

# OPTIGA™ Trust M2 ID2

Product Version: V2

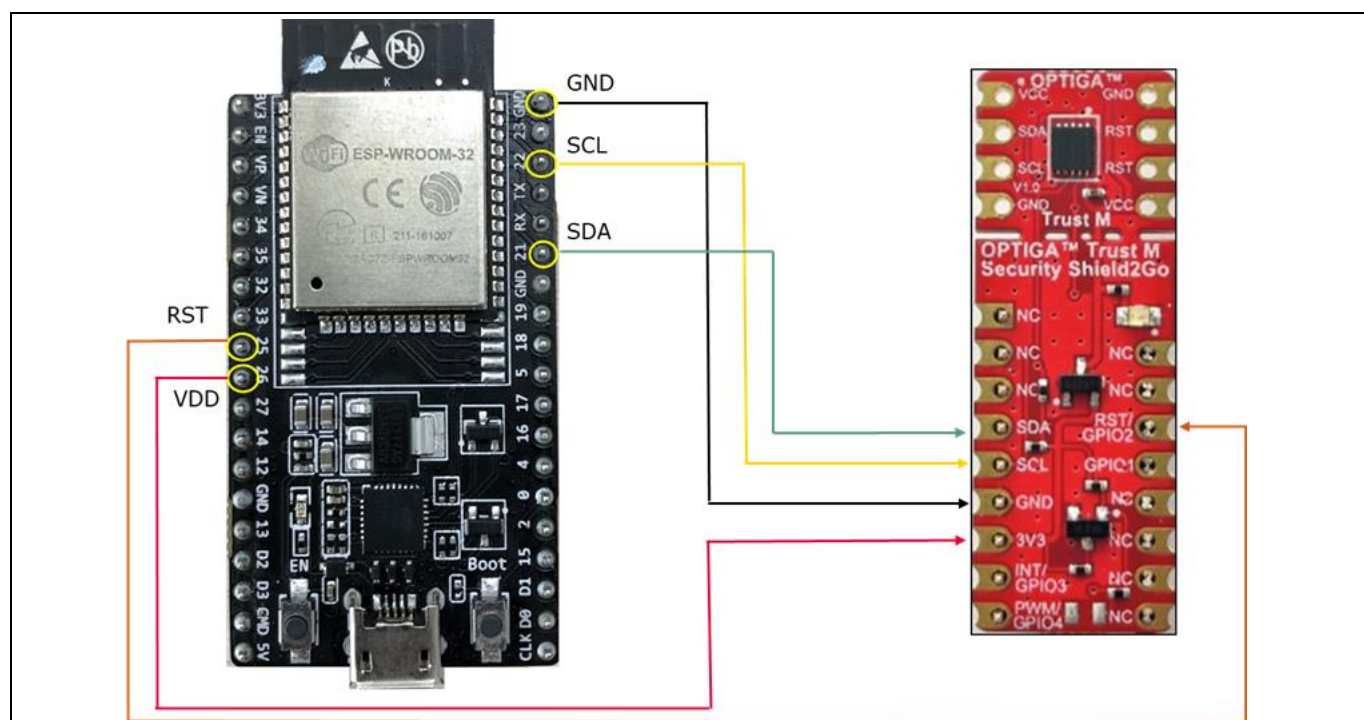
## About this document

### Scope and purpose

The purpose of this document is to guide a beginner to demonstrate [mqttapp](#) using AliOS-Things software package with the OPTIGA™ Trust M2 ID2 ESP32-DevKitC V4. The scope is limited to OPTIGA™ Trust M2 ID2 ESP32-DevKitC V4 and its hardware and software components.

### Intended audience

This document addresses: customers, solution providers, porting guide and system integrators.



## Table of Contents

<b>About this document.....</b>	<b>1</b>
<b>Table of Contents .....</b>	<b>2</b>
<b>1 Introduction .....</b>	<b>3</b>
1.1 References .....	3
1.2 Abbreviations .....	3
<b>2 OPTIGA™ Trust M2 ID2.....</b>	<b>4</b>
2.1 OPTIGA™ Trust M2 ID2 with ESP32-DevKitC V4 .....	4
2.1.1 Evaluation Kit Components.....	4
<b>3 System Setup.....</b>	<b>5</b>
3.1 System Overview .....	5
3.2 Hardware Setup.....	6
3.2.1 ESP32-DevKitC V4.....	6
3.2.2 ESP32 DevKitC Adapter for Shield2Go .....	6
3.2.3 Shield2Go Security OPTIGA™ Trust M2 ID2 .....	7
3.3 Software Setup.....	8
3.3.1 Software Components .....	8
3.3.1.1 ESP32-DevKitC V4.....	8
3.3.2 PC Requirements and Configurations .....	8
3.3.2.1 PC Requirement .....	8
<b>4 AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2 .....</b>	<b>10</b>
4.1 Quick Setup .....	10
4.1.1 Configure and build mqttapp use case for ESP32-DevKitC V4 .....	10
4.1.1.1 Configuration .....	10
4.1.1.2 Build source code.....	14
4.1.2 Steps to download example hex file to ESP32-DevKitC V4.....	15
4.1.3 Steps to execute mqttapp .....	15
<b>5 FAQs .....</b>	<b>18</b>
5.1 How to check connectivity in Ali cloud.....	18
5.2 How to update key in OPTIGA™ .....	18
5.2.1 Update AES key in OPTIGA™ .....	18
5.2.2 Update RSA 1024 key in OPTIGA™ .....	20
5.3 How to change the crypto configuration in AliOS-Things source code.....	22
5.3.1 RSA.....	22
5.3.2 AES.....	22
5.4 How to extract RSA key .....	22
5.5 How to create and update new ID2 device node.....	25
5.6 How to enable power off option to OPTIGA™ chip.....	25
5.7 How to port OPTIGA™ host library to different platform .....	26
5.8 What Infineon patch file contain .....	26
<b>Revision History .....</b>	<b>27</b>

## Introduction

# 1 Introduction

This document describes how to setup the environment to demonstrate mqttapp using AliOS-Things software package with the OPTIGA™ Trust M2 ID2 ESP32-DevKitC V4.

## 1.1 References

**Table 1**      **References**

Definition	Source
[1] ESP32-DevKitC V4_usermanual	<a href="#">espressif</a>
[2] Infineon_I2C_Protocol	<a href="#">Infineon</a>

## 1.2 Abbreviations

**Table 2**      **Abbreviations**

Abbreviation	Definition
API	Application Programming Interface
ESP32	ESP32-DevKitC V4
HW	Hardware
I2C	Inter Integrated Circuit
IoT	Internet of Things
OS	Operating System
PAL	Platform Abstraction Layer
RSA	Rivest-Shamir-Adleman
PC	Personal Computer
RST	Reset
SCL	Serial Clock
SDA	Serial Data
SW	Software
TTL	Transistor Transistor Logic
USB	Universal Serial Bus

## 2 OPTIGA™ Trust M2 ID2

OPTIGA™ Trust M2 ID2 is a security solution with a pre-programmed security controller with wide range of security features.

It supports secure data, key and metadata object update, hibernate and cryptographic toolbox functionalities, secure communication, platform integrity, data store protection and lifecycle management for Connected Device Security.

This document describe the porting guide of OPTIGA™ host library for other platforms supported by AliOS-Things.

### 2.1 OPTIGA™ Trust M2 ID2 with ESP32-DevKitC V4

OPTIGA™ Trust M2 ID2 ESP32-DevKitC V4 is designed to provide all the components required to setup the environment to demonstrate the features of the OPTIGA™ Trust M2 ID2.

#### 2.1.1 Evaluation Kit Components

**Table 3** Evaluation Kit contents

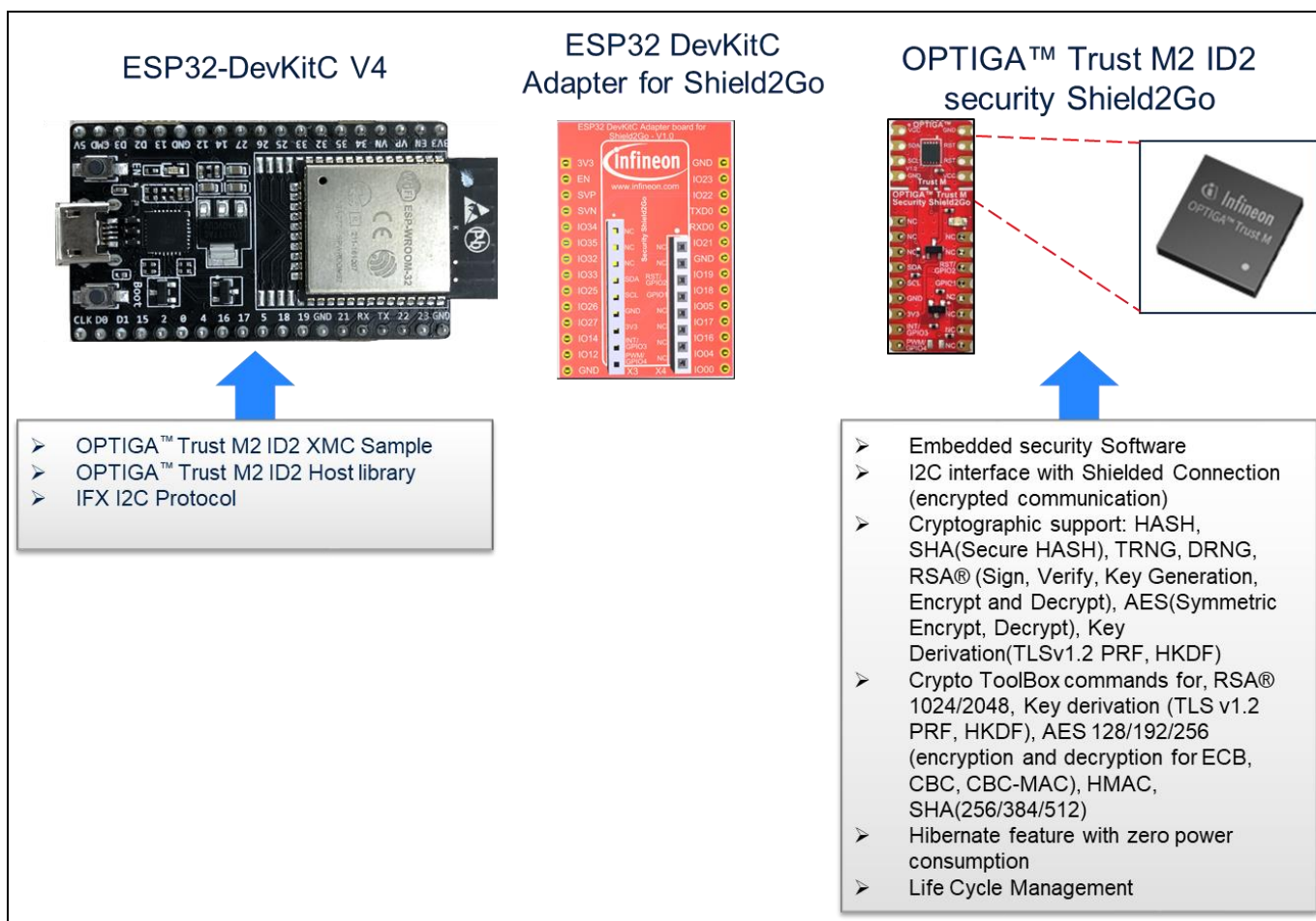
No.	Item	Description
1	ESP32-DevKitC V4	Hardware Evaluation board for ESP32 microcontroller.
2	ESP32 DevKitC Adapter for Shield2Go	ESP32-DevKitC V4 compatible connector to add Shield2Go board on ESP32-DevKitC V4.
3	OPTIGA™ Trust M2 ID2 Security Shield2Go	Shield2Go board contains OPTIGA™ Trust M2 ID2 chip. It is compatible with Infineon's My IoT adapter.
4	Micro USB to USB cable	The cable provides DC supply to ESP32-DevKitC V4 and to flash software.

