



The 5G Advanced ERA: Trends, Benefits and key Technologies

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The 5G Adv. ERA

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The four E's

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Deep dive

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Deep dive

Multiple trends are shaping and converging to the same time window we call 5G-Advanced Era

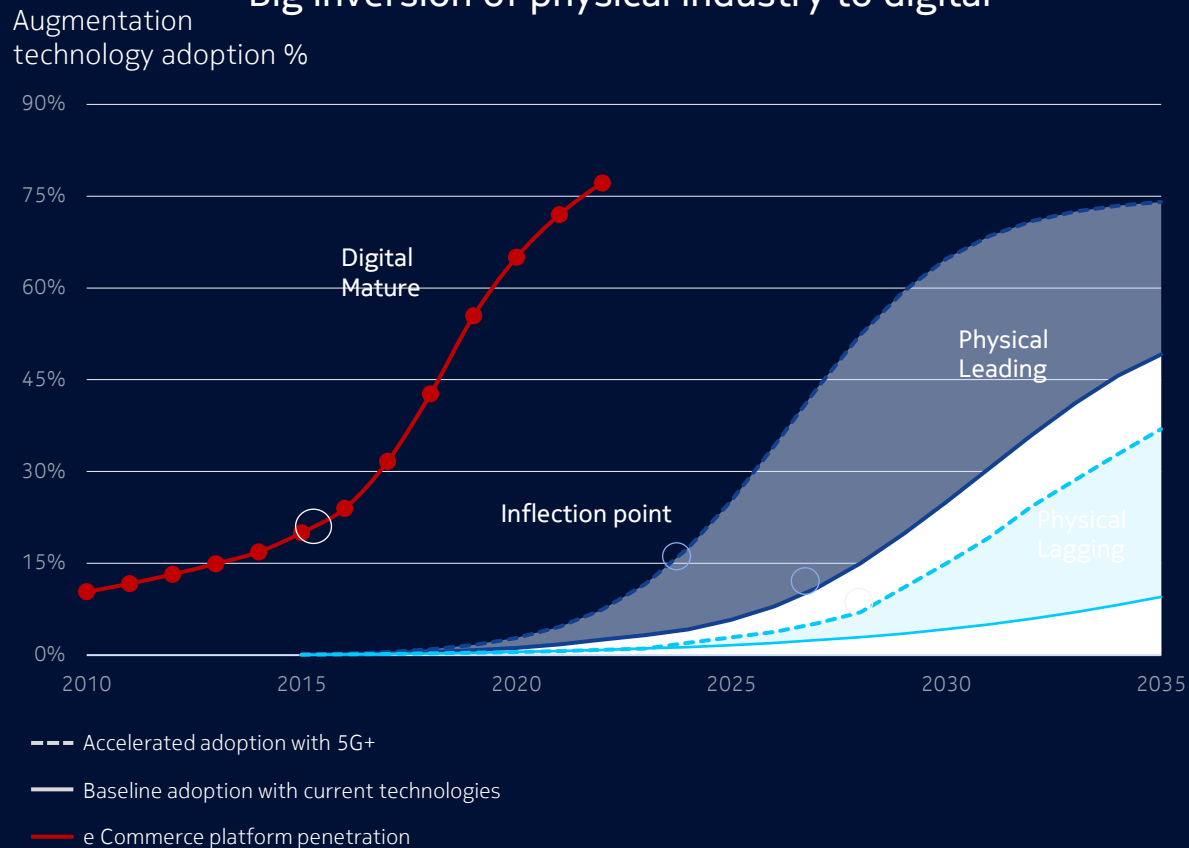


The “perfect storm” opening doors into the 5G-Advanced Era

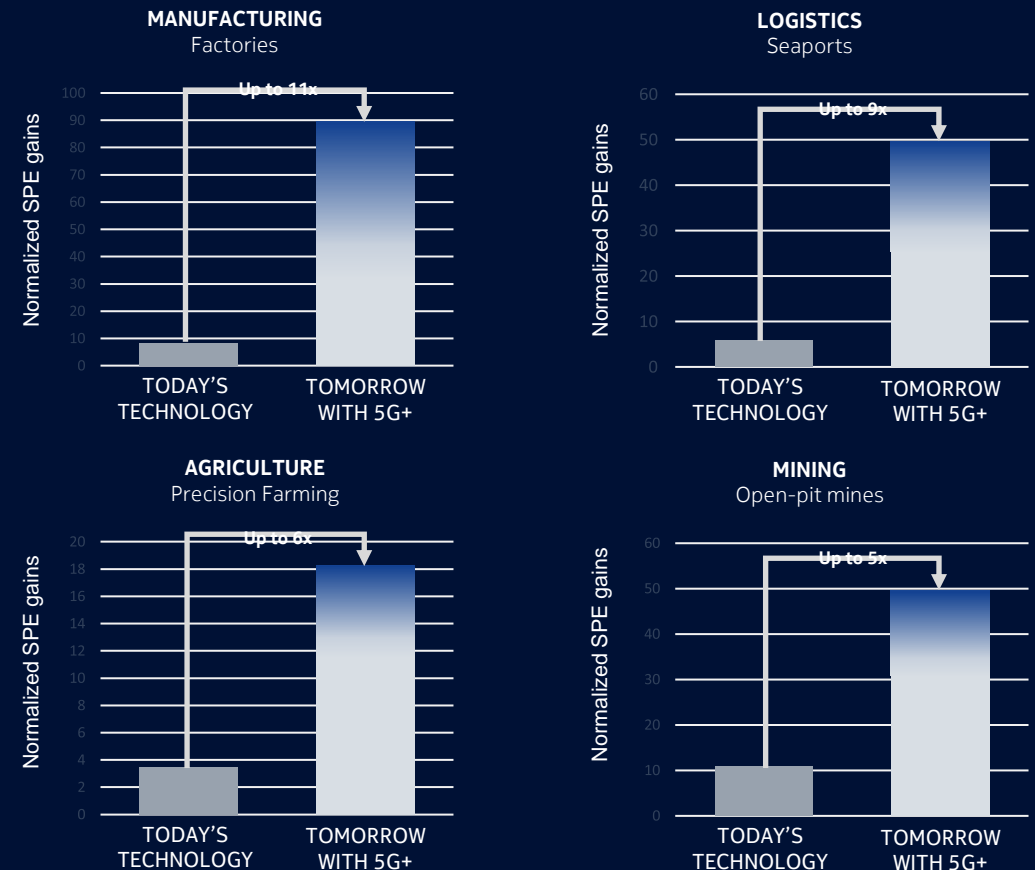
Approaching inflection point for whole ecosystem

Industries are going to see mass gains in Safety, Productivity and Efficiency (SPE)

Big inversion of physical industry to digital

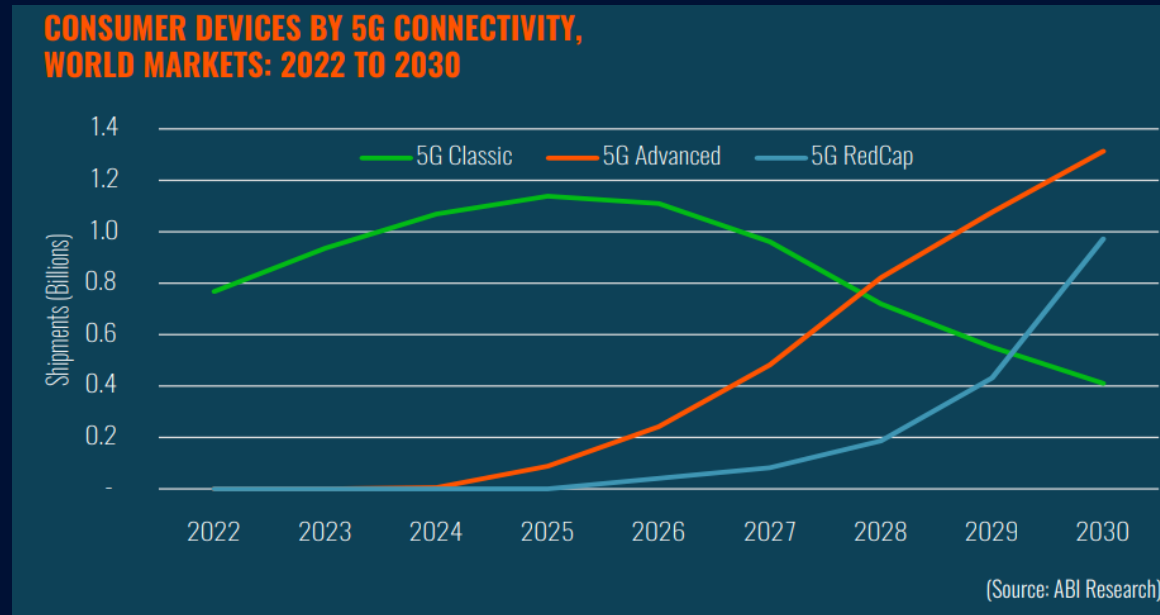


Source : Nokia BLC WP "The big inversion"



