Open networks for the 4th industrial revolution

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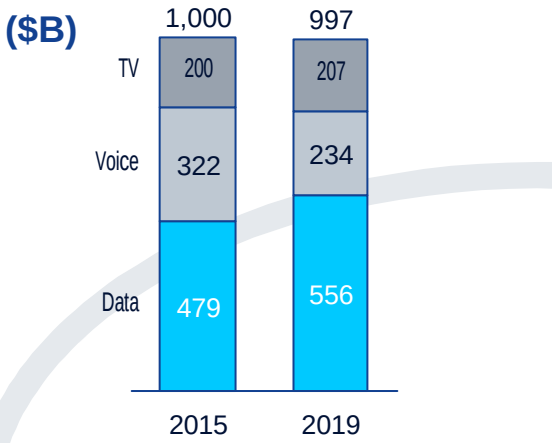
The next growth cycle is driven by an industrial revolution

Traditional CSP service revenues in mature markets* are flat



* Western Europe, Canada, USA, Japan, South Korea, Singapore, Australia, and NZ
Source: Gartner

Value creation lies in novel services where network service performance is critical

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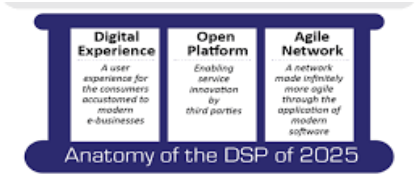
The future of digital service delivery from Digital Service Providers (DSPs)

Future DSP

- Digital experience: broad array of new services that combine cloud services and network resources
- Tailor virtual networks for each use case: latency, bandwidth, security, choice of functions
- Agile network: services are rapidly trialed, deployed & scaled
- Open platform: ecosystem of cloud and network players



Source: Analysys Mason

Implications to standards

- Standards need to cover the end-to-end chain of network, cloud, and services
- Network slicing standards are needed for configuration and assurance
- Standards need to enable automation of decisions and deployment
- Standards must define open interfaces and APIs at the right places in the end-to-end architecture

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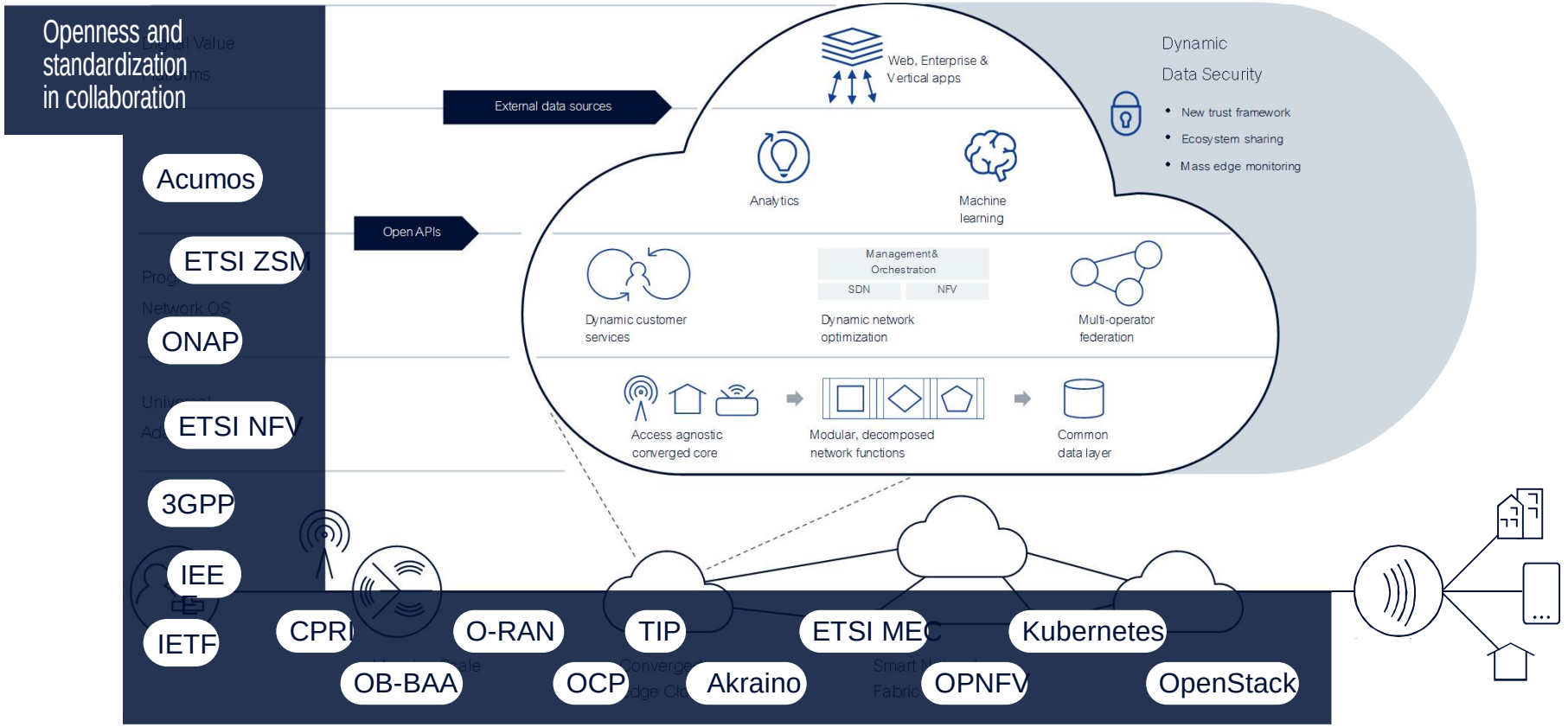
Future X architecture – built on openness



