ADAM MQTT Manual

Edition V1.0 , Oct. 2017

1. Introduction of MQTT(Message Queue Telemetry Transport)

MQTT protocol is the lightweight messaging transport. Clients connect to the broker and the MQTT message is forwarded by broker. Furthermore, ADAM is designed with features that make it more flexible in the IoT applications.

Feature 1: Actively Publish MQTT Message

Advantech ADAM can be set up to actively publish I/O data in the form of MQTT message at a user's defined interval. This feature provides an efficient way to transmit data and lower the system loading.

Feature 2: Shorten Downtime with Actively Alarm Event Notification

The alarm event is usually referred to the digital input status changes or analog input in out of the user's defined range. Advantech ADAM is designed with alarm trigger mechanism with instant notice. The MQTT message will be published to broker at the moment that alarm conditions is reached.

2. MQTT Format for ADAM module

Digital Input/output module :

ADAM-6050/6051/6052/6060/6066

Description	**MQTT Topic**	**JSON data**	**Firmware**
Get the I/O data of ADAM digital input/output module	Advantech/MAC ID /data **Example:** Advantech/0013430C981C/data	{"s":1,"t":0,"q":192,"c":1, "dix":DI status,"dox":DO status}	D version : V6.01B11 and higher version
Set the value of a digital output of ADAM module	Advantech/MAC ID/ctl/dox **Example:** Advantech/0013430C981F/ctl/do1	{"v":DO status},	D version : V6.01B11 and higher version
Will Topic	Advantech/MACID/Device_Status **Example:** Advantech/0013430C981F/ Device_Status	{ "status":"Device Status", "name":"Device Name","macid":"MACID", "ipaddr":"IP Address"}	D version :V6.01B13 And higher version

ADAM-6250/6251/6256/6260/6266

Description	**MQTT Topic**	**JSON data**	**Firmware**
Get the I/O data of ADAM digital input/output module	Advantech/MAC ID /data **Example:** Advantech/0013430C981C/data	{"s":1,"t":0,"q":192,"c":1, "dix":DI status,"dox":DO status}	AE version : A1.06B02 and higher version
Set the value of a digital output of ADAM module	Advantech/MAC ID/ctl/dox **Example:** Advantech/0013430C981F/ctl/do1	{"v":DO status},	AE version : A1.06B02 and higher version
Will Topic	Advantech/MACID/Device_Status **Example:** Advantech/0013430C981F/ Device_Status	{ "status":"Device Status", "name":"Device Name","macid":"MACID", "ipaddr":"IP Address"}	AE version : A1.06B03 And higher version

Analog Input modules: ADAM-6017

Description	**MQTT Topic**	**JSON data**	**Firmware**
Get the I/O data of ADAM Analog input module	Advantech/MAC ID /data **Example:** Advantech/0013430C981C/data	{"s":1,"t":0,"q":192,"c":1, "aix":AI value,"ai_stx":condition, "dox":DO status, "do_stx":condition}	CE version :V5.03 B03 and higher version
Get an analog input range configuration.	Advantech/MAC ID/cfg/sensor/aix **Example:** Advantech/0013430C981F/cfg/sensor/ai1	{"typ":"Range"}	CE version :V5.04 B00 and higher version
Set the value of a digital output of ADAM module	Advantech/MAC ID/ctl/dox **Example:** Advantech/0013430C981F/ctl/do1	{"v":DO status},	CE version :V5.03 B03 and higher version
Set an analog input configuration	Advantech/MAC ID/set/sensor/aix **Example**: Advantech/00D0C9F94344/set/sensor/ai1	{"typ":"Range"}	CE version :V5.04 B00 and higher version
Will Topic	Advantech/MACID/Device_Status **Example:** Advantech/0013430C981F/ Device_Status	{ "status":"Device Status", "name":"Device Name","macid":"MACID", "ipaddr":"IP Address"}	CE version :V5.04 B00 and higher version