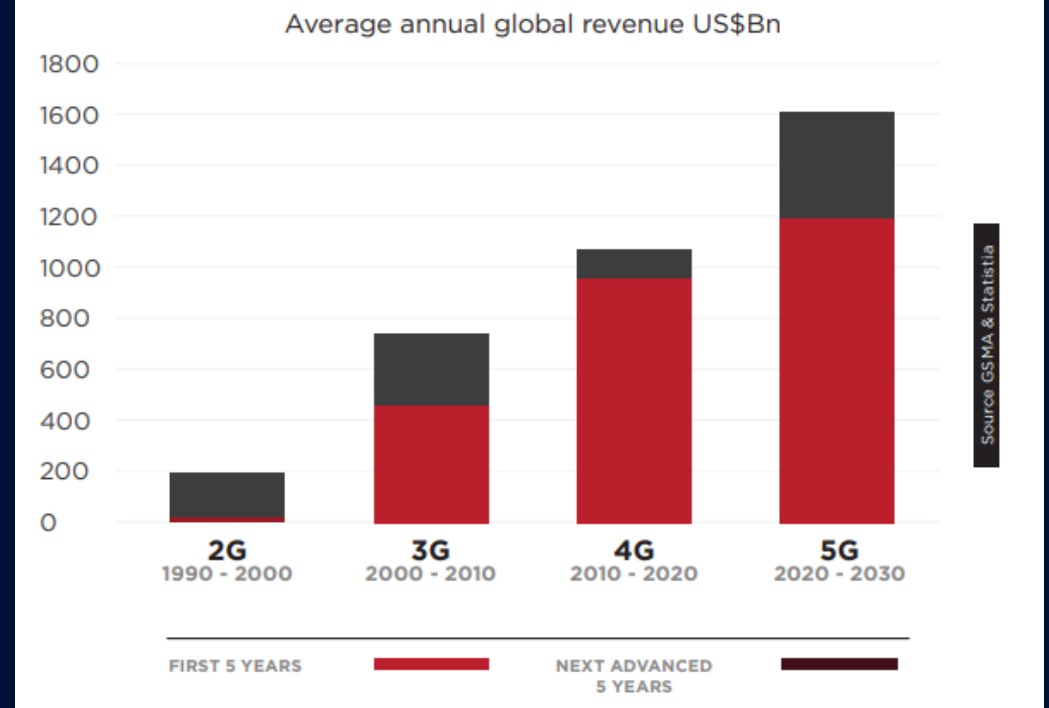
5G enabled ICT investments are larger than just 5G connectivity, address also e.g slicing, security, cloud applications, private network, AI/ML, sensor data, zero touch automation

Market forecast shows steady increase in adoption



5G-Advanced will dominate consumer devices market before 2028. Low cost IoT 5G devices are expected to grow exponentially filling in 5G network and accelerating adoption of 5G in vertical markets

FIGURE 1: Average annual revenue globally for all operators



5G cycle is longer and deeper than previous technologies, with more to gain. 5G-Advanced releases are expected to play important roles in this longer 5G journey.

