IoT Gateway Solution

~ by Renesas MPU RZ/G series ~

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

RENESAS ELECTRONICS CORPORATION

EPMSM-AA-25-0144-1

CONTENTS

IOT GATEWAY MARKET REQUIREMENTS

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

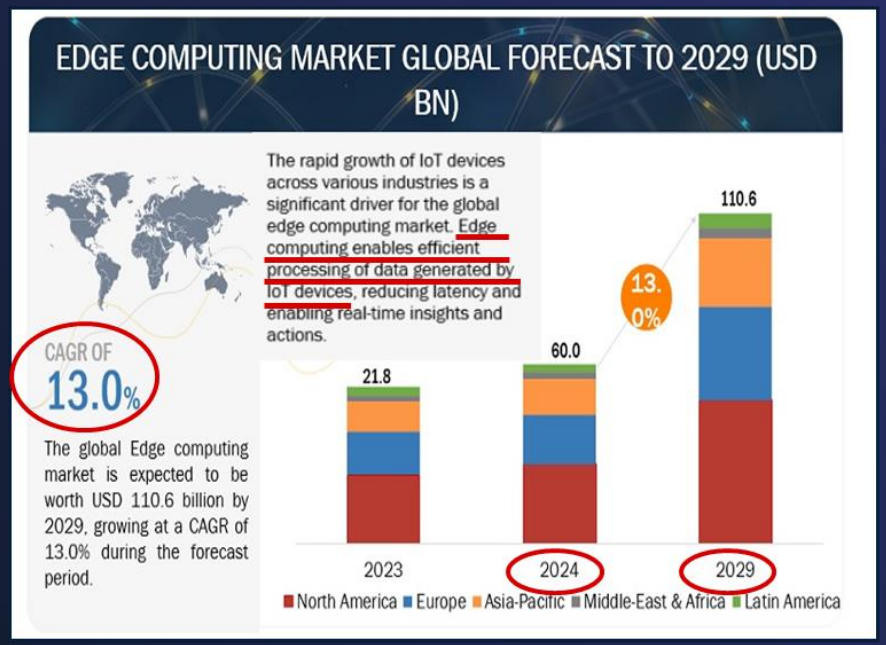
Anomaly and fault detection
Predictive Maintenance

Software and security updates

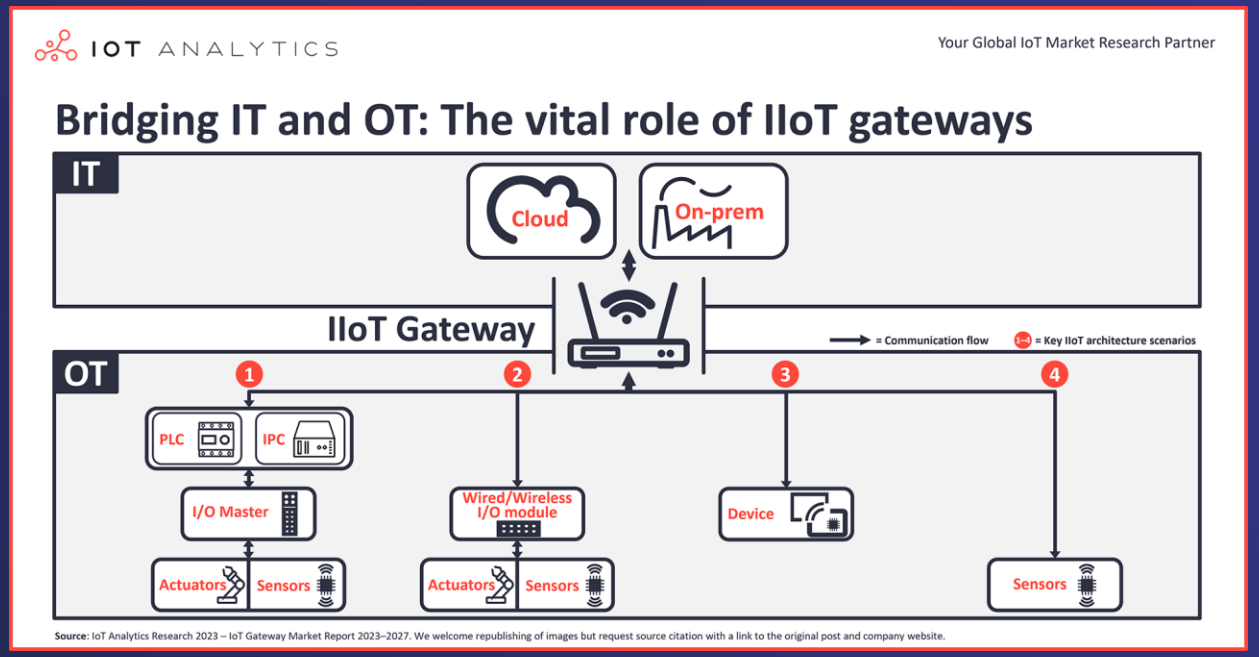
Remote Home Appliances | Building Automation | HVAC (Air Conditioning /Motor/Pump Control) | Medical Devi health care | OA | FA/Robot | Smart Energy (Storage batteries, EV chargers, etc.)

Gateway Market Trends

- ✓IoT Gateway Market continues to grow steadily.
- ✓Edge computing is 13% growth of CAGR in the coming 5 to 9 years worldwide which consist of bringing the computational capabilities of the cloud closer to the end point devices.
- ✓All aspects of society are impacted by IoT devices, hence the increased need for a processing bridge between edge and cloud.

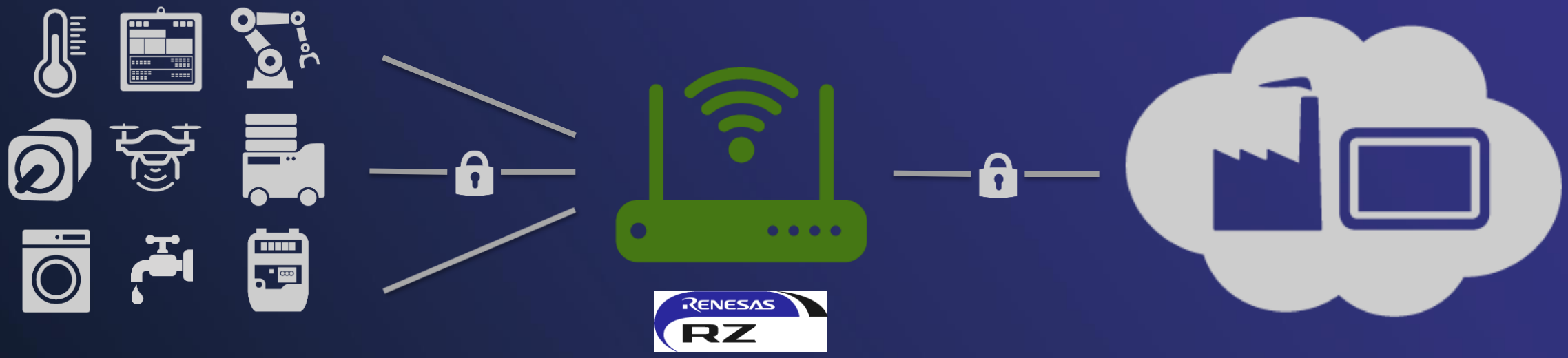


Source : https://www.marketsandmarkets.com/Market-Reports/edge-computing-market-133384090.html