General

s: Reserved for further use, default value 1

t: Reserved for further use, default value 0

q: Reserved for further use, default value 192

c: Reserved for further use, default value 1

DI/O Module

dix: Digital Input status of channel(x-1)

example: {"di2":true} means status of DI channel 1 is true

dox: Digital Output status of channel(x-1)

example: {"do2":true} means status of DO channel 1 is true

DO status true:on, false:off

DI status true:on, false:off

AI Module

aix: Analog Input value of channel (x-1)

Note: If AI channel is disabled, AI value shows “9999.9999”

ai_stx: Condition of analog Input channel (x-1)

ai_stx value	Condition
0	Channel disable
1	Streaming, normal
2	High latch
3	High momentary
4	Low latch
5	Low momentary

do_stx: Condition of digital output channel(x-1), only for ADAM-6017 Digital output

do_stx value	Condition
1	Streaming, normal
2	DO change

typ:	Input range
Range	Input rage value

Range value	Input range
0-20mA	0~20mA
4-20mA	4~20mA
+-20mA	±20mA
0-5V	0~5V
1-5V	1~5V
0-10V	0~10V
0-1V	0~1V
0-500mV	0~500mV
0-150mV	0~150mV
+-10V	±10V
+-5V	±5V
+-2.5V	±2.5V
+-1V	±1V
+-500mV	±500mV

1.3 MQTT Configuration

The MQTT of ADAM can be configured by ADAM.Net utility (V2.05.11 B05 and higher version) or ASCII command.

Note :MQTT function must be disabled before configuration and enable the MQTT function after configuration is done.

- **Host (Broker IP)**

  Users set up the broker URL or IP address . ADAM module connection to broker over standard MQTT protocol.

- **Heartbeat (keep-Alive)**

  The broker will regularly check the connection with the ADAM at interval of heartbeat (keep-Alive) setting. The minimum interval setting is 5 seconds.

- **Dead band**

  Dead band is set to determine the minimum interval between publishing two MQTT messages. It is set to prevent MQTT message from publishing excessively by noise.

- **Retain Message**

  When the retain function is enabled. The broker will store the last message of the topic. If a new subscription for the topic is made, the message will be sent to the client. Client is able to get the last message and does not need to wait until the next message is updated.

- **Will topic**

  If the client subscribes the topic for the ADAM which is disconnected, the broker will inform the clients by sending the will message to whom subscribe the will topic

  Will Topic of ADAM: Advantech/MACID/Device_Status

  Will message:

  { "status":"Device Status", "name":"Device Name","macid":"MACID", "ipaddr":"IP Address"}

  Will message example:

  {"status":"disconnect","name":"ADAM6051","macid":"00D0C9FEFFF5","ipaddr":"10.0.0.1"}

- **QoS(Quality of Service)**

  Users can choose the QoS level of publish/subscribe. Three levels of QoS (Quality of Service) are defined in MQTT.

