Future performing Networks

Realizing the full potential of Digital
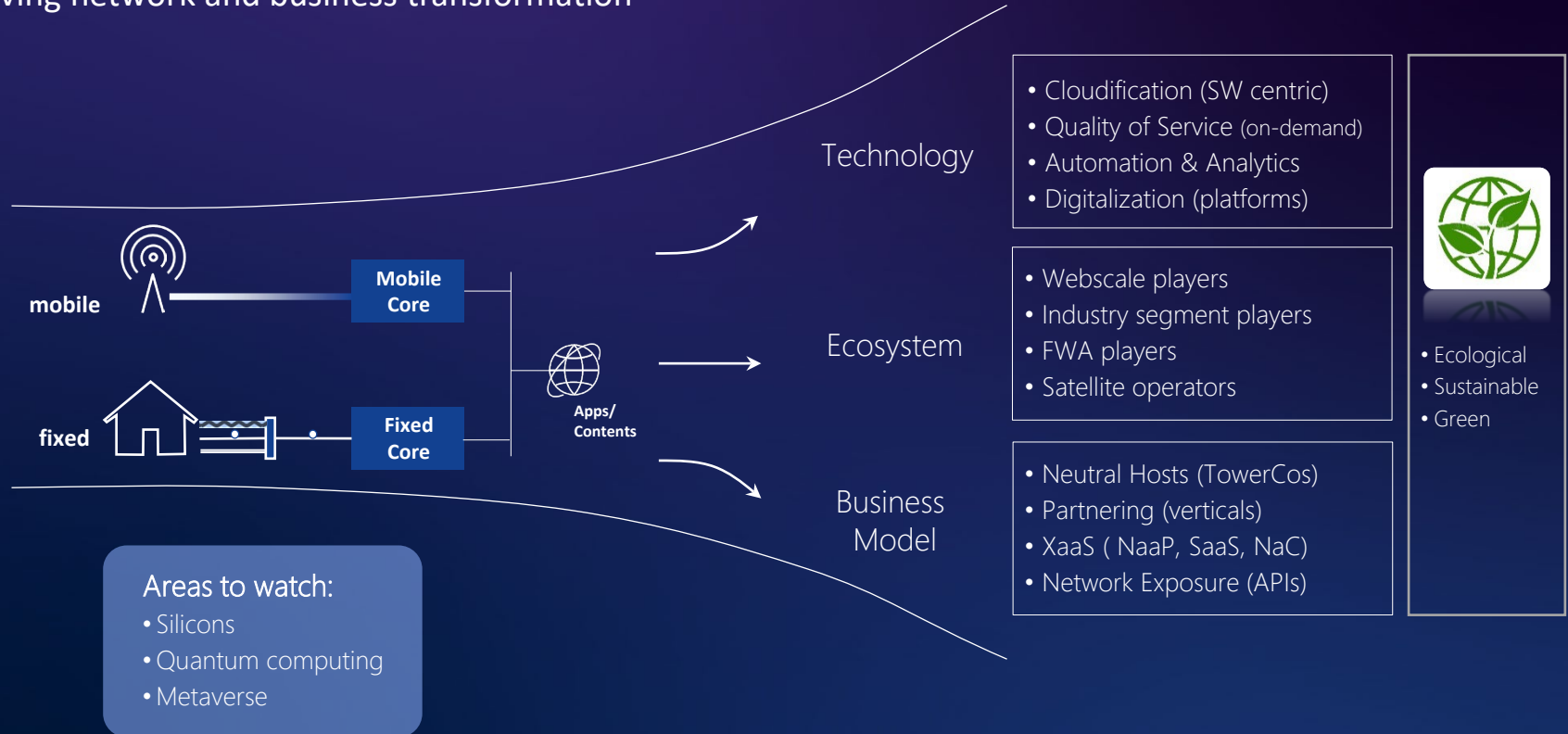
Nils Kleemann
14th of December 2023

The state of play in Networks

Driving network and business transformation

mobile

Mobile Core

fixed

Fixed Core

Apps/ Contents

Technology
- Cloudification (SW centric)
- Quality of Service (on-demand)
- Automation & Analytics
- Digitalization (platforms)

Ecosystem
- Webscale players
- Industry segment players
- FWA players
- Satellite operators

Business Model
- Neutral Hosts (TowerCos)
- Partnering (verticals)
- XaaS (NaaP, SaaS, NaC)
- Network Exposure (APIs)