Optimizing and Connecting Solutions at the Edge Devices

- ✓ **Explosion of Connected devices**: the rise of IoT sensors and smart device requires robust management
- ✓ **Increasing Data Volume**: without edge processing, networks face high bandwidth costs.
- ✓ **Heightened Security Demands**: sensitive data must be processed locally and protect privacy



PAIN POINTS FOR AN IOT GATEWAY & GATEWAY SOLUTION SUITE BY RZ/G SERIES

Needs & Pain Points for an IoT Gateway

Needs

- **Device Edge Performance:**
  - Optimized memory and performance for reliable edge operations
  - Secure connectivity with robust hardware.
  - Reliable connectivity with high throughput/bandwidth
- **Interoperable IoT Software Stack:**
  - Easy integration with industry protocols like OCPP.
  - Secure OTA and boot mechanisms.
  - Faster Go to Market solution
- **Seamless Cloud–Edge Collaboration:**
  - Simple edge deployment
  - Secure MQTT communication
  - Code portability and compatibility

Pain Points

- **Limited Edge Computing Resources:**
  - Hardware resource constrains.
  - Complexity of security features on the device.
  - Lack of connectivity options.
- **Complex Software Integration:**
  - Software components combination from multiple sources
  - Time-consuming secure firmware update integration
  - Lack of ready-to-use examples slows development
- **Bridging Cloud & Edge Environments:**
  - On-premise software deployment with embedded systems.
  - Manage secure communication between edge and cloud
  - Application source code dependent to a specific device structure

Gateway Solution to Solve the Pain Points by RZ/G

✓ Unlock seamless IoT gateway development with ready-to-go IoT application example

Pain Points

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Solution

RENESAS RZ

✓ Hardware provides:

- Dual Core CA55(1.2GHz) for edge analytics
- Edge Security
- Connectivity for Ethernet by RZ/G2L, RZ/G3S, Wi-Fi(example)

✓ Software provides:

- OCPP client protocol implementation
- Firmware OTA & Secure boot system
- Quick Start IoT Example Applications

✓ AWS IoT Greengrass enables:

- Easy-to-Start Python application by Cloud Native engineers
- Secure connectivity & MQTT protocol
- Low Code for AI/ML development and deployment

RENESAS

RZ Gateway Solution Suite

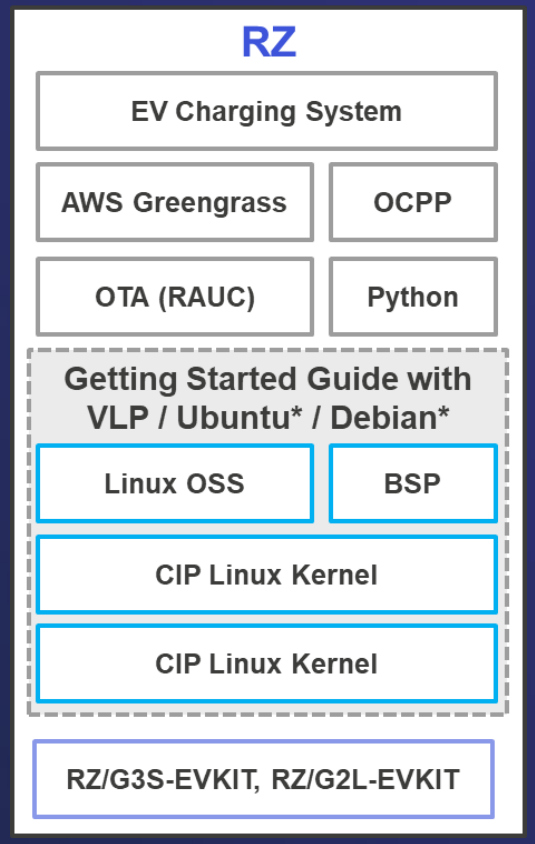
✓ RZ Gateway Solution tackles IoT Gateway Challenges by providing a whole infrastructure composed of IoT application examples, IoT infrastructure Software's and Evaluation Kits

IoT Infrastructure Software

✓RZ Verified Linux Package (**VLP**), **Ubuntu** & **Debian** support compatible
✓AWS IoT **Greengrass**
✓Robust Auto-Update Controller (**RAUC**) for FOTA

Hardware & Evaluation Kits

✓RZ/G2L & RZ/G3S Evaluation Bord Kit (EVKit)
✓High Performance CPU Cortex-A55 (over 1GHz)



