

dect

wireless technology

DECT NR+ Webinar Series

20 April 2023, 2 PM CEST



DECT NR+ webinar series

- Welcome from the DECT Forum!
- Speakers today:



Roel Ottink
DECT Forum



Jussi Numminen
Wirepas



Kristian Saether
Nordic Semiconductor

Housekeeping rules

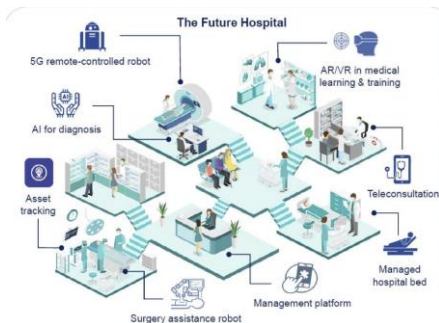
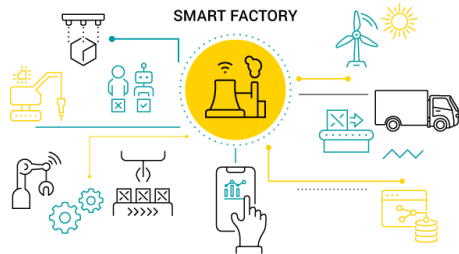
- The presentations will take around 30 minutes
- Questions:
 - Can be asked by using the 'Questions' button in the bottom righthand corner
 - Will be answered after the presentations
 - If there are too many to answer in today's webinar then they will be answered afterwards
- The webinar will be recorded and made available to all who have registered

What are we covering today

- Introduction to the series
- Evolution of the DECT technology
- The role of the DECT Forum and ETSI
- Introduction to DECT NR+
- Content preview of the next webinars

Purpose with the webinars

Applications and use cases



Features and benefits

Mesh networking High density (mMTC)

Ultra Low Latency and reliability (URLLC)

Licensed & licence free operation

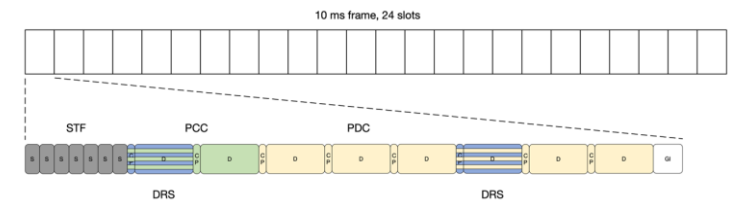
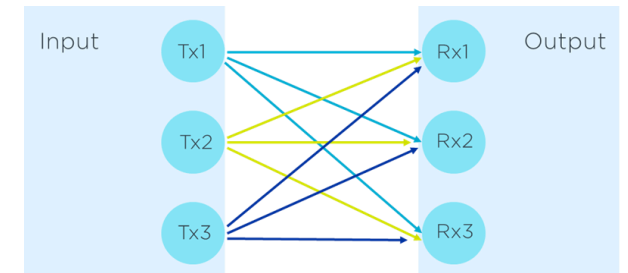
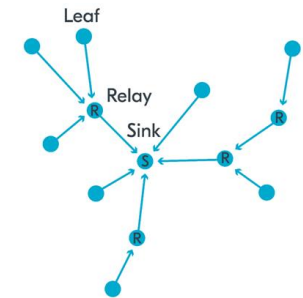
Dedicated frequency band

Private networking

Self healing and robust

Range

Technology foundation



The topics we will cover

	Topics	Dates
#1	Introduction to NR+ and DECT Forum	April 20
#2	Applications and use cases	May/June
#3	The technology (upper layers)	September
#4	The technology (lower layers)	October
#5	How to get started with NR+	November
#6	Recap and panel discussion	December



DECT technology evolution



1990

2000

2010

2020

DECT
GAP



DECT
Evolution

DECT World Map





DECT Forum founded



1997



1990

2000

2010

2020

DECT
GAP



DECT
Evolution

DECT Forum and ETSI



Activities go hand in hand and complement each other

What will DECT Forum do to make NR+ a great success:

- Marketing
 - Webinars
 - Collateral: videos, whitepapers, presentations
 - Promotion on Social Media
 - Conferences and exhibitions
- Regulatory:
 - New Regions: e.g. activities in India and China
 - New frequencies in existing regions: e.g. 3.8-4.2 GHz band in Europe
 - Defending existing frequencies
- Certification:
 - Setting up new certification programs, e.g. for interop
- Providing members a platform where they can jointly drive the development of the NR+ business

What about the name?

