# 5G for Future Industrial Internet

5GMomentum
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# Industrial Use Cases

Drone remote control (NR-Light)

Voice (eMTC)

Crane remote control (NR-Light)

AGV (URLLC)

Electricity distribution (URLLC/TSC)

Robotic control (URLLC/TSC)

Industrial sensor (NR-Light)

Traffic light (eMTC/NB-IoT)

High-def video (NR-Light)

Asset tracking (eMTC/NB-IoT)



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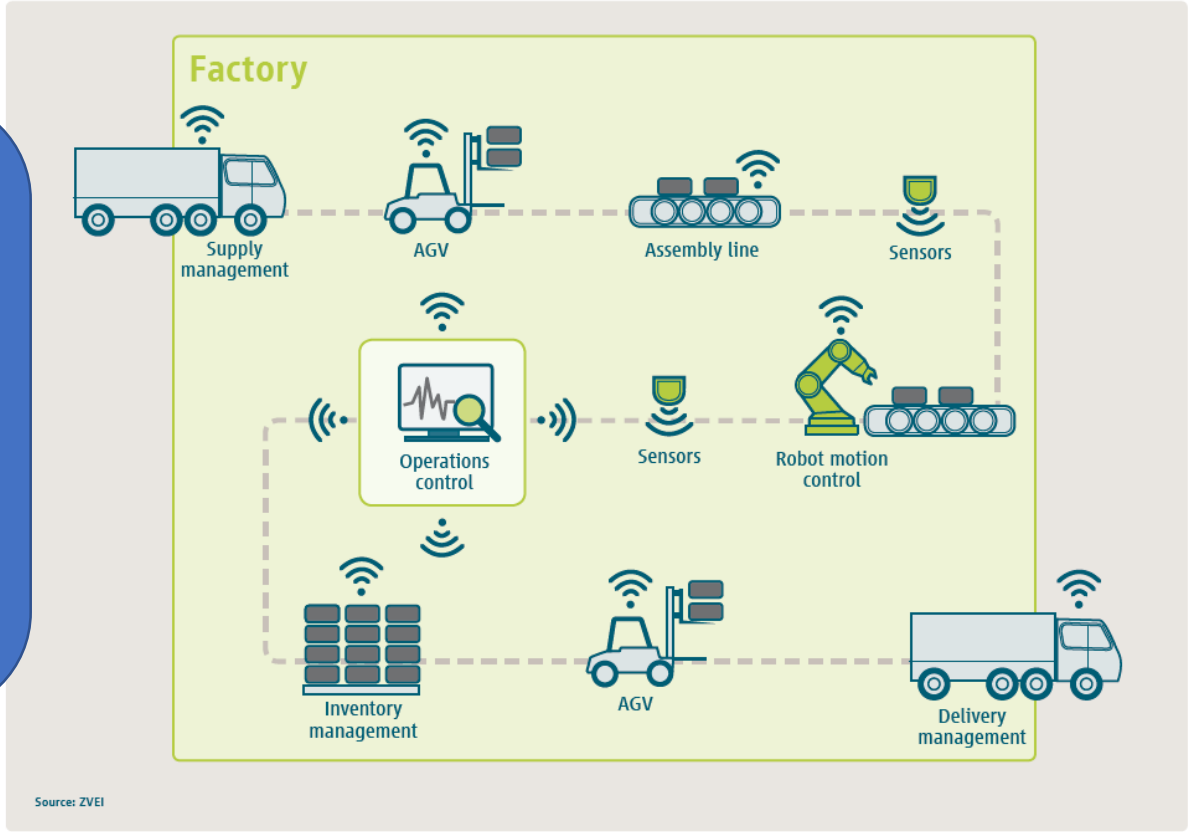
# Digital Factory

