

# Path towards Future Performing Networks

Realizing the full potential of Digital

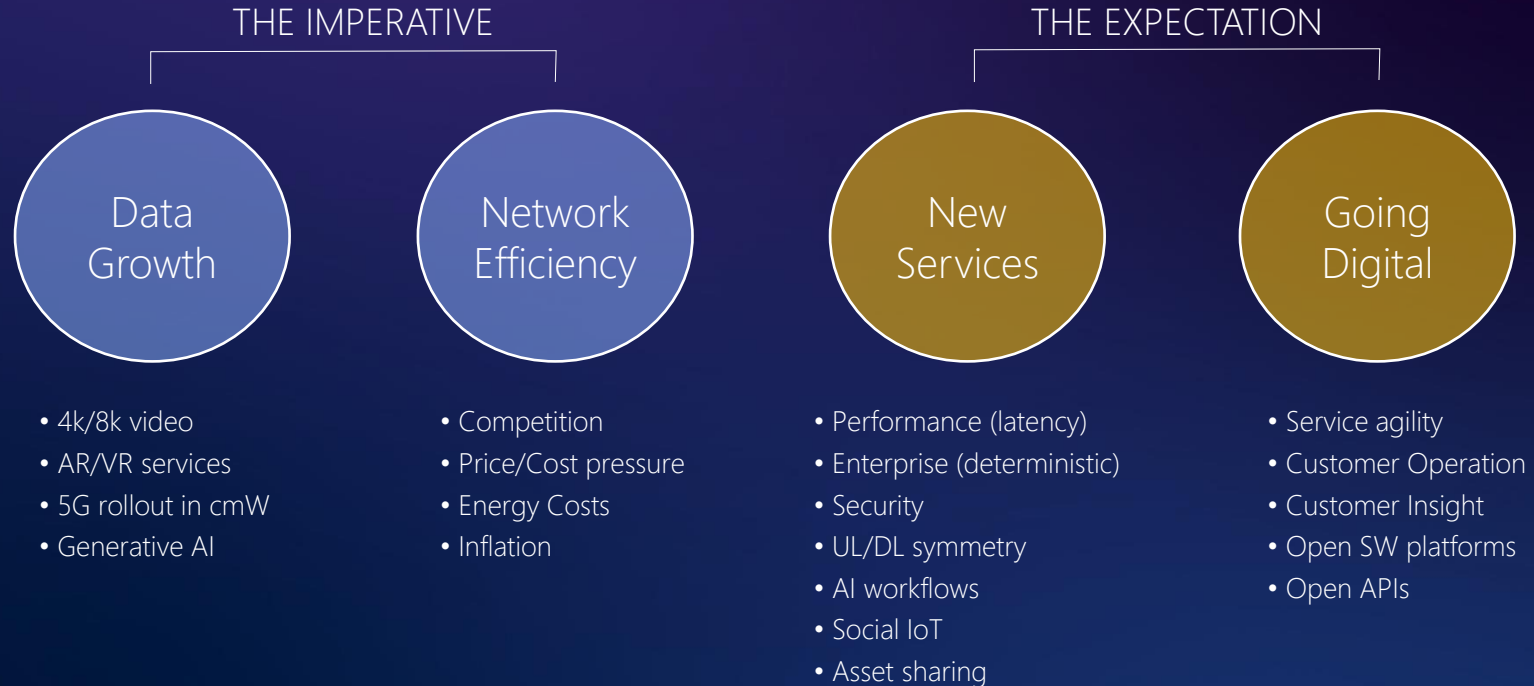
Nils Kleemann  
CTO, Central Europe

11 April, 2024

The Nokia logo is centered within a large, stylized white circular graphic that is partially cut off by the right edge of the slide. The logo itself is in a white, sans-serif font. The background of the slide is a gradient from light teal at the top to a darker green at the bottom.

