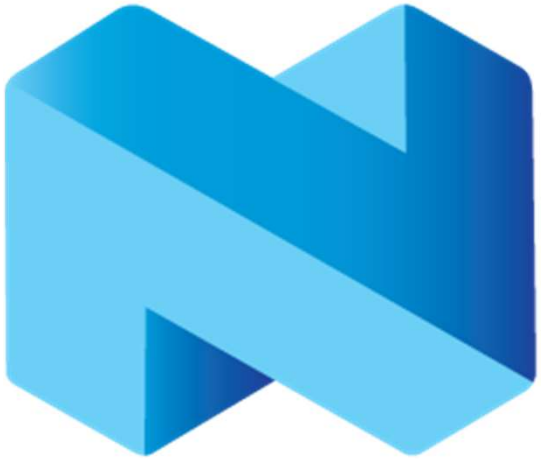


NORDIC
SEMICONDUCTOR

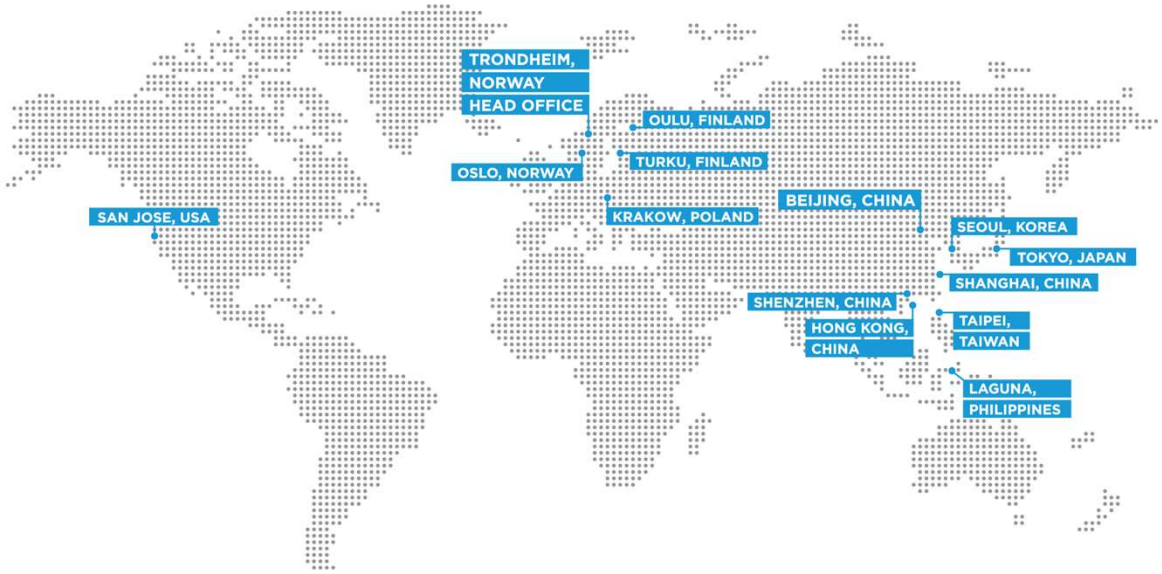
Smarter Things

An introduction to Nordic Semiconductor

Ultra Low Power Wireless Solutions

Edvin Holmseth
Uni. Of Strathclyde
January 2020

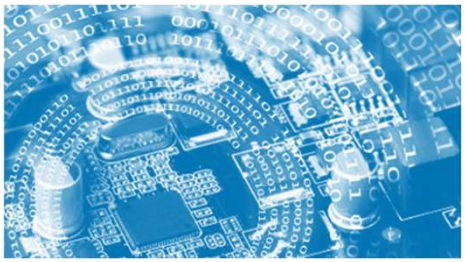
About Nordic Semiconductor



- ~1000 employees
- Founded 1983
- First 2.4GHz IC 2004
- First Bluetooth Low Energy IC in 2011
- R&D design centers
  - Norway (Short range)
  - Finland (Long range)
  - Poland
- Global sales & support offices
  - Across the entire US
  - Asia (Hong Kong, Beijing, Shanghai, Shenzhen, Seoul, Taiwan and Tokyo)
  - Europe(UK, Netherlands, Poland)

What do we make?

