

**Arm[®] Cortex[®]-M
32-bit Microcontroller**

**NuMicro[®] Family
AliOS Things On
NuMaker-IOT-M487
Quick Start Guide**

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1 OVERVIEW

NuMaker-IoT-M487 board provides multiple networking, interfaces, image sensing, audio recording, playback functions, and flexible extended data storage. The front and rear side of NuMaker-IoT-M487 board are shown in Figure 1-1. Whether you need a sensor node or a light-weight gateway, the NuMaker-IoT-M487 board is an ideal choice for IoT applications. In this guide, some steps will help you use AliOS Things on the NuMaker-IoT-M487 board. This guide includes how to get AliOS things SDK, mqttapp sample, firmware burning, and connective test.

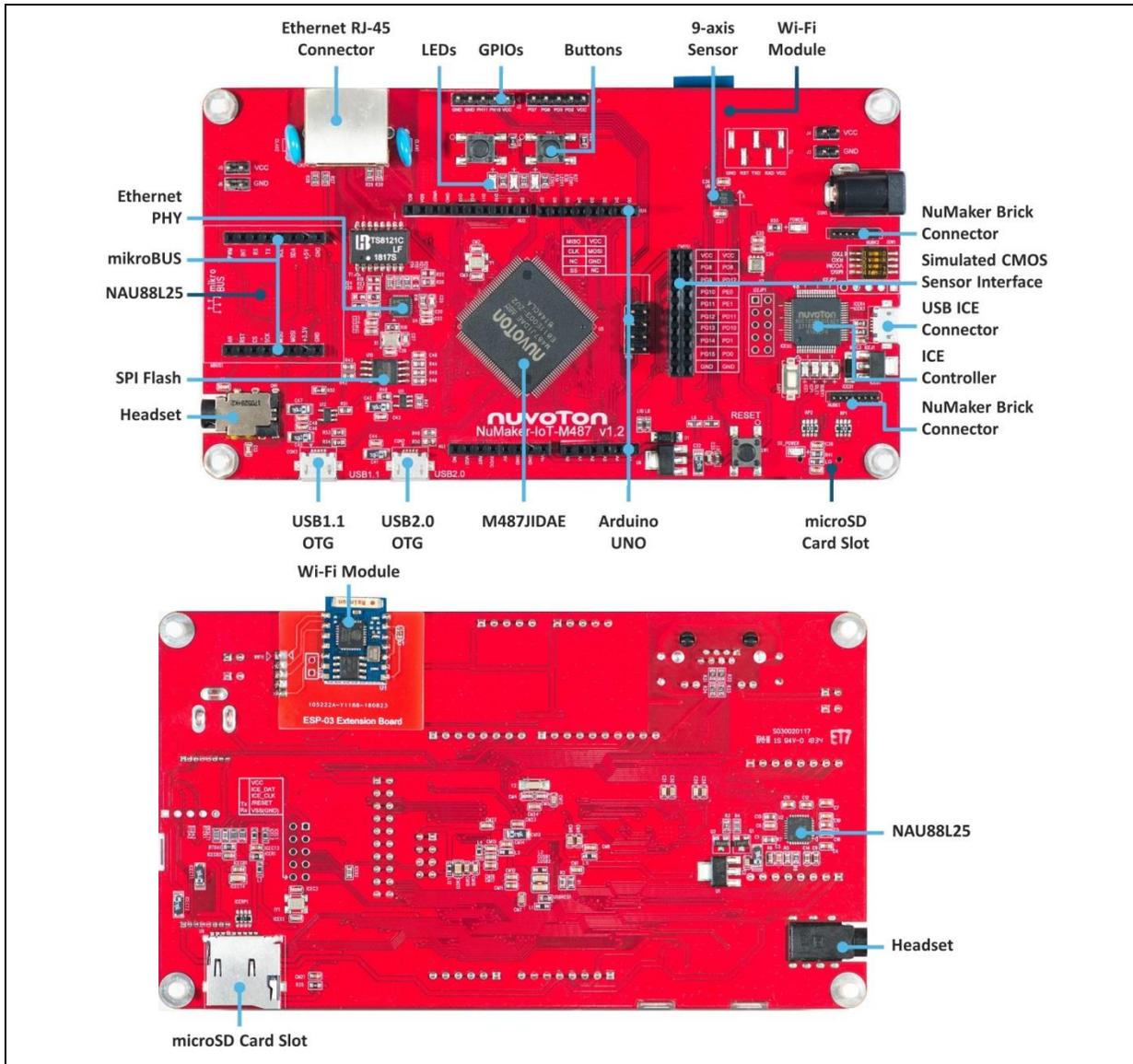


Figure 1-1 NuMaker-IOT-M487 board - Front/Rear side

2 REQUIREMENTS

2.1 Software Requirements

1. Window 7/8/10 operating system
2. Arm® Keil MDK v5 – IDE
3. Tera Term – a terminal emulator
4. Alibaba AliOS Things Software development kit

2.2 Hardware Requirements

1. NuMaker-IOT-M487 board x 1
2. USB Micro cable x 1
3. Internet-accessible Wi-Fi Router x 1.

3 GET ALIOS THINGS SDK

You can get AliOS Things SDK using Git software or download from Github website.

