

# RWS-180020

3GPP Workshop on IMT2020 submission

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## RAN outlook – Rel16 and beyond

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# Outline



- 5G vision driving the evolutionary path
- 5G evolution: Expansion and Efficiency

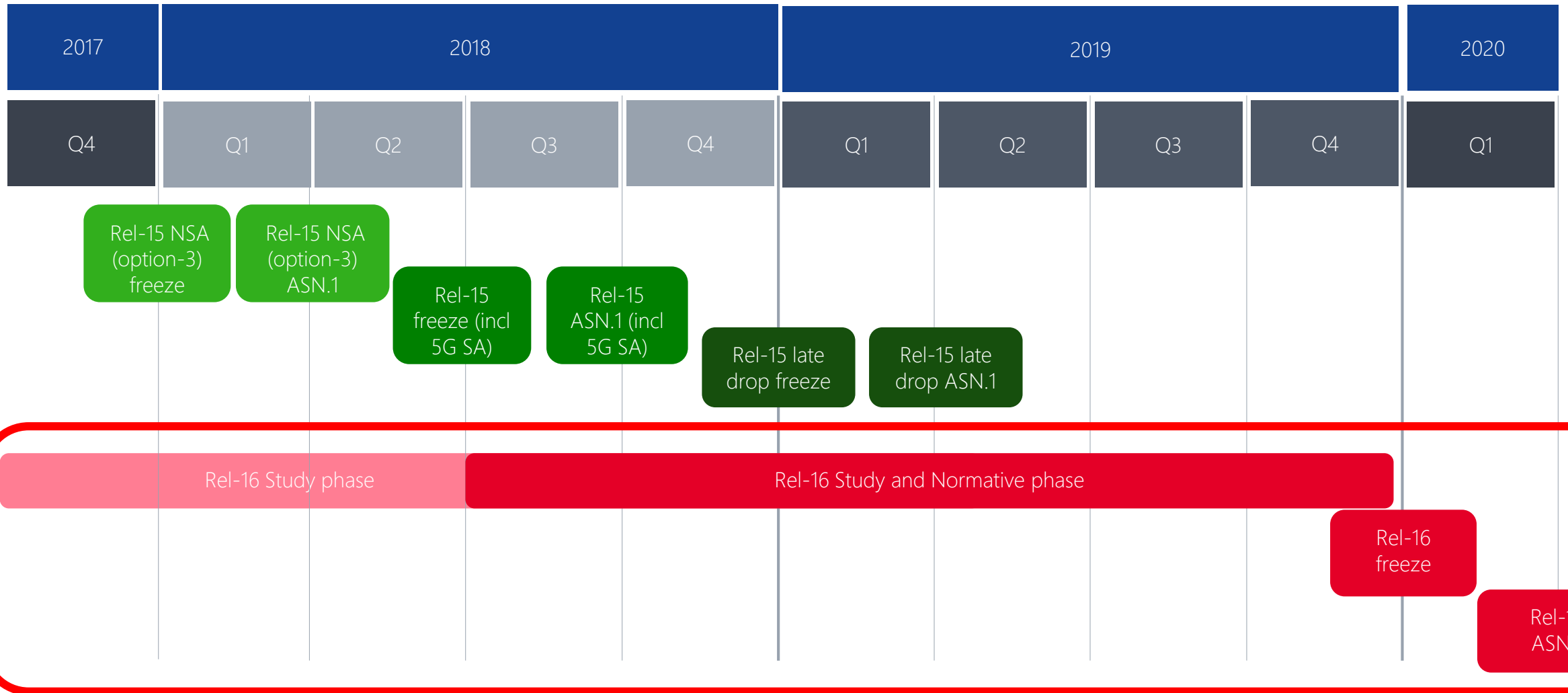
# 5G vision - for real



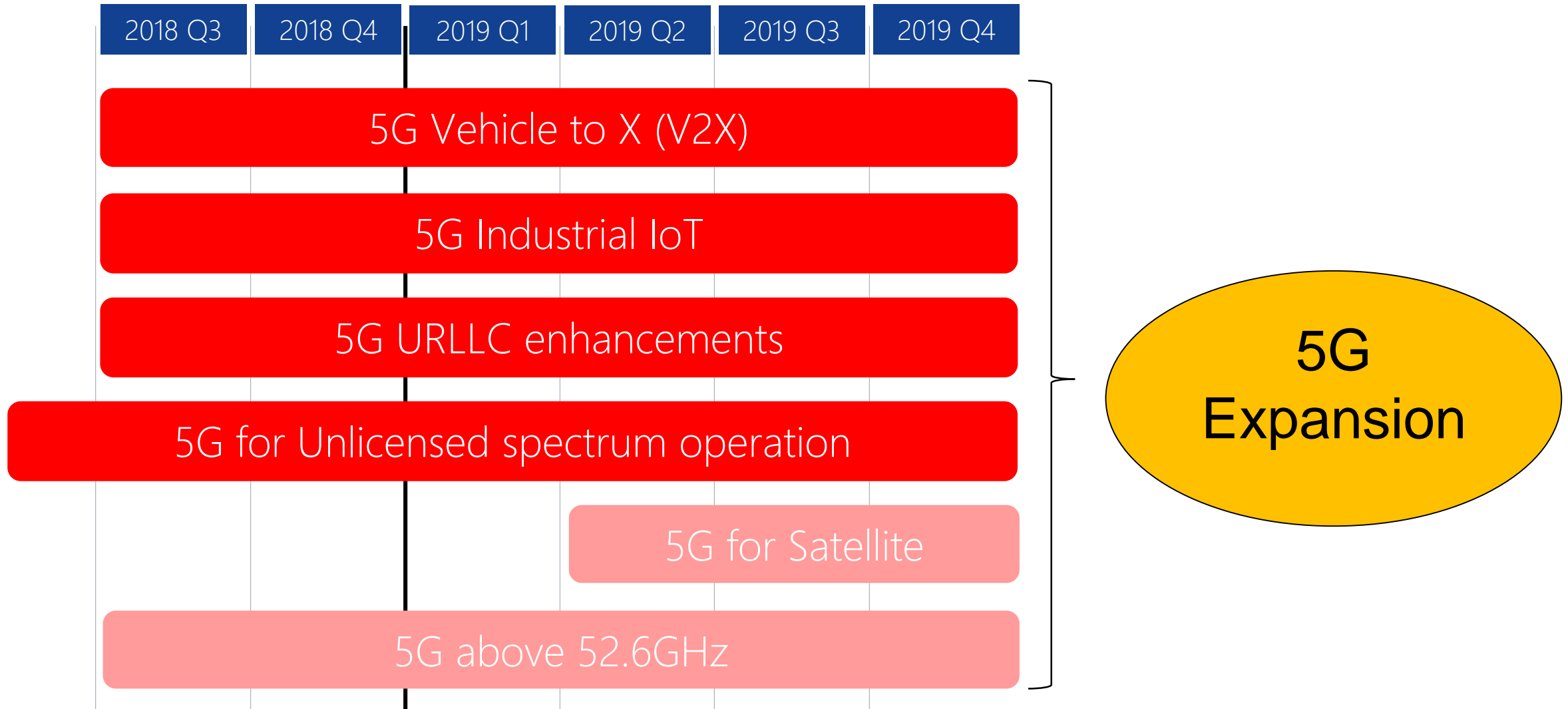
**Perfect storm** of multiple technology breakthroughs:

- **Low latency** radio with fully flexible network
- **Artificial Intelligence** and Automation
- **Device revolution** for AR/VR
