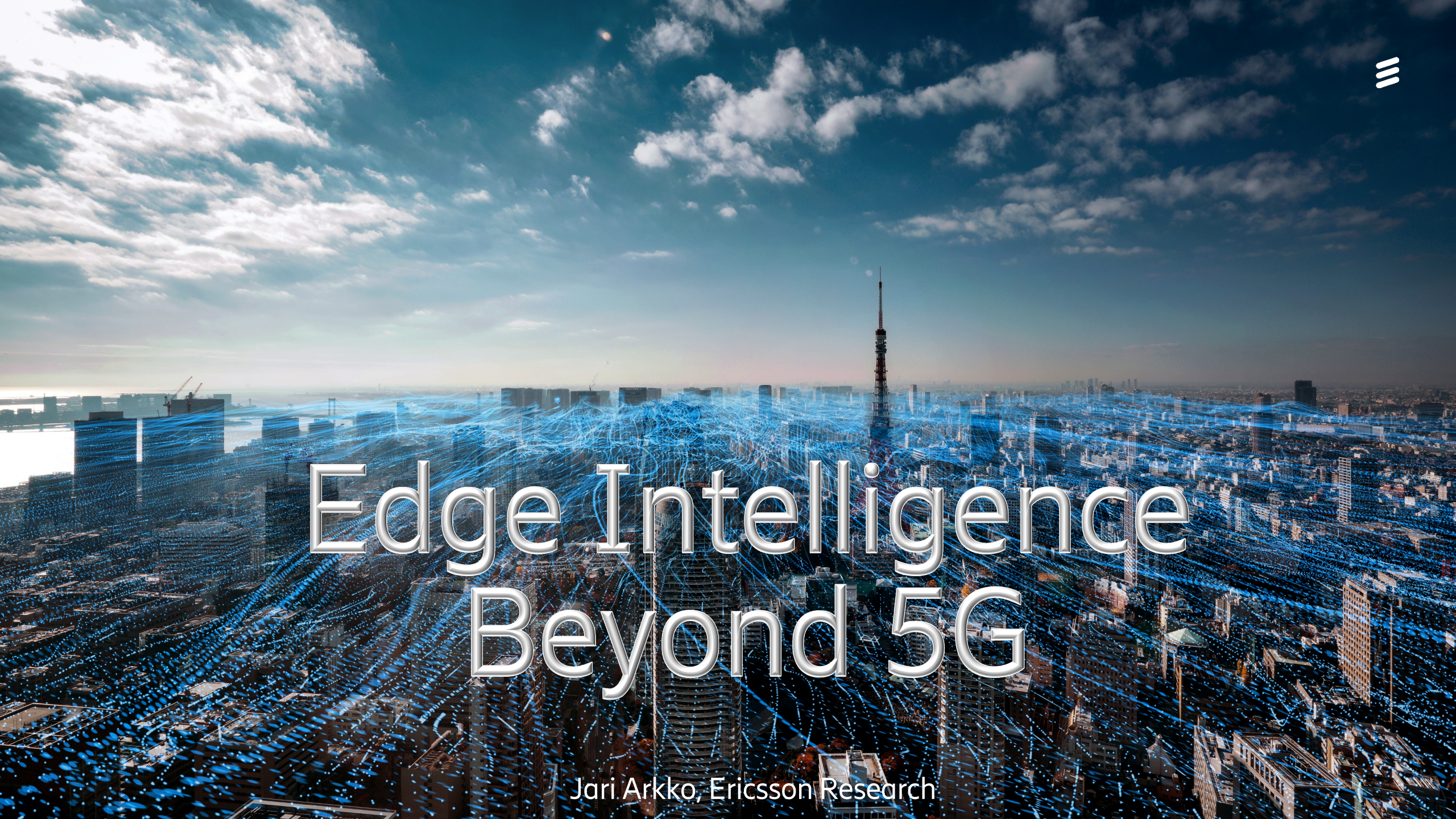


Edge Intelligence Beyond 5G

Jari Arkko, Ericsson Research

Outline

- Today’s situation
- Drivers for future networks
- Expectations for edge intelligence beyond 5G
- Some more “far out” ideas
- Summary

Edge & intelligence – where are we today?

