

dect

wireless technology



DECT World 2023 in Munich Germany

DECT NR+ Webinar Series

09 November 2023

- How to get started with DECT NR+





DECT NR+ webinar series

- Welcome from the DECT Forum!
- Fifth webinar in the series about the DECT NR+ technology
- Today we cover General Availability
- Speakers today:



Host Roel Ottink
DECT Forum



Lauri Piikivi
Nordic
Semiconductor



Jari Hämäläinen
Wirepas



Agenda

This is part 5 of the DECT Forum webinar series on NR+

1. Introduction
2. Applications
3. Technical: Upper Layers
4. Technical: PHY Layer
5. How to get started:
 - Recap of DECT NR+ webinars
 - HW
 - Mesh System
 - Closing summary

| | |
|-----------------|----------------------|
| Roel Ottink | DECT Forum |
| Lauri Piikivi | Nordic Semiconductor |
| Jari Hämäläinen | Wirepas |



Some notes

- The presentations will take around 45 minutes
- Questions:
 - Can be asked by using the 'Questions' button in the bottom righthand corner
 - Any questions about DECT NR+ are welcome
 - Following the presentations there will be a panel discussion where we will try to cover as many questions as possible
- The webinar will be recorded and made available to all who have registered
- FAQ page: <https://www.dect.org/news.aspx?id=390>



Recap of DECT NR+ Webinars

Roel Ottink

World first non-cellular 5G standard fulfilling IMT-2020 requirements

5G connectivity for enterprise IoT applications



IMT-2020 ITU-R 5G

ETSI DECT-2020 NR

TS 103 636 series:

- Part 1: Overview;
- Part 2: Radio reception and transmission requirements;
- Part 3: Physical layer;
- Part 4: MAC layer;
- Part 5: Data link control and Convergence layer.

EN 301 406-2:

- Harmonised standard: Technical requirements supporting European Commission mandates



Applications of DECT NR+

Smart Metering & Grids



Smart Homes & Buildings



Smart Cities



Industrial IoT



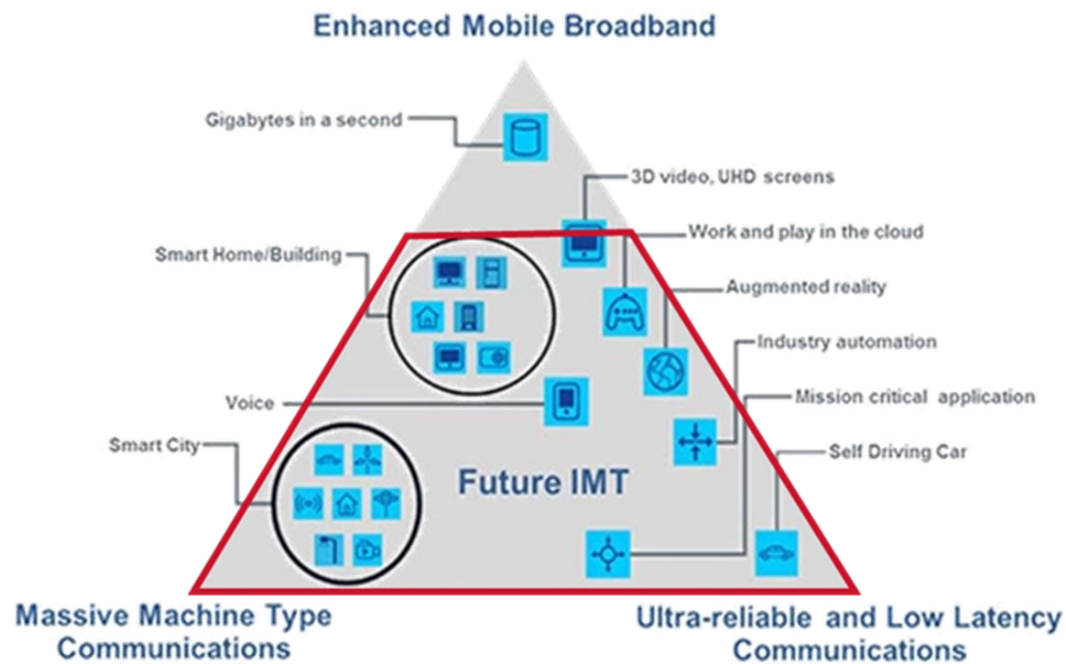
Professional Audio



DECT NR+ has been designed for:

