



# Modbus to MQTT

APPLICATION NOTE



## Used symbols



*Danger* – Information regarding user safety or potential damage to the router.



*Attention* – Problems that may arise in specific situations.



*Information or notice* – Useful tips or information of special interest.



*Example* – Example of function, command or script.



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# 1. Description of the module



This Router app is not contained in the standard router firmware. Uploading of this router app is described in the Configuration manual (see Chapter [Related Documents](#)).



The router app is v2 router platform compatible.

Modbus to MQTT is an router app for providing seamless communication between Modbus/TCP devices and MQTT device. Modbus to MQTT works as Modbus/TCP master to communicate with Modbus/TCP devices, and works as MQTT publisher/subscriber to communicate with MQTT broker.

## 2. Web Interface

Once the installation of the module is complete, the module's GUI can be invoked by clicking the module name on the Router Apps page of router's web interface.

Left part of this GUI contains menu with Router menu section. Return to Router menu section switches back from the module's web page to the router's web configuration pages. The main menu of module's GUI is shown on Figure 1.

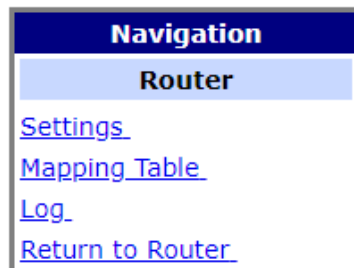


Figure 1: Menu

## 2.1 Router

### 2.1.1 Settings

Configuration of this router app can be done on Settings page, under Router menu section. All configuration items for Settings configuration page are described in the table below.

mb2mqtt Settings

Modbus to MQTT

Service Enable

OFF

Enable the Modbus to MQTT.

Log Enable

OFF

Enable the Service Log.

Broker Address

127.0.0.1

The remote Broker Server Address.

Broker Server Port

1883

The Broker Server Port Number ( 1 - 65535 ).

MQTT Keepalive

60

MQTT QoS

0

MQTT Retain

OFF

Client ID

MQTT Anonymous

Disable

Azure SAS-token generation

Disable

MQTT Username

MQTT Password

MQTT TLS

Disable

Timeout(ms)

1000

The Modbus TCP Timeout.

CSV config

Upload CSV config file

Download CSV config file

CA certificate

Upload CA certificate file

Local Certificate

Upload Local Certificate file

Local Private Key

Upload Local Private Key file

MQTT Payload Settings

Name

Enable

Field Name

Topic

Enable

topic

Name

Enable

name

Value

Enable

value

Time

Enable

time

IP

Enable

ip

Port

Enable

port

ID

Enable

id

FC

Enable

fc

Address

Enable

address

Data Length

Enable

data\_length

Custom Field

Enable

custom\_field

Custom2 Field

Enable

custom2\_field

Save

Figure 2: Settings

| Item               | Description                                                           |
|--------------------|-----------------------------------------------------------------------|
| Service Enable     | Enabled, Modbus to MQTT APN functionality of the module is turned on. |
| Log Enable APN     | Enable the Service Log.                                               |
| Broker Address     | Enter the remote Broker Server Address.                               |
| Broker Server Port | Enter Broker Server Port Number (1-65535).                            |
| MQTT Keepalive     | Enter MQTT keepalive interval (1-3600).                               |
| MQTT QoS           | Enter MQTT QoS value (0,1,2).                                         |
| MQTT Retain        | Enable for message retaining.                                         |
| Client ID          | Enter Client ID.                                                      |
| MQTT Anonymous     | Enable MQTT Anonymous                                                 |
| MQTT Username      | Enter MQTT Username.                                                  |
| MQTT Password      | Enter MQTT Password.                                                  |
| MQTT TLS           | Enable MQTT TLS.                                                      |
| Interval(ms)       | Enter Modbus TCP Polling Interval.                                    |
| Timeout(ms)        | Enter Modbus TCP Timeout.                                             |
| CSV Config         | Upload the file containing your CSV config here.                      |
| CA Certificate     | Upload your CA Certificate here.                                      |
| Local Certificate  | Upload your Local Certificate here.                                   |
| Local Private Key  | Upload your Local Private Key here.                                   |

Table 1: Settings Example Items Description

## 2.1.2 Config file

In Modbus to MQTT, user configures the mapping between Modbus/TCP and MQTT through CSV file. In the csv file, the field separator (delimiter) is a comma.