3.1 Use Git Software

You can type the following commands to clone remote repository into your storage on PC.

```
# git clone https://github.com/wosayttn/AliOS-Things
# cd AliOS-Things
# git checkout numicro
```

3.2 Download from Github Website

Please open AliOS Things repository webpage on Github and follow steps as Figure 3-1. Finally, uncompress the downloaded file.

The URL of AliOS Things SDK repository: <https://github.com/wosayttn/AliOS-Things/tree/numicro>

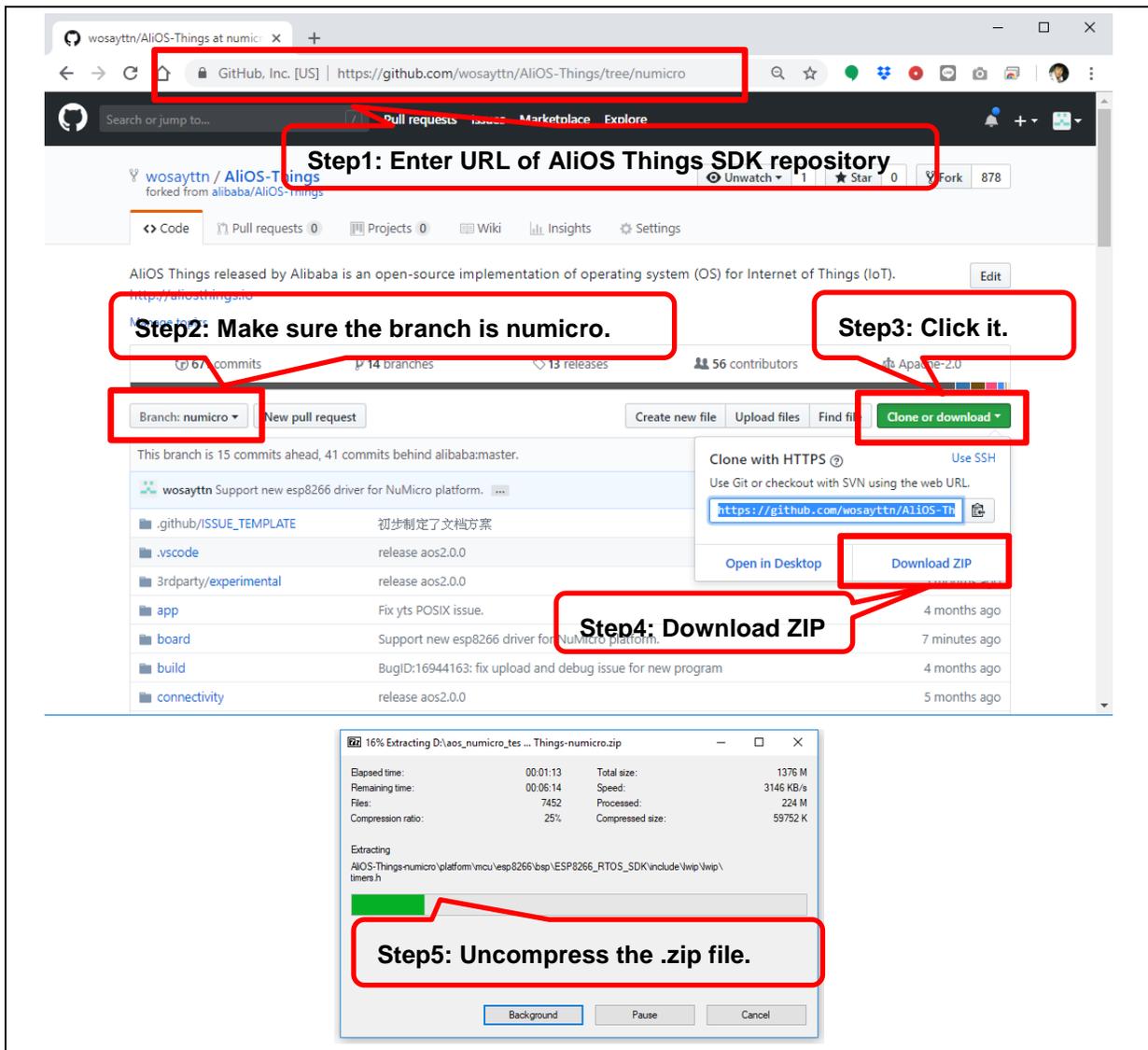


Figure 3-1 Download from Github Website

4 ALIOS THINGS MQTTAPP SAMPLE

4.1 Build mqttapp Project

Open mqttapp@numaker-iot-m487 Keil project in the uncompressed folder and click rebuild button to build mqttapp project. All steps are shown in Figure 4-1.

