Why non-cellular 5G is such a big deal in massive IoT

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Nordic Semiconductor

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Expanding Existing Technology

Nordic strong contributor to new 5G, ETSI DECT-2020 NR standard

DECT 2020 reinvents the familiar DECT technology standardized by ETSI three decades ago. Supporting highly reliable low-latency connection between large numbers of densely-packed devices, it's a scalable, cost-effective solution for enterprise IoT and machine-to-machine applications including industrial automation, sensor networks, logistics and smart buildings.

WORLD'S FIRST NON-CELLULAR 5G TECHNOLOGY, ETSI DECT-2020, GETS ITU-R APPROVAL

- Nordic main contributor to the physical layer and a key contributor to the medium access layer of the specification
- Leverage our cellular investments with initial solution being built around the nRF91 Series
- In partnership with Wirepas, a Finnish massive IoT wireless solution SW specialist company.

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Nordic: Dedicated to wireless connectivity

Broad portfolio - scalable solutions – unified software platform

Strong product and solutions portfolio…

Low-power integrated circuits (ICs)

+

Embedded software

+

Advanced development tools

…for short-, medium- and long-range connectivity technologies

Short-range IoT

Bluetooth LE, 802.15.4/ Thread, Zigbee, Matter and 2.4GHz RF SoCs

Medium-range IoT

Wi-Fi

Long-range cIoT

Multi-mode cellular LTE-M/NB-IoT Modules

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Key advantages of the NR+ technology

5G standard

A non-cellular 5G technology that meets the ITU

mMTC and URLLC requirements

No other non-cellular standard can fully meet these requirements today

Range

Beyond 2 KM range with 3Mbps bandwidth and 1 ms latency

Comparable standards offer typically ~100kbps of bandwidth and seconds of latency

Reliable

Scaling from 100 to 1M nodes per sq-km with ultra high >99.99% reliability built into lower layer to offload application layers

Comparable standards offer basic reliability below custom application layers

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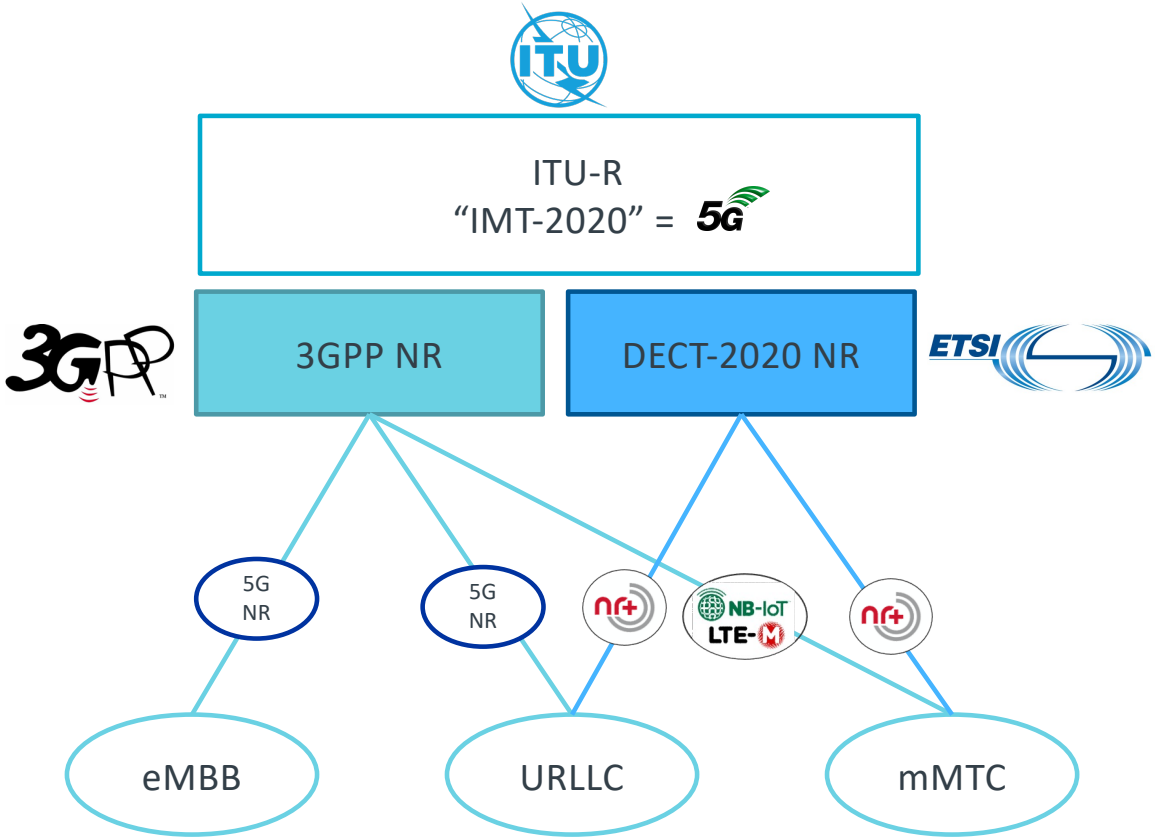
What is 5G

