

Private Wireless Networks and Edge Computing as Enablers for Industrial Digitalization

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The Nokia logo is displayed in white, uppercase letters within a large, stylized circular graphic on the right side of the slide. The graphic consists of two concentric circles: an outer white ring and an inner teal circle. The background of the slide is a gradient from teal at the top to magenta at the bottom.

Industrial plants are mostly brownfield campuses

With complex connectivity and compute environments

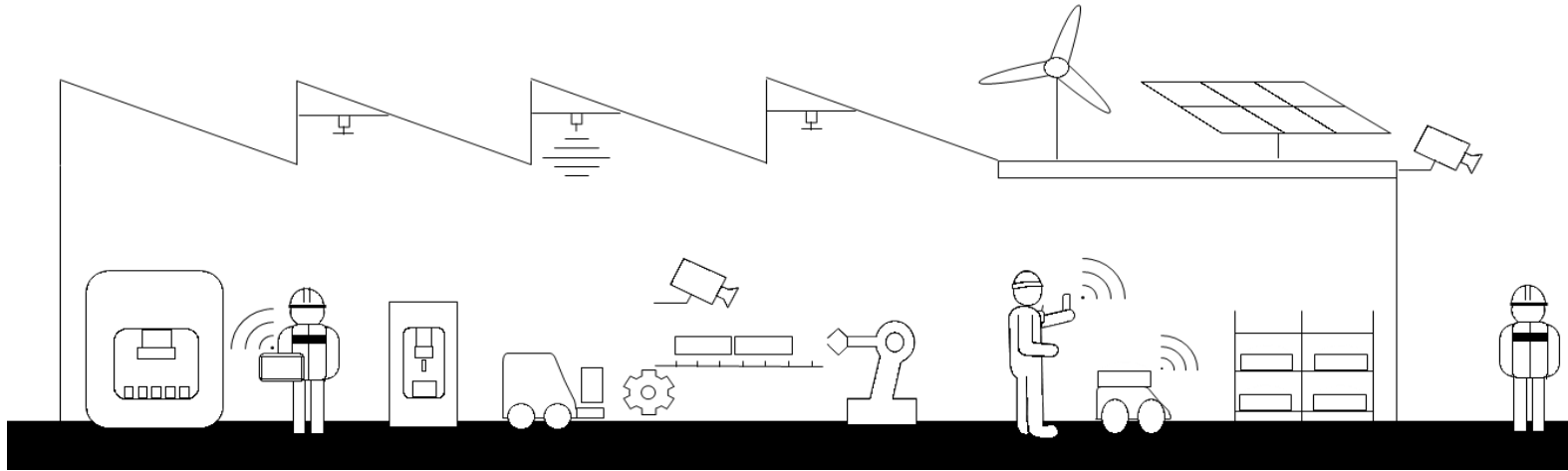


Heterogenous connectivity
environments

Heterogenous & fragmented
compute environments

Industrial plants are mostly brownfield campuses

With complex connectivity and compute environments



Heterogenous connectivity environments

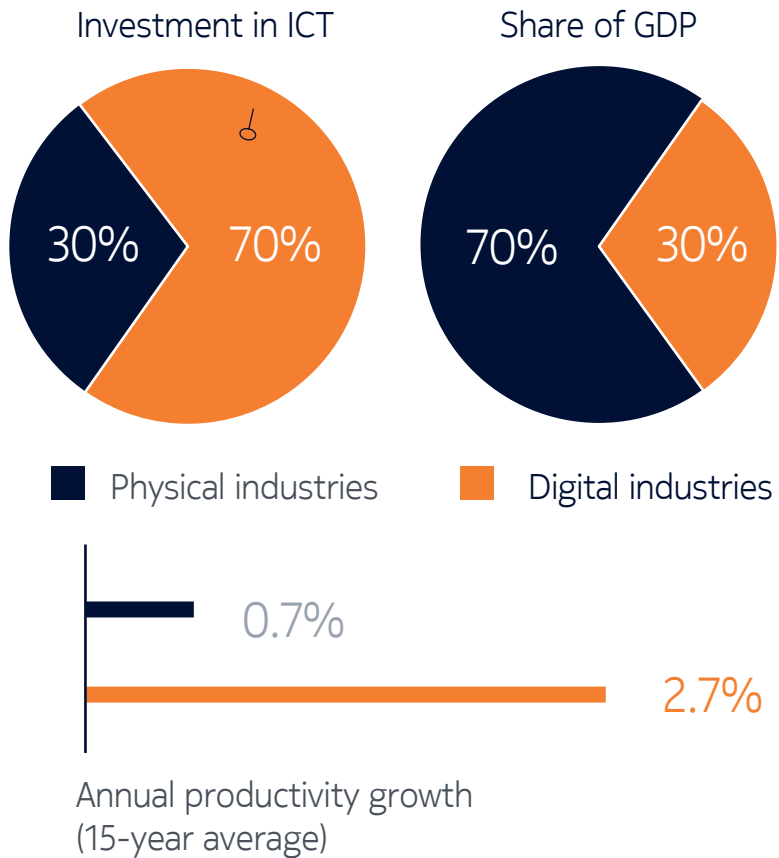
- Multiple fixed / wireless connectivity layers
 - Multiple Wi-Fi wireless networks (from different vendors)
 - Multiple low power sensors technology networks
 - Legacy voice network
- Mix of L2 industrial protocols
- Many unconnected assets

