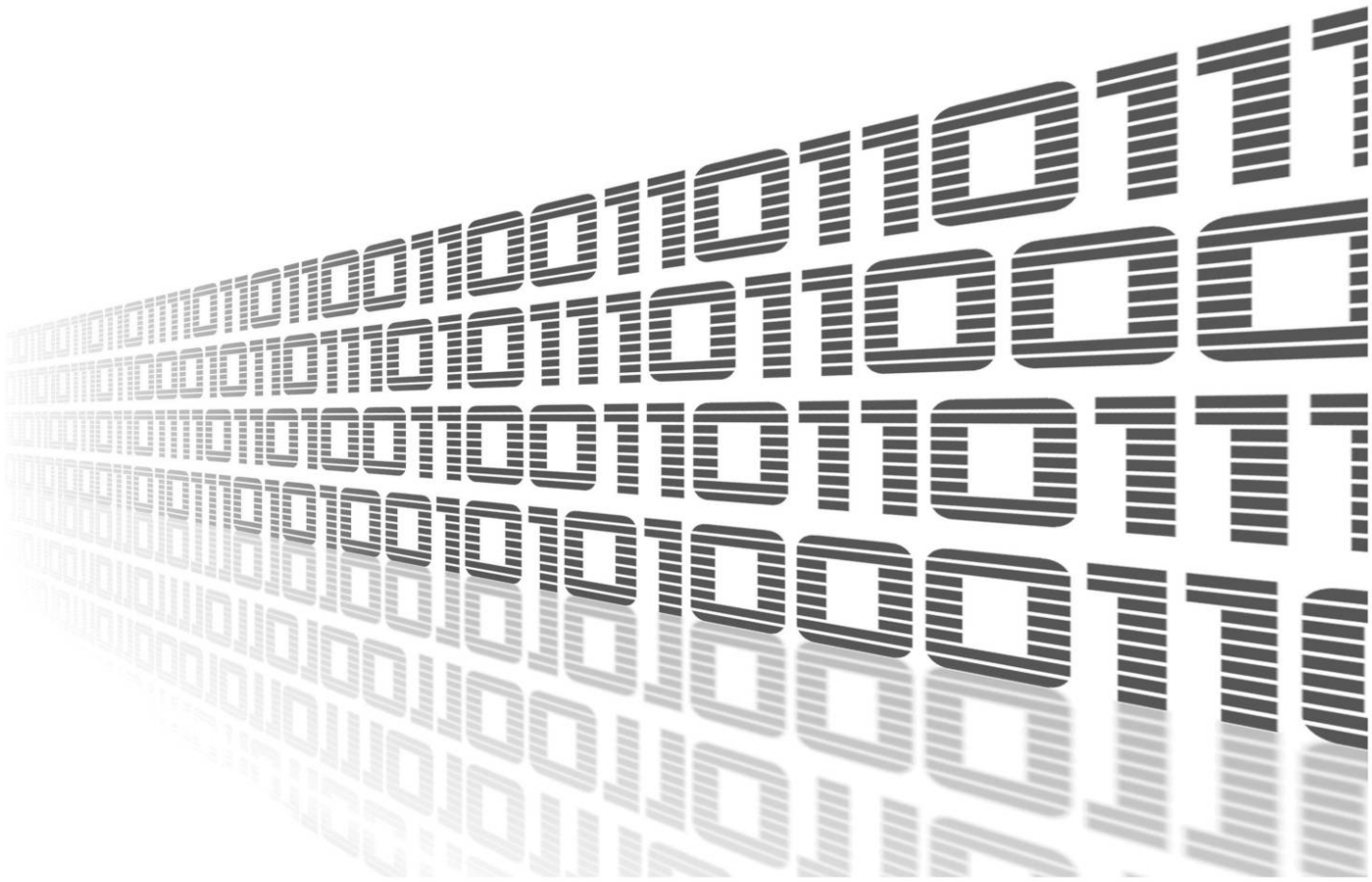
ADVANTECH

RouterApp

Modbus to MQTT



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Used symbols

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

Attention – Problems that can arise in specific situations.

Information – Useful tips or information of special interest.

Example – Example of function, command or script.

