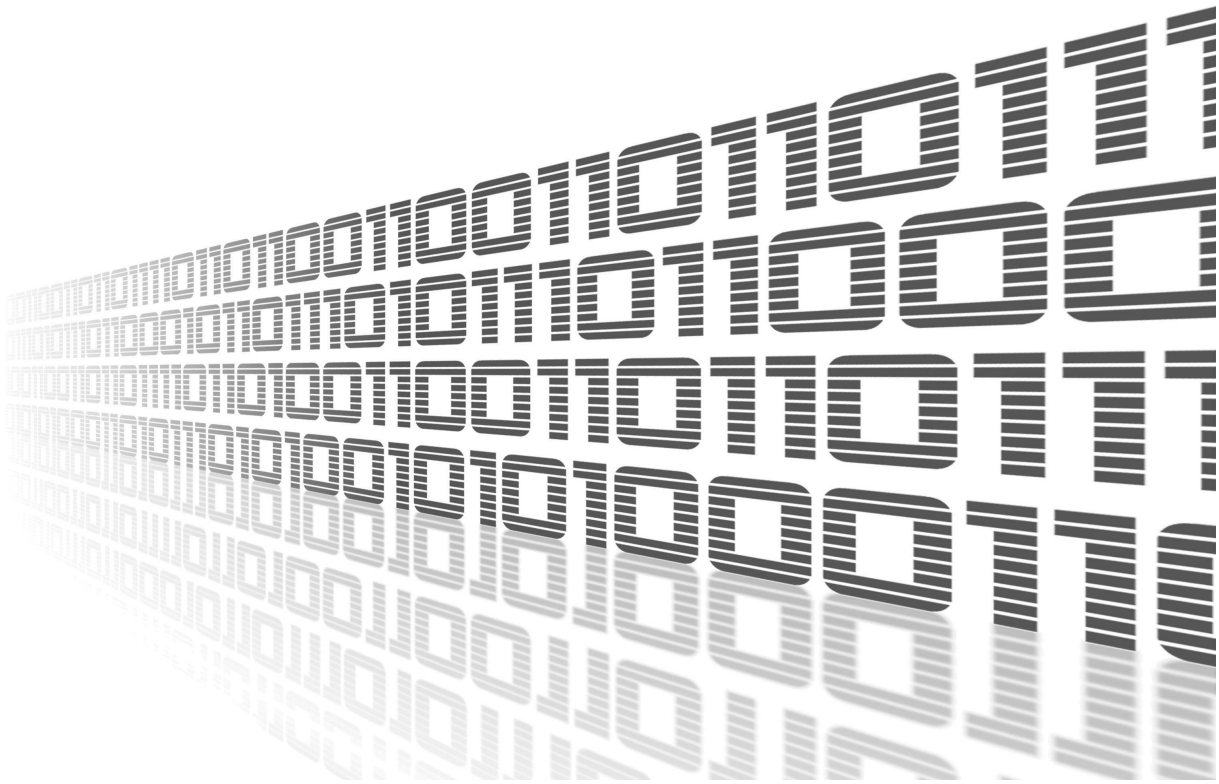
RouterApp

Modbus to MQTT

APPLICATION NOTE



www.lucom.de

ADVANTECH

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.

Advantech Czech s.r.o., Sokolska 71, 562 04 Usti nad Orlici, Czech Republic
Document No. APP-0087-EN, revised on September 23, 2022. Released in the Czech Republic.

Contents

List of Figures

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.

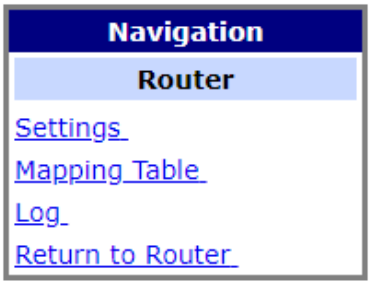


Figure 1: Menu

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.

