

# Exciting new features in nRF Connect SDK v2.1.0



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# Today's hosts

Bjørn Kvaale

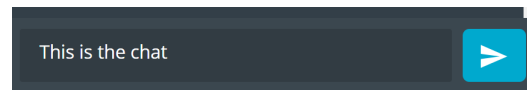
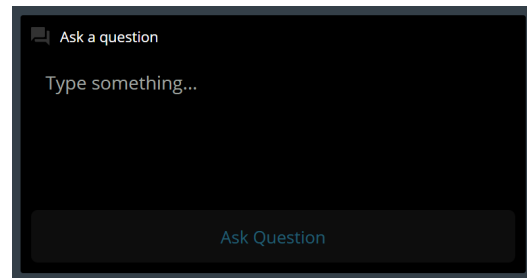


Product Marketing Engineer



# Practicalities

- Duration: 45 min presentation, 15 min Q&A
- Questions are encouraged!
  - Please type questions in the top of the right sidebar
  - All questions are anonymous
  - Try to keep them relevant to the topic
  - We will answer them towards the end
- The chat is not anonymous, and should not be used for questions
- Go to DevZone if you have more questions
- A recording of the webinar will be available together with the presentation at [webinars.nordicsemi.com/on-demand](https://webinars.nordicsemi.com/on-demand)



# Agenda

- Intro to the nRF Connect SDK
- Generic updates
- Security, Thread and Matter, Wi-Fi updates in nRF Connect SDK v2.1.0
- Cellular IoT updates in nRF Connect SDK v2.1.0
- Q&A

# Communities

Webinars



**Technology intros  
and trainings**

[nordicsemi.com/webinars](https://nordicsemi.com/webinars)

Nordic Developer Zone

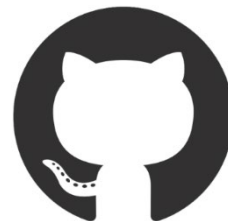


**Nordic tech support center  
& online community**

29k+ users, 80k+ Posts Q&A  
3 million page visits last 6 months

[devzone.nordicsemi.com](https://devzone.nordicsemi.com)

Nordic GitHub



121 Repos, C/C++  
Python, Javascript

[github.com/NordicSemiconductor](https://github.com/NordicSemiconductor)

## nRF Connect SDK intro

# nRF Connect SDK



- One code base and toolchain for nRF91, nRF70, nRF53, nRF52 and nRF21 Series
  - Optional for nRF52 Series (  $\geq$  v1.3.0)
- Includes LTE-M, NB-IoT, GNSS, Bluetooth Low Energy, Wi-Fi, Bluetooth mesh, Thread, Zigbee, Matter, ESB, Gazell, NFC
- Bluetooth v5.3 qualified Host and Controller stack since v2.0.0



