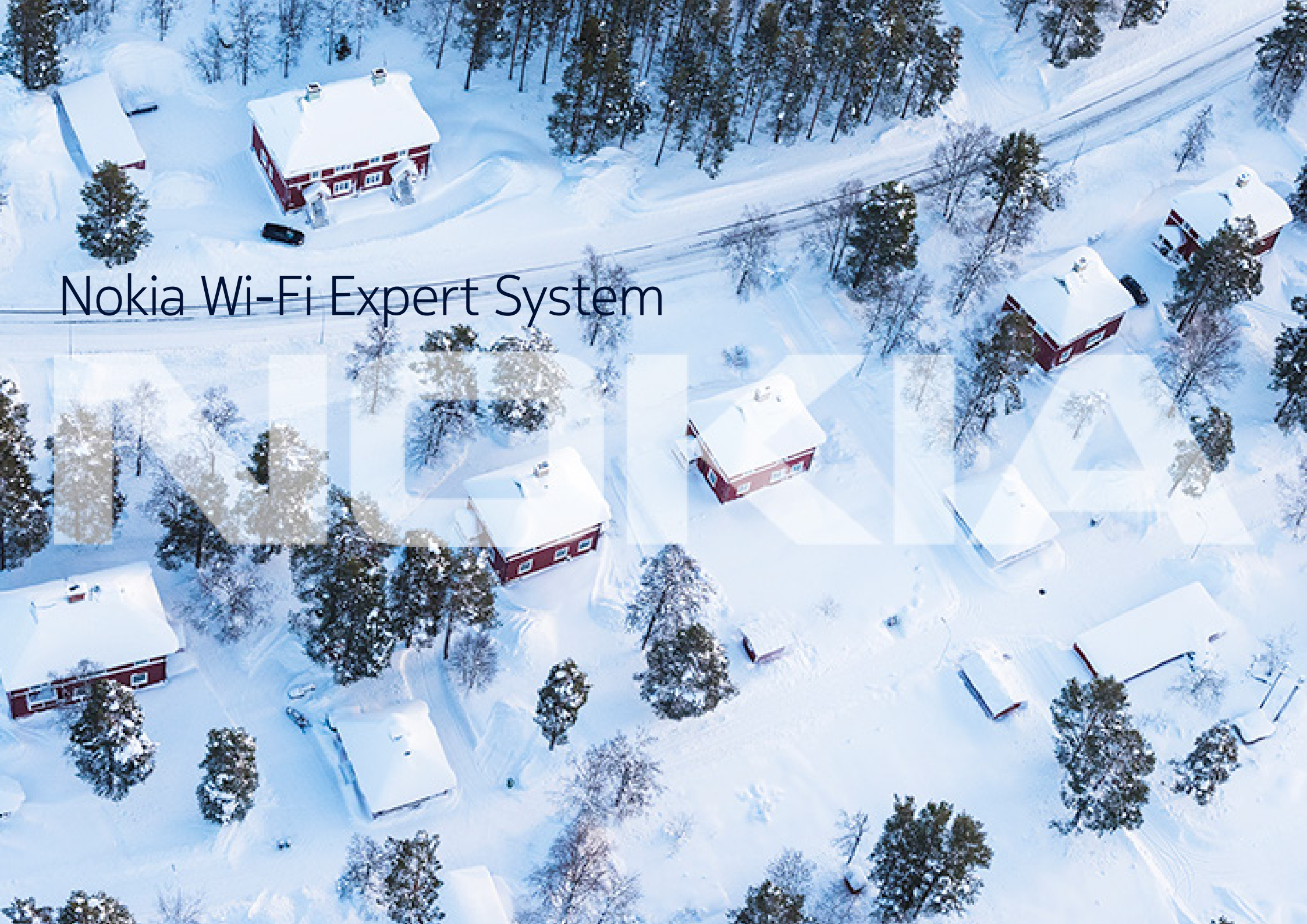


An aerial photograph of a small village in winter. The ground is covered in a thick layer of snow. Several red wooden houses with white roofs are scattered throughout the scene. Some houses have multiple chimneys. Evergreen trees, heavily laden with snow, are interspersed among the buildings. A road or path, also covered in snow, runs diagonally across the upper portion of the image. The overall atmosphere is cold and serene.

Nokia Wi-Fi Expert System

Optimize the in-home Wi-Fi experience

Wi-Fi-enabled devices in the home are multiplying so much consumers consider Internet and Wi-Fi interchangeable. Whether it is smartphones, tablets, set-top boxes (STBs), thermostats or game consoles, broadband Internet access over home Wi-Fi networks is growing dramatically. That's good news for service providers, but it's not all smooth sailing.