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1. Changelog

1.1 Modbus to MQTT Changelog

v2.0.5

- Change openssl (1.0.2u) to static library.

v2.0.6

- Add option of Azure SAS-token generation.
- Need to install Python3 user module.
- Add Data Type: Double World - Frame.
- Add "Byte Swap" field in csv file.
- Add supported Data type "String".
- Add "Word Swap" and "Byte Swap" for String Data Type.

v2.0.7

- Add show mosquitto error code and error message in the connected/disconnected function.

v2.0.8

- Add upload local cert and local key features for AWS.

v2.0.9

- Change modbus command maximum from 100 to 500.

v2.0.10

- Add polling the user module processes for each 5 seconds, if the user module crashed, it will run again.

v2.0.11

- Add "Custom2 Field" field in csv file.
- Add "Send Group" field in csv file, for MQTT send group feature.
- Add "Send interval" field in csv file, for MQTT send group feature.

v2.0.12

- Add Azure SAS-token generation (without Python3 user module). When Python3 user module installed, it will to use SAS-token generation by python.

v2.0.13

- Added ability to edit CSV, CA certificate, Local certificate and Local Private Key from WebUI.

v2.0.14

- Fixed issue when the Router App mb2mqtt is loading default configuration after Firmware update.

v2.0.15

- Fixed an issue with displaying space values in the Mapping Table page.
- Fixed an issue where the old value was displayed in the Mapping Table page when the configuration value was empty.

v2.0.16

- For WADMP: Fixed the issue that the default value has whitespaces.

v2.0.17

- To support Integer with 2 bytes size (Example: convert 0xFFFF to -1).
- Set permissions to 755 for all files in the User Module.

v2.0.18

- Fixed an issue with integer-to-float conversion.
- Add more log message for MQTT value.

v2.0.19

- Increase Custom Fields to 10 (CSV configuration fields : Q, R, U AB)

v2.0.20

- Fixed an issue where configuration comments were causing issues in the management system WADMP.

v2.1.0 (1.3.2024)

- To support platforms v2i, v3, v4 and v4i.
- Update OpenSSL to 3.0.12
- Update mosquitto to 2.0.12

v2.1.1 (6.5.2024)

- Fixed an issue with upload/download large CSV file.
- Added Modbus/TCP Multiple values in a single request.

v2.1.2 (2024-06-25)

- Resolving the connection error to Azure Event Grid when using TLS without a CA certificate.

v2.1.3 (2024-08-03)

- Added integrity checks for the -S1 platforms

2. Router App Description

This Router App is not included in the standard router firmware. Instructions for uploading this Router App can be found in the Configuration Manual (see Chapter Related Documents).

This Router App is compatible only with firmware version 6.4.x

2.1 Modbus To MQTT

Modbus to MQTT is a Router App designed to facilitate seamless communication between Modbus/TCP devices and an MQTT broker. It operates as a Modbus/TCP master to interact with Modbus/TCP devices and as an MQTT publisher/subscriber to communicate with an MQTT broker.

2.2 Web Interface

After installing the module, its GUI can be accessed by selecting the module name on the *Router Apps* page within the router's web interface.

The left side of this GUI includes a menu with *Status*, *Configuration*, and *Customization* sections. The *Status* section features *Log* and *Mapping Table* items, while the *Configuration* section includes a *Settings* item. The *Customization* section contains a *Return* item, which allows users to switch back from the module's web interface to the router's main web configuration pages. The main menu of the module's GUI is illustrated in Figure 1.

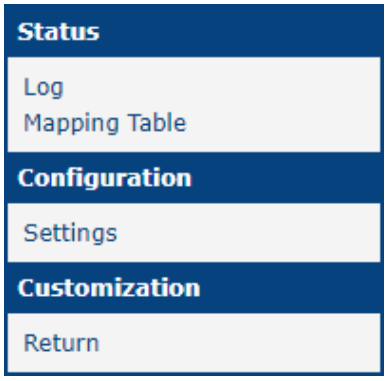

Figure 1: Menu

3. Configuration

3.1 Settings

Configuration for this Router App can be carried out on the *Settings* page, which is located under the *Configuration* menu section. Details of all configuration items available on the *Settings* page are illustrated in the figure and described in the table below.

