



# Introduction Nokia in Germany

DFN 81. Betriebstagung 08./09.10.2024

Volker Hodel / Johnny Di Stefano



At Nokia, we create  
technology that helps  
the world act together

When the world's people, machines and devices are in sync  
with each other, we can realize the full potential of digital:

- Sustainable business growth
- Productivity in industry
- Inclusive digital access



## Mobile Networks

- Radio Access Networks
- Microwave Radio Links
- Related network management software and services

**€ 9.8 bn** net sales 2023



## Cloud and Network Services

- Business applications
- Core network solutions
- Cloud and cognitive services
- Enterprise solutions

**€ 3.2 bn** net sales 2023



## Network Infrastructure

- IP networks
- Optical networks
- Fixed networks
- Alcatel Submarine Networks

**€ 8.0 bn** net sales 2023



## Nokia Technologies

- Brand licensing
- Patent licensing
- Technology licensing

**€1.1 bn** net sales 2023

7bn<sup>+</sup>

Subscriptions supported by our mobile networks

2,200<sup>+</sup>

Mission-critical customers

20,000<sup>+</sup>

Patent families

500m<sup>+</sup>

Fixed broadband lines and ports shipped

650<sup>+</sup>

Private wireless customers

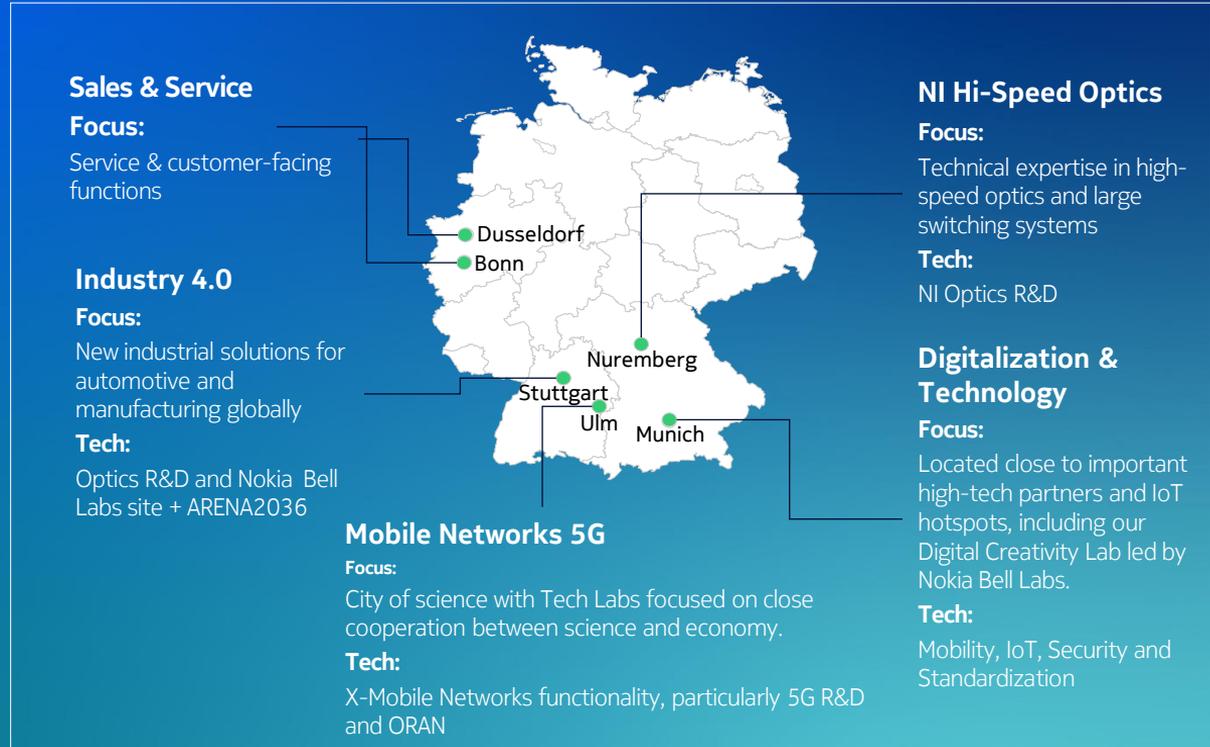
6,000<sup>+</sup>

Patent families declared essential to 5G

# Nokia Germany at a Glance

## Technology Clusters – Enablers for in-country digital development

- **Approx. 2,900 employees, thereof ~1,400 in R&D!**
- Leading in Fiber, 5G Mobile infrastructure and IoT
- Partner for telecom operators (CSPs), governments, industry & local/regional eco-system technology companies
- Nokia is leading 6G-ANNA, a German government funded 6G lighthouse research project



# Nokia Germany at a Glance

## We are winning across all technologies

### #1 FTTH

Leading supplier for Broadband

### 50+

Campus Wireless Networks

### 6G-ANNA

Nokia leads Germany's 6G flagship project to create a pre-standardized platform and overall system view

### DT

First commercial Open-RAN deployment and 100% AEON\* Optical Backbone  
 \*Advanced Evolution of the Optical Network

### TEF

>50% geographical coverage with Nokia's RAN portfolio including 5G

### VF

Partnership in private wireless triggers new deals with various industries

### #1

Enterprise business in Europe

First alternative Operator with Nokia e2e - FTTx/IP/DWDM

# Nokia powers German Communication Service Providers (CSPs)

## Vodafone

- Nokia and **Vodafone** showcase record-breaking **100 gigabit FTTH broadband** Nokia Bell-Labs and FN initiative together with VF Technology team
- Nokia and **Vodafone** partner in **ORAN field test** in Plauen
- Nokia and **Vodafone** partner in several **5G private wireless networks** in Saxony
- Nokia, Primevest and **Vodafone** **roll out fiber network** in several cities

## Telefonica O2

- Nokia supplies and installs **50% of Telefónica's 5G radio network** including 80 cities
- Nokia **refarmed Telefónica's** remaining **3G network completely to 4G**

## Deutsche Telekom

- Nokia and Fujitsu deliver first commercial **Open-RAN** deployment in Germany
- Nokia modernizes the **optical transport network** of **Deutsche Telekom** in Germany. When implemented all Internet traffic in Germany will run through Nokia WDM gear!

## Alternative Operators

- Nokia provides its **7950 XRS core router** and **7750 SR-s edge router** to **DE-CIX's Internet Exchange in Frankfurt**
- **NetCologne** delivers speeds up to 1 Gbps to its subscribers with the **Nokia G.fast technology**
- Nokia and **M-Net** demonstrate **world's first 500 gigabit transport** over a single wavelength

# Nokia powers German Enterprises

## Transport



### Deutsche Bahn

- Nokia holds **50% market share** in GSM-R
- Nokia delivers one of the **world's first standalone 5G networks** used for automated rail operation
- Nokia collaborates on first **FRMCS end-to-end Transmission in Digital Rail 5G** trial project in Erzgebirge

### Lufthansa

- Nokia powers LH's **Virtual Table Inspection** through permanently deployed **5G SA private wireless** network

## Energy



- Nokia supplies network technology for **450connect's LTE450 critical infrastructure** network
- Nokia powers **utility based broadband deployments** (city carriers) such as **EnBW** and **EON** to offer telco services to their customers
- Nokia provides **IP, Optics, Microwave Backbones to EON, EnBW** and many other utilities to support the **business and network transformation process**

## Government & Cities



- Nokia designs & delivers **high-resilient networks** to various public safety organizations such as **BWI, Dataport** and many others
- Nokia delivers **managed infrastructure services** for **BDBOS** public safety network (Federal Agency for Public Safety Digital Radio)
- Nokia/Smart Mobile Labs (SML) provide **5G campus network** for "5G4Healthcare" project of **OTH-Weiden**
- Nokia/SML deliver 5G private wireless network for **SWR's** innovation project "5G Media2Go"

## Manufacturing & Logistics



- Nokia provides **5G private wireless networks** to industry and universities including
  - **Volkswagen's** pilot project in Germany
  - **Bosch pilot** project in Stuttgart
  - **KUKA** production site in Augsburg
  - **Arena2036** - The innovation platform for mobility and production of the future
  - **Technical University (TU) Dresden**
  - **TU Kaiserslautern** first 4G/5G light tower project (through SML)

# “Gigabit- und Digitalstrategie” - Realisierung mit Nokia

mit Nokia High-Tech Lösungen und eigenen Chips aus Europa, USA und Deutschland

## FTTx



Je Fiber-Anschluss  
>50% weniger  
Stromverbrauch

## Optik-Transport



2.4Tb/s bei -60%  
Stromverbrauch

## IP-Transport



800G bei -75%  
Stromverbrauch

## Mobile / RAN



bis zu 80% weniger  
CO2 Emissionen je Standort

## Sicher und Europäisch



Nokia investiert pro Jahr ca. 5 Mrd.  
Euro in die Weiterentwicklung der  
führenden und sicheren Produkte.

Deutsche FuE Standorte sind Ulm,  
Nürnberg, Stuttgart und München.



# FN Portfolio highlights

Fiber broadband	5G FWA	Gigabit Connect	Quillion
 <p>MF-14 - industry first OLT for 6th generation broadband</p>	 <p>Leverage 5G roll-out and complement FTTH with best-in class 5G FWA CPEs</p>	 <p>Addressing MDU connectivity with G.fast and MoCA</p>	 <p>In-house ASIC family for non-blocking FTTH/x</p>
Beacon 24	SDAN	Predictive care	Cloud acceleration services
 <p>Managed Wi-Fi 7 for best user experience</p>	 <p>Automate more and innovate faster with open APIs and cloud-native platforms</p>	 <p>Identify issues before they occur and reduce outages by 34%</p>	 <p>Deliver new features in weeks instead of years</p>
<p>Digital deployment services accelerate network rollout up to 50%</p>			

# Optical Networking Portfolio

Portfolio Building Blocks > Photonic Service Engine (PSE) coherent optics

- PSE: Photonic Service Engine (PSE) coherent optics
- High-capacity optical transport and edge OTN (ROADM)
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- High-capacity optical transport and edge OTN (ROADM)

## 1830 Photonic Service Switch (PSS)

- Scalable solutions for DC, access, metro, regional & long-haul networks**
- Integrated P2P transport and OTN
  - 100Gbps per channel and up to 100Gbps per channel
  - Full featured SDN for control and OTN and OTN
  - 100Gbps per channel and up to 100Gbps per channel
  - 100Gbps per channel and up to 100Gbps per channel
  - High-capacity optical transport and edge OTN (ROADM)
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  - High-capacity optical transport and edge OTN (ROADM)



## 1830 Photonic Service Switch (PSS-x)

- P-OTN switching for business & wholesale services**
- Combined P2P switching with 100Gbps per channel and up to 100Gbps per channel
  - Integrated P2P transport and OTN
  - High-capacity optical transport and edge OTN (ROADM)
  - High-capacity optical transport and edge OTN (ROADM)
  - High-capacity optical transport and edge OTN (ROADM)



## 1830 Photonic Service Interconnect (PSI)

- Compact, modular photonic line system**
- Supports full range of 100Gbps line system interfaces including ROADM, amplifiers, O-E, O-E/O and O-E/O
  - Supports full range of 100Gbps line system interfaces including ROADM, amplifiers, O-E, O-E/O and O-E/O
  - Supports full range of 100Gbps line system interfaces including ROADM, amplifiers, O-E, O-E/O and O-E/O



### Flexible, high-capacity transport

- 100Gbps per channel and up to 100Gbps per channel
- 100Gbps per channel and up to 100Gbps per channel
- 100Gbps per channel and up to 100Gbps per channel

## 1830 Link Extender (LX)

- Extended Reach Amplifier (ERA) & EDFA enabling unamplified links of up to 100km
- High-capacity optical transport and edge OTN (ROADM)
- High-capacity optical transport and edge OTN (ROADM)
- High-capacity optical transport and edge OTN (ROADM)



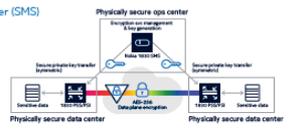
## 1830 Optical Network Extender (ONE)

- Multi-service metro access**
- Integrated OTN, SDN and physical solutions
  - High-capacity optical transport and edge OTN (ROADM)
  - High-capacity optical transport and edge OTN (ROADM)



## 1830 Security Management Server (SMS)

- Quantum safe optical transport**
- Quantum safe optical transport for the entire enterprise network
  - High-capacity optical transport and edge OTN (ROADM)
  - High-capacity optical transport and edge OTN (ROADM)



## 1830 Photonic Service Demarcation (PSD)

- Carrier Ethernet and wave services**
- Carrier Ethernet 100Gbps per channel
  - High-capacity optical transport and edge OTN (ROADM)
  - High-capacity optical transport and edge OTN (ROADM)



## 1830 Time-sensitive Packet Switch (TPS)

- Time-sensitive packet transport**
- Time-sensitive packet transport
  - High-capacity optical transport and edge OTN (ROADM)
  - High-capacity optical transport and edge OTN (ROADM)



## WaveSuite network automation software

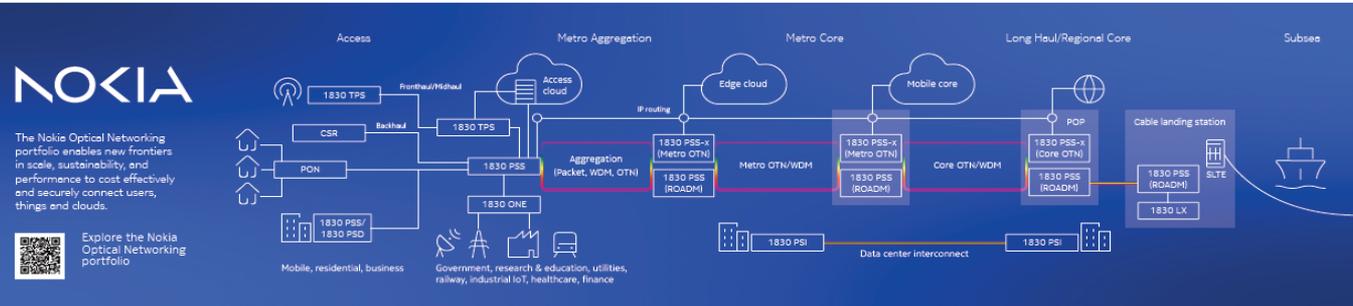
- Streamlines and reduces TCO by using automation to increase the efficiency of network operations, improve the reliability of optical networks, and reduce the risk of human error.
- **WaveSuite Network Operations Center**
  - Streamlines network operations and management with a single pane of glass.
- **WaveSuite Network Design**
  - Provides a single pane of glass for network design and optimization.
- **WaveSuite Assurance**
  - Provides a single pane of glass for network assurance and optimization.
- **WaveSuite Performance**
  - Provides a single pane of glass for network performance and optimization.
- **WaveSuite Security and Compliance**
  - Provides a single pane of glass for network security and compliance.

## Strategically achieve your goals with WaveSuite automation

- **Optimize your network and operations**
  - WaveSuite Network Operations Center
  - WaveSuite Network Design
  - WaveSuite Assurance
  - WaveSuite Performance
- **Reduce your network complexity**
  - WaveSuite Network Design
  - WaveSuite Assurance
  - WaveSuite Performance
- **Improve your network reliability**
  - WaveSuite Network Operations Center
  - WaveSuite Network Design
  - WaveSuite Assurance
  - WaveSuite Performance

## Network Services Platform (NSP)

- Defines a programmable, network automation framework for large-scale networks.
- High-capacity optical transport and edge OTN (ROADM)
- High-capacity optical transport and edge OTN (ROADM)



**NOKIA**

The Nokia Optical Networking portfolio enables new frontiers in scale, sustainability, and performance to cost effectively and securely connect users, things and clouds.

Explore the Nokia Optical Networking portfolio



# Highlights - Nokia IP-Systems

The Nokia logo is centered within a large white circle that is partially cut off by the right edge of the slide. The background of the slide is a gradient from teal at the top to magenta at the bottom.

NOKIA

# IP Routing Credentials

1.9M+ | IP Router Platforms Shipped

6 Generations  
Of market leading in-house silicon

#1 | IP edge router – global, EMEA<sup>1</sup>

1200+ | Industry, enterprise and public sector customers

8 Families  
2700+ orderable items for a complete E2E solution

#2 | IP total router North America, EMEA, CALA<sup>1</sup>  
IP edge router North America, CALA, APAC<sup>1</sup>

1400+ | SP & cloud customers including 50 largest worldwide by CAPEX

One OS  
SROS CSP DNA across all products



NOKIA

7750 SR-14s  
Service Router

# IP Networks customer successes

## Carrier/ Service Provider

1400 CSPs



## Enterprise

560 government • 280 utility • 200 transportation  
50 oil/gas/mining • 30 REN • 130 other



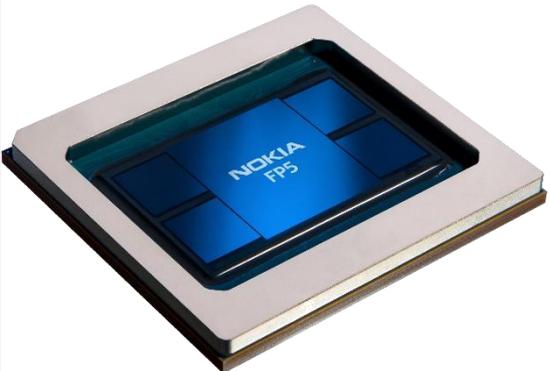
## Webscale and Interconnect

165 customer wins



# Nokia FP5 routing silicon – Market momentum

**Public references**



- Deterministic performance, fully programmable
- First to support 800GE and 1.6 Tb/s interfaces
- Proven 800G readiness and interoperability  
- 75% power savings over FP4
- Fully backwards compatible to FP4

# Nokia, Nomios to triple capacity for GÉANT European research network with new ultra-high-capacity IP backbone network



[Customer success interview \(video link\)](#)

“We are pleased to extend our relationship with Nomios and Nokia by deploying Nokia’s high-performance IP networking technology across our extensive network infrastructure. The solution adds the capabilities we need to address the anticipated exponential growth in data and our security concerns. This project ensures that GÉANT modernizes and maintains the essential world-class network the research and education communities rely on both in Europe and more than 100 countries across every region.”

