IoT and AI-Based Network Enablers for Evolution Towards Future 6G Technologies

3rd AIoTwin Summer School

Ericsson Nikola Tesla

Speaker name:

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Confidentiality class:

Open

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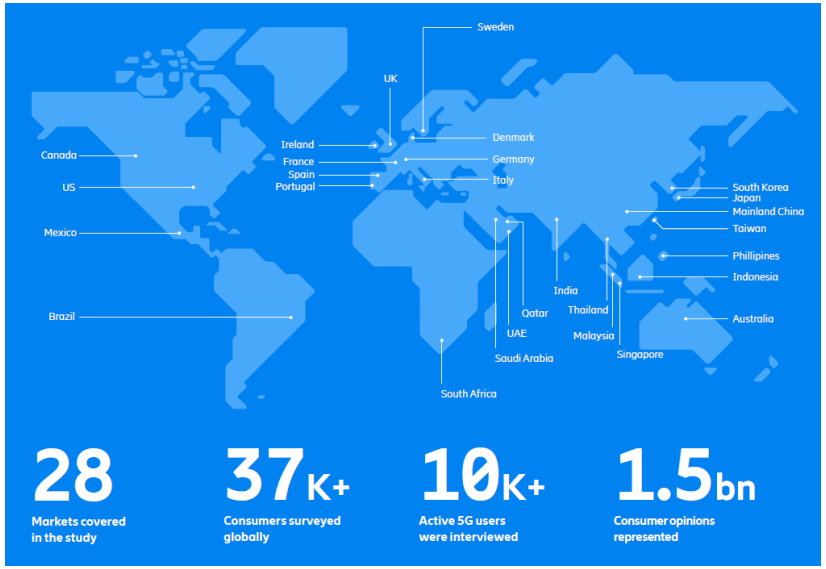
Instead of Introduction:
Value of 5G - Consumer View Report and Future Trends



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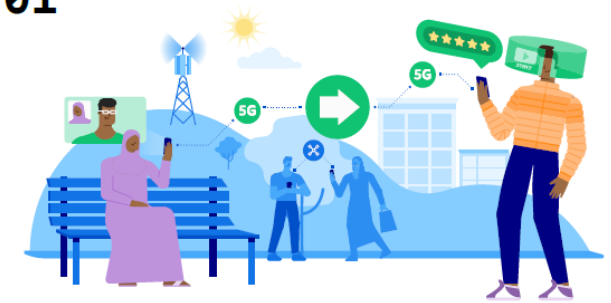

5G network satisfaction drivers are evolving beyond coverage

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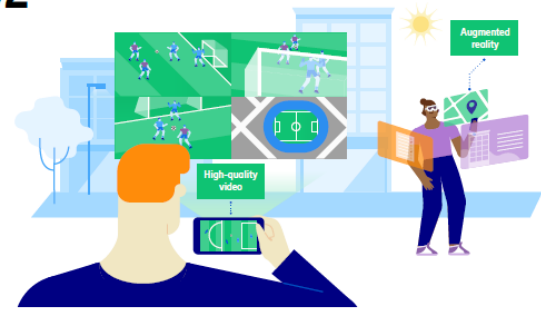

5G is reshaping video streaming and AR usage

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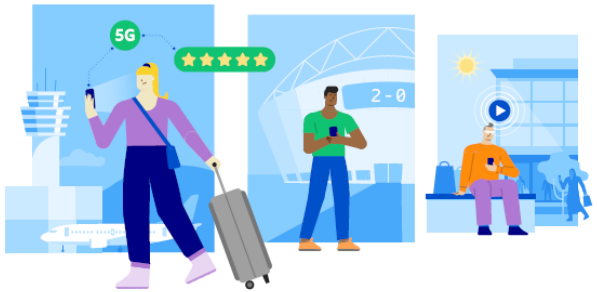

5G performance at key locations influences consumer loyalty

04

5G consumers are willing to pay a premium for differentiated connectivity

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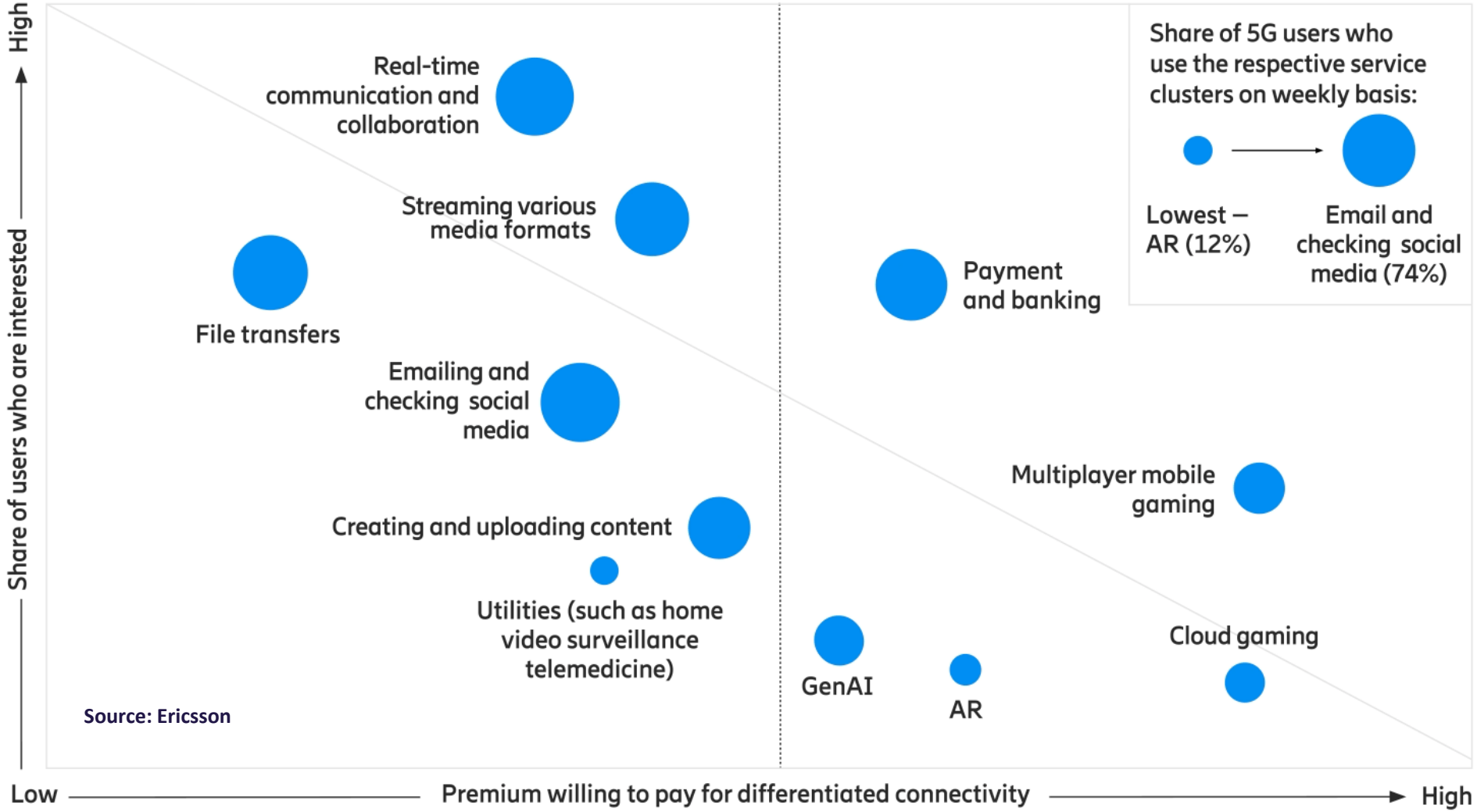
Source: Ericsson

AI-driven Applications will become one of key consumers of Differentiated Connectivity by 2030



Consumer Trends: The AI Powered Future

Artificial shoppers

Will personal AI assistants bring about the end of advertising?

Empower-less employees

AI may boost your work performance but also strip it of meaning

AI running wild

More interconnected AIs could start developing their own agenda.

Sentient screenplays

AI cloned friends set to appear in your generatively created movies.

Human digital twins

Nothing left to chance - AI reduces uncertainty by simulating anything in daily life

Data disorder

Regulation or a digital wild wild west, our future depends on data control

Key keepers

Will connected AI key keepers shield privacy or increase dependency in the digital age?