The file path of Keil project: <Path-to-AliOS-Things folder>\AliOS-Things\projects\Keil\mqttapp@numicro-iot-m487\keil_project

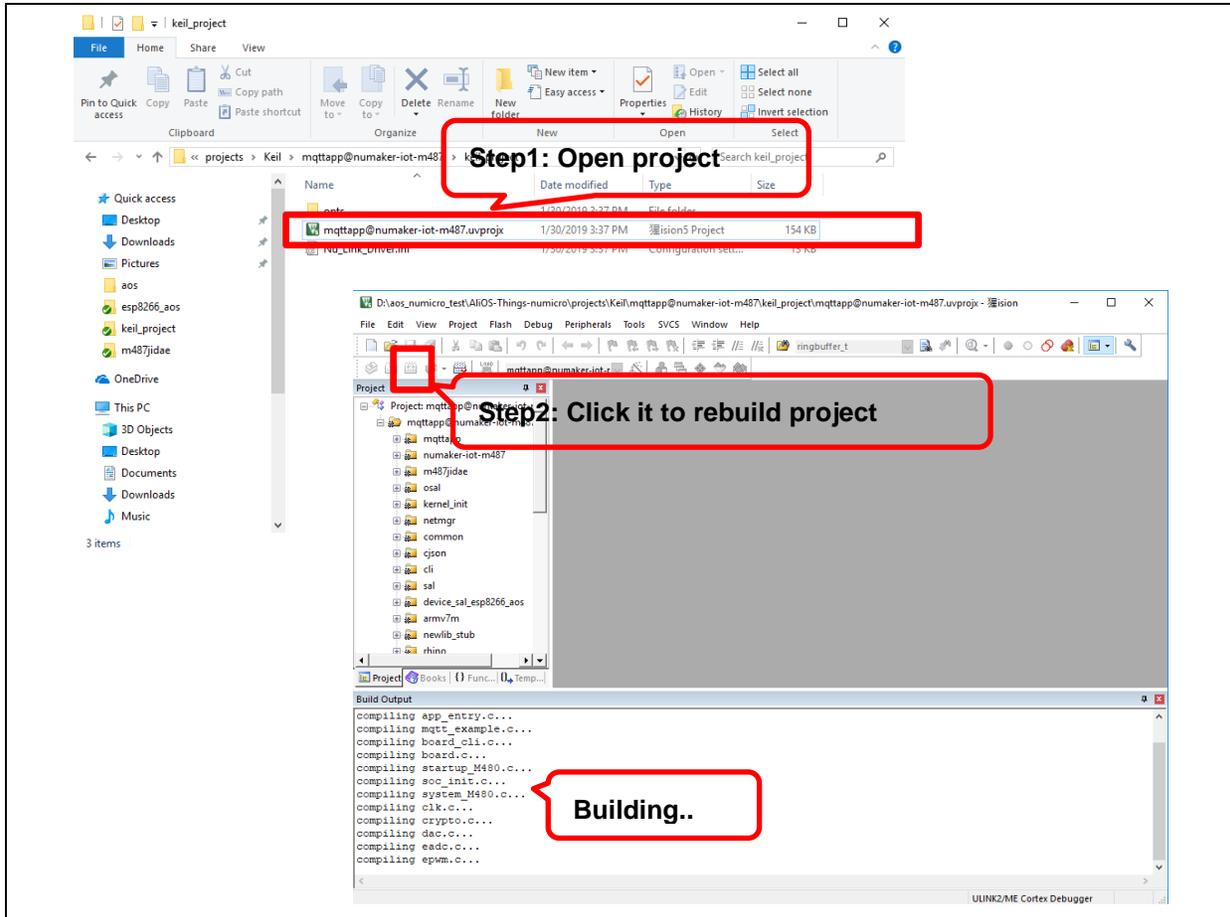


Figure 4-1 Path of Keil Project File and Rebuild Project

After building is done, it will output a binary image as shown in Figure 4-2 and its path as below.