# Generic Updates

nRF Connect SDK v2.1.0



# Generic Updates

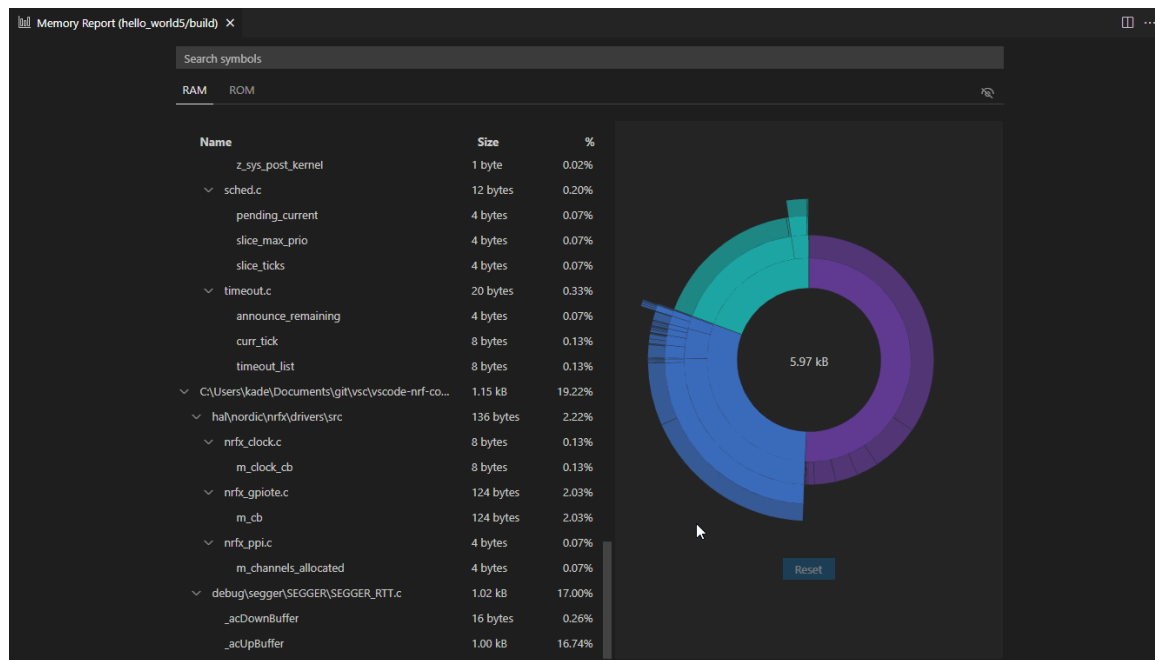
- nRF Connect for VS code improvements
- Unified installation experience across all three major operating systems: Windows 10, macOS 11, and Ubuntu 20.04 LTS
  - [Supported Operating Systems](#)
- Toolchain updates
- Finds My support for the nRF5340 SoC
- Memfault support over Bluetooth LE
- TX power envelope with FEM power control

# nRF Connect for VS Code

- Visualization of TF-M in nRF Connect for VS Code
- nRF Debug
  - Custom debugger experience for Nordic devices
  - Default debugger in nRF Connect for VS Code
  - Can use the old Cortex-debug
- Memory report
  - Partitions in multi-image devices
  - GUI visualization of memory usage

Address	Hex				Ascii
00000000	60 1b 00 20	f9 24 00 00	b5 83 00 00	b1 24 00 00	` ù\$ uf ±\$
00000010	b1 24 00 00	b1 24 00 00	b1 24 00 00	00 00 00 00	±\$ ±\$ ±\$
00000020	00 00 00 00	00 00 00 00	00 00 00 00	79 20 00 00	y
00000030	b1 24 00 00	00 00 00 00	21 20 00 00	b1 24 00 00	±\$ ! ±\$
00000040	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!
00000050	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!
00000060	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!
00000070	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!
00000080	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!
00000090	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!
000000a0	65 21 00 00	65 21 00 00	65 21 00 00	65 21 00 00	e! e! e! e!

# nRF Connect for VS Code



# Toolchain Manager for Mac

- Mac: utilizing M1 CPU performance in toolchain distributed by Toolchain Manager.
- Reduces build times by up to 50% compared to Intel CPU

# Find My support for the nRF5340 SoC

- Apple Find My utilizes the power of crowdsourced locationing
- Accessory devices communicate with iOS devices to let owners locate the accessories
- Can now support complex applications that use the Apple Find My network as a secondary functionality

# Memfault: Connected Device Observability Platform for nRF Connect SDK devices

- **Continuous Monitoring** - View device and fleet-level metrics like battery health and connectivity in real-time dashboards with customized charts and alerts for Nordic.
- **Remote Debugging** - Resolve issues more efficiently with automatic detection, deduplication, and actionable insights sent via the cloud.
- **OTA Firmware Updates** - Once bugs are fixed, deploy updates directly to customer devices in the field for quick issue resolution.
- Native integration via the nRF Connect SDK gives [Nordic developers access to Memfault on 100 devices free](#). Setup takes 5 minutes.