5G-Advanced sits between 5G and 6G

Expected 3GPP standardization timeline



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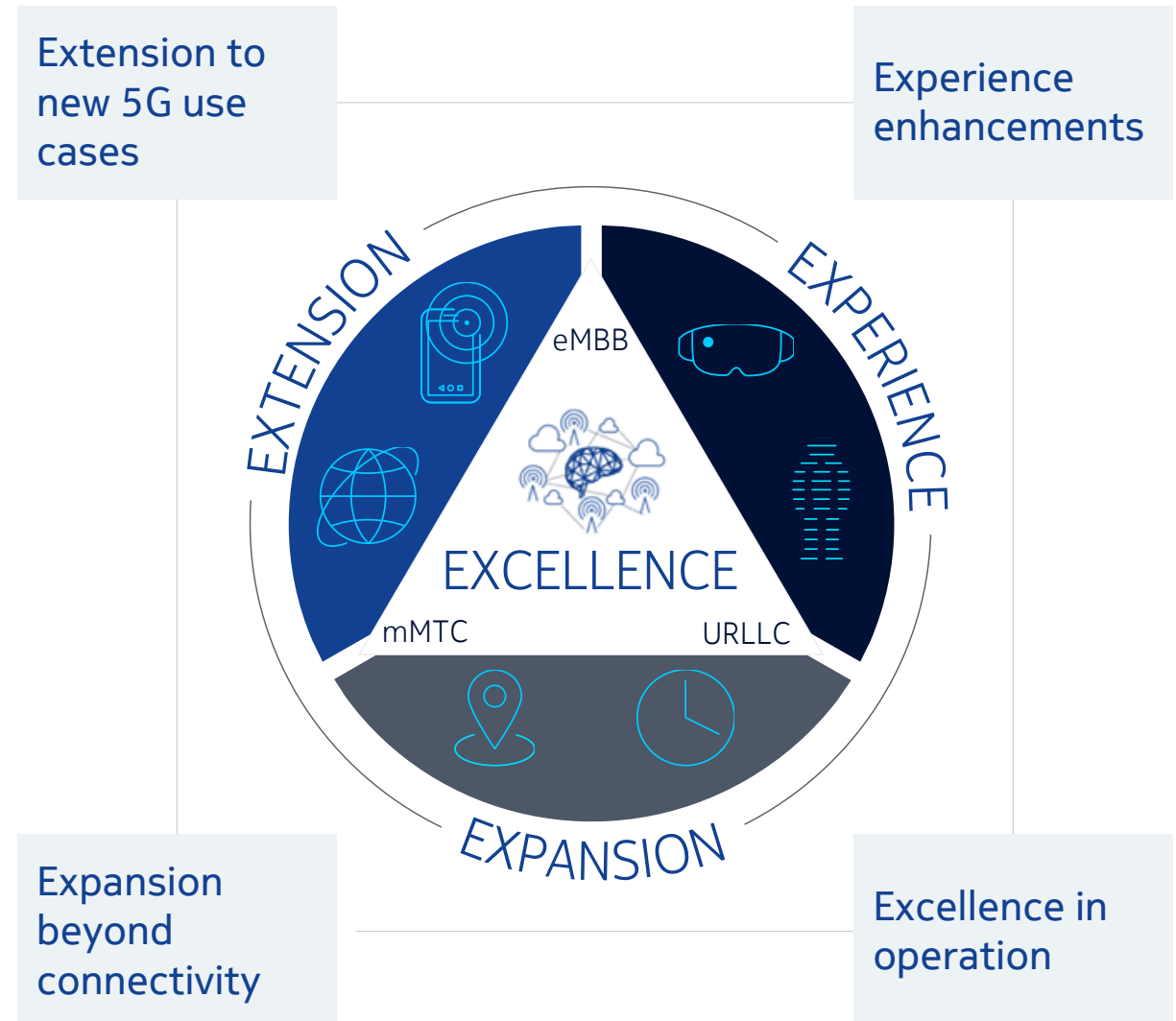
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Deep dive

