# IOT CLOUD SOLUTION ENABLED BY RENESAS MCU/MPU

## ~Presentation of the IoT Scalable Platform provided by Renesas~

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EMBEDDED PROCESSOR & CONTROLLER SOLUTION MARKETING DEPT
EMBEDDED PROCESSING MARKETING DIVISION
EMBEDDED PROCESSING PRODUCT GROUP
(EP/EPMD/EPMSM)

RENESAS ELECTRONICS CORPORATION

# CONTENTS

# IOT MARKET NEEDS

- ✓ Robust Security & Device Trust
- ✓ High Performance & Real-Time Processing
- ✓ Connectivity & Multi-Network support
- ✓ Edge AI and Real-Time Intelligence
- ✓ Cloud-Ready service & OTA Framework
- ✓ Long-Term Supply & Product Reliability

## Enhancing Product Value Proposition

Creating a comprehensive solution suite

Data collection
Remote control
Remote Monitoring

Health Monitoring
Health management

## Cost Optimization

Reducing workload and time to market

Connected Cities
Smart agriculture

Process optimization
Inventory tracking

## Security Alerts and Latest updates

Continuous updates

Anomaly and fault detection
Predictive Maintenance

Software and security updates

Remote Home Appliances 

Building Automation 

HVAC (Air Conditioning /Motor/Pump Control) 

Medical Devi health care 

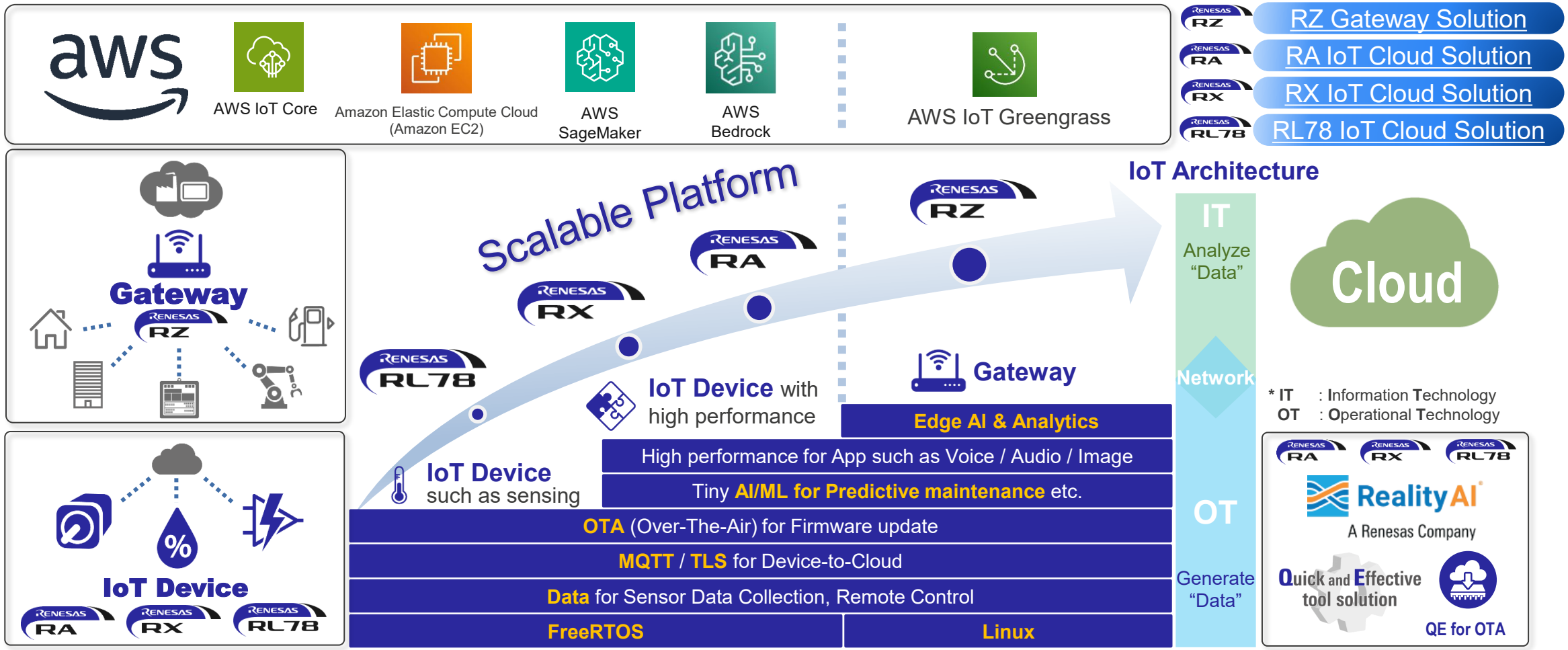
OA 

FA/Robot 

Smart Energy (Storage batteries, EV chargers, etc.) 

