Building resilient connectivity

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Oct 2026

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Agenda

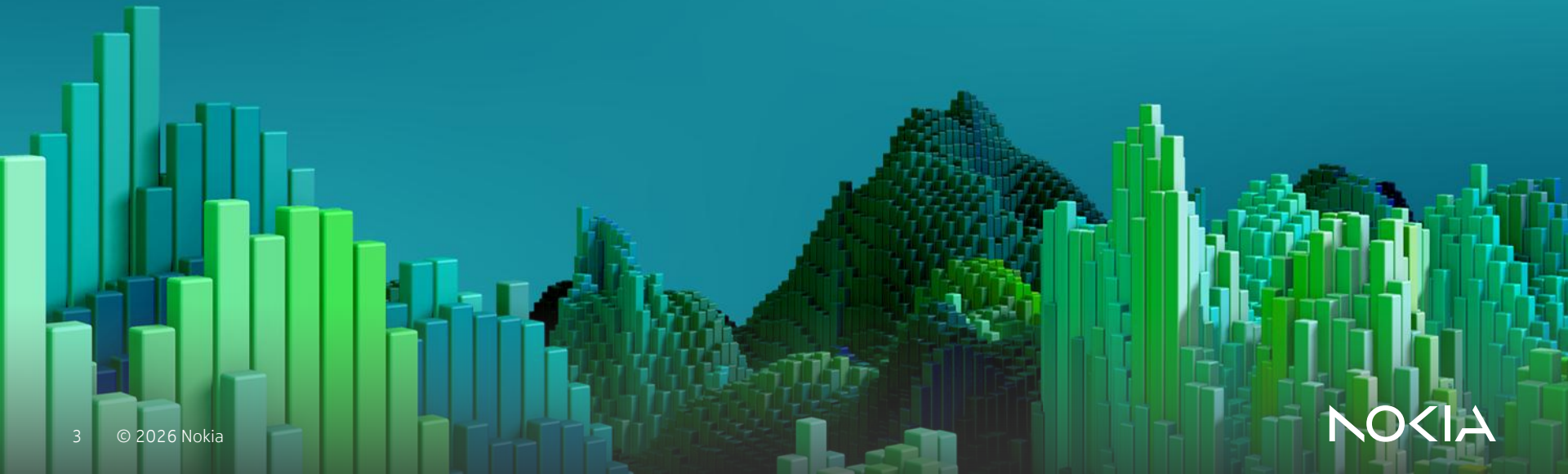
1. **Intro on Nokia**
2. Intro on Nokia Bell Labs
3. Perspectives on resilience
4. 6G
5. Nokia Defense

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We are a global leader in connectivity for the AI era

We provide the critical network infrastructure the world relies on.

Every day, we're powering our customers with advanced connectivity across fixed, mobile, and transport networks, delivering the performance and security they need to meet the demands of an AI-enabled future.



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Trusted expertise across fixed, mobile, and transport networks

1,500+

telecommunication provider customers worldwide

70%

of broadband connections in North America use Nokia fixed networks

15 in 20

of the world's fastest 5G networks use Nokia RAN

9

of the top 10 global hyperscalers use Nokia optical networks

26,000+

patent families

#1 or #2

market share[1] in voice core, SDM, 5G RAN, optical systems, edge routing and PON[2]

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1. Analyst reports including Omdia, Dell'Oro and Nokia; 2. xPON, XGS PON and ONT/OLT2

We delivered on our full-year commitments in 2025

Net sales in 2025

€19.9bn

2024: €19.2bn

Gross margin (comparable)

45.1%

2024: 47.1%

Operating margin (comparable)

10.2%

2024: 13.4%

EPS, diluted (comparable)

€0.29

2024: €0.39

Net cash and current financial investments

€3.4bn

2024: €4.9bn

Total cash and current financial investments

€6.8bn

2024: €8.7bn

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Nokia at a glance

Nokia is a global connectivity leader for the AI era, bringing trusted expertise across fixed, mobile, and transport networks

Powering advanced connectivity for:

- Telecommunication providers
- AI and cloud providers
- Mission critical enterprise (including Defense)
- Partners
- Technology licensees

160
years in business

150+
countries served with Nokia's connectivity

4.4bn+
mobile subscriptions supported by Nokia networks

~€160bn
invested in advancing connectivity since 2000

26,000+
patent families

10
Nobel Prizes for breakthrough inventions

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This is

Nokia Bell Labs:

Innovating with purpose

NOKIA BELL LABS 100 years innovating

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At Nokia Bell Labs we solve problems that address human needs through the power of human intellect

As Nokia’s award-winning industrial research lab, we innovate with purpose, pursuing responsible, sustainable technologies that will have a demonstrable impact on society.