|    | A           | B           | C            | D    | E         | F             | G       | H           | I                | J         | K         | L                | M          | N      | O                | P                | Q            |
|----|-------------|-------------|--------------|------|-----------|---------------|---------|-------------|------------------|-----------|-----------|------------------|------------|--------|------------------|------------------|--------------|
| 1  | Topic       | Name        | IP           | Port | Device ID | Function Code | Address | Data length | Modbus Data type | Data Swap | Byte Swap | MQTT Data Type   | Multiplier | Offset | Polling Interval | Send When Change | Custom Field |
| 2  | env1-DI     | DI_01       | 192.168.1.15 | 502  | 1         | 2             | 1       | 1           | Boolean          | None      | FALSE     | Boolean          | 1          | 0      | 10000            | No               | 0            |
| 3  | env1-DO     | DO          | 192.168.1.15 | 502  | 1         | 1             | 1       | 1           | Boolean          | None      | FALSE     | Boolean          | 1          | 0      | 10000            | No               | 0            |
| 4  | env1-Temp   | Temperature | 192.168.1.15 | 502  | 1         | 4             | 1       | 2           | Float            | None      | FALSE     | Float            | 1          | 0      | 10000            | Yes              | 0            |
| 5  | env1-Mode   | Mode        | 192.168.1.15 | 502  | 1         | 3             | 10      | 2           | Unsigned Integer | None      | FALSE     | Unsigned Integer | 1          | 0      | 10000            | No               | 0            |
| 6  | env1-Mode-w | Mode        | 192.168.1.15 | 502  | 1         | 16            | 10      | 2           | Unsigned Integer | None      | FALSE     | Unsigned Integer | 1          | 0      | 10000            | No               | 0            |
| 7  |             |             |              |      |           |               |         |             |                  |           |           |                  |            |        |                  |                  |              |
| 8  | env2-DI     | DI_01       | 192.168.1.16 | 502  | 1         | 2             | 1       | 1           | Boolean          | None      | FALSE     | Boolean          | 1          | 0      | 10000            | No               | 0            |
| 9  | env2-DO     | DO          | 192.168.1.16 | 502  | 1         | 1             | 1       | 1           | Boolean          | None      | FALSE     | Boolean          | 1          | 0      | 10000            | No               | 0            |
| 10 | env2-Temp   | Temperature | 192.168.1.16 | 502  | 1         | 4             | 1       | 2           | Float            | None      | FALSE     | Float            | 1          | 0      | 10000            | Yes              | 0            |
| 11 | env2-Mode   | Mode        | 192.168.1.16 | 502  | 1         | 3             | 10      | 2           | Unsigned Integer | None      | FALSE     | Unsigned Integer | 1          | 0      | 10000            | No               | 0            |
| 12 | env2-Mode-w | Mode        | 192.168.1.15 | 502  | 1         | 16            | 10      | 2           | Unsigned Integer | None      | FALSE     | Unsigned Integer | 1          | 0      | 10000            | No               | 0            |

Figure 3: CSV file

| Item          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic         | MQTT topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Name          | The name to identify the mapping.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| IP            | The Modbus device IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Port          | The TCP port number of the remote Modbus slave device.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Device ID     | The Modbus/TCP slave ID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Function Code | <p>Modbus Function Code (FC). In Modbus to MQTT, supported function codes are: 1, 2, 3, 4, 5, 6, 15, 16</p> <p><b>01:</b> Read coils;<br/> <b>02:</b> Read discrete inputs;<br/> <b>03:</b> Read holding registers;<br/> <b>04:</b> Read input register;<br/> <b>05:</b> Write single coil;<br/> <b>06:</b> Write single register;<br/> <b>15:</b> Write multiple coils;<br/> <b>16:</b> Write multiple registers.</p>                                                                                          |
| Address       | Designate the read from/write to starting address for the Modbus registry.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Data length   | <p>When FC=1, 2, 5 or 15, the unit is bit(s)</p> <p>When FC=3, 4, 6 or 16, the unit is word(s)</p>                                                                                                                                                                                                                                                                                                                                                                                                              |
| Data type     | <p>MQTT data type.</p> <p>Options: Boolean, Integer, Unsigned Integer, Float</p>                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Data Swap     | <p>The Data Swap field determines the order in which the particular bytes of the received/transmitted data are delivered.</p> <p><b>None:</b> Do not swap;<br/> <b>Word:</b> 0x01, 0x02 becomes 0x02, 0x01;<br/> <b>Double Word:</b> 0x01, 0x02, 0x03, 0x04 becomes 0x04, 0x03, 0x02, 0x01.<br/> <b>Double Word - Frame:</b> 0x01, 0x02, 0x03, 0x04 becomes 0x04, 0x03, 0x02, 0x01.<br/> <b>Quad Word:</b> 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07980 becomes 0x07980, 0x05, 0x06, 0x03, 0x04, 0x01, 0x02.</p> |

