30           "lng": 121.551753
31         },
32         "mode": "manual"

```

### 3.1 Adding Desired Properties

You can modify the JSON file to set values for the desired properties.

For example, to enable a HTTP server on port 80:

1. Add the following JSON object to the file in the **Device twin** tab.

```

18   "desired": {
19     "httpserver": {
20       "httpEnable": true,
21       "httpPort": 80
22     }
23   },
24   "$metadata": {
25     "$lastUpdated": "2021-10-27T09:21:12.3944362Z",
26     "$lastUpdatedVersion": 9
27   },
28   "$version": 9
29 }

```

2. Click the **Save** button on the top-right corner.  
The update will be shown in the metadata with a timestamp (UTC format).

```

17     "properties": {
18       "desired": {
19         "httpserver": {
20           "httpEnable": true,
21           "httpPort": 80
22         },
23         "$metadata": {
24           "$lastUpdated": "2021-10-28T02:02:00.6415414Z",
25           "$lastUpdatedVersion": 10,
26           "httpserver": {
27             "$lastUpdated": "2021-10-28T02:02:00.6415414Z",
28             "$lastUpdatedVersion": 10,
29             "httpEnable": {
30               "$lastUpdated": "2021-10-28T02:02:00.6415414Z",
31               "$lastUpdatedVersion": 10
32             },
33             "httpPort": {
34               "$lastUpdated": "2021-10-28T02:02:00.6415414Z",
35               "$lastUpdatedVersion": 10
36             }
37           }
38         },
39         "$version": 10
40       },

```

3. Click the **Reload** button.

The reported properties will also be updated.

```

94     "httpserver": {
95       "certFileName": "default.crt",
96       "httpEnable": true,
97       "httpPort": 80,
98       "httpsEnable": true,
99       "httpsPort": 8443,
100      "ipv6Enable": false,
101      "keyFileName": "default.key"
102    },

```

## 3.2 Removing a Desired Property

To remove a *desired property*, set the value of the property to `null`. When a property is removed, the corresponding metadata will also be removed.

```

17     "properties": {
18       "desired": {
19         "httpserver": null,
20       },

```

## 4 References

- N. (2021, August 12). Understand Azure IoT Hub device twins. Microsoft Docs. <https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-device-twins>
- W. (2021b, January 23). Tutorial - Synchronize device state from Azure IoT Hub. Microsoft Docs. <https://docs.microsoft.com/en-us/azure/iot-hub/tutorial-device-twins>