IETF - Lunch Series (5G Impact on Networks - Edge Cloud and Slicing)

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What is driving the network requirements?

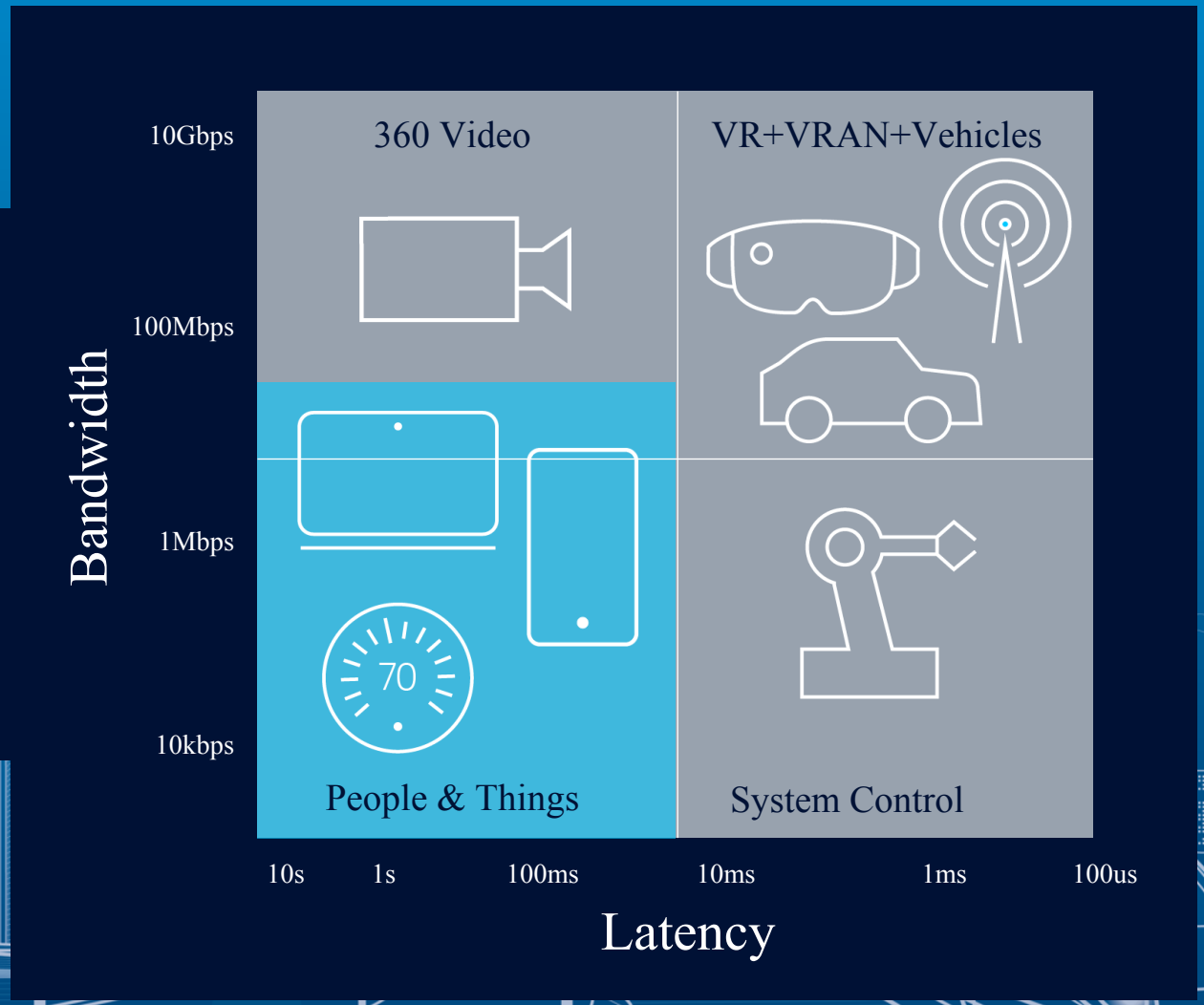
Application, people and things

Service Experience

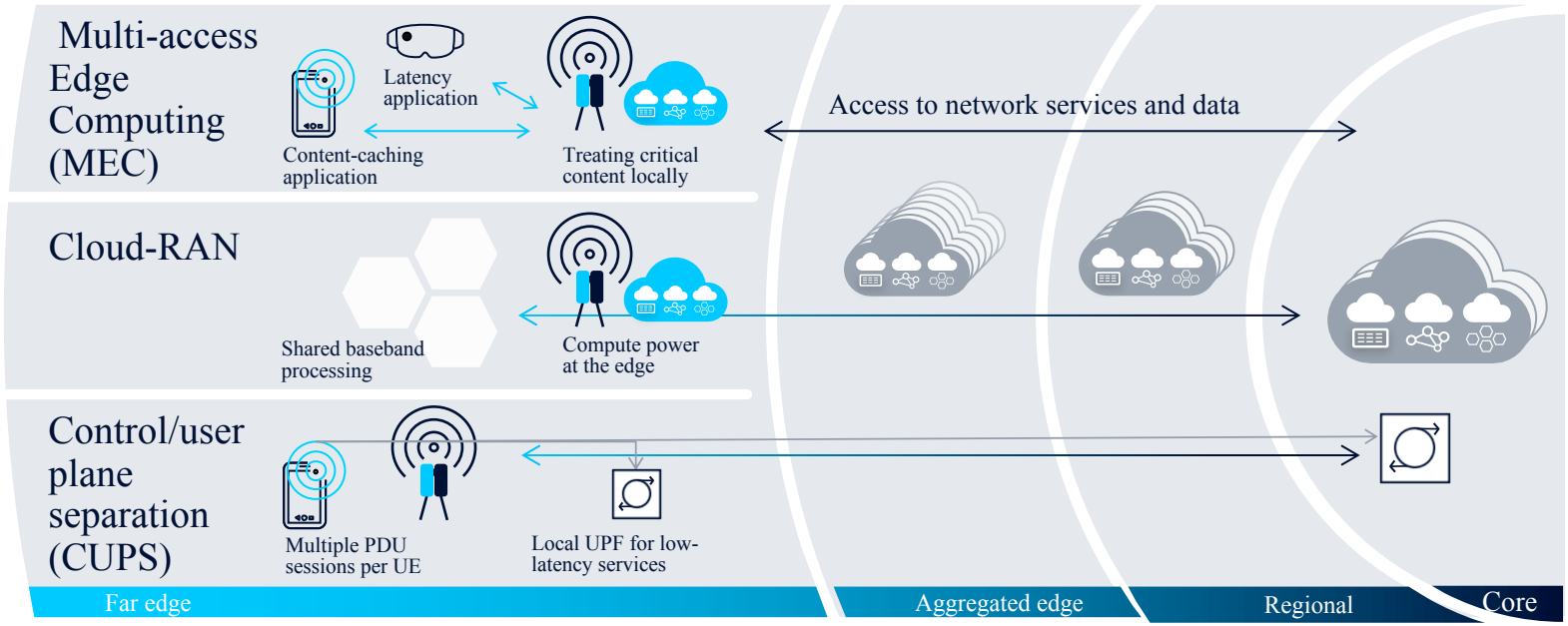
Massive broadband

Industry 4.0

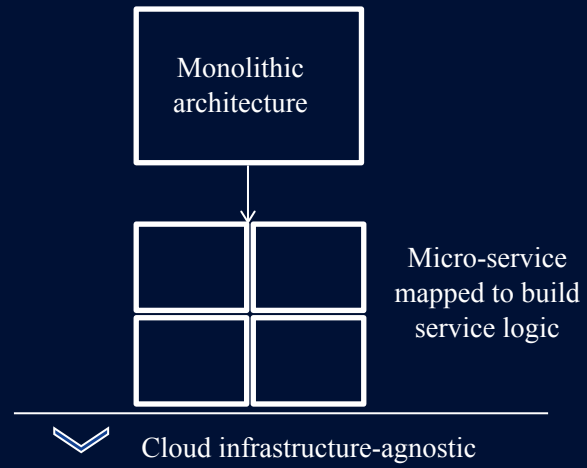
IoT



Services and workloads evolve



Workloads evolution

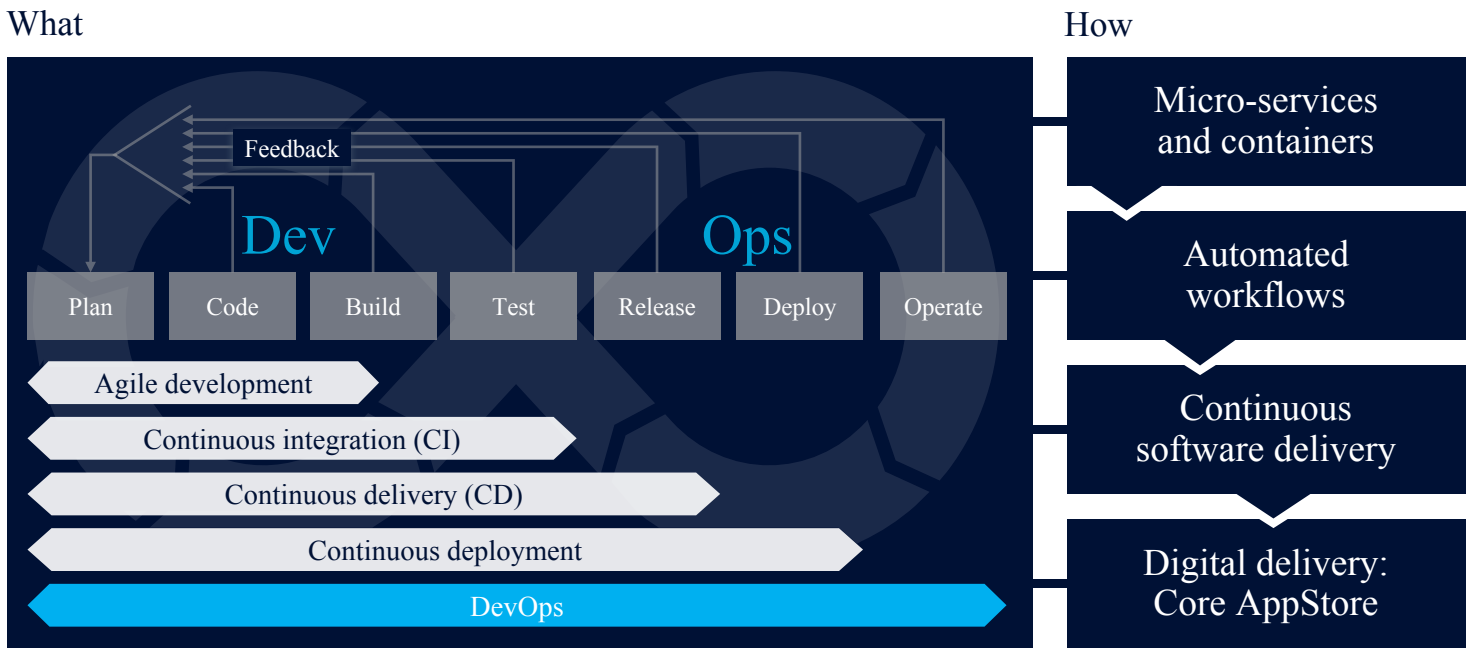


Workloads evolve

1. From bare-metal to VM
2. to container in VM
3. to container in BM
4. to functions/processors/instructions

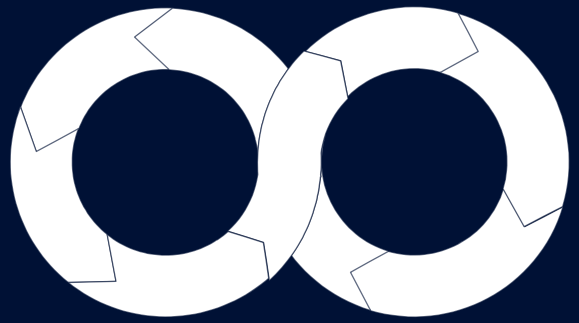