Ericsson Nikola Tesla

Source: Ericsson

Internet of Senses trends by 2030

01. Your brain is the user interface

Fifty-nine percent of consumers believe that we will be able to see map routes on VR glasses by simply thinking of a destination.

02. Sounds like me

Using a microphone, 67 percent believe they will be able to take on anyone's voice realistically enough to fool even family members.

03. Any flavor you want

Forty-five percent predict a device for your mouth that digitally enhances anything you eat, so that any food can taste like your favorite treat.

04. Digital aroma

Around 6 in 10 expect to be able to digitally visit forests or the countryside, including experiencing all the natural smells of those places.

05. Total touch

More than 6 in 10 expect smartphones with screens that convey the shape and texture of the digital icons and buttons they're pressing.

06. Merged reality

VR game worlds are predicted by 7 in 10 to be indistinguishable from physical reality by 2030.

07. Verified as real

"Fake news" could be finished – half of respondents say news reporting services that feature extensive fact checks will be popular by 2030.

08. Post-privacy consumers

Half of respondents are "post-privacy consumers" – they expect privacy issues to be fully resolved so they can safely reap the benefits of a data-driven world.

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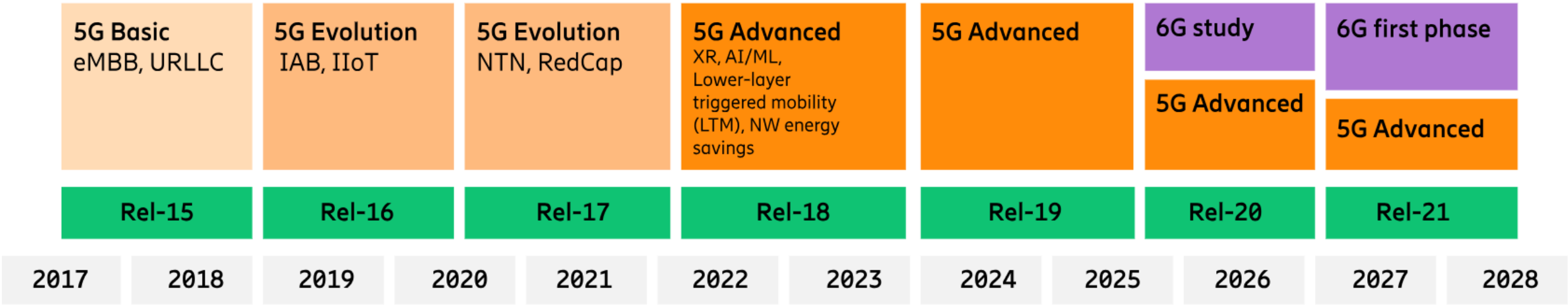
Source: Ericsson

Standardization Roadmap towards 6G

Learnings from commercial 5G networks
- Ultimate 5G performance
- New market segments / New services
- Sustainability / Energy efficiency
- Intelligent network automation

First Wave

- Bridge towards 6G
- 6G requirements

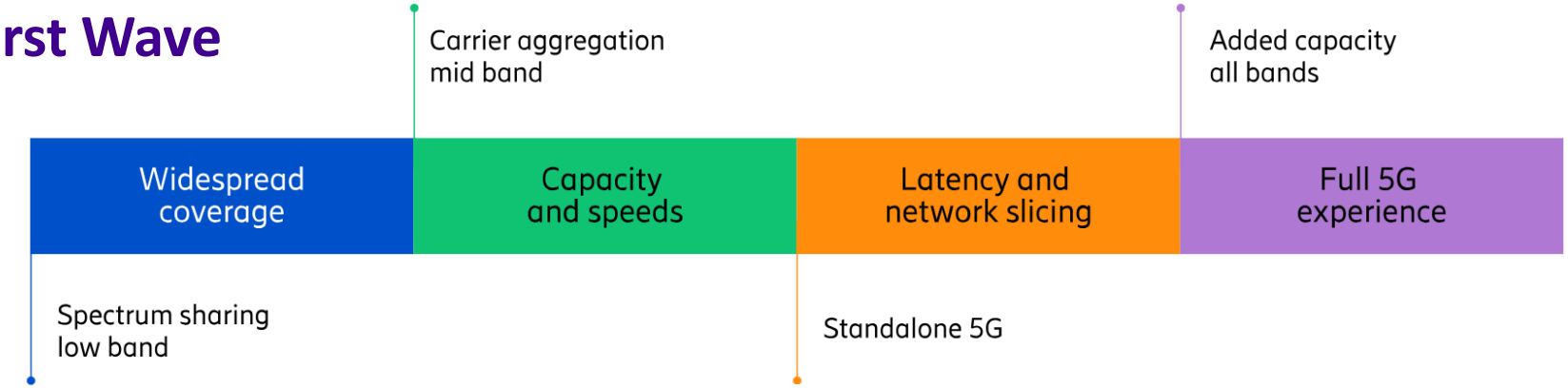


Ericsson Nikola Tesla

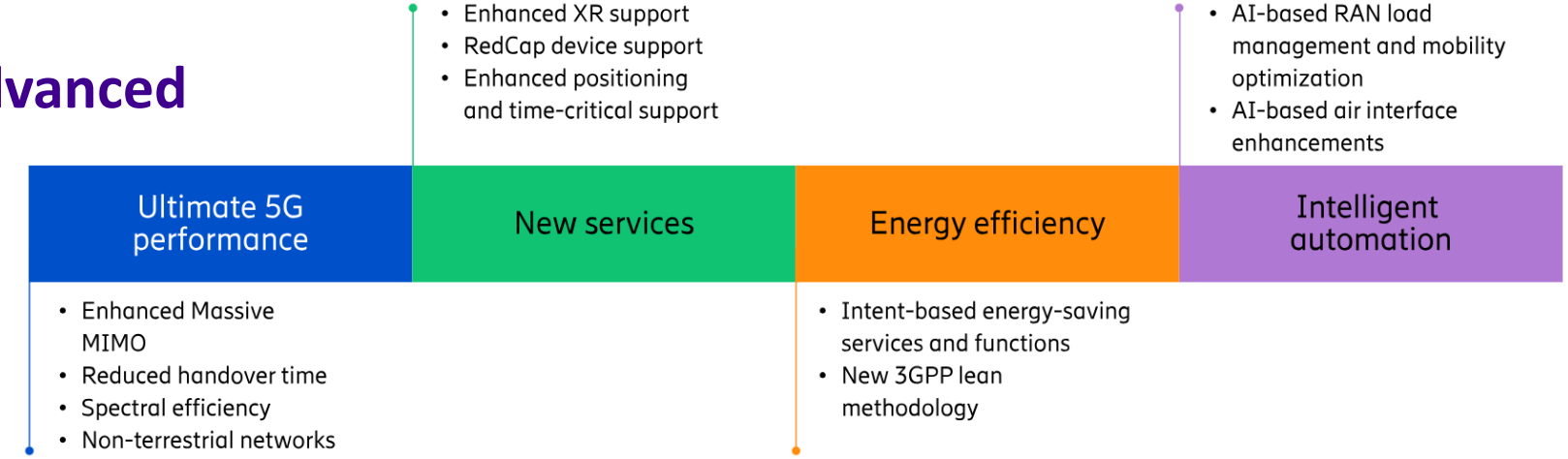
Source: Ericsson

5G Advanced as a bridge towards 6G

5G First Wave



5G Advanced



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Source: Ericsson

6G Use Cases

- **Use Cases enhanced and developed from current 5G Technology**
  - Enhanced Mobile Broadband
  - Fixed Wireless Access
  - Positioning services
  - Industrial IoT
  - Augmented Reality