# RENESAS IOT SCALABLE PLATFORM TO FACILITATE IOT PRODUCT DEVELOPMENT

## Providing extensive solutions to meet the needs of IoT products and systems.








XX : Important for IoT/Gateway

# RENESAS IOT SCALABLE PLATFORM FEATURES (1/2)

Offerings **“4 values”** that accelerate the development of Cloud-connected IoT devices

## One-Stop Solution

RX RA RL78 RZ

### Hardware

Kit for Quickly Trying Sample Programs

### Software

Driver Monitoring OTA

Sample using AWS cloud services

### Dev. Environment

RA/RX/RL78 RZ

e² studio or Linux Package development support

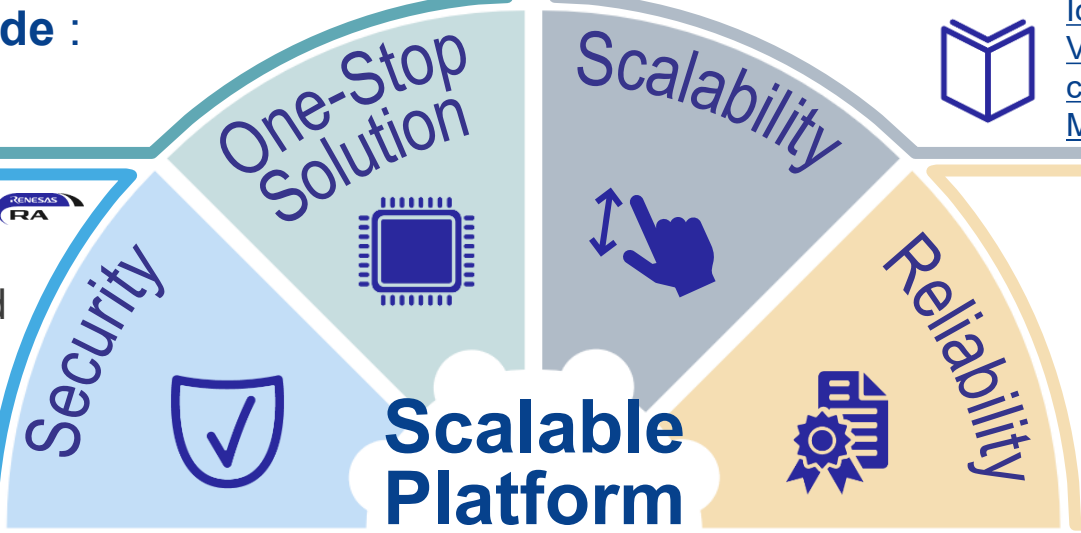
**Getting Started Guide** :
RZ / RA / RX / RL78

## Scalability

Support from Low-end to High-end **MCU** for ”**IoT Device**” solution & High-end **MPU** for “**Gateway**” solution provided

| IoT Device (RL78) | IoT Device (RX, RA) | Gateway (RZ) |
|---|---|---|
| IoT MCU（Non-RTOS） | IoT MCU（FreeRTOS） | Gateway MPU（Linux） |
| Ethernet / Wi-Fi | Ethernet / Wi-Fi | Ethernet / Wi-Fi |
| Simple IoT integration for Low-Power, OS-free MCUs | Smart task management of IoT devices with RTOS | Optimized handling of large data sets at the edge |

IoT Cloud Solution,
Various Communication Solutions combining Communication Modules with MCUs




