



Time/Space-Sensitive Use Cases and Requirements in 5G and Beyond

Workshop on Synchronization and Timing Systems

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Bell Canada

Use cases in 5G and beyond

Automation, energy efficiency, critical industrial control and precise positioning (including indoor)



Smart manufacturing



Supply chain visibility



Drone tracking



Public safety



Connected healthcare

Merger of physical, digital and virtual worlds



(Nokia)

Joint communication and sensing

Tracking & localization, object, gesture and mobility recognition

Example - Mining

Digitization & automation journey



Automation and robotics



Tracking & localization



Aerial inspection



XR & tele-operation

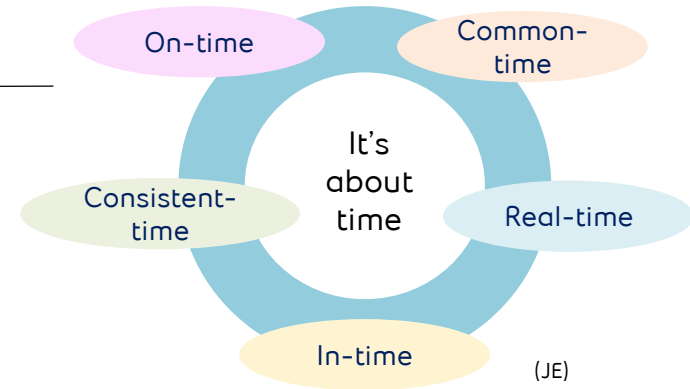
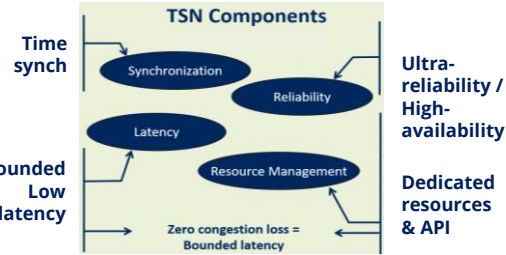
Time-sensitive 5G roadmap

IEEE 802.1 time-sensitive networking (TSN)