Quick growth of 5G network deployments

Massive demand for capacity, fast networking, and low latency

The use of networking and cloud services in new applications

- Including many critical ones

Increasingly distributed compute and CDN platforms

- Perhaps more growth of global platforms than the use of federated local systems

Rapid growth in the use of AI-technologies in almost all fields

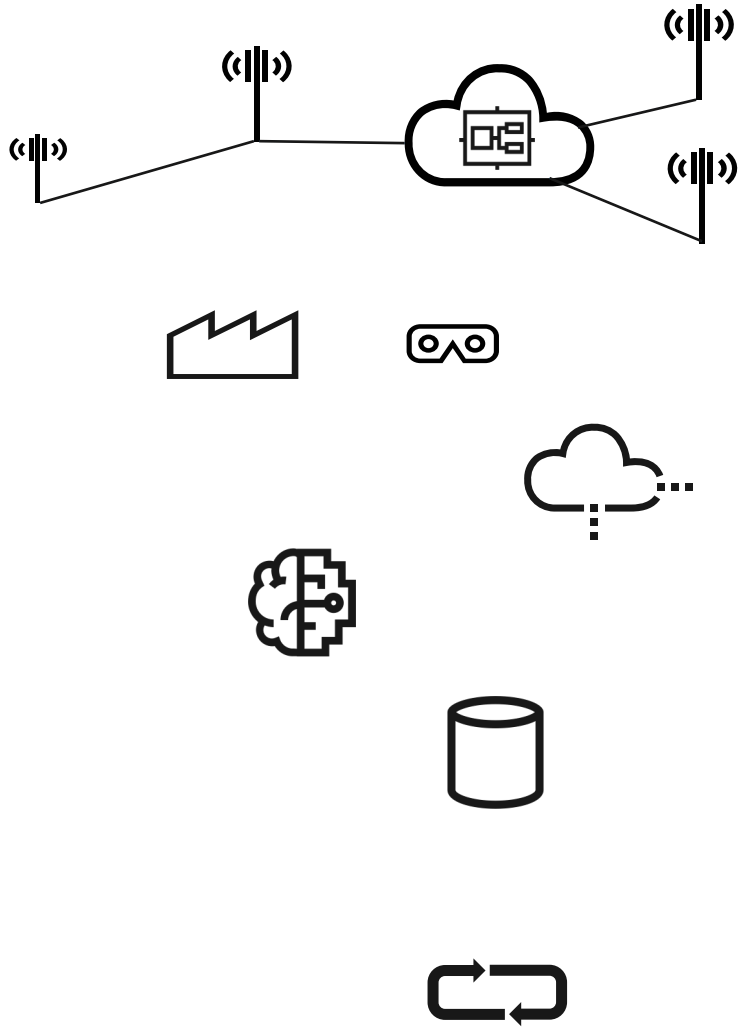
- Use cases largely within specific applications provided by a single entity

Increased role of data in most applications and systems

- Which has also led to some negative privacy effects

First steps in using AI for automation and cost-efficiency in networks

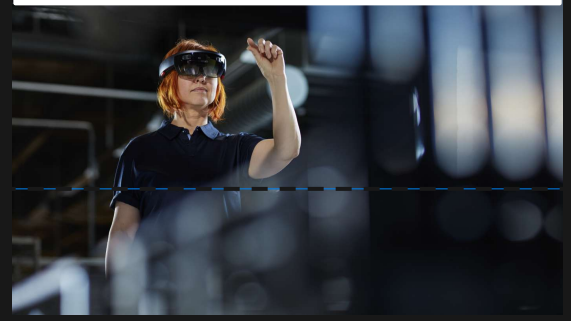
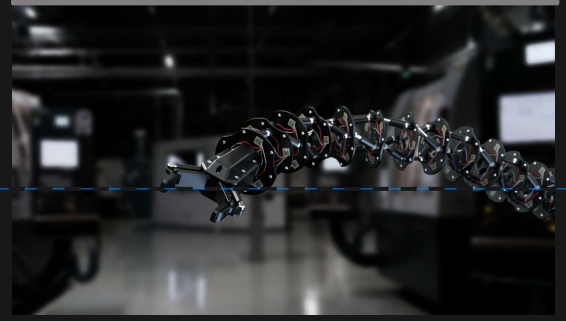
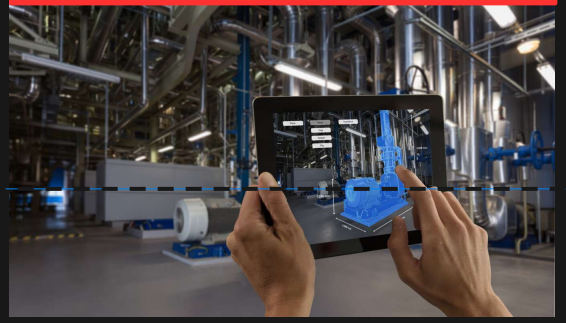
- Data sharing mechanisms, specific use cases, management systems, automation, …
- A lot of drive in the ecosystem for going further