**Memfault**

# Memfault support over Bluetooth LE

- Uses the [Memfault Diagnostic Service](#)
  - Custom service that forwards diagnostic data through a Bluetooth LE gateway
- [Bluetooth Peripheral MDS sample](#)
  - Collects core dumps, reboot reasons, metrics and trace events from devices



**Memfault**

# TX power envelope with FEM power control

- Works for Bluetooth LE and 802.15.4
- Can adjust gain on nrF21540 RF front-end module (FEM) to get closer to the target output power over the entire operating range
- Can be extended to work with other FEMs



# Security updates

nRF Connect SDK v2.1.0

# Trusted Firmware-M in nRF Connect SDK

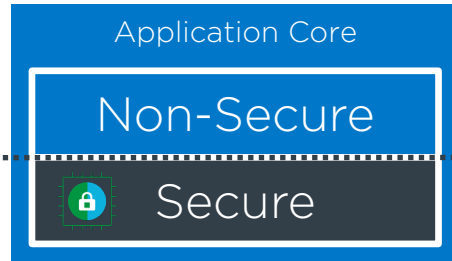
- Trusted Firmware-M is upgraded to v1.6, brings flash and RAM overhead optimizations
- Trusted Firmware-M now replaces the Secure Partition Manager (SPM)

Trusted Firmware-M isolates security critical functions from the user application using TrustZone technology:

- Cryptographic libraries
- Private keys
- Peripherals interacting with critical hardware

PSA APIs (TF-M)

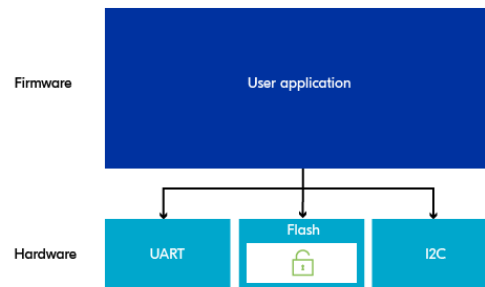
nRF53 / nRF91



# Trusted Firmware-M: Security by Separation

## Without TF-M

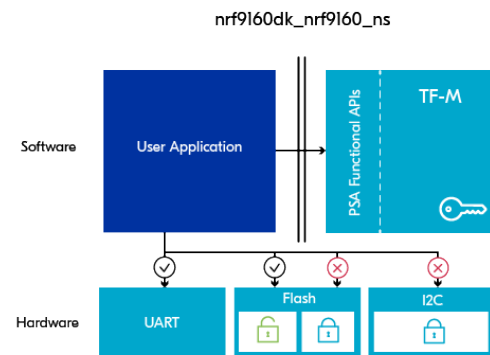
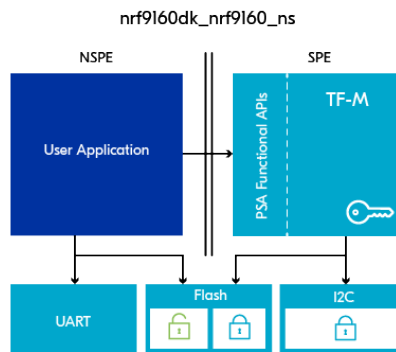
User application has access to the entire flash memory space and all peripherals



## With TF-M

User application can access peripherals and memory allocated to the Non-Secure world.

Access to Secure peripherals and storage is only possible through PSA Functional APIs accessing services in TF-M



## Thread v1.3 and Matter

# Thread evolution

## Thread 1.1

Low power  
Resilient (mesh)  
IP-based  
Open protocol  
Secure and user friendly  
IEEE 802.15.4 Radio

## Thread 1.2

### Thread 1.1 +

#### Low Power enhancements:

- Enhanced Frame Pending
- Enhanced Keep-Alive
- Coordinated Sampled Listening
- Link Metrics

#### Improvements for commercial:

- Backbone Router
- Domain Unicast Addressing
- Multicast across Thread Networks

## Thread 1.3

### Thread 1.2 +

#### Enabling Matter:

- Bidirectional DNS-based Service Discovery (Border Router and End Devices)

#### Standardizing Border Routers which connect Thread networks to existing IP infrastructure:

- Bidirectional IPv6 connectivity

#### Simplified in-field firmware update:

- Bulk transfer (TCP/TLS)