## System Setup

### 3 System Setup

This section explains the basic components required for system setup.

#### 3.1 System Overview



**Figure 1 System Overview**

This system consists of the following components:

1. ESP32-DevKitC V4
  - The ESP32-DevKitC V4 is an evaluation board with ESP32 Microcontroller from espressif. For more information refer document [\[1\]](#).
  - It is used as a reference platform to simulate the Host.
  - It interacts via I2C.
2. ESP32 DevKitC Adapter for Shield2Go
  - It acts as a gateway to add Shield2Go boards onto ESP32-DevKitC V4.
3. OPTIGA™ Trust M2 ID2 Security Shield2Go
  - Shield2Go board contains OPTIGA™ Trust M2 ID2 chip.

The following interface/connection is done among the above components:

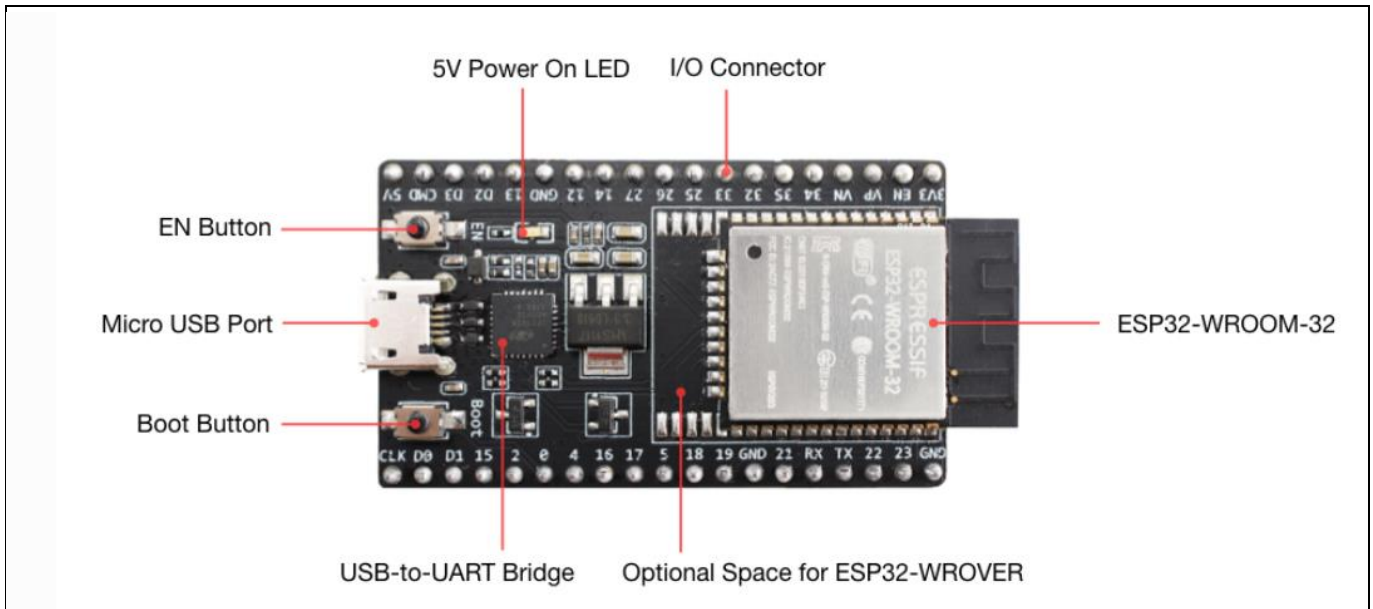
- Micro USB data cable (with Data line) from PC is connected to ESP32-DevKitC V4 to supply power.

## System Setup

### 3.2 Hardware Setup

The hardware required to run OPTIGA™ Trust M2 ID2 setup is described in this section.

#### 3.2.1 ESP32-DevKitC V4



**Figure 2** ESP32-DevKitC V4

Connector supports I2C, reset pin and power supply interfaces among others.

**Table 4** ESP32-DevKitC V4 Pin Information

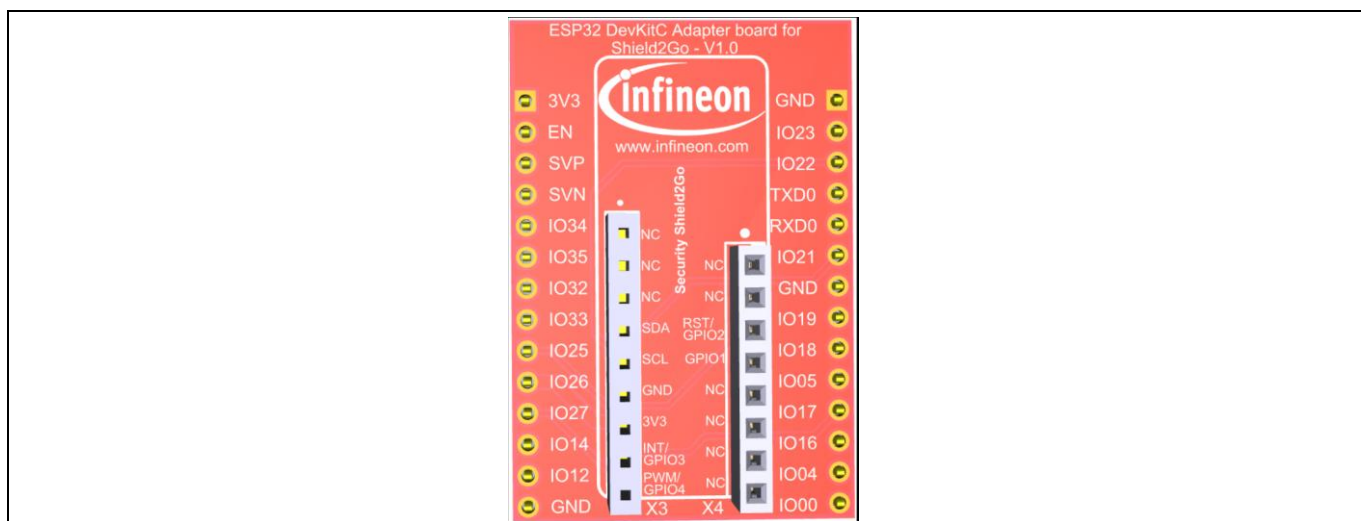
No.	Description	Pin
1	I2C SCL	GPIO 22
2	I2C SDA	GPIO 21
3	RST	GPIO 25
4	VCC	GPIO 26
5	GND	GND

For more information about the ESP32 Specification, Architecture and Design/Schematic, refer document [\[1\]](#)

#### 3.2.2 ESP32 DevKitC Adapter for Shield2Go

The ESP32 DevKitC adapter is an evaluation board that allows users to easily combine different Shield2Go boards to ESP compliant ecosystem, for fast evaluation of IoT systems. With its solderless connectors, it allows users to easily stack Shield2Go boards instead of soldering it. The adapter design is derived from ESP32-DevKitC V4 evaluation board.

## System Setup



**Figure 3** ESP32 DevKitC Adapter for Shield2Go

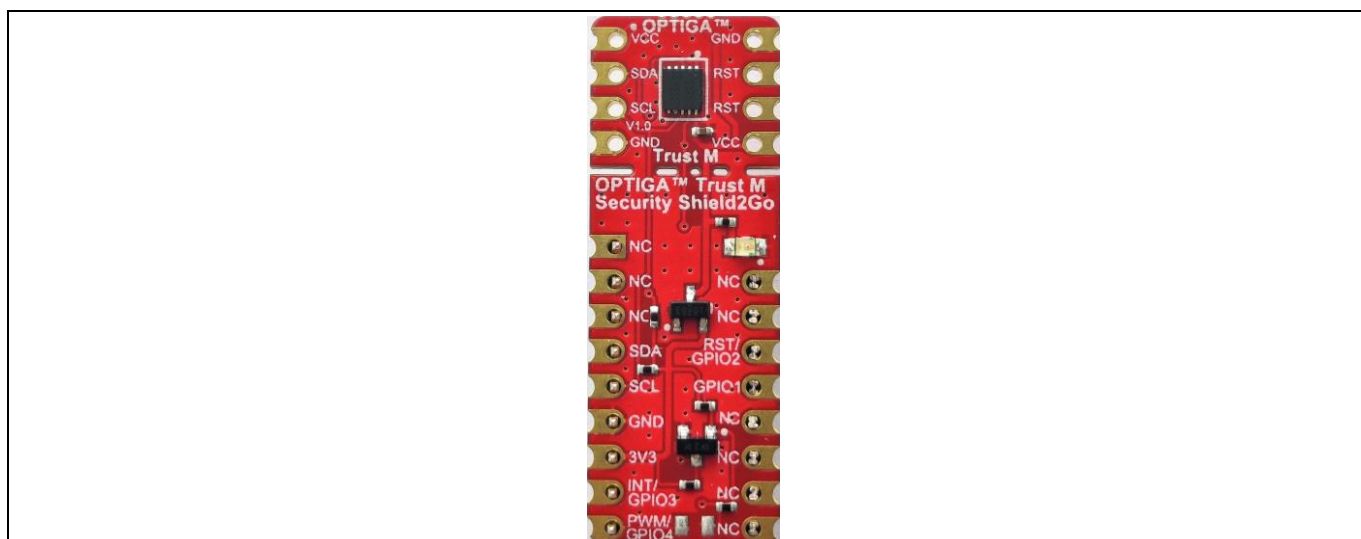
ESP32 DevKitC adapter features are as follows:

- Provide power supply and connectivity for Shield2Go boards.
- Level shifting handling capabilities between CMOS 3.3V and TTL 5V.
  - Solder bridges to selectively deactivate level shifting.
  - Additional pins enable setting the reference voltages for level shifting.
- Separate power control switches for Socket.

More information is available at [Infineon website](https://www.infineon.com).