**Bram Peeters, Chief Technology Officer at GÉANT**

[Nokia announcement \(August 15, 2023\): Nokia, Nomios to triple capacity for GÉANT European research network with new ultra-high-capacity IP backbone network](#)

- Aug 15, 2023:**
- 10-year frame agreement pegs Nokia as sole IP critical-network provider for massive backbone network migration led by partner Nomios
  - First research network to deploy 800GE routing interfaces, delivering unprecedented capacity to support long-term scientific collaboration amongst world’s top researchers
  - GÉANT’s GN5 IP/MPLS routing and switching replacement project triples existing network capacity for interconnections to National Research and Education Networks (NREN) across the

  
[Customer Success Interview \(video link\)](#)

# DE-CIX is first Internet Exchange worldwide to implement 800 Gigabit Ethernet technology

“DE-CIX, the world’s leading Internet Exchange (IX) operator, announces today that DE-CIX Frankfurt .... has achieved warp speed, introducing blistering 800 Gigabit Ethernet (GE) access technology with new Nokia line cards, effective immediately.”

“We’re proud to have been able to call Nokia our partner for almost a decade now”, says Ivo Ivanov, CEO at DE-CIX. “The advent of the 800 GE era will enable enterprises and organizations connected to DE-CIX to develop innovative use cases as yet not even dreamt of!”



“With the introduction of 800 GE access technology, we once again underline our commitment to being a technology leader,” .... We offer our customers the latest generation of hardware and a modern, scalable infrastructure that can cope with all future demands. At the same time, with the new technology we are supporting our customers’ growth. We have been working with Nokia for years and are excited to once again jointly push the limits of what’s technically possible.”

– [Dr. Thomas King, Chief Technology Officer at DE-CIX.](#)

[DE-CIX announcement \(October 18, 2022\): More bandwidth for Europe’s largest data hub:](#)

[DE-CIX is first Internet Exchange worldwide to implement 800 Gigabit Ethernet technology](#)

# Nokia and BT further collaborate on highly scalable, power efficient IP networks



“With FP5, Nokia continues to innovate to ensure IP networks have the scale, flexibility and features to help us manage increasing demand from our residential, mobile and business customers.”



Neil McRae  
Managing Director and Chief Architect, BT

## June 30, 2022:

Nokia today announced that BT will test its FP5 network processing silicon, including its 800G interfaces. The collaboration is part of the companies' long-term strategic relationship to ensure the UK's largest network has the capacity, flexibility and reduced power consumption, to deliver the best possible customer experience for the future.

BT operates the largest IP network in the UK with peak rates above 25Tbps, powered by Nokia's 77xx family of routers. With this trial, BT is the first in the UK to test the 800G interfaces on IP routers, helping to ensure the most cost-efficient scale and capacity where its future UK customer traffic demands.



**Neil J. McRae** @neilmcrae · 6h

BT & Nokia share a purpose to connect the world for good - we are super excited by FP5 which has a huge number of network processor firsts! Nokia is smashing it out of the park and enabling us to deliver the number one network in the UK for 5G and FTTP!

[BT announcement \(June 30, 2022\): Nokia and BT further collaborate on highly scalable, power efficient IP networks](#)

# Customer endorsements from FP5 Launch (Sept 2021)

## FP5: Unwavering focus on the needs of our customers



“... we are pleased to see that with FP5, Nokia continues to innovate to ensure IP networks have the scale, flexibility and features to help us stay ahead of escalating demand... we are very happy to see the focus on power optimization... seeing Nokia’s approach to building more security features into the platform is fantastic.”

Neil McRae, Managing Director and Chief Architect, BT



“... With [their] latest generation of silicon innovation and their careful attention to ensuring investment protection... we believe Nokia is delivering the right foundation to ensure IP networks can efficiently scale and transform to stay ahead of ever shifting market demands.”

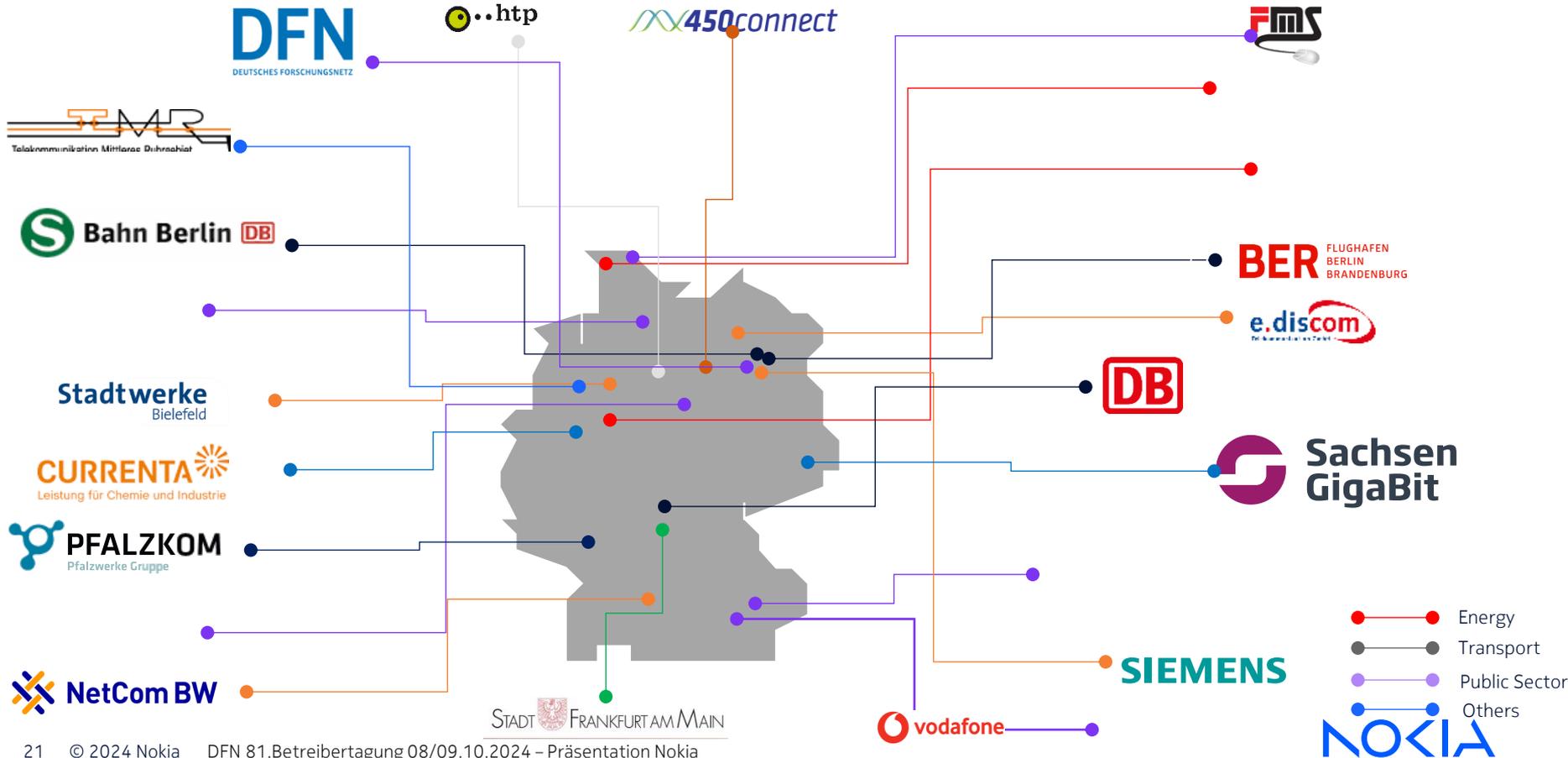
Hiroyuki Oto, SVP & GM of Core Network Development Department, NTT DOCOMO, INC.



“... innovations such as Nokia’s FP5 silicon will enable us to balance capacity, maintainability and security to deliver the best customer experience.... [and] gracefully evolve our networks as we look to manage both planned and unexpected demands in a sustainable way.”

Christian Gacon, VP, Broadband Networks, Orange France

# Nokia IP Installed Base / Germany – Transport, Power-Utilities, Public Safety, Defense



# Nokia IP Networking in Europa

## Entwicklungsstandorte

Uxbridge  
(UK)

Antwerpen  
(Belgien)

Bratislava  
(Slowakei)

Athens  
(Greece)

Mehr als **500 Mio. €** Investment in  
IP Networking R&D pro Jahr

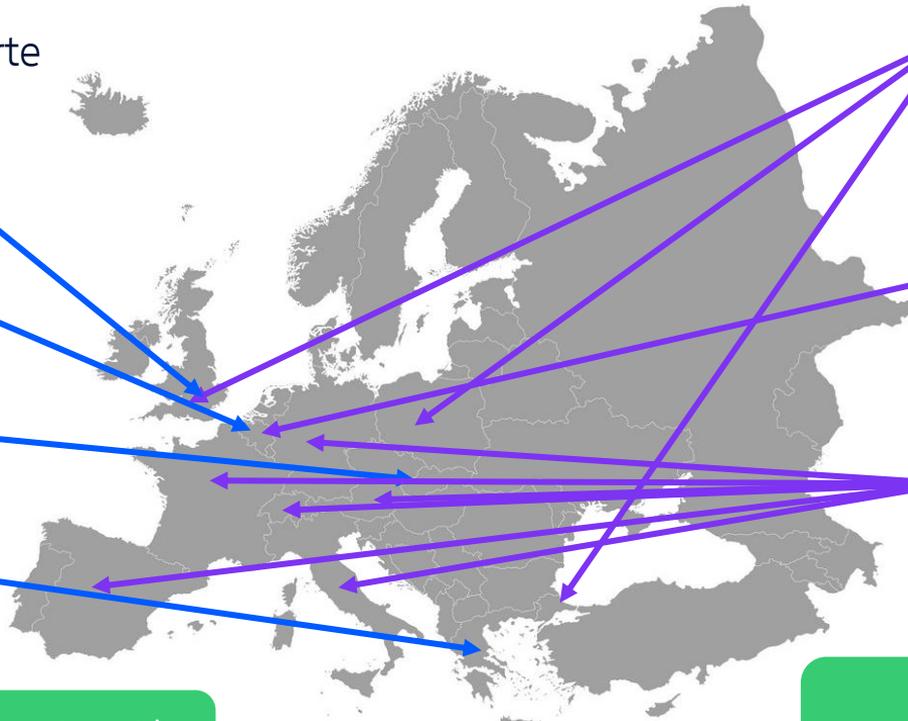
## Service-Standorte

Remote Support-  
teams  
(UK/Polen/Türkei)

Europe  
HQ – Consulting  
Antwerpen (Belgien)

Deutschland/Schweiz  
Österreich/Italien  
Spanien/ Frankreich

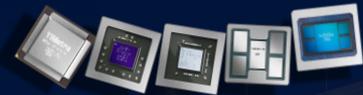
>140 IP Pre-Sales –  
>1.200 IP & Optics Post-Sales  
Mitarbeiter /-innen



# History about Nokia IP

# Nokia IP - Principles

Own Chipset for  
better control and  
longer life cycles



Own Software for  
higher quality and  
security

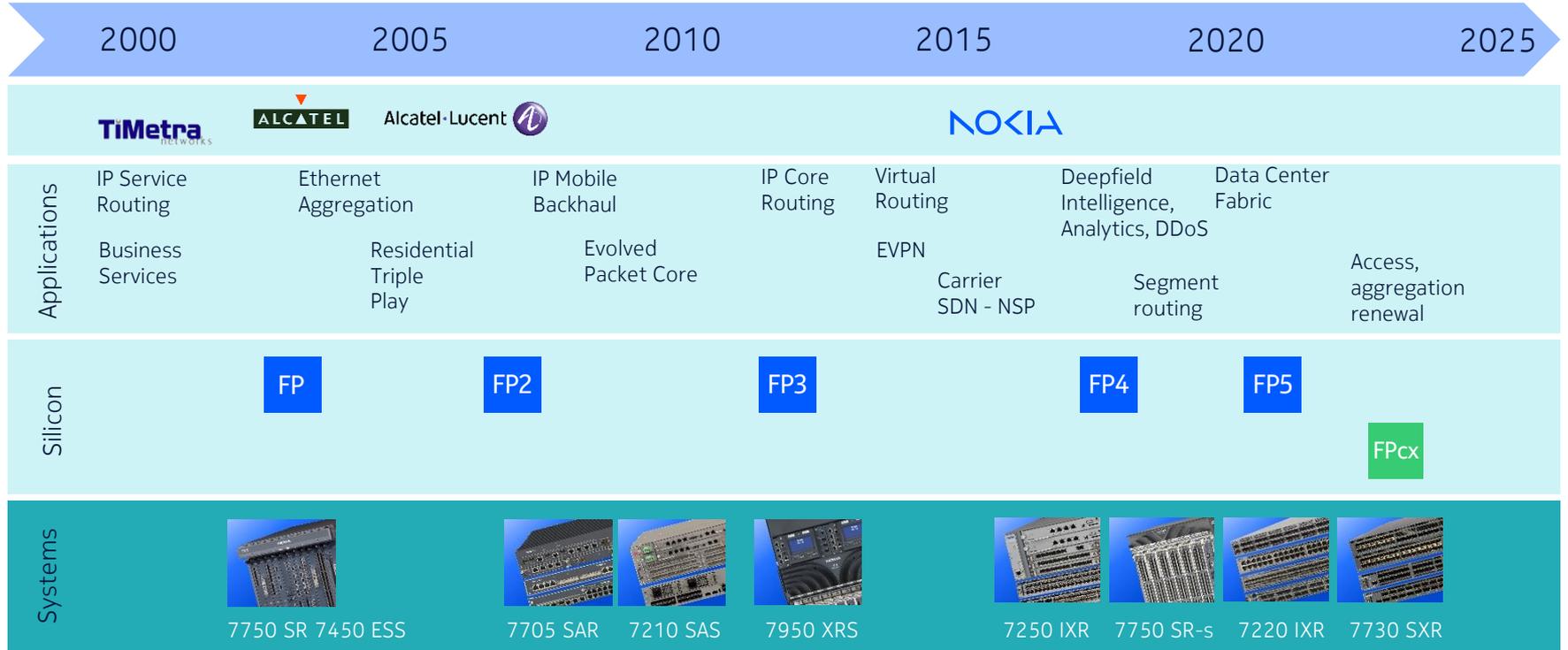
SR  
OS

Consistent Network  
Management for  
simplified  
operations

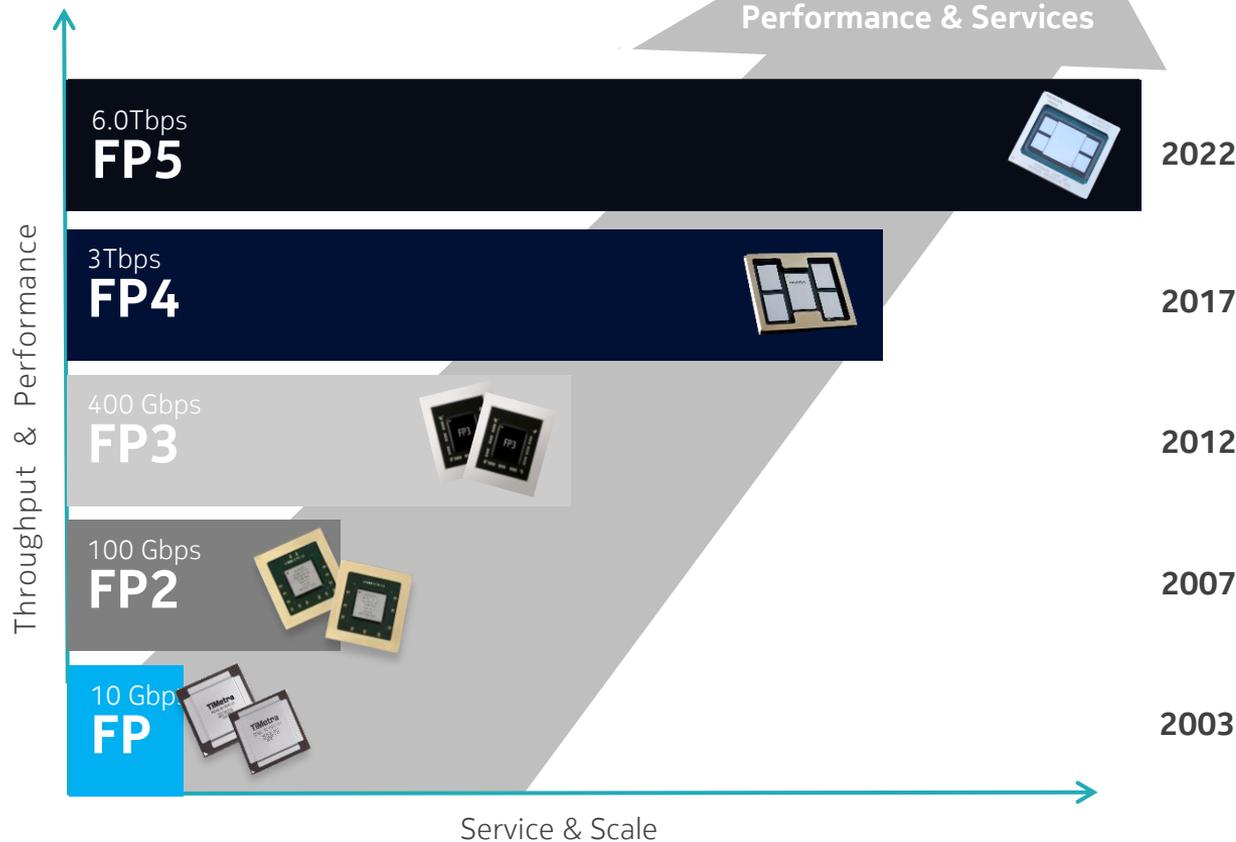


# History of innovation leadership

Continuous evolution of IP applications, services and technology



# FP: Leading full featured silicon



Industry's first  
and highest  
capacity NPUs

Five generations  
of breakthrough  
silicon

Continuous  
innovation

# Software excellence

Delivers service performance at scale

Model-driven management for deployment flexibility

SR  
OS

SR  
Linux

# 100%

Software developed totally  
in house for total control

Security certified:

- EAL3+, FIPS140-2

## Software quality is the foundation

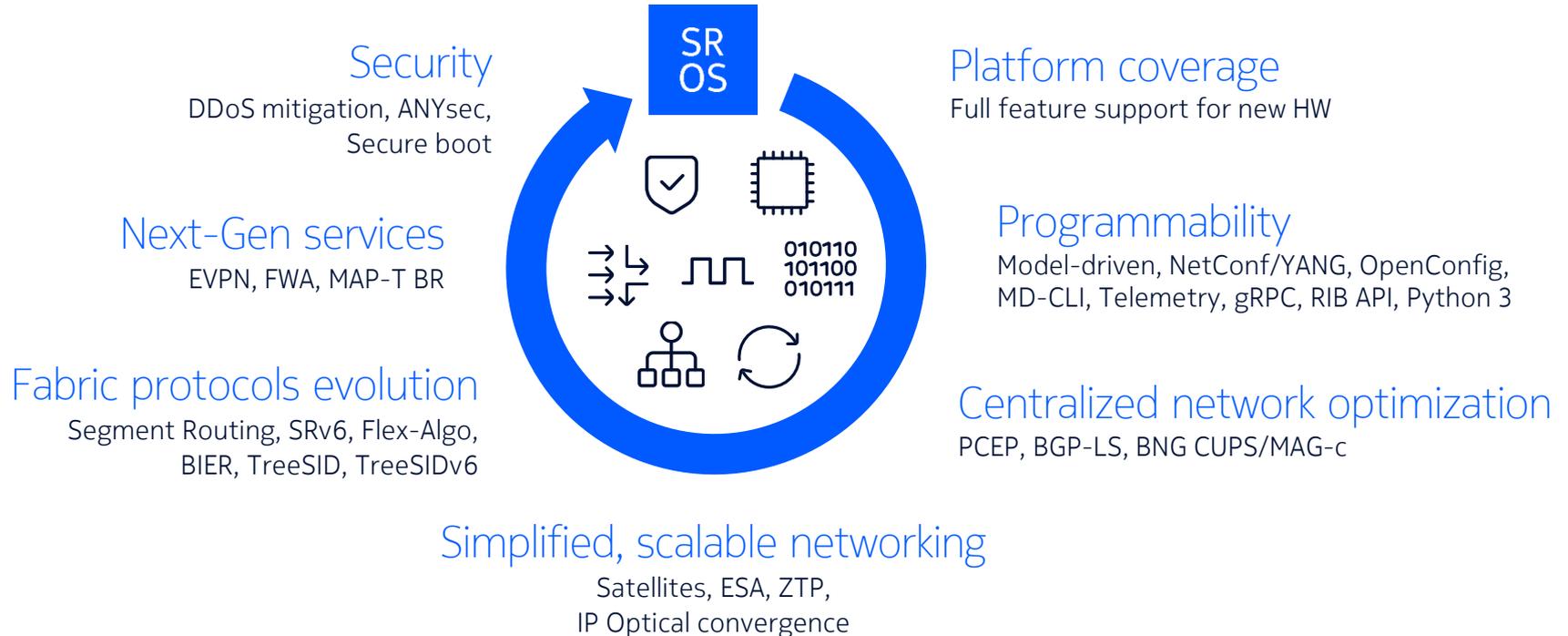
Uniquely  
balanced  
team

Continuous  
automated  
testing

Demonstrated  
reliability

Proven predictability with no major release date missed  
by more than 2 days in 15 years...

# SR OS development strategy



# Nokia - IP Networks Products

The Nokia logo is a large, white, stylized arrow pointing to the left, set against a blue background that transitions from a darker blue at the top to a lighter teal at the bottom. The word "NOKIA" is written in white, uppercase letters inside the arrow.

NOKIA

# Nokia IP Product Portfolio

Network Services Platform (NSP)

Deepfield Insight & Analytics

Network Operating Systems (SR OS, SR Linux)



7950 Extensible Routing System



7750 Service Router (SR-s series)



7750 Service Router



7730 Service Interconnect Router



7250 / 7220 Interconnect Router



7210 Service Access Switch



7705 Service Aggregation Router



Virtualized Service Router (VSR)



Virtualized Service Router - Appliance

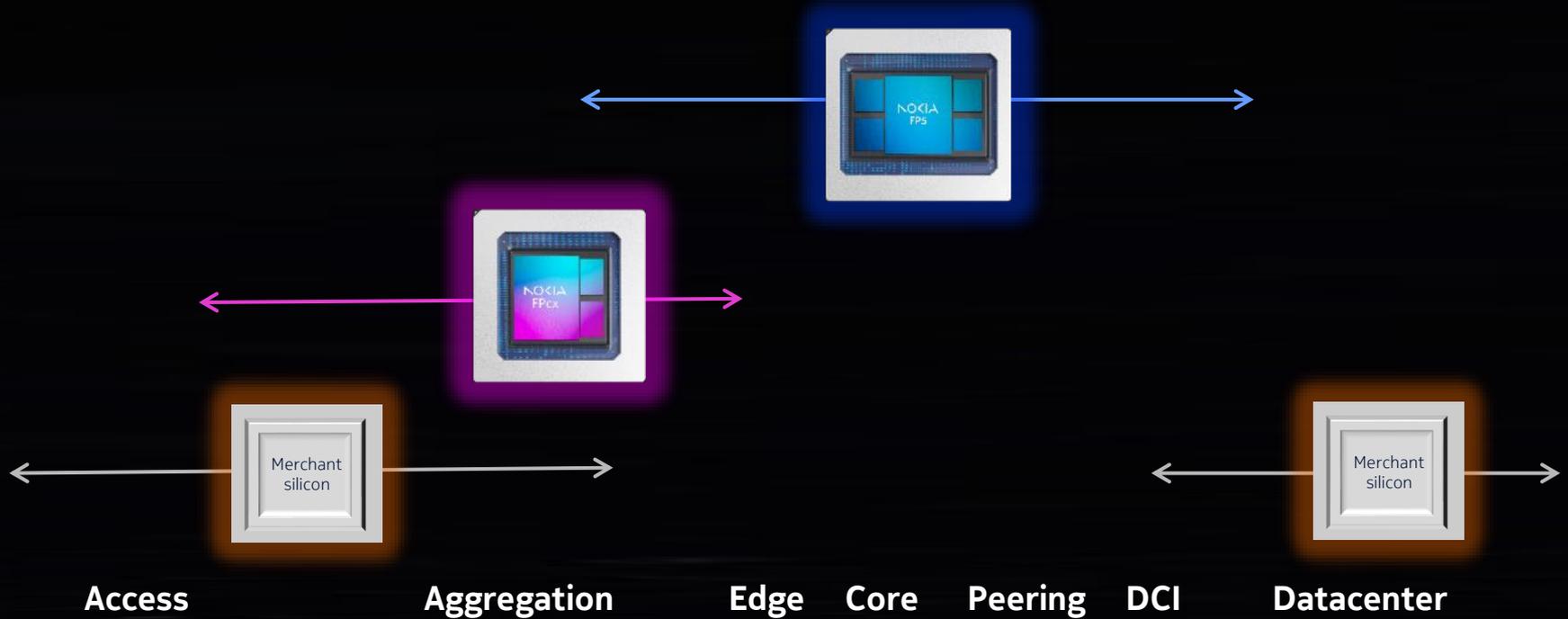
Custom-developed silicon (FP & FPcx)

Merchant silicon

Virtualized x86

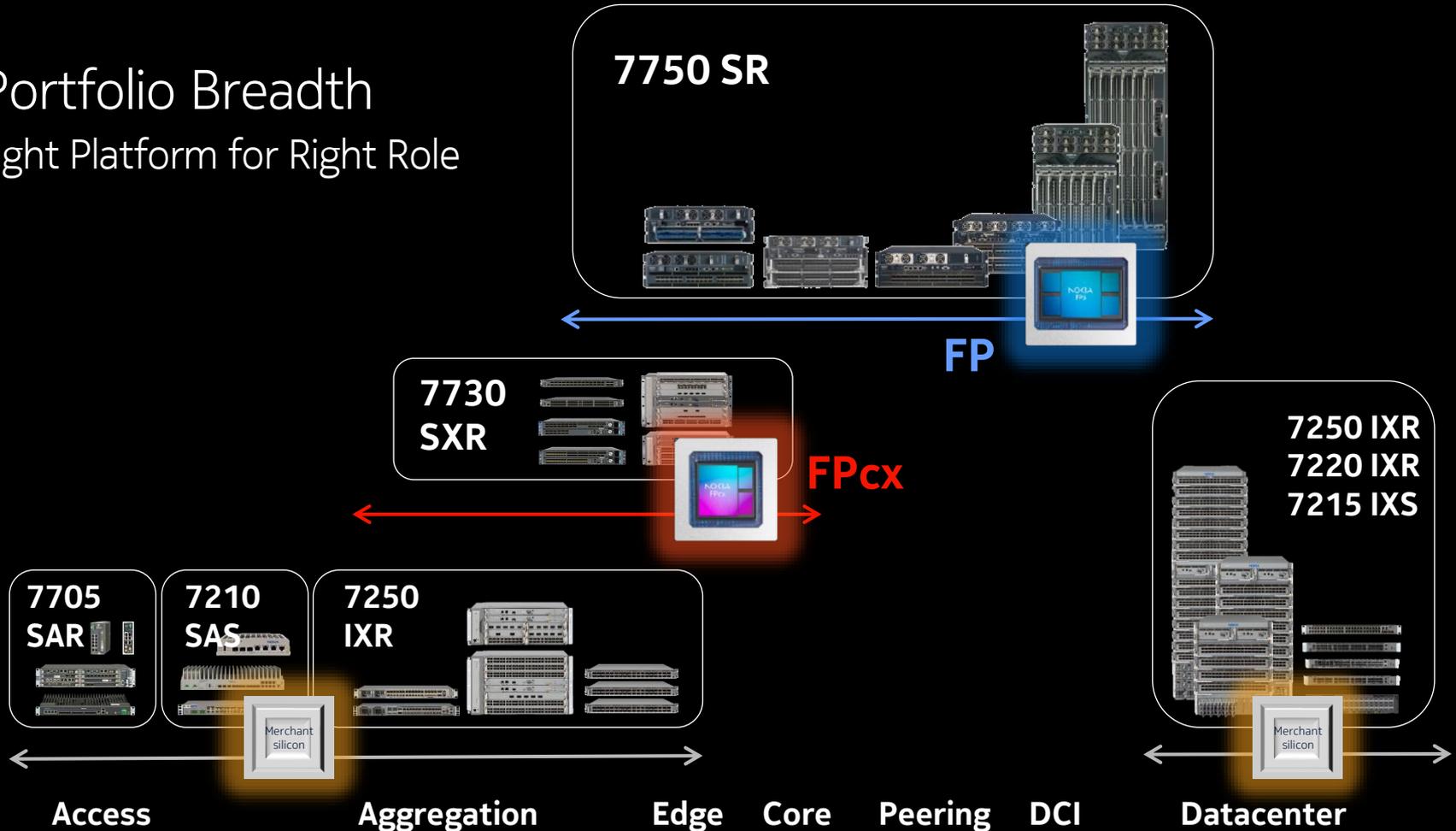
# Portfolio Breadth

## The Right Silicon for the Right Role



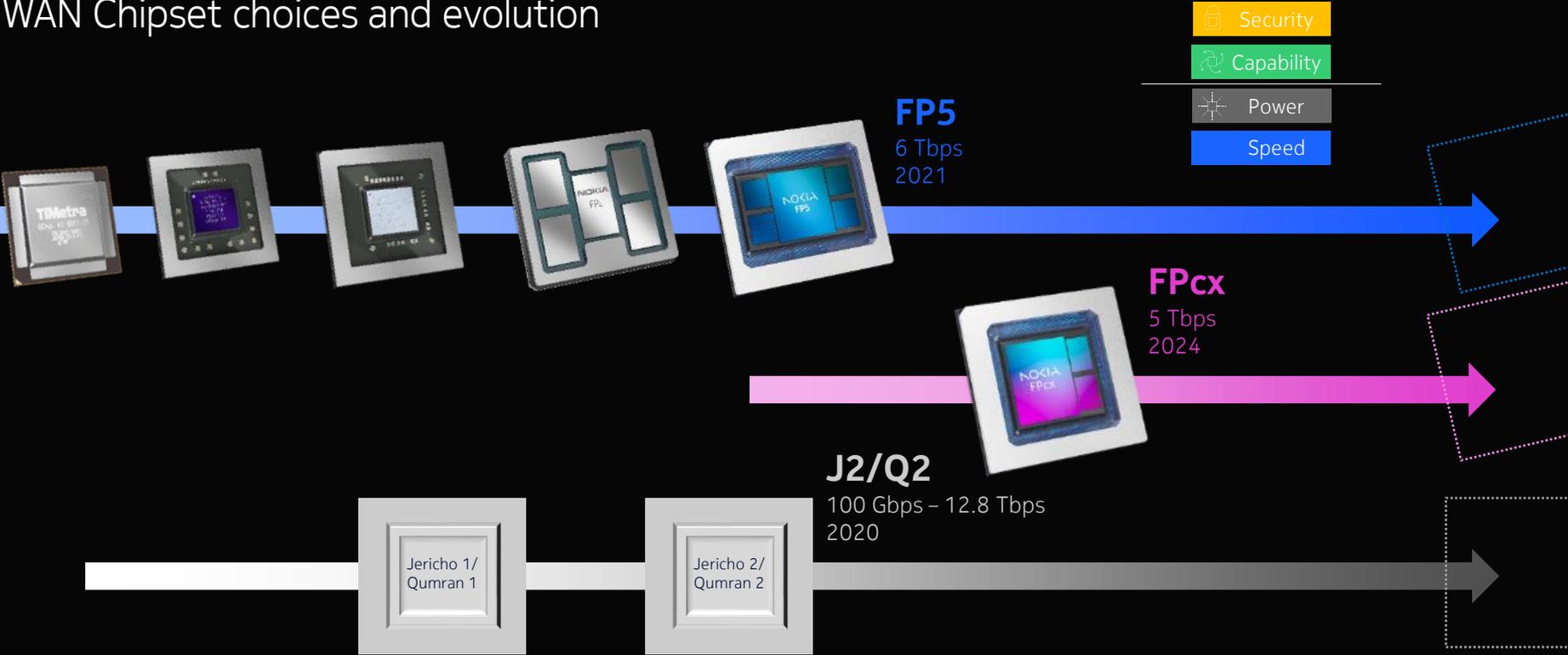
# Portfolio Breadth

Right Platform for Right Role



# All Silicon options have their own evolution path

## WAN Chipset choices and evolution



# Silicon characteristics

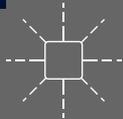
## Latest generations highlights



### Security



### Capability



### Power



### Speed

Industry Ceiling

#### FP5

- DDoS mitigation
- ANYsec/MACsec

- NPU:100% programmable
- Deterministic
- H-QoS, 256K queues

- ~0.1W/gig typical
- Right-sized capacity

- 6.0T HD, 7nm
- 112G SERDES
- 800GE

#### FPcx

- DDoS mitigation
- ANYsec/MACsec

- NPU:100% programmable
- Deterministic, line-rate memory
- H-QoS, 256K queues

- ~0.1W/gig typical
- Right-sized capacity

- 5.0T FD, 7nm
- 56G/112G SERDES
- 400GE

#### J2/Q2

- ACL
- ASIC (fixed pipeline)
- Ingress buffered
- < 0.1W/gig typical
- Right-sized capacity
- 100G – 12.8T FD, 7nm
- 56G SERDES
- 400GE

# FP4

- 3TB NPU, 50G SERDES, 400G QSFP-DD
- Deterministic
- Fully programmable
- Backward compatible
- DDOS Protection and Mitigation

**Aggregation/Edge/Core/Peering/DCI/BNG**

# FP5

- 6TB NPU, 100G SERDES, 800G QSFP-DD
- Deterministic
- Fully programmable
- Backward compatible
- DDOS Protection and Mitigation & ANYsec

# FPcx

- 5TB NPU, mixed 50G/100G SERDES
- Deterministic
- Fully programmable
- In-Service ISSU: no drops
- DDOS Protection and Mitigation & ANYsec

