Winning at the edge

Nokia edge cloud

Executive summary
The benefits of implementing a telco-cloud infrastructure are now understood and accepted. This is evidenced by the increasing number and scale of commercial cloud based network deployments. However, as we continue to evolve the network architecture, simply emulating the traditional centralized IT-cloud will not be enough. With the imminence of advanced machine communications use cases and 5G, low latency will become a basic requirement, driving the further distribution of cloud capabilities across the network, closer to the traffic, and by consequence building a layered architecture. This is the inception of the concept of an Edge cloud.

The Edge Cloud Evolution

Building generic compute capabilities at the edge of the network is not a new concept, being for example part of the definition of Multi-access Edge Computing (MEC). Nokia has actively been engaged in edge cloud trials and implementations since 2013.

Besides enabling low latency, the move to an edge cloud architecture is backed by operational benefits as well. As an example, even on a smaller data center environment, pooling and re-usage of resources will still happen, which can be a driver for OPEX savings, even more during technology shifts like from 4G to 5G.

With the implementation of an edge cloud, a variety of network functions will migrate to it. On mobile core for example, we will be able to run EPC and/or 5G NGC workloads on the edge. Another good example of network functionality that benefits from being hosted at the edge is Cloud RAN.

Cloud RAN requires a highly powerful datacenter infrastructure and some of the use cases require very low latency towards the radio units. This would be impossible to achieve with a centralized or even regional datacenter infrastructure approach, which means we need compute power at the network edge.

The foundation for network slicing

Technologies like 4G and 5G will leverage cloud capabilities, including edge cloud, to power both simple and complex use cases with consistent reliability and performance. From providing immersive video experiences to tens of thousands of people in stadiums, powering the 4th industrial revolution with connected robots, to enabling smart cities by connecting and analysing data from millions of IoT sensors and devices.

The key to making this happen is to ensure that each service receives the right level of resources and prioritization, not more, not less. Automation and the concept of network slicing will be fundamental for the execution of this vision and a highly capable edge cloud infrastructure will be a key enabler of both.

In a network slicing scenario, we can define several locations in the centralized or edge cloud to be running network functions and allocate them according to the characteristics required by each slice. Regular mobile broadband services, working on a ‘best-effort’ basis may need only a few capabilities of the edge cloud. By contrast, a highly specialized slice, built to manage industrial control systems in manufacturing or connected vehicles, will have most of the network functions running at the edge, to reduce latency and ensure consistent levels of service.
Implementing the Edge cloud

While there is no single design for the edge cloud architecture, a layered architecture is needed, with centralized and regional datacenters combined with smaller edge / far-edge datacenters. The typical architecture may be as presented below:

Figure 1. Managing the lowest latency/cost trade off with a layered architecture - First data center solution designed for far edge

Applications and Virtual Network Functions (VNFs) will be distributed across the layers based on their requirements and characteristics. Network functions supporting services and applications not requiring low latency or a high data throughput will be most likely placed on centralized or regional datacenters, while the most demanding workloads will go to the edge.

An infrastructure solution built for “The Edge”

Nokia is utilizing its hardware design capabilities to resolve the challenge of efficiently implementing cloud infrastructure at the network edge. We have designed a new solution that builds on the benefits of the x86 platform while deploying a smaller and resilient form factor, appropriate to this environment. This is combined with a cloud software infrastructure built to deliver the stringent performance requirements of the edge. The Nokia AirFrame open edge cloud infrastructure solution is Nokia’s response to the requirements of the edge cloud.

One of the most important building blocks of this solution, the AirFrame open edge server, is the first x86 solution specifically developed for edge- and far-edge cloud deployments. The AirFrame open edge server chassis is only 3U high, enabling its installation on existing base station sites. One open edge chassis supports 5 servers, each having a single Intel Xeon Scalable processor. The open edge server also leverages Nokia ReefShark capabilities to implement acceleration capabilities for Cloud RAN, Machine Learning/Artificial Intelligence and other workloads.
The ultra-small footprint provided by the solution is complemented with a real-time optimized, OPNFV compatible cloud infrastructure with OpenStack distribution built to run in small datacenters while providing the performance and low latency required by solutions like Cloud RAN. It is the first edge optimized cloud infrastructure with carrier-grade high availability as well as flexible scalability from single server edge cloud to multi-rack solutions. It offers the solution ease of deployment with remote upgrade automation and configuration management.

Why Nokia?

- E2E Cloud and extensive 5G portfolios
- Leader in telco cloud deployment
- Pioneer in edge computing
- Proven track record in Cloud RAN solutions
- Up to 100% Cloud RAN performance improvement with acceleration powered by Nokia ReefShark
- Unique infrastructure solution for the edge with AirFrame open edge server.

The Edge Cloud is now a reality

The edge cloud will be a fundamental asset for service providers to support new services and applications, opening new vertical market opportunities. The industry needs to start preparing and implementing edge infrastructure now to address these business opportunities and be ready for the next evolutionary steps of their networks, including 5G.

The AirFrame open edge cloud infrastructure is the first solution in the market to directly address the requirements of building compute capacity at the network edge.
About Nokia

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From the enabling infrastructure for 5G and the Internet of Things, to emerging applications in digital health, we are shaping the future of technology to transform the human experience. networks.nokia.com

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