### 3.2.3 Shield2Go Security OPTIGA™ Trust M2 ID2

Shield2Go boards are equipped with featured Infineon ICs and provide a standardized form factor and pin layout, allowing a 'plug and play' approach for easy prototyping.



**Figure 4** OPTIGA™ Trust M2 ID2 Shield2Go



## System Setup

The OPTIGA™ Trust M2 ID2 Shield2Go is equipped with OPTIGA™ Trust M2 ID2 security chip. It allows users to develop system solutions by combining Shield2Go with My IoT adapter and ESP32.

*Note: Ensure no voltage supplied to any of the pins exceeds the absolute maximum rating of  $V_{cc} + 0.3 V$ .*

### 3.3 Software Setup

This section describes the software used in ESP32 to run the AliOS-Things OPTIGA™ Trust M2 ID2 setup.

#### 3.3.1 Software Components

All the software components required on AliOS-Things for ESP32 are explained in the following sections.

##### 3.3.1.1 ESP32-DevKitC V4

1. OPTIGA™ Trust M2 ID2 Host Library consists of the following:
  - Service Layer  
The layers (Util and Crypt) provide APIs to interact with OPTIGA™ for various use-case functionalities.
  - Access Layer  
This layer manages the access to the command interface of OPTIGA™ security chip. It also provides the communication interface to the OPTIGA™.
  - Platform Abstraction Layer  
This layer provides platform agnostic interfaces for the underlying HW and SW platform functionalities used by OPTIGA™ libraries.
  - Platform Layer  
This layer provides the platform specific components and libraries for the supported platforms.
2. I2C Protocol  
This is an implementation as per document [\[2\]](#).
3. ESP32 I2C Driver  
These are low level I2C device driver for I2C communication from ESP32 to OPTIGA™ Trust M2 ID2 Security chip.

#### 3.3.2 PC Requirements and Configurations

##### 3.3.2.1 PC Requirement

A 32-bit or 64-bit PC with Windows 7/10 Operating System with the below requirements need to be used for setting up ESP32 to run the AliOS-Things using OPTIGA™ Trust M2 ID2 setup:

1. One USB port.
2. Python 2.7.14 version to install AliOS-Thing dependency packages  
Link to download Python 2.7.14: [Download link](#)
3. Visual Studio Code for development environment.  
Link to download Visual Studio Code: [Download link](#)
4. Git for downloading source code.  
Link to download git: [Download link](#)
5. FTD driver to access ESP32 via COM port.  
Link to download FTD driver: [Download link](#)



## **System Setup**

6. ASN1 editor require to extract OPTIGA™ supported RSA fields from key provided by Ali key distribution center user is free to use any editor which supports ASN format.

Link to download ASN1 editor: [Download link](#)

*Note: Add C:\Python27 and C:\Python27\Scripts path to environment variable in the beginning of the environment variable list.*

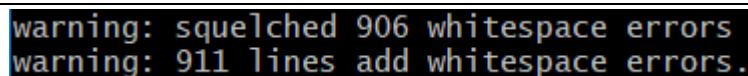
## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

### 4 AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

#### 4.1 Quick Setup

1. Setup Visual Studio Code as describe from the [link](#)
2. Follow the steps till (安装 AliOS Studio 插件) as per the git repo version from October 11, 2019.
3. Create a folder in < workspace > (here "workspace" is the folder where AliOS-Things repository will be cloned)
4. Open command prompt and go to the directory < workspace >
5. Download [aos-2.1-esp32-with-optiga-se.patch](#) file from the [link](#) (Refer [section](#) for the patch contain).
6. Execute below commands to download AliOS-Things source package
  - o git clone <https://github.com/alibaba/AliOS-Things.git>
  - o cd AliOS-Things
  - o git checkout rel\_2.1.0
  - o git pull origin rel\_2.1.0
  - o git apply <patch file path> /aos-2.1-esp32-with-optiga-se.patch

*Note: Ignore below warnings while applying the patch*



```
warning: squelched 906 whitespace errors
warning: 911 lines add whitespace errors.
```

**Figure 5** Warning while applying patch

7. Add project to Visual studio code (e.g. Go to File->edit folder to workspace->select top level directory of AliOS-Things repository).
8. Open new Terminal in visual studio code (go to Terminal ->New Terminal)
9. To upgrade aos-cube, follow the below steps in Visual Studio Code Terminal
  - o pip install --upgrade setuptools
  - o pip install --upgrade wheel
  - o pip install --upgrade aos-cube

#### 4.1.1 Configure and build mqttapp use case for ESP32-DevKitC V4

This section describes how to configure and build mqttapp example in AliOS-Things source code for ESP32.

*Note: To use customize Device name and secret please refer this [section](#).*

##### 4.1.1.1 Configuration

1. Execute below command to configure the mqttapp example
  - o aos make mqttapp@esp32devkitc -c config

*Note: while execution above step if below error occurs*

## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

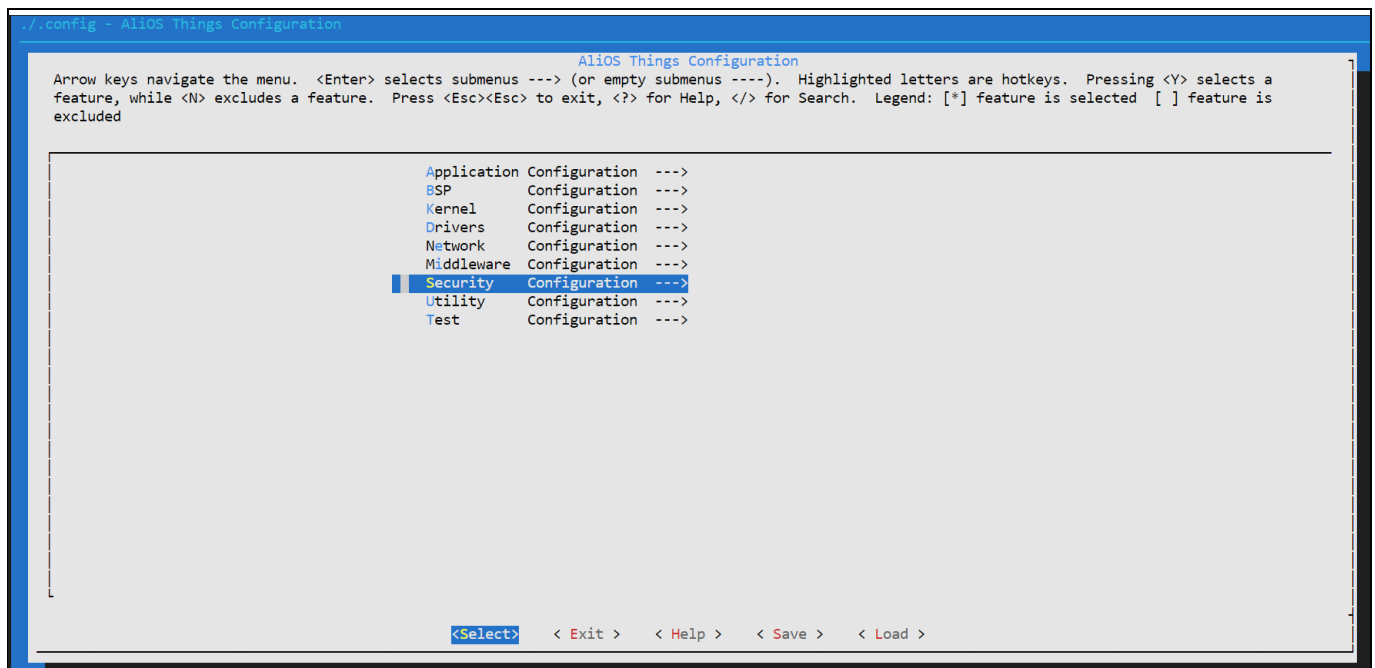
```
Can't reach url: https://gitee.com/alios-things/kconfig-frontends-win32.git
Please check your network and download it manually:

$ git clone https://gitee.com/alios-things/kconfig-frontends-win32.git ./build/kconfig/win32/
make: *** [build/build_rules/aos_kconfig.mk:94: .\build\kconfig\win32\kconfig-conf.bat] Error 1
```

**Figure 6** Error while configuring the setup

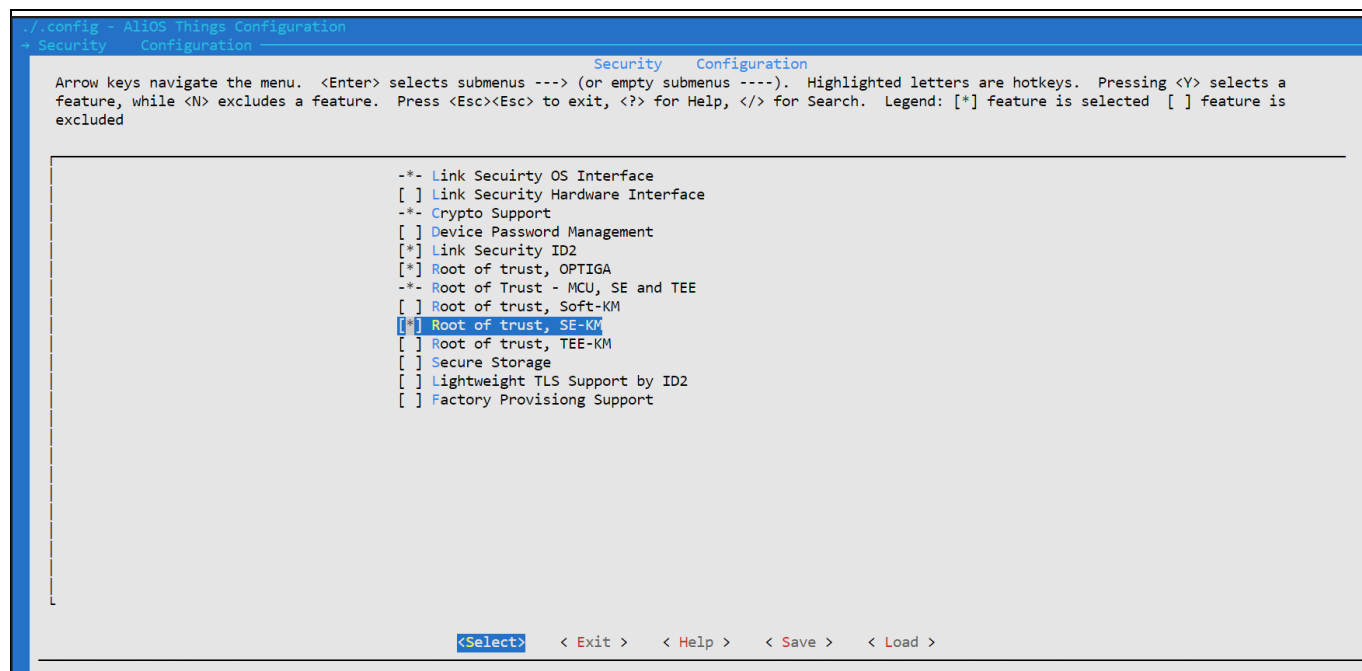
- Execute below command in the terminal
  - git clone <https://gitee.com/alios-things/kconfig-frontends-win32.git> ./build/kconfig/Win32/
  - Repeat from step 1
2. Open < workspace > \AliOS-Things\build\build\_rules\toolchain\ aos\_toolchain\_xtensa.mk file and check the variable assigned with the below specified value.
 

```
COMPILER_SPECIFIC_OPTIMIZED_CFLAGS      := -O0
```
  3. Execute below command to enable OPTIGA™ host library and iTLS
    - aos make menuconfig
  4. Below options need to be selected for ID2
    - Security -> Link Security ID2
    - Security -> Root of trust, SE-KM
    - Security -> Root of trust, OPTIGA