<Path-to-AliOS-Things folder>\AliOS-Things\projects\Keil\mqttapp@numicro-iot-m487\keil_project\Objects\mqttapp@numaker-iot-m487.bin

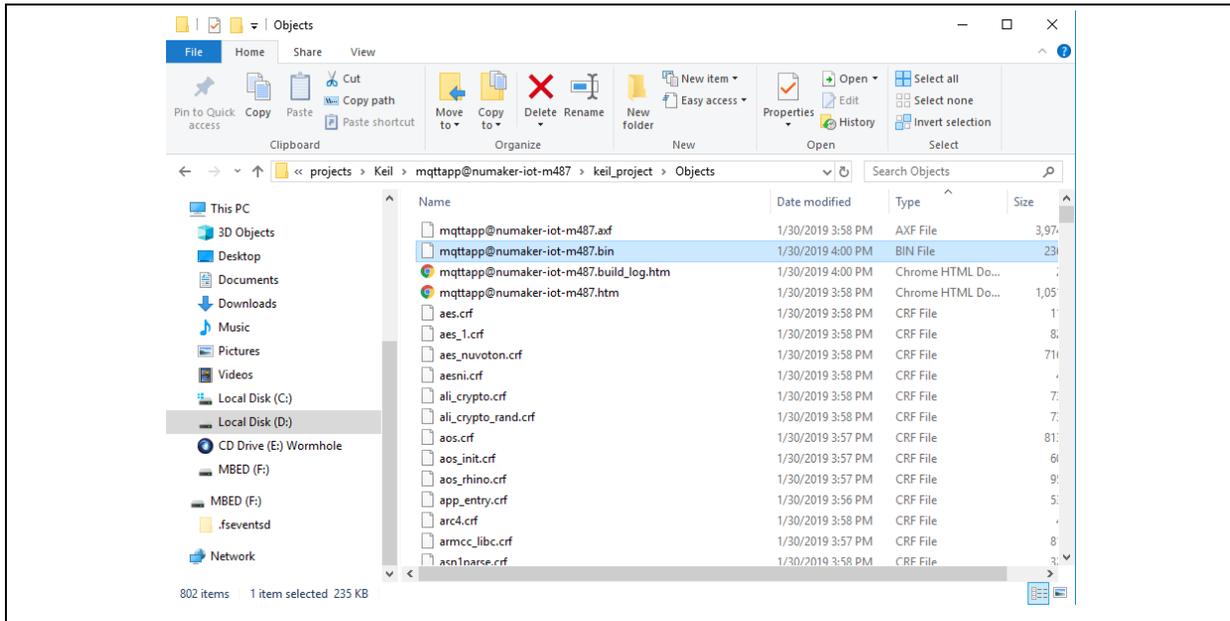


Figure 4-2 File Path of Binary Image

4.2 Burn Firmware

A simple firmware burning method is that you can drag and drop the binary image file to NuMicro MCU virtual disk to burn firmware.

4.2.1 NuMicro MCU Virtual Disk

First, you need to configure LSW1 switch on the NuMaker-IOT-M487 board. Set the four switches to 'ON' position as shown in Figure 4-3. After the configuration is done, connect the NuMaker-IOT-M487 board and your computer using the USB Micro cable as Figure 4-4. After that, window manager will show a 'NuMicro MCU' virtual disk as Figure 4-5. Finally, you will use this virtual disk to burn firmware.