# Thread 1.3 certification

- Thread 1.3 certification is a prerequisite for Matter 1.0 over Thread device certification
- nRF Connect SDK 2.0.2 (released end of July) added support for Thread 1.3.0 to enable both the testing of Matter during Specification Validation Event (SVE) and the Thread 1.3.0 Certification by Inheritance for Matter 1.0 end products
- nRF Connect SDK 2.1.0 reuses Thread libraries from nRF Connect SDK 2.0.2



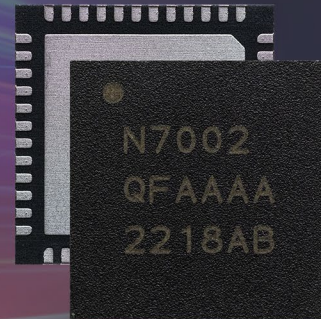
## Feature complete implementation of Matter For Thread and Bluetooth LE

- Feature complete, experimental support
- Matter Specification Validation Event (SVE) still in progress
- Not final Matter v1.0 code, can manually update the Matter portion of the SDK later
- A minor release of nRF Connect SDK v2.1 will include support for Matter SDK v1.0 tagged code



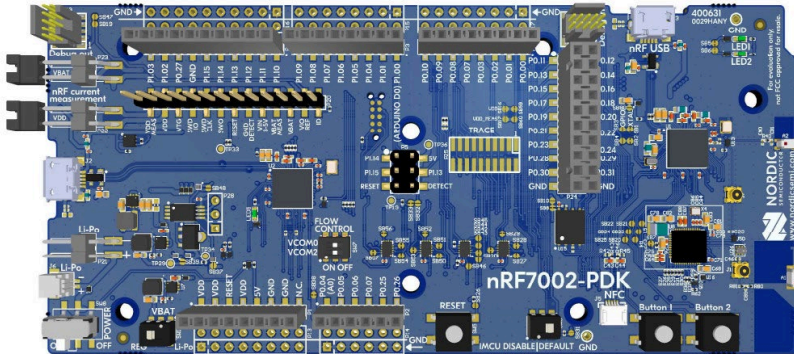
# Wi-Fi Introduction

Support for the nRF70 Series





nRF7002 DK Board support  
nRF5340 SoC and nRF7002 companion IC



- Experimental support
- Wi-Fi samples available
  - Matter Light switch
  - Matter Template
  - Matter Door Lock
  - Wi-Fi shell
- nRF7002 Wi-Fi driver
- WPA supplicant
- Wi-Fi – Short range coex

Sign up for our Wi-Fi newsletter!

Contact sales to get samples soon!

# Nordic Distance Toolbox

nRF Connect SDK v2.1.0

# Nordic Distance Toolbox (NDT)

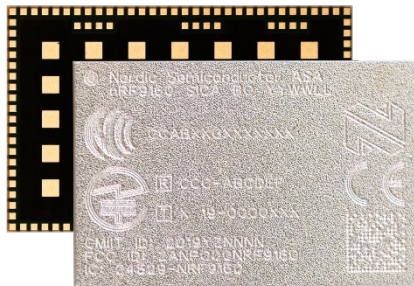
- Goal of NDT is to provide an easy-to-use interface for distance measurement
- Distance is computed based on all information available to the device
- Added experimental support for the NDT on the nRF5340 SoC with samples

# Cellular IoT updates

nRF Connect SDK v2.1.0

# Complete low power cellular IoT solution

nRF9160



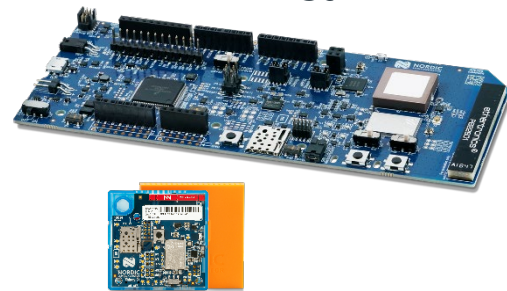
Dedicated application processor and memory  
Multimode LTE-M / NB-IoT modem with integrated  
RFFE and GNSS support  
Ultra Low Power

nRF Connect



nRF Connect SDK  
nRF Connect for Desktop  
nRF Cloud

nRF9160 DK &  
Thingy:91



Standalone development kit  
& prototyping platform  
eSIM from iBasis  
nRF52840 board controller with Bluetooth LE  
LTE, GNSS, and 2.4 GHz antennas