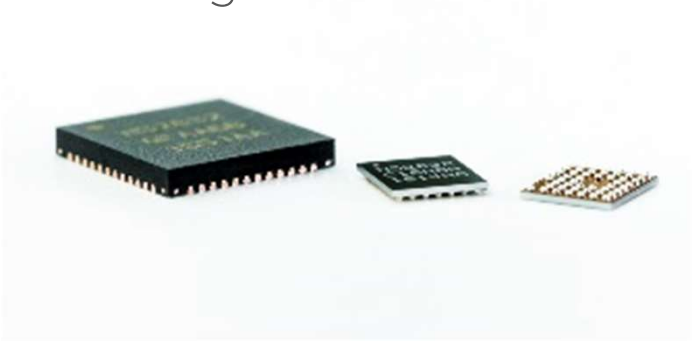
Embedded software



Wireless protocol stacks

Software Development Kits(SDKs)

Integrated circuits

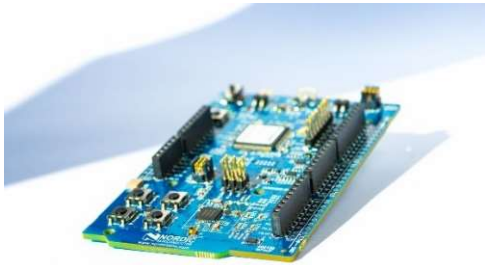


System-on-Chips (SoCs)

System-in-Package(SiPs)

Wireless connectivity ICs (Radios)

Development tools



Development kits

Software tools

Mobile Applications

A «fabless» semiconductor company

Nordic Semiconductor outsources the IC manufacturing to a Semiconductor foundry

- Taiwan Semiconductor Manufacturing Company (TSMC)

Testing and packaging of integrated circuits

- Amkor Technology (Philippines)
- ASE Group (Taiwan)

Sales and distribution

- Nordic only sells ICs through distributors.
- Logistic handled by stocking distributors

Nordic began the trend, and still the leader

Since early 2000s

Nordic #1 Since Day One

From Proprietary and ANT

Captured BLE Explosion

Solutions

From the Very Basic

To the Most Advanced

Leading in Software

Huge Customer Base

Massive Success with

nRF51 and nRF52

Upping the Game with nRF53

Working with all Major Players

Powering an incredible range of products

Wearables

Enterprise

Automation

PC/Phone/Tablet HID

Smart Home

Gaming

Beacons

Remote Controls

Automotive

Healthcare/Medical

Toys

Payment/ID

Proximity Tags

Logistics/Transport

Industrial

Automation

Market Share in Bluetooth Low Energy

* Source: DNB Markets, based on FCC, Bluetooth SIG

- All Bluetooth products must be listed with the Bluetooth Special Interest Group(SIG).
- RF products must also be certified by a tele-regulatory body like the FCC in the US.
- Based on this public information one can calculate the market share of the BLE market.
- Close to 50 % of all Bluetooth products certified in Q3/17 were using Nordic Semiconductor ICs.