- Ecological
- Sustainable
- Green

Areas to watch:
- Silicons
- Quantum computing
- Metaverse
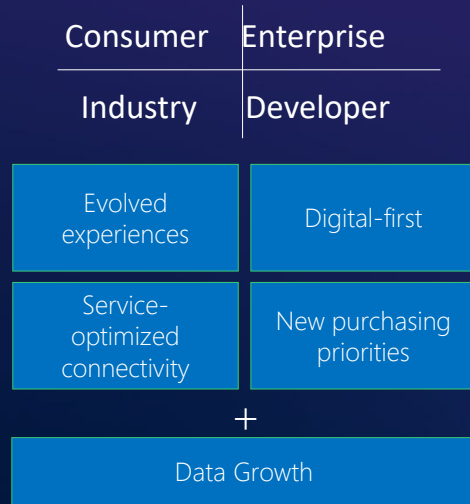
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Demand and technology vectors

Network transformation with new ways of building and integrating networks

Market demand

| Consumer | Enterprise |
| Industry | Developer |

| Evolved experiences | Digital-first |
| Service-optimized connectivity | New purchasing priorities |

+

Data Growth

Technology vectors

Network Performance
Data growth, efficiency (incl. energy), QoS/QoD

Network Value Creation
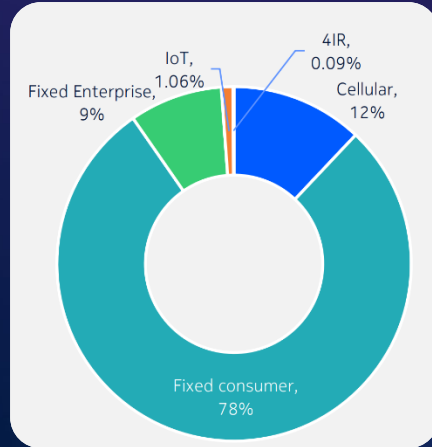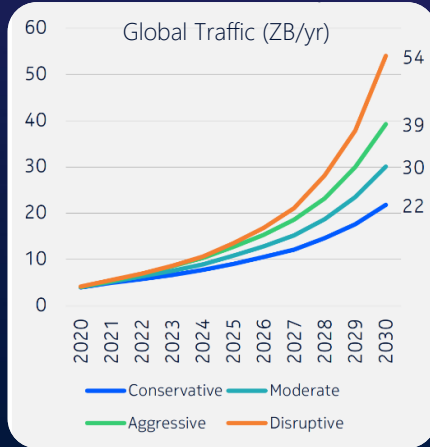B2B segment, embedded security, insights/exposure

Future Proof
scalability, platform approach, cloud

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Network Performance
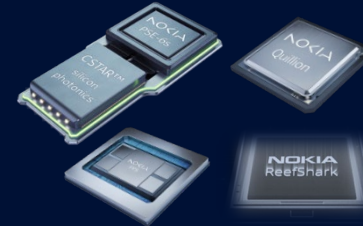
Addressing data growth, efficiency and scale

- Global Traffic expected to grow up to 13x from 2020 to 2030
- Acceleration from 2025 driven by AR/VR (Metaverse)

Global Traffic (ZB/yr)

Legend: Conservative, Moderate, Aggressive, Disruptive

- 4IR, 0.09%
- Cellular, 12%
- IoT, 1.06%
- Fixed Enterprise, 9%
- Fixed consumer, 78%

Source: Bell Labs Consulting

Silicons (SoC)

as competitive advantage

Fiber Everywhere

- 800G
- 25G/50G/100G PON
- FTTH
- Submarine

AI/ML across all levels

- Performance optimization
- Dynamic traffic steering
- Operations & Automation
- Analytics

Energy Efficiency

- Hardware evo (SoC, ng PAs)
- Technology Evo (5G/6G, conv.)
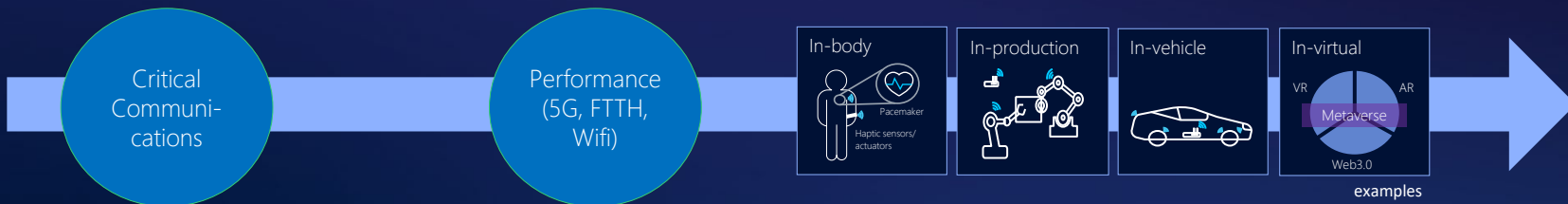- SW (switch on/off, traffic mgt)
- Opt. & Planning