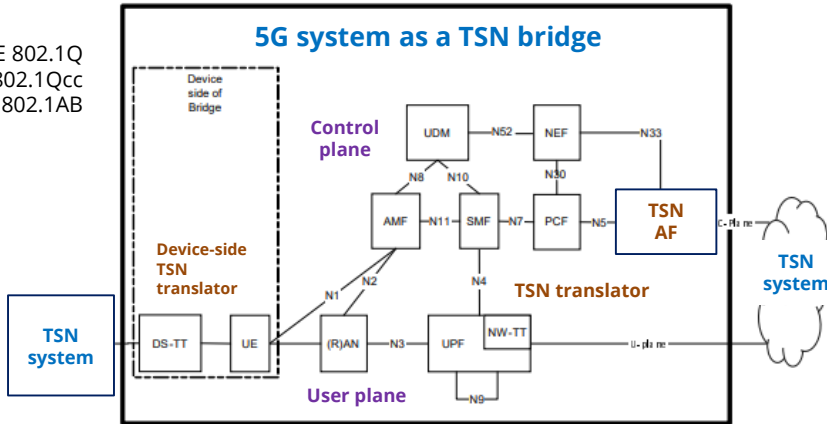


• 5G system, extended to support TSN

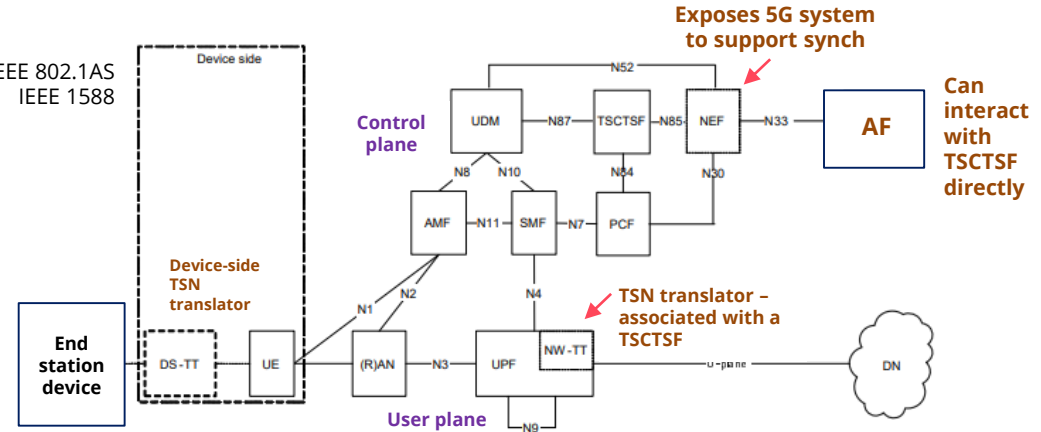
- Integrated as a bridge in an IEEE TSN
- Enablers for application function (AF) support of TSN



IEEE 802.1Q
IEEE 802.1Qcc
IEEE 802.1AB



IEEE 802.1AS
IEEE 1588



5G to enable time-sensitive communication and time synch services

- 3GPP Release 17 – published
- 3GPP Release 18 – further studies – in progress

TSCTSF – Time-sensitive communication and time synch function
AF – Application function

Applications and use cases requirements beyond 5G



Next G Alliance Report: 6G Applications and Use Cases

- Network-enabled robotic and autonomous systems
 - Multi-sensory extended reality
 - Distributed sensing and communication
 - others
- Requirements including
 - Time-sensitive communication, synchronization, and precise positioning
 - Proposed study areas
 - Other reports

