October 2012

GLOBAL tech TOUR nRF 5 SERIES

# Why nRF51? – The Top 8

NORDIC SEMICONDUCTOR

## Top 8

- Introduction of the Engineers
  - what did we work on in the nRF51 series
- We are not only a HW company anymore
  - We make HW for SW
  - Nordic creates complete ULP wireless Soc solutions
- This presentation:
  - The top 8 problems we have solved in the nRF51 series
  - Before that – some major improvements and high performance features

## Features to mention

| | |
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| **Oscillators** | • **On-chip 32kHz ± 250ppm RC** |
| **Power Supply** (Supply range) | • **1.8 to 3.6 Voltage Range** <br> • **On-chip DC/DC (2.1 to 3.6V), 20% less energy @ 3V** |
| **Radio** | • **+4dBm output power and 5.5dB better sensitivity gives 9.5dBm better link budget** <br> • **TX 10.5mA** at +0dBm (8.1mA with DC/DC at 3V supply) <br> • **RX 13mA** (9.5mA with DC/DC at 3V supply) |
| **ARM Cortex-M0 CPU** | • **Up to 10x more processing power than LE1/LO1+ and other 8051 solutions** |
| **GPIO** | • **Maximum GPIO pins for package size (32 GPIO for 48 QFN)** |

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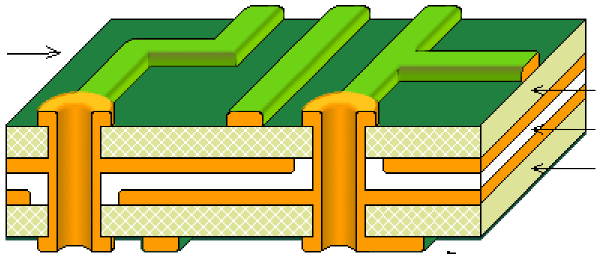
## Now the Top 8 design problems we solved…

8

We will explain the details through the day.

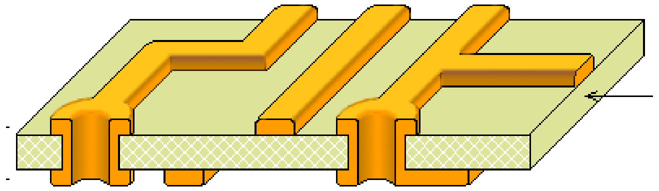
## Problem: Limited IO flexibility

- Complicated PCB design needed to route tracks



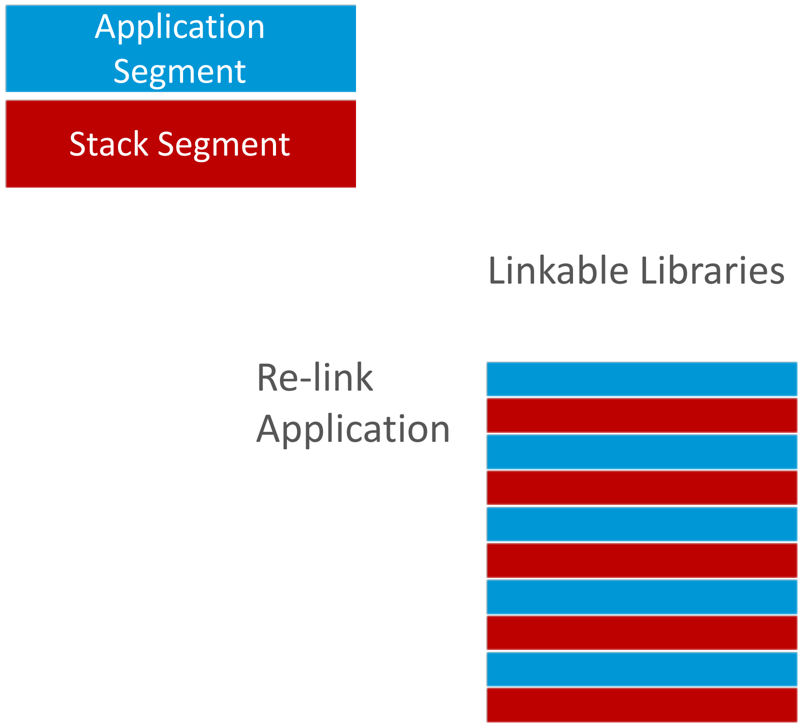
## nRF51 Solution: IO signals can use any pin