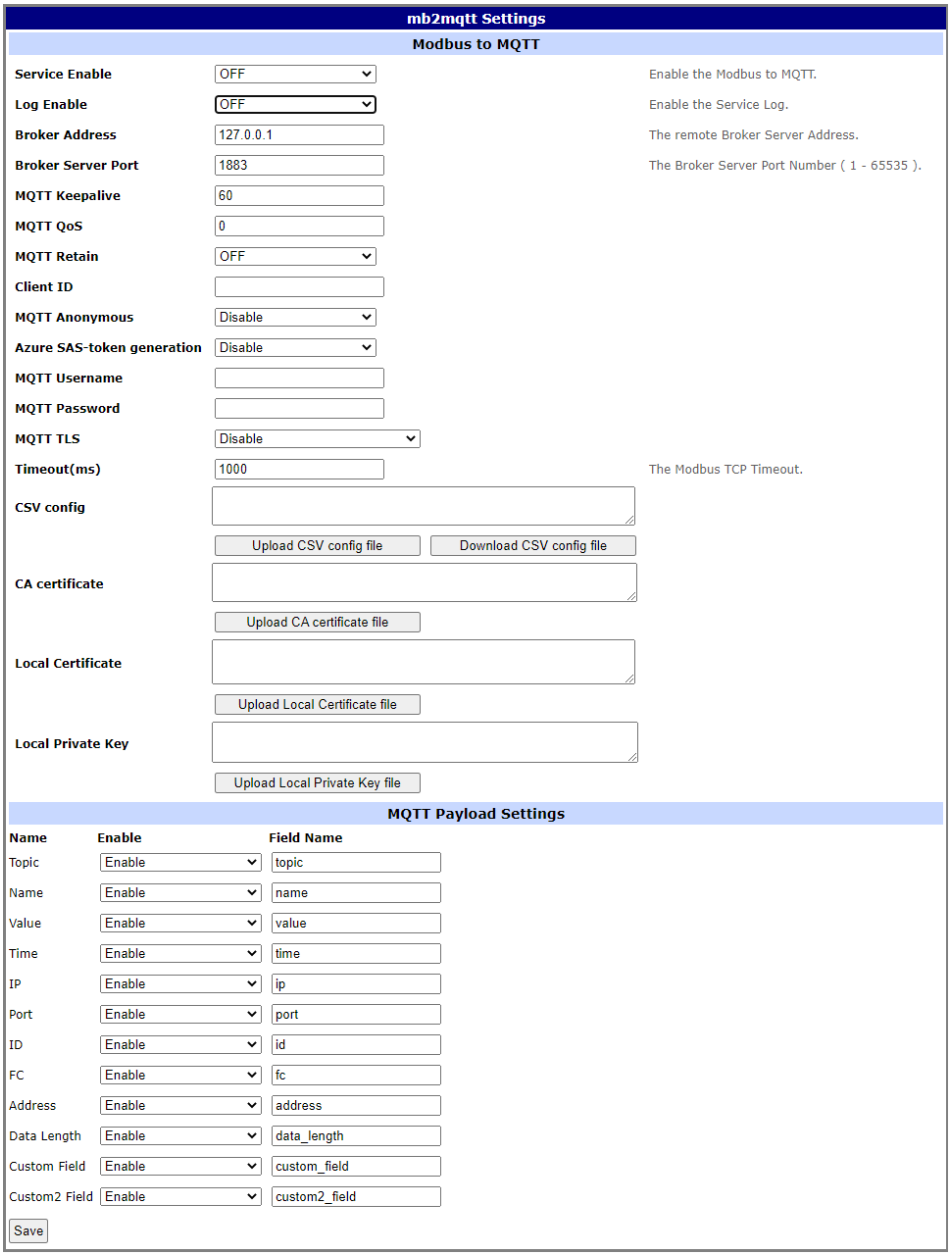


Figure 2: Settings

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.

Topic	Name	IP	Port	Device ID	Function Code	Address	Data length	Modbus Data type	Data Swap	Byte Swap
env1-DI	DI_01	192.168.1.15	502	1	2	1	1	Boolean	None	False
env1-DO	DO	192.168.1.15	502	1	1	1	1	Boolean	None	False
env1-Temp	Temperature	192.168.1.15	502	1	4	1	2	Float	None	False
env1-Mode	Mode	192.168.1.15	502	1	3	10	2	Unsigned Integer	None	False
env1-Mode-w	Mode	192.168.1.15	502	1	16	10	2	Unsigned Integer	None	False
env2-DI	DI_01	192.168.1.16	502	1	2	1	1	Boolean	None	False
env2-DO	DO	192.168.1.16	502	1	1	1	1	Boolean	None	False
env2-Temp	Temperature	192.168.1.16	502	1	4	1	2	Float	None	False
env2-Mode	Mode	192.168.1.16	502	1	3	10	2	Unsigned Integer	None	False
env2-Mode-w	Mode	192.168.1.15	502	1	16	10	2	Unsigned Integer	None	False