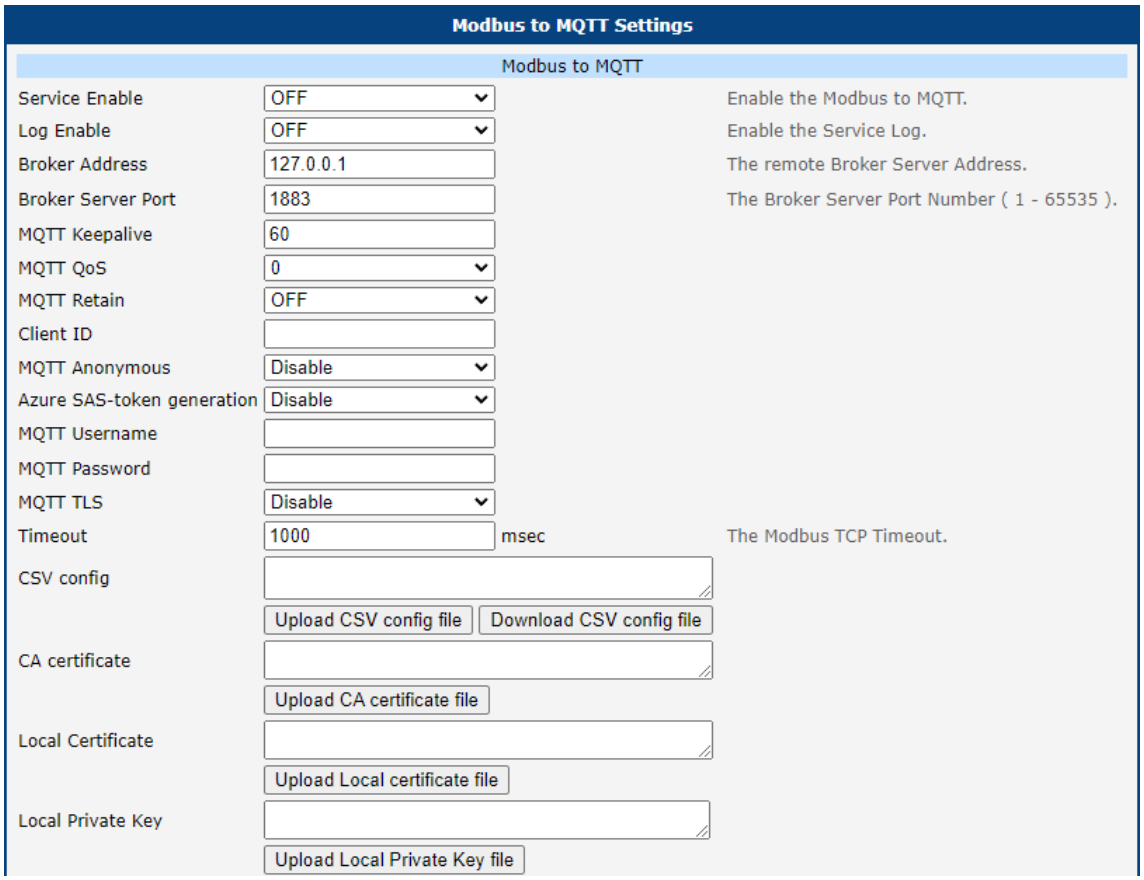

Figure 2: Settings — Part 1

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.

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Item	Description
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

The second part of the MQTT settings involves configuring the MQTT Payload. The payload is the actual content carried by an MQTT message, which can include various types of data such as sensor readings, status updates, commands, or other pertinent information required by the MQTT application.

The data within the payload can be encoded in various formats, tailored to meet the specific needs of the application utilizing MQTT.

For this setup, the payload includes predefined variables: **Topic**, **Name**, **Value**, **Time**, **IP**, **Port**, **ID**, **FC**, **Address**, and **Data Length**. Additionally, there is provision for ten custom fields that can be configured as needed.

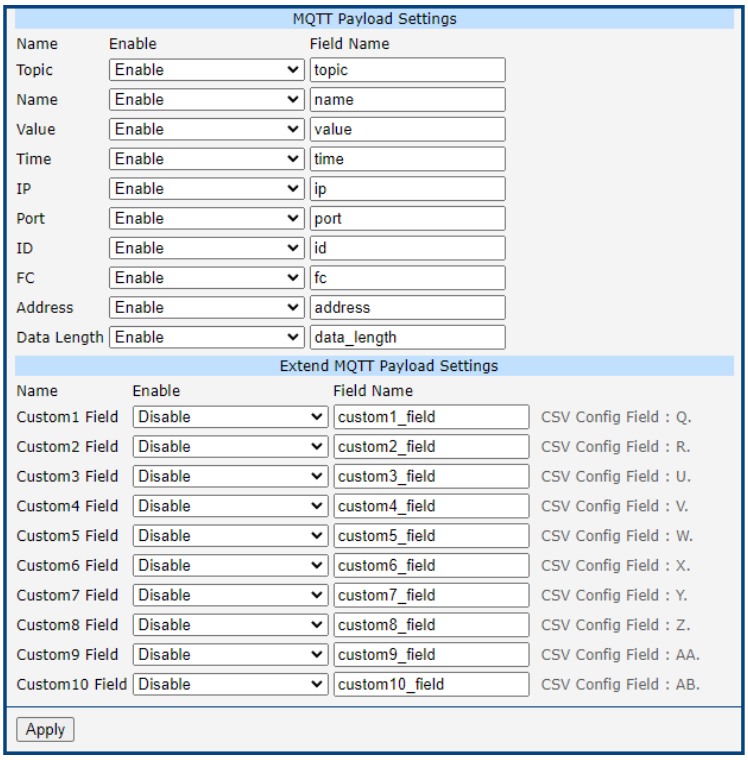

Figure 3: Settings — Part 2

3.2 CSV 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 4: 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)
Modbus Data type	Modbus data type. Options: Boolean, Integer, Unsigned Integer, Float

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Item	Description
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 Long Integer
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.