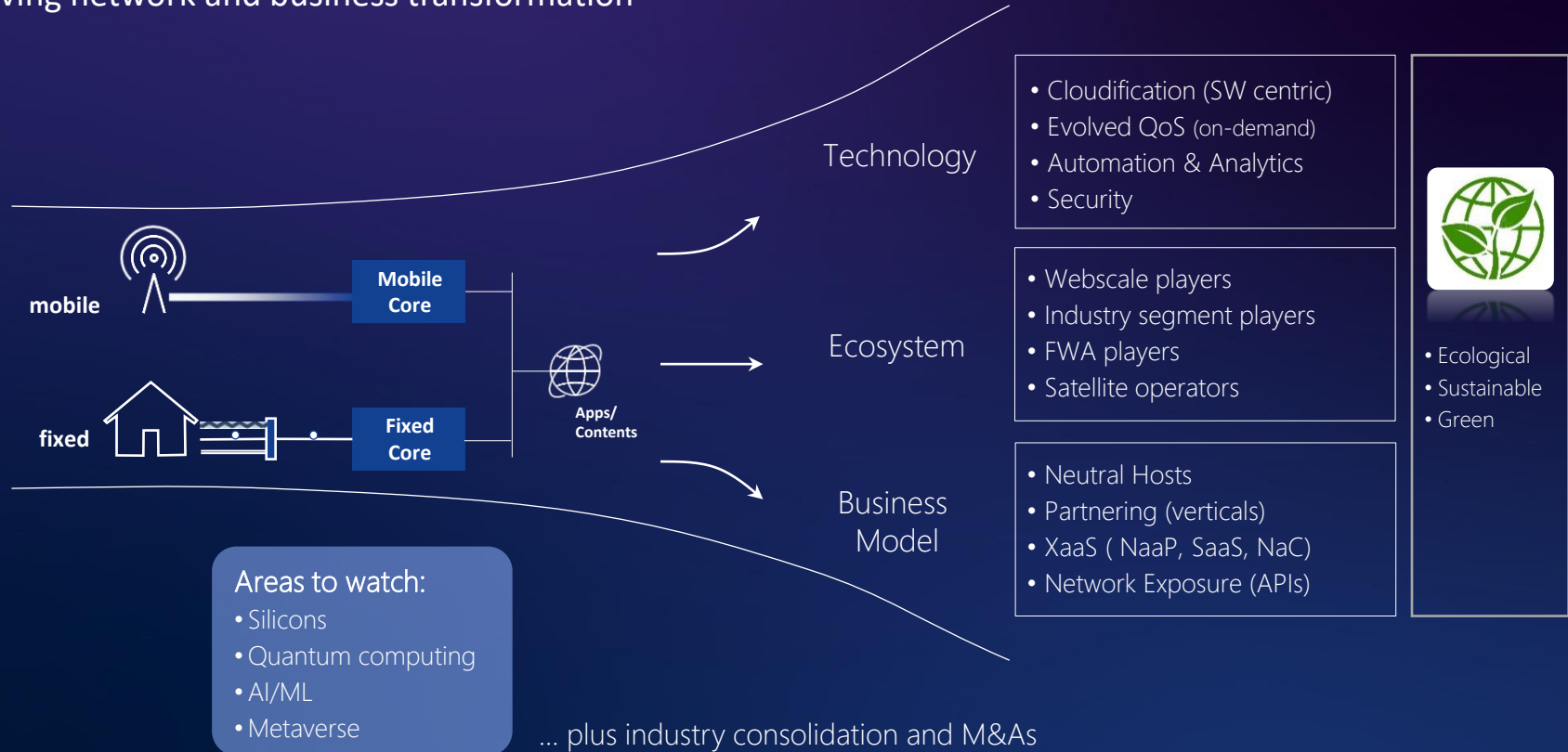
NOKIA

# The demand vectors



# The state of play in Networks

Driving network and business transformation

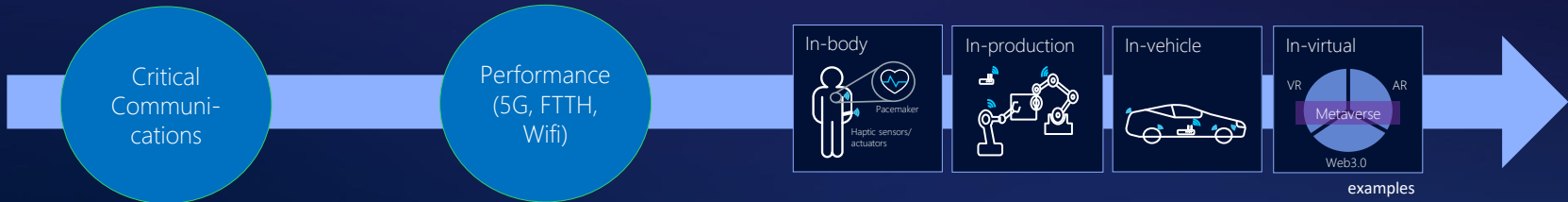


# From high performing connectivity to Network Value Creation

## New network capabilities enabling multi-party value ecosystems

Network as Code (NaC)	Edge Cloud Processing	Enhanced IoT (RedCap)
Precise Positioning	Network as Sensor	Quantum Security
Industrial Solutions	Non-Terrestrial Networks	... Network of Networks

e.g. FRMCS (railway)