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Network Value Creation

New network capabilities enabling multi-party value ecosystems

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

e.g. FRMCS (railway)

Critical Communications

Performance (5G, FTTH, Wifi)

In-body
Pacemaker
Haptic sensors/ actuators

In-production

In-vehicle

In-virtual
VR   AR
Metaverse
Web3.0

examples
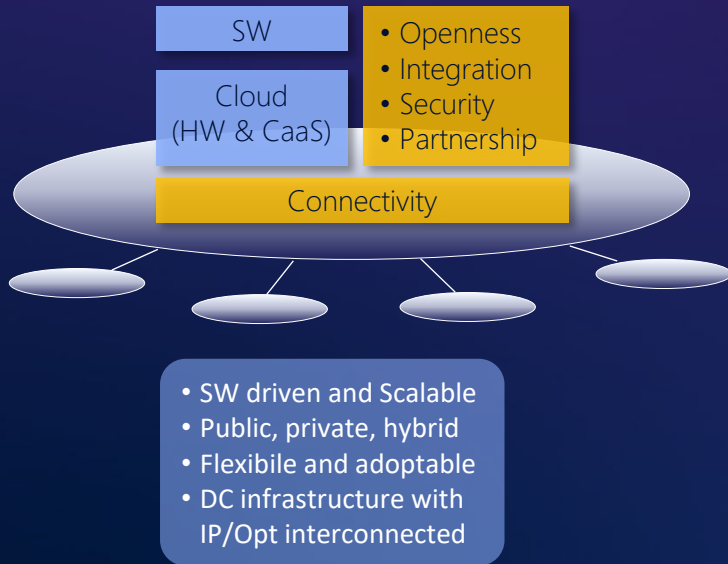
- Consumer (Smartphones)
- Remote working/learning
- Need for our daily life

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

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Future Proof Networks

Platform approach and embedded systems

SW

Cloud
(HW & CaaS)

- Openness
- Integration
- Security
- Partnership

Connectivity

- SW driven and Scalable
- Public, private, hybrid
- Flexibile and adoptable
- DC infrastructure with IP/Opt interconnected

Adaptive IP/Opt fabric with embedded IP Security (DDoS attacks)
integrated detection and mitigation of DDoS attacks

DDoS detection   DDoS mitigation
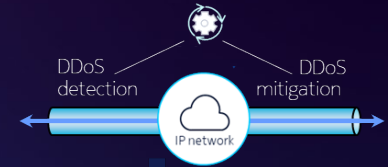
IP network

