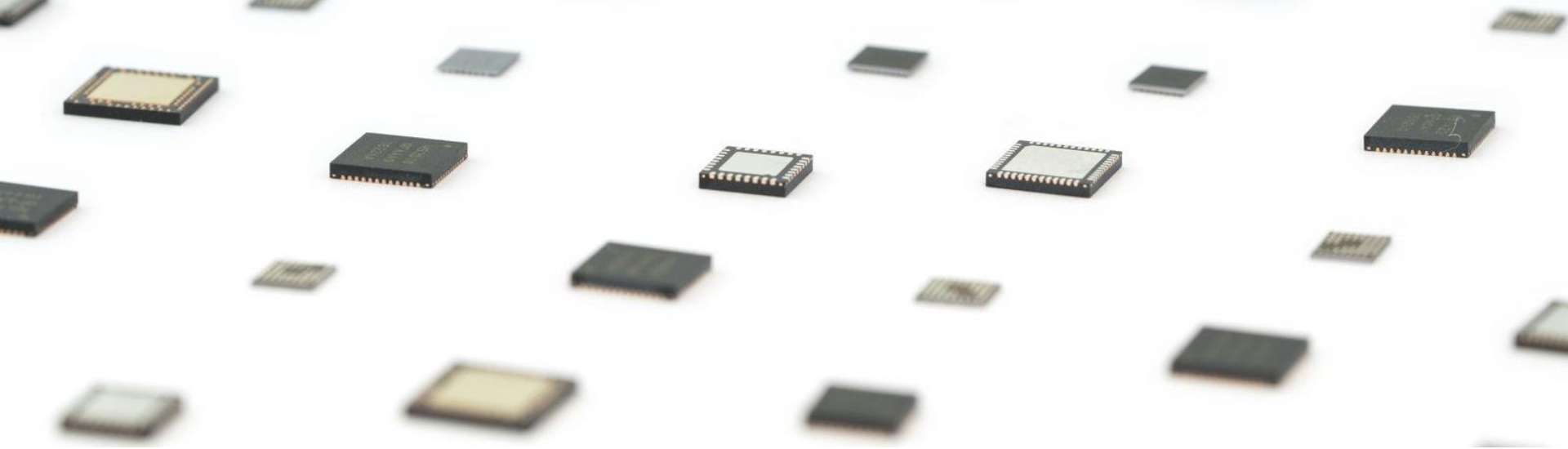

AVNET 4 in 1 Training – Nordic Semiconductor

Part 2

nRF Connect SDK / Cellular IoT Solution

25. October 2022

Kevin Kotinkar

Technical Sales Engineer

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Agenda – Nordic Part 2

- Introduction to Nordic‘s Cellular IoT Product
- Hands-on: Extend project for UDP data transmission
- Hands-on: Verify UDP data on server’s end
- Hands-on: Test the modem with AT cmds – Serial LTE Modem (SLM)

- Summary

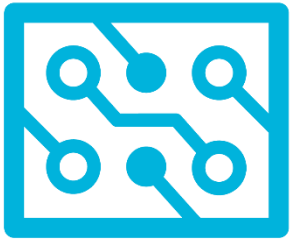
The key advantages of nRF9160

Low power

Bottom-up design from scratch

Low leakage processes

Optimized radio performance



Integration

Unprecedented level of integration

Cellular modem + programmable application processor in compact LGA SiP: 10x16x1.04mm