## Security

RX RA

✓HW Security Engine Supported TLS communication

IoT Product Security Needs and Renesas Solution IoT product

## Reliability

aws AWS Qualified Device

RX RA RL78

IoT Cloud Solution related board & kit





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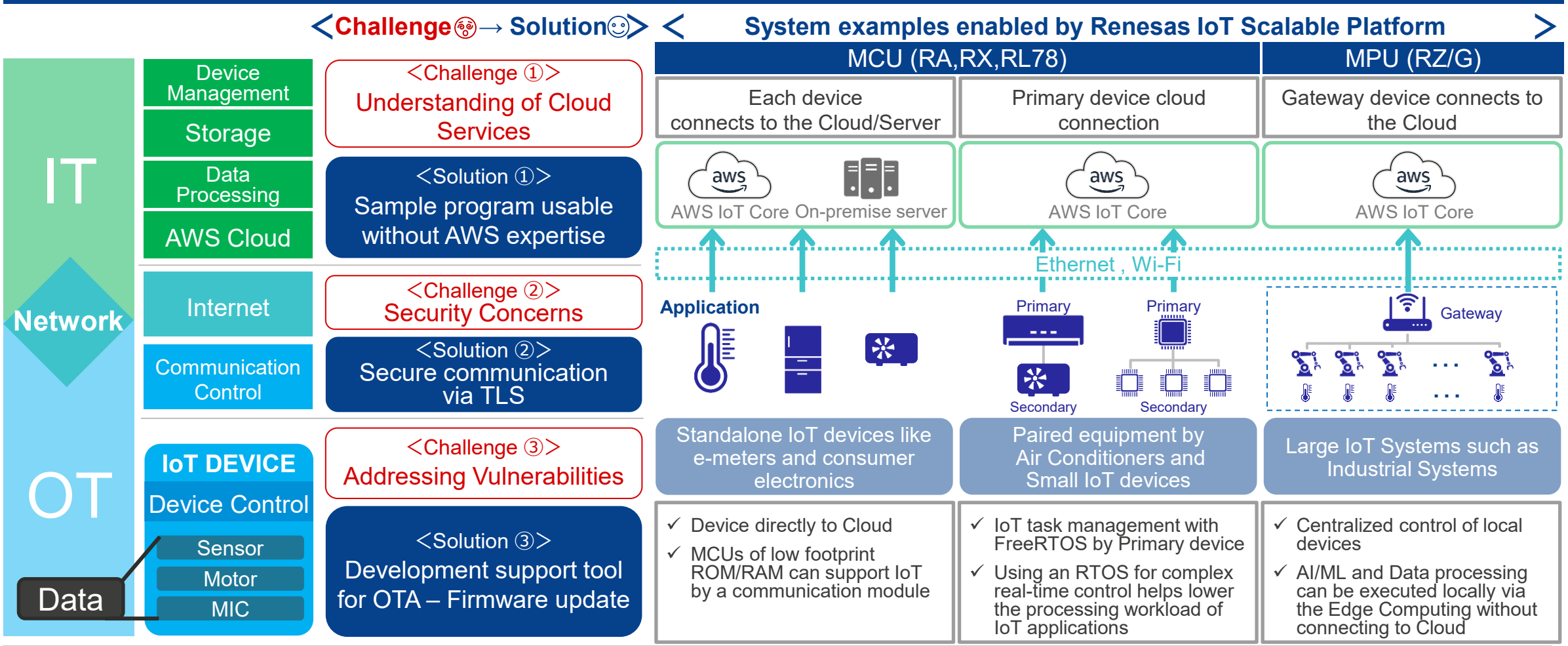
# RENESAS IOT SCALABLE PLATFORM FEATURES (2/2)

**Solve various issues faced in the development of IoT/Gateway devices that customers aim to realize.**




* **IT** : **I**nformation **T**echnology **OT** : **O**perational **T**echnology

# FOR ESSENTIAL CYBERSECURITY MEASURES FOR IOT PRODUCTS

## IoT Product Security Needs

**Threats & Measures**

With the growing number of cyber threats, efforts to strengthen security are increasing, like compliance requirements for European **CRA***

* Cyber Resilience Act

## Main Threats

- Eavesdropping on Internet Communications
- Firmware Vulnerability
- Execution of Unauthorized Software
- Cryptographic Key Leakage

## Renesas IoT Solution

### Secure Communication

- ✓ Secure communication by **TLS** support
- ✓ **High-speed TLS** communication via **Hardware Security Engine** is also supported by RA/RX family

### Secure Firmware Update

- ✓ Cloud based **OTA (Over-The-Air) firmware update** sample provided
- ✓ **Secure bootloader** sample provided
- ✓ Development support tool for firmware update **QE for OTA** (Free) provided（RA/RX/RL78）