- Consumer (Smartphones)
- IoT device connectivity
- Need for our daily life

- Music - >500MB for 1hr of Hifi quality
- Video - 10GB for 1hr of 4k video
- Gaming – 20GB for 1hr of 4k gaming

# Endless opportunities with IoT

... with particular requirements



## Specialized networks

- Robots
- In-vehicle
- At - body

## Network of networks

- Personal (D2D, sidelink)
- Ultra dense (small cell)
- TN/NTN (extr. coverage)

## Secure & Reliable

- Positioning
- Deterministic
- Resiliency

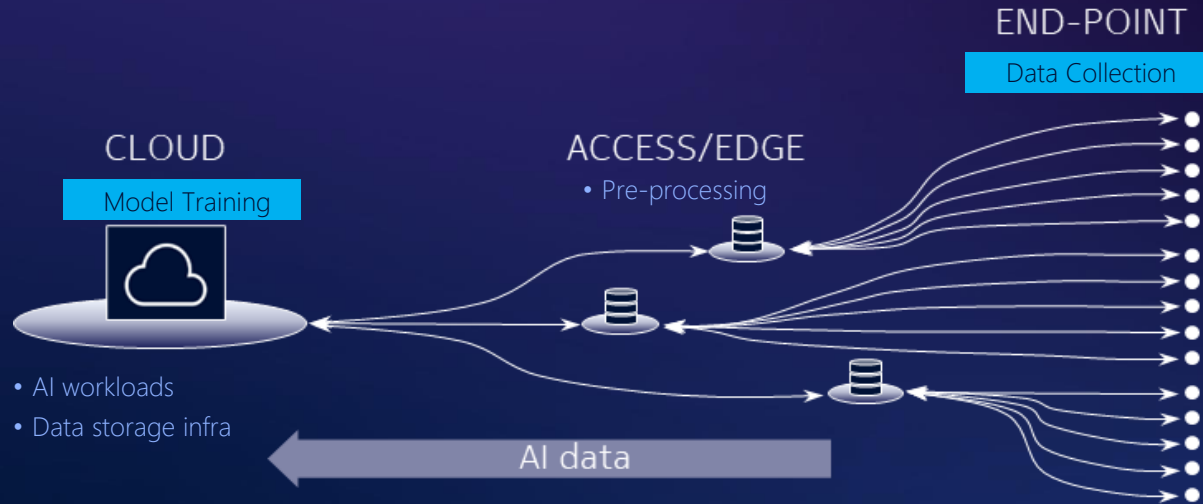
- **Partner ecosystems**, not single providers, will **drive innovation and value creation**
- Open ecosystem, where **any player can pursue different roles and approaches** per selected opportunity
- The **role of developers** moves to center stage