Ease of use

Globally pre-certified module

Nordic Software Development Kit

Modem Lib ~~(AT commands)~~

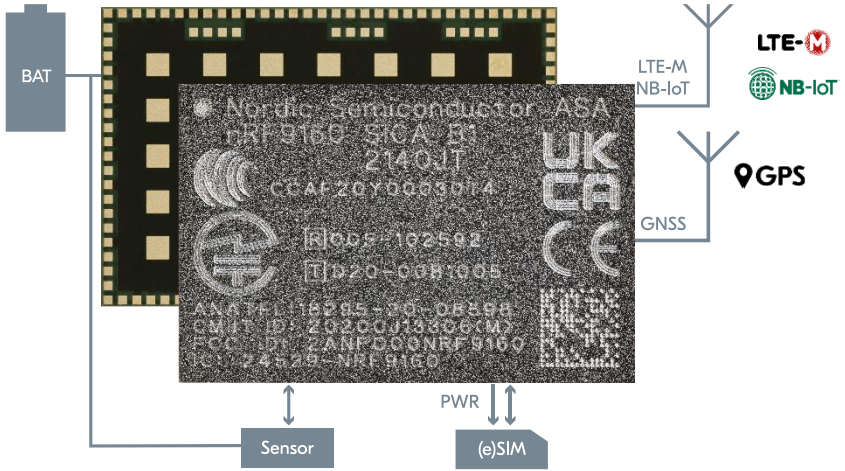
nRF9160 System-in-Package (SiP)

- Based on **Nordic's RFMCU System Design:**
  - Multiband **LTE-M/NB-IoT** modem with GPS
  - **Integrated Arm® Cortex® M33 MCU** for the application

- **High level of integration**
  - Includes PMIC, RF FEM, passives and crystals
  - Externally required: Power, Sensors, SIM & antenna

- **Ultra Low Power** *(values include SIM + App MCU current)*
  - Avg. 18µA @ 81.92s eDRX
  - Power saving mode (PSM) floor current: 2.7 µA

- Multiband support for global coverage
- **Pre-certified module** as System-in-Package (SiP)