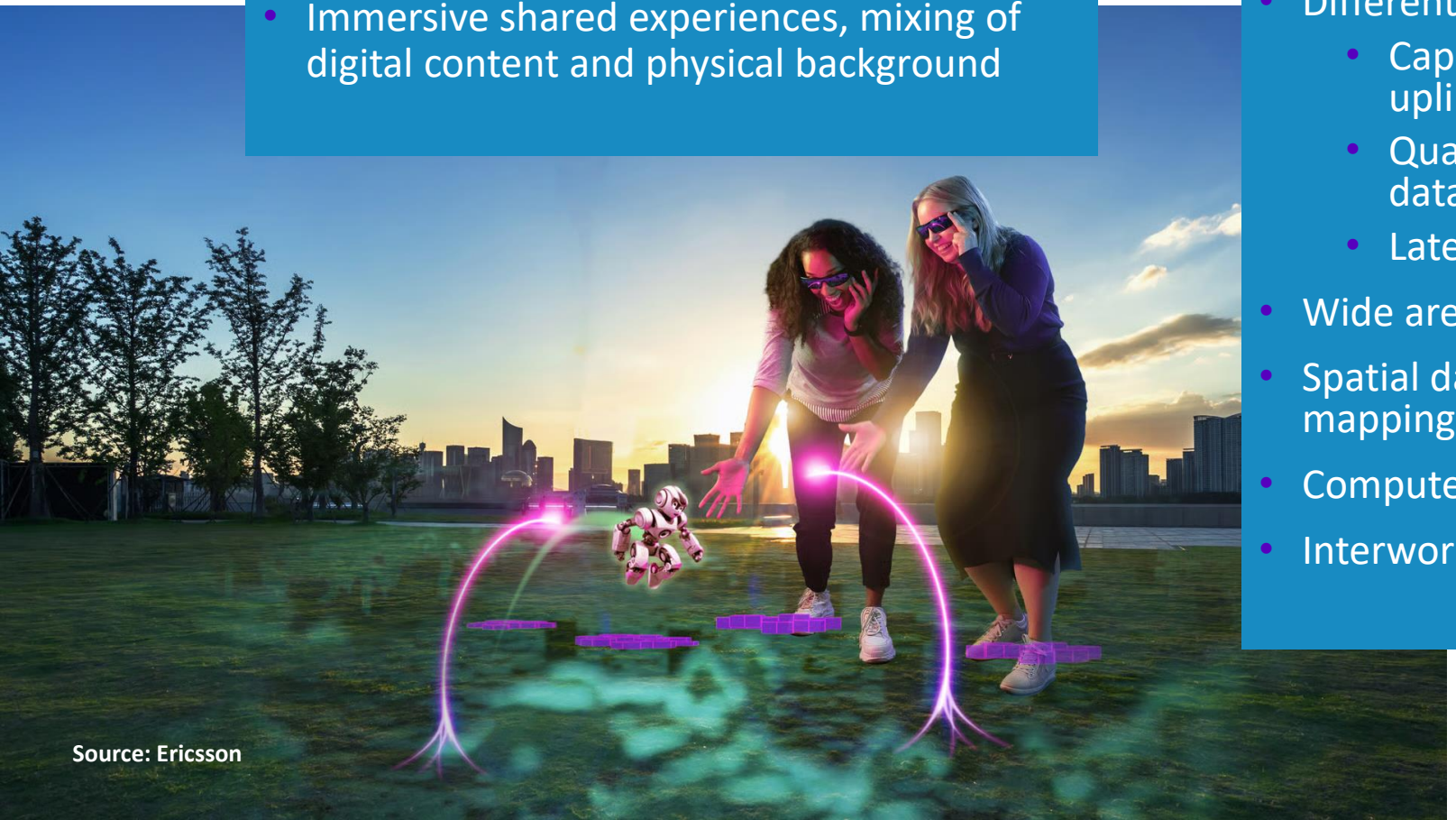
- **Entirely new and 6G-specific groups of Use Cases**
  - Global coverage
  - Wide-area mass-market mixed reality
  - Autonomous mobility

Source: Ericsson

Mixed Reality (MR) – Immersive shared experiences

What?

- Immersive shared experiences, mixing of digital content and physical background



Source: Ericsson

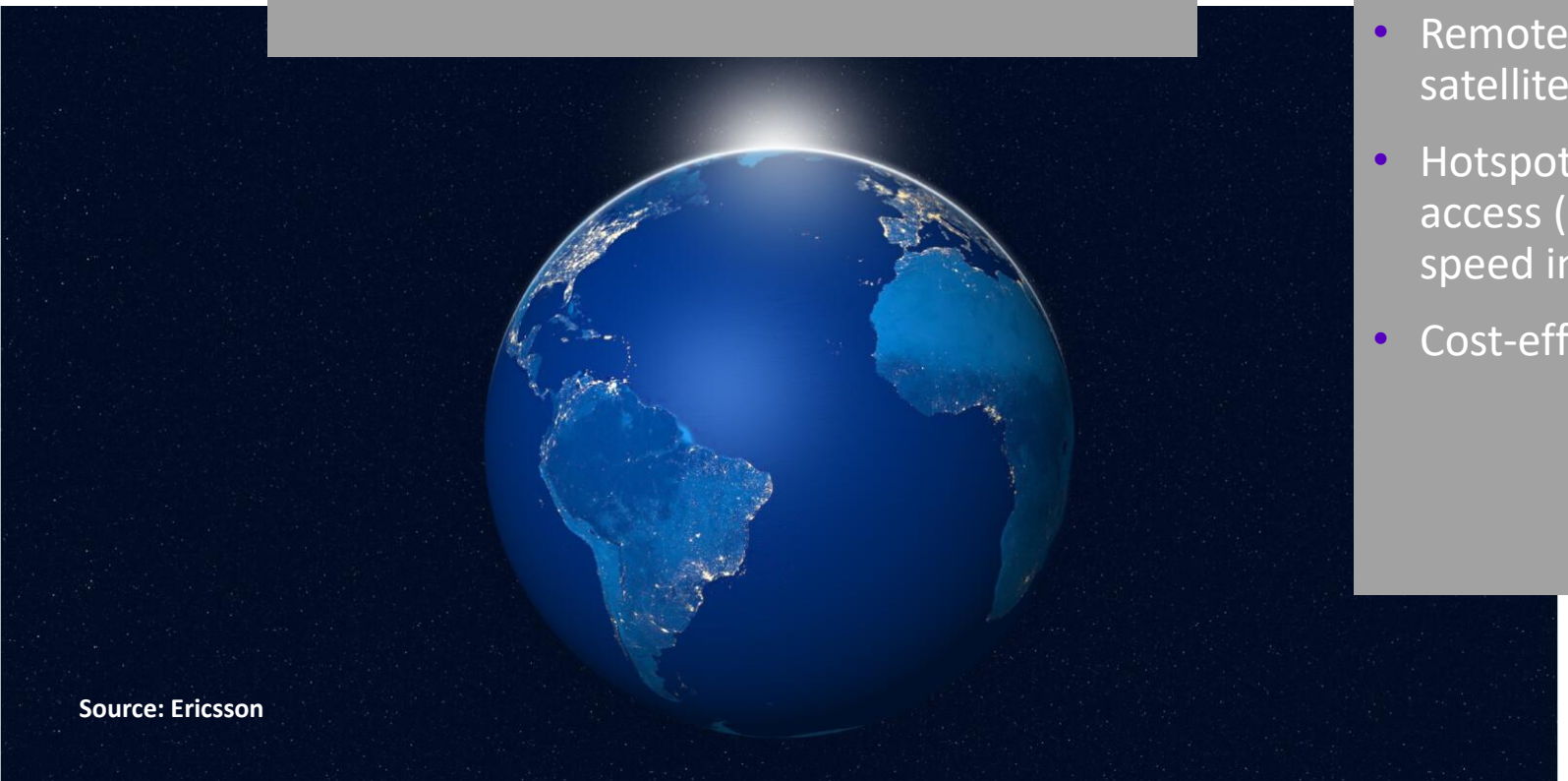
How?

- Differentiated connectivity:
  - Capacity for high user density and high uplink and downlink data rates
  - Quality of service adapted to different data streams
  - Latency needs to be robust
- Wide area service coverage without gaps
- Spatial data and digital twinning for spatial mapping
- Compute/AI offload
- Interworking with app platforms

Global Internet – Digitalization for everyone, everywhere

What?

