

You can't see the future,
but you can be ready for it

Part 2: Future-proof your network. Accelerate your success.

NOOIKAA



Secure your future

- 3** Evolve your RAN, don't replace it
- 4** Three guiding principles for a new radio network
- 5** Harness the cloud's speed and scalability for your customers
- 6** When innovation just can't wait
- 7** Tested and ready for 5G
- 8** Save energy, save money, aim for zero emissions
- 9** A complete radio access solution ready for the future
- 10** Ten ways AirScale delivers ten times the performance

Evolve your RAN, don't replace it

You can't see the future, but you can be sure that 5G and the growing Internet of Things (IoT) will demand a much wider range of communications services. It's also clear that new network capabilities will be needed to run increasingly diverse use cases.

Yet deploying the necessary technologies doesn't mean replacing huge chunks of installed infrastructure. That's not commercially feasible. Instead, networks will evolve.

Nokia AirScale is the new way to build networks. One that works with and evolves existing Nokia Flexi networks. With AirScale in place, you can quickly deploy 5G on existing LTE bands, as well as new bands, such as mmWave.

Now you can use your existing network investments fully and take advantage of new spectrum, winning new business along the way:

4.5G: extends mobile broadband to support new IoT and public safety use cases by upgrading existing Nokia Flexi base stations

4.5G Pro: Nokia AirScale delivers 1 Gigabit peak data rates. Right now, the gigabit experience is a prime revenue opportunity for operators

4.9G: Offer 5G-like services with the AirScale radio platform and Cloud RAN deployments to achieve data rates way over 1 Gigabit and with ultra-low latency of 2 ms

Nokia AirScale Radio Access supports any radio technology (2G, 3G, TDD-LTE, FDD-LTE, 4.5G Pro, 4.9G and 5G) running simultaneously and integrates carrier-grade Wi-Fi access.



Three guiding principles for a new radio network

To deliver substantially higher performance for the future programmable world, radio access networks must be far more flexible than today's monolithic architecture allows.

1

Deploy services instantly

Networks must be able to deploy services instantly to take immediate advantage of the latest performance enhancements. This capability is the IT world's hallmark, with players using cloud computing to introduce new software continuously.

2

Open for innovation

Based on the telco cloud, AirScale radio access can address a world of new applications, services and plug-ins created by a wide range of developers. These can be integrated into the RAN and use information from real radio conditions.

3

Scale to unlimited capacity and connectivity

AirScale deploys an innovative network architecture. One that's ready for new licensed and unlicensed spectrum and new 5G radio technologies. Now you can scale up to deliver unlimited capacity and IoT connectivity - all without lengthy preparation.

Close the gap between telco and IT – launch an app in hours!

With Nokia AirScale radio access, you can launch a new service with a lead time of just days or even hours, instead of the months telco networks have conventionally needed.

Innovation moves from being an ambition, to become part of the normal everyday business of delivering high quality, reliable telco services.