Beyond 5G drivers and use cases

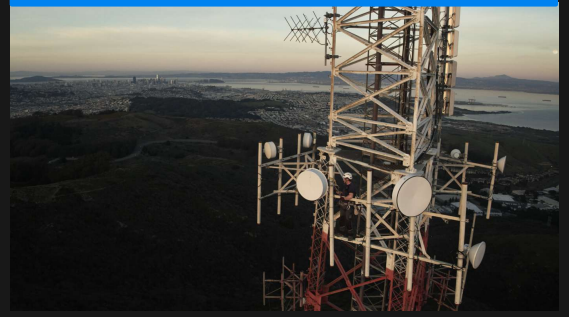
Trustworthiness	Sustainable world
Application demands	Simplified life

Use-case scenarios

The Internet of Senses	Connected Intelligent Machines	Digitalized & programmable physical world
		

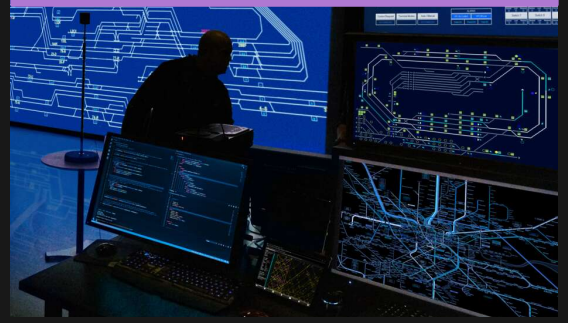
Technology evolution beyond 5G