### Unauthorized Access Protection

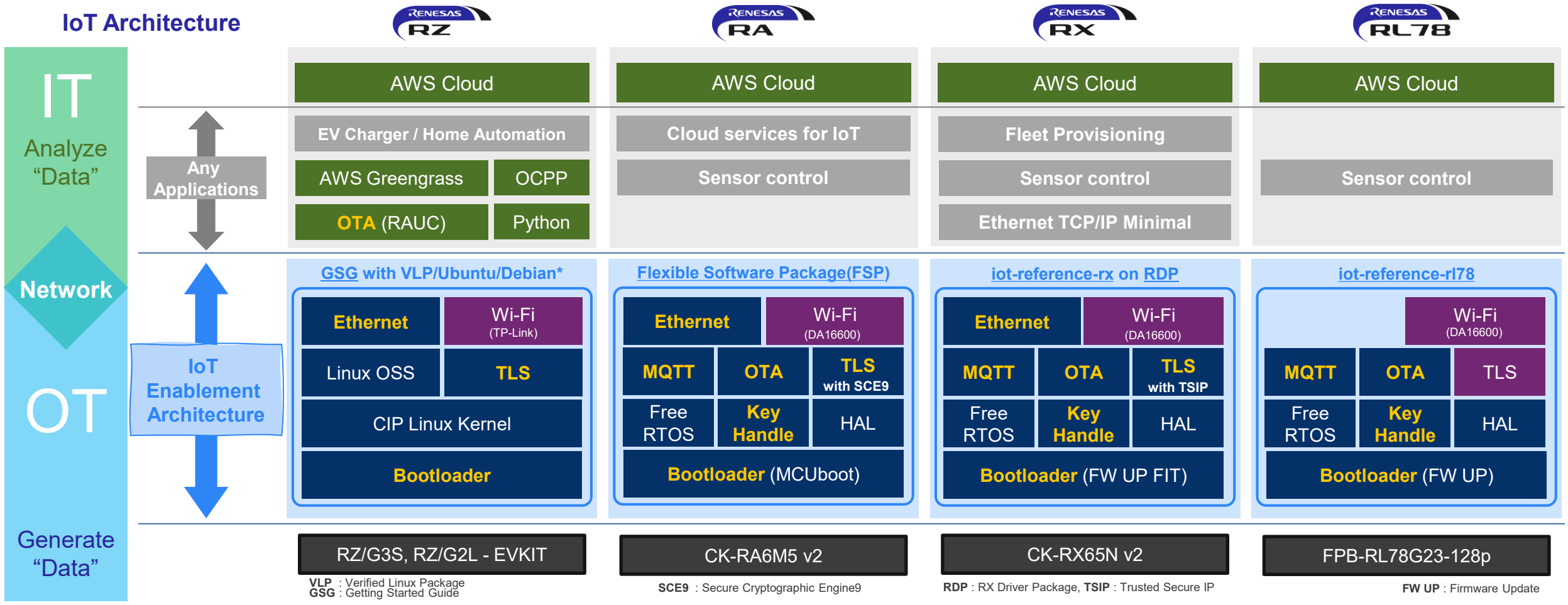
- ✓ Key Information Protection via Hardware Security Engine

**RZ/RA/RX** family：Renesas Secure IP（RSIP）
**RA** family　　：Secure Crypto Engine（SCE）
**RX** family　　：Trusted Secure IP（TSIP）
**RZ** family　　：Trusted Secure IP（TSIP）