Operations and life-cycles evolve

Radically reduce cycle time for higher value capture and faster time-to-market



DevOps

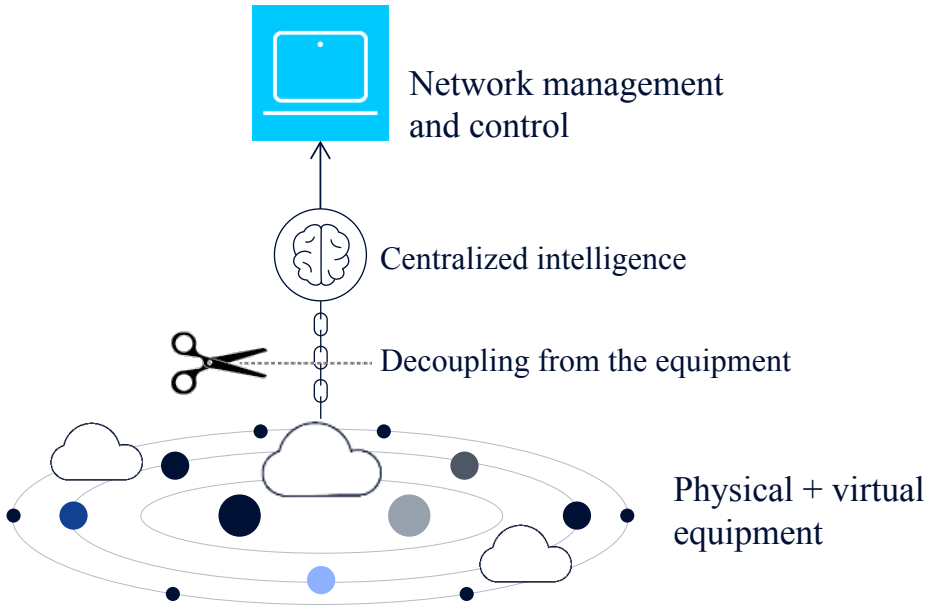
Methodologies and processes for business agility



1. Up to 10x fewer network failures
2. Up to 10x faster time-to-market
3. Up to 10X operational efficiencies

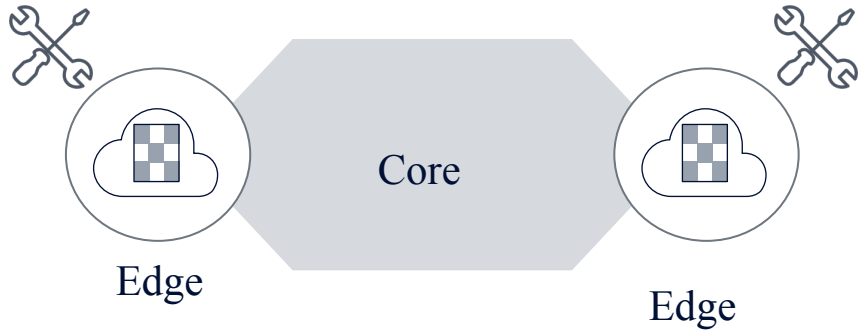
How do we deal with all of this?
Let’s take a step back – key principles

Principle 1



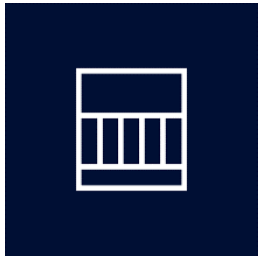
Transport – service decoupling

Principle 2



Provision the edge and don’t touch the core

What is an Edge?