  Level 0: broker/client deliver the message at most once

  Level 1: broker/client deliver the message at least once

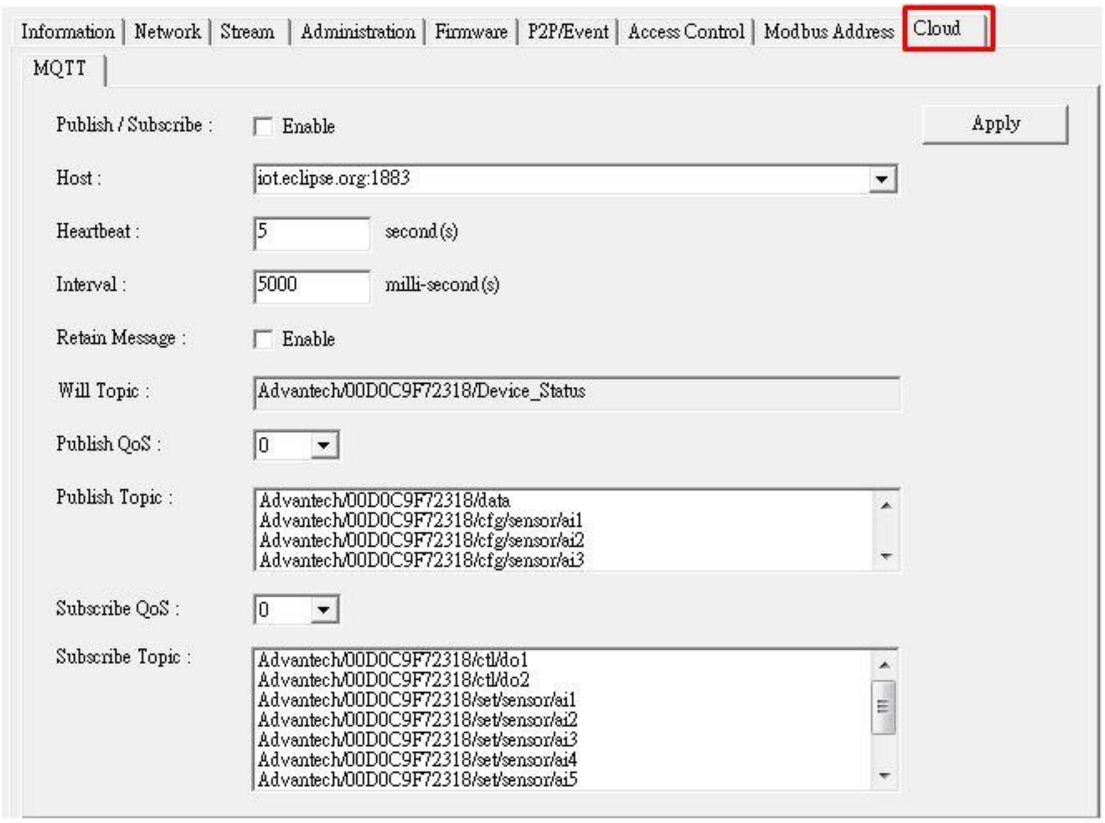
  Level 2: broker/client deliver the message exactly once

- **Publish/Subscribe Topic**

  The MQTT message is forwarded by broker based on the MQTT topic. Each message contains the data value. When client publishs MQTT message to broker, the clients who subscribe the topic will receive the MQTT message accordingly.

1.3.1Configuration by ADAM.Net utility

Click “Cloud button” in the function list to configure the MQTT setting



Publish / Subscribe : □ Enable

Host : iot.eclipse.org:1883

Heartbeat : 5 second (s)

Interval : 5000 milli-second (s)

Retain Message : □ Enable

Will Topic : Advantech/00D0C9F72318/Device_Status

Publish QoS : 0

Publish Topic :
Advantech/00D0C9F72318/data
Advantech/00D0C9F72318/cfg/sensor/ai1
Advantech/00D0C9F72318/cfg/sensor/ai2
Advantech/00D0C9F72318/cfg/sensor/ai3

Subscribe QoS : 0

Subscribe Topic :
Advantech/00D0C9F72318/ctl/do1
Advantech/00D0C9F72318/ctl/do2
Advantech/00D0C9F72318/set/sensor/ai1
Advantech/00D0C9F72318/set/sensor/ai2
Advantech/00D0C9F72318/set/sensor/ai3
Advantech/00D0C9F72318/set/sensor/ai4
Advantech/00D0C9F72318/set/sensor/ai5

Users could set up the broker URL or IP address at “Host”. Three public broker sources link are listed in the utility

- iot.eclipse.org
- test.mosquitto.org
- broker.mqttdashboard.com

1.3.2 Configuration by ASCII

Digital input/output modules:

ADAM-6050/6051/6052/6060/6066/6250/6251/6256/6260/6266

Command	**Description**	**Remarks**
%aaSETMQTTENxx	Set MQTT enable/disable aa: always 01 xx: 01 (enable), 00 (disable)	Return: >01 Error: ?01