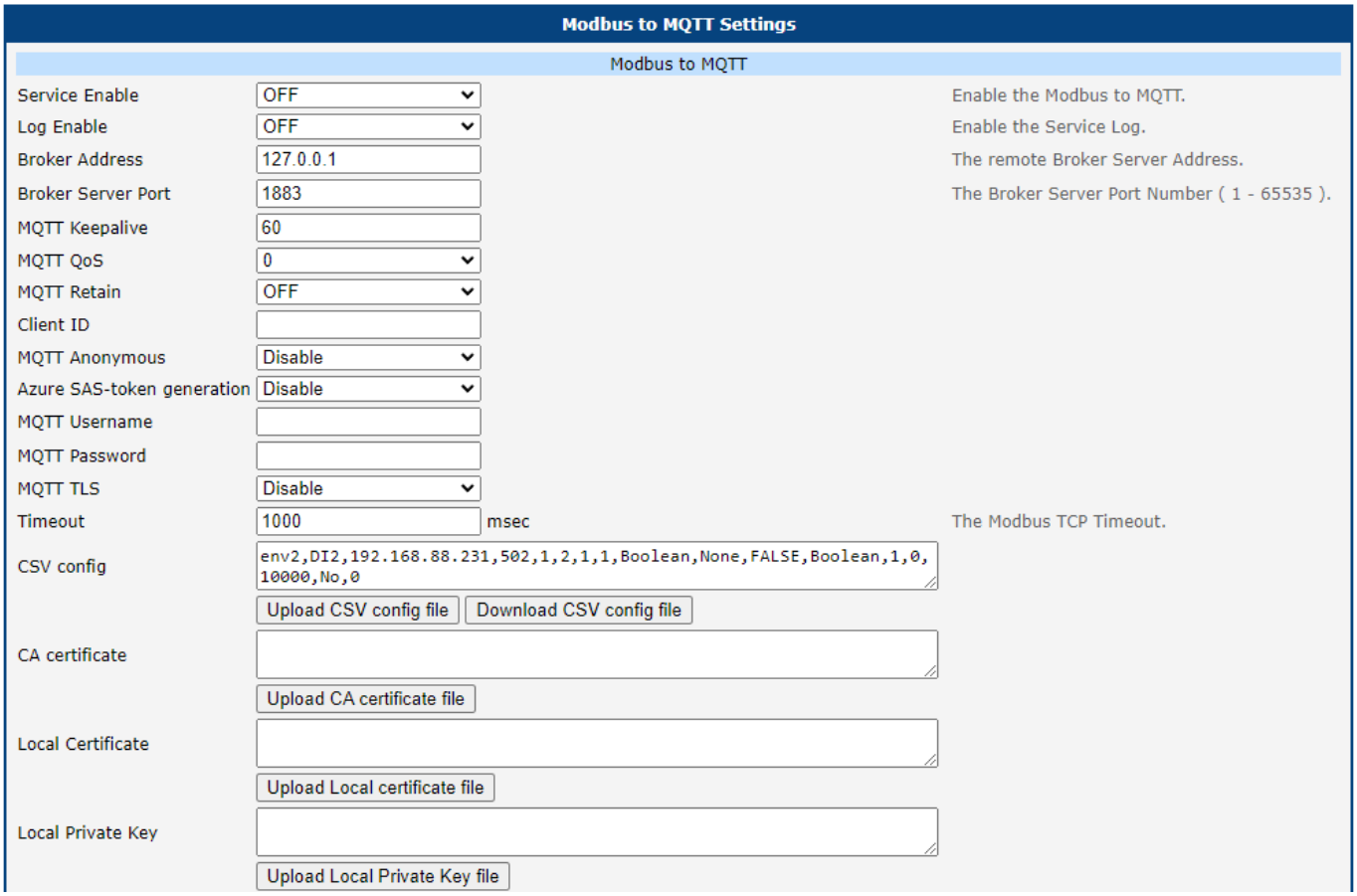

Figure 5: CVS file import

CSV Example

Copy-pastable example from the section above:

```
env1–DI,DI_01,192.168.1.15,502,1,2,1,1,Boolean,None,FALSE,Boolean,1,0,10000,No,0,0
env1–DO,DO,192.168.1.15,502,1,1,1,1,Boolean,None,FALSE,Boolean,1,0,10000,No,0,0,0
env1–Temp,Temperature,192.168.1.15,502,1,4,1,2,Float,None,FALSE,Float,1,0,10000,Ye
env1–Mode,Mode,192.168.1.15,502,1,3,10,2,Unsigned Integer,None,FALSE,Unsigned Inte
env1–Mode–w,Mode,192.168.1.15,502,1,16,10,2,Unsigned Integer,None,FALSE,Unsigned
env2–DI,DI_01,192.168.1.16,502,1,2,1,1,Boolean,None,FALSE,Boolean,1,0,10000,No,0,0
env2–DO,DO,192.168.1.16,502,1,1,1,1,Boolean,None,FALSE,Boolean,1,0,10000,No,0,0,0
