Nokia IP Anyhaul
Transport to flawless mobile experiences

- Prepare your network for ultra-broadband, IoT and 5G
- Eliminate bottlenecks and accommodate new demands for capacity, efficiency and services
- Extend the life of your mobile transport investment through LTE and beyond—on the path to 5G

The use of video and new applications such as augmented reality (AR) and virtual reality (VR) continues to further fuel mobile users’ demand and is raising network data volumes well into petabyte territory. The Internet of Things (IoT) promises connectivity to a very large number—possibly in the range of billions—of sensors and devices.

Mobile technologies and architectures are changing to be able to deliver more speed, lower latency and ubiquitous connectivity to all these users and devices. To deliver flawless user experiences, mobile transport must also evolve—to pave the way for further radio evolution and smooth introduction of new features.

With Nokia IP Anyhaul, an IP mobile transport solution with leading-edge capabilities, mobile network operators can create value for their customers by being among the first to support ultra-broadband connectivity and IoT applications.

Mobile network changes
Mobile network operators have always been focused on improving network coverage and capacity to provide improved connectivity for users and devices. Most recently (in LTE and LTE-A), these efforts have been mainly in the areas of macro cell and small cell densification using techniques such as carrier aggregation (CA) and coordinated multipoint (CoMP). It is expected that 5G will drive significant growth in both the number of access points and in the bandwidth required for each mobile user or device.

In addition to improved connectivity and higher speeds, user experience is equally dependent on low latency, especially for new, real-time and interactive applications such as intelligent transportation systems, AR and VR. To address the important issue of latency, network architecture has been changing.

Changes in RAN
Radio access network (RAN) technology is evolving from distributed to centralized to cloud architectures. Centralization and “cloudification” of baseband processing need to achieve benefits on both the technical and the economic side.

The use of bandwidth-intensive Common Public Radio Interface (CPRI™) protocol for fronthaul has driven optical fronthaul deployments. However, for large-scale network deployments, and particularly for the new radio technologies on the path to 5G, more bandwidth-efficient and cost-effective transport is required.

Ongoing activities toward more efficient and scalable RAN solutions—including the definition of the next-generation fronthaul interface (NGFI), will allow the use of low-latency Ethernet transport.

It is expected that a wide range of RAN options will exist as we evolve toward 5G, with a number of alternatives already being discussed and proposed for the split of RAN functions between the radio units and baseband processing units. Addressing all these different options will require a variety of interchangeable platforms and capabilities in the fronthaul, midhaul and backhaul parts of the transport network with a management system that simplifies operations and enables rapid creation and activation of new services.
Changes in packet core
In mobile packet core, we are already witnessing evolution in the form of further virtualization of packet core functions along with the emergence of “cloud-native” packet core solutions such as Nokia Cloud Packet Core. These advancements allow network slicing and distribution of packet core functions across the network, to improve network performance and quality of service. With functionality being moved around the network, IP routing is required for any-to-any communications over diverse and ever-changing topologies.

Changes in content delivery networks
Application and content servers are finding their place in mobile cloud (data centers), and content is shifting closer to users. A very important industry initiative, largely led by Nokia—Multi-Access Edge Computing—is gaining momentum and is further shaping the architecture of mobile networks (see Figure 1). MEC can rapidly process content at the very edge of the mobile network, delivering an experience that is ultra-responsive because latency is significantly reduced. As with the changes in the packet core, introduction of MEC clouds drives new requirements for interconnectivity, routing, bandwidth and efficiency.

Nokia IP Anyhaul solution
The mobile transport network needs to stay in step with the evolution of mobile technologies—or even to evolve first—to facilitate the introduction of new radio capabilities.

The Nokia IP Anyhaul solution (see Figure 2) delivers 5G-ready features:
- Terabit scale
- Low latency
- Dynamic interconnectivity
- Improved port densities
- Support for next-generation interfaces such as latency-sensitive Ethernet for next-generation fronthaul
Nokia IP Anyhaul addresses key network requirements for traffic growth and major architectural changes on the path to 5G while allowing mobile operators to maximize the return on their investment in mobile transport.