%aaSETMQTTADxx…x	Set IP address of the broker aa: always 01 xx…x: IP address/domain (0~50 character)	Return: >01 Error: ?01
%aaSETMQTTHBxxxx	Set heartbeat interval aa: always 01 xxxx: heartbeat interval in second (0005~FFFF)	Return: >01 Error: ?01
%aaSETMQTTPDxxxx	Set publishing deadband aa: always 01 xxxx: publishing deadband in millisecond (0032~03E8)	Return: >01 Error: ?01
%aaSETMQTTPRxx	Set publishing retain enable/disable aa: always 01 xx: 01 (enable), 00 (disable)	Return: >01 Error: ?01
%aaSETMQTTPQxx	Set publishing Qos aa: always 01 (xx): publishing Qos (00~02)	Return: >01 Error: ?01
%aaSETMQTTSQxx	Set subscribing Qos aa: always 01 (xx): publishing Qos (00~02)	Return: >01 Error: ?01
ujhhhj%aaGETMQTTEN	Get MQTT enable/disable aa: always 01	Return: !01 (enable) !00 (disable) Error: ?01
%aaGETMQTTAD	Get IP address of the broker aa: always 01	Return: !IP Address/Domain (IP Address/DomainName) Error: ?01
%aaGETMQTTHB	Get heartbeat interval aa: always 01	Return: !xxxx (heartbeat interval in hex format) Error: ?01
%aaGETMQTTPD	Get publishing deadband aa: always 01	Return: !xxxx (deadband in hex format) Error: ?01
%aaGETMQTTPR	Get publishing retain enable/disable aa: always 01	Return: !00 (enable) !01 (disable) Error: ?01

%aaGETMQTTPQ	Get publishing Qos aa: always 01	Return: !xx (publishing Qos in hex format) Error: ?01
%aaGETMQTTSQ	Get subscribing Qos aa: always 01	Return: !xx (subscribing Qos in hex format) Error: ?01

Analog input modules

ADAM-6017

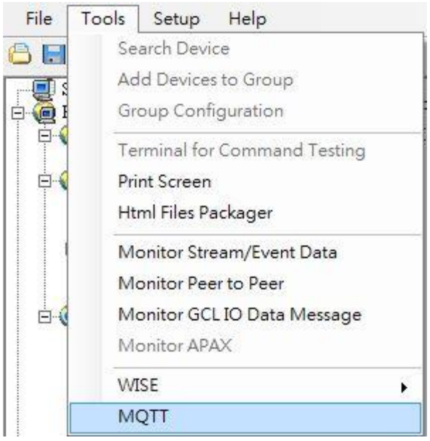
Command	Description	Remarks
%aaSETMQTTENxx	Set MQTT enable/disable aa: always 01 xx: 01 (enable), 00 (disable)	Return: >01 Error: ?01
%aaSETMQTTADxx…x	Set IP address of the broker aa: always 01 x⋯x: IP address/domain (0~50 character)	Return: >01 Error: ?01
%aaSETMQTTHBxxxx	Set heartbeat interval aa: always 01 xxxx: heartbeat interval in second (0005~FFFF)	Return: >01 Error: ?01
%aaSETMQTTSTxxxxxxxx	Set publishing data streaming interval time aa: always 01 xxxxxxxx: publishing data streaming interval time in millisecond (0032~FFFFFFFF)	Return: >01 Error: ?01
%aaSETMQTTPRxx	Set publishing retain enable/disable aa: always 01 xx: 01 (enable), 00 (disable)	Return: >01 Error: ?01
%aaSETMQTTPQxx	Set publishing Qos aa: always 01 (xx): publishing Qos (00~02)	Return: >01 Error: ?01