**Figure 7** Menuconfig option to Security section

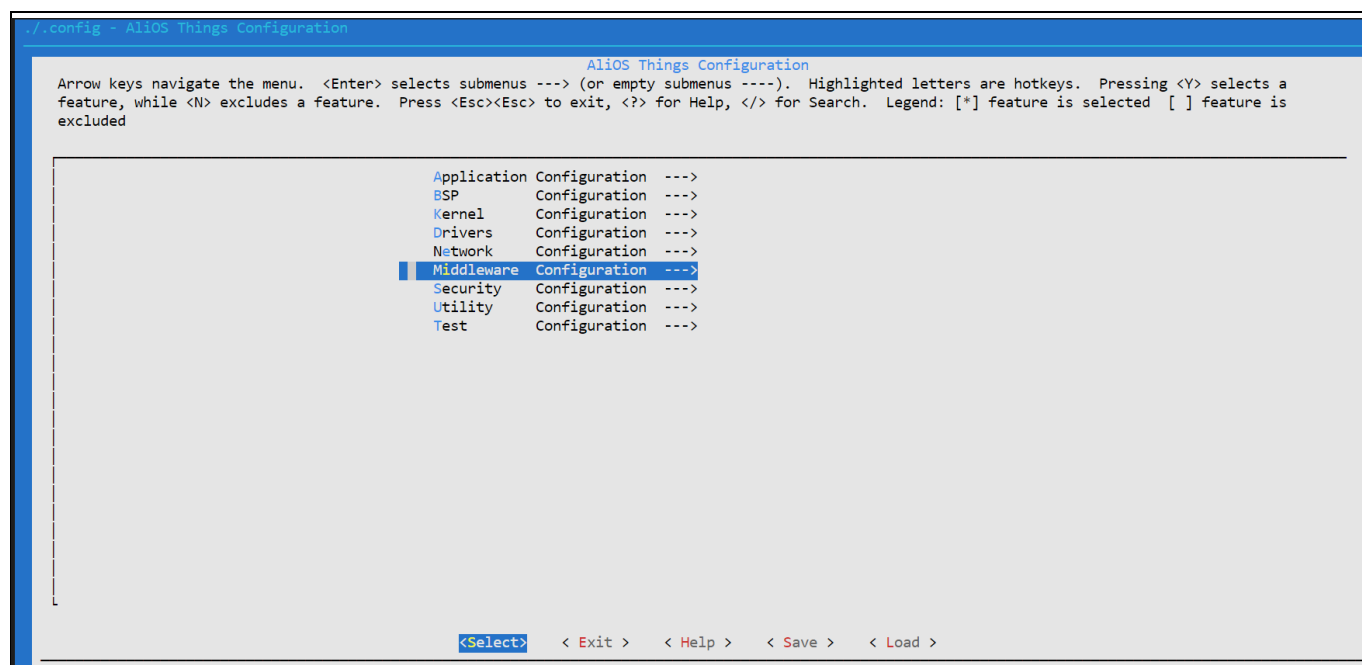
## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2



**Figure 8** Menuconfig option to select ID2, SE-KM, OPTIGA

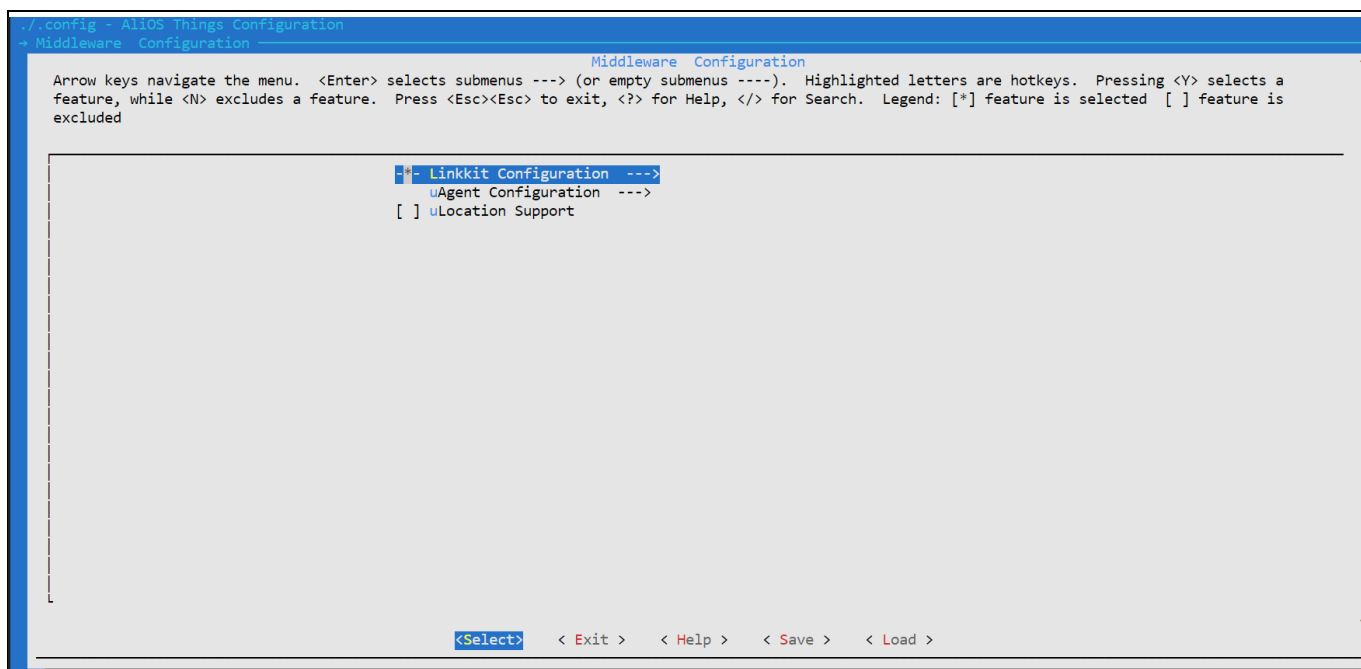
### 5. Change below options to change TLS to iTLS

- Deselect Middleware -> Linkkit Configuration -> Linkkit HAL Config -> support TLS
- Select Middleware -> Linkkit Configuration -> Linkkit HAL Config -> support ITLS