Heterogenous & fragmented compute environments

- Data stays in the machine
- Value of data not extracted
- Multiple compute units, even for single asset often not orchestrated
- Multi-OS environments
- Legacy compute units
- Legacy applications
- Different compute types: Machine PLCs, Machine control PC, etc...

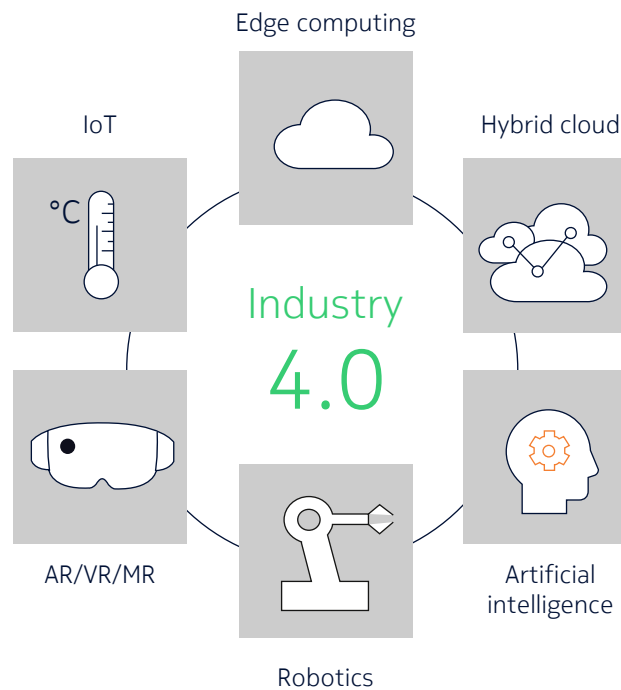
On the cusp of the 4th industrial revolution

...and this is happening NOW



Source: The Technology CEO Council

Confluence of key technologies enablers create the perfect environment for Industry 4.0