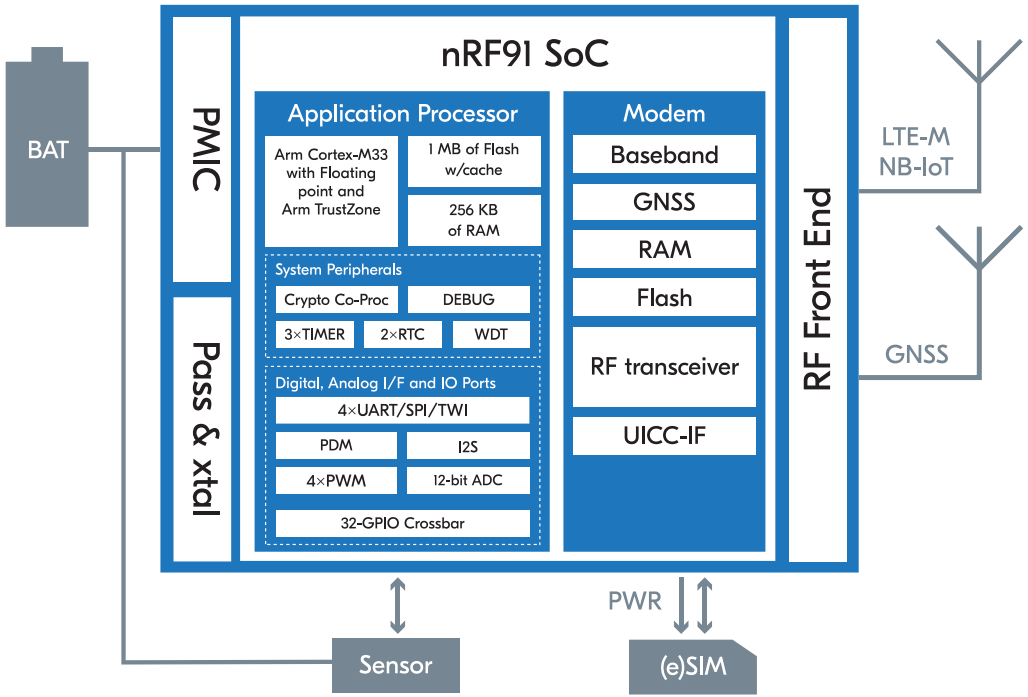


10x16x1.04mm formfactor

Pre-certified SiP

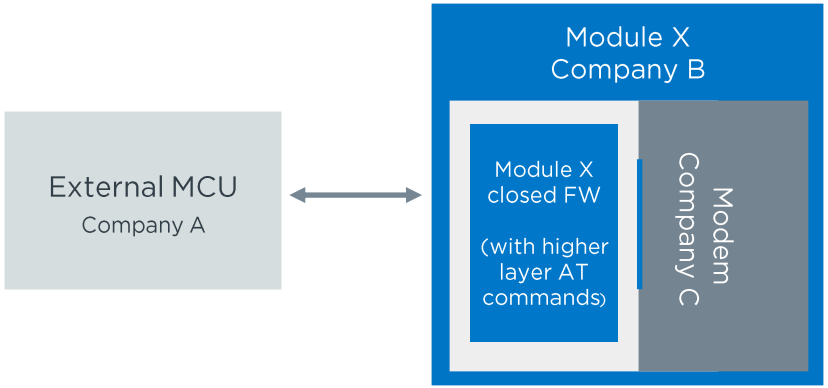
Global coverage

nRF9160 System-in-Package (SiP)



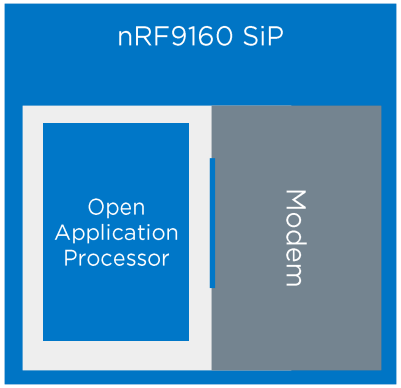
How does Nordic solution compare

Other cellular solutions



- Dependent on several vendors (e.g. modem chip vendor)
  - No guaranteed of support or issues fixed
  - Traditional serial modem communication can add extra complexity, lower throughput and higher power consumption

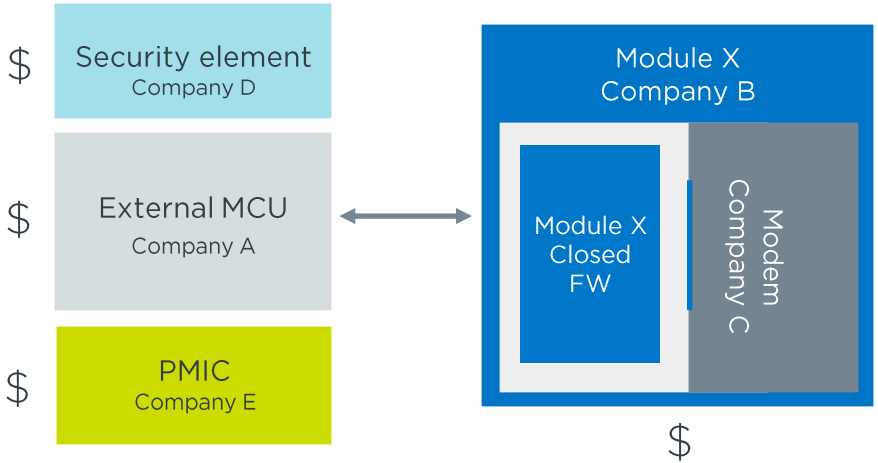
Nordic solution



- Whole solution developed by Nordic
  - Full integration of secure communication, opensource libraries for major protocols and clouds
  - Support for application and modem firmware updates (signed images)
  - Frequent updates on firmware and libraries

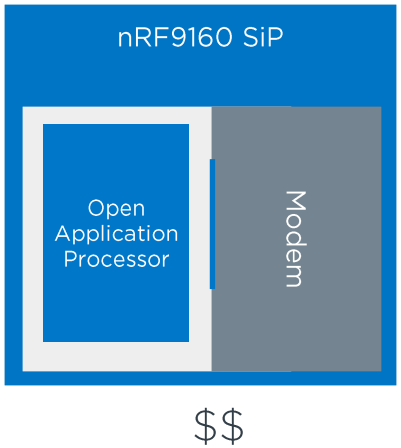
Cost comparison

Other cellular solutions



- Customer must develop/maintain own communication/security libraries
- More components on BOM add cost, size and supply chain challenges
- Challenging to support for the full lifecycle of the product