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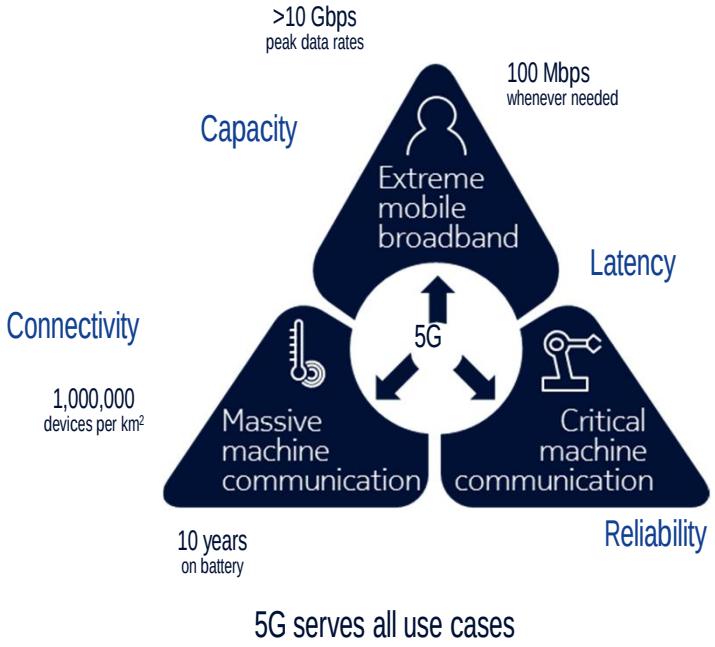
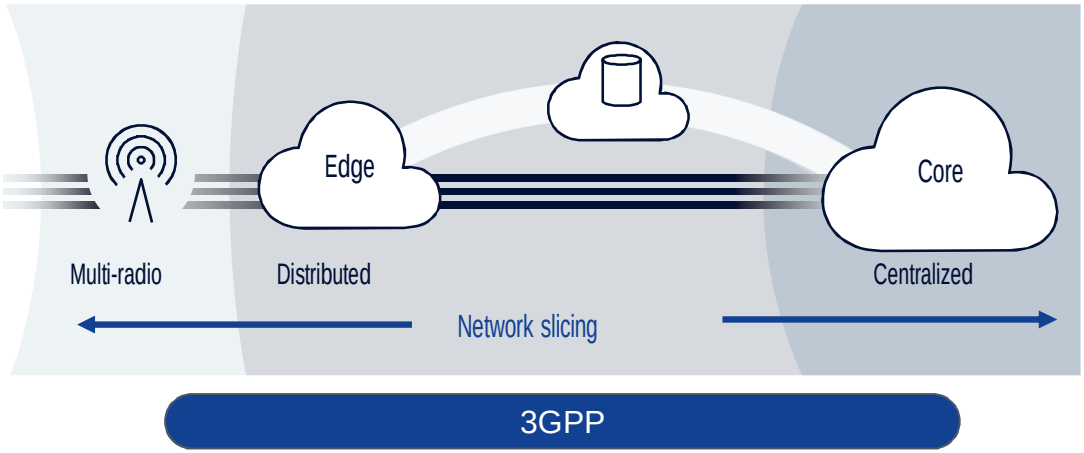
5G is the first network designed to connect everything, in an open and agile way

3GPP is uniquely positioned to deliver the standards as it covers the network E2E





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3GPP for industrial grade networks in next releases

Enhancements for latency and reliability in Radio and E2E

- Higher reliability with multi-connectivity etc.
- Deterministic QoS

Industrial IoT in 5GS and NR

- Support for Wireless Industrial Ethernet and deterministic communications
- High performance, wide area

5G Private Networks in licensed and unlicensed bands

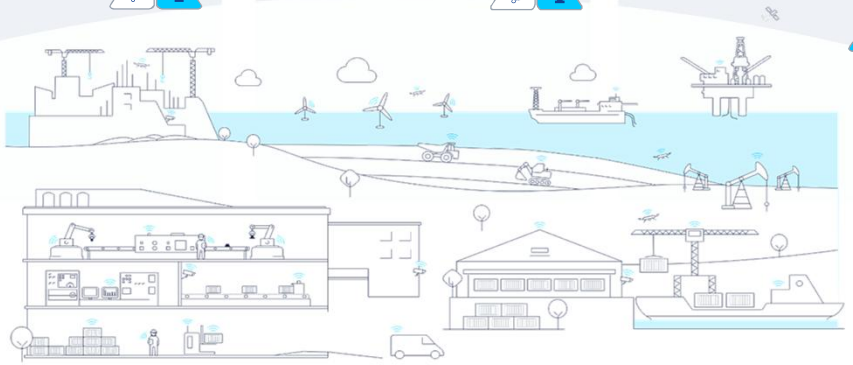
- Enable easy and cost effective deployment of industrial private networks
- High frequency

