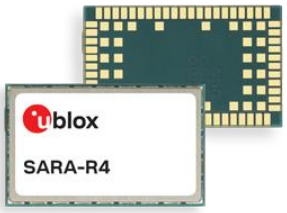
SARA-R4 series

AT command connect to AWS IoT core

Application note



Abstract

This document provides examples of how to use AT commands to connect the AWS IoT service with u-blox SARA-R4 series modules.

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UBX- 20010011 - R01

Document information

Title	**SARA-R4 series**
Subtitle	AT command connect to AWS IoT core
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Disclosure restriction	

Product status	**Corresponding content status**	
Functional sample	Draft	For functional testing. Revised and supplementary data will be published later.
In development / Prototype	Objective specification	Target values. Revised and supplementary data will be published later.
Engineering sample	Advance information	Data based on early testing. Revised and supplementary data will be published later.
Initial production	Early production information	Data from product verification. Revised and supplementary data may be published later.
Mass production / End of life	Production information	Document contains the final product specification.

This document applies to the following products:

Product name
SARA-R4 series

Contents

1 Steps for Getting started with AWS IoT

To get started with AWS IoT service, follow the steps shown on the AWS website:

https://docs.aws.amazon.com/iot/latest/developerguide/iot-gs.html

You can also get an AWS IoT certification, though currently only a legacy certification is supported:

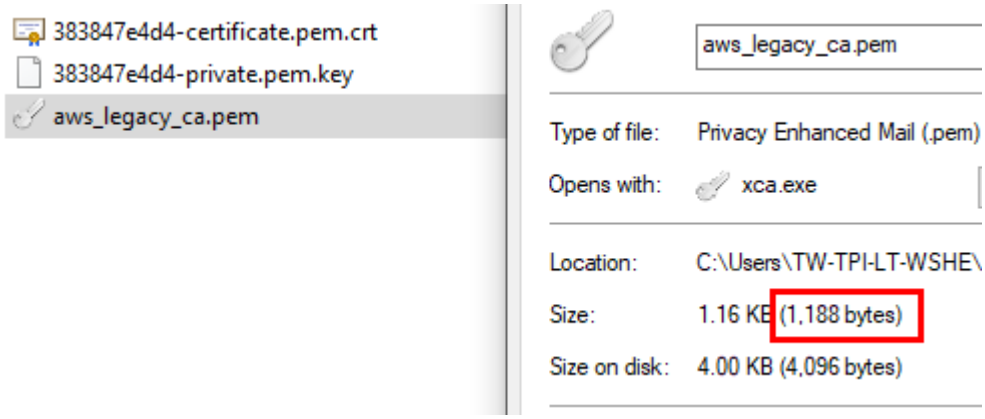
https://docs.aws.amazon.com/iot/latest/developerguide/create-device-certificate.html

For more details on AT commands, see SARA-R4 AT commands manual [2].

1.1 Store certifications in module flash

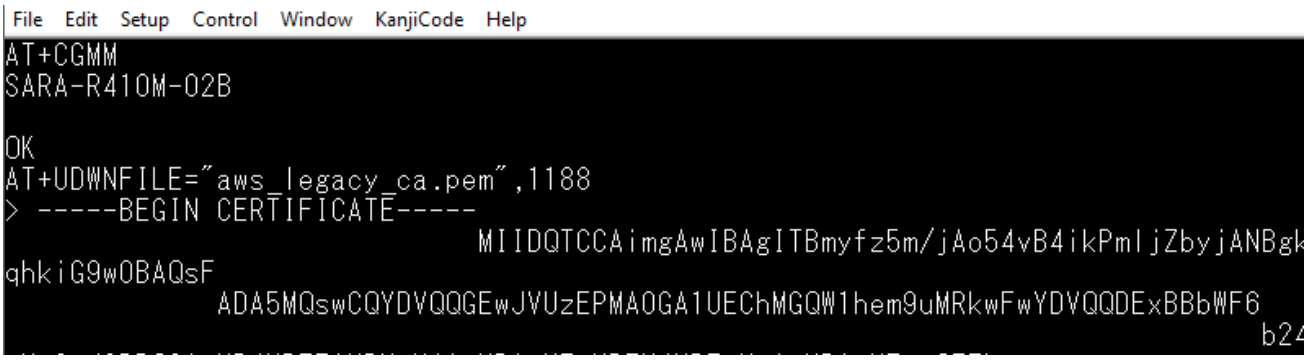
After downloading the CA, CC, and PK from AWS, store them in the module via AT commands. Here are the steps to download files to the module's flash memory:

1.1.1 Check the file size



1.1.2 Use terminal software to write the file in the module

In the following example TeraTerm is used to write CA, CC, and PK in the module. After character ">" choose File tab->Send file-> Select "aws_legacy_ca.pem"



1.1.3 File stored successfully

1.1.4 Stored the 3 files in the module flash

Repeat steps 1.1.1 - 1.1.3 to download the other files "383847e4d4-certificate.pem.crt" and "383847e4d4-private.pem.key".