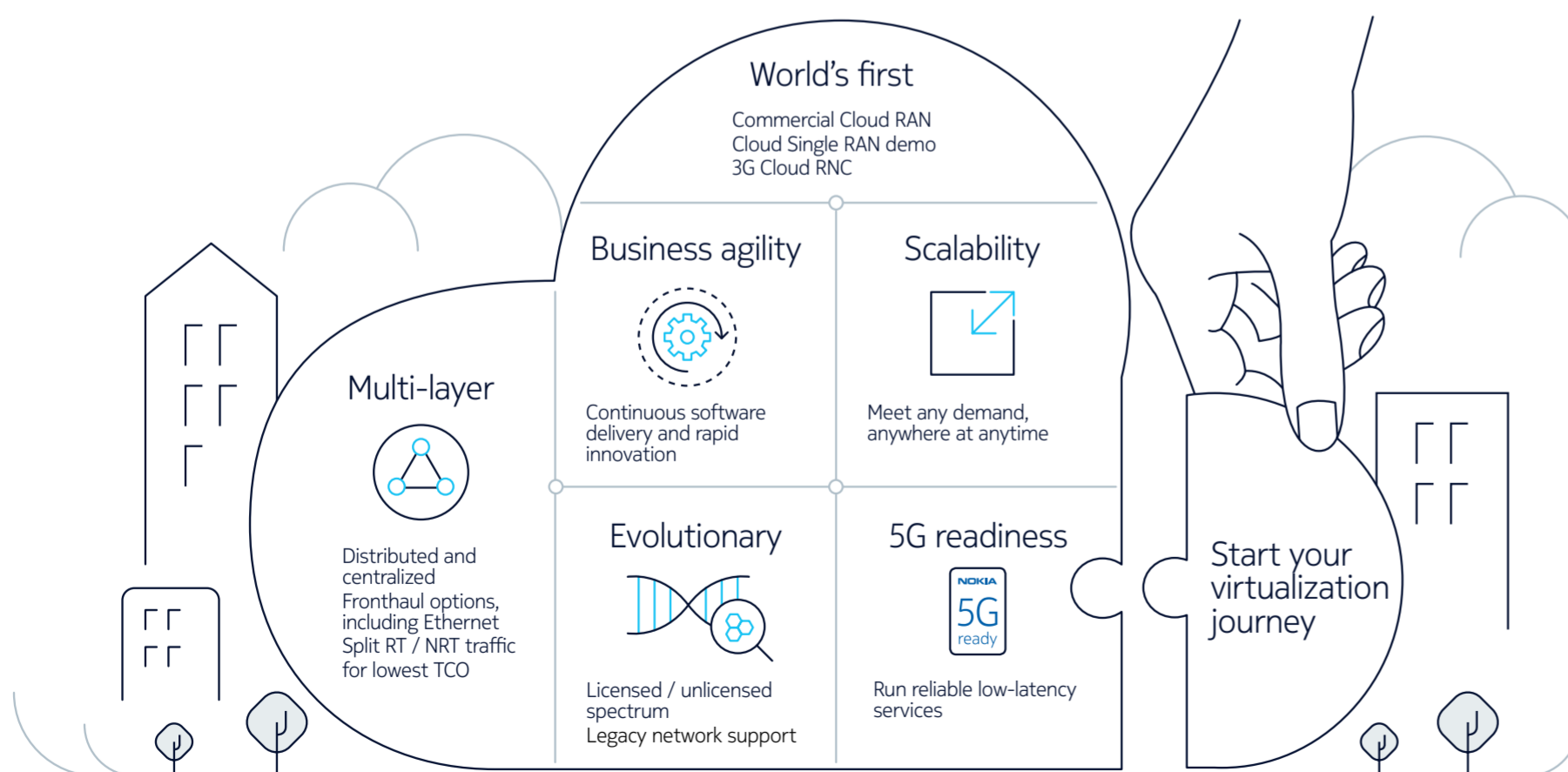
1 INSTANT SERVICE DEPLOYMENT

Harness the cloud's speed and scalability for your customers

Being cloud-based, AirScale makes resources for new functions available in minutes instead of the months conventional networks need. You can quickly react to new demands by launching services to boost business, or partner with over-the-top (OTT) players.

AirScale Cloud RAN delivers high bandwidth and low latency on existing assets like aggregation sites and transport infrastructure. Radio functions can be run in large centralized data centers or smaller distributed sites, or a combination of both. Yet, all components are efficiently managed as a single cloud.

But that's not all. AirScale runs Nokia Multi-access Edge Computing (MEC) on the same AirFrame data center /cloud infrastructure servers as the Cloud RAN. This makes it easy for applications and services to seamlessly use real radio data. Your customers can enjoy locally relevant services with near-zero latency.



Nokia AirScale Cloud RAN is commercially proven

Nokia has shown the world's first demonstration of Cloud Single RAN for 2G, 3G, 4G and 5G baseband, as well as 2G and 3G radio network controllers in the cloud.

In addition, SK Telecom in Korea has used AirScale to achieve the world's first deployment of Cloud RAN in a commercial network. The cloud base station features a functional split between real-time and non-real-time traffic, bridging 350 km on the midhaul interface over Ethernet between the radio access point and AirFrame Data Center while maintaining excellent key performance indicators (KPIs).

“ Our experience shows that the Cloud RAN KPI values are equivalent to a legacy LTE network. This was the first bridging of such a long a distance with Cloud RAN and the Cloud base station protocol stack being split. Cloud-based radio networks deliver the scalability and flexibility we need to meet the future data demands of our customers, and enable new levels of experience and maximum operational efficiency, paving the way to 5G.