AI/ML and Security as  
key enabler for reliable  
IoT services

# AI/ML – driving DC infrastructure and connectivity

DC fabric, Edge and DC Interconnect as the foundation

AI challenges



## Data

- Access
- Complexity
- Governance
- Privacy

## Scale

- Model training
- Infrastructure
- Cost
- Sustainability

## Ecosys. & Standards

- Interop. framework
- Requirements and capabilities
- Testing

## Trust & governance

- AI trustworthiness
- AI security
- AI ethics
- AI regulations

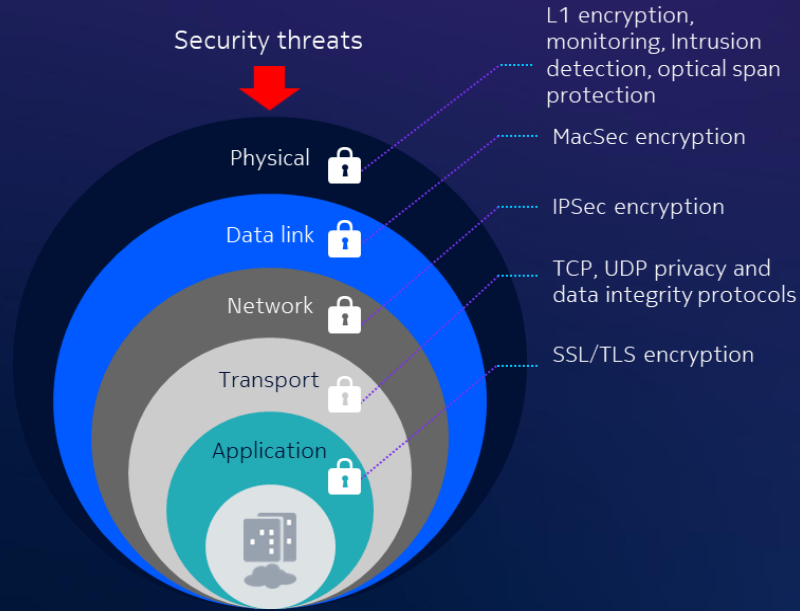
Data centres will require scalable, high-performance, dedicated back-end networks to support their AI workloads and data storage infrastructure to GPUs used for AI model training.

(Analysis Mayson)

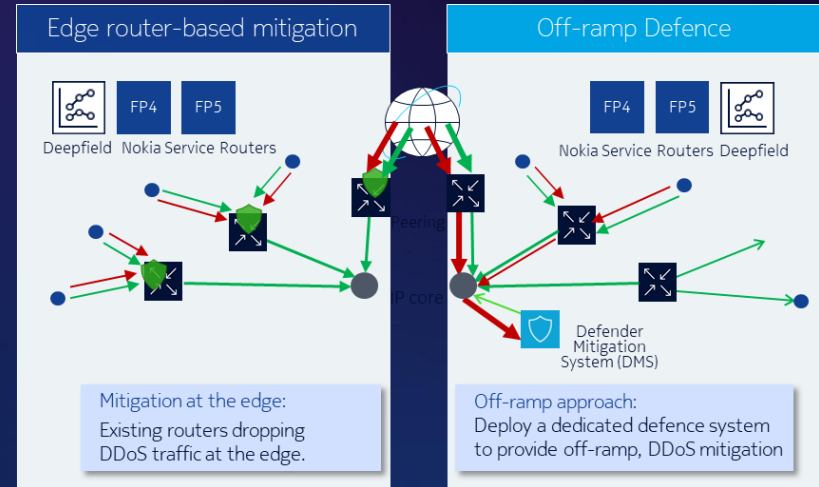
# Security – as multi-layered approach and DDoS attack mitigation

... with Quantum computing the next big thing

## Encryption



## DDoS attack mitigation



# Non terrestrial Networks

Communication continuity and resiliency

## “Privatization” of the Space

The new Space Economy



### LEO satellites disrupting space economy

- Launch cost reduced
- Satellite cost reduced
- Launch intervals reduced
- #satellites per launch increased
- End-to-end latency reduced
- Throughput increased





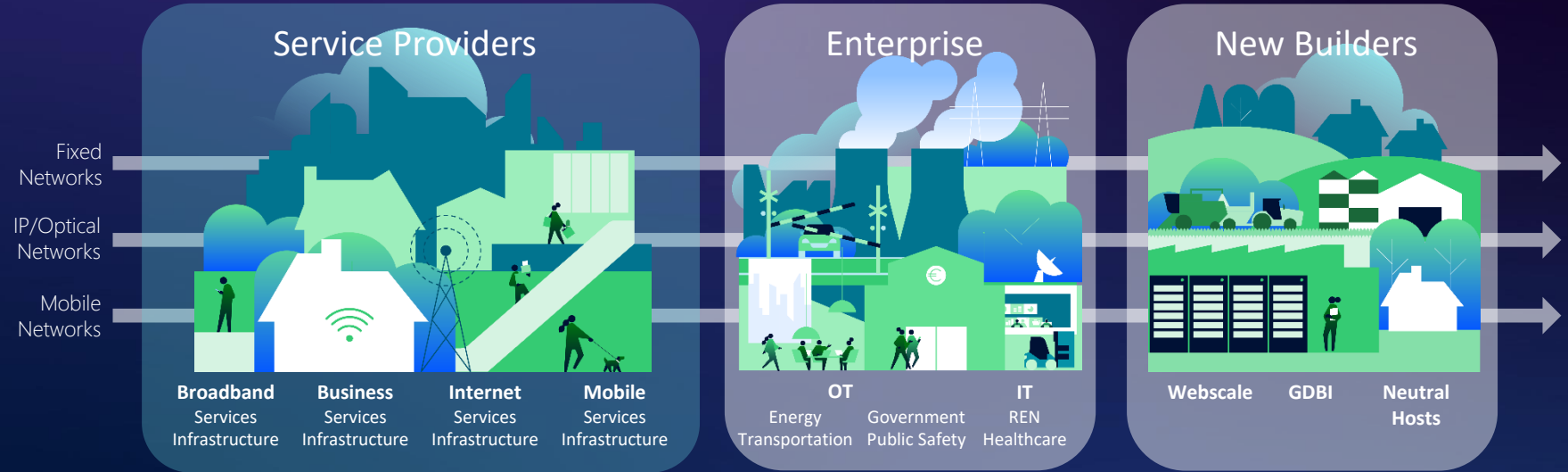
# Evolution towards a future performing Network