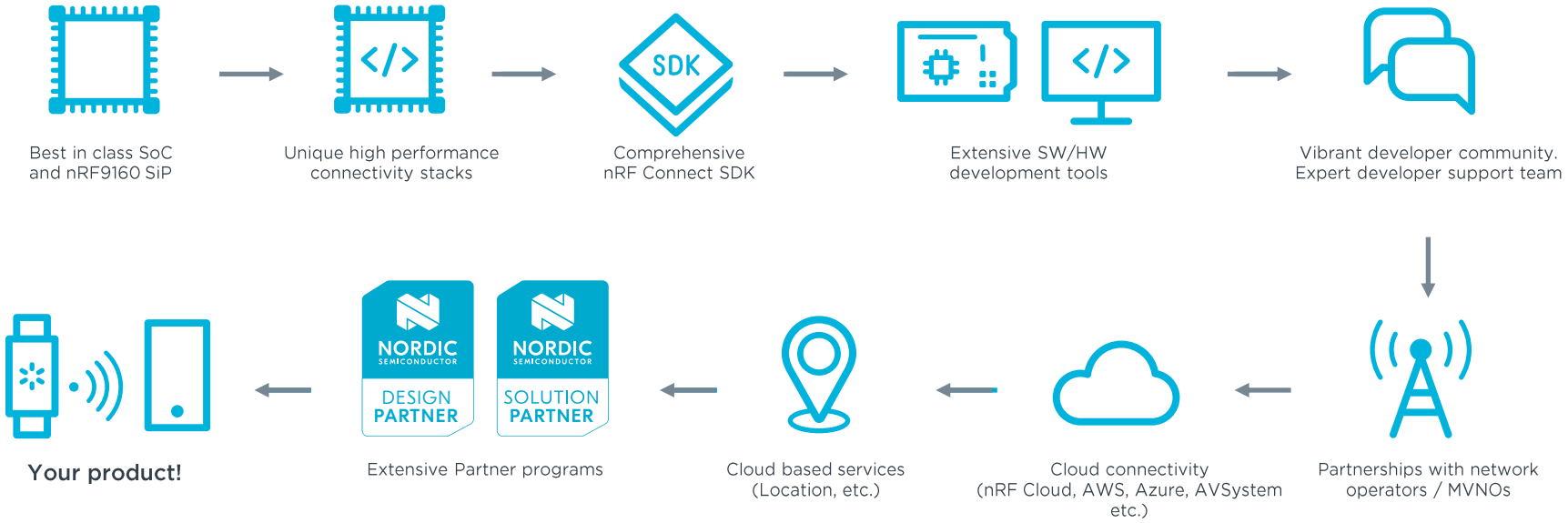
Nordic solution



- Less components on BOM
- Smaller footprint of the total design
- Maintained by Nordic
- One support channel

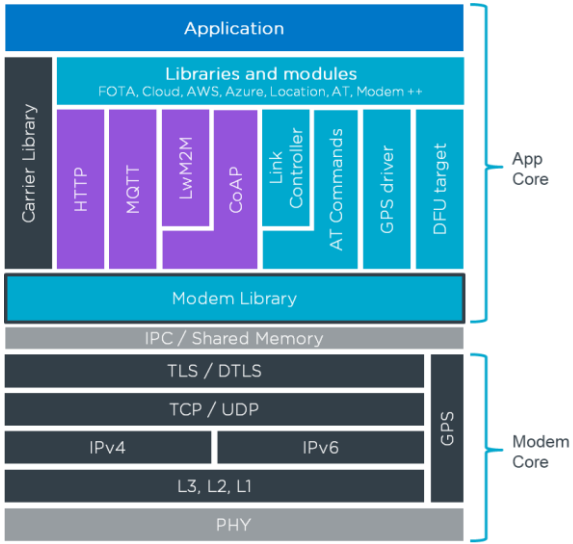
Solving the customer journey

From idea to finished product



Developer friendly and open environment

nRF Connect SDK



Support for all major protocols

- e.g. MQTT, CoAP, LWM2M, HTTP(S), etc.