That's because Wi-Fi setup can be cumbersome and configuration can be more complex than expected. On top of that, consumer expectations for quality of experience (QoE) and easy access to self-care tools are continuing to rise, therefore demand will only continue to increase. Consider, for example, the high expectations for voice over Wi-Fi (VoWi-Fi) service quality as compared to the lower Wi-Fi quality required for Internet browsing. And, when it comes to video streaming, the need for a high bandwidth and highly reliable Wi-Fi network will also increase. In fact, millennials are already streaming more programs on their companion Wi-Fi devices than traditional TV in the living room.

Within home network environments, managing the customer experience requires control over Wi-Fi performance. By leveraging data analytics, the Nokia Wi-Fi Expert System enables both consumers and help-desk agents to quickly, easily, and accurately qualify the home network for advanced services. It also lets them optimize in-home quality of service (QoS) so that particular services, such as VoWi-Fi or video, get the necessary treatment. The resulting performance improvements translate into improved customer satisfaction, as well as significant reductions in service provider operating expenses.

Managing complexity

The complexity of the home network environment is driving up support costs for service providers. Often they have little or no visibility into the devices connected to the home network. Service providers simply aren't aware of the services being used. Nor are they aware of how these services and the home network are performing. This is a problem. Wi-Fi user experience depends on the type of service, such as voice, browsing or video, as well as the subscriber's location in the house. Adding to the challenge, there's the potential for neighboring Wi-Fi signal interference. All of these factors can negatively affect QoE. That's important because a positive customer experience inspires loyalty, generates upsell opportunities and attracts new subscribers.

To address these challenges, the Wi-Fi Expert System allows service providers to:

- Deliver fast, reliable speeds to subscribers on the go and in the home
- Take responsibility for a great customer experience all the way to the device
- Empower home users by providing them with easy-to-use, self-care services to optimize their in-home Wi-Fi experience
- Provide service transparency and a branded experience
- Leverage the perceived advantage of faster, more secure in-home Wi-Fi
- Validate remotely in-home connectivity of Wi-Fi access points, such as residential gateways (RGW) or extenders, as well as the customer's mobile and fixed devices
- Directly address the most common triggers for customer Wi-Fi support calls by providing simplified, automated and contextual tools, including web-based portals and mobile applications
- Deliver relevant insights on a per subscriber, inhome Wi-Fi performance basis as well as across the entire Wi-Fi access point installed base
- Proactively self-heal Wi-Fi access points and customer's device settings to deliver a superior managed Wi-Fi experience