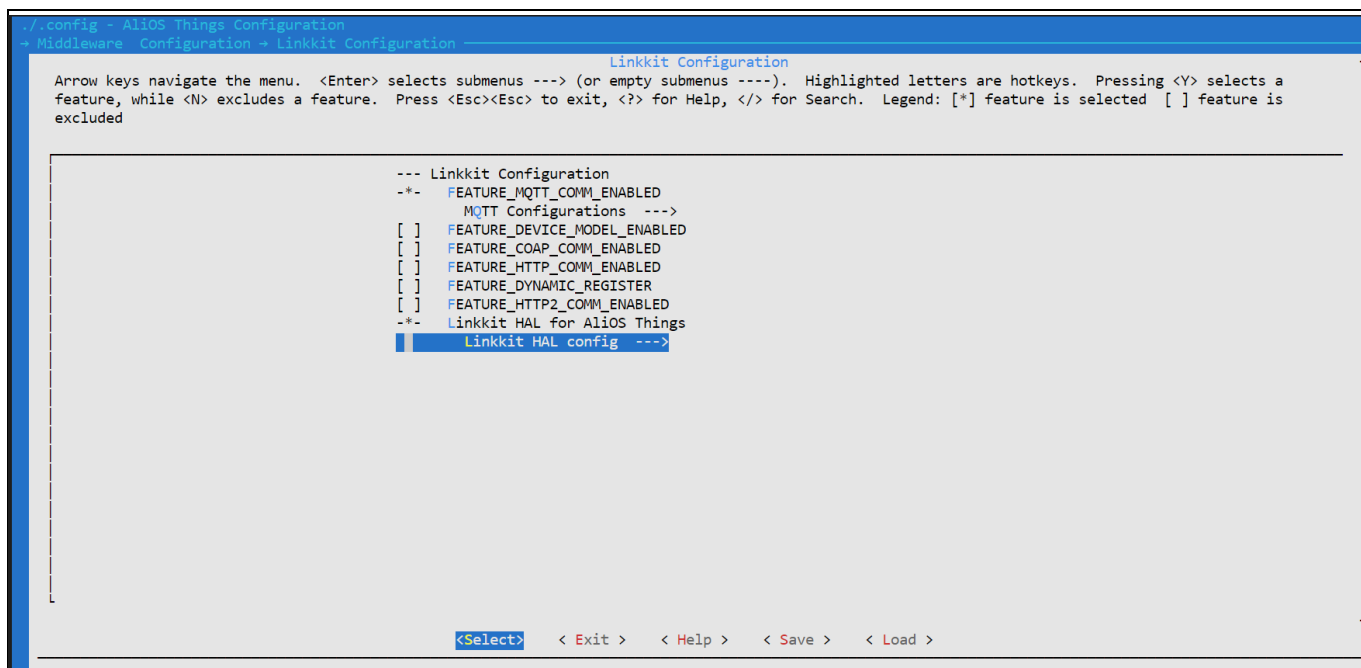


**Figure 9** Menuconfig option to Middleware

## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

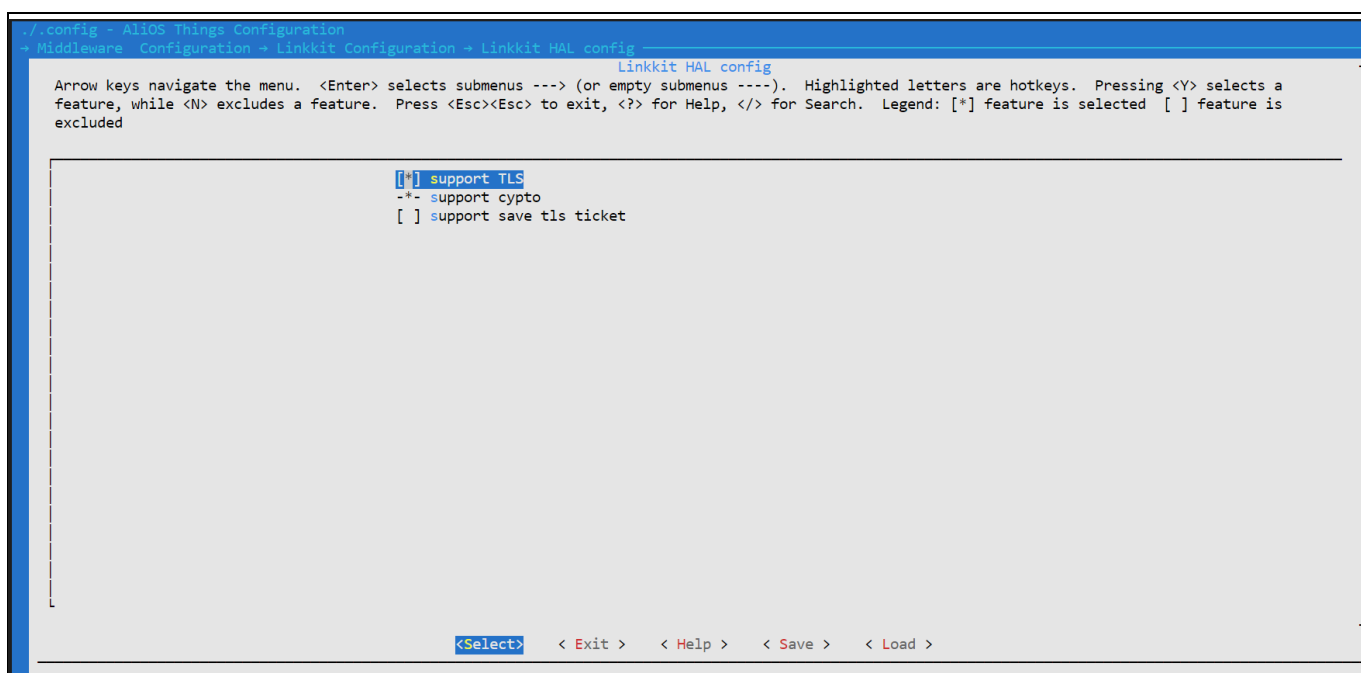


**Figure 10** Menuconfig option to Linkkit Configuration

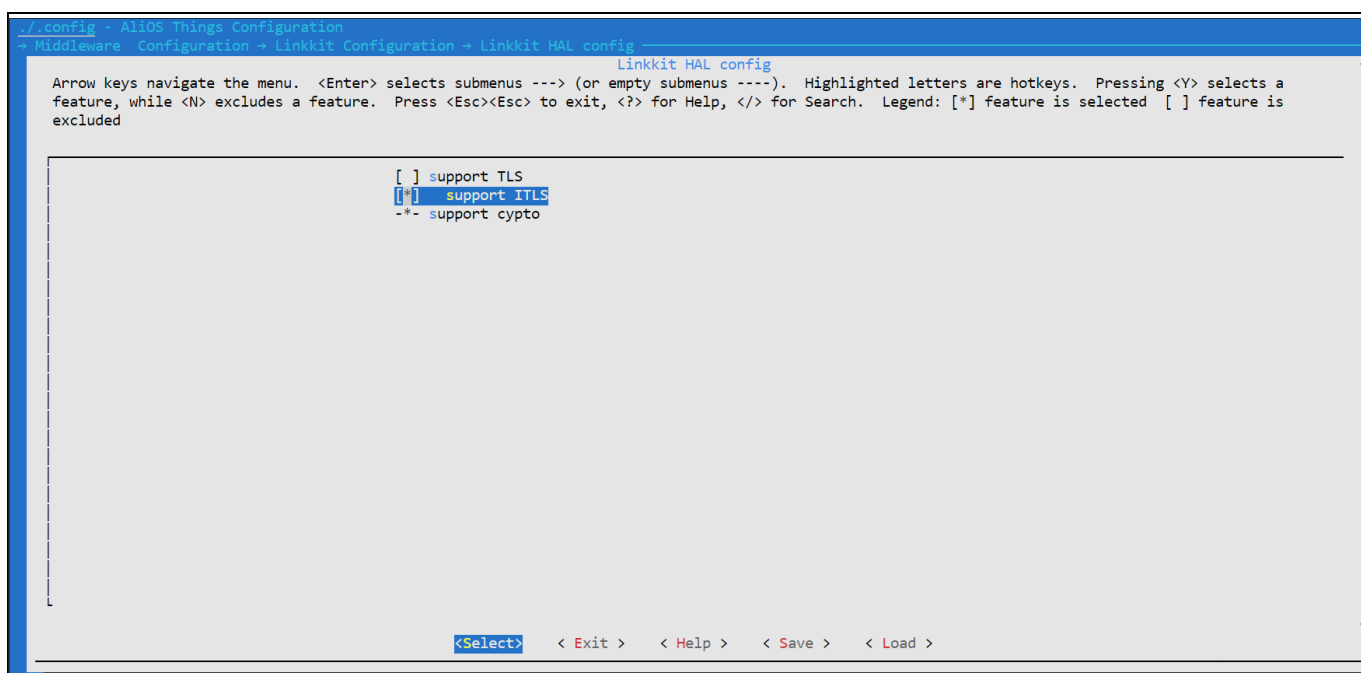


**Figure 11** Menuconfig option to Linkkit HAL config

## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2



**Figure 12** Menuconfig option to deselect support TLS



**Figure 13** Menuconfig option to select support ITLS

6. Save and exit from menuconfig

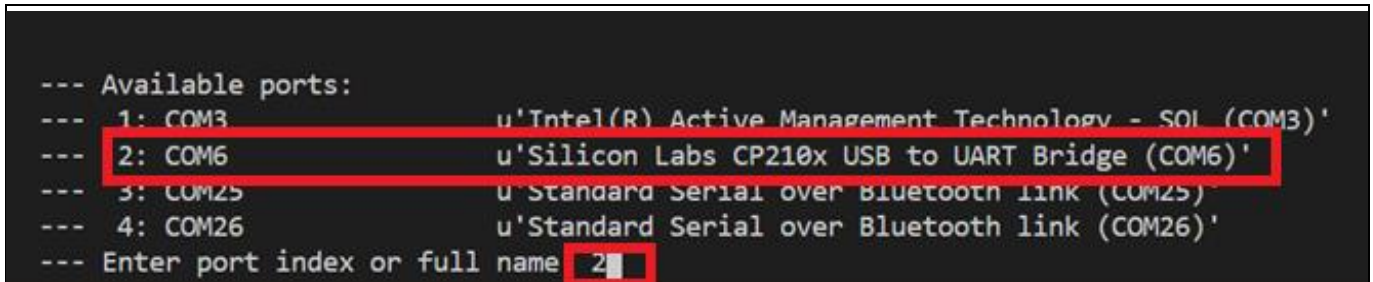
### 4.1.1.2 Build source code

- To build source code execute below command
  - o `aos make`

## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

### 4.1.2 Steps to download example hex file to ESP32-DevKitC V4

1. Execute below command to flash the generated HEX file (Check the COM port number from device manager which is connected with your ESP32-DevKitC V4)
  - aos upload mqttapp@esp32devkitc



```
--- Available ports:
--- 1: COM3          u'Intel(R) Active Management Technology - SOL (COM3)'
--- 2: COM6          u'Silicon Labs CP210x USB to UART Bridge (COM6)'
--- 3: COM25         u'Standard Serial over Bluetooth link (COM25)'
--- 4: COM26         u'Standard Serial over Bluetooth link (COM26)'
--- Enter port index or full name 2
```

Figure 14 Selecting COM port

### 4.1.3 Steps to execute mqttapp

1. Execute below command to run mqttapp (Check the COM port number from device manager which is connected with your ESP32-DevKitC V4)
  - aos monitor COMn 115200('n' is the port number assigned to ESP32-DevKitC V4)
2. Press reset button
3. To configure Wi-Fi execute below command (after restart press enter in serial port console)
  - netmgr connect wifi\_name wifi\_password
4. Below is the example log of successful cloud connection



## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

```

a1FCMDh4ypx.IFXDeviceMqttTest|securemode=8,timestamp=2524608000000,signmethod=
hmacsha256,gw=0,ext=0,partner_id=example.demo.partner-id,module_id=example.dem
o.module-id,authtype=id2,a=aos-r-2.1.0|
[002632]<I> -----
[002637]<I>      MQTT init success!
[002640]<I>      Connecting to /a1FCMDh4ypx.itls.cn-shanghai.aliyuncs.com/1883...
[004936]<I>      ok
[004937]<I>      . Setting up the SSL/TLS structure...
[004937]<I>      ok
ID2 Client Version: 0x00010104
ID2 Client Build Time: Aug 20 2019 12:12:52
=====
ID2_DEBUG                : 0
ID2_OTP_LOCAL_TEST       : 0
ID2_LOCAL_TEST           : 0
ID2_SET_ID_KEY_SUPPORTED : 0
ID2_KM_API_EMU           : 0
ID2_ITLS_SUPPORTED       : 1
ID2_OTP_SUPPORTED        : 0
ID2_USE_ALI_CRYPTO       : 1
ID2_CRYPTO_TYPE_CONFIG   : ID2_CRYPTO_TYPE_AES
=====
[005045]<I>      Performing the SSL/TLS handshake...
ID2=> id2====> encrypt len=48 !!!
ID2=> id2====> encrypt len=48 !!!
mbedtls_parse_auth_code_ext 413: . Verify iTLS Server authCode OK!
ID2=> id2====> decrypt len=64 !!!
ID2=> id2====> irot_hal_cleanup entry!!!
ID2=> id2====> irot_hal_cleanup exit!!!
[039970]<I> ===== iTLS handshake used time(usec):
34924719
[039971]<I>      ok
[039978]<I>      iTLS send data(307 bytes) used time(usec): 5455
[040521]<I> ===== iTLS receive data(1 bytes) used
time(usec): 541832
[040521]<I> ===== iTLS receive data(1 bytes) used
time(usec): 29
[040526]<I> ===== iTLS receive data(2 bytes) used
time(usec): 29
[040534]<I>      mqtt connect success!
[040543]<I>      iTLS send data(201 bytes) used time(usec): 4737
[040545]<E>      the network interface info set failed or not set, written len is 0
[040555]<I>      iTLS send data(479 bytes) used time(usec): 4470
[040559]<I>      iTLS send data(111 bytes) used time(usec): 2538
[040563]<I>      iTLS send data(64 bytes) used time(usec): 2222
mqtt_client|262 ::
publish message:
topic: /a1FCMDh4ypx/IFXDeviceMqttTest/update
payload: update: hello! start!
rc = 4
[040581]<I>      iTLS send data(42 bytes) used time(usec): 2359
[040583]<I>      mqtt subscribe packet sent,topic =
/a1FCMDh4ypx/IFXDeviceMqttTest/data!
[042795]<I>      iTLS send data(60 bytes) used time(usec): 3603
mqtt_client|287 ::
publish message:
topic: /a1FCMDh4ypx/IFXDeviceMqttTest/data
payload: data: hello! start!
rc = 6
[042804]<I> ===== iTLS receive data(1 bytes) used
time(usec): 2958
[042809]<I> ===== iTLS receive data(1 bytes) used
time(usec): 22
[042817]<I> ===== iTLS receive data(2 bytes) used
time(usec): 18
event_handle|084 :: publish success, packet-id=1
mqtt_client|313 :: -----cnt = 1 -----
[043006]<I> iTLS send data(85 bytes) used time(usec): 3323
mqtt_client|318 :: packet-id=7, publish topic      msg=
{"attr_name":"temperature","attr_value":"1"}
mqtt_client|328 :: -----cnt 1 = 1 -----
mqtt_client|313 :: -----cnt = 2 -----
[045215]<I> iTLS send data(85 bytes) used time(usec): 3165