1.2 Check CA, CC, and PK in file system

Command	Response	Description
AT+ULSTFILE=2,"aws_legacy_ca.pem"	+ULSTFILE: 1188 OK	CA availability in the module.
AT+ULSTFILE=2,"383847e4d4-certificate.pem.crt"	+ULSTFILE: 1224 OK	CC availability in the module.
AT+ULSTFILE=2,"383847e4d4-private.pem.key"	+ULSTFILE: 1679 OK	PK availability in the module

1.3 Import CA, CC, and PK from a file store on file system

Command	Response	Description
AT+USECMNG=1,0,"aws_legacy_ca.pem","aws_legacy_ca.pem"	+USECMNG: 1,0,"aws_legacy_ca.pem","CB17E431673EE209FE455793F30AFA1C" OK	Import CA.
AT+USECMNG=1,1,"383847e4d4-certificate.pem.crt","383847e4d4-certificate.pem.crt"	+USECMNG: 1,1,"383847e4d4-certificate.pem.crt","50C3004AAE690124E3D7F96F904D7084" OK	Import CC.
AT+USECMNG=1,2,"383847e4d4-private.pem.key","383847e4d4-private.pem.key"	+USECMNG: 1,2,"383847e4d4-private.pem.key","CD879AA22744A7211D3AF5D3BEFAFF29" OK	Import PK.

1.4 Enable HEX mode and set security profile

Command	Response	Description
AT+UDCONF=1,1	OK	Enable the HEX mode.
AT+USECPRF=0,0,1	OK	Set the certificate validation level 1.
AT+USECPRF=0,1,0	OK	Set the TLS version to any.
AT+USECPRF=0,2,0	OK	Set automatic the cipher suite.
AT+USECPRF=0,3,"aws_legacy_ca.pem"	OK	Set the trusted root certificate internal name.
AT+USECPRF=0,5,"383847e4d4-certificate.pem.crt"	OK	Set the client certificate internal name.
AT+USECPRF=0,6,"383847e4d4-private.pem.key"	OK	Set the client certificate internal name.

1.5 Create TCP socket and connect to AWS IoT with SSL enable

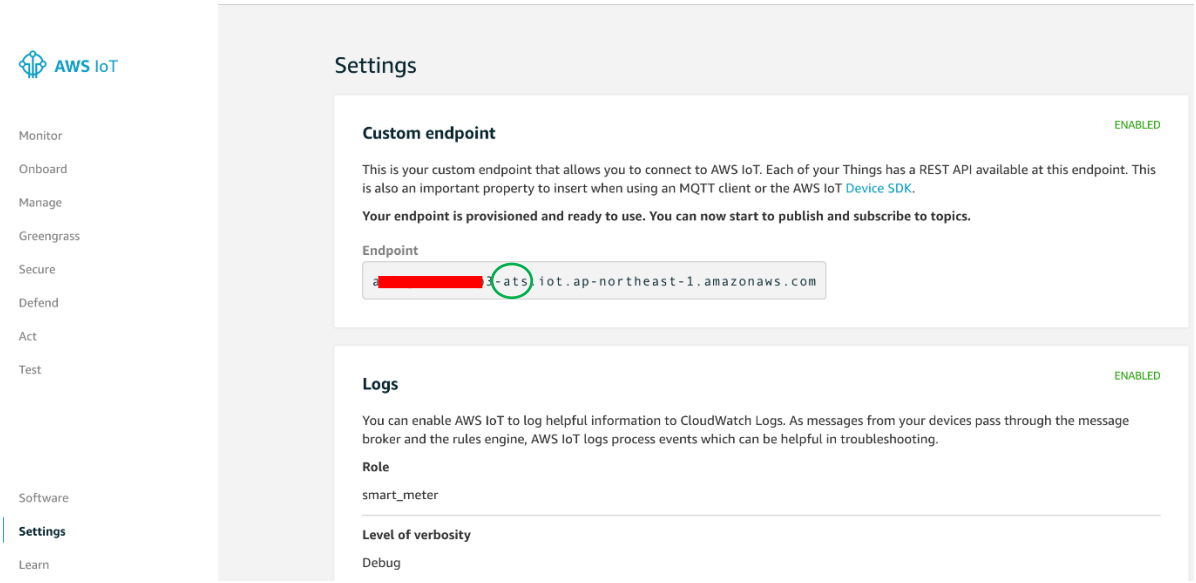
Use the +COPS read command to check the network registrations status.