# Cellular Highlights

- LwM2M queue mode now enables eDRX and PSM support
- nRF Cloud Location Services supported via LwM2M/CoAP
- Support for Microsoft Azure Embedded C SDK
- Enhanced modem trace reliability and robustness
- nRF Cloud full modem FOTA supported
  - Requires external flash

# Zephyr LwM2M v1.1

- App layer protocol with device management
- Based on CoAP/UDP, defined by Open Mobile Alliance
- LwM2M carrier library required in AT&T, T-Mobile or Verizon certified product
- [LwM2M carrier sample](#)





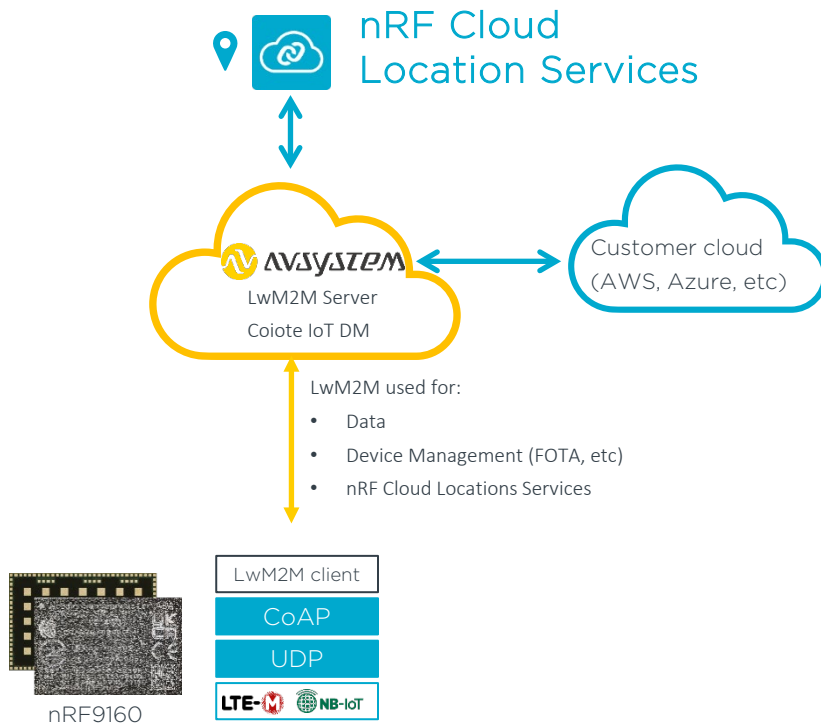
# Zephyr LwM2M v1.1

- In nRF Connect SDK v2.0.0
  - Composite Read, Write and Notification
  - Send operation
  - CBOR (and JSON) data format
- In nRF Connect SDK v2.1.0
  - SenML-CBOR content format
  - Composite operations
- LwM2M v1.1 now supported



# AVSystem + nRF Cloud Location Services

- Full featured LwM2M device management.
  - With support for nRF Cloud Location Services.
- Using our Zephyr LwM2M stack. (Or AVsystem Anjay LwM2M stack).
- Nordic delivers location services and AVSystem delivers device management.
- nRF Cloud Location Services through Coiote LwM2M Server
  - Used in both [lw2m client sample](#) and [Asset Tracker v2 application](#)
- Free trial, getting started documentation and webinar recording. See [partner page](#).
- Webinar recording goes through getting started