```

Figure 15 Successful client server authentication log of mqttapp

## AliOS-Things environment setup Using OPTIGA™ Trust M2 ID2

View Details

MessageID

1276024802876092928 [Copy](#)

Topic

/a1FCMDh4ypx/IFXDeviceMqttTest/data

Time

Jun 25, 2020, 10:59:55.057

Content

Text (UTF-8)

▼

{"attr\_name": "temperature", "attr\_value": "1"}

[Copy](#)

Off

Figure 16 Server side hosted log

## FAQs

### 5 FAQs

#### 5.1 How to check connectivity in Ali cloud

1. Login to <https://cn.aliyun.com/> using personal credential
2. Go to show device log section

#### 5.2 How to update key in OPTIGA™

1. Use protected key update feature to write AES and RSA key
2. Use the tool in the below path to generate manifest and fragments  
*AliOS-Things\3rdparty\experimental\optiga\example\tools\protected\_update\_data\_set\*

##### 5.2.1 Update AES key in OPTIGA™

1. Open **AliOS-Things\3rdparty\experimental\optiga\example\tools\protected\_update\_data\_set\samples\payload\key\aes\_key\_128.txt** file.
2. Write 16 bytes AES key provided by ali ID2 key distribution center in aes\_key\_128.txt file.
3. Open **samples\gen\_key\_update\_data\_set.bat** file and copy the below batch command.  
%PATH%\protected\_update\_data\_set.exe payload\_version=3 trust\_anchor\_oid=E0E3 target\_oid=E200  
sign\_algo=RSA-SSA-PKCS1-V1\_5-SHA-256 priv\_key=..\samples\integrity\sample\_rsa\_1024\_priv.pem  
payload\_type=key key\_algo=129 key\_usage=02 key\_data=..\samples\payload\key\aes\_key\_128.txt
4. Execute the **gen\_key\_update\_data\_set.bat** from the below path  
*AliOS-Things\3rdparty\experimental\optiga\example\tools\protected\_update\_data\_set\samples\*
  - Example output is shown as below

## FAQs

```

Payload version      : 3
Trust anchor oid     : E0E3
Target oid           : E200
Signature Algorithm  : RSA-SSA-PKCS1-V1_5-SHA-256
Private key          : ..\samples\integrity\sample_rsa_1024_priv.pem
Type of Payload      : key
Key Usage            : 02
Key algorithm        : 129
Key Data             : ..\samples\payload\key\aes_key_128.txt

Info : Setting value for data formatter
Payload version      : 3
Trust anchor oid     : E0E3
Target oid           : E200
Digest algorithm     : 29
Signature Algorithm  : FFFE5C
Type of Payload      : FFFFFFFD
Manifest Data , size : [206]
uint8_t manifest_data[] =
{
0x84, 0x47, 0xA1, 0x01, 0x3A, 0x00, 0x01, 0x00, 0xA3, 0xA1, 0x04, 0x42, 0xE0, 0xE3, 0x58, 0x3C,
0x86, 0x01, 0xF6, 0xF6, 0x84, 0x22, 0x13, 0x03, 0x82, 0x18, 0x81, 0x02, 0x82, 0x82, 0x20, 0x58,
0x25, 0x82, 0x18, 0x29, 0x58, 0x20, 0x37, 0x5E, 0x3D, 0xD1, 0x7A, 0xA8, 0x59, 0x88, 0xA2, 0x4A,
0xB9, 0xC2, 0x9A, 0xBA, 0xCD, 0x2A, 0xD8, 0x8B, 0x06, 0x33, 0xD1, 0x84, 0x5B, 0x31, 0x4F, 0xDC,
0x5D, 0xCD, 0x36, 0x58, 0x8C, 0xE7, 0xF6, 0x82, 0x40, 0x42, 0xE2, 0x00, 0x58, 0x80, 0x60, 0x4D,
0xA6, 0x5F, 0x81, 0x40, 0x32, 0x49, 0x39, 0xC4, 0x0B, 0xD6, 0x5D, 0xE5, 0xBA, 0xBC, 0xAA, 0x4A,
0xEB, 0xAF, 0xC4, 0x0A, 0x08, 0xDC, 0x0B, 0xED, 0x10, 0x63, 0x66, 0x08, 0xFA, 0x4C, 0x3C, 0x1F,
0x41, 0x50, 0x1A, 0x13, 0x93, 0xAF, 0x36, 0x2E, 0x86, 0x46, 0x98, 0x36, 0x5C, 0xD5, 0x41, 0xE2,
0x15, 0x1E, 0xF4, 0x37, 0x7E, 0x5D, 0x43, 0xB6, 0x1E, 0x49, 0xB6, 0xA8, 0x43, 0xAC, 0x66, 0x20,
0xFE, 0xEE, 0x4C, 0x7C, 0x76, 0x66, 0xDA, 0xFF, 0xAC, 0x01, 0x89, 0xD9, 0x63, 0x18, 0x76, 0x3C,
0xB0, 0x0C, 0x54, 0x75, 0x2C, 0x17, 0xB2, 0xE6, 0xE7, 0x6E, 0x22, 0xC4, 0x89, 0xE7, 0x68, 0xD9,
0x37, 0x2F, 0xE8, 0xAD, 0x31, 0x76, 0x7A, 0xB5, 0x5C, 0x5A, 0x7B, 0xD0, 0x1F, 0x75, 0x2A, 0x66,
0x37, 0x86, 0x96, 0xF1, 0x34, 0x01, 0x28, 0xE1, 0x11, 0x20, 0xCF, 0x69, 0x20, 0x56,
};

Fragment number:[01], size:[019]
uint8_t fragment_01[] =
{
0x01, 0x00, 0x10, 0x22, 0x38, 0x5E, 0xA7, 0xEB, 0x61, 0x94, 0xB9, 0xD7, 0xFF, 0xD4, 0x1C, 0xA5,
0x68, 0x34, 0xD3,
};

```

**Figure 17 Example log of manifest and fragment data for AES key**

5. Make the following changes in AliOS-Things\3rdparty\experimental\optiga\example\optiga\usecases\example\_ali\_id2\_key\_update.c file
  - a. Copy "manifest\_data[]" and replace it in "manifest\_aes\_key[]"
  - b. Copy "fragment\_01[]" and replace it in "aes\_key\_final\_fragment\_array[]"
  - c. Copy 12 bytes unique device ID(provided by ali ID2 distribution center) and replace it in "device\_id[]"
6. Invoke function example\_optiga\_util\_ali\_id2\_aes\_key\_update() in the beginning of application\_start() present in AliOS-Things\app\example\mqttapp\app\_entry.c
7. Go back to root folder and build source code using below command
  - o aos make
8. Flash and execute application

## FAQs

### 5.2.2 Update RSA 1024 key in OPTIGA™

1. Open AliOS-Things\3rdparty\experimental\optiga\example\tools\protected\_update\_data\_set\samples\payload\key\rsa\_1024\_test.pem file.
2. Copy the RSA key generated from the key provided by Ali ID2 key distribution center in rsa\_1024\_test.pem file (Refer section [How to extract RSA key](#))
3. Open samples\gen\_key\_update\_data\_set.bat file and copy the below batch command  
%PATH%\protected\_update\_data\_set.exe payload\_version=3 trust\_anchor\_oid=E0E3 target\_oid=E0FC  
sign\_algo=RSA-SSA-PKCS1-V1\_5-SHA-256 priv\_key=..\samples\integrity\sample\_rsa\_1024\_priv.pem  
payload\_type=key key\_algo=65 key\_usage=12 key\_data=..\samples\payload\key\rsa\_1024\_test.pem
4. Execute the gen\_key\_update\_data\_set.bat from the below path  
AliOS-Things\3rdparty\experimental\optiga\example\tools\protected\_update\_data\_set\samples\
5. Example output is shown as below