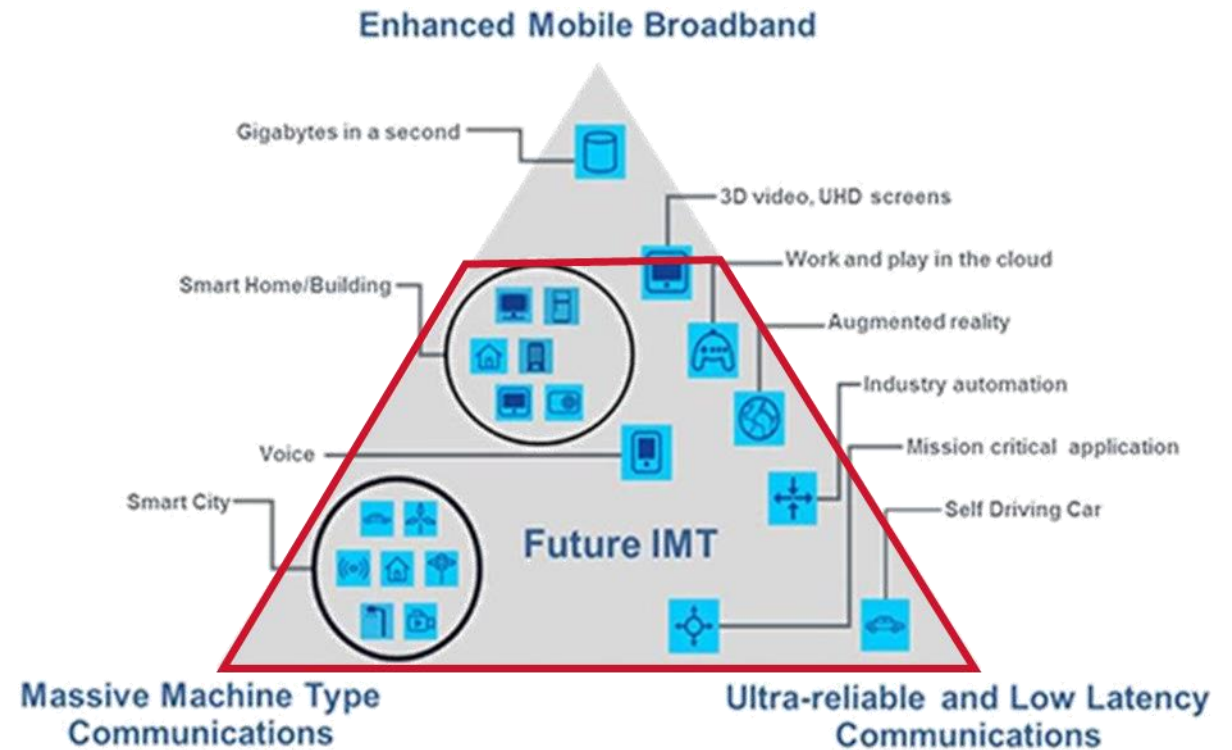
- ETSI refers to it as DECT-2020 NR
- You may also have heard DECT-2020, Private 5G, 5G NR
- DECT Forum has decided to market the technology as:



- NR refers to the state-of-the-art new radio
- The + signifies the new possibilities that this radio makes possible

DECT NR+ is a 5G technology

- ITU-R defines the mobile communication requirements for IMT frequencies.
 - International Telecommunication Union (ITU) is a United Nations specialized agency for information and communication technologies
 - IMT-2020 technology is the official name for 5G
- DECT NR+ meets the massive Machine Type Communication (mMTC) and the Ultra-Reliable and Low Latency Communication (ULLRC) service requirements set by ITU-R for 5G technology.
- DECT NR+ can address both requirements with the ETSI TS 103 636 standards series.