# Efficiency comparison

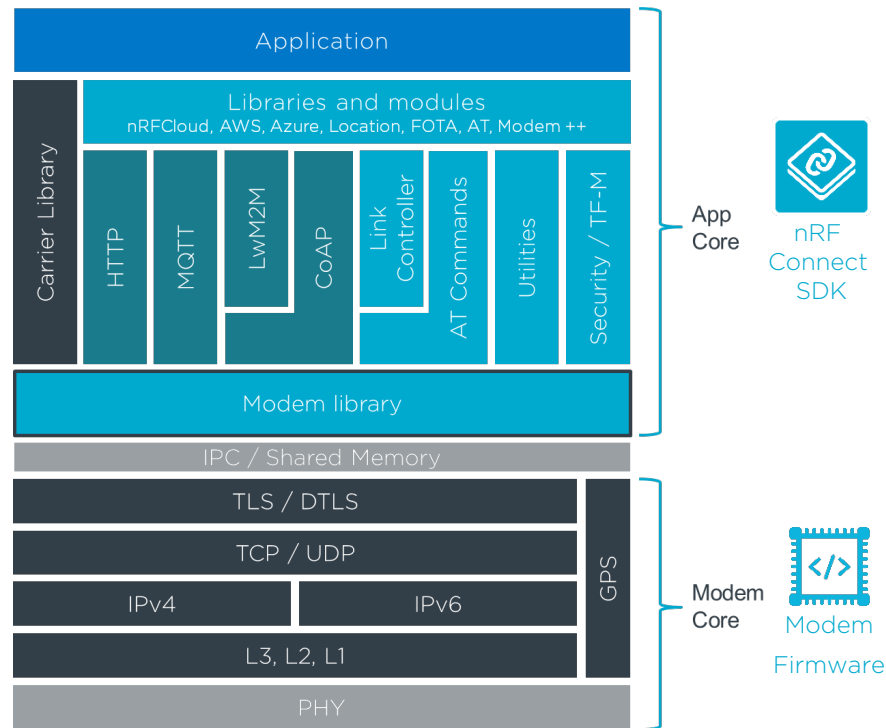
## Device management for low power constrained devices

- [Source MachNation, 2020](#)
- Metrics of a typical IoT device
- AWS IoT MQTT broker
- AVSystem Coiote LwM2M
- Data reporting scenario
  - Update of one string, one floating-point number, one integer, and one Boolean every 30 seconds
  - 10 reports over 5 min
- FOTA scenario
  - Download 1,048,576 byte test file

	LwM2M	MQTT	Efficiency
Initial connection	4213 bytes	14907 bytes	LwM2M 72% more efficient
	14 packets	53 packets	
Steady-state	179 bytes	260 bytes	LwM2M 31% more efficient
	2 packets	3 packets	
Data reporting	1820 bytes	15394 bytes	LwM2M 88% more efficient
	10 packets	30 packets	
Single platform to device	181 bytes	217 bytes	LwM2M 17% more efficient
	2 packets	2 packets	
FOTA update	1.15 MB	1.11 MB	MQTT 4% more efficient