The Complete Bluetooth® low energy solution

Unique high performance Bluetooth stacks

Best in class, broad selection Bluetooth SoCs

World class specialist support teams

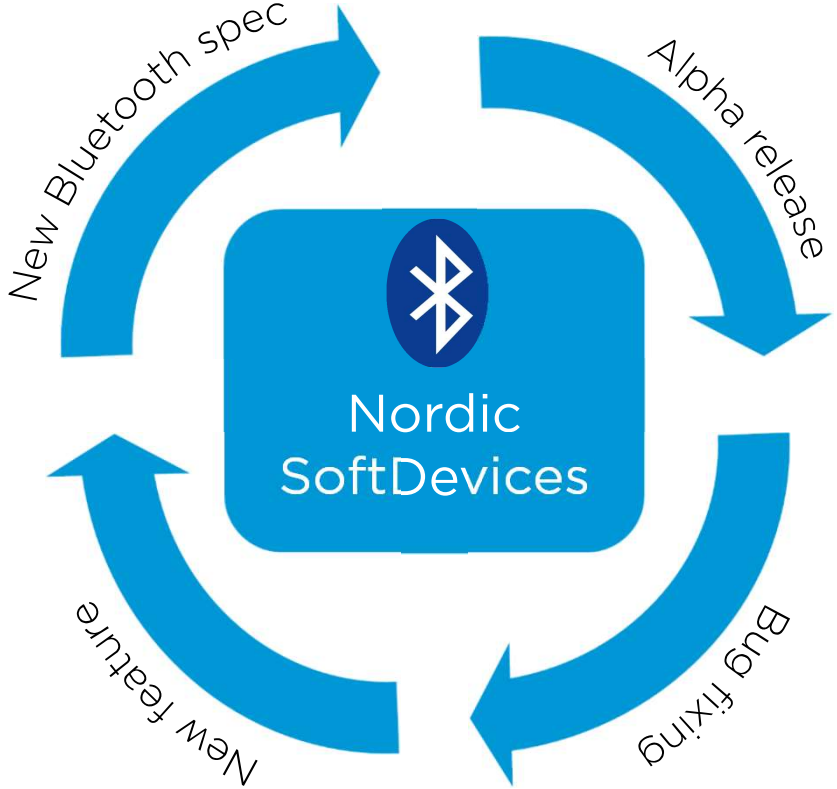
Comprehensive SDKs

