

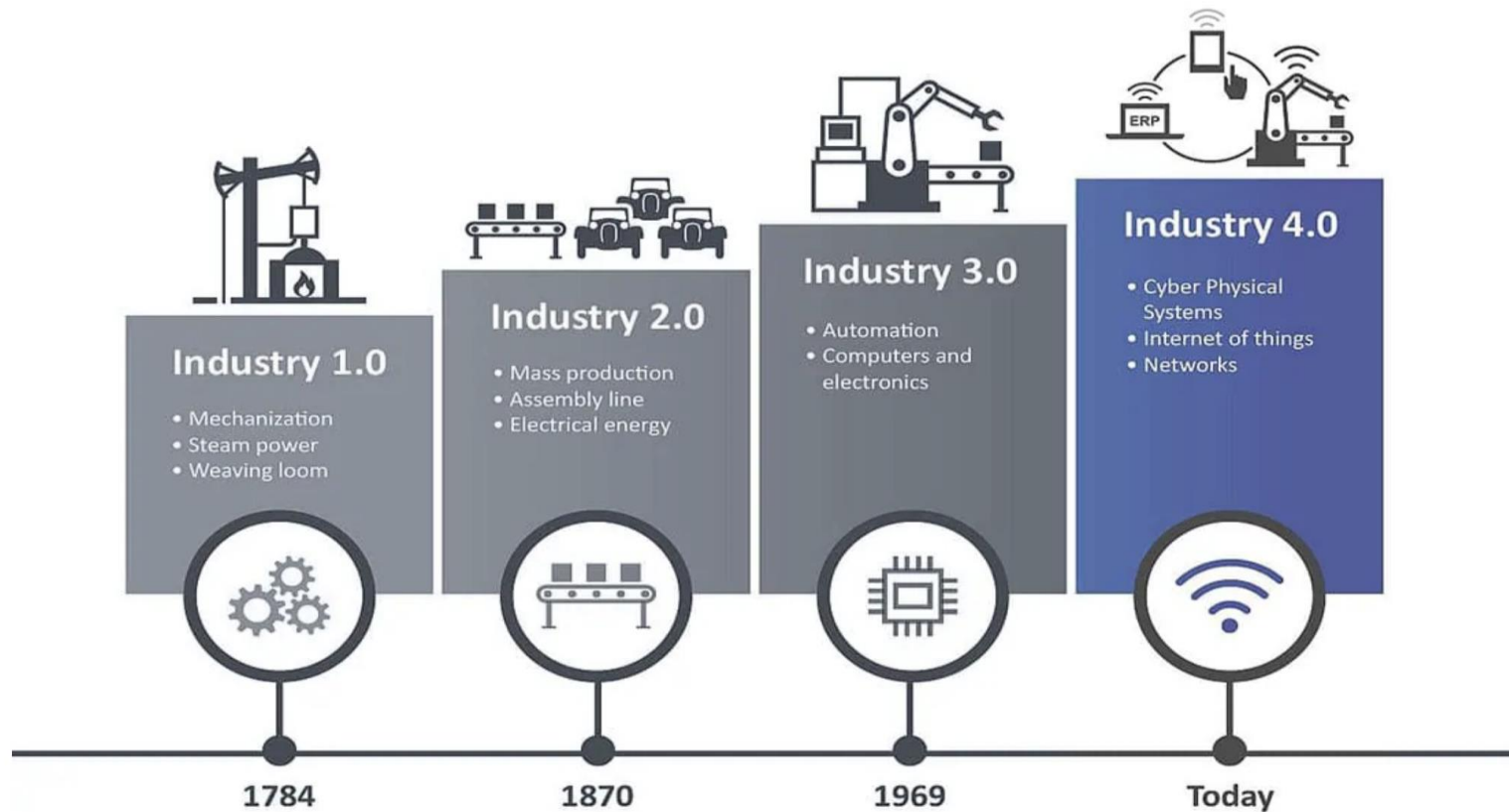
5G Technology for Industrial 4.0

Poohmipat Sripukdee

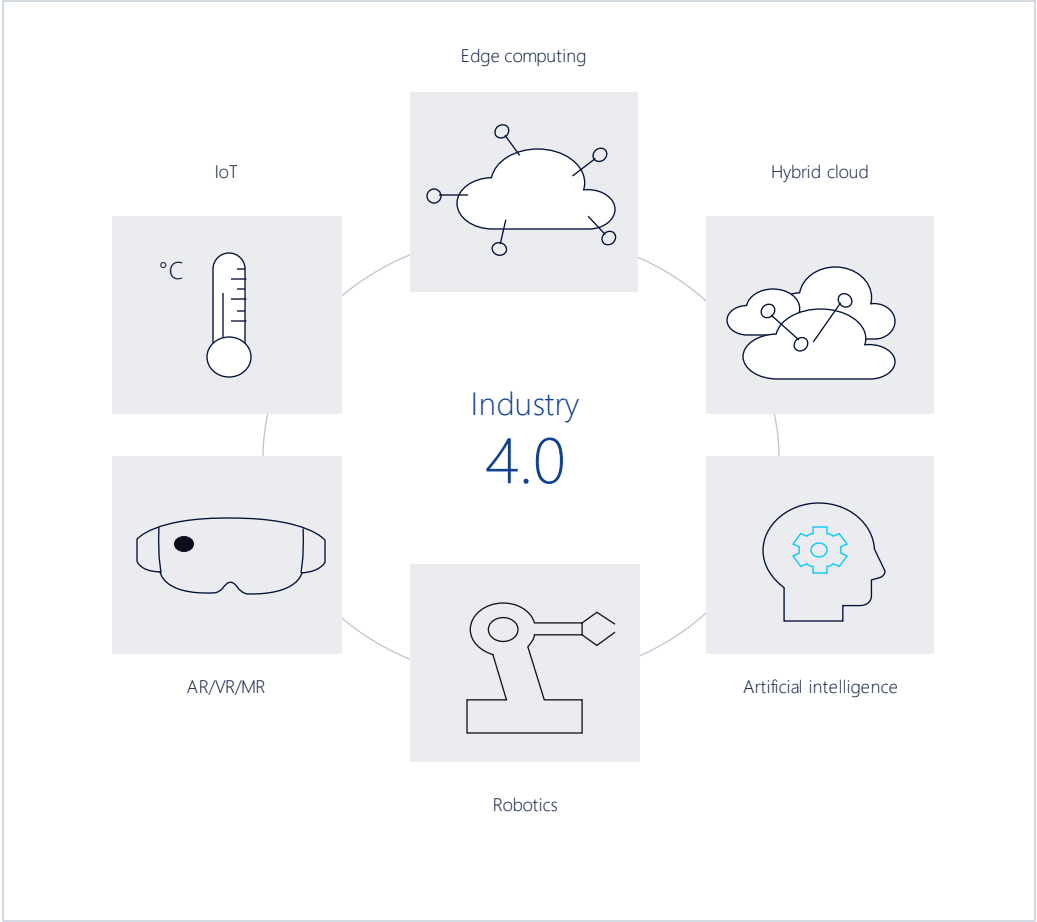
Mobile Network Principal Architect

One NZ






Industrial 4.0



Confluence of key technologies enablers create the perfect environment for Industry 4.0



Most common triggers to Mobile Network for Industry 4.0

Current wireless tech limitations	Introduction of new use cases	Incidents & External factors	Innovation & paradigm shift	Wireless connectivity...
<ul style="list-style-type: none">• Issues with existing use cases on existing wireless tech (e.g. AGV on Wi-Fi)• Issue with existing wireless tech (e.g. aging PMR & PAMR network)	<ul style="list-style-type: none">• Specific new use cases that require reliable wireless (e.g. Mine autonomous haulage)• Remote sites (e.g. Offshore sites)	<ul style="list-style-type: none">• Worker safety (e.g. dangerous environments, ...)• Site security breach• Data privacy breach• Major disasters	<ul style="list-style-type: none">• I4.0 "innovation" corporate projects• Industry segment paradigm-shift (e.g. Distributed power generation)	<ul style="list-style-type: none">• Greenfield sites• Brownfield sites with no existing wireless networks
				