- **Vertical industries** going cellular

# Timeline



# Release 16 – 5G Expansion

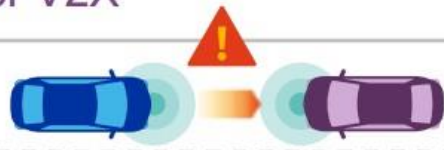


# V2X evolution towards 5G

Evolution to 5G, while maintaining backward compatibility

**Basic safety**  
802.11p or C-V2X R14

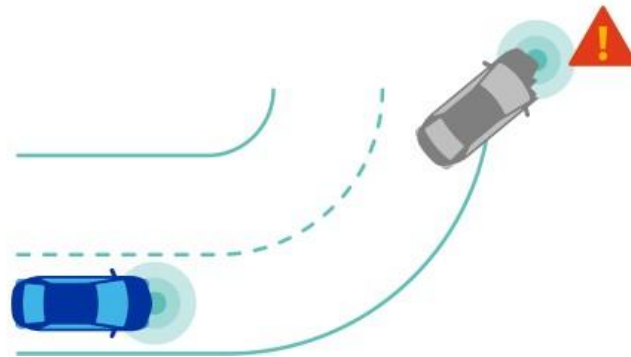
Established foundation for V2X



Basic Safety services incl. warnings and signal phase information

**Enhanced safety**  
C-V2X R14/15

Enhanced range and reliability



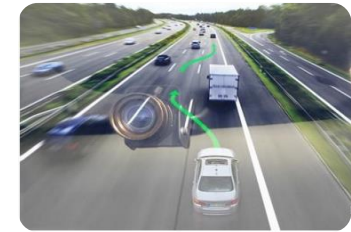
**Advanced safety**  
C-V2X R16 (building upon R14)