DECT NR+ design objectives for private networks

- DECT NR+ design objective is to create a wireless communication technology that can be deployed by anyone, operated by anybody and used anywhere.
- Its operation must be simple, autonomous, and able to co-exist with other local networks in the same area sharing the spectrum.
- Technology is easy to introduce into new frequency bands.
- It should be application agnostic enabling rapid adoption of different use cases and fostering digitalization.
- It should focus on ultra-reliable low latency communication and massive-scale machine communication networks exploiting mesh communication.

Private network, designed for shared spectrum operation

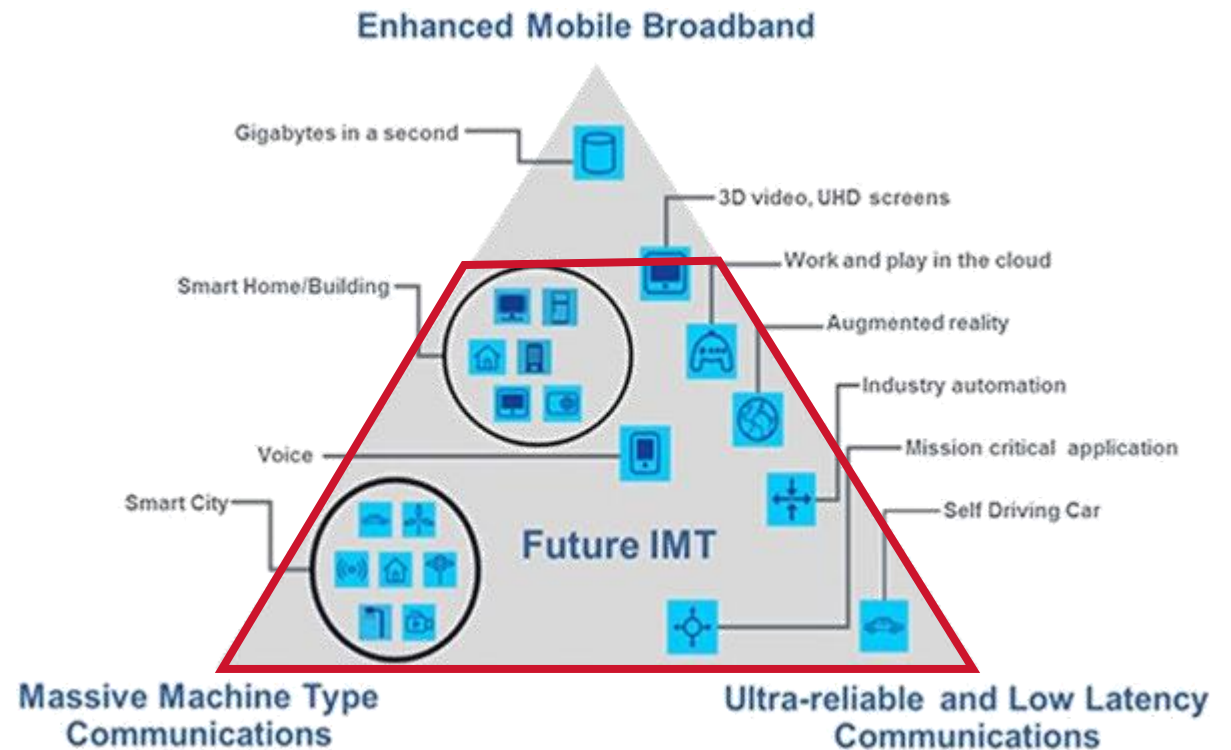
- DECT band at 1.9 GHz provides a unique spectrum to operate. DECT NR+ and classical DECT can operate with minimal interference sharing the common spectrum asset.
 - Interference management is possible to optimize as the technologies in this band are known. This provides the state of art shared spectrum performance.
 - Autonomous de-centralized frequency channel selection optimizes the local spectrum use improving the reliability
 - Local and optimal spectrum operation minimizes connectivity management, which is needed for scaling for large systems.
- DECT NR+ supports multiple TDD bands, licensed and unlicensed bands, from 450 MHz up to 6 GHz range.