- Bridging the digital divide with a ubiquitous network



Source: Ericsson

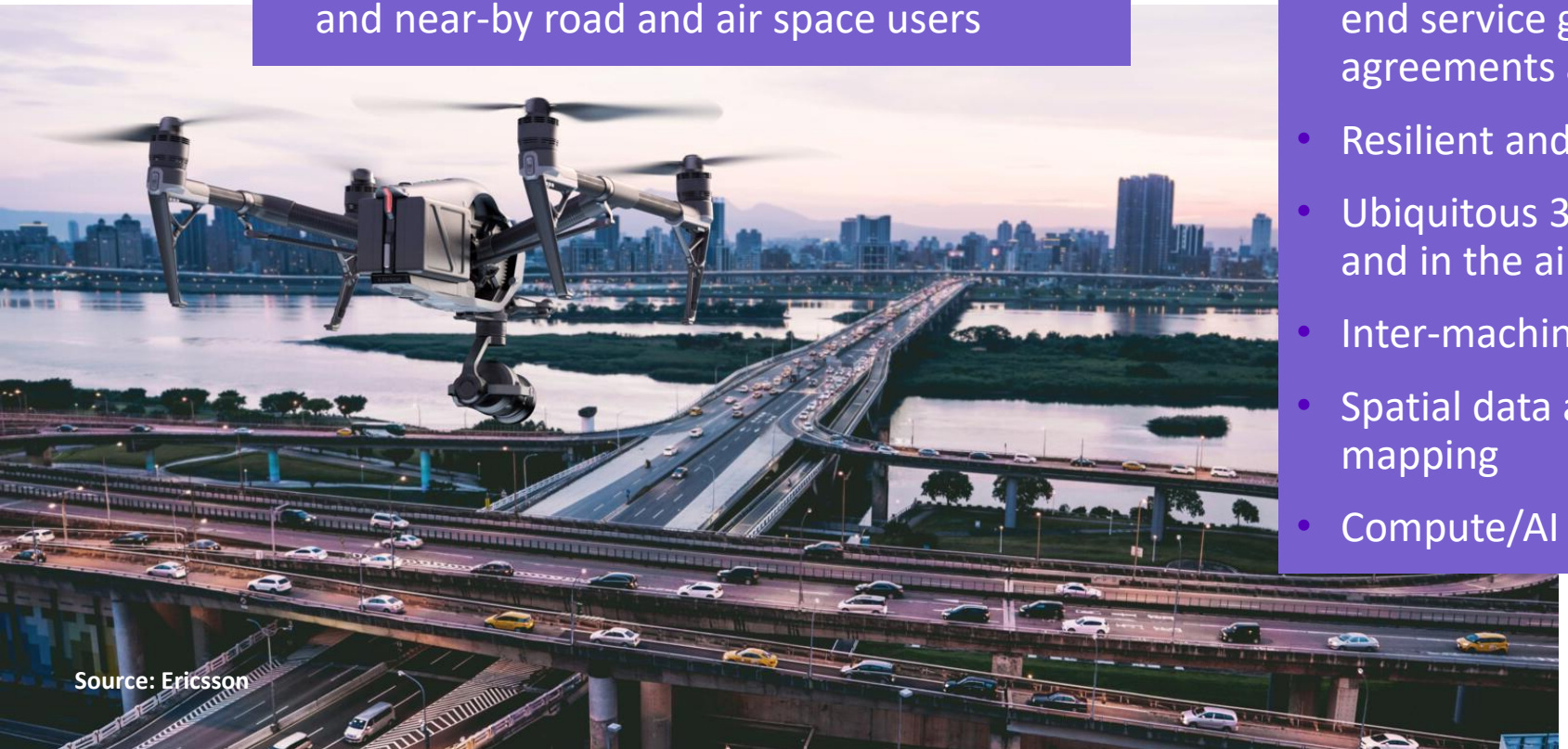
How?

- Basic MBB coverage in rural areas from high towers
- Remote and complementary coverage with satellites, providing basic MBB everywhere
- Hotspots and homes with fixed wireless access (FWA), indoor network, and high-speed internet
- Cost-efficiency is important

Autonomous mobility – Supporting smart transport

What?

- Networks supporting smart transport with information about position, environment, and near-by road and air space users



Source: Ericsson

How?

- Predictable time-critical communication and high service availability with end-to-end service guarantees (service level agreements and observability)
- Resilient and observable service delivery
- Ubiquitous 3D connectivity on the ground and in the air
- Inter-machine communication
- Spatial data and digital twinning for spatial mapping
- Compute/AI offload

Critical services – Priority emergency communication

What?

- End-to-end service guarantees (service level agreements) and efficient service-tailored resilience.

How?

- Seamless coverage including fallback networks, for example satellites
- Recovery – self-healing networks using AI-powered automation
- Observability for service level agreement tracking and prediction/automation

Source: Ericsson

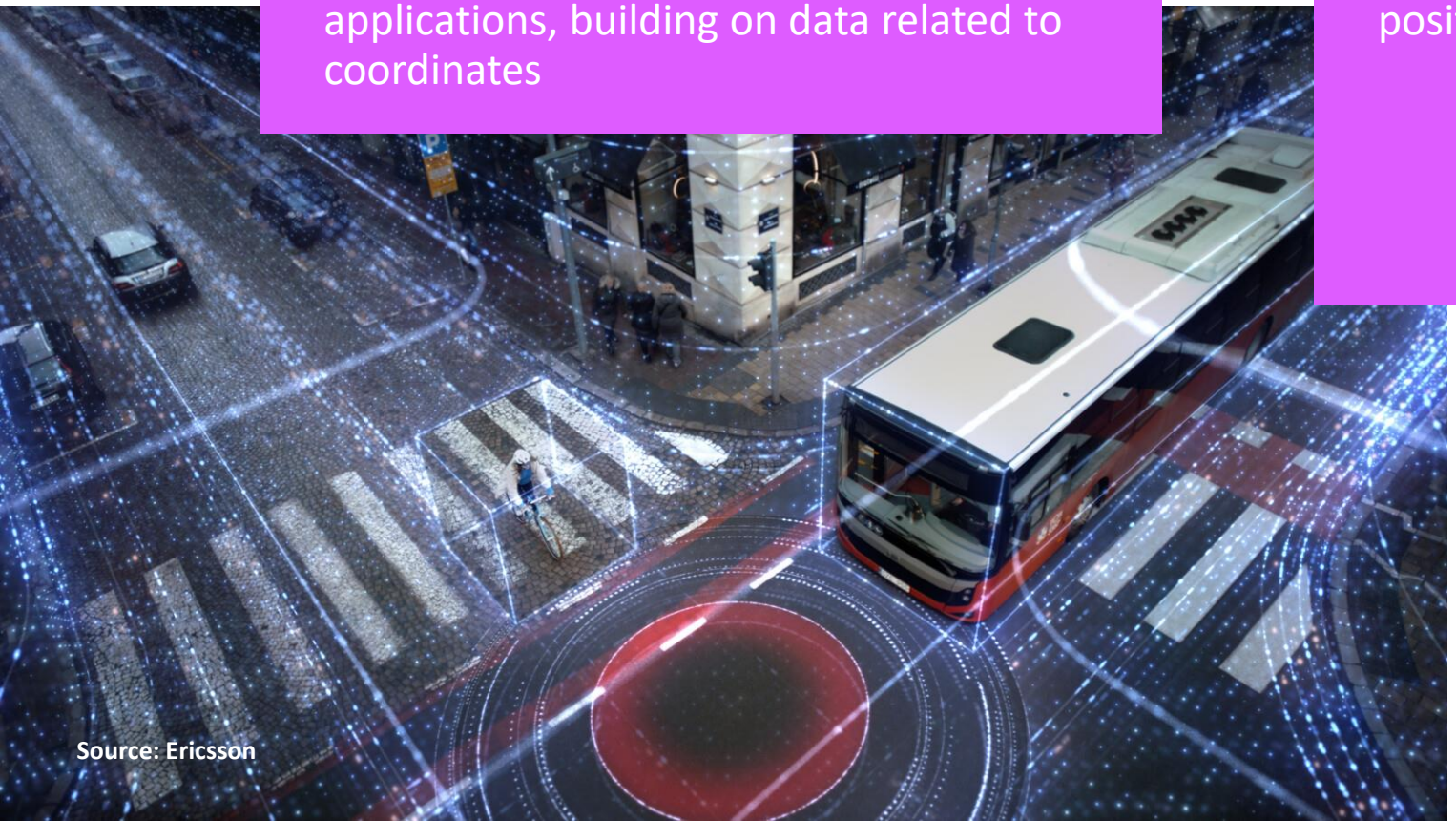
Spatial data – Exposing data related to coordinates

What?