Limitless connectivity



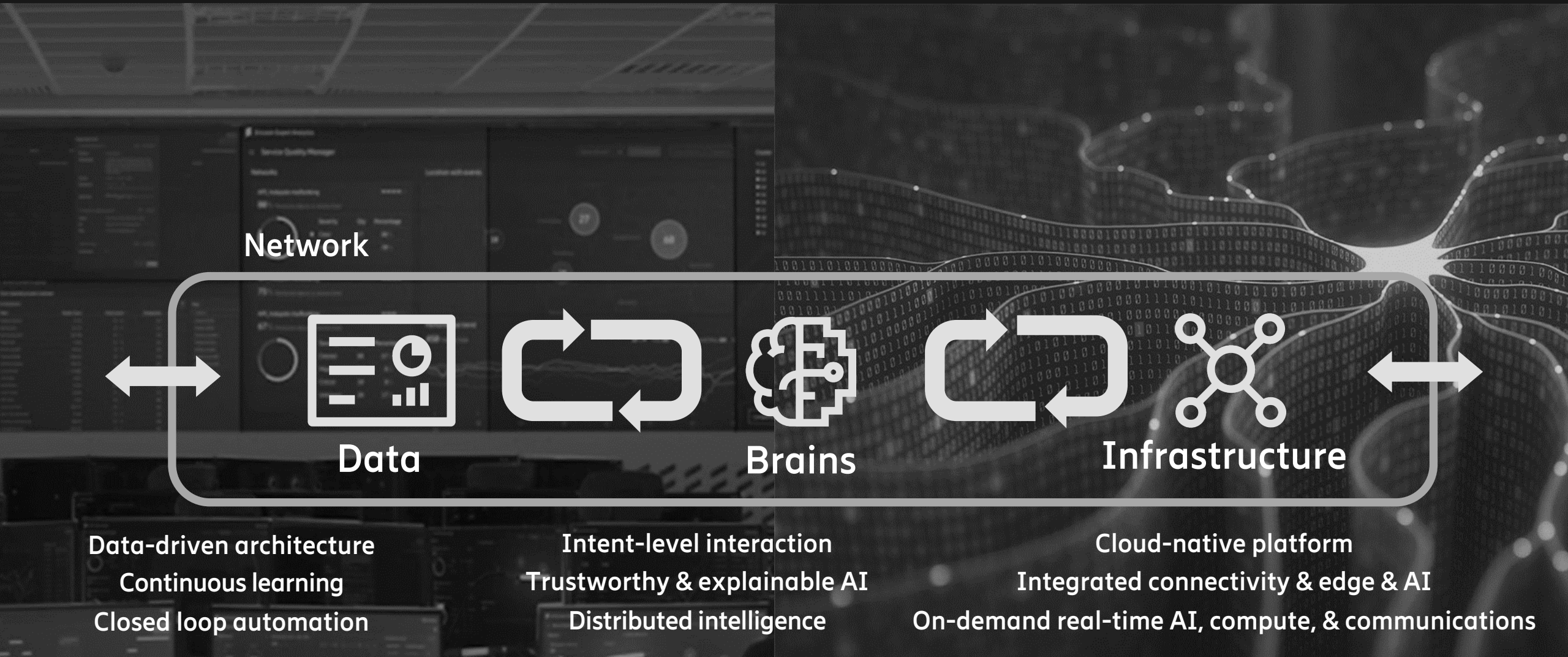
Trustworthy Systems

Cognitive network



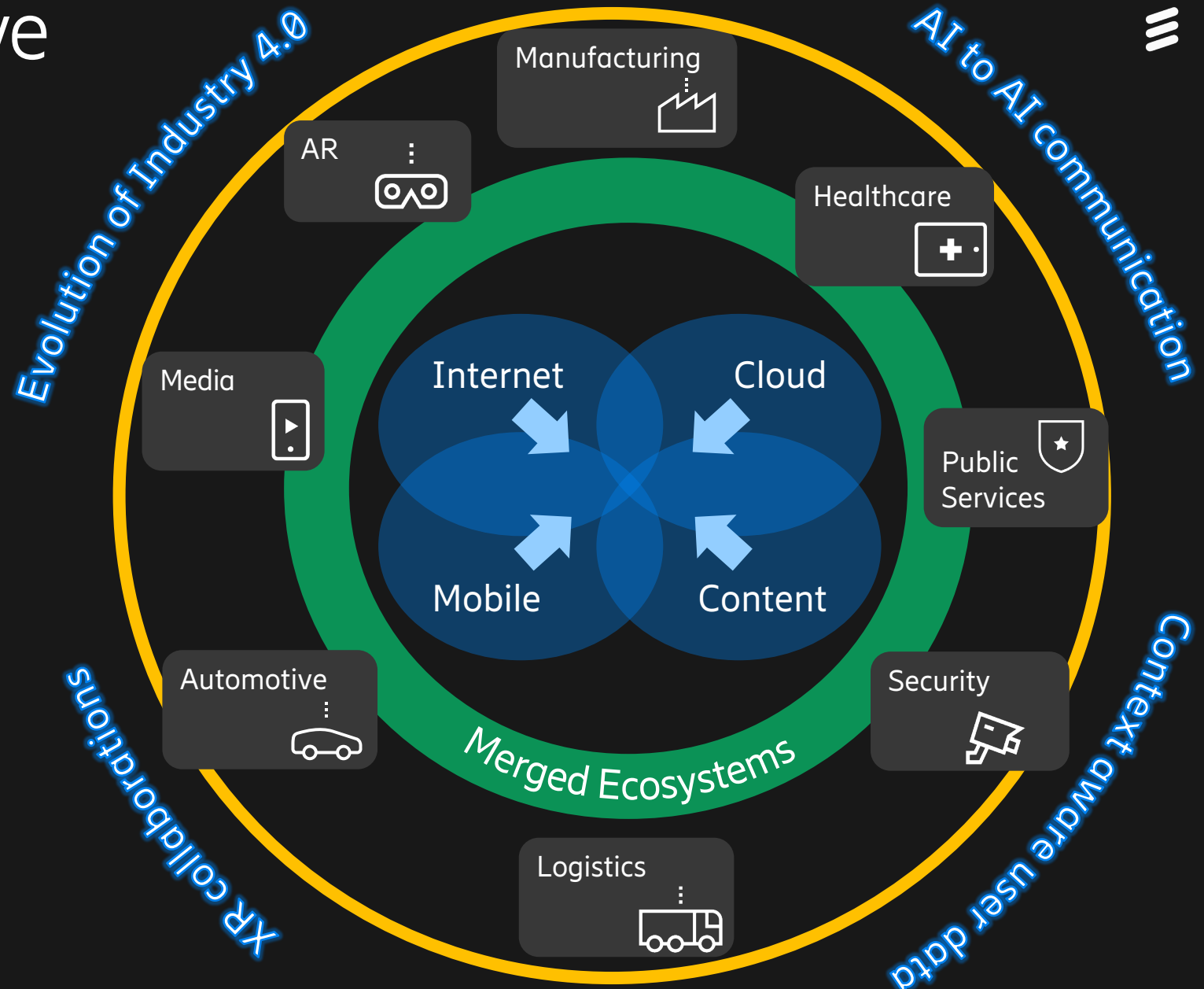
Network compute fabric

Cognitive networks



The new collaborative reality

- Old ecosystems merge
- World-wide system of interconnected components
- Hard to separate the original ecosystems