## FAQs

```

Tool Version : 2.00.2449
Info : Default values are set
Info : User provided inputs
    Payload version      : 3
    Trust anchor oid     : E0E3
    Target oid           : E0FC
    Signature Algorithm   : RSA-SSA-PKCS1-V1_5-SHA-256
    Private key           : ..\samples\integrity\sample_rsa_1024_priv.pem
    Type of Payload       : key
    Key Usage             : 12
    Key algorithm         : 65
    Key Data              : ..\samples\payload\key\rsa_1024_test.pem

Info : Setting value for data formatter
    Payload version      : 3
    Trust anchor oid     : E0E3
    Target oid           : E0FC
    Digest algorithm     : 29
    Signature Algorithm   : FFFEFFFF5C
    Type of Payload       : FFFFFFFFD
Manifest Data , size : [208]
uint8_t manifest_data[] =
{
    0x84, 0x47, 0xA1, 0x01, 0x3A, 0x00, 0x01, 0x00, 0xA3, 0xA1, 0x04, 0x42, 0xE0, 0xE3, 0x58, 0x3E,
    0x86, 0x01, 0xF6, 0xF6, 0x84, 0x22, 0x19, 0x01, 0x0D, 0x03, 0x82, 0x18, 0x41, 0x12, 0x82, 0x82,
    0x20, 0x58, 0x25, 0x82, 0x18, 0x29, 0x58, 0x20, 0x5C, 0x05, 0x4B, 0xC2, 0x72, 0x73, 0xD2, 0xDC,
    0xC1, 0xFD, 0x29, 0x79, 0x29, 0x96, 0x1B, 0xC8, 0xB3, 0x86, 0xD6, 0xE5, 0x46, 0x1D, 0xD3, 0x58,
    0x22, 0xF6, 0xED, 0x12, 0x0F, 0x41, 0xDB, 0x04, 0xF6, 0x82, 0x40, 0x42, 0xE0, 0xFC, 0x58, 0x80,
    0x6B, 0xEA, 0x79, 0xB9, 0xE7, 0xB8, 0x81, 0x47, 0x18, 0x8F, 0x35, 0x9D, 0xD4, 0x3F, 0xF9, 0xFB,
    0x6F, 0x1C, 0x87, 0xA4, 0xD7, 0x21, 0x5F, 0xA3, 0x49, 0x1C, 0x2D, 0x90, 0xDA, 0xD6, 0x62, 0x5C,
    0x79, 0x11, 0x5B, 0xDA, 0x26, 0xB6, 0x5B, 0xCF, 0x26, 0x40, 0x4F, 0x9A, 0x01, 0x66, 0x44, 0x4D,
    0xFA, 0x43, 0x62, 0xD1, 0xA0, 0xAA, 0xCB, 0x18, 0x06, 0x73, 0x89, 0x8C, 0xFD, 0xF5, 0xDC, 0xCF,
    0xA0, 0xA8, 0x16, 0x4D, 0x4B, 0xAC, 0x52, 0xD0, 0x17, 0xBF, 0x66, 0x12, 0x87, 0xC2, 0x5A, 0x46,
    0x09, 0xBE, 0x9C, 0x1F, 0x86, 0x92, 0xE0, 0xEB, 0xAB, 0xBC, 0x06, 0x38, 0xB8, 0x94, 0xA3, 0x67,
    0x54, 0x97, 0xA0, 0xB7, 0xB1, 0xD2, 0xE9, 0xA8, 0xA1, 0x0A, 0x8A, 0xC9, 0x8F, 0xB2, 0xC0, 0x63,
    0x39, 0x57, 0xB9, 0xC3, 0xCC, 0x7C, 0x0E, 0x98, 0x4F, 0x8E, 0x7C, 0x93, 0x9A, 0x4A, 0x10, 0xBF,
};

Fragment number:[01], size:[269]
uint8_t fragment_01[] =
{
    0x01, 0x00, 0x80, 0x47, 0x66, 0x91, 0x69, 0xF7, 0xA1, 0xAF, 0x25, 0x4F, 0xAA, 0x43, 0xF5, 0xCA,
    0x3D, 0x54, 0xB4, 0x1A, 0xDF, 0x08, 0xCC, 0xCC, 0xD1, 0xB0, 0xB1, 0x20, 0x02, 0xA9, 0x1D, 0xE0,
    0x55, 0x4D, 0x6A, 0x9A, 0x28, 0x94, 0x5A, 0x98, 0x67, 0x10, 0x03, 0x12, 0xDD, 0x46, 0x3E, 0x14,
    0x0F, 0x08, 0x06, 0x1A, 0x20, 0x3C, 0x42, 0x08, 0x17, 0x55, 0xA9, 0xED, 0x9A, 0x83, 0xB2, 0x99,
    0xA6, 0x37, 0x55, 0x79, 0x2D, 0x6F, 0xE2, 0xAC, 0x23, 0xCE, 0xAE, 0x43, 0x37, 0x12, 0xDF, 0x9B,
    0x7F, 0x1F, 0x92, 0x27, 0x14, 0x13, 0x29, 0xEB, 0x03, 0x02, 0x23, 0x35, 0x45, 0xF1, 0xB1, 0xCD,
    0x8C, 0x80, 0x9A, 0x46, 0x8E, 0x11, 0x46, 0xC8, 0xA6, 0xDA, 0xA1, 0xDC, 0xF6, 0xD9, 0x6A, 0x86,
    0x90, 0x2A, 0xD8, 0x11, 0xC8, 0x31, 0x5F, 0x4B, 0xBA, 0xBC, 0x29, 0xAA, 0xC7, 0x4E, 0x49, 0x1E,
    0x50, 0xE7, 0x21, 0x02, 0x00, 0x80, 0x8D, 0x8C, 0xFE, 0x31, 0x2A, 0xB2, 0x90, 0xFD, 0x7F, 0x4A,
    0xC1, 0xE0, 0xDA, 0xF6, 0x28, 0x2F, 0xD2, 0xCC, 0xAF, 0x99, 0xD2, 0xBB, 0x8A, 0x20, 0xAF, 0x5A,
    0x49, 0xB2, 0x1B, 0x60, 0x55, 0x3E, 0xAD, 0x26, 0x12, 0xC3, 0xD5, 0xD2, 0xDF, 0x12, 0xDE, 0xFF,
    0x77, 0x6C, 0x23, 0x99, 0x90, 0x3F, 0x74, 0x88, 0xA7, 0x29, 0xCD, 0xFC, 0x0C, 0x76, 0x4A, 0x88,
    0x06, 0x6B, 0xAE, 0xB9, 0xC5, 0x16, 0x5C, 0x15, 0xFB, 0x49, 0xC1, 0x10, 0xA9, 0x24, 0xD7, 0x8F,
    0x41, 0x83, 0x5C, 0xD7, 0x63, 0x47, 0x6A, 0xA0, 0x78, 0x81, 0xBB, 0xA4, 0x66, 0x94, 0x2B, 0x50,
    0xCA, 0x1F, 0xF7, 0x7E, 0x54, 0xB2, 0xAF, 0x43, 0x9B, 0x59, 0x2B, 0xAE, 0xAB, 0xF7, 0x79, 0x71,
    0xF2, 0x4B, 0x64, 0xFC, 0xBB, 0x86, 0x67, 0x70, 0x75, 0x44, 0x74, 0x0B, 0xCE, 0x5F, 0x50, 0x05,
    0xA5, 0x12, 0x87, 0xCD, 0x79, 0xE9, 0x03, 0x00, 0x04, 0x00, 0x01, 0x00, 0x01,
};

```

Figure 18 Example log of manifest and fragment data for RSA key

## FAQs

6. Make the following changes in AliOS-Things\3rdparty\experimental\optiga\example\optiga\usecases\example\_ali\_id2\_rsa\_key\_update.c file
  - a. Copy "manifest\_data[]" and replace it in "manifest\_rsa\_key[]"
  - b. Copy "fragment\_01[]" and replace it in "rsa\_key\_final\_fragment\_array[]"
  - c. Copy 12 bytes unique device ID(provided by ali ID2 distribution center) and replace it in "rsa\_device\_id[]"
7. Invoke function example\_optiga\_util\_ali\_id2\_rsa\_key\_update() in the beginning of application start() present in AliOS-Things\app\example\mqttapp\app\_entry.c
8. Go back to root folder and build source code using below command
  - o aos make

### 5.3 How to change the crypto configuration in AliOS-Things source code

This section describes the modification require to use key type as per needs.

#### 5.3.1 RSA

1. Below Modification is required in AliOS-Things\security\irot\se\chipset\chip\_template\chip\_config.h  
`#define CHIP_CRYPTOTYPE_CONFIG CHIP_CRYPTOTYPE_RSA`
2. Below Modification is required in AliOS-Things\security\id2\aos.mk  
`ifeq ($(CONFIG_LS_KM_SE), y)  
 $(NAME)_DEFINES += ID2_CRYPTOTYPE_CONFIG=ID2_CRYPTOTYPE_RSA`

#### 5.3.2 AES

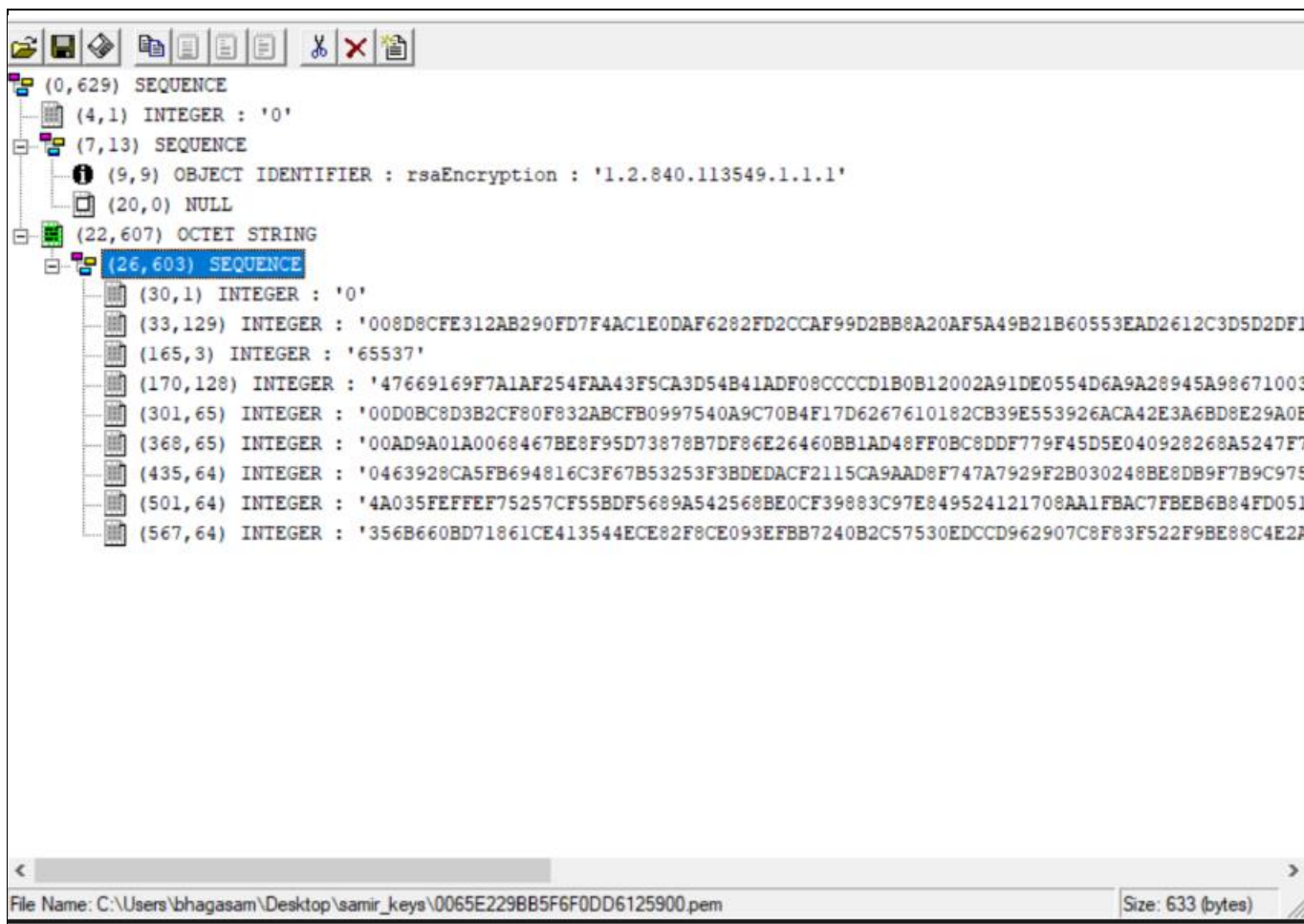
1. Below Modification is required in AliOS-Things\security\irot\se\chipset\chip\_template\chip\_config.h  
`#define CHIP_CRYPTOTYPE_CONFIG CHIP_CRYPTOTYPE_AES`
2. Below Modification is required in AliOS-Things\security\id2\aos.mk  
`ifeq ($(CONFIG_LS_KM_SE), y)  
 $(NAME)_DEFINES += ID2_CRYPTOTYPE_CONFIG=ID2_CRYPTOTYPE_AES`