Motivations, use cases, and requirements beyond 5G - NGMN

Societal & Environmental Benefits

**Expanded & Differentiated Services
with Novel Experience**

**Operational Necessities To
Create & Deliver Enhanced Value**

ENHANCED HUMAN COMMUNICATION

XR immersive holographic
telepresence communication

Multi-modal communication for
teleoperation

Intelligent interaction: sharing of
sensation, skills & thoughts

ENABLING SERVICES

3D positioning, localization,
and tracking

Interactive Mapping, digital
twins & virtual worlds

Automatic detection protection &
inspection

Digital healthcare & Smart Industry

ENHANCED MACHINE COMMUNICATION

Robot Network Fabric

Interacting Cobots

NETWORK EVOLUTION

Trusted Native AI - AlaaS

Coverage expansion

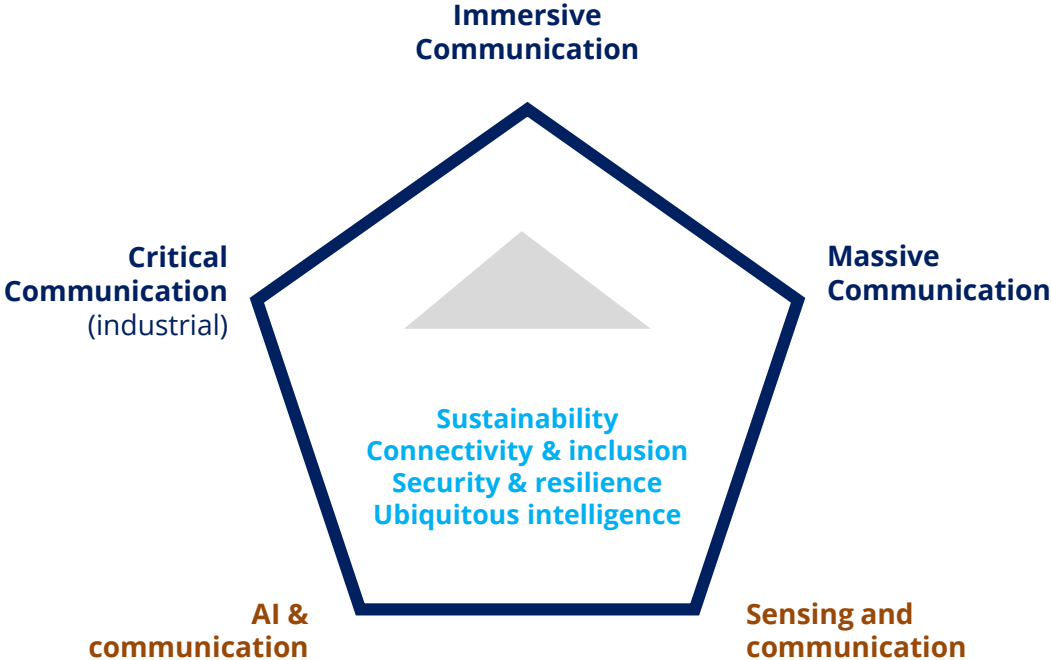
Energy Efficiency

Cobot - cooperative robot



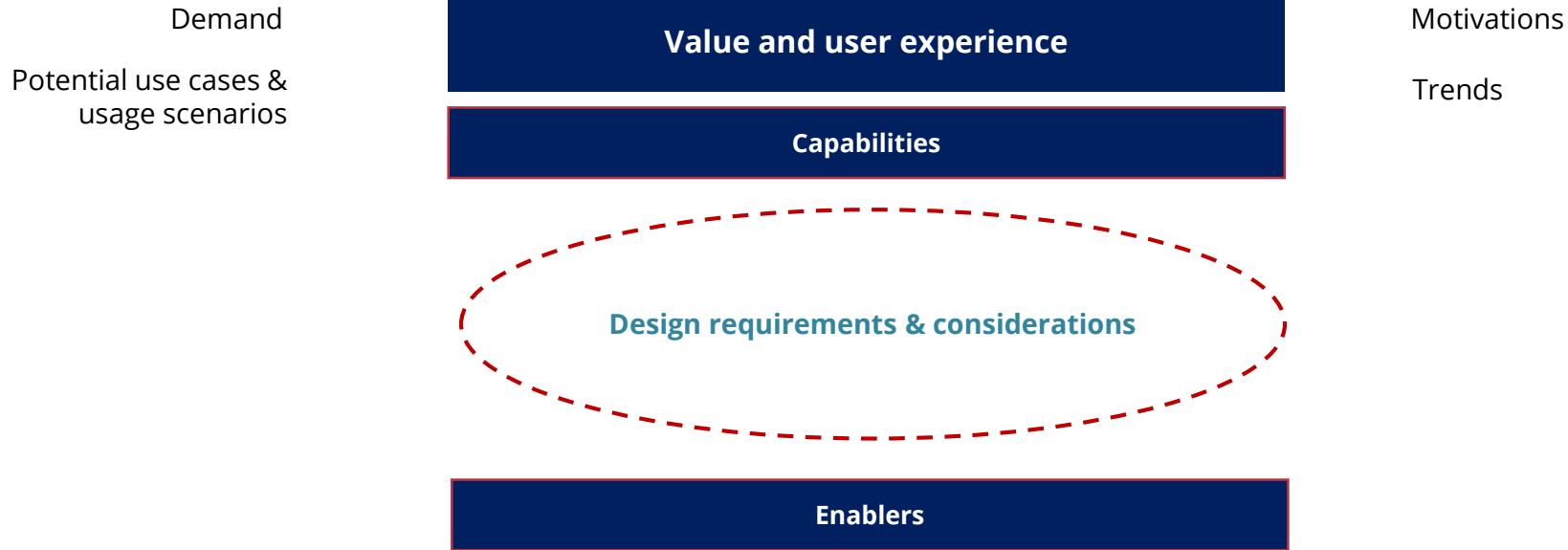
NGMN – Next Generation Mobile Network Alliance

