

# **RX Family**

AWS Cloud Connectivity for MCU Firmware Update Over-the-Air on

# CK-RX65N v2 with Wi-Fi DA16600

# Introduction

This document provides instructions for running the AWS Cloud Connectivity for MCU Firmware Update Over-the-Air project on CK-RX65N v2 using Wi-Fi DA16600, utilizing the MCU firmware update command of Wi-Fi DA16600 module.

# **Target Device**

RX Family

- RX600 Series
  - RX65N Group

# Hardware

• CK-RX65N v2

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

**Note:** This demo project has also been successfully reused on the FPB-RX140 board. However, some module configurations must be adjusted to ensure compatibility with the FPB-RX140 device and its memory constraints.

# **Related Documents**

- [1] Firmware Integration Technology User's Manual (R01AN1833)
- [2] RX Family FWUP Module Using Firmware Integration Technology (R01AN6850)
- [3] Renesas MCU Firmware Update Design Policy (R01AN5548)
- [4] CK-RX65N v2 User's Manual (R20UT5366)
- [5] US159-DA16600EVZ Evaluation Board Manual (R15UZ0006)

# Contents

1	Overview	3
1.1	Workflow	4
1.2	Operation Confirmation Conditions	. 5
1.3	Equipment List	. 5
1.4	Sample Project Code Sizes	. 6
2	Demo Dreiset Cetur	7
2	Demo Project Setup	/
2.1	Hardware Setup	/
2.2		
2.2.1	Installing Tool	ð
2.2.1	1 Install Python	
2.2.1	2 Installing OpenSSL	9
2.2.1	.3 Installing Renesas Image Generator	11
2.2.1	.4 Installing Tera Term	12
2.2.1	.5 Installing Renesas Flash Programmer	13
2.2.2		14
2.2.3	Check DA16600 WI-FI SDK Version	18
2.2.4	Generate Key Pairs and Certificates	19
2.2.5	Project Description	20
2.2.0		21
	Consists Figure on a file and figure state the American CO Ductort	<b>0</b> 4
2.2.7	Create Firmware File and Upload to the Amazon S3 Bucket	24
2.2.7	Create Firmware File and Upload to the Amazon S3 Bucket	24 24
2.2.7 2.2.7 2.2.7	Create Firmware File and Upload to the Amazon S3 Bucket C.1 Create Firmware File C.2 Upload Firmware to Amazon S3 Bucket	24 24 28
2.2.7 2.2.7 2.2.7 2.2.8	Create Firmware File and Upload to the Amazon S3 Bucket Create Firmware File Upload Firmware to Amazon S3 Bucket Create Firmware Initialization	24 24 28 35
2.2.7 2.2.7 2.2.7 2.2.8 2.2.8	Create Firmware File and Upload to the Amazon S3 Bucket 1 Create Firmware File 2 Upload Firmware to Amazon S3 Bucket 3 Create Firmware Initialization 3.1 Building CK-RX65N Application Project	24 24 28 35 35
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8	Create Firmware File and Upload to the Amazon S3 Bucket Create Firmware File Upload Firmware to Amazon S3 Bucket Create Firmware Initialization Building CK-RX65N Application Project Building CK-RX65N Bootloader Project	24 24 28 35 35 36
2.2.7 2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8	Create Firmware File and Upload to the Amazon S3 Bucket Create Firmware File Upload Firmware to Amazon S3 Bucket Create Firmware Initialization Building CK-RX65N Application Project Building CK-RX65N Bootloader Project Creating the Initial Firmware	24 28 35 35 36 37
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3	Create Firmware File and Upload to the Amazon S3 Bucket 1 Create Firmware File 2 Upload Firmware to Amazon S3 Bucket 2 Create Firmware Initialization 3 Building CK-RX65N Application Project 3 Creating the Initial Firmware Execute the Demonstration Project	24 24 28 35 35 36 37 38
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3	Create Firmware File and Upload to the Amazon S3 Bucket Create Firmware File Upload Firmware to Amazon S3 Bucket Create Firmware Initialization Building CK-RX65N Application Project Building CK-RX65N Bootloader Project Creating the Initial Firmware Execute the Demonstration Project	24 24 28 35 35 36 37 38
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3 4	Create Firmware File and Upload to the Amazon S3 Bucket	<ul> <li>24</li> <li>24</li> <li>28</li> <li>35</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>44</li> </ul>
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3 4 4.1	Create Firmware File and Upload to the Amazon S3 Bucket	<ul> <li>24</li> <li>24</li> <li>28</li> <li>35</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>44</li> <li>44</li> <li>44</li> </ul>
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3 4 4.1 4.1.1	Create Firmware File and Upload to the Amazon S3 Bucket	<ul> <li>24</li> <li>24</li> <li>28</li> <li>35</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>44</li> <li>44</li> <li>44</li> <li>44</li> </ul>
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3 4 4.1 4.1.1 4.1.2	Create Firmware File and Upload to the Amazon S3 Bucket	<ul> <li>24</li> <li>24</li> <li>28</li> <li>35</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>44</li> <li>44</li> <li>44</li> <li>44</li> <li>44</li> </ul>
2.2.7 2.2.7 2.2.8 2.2.8 2.2.8 2.2.8 2.2.8 3 4 4.1 4.1.1 4.1.2 4.2	Create Firmware File and Upload to the Amazon S3 Bucket	24 24 28 35 35 36 37 38 44 44 44 44



## 1 Overview

This demo project shows the integration of AWS Cloud Connectivity for MCU Firmware Update Over-the-Air on the CK-RX65N v2 development board, utilizing the MCU firmware update command of Wi-Fi DA16600 module for seamless wireless communication.

#### Key Steps in the Project:

- **Prepare an AWS Account and S3 Bucket:** Set up an AWS account and create an S3 bucket to serve as the server for uploading firmware.
- **Generate Key Pairs and Certificates:** Generate a public key and a private key to create both the initial firmware and the firmware used for updates.
- **Generate and Upload the Firmware File:** Generate the new firmware to be flashed onto the board via OTA and upload it to the Amazon S3 bucket.
- **Generate the initial firmware:** Configure and build the initial firmware, then generate the firmware file using the designated tool.
- Execute the Demonstration Project: Execute the demo project to validate the OTA process.

The following section provides a comparison of Firmware Update Over-the-Air (OTA) demonstrations using two approaches.

• DA16600 Wi-Fi Module with OTA On-Chip Commands:

The DA16600 module connects to the AWS server and downloads the firmware directly.

The downloaded firmware is then transferred to the MCU host for deployment.

In this demonstration, HTTP and firmware updates are offloaded, the firmware file URL is retrieved using a web browser, TLS is not used in this demonstration. TLS is planned for the next demonstration.



Figure 1.1 OTA Demonstrates with Wi-Fi DA16600 OTA On-Chip Commands

### 1.1 Workflow





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# **1.2 Operation Confirmation Conditions**

Demo project operations have been confirmed in the following conditions.