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An unrivalled track record of driving innovation that changes the way we live, work and communicate


Transistors


Information Theory


Solar cells


Laser/fiber optics


Satellite communications

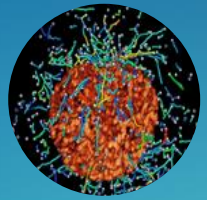

Charge-coupled devices


Unix/C/C++


Coherent optics


Cellular communications


Neural networks


Super-resolution microscopy


Multi-antenna systems

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Global recognition for ground-breaking discoveries

10 Nobel Prizes



5 Turing Awards



5 Draper Prizes



14 US National Medals of Science



12 US National Medals of Technology & Innovation



3 Japan Prizes



3 Technology Emmy® Awards



2 Grammy Awards



1 Oscar



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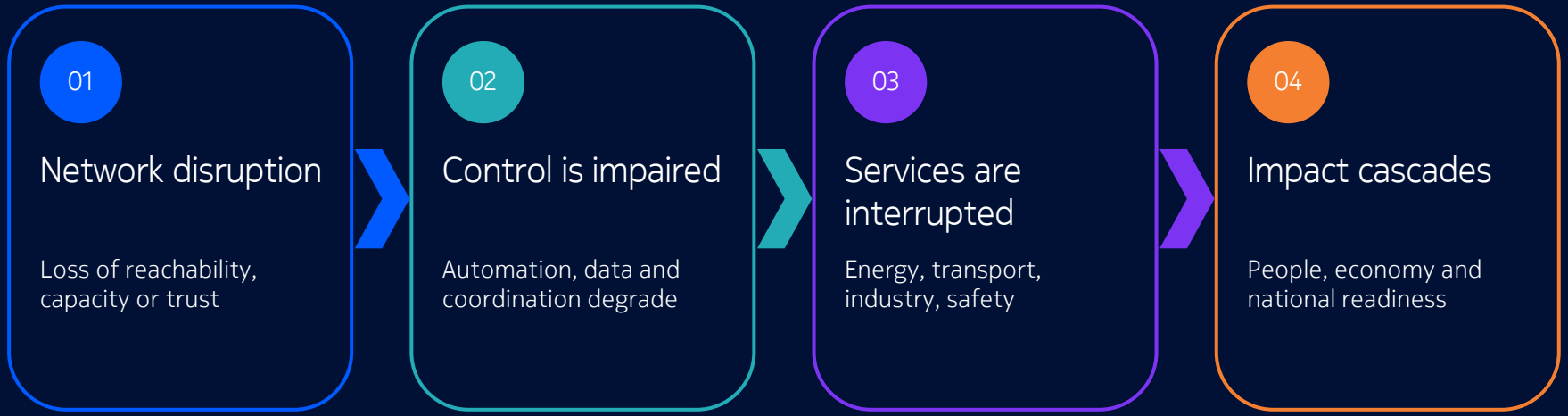
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When the network stops, the economy does too

Telecommunications now sit underneath every essential service.