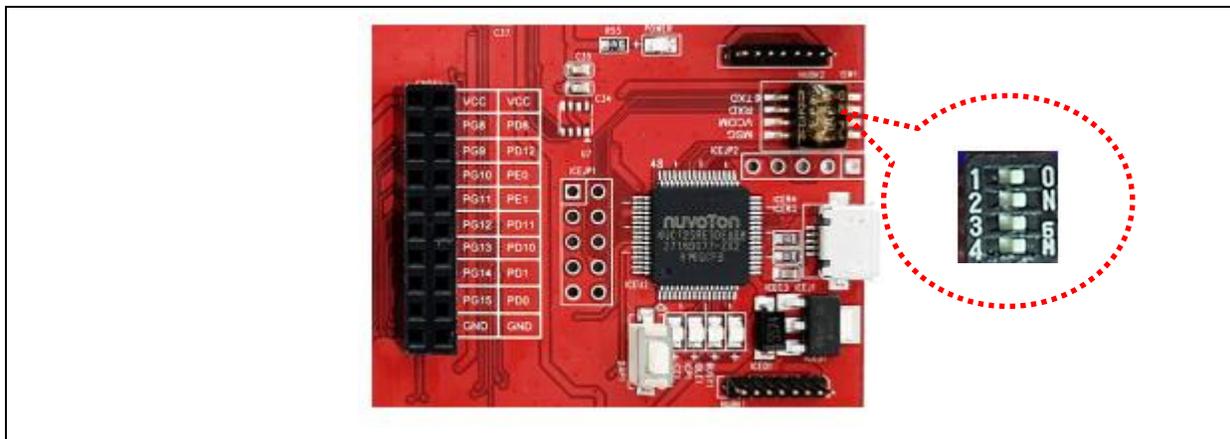


Figure 4-3 ISW1 Configuration on NuMaker-IOT-M487 board

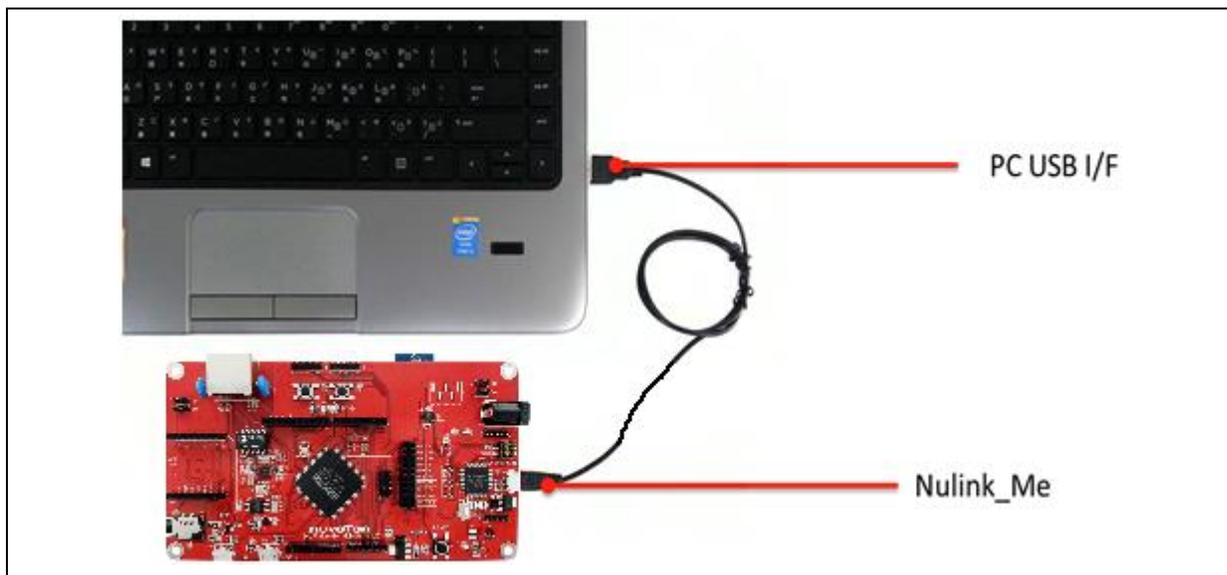


Figure 4-4 Connect NuMaker-IOT-M487 board and PC Using Micro USB Cable

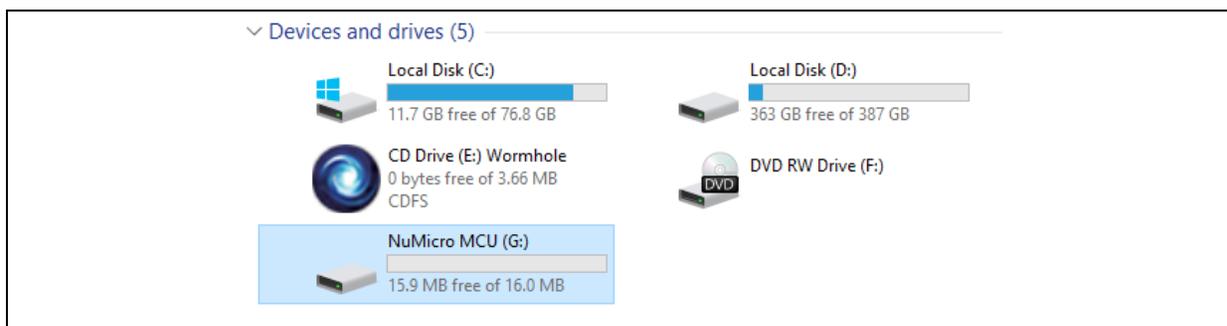


Figure 4-5 NuMicro MCU Virtual Disk

4.2.2 Drag and Drop

You can drag and drop a binary image file into the NuMicro MCU virtual disk to burn firmware as Figure 4-6. The path of mqttapp binary image file is below:

```
<Path-to-AliOS-Things folder>\AliOS-Things\projects\Keil\mqttapp@numicro-iot-
m487\keil_project\Objects\mqttapp@numaker-iot-m487.bin
```