5G-Advanced

New usage areas,
new services,
boosted resiliency
and operability

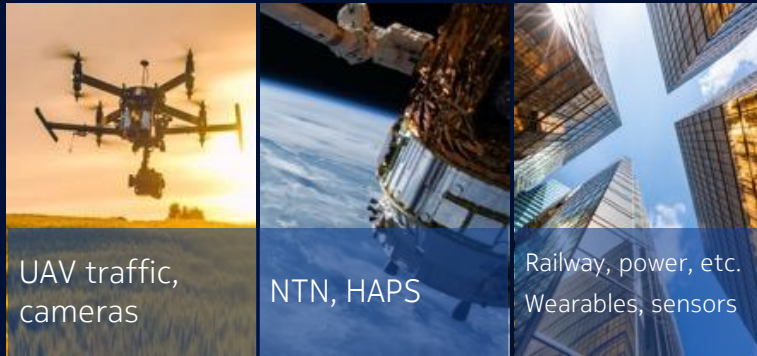
Four dimensions of innovation



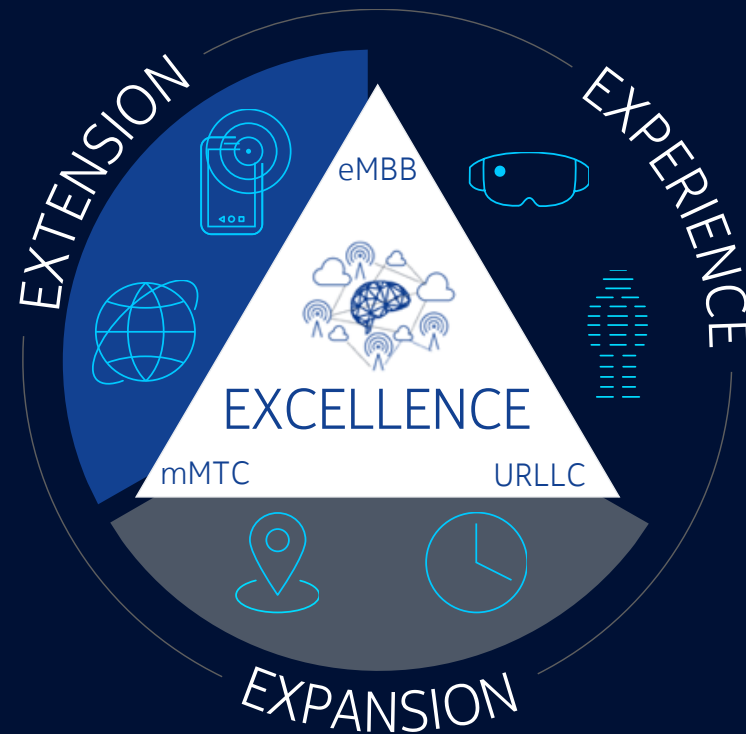
5G-Advanced

New usage areas, new services, boosted resiliency and operability

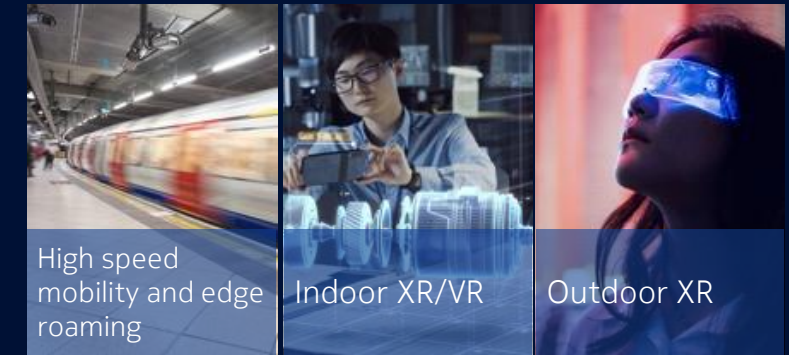
Extending global 5G-Advanced reach for IoT and basic MBB



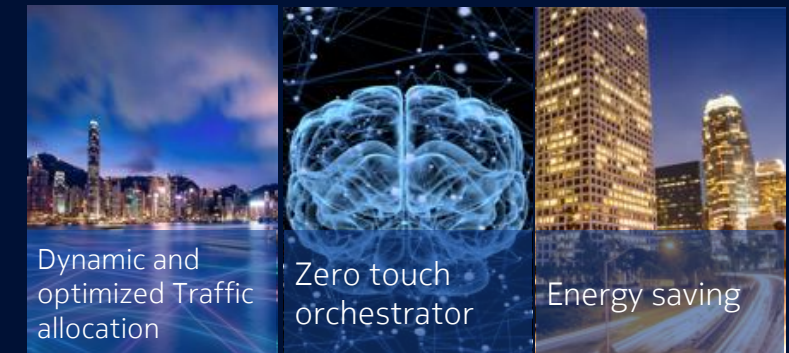
Expansion to Support Positioning, Time Sync aaS also without GNSS – Enabling New Use Cases



Extreme MBB experience with bounded latency, high data rates enabling IIoT for FR2