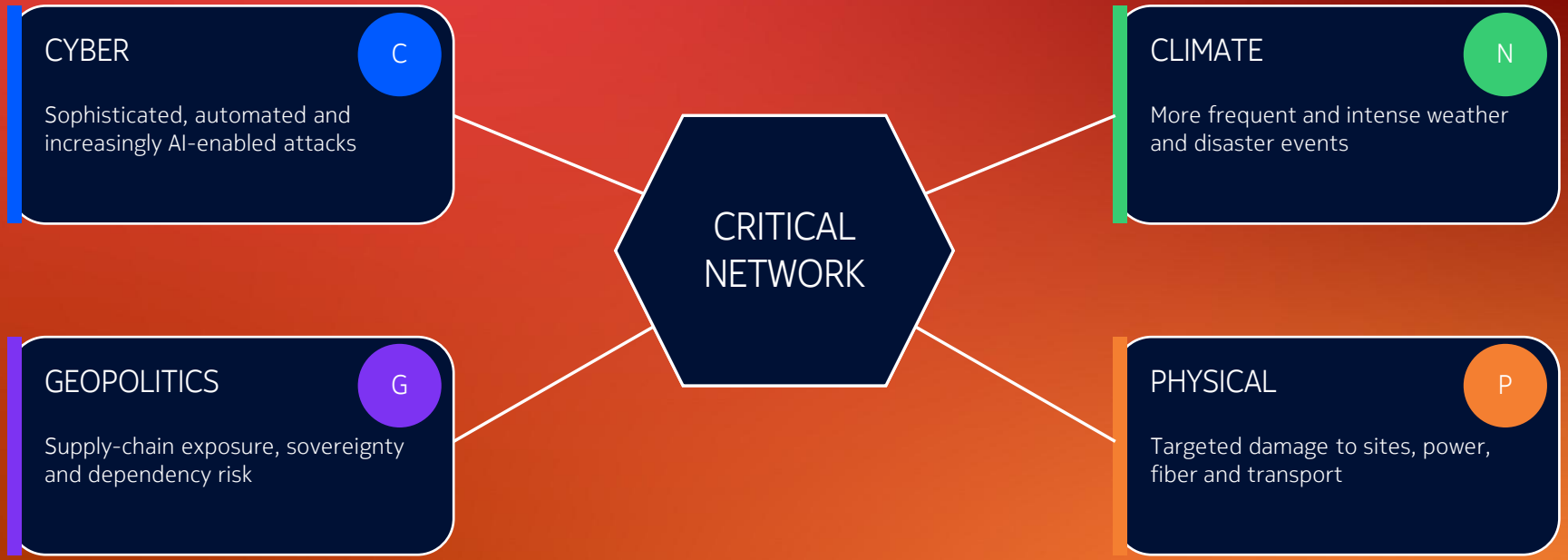


Resilience protects mission continuity, not just network availability.

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Four forces are converging on one infrastructure

The threat model is cyber, geopolitical, environmental and physical.



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The AI supercycle and Industry 4.0 make deterministic connectivity mission-critical.

AI workloads

Distributed inference
Real-time data movement
Edge-to-cloud coordination

LOW LATENCY

Industry 4.0

Machine control
Digital twins
Autonomous operations

DETERMINISM

Public safety

Situational awareness
Mission communications
Coordinated response

AVAILABILITY

RESILIENT CONNECTIVITY is the shared operating foundation!

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Resilience is continuous mission delivery—not redundancy

A closed loop: anticipate, withstand, recover and adapt.



Redundancy is an input. Measured mission continuity is the outcome.

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Security by design makes autonomy trustworthy

Protect every layer and make every automated action inspectable, bounded and reversible.

END-TO-END SECURITY



THE GLASS BOX IMPERATIVE

01	Observable	What changed, where and when
02	Traceable	Signals, context, model and policy
03	Bounded	Explicit safety limits and blast radius
04	Reversible	Rollback is a standard control
05	Auditable	Clear accountability for every action

Examples: NIST NCCoE 5G Cybersecurity Project · Nokia NetGuard · Nokia Glass Box governance.

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AI moves resilience from reactive to proactive

Sense, predict, decide, remediate and learn within governed boundaries.