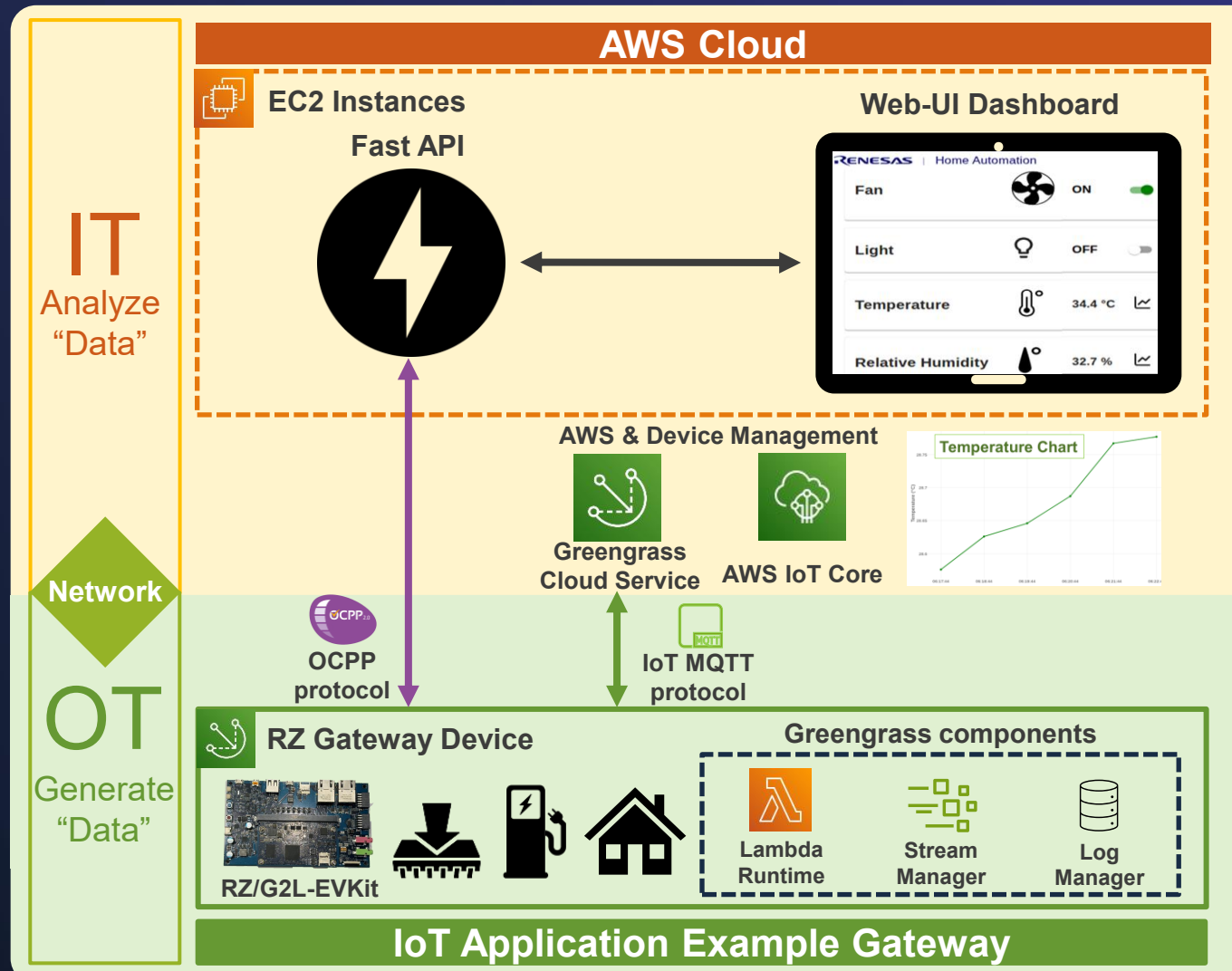
IoT Application Example

✓EV Charger Station App
OCPP Protocol Implementation
Web-Socket Communication
✓Firmware OTA Update
A/B seamless update
x.509 Public Key Infrastructure (PKI) key ring file
✓Home Automation App
Sensor data monitoring

Network I/F

✓Ethernet by RZ/G2L, RZ/G3E
✓Wi-Fi (example using TP-Link)

IoT Gateway High Level Design for Applications



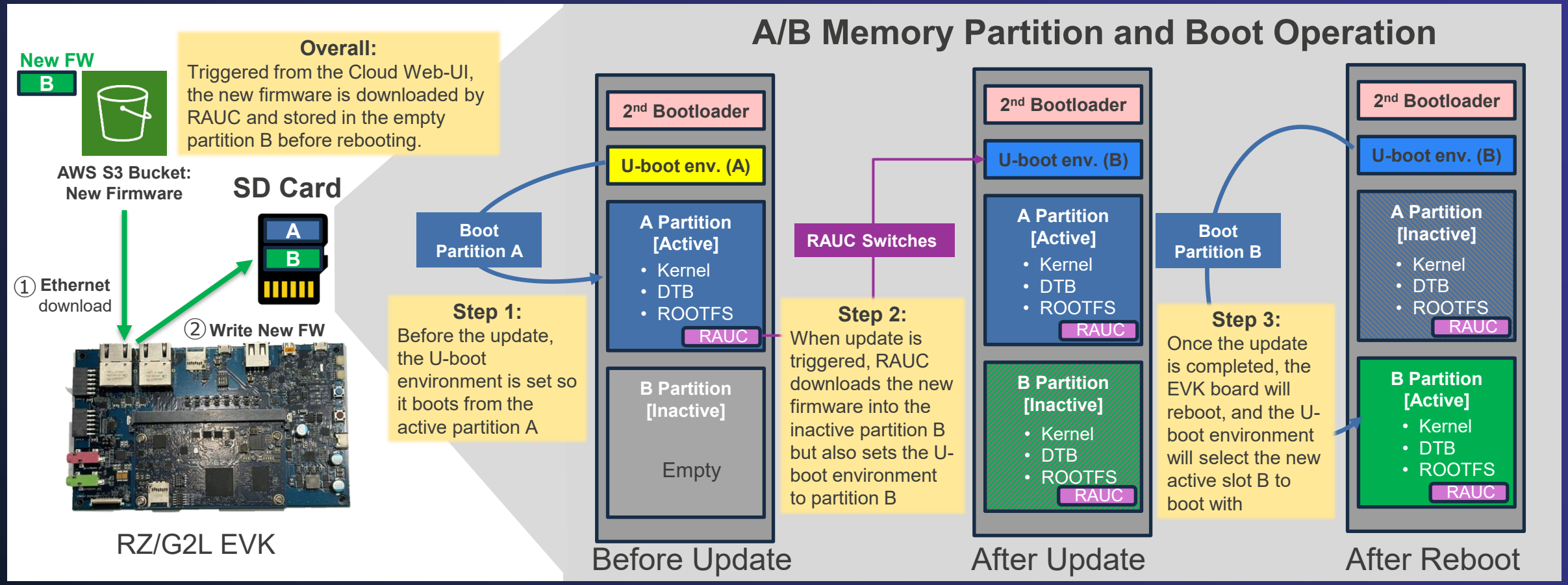
component used

Software Component	Firmware OTA Update	EV Charging Station	Home Automation
EC2 Instance - Web-UI - Fast API	✓	✓	✓
AWS IoT Core	✓	✓	✓
S3 Bucket	✓		
Amazon Timestream			✓
Device Shadow			✓
OCPP v.2.0.1		✓	
MQTT	✓	✓	✓
Greengrass Custom Component		✓	✓
Lambda Function	✓		
Stream Manager			✓

OTA MECHANISM WITH RZ/G GATEWAY SOLUTION

OTA Mechanism with RZ/G Gateway Solution

✓Gateway Solution can provide OTA (FW Update) based on Robust Auto-Update Controller (RAUC) and AWS IoT Cloud by RZ/G2L EVK.



IOT GATEWAY APPLICATION EXAMPLE

Primary focus

IoT Gateway Use Cases & Key Requirements

RZ Product Greenfield

EV Charging Station

- Usage Analytics
- Remote management

CAGR 34.5% (2022 - 2033)

Smart Home Panels

- IoT device aggregation
- Local Interface

Building Gateway

- Central control for HVAC, Lighting, etc…

CAGR 8.19% (2024 - 2034)

Industrial Gateway

- Predictive Maintenance
- Optimized operations

Key Requirements

- Interoperability & Scalability
- Data management & Analytics
- Edge AI
- Reliable Operation
- Edge to Cloud Integration
- Cloud Native Structure
- Security & Privacy

RENESAS

IoT Gateway Application Concept

- ✓ The RZ Gateway Solution sample projects are structured by:
  - RZ/G Evaluation Kits that represents the Gateway and will collect / generate data and send it to the Cloud.
  - AWS Cloud environment as the Management system allowing Gateway remote control and visualization.