Capability of 5G

5G 4G 3G

Mobile network
evolution toward 5G

MOBILE NETWORK AND SERVICE EVOLUTION

1G

1980-1990



NMT/AMPS

2G → 2.5G

1990-2004



GSM → GPRS → EDGE

3G → 3.5G

2004-2010



UMTS → HSDPA → HSPA+

4G → 4.9G

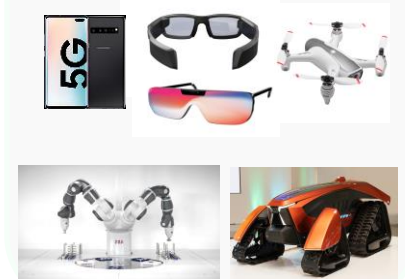
2010-2018



LTE → LTE Advance → NB-IOT/LTE-M

5G

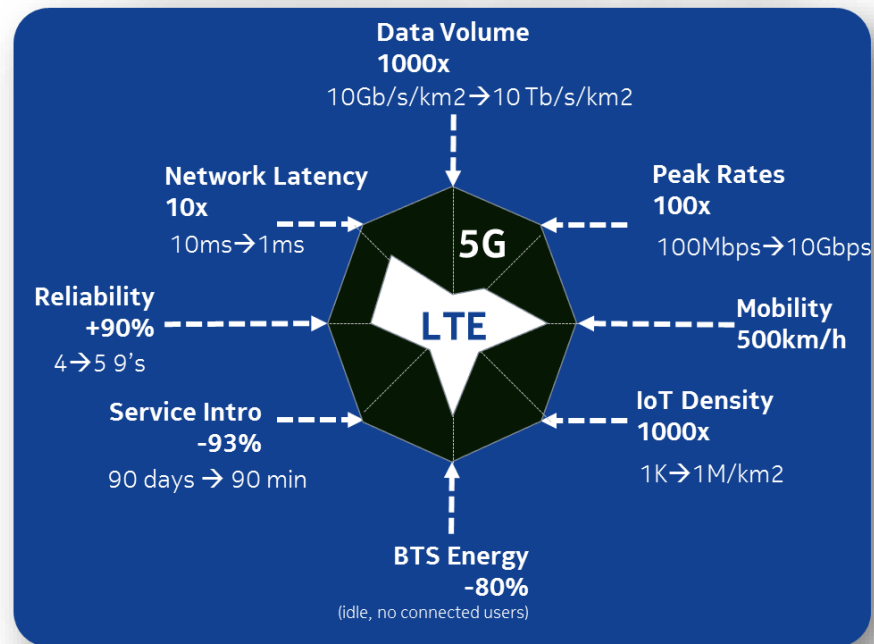
2019 →



Comparison with 4G

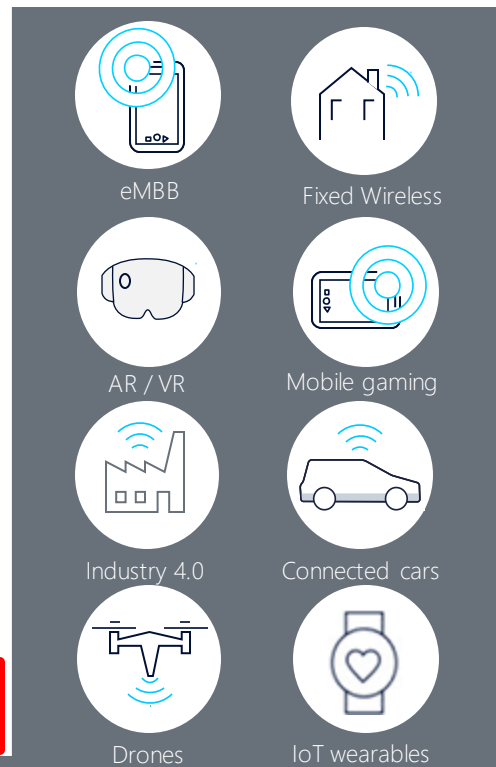
	Use-Case	LTE possible	LTE limitations	
Consumers	Mobile Broadband	✓	DL Tput	<div>↑</div> <div>maturity</div> <div>↓</div>
	Fixed Wireless Access	✓	reliability, DL Tput, cost	
	Event experience	-	latency, UL tput	
	In -Vehicle Entertainment	✓	DL Tput, high mobility	
Industries	Critical automation	-	latency, reliability	
	Tele-operation	✓	reliability, latency	
	Highly interactive AR	-	latency, UL Tput	
	Mass sensor arrays	✓	cost sensitivity	

LTE limitations for certain use cases



5G is a giant leap

	Today	2020-25
Speed	100 Mbps	100x faster
Users	10M people	+100M 'things'
Latency	>>10 ms	10x less
Reliability	Network availability	Service availability 99.999%
Network service level	Best effort for all	Committed SLAs
Logical networks	1	Many (slices)