Table 1.1	Operation	Confirmation	Conditions

Item	Description
MCU	R5F565NEHxFB
Board	CK-RX65N v2
	(Product no.: RTK5CK65N0S04000BE)
IDE (Integrated Development	Renesas Electronics
Environment)	e2 studio 2024-07
C compiler	Renesas Electronics
	CC-RX V3.06
Firmware programming tool	Renesas Flash Programmer V3.15.00
Firmware update module	RX Family FWUP Module Using Firmware Integration Technology
	R01AN6850EJ0204
Python	Python 3.12.7
Keygen tool	Win64 OpenSSL v3.0.12
SDK (Software Development	DA16200/DA16600 SDK V3.2.9.2
Kit)	

# 1.3 Equipment List

The following lists the equipment required for the demo projects.

#### Table 1.2 Equipment List

Item	Description
Board	CK-RX65N v2
	CK-RX65N - Cloud Kit Based on RX65N MCU Group
Wi-Fi DA16600 module	PMOD Expansion Board for DA16600MOD
	US159-DA16600EVZ - Ultra-Low-Power Wi-Fi + Bluetooth Low
	Energy Combo Pmod Board
UART-TTL	CP2101 USB TO TTL BOARD V4.2
	CP2101 USB TO TTL BOARD V4.2 (agencyelectronics.com)
Micro USB Type-B cable x 2	Connect the designated USB port on the base board to a
	PC for serial logging.
	Connect another USB port on the base board to a PC for
	debugging purposes.
Jumper pin x 3	It is used to enable debugging mode.

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# **1.4 Sample Project Code Sizes**

The tables below show the ROM, RAM, and maximum stack sizes for the sample projects included in the package associated with this application note. The values in the table below have been confirmed under the following conditions:

Compiler version: Renesas Electronics C/C++ Compiler for RX Family V3.06.00

#### CC-RX

- Optimization level: Size and execution speed (-Odefault)
- Delete variables/functions that have never been referenced (optimize=symbol\_delete)

#### Table 1.3 ROM, RAM, and Maximum Stack Sizes for Sample Project

	ROM, RAM, and	I Stack Codesize	
Device	Category	Memory Used (byte)	Remarks
RX65N	ROM	80267	ck_rx65n_v2_app
	RAM	44193	
	Stack	548	
	ROM	18982	ck_rx65n_v2_app_new
	RAM	8398	
	Stack	52	
	ROM	34198	ck_rx65n_v2_bootloader
	RAM	16279	_
	Stack	164	



# 2 Demo Project Setup

# 2.1 Hardware Setup

First, the following shows the overall configuration of hardware that makes up the demo project.



Figure 2.1 Hardware Connection

The following describes how to connect hardware.

- On the base board, position the jumper on **pins 1-2** of **J16** to enable debugging mode.
- Connect the DA16600 PMOD to PMOD1 on the base board.
- Connect **J20** on the base board to a PC using a USB cable for serial log.
- Connect **J14** on the base board to a PC using a USB cable for debugging.
- Connect the TXD pin of the UART TTL to pin 2 of J3 of the DA16600 Wi-Fi module.
- Connect the RXD pin of the UART TTL to pin 3 of J3 of the DA16600 Wi-Fi module.
- Connect the **GND pin** of the **UART TTL** to **pin 4** of **J3** of the DA16600 Wi-Fi module.

### 2.2 Software Setup

#### 2.2.1 Installing Tool

#### 2.2.1.1 Install Python

Python generates initialization firmware from bootloader and application projects, and application

firmware from the new application project.

Follow the steps below to install Python:

(1) Access the Python download web site.

Download Python | Python.org

(2) Download the Python 3.12.7 installer.

#### Click the **Download** link for Python 3.12.7.

Looking for a specific release?

Python releases by version number:

Release version	Release date		Click for more	
Python 3.10.16	Dec. 3, 2024	🕹 Download	Release Notes	A
Python 3.9.21	Dec. 3, 2024	🕹 Download	Release Notes	
Python 3.13.0	Oct. 7, 2024	🕹 Download	Release Notes	
Python 3.12.7	Oct. 1, 2024	🕹 Download	Release Notes	
Python 3.11.10	Sept. 7, 2024	🕹 Download	Release Notes	
Python 3.10.15	Sept. 7, 2024	📥 Download	Release Notes	
Python 3.12.6	Sept. 6, 2024	🕹 Download	Release Notes	
D. 44	C + C 2024		D.L. N.A	•

#### Figure 2.2 The Options for Installing the Release Version of Python

#### Download the installer for the operating system you are using.

Version	Operating System	Description	MD5 Sum	File Size	GPG	Sigstore	SBOM
Gzipped source tarball	Source release		5d0c0e4c6a022a87165a9addcd869109	25.8 MB	SIG	.sigstore	SPDX
XZ compressed source tarball	Source release		c6c933c1a0db52597cb45a7910490f93	19.5 MB	SIG	.sigstore	SPDX
macOS 64-bit universal2 installer	macOS	for macOS 10.13 and later	82711848a795f6d7b25e81844d5a9a3f	43.3 MB	SIG	.sigstore	
Windows installer (64-bit)	Windows	Recommended	b51e0889be50c55fbdd809f4ad587120	25.3 MB	SIG	.sigstore	SPDX
Windows installer (32-bit)	Windows		5d5452249401822cb3ad1bce7105d5fd	24.1 MB	SIG	.sigstore	SPDX
Windows installer (ARM64)	Windows	Experimental	19bdd2de8a7ccb6f1115f85bc54c1764	24.6 MB	SIG	.sigstore	SPDX
Windows embeddable package (64-bit)	Windows		4c0a5a44d4ca1d0bc76fe08ea8b76adc	10.6 MB	SIG	.sigstore	SPDX
Windows embeddable package (32-bit)	Windows		21a051ecac4a9a25fab169793ecb6e56	9.4 MB	SIG	.sigstore	SPDX
Windows embeddable package (ARM64)	Windows		6fc899d8dbd46dd2b585a038f7cf68a4	9.8 MB	SIG	.sigstore	SPDX

#### Figure 2.3 Python Windows Installer

#### 2.2.1.2 Installing OpenSSL

**OpenSSL** is a tool used to generate the cryptographic key pair required for firmware encryption and decryption during both initialization and application firmware creation. OpenSSL can generate the following keys for use in the firmware update process:

- Private key: Used to encrypt the firmware and ensure its integrity.
- **Public key**: Used by the bootloader to decrypt and verify the firmware during update.

Follow the steps below to install and configure OpenSSL for this purpose.

(1) Access the Win32/Win64 Download Website for OpenSSL

Win32/Win64 OpenSSL Installer for Windows - Shining Light Productions

(2) Download the OpenSSL Installer

Download the installer for the operating system you are using.

Win64 OpenSSL v3.0.12 Light <u>EXE   MSI</u>	5MB Installer	Installs the most commonly used essentials of Win64 C by the creators of <u>OpenSSL</u> ). Only installs on 64-bit ve chipsets. Note that this is a default build of OpenSSL a information can be found in the legal agreement of the
Win64 OpenSSL v3.0.12 <u>EXE   MSI</u>	140MB Installer	Installs Win64 OpenSSL v3.0.12 (Recommended for so <u>OpenSSL</u> ). Only installs on 64-bit versions of Windows this is a default build of OpenSSL and is subject to loca found in the legal agreement of the installation.
Win32 OpenSSL v3.0.12 Light EXE   <u>MSI</u>	4MB Installer	Installs the most commonly used essentials of Win32 C 32-bit OpenSSL for Windows. Note that this is a defau and state laws. More information can be found in the le
Win32 OpenSSL v3.0.12	116MB Installer	Installs Win32 OpenSSL v3.0, 12 (Only install this if you

#### Figure 2.4 The Options for Installing the Release Version of OpenSSL

(3) Run the Installer and Follow the Prompts to Install OpenSSL.

