

RISC-V Reiwa1 IoT demo

Andes N22 service platform using Amazon AWS

September 30, 2019

SH Consulting Group

SH Consulting Group (SHC) has engineers in US, Vietnam and in Japan specialized in providing stability to RTOS, device drivers, and wireless connectivities for MCUs such as H8s, SHs, ARMs and RISC-Vs. It has been integrating OSes such as QNX, .NETMF, Linux, and Windows for MCUs and wireless solutions such as Lora, WiFi and Bluetooth for many years. They worked on Windows, Android and iOS platforms. In recent years SHC engineers enabled FreeRTOS for large semiconductor companies on ARM platforms and direct this effort to RISC-Vs.

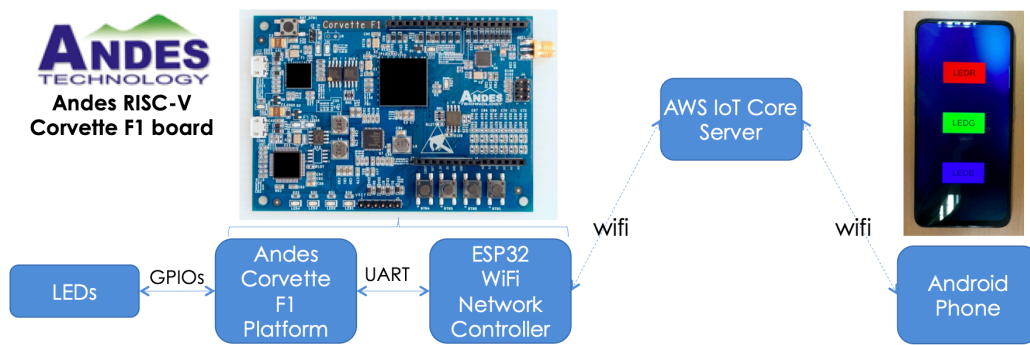


Figure 1. SHC's Reiwa1 IoT Demo Hardware Blocks

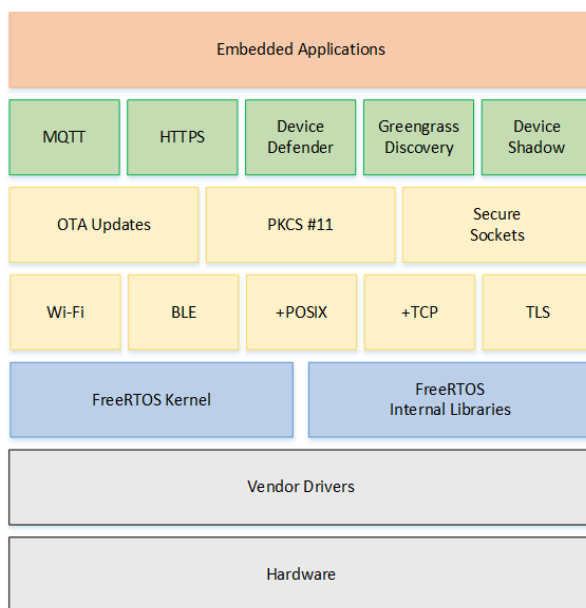


Figure 2. FreeRTOS Block Diagram

- FreeRTOS is an open source RTOS for IoTs. FreeRTOS, freely distributed under the MIT open source license, offers both a kernel and a software library that securely connects to the cloud (or other edge device). It offers features to program, deploy, secure, connect, and manage IoT devices. The program is meant to connect IoT device to AWS cloud services such as AWS IoT Core, IoT Greengrass, and other IoT devices running AWS IoT Core. AWS

IoT (Greengrass) offers a runtime that enables local execution of AWS Lambda, messaging, device shadows, and security. IoT operators can collect data and perform operations from IoT devices and IoT applications on IoT servers. A notable feature FreeRTOS Amazon offers is OTA or over-the-air firmware update. With OTA the IoT service operators from a remote place can deploy new firmware images to a single IoT device, a group of IoT devices, or entire fleet of IoT devices. The IoT operator can digitally sign firmware using Code Signing for AWS IoT, and verify the authenticity and integrity of new firmware after it has been deployed to devices.