Private network, designed for shared spectrum operation

- DECT-NR+ technology supports multiple network topologies which can share the same spectrum. One device can support any topologies with the same design.
 - Mesh enables a network that does not have a limit in range. Each device is extending range or increases communication reliability.
 - Star topology enables minimal latency operation.
 - Point-to-point connections thanks to local decisions

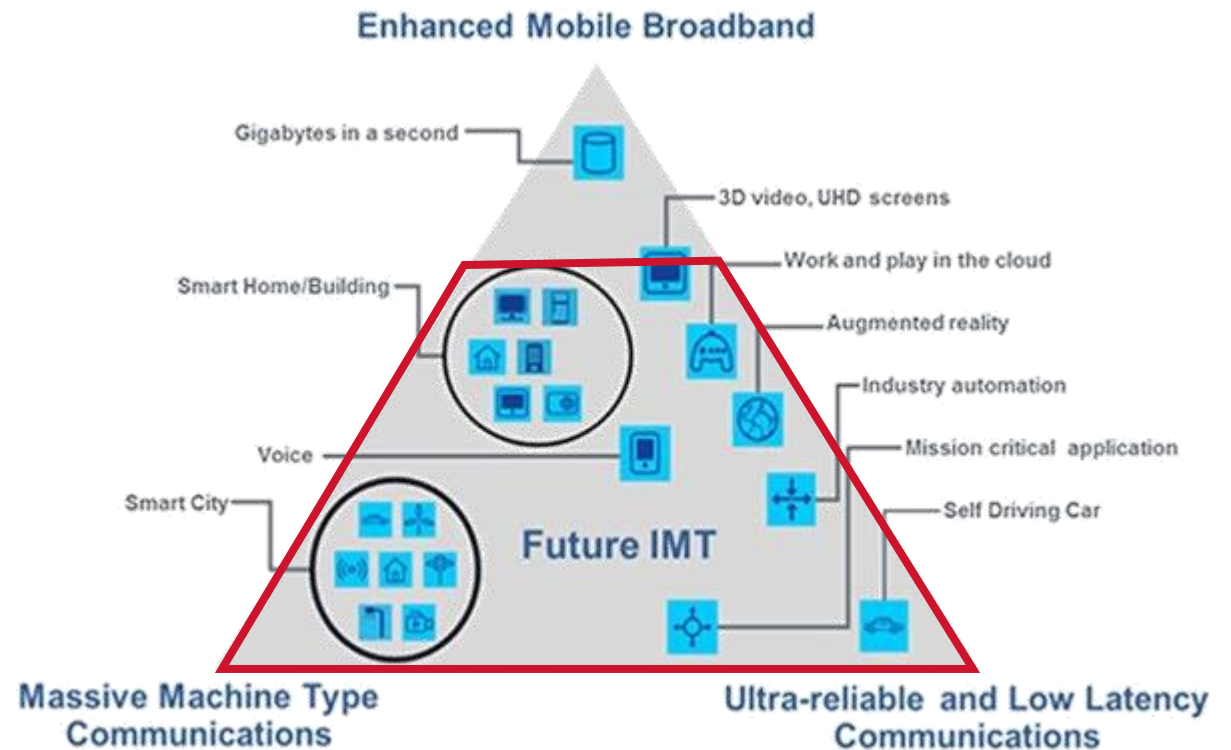
DECT NR+ Scalability

- Scalability means for DECT NR+ that we can support more than 4 Billion devices in the same network.
- The number of devices in a network is so high that centralized control would not improve the performance, on the contrary
- De-centralization and local device-level decisions are enabling large-scale networks
- Wide area coverage is achieved with mesh topology, with better S/N condition and low(er) device transmission power.