- Platform service offered as APIs to applications, building on data related to coordinates

How?

- Use integrated sensing and communication, positioning, timing, and compute/AI



Source: Ericsson

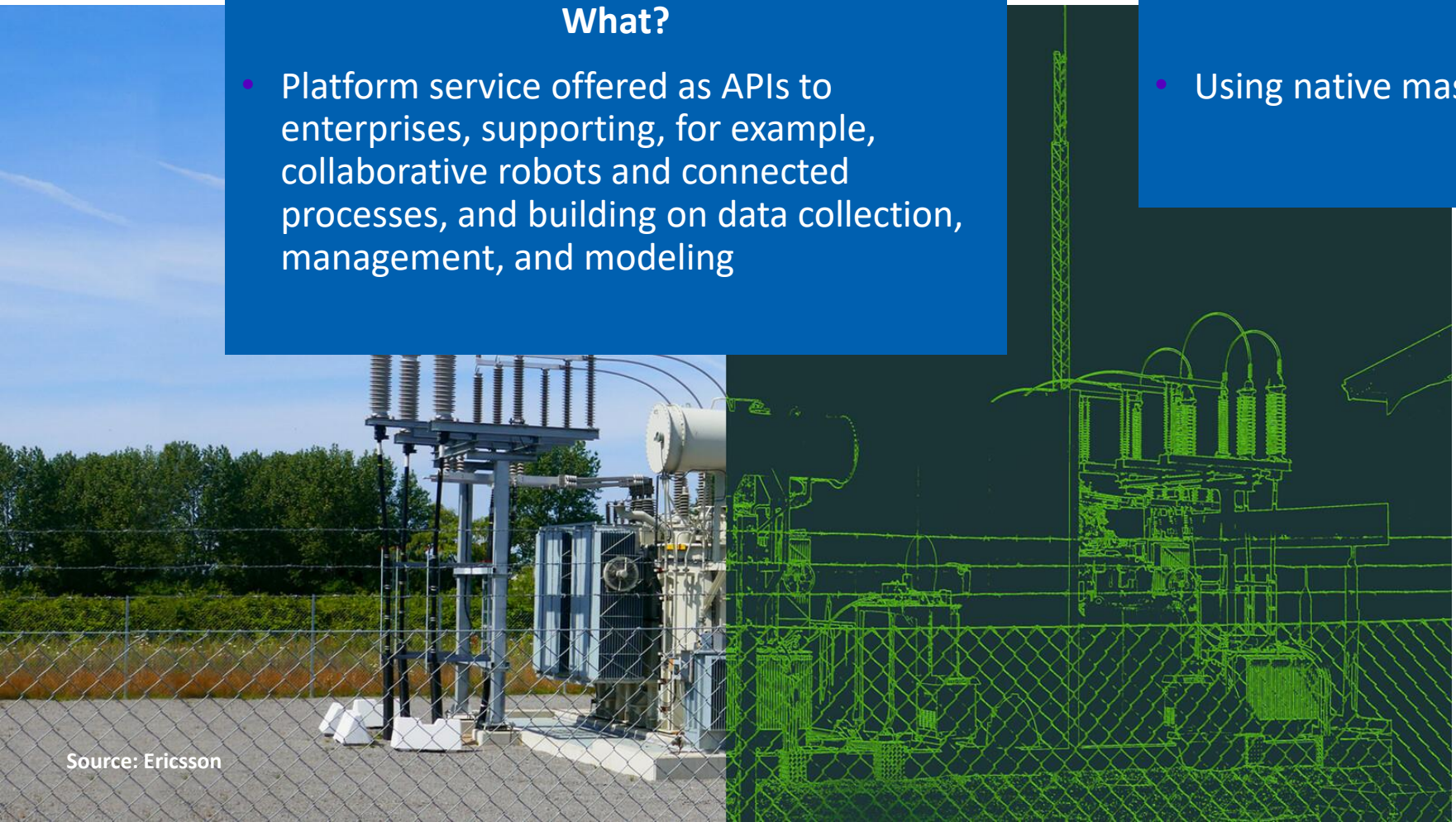
Massive digital twin – Data collection, management, and modeling

What?

- Platform service offered as APIs to enterprises, supporting, for example, collaborative robots and connected processes, and building on data collection, management, and modeling

How?

- Using native massive IoT and compute/AI



Source: Ericsson

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AI communication – Unlocking learning potential through networks

What?

- Personal assistance, enhanced senses through devices, and generated video content

How?

- Using compute/AI and low latency communication

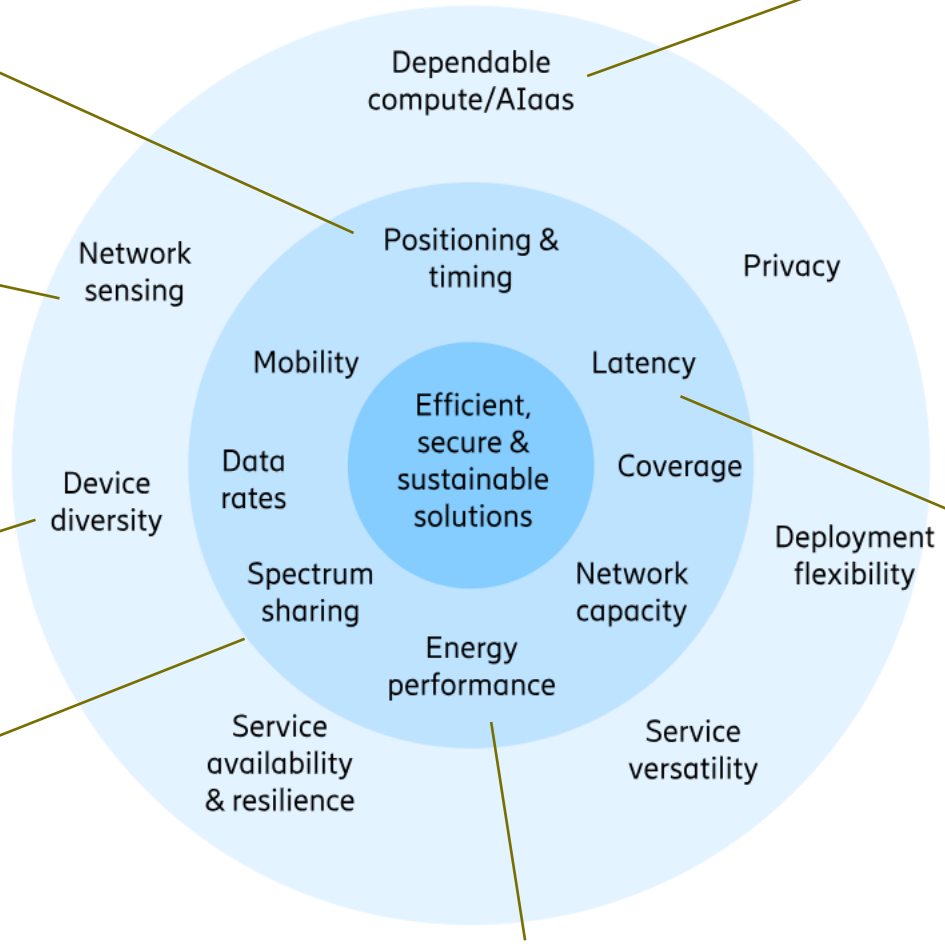
Source: Ericsson

6G Platform Capabilities

The use of simultaneous location and mapping services capable of providing interactive 4D maps of whole cities that are precise in position and time

Through a pervasive AI native architecture, 6G will be defined as a platform featuring intelligence everywhere, a distributed data infrastructure, autonomous operations and network functions exposed as services through AIaaS. Exposure of computing resources to applications is also expected under 6G.

Sensing will be used for tasks such as detecting road traffic and setting off an alarm when a person enters a factory hall. 6G networks will need to use radio resources efficiently for both communication and sensing, including scalable mechanisms for distributing the results, AI-based interpretation of results, and security mechanisms.



Massive number of low power wide area (LPWA)- and zero energy IoT devices, as well as novel mixed reality use cases with new device form factors that will place new entirely new requirements on the network

The possibility to provide several hundred gigabits per second and end-to-end sub-millisecond latency in specific scenarios. Equally or perhaps even more important is the possibility to provide high-speed connectivity with predictably low latency and a low jitter rate.