- Smart metering & Smart grid
- Smart homes and buildings
- Smart cities
- Industrial IoT
- Professional audio applications

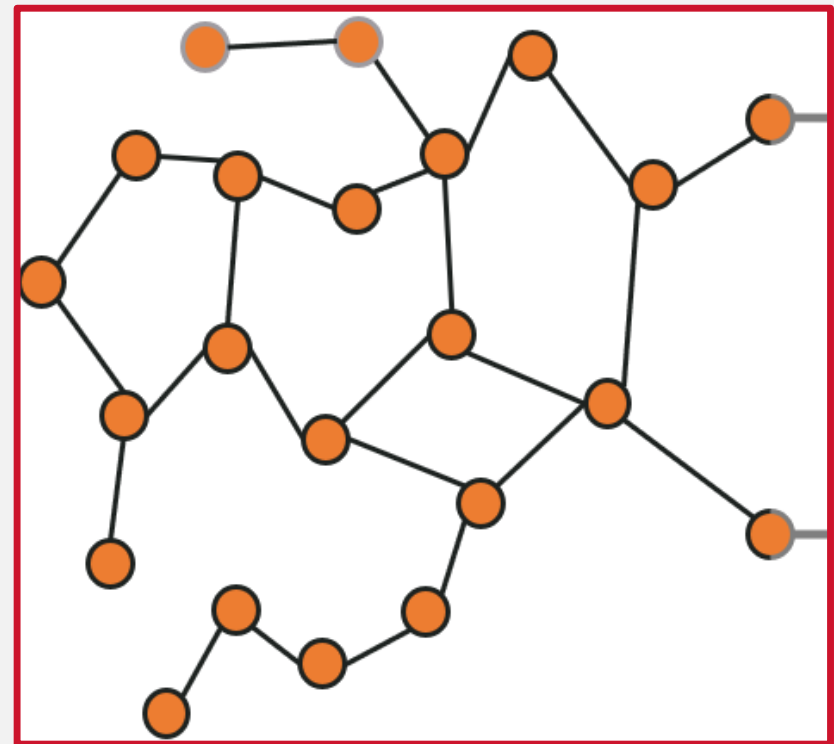
IMT-2020 (5G)



- IMT-2020 is defined by the ITU-R
- ITU-R defines global radio spectrum use for wireless services, new requirements for mobile communication come every ~10 years.
- DECT NR+ is the world's first non-cellular 5G technology in ITU M.2150 recommendation
- DECT NR+ focuses on mMTC and URLLC

Features and benefits:

- Licensed and license free operation
- Dedicated frequency band
- Self-healing and robust Mesh networking
- Long range
- High density machine to machine communication
- Ultra low latency
- Reliability