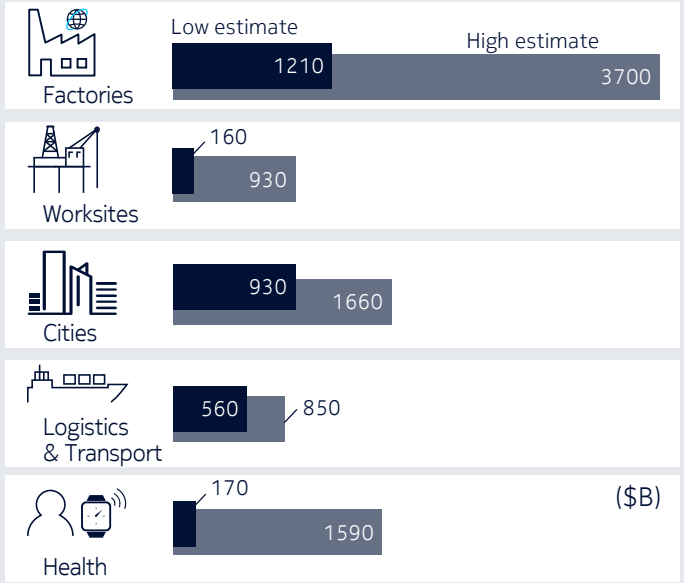
- Things Connected
- Multitude of edge clouds
- Augmented intelligence control platforms
- High-performance network