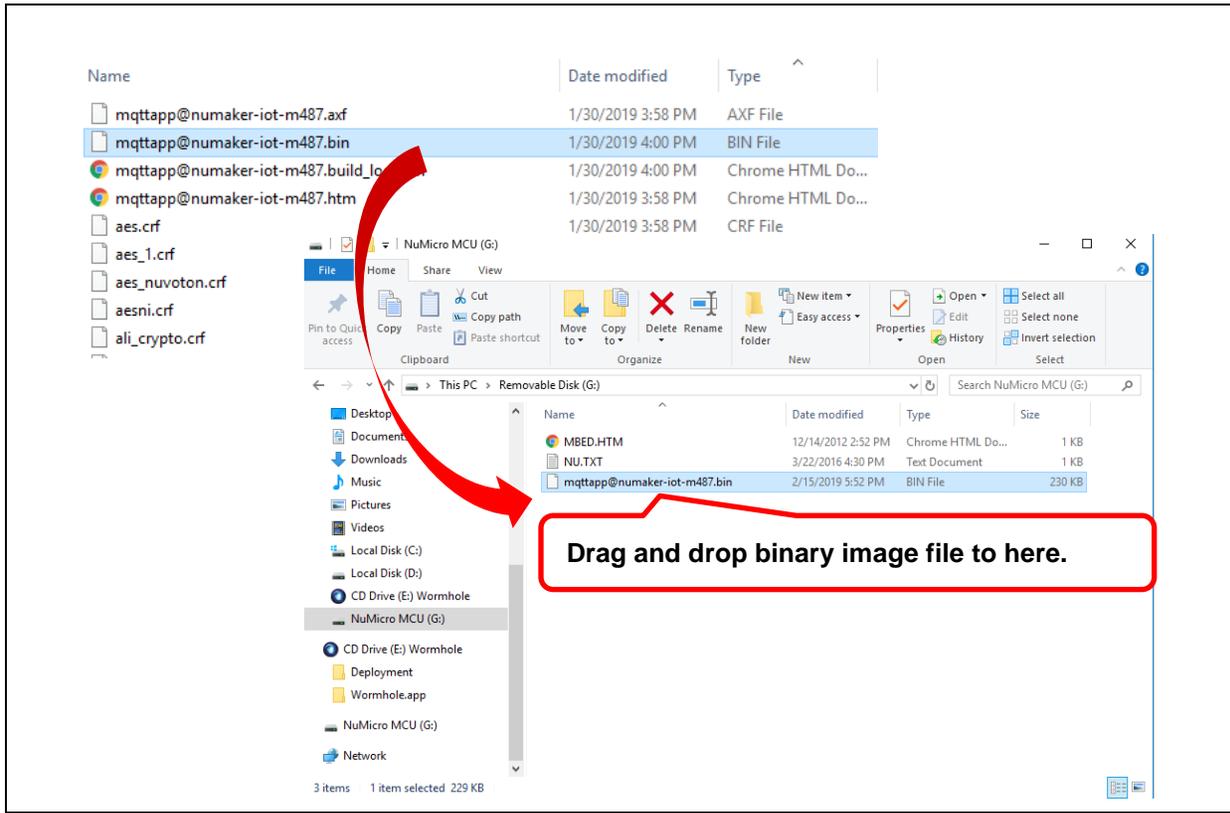


Figure 4-6 Simple Firmware Burning Method

4.3 Test Wi-Fi Local Connectivity

You can use Tera Term terminate emulator to type commands of AliOS Things OS. All parameters of serial communication are shown in Figure 4-7. Here, you can find out the corresponding port number of **Nuvoton Virtual Com Port** in window device manager. For example, the serial port is **COM30**.