After the device has been registered to the network, create a TCP socket to connect with.

To get AWS end point, follow the steps on the website:

Command	Response	Description
AT+USOCR=6	+USOCR: 0 OK	Create TCP socket.
AT+USOSEC=0,1,0	OK	Enable SSL/TLS connection on a TCP socket.
AT+USOCO=0,"[redacted].iot.ap-northeast-1.amazonaws.com",8883	OK	Connect to AWS IoT server by AT command.

To get the end point, it should be on AWS account > Settings > Endpoint. It should delete **"-ats"** because currently only legacy certification can be supported.



2 Send MQTT message from module to AWS IoT core

MQTT messages require conversion from ASCII to hexadecimal format. The arguments for these messages include the MQTT topic and payload. The messages have been created by the AWS IoT SDK. For more details, see the website for AWS IoT SDKs:

https://docs.aws.amazon.com/iot/latest/developerguide/iot-sdks.html

The examples here are using Python.

Connect the end point with default connection header, Client ID, and protocol.

ASCII message	MQTT_Test ?SDK=Python&Version=1.4.7
HEX number	103000044d5154540482025800094d5154545f5465737400193f53444b3d507974686f6e2656657273696f6e3d312e342e37
AT command	AT+USOWR=0,50,"103000044d5154540482025800094d5154545f5465737400193f53444b3d507974686f6e2656657273696f6e3d312e342e37"

2.1 Subscribe to a topic and receive a message from AWS IoT core

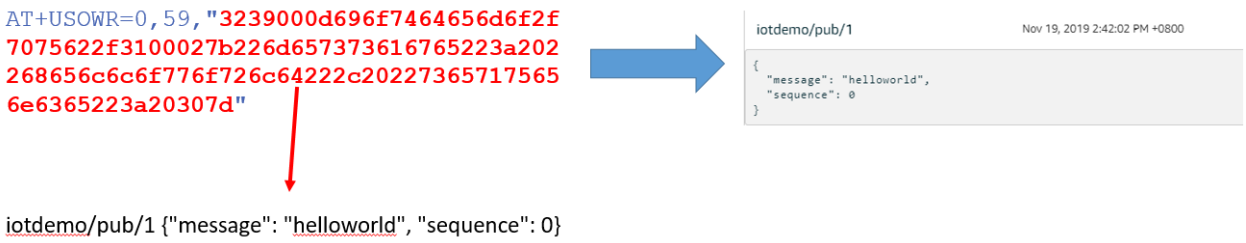
Subscribe topic: iotdemo/pub/1

ASCII message	iotdemo/pub/1
HEX number	82120001000d696f7464656d6f2f7075622f3101
AT command	AT+USOWR=0,20,"82120001000d696f7464656d6f2f7075622f3101"

2.2 Publish message to AWS IoT core

Publish message: iotdemo/pub/1{"message": "helloworld", "sequence": 0}

ASCII message	iotdemo/pub/1{"message": "helloworld", "sequence": 0}
HEX number	3239000d696f7464656d6f2f7075622f3100027b226d657373616765223a202268656c6c6f776f726c64222c202273657175656e6365223a20307d
AT command	AT+USOWR=0,59,"3239000d696f7464656d6f2f7075622f3100027b226d657373616765223a202268656c6c6f776f726c64222c202273657175656e6365223a20307d"