# The quest for new economic value

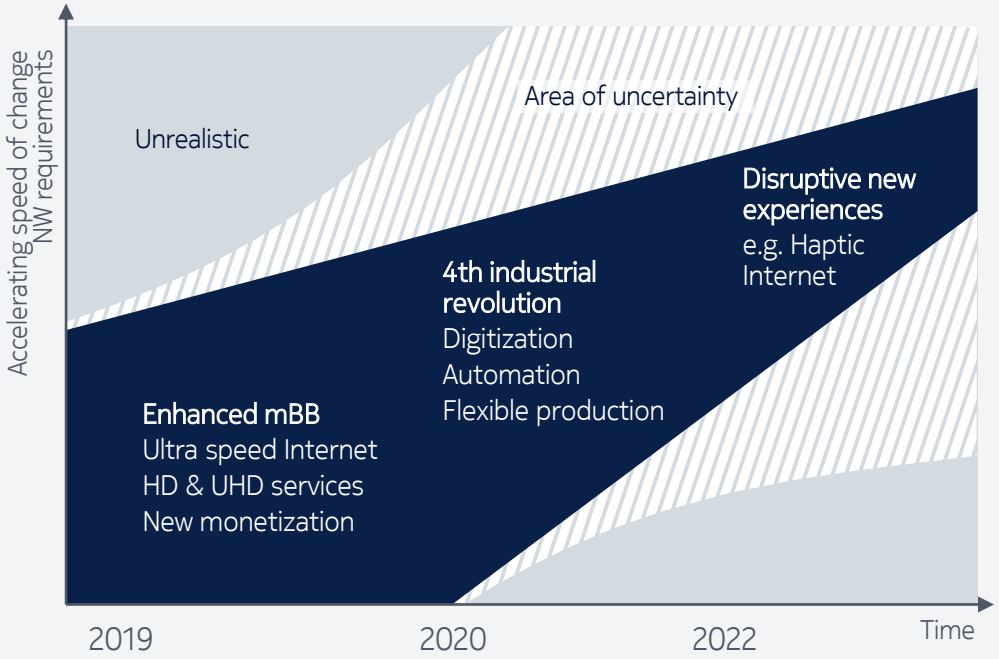
## What analysts are saying

### New DSP markets offer significant revenue expansion




Estimated 2025 value creation potential of the IoT
- *McKinsey Global Institute*

### ...be prepared for the obvious and the uncertain



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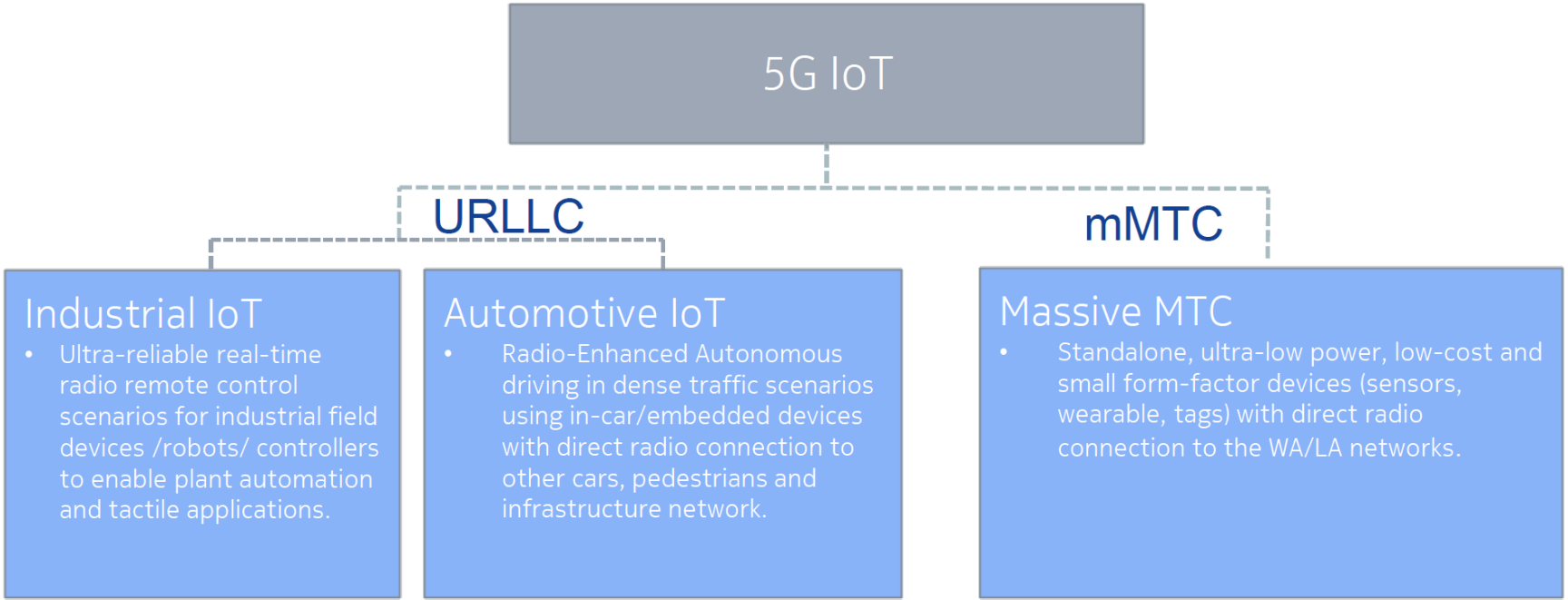
# 5G Internet of Things