Positioning for 5G and IoT

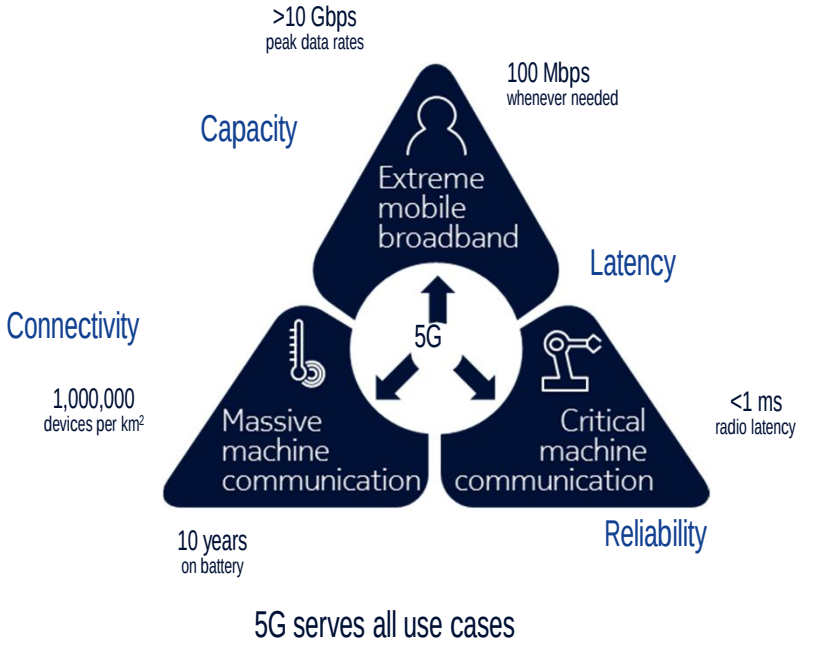
- Positioning with scalable bandwidth and beamforming

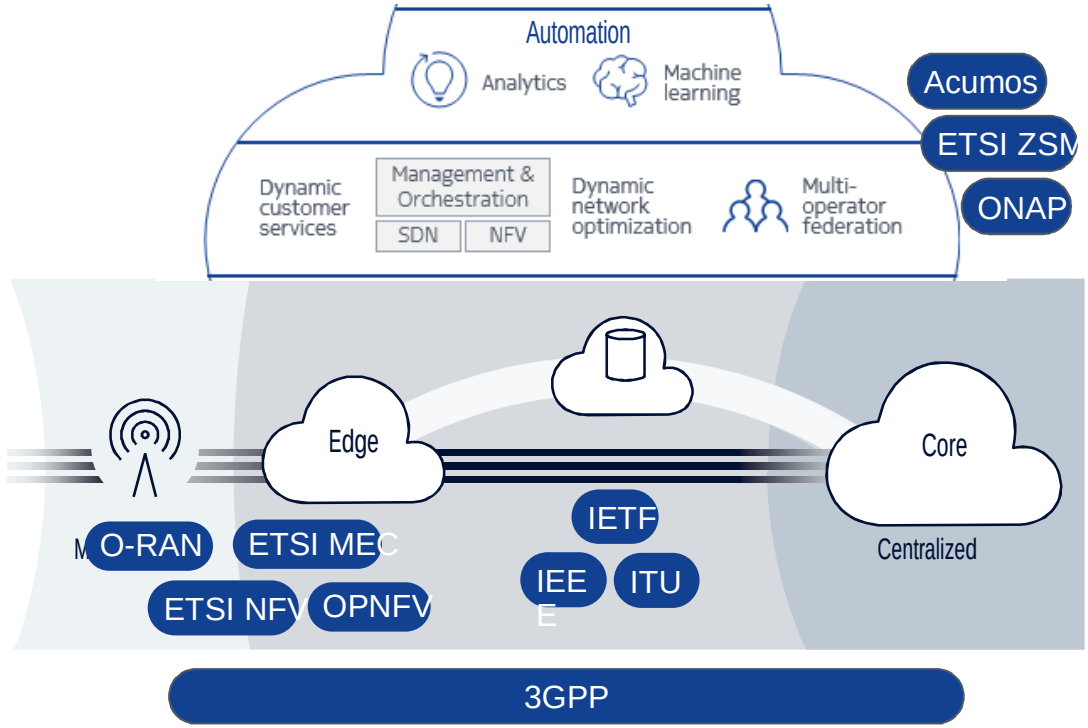
Cellular IoT evolution

- New NR IoT UE categories for uses cases beyond NB-IoT/eMTC
- Multi access



In addition to 3GPP standards we need to define the domains of cloud, transport, control, and automation