Leaf switch

PE
BNG
User Plane
DC-GW

Peering

Packet core
vBNG
User Plane

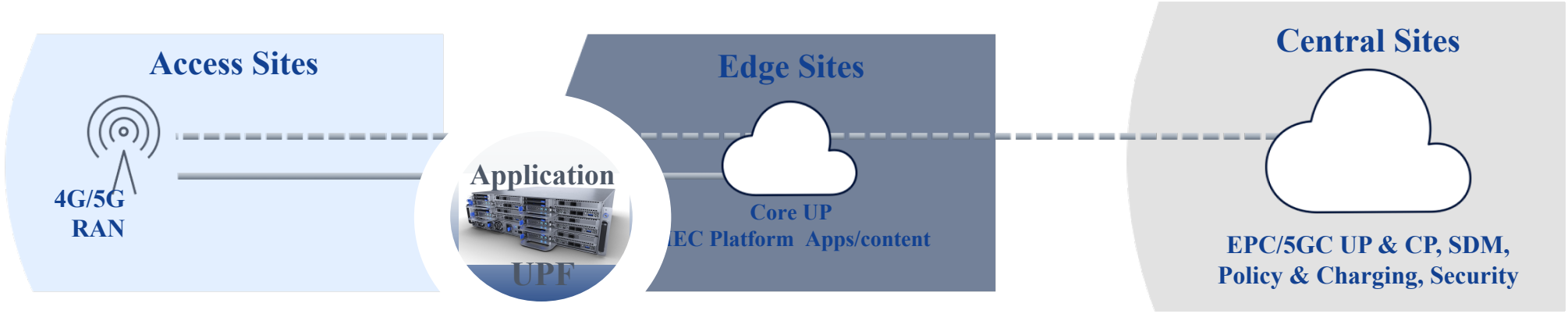
Cloud RAN
Cloud Access

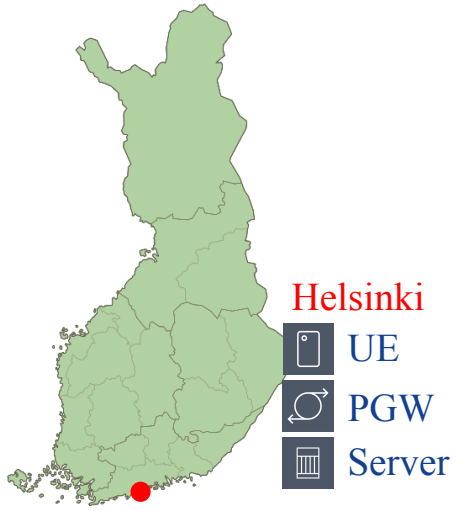
vswitch

Physical

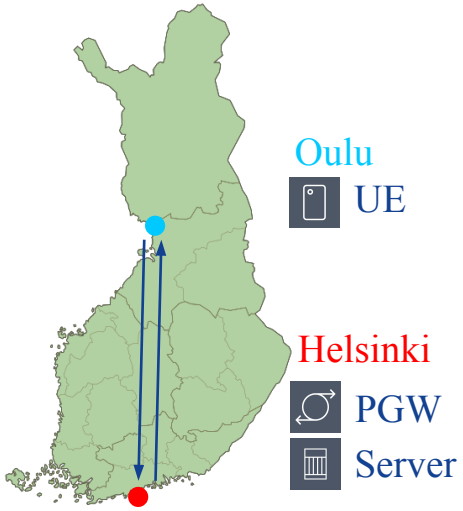
Virtual

Where is the Edge?
Central or distributed ?

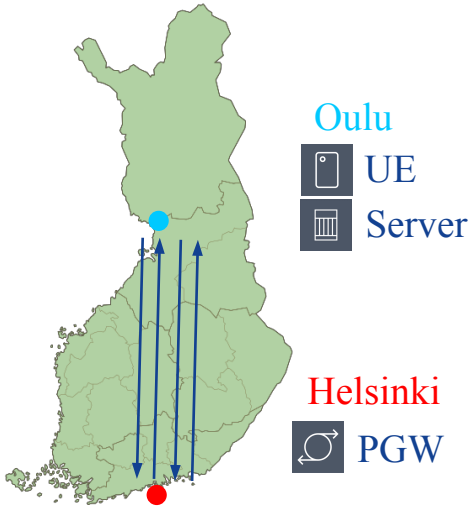




Ping/RTT 11 ms

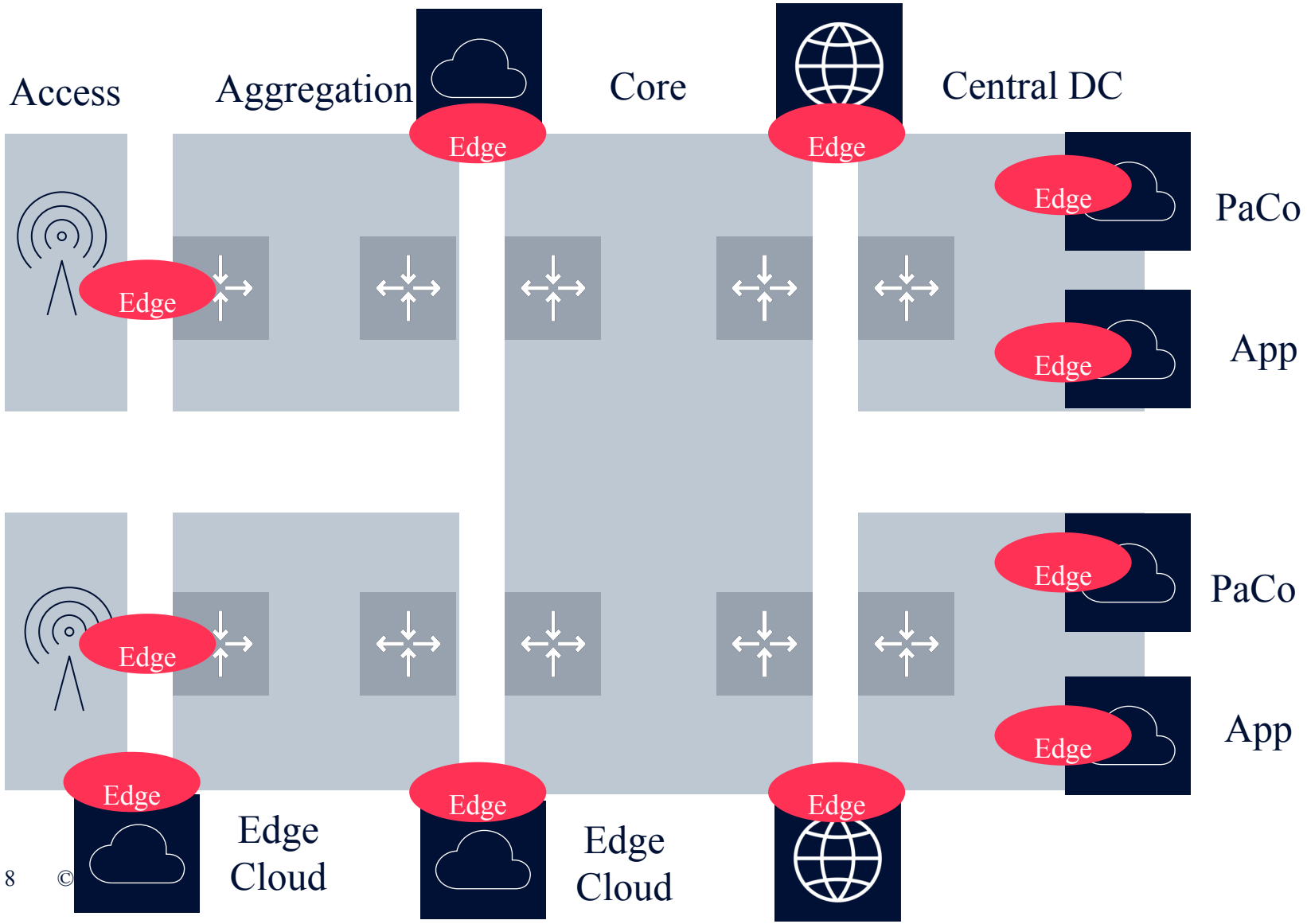


Ping/RTT 20 ms



Ping/RTT 29 ms

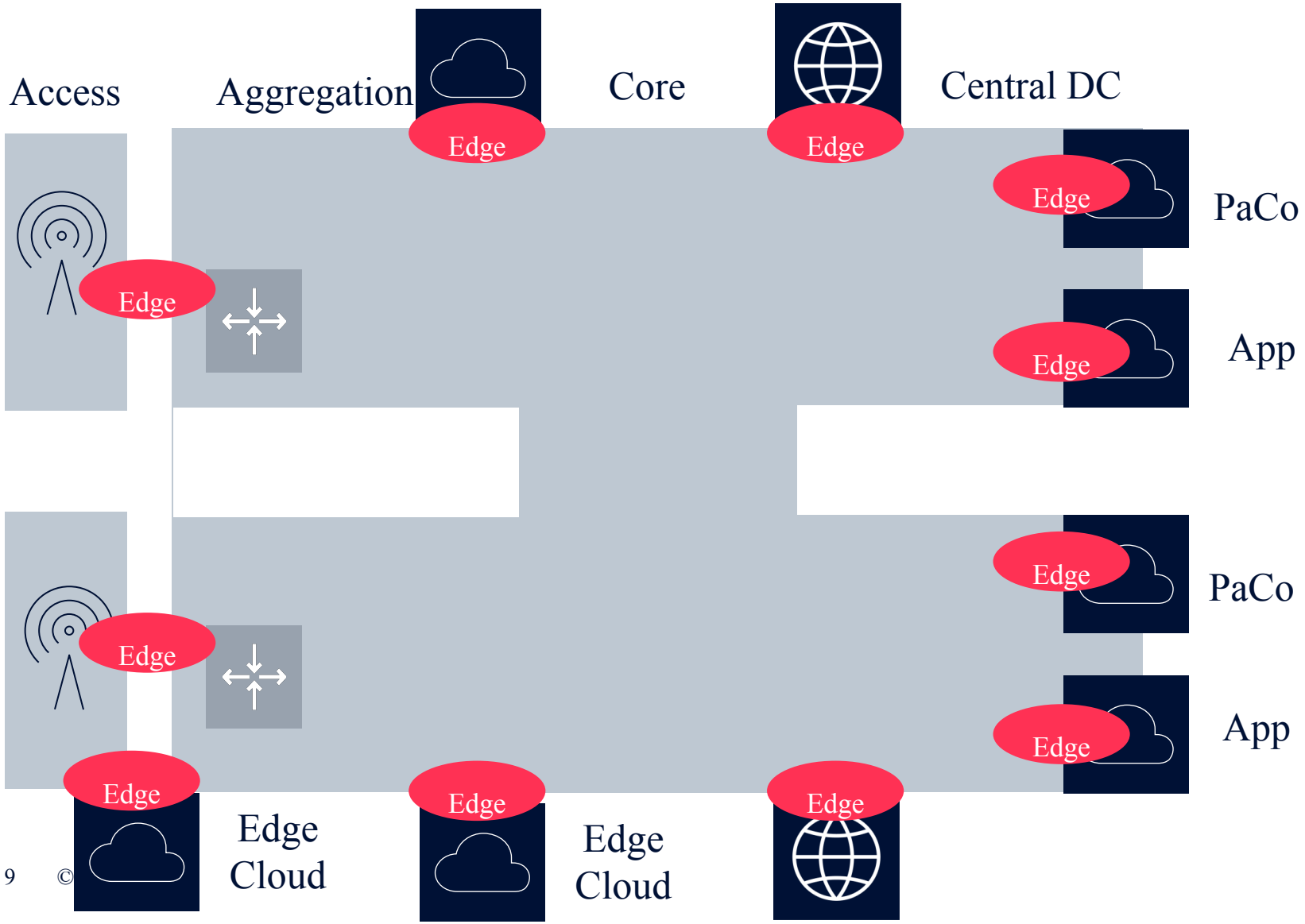
Let's look at the network?