<p><b>Performance</b> Cost &amp; Service optimized</p>	<p><b>Enablers</b></p> <ul style="list-style-type: none"> <li>• Spectrum</li> <li>• Silicons</li> <li>• Fiber (25/50GPON, 800G)</li> <li>• Non-terrestrial (NTN)</li> </ul>	<p><b>Architectural</b></p> <ul style="list-style-type: none"> <li>• AnyRAN</li> <li>• Multi-Cloud incl. EDGE</li> <li>• Multi-Access</li> <li>• IP/Optical coordination</li> </ul>	<p><b>Operational</b></p> <ul style="list-style-type: none"> <li>• Automation</li> <li>• Energy efficiency</li> <li>• Security (PQC, DDoS)</li> <li>• Asset Sharing</li> </ul>		
<p><b>Digitalization</b> New biz models, revenues and value</p>	<p><b>Exposure</b></p> <ul style="list-style-type: none"> <li>• Open SW platform</li> <li>• Open APIs</li> <li>• Disaggregation (SDN)</li> <li>• Analytics &amp; Insights</li> </ul>	<p><b>Services</b></p> <ul style="list-style-type: none"> <li>• Connectivity-on-Demand</li> <li>• Wholesale &amp; Sharing</li> <li>• Service Quality Mgmt</li> <li>• Network-as-Code</li> </ul>	<p><b>Automation</b></p> <ul style="list-style-type: none"> <li>• Telemetry insight</li> <li>• Digital Twin</li> <li>• OSS automation (LCM)</li> <li>• Customer Portal (AI)</li> </ul>		
<p><b>Future Proof</b></p>	<p><b>Fiber for Everything</b></p> <ul style="list-style-type: none"> <li>• Fixed broadband</li> <li>• Fiber to mobile site</li> <li>• Subsea cable</li> </ul>	<p><b>Analytics Platform</b></p> <ul style="list-style-type: none"> <li>• Services</li> <li>• Performance</li> <li>• Experience mgmt. (DEM)</li> </ul>	<p><b>Security Platform</b></p> <ul style="list-style-type: none"> <li>• DDoS</li> <li>• ANYsec</li> <li>• Quantum</li> </ul>	<p><b>Automation Platform</b></p> <ul style="list-style-type: none"> <li>• Wholesale</li> <li>• LCM incl. slicing</li> <li>• AI/ML</li> </ul>	<p><b>IP/Optical Interworking</b></p> <hr/> <p><b>DC &amp; Multi-Cloud</b></p>

# Nokia Offering

Addressing all segments and service aspects



... with an R&D Power House (Bell Labs) driving innovations and standardization  
e.g. 5G Adv. and 6G standardization and innovations (e.g. radio & fiber sensing)

# Summary

## The Power of “n”

- Beyond data growth and performance - enabling New Services and going Digital also in focus
- New network capabilities enabling endless IoT opportunities with multi-party value ecosystems
- AI and Security as enablers for reliable IoT services
- Non-terrestrial networks as back-up and for new IoT services
- Future performing networks based on “fiber everywhere” and platforms for analytics, automation and security



... with Nokia addressing all aspects of this journey.

# Future performing Networks

To realize the full potential of Digital

# NOKIA