Network operations

Anomaly detection
Predictive maintenance
Automated fault remediation

Resource intelligence

Traffic-aware optimization
Capacity balancing
Proactive risk prediction

Field and delivery safety

PPE Lens
Hazard Detection Lens
On-device privacy-first AI

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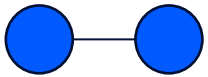
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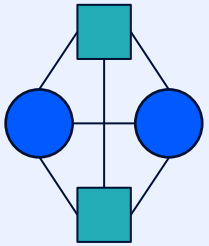
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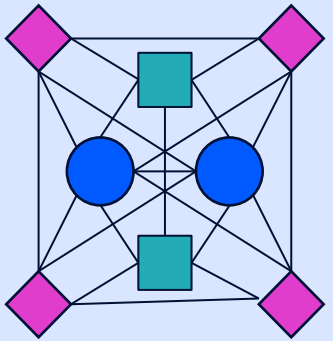
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The (r)evolution of AI and LLM is redefining network needs

Humans Machines/IoTs AI agents/tokens







2G & 3G

Built mainly for human communications

4G & 5G

Expanded to support machine and IoT connectivity

6G

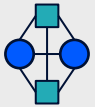
Extend further to connect AI agents and intelligence

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From connectivity to intelligence

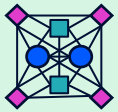
Humans Machines/IoTs AI agents/tokens

Today's networks



- Excel at connecting people and devices reliably and efficiently, optimizing speed, coverage and capacity
- They are still predominantly data transport systems

Tomorrow's networks



- Evolve from connecting data to understanding and processing intelligence
- They will provide perception, coordination, and governed autonomy.

2G & 3G

Built mainly for human communications

4G & 5G

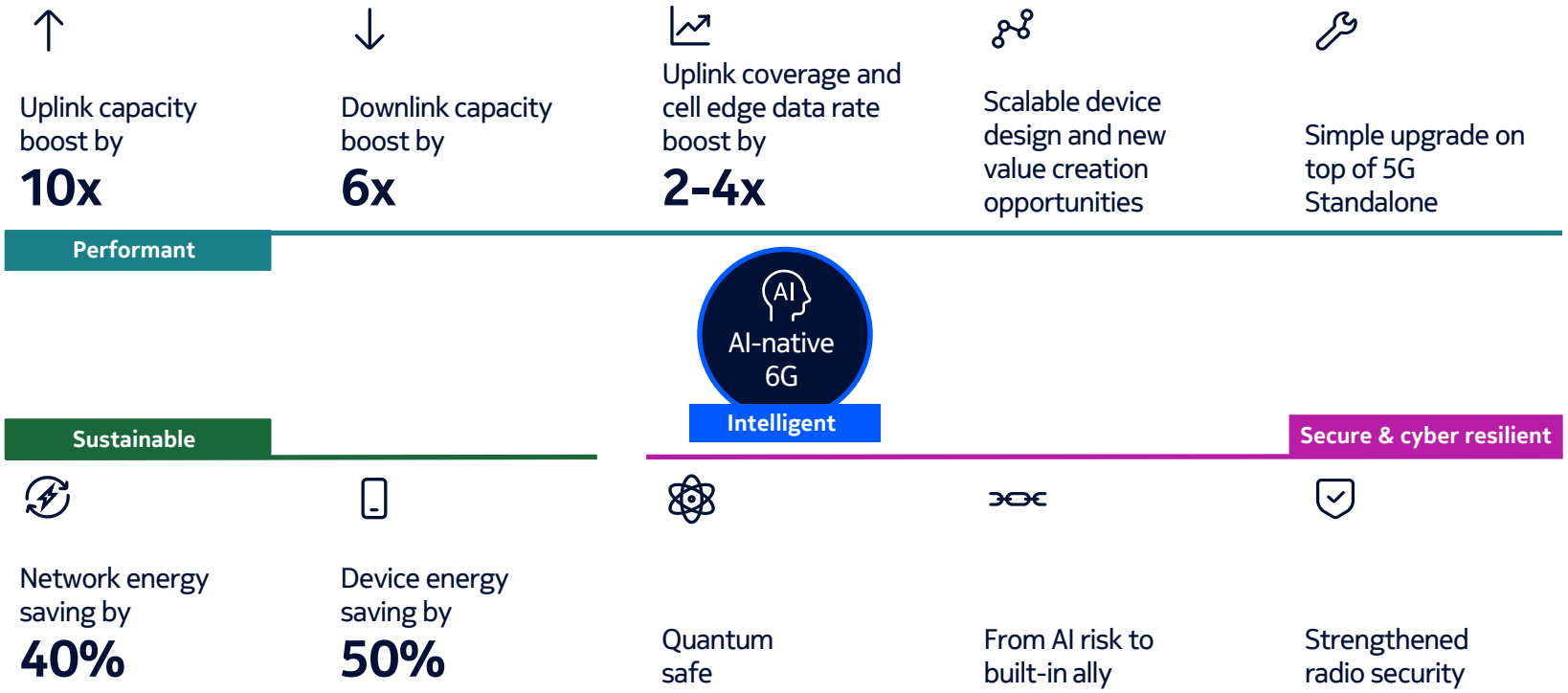
Expanded to support machine and IoT connectivity