Select the option to copy the OpenSSL DLLs to the OpenSSL binaries directory.

(4) From the Start Menu, Open the Win64 OpenSSL Command Prompt.



Figure 2.5 OpenSSL Windows (64-bit)

(5) Confirm the OpenSSL Command from the Command Prompt.

Execute the following command and confirm that version information appears.



Figure 2.6 Checking OpenSSL Version



#### 2.2.1.3 Installing Renesas Image Generator

Renesas Image Generator is a tool that generates the firmware images used by the firmware update module. Renesas Image Generator can generate the following images for use by the firmware update module:

- Initial image: An image file containing the bootloader and application program written by flash writer during initial system configuration (extension: mot).
- Update image: An image file containing the updated firmware (extension: rsu).

Renesas Image Generator is provided as part of the Firmware Update FIT module.

(1) Download the Firmware Update Module:

RX Family Firmware Update module

(2) Extract the Downloaded Firmware Update Module

Extract the file RenesasImageGenerator.zip in the firmware update module.

The **RenesasImageGenerator** folder contains the Renesas Image Generator script file

(image-gen.py) and the parameter files for various devices (\*\_ImageGenerator\_PRM.csv).

	> Downloads > r01an6850xx0204-rx-fwup > Renesas	ImageGenerator >
	(i) (i) (i) Sort $\sim$ (ii) View $\sim$	
	Name	✓ Date modified
	✓ Earlier this week	
	RX72N_DualBank_ImageGenerator_PRM.csv	11/24/2024 10:26 PM
	RX72N_Linear_Full_ImageGenerator_PRM.csv	11/24/2024 10:26 PM
,	RX72N_Linear_Half_ImageGenerator_PRM.csv	11/24/2024 10:26 PM
,	RX671_Linear_Half_ImageGenerator_PRM.csv	11/24/2024 10:26 PM
,	💿 image-gen.py	11/24/2024 10:26 PM
	RX23EA_Linear_Full_ImageGenerator_PRM.csv	11/24/2024 10:26 PM
	RX23EA_Linear_Half_ImageGenerator_PRM.csv	11/24/2024 10:26 PM

Figure 2.7 Renesas Image Generator Package

#### 2.2.1.4 Installing Tera Term

Terminal software (example: Tera Term) is required to output demo project logs. The following show the serial port settings.

(1) Access the Tera Term Download Site.

Releases · TeraTermProject/osdn-download · GitHub

(2) Download the Tera Term Installer.

Tera Term 5.0 (Latest)		
Source code is not available. Tera Term 5.0 is available <u>here</u> .		
▼Assets s		
𝔅teraterm-5.0.exe	8.29 MB	Oct 15, 2023
𝔅teraterm-5.0.zip	10.7 MB	Oct 15, 2023
𝔅teraterm-5.0_pdb.zip	15.1 MB	Oct 15, 2023
Source code (zip)		Jul 12, 2023
Source code (tar.gz)		Jul 12, 2023
4 23 23 people reacted		

#### Figure 2.8 Tera Term Version 5.0

- Run the installer and follow the prompts to install Tera Term.
- Confirm that Tera Term starts when you click the Tera Term icon in the Start menu.



#### 2.2.1.5 Installing Renesas Flash Programmer

**Renesas Flash Programmer (RFP)** is a utility provided by Renesas that allows users to write firmware to support Renesas MCUs via various interfaces such as USB, UART, or serial programming. It is an essential tool for flashing both the initial firmware and subsequent updates during development and production. Follow the steps below to install Renesas Flash Programmer on your computer.

(1) Access the Renesas download web site.

Renesas Flash Programmer (Programming GUI)

# Downloads

All Types	✓ Q Start typing to filter results by title	
Туре 🗘	Title 🗘	Date 🗘
Software & Tools - Evaluation Software	Renesas Flash Programmer V3.17.00 Linux(x64) 合 Log in to Download TGZ 42.07 MB 日本語	Oct 22, 2024
Software & Tools – Evaluation Software	Renesas Flash Programmer V3.17.00 Windows Log in to Download ZIP 83.00 MB 日本語	Oct 22, 2024
Software & Tools - Evaluation Software	Renesas Flash Programmer V3.17.00 macOS(ARM64)	Oct 22, 2024

Figure 2.9 Renesas Flash Programmer



### 2.2.2 Terminal Software Setting

- ✤ With the UART TTL connection port of the DA16600:
- (1) Open Tera Term select **New connection** and select Serial and the appropriate COM port for your **UART-to-USB** adapter, and **click OK**

	Service:	History Telnet	ТСР рог	rt#: 22	
		O SSH	SSH version:	SSH2	~
	O Other Protocol: UNS	UNSPEC	~		
• Serial	Port:	COM6: Silico	on Labs CP210x l	JSB to UA	F ~

Figure 2.10 Tera Term Serial Connection

(2) Click Setup > Terminal..., in "New-line" section, set "Receive" as AUTO.

Tera Term: Terminal	setup					×
Terminal size				New-line	OK	
80	×	24		Receive:	AUTO ~	
Term size = win size				Transmit:	CR ~	Cancel
🗆 Auto w	indow	resize				
Terminal ID: VT100 ~		~	Local echo			
Answerba	ck:			Auto	switch (VT<-:	>TEK)
Coding (re UTF-8	eceive)			Coding UTF-8	) (transmit) I v	
lo	cale: a	america	เท	C	CodePage: 6	5001

Figure 2.11 Terminal Setup for the UART TTL

(3) Click **Setup > Serial port...** and ensure that the speed is set to **230400**.

Tera Term: Serial port setup			×
Port:	сомз	~	ок
Speed:	230400	~	
Data:	8 bit	~	Cancel
Parity:	none	~	
Stop bits:	1 bit	~	Help
Flow control:	none	~	
Transmit delay			
0 msec	/char 0	mse	ec/line

Figure 2.12 Serial Port Setup for UART TTL

(4) Verify the display output on the terminal.

Pressing Enter on the terminal will display the line [/DA16600] # on the screen.

M	COM6	- Tera Te	erm VT			_	×
File	Edit	Setup	Control	Window	Help		
[⁄DA	1660	0] #					
							1

Figure 2.13 UART TTL Terminal

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- ✤ With the USB serial connection of CK-RX65N v2:
- (1) Open an additional Tera Term window, **select New Connection**, then choose Serial and the correct COM port for your **USB Serial** device, and **click OK**.

○ T CP/IP	Host:	myhost.exar	nple.com		$\sim$
	Service:	History Telnet	ТСР ро	rt#: 22	
		O SSH	SSH version:	SSH2	~
		O Other	Protocol:	UNSPEC	~
• Serial	Port:	COM3: USB	Serial Device (C	омз)	~

Figure 2.14 Select USB Serial Port

(2) Click Setup > Terminal..., select "New-line Receive" as AUTO. and tick the "Local echo" option.