**Access/Aggregation/Edge**

75% Generational power decrease for a 3.75x increase in performance





# IP Routing Portfolio

## DFN- IP Platform

### 7730 Service Interconnect Router (SXR)

- Scalable, high-end platform designed for the access, aggregation and service edge applications in CSP and mission-critical networks
- Powered by Nokia FPv 3.0 7x IPv6 routing silicon
- Interface breadth from 1GE to 40GE with full line-rate and coherent optics support
- Silicon-based IP network security without performance impact. DDoS mitigation on all platforms, AntyMiracleSec on select performance/10G4.
- Enabled by Nokia open, resilient, and extensible SR Linux network operating system (NOS)



### 7250 Interconnect Router (IXR)

- High-port-density, stable interconnect routers
- Optical backbone options include 4 x 100GE, 2 x 100GE, and 2 x 50GE, x 100GE
- Optimized for management of IP-based transport bandwidth, flexible network elements, and mission-critical routers
- 7250 IXR line: 7250 IXR-4, 7250 IXR-4, and 7250 IXR-4T models. 7500 Ethernet Satellite port extender or stand-alone router
- Proven and highly resilient SR OS software delivers a rich set of IP routing capabilities



### 7210 Service Access System (SAS)

- Access, demarcation and cost-effective GE aggregation routers
- High-density and line-rate throughput
- 7210 SAS-6, 7210 SAS-6 and 7210 SAS-5P series models. 7500 satellite port extender and stand-alone router
- Proven and highly resilient SR OS software delivers a rich set of IP routing capabilities



### 7750 Service Router (SR)

- Scalable, comprehensive and deterministic routing for edge and core applications in CSP, enterprise and mission-critical networks
- Powered by Nokia FPv 6.0 7x IPv6 and FPv 3.0 7x IPv6 routing silicon
- Variable 10GE, 25GE, 50GE, 100GE, 200GE, 400GE, 800GE and up to 1 T of line-rate chassis
- Silicon-based IP network security without performance impact. All platforms support DDoS mitigation and line-rate encryption using AntyMiracleSec
- Proven and highly resilient SR OS software delivers a rich set of IP routing capabilities



### 7705 Service Accessing Router (SAR)

- Access and aggregation routers supporting datapath encryption including IPsec and NIS (on select platforms)
- Well-suited for mission-critical and industrial applications, particularly for legacy-to-packet adaptation
- Multitenant interface delivering Ethernet, packet microwave, TDM, SD-WAN, CSP 5G, E2E and other legacy interfaces
- Proven and highly resilient SR OS software delivers a rich set of IP routing capabilities



### Portfolio Building Blocks

#### Nokia FP routing silicon

- FPv3**
  - 6.7x full duplex IPv6, fully programmable network processor for high-performance, state and feature-rich services for the most demanding IP edge and core applications
  - Deterministic, secure performance parity under all network loads, operations and full services without compromise
  - Silicon-based IP network security without performance impact. All platforms support DDoS mitigation and line-rate encryption using AntyMiracleSec
- FPv6**
  - 5.7x full duplex IPv6, fully programmable network processor for long-pipeline and feature-richness optimized for 5G access, aggregation and service edge applications
  - Carrier-scale and assured services with granular SLA enforcement and high service scale for a wide range of routing applications
  - Silicon-based IP network security without performance impact. All platforms support DDoS mitigation, and line-rate encryption using AntyMiracleSec is offered on select performance/10G4

#### Network operating systems

- SR OS**
  - Proven, robust and highly reliable, supports the industry's most comprehensive suite of IP, MPLS and segment routing features
  - Carrier-level scale and performance across all IP6s and subscriber management scale
  - Ground-up multi-domain architecture and telemetry services at a high level of granularity
  - Industry-leading non-stop services, routing and in-service software upgrade support
- SR Linux**
  - Embeds cloud-native design principles with a Linux-based, modular, microservices, stateful architecture
  - Leverages proven SR OS protocol stacks and networking applications for a feature-rich, hardened, interoperable, and secure solution
  - Ground-up multi-domain architecture and telemetry services at a high level of granularity
  - Built for openness across the stack on customizability, offering a true application platform

#### Virtualized Service Router (VSR)

- VSR**
  - Flexible, high-performance, virtualized IP router designed and optimized for cloud scaling in cloud-based server environments
  - Flexible delivery of a wide range of SR OS routing and network applications, adaptable as virtual network function or combined network element
  - Allows simplified lifecycle management, operations and maintenance across multi-tenant virtualized networks in hybrid network scenarios, when deployed along with physical network elements

#### Network Services Platform (NSP)

- NSP**
  - Defines a programmable, network automation framework for IP/MPLS, Ethernet, IP optical and microwave networks
  - Abstracts network complexity by using intent-based networking that turns high-level service definitions into device-specific commands
  - Improves network reliability with powerful assurance and analytics capabilities to anticipate and troubleshoot the network and its blocks quickly and efficiently

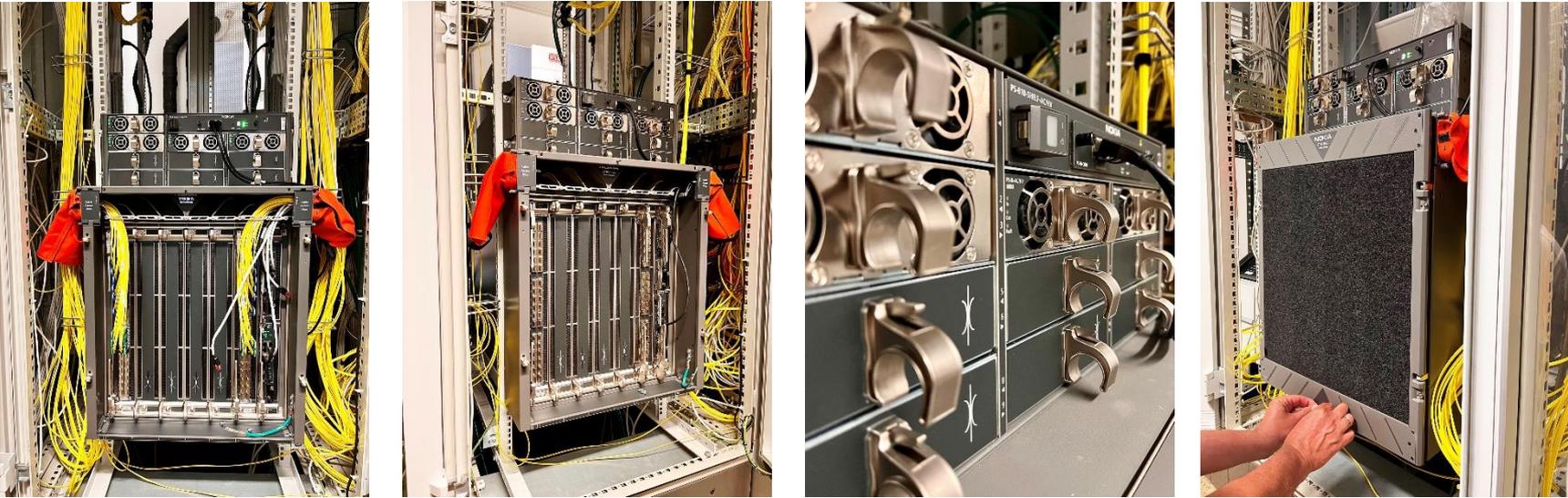
#### DeepFeed Network Analytics and DDoS Security

- DeepFeed**
  - Pantry-scale, big data service portfolio for real-time, multidimensional network analysis and superior insights
  - DeepFeed Cloud (Demand) and DeepFeed Secure (Demand) data feeds for up-to-date internet content applications/services and security control
  - DeepFeed Defender for fast and accurate DDoS detection and mitigation orchestration
  - 7750 DMS-1-4D: Purpose-built FPv3-based, 2.8 Tbps IPv6 system for scalable, cost-efficient DDoS mitigation





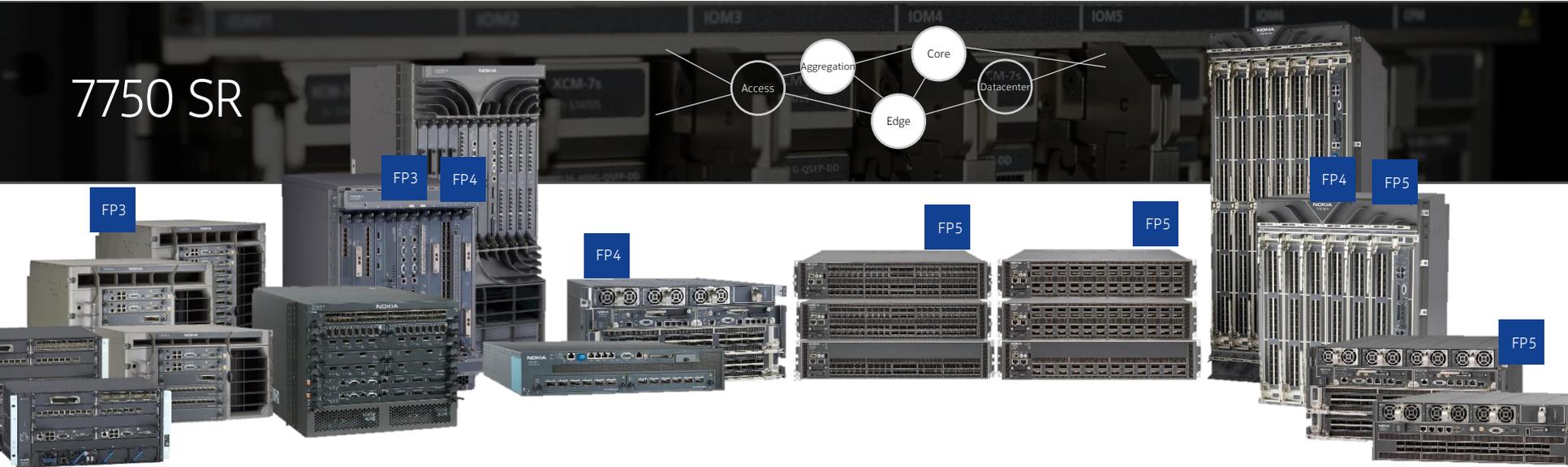
# Renewal of core routers on the IP platform (Pictures posted on DFN web page)



[Pictures of the installation of the Nokia 7750 service router at the site of the X-WiN core network node at Leibniz University Hannover](#)

DFN announcement (May 14, 2024): [Renewal of core routers on the IP platform](#)

# 7750 SR



## Capacity

- FP silicon for demanding network roles
- Up to 230T FD
- 800GE to native GE interfaces
- 1.6T flows today

## Extensible

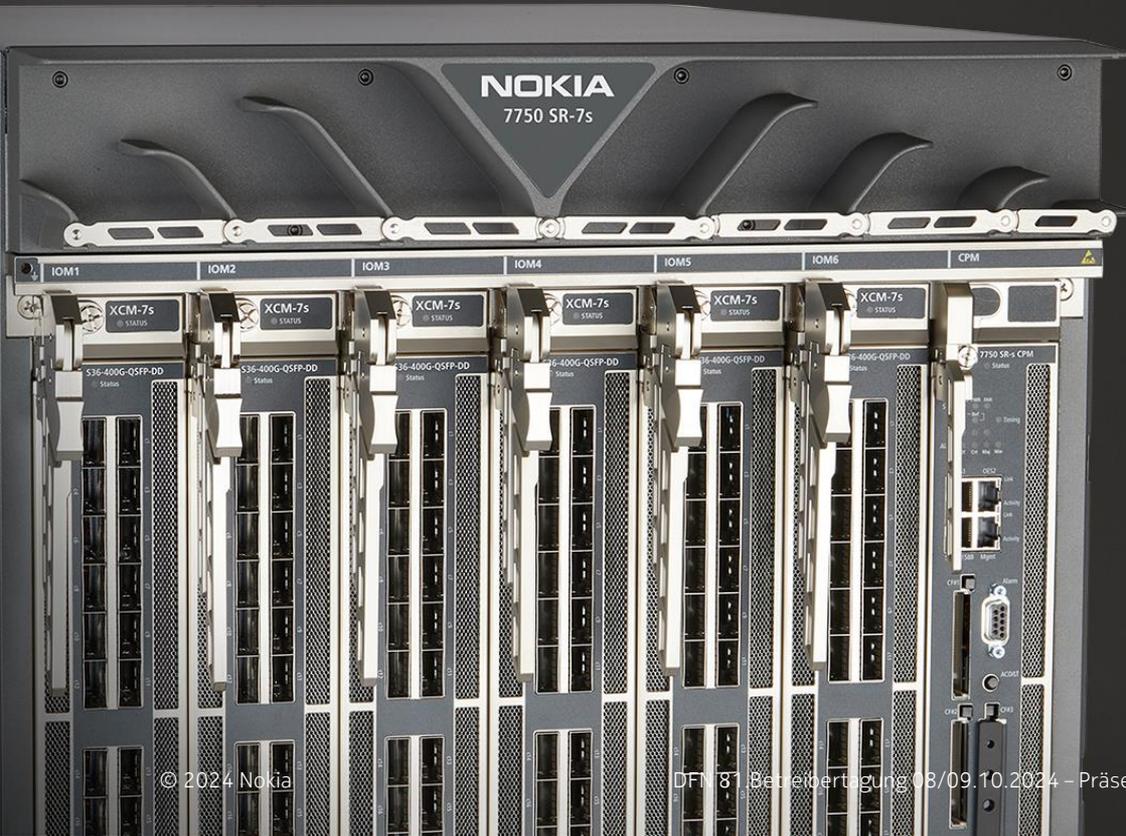
- Deterministic
- Full set of SROS edge, core and aggregation functions/services
- Secure: ANYsec/MACsec & native DDoS mitigation

## Efficient

- As low as 0.1W/gig with FP5
- Mechanical designs enable full density of 400GE/800GE coherent
- 25%-40% power savings with supported optics

# Nokia 7750 SR

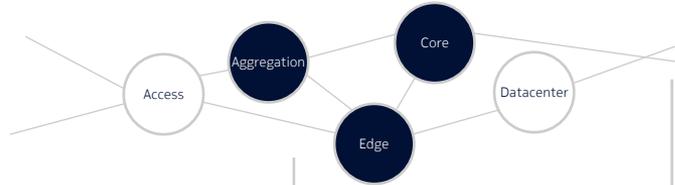
The route to remarkable IP networking



- Innovation without compromise
  - Speed and capacity
  - Flexible capability
  - IP network security
  - Sustainability

# 7750 SR

Master the unexpected



**7750 SR-1/1x**  
Modular or Fixed  
Integrated GNSS (1x)

**1.5T - 6.0T FD**  
Up to 19.2T IA



**7750 SR-1s/1se**  
High-Capacity Edge  
Modular or Fixed  
Integrated GNSS (1se)

**2.4 - 19.2T FD**



**7750 SR-2s/2se**  
Control/Fabric Redundant  
2-slots  
Integrated GNSS (2se)

**9.6T / 36T FD**  
24T / 38.4T IA



**7750 SR-7s**  
Control/Fabric Redundant  
6-slots

**108T FD**  
115.2T IA



**7750 SR-14s**  
Control/Fabric Redundant  
12-slots

**216T FD**  
230.4T IA

800G today, best-in-class optics cooling, 0.1W/gig

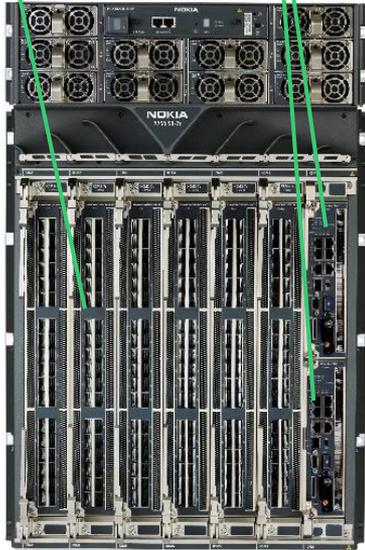
FP: NPU, deterministic, feature-rich with quality day-1, secure

# DFN – IP-Plattform – Nokia 7750 SR-7s / 7750 SR-2se

- Orthogonal direct cross connect
- Power de-coupled
- Fans and SFMs de-coupled

Up to 6 XMAS

CPM



power shelf connector



Four SFMs  
insert behind  
middle two  
fan trays



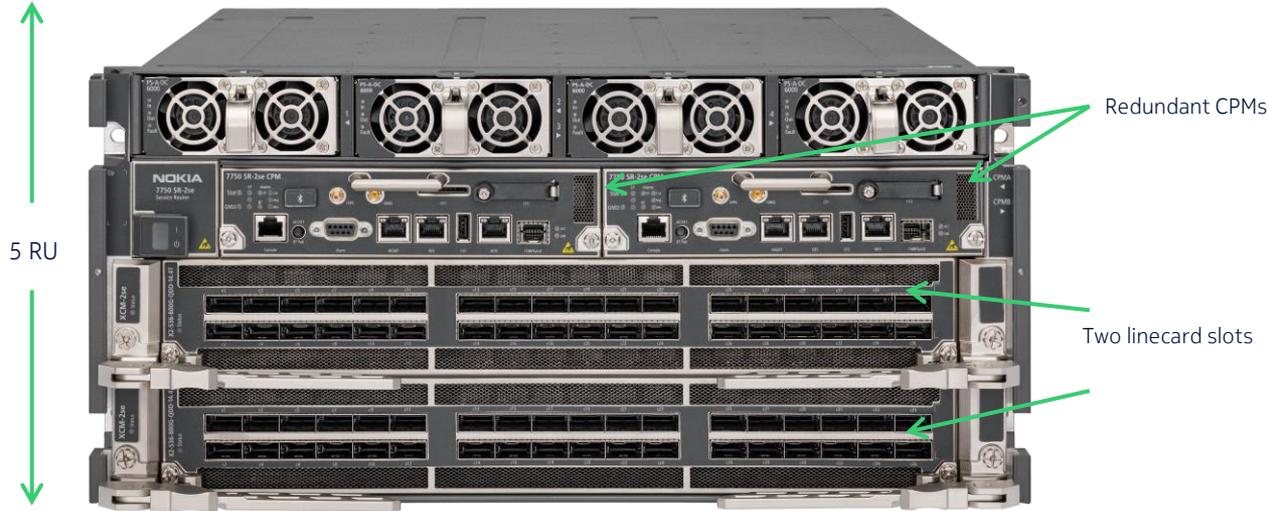
Four  
fan  
trays

Nokia 7750 SR-2se



# Compact and customizable

Nokia 7750 SR-2se: High-capacity edge



Upgradable within FP5: 2.4T to 36 FD,  
Control and fabric redundant  
FP5 value add + Integrated GNSS

