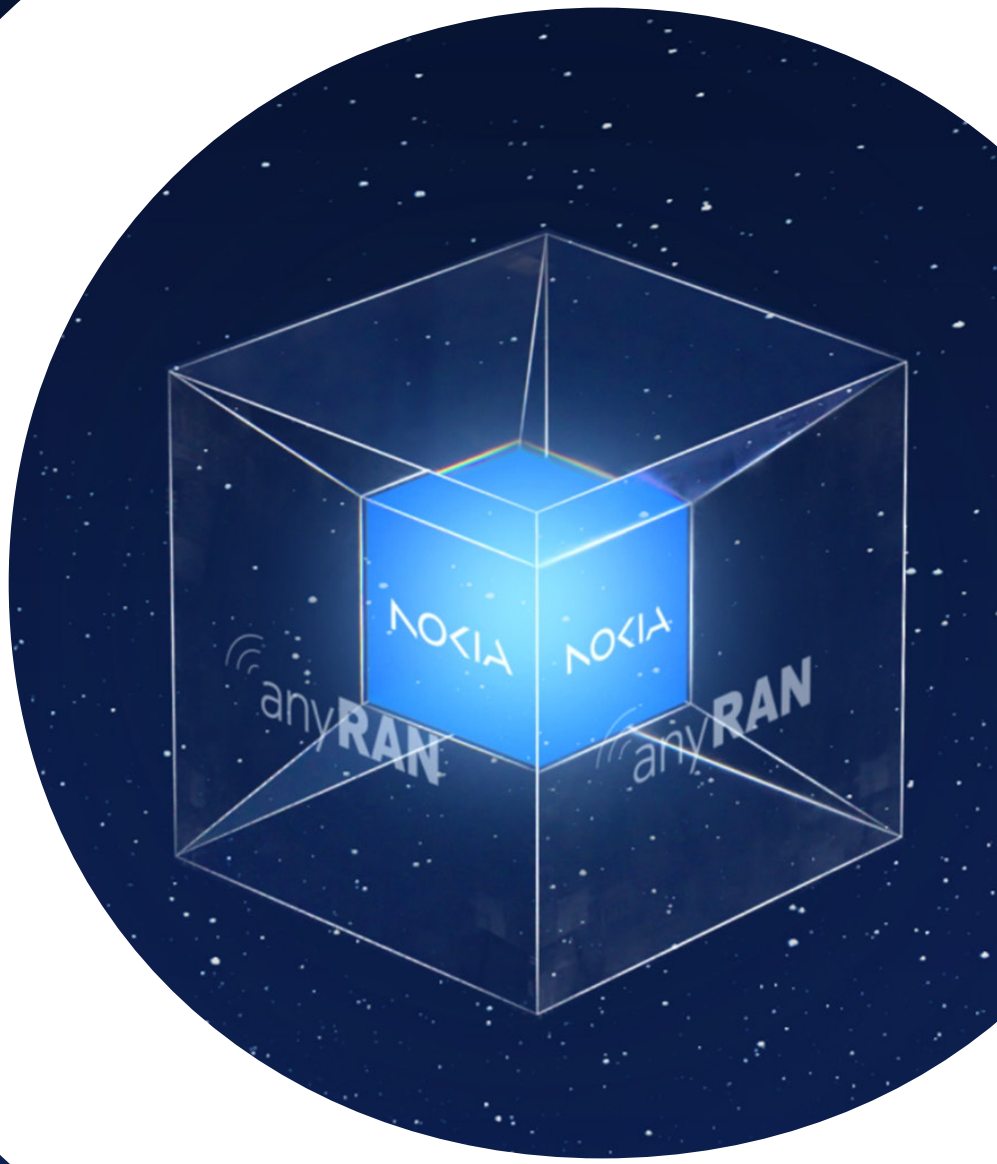
SOLUTION BRIEF

Nokia Cloud RAN: Shaping the future of radio networks



NOKIA

Starting your Cloud RAN journey

Cloud RAN is an emerging technology in the radio access network domain.

The basic principle of Cloud RAN is the separation of RAN baseband software from the baseband processing hardware, which is also called vertical disaggregation of RAN.

