

Networks that lead:
Stories from IP
networking heroes

NOKIA



IP networking heroes

According to our service provider customers, IP networks are the critical, irreplaceable foundation behind most of the activities that define our daily lives. We agree. It is IP networks that kept all of us engaged and working during the pandemic. It is 5G IP networks and the new capabilities they bring that are rapidly changing the way we live, work and play — for the better. And it is IP networks that will be at the core of the coming metaverse.

There are many stories of how IP networks are helping to transform, nurture, unite, innovate, digitalize, and protect the world around us. We would like to tell each story through the eyes of the heroes that enable it, our service provider customers.

Network traffic in response to COVID-19

Five weeks of lockdown compared to the previous week:

Increase in network traffic

30–50%

One month into lockdown:

Increase in peering traffic as on-net caches reached their capacity

100%+

Six months into the pandemic:

Traffic levels stabilize above pre-pandemic levels

20–30%





5G will generate 10 times more traffic and generate far more strict SLA control than 3G/4G.

Networks that transform

Fulfilling the promise of 5G

From industrial-scale IoT to massive wireless bandwidth to new low-latency applications and services, 5G is transforming our daily lives and the way we conduct business. 5G is just as transformational to the IP networks that enable it, impacting everything from IP network scale and capability to network operations.

5G deployments are not without their challenges, however, especially as service providers look to monetize their 5G investments with high-value services that offer their customers new ways of working and playing. Yet many of our customers are finding innovative ways to successfully overcome these challenges.

For **Windstream**, the arrival of 5G and the increased use of mobile applications, video streaming and gaming, coupled with continued growth in remote working, are driving massive increases in backbone bandwidth. According to Buddy Bayer, Chief Network Officer, delivering more throughput and higher capacity to Windstream’s customers is critical. Nokia helped by enabling Windstream to build an IP backbone with 400G-capable routers, making it possible to stay ahead of its customers’ network needs. Deterministic performance was also critical for ensuring high service quality, even when the network was running at full capacity. According to Mr. Bayer, despite dealing with COVID-19 capacity surges in excess of 30 percent in some places, “with Nokia’s scalable routers in place... Windstream’s core network performed without interruption to its customers.”

British Telecom’s Howard Watson, Group CTIO, shares a similar experience. According to Mr. Watson, 5G and FTTP “create an amazing customer experience, and drive people to watch more, play more and share more,” leading to “massive traffic growth.” Nokia routers provided the scale BT needed to converge these rapidly growing services over a single backbone. Nokia’s programmable IP network infrastructure also provides BT

with the telemetry and automation capabilities it needs to make the most efficient use of its new network assets.

Deutsche Telekom’s Bernhard Scholl echoes the need to deliver more throughput and higher capacity. According to Mr. Scholl, the primary drivers for this growth are bandwidth applications’ shift to on-demand video and the growing usage of cloud-based services. In addition to addressing DT’s capacity needs, Nokia’s 5G IP transport with automated network slicing, end-to-end orchestration and deterministic performance was able to address DT’s stringent 5G IP transport requirements, making it possible to provide the top-quality subscriber experience DT’s customers were looking for.

For **Telus** CTO Ibrahim Gideon, 5G represents enormous service potential. According to Mr. Gideon, “with an exponential increase in capacity, bandwidth and speed, 5G will change the way we live and work,” and will provide the foundation for “Smart Cities, Industry 4.0, network generation virtual healthcare, immersive education, agriculture technology and next-level gaming.” The Nokia routing infrastructure provides the scale, performance, low latency and extensive service capabilities Telus needs to address these new service requirements.

Networks that nurture

Building networks sustainably

By focusing on making their networks less wasteful and more efficient, service providers are not only improving their bottom line with their sustainability initiatives, they are also helping to protect the planet. But with all the pressures of running a network, including dealing with planned events such as 5G evolution – and unplanned events such as the COVID-19 pandemic – maintaining that focus is no easy task.

Few providers know this better than **Orange**. With the pandemic came massive surges in the French service provider's network that had to be managed without impacting customers. New video services added to the bandwidth deluge, as Lionel Messi's move from Barcelona to Paris resulted in an unplanned telecom manifestation of "the Messi effect." At this point, Orange was also well along on its transformational journey to deliver on the promise of 5G.