Network wide AI/ML enhancements, further network energy saving, network slicing



5G-Advanced Rel18

New usage areas, new services, boosted resiliency and operability

Extension to new 5G use cases:

- Uplink coverage
- IoT optimized RedCap
- Non-terrestrial networks (NTN)
- UAV optimization
- Sidelink enhancements
- Sub 5MHz for verticals

Expansion beyond connectivity:

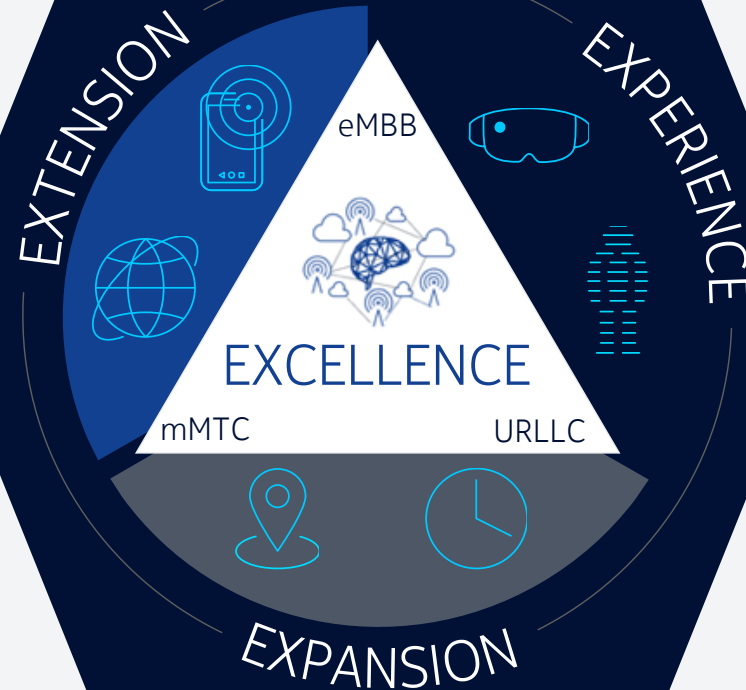
- Positioning enhancements
- Timing Resiliency

Experience enhancements:

- Extended reality (XR)
- MIMO enhancements
- Mobility enhancements
- Duplex operations
- Edge computing

Excellence in operation:

- AI/ML for NG-RAN
- AI/ML for Air Interface
- AI/ML in 5G Core
- Network energy efficiency
- Mobile IAB
- DSS enhancements
- Network slicing



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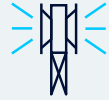
Deep dive

5G-Advanced brings improvements in many areas



Enhanced mobility

- Reliability to 99.9%
- Break from 50 to 0 ms (FR2)
- Improved FR2 Scell setup



Enhanced coverage

- PUSCH 2 dB
- RACH 5 dB



MIMO performance

- Enhanced uplink
- Multi-cell uplink
- +20% for high-speed mobiles



XR (AR, VR, gaming)

- Guaranteed
- Seamless
- Low power consumption
- Edge computing



Resilient timing

- No GPS required
- Timing service over 5G network



5G to replace GSM-R

- Enable GSM-R migration to 5G with <5 MHz support for dedicated spectrum



Enhanced sidelink

- Sidelink meeting public safety needs
- Sidelink to XR display etc.



IoT optimized REDCap

- 70% lower cost
- Lower power consumption



Accurate positioning

- <10 cm indoor positioning, using carrier phase
- Complement to GNSS outdoors



Network operation efficiency

- More flexible TDD spectrum use
- AI/ML automation
- Energy efficiency

The four E's to enable superior network capability

Experience

enhancements

Extension

to new 5G use cases

Expansion

beyond connectivity

Excellence

in operation

Key takeaways – so far

Multiple trends are converging in the same time window.

The need to enable advanced use cases is growing – device ecosystem is maturing.

5G-Advanced will allow the optimal deployment to meet heterogeneous requirements at the same time.

5G-Advanced will enhance key performance metrics from 5G.

3GPP Rel-18 spec ready in 2024, products for 2025 onwards.