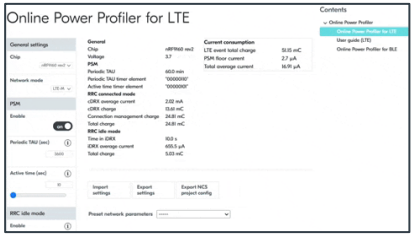
Native in nRF Connect SDK

- All open source and free of charge
- Flexible sockets: connect to multiple Clouds and services
- Robust and flexible FOTA
- RTOS for a modular approach
- Full application and cloud examples
- Publicly hosted on GitHub

Connectivity protocols seamlessly integrated with modem

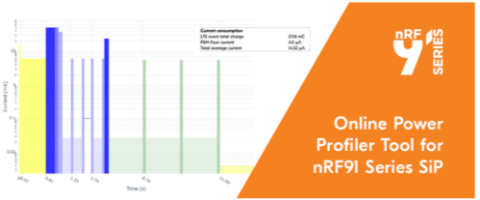
- Nordic owns of the entire solution – simple support
- Focus on your own application

Developer friendly and open environment



Demo of Online Power Profiler

Estimate power consumption



Made to also fit cellular beginners

- Extensive User Guide available

No expensive LTE call box needed anymore

- Control and set network parameters

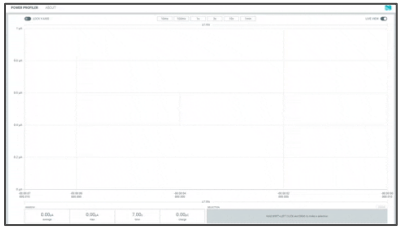
Re-configure, test and learn quickly

- See what and how parameters affects power consumption

Export settings to nRF Connect SDK UDP sample

- Unified solution with the Power Profiler Kit II

Developer friendly and open environment



Demo of the Power Profiler

Measure power consumption

Perfect to track and measure power consumption

- Simple, accurate and powerful

Easy to estimate battery life

- Auto-calculates energy consumption

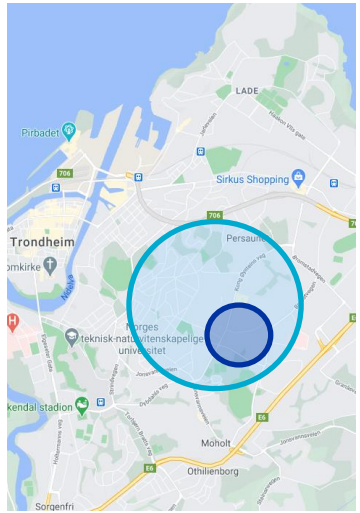
Spot and debug unwanted current drains

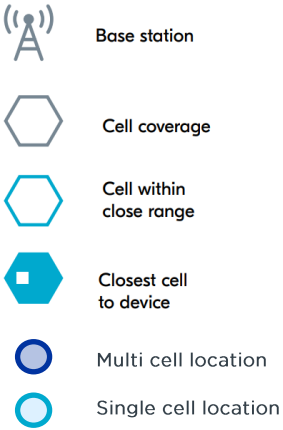
- Continuously during engineering cycle
- Compare with the Online Power Profiler

Easy and cost-efficient

LTE based location services

- Benefits of LTE based is that it uses **ultra low power**
  - It works inside buildings
  - Does not use the GPS modem
- Single cell location
  - Get rough location based out of nearest cell tower
  - Accuracy ~1km
- Multi cell location
  - Get medium location based out of nearest cell tower
  - Up to 17 cell tower can be used at once
  - Accuracy ~300m
- Combine different technologies
  - GPS and Cell ID based