Despite having to deal with these challenges, Orange remains laser focused on its sustainability goals. According to Christian Gacon, VP Broadband Networks, Orange's commitment to sustainability is so important, that it is tied to employee compensation. Every single Orange employee is financially incented to put sustainability front and center as they build and operate Orange's IP networks.

Foremost among Orange's sustainability goals is reducing energy consumption relative to network growth. Nokia's latest router chipset, the FP5, will make a significant contribution in this area as it consumes 75 percent less power than previous-generation FP chipsets.

Even more challenging than reducing energy consumption, according to Orange, is minimizing carbon dioxide emissions. Emissions are difficult to quantify and reducing them requires close cooperation with vendors. As well, success requires router longevity and reuse and that means extending the concept of programmability, from telling a router what to do to telling the router to do something completely different. At Orange, Nokia routers have a long history of field upgradability and re-programmability to perform different tasks. In addition to router longevity, **Nokia's industry-leading emissions reduction targets** at a corporate level are key to helping Orange achieve its own carbon emissions goals.



The ICT sector is now responsible for 3% - 4% of global CO₂ emissions, about twice the level of the much more heavily scrutinized aviation sector. Within the ICT sector, telcos are responsible for 1.6% of total global CO₂ emissions.

Source: Boston Consulting Group (BCG), Putting Sustainability at the Top of the Telco Agenda, 2021
Press release



Router longevity and reuse in practice

This Nokia 7750 SR was installed at a Nokia customer in 2004 and is still in service today! 18 years and 9 major software releases later.

Networks that unite

Network interconnection providers

Network interconnection providers, also known as internet exchanges (IX), perform the critical role of interconnecting IP networks – and the cloud services that depend on them – at massive speeds and scale, and with greater reliability and security.

Equinix, one of the world's largest interconnection and colocation (colo) providers, allows customers to streamline operations and reduce costs as they implement 5G, IoT and Industry 4.0 services using the Equinix global footprint. To achieve global scale, Equinix had to consolidate multiple networks from multiple vendors into one seamless and automated whole that would interconnect all its data centers. According to Muhammad Durrani, Director of IP Architecture, their customers' intense focus on 5G also posed "special demands for our network, from ultra-low latency to ultra-broadband performance, all with business and mission-critical reliability." In the Nokia routing infrastructure, Equinix found the end-to-end router portfolio it needed, says Mr. Durrani, one that provided a dynamic and highly programmable network fabric and deterministic performance that met its goals. Nokia's advanced routing technology and network automation also allow Equinix to determine the best available paths between its sites to meet its customers' strict SLA requirements.

For **DE-CIX**, the operator of Europe's largest IX hub, located in Frankfurt, scalable speed and capacity are primary concerns as bandwidth-intensive 5G and cloud services proliferate. DE-CIX also considers specialized edge routers to be a critical element of IX infrastructure since they perform the pivotal role of connecting external networks with DE-CIX's own internal network. According to Dr. Thomas King, CTO at DE-CIX, with Nokia industry-leading edge router technology and "the broad

portfolio of Nokia equipment, we can easily launch internet exchanges of all sizes, an important component of our global expansion strategy." The combination of Nokia edge router technology and 800GE links, says Mr. King, also allows DE-CIX "to make our platform future proof and to offer our customers reliable and smooth peering and interconnection services over the long term."

London's **LINX** has similar performance requirements and has selected Nokia routers to support interconnection and peering services up to 400GE initially, with the ability to seamlessly grow capacity and scale to higher speeds. Lower latency and reliable connectivity are also important attributes of the service LINX provides. With Nokia routers, network performance and capabilities such as traffic engineering do not degrade as LINX cranks up service speeds. According to Mariano Julia, Enterprise Architect, Nokia routers will enable LINX to "respond to our members' needs more quickly, offering them better connectivity, improved network performance and more control."