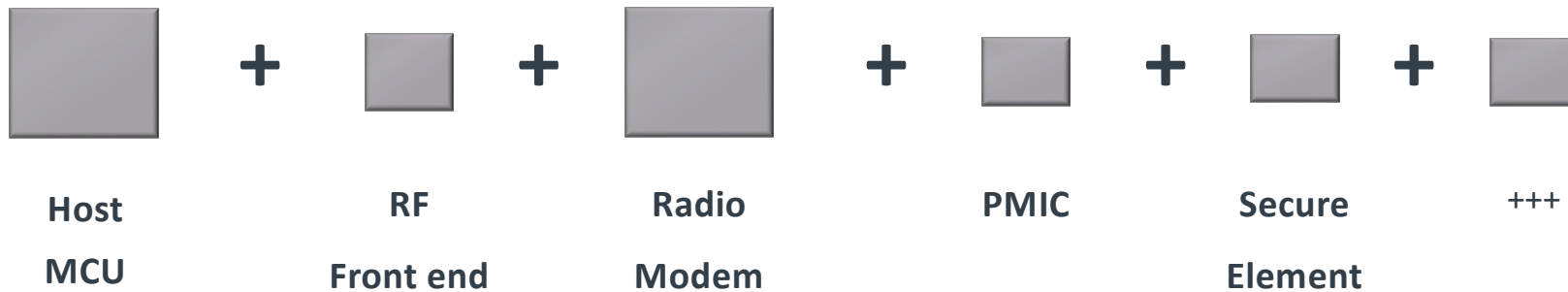




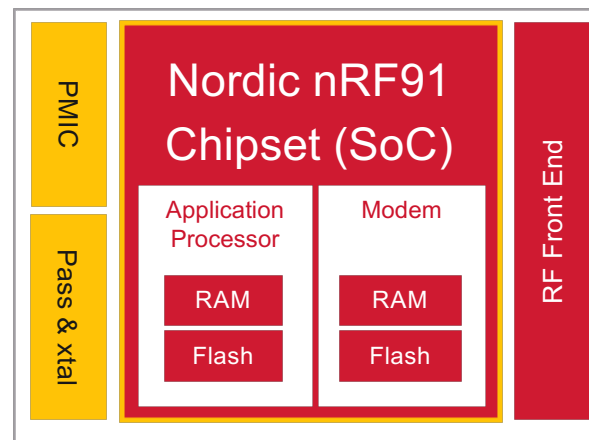
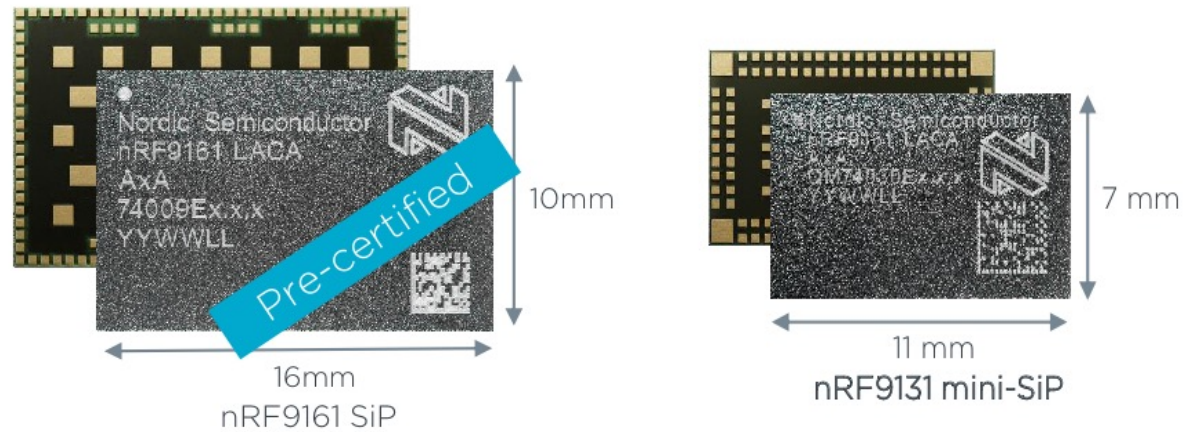
HW

Lauri Piikivi

Nordic DECT NR+ / Cellular HW



Nordic nRF9161 and nRF9131



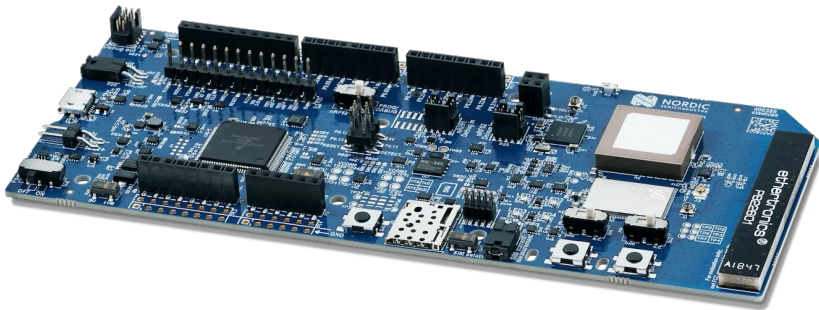
Nordic nRF9161 DevKit

nRF91 Series

- 1 MB Flash & 256 KB RAM
- 4 x SPIM/SPIS/UART/TWIM/TWIS
- PDM, I2S, PWM, ADC
- 32 GPIOs

- SEGGER J-Link OB Debugger with debug out support
- UART interface through VCOM port
- USB connection for debug/programming and power