>70%

enterprise are investing in IIoT today

<https://www.pwc.pt/pt/temas-actuais/pwc-apresentacao-iiot.pdf>

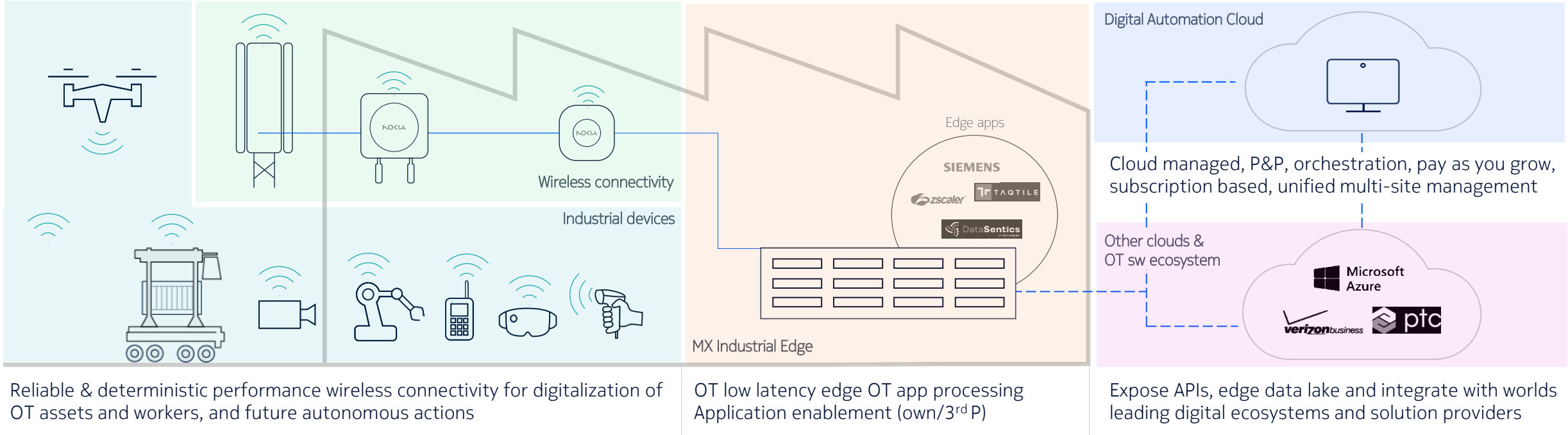
49%

IT are reporting working closer with OT on IoT projects (32% in 2018)

451 research - Internet of Things, Organizational Dynamics 2019

One platform for industrial digitalization

Accelerate I4.0 transformation with private wireless, edge, apps, cloud and Solution-aaS