# Microsoft Azure Embedded C SDK

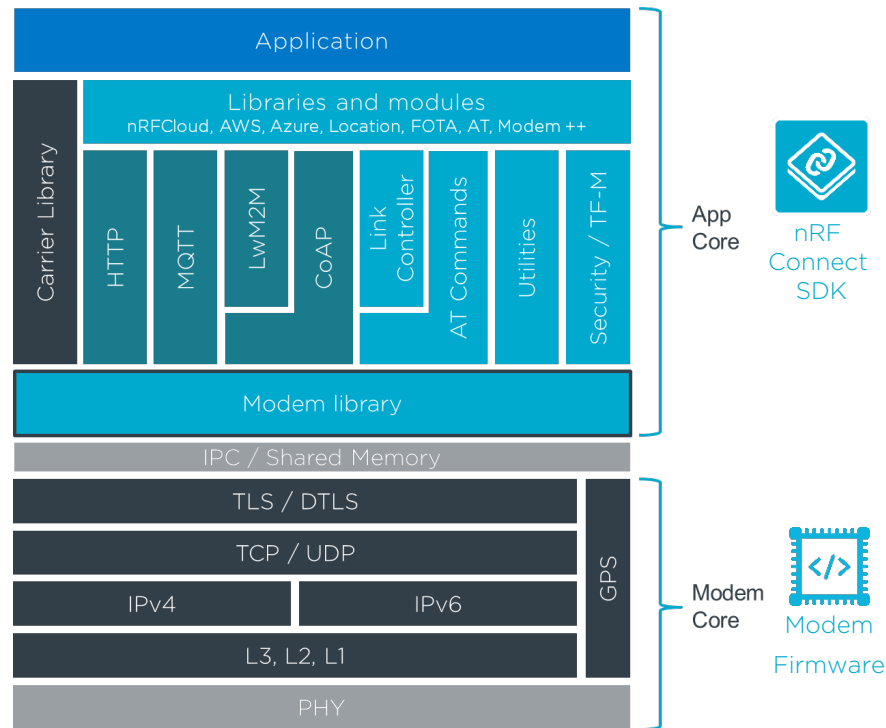
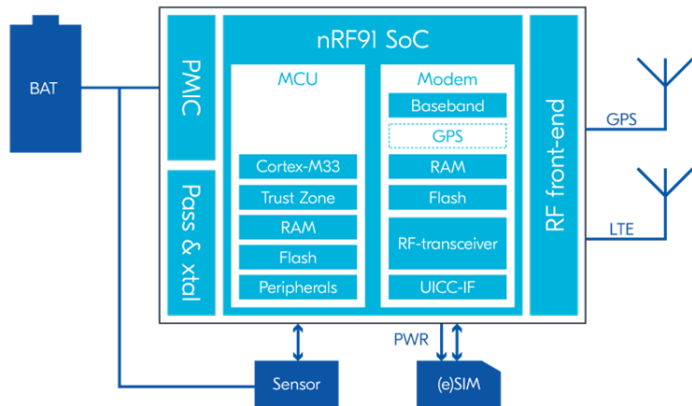
- Allows the nRF9160 to leverage Azure services
  - Device to cloud telemetry, cloud to device messages, direct methods, device twins, device provisioning and FOTA
- Included as a library in nRF Connect SDK
- Azure Embedded C SDK v1.4.0-beta.1 supported ([see doc](#))



# Enhanced modem trace reliability

- Modem tracing over UART and RTT
- Enhancement for handling modem traces for increased robustness/reliability
- Modem trace backend sample demonstrates how to add a custom trace backend

# nRF Connect SDK overview



# Supported Modem firmware



- [mfw\\_nrf9160 v1.3.2](#)
- [Compatibility matrix](#)
- [nRF9160 Certification web page](#)

nRF9160 modem firmware version	nRF Connect SDK
1.3.0	1.6.0
	1.6.1
	1.7.0
1.3.1	1.7.0
	1.8.0
	1.9.0
1.3.2	1.8.0
	1.9.0
	1.9.1
	2.0.0
	2.1.0

Table 1. nRF9160 modem firmware and nRF Connect SDK versions

# Modem Firmware v1.3.2

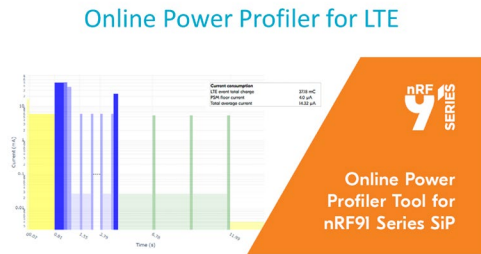
- Full release notes in modem zip folder or on [our webpage](#)
- Focus on carrier and customer fixes, power consumption and location
- Reduced mobility for stationary devices.
- Fixed flow control between modem and application.
- Obstructed satellite visibility detection feature for GNSS (Early Indoor / No GNSS signal detection)





# Tools for saving power

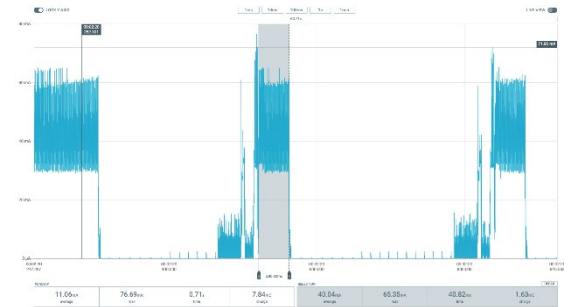
## Online Power Profiler



## Power Profiler Kit II



## Power optimization guide



# Get on it

#1

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#2

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Q&A