Observations

- **Many touch points**
  - Different workloads – physical/virtual
  - How to provide a dynamic service in such environment
  - How to optimize the service in this environment
  - How to provide an E2E view of the service in this environment
  - How to handle insight driven automation

Introducing NFIX



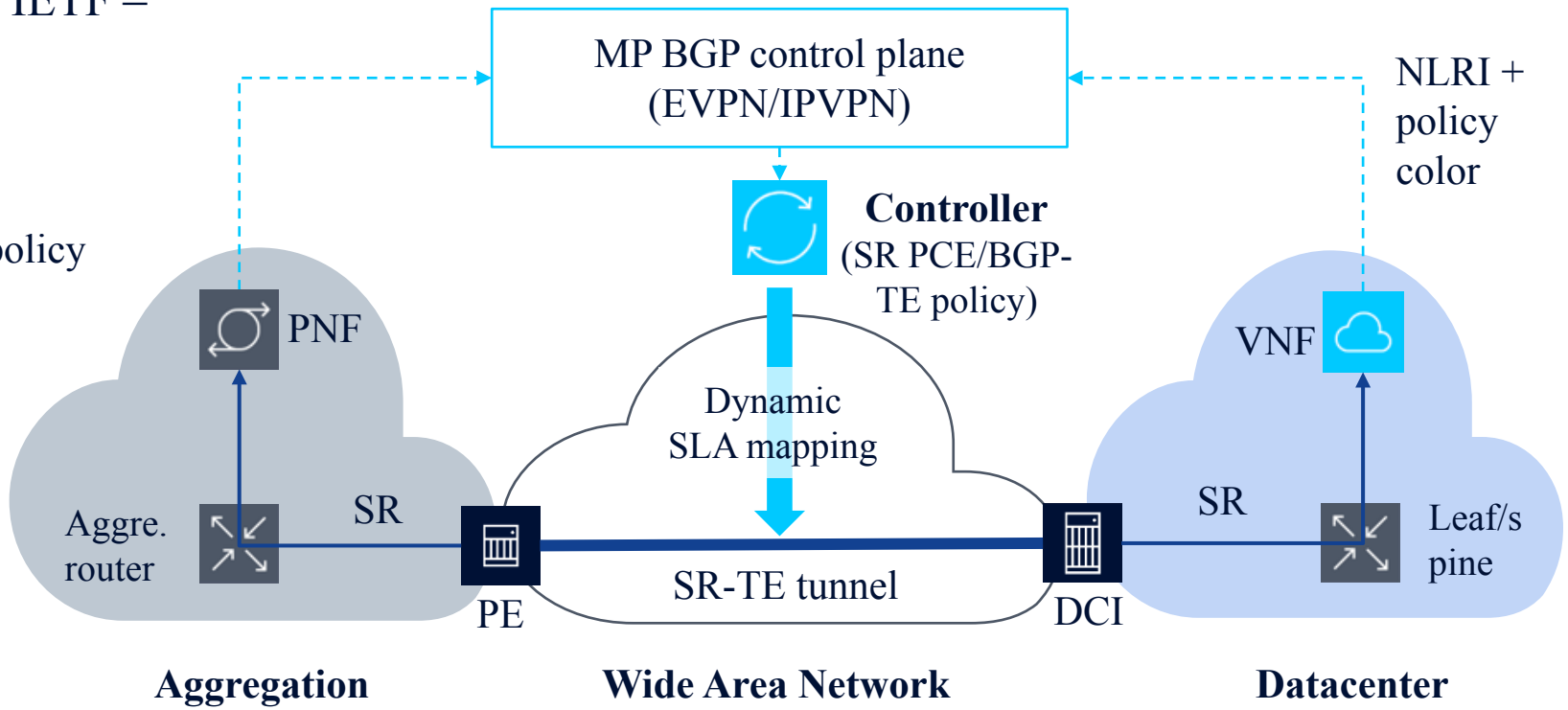
An IP fabric with an API

- Built on the basis of seamless MPLS
- Provision the edge, don't touch the core
  - Edge: pNF, vNF, cNF, etc
- SLA/KPI represented by network instruction set (segment routing)
- Central control through an API to provision services provide fabric insights, measure KPI(s), optimize when needed, etc
  - Day-1/2 operation

NF-IX: Network Functions Interconnect Architecture
Cloud-speed service provisioning with guaranteed SLAs

Build on Open standards build in IETF – evolution from seamless MPLS

- MP-BGP control plane for IP/Ethernet VPNs
- Segment Routing – PCEP/SR-TE policy
- Service chaining
- Netconf/GRPC – Yang
- Telemetry



Any service interconnect with guaranteed SLA(s)