- Low cost 2 layer PCBs are possible
- Simple layout of external components



## Problem: Application can break the protocol stack

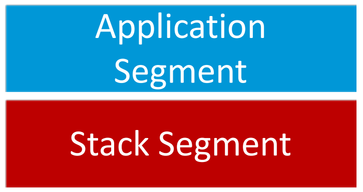
- Extensive testing on final product
- Long development times



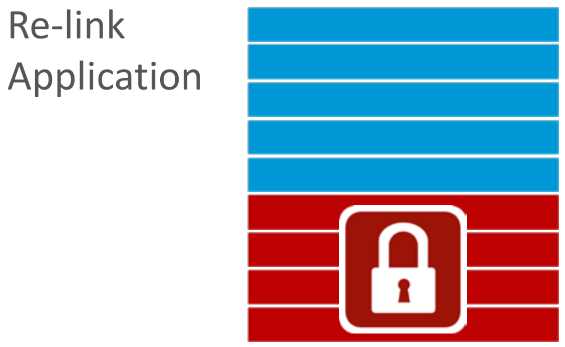
Memory Map

## nRF51 Solution: SotfDevice Architecture

- Application program is isolated from the protocol stack
- Application developer does not need to re-link the protocol stack



SoftDevice



Memory Map

## Problem: CPU interrupt latency effects real time tasks

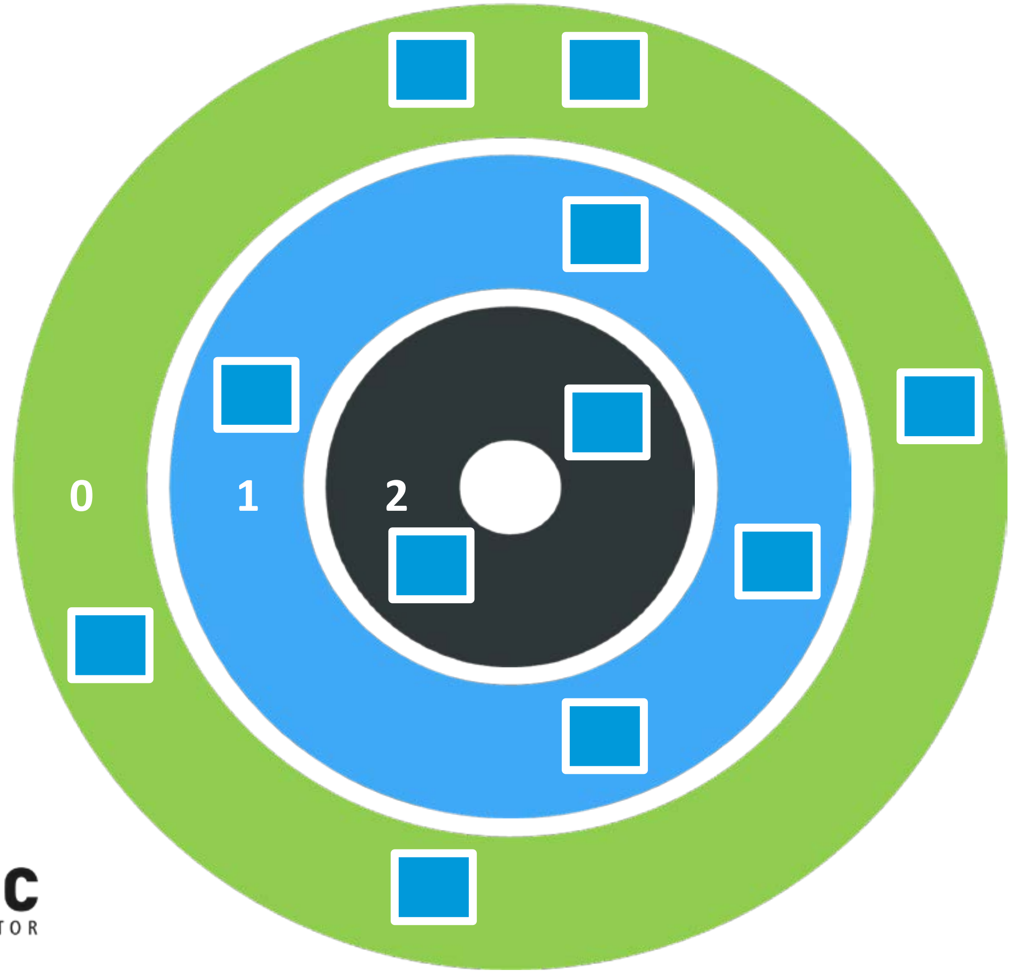
- Software changes real time behavior

## nRF51 Solution: Programmable Peripheral Interconnect (PPI)

- We have a true real time system

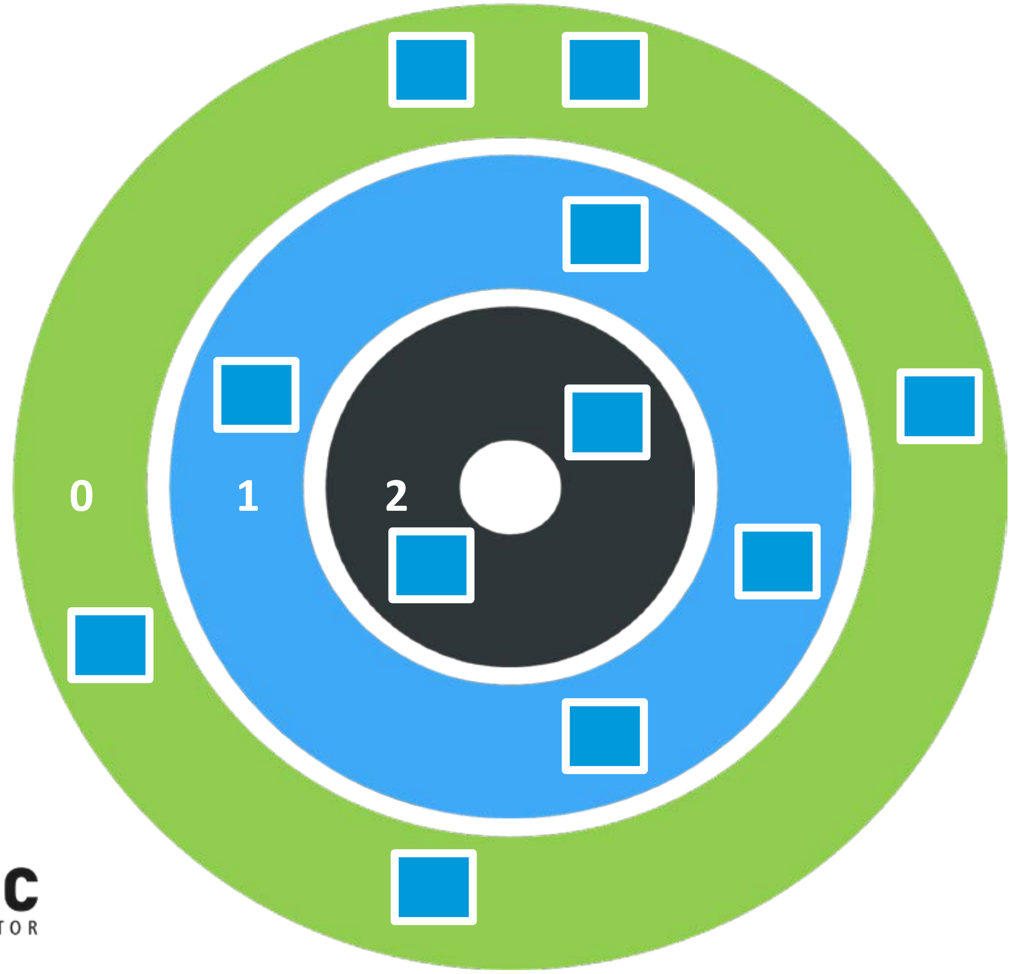
## Problem: Inflexible power management

- Modes manually controlled
- Need to turn on many peripherals to use only 1 of them



## nRF51 Solution: Automated power management

- 2 modes: ON and OFF
- Peripherals only use power when they need power



## Top 8

### Problem: Application power management is too hard

- You need to write a lot of code to do good Power management

### nRF51 Solution: SoftDevice power management API

- 1 API call will make your application low power

## Top 8

### Problem: CPU must move data to and from peripherals

- Energy used for moving data
- Waste of CPU cycles and application code to do this

### nRF51 Solution: Direct transfer between peripherals and RAM (EasyDMA)

- No CPU or code required to copy packet data

## Top 8

### Problem: Changing power mode costs time and energy

- Going to sleep costs more energy than it saves
- Complicates application development

### nRF51 Solution: Fast power regulator and clock startup

- Peripheral and CPU startup time negligible
- 50x times better than LE1 / LU1

## Top 8

### Problem: The device you use does not support the protocol you want

- Multiple devices for multiple protocols
- Develop new code for your application

### nRF51 Solution: New multi-protocol 2.4GHz Radio

- The same device can be used in all your wireless designs

- Programmable modulation, deviation and packet format
- *Bluetooth®* 4.0 low energy and ANT™ compliant
- nRF24L series 2.4GHz RF 250kbps, 1Mbps, 2Mbps compatible

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