Tera Term: Terminal setup	×
Terminal size	New-line OK
80 × 24	Receive: AUTO
Term size = win size	Transmit: CR  V Cancel
Auto window resize Terminal ID: VT100 ~	E Local echo
Answerback:	□ Auto switch (VT<->TEK)
Coding (receive) UTF-8 v	Coding (transmit) UTF-8
locale: american	CodePage: 65001

Figure 2.15 Terminal Setup

Sneed:	115200	~	ок
Data:	8 bit	~	Cancel
Parity:	none	~	
Stop bits:	1 bit	~	Help
Flow control:	none	~	
Transmit delay	/		

(3) Click **Setup > Serial port...** and ensure that the speed is set to **115200**.

Figure 2.16 Terminal Setup for USB Serial Port

(4) Verify the display output on the terminal.

The terminal output will appear here during the demo execution.





#### 2.2.3 Check DA16600 Wi-Fi SDK Version

(1) On the UART TTL terminal in Tera Term, type the command "ver".

🧧 COM6 - Tera Term VT	-	×
<u>File Edit Setup Control Window H</u> elp		
<pre> [/Del6600] # [/Del6600] # [/Del6600] # ver  ***********************************</pre>		
[/DA16600] #		

Figure 2.18 Check SDK Version

- (2) Check the SDK version. If the current version is **v3.2.9.2** or higher, you can proceed to the next step; otherwise, follow the steps below to upgrade:
  - Download the firmware using this link.
     DA16600 DA16200 SDK Image.
  - Flash the new firmware via Tera Term by following the instructions provided in the <u>UM-WI-056</u> <u>DA16200 DA16600 FreeRTOS Getting Started Guide</u> under Section 4.5.2 Using Macro Script of Tera Term.



### 2.2.4 Generate Key Pairs and Certificates

This section will generate a public key and a private key to create the initial firmware and the firmware used for updates.

To do this, open OpenSSL and enter the commands highlighted in yellow to generate the firmware verification keys.

openssl ecparam -genkey -name secp256r1 -out secp256r1.keypair						
using curve name prime256v1 instead of secp256r1						
openssl ec -in secp256r1.keypair -outform PEM -out secp256r1.privatekey						
read EC key						
writing EC key						
openssl ec -in secp256r1.keypair -outform PEM -pubout -out secp256r1.publickey						
read EC key						
writing EC key						



#### 2.2.5 **Project Description**

The demo project is structured into multiple components to support the firmware update process. Each component plays a specific role in demonstrating the OTA update mechanism on the RX65N platform.

- ck-rx65n-app: The existing application that the MCU runs before the firmware update process begins.
- **ck-rx65n-bootloader**: The bootloader responsible for handling the firmware update process.
- **ck-rx65n-app-new**: The new application that the MCU runs after the firmware update is successfully completed.

👼 ck-rx65n-app	3/18/2025 4:20 PM	File folder
🦻 ck-rx65n-app-new	12/20/2024 3:34 PM	File folder
👼 ck-rx65n-bootloader	3/18/2025 4:22 PM	File folder

#### Figure 2.19 The Project Folder Structure Consists of Three Main Components



## 2.2.6 Importing The Demo Project

- (1) Clone the demo project
- (2) Extract the demo project
- (3) Start e2 studio
- (4) From the **File** menu, select **Import**

File	Edit Source Refactor Navigate	Search Project	Renesas Views	Ru
~	New Open File	Alt+Shift+N >		
	Recent Files	>		
	Close Editor	Ctrl+W		
	Close All Editors	Ctrl+Shift+W		
	Save	Ctrl+S		
	Save As			
0	Save All	Ctrl+Shift+S		
	Revert			
	Move			
ľ	Rename	F2		
8	Refresh	F5		
	Convert Line Delimiters To	>		
8	Print	Ctrl+P		
20	Import			
4	Export			

Figure 2.20 Importing the Project



#### (5) Select Existing Projects into Workspace



Figure 2.21 Select Existing Projects into Workspace

(6) In **Select root directory**, select the folder extracted, select the check boxes for the following projects, and then click **Finish** 

Mimport 🕈					
mport Projects Select a directory to search fo	or existing Eclipse projects.			1,	
Select root directory:	your workspace	\ota_ck_m	(65n_wifi_da_1660)	)_app\demo_project	Browse
Select archive file:					Browse
rojects:					
ck-rx65n-app (C:\User	s\svantruong\e2_studio\Workspa	ace12\ota_ck_rx65n	_wifi_da_16600_ap	p\demo_project\CkRx65	Select All
ck-rx65n-app-new (C:\	Users\svantruong\e2_studio\Wo	vrkspace12\ota_ck_r	x65n_wifi_da_1660 k rx65n wifi da 16	0_app\demo_project\Ck	Deselect All
	e. tosets (stantinonig (ez_stanto (	nonspace is long_c	<	ooo_app (aemo_project)	Refresh
Options					
Search for nested project	s				
Copy projects into works	pace				
Hide projects that already	y exist in the workspace				
_ mae projects that alleady					
Working sets					
Working sets	sets				New
Working sets Add project to working Working sets:	sets			~	New Select
Working sets Add project to working Working sets:	sets			3	New Select

Figure 2.22 Complete Import Project

#### 2.2.7 Create Firmware File and Upload to the Amazon S3 Bucket

#### 2.2.7.1 Create Firmware File

(1) Build the **ck-rx65n-app-new** project.

For guidance on building this project, please refer to section 4.2 'Build a Sample Project' in the <u>E2</u> <u>Studio IDE User's Manual: Quick Start Guide</u> (R20UT5293).

#### (2) Copy the file ck-rx65n-app-new.mot from the folder

\ota\_ck\_rx65n\_wifi\_da\_16600\_app\demo\_project\ck-rx65n-app-new\HardwareDebug to the RenesasImageGenerator folder that you downloaded in Section 2.2.1.3.



Figure 2.23 Put MOT File to the RenesasImageGenerator Folder



(3) Copy the **secp256r1.privatekey**, which is used to sign the image for authenticity and was generated in **Section 2.2.4** to the **RenesasImageGenerator** folder that was downloaded in **Section 2.2.1.3**.