5G era use cases – CSP journey towards a DSP

mMTC

eMBB

URLLC

Sensors



Coverage

Logistics/Supply chain

High uplink throughput



Local content/processing

Video analytics

Special Connectivity

High throughput



Local content/processing

Stadium/Exhibition

High throughput



Fixed Wireless Access

Consumer experience

High throughput



Low latency with mobility

Cloud Gaming



Local content/processing

Augmented reality

Tele-operation, critical communication

Low latency with mobility



High reliability

Remote operations

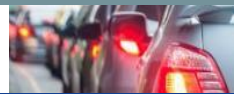


High reliability & security

Public safety

V2X, critical automation

Low latency with mobility



Ultra reliability

Assisted driving, platooning

Low latency



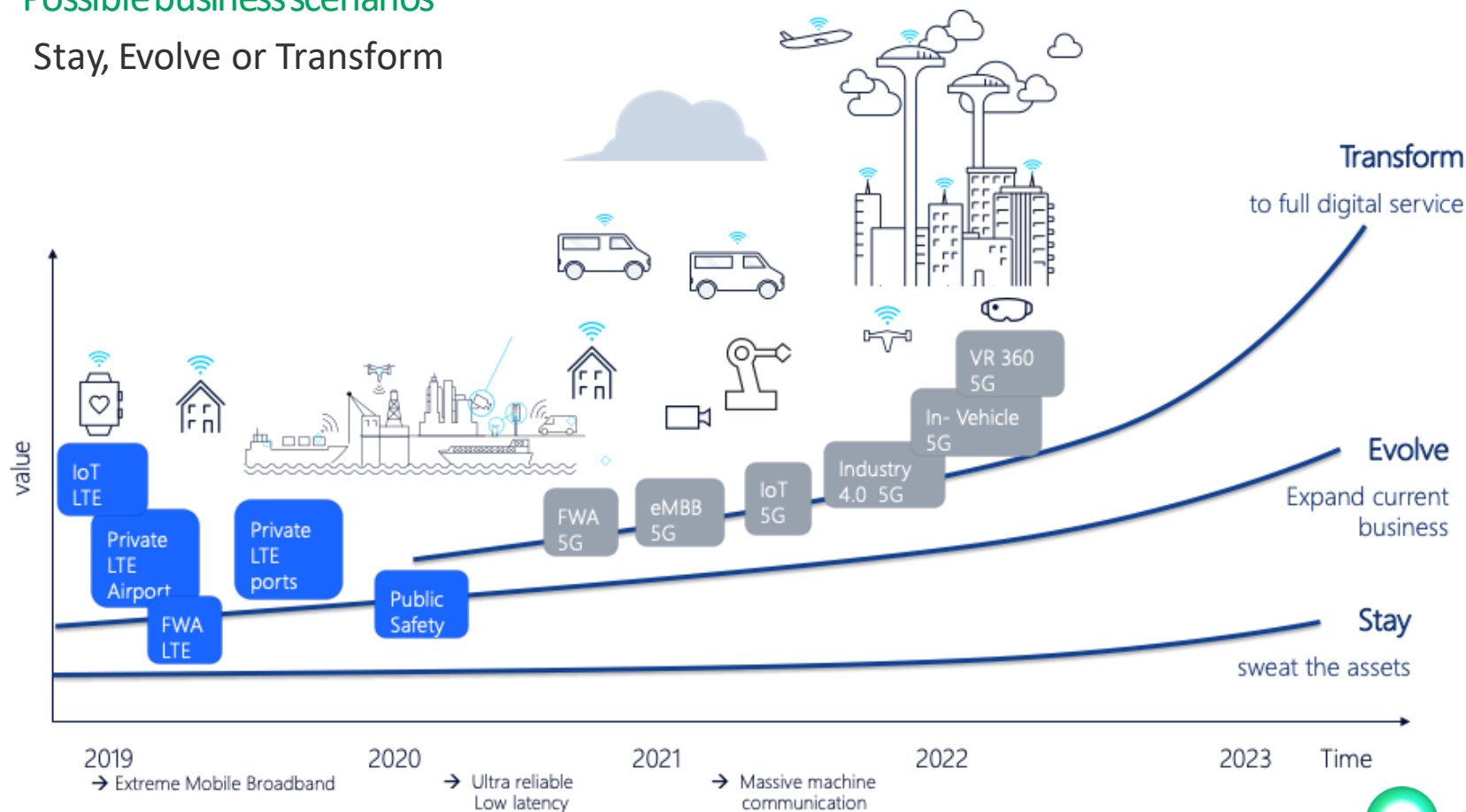
Ultra reliability

Factory automation

CSP : Communication Service Provider DSP : Digital Service Provider

Possible business scenarios

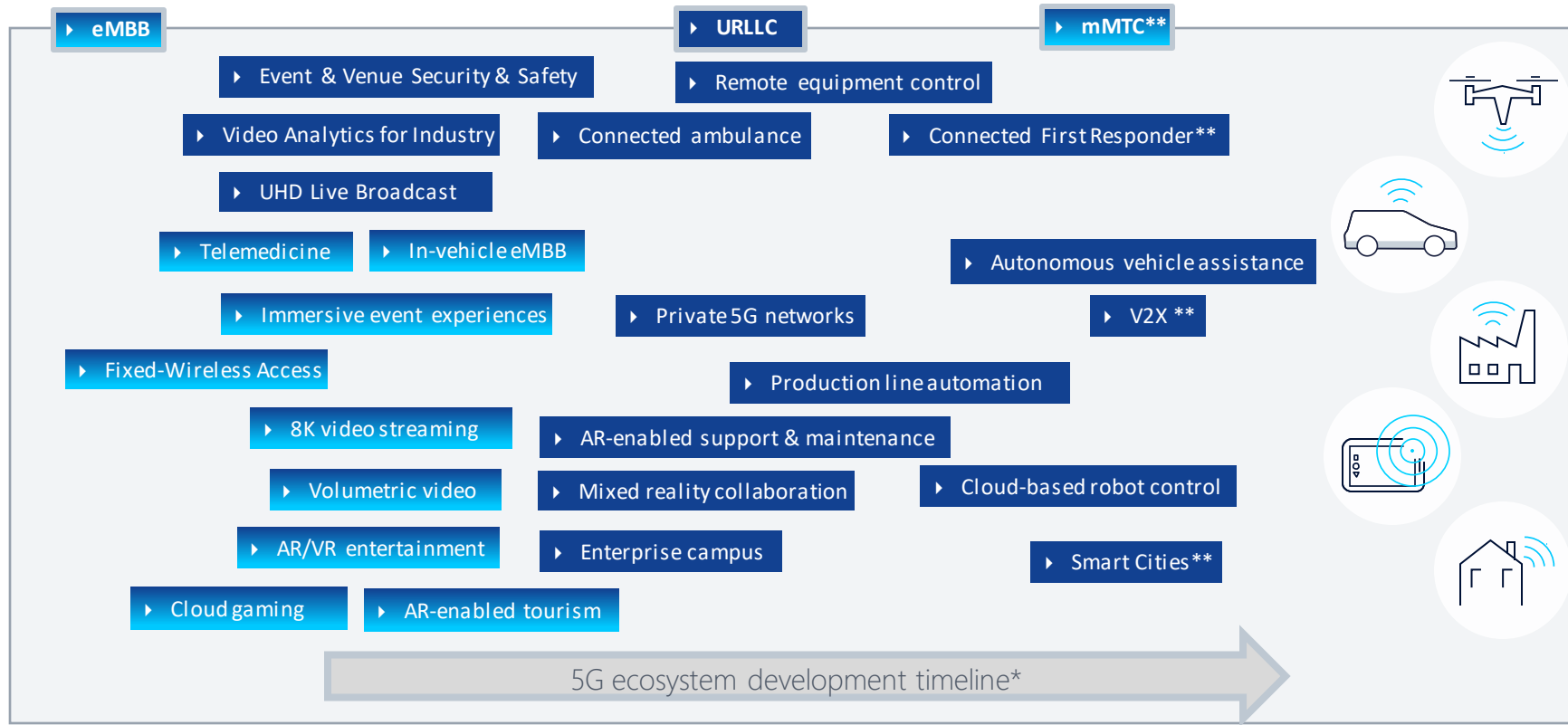
Stay, Evolve or Transform



Selected 5G use cases with notable customer interest

Connected enterprise

Connected consumer



*indicative, including standards, devices and business ecosystem

**includes multiple individual use cases; currently LTE-supported



FIXED WIRELESS ACCESS



5G to the Home

Key requirements: Fixed. High sustained capacity & (D/L) throughput

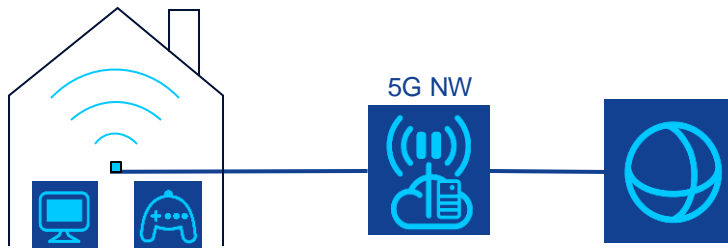
End-customer need /value proposition

- Access to ultra-high speed broadband is increasingly becoming a consumer expectation, as well as a governmental requirement in many countries.
- Fiber-to-the-home is typically the most cost effective way to deliver this but, for many locations, FTTH may not be feasible due to specific costs or restrictions in deploying fiber to the particular premises.



Why 5G?

- Fixed Wireless Access viable where the cost or difficulty of fiber connectivity is prohibitive.
- 5G able to provide throughput and latency to fully meet typical residential needs.
- Network slicing can be used to create different tiers of residential connectivity needs (5G NR+CN networks)



5G to the Business (Small/Medium Enterprise)

Key requirements: Fixed. High sustained capacity & (D/L) throughput. High reliability & security.

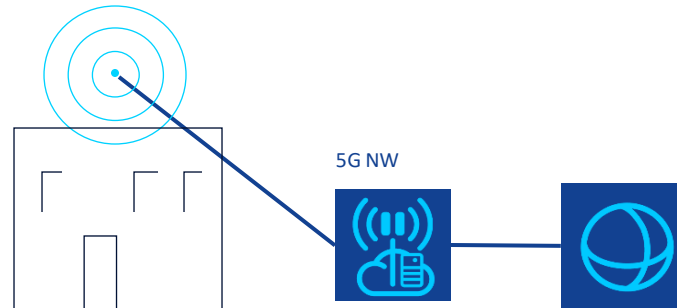
End-customer need /value proposition

- Access to ultra-high speed broadband is increasingly becoming a business need, delivering economic benefits which are emphasised in many national digital initiatives.
- Fiber-to-the-premises is typically the most cost effective way to deliver this but, for many locations, FTTH may not be feasible due to specific costs or restrictions in deploying fiber to the particular premises.



Why 5G?

- Fixed Wireless Access viable where the cost or difficulty of fiber connectivity is prohibitive.
- 5G able to provide throughput and latency to fully meet typical SME needs.
- E2E Network slicing can be used to create different tiers of business connectivity needs (5G NR+CN networks)



5G VIDEO



UHD Video – Live Broadcast over 5G

Key requirements: Nomadic. Very high (U/L) throughput, High reliability, on demand

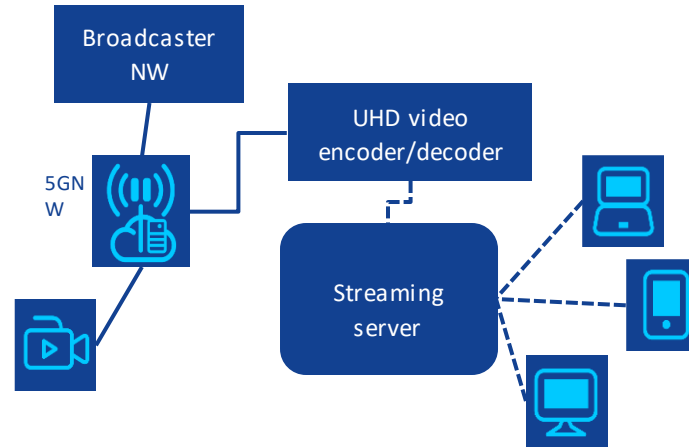
End-customer need /value proposition

- Increasing demand for ultra-high quality, live-to-web/air broadcasts of planned & ad hoc events, without restriction on location.
- UHD video demands on uplink cellular throughput from 25 Mbps – up to & beyond 1Gbps (single-multiple feeds).
- Modern smartphone camera capabilities also put potential within the reach of non-professionals, e.g. vloggers.