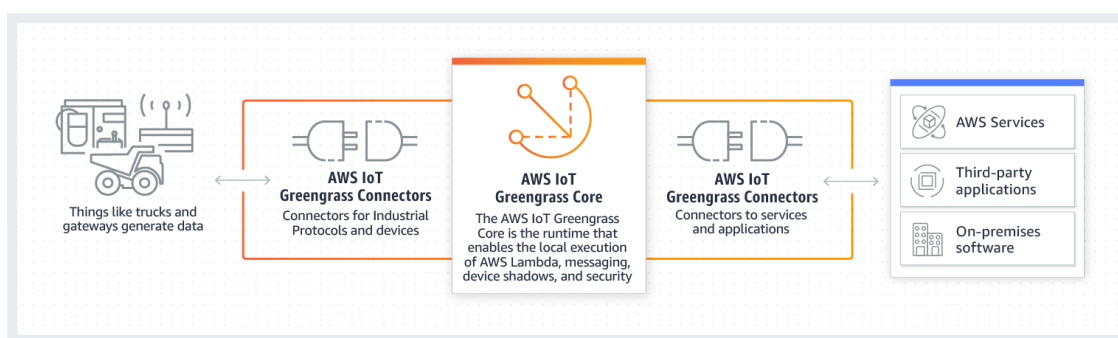


Figure 3. Amazon AWS IoT services

An IoT can be connected to the cloud Amazon AWS IoT services or local net devices to realize simple functions. Such function includes appliances, sensors, fitness trackers, industrial automation and automobiles. The cloud IoT consists of three parts. (1) AWS IoT Connectors connects to AWS IoT Greengrass Core. (2) AWS IoT Greengrass Core has a capability to locally execute Lambda, message broker functions, device shadows, and security. Device shadows acts as a pseudo device when the device is not connected. (3) AWS IoT Greengrass enables other cloud services including AWS services, third party applications, and IoT operators on-premise software.

Andes offers, for Andes N22, an Arduino compatible Corvette-F1 FPGA sandbox board, a

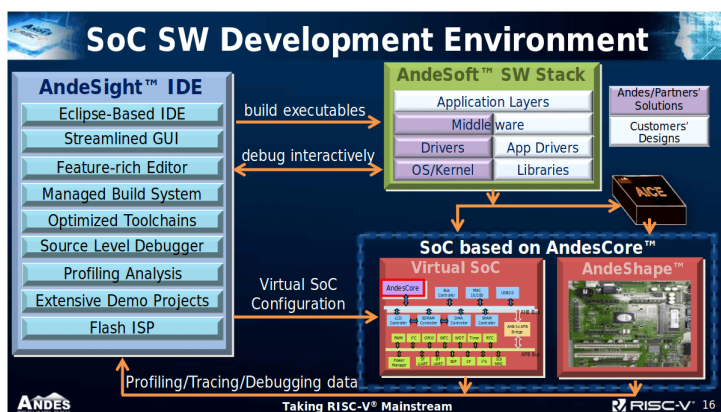


Figure 4. Andes N22 RISC-V Software Infrastructure

development kit ADP-XC7K, AICE-MINI + and AICE-MICRO, and Eclipse-based IDE tools AndeSight. Andes N22 core furthermore supports other open source programming

environments: FreeRTOS, ThreadX RTOS. In addition, RISC-V enables operating systems including Zephyr, RT-Thread, $\mu\text{C} / \text{OS-II}$, MyNewt, SylixOS, LiteOS, AliOS Things, which can also be made to run at Andes N22 RISC-V.

In SH Consulting's demo, FreeRTOS, Andes N22 RISC-V SoC, and Amazon's AWS IoT Core are connected via WiFi function (using the ESP32 WiFi chip) to AWS Cloud services. This demo shows that anyone can build IoT applications on the Andes N22 RISC-V and accelerated AWS IoT services. Starting with this demo, you can easily complete your application using only high-level languages and high-level APIs. We show the software system blocks in the figure below.

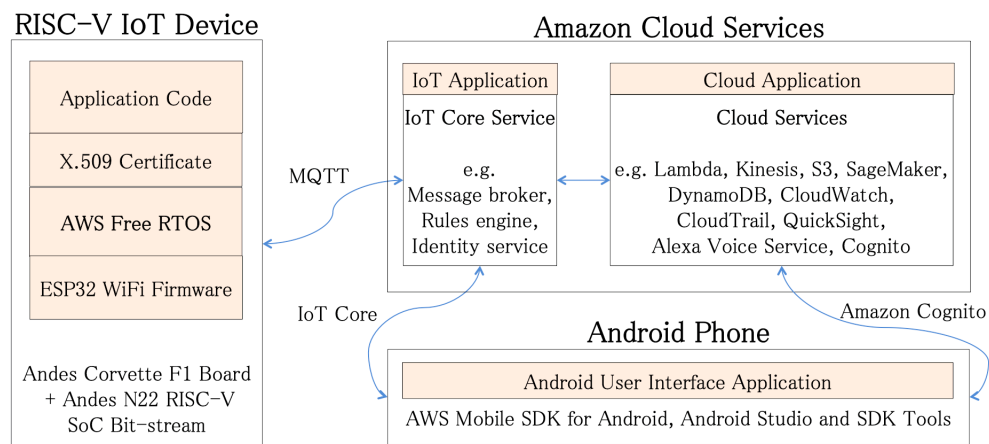


Figure 5. SHC's Reiwa1 IoT Demo Software Blocks

SHC has been always an embedded connectivity specialists providing stabilities to embeds systems of many mass-produced systems. Frequently the source of instability reside in both the IoT's internal and its local gateways such as Windows, IOSes, and Android. The engineers are ready to handle those situations frequently appear on mass-produced IoT systems. SHC is an Andes technology partner.