Mr. Jinhyo Park, SVP,
Head of N/W R&D Center of SK Telecom

2 OPEN FOR INNOVATION

When innovation just can't wait

Stay ahead of the competition. AirScale core and radio functions run on the same Nokia AirFrame data center servers, aligning them more closely than ever. New software can be deployed across the network without needing to upgrade each network element, for rapid, almost continuous network upgrades.

For example, the full power of Nokia Smart Scheduler can be deployed on large cell clusters and managed from one place to improve cell coordination, load balancing, traffic aggregation and interference mitigation.

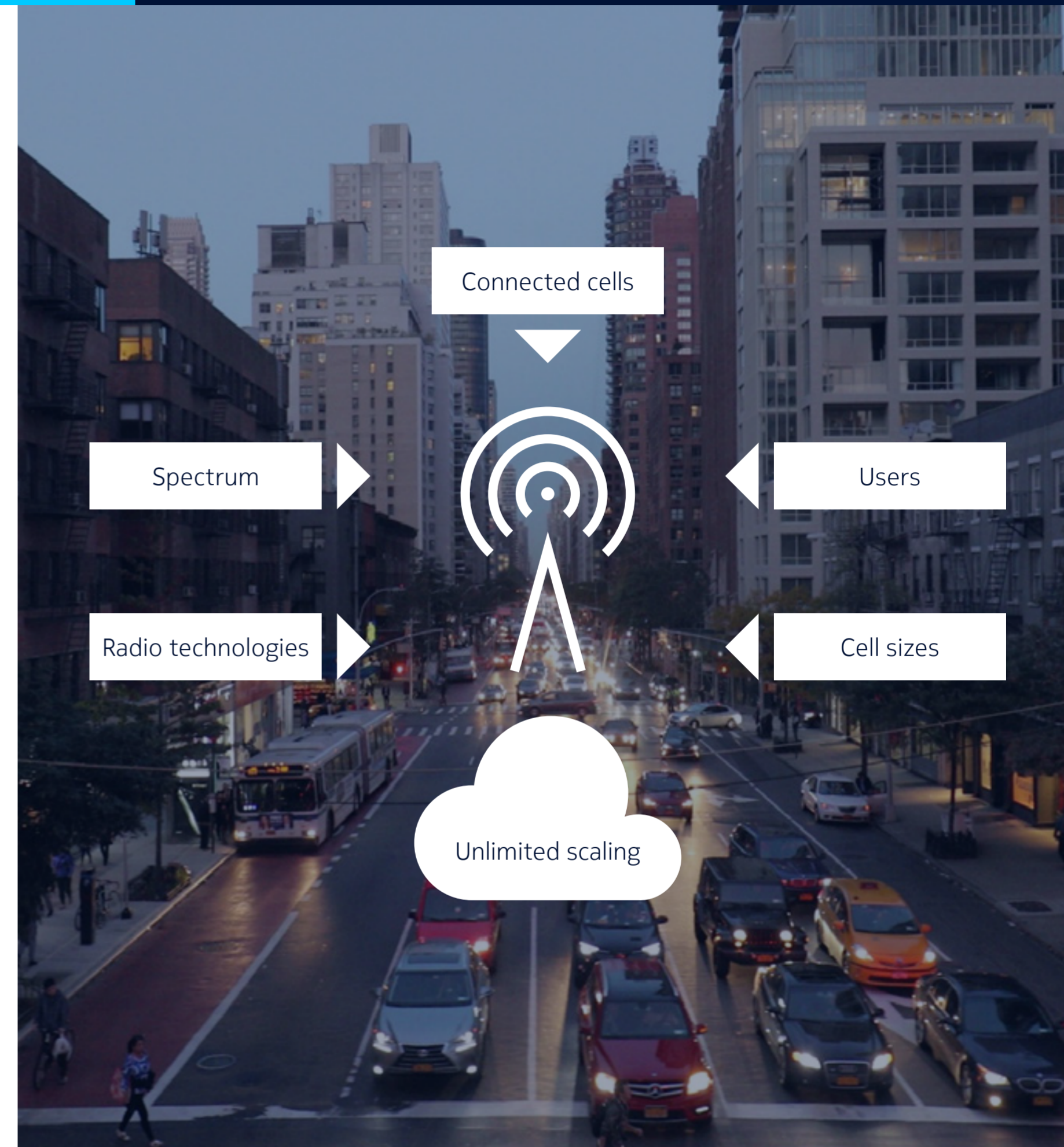
3 SCALABILITY

Eliminate capacity bottlenecks forever

A constant headache for network planners is to ensure capacity to always satisfy demand, otherwise customers complain.