Why 5G?

- MBB essential for location independence– indoor and outdoor.
- 5G uniquely able to provide throughput required for UHD uplink streaming.
- Network slicing reserves network resources, on-demand and dynamically (5G NR+CN networks).

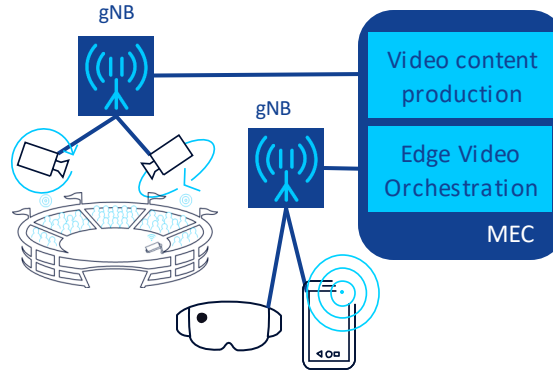
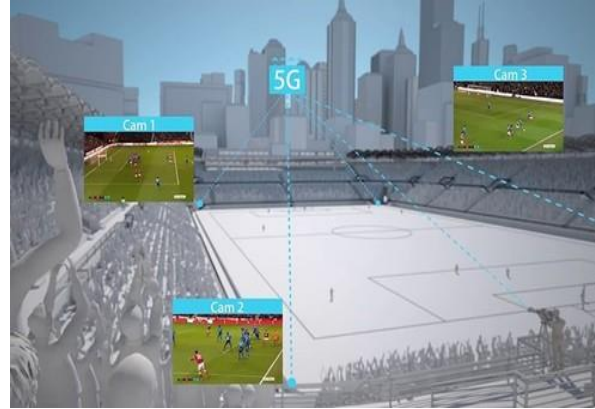


5G Multi-view / immersive events

Key requirements: Pedestrian. Very high (U/L) throughput for cameras, High throughput & capacity for viewers. Low latency for U/L & D/L feeds. High reliability.

End-customer need /value proposition

- Multi-screen viewing can tangibly enhance audience engagement by providing the viewer's preferred visual perspectives.
- Viewer expectations drive the need for HD+ video resolution, with tight time synchronisation to the live action view.
- Also relevant to combine with targeted advertising and social media interaction.



Why 5G?

- 5G provides throughput required for HD+ video streaming, with low enough latencies to synchronise supplementary views with the live action; ensuring interference-free connectivity for large numbers of connected devices & clients



5G enabled video analytics for Industry

Key requirements: Pedestrian/drone mobility. High bandwidth & low latency (U/L). High reliability & localised security.

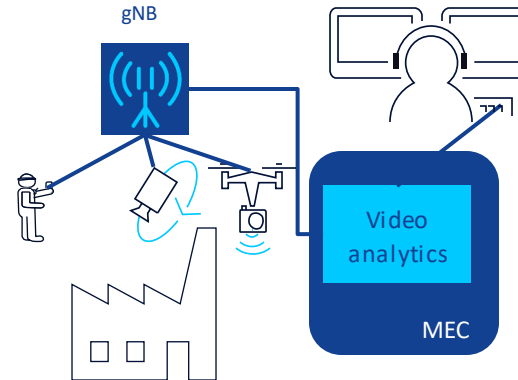
End-customer need /value proposition

- Industrial automation increasingly leverages the use of video analytics and photogrammetry as tools to detect anomalies in operational workplaces, assets and processes.
- Ultra-high quality imaging, delivered with very low latency is becoming a key requirement to facilitate accurate, timely anomaly detection.
- Cameras may be fixed, or mounted on robots or drones, facilitating full automation of the activity.



Why 5G?

- 5G uniquely can manage the capacity needs of mobile UHD video uplink feeds (e.g. >20Mbps), ensuring interference-free radio resource management.
- Network slicing (5G NR+CN networks) enables separate network resource definition for high bandwidth video with low latency delivery.



GAMING



5G eGaming

Key requirements: Nomadic/moderate mobility. High bandwidth & low latency

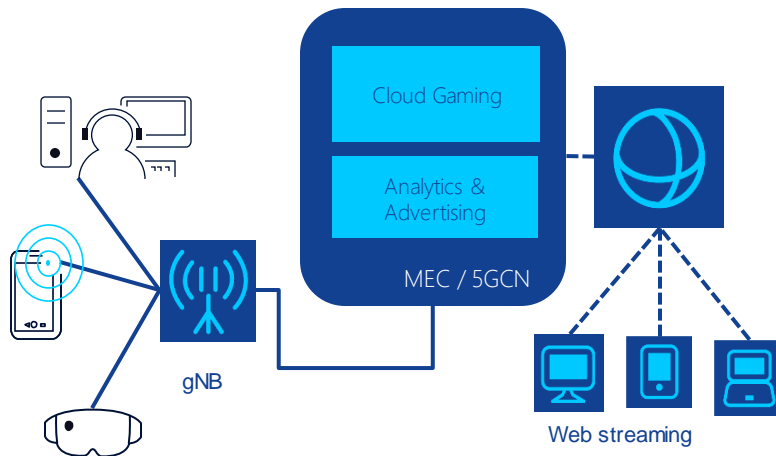
End-customer need /value proposition

- Games industry generated \$108.4bn in revenues in 2017 (\$59.2bn from mobile). eSports expected to be a \$1bn business in 2018 with a current global audience of 258m viewers.
- Esports gamers aspire to E2E latency in the order of 10ms.
- Limited availability of fiber and location-independence of wireless drive the case for 5G.



Why 5G?

- 5G provides the degree of low latency aspired to by gamers, with capacity to support the highest resolution of game video needed, together with the location-independence of wireless connectivity.





MIXED REALITY

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5G Mixed Reality Team Sports

Key requirements: Nomadic/pedestrian mobility. High bandwidth (D/L) & low latency (U/L & D/L)

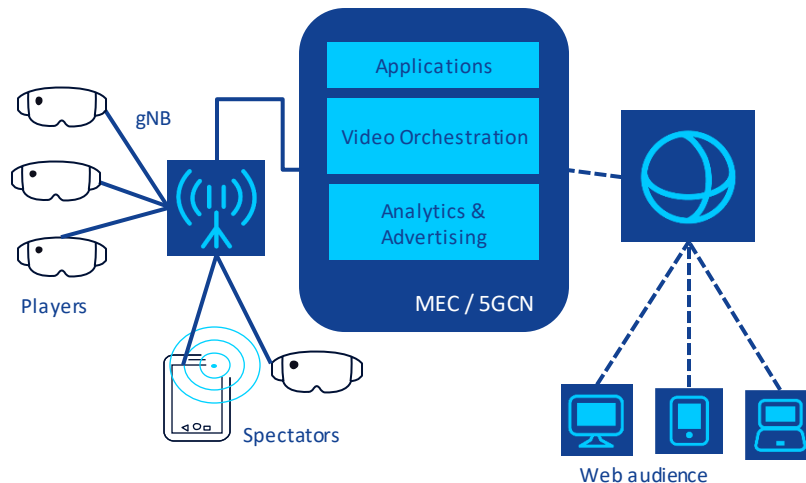
End-customer need /value proposition

- The rise in popularity of mixed reality team games such as HADO provide a window on the potential of what can be realised with 5G, via reliable, low-latency wireless connectivity, with real location independence.



Why 5G?

- 5G easily provides the low latency required to sync high definition augmented content with the fast-moving team action, with capacity to support high resolution video feeds to local and remote audiences; together with location-independence enabling impromptu game creation, with interference-free connectivity supporting large numbers of connected devices.



5G Mixed Reality Collaboration

Key requirements: Nomadic/pedestrian mobility. High bandwidth (D/L) & low latency (U/L & D/L). High reliability (enterprise).

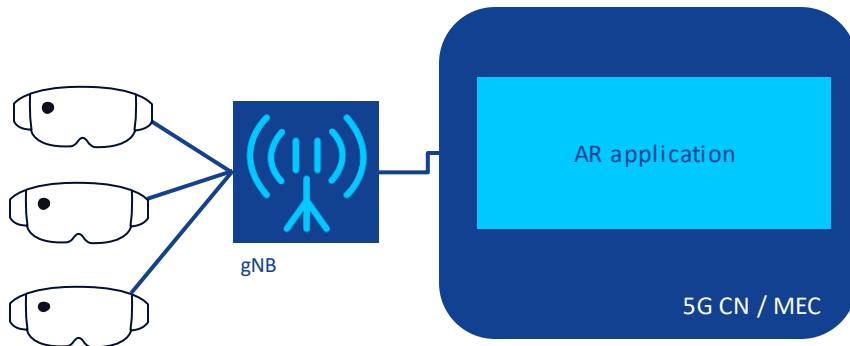
End-customer need /value proposition

- Early market solutions such as Microsoft Hololens have demonstrated the productive value of teams of individuals working in 'mixed-reality' mode, i.e. sharing and manipulating the same augmented content within their real world interaction. Wireless connectivity adds real freedom of movement – e.g. enabling an AR-enhanced school nature trip outdoors.