6G

Extend further to connect AI agents and intelligence

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The four pillars and expected benefits



Capacity scenario: 5G with 100MHz@mid-band, 6G with 100MHz@mid-band + 200MHz@upper mid-band + UL booster; Energy saving scenario: Low load / Low activity

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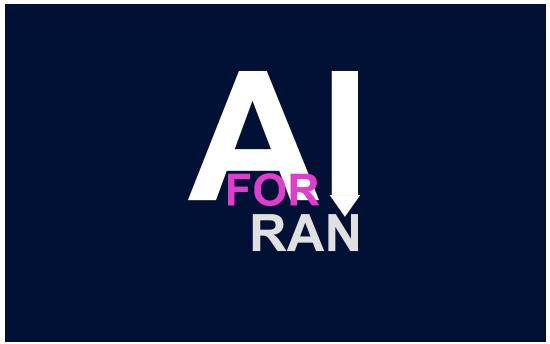
AI-RAN unlocks monetization and efficiency opportunities

Paving the path to AI-native 6G networks



RAN augmenting
AI-app performance

Monetization



AI augmenting
RAN performance

RAN efficiency



Leveraging
synergies

Future-proof

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Ensure a robust 6G security posture from the start

Threat vectors for 6G - fueled by emerging technologies

Quantum computing threatens current cryptography

Offensive use of **AI** crafts adversarial inputs

AI will amplify current cyberattacks

SW-defined radios can spoof signals and jam

We need to prepare today for tomorrow

Post-quantum cryptography	AI security	Radio lower-layer protection	Security for sensing	AEAD support	Authentication enhancement	Security for new NAS	Data security	Security monitoring

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Secure-by-design: four core traits

Secure-by-design

A future-proof 6G that anticipates emerging threats

Privacy preserving

Protect users and their data at any time

Resilient & reliable

Unprecedented service availability

Automated security

Simplifying security at scale

Sustainable security

Trusted & affordable security for everyone

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Secure-by-design: achieving it through reuse, reinforce, redesign

Secure-by-design

A future-proof 6G that anticipates emerging threats

Privacy preserving

Protect users and their data at any time

Resilient & reliable

Unprecedented service availability

Automated security

Simplifying security at scale

Sustainable security

Trusted & affordable security for everyone

Reuse

Leverage proven security features from 5G

Reinforce

Enhance existing mechanisms where necessary and possible

Redesign

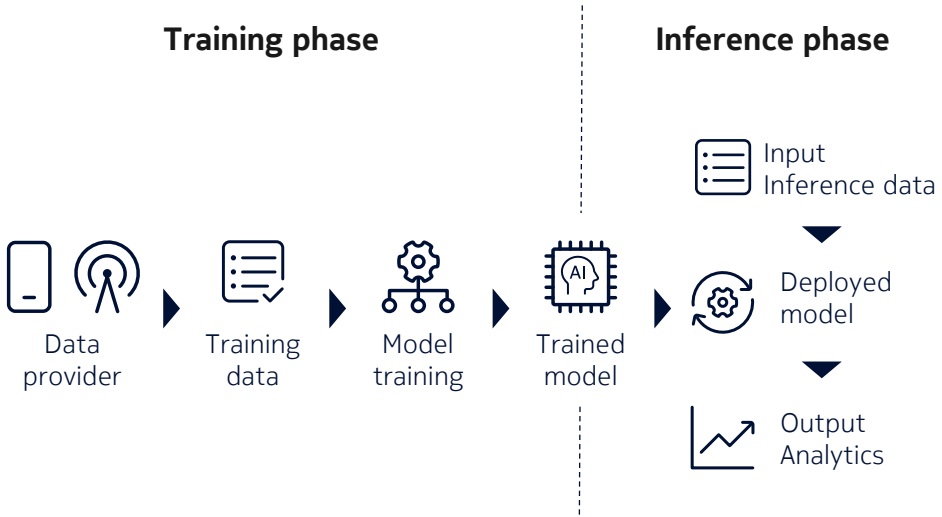
Develop new solutions

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Holistic AI security and trust framework