This is enabled by virtualizing the baseband functions, the centralized unit (CU) and the distributed unit (DU), and using commercial off-the-shelf (COTS) hardware combined with a Containers-as-a-Service (CaaS) software layer.

Cloud architecture ensures optimized resource usage across different workloads, which helps reduce operational costs.

Most mobile operators are expected to start their cloudification journey with a gradual evolution toward their target RAN architecture, with the co-existence of purpose-built RAN, Cloud RAN and, depending on the business strategy, Open RAN.

The adoption of cloud technologies and disaggregation will accelerate, and Cloud RAN will become increasingly significant in hybrid radio networks.

At Nokia, we develop our Cloud RAN solutions under the unique anyRAN approach, which provides the widest choice of strategic options to support the RAN evolution of communications service providers (CSP) and enterprises.

Commercial drivers for RAN disaggregation

More supplier options

A more diverse and competitive ecosystem of technology suppliers.

Flexibility in selecting the best solutions from different companies and switching suppliers.

Operational efficiency

Common management and orchestration tools to simplify and automate network operations.

Reduced complexity and costs, faster deployments and upgrades.

Optimized resource usage and scalability

Scaling network capacity more dynamically and efficiently.

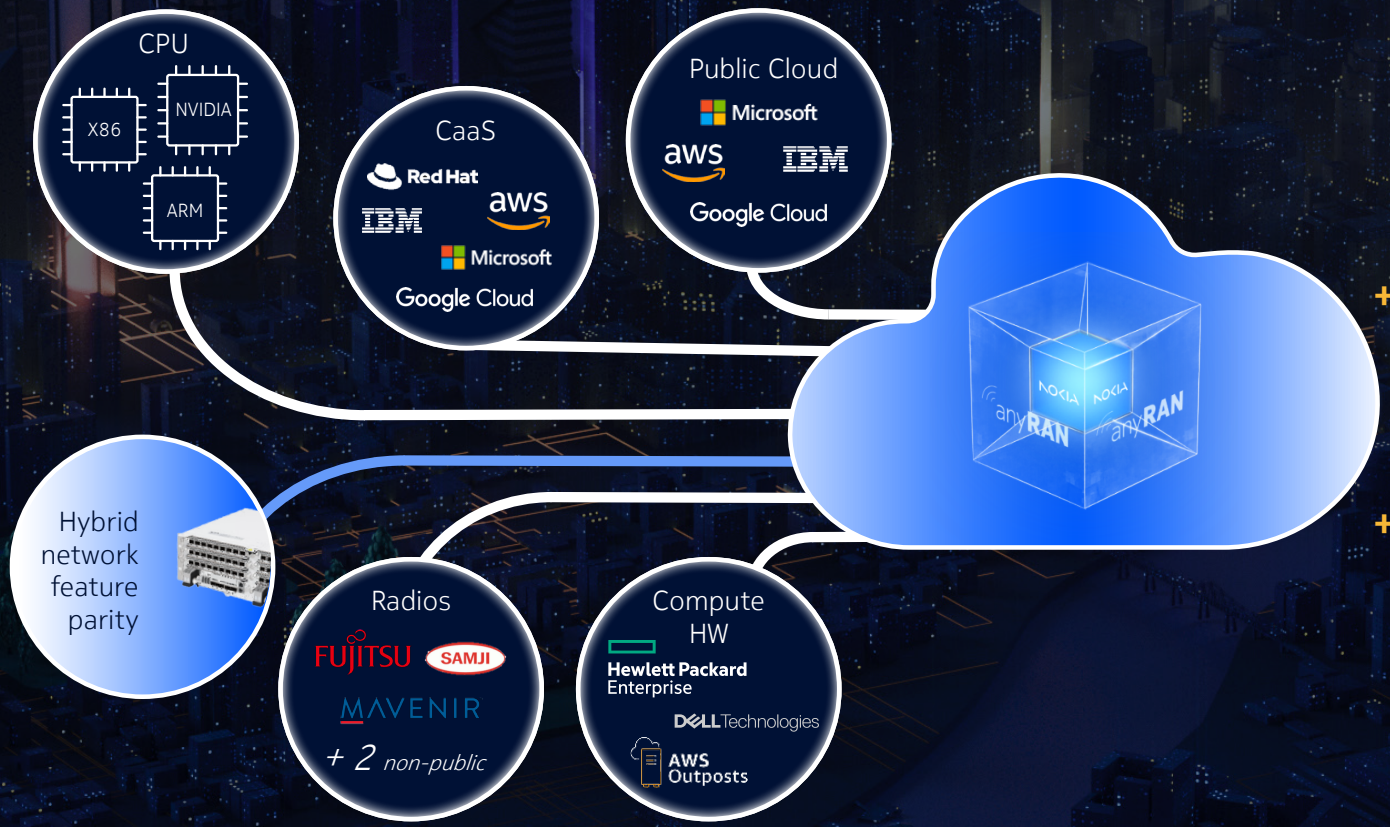
Sharing resources for RAN workloads and alternative workloads such as AI processing.