Applications example

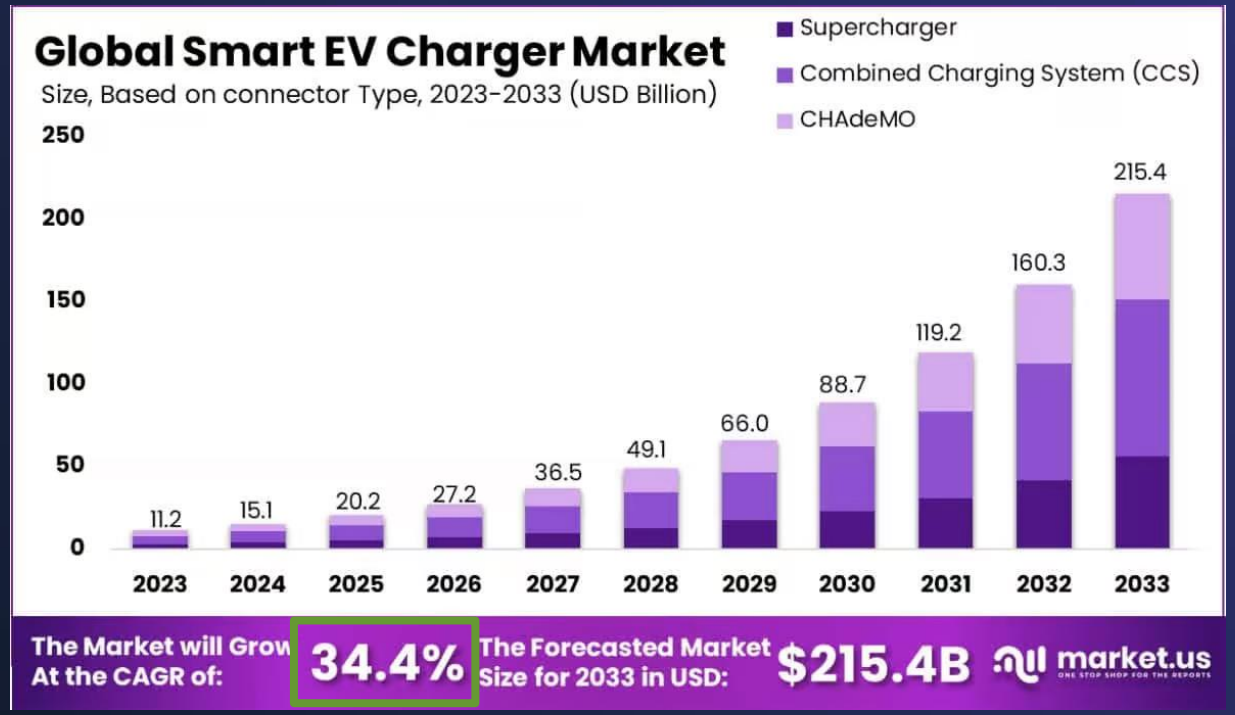
Primary focus

Application	Target Product	Challenges	Market Growth CAGR
EV Charging Station	RZ/G	• Fast-Evolving Market / frequent update • Secure Payment & User Authentication • Load Balancing & Energy Management	**34.4%** 2024~2033
Smart Home Gateway	RZ/G	• Fragmented Ecosystem • Security & Privacy concerns	8.19% 2025~2034
Building/Office Gateway	RZ/G RZ/N	• Integration with Legacy Systems • Regulations & Energy Codes	12% 2023~2028
Healthcare Gateway	RZ/G	• Regulatory Compliance • Cybersecurity & Patient Data Privacy • Integration with Legacy EMR/EHR Systems	17.8% 2023~2028
Industrial Gateway	RZ/T	• High Reliability & Uptime • Complex Security Requirements • Integration with Legacy Equipment	12.7% 2024~2032

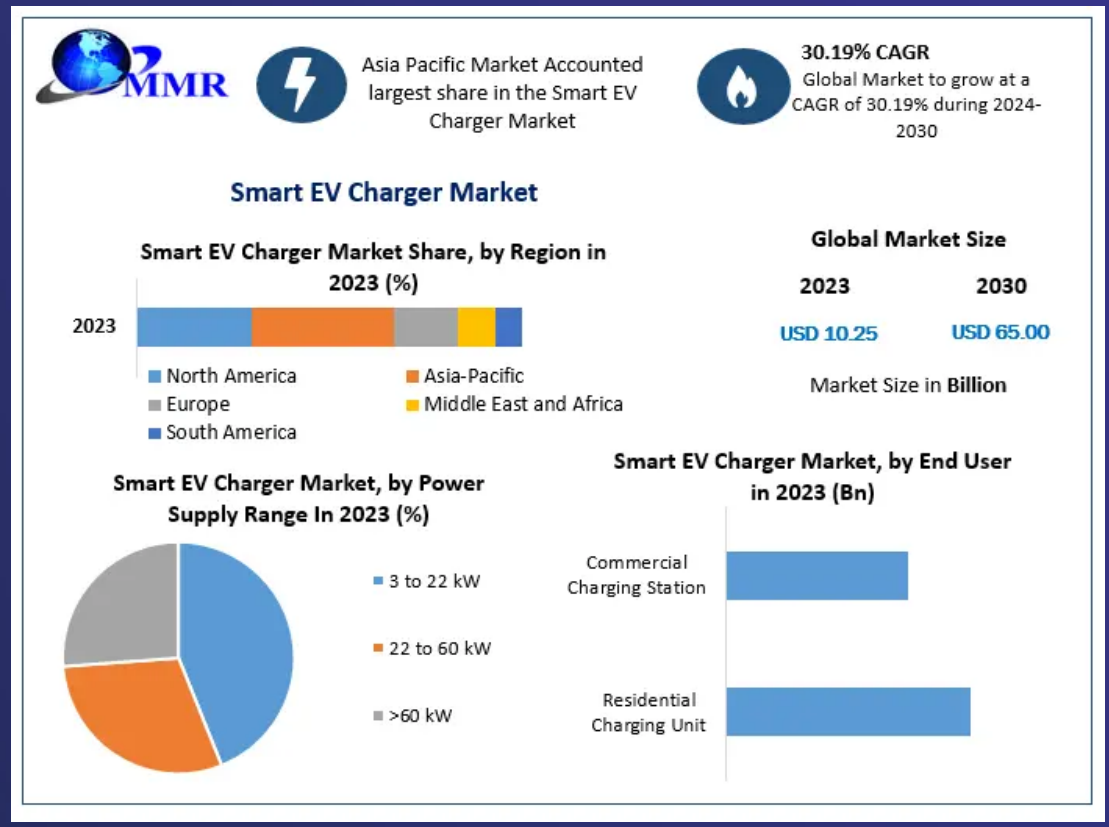
EV Charger Market

✓Related to IoT Gateway Market, Smart EV charger market is rapidly growing worldwide with a 34.4% CAGR.