Key drivers for edge deployments with private wireless networks

Data sovereignty
and security

Processing critical
data on prem

Network
performance

Stringent SLA, low
latency or QoS
requirements

Mission critical
performance and
resilience

Even without
internet
connectivity

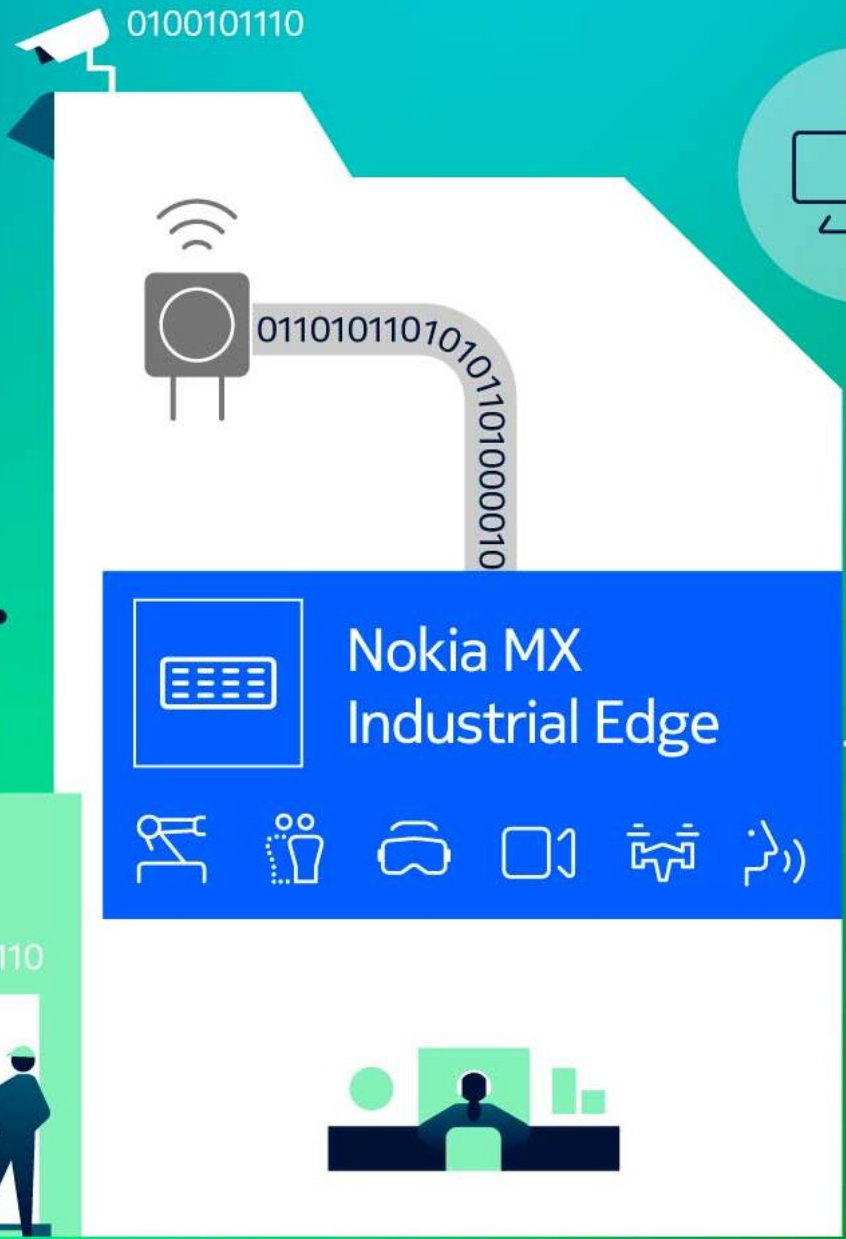
Network efficiency

Data can processed
in the edge to avoid
overloading

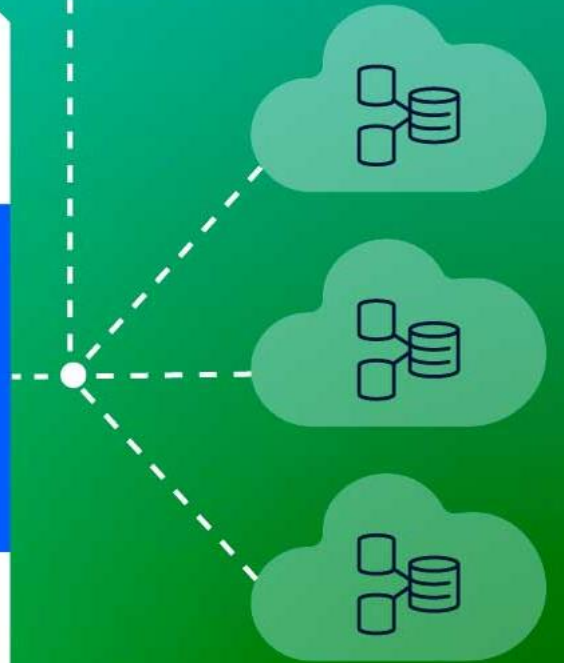
Accelerated OT digitalization

MX Industrial Edge

On-premises edge solution to accelerate OT digitalization of I4.0 use cases



A cloud icon containing a computer monitor and a laptop icon. The text "Nokia Digital Automation Cloud Network & Service management" is written in blue and white text inside the cloud.



Industrial and hyperscaler cloud solutions

MX Industrial Edge

On-premises edge solution to accelerate OT digitalization of I4.0 use cases



Nokia Digital
Automation Cloud
Network & Service
management



Off-the-shelf	As-a-service	High performance, resilient and secure architecture	Runs Kubernetes and VM based workloads	Customer total control over data	Ecosystem neutral	Growing industrial app catalog	3rd party workloads with market place model
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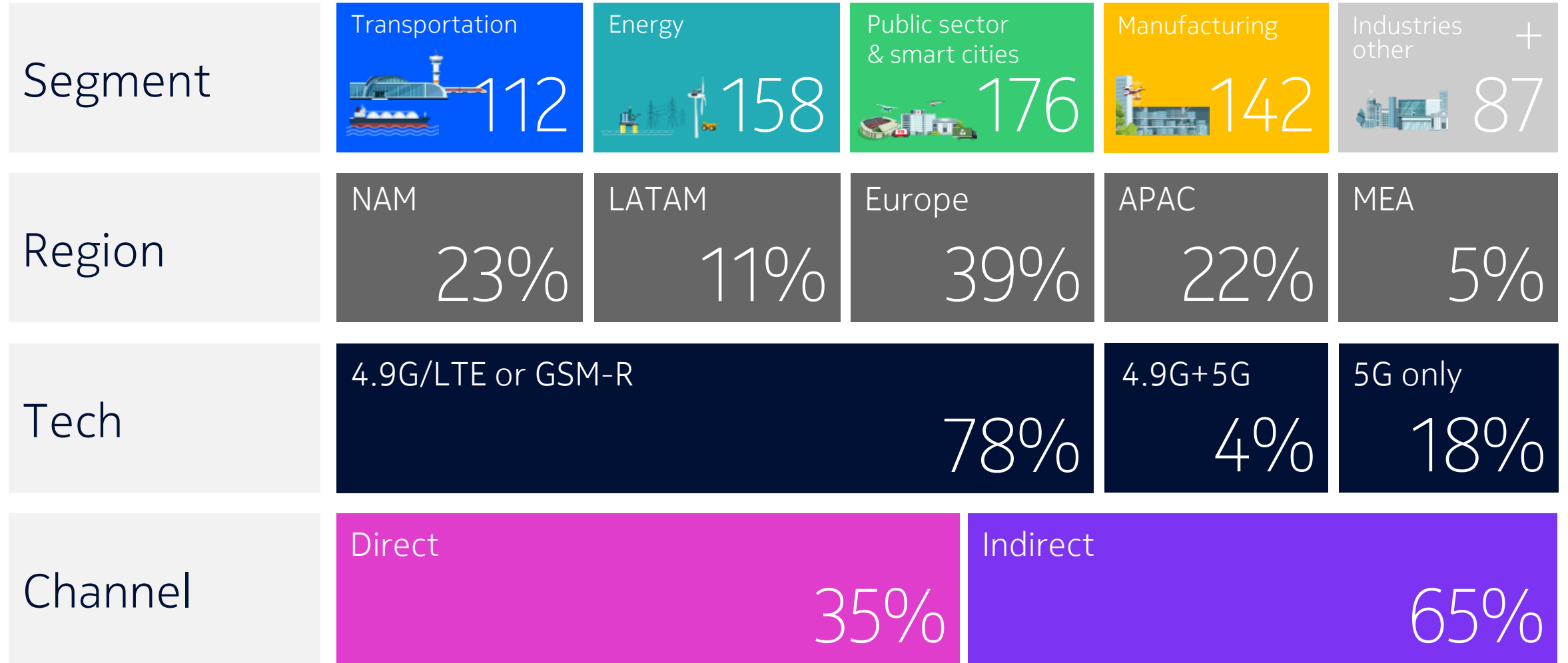