- 5G is owned by International Telecommunication Union (ITU)
- ITU-R sets the requirements and guidelines in IMT-2020 = “5G”
- 3GPP and ETSI develops radio access technologies to meet the requirements
- 3GPP develops 5G NR, LTE-M and NB-IoT
- ETSI develops DECT-2020 NR



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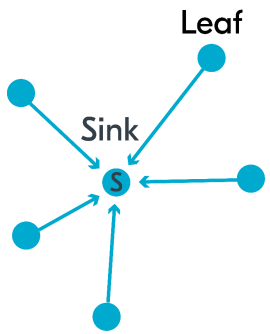
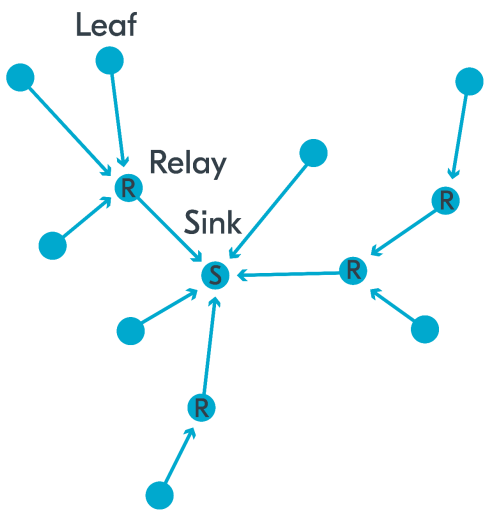
NR+ Key Feature Summary

- 1.9 GHz License-exempt band
- Direct, Star and Mesh topologies
- Low latency operation
- Dynamic channel selection based on spectrum sensing
- Interference avoidance
- Scheduled and unscheduled services
- Scalable physical layer
- Up-to-date security based on AES and CCM
- Ultra low power consumption devices





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Ideal for local area, de-centralized applications

- Single global band = Simplify the product design
- Easy to install new devices into the network
- No subscription costs or base stations required
- Scalable and reliable networks – star or mesh
- Completely autonomous
- Sustainability
- Secure

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Ideal for local area, de-centralized applications

- Industry 4.0
  - Industry automation, conditioning monitoring, building automation and lighting control, logistics chain

- Smart cities
  - Utilities, electricity or water metering, energy distribution system management, environment monitoring, public infrastructure and transport applications

- Professional Audio
  - Audio and media industry applications

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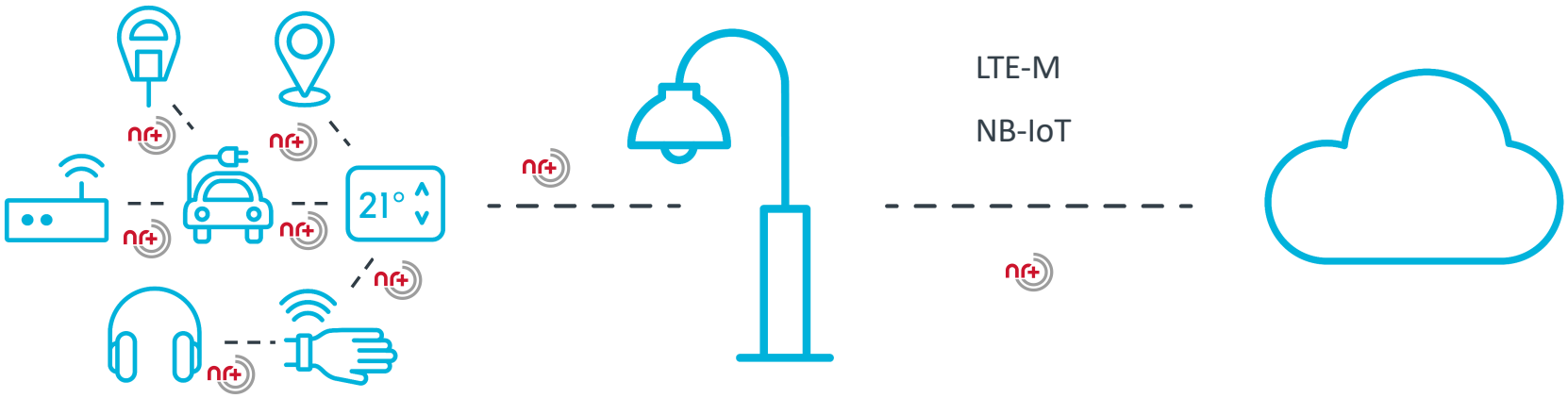
NR+ for Smart City