- Arduino Uno form factor extension
- Supports Bluetooth LE
- 4 LEDs user-programmable, 2 buttons, 2 switches





Nordic DECT NR+ SW

nRF9161 and nRF9131 in production December 2023

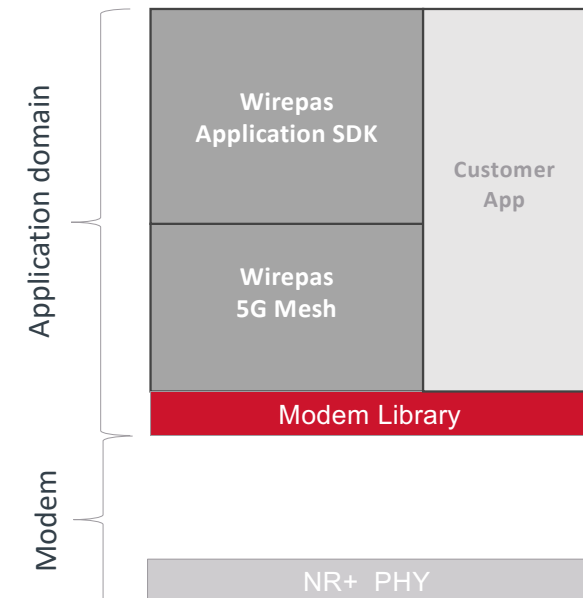
NR+ Phase 1 SW release February 2024

Nordic stack implementation for NR+ PHY-level

2 options to make a product:

- mMTC: Wirepas 5G Mesh solution, mains powered devices focus, thousands of devices
- URLLC: Customers can make or port their own stack implementation on Nordic PHY API

Nordic DECT NR+ PHY is separately licensed, free-of-charge

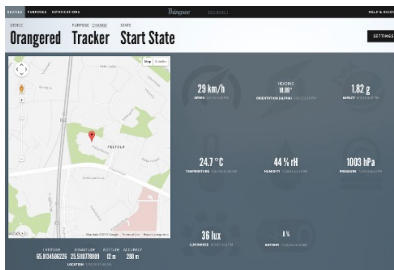




Mesh System

Jari Hämäläinen

Wirepas Mesh Use Cases



Customer
Web UI
Example



Customer
Hardware
Examples

Multiple Applications

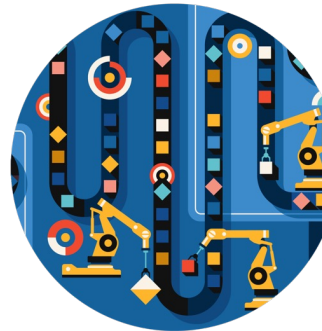
Smart Metering



Smart Tracking



Smart Manufacturing



Smart Buildings

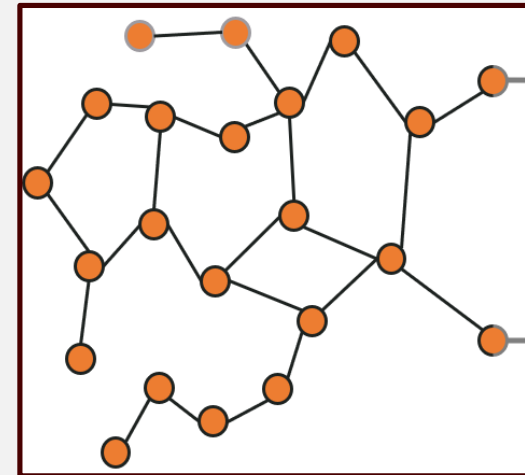


Benefits of DECT NR+ Mesh Technology

Amazing performance in unseen cost point

- Operates on a free, license-exempt, global spectrum
- No SIM-cards
- Reliability
 - Service Level Agreements >99.9 %
- Scalability
 - Thousands of equipment in an area sized of a stadium
 - Thousands devices per gateway
 - Range extended by each node
- Superior coverage
 - For the most demanding environments, inside and outside.
 - No black spots, e.g., cellars, machine rooms