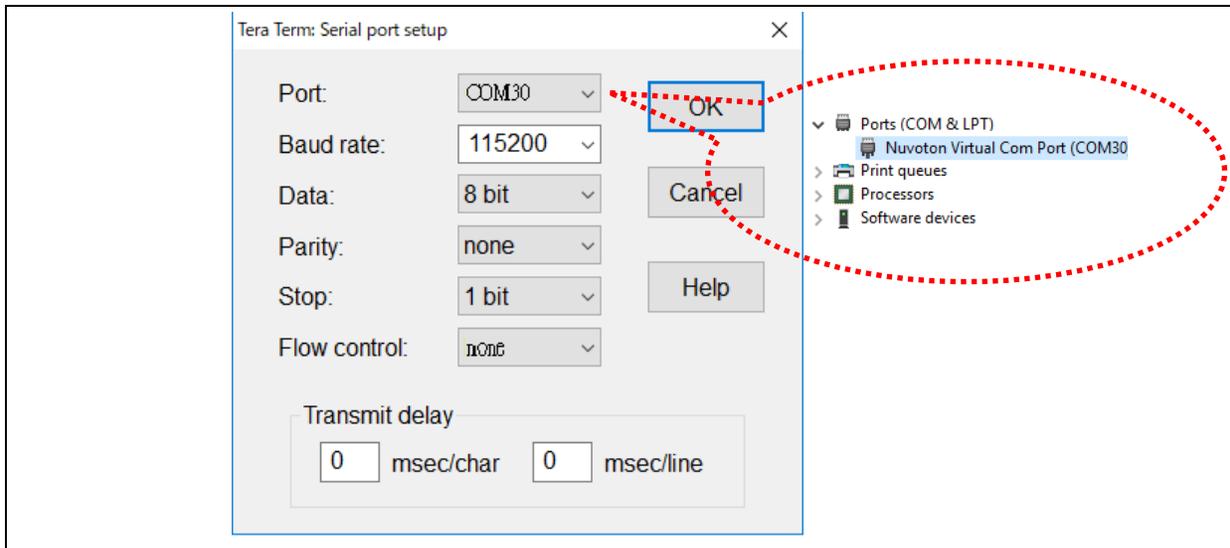


Figure 4-7 Nuvoton Virtual Serial Port Number and Serial Communication Configuration in Tera Term

Open serial communication and press Reset button on board. After system reset, Tera term terminate emulator will print messages on screen as Figure 4-8.

```
[APROM]
Company ID ..... [0x00000da]
Product ID ..... [0x00d48750]
Unique ID 0 ..... [0x00310021]
Unique ID 1 ..... [0x013ad026]
Unique ID 2 ..... [0x00000d7]
Unique Customer ID 0 ..... [0xffffffff]
Unique Customer ID 1 ..... [0xffffffff]
Unique Customer ID 2 ..... [0xffffffff]
Unique Customer ID 3 ..... [0xffffffff]
uid_hash_value=0xfe20a8a5
FMC User config: 0:ffffffff, 1:ffffffff, CBS:3
[hw_start_hal] ARMCC
Heap start address: 0x20008b38
Heap size: 125 KB
wifi init success!!
trace config close!!!
[000069]<V> aos framework init.
[netm_hardreset 369]
[netm_hardreset 382]
[000619]<I> netm status change to 1
[000622]<I> wifi ready
AT+GMR
AT version:1.6.2.0(Apr 13 2018 11:10:59)
SDK version:2.2.1(6ab97e9)
compile time:Jun 7 2018 19:34:26
Bin version(Wroom 02):1.6.2
[000771]<I> netm status change to 4
[000796]<E> linkstat_cb is NULL
[001595]<I> netm status change to 5
#
```

Figure 4-8 Serial Communication Using Tera Term and Boot-up Messages

First, you must set Wi-Fi SSID and password manually as Figure 4-9. Once it is associated with Wi-Fi router, these Wi-Fi SSID and password will be stored in internal Flash. The network managing command is shown below:

```
netmgr connect ssid password open|wep|wpa|wpa2
ex: ssid: NT_ZY_BUFFALO, password: 12345678

# netmgr connect NT_ZY_BUFFALO 12345678
# [056594]<I> netm status change to 2
[059470]<I> netm status change to 4
[060394]<I> netm status change to 5
[061506]<I> Got ip : 192.168.11.43, gw : 192.168.11.254, mask : 255.255.255.0
[061515]<V> wifi_service_event config.ssid NT_ZY_BUFFALO
```

Figure 4-9 Wi-Fi Local Connectivity and get IP Address

4.4 Test Ali-Cloud Service

Before testing Ali-Cloud MQTT server, you need to get three-parameters obtained from the Ali-Cloud and update three-parameters to mqtt_example.c source code as shown in Figure 4-10. Please note the three-parameters in mqttapp source code are for demo by default. After leased an IP address from DHCP server of Wi-Fi router, mqttapp routing will connect to Ali-Cloud MQTT server automatically as shown in Figure 4-11. Please remember, the three-parameters in source code are for product development and test, do not apply it in your any product. For application and configuration of Ali-Cloud three-parameters, you can refer to AliOS Things official document. You can find it in <https://github.com/alibaba/AliOS-Things/wiki/stm32-networking.zh>.