Orthogonal direct cross connect  
4x SFMs at rear behind fan modules  
Fans and fabrics separate

# Verfügbare XMA-Linecards

## FP4: Fixed XMA-s

36-port 4.8T 400G QSFP-DD



3.6T FD → 4.8T FD → 12T iA  
64GB buffer +12M 64B pre-buffer

36-port 3.6T QSFP28



3.6T FD  
48GB buffer +6M 64B pre-buffer

36-port 2.4T QSFP28



1.6T FD → 2.4T FD → 3.6T iA  
32GB buffer +6M 64B pre-buffer

18-port 1.2T QSFP28



0.6T FD → 1.2T FD → 1.8T iA  
16GB buffer +3M 64B pre-buffer

## FP5: Fixed XMA2-s

36-port 18.0T 800G QSFP-DD



14.4T FD → 18.0T FD & 19.2T IA  
192GB buffer +21.6M 64B pre-buffer

36-port 12.0T 800G QSFP-DD



9.6T FD → 12T FD & 19.2T iA  
128GB buffer +21.6M 64B pre-buffer

36-port 6.0T 800G QSFP-DD



4.8T FD → 6T & 19.2T iA  
64GB buffer +21.6M 64B pre-buffer

36-port 3.0T 400G QSFP112



2.4T FD → 3T & 9.6T iA  
32GB buffer +10.8M 64B pre-buffer

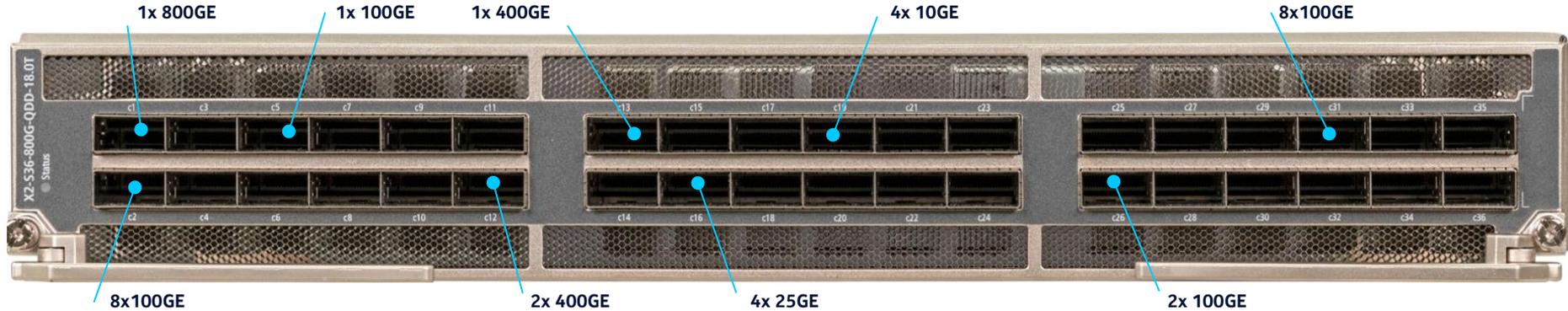


licence upgrade path: x → y → z, OR x → y, OR x

# Nokia 7750 SR-s - 36port 800G QSFP-DD XMA2

DFN

Performance for demanding roles



3x capacity & 3x buffer increase FP4 to FP5

All ports 800G capable

Universal ports

Belly-to-Belly cage design

Honeycomb mesh air intakes

# Alternative – Solutions

The Nokia logo is centered within a large white circle that is partially cut off by the right edge of the slide. The background of the slide is a teal-to-green gradient.

NOKIA

# Alternative - Choice of IP Routing platforms

Best fit for performance, features, scale in all network applications

7705 SAR



7250 IXR



7730 SXR



7750 SR



7750 SR-s



7210 SAS



Merchant

FPcx

FP

# 7750 SR Family overview

# Nokia FP silicon

## FP5: 6.0 Tb/s\*

Network Processing Unit



**FP5: 7nm / 112G SERDES** Nokia's 5th generation IP routing silicon

- 400GE, **800GE** and 1.6 Tb/s IP interfaces
- **75%** reduced power consumption at **3.75x** increase in performance **over FP4**
- **DDoS** protection
- **ANYsec** line-rate encryption (L2, L2.5 and L3)

## FP4: 3.0 Tb/s\*

Network Processing Unit



**FP4: 16nm / 56G SERDES** Nokia's 4th generation IP routing silicon

- 400GE (**800GE** & **ANYsec** with **new MDA**) and 1.0 Tb/s IP interfaces
- **50%** reduced power consumption over **FP3**
- **DDoS** protection



- Always deterministic: Performance certainty for predictable system operation
- Maximize ROI and longevity: Highly programmable, backwards compatible and flexible licensing

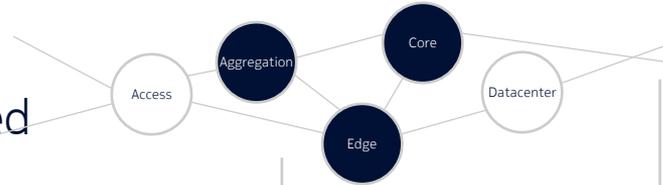
\*) Half duplex values

**FP5 is not intended to replace FP4, both chipsets will coexist for the long period of time**

**Decision to be made based on requirements on capacity and functionality**

# 7750 SR

Master the unexpected



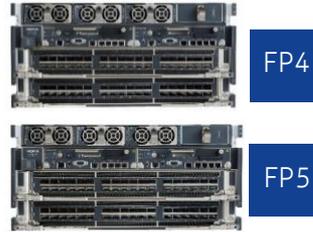
**7750 SR-1/1x**  
Modular or Fixed  
Integrated GNSS (1x)

**1.5T - 6.0T FD**  
Up to 19.2T IA



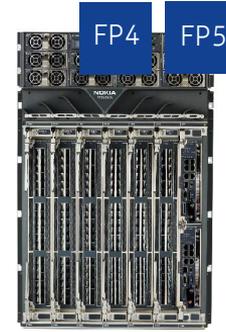
**7750 SR-1s/1se**  
High-Capacity Edge  
Modular or Fixed  
Integrated GNSS (1se)

**2.4 - 19.2T FD**



**7750 SR-2s/2se**  
Control/Fabric Redundant  
2-slots  
Integrated GNSS (2se)

**9.6T / 36T FD**  
24T / 38.4T IA



**7750 SR-7s**  
Control/Fabric Redundant  
6-slots

**108T FD**  
115.2T IA



**7750 SR-14s**  
Control/Fabric Redundant  
12-slots

**216T FD**  
230.4T IA

800G today, best-in-class optics cooling, 0.1W/gig

FP: NPU, deterministic, feature-rich with quality day-1, secure

# 7750 SR-s overview



	7750 SR-1s	7750 SR-1se	7750 SR-2s	7750 SR-2se	7750 SR-7s	7750 SR-14s			
Height / depth	3RU / 687.8 mm	3RU / 687.8 mm	5RU / 813.5 mm	5RU / 803 mm	16 or 17RU / 858.5 mm	27 or 28RU / 858.5 mm			
System configuration	Fixed: 2.4T (FD), 4.8T (FD) Modular: 3T (FD)	Fixed config	2 slots, modular XMA-s / IOM-s	2 slots, modular XMA2-s, IOM2-se	6 slots, modular XMA2-s, XMA-s, IOM2-se, IOM-s	12 slots, modular XMA2-s, XMA-s, IOM2-se, IOM-s			
Fabric, control	Integrated, simplex	Integrated, simplex	Fabric and control redundant	Fabric and control redundant	Fabric and control redundant	Fabric and control redundant			
System capacity (FD)	Up to 4.8 Tb/s	19.2 Tb/s	9.6 Tb/s	36 Tb/s	108Tb/s	216 Tb/s			
Line rate slot forwarding (FD)	4.8 Tb/s	19.2 Tb/s	4.8 Tb/s	18 Tb/s	18 Tb/s	18 Tb/s			
Port density: 800G/400G 100G/10G	- / 12 48 / 360	24 / 48 192 / 360	- / 24 96 / 720	36 / 84 360 / 720	108 / 252 1080 / 2160	216 / 504 2160 / 4320			
IA system capacity (FD)	12 Tb/s	All ports to 19.2 Tb/s line rate	24 Tb/s	38.4 Tb/s	115.2 Tb/s	230.4 Tb/s			
IA slot capacity (FD)	12 Tb/s	All ports to 19.2 Tb/s line rate	12 Tb/s	19.2 Tb/s	19.2 Tb/s	19.2 Tb/s			
Port density: 800G/400G 100G/10G	- / 24 120 / 360	24 / 48 192 / 360	- / 48 240 / 720	48 / 96 384 / 720	144 / 288 1152 / 2160	288 / 576 2304 / 4320			
Common parts	FP4	FP5	FP4 line cards	FP4	FP5 line cards	FP5	FP4 and FP5 line cards	FP4	FP5
	Power supply units (PSUs)					Switch Fabric Modules (SFMs) and fans			

IA – intelligent aggregation

# Nokia 7750 SR-2s / SR-2se

Identical Form Factor; 3x performance

7750 SR-2s



## Edge Cost Optimized

Midplane connector system optimized for **56G** SERDES

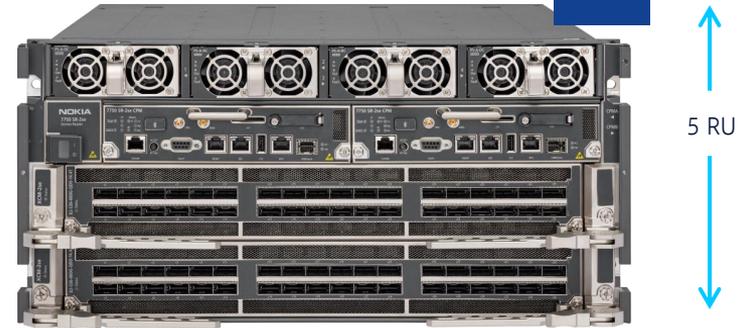
Load sharing XCM fabric architecture

Optimized for P4/Q4/T4/S4 architecture

Upgradeable within FP4: 0.8T to **9.6T FD** to 24T iA

Common PSUs with SR-2se

7750 SR-2se



## High-Capacity Edge

**Orthogonal direct cross connect; 112G** SERDES +

Up to four SFMs insert at rear behind fan modules

Compact and full system config options 

Upgradeable within FP5: 2.4T to **36T FD** to 38.4T iA

Common PSUs with SR-2s

FP5 value add + Integrated GNSS

# IOM Breadth

## FP4: Modular IOM-s

### IOM-s 3.0T

1.6T FD → 2.4T FD → 3T FD

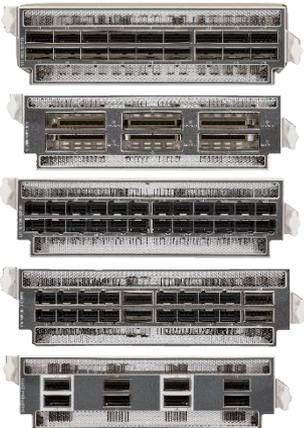


### IOM-s 1.5T

0.8T FD → 1.5T FD



MDA-s



18p QSFP28

6p CFP2 DCO

24p 10/100 SFP-DD

16p 10/25/100 SFP-DD with MACsec & 4p QSFP28

4p QSFP-DD & 4p QSFP28

## FP5: Modular IOM2-se

### IOM2-se 6.0T

3.2T FD → 6T FD



### IOM2-se 3.0T

1.6T FD → 3T FD



MDA-se



14p 800G QSFP-DD & 4p 400G QSFP

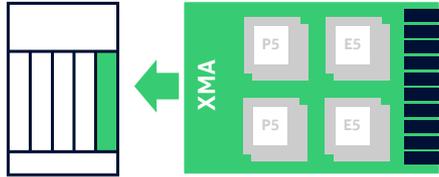
6p 800G QSFP-DD

24p 200G SFP-DD

6p 400G CFP2 DCO

# FP5 I/O Modules and Media Dependent Adapters

Even more granular connectivity options



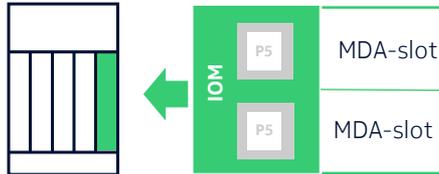
## XMA2-se

Expandable  
Media Adapter

Integrated XMAAs maximize port density and slot capacity



18T  
FD/19.2IA  
6x FP5



## IOM2-se

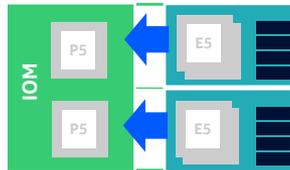
Input/output  
Module

IOM/MDA concept maximizes versatility and modularity



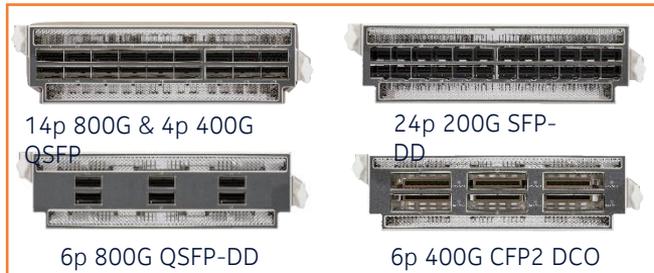
4.8T → 6T FD  
2x FP5

2.4T → 3T FD  
1x FP5



## MDA2-se

Media  
Dependent  
Adapters



# High-density edge routing, BNG, DCI, aggregation

## Nokia 7750 SR-1x fixed chassis routers (FP5)

### 7750 SR-1-24D (2.8T FD)



- 1) 24p **400G** QSFP-DD (2.4T)
- 2) 24p **800G** QSFP-DD (9.6T IA)

### 7750 SR-1-48D (2.8T FD)



- 1) 48p **400G** QSFP-DD to 19.2T IA

### 7750 SR-1x-48D (6.0T FD)



- 1) 48p **400G** QSFP-DD (4.8T)
- 2) 48p **800G** QSFP-DD (6.0T/19.2T IA)

### 7750 SR-1-46S (2.8T FD)



- 1) 40p **10/25**, 6p **400G** QSFP-DD (2.4T)
- 2) 40p **10/25/50/100/200** and 6p **800G** QSFP-DD (2.8T/6.4T IA)

### 7750 SR-1-92S (2.8T FD)



- 1) 80p **10/25**, 12p **400G** (2.4T)
- 2) 80p **10/25/50/100/200** and 12p **400G** QSFP-DD (12.8T IA)

### 7750 SR-1x-92S (6.0T FD)



- 1) 80p **10/25**, 12p **400G** (4.8T)
- 2) 80p **10/25/50/100/200** and 12p **800G** QSFP-DD (12.8T IA)

# Nokia 7750SR-1 (FP4)



## Fully modular

- Expand with 750G MDA-e-XPs in 2RU
- Common spares across SR-7/-12/-12e IOM5e

## Intelligent aggregation

- 1.5T FD line rate or 4.0T FD with intelligent fan-in/out

## Flexible interfaces

- 6/12-port Universal QSFP28
- 3-port CFP2 DCO
- 6-port Universal QSFP-DD
- 16-port 10G/25G SFP28 with MACsec & 2p QSFP28
- 8-port 100G & 2-port 800GE
- 2-port 400G & 2-port 800GE

Full sync, break-out and satellite support

# 7750 SR Ethernet Satellites

## MPLS Enabled Access & Aggregation



<b>7210 SAS-Mxp GE Satellite</b>	<b>7210 SAS-Sx GE Satellite</b>	<b>7210 SAS-Sx 10G/1G Satellite</b>	<b>7250 IXR-e (big) 1/10/25G Satellite</b>	<b>7250 IXR-s 10G/1G Satellite</b>	<b>7250 IXR-Xs 10/25/50G Satellite</b>	<b>7250 IXR-X1 100GE Satellite</b>
64G FD ETR	24-port: 64G FD, 48-port: 98G FD 6 Variants total	1.04T FD	<b>300G FD ETR</b>	<b>800G FD</b>	<b>4.8T FD</b>	<b>4.8T FD</b>
22x SFP, 2x Combo, 4x SFP+	<ul style="list-style-type: none"> <li>• 46x SFP, 2x Combo, 4x SFP+</li> <li>• 22x SFP, 2x Combo, 4x SFP+</li> <li>• 48x TX, 4x SFP+</li> <li>• 24x TX, 4x SFP+</li> </ul>	64x SFP+/SFP, 4x QSFP28	<b>24x SFP+/SFP, 8x SFP28/SFP+/SFP, 2x QSFP28</b>	<b>48x SFP+/SFP, 6x QSFP28</b>	<b>48x SFP56/SFP28/SFP+, 6x 400G QSFP-DD</b>	<b>32x QSFP28, 4x 400G QSFP-DD</b>
1.5RU	1RU	1.5RU	<b>1RU</b>	<b>1RU</b>	<b>1RU</b>	<b>1RU</b>
253mm deep	387mm – 406mm deep	450mm deep	<b>254mm deep</b>	<b>450mm deep</b>	<b>546mm deep</b>	<b>546mm deep</b>

