

Under new ownership

AWS takes 'stewardship' of FreeRTOS as it continues to build its embedded IoT presence from edge to cloud. By **Graham Pitcher**.

Since its launch by Real Time Engineers some 15 years ago, FreeRTOS has grown to be one of the most popular real time operating systems – if not the most popular. According to Richard Barry, the operating system's developer and founder of Real Time Engineers (RTE), even today, FreeRTOS is downloaded once every three minutes.

But FreeRTOS is experiencing interesting times. In November 2017, Amazon Web Services (AWS) announced that it was taking 'stewardship' of FreeRTOS. Alongside that announcement was the news that Barry was joining AWS as principal software developer for its IoT Device Services operation.

"The FreeRTOS user base continues to grow," he noted, "whichever way you measure it. And the rate of growth has increased."

Whilst it would be unfair to

describe Barry as a 'one man band' at RTE, he was closely associated with the development of FreeRTOS. "As interest in FreeRTOS grew, the rate of development slowed somewhat," he admitted. "Providing support for FreeRTOS was very important to me and I spent more time working with individuals and companies to help them with their use of the OS."

Nevertheless, FreeRTOS continued to develop. "The last release by RTE was version 9. One of the big additions to that release was task notification," he said. "The original goal for FreeRTOS was to keep all code as small as possible, but devices now have more flash and RAM and there's more use of multicore.

"The aim was to make support as wide as possible, with a range of applications that could be used on

different processor topologies," he continued. "One thing is certain; the market has changed a lot in the last 15 years."

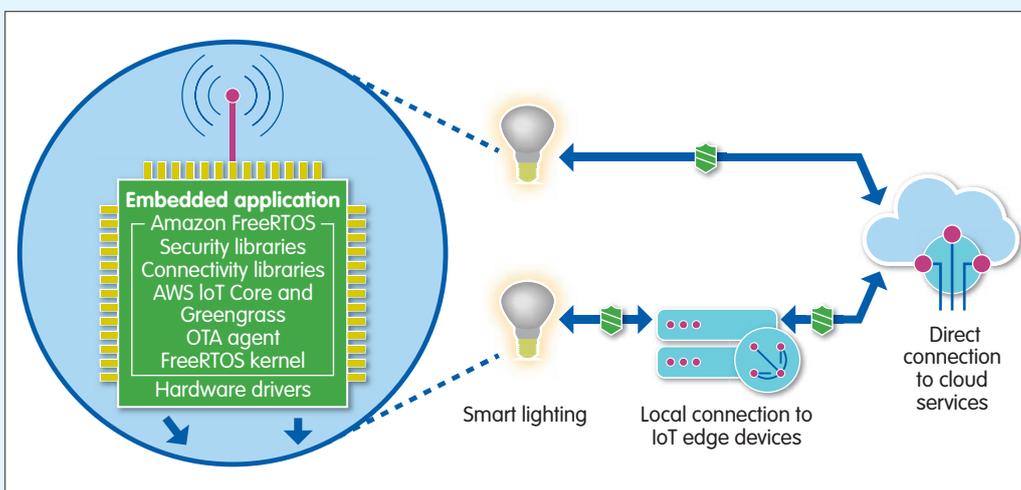
With the AWS move came the launch of Amazon FreeRTOS. "The FreeRTOS kernel is the product it always was," Barry asserted. "Amazon FreeRTOS is an extension of FreeRTOS."

Alluding to the time spent supporting customers, Barry said Amazon was able to help with a couple of notable items. "One is an easier way of downloading the code. Previously, FreeRTOS was distributed as a single ZIP file, with mature documentation. Now, it can be downloaded via the Amazon console. From that, you can select the chips you need to support and the libraries you'd like. The selection is then generated as a project with only those files you need. It's a greatly simplified process and a qualification programme makes sure the package is tested and works consistently."

One other big change brought about by the move to AWS is in the licensing model. FreeRTOS and Amazon FreeRTOS are now subject to the MIT license. "It's a liberal licence," Barry pointed out, "and one of the most common open source licences. The move is intended to remove barriers to adoption."

Already, the AWS influence is being seen in FreeRTOS. "One of the things we've looked to do is to make the OS more multicore friendly," Barry said. "For example, we've laid out methods of passing data from core to core. And, in the first version of Amazon FreeRTOS, there are stream buffers; gateways for tasks

Figure 1: Amazon FreeRTOS enables secure connection to cloud services or to other edge devices, as well as supporting remote updates over the air



to ‘talk’ with other tasks. There is also transport for core to core communications.

“As far as the FreeRTOS kernel is concerned,” he continued, “the user base will have the benefit of greater resources – and you can see that immediately through the release of FreeRTOS version 10.”