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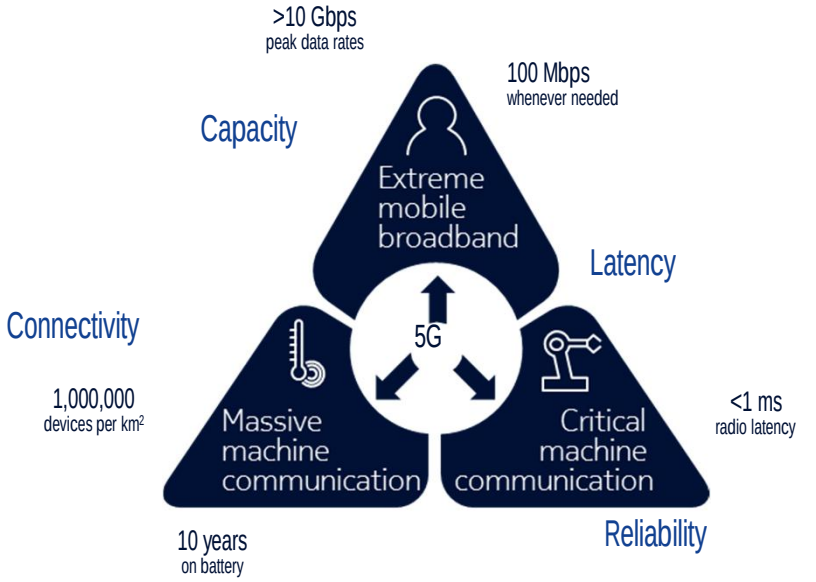
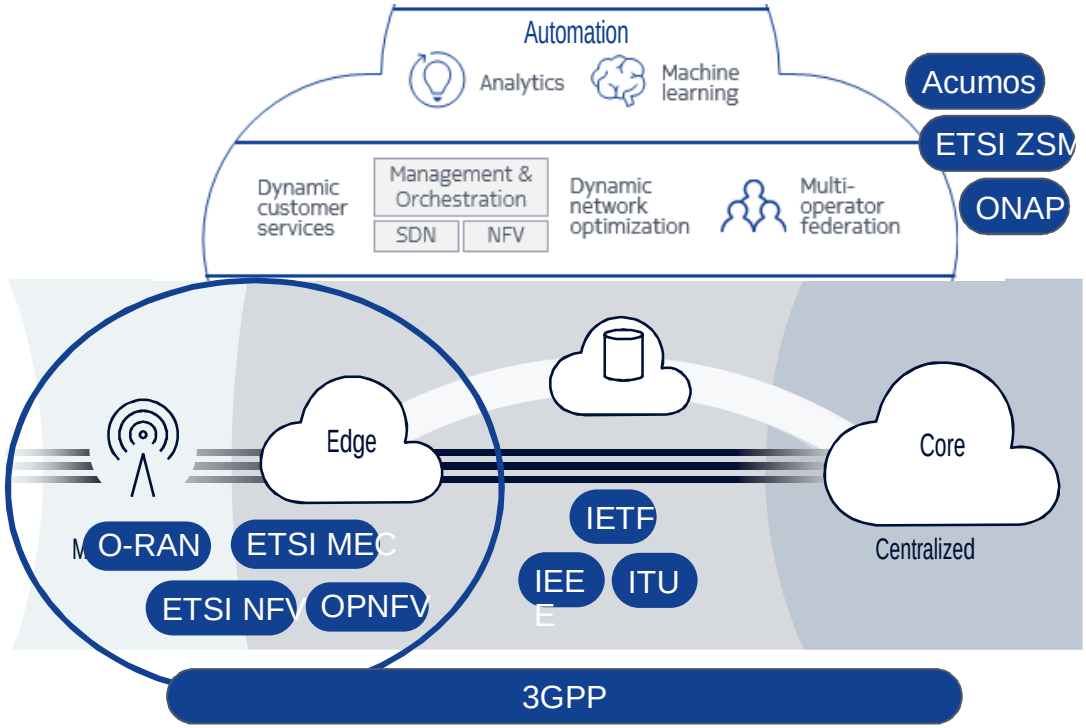
The network edge is going through a major architectural change