AirScale provides the cure through centralization that enables the deployment of unlimited scalability and unrestricted connectivity, wherever and whenever it is needed. That's important because 5G will create huge traffic volume, much of it arising unpredictably.

AirScale Base Station offers market-leading 28 Gbps baseband capacity per system module. If you need more capacity, system modules can be chained together, while further baseband processing capacity can even be delivered from the cloud.



With Nokia AirScale Radio Access, large pools of up to 144 cells are possible and can be extended by chaining system modules with a Centralized RAN for an unlimited number of connected cells.

Tested and ready for 5G

AirScale radio access is 5G ready. With a simple upgrade of radio unit software, you can deploy 5G on existing LTE bands, sharing spectrum with LTE where feasible. AirScale has been tested running 5G signals on the 700 MHz band, among others. This is the first solution proven with 5G on low frequency bands, enabling wide coverage through the easy re-use of existing spectrum.

AirScale is the basis for Nokia 5G FIRST, the world's first 5G solution that's ready to go.

5G FIRST spans the entire network, using Nokia AirScale and AirFrame platforms including AirScale massive MIMO Adaptive Antenna, Cloud Packet Core and mobile transport. This complete and versatile solution is supported by a full range of services to get you into the world of 5G as quickly and smoothly as possible.

Unlike technology showcases using proprietary specifications, 5G FIRST is based on well-defined market requirements. This lets you launch specific 5G use cases immediately, knowing that your investments will deliver substantial returns long into the future.

5G FIRST is also backed by a community program that is accelerating the development of new 5G services.

Turning your 5G vision into business reality begins with the use cases. Nokia 5G Acceleration Services help you build a solid business case, plan your 5G network and operations and complete the necessary transformation.



Save energy, save money, aim for zero emissions

With around 80 percent of a network's energy being consumed by base station sites, energy efficiency makes good business sense by helping you to cut costs and lower emissions by decoupling traffic growth from the energy bill.

Nokia AirScale Base Station works in combination with clever energy-saving features such as very low energy use when there is no traffic, or shutting off network layers experiencing low traffic, to reduce energy consumption. The result is up to 60 percent higher energy efficiency. With sites consuming less energy, you can begin to migrate your network to carbon-free energy. This can be in the form of grid-based or Nokia Base Station renewable solutions to achieve further cost savings and substantially reduced emissions.

High-power single and multiband radios reduce the number of radio units needed at sites, making AirScale Base Station easier and faster to set up with as much as 66 percent less installation time. It also blends more easily into the background for an almost invisible, environmentally-friendly site.