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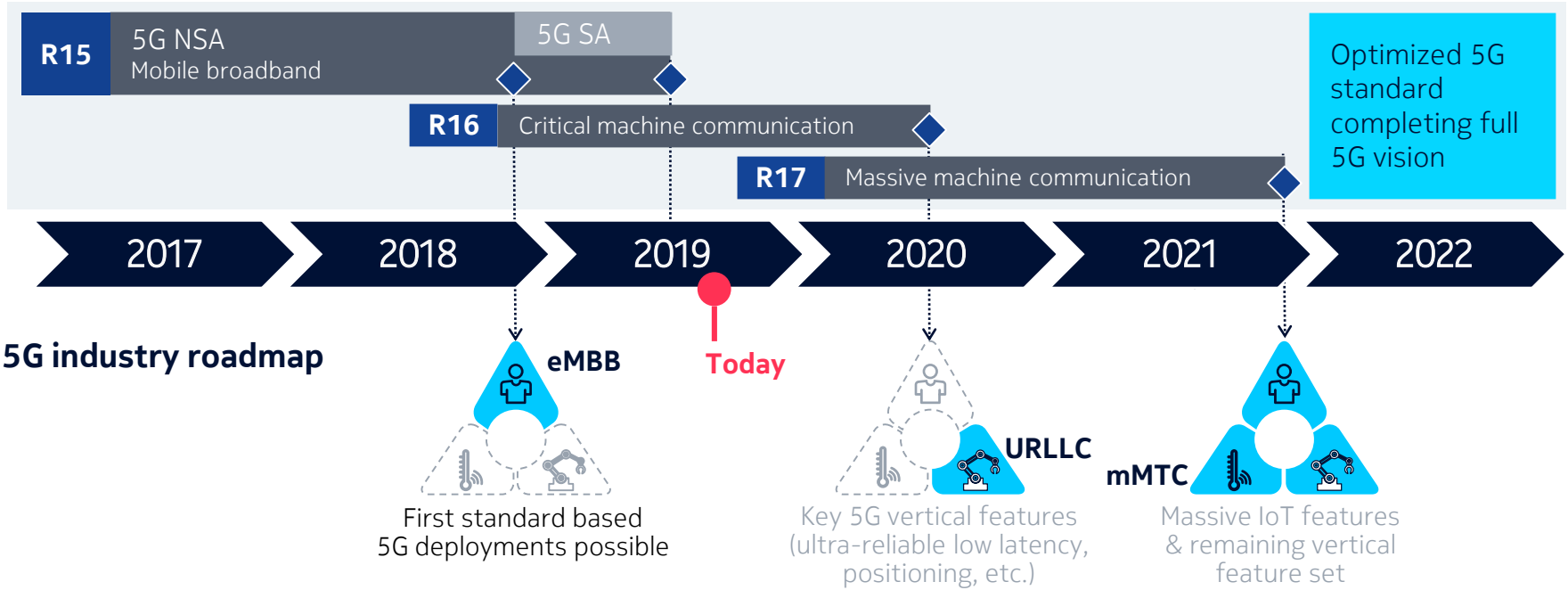
# Realizing the full promise of 5G through 3GPP evolution

## 5G standards roadmap



# Release 16 – under preparation

- Unlicensed 5G
  - unlicensed bands enable deployment without a frequency license
  - better performance compared to WiFi
- 5G New Radio based IoT User Equipment categories
- Industrial IoT, URLLC enhancements
  - Basic URLLC features in Rel 15, improve reliability
  - New use cases: Factory automation, Transport Industry, Electrical Power Distribution
  - Support for Wireless Ethernet and Time Sensitive Networking (TSN)



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# Release 17 – under discussion

- Enhanced Industrial IoT: Wide Area Time Sensitive Communications (TSC), Deterministic networking
  - need more versatile 5G synchronization/timing delivery solution for all applications/verticals
- Positioning Enhancements
  - Call location, factory/campus automation, drones
- For future: mmW bands (large bandwidths, high accuracy)



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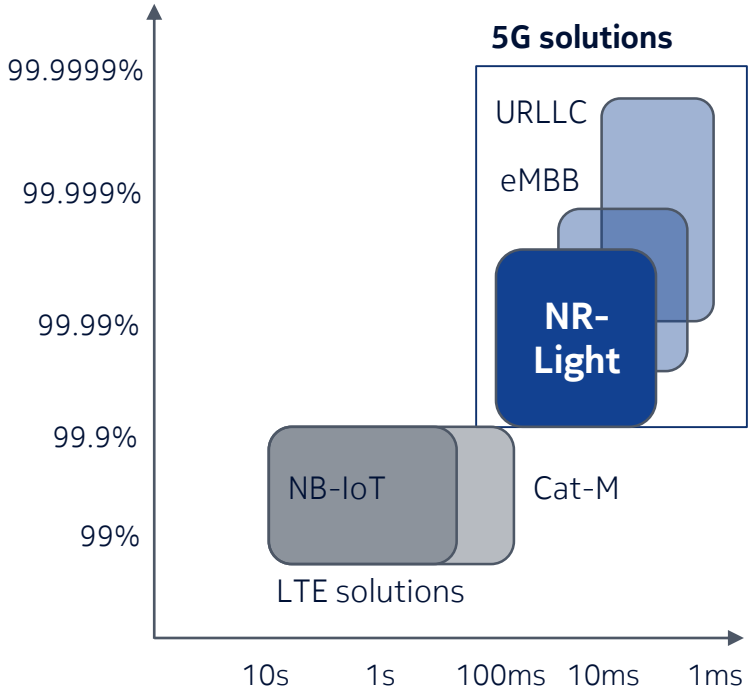
# NR-Light (5G IoT) Bridging the Gap between 5G and Cat-M