RenesasImageGenerator × +							
> Downloads > r01an6850xx0204-rx-fwup > RenesasImageGenerator	Search RenesasImageGenerator						
▲ Image: A Sort ~ Image: Sort ~ Image: A Sort ~ Image:							
Last month							
ck-rx65n-app-new.mot RX72N_DualBank_ImageGenerator_PRM.csv	RX140_Linear_Half_ImageGenerator_PRM.csv						
RX72N_Linear_Full_ImageGenerator_PRM.csv	RX231_Linear_Full_ImageGenerator_PRM.csv						
RX72N_Linear_Half_ImageGenerator_PRM.csv	RX231_Linear_Half_ImageGenerator_PRM.csv						
RX671_Linear_Half_ImageGenerator_PRM.csv	RX261_Linear_Full_ImageGenerator_PRM.csv						
💿 image-gen.py	RX261_Linear_Half_ImageGenerator_PRM.csv						
RX23EA_Linear_Full_ImageGenerator_PRM.csv	RX660_Linear_Full_ImageGenerator_PRM.csv						
RX23EA_Linear_Half_ImageGenerator_PRM.csv	RX660_Linear_Half_ImageGenerator_PRM.csv						
RX23EB_Linear_Full_ImageGenerator_PRM.csv	RX671_DualBank_ImageGenerator_PRM.csv						
RX23EB_Linear_Half_ImageGenerator_PRM.csv	RX671_Linear_Full_ImageGenerator_PRM.csv						
RX24T_Linear_Full_ImageGenerator_PRM.csv	secp256r1.privatekey						
RX24T_Linear_Half_ImageGenerator_PRM.csv							
RX26T_DualBank_ImageGenerator_PRM.csv							

Figure 2.24 Put Private Key to the RenesasImageGenerator Folder



(4) Open a command prompt, navigate to the **Renesas Image Generator** folder, and run the command below to install the **pycryptodome** library — required for encryption and signing operations during firmware processing (skip if already installed):

#### <mark>pip install pycryptodome</mark>



Figure 2.25 Install Python Library

(5) Open a command prompt, navigate to the Renesas Image Generator folder, and execute the following command to generate the file **app\_new.rsu**. This file will be uploaded to the bucket as the new firmware that the device will download.



Figure 2.26 Generate the app\_new.rsu File

**RX** Family

#### (6) Get the size of the app\_new.rsu file

This parameter is used to configure the firmware size and will be referenced in **Section 2.2.8.1**.

Follow the steps below to obtain accurate results:

- Right-click on the file app\_new.rsu.
- Select Properties.
- In the General tab, you will see Size

📋 app_new.rsu 📃 Edit in Notepad	app new.rsu Properties
🗋 ck-rxp5n-app-new.nx 襘 WinMerge	
🗟 image-gen.py 🚺 📑 Compare using MobaDiff	General Digital Signatures Security Details Previous Versions
🖾 RX23E Linear_Full_Ir 👂 Edit with MobaTextEditor	
RX23EA Linear_Half_I Add to Favorites	⊘ app_new.rsu
RX23EB_Linear_Full_In 7-Zip	· · · · · · · · · · · · · · · · · · ·
📧 RX23EB_Linear_Half_II 👛 Select Left File for Compare	⊘ Type of file: RSU File (.rsu)
😰 RX24T_Linear_Full_Im 🎈 Scan with Microsoft Defender	Opens with: J Pick an app Change
RX24T_Linear_Half_In Give access to	⊘
RX26T_DualBank_Ima	C:\Users\svantruong\OneDrive - Hitachi Vantara\Des
RX26T_Linear_Full_Im. TortoiseGit >	Size: 31.1 KB (31.872 bytes)
🛯 RX26T_Linear_Half_Im 🖓 TortoiseSVN >>	Ø
RX65N_DualBank	Size on disk: 32.0 KB (32,768 bytes)
RX65N_Linear_Full_m	$\odot$
RX65N_Linear_Half_n Assare	✓ Greated: Wednesday, March 5, 2025, 5:43:32 PM
Restore previous versions	Modified: Wednesday, March 5, 2025, 5:43:32 PM
RX66T_Linear_Half_Im Send to >	Accessed: Today, March 17, 2025, 8 minutes ago
RX72N_DualBank_Imi     Cut	· · · · · · · · · · · · · · · · · · ·
RX72N_Linear_Full_Im     Conv	Attributes: Read-only Hidden Advanced
RX72N_Linear_Half_In	
RX130_Linear_Full_Im     Create shortcut	$\odot$
RX130_Linear_Half_Im Pelete	$\odot$
Rename	
Properties	OK Cancel Apply

Figure 2.27 Get Size of the Firmware



#### 2.2.7.2 Upload Firmware to Amazon S3 Bucket

#### 2.2.7.2.1 Create Amazon S3 Bucket

 Access the AWS web site (<u>Cloud Computing Services - Amazon Web Services (AWS)</u> and click Sign In to the Console.



Figure 2.28 Sign-In to Console AWS

(2) Enter your email address or account ID, and then click **Next.** 

If you are using the root account to sign in, select the "Sign in using root user email" option and enter the email address of the root account. If you are an IAM user, enter the **Account ID** (12-digit number or account alias), **IAM username**, and **Password** in the corresponding fields.

IAM user sign in 🚯	AWSID	r
Account ID (12 digits) or account alias	re: II IVEI IL	
IAM username	Tune in for free	
Password	biggest AWS	
Show Password Having trouble?	updates this year.	
Sign in	DECEMBER 2-6, 2024   LAS VEGAS, NEVADA	Man
Sign in using root user email		
Create a new AWS account		
Remember this account		

#### Figure 2.29 User Sign-In

(3) After logging in to AWS, select your region in the top right of the screen.

<u>ک</u> ک	🕐 😫 Tokyo 🔺
United States	
N. Virginia	us-east-1
Ohio	us-east-2
N. California	us-west-1
Oregon	us-west-2
Asia Pacific	
Mumbai	ap-south-1
Osaka	ap-northeast-3
Seoul	ap-northeast-2
Singapore	ap-southeast-1
Sydney	ap-southeast-2
Токуо	ap-northeast-1

Figure 2.30 Setting Region in AWS

(4) From the **Services** menu, select **Storage** and then **S3**.

III Q Search	[Alt+5]
Recently visited Favorites	Storage ×
All applications All services	AWS Backup AWS Backup centrally manages and automates backups across AWS services
Analytics Application Integration	EFS Managed File Storage for EC2
Blockchain	AWS Elastic Disaster Recovery
Business Applications	Scalable, cost-effective application recovery to AWS
Cloud Financial Management	FSx
Compute	Fully managed third-party file systems optimized for a variety
Containers	O WORKDADS
Customer Enablement	53
Database	Scalable Storage in the Cloud
Developer Tools	53 Glacier
End User Computing	Archive Storage in the Cloud
Front-end Web & Mobile	Storage Gateway
Game Development	Hybrid Storage Integration
Internet of Things	
Machine Learning	
Management & Governance	
Media Services	
Migration & Transfer	
Networking & Content Delivery	
Quantum Technologies	
Robotics	
Satellite	
Security, Identity, & Compliance	
Storage	

Figure 2.31 S3 AWS Bucket

(5) On the **Buckets** page, click the **Create bucket** button.

Amazon S3 > Buckets		0 1	6
Amazon S3	Account snapshot - updated every 24 hours All AWS Reg Storage lens provides visibility into storage usage and activity trends. Met General purpose buckets Directory buckets	Ions View Storage Lens dashboard trics don't include directory buckets. Learn more	)
Access Points Object Lambda Access Points Multi-Region Access Points Batch Operations IAM Access Analyzer for S3	General purpose buckets (9) Info All AWS Regions Buckets are containers for data stored in S3. Q Find buckets by name	Create bucket	
	Name   AWS Region	▼     IAM Access Analyzer     Creation date     ▼	

#### Figure 2.32 Create a Bucket

(6) Enter an S3 Bucket name.

Amazon S3 > Buckets > Create bucket

# Create bucket Info

Buckets are containers for data stored in S3.