Expected future usage scenarios and E2E capabilities



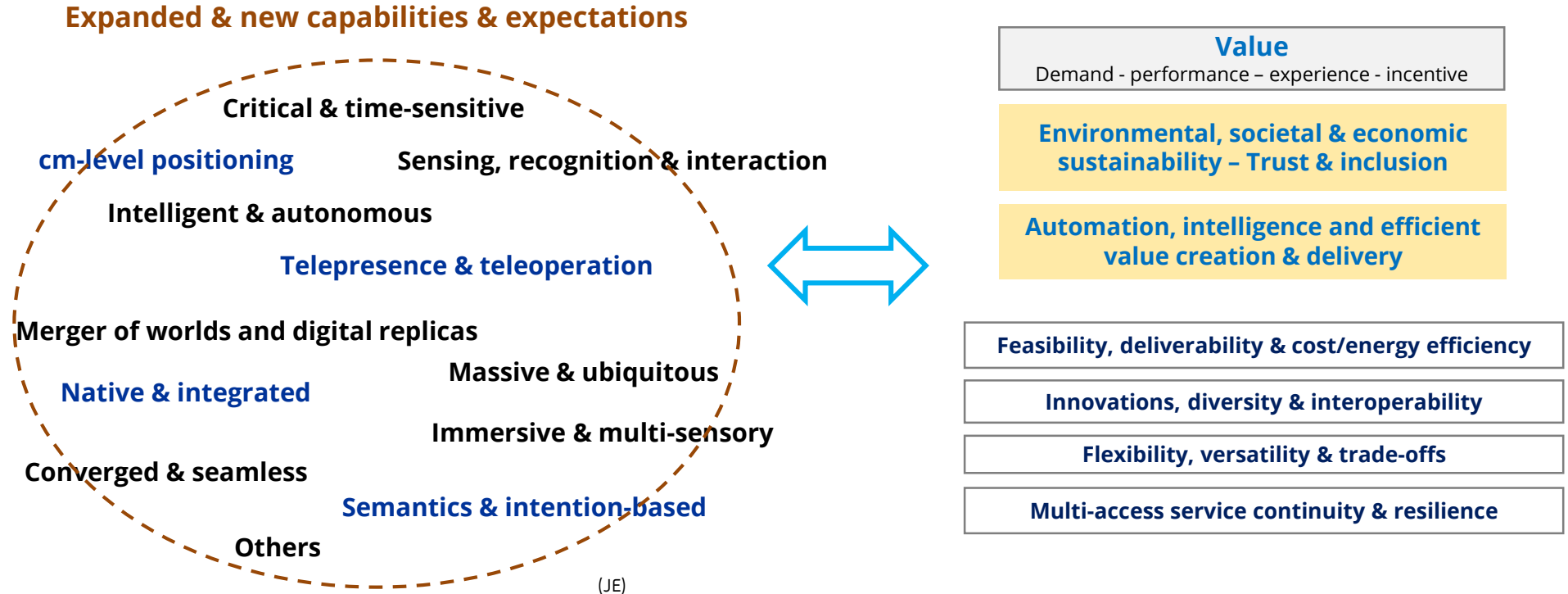
Time-sensitive networking, precise positioning, synchronization and extreme reliability requirements

Value creation and delivery



What will be the value and how it will be delivered

Value creation and delivery

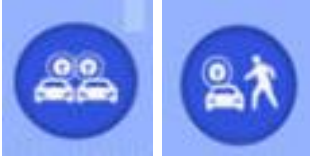


Research, innovations and our collective efforts are essential to enable this, address the emerging and future needs, and further lead with possibilities and paradigms not imagined today

It's about ...



(Canadian Manufacturers & Exporters)



(Qualcomm)

Timing at right or same moment, and

Sensing & positioning at the right place & time



(IEEE)



Bell

Thank you