**Full range of satellite ports from 1GE to 100GE**

# 7250 IXR Family overview

# Nokia 7250 IXR

7250 IXR-ec



7250 IXR-e small



7250 IXR-e big



## 7250 IXR-e

Compact  
ETR with GNSS  
64G, 120G or  
300G FD +  
conformal coat

7250 IXR-e2c



7250 IXR-e2



## 7250 IXR-e2

Compact  
ETR with GNSS  
100G FD or  
800G FD

7250 IXR-R4



7250 IXR-R6



## 7250 IXR-R

Control Redundant  
ETR & GNSS (R6)  
160G FD/slot  
300G or 800G FD

7250 IXR-R6d



7250 IXR-R6dl



## 7250 IXR-Rd

Control Redundant  
ETR & GNSS  
300/500G FD/slot  
2.4T FD

7250 IXR-s



## 7250 IXR-s

Fixed form factor  
800G FD

7250 IXR-X3b



7250 IXR-X1b



7250 IXR-X3



7250 IXR-X1



7250 IXR-Xs



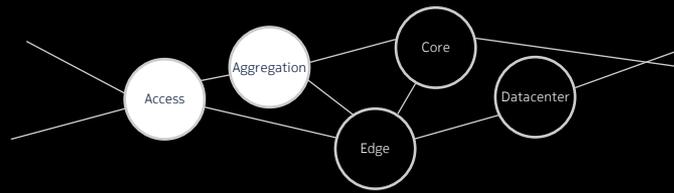
## 7250 IXR-X

Fixed form factor  
4.8T to 14.4T FD

Scalable, common design approach

300mm ETSI compliant

# 7250 IXR-e Series



## 7250 IXR-e

SR OS

300G FD  
GNSS\*  
Conformal coating\*

2 x QSFP28,  
8 x SFP28,  
24 x SFP+/SFP



## 7250 IXR-e

SR OS

120G FD  
GNSS\*  
Conformal coating\*

14 x SFP+/SFP,  
4 x RJ45 GE



## 7250 IXR-ec

SR OS

64G FD  
Conformal Coating\*

6 x SFP+/SFP,  
20 x GE,  
4 x RJ45 GE



Class D timing

## 7250 IXR-e2

23.7.R2

SR OS

800G FD  
GNSS

2 x 400G QSFP-DD,  
2 x QSFP28,  
24 x SFP28



Class D timing

## 7250 IXR-e2c

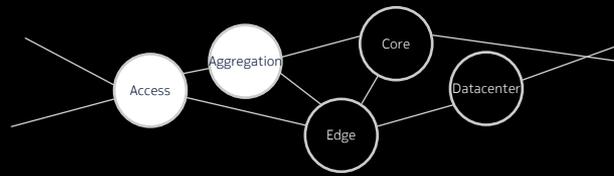
23.10.R3

SR OS

100G FD  
PEP

2x QSFP28,  
12 x SFP28/SFP+/SFP

# 7250 IXR-X series



**7250 IXR-s**

SR  
OS

800G FD

6x QSFP28,  
48 x 10/1GE



**7250 IXR-Xs**

SR  
OS

4.8T FD

6 x 400G QSFP-DD,  
48 x SFP56/SFP28/SFP+



**7250 IXR-X1**

SR  
OS

4.8T FD

4 x QSFP-DD,  
32 x QSFP28



**7250 IXR-X1b**

24.7.1

SR  
Linux

7.2T FD  
MACsec all ports

12 x 400G QSFP-DD  
24 x QSFP28



**7250 IXR-X3**

SR  
OS

14.4T FD

36 x 400G QSFP-DD



**7250 IXR-X3b**

24.7.1

SR  
Linux

14.4T FD  
MACsec all ports

36 x 400G QSFP-DD

# Platform Overview

7250 IXR-R6d / IXR-R6dl

## 7250 IXR-R6d



## 7250 IXR-R6dl



- Dual common CPIOMs
- 2.4T FD
- 6x MDA slots: ½ width on IXR-R6d, full width on IXR-R6dl
- Modular unique fan trays
- Modular unique MDA with a common design



-48 V DC /  
-60 V DC  
redundant

Right rear corner

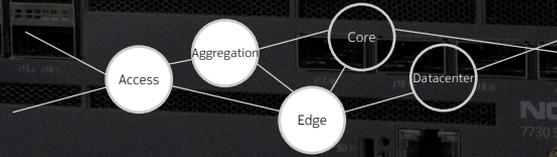
**All up-front access, ETR, MACsec on all MDA interfaces**

# 7250 IXR-R6d/R6dl MDAs

MDA	R6d	R6dl	IXR config
1-connector QSFP-DD, 1-connector QSFP28			1 x QSFP-DD + 1 x QSFP28
5-connector QSFP28			5 x QSFP28
2-connector CFP2-DCO			2 x CFP2-DCO
2-connector QSFP28, 16-connector SFP+			2 x QSFP28 100GE + 16 x SFP+/SFP
20-connector SFP+			20 x SFP+/SFP
18-connector SFP28			15 x SFP28, 3x SFP+
10-connector SFP56			10 x SFP56/SFP28/SFP+
32-connector cSFP			32 x cSFP
46-connector SFP+			45 x SFP+, 1xSFP
80-connector cSFP			80 x cSFP



# 7730 SXR



## Capable

- 3.6 – 5.6T FD
- 400GE to native 1GE
- NPU: 100% programmable
- Deterministic
- R6d/dl: Simple upgrade from 7250 to 7730 SXR with full re-use

## Flexible

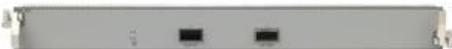
- Advanced buffers, features, scalability, upgradeability
- Coherent optics enabled
- Hardware-based timing with GNSS
- ETR: -40-65C

## Efficient

- 0.1W/gig: Merchant silicon equivalent
- In-Service ISSU with ZPL: optimize platform options for CAPEX/OPEX savings
- Drive agility into network upgrades

# 7250 IXR-R6d/dl & 7730 SXR-R6d/dl MDAs

All MDAs supported with both systems

Card name	Details		
2-port 400GE	<ul style="list-style-type: none"><li>1 x CFP2-DCO 400GE + 1 x CFP2-DCO 100GE</li><li>2 x CFP2-DCO 200GE/100GE</li></ul>		
5-port 100GE	<ul style="list-style-type: none"><li>5 x QSFP28 100GE</li></ul>		
1-port 400GE + 1-port 100GE	<ul style="list-style-type: none"><li>1 x QSFP-DD + 1 x QSFP28 100GE</li></ul>		
10-port 50GE	<ul style="list-style-type: none"><li>10 x SFP56/SFP28/SFP+ 50GE/25GE/10GE</li></ul>		
15-port 25GE + 3-port 10GE	<ul style="list-style-type: none"><li>15 x SFP28/SFP+ 25GE/10GE + 3 x SFP+ 10GE</li></ul>		
20-port 10GE/1GE	<ul style="list-style-type: none"><li>20 x SFP+/SFP 10GE/1GE</li></ul>		
46-port 10GE (7250 IXR-R6dl) <sup>7</sup>	<ul style="list-style-type: none"><li>45 x SFP+ 10GE + 1 SFP 1GE</li></ul>		
32-port GE cSFP (7250 IXR-R6d)	<ul style="list-style-type: none"><li>32-port GE cSFP (7250 IXR-R6d)</li></ul>		
80-port GE cSFP (7250 IXR-R6dl)	<ul style="list-style-type: none"><li>80-port GE cSFP (7250 IXR-R6dl)</li></ul>		

## When migrating to SXR

Up to 500G in all slots →

Full bandwidth in all slots →

Full bandwidth in all slots →

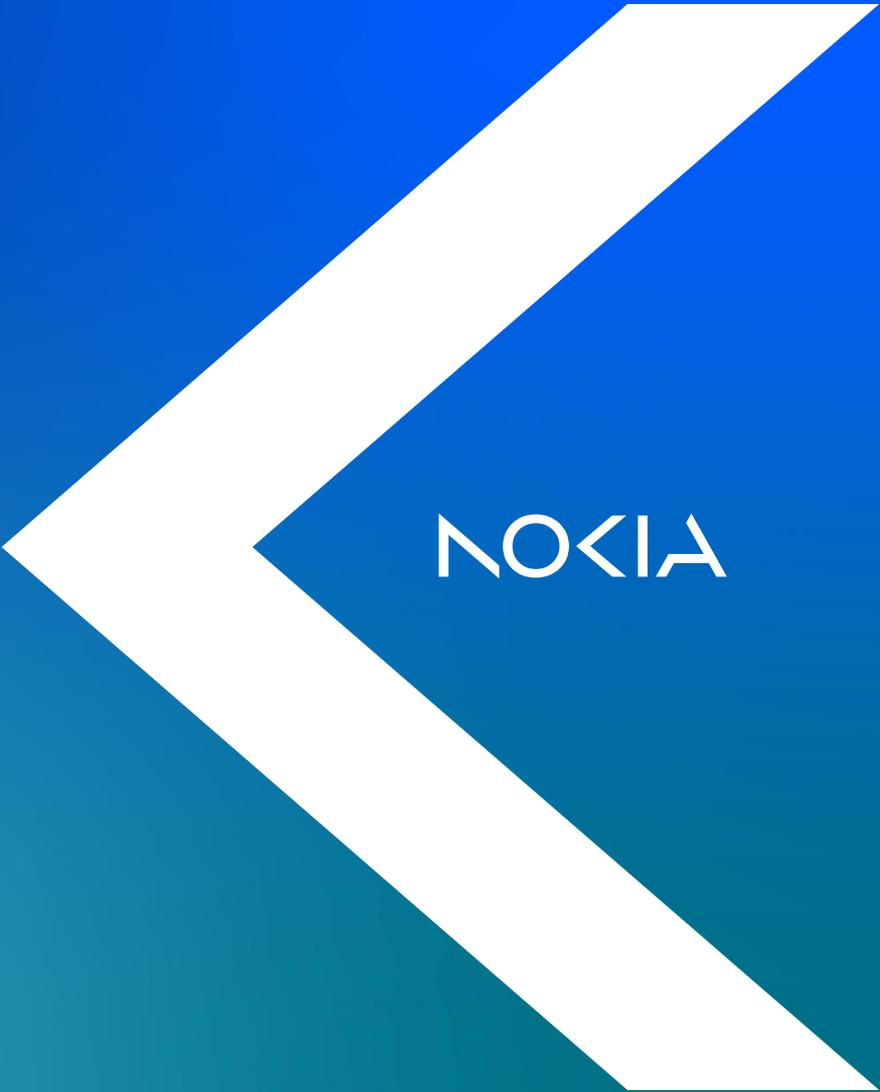
Full bandwidth in all slots →

25GE++: 18 x 25/10G →

10GE++: 46 x 10GE/1GE →

80 x GE cSFP →

# Further IP-Products

The Nokia logo is positioned on the right side of the slide, centered vertically. It is contained within a large, white, stylized arrow shape that points to the left. The arrow is composed of two thick, parallel lines that meet at a point on the left side. The word "NOKIA" is written in a white, sans-serif font inside the arrow's shaft.

NOKIA

# 7705 SAR product family

Purpose-built for industries, enterprises and governments

Chassis system  
Redundant switch  
fabrics



**7705 SAR-8**



**7705 SAR-X  
7705 SAR-Ax**

Industry focussed



**7705 SAR-Hc  
7705 SAR-Hm/Hmc**

Outdoor  
Pole, strand mount



**7705 SAR-Wx**

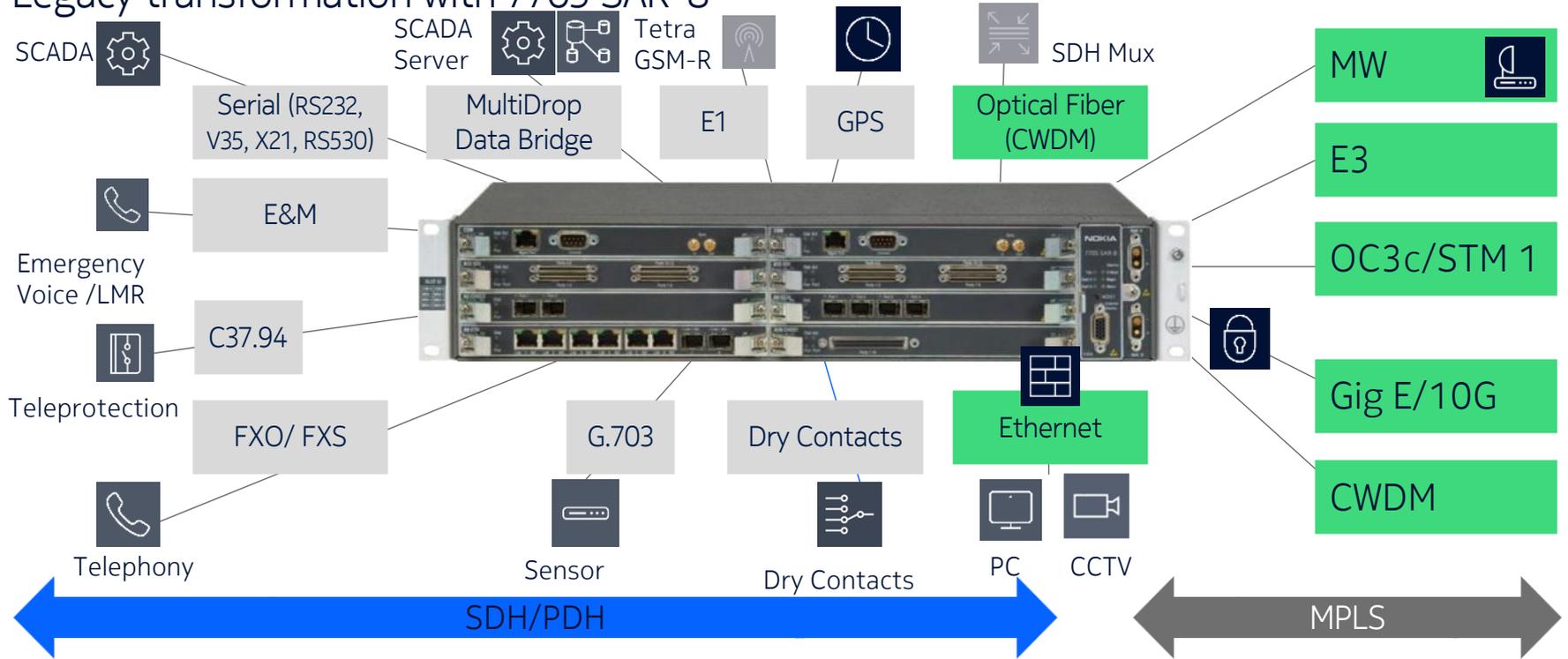
- 3G, 4G data rate - 30Gb/s
- DIN rail, pole, rack mounted systems
- Passive or active cooling

- A selection of Ethernet, SDH/PDH, legacy data and voice cards, and teleprotection (c37.94)
- Wireless uplinks: wi-fi, 3G, 4G option on Hm/Hmc

- Network security using IPsec or Network Group encryption (NGE)
- Feature-rich leveraging SROS capabilities and managed by NSP

# Pushing IP/MPLS to the edge

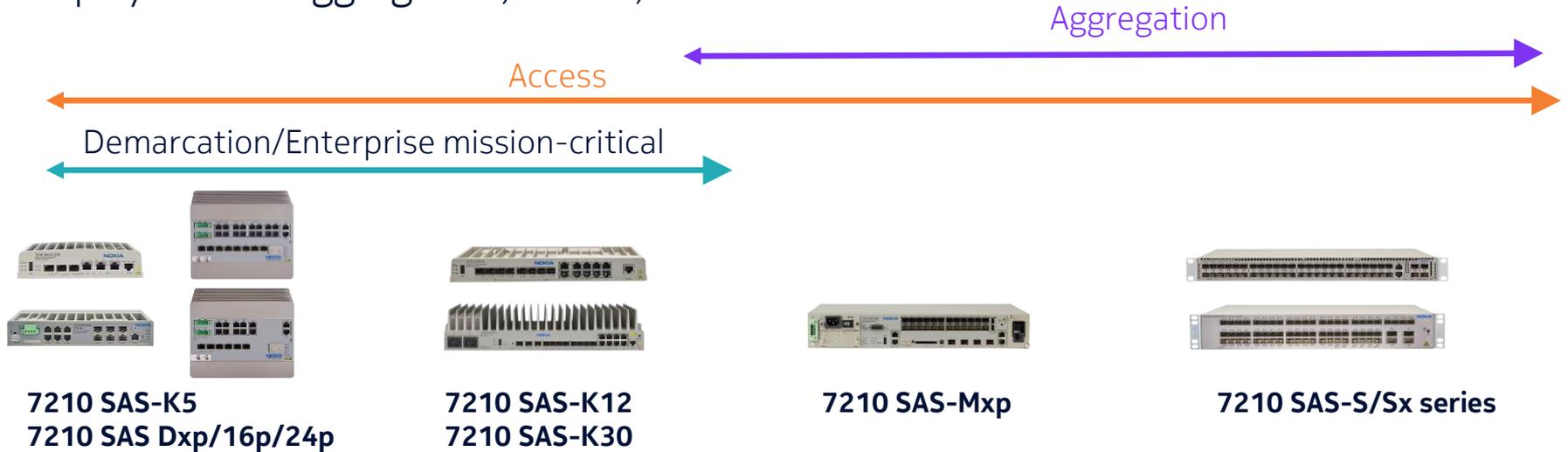
## Legacy transformation with 7705 SAR-8



Evolve your networks without changing your applications

# 7210 SAS product family

Simplify 1/10GE aggregation, access, and demarcation



- 5 Gb/s – 1.08 Tb/s
- DIN rail, standalone, rack mounted systems
- Passive or active cooling

- Ethernet only or IP/MPLS/Segment routing/Ethernet transport feature
- Low to high density ports supporting Power over ethernet

- Deep buffers, enhanced OAM\*
- Feature-rich leveraging SROS capabilities and managed by NSP

# Nokia Licenses

The Nokia logo is a large white circle on a blue-to-green gradient background. Inside the circle, the word "NOKIA" is written in white, uppercase, sans-serif font.