Higher spectral efficiency combined with highly efficient multi-RAT spectrum sharing (MRSS) between 6G and 5G will be key to making efficient use of limited low- and mid-band spectrum supply

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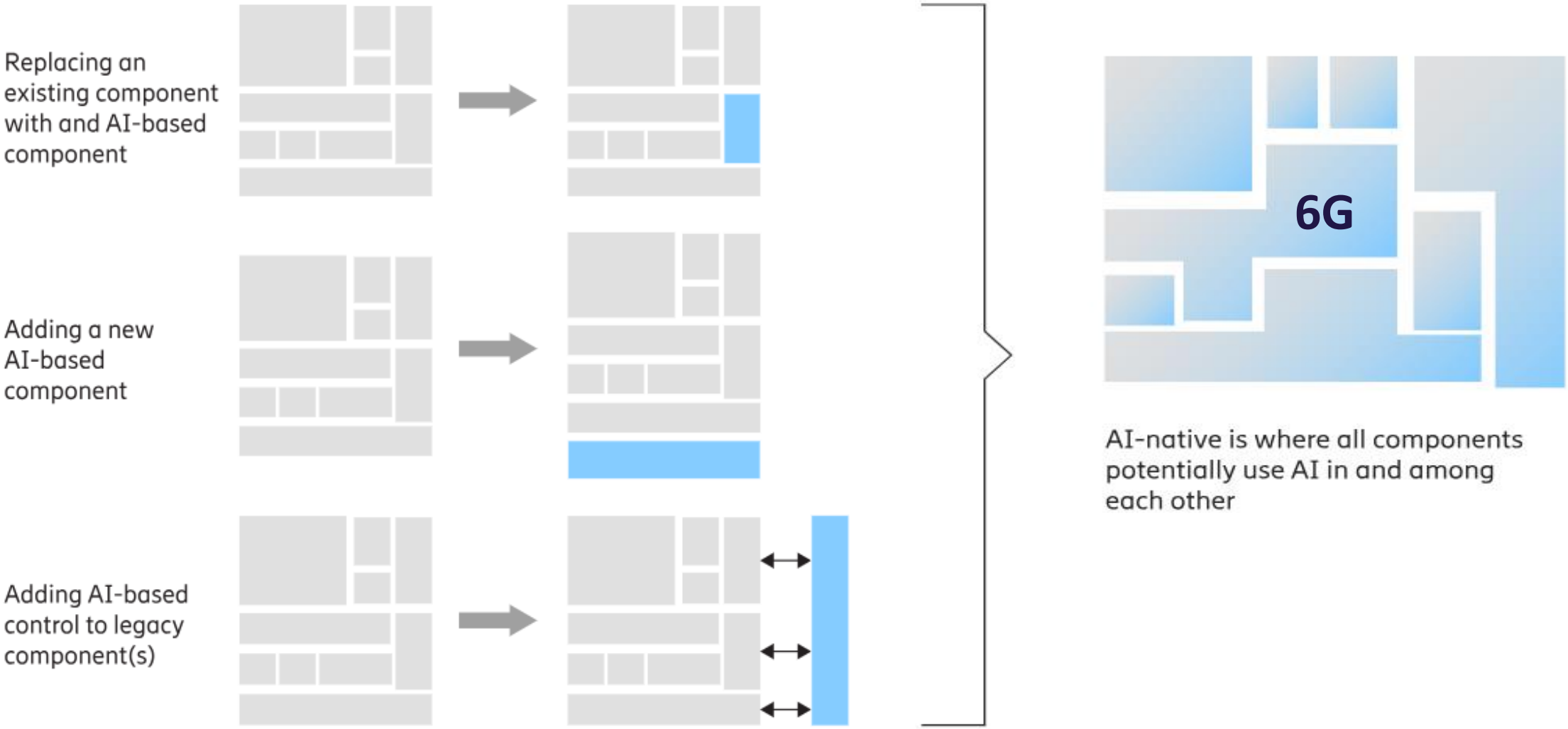
Ultra-low power AI and a new dynamic sleep and wake capability of carriers and transmission points. Wake-up signals and dynamic bandwidth adaptation on the device side

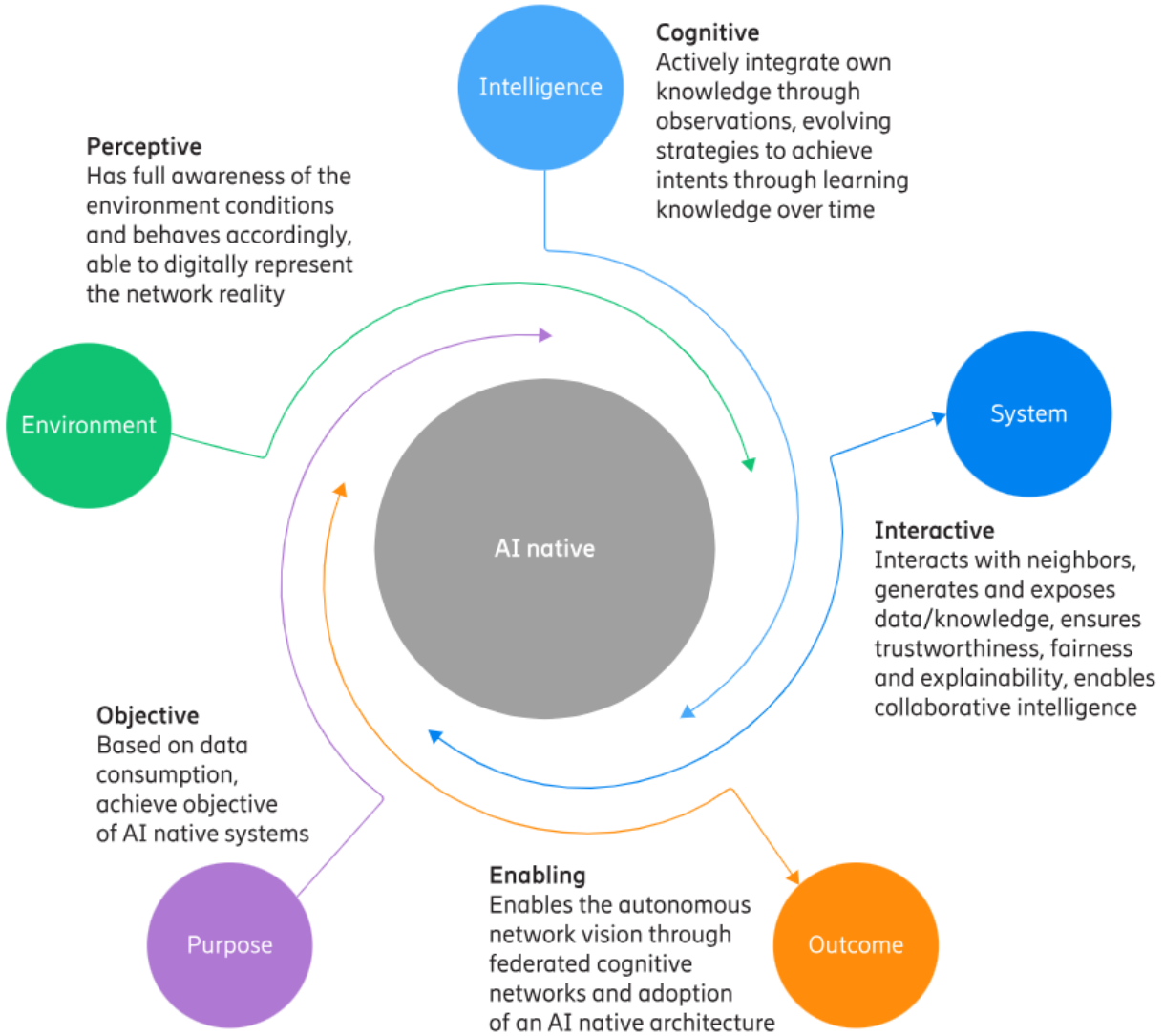
Strategies for introducing AI-based components in Telco networks