✓By adapting the software infrastructure of the Gateway, EV charging solution can be easily implemented and deployed.

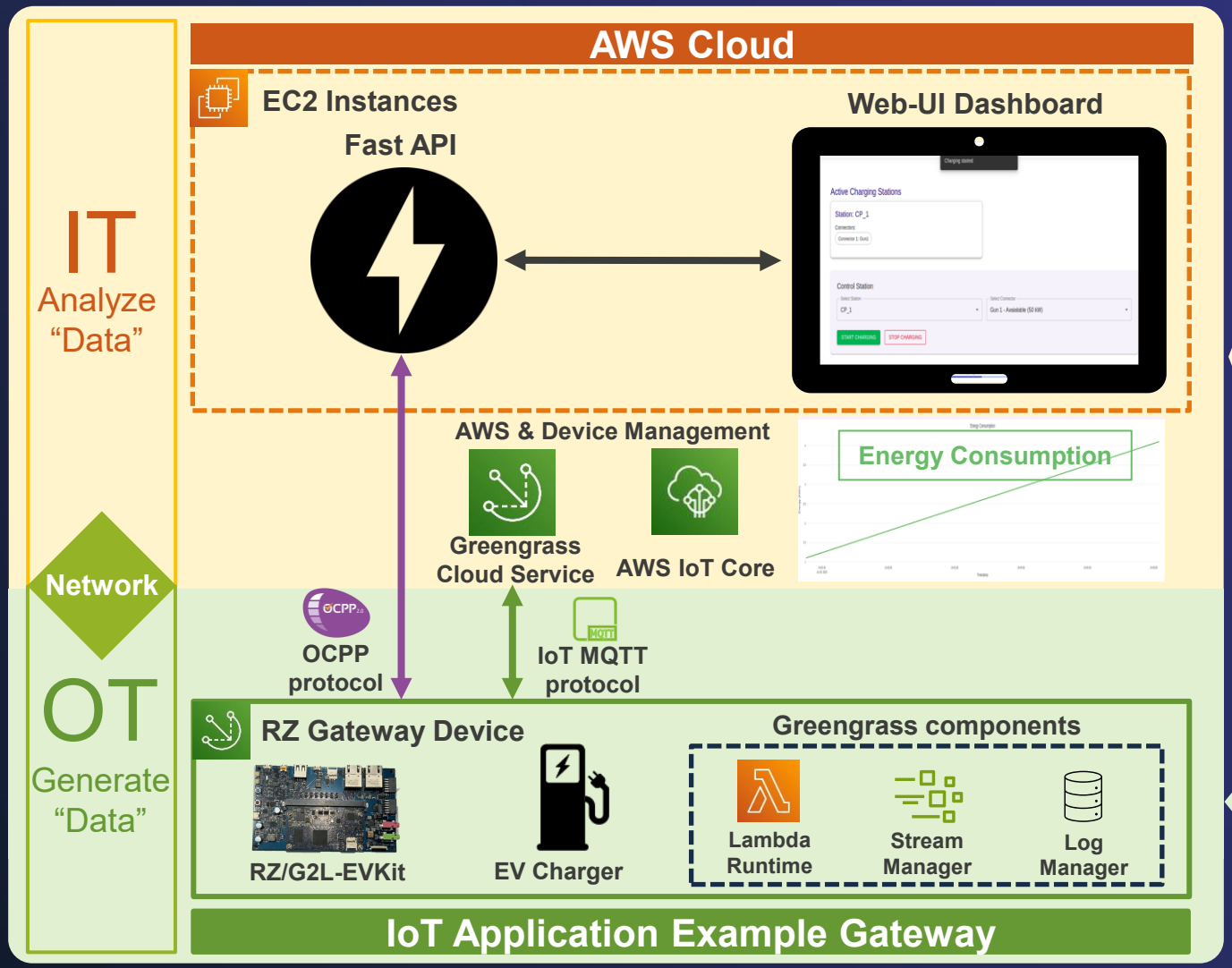


Source: Smart EV Charger Market Size, Share | CAGR of 34.4%



Source: Smart EV Charger Market - Global Industry Analysis and Forecast

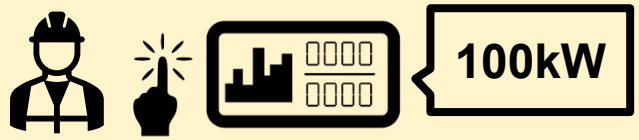
EV Charging Station Example



Features

Web-UI Dashboard (Admin):

- Charger power control



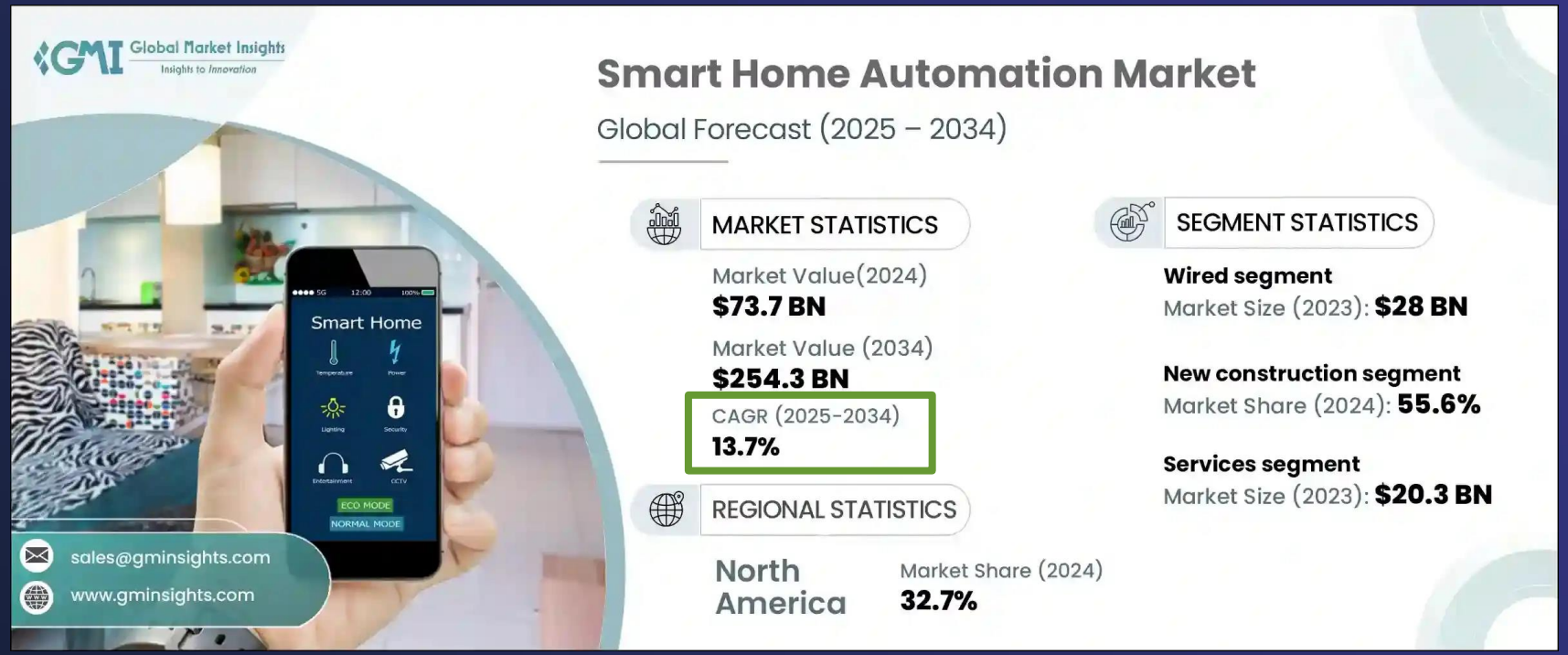
Web-UI Dashboard (User):