Why 5G?

- 5G provides the low latency and bandwidth required to sync high definition augmented content with actions of the collaborating team. 5G also provides location-independence; enabling outdoor, mobile and instantly organised collaborations.



5G AR-enabled tourism

Key requirements: Nomadic/pedestrian mobility. High bandwidth & low latency (D/L)

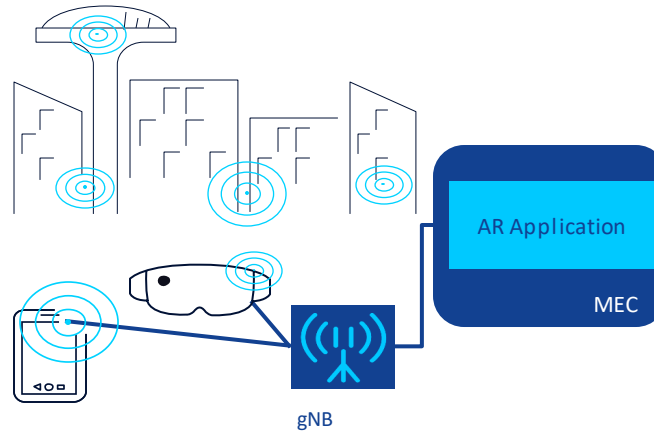
End-customer need /value proposition

- In addition to being an opportunity it is increasingly expected by today's consumers to have access to an additional stream of contextual information linked to the activity they are engaged in.
- Tourists will place a premium on the capability to receive pertinent information in their own language, covering a range of tourist attractions.
- The maturity of AR headsets will further boost this opportunity.



Why 5G?

- 5G provides excellent capacity for HD video-rich contextual information streaming, with low latencies to ensure that the provision of the information is in good sync with the action or selection of the tourist.
- Initial 5G rollouts should typically provide good indoor & outdoor coverage for main tourist attractions, guaranteeing interference-free connectivity for large numbers of connected devices & clients.



5G Volumetric video / Avatar-based interact

Key requirements: Fixed/nomadic, with very high (U/L) throughput for cameras. Full mobility with high throughput & low latency for viewers.

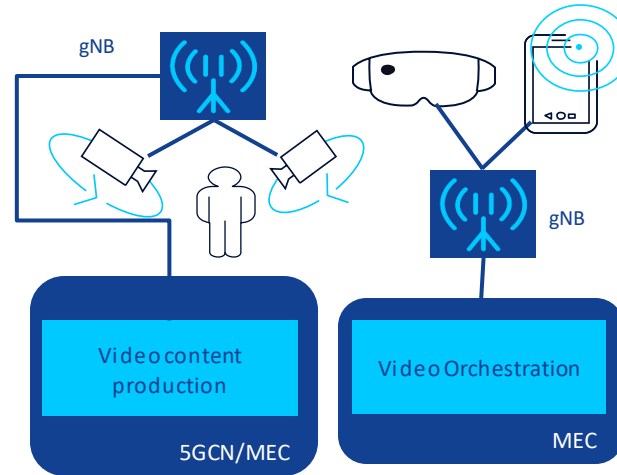
End-customer need /value proposition

- Volumetric video and avatar-based communication offers a new and exciting class of social interaction services which can be positioned as a showcase for 5G innovation.
- Volumetric video can be captured in specialised multicamera facilities, and avatars generated can be sent via 5G to be used in different types of social video services. These services in turn can rely on 5G to stream generated content to participating audiences.



Why 5G?

- 5G provides throughput needed for upload raw volumetric video captures, and to stream avatar-based content, with low enough latencies to synch the generated video/avatar within the related mixed reality content, to a widespread, mobile audience.



5G AR-enhanced Support and Maintenance

Key requirements: Nomadic/pedestrian mobility. High bandwidth & low latency (U/L&D/L). High reliability.

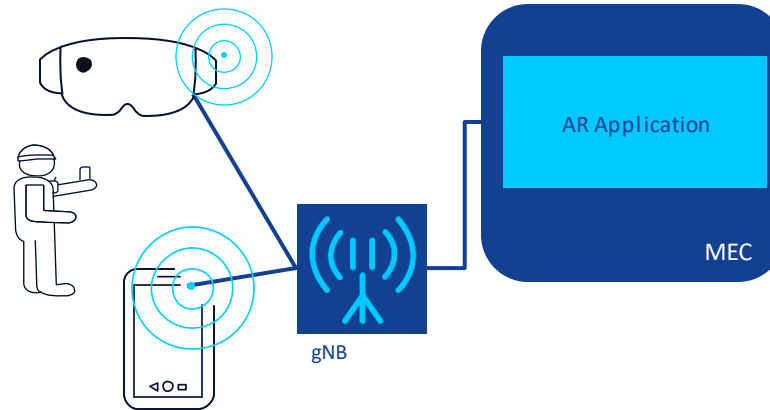
End-customer need /value proposition

- The costs of supplying remote support via expert field workers is a sizable expense for product companies. AR-enhanced support allows non-expert or even customer staff to effectively service installations with the aid of clear and contextual visual instructions.
- The evolution of AR headsets (e.g. supporting HD+ video uplink for remote fault/installation analysis) will further boost such capabilities.



Why 5G?

- 5G provides excellent capacity for HD video-rich contextual information streaming, with low latencies to ensure that the provision of the information is in good sync with the actions or selections of the support personnel. HD+ video uplink can also be supported for fault analysis. Cellular connectivity provides full location independence for field workers.



SECURITY & SAFETY



5G Security & Safety for events & venues

Key requirements: Pedestrian/drone mobility. High bandwidth & low latency (U/L&D/L). High reliability & localised security.

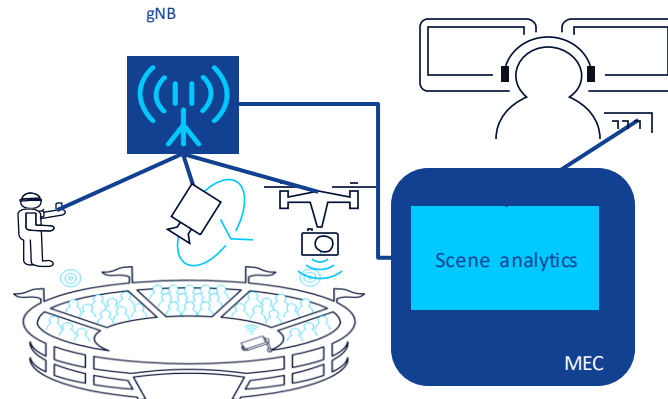
End-customer need /value proposition

- Security needs for major events and venues are ever escalating in today's world.
- Technologies, especially wireless video-based, are essential to supplement the limits of human surveillance, and provide the flexibility to cover the widest range of venue types and locations.
- Video analytics, augmented by ultra-high definition feeds enable a wide variety of early detection and prevention approaches, e.g. facial recognition, abnormal behaviour, people counting, heatmaps, etc.



Why 5G?

- MBB provides location independence for ad hoc events, and flexible configurability for fixed venues.
- 5G can manage the capacity needs of multiple RT HD video feeds, ensuring interference-free radio resource management.
- Network slicing (5G NR+CN networks) enables separate network resource definition for high bandwidth video and low latency drone control.



5G Connected first responder / Incident cont

Key requirements: pedestrian-drone mobility. Network slicing: Multiple variations in requirement for latency & throughput (UL/DL). Priority reliability and security.