Source: Ericsson

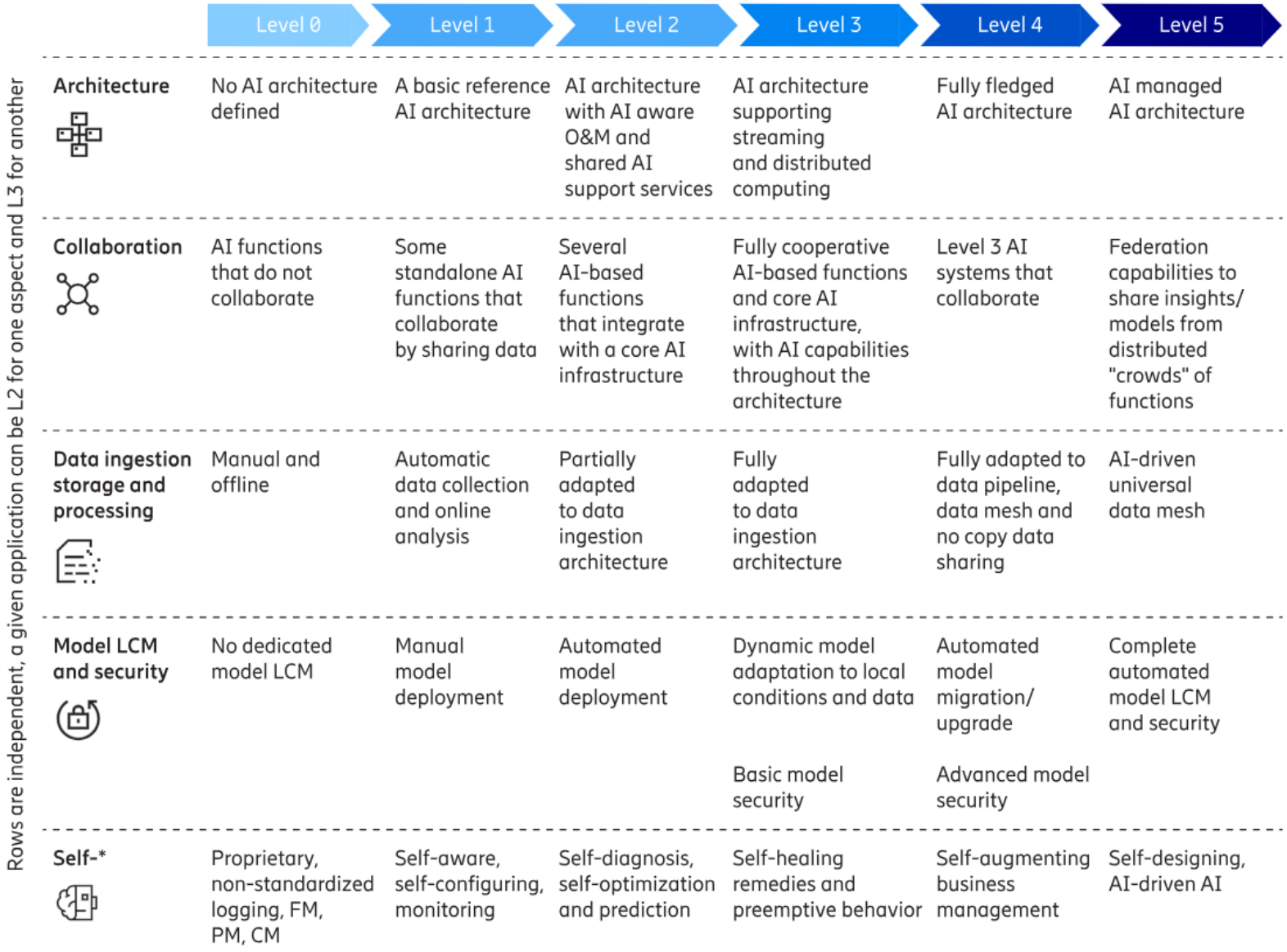
AI-Native Architecture – a baseline for 6G

"AI native is the concept of having intrinsic trustworthy AI capabilities, where AI is a natural part of the functionality, in terms of design, deployment, operation, and maintenance. An AI native implementation leverages a data-driven and knowledge-based ecosystem, where data/knowledge is consumed and produced to realize new AI-based functionality or augment and replace static, rule-based mechanisms with learning and adaptive AI when needed."