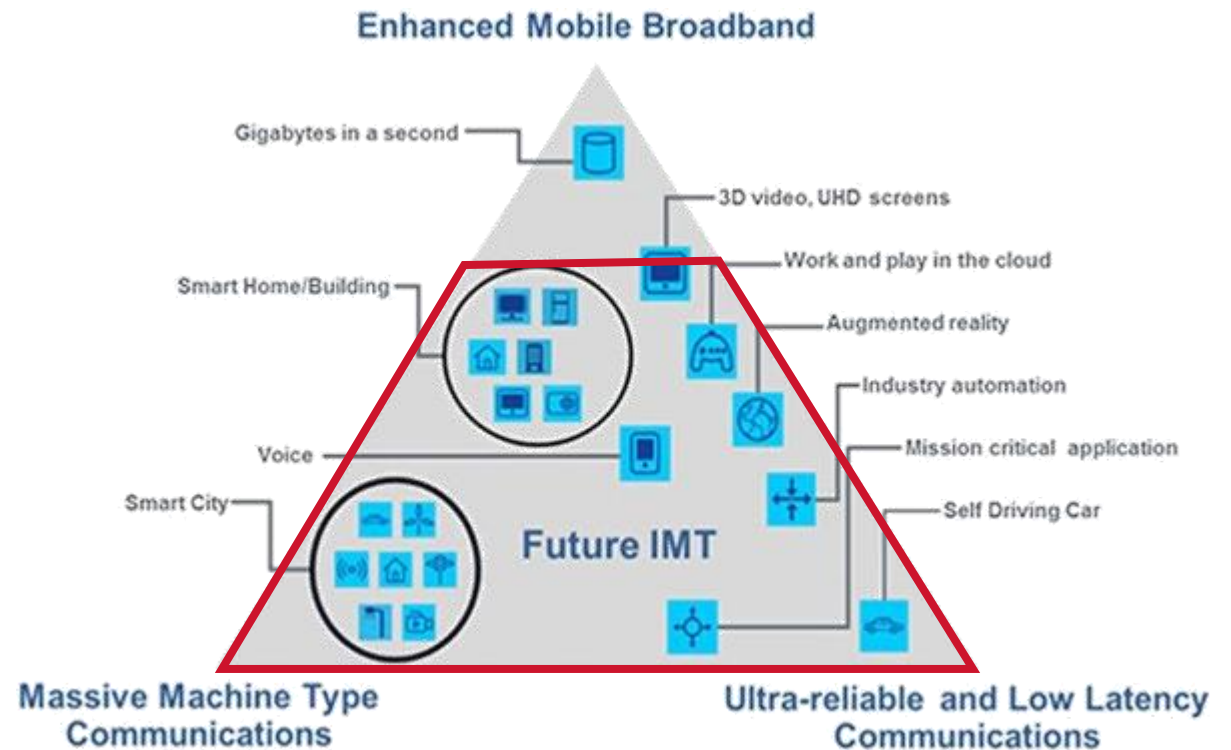
DECT NR+ Density

- Device density is an important requirement for industrial and utilities operations.
- The density of > 1000 units in very close proximity is achieved by local autonomous operation, where devices can coordinate the routing between them by using FDMA and TDMA operation and wide power ctrl range down to -40 dBm to limit the overhearing.
- The number of devices in a network is so high that centralized control would not improve the performance, as the control plane traffic becomes significant.



DECT NR+ Latency

- DECT NR+ physical layer is designed to support low latency operation. The time from receiving mode to transmission mode is very short $< 14 \mu\text{s}$ (i.e. guard interval).
- The device can have multiple receiving and transmission events within one 10ms radio frame.
- The standard enables less than 1ms radio layer latencies in a single link.
- Each radio link may operate with low latency in a mesh operation to minimize the e2e latency.