- Smart Street Lights
- Scale city-wide using same network infrastructure



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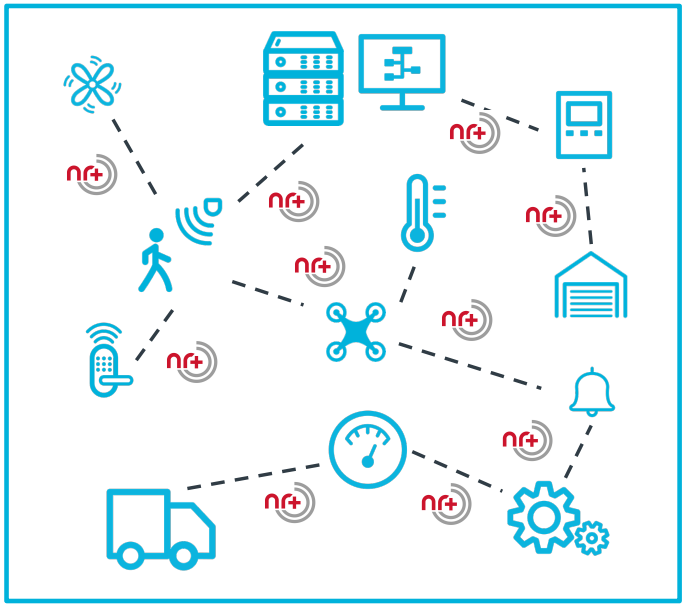
NR+ for Smart Warehouses

- Self-driving factory vehicles
- Massive amount of connect equipment
- Hard low latency requirements
- Self-healing and self-organizing properties



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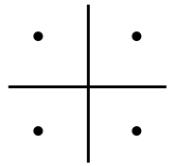
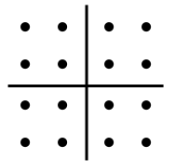
NR+ Physical (PHY) layer and Nordic plans

- Cycle prefix (OFDM) modulation for UL and DL
  - Resulting nominal bandwidth scaling from 1.728MHz, 3.456, 6.912, 13.824, 20.736, 27.648, 41.472, 55.296, 82.944, 110.592, 165.888, 221.184 MHz
  - Sub-carrier spacing (SCS) is scalable: 27kHz, 54kHz, 108kHz, 216kHz
- Physical Data Channel (PDC) modulation supporting BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM
  - With supporting "turbo coding rates": ½, 2/3, 3/4, 5/6
- High data rate scalability
  - Spec. scales up to 9Gbit/s data rate
  - Nordics initial solution will support *3.4Mbit/s peak rate*)
- Hybrid automatic repeat request (HARQ) methodology
  - HARQ retransmission latency <417µs

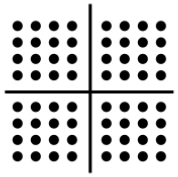
QPSK
2 bits/symbol



16QAM
4 bits/symbol



64QAM
6 bits/symbol



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Comparing vs. other short-range wireless

	Reliability	Security	Bandwidth	Range	Future Proofing
NR+	High	Medium	Medium to High	High	High
Wi-Fi	Medium	Medium	High	Medium	Medium
Bluetooth	Medium	Medium	Low	Low	Medium
802.15.4	Medium	Medium	Low to Medium	Medium	Mediuml
ISM RF	Low	Low	Medium	Low	Low

Source: ABI Research

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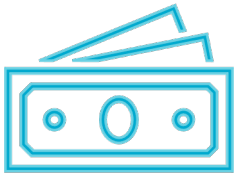
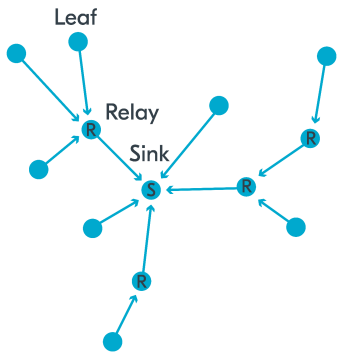
Benefits for the customer/developer

- **Low cost of ownership**
  - No base stations
  - No SIM needed
  - No subscription
  - Easy install



- **Scalable & reliable**
  - No single points of failure
  - Completely autonomous
  - Years of battery life
  - Secure
  - Over the Air updates



Millions of devices in one network

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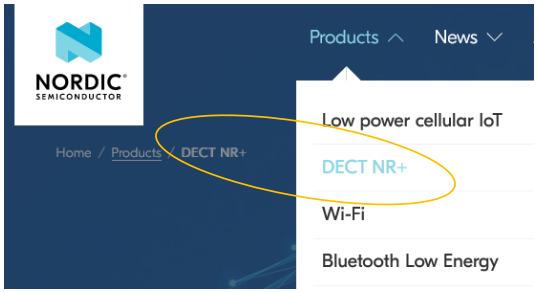
Nordic and NR+ in Summary

- **Wirepas is our solution partner**
  - Nordic focus on the hardware and the physical part
  - Wirepas is the solution supplier

- **Lead customers support from late 2022 w/Wirepas**
  - More and mass customer support planned during 2023

- **For news/updates from Nordic on NR+ go to our landing page:**
  - https://www.nordicsemi.com/Products/DECT-NR

- **Please reach out directly for questions and further discussions**
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