Threats

- Data and model poisoning
- Data leakage
- Consent violation



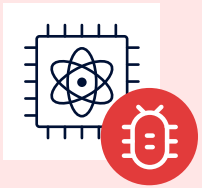
Solutions

- Robust training and adversarial detection
- Privacy enhancing technique
- Granular dynamic consent management
- Explainable inference
- Access control and API security

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Quantum-safe 6G

Threats



Quantum threat to Asymmetric Cryptography:
Shor's Algorithm

Asymmetric Crypto = Broken
Most used for:
Key-Agreement, Authentication

Migration to quantum-resistant cryptography algorithms

Solutions

Vulnerable crypto algorithms being replaced by quantum-resistant ones

Hybrid solutions	Combine quantum-safe cryptography with legacy cryptography
Defense-in-depth	Employ different layers of encryption, all with quantum-resistant methods
Crypto agility	Have flexibility to accommodate updated algorithms with no disruption

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Nokia Defense: Connecting intelligence for defense

4.4+ bn

mobile subscriptions supported by Nokia networks

150+

countries served with Nokia's connectivity

~€160 bn

invested in advancing connectivity since 2000

- Decades of powering national defense communications networks
- Defense-grade connectivity on proven Nokia technology
- Hardened and interoperable for military use
- Co-innovated with armed forces

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NOKIA DEFENSE

Wireless technologies: from military to civil … and back to military

From Military wireless technologies

1950s to 1990s

Defense led the development of all new wireless technologies

- Basic Modulation Techniques
- Encryption & Spread Spectrum
- Vacuum Tube & Early Transistor Radios
- VHF & UHF Tactical Radios
- SDR, MANET

2020s…..

Defense to leverage dual-use technologies to power innovative data – centric services that will **give forces an information advantage.**

Commercial wireless technologies

1990s to 2020s

Since 1990's the **telecom industry has massively invested** in 3GPP technologies (2G - >5G).

And **5G** is now providing **best in class wireless performance** at CoTS cost.

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Change in warfare demands intelligent connectivity

Multidomain operations, unmanned systems and AI-enabled capabilities depend on secure, resilient and interoperable connectivity.



"We must ensure that technologies shaping our future security, from Artificial Intelligence to quantum and 5G, reflect our values and reinforce our defense. Dual-use innovation is essential — our ability to harness civilian technologies for military applications will define our strategic advantage."

Jens Stoltenberg
NATO Secretary General, remarks at the NATO Public Forum, Vilnius Summit, July 2023.

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The capabilities we provide



Sensing

Networks as sensors, many feeds fused into one clear picture — detecting threats early.



Connectivity

Our core. Secure, resilient tactical 5G, hardened for contested and mobile operations.



Command & Control

Interoperable with existing C2 environments and partnered with NestAI to deliver ready-to-deploy AI use cases.

What makes us different?

End-to-end connectivity
— from the tactical edge to backhaul to data center

Dual-use
— built on Nokia's commercial-scale 5G
— powered by Nokia’s Routing, Fiber and Data Center capacity

Operationally proven
— validated in real deployments

European and sovereign
— trusted for security and control

NOKIA DEFENSE

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Examples of customer cases

Publicly announced programs and partnerships already delivering across Europe and the US.

Finnish Defence Forces

FINLAND / NATO

With Telia, the world's first cross-border 5G standalone network slice hand-over.

Lockheed Martin & Verizon

UNITED STATES

Military-grade 5G inside Lockheed Martin's 5G.MIL® hybrid base station.

NestAI partnership

EUROPE

AI-enabled C2 on deployable 5G, built to NATO requirements.

Lyse & Norwegian Armed Forces

NORWAY / NATO

Deployable 5G for the Norwegian Armed Forces, trialled in the Joint Viking exercise.