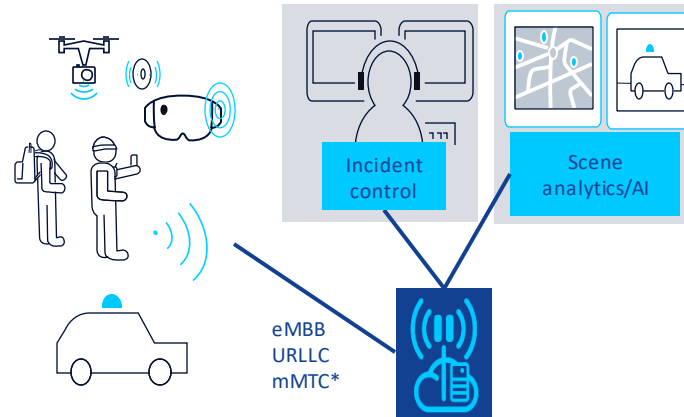
End-customer need /value proposition

- Connectivity becomes increasingly vital to first responders and incident coordinators; ensuring not successful outcomes, and the safety of field personnel. HD audio-visual, and bio-sensor multi-feeds and analytics provide control rooms with real-time situational awareness. First responders can receive rich real time AR-enhanced content on local schematics and potential hazards.



Why 5G?

- 5G's unique versatility provides comprehensive multi-service connectivity, with E2E network slicing enabling multiple network slices in 5G NR+CN networks, prioritising the most critical communication streams, including UHD video uplink and downlink, low latency control transmissions, and field personnel health and safety information.



*subject to 3GPP Rel 16/17 mMTC standardisation



CONNECTED HEALTH

Telemedicine: 5G-enabled remote diagnostic

Key requirements: Nomadic mobility. High bandwidth & low latency (U/L&D/L). High reliability & security.

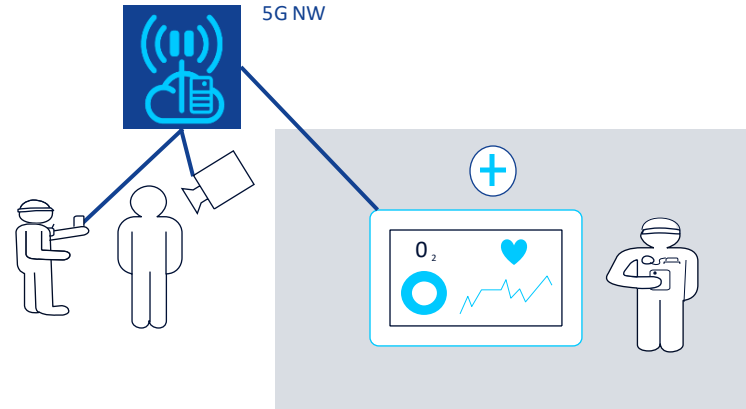
End-customer need /value proposition

- In many parts of the world first line medical care is available via small local health centres and/or travelling doctors, with limited facilities in terms of specialist diagnostic equipment, and high quality connectivity.
- 5G can enable local healthcare professionals to connect to specialist medical and diagnostics centres and via reliable HD+ 2-way video links, with connectivity also supporting data feeds from portable telemedicine equipment.



Why 5G?

- MBB provides location independence for remote or travelling healthcare professionals.
- 5G can fulfil the capacity needs of bidirectional real-time HD+ video feeds.
- Network slicing (5G NR+CN networks) enables separate network resource definition for high bandwidth high definition bi-directional video over commercial 5G networks.



Telemedicine: 5G-enabled ambulance diagnostics

Key requirements: Vehicular mobility. High bandwidth & low latency (U/L&D/L). High reliability & security.

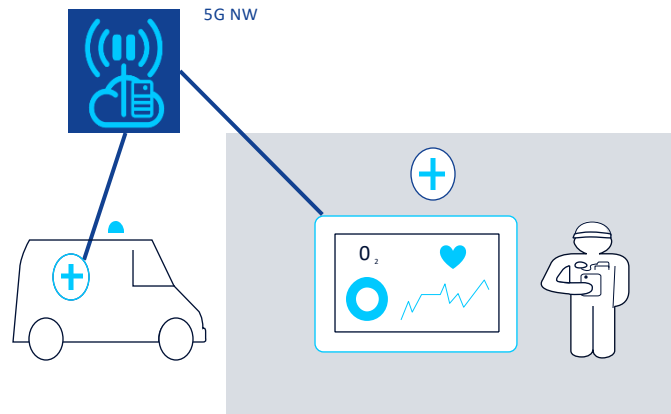
End-customer need /value proposition

- For patients en route to emergency hospital care minutes can make the difference between tragedy and successful care.
- Connected ambulances can help gain these key minutes by delivering in-transit feeds of patient diagnostic data and HD video, enabling ER doctors to prepare for incoming casualties, and also deliver life-enhancing guidance to paramedics.
- Connected ambulances could also benefit from V2X technologies in order to avoid delays caused by traffic jams.



Why 5G?

- MBB required for high speed broadband & mobility.
- 5G can fulfil all the capacity needs of bidirectional real-time HD+ video and diagnostic data feeds.
- Network slicing (5G NR+CN networks) enables separate network resource definition for HD streams over commercial 5G networks. (A dedicated or sliced public safety network may be made available for the service)



SMART CITIES



5G Smart water metering*

Key requirements: No mobility. Massive scale deployment & coverage. Reliability & security.

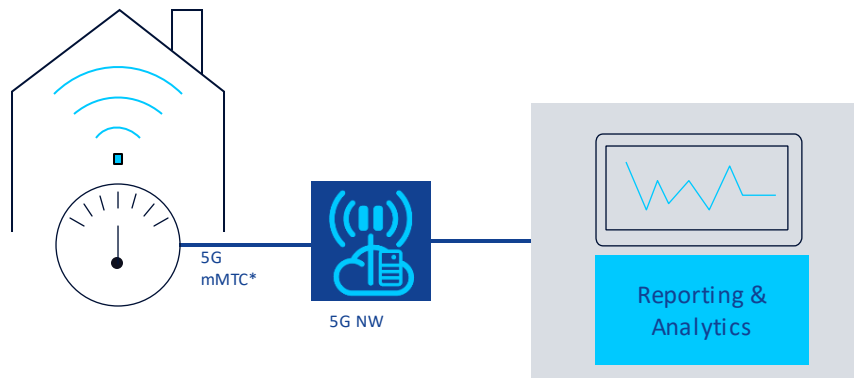
End-customer need /value proposition

- Water is a scarce resource and utilities are strongly focused on regulating and monitoring its usage across transmission, distribution and collection systems.
- Measurement locations are typically remote, requiring (long life) battery-powered connectivity solutions with excellent indoor coverage (i.e. LPWA IoT)



Why 5G?

- 5G (Release 16+) will be optimised for massive M2M connectivity (smart metering being a good example).
- Network slicing (in 5G NR+CN) will enable operators to create multiple network slices, each tuned to the characteristics of specific use cases.
- It is expected that Rel 16+ will integrate evolved versions of current 3GPP LPWA interfaces to the 5G Core Network.



5G Smart City environmental monitoring *

Key requirements: No mobility. Massive scale deployment & coverage. High reliability & security.

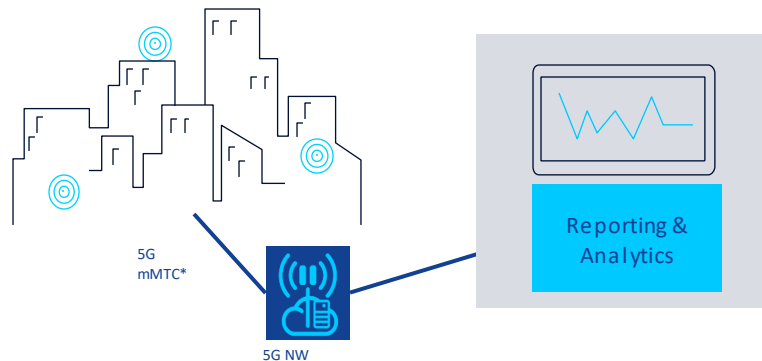
End-customer need /value proposition

- Environmental monitoring solutions are focused on public quality of life aspects such as air & water pollution, flooding, noise and similar concerns.
- Measurement sensors will be spread throughout in a city, often in inaccessible locations, requiring (long life) battery-powered connectivity solutions with excellent indoor and outdoor coverage (i.e. LPWA IoT)



Why 5G?

- 5G (Release 16+) will be optimised for massive M2M connectivity, e.g. supporting huge numbers of different sensor types.
- Network slicing (in 5G NR+CN) will enable operators to create multiple virtualised networks, each tuned to the characteristics of specific sensors and use cases.
- It is expected that Rel 16+ will integrate evolved versions of current 3GPP LPWA interfaces to the 5G Core Network.



CONNECTED VEHICLES

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5G Connected vehicle (in-vehicle eMBB)

Key requirements: High speed mobility. High (D/L) throughput.
Broad coverage. High reliability (enterprise).