### 5.4 How to extract RSA key

1. Open the RSA key data provided by Ali in ASN.1 editor and copy the highlighted section as shown below (from the highlighted section its only contain the key part)



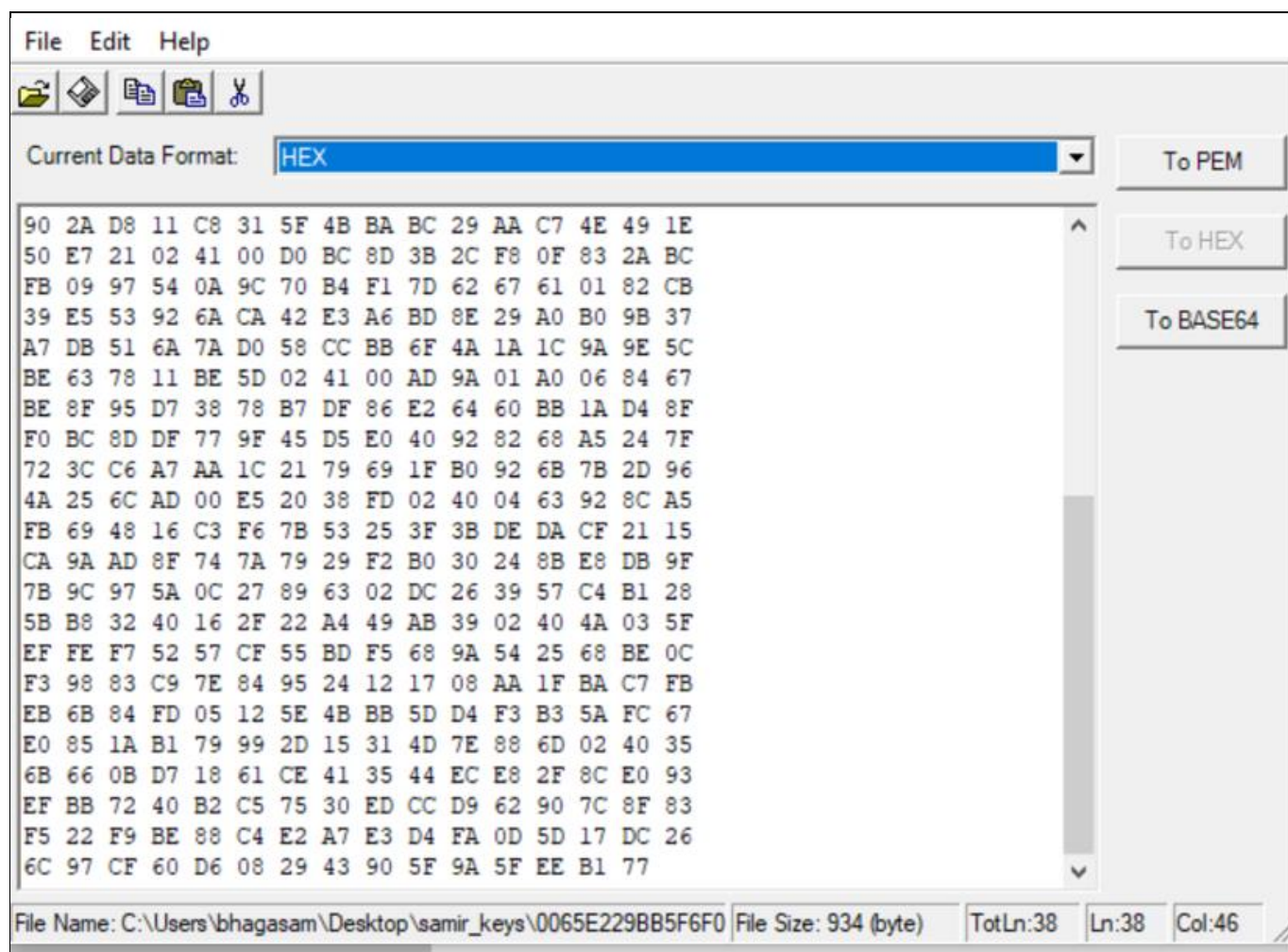
## FAQs



**Figure 19** Extraction of only key part

- Go to Tools-> Data Converter and paste the copied hexadecimal data as shown below

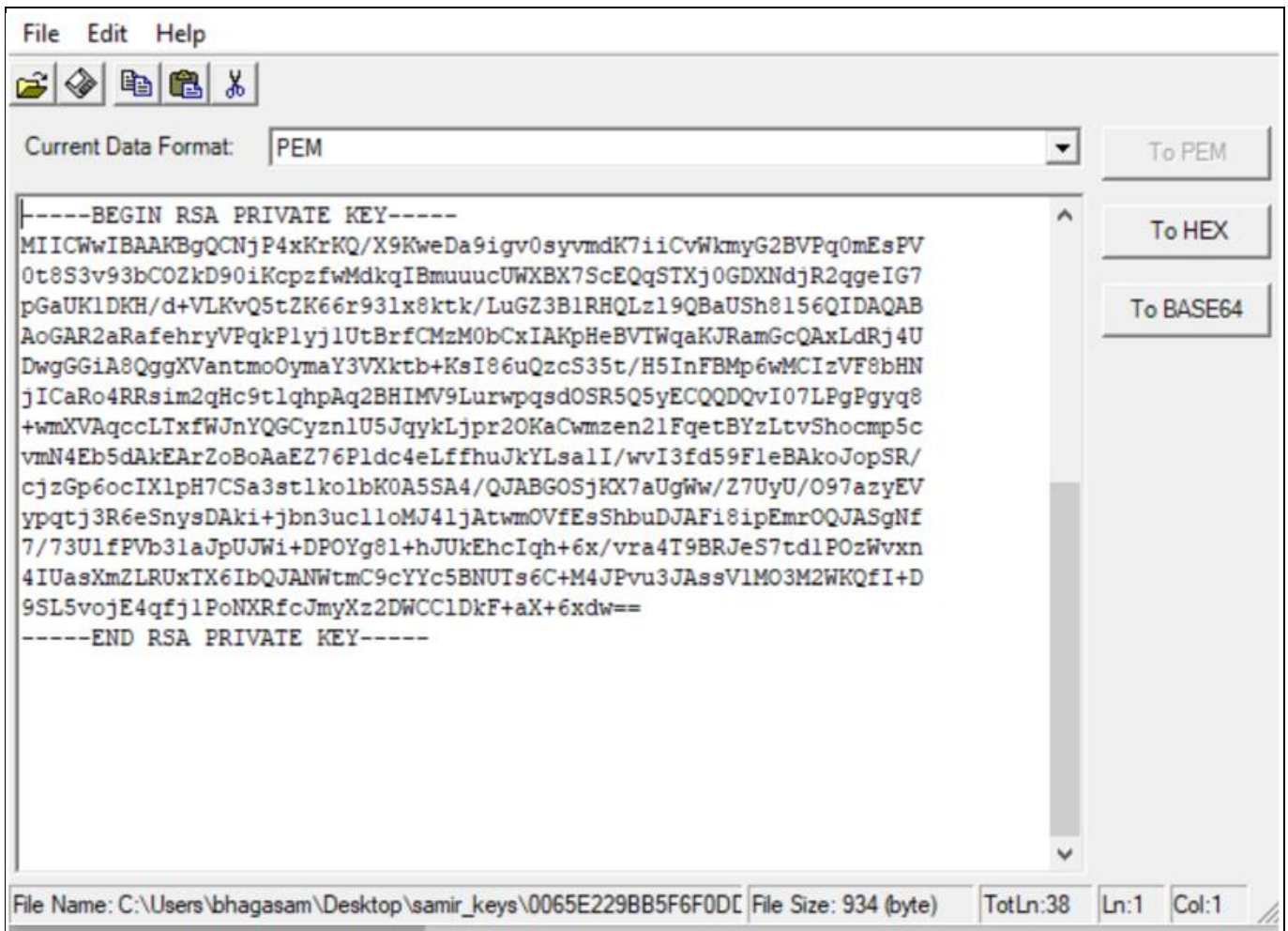
## FAQs



**Figure 20** Converting to HEX format

- Click button "To PEM" to convert hexadecimal data to .pem format

## FAQs



**Figure 21** Converting HEX to PEM format

4. Save the file in AliOS-  
Things\3rdparty\experimental\optiga\example\tools\protected\_update\_data\_set\samples\payload\key\rsa\_1024\_key.pem

## 5.5 How to create and update new ID2 device node

1. Create an ID2 device node in <https://cn.aliyun.com/>
2. Replace the device name and device secret in the below section present in AliOS-Things\app\example\mqttapp\mqtt\_example.c file
 

```

#define DEVICE_NAME "your device name"
#define DEVICE_SECRET "your device secret"
#define PRODUCT_KEY "your product key"
#define PRODUCT_SECRET "your product secret"

```

## 5.6 How to enable power off option to OPTIGA™ chip

1. Before doing an OPTIGA™ chip power off, it is recommended to wait until the security event counter on OPTIGA™ reaches zero. This can lead to certain time delays which leads to connection timeout on the server side.

## FAQs

2. The above code flow is implemented in `irod_hal_cleanup` but it is disabled by default using macro `OPTIGA_SE_ENABLE_POWER_DOWN`.
3. To enable the code flow, uncomment the macro definition present in AliOS-Things\security\irod\se\src\core\optiga\_se\_adapter.c file  

```
#define OPTIGA_SE_ENABLE_POWER_DOWN
```

## 5.7 How to port OPTIGA™ host library to different platform

The host library present in AliOS-Things\3rdparty\experimental\optiga location can be port to different platform supported by the AliOS-Things framework.

1. Platform abstraction layer for platform low level drivers like I2C, Timer located in AliOS-Things\3rdparty\experimental\optiga\pal can be modified as described [here](#).
2. User need to use platform specific libitls.a library which should be present in AliOS-Things\security\itls\lib\<platform specific folder>.

## 5.8 What Infineon patch file contain

Below are the modification present in the patch.

1. OPTIGA™ host library including platform dependent file for ESP32 specific.
2. Modified i2c driver to support read and write operation for maximum 20bytes of data
3. Shielded connection option is disabled due to the limitation of the i2c driver.
4. ESP32 platform supported libitls.a library.

## Revision History

## Revision History

**Table 5**

<b>Document version</b>	<b>Date of release</b>	<b>Description of changes</b>
2.00	2020-06-29	ES Release

## Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2020-06-11**

### Published by

**Infineon Technologies AG**  
**81726 Munich, Germany**

**© 2020 Infineon Technologies AG.**  
**All Rights Reserved.**

**Do you have a question about this document?**

**Email:**  
[DSSCustomerService@infineon.com](mailto:DSSCustomerService@infineon.com)

**Document reference**

## IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office ([www.infineon.com](http://www.infineon.com)).

## WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.