Higher throughput  
Higher reliability

Wideband ranging and positioning  
Lower latency



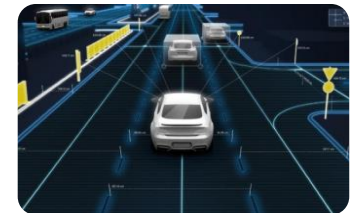
Vehicle Platooning



Cooperative Manoeuver, Sensor sharing



Remote Driving



Advanced Driving

# Industrial IoT and URLLC



- Focus on both commercial and industry use
  - 📶 AR/VR, Factory automation, Transport Industry (incl Automotive), Electrical Power Distribution
- Establishing Rel15 baseline performance
- Time Sensitive Networking (TSN)
  - 📶 Accurate reference timing, wireless Ethernet, etc...
- Reliability and latency enhancements: L1/L2/L3 concepts
- Intra-UE prioritization and multiplexing

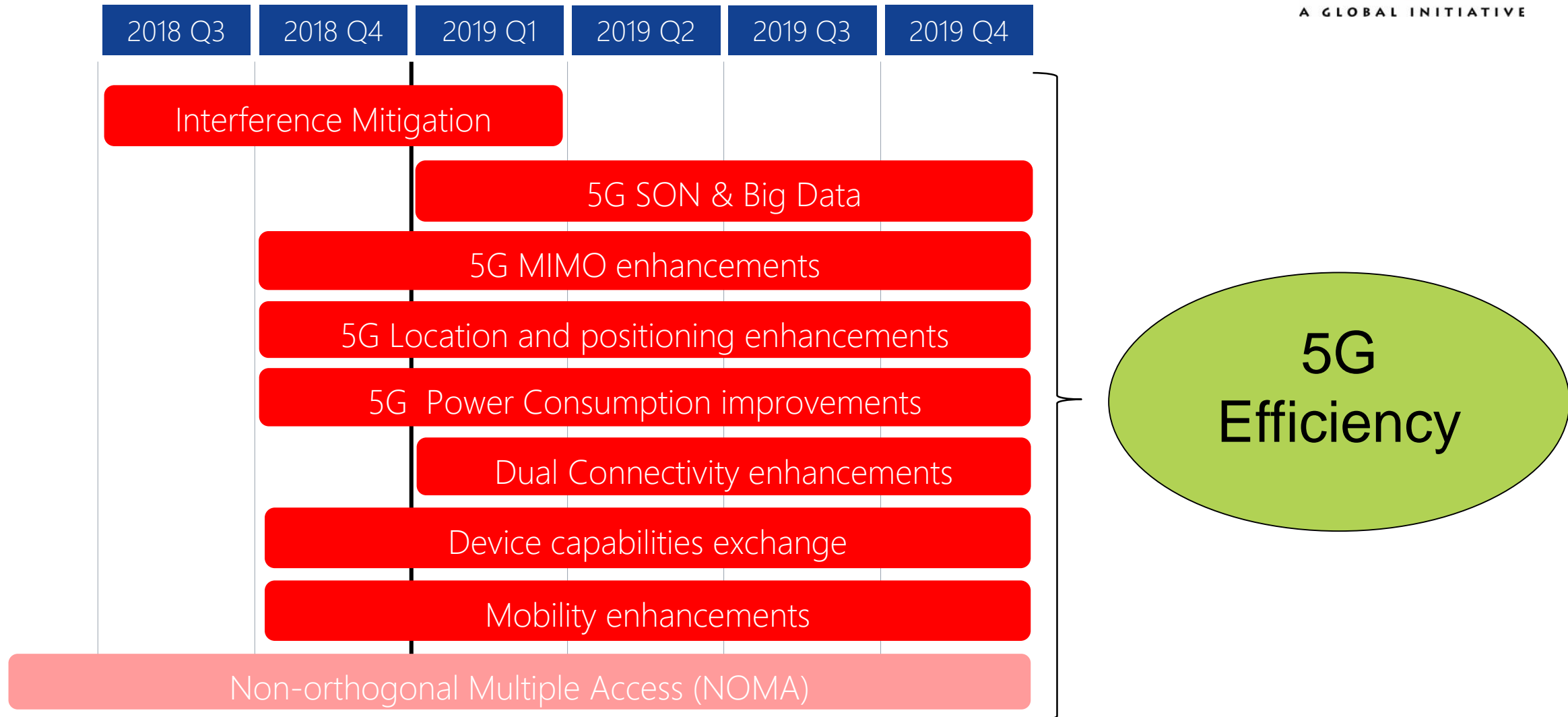
# 5G NR in unlicensed bands



- 3GPP work on unlicensed operation will be focused on NR
  - No new functions on LTE-LAA
- NR-U specifications kept separate, not part of the ITU submission
- Focus is on bands below 7GHz
- Addresses both LAA and Standalone operation