# IOT ENABLEMENT ARCHITECTURE
# OPTIMIZED FOR IOT PRODUCTS

Sample Project
Implementation outside the MCU/MPU

## IoT / Gateway Platform for Various Applications




**VLP** : Verified Linux Package
**GSG** : Getting Started Guide

**SCE9** : Secure Cryptographic Engine9

**RDP** : RX Driver Package, **TSIP** : Trusted Secure IP

**FW UP** : Firmware Update

* Ubuntu / Debian only for RZ/G2L

# DELIVERABLES FOR RENESAS "MCU" CLOUD SOLUTION

Renesas MCU Cloud Solution

IoT Software

IT

Network

OT

IoT Hardware

## Valuable IoT Software Sample for MCUs

RENESAS RL78

**Getting Started Guide:** Connecting AWS in Wi-Fi: FPB-RL78G23-128p + FreeRTOS

**Application Note:**

Driver

US159-DA16XXXMEVZ Wi-Fi Control

HTTP MQTT

> Wi-Fi DA16600 Multiple Protocols Demo

RENESAS RA

**Getting Started Guide :** AWS Connectivity on CK-RA6M5v2 with Wi-Fi DA16600

**Application Note :** MQTT/TLS - Wi-Fi DA16600

**Flexible Software Package Documentation:**

MQTT AWS MQTT

OTA AWS OTA PAL on MCUBoot

HTTP AWS coreHTTP

RENESAS RX

**Getting Started Guide :** iot-reference-rx (GitHub)

**Application Note :**

MQTT OTA

How to Implement FreeRTOS OTA Using AWS

MQTT Fleet Provisioning

How to Implement AWS IoT Fleet Provisioning

MQTT OTA Dashboard Fleet Provisioning

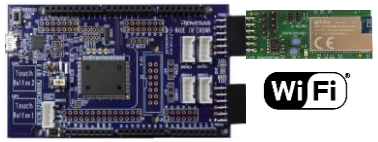
AWS Connectivity on CK-RX65N v2 with Wi-Fi

## IoT Dedicated Kits

aws qualified device FreeRTOS

WINNING COMBOS

RENESAS RL78

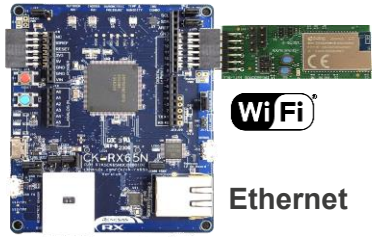



FPB-RL78G23-128p

+

DA16600 Wi-Fi Module PMOD

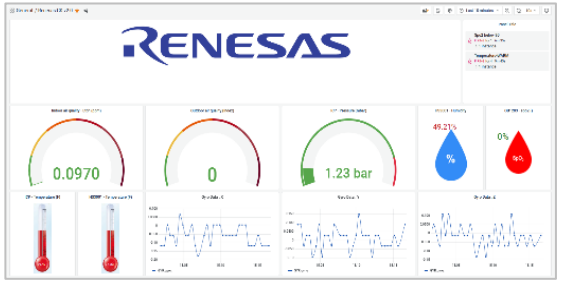
RENESAS RA RENESAS RX




Ethernet

CK-RA6M5 v2 / CK-RX65N v2

(incl. DA16600 Wi-Fi module Pmod in the kit)




IoT Dashboard

## Development

Quick and Effective tool solution

QE for OTA

# DELIVERABLES FOR RENESAS "MPU" CLOUD SOLUTION

RZ Gateway Solution

IoT Software

IT

Network

OT

IoT Hardware

## Real Life Gateway Use Case for MPUs

RENESAS RZ

OTA
OCPP OCPP OCPP
MQTT MQTT MQTT
Yocto | Ubuntu* | Debian*

* Debian / Ubuntu only for RZ/G2L

**Getting Started Guide:**
RZ Gateway Solution - Getting Started Guide - Renesas-wiki - Confluence

**IoT Application Examples on GitHub:** renesas-rz/rz-gateway-solution

- OTA **Firmware Over-The-Air implementation (RZ/G2L)**
- OCPP **EV Charging Station (RZ/G2L)**
- MQTT **Home Automation (RZ/G2L)**
- **Basic AWS Cloud Connectivity App (RZ/G3S)**

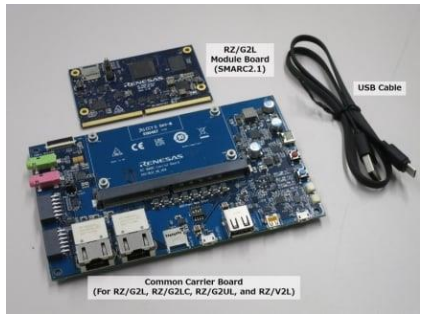
## Development on the Cloud

aws

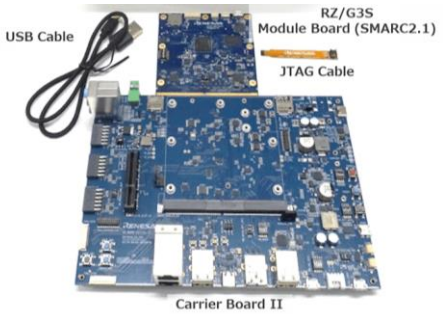
**AWS Services &**
**AWS IoT Greengrass**