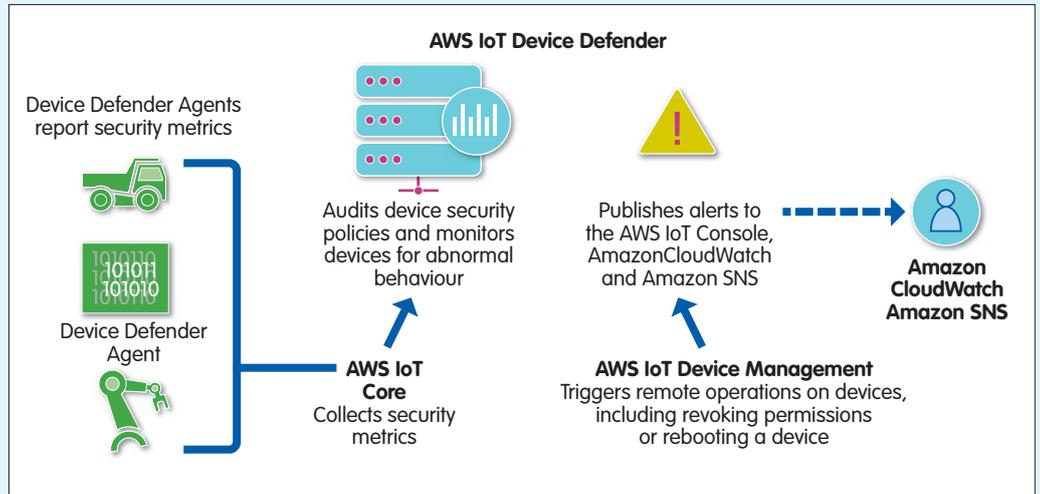
As might be expected from a company well versed with the cloud, Amazon FreeRTOS is cloud native. The FreeRTOS kernel is one of the libraries in the OS, with a focus on connectivity and security,” Barry noted. “And the integrated libraries are design to be secure by default.

“Because security and connectivity are already there, time to market should be shorter. This will allow customers to focus on innovation and differentiation, rather than learning about the libraries and integrating them.”

But what does the word ‘stewarding’ mean? “Everything Amazon provides is MIT licensed,” Barry pointed out. “So, stewarding relates to the licensing terms and to AWS putting in the resources needed to create the features for which customers are asking. But nothing will change as far as the FreeRTOS community is concerned.”

Nevertheless, Barry does accept that it will be necessary to differentiate between FreeRTOS and AmazonFreeRTOS. “The FreeRTOS kernel will continue as it always has; it has massive application. But AWS has the AWS IoT Core service and we want to make it as easy as possible for people to connect to that.

“Once you put AWS Client Service and Amazon FreeRTOS together, you can create an ecosystem from the Cloud to the gateway. With Greengrass for Linux and Amazon FreeRTOS on an MCU, you can have end to end integration. But,” he asserted, “there are no plans to diverge the kernel; it will be the same version.”



Michael Garcia, senior technical programme manager, AWS IoT, noted: “With Amazon FreeRTOS and Greengrass, you can connect sensors to local computing and machine learning and that data can be connected back to the cloud. Customers are interested in using analytics to transform that data and to get insights into their processes.

“Those insights can be used to train a module and, using Greengrass’ OTA (over the air) update facility, that training can be pushed back to the edge, so the edge gets smarter and smarter.”

And he recognises the importance of security. “Security is everywhere,” he claimed. “It’s an AWS priority and is built in. There are libraries and security mechanisms in Greengrass to control the execution of local compute. When you connect to the Cloud, there are certificates and, on top of that, we have announced AWS Device Defender.

“If someone can exploit a chipset,” he continued, “you have to be able to detect that and that’s what Device Defender allows you to do. You can then compare that to a security policy and take action. For example, you could execute a remote job, such as quarantining, or perform a hard factory reset.”

Garcia contended: “It’s an end to end story; from the most constrained

Figure 2: AWS IoT Device Defender audits security policies to make sure devices aren’t deviating from best practices



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Richard Barry

devices all the way to the Cloud. Users now have the tools they need to access complex analytics and machine learning, while making it easy to manage things and remain secure.”

Barry noted that one of the questions he is asked most often is ‘what happens to the relationship with Wittenstein?’. “The answer is that it will continue as normal. It’s an important part of the ecosystem, especially for safety critical applications.”

Commenting in November, Dr David Cowling, managing director of Wittenstein high integrity systems, said: “We have a long and successful history of working with Richard Barry and the FreeRTOS project. As part of our strategic business alliance with AWS, we will continue to provide Amazon FreeRTOS users with the option of commercial licensing and, for those developing safety critical systems, the ability to upgrade to SAFERTOS.”

Concluding, Barry said: “There’s a FreeRTOS ecosystem that exists already. Anyone in that ecosystem with connectivity or security requirements should be looking at the opportunity to innovate using cloud services. It’s a huge boost to the FreeRTOS community and you don’t have to be an AWS customer to use either kernel.”