- Energy consumption check
- Start and stop charging

- **OCPP** protocol ver.2.0.1
- **MQTT** for AWS and device management
- **Web-Socket for EV Charger** and Station data exchange

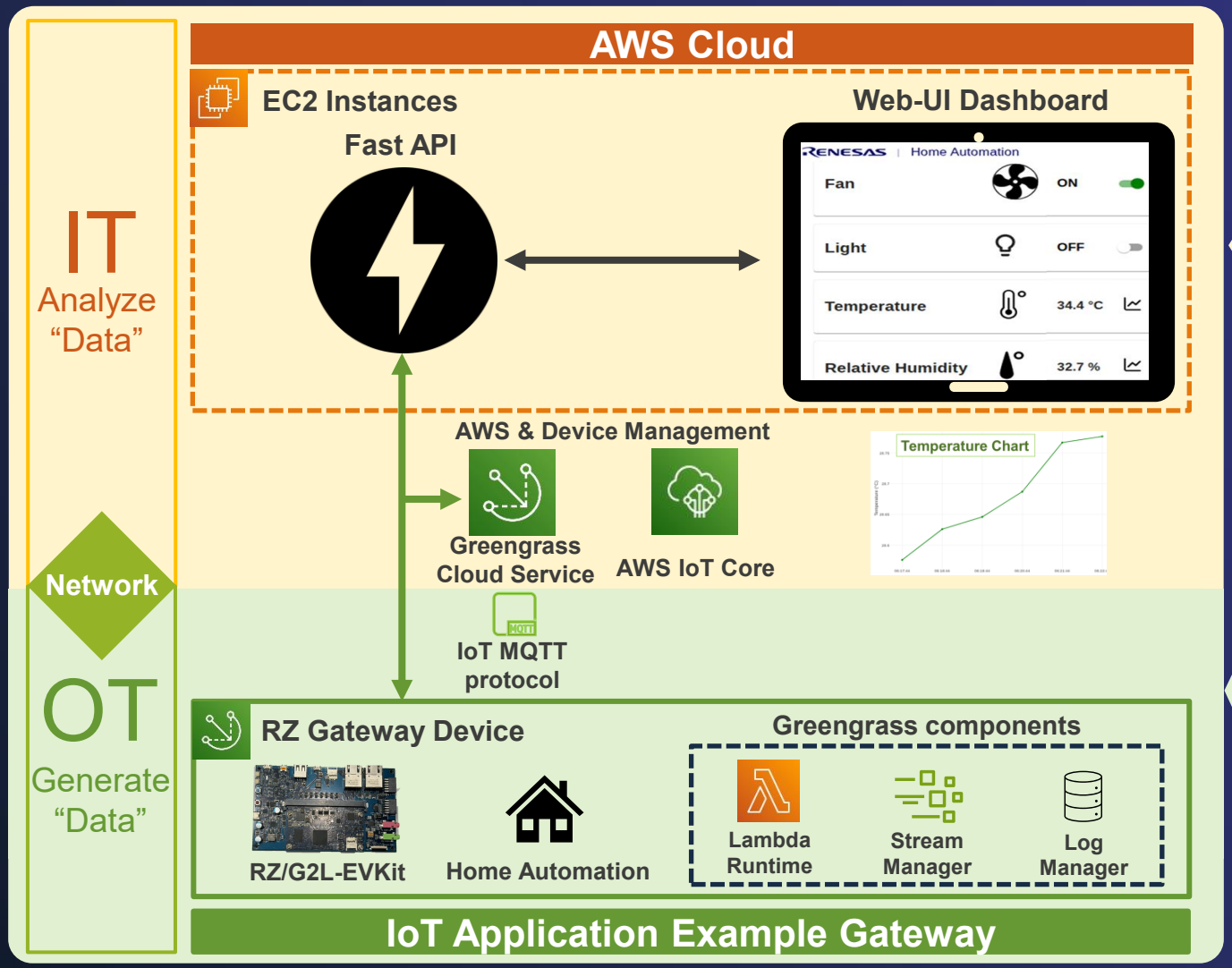
SMART HOME GATEWAY MARKET

- ✓ Smart Home automation market is growing steadily with a global CAGR of 13.7%
  Wireless technologies & IoT device connectivity advancements are driving growth in addition for an increase demand for energy efficiency and government supports.
- ✓ Such trends can be interpolated to the Home Gateway product segment as well



Source: Smart Home Automation Market Size, Share & Trend Report, 2034

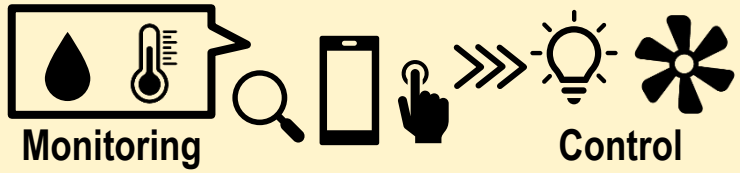
Home Automation Example



Features

Web-UI Dashboard:

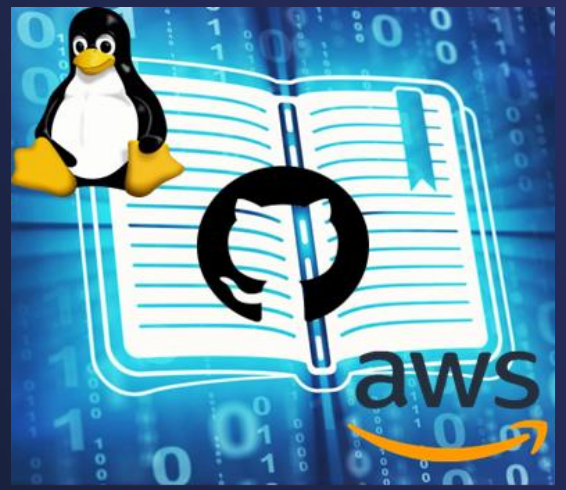
- Temperature & Humidity check
- Turn On / Off LED and Fan