## Evaluation Board Kits

RENESAS RZ




RZ/G2L-EVKit




RZ/G3S-EVKit

## Development on the Edge

Linux

**PC**





RENESAS

# OTA / FIRMWARE UPDATE SOLUTION THAT CAN SUPPORT – BOTH CLOUD INTEGRATION AND CLOUD AGNOSTIC ENV.

RA RX RL78

Renesas MCU-Based Firmware Update

## Supports Firmware updates for various system configurations from OTA (Over-The-Air) via Cloud to Local application updates

### Support for Cloud Service (AWS) Integration

| With Cloud | Non-Cloud |
|---|---|
| Wi-Fi / Ethernet | Serial Communication |

### Update Target

| Primary | Secondary |
|---|---|
| FreeRTOS / non-OS | non-OS |

### Flash ROM Update Method

- **Dual-Bank Method**: Bank0 (main) / Bank1 (buffer)
- **Partial Update Method**: Single Bank (main, buffer)
- **Full Update Method**: Single Bank (main)

### Renesas-exclusive development support tool QE for OTA

Quick and Effective tool solution

QE for OTA


- Create Firmware, Bootloader
- Create and Integrate Signature verification
- Execute Firmware update
- Debug

### Sample Program - Driver

| Feature | | RA | RX | RL78 |
|---|---|---|---|---|
| OTA | OTA Firmware Update via AWS IoT Core | ● | ● | ● |
| | Secondary Device Firmware Update | - | ● | ● |
| Security | Secure FW Update & Secure Boot | ● (MCUboot) | ● (FW UP / MCUboot) | ● (FW UP) |





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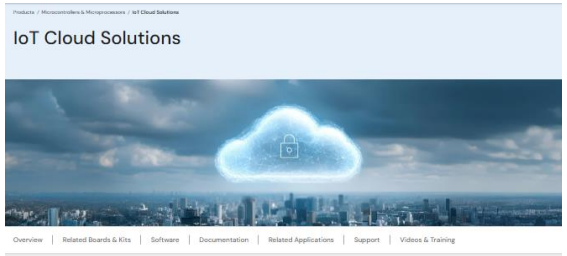
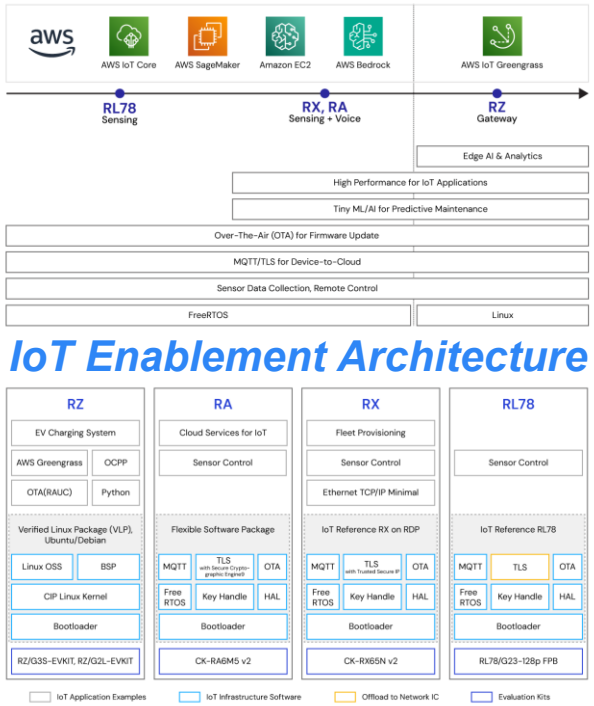
# SUMMARY

- ✓ **Renesas MCU Cloud solution** can ***realize your tomorrow's IoT products***.
- ✓ Please go to the Renesas official web page for more and the latest information.