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| Item                  | Description                                                                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Byte Swap             | Option: True, False<br>When option is True:<br>0x01, 0x02 becomes 0x01, 0x02.<br>0x01, 0x02, 0x03, 0x04 becomes 0x01, 0x02, 0x03, 0x04. |
| MQTT Data type        | MQTT data type.<br>Options: Boolean, Integer, Unsigned Integer, Float, Long Integer, Unsigned                                           |
| Multiplier            | The value used to multiply the data value.                                                                                              |
| Offset                | The value used to add/subtract the data value.                                                                                          |
| Polling Interval (ms) | Modbus Polling Interval, unit: milliseconds.<br>The value range: 1 10000000                                                             |
| Send When Change      | Select that the data is sent immediately when change happens on modbus slave.<br>Options: Yes, No                                       |
| Custom Field          | Custom definition value                                                                                                                 |

Table 2: Configuration items description

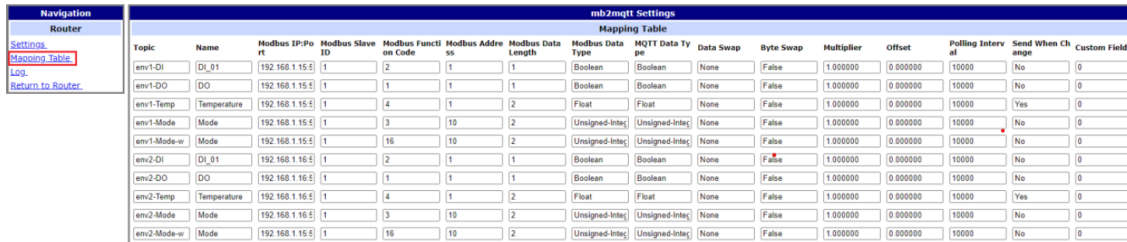
The CSV file could be imported into Advantech router in router app Setting WEB page. After import CSV file and click “Save” button, the new mapping configuration will take effect immediately.

| mb2mqtt Settings           |                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Modbus to MQTT             |                                                                                                                                                                                                                       |
| Service Enable             | <input type="text" value="OFF"/> <small>Enable the Modbus to MQTT.</small>                                                                                                                                            |
| Log Enable                 | <input type="text" value="OFF"/> <small>Enable the Service Log.</small>                                                                                                                                               |
| Broker Address             | <input type="text" value="127.0.0.1"/> <small>The remote Broker Server Address.</small>                                                                                                                               |
| Broker Server Port         | <input type="text" value="1883"/> <small>The Broker Server Port Number ( 1 - 65535 ).</small>                                                                                                                         |
| MQTT Keepalive             | <input type="text" value="60"/>                                                                                                                                                                                       |
| MQTT QoS                   | <input type="text" value="0"/>                                                                                                                                                                                        |
| MQTT Retain                | <input type="text" value="OFF"/>                                                                                                                                                                                      |
| Client ID                  | <input type="text"/>                                                                                                                                                                                                  |
| MQTT Anonymous             | <input type="text" value="Disable"/>                                                                                                                                                                                  |
| Azure SAS-token generation | <input type="text" value="Disable"/>                                                                                                                                                                                  |
| MQTT Username              | <input type="text"/>                                                                                                                                                                                                  |
| MQTT Password              | <input type="text"/>                                                                                                                                                                                                  |
| MQTT TLS                   | <input type="text" value="Disable"/>                                                                                                                                                                                  |
| Timeout(ms)                | <input type="text" value="1000"/> <small>The Modbus TCP Timeout.</small>                                                                                                                                              |
| CSV config                 | <div> env2,DI2,192.168.88.231,502,1,2,1,1,Boolean,None,FALSE,Boolean,1,0,10000,No,0 </div> <div> <input type="button" value="Upload CSV config file"/> <input type="button" value="Download CSV config file"/> </div> |
| CA certificate             | <div> <input type="text"/> </div> <div> <input type="button" value="Upload CA certificate file"/> </div>                                                                                                              |
| Local Certificate          | <div> <input type="text"/> </div> <div> <input type="button" value="Upload Local Certificate file"/> </div>                                                                                                           |
| Local Private Key          | <div> <input type="text"/> </div> <div> <input type="button" value="Upload Local Private Key file"/> </div>                                                                                                           |