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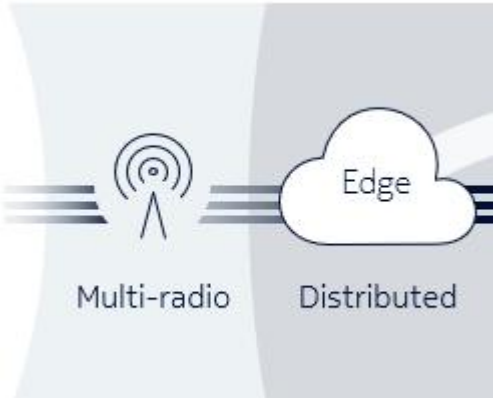
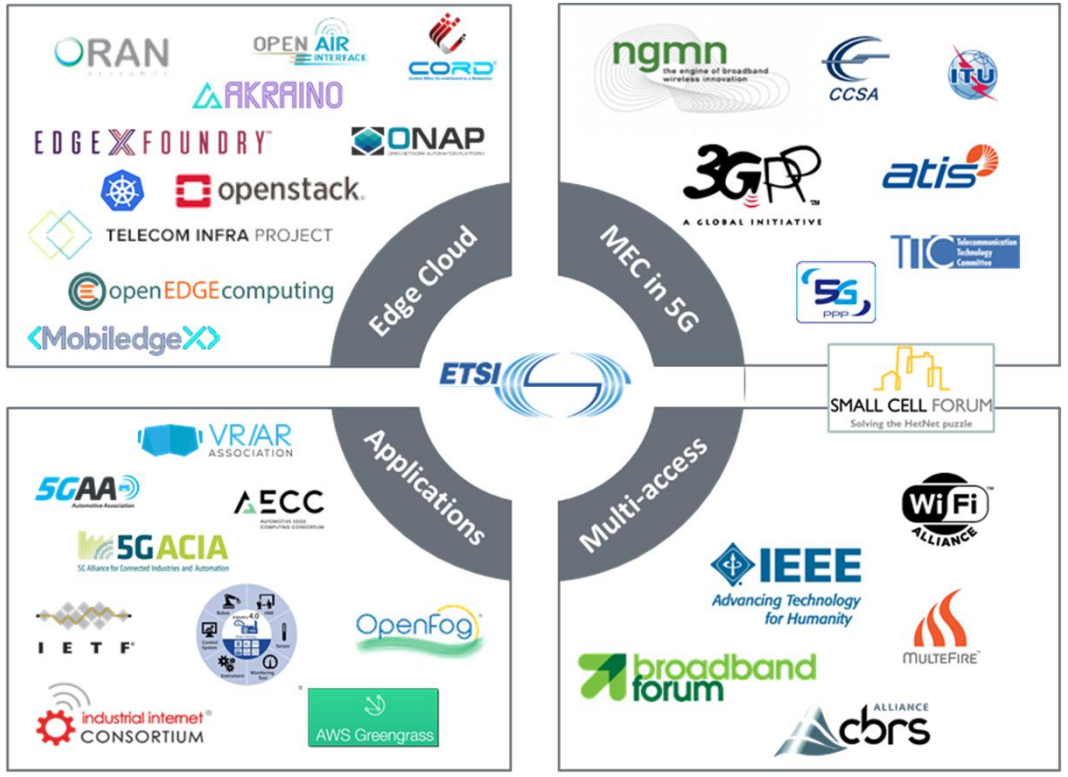
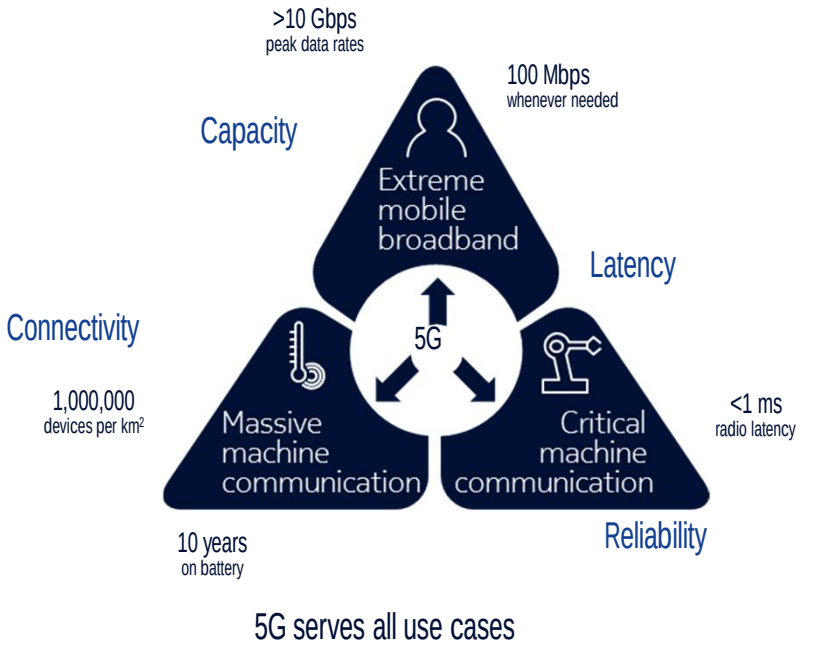
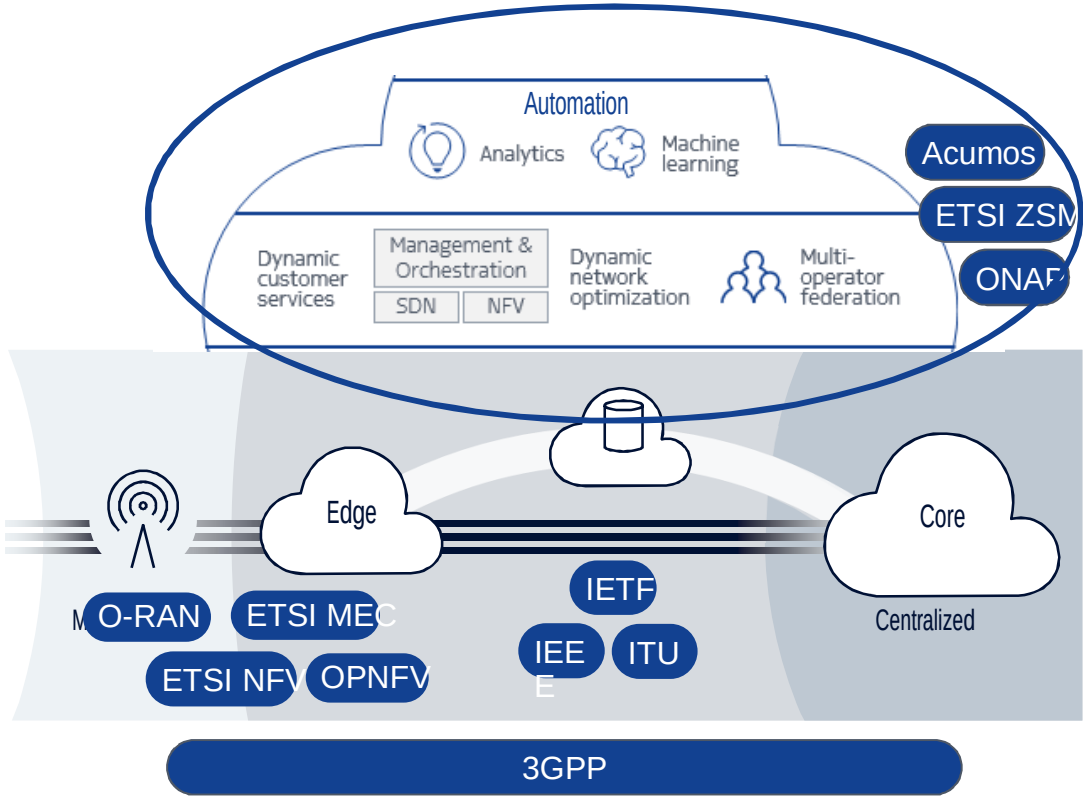
Industry Landscape around the edge – from cloud infrastructure to applications