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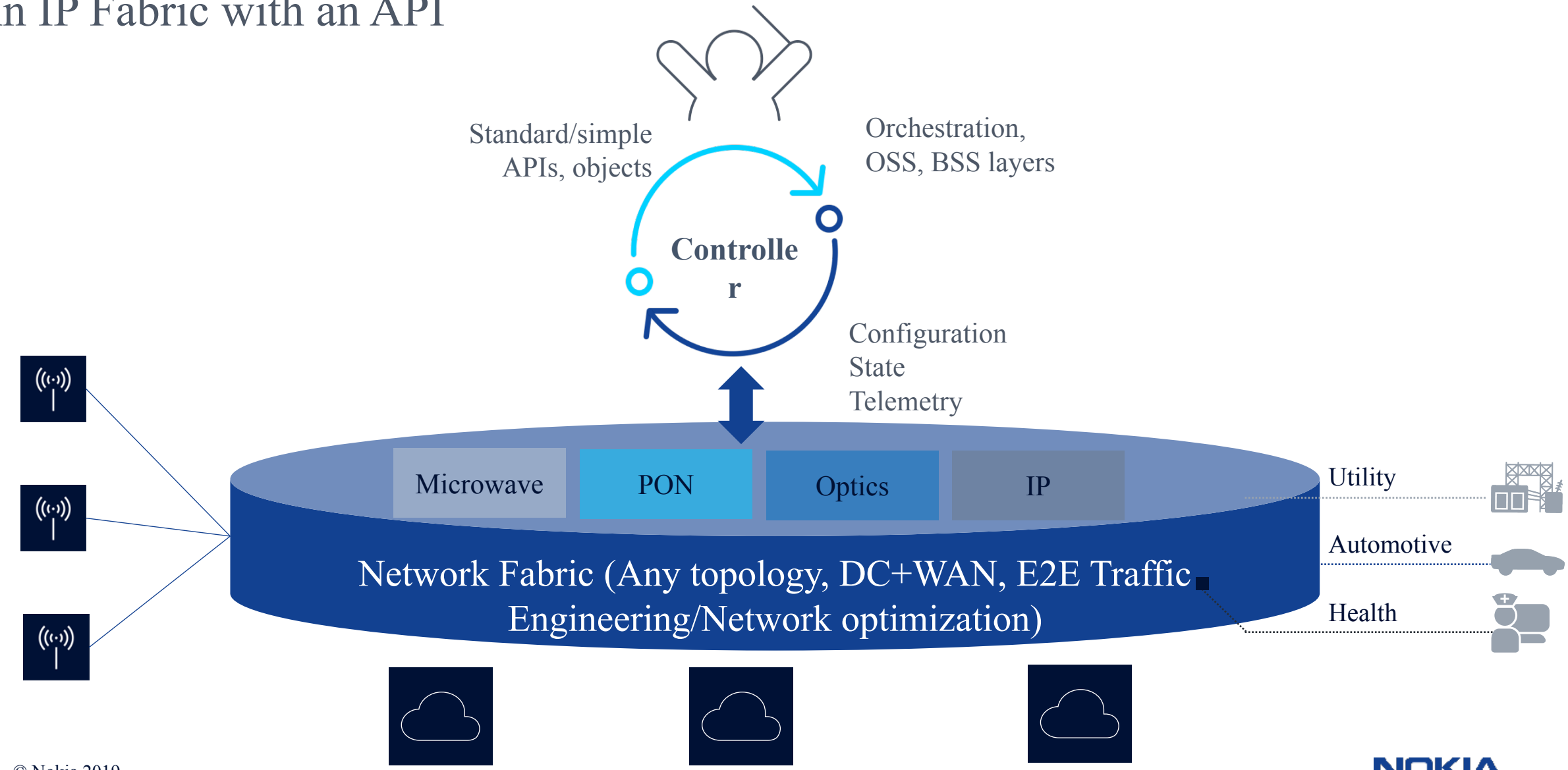
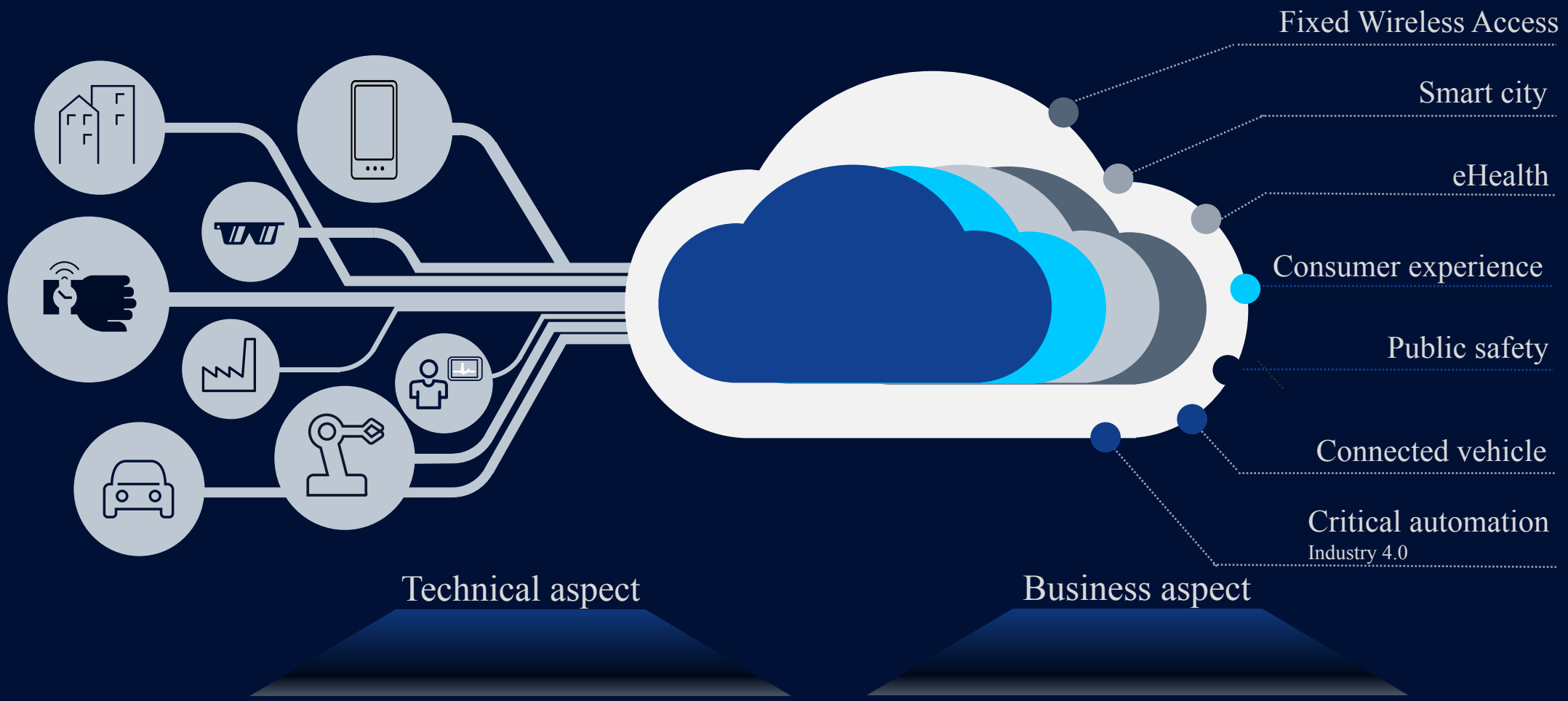
NF-IX: Network Functions Interconnect Architecture

An IP Fabric with an API

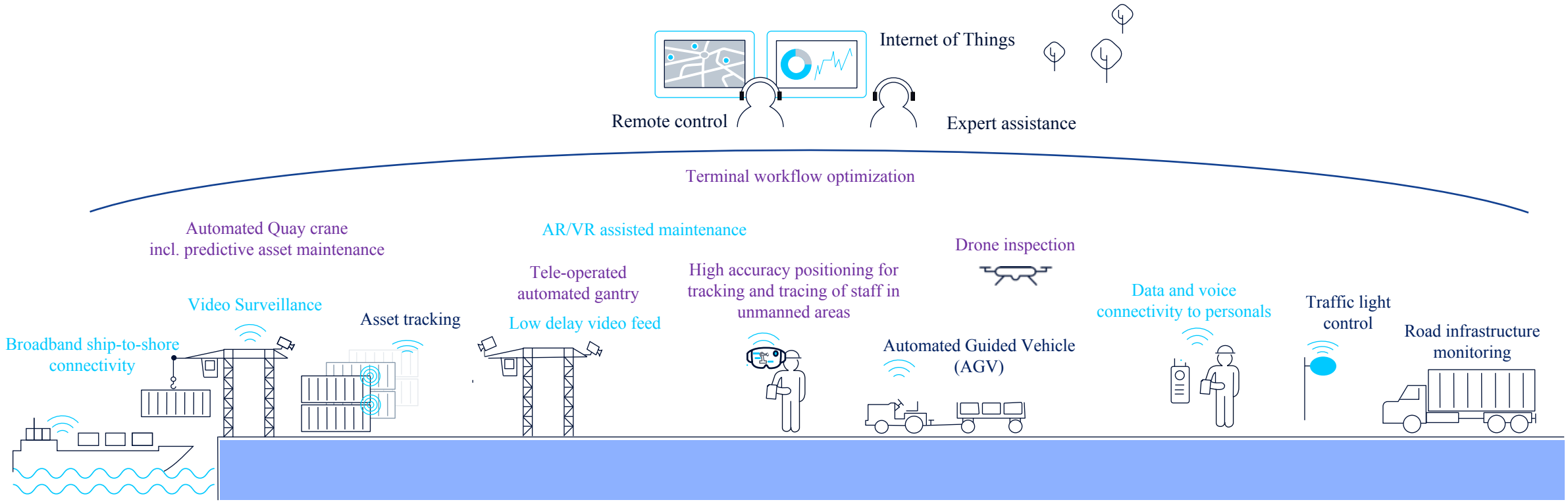


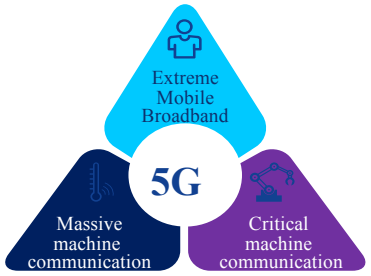
5G Business Drivers & Applications



Using a set of E2E features to cost-effectively tailor network capabilities for a specific service