General configuration	
AWS Region	
Asia Pacific (Tokyo) ap-northeast-1	
Bucket type Info	
• General purpose Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple Availability Zones.	O Directory Recommended for low-latency class, which provides faster pro
Bucket name Info	
myawsbucket	
Bucket name must be unique within the global namespace and follow the bucket naming rules. See rules for b	ucket naming [
Copy settings from existing bucket - <i>optional</i>	
Choose bucket	
Format: s3://bucket/prefix	

#### Figure 2.33 Create a Bucket Name

(7) Disable Block all public access.



#### Figure 2.34 Configure Public Access

(8) Create Bucket.



Figure 2.35 Create Bucket

#### 2.2.7.2.2 Upload the Firmware File to the Amazon S3 Bucket

(1) Choose your S3 bucket, and then click **Upload**.

Amazon S	3 > Bucket	s > s3pocdem	o-public	0
s3	pocdem	10-public	Info	
_	Objects	Properties	Permissions Metrics Management Access Points	
	Objects (	5) Info	Create folder	

#### Figure 2.36 Uploading the Firmware File

(2) Click on **Add File**, then select the firmware you created in the previous section. Double-check to ensure it is the correct firmware before clicking **Upload**.

	Drag and drop files and fold	lers you want to upload here, or choose Add fi	les or Add folder.	
Files and folders (1 tota	al. 31.1 KB)		Remove Add files	Add folder
All files and folders in this table v	vill be uploaded.			
Q Find by name				< 1
✓ Name	▼   Folder	▼   Type	▼ Size	7
app_new.rsu 2	-	-	31.1 KB	
Destination Info				
Destination Info				
Destination Info Destination s3://s3pocdemo-public [2] > Destination details				
Destination Info Destination s3://s3pocdemo-public [3] > Destination details Bucket settings that impact new of	bjects stored in the specified destination.			
Destination Info Destination 53://s3pocdemo-public [3] > Destination details Bucket settings that impact new of Permissions	bjects stored in the specified destination.			
Destination Info Destination s3://s3pocdemo-public [2] > Destination details Bucket settings that impact new of Permissions Grant public access and access to other	bjects stored in the specified destination.			
Destination Info Destination s3://s3pocdemo-public [3] > Destination details Bucket settings that impact new of Permissions Grant public access and access to other Properties Sectify storage class, encryption settif	bjects stored in the specified destination. r AWS accounts. nos. tags. and more.			
Destination Info Destination s3://s3pocdemo-public [2] > Destination details Bucket settings that impact new of Permissions Grant public access and access to othe Properties Specify storage class, encryption settin	bjects stored in the specified destination. r AWS accounts. 195, tags, and more.			3,



(3) Update S3 bucket permissions.

> Buckets > s3pocdemo-public
ects Properties Permissions Metrics Management Access Points
rmissions overview
ess finding ss findings are provided by IAM external access analyzers. Learn more about <u>How IAM analyzer findings work</u> [ <sup>2</sup> ] v analyzer for ap-northeast-1
ock public access (bucket settings)
ic access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to all your 53 buckets and objects is blocked, turn on Block a ic access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correc out public access. If you require some level of public access to your buckets or objects within, you can customize the individual settings below to suit your specific storage use cases. Learn more
k all public access
ndividual Block Public Access settings for this bucket
Liket policy written in JSON, provides access to the objects stored in the bucket. Bucket policies don't apply to objects owned by other accounts. Learn more [2]

#### Figure 2.38 Update S3 Bucket Permission

(4) Update the policy for the S3 bucket permissions.

See below figure and ensure you enter your bucket name





Figure 2.39 Update Policy for S3 Bucket Permission

RENESAS

(5) Save the changes.

"Version": "2012-10-17", ▼ "Statement": [	Edit statement
<pre>{     "Sid": "PublicReadGetObject",     "Effect": "Allow",     "Principal": "*",     "Action": "S3:GetObject",     "Resource": "arn:aws:s3:::s3pocdemo-public/*"   } } </pre>	Select a statement Select an existing statement in the policy or add a new statement. Add new statement
anuity 0 (R) Errors: 0 A Warnings: 0 O Supportings: 0	Preview external access

Figure 2.40 Save Policy

- (6) Get the Object URL of the firmware you just uploaded.
  - 1. On the **Objects** page of your S3 bucket, locate and select your firmware file (app\_new.rsu).
  - 2. Click **Copy URL** to copy the file's download link.

Objects Properties	Permissions Metrics	Management Access Poi	nts		
Objects (5) Info		🖞 Copy URL 👱 Download (	Open 🖸 Delete	Actions 🔻 Create folder	Upload
Objects are the fundamental entiti grant them permissions. Learn more	es stored in Amazon S3 You ca re 🖸 2	an use Amazon S3 inventory 🖸 to get a	list of all objects in your bucket.	For others to access your objects, you'll need to	explicit
Q Find objects by prefix				< 1	> €
Name	<ul> <li>Туре</li> </ul>	▼   Last modified	▼   Size	▼ Storage class	
	rsu	November 11, 2024, (UTC+07:00)	16:07:57	53.1 KB Standard	
app_new.rsu	rsu	November 25, 2024, (UTC+07:00)	15:01:20	31.1 KB Standard	

Figure 2.41 Get Firmware URL

<u>Note:</u> The URL obtained from AWS will be used to configure in the **Section 2.2.8.1**, so make sure to save it.

#### 2.2.8 Create Firmware Initialization

#### 2.2.8.1 Building CK-RX65N Application Project

(1) Configure firmware version, Wi-Fi, firmware type, and URL in demo\_config.h at

#### \ota\_ck\_rx65n\_wifi\_da\_16600\_app\demo\_project\ck-rx65n-app\src\demo\_config

erine Ar_wiri_0010	SSID /* WI-FI NETWORK SSID */	SSID
@brief Wi-Fi network passwor Set this to the password req	rd. quired to join your Wi-Fi network.	
*/ define AP_WIFI_PASSWORD	"PASSWORD" /* Wi-Fi password */	PASSWORD
* @brief Firmware URL. * * The URL where the firmware u	update is hosted. Used for downloading the firmw	vare.
*/ define URL_FW	"URL_FW"	Firmware URL from AWS
/ /# * @brief Size of firmware .	"URL_FW"	Firmware URL from AWS

#### Figure 2.42 Configure Firmware Version, Wi-Fi Network, and Firmware URL

- Check the current firmware version.
- AP\_WIFI\_SSID: Set the access point name (SSID) of the local Wi-Fi network that the board will connect to.
- AP\_WIFI\_PASSWORD: Set the password for the local Wi-Fi network
- URL\_FW: Firmware URL from AWS S3 bucket. Refer to **Section 2.2.7.2.2**.
- SIZE\_OF\_FW: The size of the firmware uploaded to the AWS S3 bucket. Refer to Step (6): Get the Object URL of the firmware you just uploaded in Section 2.2.7.2.2.

(2) Building the project.