NOKIA

# Nokia – License Model: customized – Fit for purpose & Pay-as-you-grow

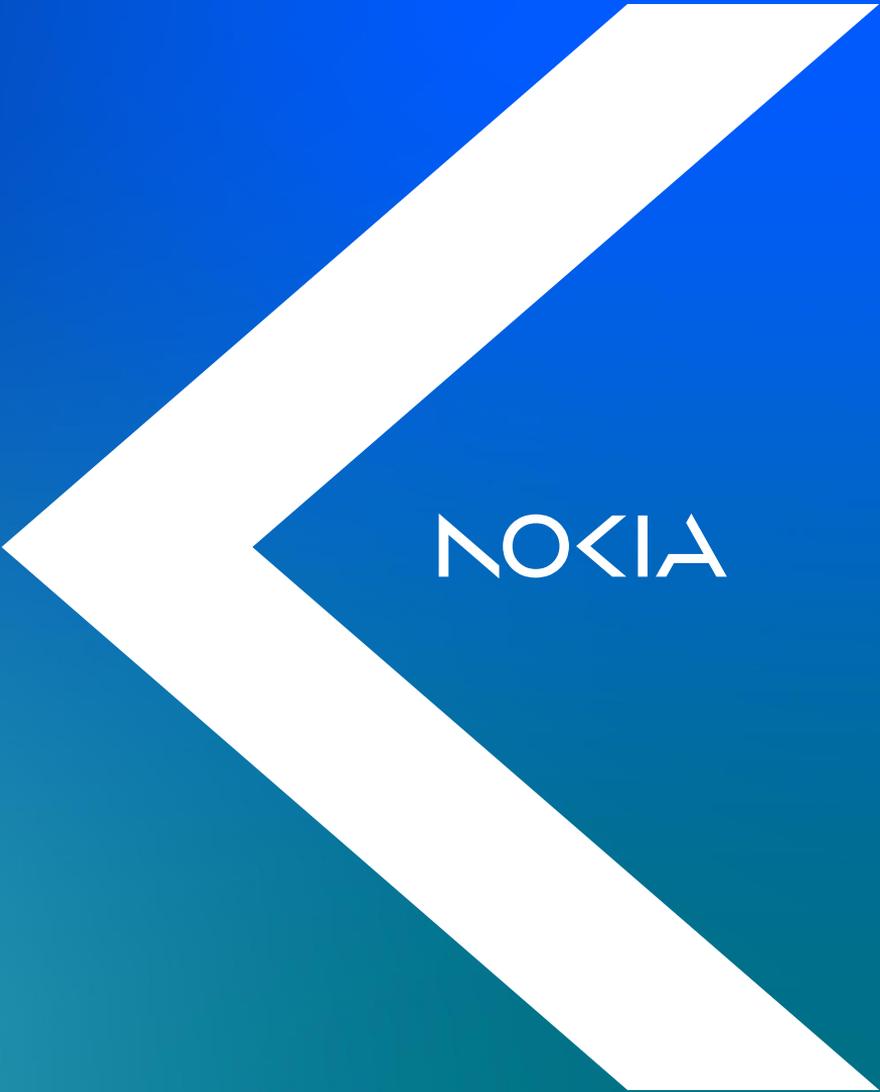
All licenses are permanent – No Expire date

- Flexible entry points, scale as required and pay only for functionality used
- Capacity licenses agreed on customer needs – and scaling model (mainly) without technical enforcement
- Functional licenses based on customer requirements and growth

Upgrade & Software lifecycle

- multiyear SW-support without upgrade possible
- no upgrade mandatory

# IP Networks Services

The Nokia logo is a large, white, stylized arrow pointing to the left, set against a blue background that transitions from a darker blue at the top to a lighter teal at the bottom. The word "NOKIA" is written in white, uppercase letters inside the arrow.

NOKIA



## Audit & Plan

- Network Readiness Evaluation
- Network Review/Audit



## Maintain

- Software Support Service
- Return for Repair /Replace
- Advanced Replacement
- Refurbishment
- Care Advanced Services
- Customer Technical Advocate



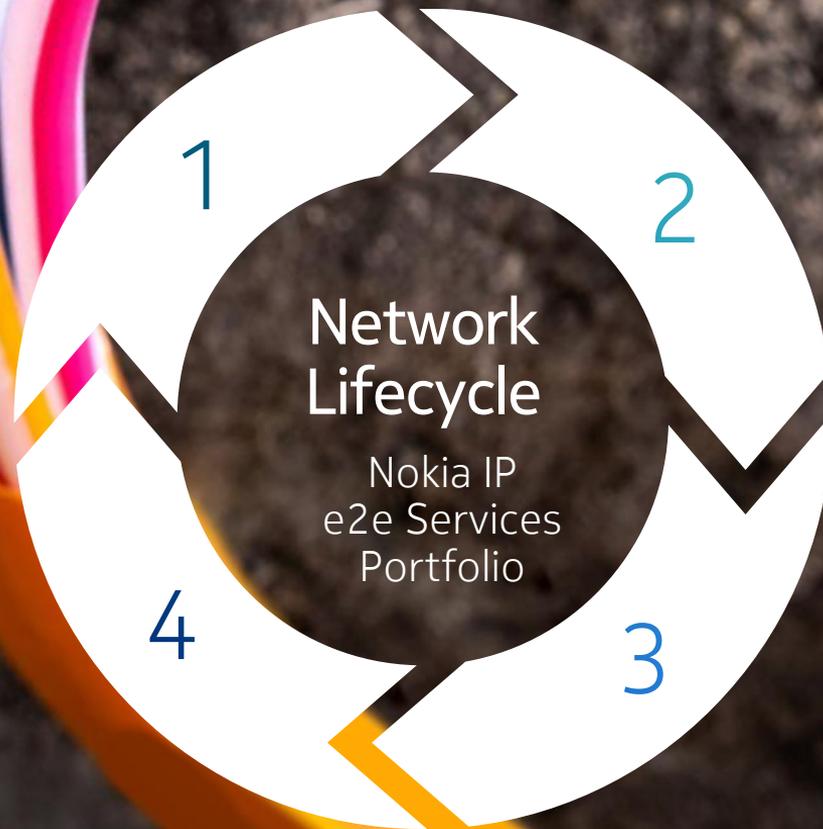
## Design & Build

- Deployment
- System Integration
- Network Test Automation



## Optimize & Transform

- Planning & Optimization
- Legacy Transformation
- Network Software Upgrade



# Network Lifecycle

Nokia IP  
e2e Services  
Portfolio

Training Services

Security Services

Program/Project Management Services

# IP services

## Advanced services partner for the connected world

Professional services

Care and maintenance

Deployment and integration

Learning services

Enabling automation



Global delivery centers



Cloud-based engineering services



Digital twin and staged solutions



Factory migration and digital process automation



Networks as-a-Service



## Technology lifecycle innovation and optimization

Increased agility speed-to-respond



Accelerated time-to-market



Reduced cost-to-serve



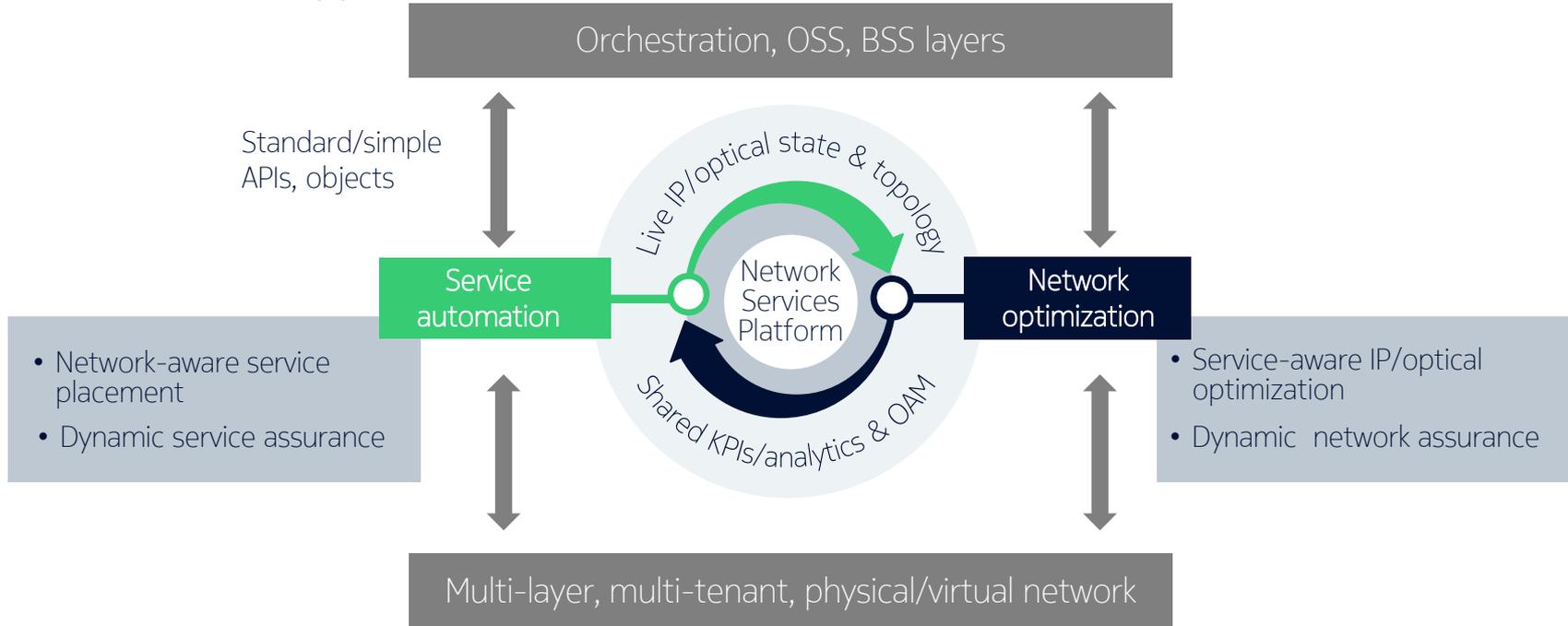
# Nokia – Managementsystem

The Nokia logo is a large white circle on a blue-to-green gradient background. Inside the circle, the word "NOKIA" is written in white, uppercase, sans-serif font.

NOKIA

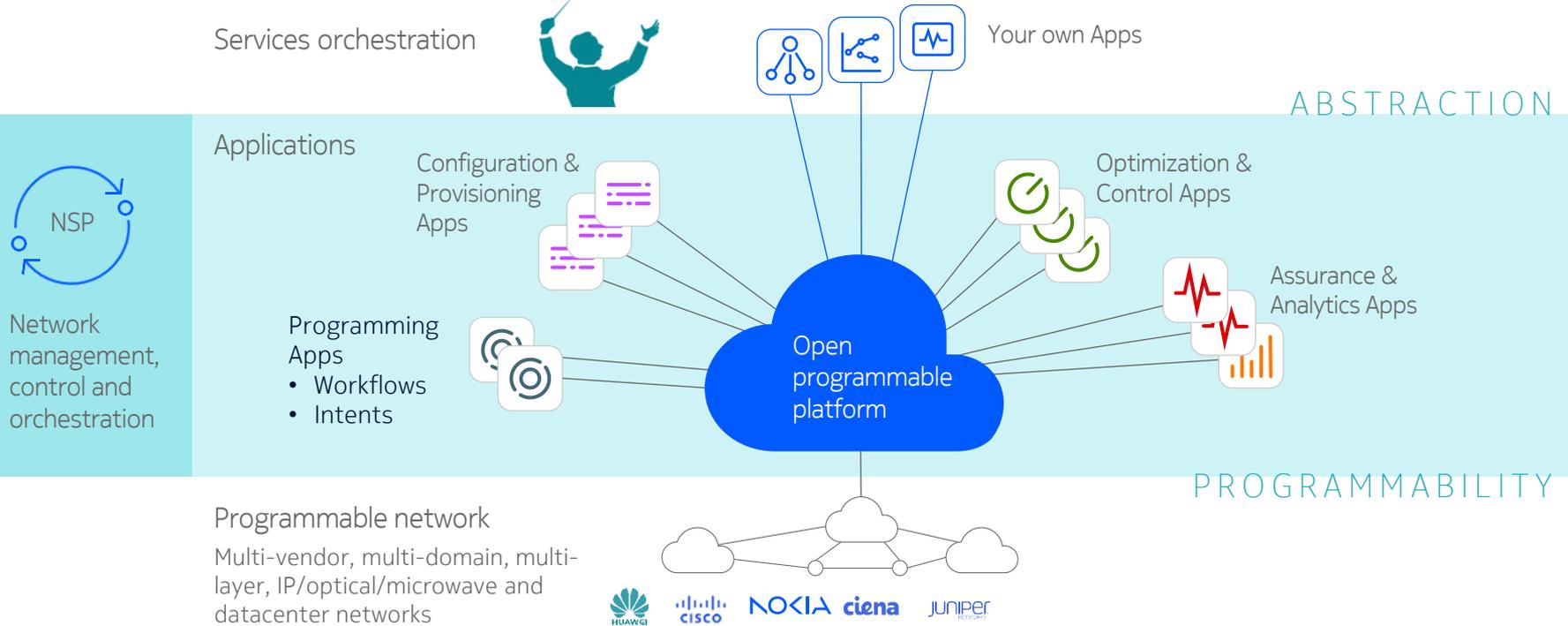
# Network Services Platform (NSP)

Nokia's holistic approach to carrier SDN

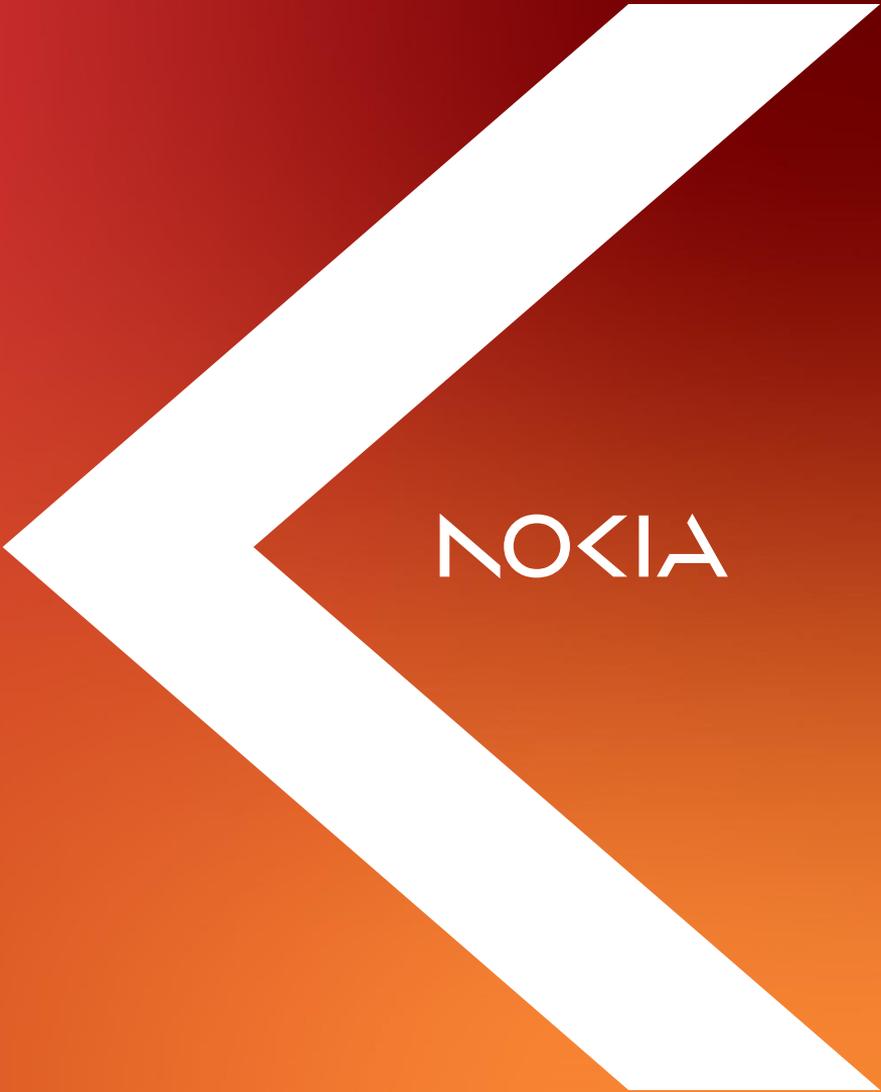


# NSP Network Services Platform (NSP)

a comprehensive, integrated, and programmable platform to manage, automate and control multivendor IP/optical networks

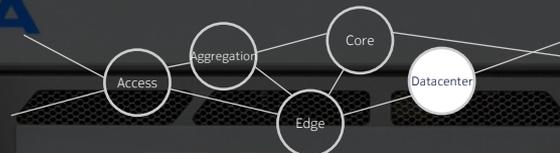


# Nokia - Datacenter Portofolio

The Nokia logo is a large, white, stylized arrow pointing to the left, set against a dark red background. The word "NOKIA" is written in white, uppercase letters inside the arrow's shaft.