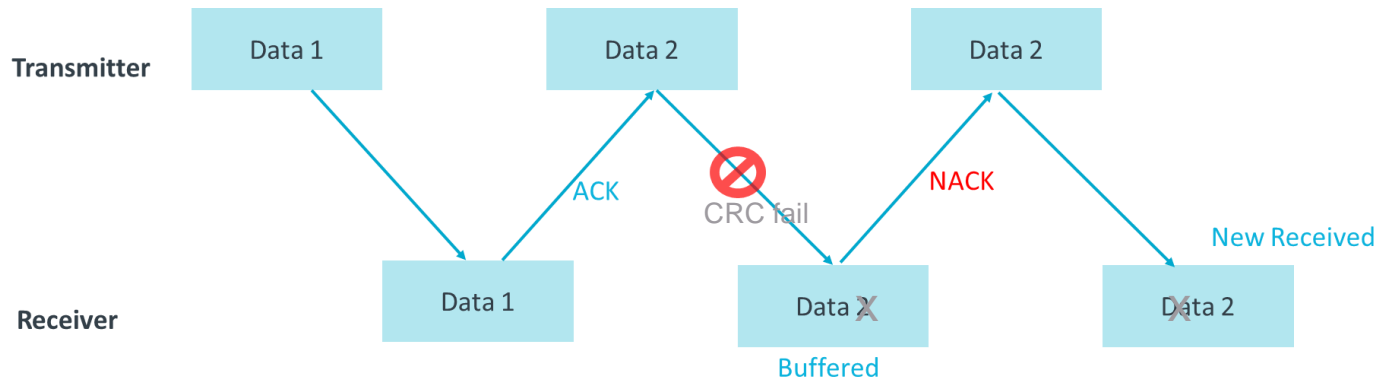
Low Power Consumption



- DECT NR+ has a unique feature set for power savings
 - Dynamic power control of transmissions, -40dBm to +23dBm
 - The Relay device, which manages the radio usage in its cluster, can tell child nodes when the Relay device can be reached for uplink data forwarding
 - Even Relay devices can sleep
 - The Relay device pages the child devices in beacon messages, telling a child when it must listen for downlink data
 - Leaf only needs to listen to beacon message, beacon period from 10ms up to 32s
- DECT NR+ defines routing and re-transmissions on radio stack level, enabling the “multi-core or multi-domain systems to carry out reliable radio communications without waking up other cores

Range and Reliability

- Uses cellular technology algorithms proven in billion of devices globally
- DECT NR+ can use Transmission (TX) power levels up to +23 dBm
 - Over 3 km range in Line-of-Sight
 - Hundreds of meters of range even in challenging urban and factory environments
- Relay scans channels for interference avoidance, updates the cluster's radio resource allocation, and can instruct children to change channels
- Hybrid Automatic Repeat Request (HARQ) for range and reliability
 - Hybrid means it has a Forward Error Correction and repeat request
 - HARQ used automatically for unicast transmissions



Next webinars preview

- Webinar #2 Applications:
 - Which are the application areas and use cases:
 - Smart metering/grid
 - Building management
 - Industrial IoT
 - Professional Audio and PMSE
 - Smart hospital
 - How do the features and benefits of NR+ meet the demands in these applications and use cases

Next webinars preview

- Webinar #3 Technology – upper layers: Radio protocols
 - System topologies and deployments for the use cases
 - Forming and routing in a mesh network
 - End-to-end protocol functions
 - Link specific functions
 - Details on channel access
- Webinar #4 Technology – lower layers: Physical layer
 - OFDM parameterization
 - PHY packet structure
 - Synchronization and channel estimation/equalization
 - Channel coding and HARQ
 - Link performance

Next webinars preview

- Webinar #5 Commercial / How to get started:
 - Look at the Nordic System-in-Packages and development kits
 - Wirepas software development kit
 - Highlights from early customers
- Webinar #6 Recap and Panel discussion:
 - Summary of the previous webinars
 - Review of the feedback received
 - Panel discussion addressing questions received before or at the meeting

DECT NR+ webinar series

- We hope you enjoyed this webinar!
- Be part of shaping the NR+ journey and join us at the DECT Forum!

<https://www.dect.org/application-for-membership.aspx>

- Contact roel.ottink@dect.org for information
- Question time