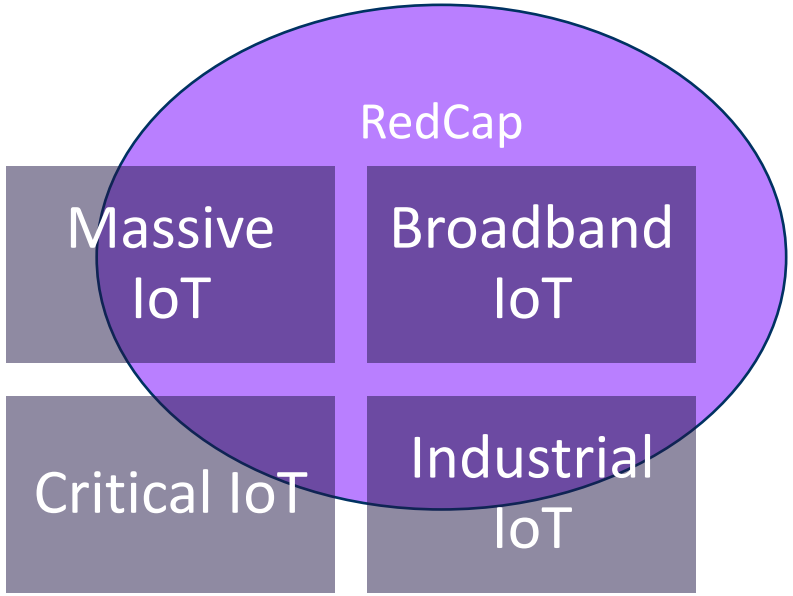
Source: Ericsson

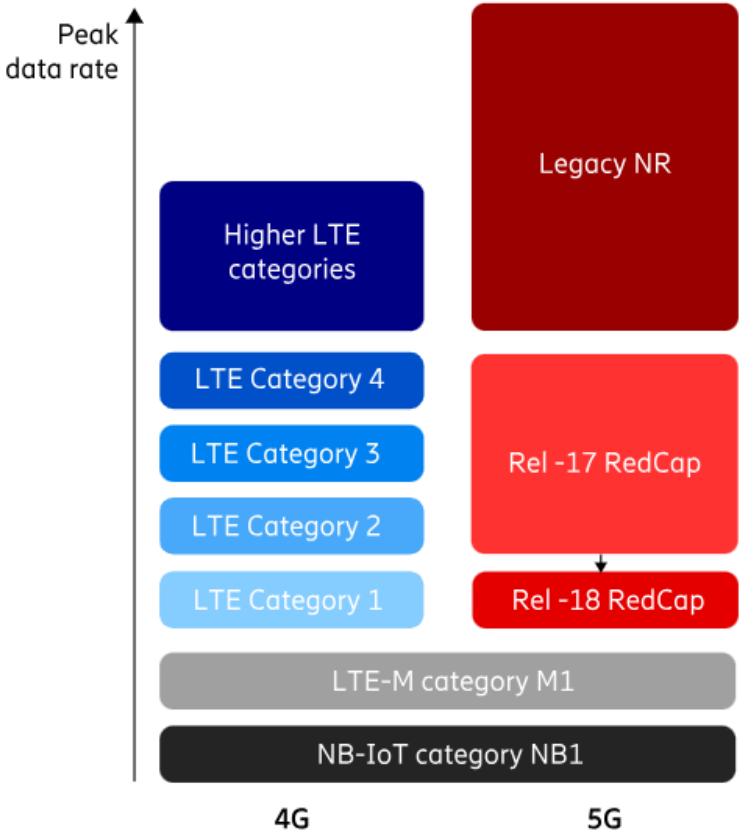
Ericsson's AI-native Maturity Model



Source: Ericsson

RedCap – 5G IoT Standard for Consumers and Industries



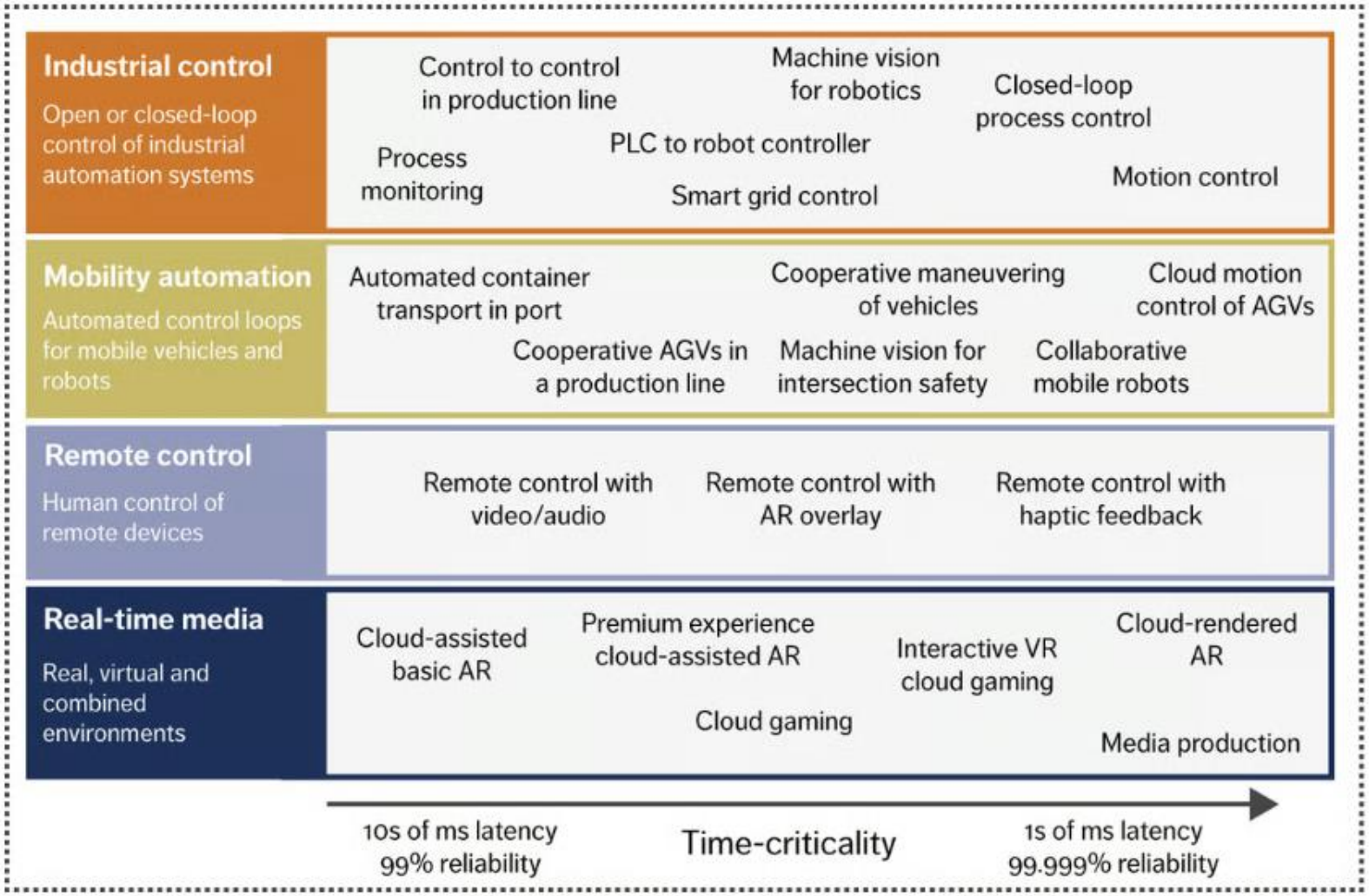


Key Features of RedCap

- Reduced Complexity
- Increased Battery Life with extended discontinuous reception (eDRX) cycles
- Higher Bandwidth than Massive IoT
- Support for Network Slicing and Enhanced positioning

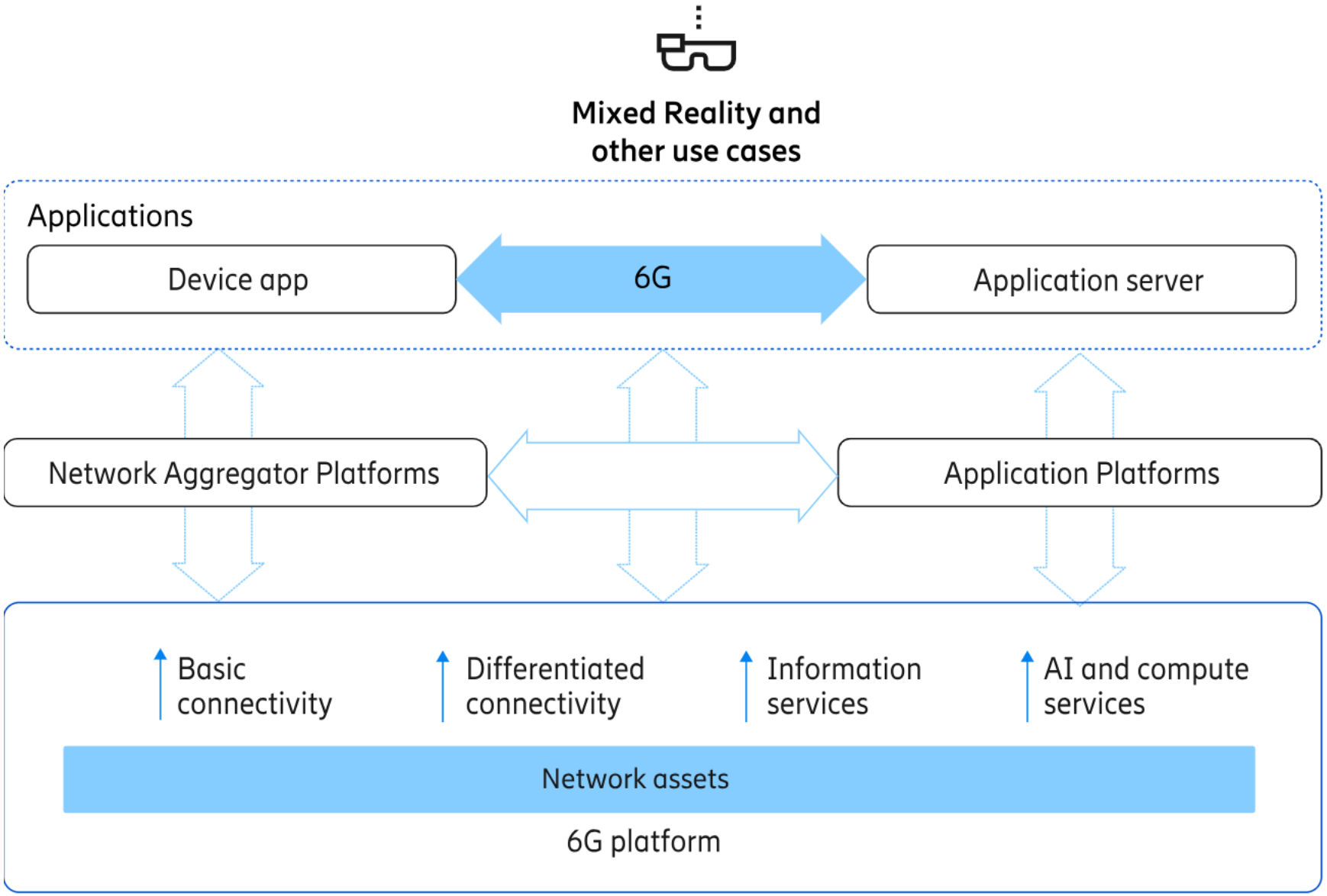
Source: Ericsson

Time-critical Use Cases Common Across Multiple Industries



Source: Ericsson

6G: An Open Platform for Realizing Future Use Cases



Source: Ericsson

Summary

5G Advanced

- AR/VR capabilities
- AI/ML based optimizations
- RedCap and Critical IoT
- Differentiated Connectivity

Evolve to...

- ... Fully Immersive communication
- ... AI-native Architecture
- ... Connected World with billions of devices and sensing capability
- ... Human-centric Self-organizing network

6G

- AI-native applications
- Internet of Senses
- Sub-THz spectrum
- Digitalized and programmable physical world
- New security requirements
- High Energy Efficiency

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