- Wi-Fi support
  (TP-Link Archer TX1U Nano)
- **MQTT** for:
  - Sensor data exchange
  - Remote device control
  - AWS and device management

DELIVERABLES

Deliverables



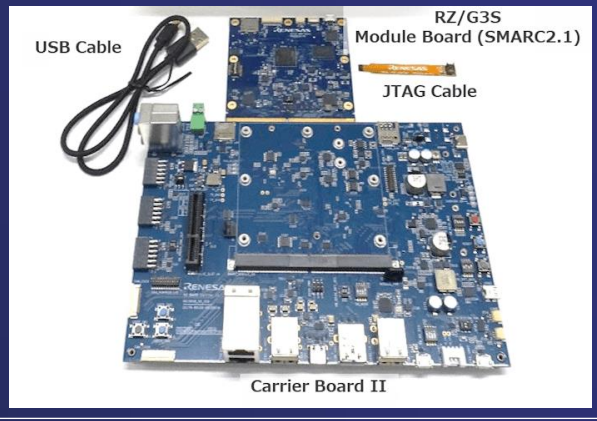
Quick Start Procedure:

- ✓ An extensive Getting Started Guide (GSG) detailing how to build the Linux environment and run the sample demo is provided on the Renesas **Wiki page**.
- ✓ Patch files for the RZ Verified Linux Package (VLP) and script files for the sample projects can be downloaded from the RZ GitHub repository

Evaluation Kits: the following evaluation board supports the RZ Gateway Solution

RZ/G2L-EVKit

RZ/G3S-EVKit



Deliverables - Details

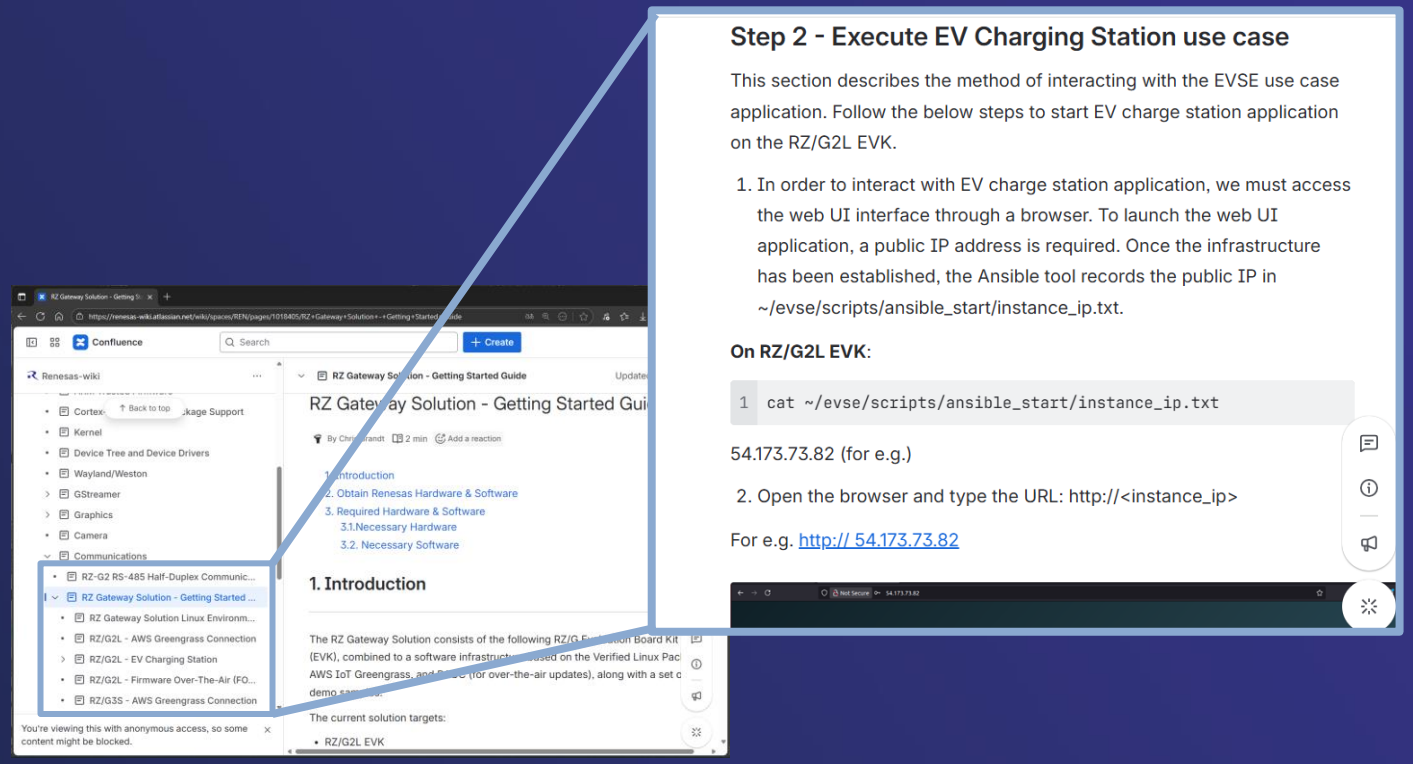
In addition to RZ Gateway GitHub repository,
well illustrated guides were prepared to enable each IoT examples use cases.

Guide Details

- Hardware Setup
- How to build Linux environment with VLP

- How to connect with AWS

- How to run sample demo:
  - EV Charging Station
  - Home Automation
  - FOTA Update



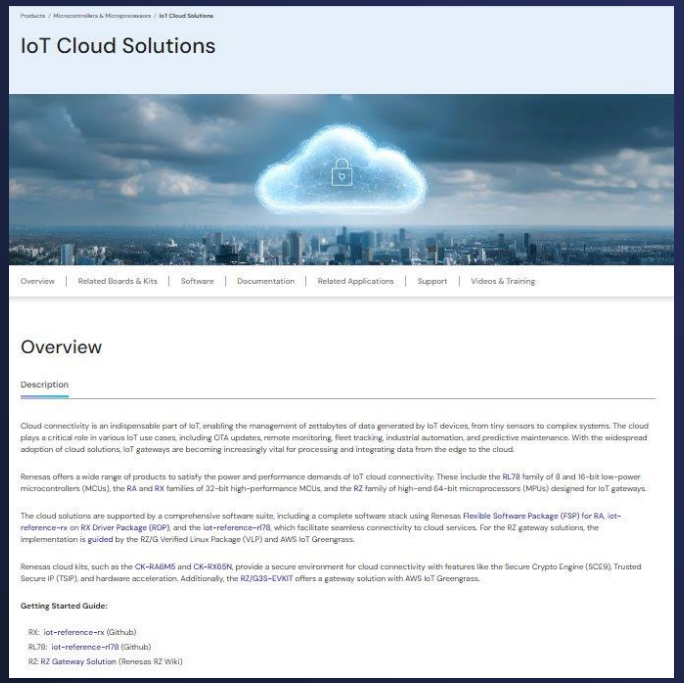
RZ Gateway Solution - Getting Started Guide - Renesas-wiki - Confluence