According to CTO Simon Muyal, **FranceIX** shares the scalable capacity and flexibility challenges experienced by many of Nokia's other IX customers. Rapid service deployment is also a key attribute, says Mr. Muyal, as Nokia allows FranceIX to deliver "less than a day from receiving a request." Given the pivotal role played by an IX, service reliability is a critical concern, with Nokia providing the greater connection capacity and stability FranceIX needs to satisfy its customers.

As the bandwidth trailblazers of the network services industry, interconnection providers are already deploying routing systems capable of 800GE interconnections.

Networks that digitalize

Networks that respond to the cloud

Cloud service providers allow enterprises, webscale companies and other service providers to cut IT costs, extend their reach, or simply accelerate their cloud deployments through a variety of cloud services. These range from hosting to colo, and they often come with the IP network connectivity their customers need to build private, public and hybrid clouds.

For Mario Hangjas, Senior Director at **NorthC**, “the digital transformation of the Netherlands economy and the growing role of regions within it means there is a growing demand for local data centers and for high-speed, reliable connectivity between regions.” NorthC chose Nokia routers for their Region Connect Ring so that customers could directly access network and cloud services not available in their own region and do so in a manner that met their bandwidth, latency and performance needs. Operational efficiency was also an important consideration for the company as it looked to ensure customer satisfaction. SDN automation of NorthC’s customer connections and optical interconnection links using Nokia Network Services Platform (NSP) reduces response times and allows them to satisfy customer needs in hours instead of days. This ensures customers can always operate at full speed, growing and scaling up connectivity as needed.

Spain’s **everyWAN** was looking to expand its cloud services and scale capacity to handle the enormous growth in traffic driven by the convergence of communications and IT across

national and international regions. According to Pau Nadeu, everyWAN CTO, robustness was a key requirement as the service provider’s customers “expect the very best IP transit, interconnection and data center services.” With Nokia, everyWAN has seen a significant reduction of network incidents compared to its previous network and has not experienced any network outages. These improvements have enhanced the perception of everyWAN’s services by its customers. everyWAN was also keen to leverage the Nokia solutions’ ability to select the best routes based on latency, jitter, speed fluctuation and packet loss as part of a new, premium pay-as-you-go service for its customers.

Efficiency and reliability were also top of mind for California’s **OpenColo**, a boutique colo and hosting service provider looking to implement IP routing both within and between their data centers. Nokia’s SR Linux and 7750 SR routers share the same proven routing protocols, which allows OpenColo to offer its customers more reliable and stable data center switching and internet connectivity.

Nokia’s Linux-based NetOps development toolkit for the data center was also a key decision factor for OpenColo, allowing the service provider to improve operational efficiency and reduce risk while managing rapid change. Scott Brookshire, OpenColo’s CTO, says “Nokia SR Linux was an easy choice. We wanted a solution that was extensible, open, supported telemetry and gNMI, and was provided by a company that transforms networking both on the software and hardware side.”

China’s **Capital Online** had similar requirements. The cloud- computing service provider was looking for a converged backbone network to provide more reliable cloud services with a better customer experience. According to Xu Xiaohu, Chief Architect, Nokia is “a trusted partner of critical networks” with “abundant experience helping its global customers build high capacity and quality IP networks.” The deployment of Nokia routers, says Xiaohu, will help Capital Online “accelerate the transformation of our network to provide faster, more reliable network services for our global customers.”





Networks that innovate

IP networks at the forefront of technology

Every industry has early adopters that differentiate themselves through innovation, by being the first to offer their customers the benefits that new technologies bring to the table.

Finland's **Elisa** is a prime example of an early adopter in the telecommunications and digital services market. Looking to combine gigabit-speed fixed and wireless access, Elisa needed to turbocharge its Nokia routers to stay ahead of the capacity curve. Looking to go where no provider had gone before – all the way to one terabit (Tb) interfaces – Elisa wanted to minimize the operational complexity and overhead associated with using multiple lower-speed links. According to Kalle Lehtinen, CTO, “Elisa continues its string of world firsts with this record-breaking IP routing achieved with Nokia, enabling us to leapfrog an 800G progression, that other service providers are only strategizing about...[This allows us] to stay ahead of the curve and maintain our commitment to our customers.”