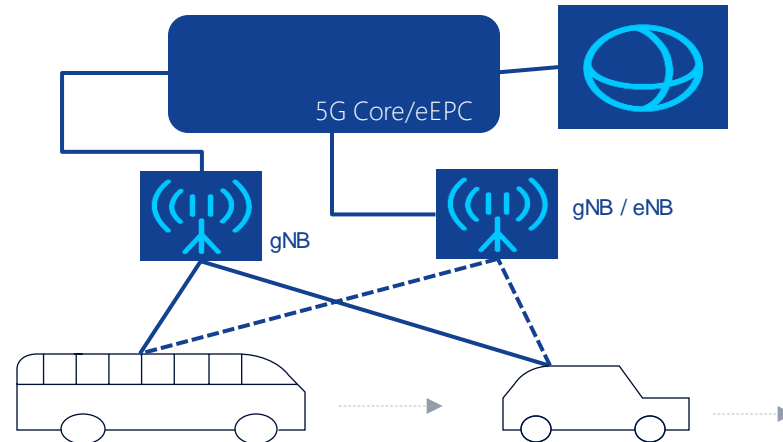
End-customer need /value proposition

- Connected vehicle are seen as a very strong opportunity area for operators, given the essential need for broadband data with high mobility.
- Numerous consumer and B2B solution propositions exist, e.g. in-vehicle hotspot and infotainment, eCall, HD navigation, usage-based insurance, stolen vehicle recovery, roadside assistance, predictive maintenance, vehicle firmware updates.
- (V2V, V2I & V2P represent a different category of solution and are not included here).



Why 5G?

- 5G provides throughput, capacity and mobility for the full range of connected car services, extending the capability of 4G connectivity; e.g. enabling HD/UHD infotainment streams simultaneously to multiple passengers per vehicle.



Autonomous vehicle remote assistance over 5G

Key requirements: vehicular mobility, High U/L bandwidth & very low latency (U/L&D/L), Very high reliability & security.

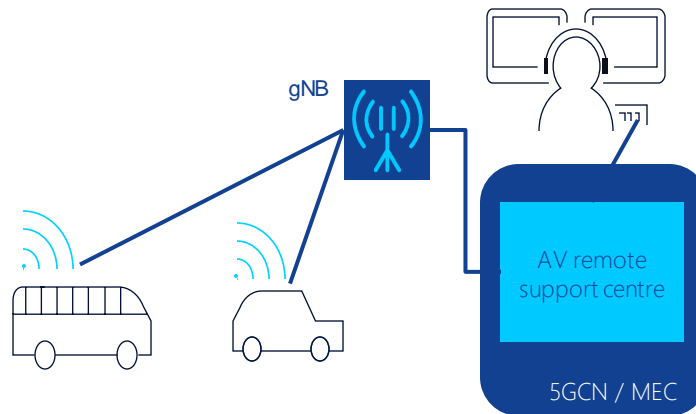
End-customer need /value proposition

- Autonomous vehicles are dependent on machine vision (e.g. LIDAR) to analyse road conditions and traffic signs. In e.g. bad weather conditions AVs may be unable to interpret their surroundings thus forced to stop.
- Level 5 AVs might lack a qualified driver on board, and thus require remote assistance, leveraging high reliability, low latency broadband connectivity to allow a remote operator to steer the AV to a recovery position based on video feeds from the vehicle.



Why 5G?

- 5G provides the high-reliability, low latency connectivity needed to support stranded AVs, with adequate bandwidth to support UHD video uplink from the vehicles. Dedicated E2E network slices can ensure tailored network characteristics over commercial 5G networks.
- MEC/distributed edge computing can also be deployed to further optimise latency performance.



5G Vehicle-to-everything (V2X) & Intelligent traffic management

Key requirements: vehicular mobility. Network slicing: Multiple variations in requirement for latency & throughput (UL/DL). High reliability and security.

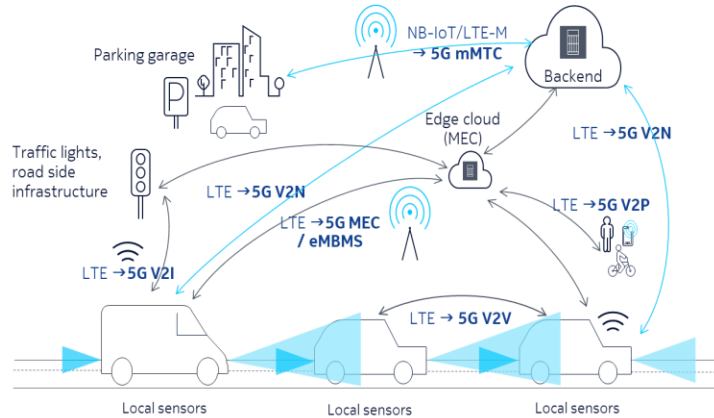
End-customer need /value proposition

- V2X encompasses a number of developing standards for communication between vehicles (autonomous or human-controlled) infrastructure, humans and networks with an aim to support safety and efficiency-focused solutions. These are seen as an evolution towards intelligent transport systems: vehicle and Infrastructure based management of traffic flow via cameras, traffic lights, road tolling infrastructure and signs.



Why 5G?

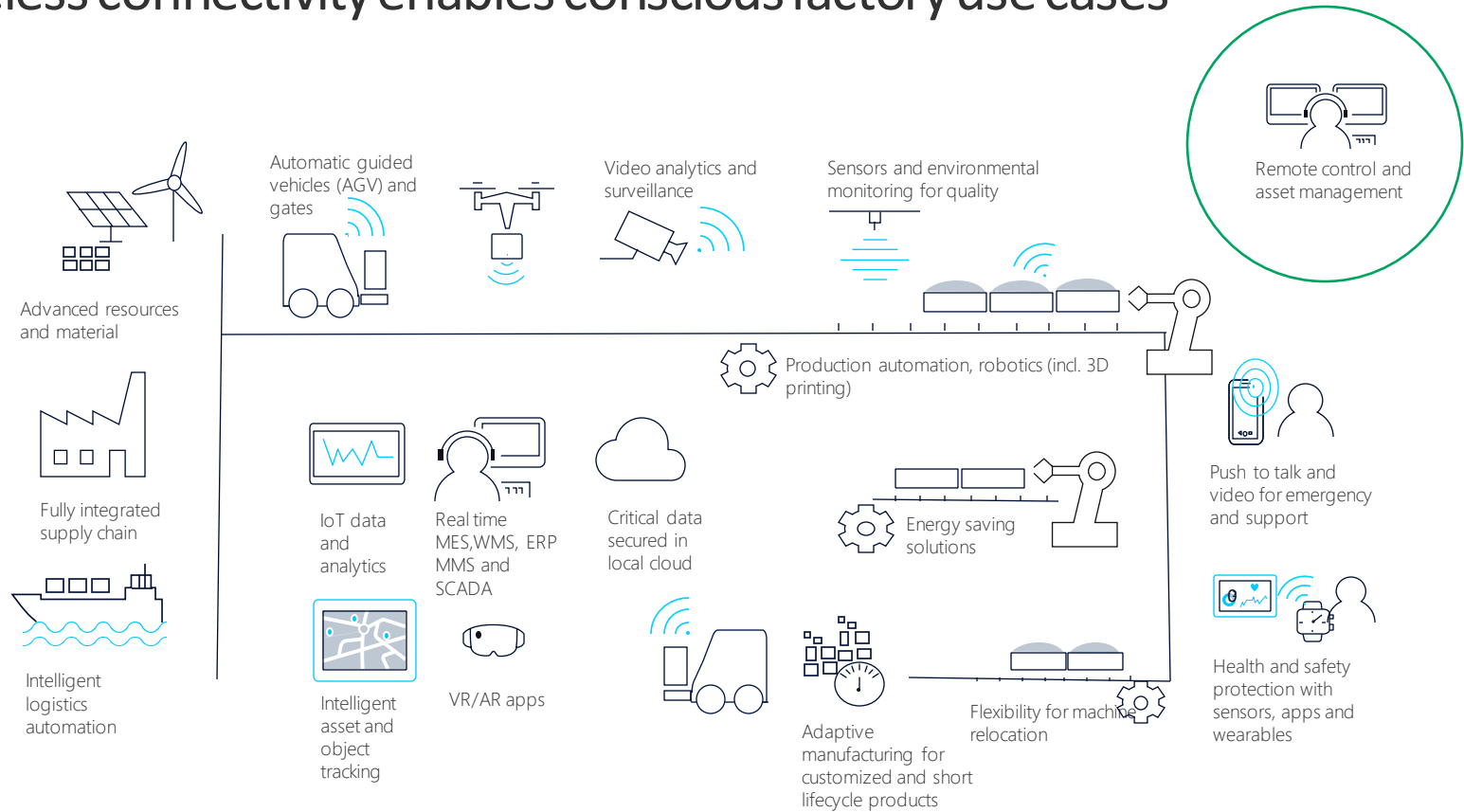
- V2X solutions can be met via a mix of different connectivity solutions, including LTE and DSRC (Dedicated Short Range Communication), but 5G has the unique flexibility to meet all V2X multi-service requirements, including unparalleled capability in terms of latency, reliability and capacity, guaranteeing interference-free connectivity for large numbers of connected devices & clients. E2E network slicing (in 5G NR+CN) will support multiple network slices, allowing multitenant and multi-application specific network configurations specific to each V2X need.