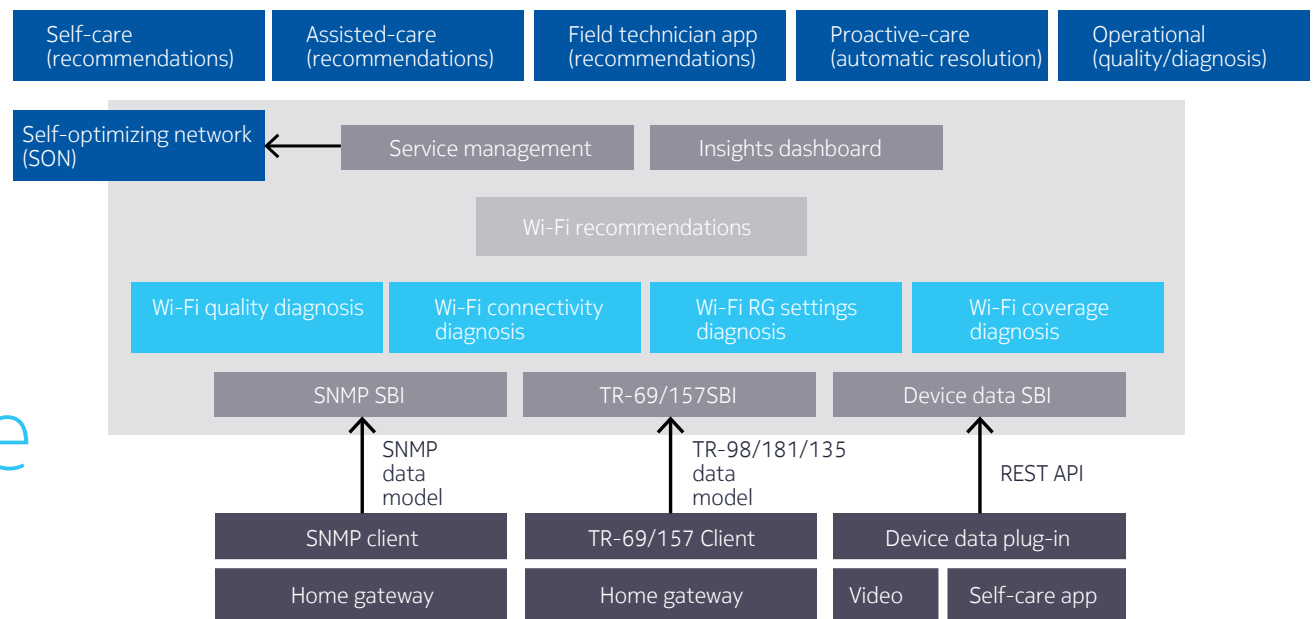
Improving the consumer experience

The Wi-Fi Expert System provides consumers with a simple way to conveniently activate, configure and troubleshoot the in-home Wi-Fi network. At the same time, for service providers, it offers advanced in-home Wi-Fi monitoring and optimization tools. In both instances, the overall goal of the system is to improve the home Wi-Fi customer experience and reduce the number of support calls.

System components	Features	Benefits
Self-care	Provides an optimized and simplified self-service experience on smartphones and tablets.	- Transforms and improves self-care. - Reduces the number of help-desk calls and no trouble found (NTF) residential gateway returns (more than 20 percent reduction expected in the long term).
Assisted-care	- Extends the self-care use cases to the help desk. - Provides simple and extensible home management workflows.	- Empowers the support agent and improves operational efficiency. - Reduces average handling time for call center agents and improves first contact resolutions (FCR) rates resulting in fewer Level 2 and Level 3 escalations and transfers, which contribute to improved customer satisfaction and net promoter scores (NPSs). - Lowers NTF device swaps and unnecessary field technician visits.
Field technician app	- Tests Wi-Fi strength, interference. - Shows customer details. - Offers an easy-to-use Wi-Fi site survey application.	- Empowers the field force by extending troubleshooting use cases to the app. - Ensures that field technicians follow specific installation and troubleshooting processes prior to job completion. - Improves field visit success rates and reduces average field visit duration. - Optimizes the in-home Wi-Fi reception with
Proactive-care	Analyzes end-user device and RGW/Extender data to determine the end-user experience to proactively take action to resolve issues.	- Reduces the support burden on service providers by providing automated on-device, in-home Wi-Fi management and optimization for connectivity, configuration, and home network performance. - Increases QoS performance and reduces the number of help-desk calls and NTF RGW returns.
Dashboard and operational reports	- Allows per subscriber drilldown on Wi-Fi key performance indicators (KPIs) and quality (KQI) scoring. - Delivers Wi-Fi KPI and KQI analytics per region and per Wi-Fi access point vendor.	Empowers the operations team with relevant insights on Wi-Fi performance to drive device, network and business process optimizations.



Wi-Fi Expert System Components and Architecture



How It Works

There are five easy-to-use interfaces to the Wi-Fi Expert System

1. Self-Care

Self-care functionality includes:

- Nokia self-service smartphone or tablet app
 - Simplified configuration of the home Wi-Fi network
 - Simplified configuration of the smartphone or tablet
 - Simplified optimization of the home Wi-Fi network through the Nokia Wi-Fi Expert System
 - Proactive notifications when Wi-Fi performance is degraded and user action is needed
- Nokia Wi-Fi Expert System
 - Monitors and measures Wi-Fi performance in the home
 - Leverages data analytics from mobile devices and customer premises equipment (CPE)
 - Determines when and where Wi-Fi performance is impacted
 - Recommends performance improvement alternatives, such as adding an extender, changing channels, or switching bands