- **6G plays a key role in this new reality**



Intelligence & ideas for new applications

Joint communication and sensing

Sensing functionality as an integrated part of the communication network

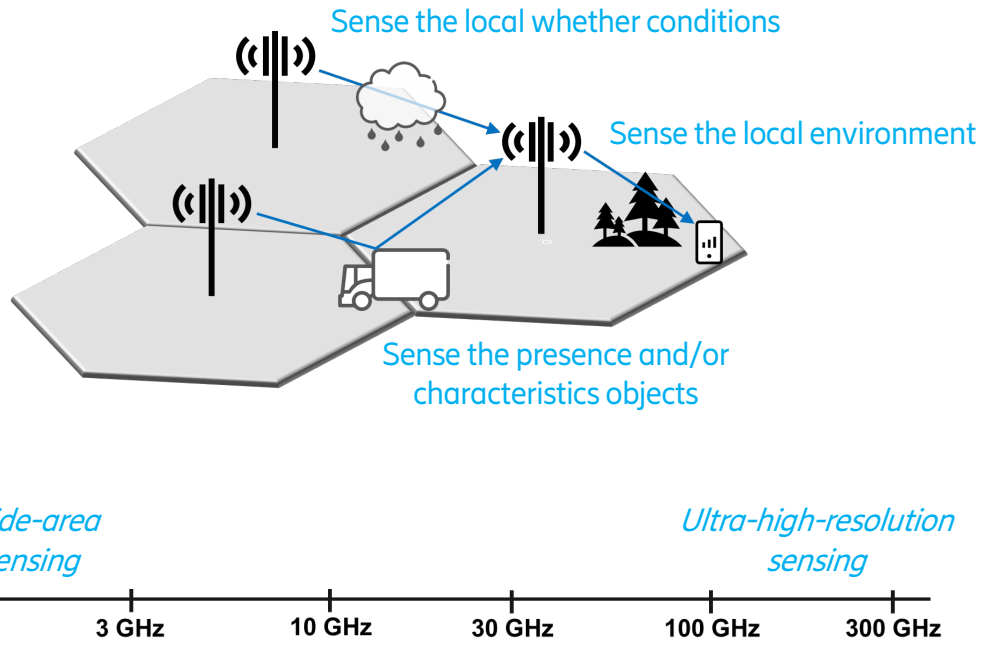
- Higher frequency communications allow sensing the environment
- "Each blockage of a communication link is a sensing opportunity"*