MQTT Data Type	Multiplier	Offset	Polling Interval (ms)	Send When Change	Custom Field	custom2 field	Send Group	Send Interval
Boolean	1	0	10000	No	0	0	0	1
Boolean	1	0	10000	No	0	0	0	1
Float	1	0	10000	Yes	0	0	0	1
Unsigned Integer	1	0	10000	No	0	0	0	1
Unsigned Integer	1	0	10000	No	0	0	0	1
Boolean	1	0	10000	No	0	0	0	1
Boolean	1	0	10000	No	0	0	0	1
Float	1	0	10000	Yes	0	0	0	1
Unsigned Integer	1	0	10000	No	0	0	0	1
Unsigned Integer	1	0	10000	No	0	0	0	1

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	Modbus Function Code (FC). In Modbus to MQTT, supported function codes are: 1, 2, 3, 4, 5, 6, 15, 16 **01**: Read coils; **02**: Read discrete inputs; **03**: Read holding registers; **04**: Read input register; **05**: Write single coil; **06**: Write single register; **15**: Write multiple coils; **16**: Write multiple registers.
Address	Designate the read from/write to starting address for the Modbus registry.
Data length	When FC=1, 2, 5 or 15, the unit is bit(s) When FC=3, 4, 6 or 16, the unit is word(s)

Continued on the next page

Continued from previous page

Item	Description
Modbus Data type	Modbus data type. Options: Boolean, Integer, Unsigned Integer, Float
Data Swap	The Data Swap field determines the order in which the particular bytes of the received/transmitted data are delivered. **None**: Do not swap; **Word**: 0x01, 0x02 becomes 0x02, 0x01; **Double Word**: 0x01, 0x02, 0x03, 0x04 becomes 0x04, 0x03, 0x02, 0x01. **Double Word - Frame**: 0x01, 0x02, 0x03, 0x04 becomes 0x04, 0x03, 0x02, 0x01. **Quad Word**: 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07980 becomes 0x07980, 0x05, 0x06, 0x03, 0x04, 0x01, 0x02.
Byte Swap	Option: True, False When option is True: 0x01, 0x02 becomes 0x01, 0x02. 0x01, 0x02, 0x03, 0x04 becomes 0x01, 0x02, 0x03, 0x04.
MQTT Data type	MQTT data type. Options: Boolean, Integer, Unsigned Integer, Float, Long Integer, Unsigned
Multiplier	The value used to multiply the data value.
Offset	The value used to add/substract the data value.
Polling Interval (ms)	Modbus Polling Interval, unit: milliseconds. The value range: 1 10000000
Send When Change	Select that the data is sent immediately when change happens on modbus slave. Options: Yes, No
Custom Field	Custom definition value
Custom2 Field	Custom definition value
Send Group	Set group number for MQTT multiple messages to one message. The value range is from 0 to 500. When the value is 0, this feature is disabled.
Send Interval	Send MQTT message interval for the group in seconds. The value range is from 1 to 10000 seconds.

Table 2: Configuration items description

The CSV file can 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.