Example: Ports - Leveraging technology to enhance productivity





Challenges by 2025

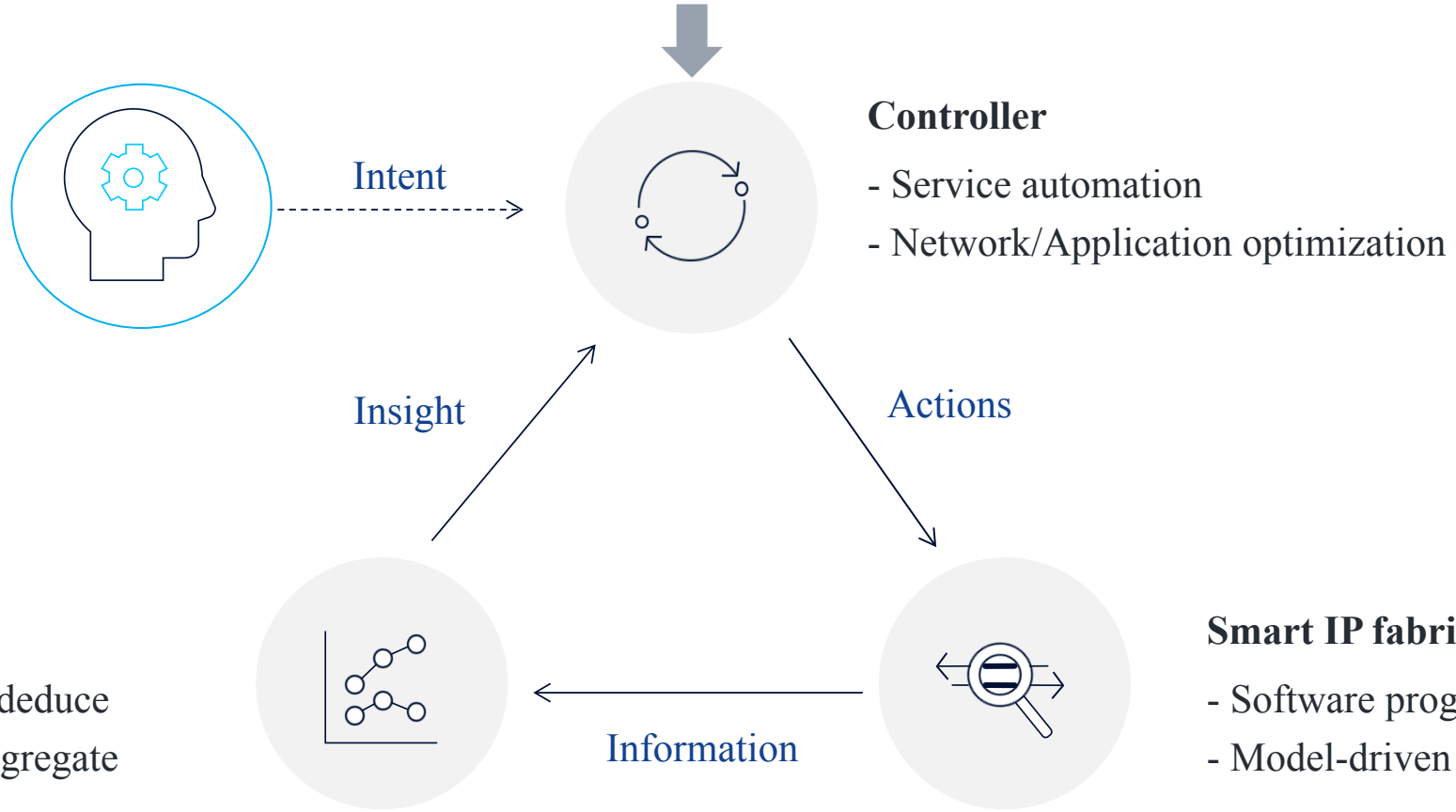
- 18 Million containers per year
- Several 10K trucks on harbour area streets every day
- Self driving/flying vehicles (public, private, enterprise)

100,000+ sensors connected

- Sharing data between ships & ship-pers, trucks, port operators
- Emission measurement
- Cargo maintenance: Real-time info on location, temperature, humidity

- Better traffic/process flow
- Enhanced experience & security (e.g. incl. AR & cruise ship passengers)
- Improved pollution control

Insight-driven automated networking
Closing the loop between intent and outcome



Introducing and automating services faster
Transport realization using NF-IX

Problem

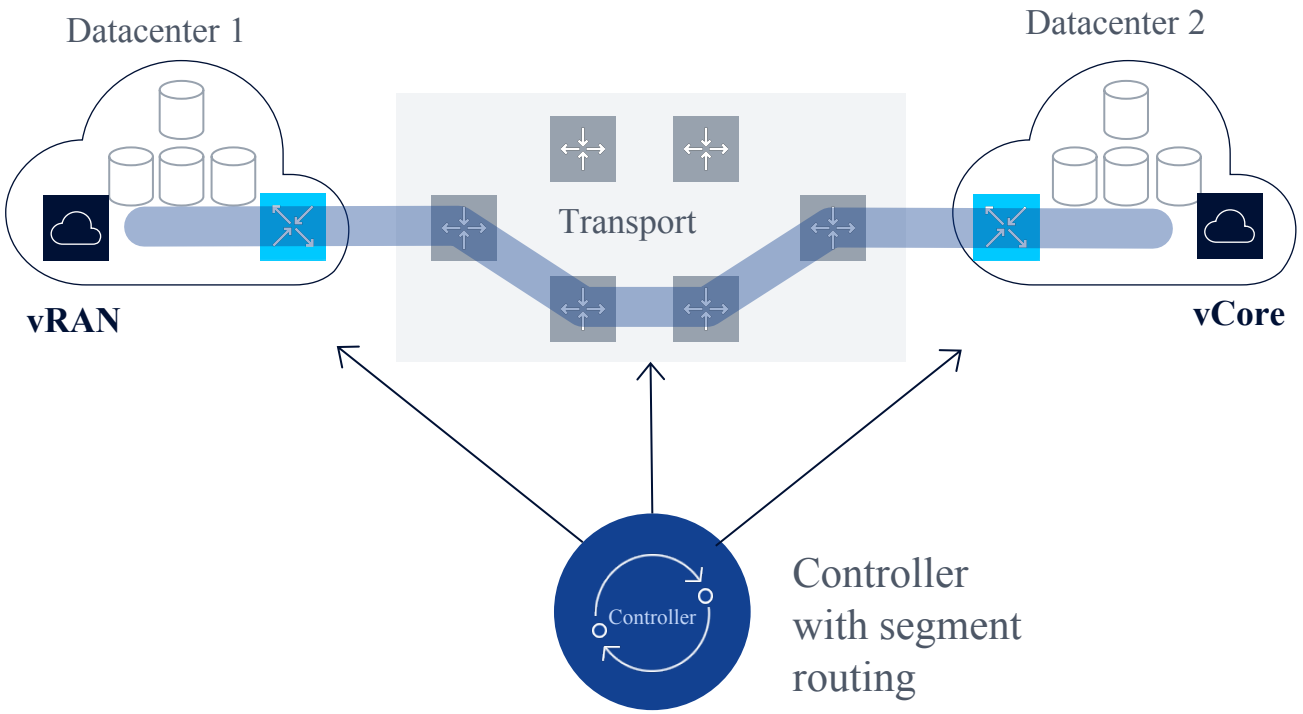
How to dynamically adjust transport network resource needs to match fluctuating service demands

Solution

NF-IX automatically creates connectivity between PNF/VNF nodes across clouds & WANs

Benefits

- Fast service provisioning
- Guarantee transport SLAs for each service
- Optimize network resources as load conditions change



Transport Slicing is a combination of multiple services with assurance and KPI(s)