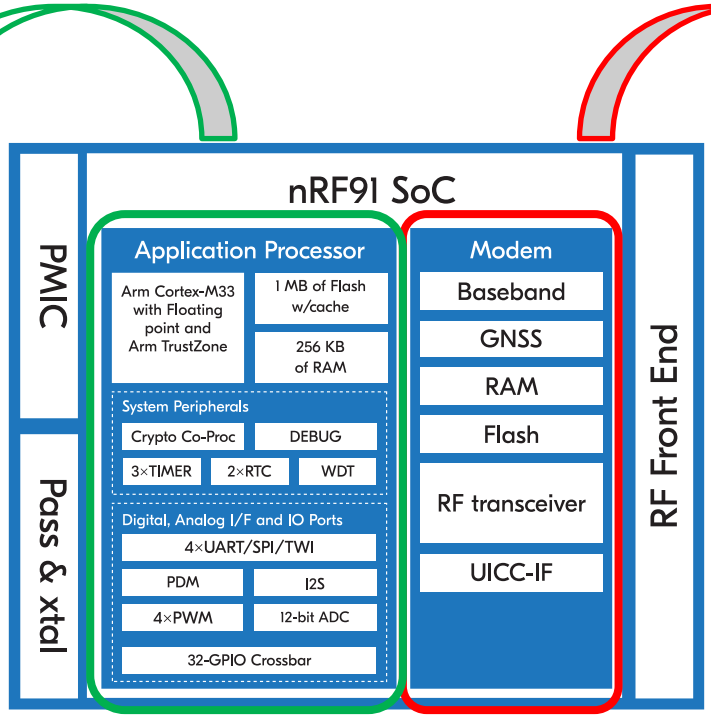


Hands-on

nRF9160 System-in-Package (SiP)

ARM MCU (open processor)

- Task: Develop own software
- Interact with peripherals, configure modem, send data
- Ready to use examples: SLM, MoSh

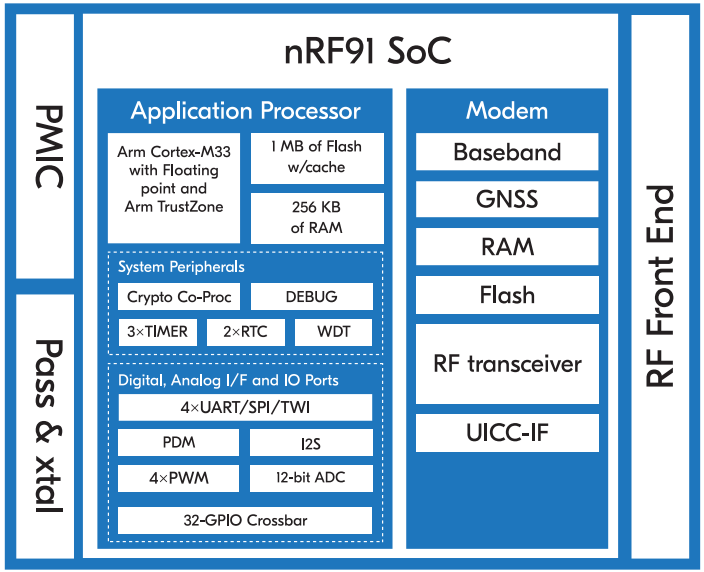


Modem Firmware (compiled binary)

- Task: Update to latest certified version, e.g. v1.3.2
- Includes set of AT cmds, LTE protocol stack etc.

Serial LTE Modem

- Customer can interact with Modem through UART
- Customer can use SLM specific AT commands and/or implement his own AT commands



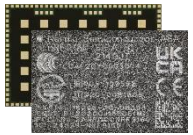
Modem Firmware (compiled binary)

- Includes 3GPP standardized AT commands
- + Nordic proprietary commands that are certified as part of Modem Firmware

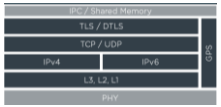
- AT Communication:

So, in summary…

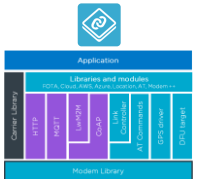
We do not only provide a modem, and nor just a best-in-class SiP



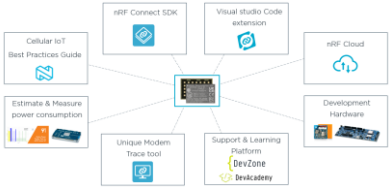
Best in class SoC and nRF9160 SiP



Unique high performance connectivity stacks



Comprehensive nRF Connect SDK



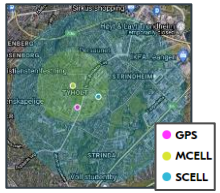
Extensive SW/HW development tools

DevZone

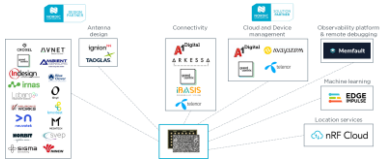
Vibrant developer community. Expert developer support team

Partnerships with network operators / MVNOs

Cloud connectivity (nRF Cloud, AWS, Azure, AVSystem etc.)



Cloud based services (Location, etc.)



Extensive Partner programs

Your product!

Nordic provides the complete cellular IoT solution

Thank you