Extensive SW/HW development tools

Vibrant developer community

End Product

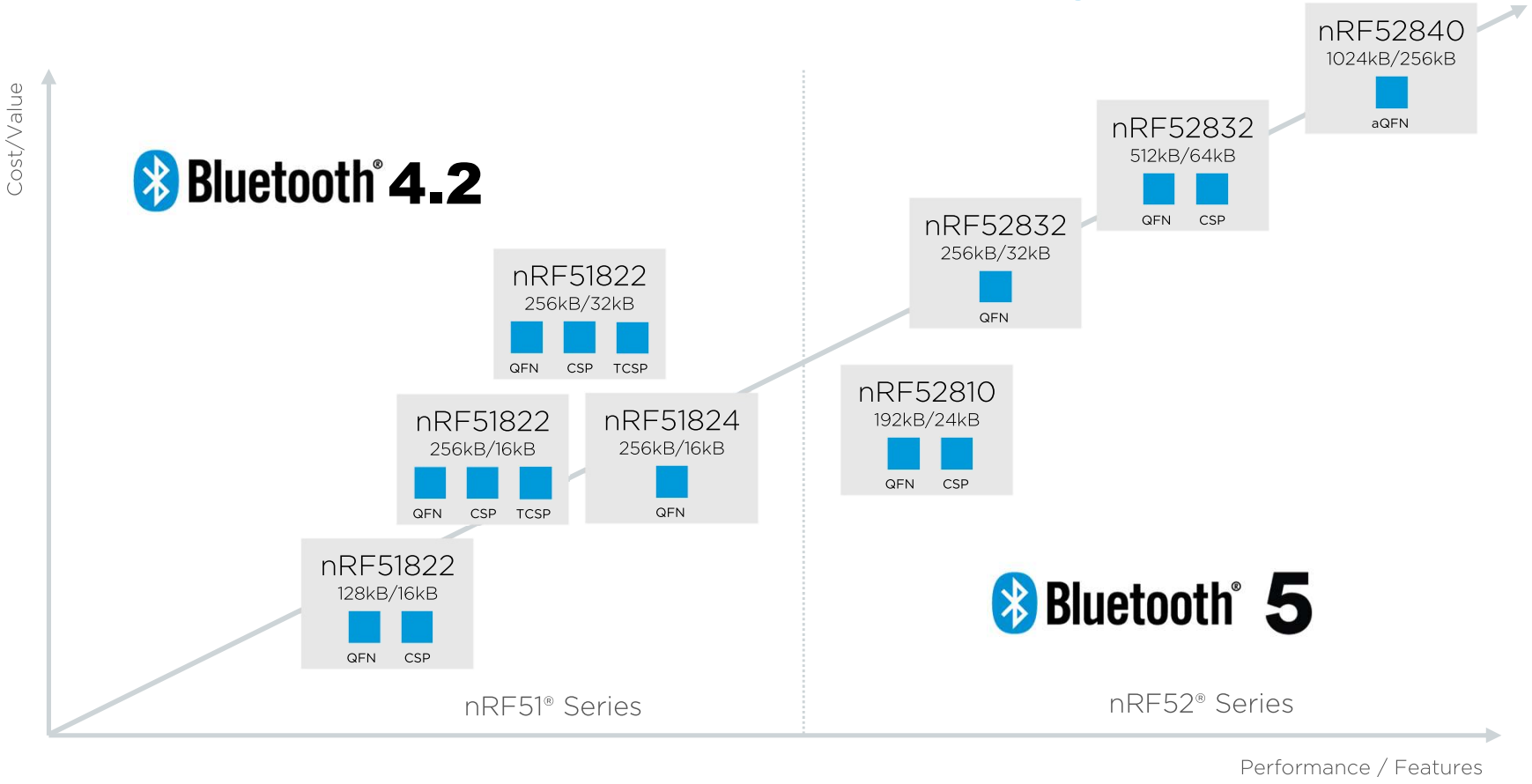
Nordic Bluetooth Stacks



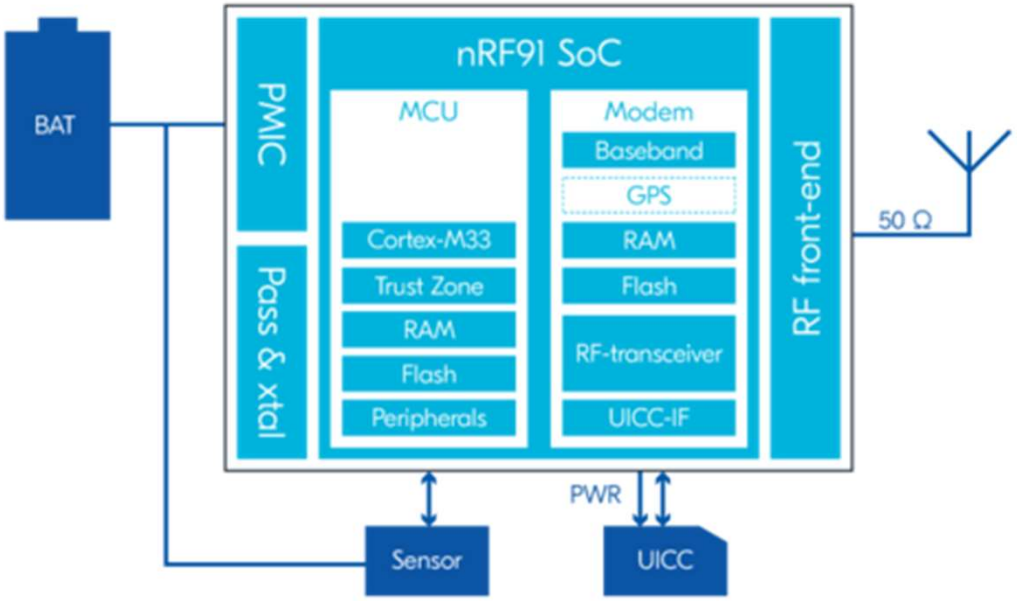
Nordic Bluetooth stacks developed entirely in-house