%aaSETMQTTSQxx	Set subscribing Qos aa: always 01 (xx): publishing Qos (00~02)	Return: >01 Error: ?01
%aaGETMQTTEN	Get MQTT enable/disable aa: always 01	Return: !01 (enable) !00 (disable) Error: ?01
%aaGETMQTTAD	Get IP address of the broker aa: always 01	Return: !IP Address/Domain (IP Address/DomainName) Error: ?01
%aaGETMQTTHB	Get heartbeat interval aa: always 01	Return: !xxxx (heartbeat interval in hex format) Error: ?01
%aaGETMQTTST	Get publishing data streaming interval time aa: always 01	Return: !xxxxxxxx (data streaming in hex format) Error: ?01
%aaGETMQTTPR	Get publishing retain enable/disable aa: always 01	Return: !00 (disable) !01 (enable) Error: ?01
%aaGETMQTTPQ	Get publishing Qos aa: always 01	Return: !xx (publishing Qos in hex format) Error: ?01
%aaGETMQTTSQ	Get subscribing Qos aa: always 01	Return: !xx (subscribing Qos in hex format) Error: ?01

1.4 How to start the MQTT with ADAM

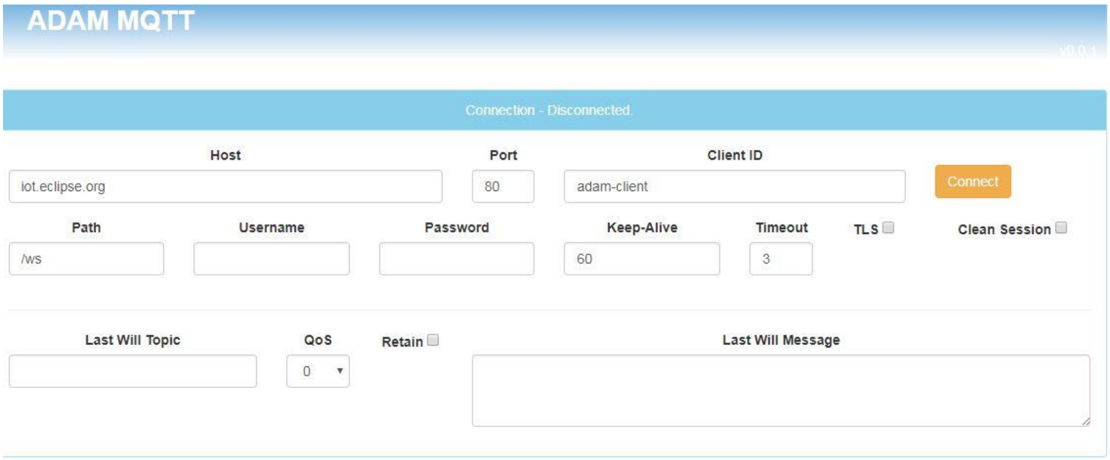
ADAM.Net utility provides the pages to simulate MQTT client to test the MQTT of ADAM modules. Users are able to experience the benefits of the ADAM with MQTT in 4 steps.

Step 1 :Click “Tools” and “MQTT”, the page will forward to ADAM MQTT page



Step 2 :Set up the connection

In the connection configuration page, user is able to set up the client information. The default host is public broker source” iot.eclipse.org” at port 80. Users can also set up the host URL or IP address. Click “connect” when the configuration is done.



ADAM MQTT

v0.0.1

Connection - Disconnected.

Host: iot.eclipse.org

Port: 80

Client ID: adam-client

Connect

Path: /ws

Username:

Password:

Keep-Alive: 60

Timeout: 3

TLS □

Clean Session □

Last Will Topic:

QoS: 0

Retain □

Last Will Message:

Note: 1. Path, Username, Password, TLS, Clean session function is not released

2. The webpage only supports the connection to broker over WebSocket

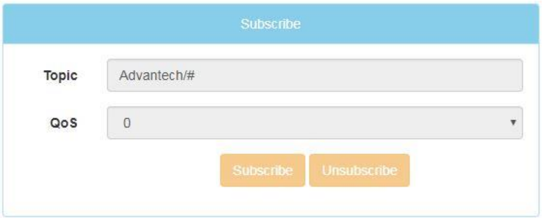
Step 3: Subscribe/Publish function

Subscribe

Users set up the topic and choose the QoS level, then click the subscribe button. The message of the topic will be shown in the history field.