Traffic safety, site surveillance, environment, …

Needs (local) intelligence to recognize what various sensing observations mean (e.g., car, pedestrian, animal, …)

Needs a new way to convey results to applications

- Different from today's PDP contexts, tunnels, bit pipes

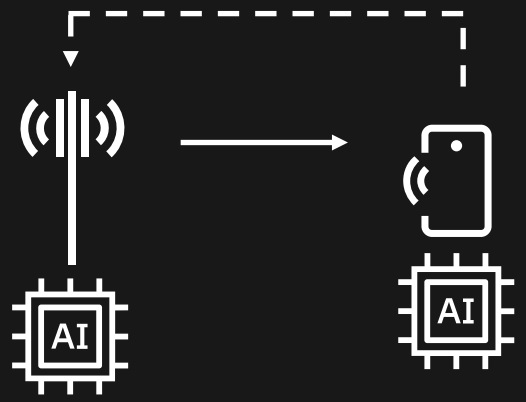


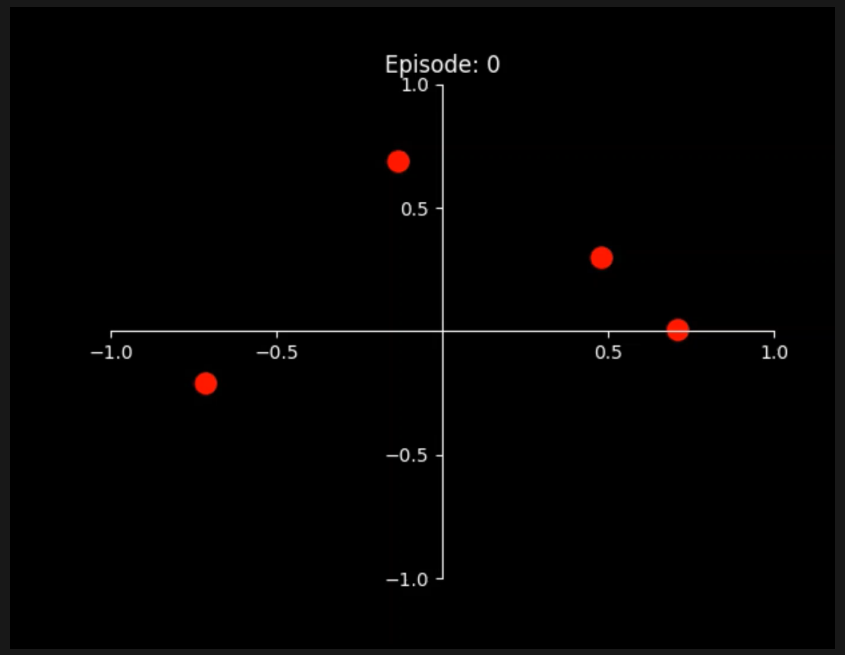
*) Chaccour et al: Seven Defining Features of Terahertz (THz) Wireless Systems: A Fellowship of Communication and Sensing

Intelligence & ideas for new applications

Artificial intelligence –based radio interfaces

Self learning transmission and reception





Dahlman et al: Artificial Intelligence in Future Evolution of Mobile Communication

O'Shea: An Introduction to Deep Learning for the Physical Layer

Intelligence & ideas for new applications

Collaboration technology

Applications, networks, and cloud platforms exchanging information

- This will not happen unless there are (a) incentives for all parties (b) tech to do it

AI-AI collaboration interfaces, across systems and vendors

Data collection & sharing architectures

- E.g., home and serving operators, or networks and applications

Fluid and seamless use of terminal, network, and cloud computing resources

Summary

AI for the edge & network

AI for the users & applications

Future system architectures are data-oriented

- There's a need for local, edge-based intelligence and for various improvements in machine-learning and AI technology

But what is also needed is

- How do we enable different AI systems interact with each other, in an interoperable manner?
- Can we avoid a situation where all data is collected somewhere and controlled by someone else than the user?
- Understanding new things we can do, not just optimizing old systems (e.g., what can AI do for future 6G sensing capabilities?)