env2–Temp,Temperature,192.168.1.16,502,1,4,1,2,Float,None,FALSE,Float,1,0,10000,Ye
env2–Mode,Mode,192.168.1.16,502,1,3,10,2,Unsigned Integer,None,FALSE,Unsigned Inte
env2–Mode–w,Mode,192.168.1.15,502,1,16,10,2,Unsigned Integer,None,FALSE,Unsigned
```

4. Status

4.1 Log

Log messages from the Router App will be displayed in this section.

4.2 Mapping table

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

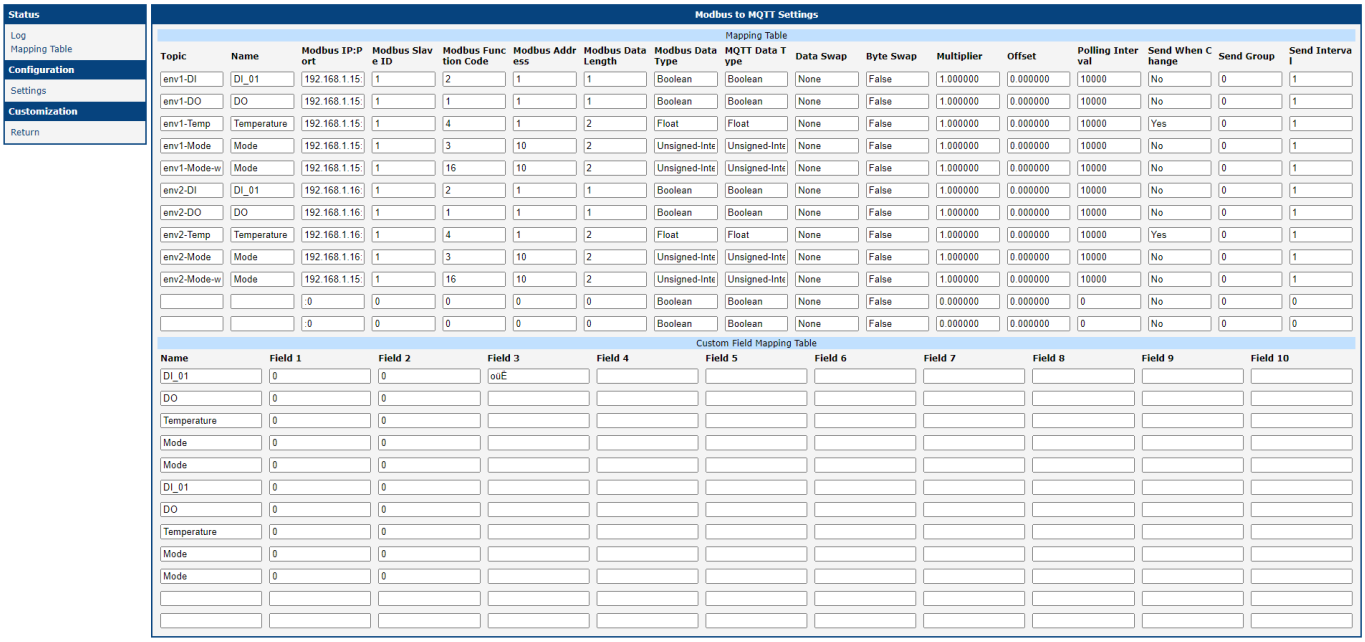

Figure 6: Mapping table

4.3 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"
}
```

5. Related Documents

You can obtain product-related documents on *Engineering Portal* at *icr.advantech.com* 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.