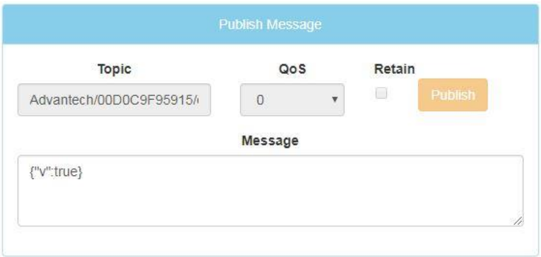
Publish

Set up publish topic, QoS and message, then click Publish button. The MQTT message will be published to the broker. If the retain function is enabled. ADAM will receive the last message when subscribes the topic.



Topic: Advantech/#

QoS: 0



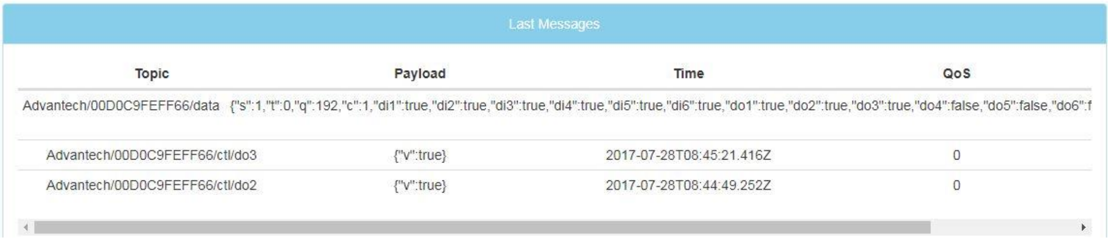
Topic: Advantech/00D0C9F95915/(

QoS: 0

Message: {"v":true}

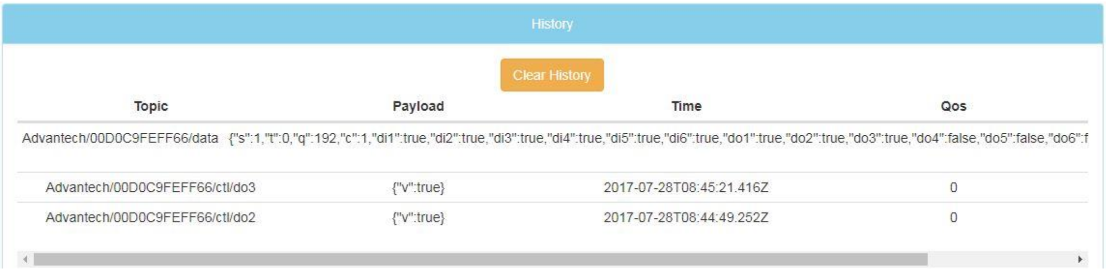
Step 4: Review the MQTT Message

Users can read the last MQTT message and the historical messages in last message column and history column.



Topic	Payload	Time	QoS
Advantech/00D0C9FEFF66/data	{"s":1,"t":0,"q":192,"c":1,"di1":true,"di2":true,"di3":true,"di4":true,"di5":true,"di6":true,"do1":true,"do2":true,"do3":true,"do4":false,"do5":false,"do6":f		
Advantech/00D0C9FEFF66/ctl/do3	{"v":true}	2017-07-28T08:45:21.416Z	0
Advantech/00D0C9FEFF66/ctl/do2	{"v":true}	2017-07-28T08:44:49.252Z	0

Last message of ADAM module



Topic	Payload	Time	Qos
Advantech/00D0C9FEFF66/data	{"s":1,"t":0,"q":192,"c":1,"di1":true,"di2":true,"di3":true,"di4":true,"di5":true,"di6":true,"do1":true,"do2":true,"do3":true,"do4":false,"do5":false,"do6":f		
Advantech/00D0C9FEFF66/ctl/do3	{"v":true}	2017-07-28T08:45:21.416Z	0
Advantech/00D0C9FEFF66/ctl/do2	{"v":true}	2017-07-28T08:44:49.252Z	0

History message of ADAM module