#### 2.2.8.2 Building CK-RX65N Bootloader Project

#### (1) Update public key

Since the Renesas Image Generator is used to create the initial firmware, the public key must be pasted into the bootloader project to match the private key located in the Renesas Image Generator folder. This ensures that the initial firmware can be generated successfully. Follow the instructions below to complete this setup

- 1. Copy the contents of the **secp256r1.publickey** file you created in Section 2.2.4
- 2. Paste the public key into CODE\_SIGNENR\_PUBLIC\_KEY\_PEM in

\ota\_ck\_rx65n\_wifi\_da\_16600\_app\demo\_project\ck-rx65n-bootloader\src\key\code\_signer\_public\_key.h.



#### Figure 2.43 Assign a Public Key to Bootloader Project

(2) Building the project.

#### 2.2.8.3 Creating the Initial Firmware

This section is used to create the initial firmware(**userprog.mot**), which is executed on the MCU before the

Over-The-Air process begins. Follow the setup steps below to generate the initial firmware correctly:

(1) Place the following files in the Renesas Image Generator folder:

- The results of the build process in Section 2.2.8.1: ck-rx65n-app.mot
- The results of building the bootloader in Section 2.2.8.2: ck-rx65n-bootloader.mot
- The private key created in Section 2.2.4: secp256r1.privatekey

#### (2) Use Renesas Image Generator to generate the initial firmware

Open a command prompt, navigate to the Renesas Image Generator folder, and execute the following command to generate the file **userprog.mot**.



#### Figure 2.44 Create the Initial Firmware

#### Parameter explanation:

- **-iup**: Input user program (.mot file for application firmware)
- **-ip:** Input parameter file (.csv with image generation settings)
- **-o:** Output file prefix (e.g., userprog.mot)
- **-ibp:** Input bootloader program (.mot file)
- **-key:** Private key file for signing the firmware
- **-vt:** Verification type (e.g., ecdsa for digital signature)
- **-ff:** Firmware format (e.g., RTOS)



# 3 Execute the Demonstration Project

(1) Start the Renesas Flash Programmer and open the **flash.rpj** project.

This step is used to add the **flash.rpj** file to Renesas Flash Programmer, which is used to flash the initial firmware to the target board.

Follow the steps below to complete the setup. To open the project, select **File > Open Project**.

The **flash.rpj** (project is located in the following folder of the sample program:

\ota\_ck\_rx65n\_wifi\_da\_16600\_app\flash\_project.

Renesas Flash Programmer V3.1	5.00 — X		
File Target Device Help	Please specify the project file.		×
Operation Operation Settings Block S Project Information	$\leftarrow \rightarrow \vee \uparrow$	Search flash_project	Q
Current Project: rx65n_prj.r,	Organize 👻 New folder	≣ ▼	
Microcontroller: RX Group	Documents 🖈 Name	Date modified	Туре
Program Files C:\Users\svantruong\OneDrive - CRC-32: F4FE3849	Pictures <ul> <li>erase.rpj</li> <li>Music</li> <li>flash.rpj</li> </ul> Videos <ul> <li>flash.rpj</li> </ul>	11/26/2024 4:16 PM 3/5/2025 5:35 PM	RPJ File RPJ File
Command	Screenpresso test		
Erase >> Program >> Venty	HardwareDebug HardwareDebug Kenesas Electroni This PC		
Renesas Flash Programmer V3.15.00 [ Loading Project (C:¥Users¥svantruong ¥rx65n_prj¥rx65n_prjrpj)	Local Disk (C:)		
	File <u>n</u> ame: rx65n_prj.rpj	Project files (*.rpj)       Open	Cancel .::
	Clear status and message		

Figure 3.1 Open the flash\_project.rpj Project

RX Family

#### (2) Select the initial firmware (userprog.mot)

Perform this step to flash the initial firmware to the MCU, which **userprog.mot** (created in **Section 2.2.8.3**) is the initial firmware.

🕌 Renesas Flash Programm	ner V3.15.00	—	×	
File Target Device Hel	p			
Operation Operation Settings	Block Settings Connect Setting	gs Unique Code		
Project Information Current Project: flas Microcontroller: RX	shupj K Group	Endian: Little	~	
Program Files				
		1 Add/Remove Files		
Commar 🛃 File Details	C		×	
		Add File(s) Remove Selected	f File(s)	
File Name		Type Address/0	Offset	
	📓 Please specify the prog	ram file.		×
Renesas Flas Loading Proje ¥rx65n_prj¥rx Loading Proje	$\leftarrow \rightarrow \sim \uparrow$	🦳 « Rene > Renesasl 🗸	C Search Rene	saslmageGenerator 🔎
¥flashrpj)	Organize 🔻 New fol	der		≣ ▼ 🔲 😮
	A Home	Name	Status	Date modified
	🔁 Gallery	🗋 ck-x65n-app.mot	$\odot$	3/5/2025 9:52 AM
	lesson - Hitachi Van	ck-n65n-app-new.mot	$\odot$	12/11/2024 11:17 AM
		ck-rx 5n-bootloader.mot	0	3/5/2025 1:55 PM
	🛄 Desktop 🔹 🖈	userprog.mot	$\odot$	3/5/2025 5:24 PM
	🚽 Downloads 🖈 🛛			
	📑 Documents 🖈			
	Pictures 🖈			
	🕖 Music 🔹 🖈			
	🛂 Videos 📌			
	Screenpresso			
	File	<u>n</u> ame:	~ At support	ed files (*.hex;*.mot;
			4 <u>Open</u>	Cancel

Figure 3.2 Select the Initial Firmware

(3) Click "**Start**" to begin flashing the initial firmware.

💒 Renesas Flash Programmer V3.15.00		-		×
<u>File</u> Target <u>D</u> evice <u>H</u> elp				
Operation Operation Settings Block Settings Connect Settings Unique Code				
Project Information Current Project: flash.rpj Microcontroller: RX Group	Endian:	Little	~	
Program Files	-			
CPC-32-EAEE3949	Add /	erator\use Remove Fi	iles	
CNC-32. F4FE3043	<u>M</u> uu/1	temove n	103	
Command				
Erase >> Program >> Verify	_			
<u>S</u> tart OK				
[Code Flash 1] 0xFFEFFF80 - 0xFFF0F7FF size : 62.1 K [Code Flash 1] 0xFFFEFF80 - 0xFFFF87F size : 62.3 K [Code Flash 1] 0xFFFFFF80 - 0xFFFFFFFF size : 128				
[Code Flash 1] 0xFFEFFF80 - 0xFFF0F7FF size : 62.1 K [Code Flash 1] 0xFFFEFF80 - 0xFFFF87F size : 62.3 K [Code Flash 1] 0xFFFFF80 - 0xFFFFFFFF size : 128 Writing data to the target device [Config Area 1] 0xFE7F5D00 - 0xFE7F5D2F size : 48 [Config Area 1] 0xFE7F5D40 - 0xFE7F5D7F size : 64				
[Code Flash 1] 0xFFEFFF80 - 0xFFF0F7FF       size : 62.1 K         [Code Flash 1] 0xFFFEFF80 - 0xFFFF87F       size : 62.3 K         [Code Flash 1] 0xFFFFF80 - 0xFFFFFFF       size : 128         Writing data to the target device       [Config Area 1] 0xFE7F5D00 - 0xFE7F5D2F       size : 48         [Config Area 1] 0xFE7F5D40 - 0xFE7F5D7F       size : 64         Verifying data       [Config Area 1] 0xFE7F5D00 - 0xFE7F5D2F       size : 48         [Config Area 1] 0xFE7F5D00 - 0xFE7F5D2F       size : 64				
[Code Flash 1] 0xFFEFFF80 - 0xFFF0F7FF       size : 62.1 K         [Code Flash 1] 0xFFFEFF80 - 0xFFFF87F       size : 62.3 K         [Code Flash 1] 0xFFFFF880 - 0xFFFFFFF       size : 128         Writing data to the target device       size : 128         [Config Area 1] 0xFE7F5D00 - 0xFE7F5D2F       size : 48         [Config Area 1] 0xFE7F5D40 - 0xFE7F5D7F       size : 64         Verifying data       [Config Area 1] 0xFE7F5D40 - 0xFE7F5D2F         [Config Area 1] 0xFE7F5D40 - 0xFE7F5D7F       size : 48         [Config Area 1] 0xFE7F5D40 - 0xFE7F5D7F       size : 64         Disconnecting the tool       Operation completed.				