Orchestration and management are critical for E2E control and agility





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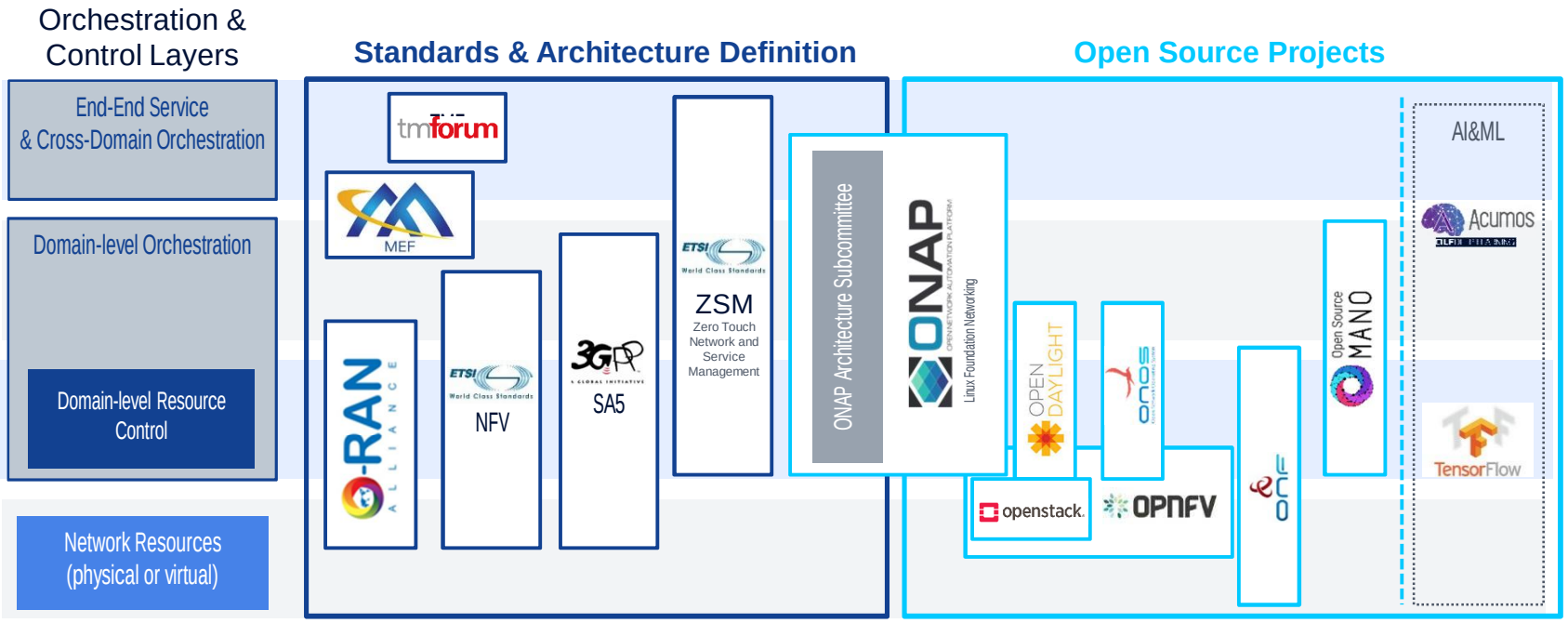
Orchestration, control, and automation are going through a major transformation