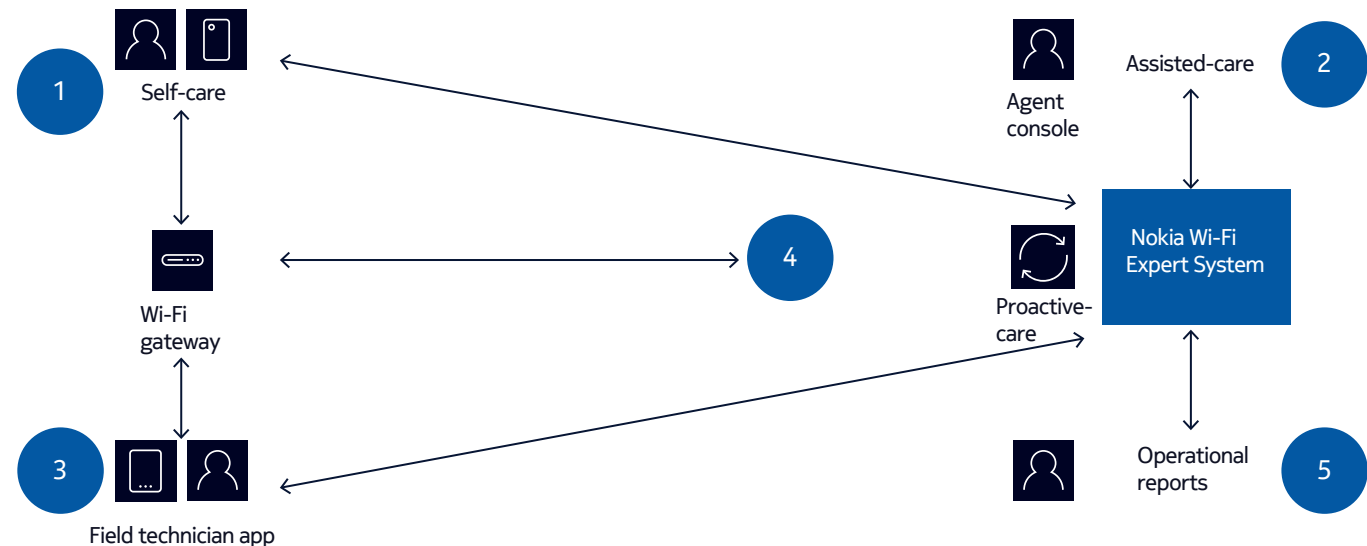
2. Assisted-Care

Assisted-care runs on an agent console that:

- Displays the Wi-Fi interference and signal strength analytics and recommends the best channel for each Wi-Fi band
- Validates the in-home Wi-Fi connectivity state of the different Wi-Fi access points and mobile devices

- Provides the help desk with results from Wi-Fi self-care performance analysis for improved troubleshooting
- Uses the Wi-Fi Expert System recommendations that drive the help desk Wi-Fi optimization workflows to reduce average handling time (AHT) per call and increase first contact resolution (FCR)

- Sends notifications to customers to initiate a resolution, such as a channel change, to resolve interference issues





3. Field Technician App

The field technician app collects and retrieves data to improve on-site troubleshooting by field technicians. As well, it combines the work order management system with specialized testing and diagnostics tools. Features include:

- Wi-Fi interference
- Capture of customer signoff on site to close ticket
- Wi-Fi signal strength
- Wi-Fi data collection and storage
- Optional integration with trouble ticket system and GPS for order management and route planning
- Access to relevant customer data
- Optional link to instructional troubleshooting videos

4 Proactive-Care

Features include:

- Automated recommendations for an optimized Wi-Fi experience
 - Proactive alert on poor VoWi-Fi quality along with recommendations on corrective actions
 - Proactive alert when extender is disconnected
 - Proactive reboot when there is consistent low Wi-Fi quality
- Tools to measure and diagnose Wi-Fi quality
- Leveraging the Wi-Fi Expert System recommendations to automatically change Wi-Fi settings based on operator policies
- Integration with Self-care portal and mobile applications to optimize home Wi-Fi performance

5 Dashboard and Operational Reports

Features include:

- Interference and auto channel selection algorithm performance per firmware/region
- Wi-Fi error rate per CPE firmware/vendor
- Wi-Fi utilization subscriber ranking and user equipment (UE) type ranking
- Correlated Wi-Fi and access link quality score-network-wide, per CPE firmware, per DSLAM/CMTS
- Hotspot Wi-Fi authentication and speed experience score-network-wide, per CPE firmware, per UE type, per DSLAM/CMTS
- Rogue users/devices detection

About Nokia Customer Care Solutions

Customer Care Solutions by Nokia is a first-of-its-kind portfolio specialized to automate care, service, network and IT operations with unparalleled data analysis. Today, there are more than 600 deployments worldwide to fulfill, optimize and protect customer experiences. Because we know the whole network, only Nokia can provide the CEM software solutions purpose-built for cloud, mobile and fixed environments. We are making it easy for people and businesses to get the most out of technology. For more information, please visit <https://networks.nokia.com/solutions/customer-care>.

Our Wi-Fi Expert System enables customer self-care, faster help-desk troubleshooting, as well as significantly lower support costs. The outcome is a measurably improved customer experience, happier subscribers, and improved net promoter scores. Together with our service provider partners, we are building competitive advantage, enhancing end-user experiences, and accelerating the move to a digital society. For more information about how Nokia can contribute to your success, contact your nearest Nokia partner.





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About Nokia

Nokia is a global leader in the technologies that connect people and things. Powered by the innovation of Bell Labs and Nokia Technologies, the company is at the forefront of creating and licensing the technologies that are increasingly at the heart of our connected lives.

With state-of-the-art software, hardware and services for any type of network, Nokia is uniquely positioned to help communication service providers, governments, and large enterprises deliver on the promise of 5G, the Cloud and the Internet of Things. <http://nokia.com>

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