Figure 3.3 Flash Initial Firmware

(4) Check if the Wi-Fi is connected.

When the terminal displays the message highlighted in the image below, it indicates that the Wi-Fi connection has been successfully established. Refer to **Figure 3.4** for more details.

COM6 - Tera Term VT	_	×
File Edit Setup Control Window Help		
Connection COMPLETE to 12:7b:c8:a8:e1:93		
DHCP Client WLAN0: SEL(6)		
THE USER GAIL-DACK : Success to connect W1-F1		
DHCP Client WLANO: CHK(8)		
DHCP Client WLANU: BOUND(10) Assigned addw : 192 168 8 64		
netmask : 255.255.0		
gateway : 192.168.8.1		
DNS addr : 8.8.8.8		
DHCP Server IP : 192.168.8.1		
Lease Time : 04h 00m 00s Papaual Tima : 02h 00m 00s		
DUCD CLASSE UTANO, CEL(C)		
DHCF Client WLHND: SEL(6)		
DHCP Client Started WLANO.		
DHCP Client WLHND: KEQ(1) DHCP Client WLAND: CHK(8)		
DHCP Client WLANO: BOUND(10)		
Assigned addr : 192.168.8.64		
gateway : 192.168.8.1		
DNS addr : 8.8.8.8		
DHCP Service IP : 192 168 8 1		
Lease Time : 04h 00m 00s		
Renewal Time 🛛 : 02h 00m 00s		

Figure 3.4 Active Wi-Fi Connection

If the message shown in the image below does not appear in the terminal, it means the Wi-Fi connection is inactive or has not been established. Refer to **Figure 3.5** for more details.



- (5) Request to update the firmware.
  - 1. Waiting for the network connection to be successfully established (see Figure 3.6).

2. Using the PC keyboard, select the terminal window and type the following string: update, then press Enter. This sends the string via the USB serial connection of the CK-RX65N v2 in Tera Term.



Figure 3.6 Send a Signal to Request a Firmware Update



(6) Observe the Firmware Update Over-the-Air process

The firmware update process starts with progress messages such as 10%, 20%, up to 100% (indicating that percent of flash memory blocks that was written new firmware) displayed in the terminal. **Upon successful completion**, the firmware is updated from **1.0.0** to **1.0.1**. If an error occurs during the update, the MCU automatically resets, and the previous stable firmware version is retained.

COM3 - Tera Term VT	-	Х
<u>Eile Edit Setup Control Window H</u> elp		
Firmware version 1.0.0		
Velcome to Yoc-Demo Waiting for network connection to be established		
Network connected successfully		
Please input "update" to start demo:		
npuate Request Download is successful.		
Request Transfer is successful.		
Start Reprogramming		
Firmware update: 10 % complete.		
Firmware update: 40 × complete.		
Firmware update: 50 % complete.		
Firmware update: 60 % complete.		
Firmware update: 70 % complete.		
rirmware update: 80 % complete.		
Firmware update: 100 × complete.		
Firmware writing completed.		
Congratulations! Firmware Updated Successfully.		
Reset device		
Firmware version 1.0.1		
Check the LEDs on the board.		

Figure 3.7 OTA Result

Remark: Successfully updated the version from 1.0.0 to 1.0.1.



# 4 Appendix

### 4.1 Known Issues for DA16600

#### 4.1.1 Firmware Size Limit Causes Update Failure

The DA16200/DA16600 SDK V3.2.9.2 restricts firmware downloads from the server to under 256 KB. Attempting to download firmware exceeding this limit results in an error, preventing successful completion. This affects users needing larger firmware updates.

- OTA Update : <MCU\_FW> Download - Start - OTA: <MCU\_FW> FW size error. (Allowable size = 262143, Receiving size = 1048576)

#### Figure 4.1 Error Log

#### 4.1.2 Resolution

(1) Download DA16200/DA16600 FreeRTOS SDK V3.2.9.2

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Download the DA16200/DA16600 FreeRTOS SDK V3.2.9.2

(2) Importing DA16600 FreeRTOS SDK Project into e2 studio.

Importing the DA16600 FreeRTOS SDK Project into e2 studio is similar to importing the DA16200 FreeRTOS SDK Project. Therefore, please refer to <u>UM-WI-056 DA16200 DA16600 FreeRTOS Getting</u> <u>Started Guide</u> under Section 5.4 Importing DA16200 FreeRTOS SDK Project into e2 studio for detailed instructions on the process.

(3) Modify the project.

 In e2 studio Project Explorer, open the file config\_generic\_sdk.h in the folder da16600\get\_started\include\user\_main and modify the macro highlighted as below.

```
#if defined ( __SUPPORT_OTA__ )
#define __OTA_UPDATE_MCU_FW__
#endif //__SUPPORT_OTA__
```



 In e2 studio Project Explorer, open the file da16200\_map.h in the folder da16600\core\bsp\driver\include\DA16200 and modify the two macros highlighted as below.

```
/* DA14531 BLE Firmware Download start */
#define SFLASH_BLE_FW_BASE (SFLASH_14531_BLE_AREA_START)
/* DA14531 BLE Security DB Area start */
#define SFLASH_USER_AREA_BLE_SECURITY_DB (SFLASH_BLE_FW_BASE + __BLE_IMG_SIZE__)
/* SFLASH User Area */
#define SFLASH_USER_AREA_1_START 0x00600000
#define SFLASH_USER_AREA_1_END 0x00800000
```

(4) Building project.

Please refer to <u>UM-WI-056 DA16200 DA16600 FreeRTOS Getting Started Guide</u> under **Section 5.5 Building Projects** for detailed instructions on the process.

(5) Flash the new firmware.

Flash the new firmware via Tera Term by following the instructions provided in the <u>UM-WI-056 DA16200</u> <u>DA16600 FreeRTOS Getting Started Guide</u> under **Section 4.5.2 Using Macro Script of Tera Term**.



# 4.2 Debugging

OTA\_LOG in the project is used to provide additional error information during the debugging process.



# **Revision History**

		Revision History	
Rev.	Date	Page	Summary
1.00	Apr.22.2025	-	First edition issued