New business models

Readiness and scalability to support diverse enterprise and CSP use cases and offer services at the network edge.

Faster time to market with new revenue models for monetization options.

Nokia anyRAN: the widest choice of strategic options to support the RAN evolution of CSPs and enterprises



+ Deployment flexibility
+ Optimum scaling
+ Maximum openness
+ High energy efficiency
+ Unrivalled performance

Nokia Cloud RAN reference designs with leading technology partners

Nokia's commercial end-to-end 5G Cloud Ran solution is based on pre-integrated and fully tested reference designs. It is a safe, future-proof investment.

Our virtualized baseband functions (vCU and vDU) can run on diverse hardware platforms. The reference designs include server hardware from Hewlett Packard Enterprise (HPE) and Dell Technologies (Dell).

We also offer a choice of general-purpose processor options including x86 and Arm.

Our reference designs are pre-integrated with the RedHat OpenShift Cloud Platform (OCP) on the CaaS software layer.

We deliver the best-performing Cloud RAN and purpose-built RAN as one network with common radio network management anchored in MantaRay Network Management.

MantaRay NM provides radio network lifecycle management (LCM) as well as fault, configuration, accounting, performance and security (FCAPS) management.

This comprehensive solution also handles packet core, mobile core, and enterprise systems.

With proven reference designs and overarching management and automation capabilities, we help our customers accelerate Cloud RAN deployments, reduce planning and configuration efforts and ensure faster time-to-market.

Nokia Cloud RAN solutions with leading webscale companies

We are working very closely with our webscale partners including Amazon Web Services (AWS), Google, IBM and Microsoft to integrate their cloud platforms into the Nokia Cloud RAN architecture.

By combining cutting-edge hardware and software technologies, along with multiple hardware and CaaS platform options, we can support the future deployment models of CSPs and enterprises.

A fully managed, scalable cloud-native infrastructure and managed services brings readiness and scalability to address new use cases and demands at the network edge.

To accelerate and simplify deployments, we design and develop efficient zero-touch provisioning solutions together with our partners.

In our webscale partner solutions, the cloud infrastructure partner typically provides also automation tools, which are tightly integrated with Nokia's automation and orchestration solution.

Accelerated Cloud RAN deployments with proven and fully tested reference designs.

Feature and performance consistency with common RAN software for Cloud RAN and purpose-built RAN.

The widest choice of strategic options with leading industry partners.

Nokia services for Cloud RAN deployments

At Nokia, Cloud RAN service engineers work closely with the R&D organization to develop technical skills as early as possible. They engage in very early Proof-of-Concept (PoC) activities and customer trials to design, integrate and test new solutions.

Our service teams support CSPs and enterprises in the design, deployment and optimization of their Cloud RAN solution.

With our digital tool ecosystem, we create the end-to-end solution architecture and an accurate project-specific design to meet the specific customer requirements.

The deployment of a cloud-native RAN solution requires orchestrating multiple disaggregated components and layers, potentially from different suppliers.

In many cases, operators will migrate traffic from purpose-built RAN sites in the commercial network into a Cloud RAN solution, which requires a very short maintenance window.

Our Cloud RAN trials with customers have provided us with deep insights into the challenges in production environments. We have leveraged these learnings to further enhance our solutions and capabilities to deploy such solutions at scale.