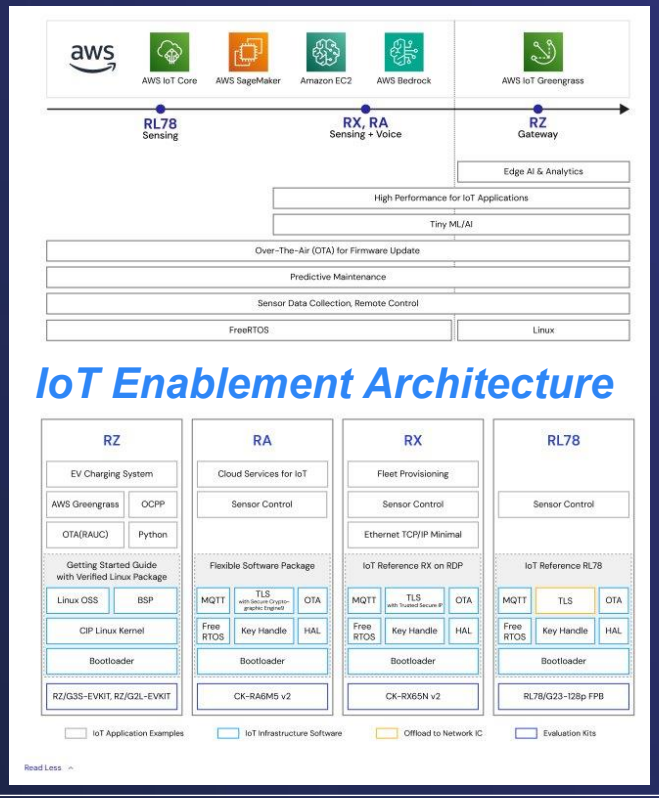
SUMMARY

SUMMARY

- ✓ Renesas **RZ Gateway Solution** enables a **quick edge to cloud solution development**.
- ✓ Please go to the Renesas official web page for more and the latest information.

Renesas IoT Cloud





- ✓ Latest Solution Information
- ✓ List of RZ/G Evaluation Kits Information
- ✓ Getting Started Guide document
- ✓ Various sample demos (Firmware OTA, EV Charging Station, and Home Automation)

APPENDIX

COMPETITOR BENCHMARK AND OUR VALUE PROPOSITION

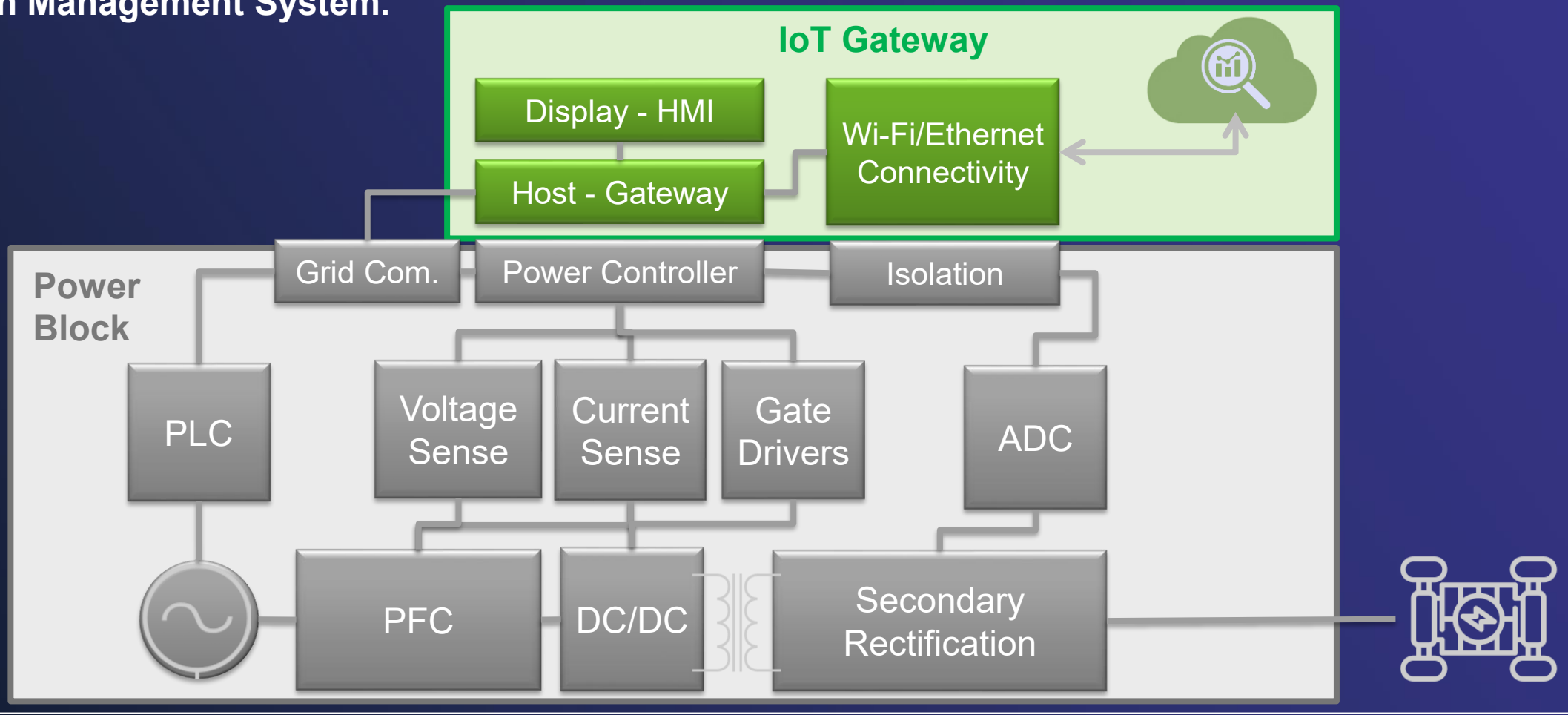
- **Where competition provide difficult to re-use Turnkey solution, Renesas provide an open and easy to use solution environment.**

  *** user can deploy and execute the application easily without having to compile it thanks to Python code**

Solution	Easy to re-use	Compilation Free*	Cloud Connectivity	FOTA included	Wireless connectivity	HMI	Kit Price
RENESAS RZ Gateway Solution	Renesas merit ✓	✓	✓ AWS	✓	✓ under planning	△ not in Gateway app. example	200$
Competitor A	✓	-	✓ Azure	-	✓	✓	3,900$
Competitor B	- Partner sol.	-	-	-	✓	✓	Not in sale

RENESAS RZ GATEWAY SOLUTION
Target Scope for EV Charger

- ✓ **Focus on IoT Gateway functionalities and connectivity with Charge Point Operator / Charging Station Management System.**



Renesas.com