AirScale has up to

60%

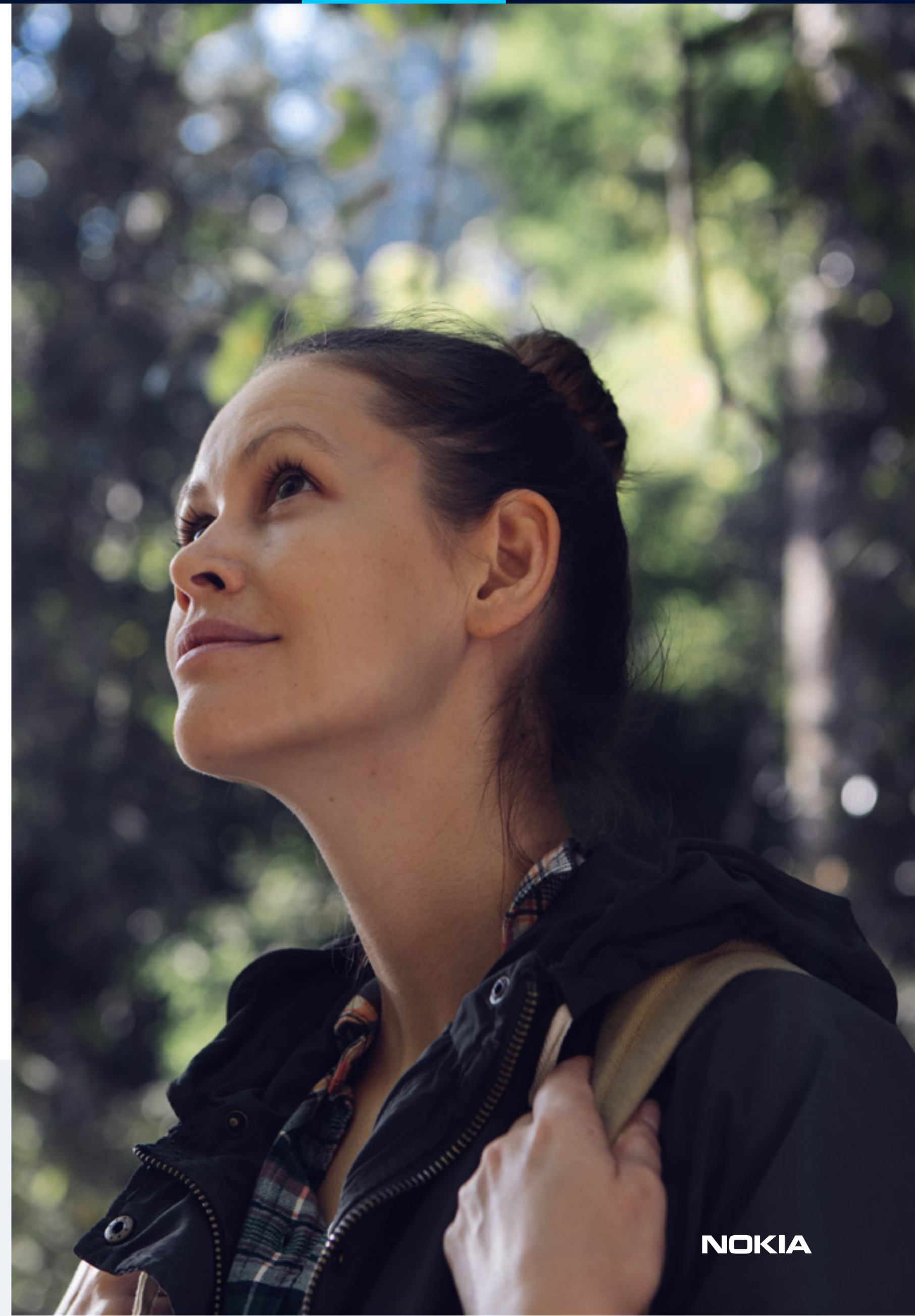
lower energy consumption

and up to

50%

lower total cost of ownership

Nokia AirScale Base Station features a simple one-click mounting system that cuts installation time up to 66%.



A complete radio access solution ready for the future

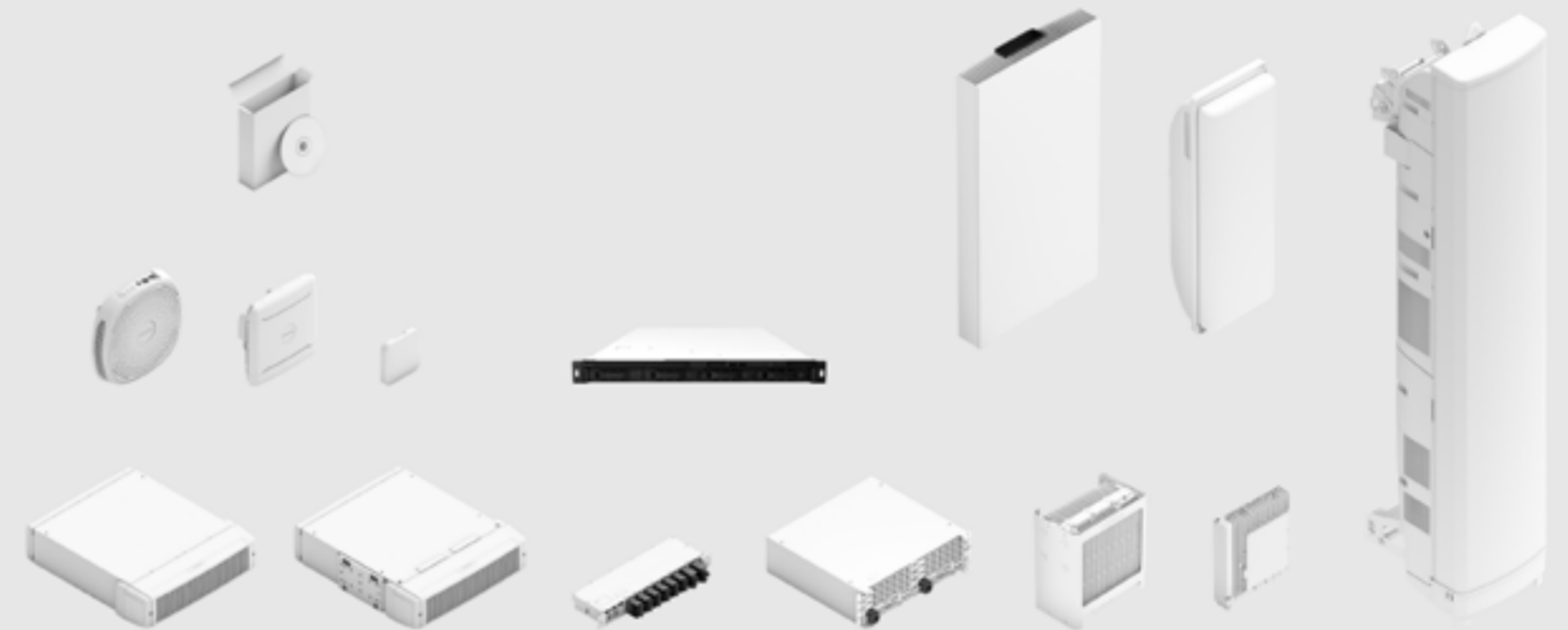
Nokia AirScale is more than just a new base station or new radio access software. This is an entirely new radio access network with all the hardware and software needed to prepare you for the IoT and 5G future.