Nokia makes Cloud RAN a commercial reality in customer networks

Nokia has over 300 public 5G RAN references with the industry-leading AirScale portfolio. This gives Nokia outstanding competence and understanding how 5G works.

We have conducted comprehensive Cloud RAN trials with several customers worldwide on different hardware platforms, verifying the performance, interoperability, integration, orchestration and deployment flexibility of our solution. Commercial deployments are available from October 2024.

With common RAN software, we ensure feature and performance consistency across the entire commercial footprint of Nokia Cloud RAN and purpose-built RAN right from the start.

In collaboration with leading technology companies, we provide the widest choice of strategic options for making Cloud RAN a commercial reality.

Comprehensive Cloud RAN trials with customers

e& UAE: the first Cloud RAN trial in the Middle East based on Nokia's reference design

- Successful end-to-end data calls using commercial 5G smartphones.
- Direct comparison of Cloud RAN with e& UAE's commercial radio access network built with the Nokia AirScale baseband.
- Similar downlink and uplink data rates and low latencies observed in both RAN environments.
- The trial confirmed that the anyRAN approach ensures feature and performance consistency between Cloud RAN and purpose-built RAN, and that Cloud RAN can scale capacity dynamically to meet data traffic fluctuations.

Elisa Finland: Europe's first Cloud RAN trial based on Nokia's reference design

- Successful 5G data calls and integration with Elisa's commercial 5G Core.
- Direct comparison of Cloud RAN with Elisa's commercial radio access network built with the Nokia AirScale baseband.
- Uplink and downlink data rates and network key performance indicators in line with the expectations.
- The trial confirmed that the anyRAN approach enables a fast transition to hybrid RAN environments, ensuring consistent performance and interoperability.

Feature and performance consistency are prerequisites for large-scale Cloud RAN deployments.

Why Nokia

We enable our customers to realize the full potential of digital with **truly open network architectures**, which seamlessly integrate into any ecosystem.

Driving the fusion of AI, Cloud and RAN

As the next step in Cloud RAN evolution, AI will bring even more optimization and monetization options.

Nokia is actively participating in the work of the AI-RAN Alliance and working closely with industry partners to help steer this exciting development.

Our collaboration with T-Mobile and NVIDIA represents a major step towards transforming the future of radio networks with artificial intelligence.

We are also working very closely with other industry partners and customers, such as SoftBank, to develop AI-RAN on our Cloud RAN platform.

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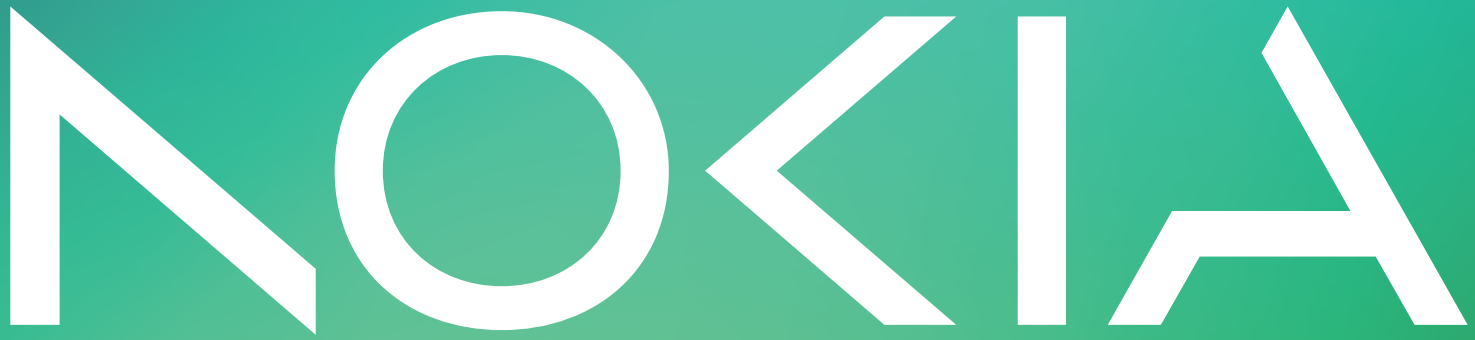

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.