ONAP and ZSM are key initiatives for E2E automation

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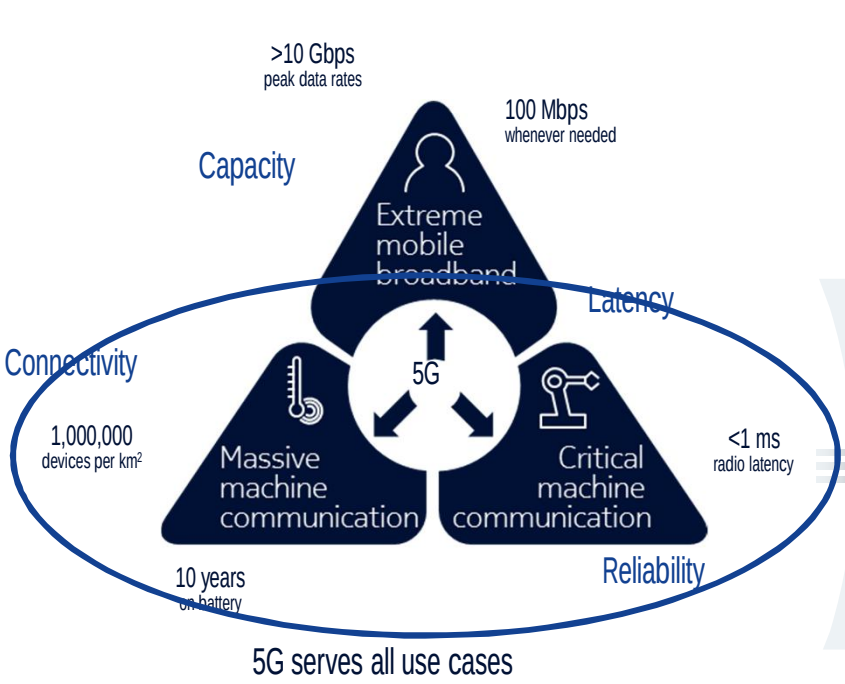
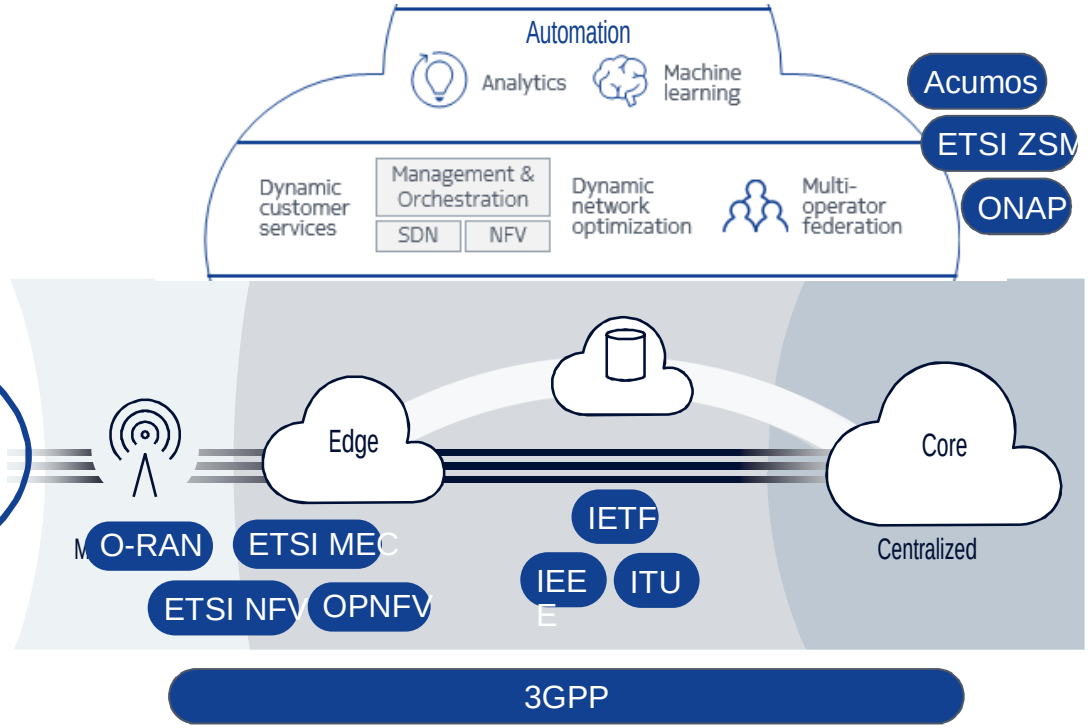
We need more than network standards to enable new IoT use cases