All of AirScale's innovation is compatible with legacy radio networks so you can combine AirScale Base Station with installed infrastructure to make full and continued use of your existing investments.

Nokia AirScale Radio Access includes the following elements:

- Nokia AirScale Base Station comprising single, dual and triple band radio units; and indoor and outdoor system modules
- Nokia AirScale Active Antennas
 - Nokia AirScale Compact Active Antennas
 - Nokia AirScale massive MIMO Adaptive Antennas
- Nokia AirScale Cloud RAN
 - Nokia AirScale Cloud Base Station
 - Nokia AirScale RNC
- Nokia AirScale Wi-Fi
 - Nokia AirScale Wi-Fi Controller
 - Portfolio of Wi-Fi access points
- Common software across 2G, 3G, 4G and 5G radio access technologies
- Nokia Zero emissions solutions
- Services

Nokia AirScale Radio Access



A more active approach to antennas

Nokia AirScale moves antenna technology into the 5G era with active antennas and by introducing massive Multiple Input Multiple Output (mMIMO) technology.

These high-performance antennas boost spectral efficiency substantially, enable beamforming to focus and improve coverage, and increase capacity. Massive MIMO is a central technology of 5G.

Deploying an active antenna is a different process to that for a passive antenna. With our expert support, you can plan and prepare your active antenna strategy now to be confident they will work from day one.

10 ways AirScale delivers 10 times the performance

1. Meets the needs of data-hungry and lucrative new applications and services from 5G and IoT through scalable baseband capacity
2. Delivers extreme broadband speeds that are ten times the performance of previous generation radio access base stations
3. Supports multi-access edge computing for new apps that make use of local context to deliver more compelling, business-winning services
4. Delivers ultra-low latency, which is essential to meet the needs of exciting new applications like remote surgery or autonomous cars. 4.9G is already demonstrated to achieve 2 ms latency.
5. Delivers continuous software updates to ensure the latest capabilities are brought on line quickly, giving you a competitive edge by delivering new experiences as soon as they become available
6. Uses 60 percent less energy for lower costs to help improve profitability and reduce carbon emissions
7. Installs easily and quickly for lower rollout costs
8. Offers complete freedom since it is cloud-based and supports different architectures
9. Existing radio network infrastructure can be used well into the future for the highest return on legacy investments
10. Supports 2G-5G radio technologies, licensed and unlicensed spectrum - no matter what devices customers use, you can deliver the services they want, seamlessly

“ Nokia’s ability to offer future-proofed 5G hardware, delivered as part of a distributed, centralized or cloud RAN architecture, differentiates it from its closest competitors.”

Michael Sullivan-Trainor,
Executive Analyst, Telecom Technology Business Research, Inc

Nokia is a registered trademark of Nokia Corporation. Other product and company names mentioned herein may be trademarks or trade names of their respective owners.

Nokia Oyj
Karaportti 3
FI-02610 Espoo
Finland
Tel. +358 (0) 10 44 88 000

Product code SR1708015005EN

© Nokia 2017

NOKIA