**NR-Light:**

- 10-100x reliability vs NB-IoT/Cat-M
- 10-100x latency vs NB-IoT/Cat-M
- 10 dB extra coverage vs eMBB
- 100 Mbps data rate

- No need to support 3 different networks
- Better system efficiency with NR
- Deploy URLLC & NR-Light in also FR2 and new spectrum
- Better integration and benefits from 5G core and architecture – network slicing, service based architecture



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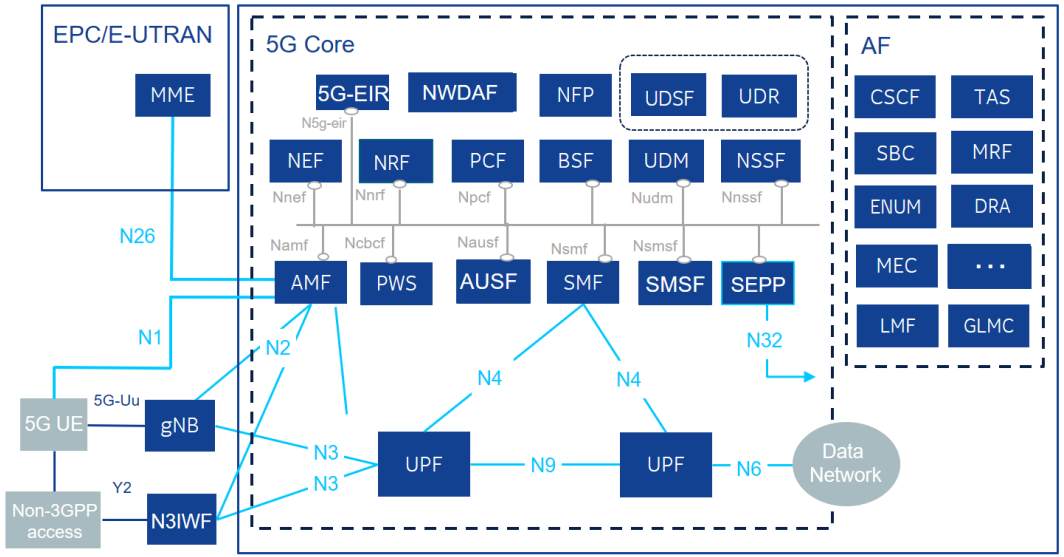
# Other topics

## 5G Core enables plethora of new services

- Non-3GPP-interworking
- Wireline access
- MEC
- Virtualization
- Security
- Open interfaces
  - Applications&Services
- Automation
- Slicing