LMT — Baltic tactical 5G

LATVIA / NATO

Joint tactical 5G on Europe's first 5G military testbed at the Ādaži NATO base.

Counter-drone & sensing

FINLAND / BORDER

Networks that double as sensors — detecting threats to infrastructure and borders early.

Highly resilient dedicated WAN

MULTIPLE COUNTRIES / NATO

Secure inter-datacenter connectivity

MULTIPLE COUNTRIES / NATO

Modernization of LAN services

MULTIPLE COUNTRIES / NATO

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NOKIA DEFENSE

Opportunity: 5G+ as the digital backbone

Democratized technology
Global scale and vendor agnostic ecosystem (3GPP) enabling authority and ownership of the network

Interoperability
International common standards, interoperable waveform and open architectures by design

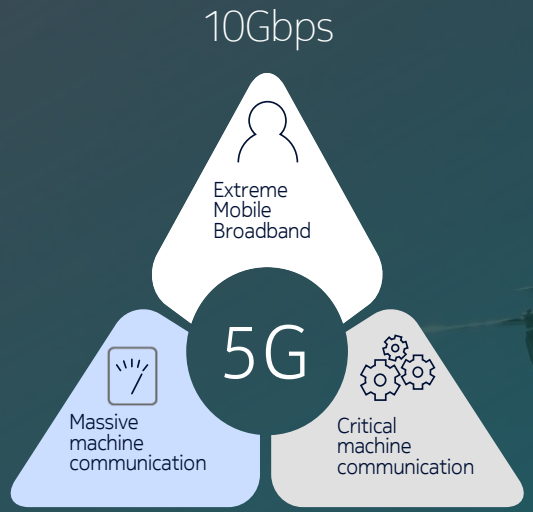
Sustainability
Low relative SWAP, energy consumption and logistical support

Intuitive
Familiar device ecosystem with lower cognitive burden providing simplicity forward

Flexibility
Virtualized functions providing network topology choice and bearer of opportunity for backhaul

Survivable
Enhanced security build into the stand and commercial waveform to mask military signature in the EMS