Optimizing services in real time

Closed-loop action to intelligently place paths to meet SLA

Problem

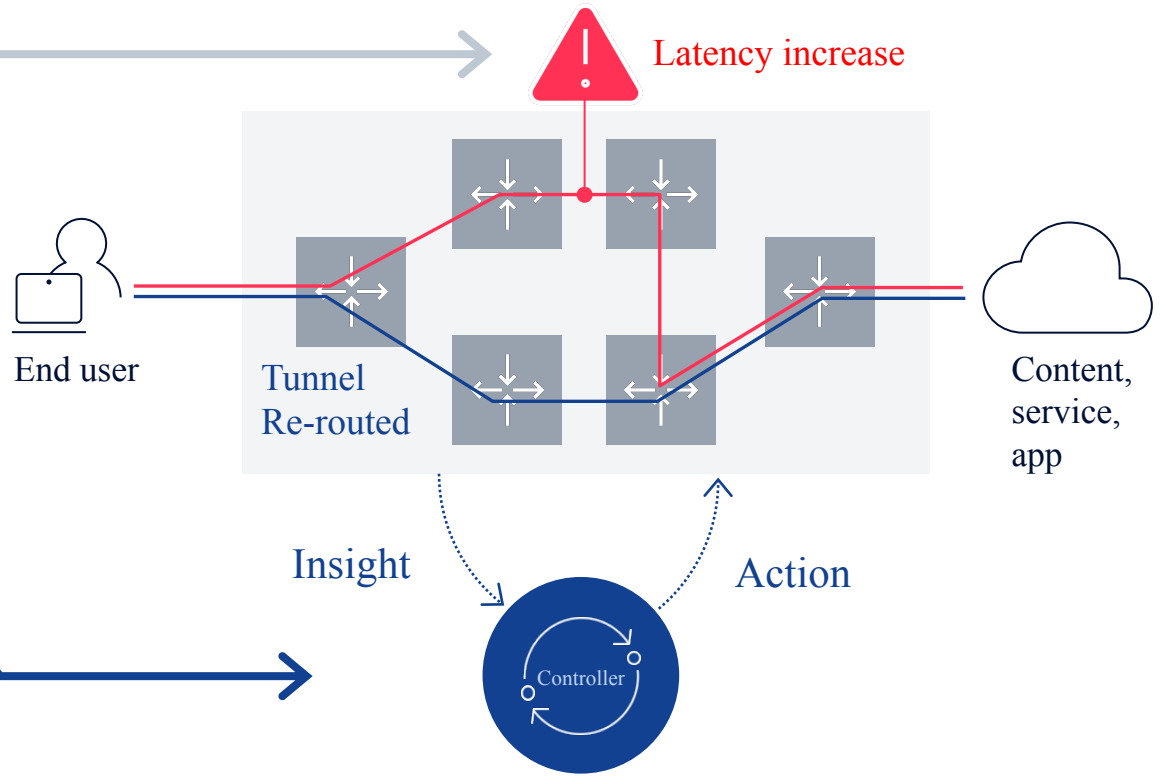
Inefficient operations impact end user QoE and resources

Solution

Centralized, instant network resource control with real-time visibility

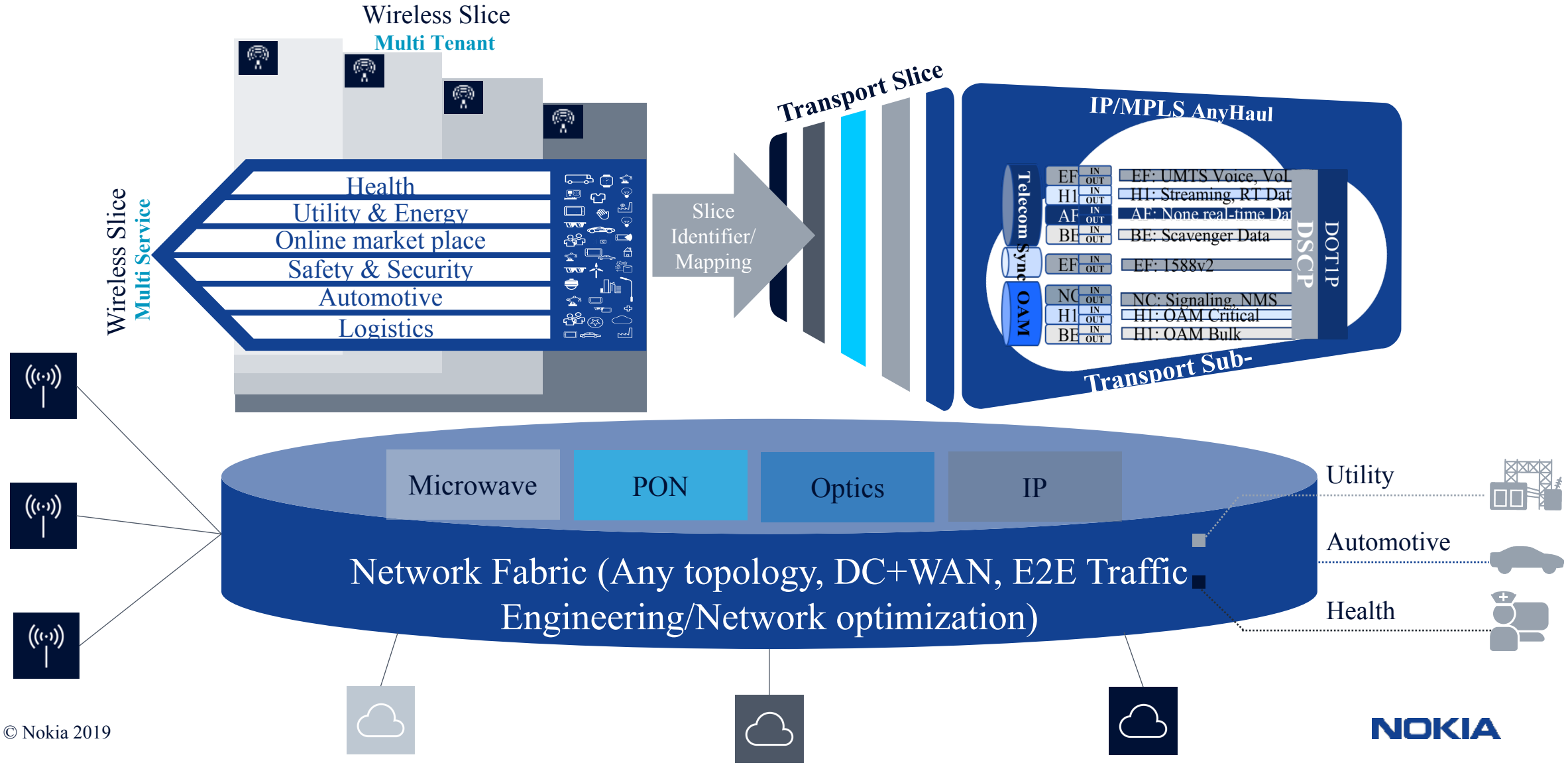
Benefits

- Increase network utilization
- Avoid congestion
- Enhance network resiliency
- Improve service performance (latency, packet loss, jitter…)