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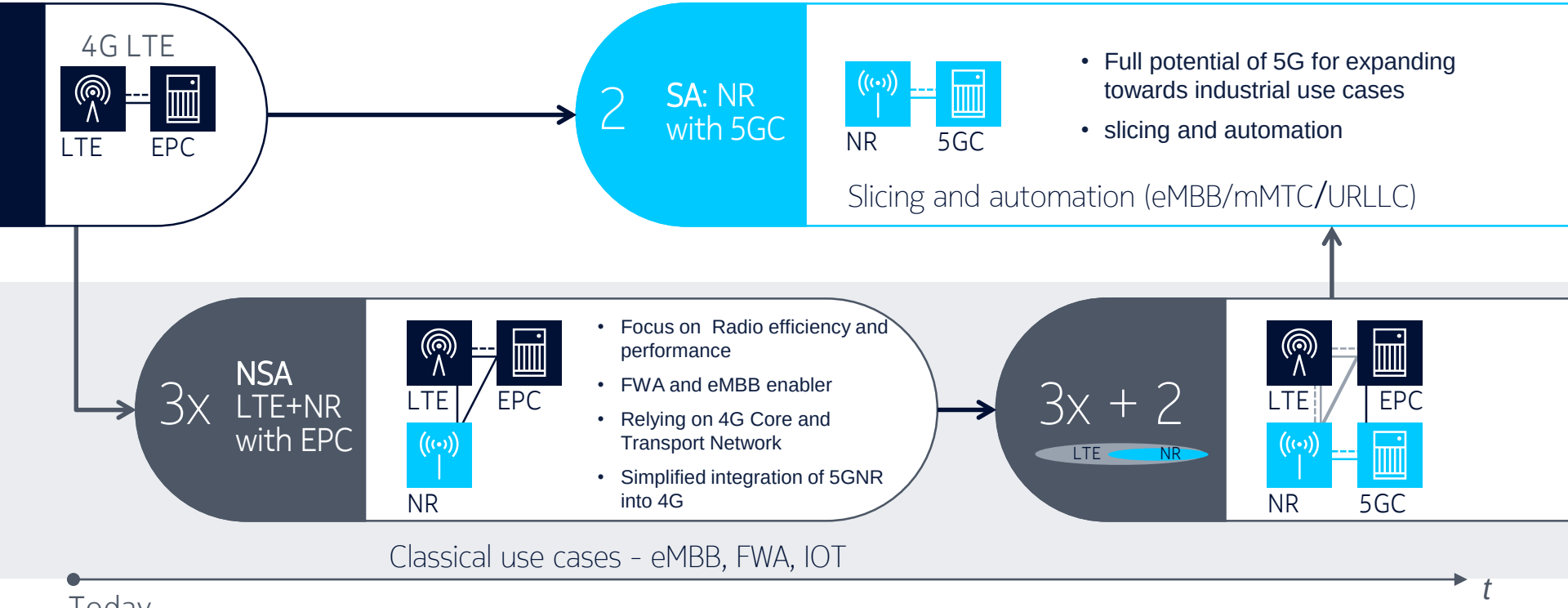
# Options for 5G evolution

## Standalone (SA) and non-standalone (NSA)



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# 5G Network Slicing - One size does not fit all

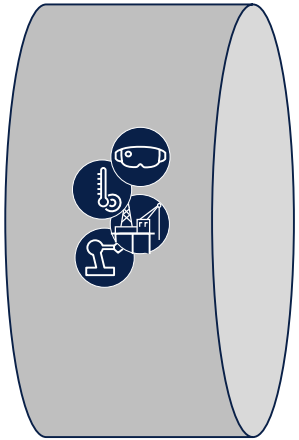
Immersive gaming
high throughput / low latency

Meter/sensor (IoT)
low throughput / high reliability

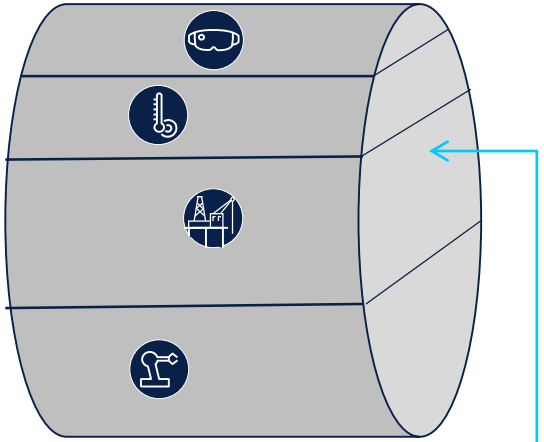
Mobile tele-operation
low latency / ultra reliability

Industrial robotics
low latency / ultra reliability

Pre-5G era



**5G slices**



Network Slice
virtual network with certain SLA (latency, throughput etc.)



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