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Industrial and
hyperscaler
cloud solutions

Nokia private wireless customer statistics Q3-2023



Use case examples

Enabled by edge compute, powered by private wireless



Manufacturing & logistics



Process industry



Mining



Ports

KPIs and evolving needs are driving the adoption of digital technologies



Fast, reliable, and secure mobile data connectivity



Mission-critical voice and video communications



Video streaming and analytics



Sensor networks, IoT, analytics and AI



Low-latency for extreme autonomy and automation



Asset monitoring and predictive maintenance



Geo-location, geo-tracking and geo-fencing



Robots, drones and digital twins



Augmented/Virtual Reality

Rich set of digitalization enablers





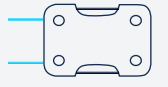
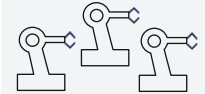
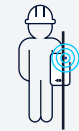





Nokia Industrial Application Catalog running on MXIE

Nokia's

Nokia's WIP

Partner's

Partners' WIP

<p>Wireless Connectivity</p> 	<p>Nokia DAC 4G/5G Core</p> <p>Nokia DAC WiFi</p> <p>CBRS domain proxy</p> <p>Nokia MX Boost</p>	<p>Communications</p> 	<p>Nokia Team Comms</p> <p>Nokia Group Communications</p>	<p>Solution O&M</p> 	<p>Nokia Network Digital Twin</p> <p>Nokia Industrial device management</p>
<p>Video Analytics</p> 	<p>Nokia Scene Analytics</p> <p>ATOS DataSentic QI</p>	<p>Tracking and Positioning</p> 	<p>Nokia High Accuracy Indoor Positioning (HAIP)</p> <p>5G Positioning</p> <p>...</p>	<p>Robotics & mechatronics</p> 	<p>Nokia Drone Networks</p> <p>...</p>
<p>Connected worker & XR</p> 	<p>Taqtile Manifest</p> <p>...</p>	<p>Enterprise security</p> 	<p>NetGuard End-point Sec</p> <p>Zscaler Private Access</p> <p>Palo Alto Firewall</p> <p>...</p>	<p>Industrial connectivity</p> 	<p>PTC Thingworx</p> <p>Siemens MindConnect Software Agent</p>
<p>IIoT & digital twin</p> 	<p>Nokia Integrated Operations Center (IOC)</p> <p>Litmus Edge</p> <p>Crosser</p> <p>...</p>	<p>Video enabler</p> 	<p>Smart Mobile Labs EVO</p> <p>RXRM</p>	<p>Cloud connectivity</p> 	<p>Azure IoT Edge</p> <p>Azure ARC</p>

Pre-configured Industrial applications accessed from Nokia Industrial Application Catalog

Automated provisioning on MXIE from Nokia DAC

Automated application lifecycle management

Includes Nokia and 3rd applications – offering growing

Applications brewing within many categories such as Security, IIoT and Edge AI

Key joint success – Partnerships and ecosystems

Fresh ecosystem & partnership news from the MXIE world



Virgin Media O2 Business is UK's first telco to launch commercial plug-and-play 5G SA Private Network



Onboarding ctrlX OS to Nokia MXIE.



Nokia integrates Microsoft Azure Arc capabilities into the MX Industrial Edge.



VTT, Nokia and Sandvik take steps together towards safe autonomous underground mining supported by 5G and edge intelligence.



You?



NOKIA