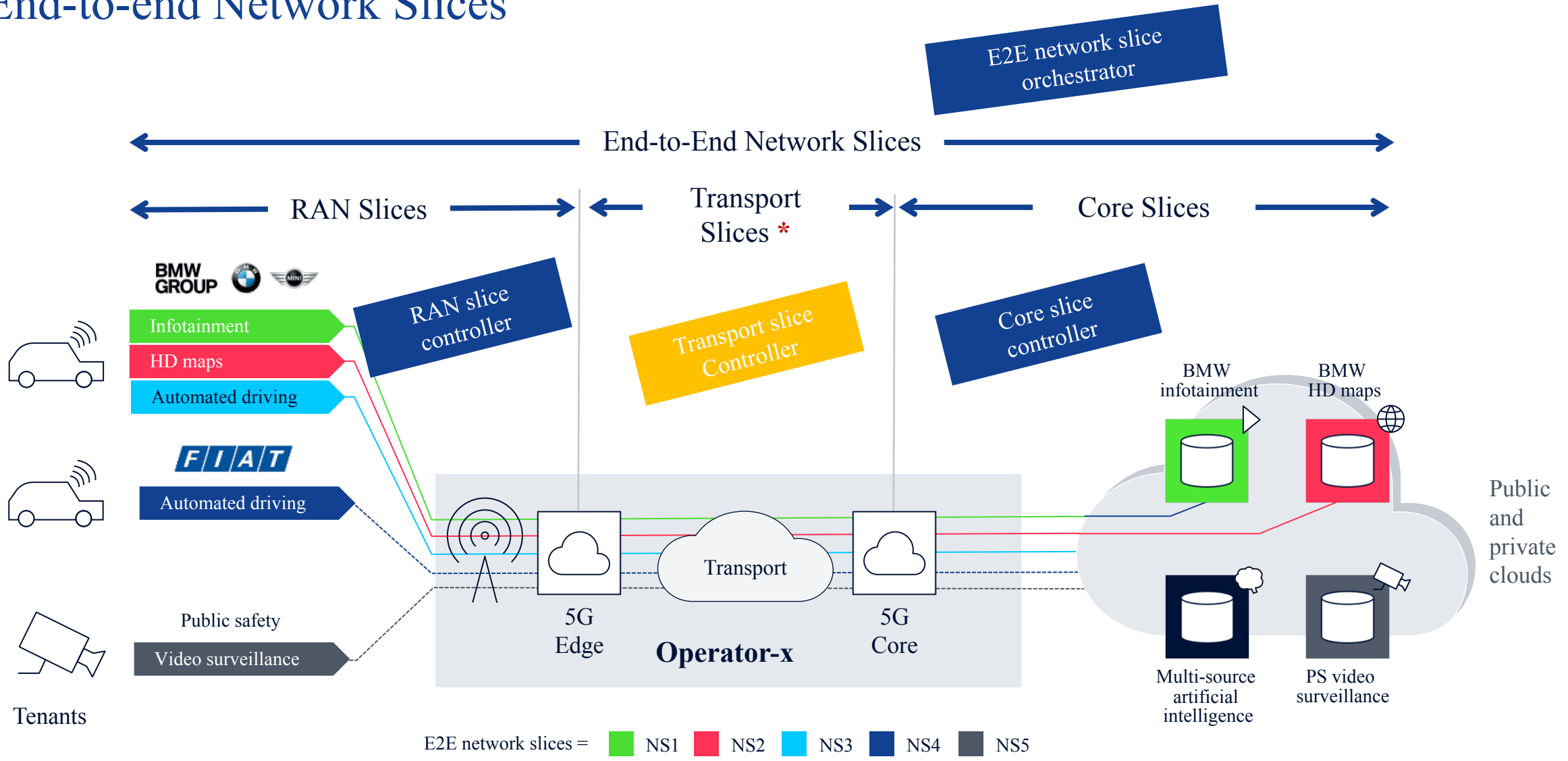


Slicing

NFIX is simplifying network slicing with insight-driven automation



End-to-end Network Slices

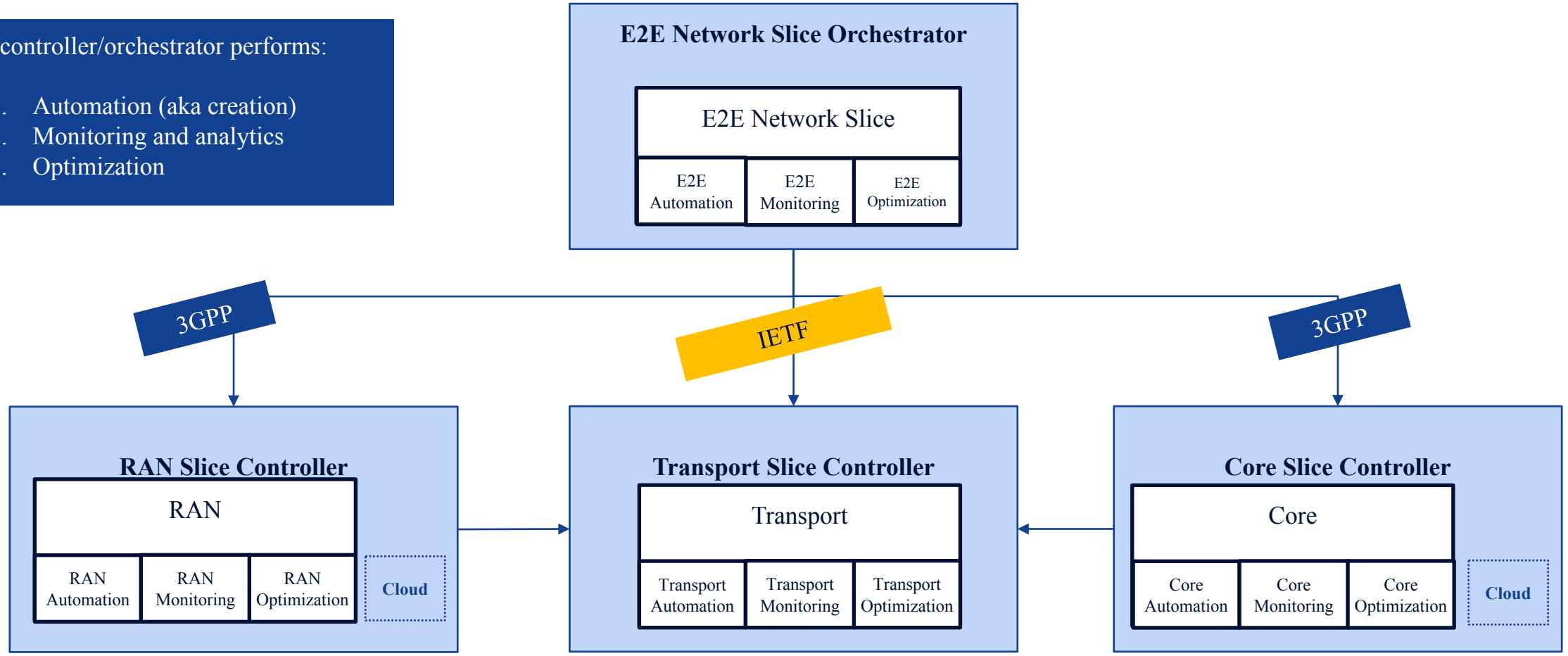


* Also called Transport Sub-Slices and Transport Slice-Subnets

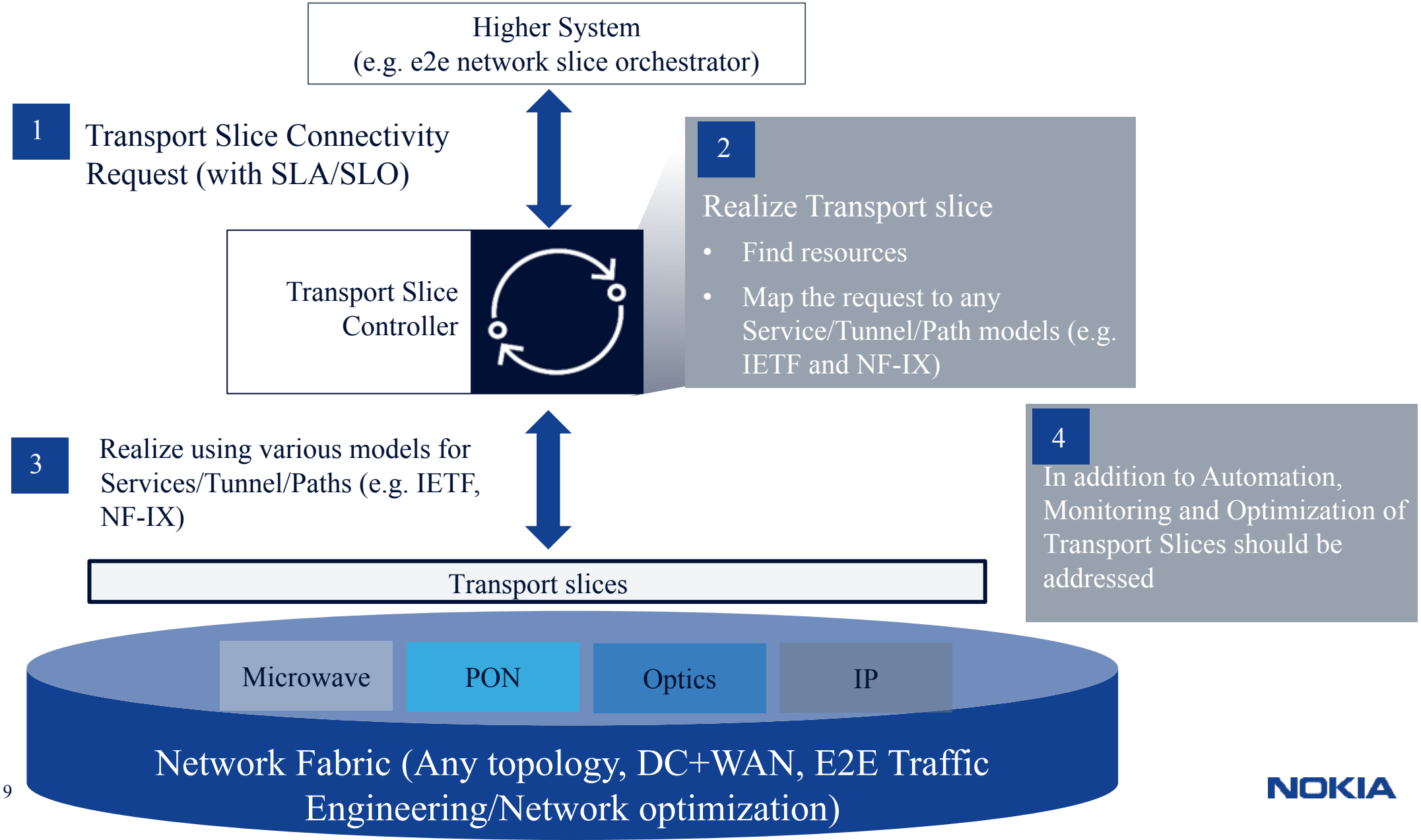
Management and Control of E2E Network Slice and Transport Slices

Each controller/orchestrator performs:

1. Automation (aka creation)
2. Monitoring and analytics
3. Optimization



Transport Slice Automation



Key Takeaways

1. NFIX enables ubiquitous connectivity (Access, Core, Cloud) with SLA(s)

2. Transport slice controller provides a programmable framework for insight driven automation and assurance

3. This framework is built upon IETF standards, Open and multi-vendor

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