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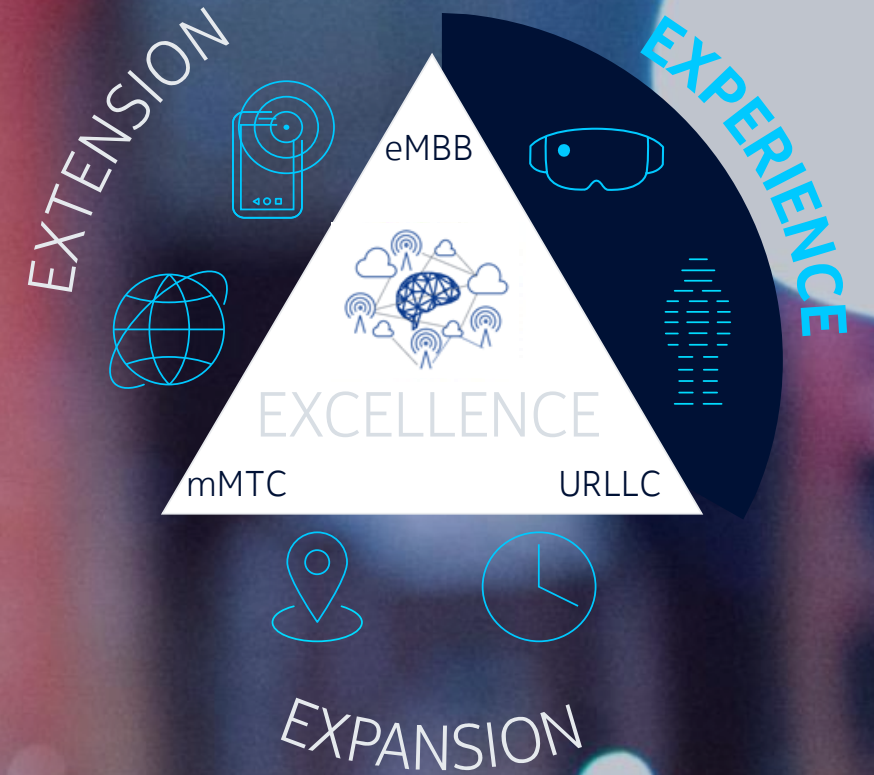
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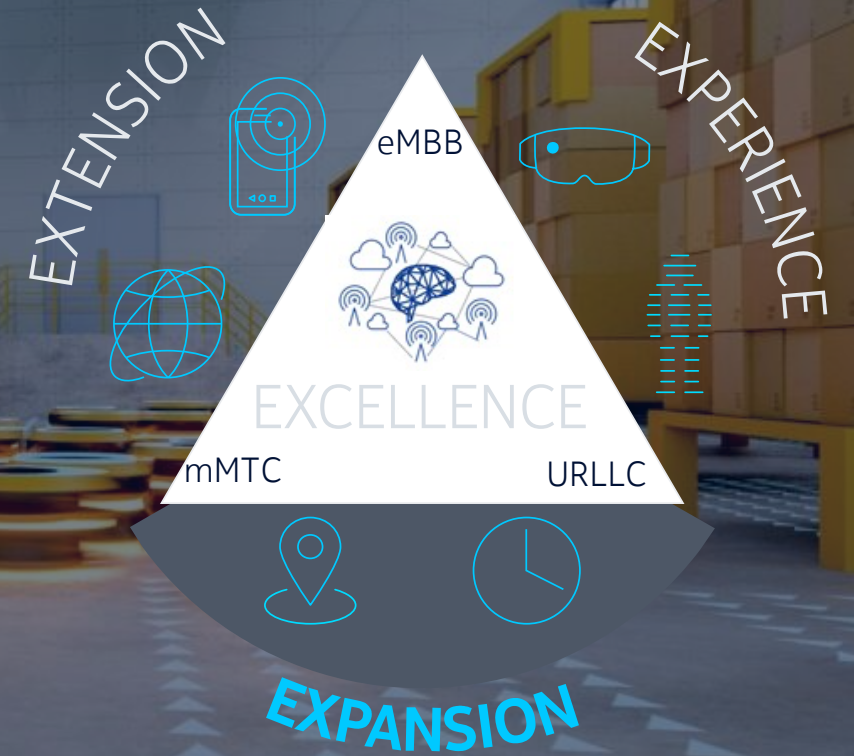
Experience



