DECT NR+ Webinar Series
29 April 2024
DECT NR+ webinar series

• Welcome from the DECT Forum
• First of a new series of webinars in 2024
• Speakers today:

Roel Ottink
DECT Forum

Lauri Piikivi
Nordic
Semiconductor

Jari Hämäläinen
Wirepas
Today’s topics

• Overview DECT NR+
• DECT Forum activities
• Update from Nordic Semiconductor
• Update from Wirepas
• NR+ at events
• Questions
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 we will provide answers to the questions that have come in.

• The webinar will be recorded and made available to all who have registered

• FAQ page: https://www.dect.org/news.aspx?id=390
Overview DECT NR+
DECT NR+ standard

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

IMT-2020 ITU-R 5G
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
DECT NR+

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
DECT Forum activities

• Approvals process in the US started

• Europe: 3.8-4.2 GHz band – assigned by the EU for Wireless Broadband Systems

• Focus on IoT but increasing interest from other segments:
  • Professional audio
  • Healthcare
  • Smart Home – contacts with CSA about Matter

• Marketing:
  • Hannover Messe
  • DECT World event (November 14-15)
HW

Lauri Piikivi
Nordic Product Family for DECT NR+

nRF91 Series
- 1 MB Flash & 256 KB RAM Application core
- 4 x SPIM/SPIS/UART/TWIM/TWIS
- PDM, I2S, PWM, ADC
- 32 GPIOs

- DECT NR+ PHY firmware is alternative modem firmware for nRF91-family
- No concurrent operation with LTE modem
Nordic DECT NR+ HW

Nordic nRF91 Chipset (SoC)

Application Processor
- RAM
- Flash

Modem
- RAM
- Flash

RF Front End

PMIC

Pass & xtal

Host MCU

RF Front end

Radio Modem

Secure Element

PMIC

XTAL

Not integrated in nRF9131
Nordic NR+ SW 2024

- Nordic implements NR+ PHY-level only

- 3 Paths for customers
  - Wirepas: 5G Mesh solution, smart meters focus, mains-powered large networks
    - Separately licensed from Wirepas
  - Lynq Networks: low latency audio and real-time sensors
    - Separately licensed from Lynq Networks
    - Push-to-talk and full-duplex audio
  - Customers make their own stack implementation on Nordic PHY
Nordic nRF9161 DevKit

- 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
- nrf9151 DevKit coming soon
- All the 91-family SIPs are SW compatible
Mesh System

Jari Hämäläinen
Wirepas Mesh Use Cases

Multiple Applications

- Smart Metering
- Smart Tracking
- Smart Manufacturing
- Smart Buildings

Customer Web UI Example

Customer Hardware Examples
Benefits of 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 of 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
Case example of Smart metering system

End-customer: Utilities

Product: Smart electricity 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 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-2020 NR standardisation in order to become a leading wireless technology provider
Wirepas Software Products

Any Application | Wirepas Mesh Network
Device Hardware | Gateway

Wirepas Connectivity Suite

License from Wirepas

Device Hardware

Wirepas Mesh Software

Gateway

Gateway

MQTT Broker

Customer Backend and Data

License from Wirepas

Wirepas Backend

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

- Read documentation on Wirepas Connectivity Suite
  - [https://developer.wirepas.com/](https://developer.wirepas.com/)
- Contact Nordic Semiconductor
  - nRF9161, nRF9151 or nRF9131 hardware
- License and get access to Wirepas 5G Mesh software
- Download the latest SDK and software binaries from Github
  - [https://github.com/wirepas](https://github.com/wirepas)
  - and run on Nordic semiconductor nRF91 platform
- For smart electricity metering
  - Quick start with our reference application to support DLMS based communication
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 lower layer 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 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

- **Physical layer and chipset**
  - Nordic Semiconductor nRF9161, nRF9151 and NRF9131 System-in-Package chipsets

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

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Mobile broadband (MBB)

Massive machine-type (mMTC)

Ultra reliable low latency (URLLC)
Wirepas 5G Mesh

- Available now, covering
  - Long range profile
  - Mains powered devices
  - E.g. Smart metering, emergency lighting, street lighting and heating, ventilation, and air conditioning (HVAC) systems

- EU and additional CEPT countries, Australia, New Zealand, South Africa, India: 1880-1900MHz (band 1, 11 channels)

Non-cellular 5G connectivity network for enterprise IoT
NR+ demo
Demo in action at events
Close up of the demo screen
Feedback from past events and demos

The technology has been widely presented at events such as

• MWC (Mobile World Congress)
• NFMT (National Facilities Management and Technology Conference and Expo)
• Distributech
• CSA member meeting
• Schneider Innovation Summit
• Embedded World
• Hannover Messe

Feedback received

• Impressive was the most used expression, esp. when showing range and scale.
• Loads of question on the availability:
  o of spectrum throughout regions
  o of stacks and chip vendors
  o of standard protocols (such as DLMS, Matter, OPC etc.)
• High demand for (free) evaluation
• Amazing to see the connections just working in a big busy hall with a lot of other radio traffic
See the NR+ demo live at these events

- **Powertage**
  - June 4 – 6
  - Zurich

- **Smarter E**
  - June 17-21
  - Munich

- **Things Conference**
  - Sept 25 – 26
  - Netherlands

- **ENLIT Europe**
  - Oct 21-24
  - Milan

- **Wirepas OPEN**
  - June 11-12
  - Helsinki

- **MWC Shanghai**
  - 26-28, June

- **Wireless Congress**
  - Nov 12-14
  - Munich

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**Confirmed**

**Not yet confirmed**

May   June   July   August   Sept   Oct   Nov   Dec
Special invitation for attendees of this webinar only.

See the demo live at Wirepas OPEN in Helsinki June 11 -12.
Wrap-Up
Wrap-up – Now you can start with NR+

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

Nordic Semiconductor offering

• nrf9161 and nrf9131
• Production started end of 2023, samples available
• Development Kit available

Wirepas 5G Mesh offering

• Generally available now, covering
  • Long range profile
  • Mains-powered applications
  • Smart metering, emergency lighting, street lighting and heating, ventilation, and air conditioning (HVAC) systems