Figure 4: CVS file import

## 2.1.3 Mapping table

The Modbus/TCP to MQTT mapping will be shown in Mapping Table WEB page.



| Topic       | Name        | Modbus IP-Port | Modbus Slave ID | Modbus Function Code | Modbus Address | Modbus Data Length | Modbus Data Type | MQTT Data Type | Data Swap | Byte Swap | Multiplier | Offset   | Polling Interval | Send When Change | Custom Field |
|-------------|-------------|----------------|-----------------|----------------------|----------------|--------------------|------------------|----------------|-----------|-----------|------------|----------|------------------|------------------|--------------|
| env1-DI     | DI_01       | 192.168.1.15   | 5               | 2                    | 1              | 1                  | Boolean          | Boolean        | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env1-DO     | DO          | 192.168.1.15   | 5               | 1                    | 1              | 1                  | Boolean          | Boolean        | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env1-Temp   | Temperature | 192.168.1.15   | 5               | 4                    | 1              | 2                  | Float            | Float          | None      | False     | 1.000000   | 0.000000 | 10000            | Yes              | 0            |
| env1-Mode   | Mode        | 192.168.1.15   | 5               | 3                    | 10             | 2                  | Unsigned-Intec   | Unsigned-Intec | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env1-Mode-w | Mode        | 192.168.1.15   | 5               | 16                   | 10             | 2                  | Unsigned-Intec   | Unsigned-Intec | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env2-DI     | DI_01       | 192.168.1.16   | 5               | 2                    | 1              | 1                  | Boolean          | Boolean        | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env2-DO     | DO          | 192.168.1.16   | 5               | 1                    | 1              | 1                  | Boolean          | Boolean        | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env2-Temp   | Temperature | 192.168.1.16   | 5               | 4                    | 1              | 2                  | Float            | Float          | None      | False     | 1.000000   | 0.000000 | 10000            | Yes              | 0            |
| env2-Mode   | Mode        | 192.168.1.16   | 5               | 3                    | 10             | 2                  | Unsigned-Intec   | Unsigned-Intec | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |
| env2-Mode-w | Mode        | 192.168.1.16   | 5               | 16                   | 10             | 2                  | Unsigned-Intec   | Unsigned-Intec | None      | False     | 1.000000   | 0.000000 | 10000            | No               | 0            |

Figure 5: Mapping table

## 2.1.4 MQTT Data Format

When Modbus/TCP FC is 1, 2, 3 or 4, Modbus to MQTT will work as MQTT publisher to post Modbus/TCP data in JSON format to MQTT broker. When Modbus/TCP FC is 5, 6, 15 or 16, Modbus to MQTT will work as MQTT subscriber to ask subscription information, and forward the data to Modbus/TCP device.

Here are the example of MQTT data that is published from Modbus to MQTT.

```
{
  "time" : "2020-06-09 15:25:06.667",
  "topic" : "env1-DI"
  "name" : "DI_01",
  "value" : true,
  "ip" : "192.168.1.15",
  "port" : "502",
  "id" : "1",
  "fc" : "1",
  "address" : "1",
  "data length" : "1"
}
```

Note that Modbus to MQTT verify just topic, name and value fields of the received subscription information.

```
{
  "topic": "env1-Mode-w",
  "name": "Mode",
  "value": "1234"
}
```

### 3. Related Documents

You can obtain product-related documents on *Engineering Portal* at [icr.advantech.cz](http://icr.advantech.cz) address.

To get your router's *Quick Start Guide*, *User Manual*, *Configuration Manual*, or *Firmware* go to the [Router Models](#) page, find the required model, and switch to the *Manuals* or *Firmware* tab, respectively.

The *Router Apps* installation packages and manuals are available on the [Router Apps](#) page.

For the *Development Documents*, go to the [DevZone](#) page.