AnyRAN and AnyCore
running network functions on various cloud platforms

aws

Microsoft

Google Cloud

Hewlett Packard Enterprise
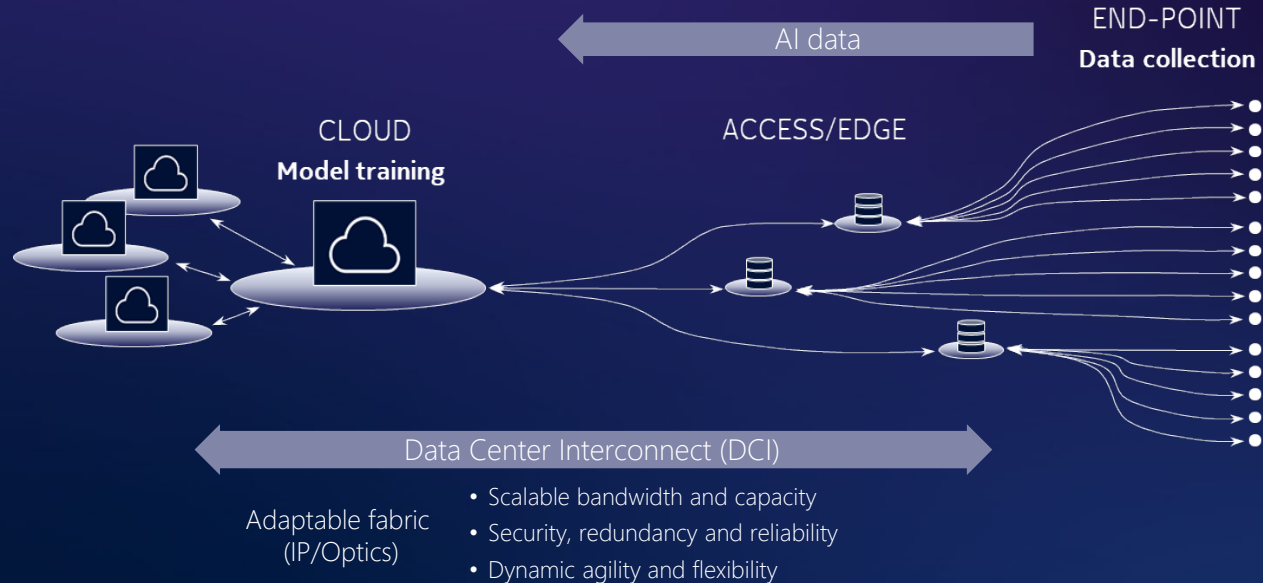
DELL

Analytics and Exposure Platforms
Expose network insights and network information

Wifi Open SW Platform
running applications on top (security, sensing, slicing)

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AI/ML - driving greater compute power and connectivity

DC infra and DC Interconnect (IP/Opt) as the foundation

AI data

END-POINT
Data collection

CLOUD
Model training

ACCESS/EDGE

Data Center Interconnect (DCI)

Adaptable fabric
(IP/Optics)

- Scalable bandwidth and capacity
- Security, redundancy and reliability
- Dynamic agility and flexibility

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

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Partner Ecosystems and SW developers in focus

Network Performance
Data growth, efficiency (incl. energy), QoS/QoD

Network Value Creation
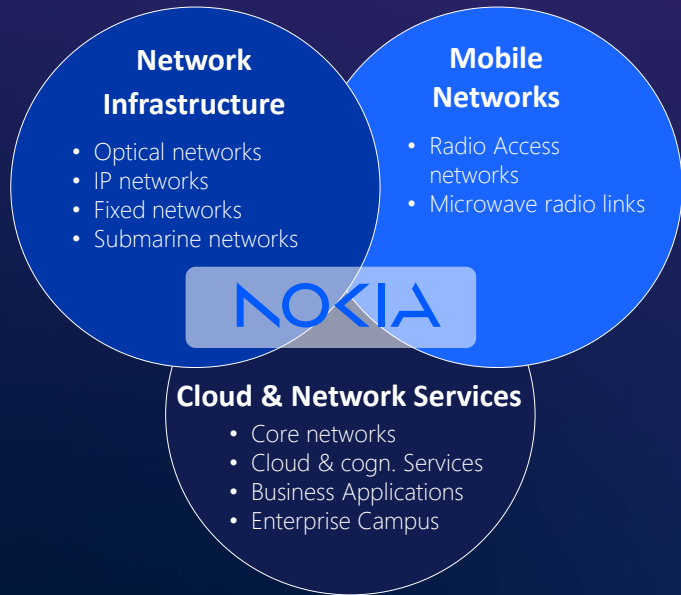B2B segment, embedded security, insights/exposure

Future Proof
scalability, platform approach, cloud

- **Open, scalable and interconnected platforms** as the foundation

- **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 SW developers** moves to the center stage

- **Speed and flexibility** are key competitive qualities

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Nokia

Delivering networks that sense, think and act

Network Infrastructure
- Optical networks
- IP networks
- Fixed networks
- Submarine networks

Mobile Networks
- Radio Access networks
- Microwave radio links

Cloud & Network Services
- Core networks
- Cloud & cogn. Services
- Business Applications
- Enterprise Campus

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Nokia Hellas

1007 Employees

Customer Sales & Delivery
Customers in Greece, Cyprus, Albania

R&D 900 Employees

Fixed Network R&D
Fiber, SDAN, FWA 4G/5G, Legacy

Mobile Network R&D
X-Haul (Microwave)

Core & Nw Services R&D
5G SMSF, TAS, EPC, 5GC, MPN

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Future performing Networks
To realize the full potential of Digital

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