- Co-existence with LTE-LAA and other incumbent technologies



# Release 16 – 5G Efficiency

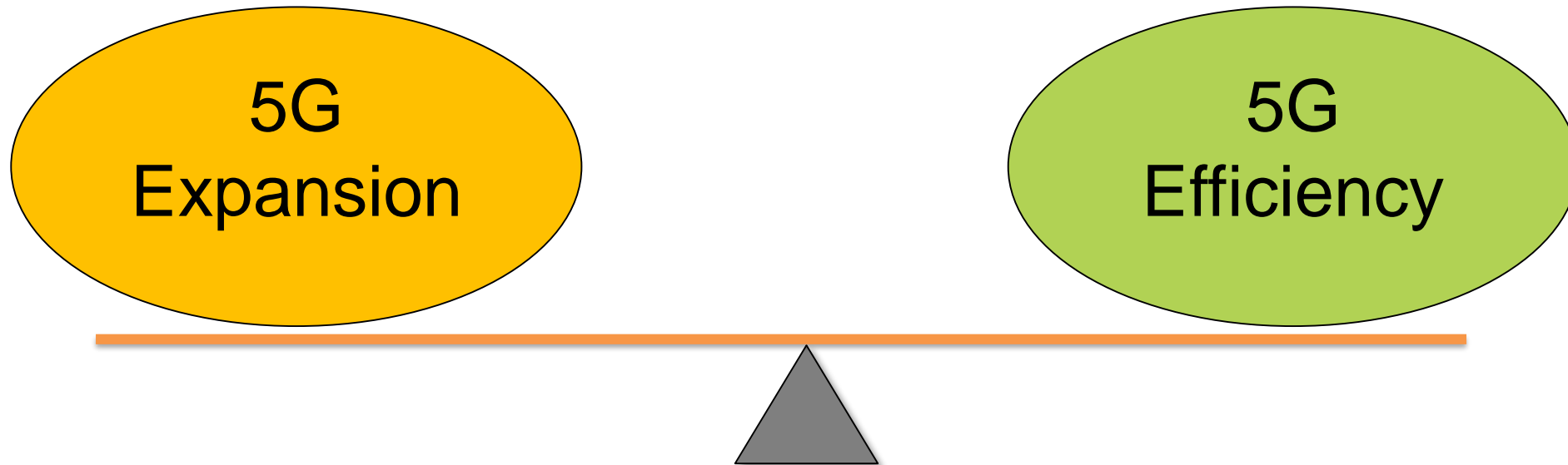


# Positioning in 5G



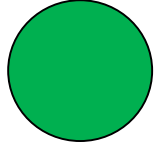
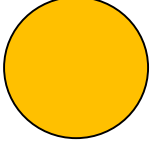
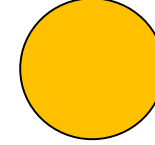
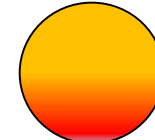
- Going beyond basic regulatory requirements (E911)
- Start with identifying accuracy, latency, capacity and coverage requirements
- Both commercial and regulatory scenarios
- Both indoor and outdoor
- Both low (FR1) and high (FR2) frequency bands

# Balance



# 5G vision – where are we?

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- **Low latency** radio with fully flexible network 
- **Artificial Intelligence** and Automation 
- **Device revolution** for AR/VR 
- **Vertical industries** going cellular 



Thank you!



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