Factory Use case







Wireless connectivity enables conscious factory use cases



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Network Slicing for Industrial Use Cases

Possible network slicing for industrial use cases			
Slice 1	Slice 2	Slice 3	Slice 4
Augmented reality	Control-to-control	Mobile robots	Plant asset management
eMBB + URLLC	URLLC	URLLC	mIoT
<ul style="list-style-type: none">AR smart glasses for technical staffs 	<ul style="list-style-type: none">Communication between different machines 	<ul style="list-style-type: none">Control robots or AGV 	<ul style="list-style-type: none">Asset tracking on material and products, intelligent supply and demand planning process 

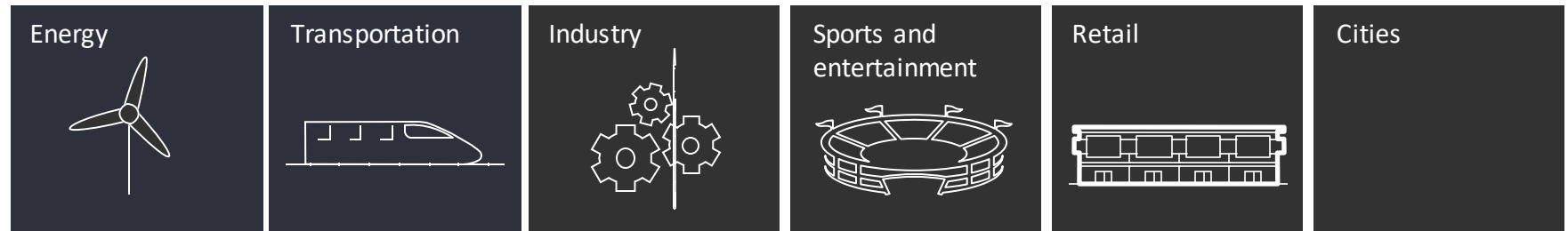
Private Network



Megatrends



Industry verticals seeking ways to address future challenges and improve business efficiency for competitive advantage



Private Networks by industry vertical

Manufacturing



Better connectivity is the key to gaining value, efficiencies, and productivity in factories

Mining



As mining digs deeper, industry digitalization increases productivity by connecting assets, automating processes, and analyzing data

Ports



Connected ports bring more vessels, more trade, and an increase in sustainable development

Offshore and process industries



Private networks provide reliable connectivity for increased efficiency, productivity, and safety for the offshore platforms and refineries

Power utilities



Utilities face a dramatic business and technological transformation with interconnected and interdependent players in the ecosystem

Aviation



Private networks enable airports and airlines to digitally transform combining communication services and digital solutions

Key motivations behind enterprises to build private cellular networks

Reliable quality

- Dedicated mobile network for enterprises
- Fulling the stringent and mission critical tasks
- Own edge cloud within facility

Higher security

- Isolated from public cellular network
- Protection of confidential data

Remote access

- Access to remote sites where public cellular coverage may not be available
- Improve operation efficiency with connected facility

Private Networks by industry vertical



Advanced Industry 4.0 at Nestle

Taking advantage of 5G technologies requires flexible, high throughput, low latency networks connecting many massive numbers of devices.

Manufacturing



Delivering a triple bottom-line at Belfast Harbour

20% saving on maintenance. 56% cost reduction for CCTV surveillance. 50% reduction in time spent on inspection. Safety and sustainability benefits.

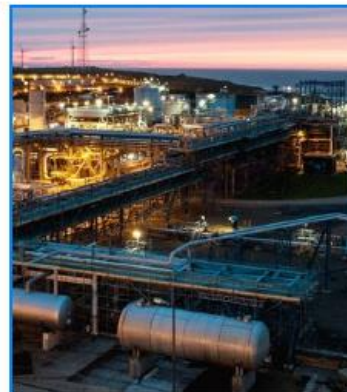
Ports



Epiroc, Ericsson and the mine of the future

Collaboration has led to the development of a robust and reliable cellular-based communication concept for the mining industry.

Mining



Centrica Storage builds plant of the future

First 5G mobile private network for the oil and gas industry. Digitalizing critical maintenance and engineering operations.

Oil & Gas



Digitalized operations at Paris airports

Cellular technology connecting the professional ecosystem across major airports in Paris. Perfect performance. Built-in security. Complete control.

Airports

Ports

Connected ports bring more vessels, more trade, and an increase in sustainable development.

Example of challenges

- Automation and control of large machinery
- Health and safety of workforce
- Seamless connectivity over large areas

Examples of use cases

- Automation of RTG cranes
- Condition monitoring
- Drones for surveillance
- Remote control of STS cranes

Reference: Arthur D. Little

C2 General

Estimated ROI



178%

Benefit example

20%

reduction with optimized
vessel berthing



Rotterdam World Gateway

A digital port with private connectivity: from possibilities to secure realities made possible by cellular technology, has allowed Rotterdam World Gateway to enable reliable and quality communication services for its automated container terminal

Cellular technology provides:

Perfect performance

Cellular technology provides the highest performance available with robust security protocols

Secure remote access

Enabling innovative monitoring and control use cases reducing costs and increasing productivity

Scalable capacity

Cellular technology providing the capacity to scale use cases


Enabled by
Ericsson Private Networks

In partnership with
Rotterdam World Gateway

Outcome:

A fast, secure, and reliable network providing

99.99%
availability
for 365/24/7 operations

- 
- Data communication between customer application server and Automated Guided Vehicles
 - Data communication towards workflow terminal in manned-truck
 - Data communication towards ruggedized tablets, to be used between container stacks at reefer areas
 - Connect MIFI devices with private 4G SIM cards for laptops

Aviation 4.0

Aviation 4.0 Vision...

"Focus on Connectivity and Realtime information by connecting all airport stakeholders and customer in one fully integrated Digital Ecosystem."

This technology enabled intelligent aviation digital ecosystems provide the individual benefit to the customer & stakeholders, which they are willing to use and pay for."

Key enablers for Aviation 4.0

- Industrial Network Connectivity
- Cloud
- Artificial Intelligence
- Data Analytics
- Applications
- Cellular enabled Devices



... resonates with key priorities across industry

Optimize Operations

Unmanned
Automated
Flowthrough

Drive Economics of Scale

Revenue protection
Revenue diversification
TCO improvement

Innovate Customer Experience

Seamless PAX journey
Personalized service

Enhance Safety and Security

Preventive & Proactive measures
Environmental sustainability

Quick wins for the Aviation 4.0 transformation

Cellular Push to Talk

Challenge: Legacy systems can no longer support new data and video communication needs of airport staff as well as are costly to operate and maintain.



Benefit

- 50% TCO reduction of mission critical nw.
- 20-40% performance gain (reliable operations) → Improve turnaround time

References

AIRFRANCE



Asset Tracking & Monitoring

Challenge: Burden to establish better controls over coordination of airport services, and it is difficult to do that with manual routines and checks.



Benefit

- Increased utilization → reduce idle time of asset → improve TCO
- Dynamic asset allocation – improve KPIs (e.g., turnaround time etc.)

References



AR- Load Management

Challenge: Load Management (loading/unloading), high on manpower requirement process and directly impacts On the Time performance of the flight



Benefit

- 30-50% Reduction in Load Mgmt time → efficiency in turnaround time, fuel burn.
- You - See – What -I see operations → effective utilization of manpower

References



Facial Recognition - Biometric

Challenge: Siloed operations and system across Authority, Partner and Tenants to manage and operate PAX flow



Benefit

- 30-50% Reduction in Boarding time → hassle free Self - service PAX flow
- Secure and Real time Data → leverage for PAX offers and portfolio diversification

References

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