HEX-Five Security

RA Ecosystem Partner Solution

MultiZone® Secure IoT Firmware

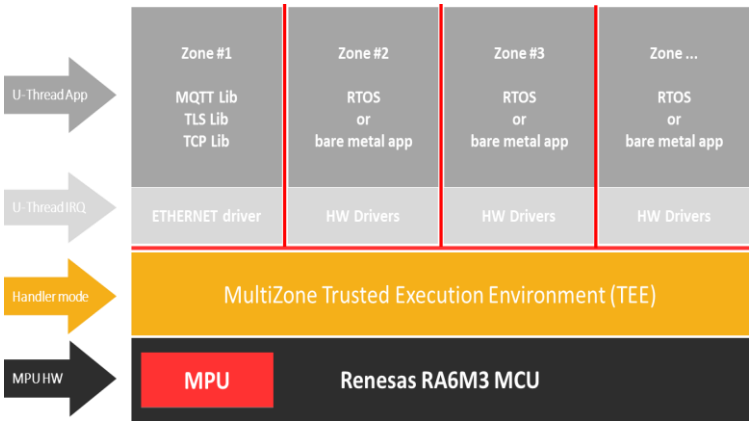
Solution Summary

The MultiZone® IoT Firmware is the quick and safe way to build secure IoT applications with RA6M3 microcontrollers. It provides secure access to IoT clouds, real-time monitoring, secure boot, and remote firmware updates. The built-in Trusted Execution Environment provides hardware-enforced separation to shields the execution of trusted applications from untrusted 3rd party libraries.

Features/Benefits

- Fully integrated with Renesas e² Studio and FSP (Flexible Software Package)
- Safe and quick way to add high-grade security and separation – up to 4 "secure worlds"
- Rapid development: pre-integrated TEE, TLS/ECC, TCP/IP, MQTT, RTOS, FSP
- Easy retrofit of existing hardware and software - no need for a system redesign
- Convenient MPU-based alternative to an Arm® TrustZone® upgrade
- Convenient software license priced per design – no royalties, no GPL contamination

Block Diagram



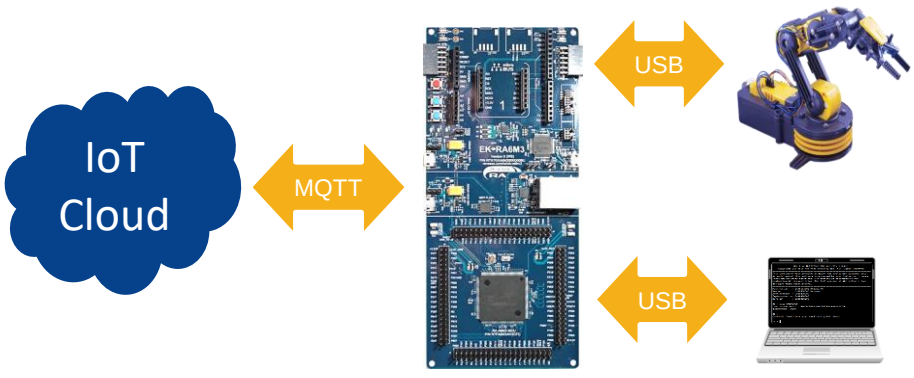
Hardware-Grade Security

Rapid Development

Easy Integration

Target Applications

- IoT
- Healthcare
- Meter
- Industrial
- Connectivity
- Building Automation



Reference Application on EK-RA6M3

2020.10

HEX-Five Security

Technical Specs

IDE ▪ Renesas e² Studio 7.8.0 ▪ Hex Five's reference projects	▪ MultiZone IoT Firmware: MQTT, TLS, TCP/IP, RTOS, TEE, robot, terminal ▪ MultiZone SDK: TEE, USB Robot, uart terminal, bare metal buttons & leds ▪ MultiZone Blinky: TEE, uart terminal, bare-metal buttons & leds ▪ MultiZone Minimal: TEE, 4 zones available for user applications	
FSP ▪ Renesas FSP 1.1.0 ▪ Hex Five's USB patch	▪ USB – optional, required for the robotic arm app ▪ UART – optional, required for the MultiZone terminal app ▪ Ethernet – optional, required for MQTT / TLS access to cloud services	120KB 32KB
TCP/IP library ▪ LWIP 2.1.1 ▪ Hex Five security patches	▪ IP, ICMP, UDP, TCP, ARP, DHCP, DNS, SNTP, MQTT ▪ Light weight single threaded execution ▪ Fully integrated with SSL stack	40KB 16KB
SSL library ▪ mbed TLS 2.23.0 ▪ Hex Five secure configuration	▪ TLSv1.2, Cipher TLS_AES_128_GCM_SHA256 ▪ ECC: prime256v1, Private Key NIST CURVE: P-256 ▪ Mutual authentication, Cert expiration verification, TLS large fragment	64KB 32KB
Real Time OS (optional) ▪ FreeRTOS 10.3.0 ▪ Hex Five integration with TEE	▪ Secure unprivileged execution of kernel, tasks, and interrupt handlers ▪ No memory shared with TCP/IP and SSL library code ▪ No memory shared with other applications running in separate zones	32KB 16KB
Trusted Execution Environment ▪ MultiZone Security TEE 2.0 ▪ RA6M3 optimizations	▪ 4 separated Trusted Execution Environments (zones) enforced via MPU ▪ 8 memory-mapped resources per zone – i.e. ram, rom, i/o, uart, gpio, eth, … ▪ Secure inter-zone messaging – no shared memory, no buffers, no stack, etc ▪ Protected user-mode interrupt handlers mapped to zones – up to 128	4KB 4KB

Use Cases

Secure access to private or public clouds

✓ Customer needs MQTT, TLS, ECC, mutual authentication optimized for MCU devices	**MultiZone** provides built-in secure connectivity to commercial cloud providers like AWS, Azure, etc
✓ Customer is concerned about backdoors and lack of separation in 3rd party software	**MultiZone** provides four separated execution environments, hardware enforced, software defined
✓ Customer can't afford time, cost and the technology risk of a complete system redesign	**MultiZone** can retrofit existing hardware and software, works out-of-the-box, and it is available now

Remote device provisioning and firmware updates

✓ Product must comply with new IoT regulation requiring remote firmware updates - OTA	**MultiZone** provides high-grade security OTA updates via open standard MQTT and TLS protocols
✓ Customer is concerned about time, cost, and security risk of developing a DIY solution	**MultiZone** is commercial-grade, available immediately, and built from the ground up for security
✓ Customer is concerned about the vendor lock-in inherent in commercial cloud services	**MultiZone** remote firmware updates work with any commercial or private IoT cloud

Safety critical applications

✓ Product must comply with safety critical regulations – i.e. medical devices, automotive	**MultiZone** guarantees non interference and spatial and temporal separation of programs
✓ Customers needs to shield critical functionality from 100's of KB of untrusted 3rd party sw	**MultiZone** provides high-grade security and separation for up to 8 execution environments
✓ Customer looking for low-cost alternatives to proprietary RTOS and hypervisors	**MultiZone** offers a simple convenient license priced per customer's design – no royalties