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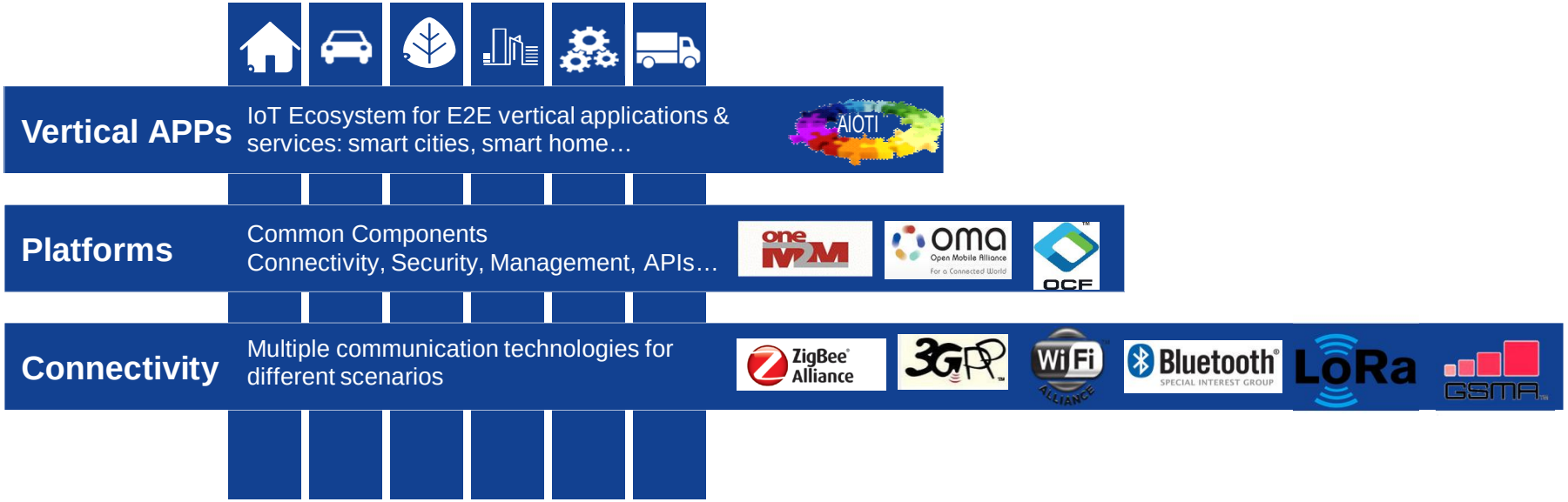
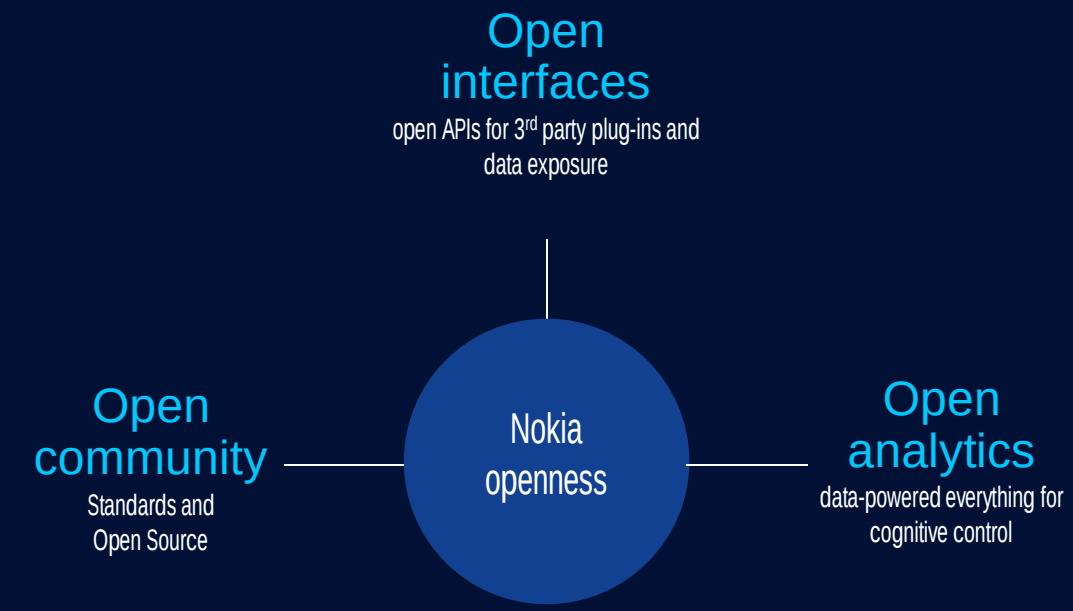
A vertical view, what is needed to enable IoT applications

- ü Deep, vertical-specific insights
- ü Interoperability and open interfaces
- ü Cooperation cross industries
- ü Industrial implementation: open source



Always open

Delivering on 5G promises

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