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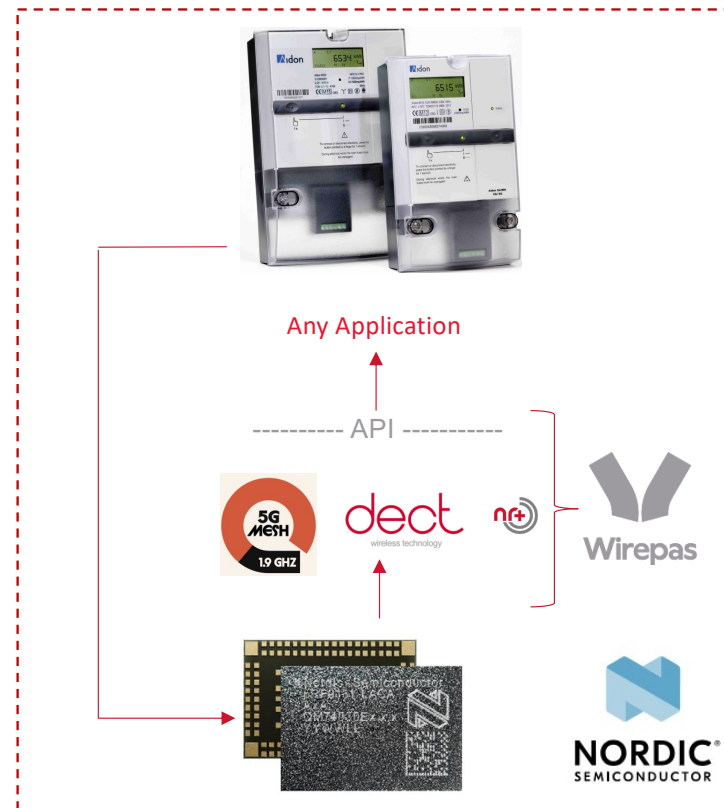


Case example of Smart metering system

End-customer:
Utilities

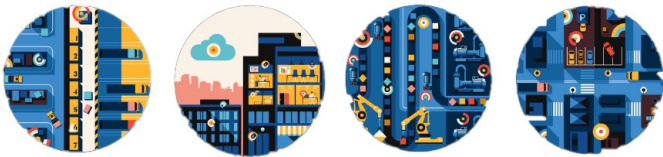


Product:
Smart metering



- **1) End customer**
Utilities company building a new solution selects their smart metering provider
- **2) Product**
Smart metering company selects the right chipset that has Wirepas 5G Mesh pre-integrated
- **3) Product**
Smart metering company uses Wirepas SDK to integrate Wirepas 5G Mesh with their applications, and provides the product to the end customer.
- **4) End customer**
Utility provider run their business