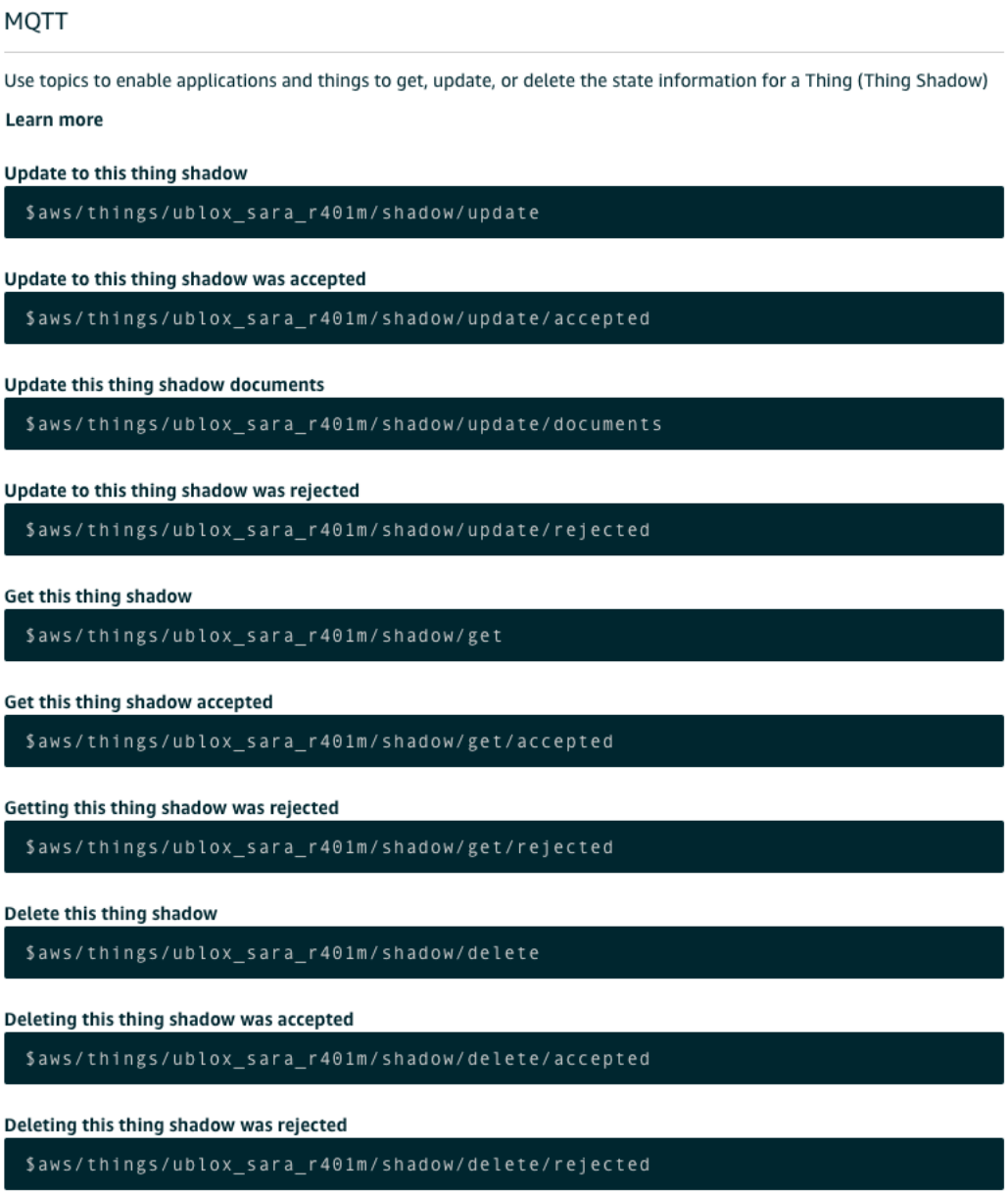
☞ For more details about the conversion from ASCII to HEX format, see appendix A.

3 Using AWS IoT device shadow

When AWS IoT Core registers a thing, a shadow can be used to interact with the device. For more details, see:

https://docs.aws.amazon.com/iot/latest/developerguide/device-shadow-data-flow.html

Example: When you register “ublox_sara_r401m” as a thing, then its reversed MQTT topic for shadow would be:



3.1 Update the contents of a device shadow

Boot up the device and issue the +USOWR AT command to publish updates to shadow service from SARA-R410M.

3.2 Subscribe and retrieve the latest state stored in device shadow

Boot up the device and issue the +USOWR AT command to subscribe to a shadow topic from the shadow service, and then use “AT+USORD” to receive subscribed shadow message.

☞ As described in section 2, convert ASCII to HEX. See Appendix A for information about how to convert from ASCII to HEX

Appendix

A How to convert ASCII to HEX

You can use this website tool to convert ASCII to HEX:

https://www.rapidtables.com/convert/number/ascii-to-hex.html

Related documents

[1] u-blox SARA-R4 series Data Sheet, doc. no. UBX-16024152
[2] u-blox SARA-R4 series AT commands manual, doc. no. UBX-17003787
[3] u-blox SARA-R4 series system integration manual, doc. no. UBX-16029218

☞ For regular updates to u-blox documentation and to receive product change notifications, register on our homepage (www.u-blox.com).

Revision history

Revision	Date	Name	Comments
R01	12-Mar-2020	wshe	Initial release

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