Solution components
Our expanded IP Anyhaul portfolio encompasses several product families:
- Nokia 7705 Service Aggregation Router (SAR)
- Nokia 7210 Service Aggregation Switch (SAS)
- Nokia 7250 Interconnect Router
- Nokia 7750 Service Router (SR)
- Nokia Virtualized Service Router (VSR).

The Nokia IP Anyhaul solution is managed by the Nokia Network Services Platform, through which mobile operators can benefit from SDN-automated provisioning, optimization and assurance. These capabilities allow operators to significantly improve their ability to rapidly address changing market requirements and deliver premium broadband services.

Figure 3 shows an example of a possible IP Anyhaul deployment.

Solution features

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<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>High capacity</td>
<td>Up to terabit capacity with high port density of next-generation Ethernet interfaces (from 1GE to 100GE). Delivered through space- and power-efficient, temperature-hardened form factors.</td>
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<tr>
<td>Low latency</td>
<td>With new product architectures that allow flexible deployment options such as cost-effective transport of both low-latency and bursty traffic</td>
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<td>Enhanced Quality of Service (QoS)</td>
<td>Advanced traffic engineering and management capabilities to support the most stringent Service Level Agreements for a wide range of services</td>
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<td>Dynamic interconnectivity</td>
<td>Efficiently connect users with content located in Multi-Access Edge Computing and distributed across cloud mobile data centers.</td>
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<td>Synchronization options</td>
<td>Built-in support for many diverse synchronization options: GNSS, SyncE/IEEE1588v2, BITS (with full redundancy for all)</td>
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<tr>
<td>Security</td>
<td>Efficient, high-bandwidth IPsec, MACsec and use of VPNs for traffic and resource isolation</td>
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<tr>
<td>SDN-readiness</td>
<td>Ensured programmability and automation through the Nokia Network Services Platform (NSP)</td>
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Figure 3. A Nokia IP Anyhaul network deployment
Solution benefits

The Nokia IP Anyhaul portfolio can eliminate bottlenecks and accommodate new demands for capacity, efficiency and services. With the Nokia IP Anyhaul solution, mobile operators can create value for their customers by being among the first to support ultra broadband connectivity and IoT applications. Specifically, Nokia IP Anyhaul can help to:

- Facilitate densification of macro and small cell deployments
- Enable rapid deployment of new services such as broadcasting and public safety
- Support growth of IoT applications
- Ready the mobile transport network for increased bandwidth demand, future growth and architectural changes—on the path to 5G
- Open new business opportunities by allowing the network to be used as a set of resources which can be exposed and offered to business partners
- Leverage existing investment in mobile transport

The Nokia advantage

Nokia offers the industry’s most comprehensive portfolio of purpose-built IP/MPLS mobile anyhaul products: the IP Anyhaul solution is deployed in hundreds of networks worldwide.

Our commitment to continuous innovation makes us an ideal partner for delivering ultra-broadband services, supporting growing IoT applications and evolving to 5G.

With Nokia, you can rest assured that your investment will safely accommodate future growth. We can help plan, build, integrate and operate mobile anyhaul networks with a holistic view of the entire network. Our global reach, expertise, operational consistency and agility make us a trusted partner.

To learn more, please visit our IP Anyhaul web page.

What analysts are saying

“As networks evolve toward cloud-based, software-mediated platforms, the architectural requirements of network infrastructure are changing, requiring programmable, flexible and dynamic attributes.

Nokia’s IP ‘anyhaul’ approach, supported by an end-to-end portfolio, not only addresses the need for programmable, flexible and dynamic data transport across any domain, but also is optimized to support the network requirements that 5G will bring.”

Patrick Filkins,
Telecom Analyst,
Technology Business Research Inc.

“As we progress towards 5G, we are witnessing dramatic changes across the RAN, packet core and mobile cloud environments. These changes clearly place increased pressure on the transport network that will prove critical to user experience and operator success.

With a refreshing perspective on the evolution of mobile transport, Nokia’s IP mobile anyhaul is addressing the most compelling mobile transport issues of today while getting the mobile transport network ready for 5G.”

Richard Webb,
Research Director,
Mobile Backhaul & Small Cells
IHS Markit Technology