NOKIA

## 7215 IXS / 7220 IXR / 7250 IXR



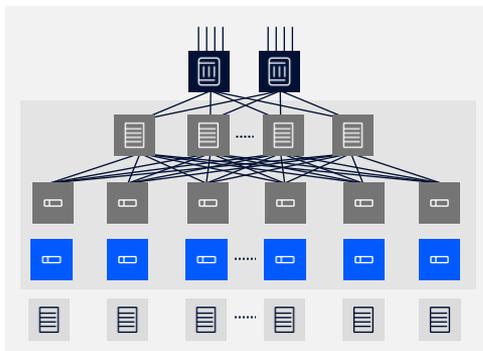
Data center edge

Spine (1 to N) layers

Leaf

Management

Servers



Nokia 7750 SR  
Nokia 7250 IXR-6e/10e/18e

Nokia 7250 IXR-6e/10e/18e  
Nokia 7220 IXR D5/H2/H3/H4

Nokia 7220 IXR D1/D2L/D3L/D4/D5

Nokia 7220 IXR-D1, 7215 IXS-A1



Management ToR

7215 IXS-A1  
7220 IXR-D1

- 88G (FD)
- 48x GE
- 4x 10GE



Leaf

7220 IXR-D2L

- 2T (FD)
- 48x 25GE
- 8x 100GE
- 2x 10GE



Fixed spine

7220-IXR-D3L

- 3.2T (HD)
- 32x 100GE
- 2x 10GE



Fixed spine

7220 IXR-D4, D5

- 6T (FD)
- 28x 100GE + 8x400GE (D4)
- 12.8T (FD)
- 32x 400GE (D5)
- 2x10GE



Fixed spine

7220 IXR-H2, H3, H4  
H4-32D

- 12.8 T (FD)
- 128x 100GE (H2)
- 32x 400GE (H3, H4-32D)
- 25.6T (FD)
- 64x 400GE (H4)



Fixed spine

7250 IXR-X1b, X3b

- 7.8 T (FD)
- 24x 100GE + 12x400GE (X1b)
- 14.4T (FD)
- 36x 400GE (X3b)



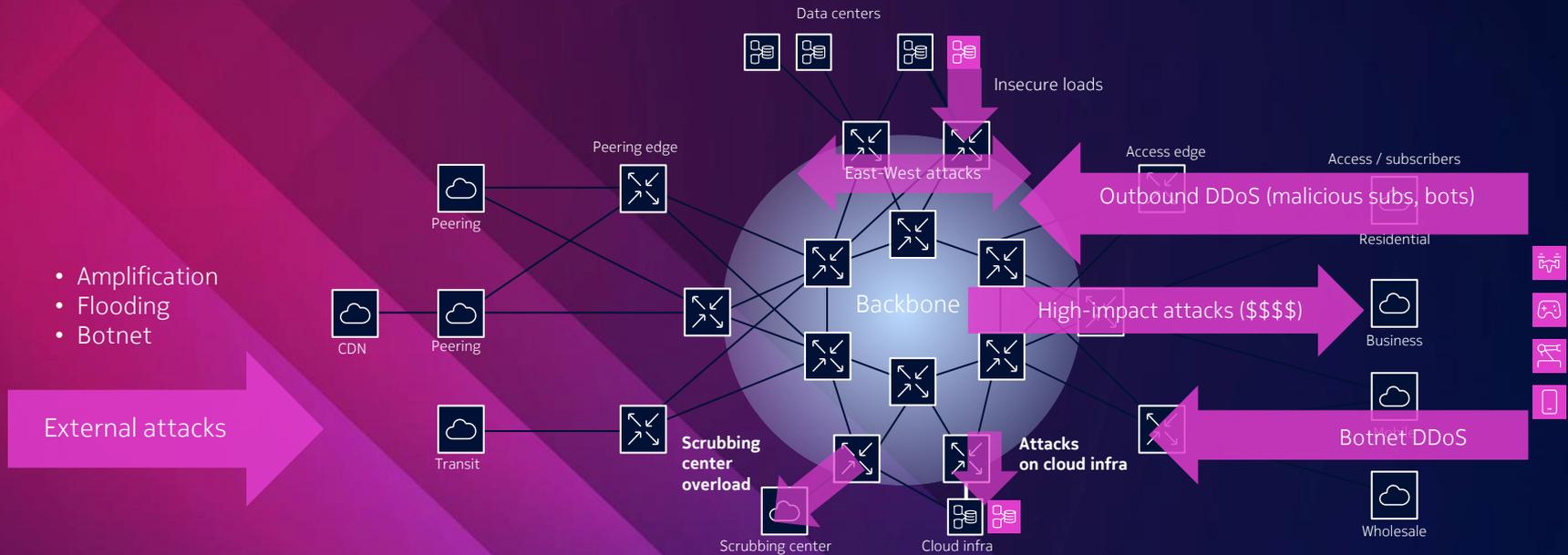
Super spine/DCI

7250 IXR-6e/10e/18e

- 115.2/230.4/460.8T FD
- Cntrl/Fab Red
- 36 x 400 IMM
- 60 x 100 IMM
- 36 x 800 IMM

# Nokia - Deepfield for DDoS protection & 7750 Defender Mitigation System

# DDoS is everywhere (and coming from all directions)



- Amplification
- Flooding
- Botnet

# Nokia Deepfield Defender

A big-data-driven solution for DDoS protection



Nokia Deepfield  
Secure Genome



Nokia  
Deepfield



IP  
Silicon

## Build Context



## Detect



## Mitigate

Today's complex DDoS threats require security context info about

- Sources sending traffic
- DDoS threats

Reliable context-based detection working out-of-the-box.

Leverage scalable filtering power of Nokia IP silicon to provide scalable, cost-efficient and fast DDoS mitigation at network edge.

# Nokia Ansprechpartner

Volker Hodel

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Mobil: 0172/6204999

Johnny Di Stefano

Email: [johnny.di\\_stefano@nokia.com](mailto:johnny.di_stefano@nokia.com)

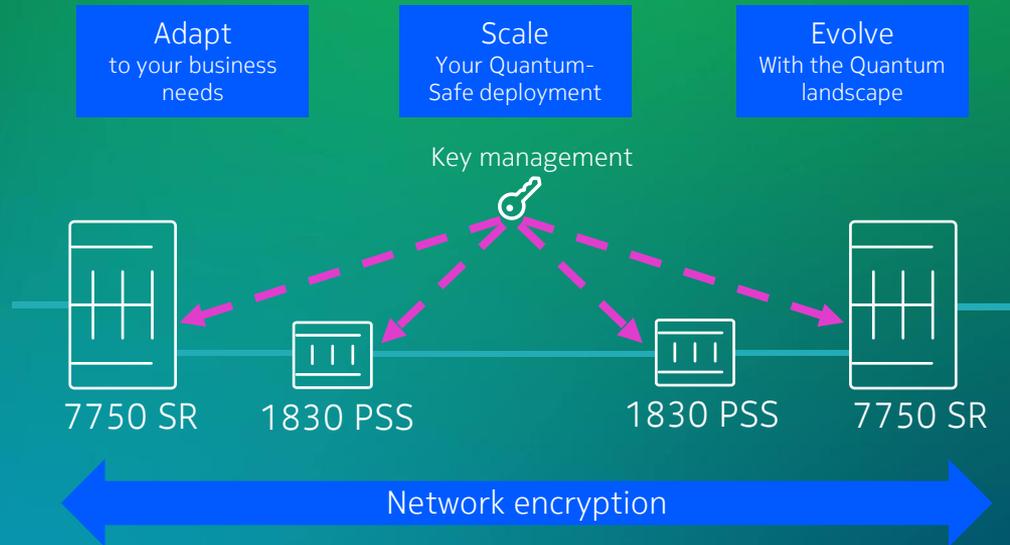
Mobil: 01511/4208192

# Backup

# Nokia 7750 SR AnySec Intro

# Security is the main reason why enterprises switch vendors

- Transport encryption
- Quantum-safe networking



# Overall portfolio

## IP-Networks - care and maintenance



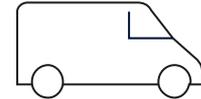
### Software services

- Advanced predictive services
- Expert knowledge base access
- Remote technical support
- Resident engineer
- Customer technical advocate
- Modular Platinum Support



### Hardware services

- Return for repair
- Advanced exchange



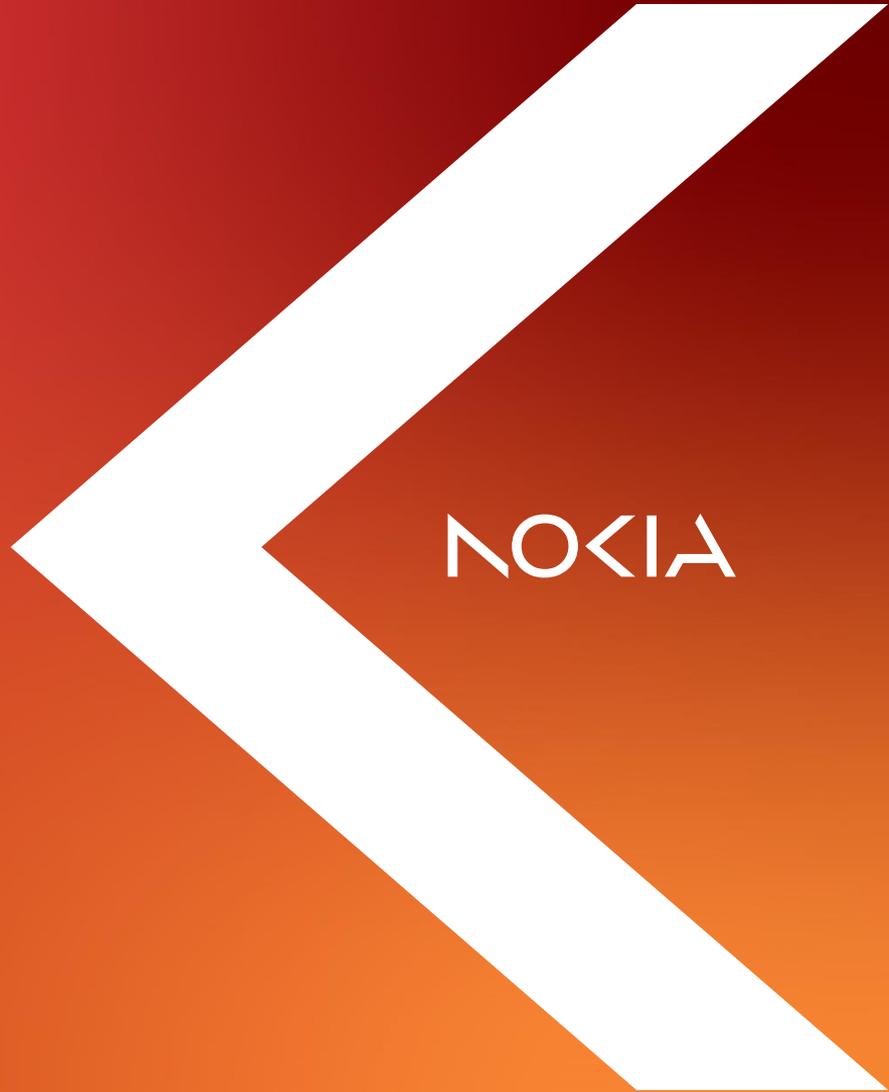
### Field maintenance

- Field corrective maintenance
- Scheduled field maintenance

Bundled Advanced Exchange + Field Maintenance Services for Nuage

# Service Routing Certification (SRC) Program

2024



NOKIA

# Certifications

Demonstrate your expertise with an industry-recognized certification



Nokia Certified Network Routing Specialist I (NRS I)

Learn the essentials of IP networking and VPN service routing.

[Learn more](#)



Nokia Certified Network Routing Specialist II (NRS II)

Acquire Nokia IP/MPLS service routing expertise.

[Learn more](#)



Nokia Certified Service Routing Architect (SRA)

Master the knowledge and skills to design and support high performing Nokia Service Router networks.

[Learn more](#)

# Flexible learning delivery

Learn your way



## Instructor-led

- Hands-on courses and workshops to prepare for exams
- Virtual and face-to-face deliveries
- Open-enrollment public classes across multiple time zones
- Schedule private classes virtually, at your office, or at select Nokia facilities



## Self-paced

- Digital self-study materials complete with lab guides
- Self-study certification bundles with everything you need
  - Self-study materials
  - My SR Learning Labs
  - All the exams
- Free practice exams



## Remote lab access

- Access lab exercises complete with inline instructions and solutions, giving you everything you need in one easy-to-use browser-based application.
- Develop practical skills and prepare for lab exams

# Optics overview

	100G QSFP28	100G QSFP28 Single Lambda	200G QSFP-DD (QSFP28-DD)	100G SFP-DD (SFP56-DD)	100G SFP112 (SFP112)	200G SFP-DD (SFP112-DD)	400G QSFP-DD (QSFP56-DD)	400G QSFP112 (QSFP112)	800G QSFP-DD (QSFP 112-DD)
Market availability	Now	Now	Now	Now	1H'24	2H'24	Now 100G PAM4 - 2023	2023	Now
Modulation	25G NRZ	50 PAM4	25G NRZ	50 PAM4	100G PAM4	100G PAM4	50G PAM4 (SR8, LR8) 100G PAM4 (DR/FR/LR) Coherent	100G PAM4	100G PAM4
Approximate module dimensions (length x width to scale)									
Electrical signaling (Gb/s)	CAUI-4 (4x25)	CAUI-4	CAUI-4 (4x25)	100GAUI-2	100GAUI-1	200GAUI-2	400GAUI-8	400GAUI-4	400GAUI-4
Media	MMF, SMF	MMF, SMF	MMF, SMF	MMF, SMF	MMF, SMF	MMF, SMF	MMF, SMF	MMF, SMF	MMF, SMF
Power consumption	5.5w	4.5w	8w	4w	<3.5w	<5w	Today: 12-14w to Will go to 8W (1H'24) 23.3w (coherent)	Today: 8w Will go to 6W 2H'24	Today: 16-18w Will go to 14W 1H'24
Industry standard module									
	(18.4mm wide)	(18.4mm wide)	(18.4mm wide)	(13.5mm wide)	(13.5mm wide)	(13.5mm wide)	(18.4mm wide)	(18.4mm wide)	(18.4mm wide)
Other optics that can plug into this cage	QSFP+	QSFP+	QSFP28 QSFP+	SFP56 SFP28 SFP+	SFP56-DD SFP56 SFP28 SFP+	SFP112 SFP56-DD SFP56 SFP28 SFP+	QSFP28-DD QSFP28 QSFP+	QSFP28 QSFP+	QSFP56-DD QSFP28-DD <b>400G QSFP112</b> QSFP28 QSFP+

# Quillion based portfolio for any deployment and any service



FX-16



FX-8



FX-4



SF-8



DF-16



DF-32



MF-2



MF-14

Large central office  
deployments

Outside  
deployments

Low density  
deployments

Massive delivery of  
25G and beyond

# Nokia Multi-PON

## Buy 10 – get 25



### One card – multiple flavors

- GPON
- XGS-PON
- GPON and XGS-PON co-existing
- 25GS-PON

### High performance

- High density
- Non-blocking
- 50% less power consumption
- Low latency

### Intelligent evolution

- Pay-as-you-grow
- SDN enabled
- Less equipment, less re-cabling
- Fast time to market with 10G services

# Nokia mesh-enabled ONTs

## GPON ONTs

## XGS-PON ONTs

		160 MHz				160 MHz	160 MHz	320 MHz
<b>G-2425G-A</b>	<b>G-2425G-B</b>	<b>G-1426G-A</b>	<b>G-2426G-A</b>	<b>G-2426G-B</b>	<b>XS-2426G-A</b>	<b>XS-2426G-B</b>	<b>XS-2426X-A</b>	<b>XS-2437X-B</b>
AC1200 (2+2)	AC2300 (4+4)	AX3000 (2+2)	AX1800 (2+2)	AX3600 (4+4)	AX1800 (2+2)	AX6000 (4+4)	AX6000 (4+4)	BE19000 (4+4+4)
2 POTS	2 POTS	1 POTS	2 POTS	2 POTS	2 POTS	2 POTS	2 POTS	2 POTS
4 x GE LAN	4 x GE LAN	4 x GE LAN	4 x GE LAN	4 x GE LAN	4 x GE LAN	1x 2.5 GE LAN + 3x GE LAN	1x 10 GE LAN + 3x GE LAN	1x 10 GE LAN + 3x GE LAN

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Available 3Q 2024

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