***Renesas IoT Cloud***




***IoT Enablement Architecture***

- ✓ **Latest Solution Information**
- ✓ **List of AWS Partner Device certification Kits**
- ✓ **Tutorial Videos**
- ✓ **Various sample programs (sensor data visualization, OTA, etc. ) and Application Notes**

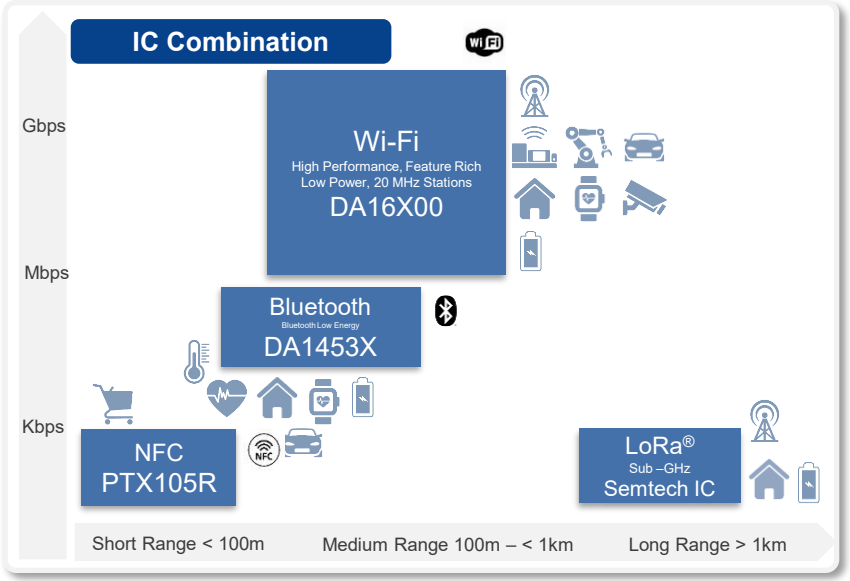
www.renesas.com

# APPENDIX :

## VARIOUS COMMUNICATION SOLUTIONS COMBINING COMMUNICATION MODULES WITH MCUS

### Offerings of MCU drivers for Renesas own Bluetooth® LE, Wi-Fi, NFC, LoRa®

| Connectivity | RENESAS RA | RENESAS RX | RENESAS RL78 |
|---|---|---|---|
| **Bluetooth LE** | • DA14531 and FSP BLE Framework | • DA1453x BLE Control Module Using Firmware Integration Technology | • DA1453x BLE Control Module Using Software Integration System |
| **Wi-Fi** | • FSP DA16XXX MQTT On-chip Client<br>• FSP DA16XXX HTTP On-chip Client | • DA16XXX Wi-Fi Control Module Using Firmware Integration Technology | • DA16XXX Wi-Fi Control Module Using Software Integration System |
| **NFC** | • NFC Reader Driver on PTX (rm_nfc_reader_ptx) | • NFC Control Module Using Firmware Integration Technology | • NFC Control Module Using Software Integration System |
| **LoRa** | • LoRa-Based Solutions for RA MCUs | – | • LoRa-Based Solutions for RL78 MCUs |




**開発環境**

**Bluetooth LE**

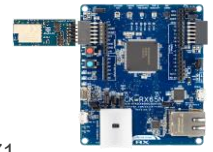
**RA MCU:**
EK-RA8M1, EK-RA6M4, EK-RA6M5, EK-RA2E1
**RX MCU:**
CK-RX65N, EK-RX671, RX66N Target Board, RX671 Target Board, FPB-RX140, EK-RX261, FPB-RX261
**RL78 MCU:**
FPB-RL78G23-128p


EX) RL78/G23-128p FPB

**DA1453X PMOD:**
DA14531MOD or DA14535MOD

**Wi-Fi**

**RA MCU:**
EK-RA6M4
**RX MCU:**
CK-RX65N, EK-RX671, RX66N Target Board, RX671 Target Board, FPB-RX140, EK-RX261, FPB-RX261
**RL78 MCU:**
FPB-RL78G23-128p


EX) CK-RX65N

**DA16X00 PMOD:**
DA16200MOD or DA16600MOD

**NFC**

**RA MCU:**
EK-RA4M2
**RX MCU:**
EK-RX261
**RL78 MCU:**
FPB-RL78G23-128p


EX) EK-RX261

**PTX105R PMOD:**
PTX105RQC

**LoRa**

**RA MCU:**
FPB-RA2E1, EK-RA2L1, FPB-RA0E1, FPB-RA0E2
**RL78 MCU:**
FPB-RL78G23-64p, FPB-RL78G23-128p, FPB-RL78G22, FPB-RL78L23, FPB-RL78G14


EX) FPB-RA0E2

**Semtech IC Sheild:**
Semtech SX1261 / 1262 Shield