- Bluetooth 5 for nRF52 Series
- Bluetooth 4.2 for nRF51 Series
- Full control over development & improvements
- Best throughput performance in Bluetooth low energy
- Used as benchmark in Bluetooth interoperability tests

The nRF5x Series – Short range

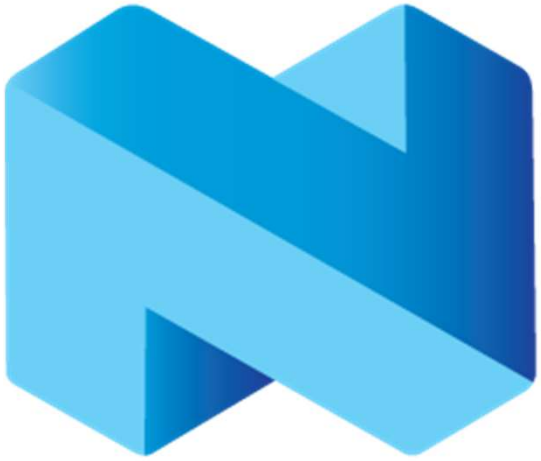


The nRF91 Series – Long range



Nordic's LTE low-power cellular IoT solution

- Low power MCU with Integrated LTE-M and NB-IoT Modem
- Designed and optimized for cellular IoT applications
- Built-in GPS receiver for asset tracking



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Agenda

Monday, March 7th|				
		Topic	Description	Duration(mins)
17:00	17:30	Registration and Pizza	Course participants register, get the nRF52 DK+ servo+jumper cables and we eat pizza.	30
17:30	18:00	Introduction to Nordic Semiconductor, course agenda and nRF52 intro	A short presentation of Nordic Semiconductor ASA as a company and a quick walkthrough of the course agenda.	30
18:00	18:30	Bluetooth Low Energy(BLE)	Crash-course in the Bluetooth Low Energy protocol	30
18:30	18:45	Break	-	15
18:45	19:15	Introduction to Visual Studio Code	Quick intro to VSC: Building projects, flashing the nRF52, modifying build parameters, debugging	30
19:15	19:30	Walk through the Hands-on	Quick walkthrough of the hands-on and PWM signals	15
19:30	20:00	Start working with the Hands-on	Start creating our project for the nRF52840	90
20:00	20:30			
20:30	21:00			

Course Agenda

Tuesday, March 8th				
		Topic	Description	Duration(mins)
17:00	17:30	Pizza	Eating Pizza	30
17:30	18:00	SoftDevice Controller Introduction	Short introduction to the SoftDevice Controller	30
18:00	19:00	Bluetooth Low Energy(BLE) Hands-on with the nRF52840	Start working on the Bluetooth Low Energy part of the Hands-on	60
18:30	19:00			
19:00	19:15	Nordic Tools	Introduction to Nordic Development tools	15
19:15	19:30	Break	-	15
19:30	20:00	Bluetooth Low Energy(BLE) Hands-on with the nRF52840	Implement event handling for Bluetooth Low Energy Events	90
20:00	20:30			
20:30	21:00			

Course Agenda

Thursday, March 10th				
		Topic	Description	Duration(mins)
17:00	17:30	Pizza	Eating Pizza	30
17:30	18:00	Bluetooth Low Energy(BLE) Hands-on with the nRF52840	Roundup: Work on whatever you have left of the Hands-on *(Take breaks as you need)*	180
18:00	18:30			
18:30	19:00			
19:00	19:30			
19:30	20:00			
20:00	20:30			
20:30	21:00	Kahoot Quiz	Kahoot Quiz to check see if you have learned anything during the course. Prize for the winner.	30