Extension



Expansion

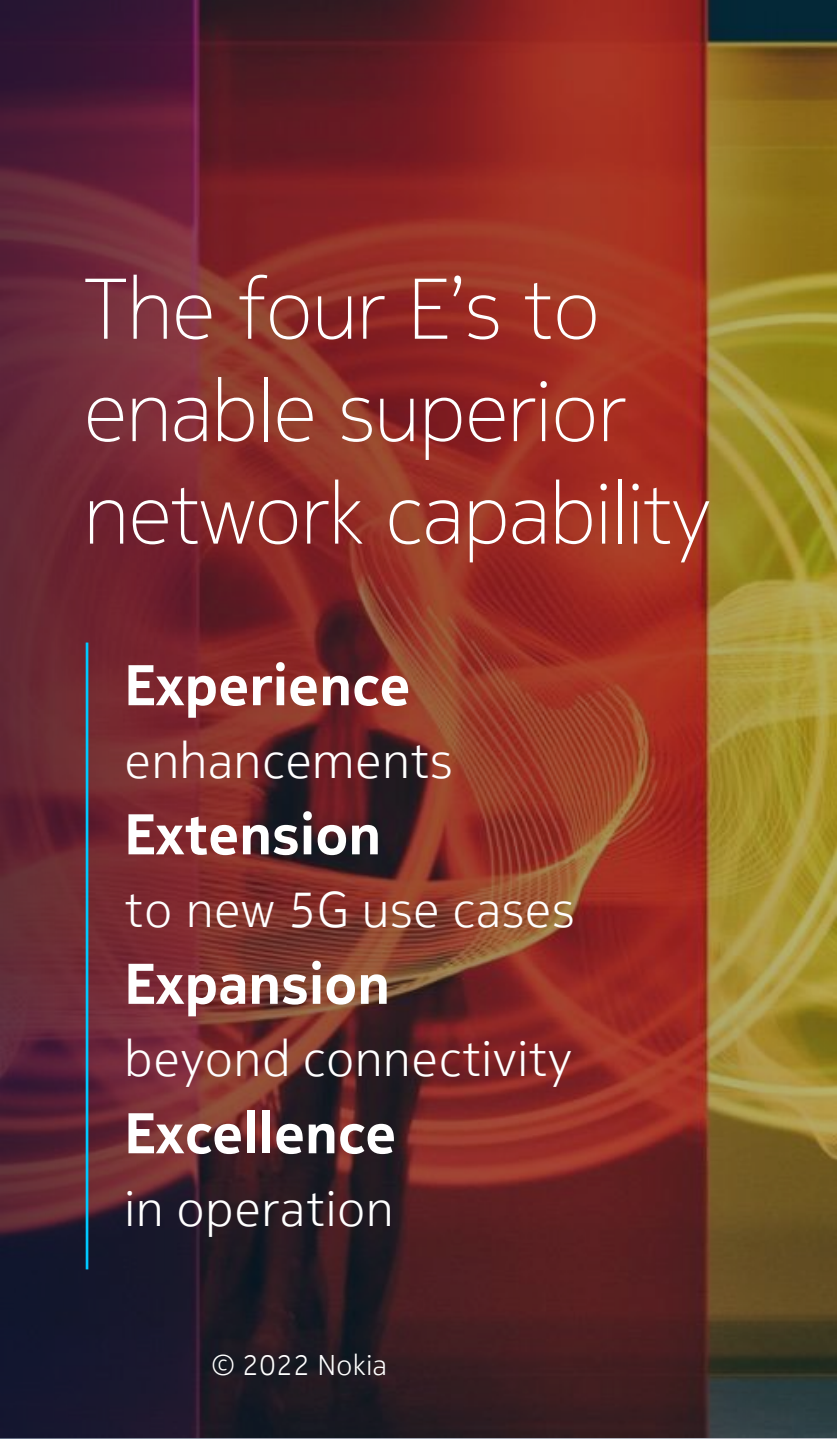


Excellence





Beyond Rel-18 and towards 6G



The four E's to
enable superior
network capability

Experience

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to new 5G use cases

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beyond connectivity

Excellence

in operation

Summary and Outlook

5G-Advanced offers a rich set of technology features and enhancements to existing 5G and will enable new use cases.

It will go beyond connectivity and leverage on excellence in operation.

Multiple trends are converging and creating an opportunity window through business and ecosystem transformation.

5G Advanced is also embracing long-term topics that will continue and mature most likely in 6G.

NOKIA