The figure consists of two screenshots from the Ali-Cloud IoT console and a code block. The top screenshot shows the 'Product Information' page for 'm487jdae_basic'. The 'ProductKey' is 'a1L7sheel' and the 'ProductSecret' is 'dEfhsQipc8Jez7gm'. The bottom screenshot shows the 'Device Information' page for 'nsUqakB3YTZWbYpqqKP'. The 'DeviceSecret' is 'n2W2TYxBoJE7qHoar142KWzCZQE7lVFO' and the 'DeviceName' is 'nsUqakB3YT...'. The code block below shows the configuration for a three-parameter device, with the second parameter set to match the device details in the screenshot.

```

/*
 * Copyright (C) 2015-2018 Alibaba Group Holding Limited
 */
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <stdarg.h>

#include "iot_import.h"
#include "iot_export.h"
#include "app_entry.h"

#if 0
#define PRODUCT_KEY           "a1M2xOdcBnO"
#define PRODUCT_SECRET       "h4I4dneEFp7EImTv"
#define DEVICE_NAME          "test_01"
#define DEVICE_SECRET        "t9GmMf2jb3LgWfXBaZD2r3aJrfVWBv56"
#else
#define PRODUCT_KEY           "a1L17sjheel"
#define PRODUCT_SECRET       "dEfhsQipc8Jez7gm"
#define DEVICE_NAME          "nsUqakB3YTZWbYpqqKP"
#define DEVICE_SECRET        "n2W2TYxBoJE7qHoar142KWzCZQE7lVFO"
#endif
    
```

Figure 4-10 Ali-Cloud Three-parameters Configuration

```
[061506]<I> Got ip : 192.168.11.43, gw : 192.168.11.254, mask : 255.255.255.0
[061515]<V> wifi_service_event config.ssid NI_ZY_BUFFALO
[inf] iotx_device_info_init(27): device info created successfully!
[dbg] iotx_device_info_set(37): start to set device info!
[dbg] iotx_device_info_set(51): device info set successfully!
[inf] guider_print_dev_guider_info(268)
.....
[inf] guider_print_dev_guider_info(269)      ProductKey : a1Mzx0dcBn0
[inf] guider_print_dev_guider_info(270)      DeviceName : test_01
[inf] guider_print_dev_guider_info(271)      DeviceID : a1Mzx0dcBn0.test_01
[inf] guider_print_dev_guider_info(273)
.....
[inf] guider_print_dev_guider_info(274)      PartnerID Buf : ,partner_id=example.demo.partner-id
[inf] guider_print_dev_guider_info(275)      ModuleID Buf : ,module_id=example.demo.module-id
[inf] guider_print_dev_guider_info(276)      Guider URL :
[inf] guider_print_dev_guider_info(278)      Guider SecMode : 2 (TLS + Direct)
[inf] guider_print_dev_guider_info(280)      Guider Timestamp : 2524608000000
[inf] guider_print_dev_guider_info(281)
.....
[inf] guider_print_dev_guider_info(287)
.....
[inf] guider_print_conn_info(245): -----
[inf] guider_print_conn_info(246): [ 0 6 1 6H507s]t<c V:> aw1MfZix_OsdecrBvni0c_ei_oetv-eanst- mcqotntf.icgn.-ssshiadn_gNhTa_iZ_Va_1B1UyFuFnAclso.
c
om
[inf] guider_print_conn_info(247):      Port : 1883
[inf] guider_print_conn_info(250):      ClientID : a1Mzx0dcBn0.test_01|securemode=2,timestamp=2524608000000,signmethod-hmacsha1,gw=0,ext=0,partner_id=example.demo.partner-id,module_id=ex
ample.demo.module-id]
[inf] guider_print_conn_info(252):      TLS PubKey : 00039848 ('-----BEGIN CERTI ....')
[nr] guider_print_conn_info(255): -----
[dbg] IOT MQTT Construct(3098): sizeof(iotx_mc_client_t) = 180!
[nf] iotx_mc_init(2183): MQTT init success!
[61724]<I> Loading the CA root certificate ...
[61730]<I> ok (0 skipped)
[61733]<I> Connecting to /a1Mzx0dcBn0.iot-as-mqtt.cn-shanghai.aliyuncs.com/1883...
[tm query_dns_server: 208.67.222.222
[tm_parse_domain "a1mzx0dcBn0.iot-as-mqtt.cn-shanghai.aliyuncs.com"
[62205]<I> ok
[62206]<I> . Setting up the SSL/TLS structure...
[62212]<I> ok
[62214]<I> Performing the SSL/TLS handshake...
```

Three-parameters

Connected Ali-Cloud MQTT server

Figure 4-11 Connected Ali-Cloud MQTT Server

5 CONCLUSION

From the basic end nodes to the gateways and the clouds, IoT applications require control, networking, encryption and other related technologies. Alibaba and Nuvoton provide the NuMaker-IOT-M487 development kit to help your product to market quickly.

6 REVISION HISTORY

Date	Revision	Description
2019.02.22	1.00	1. Initially issued.

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