How do you get started DECT NR+



As an industrial end-customer

- Look for the right partner for your application from Wirepas partner program



As a product or solution provider

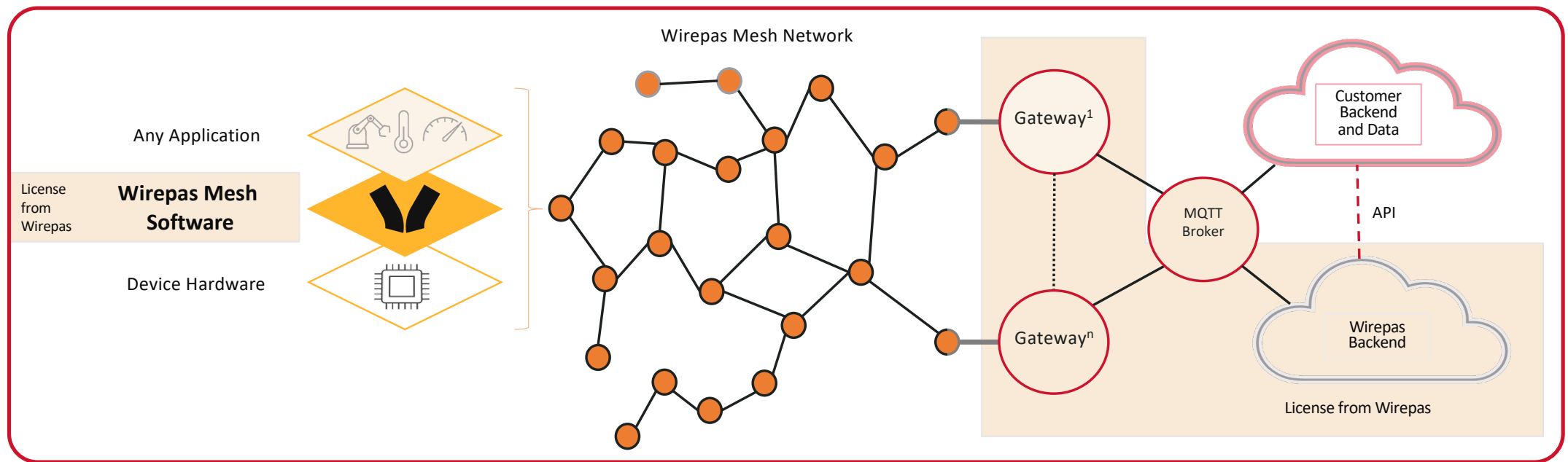
- Join Wirepas Partner Program in order to get access to Mesh products
- Choose your chipset
- License Wirepas product
- Get prepared to fulfill the
 - Harmonised standard
 - Product certification



As a wireless technology provider

- Get familiar with the ETSI standards
- Join ETSI DECT NR standardisation in order to become a leading wireless technology provider

Wirepas Software Products



How to get hands-on with Wirepas 5G Mesh?

- Read documentation on Wirepas Mesh
- <https://developer.wirepas.com/>
- Download the latest SDK from Github
- <https://github.com/wirepas>
- Development Hardware & Software
 - Start with existing hardware development kits and low latency, up/downlink functionality
 - Move to Nordic nRF9161 once stable binary available (Note need to have radio permit for early trials before certified products)
 - License required for the Wirepas binaries

One Wirepas SDK – three radio profiles



One technology, three products.
One software, many hardware options.



Wirepas 5G Mesh 1.0 focuses on mMTC use cases

• CVG Layer

- Segmentation and reassembly
- PDU max 1500 bytes (including IPv6 payload)
- OTAP, for Physical layer modem, protocol and application software.

• DLC Routing support

- Uplink packet routing to the selected next hop with backend addressing,
- Downlink packet routing with selective flooding to unicast/multicast/broadcast addresses.

• DLC Transmission support

- QoS with two traffic classes,
- Cumulative transfer delay, through the mesh network,
- DLC Service type 2 with ARQ for HARQ failures or route changes.

• MAC layer spectrum management support

- Dynamic operating channel selection
- Synchronized operating channel change,
- Optimized Cluster Beacon transmission timing,
- Auto role mode selection between router and non-router modes (FT and PT or PT only),
- Dynamic route cost calculations with load balancing.

• MAC layer next-hop selection support

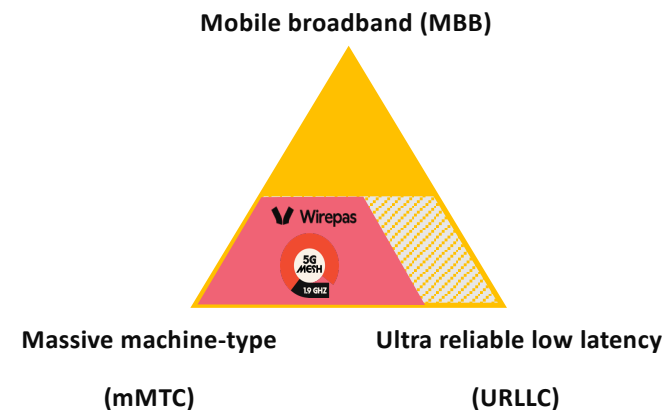
- Dynamic next hop selection based on minimum signal quality and minimum route cost.
- Network Beacon scanning and synchronized Cluster Beacon detection,
- Neighboring cluster discovery from own cluster and Synchronized neighbouring cluster detection,