Massive IoT
High sensor density, long battery life

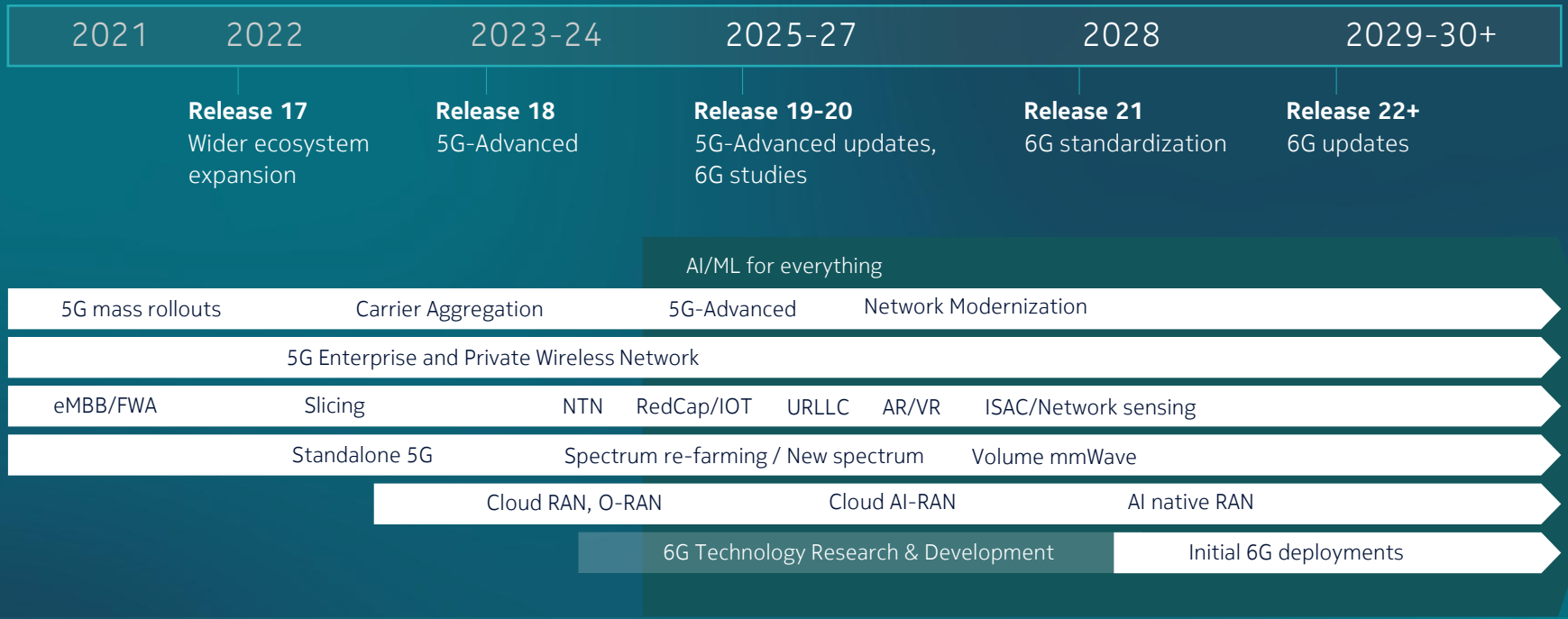


Latency & Reliability

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Nokia continues to invest on technology for sustainable leadership

5G-Advanced, Cloud RAN, and AI-RAN will create new opportunities



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Connectivity Culture Change

Innovative use of networks

Government Input

3GPP eco-system input

Current NATO Standards Processes

Use Cases

NATO Wireless Communications Standardization Project

3GPP Specs

Profiles of 3GPP specifications (in STANAG)

2

To STANAG

3a

To 3GPP

3GPP

1

Improved Standards Processes


NATO UNCLASSIFIED rel AUS, AUT, CHE, JPN, ROK, NZL
OTAN SANS CLASSIFICATION rel AUS, AUT, CHE, JPN, ROK, NZL

STANDARDIZATION AGREEMENT | ACCORD DE NORMALISATION

STANAG 5665

5G Cellular Communications for Defence | Communications cellulaires 5G pour la défense

EDITION/EDITION 1

XX XXXX/XXXX 20XX (to be filled by NSO only)

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Improved NATO standardization process that can be adopted within the NATO Digital Policy Committee if appropriate

Necessary additional features proposed in 3GPP if appropriate, by member companies after pre-standardisation alignment in NWCSP

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Nokia 5G for Tactical Defense

5G devices are easy to use and they offer secure voice and high-capacity data connection for battlefield data

- Dual Use – leveraging the R&D industry investment $100B commercial cellular market
- Open conforming to O-RAN, 3GPP standards – avoid proprietary defense industry lock-in.
- Bring in new suppliers into ecosystem and recompete to keep prices down.

European Technology

10x
lower cost
than existing military radio

10x
Higher capacity
than existing military radio



Network in a backpack

1 km distance

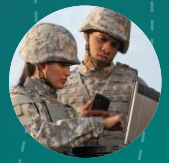


250 5G devices in the network



Vehicle mounted network

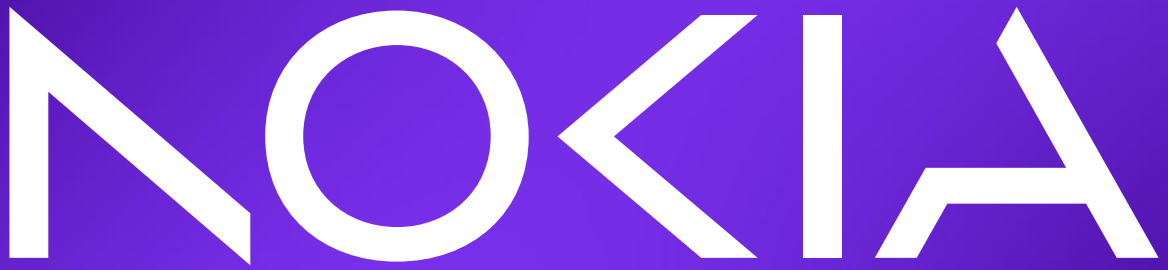
10 km distance



1000 5G devices in the network

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