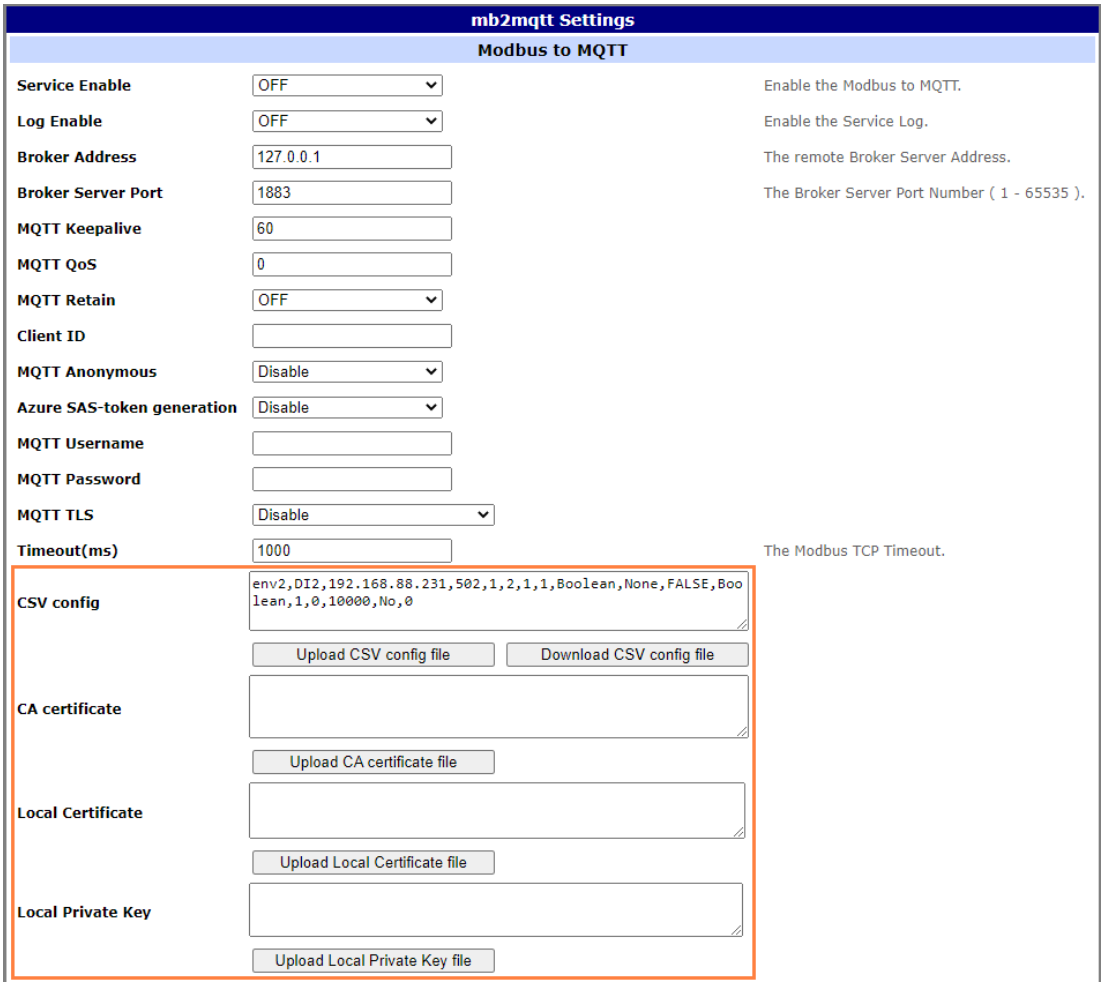
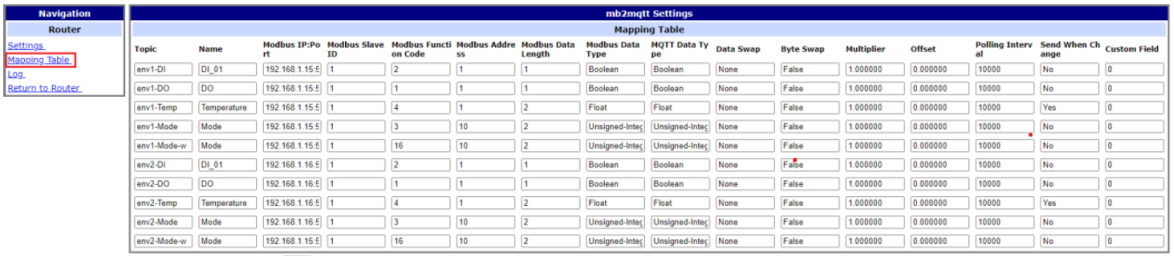


Figure 4: CVS file import

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	1	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	1	Boolean	Boolean	None	False	1.000000	0.000000	10000	No	0
env1-Temp	Temperature	192.168.1.15:5	1	4	1	2	Float	Float	None	False	1.000000	0.000000	10000	Yes	0
env1-Mode	Mode	192.168.1.15:5	1	3	10	2	Unsigned-Integ	Unsigned-Integ	None	False	1.000000	0.000000	10000	No	0
env1-Mode-w	Mode	192.168.1.15:5	1	16	10	2	Unsigned-Integ	Unsigned-Integ	None	False	1.000000	0.000000	10000	No	0
env2-DI	DI_01	192.168.1.16:5	1	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	1	Boolean	Boolean	None	False	1.000000	0.000000	10000	No	0
env2-Temp	Temperature	192.168.1.16:5	1	4	1	2	Float	Float	None	False	1.000000	0.000000	10000	Yes	0
env2-Mode	Mode	192.168.1.16:5	1	3	10	2	Unsigned-Integ	Unsigned-Integ	None	False	1.000000	0.000000	10000	No	0
env2-Mode-w	Mode	192.168.1.15:5	1	16	10	2	Unsigned-Integ	Unsigned-Integ	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* 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.