• MAC transmissions support

- Transmission power control.
- Random Access transmission with LBT, HARQ, and exponential backoff.
- Transmission length adaptation with a single sub-slot granularity.
- Maximum transport block size 1664 bits with TX duration 1.66ms (8 sub-slots)

• Compatibility to the following ETSI standards:

- TS103.636 series and HS EN301.406-2
- TS103.874-2 profile specification (not published yet)



• Physical layer and chipset

- Nordic Semiconductor nRF9161 and NRF9131

• Long range profile – radio parameters

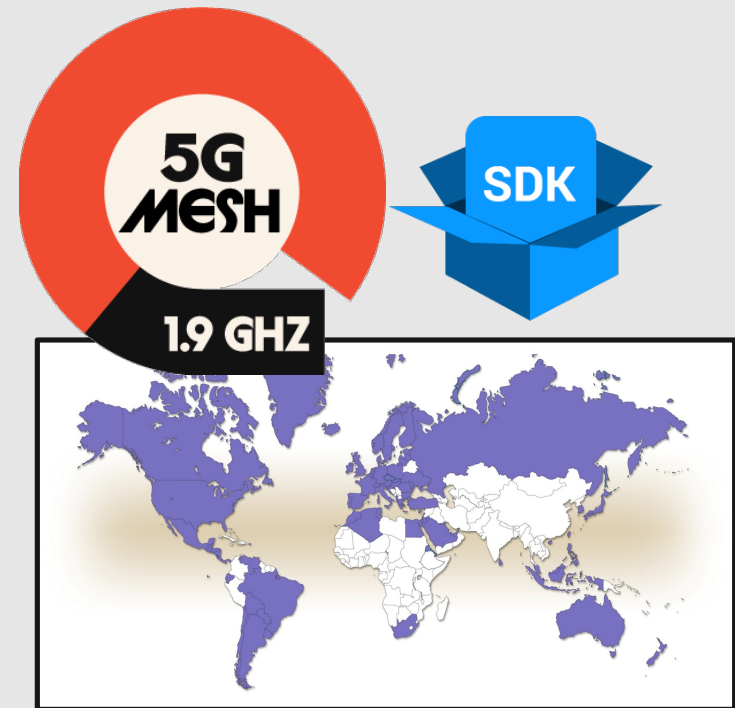
- 1880-1900 MHz (band 1, 11 ch)
- Physical layer with 1.728MHz per channel, MAC Layer data rate is 1.1 Mbps
- Max +19 dBm outpower, min power -40 dBm.
- Retransmissions with HARQ for data reliability.
- Range over 5 km Line of Sight



Summary: DECT NR + Availability by Wirepas

Wirepas 5G Mesh 1.0

- Beta release available by the end of 2023 for the first lead customers
- General availability 1Q/2024 covering
 - Long range profile
 - Smart metering, emergency lighting and street lighting
 - Mains powered devices
- EU, CEPT, Australia, New Zealand, South Africa, India: 1880-1900MHz (band 1, 11 ch)



Non-cellular 5G connectivity network for enterprise IoT



Wrap-Up





Wrap-up – Now you can start with DECT NR+

DECT NR + is a non-cellular 5G connectivity network for enterprise IoT

Nordic Semiconductor offering

- nrf9161 and nrf9131
- Production starts end of 2023, samples available
- Development Kit available

Wirepas offering

- Beta release available by the end of 2023 for the first lead customers
- General availability 1Q/2024 covering
 - Long range profile
 - Smart metering, emergency lighting and street lighting
 - Mains-powered applications