Vodafone Turkey upped the ante by leveraging Nokia IP routers to provide the world's first intercontinental Tb IP link, an area where the consolidation of multiple lower-speed links into one higher-speed link pays even more dividends when it comes to operational simplicity.

Another key area of innovation within the communications service provider (CSP) space revolves around improved integration of cloud services with the networks that enable them. A new NetOps era is emerging as CSPs look for tools and capabilities that allow IP networks to dynamically adapt to the changing needs of cloud applications – from the data center all the way to edge cloud. **Elisa** is an early adopter of this technology. According to Mr. Lehtinen, with Nokia's Adaptive Cloud Networking, Elisa has “the capability to extend the flexibility and dynamicity of a cloud to the network and to interconnecting services in different cloud environments.” This will allow Elisa “applications in the cloud to consume the network as a dynamic resource in which the network dynamically adapts to changes in service demand.” Elisa expects early adoption to yield big benefits for its 5G deployments, further enhancing its position as a telecommunications market leader in Finland.

Elisa led the world by trialing the world's first 1 terabit IP link, followed shortly by Vodafone Turkey who trialed the first 1 terabit link connecting two continents.

Networks that protect

Public safety network evolution

Public safety networks are responsible for the prevention of crime, participating in searches for lost and missing persons, supporting the communications needs of first responders, assisting in cases of national or local disasters or emergencies, and supporting many other critical services. They need to be fast, secure, extremely reliable, and flexible enough to handle the many new services planned to better protect the people and property around us.

The **State of Vermont's** Public Safety Department operates mission-critical networks that keep first responders connected 24 x 7. They upgraded to Nokia packet microwave technology and a Nokia IP/MPLS network that could also backhaul their time-division multiplexing (TDM) traffic, improve availability and support new bandwidth-hungry applications such as video. According to Terry M. LaValley, Director Radio Technology Services, "the safety of our workers and the people of Vermont is our first priority. In upgrading our public safety communications network, we're ensuring our teams can stay connected and are communicating when it counts most."



When the **State of Michigan**, investigated upgrading its mission-critical microwave network spanning 59,415 square miles and serving 1,562 local, state, federal, tribal and private partners, network architects had multiple changes in mind. In addition to adding new high-speed voice and data capabilities, they wanted to migrate public safety applications seamlessly in the new converged network while leveraging existing equipment as much as possible to conserve government budget. With Nokia, they found a reliable, scalable, and secure IP/MPLS backhaul network with robust QoS that ensured critical traffic would always be delivered with the highest priority, and which public safety agencies from across the state could share with no performance degradation.





There's no stopping now

Charting a course to the metaverse

As challenging as it was for our customers to navigate the rapid and unpredictable change they experienced during COVID-19, they not only weathered the storm, they exceeded the needs of their customers while growing the bottom line. They also succeeded in their efforts to transform their IP networks to meet the needs of 5G. But new challenges lie ahead as the cloud-to-network integration journey that began with 5G evolves into the 3D cyberworld of the metaverse.

To thrive in the metaverse, service providers will have to invest in a new generation of low-latency, cloud-based services for their enterprise and consumer customers. They will have to deliver and deploy these services over IP networks faster and more efficiently than ever before. And they will have to accomplish it all while dealing with greater uncertainty amid the need for more of everything — more scale, more capacity, more stringent quality of service, more sustainability, more profitability and more protection from increasingly severe network-level threats that threaten everything.

Getting there will be challenging. Many IP networks force providers along narrow technology paths that limit performance or features, or encourage wasteful “rip and replace” strategies that increase costs and carbon footprint. Service providers need IP networks they can trust to keep up with evolving, cloud-based metaverse services — from the data center to the network edge — without compromising on performance, service capability or their sustainability goals. With their investment in IP networks from Nokia, our network heroes are already on a strong path to mastering the coming metaverse.

Ready to chart your course
to the coming metaverse? **Start here**

Nokia OYJ
Karakaari 7
02610 Espoo
Finland

Tel. +358 (0) 10 44 88 000

CID: 212476 (February)

nokia.com

NOKIA

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

As a B2B technology innovation leader, we are pioneering the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.

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.

© 2023 Nokia