

NOKIA

Programmable
connectivity



The future of applications is to be “network-aware”. Are you ready?

Historically, applications have been confined to the “over-the-top” world, operating independently of the underlying network. This limited their potential and left users frustrated with inconsistent performance.

Today, the telecom industry is embracing a new era of network openness, allowing applications to interact directly with the network to enhance performance and to enrich user experiences.

This presents a unique opportunity for application developers to unlock a new level of innovation and deliver truly transformative experiences.

The Challenge

How can application developers leverage this network openness to create the next generation of applications that deliver superior performance, personalized experiences, and unprecedented user engagement?

The Solution

Nokia Network as Code is the API aggregator platform that empowers developers to tap into the power of network-aware applications.

Our platform simplifies the process of interacting with telecom networks, providing developers with the tools and resources they need to:

- Request and receive the specific network performance required by their applications

- Optimize application performance based on real-time network conditions

- Deliver personalized experiences tailored to individual user needs

- Unlock new possibilities for innovation and user engagement

73%
of developers
surveyed are
interested in using
APIs to call
capabilities in 5G
network

Analysys Mason survey
“Programming the networks
of the future.
What developers need to
know.”

Network quality: an important obstacle to application experience

Historically, developers have designed their applications to operate on best-efforts networks. This takes into account the impact of performance degradations due to factors like network congestion, event-related density fluctuations, etc. As such, developers have to rely upon techniques like buffering and spooling to minimize the impact to their application end-users.

VIDEO: Quality on Demand

Network as Code's Quality on Demand enables applications to signal the network to receive improved network quality in real-time.

This limits the freedom to create new and exciting applications that would not work effectively in situations of network quality degradation.

Cloud Computing:

Limits applications that rely heavily on cloud computing, allowing for quicker access to resources and services

Updates and Syncing:

Slows applications that frequently update or sync data with the cloud

Loading Times:

For applications that require data from the internet, such as web apps or cloud-based services

Real-Time Communication:

Causes lag, buffering and poor audio/video quality for applications that require real-time data exchange, such as remote operations, video calls or online gaming

User Experience:

Causes negative user experience including errors, timeouts, or crashes, leading to frustration.

Can Quality on Demand help ?

Today's 5G-era networks hold untapped potential and the telecom industry has mobilized to unlock capabilities for innovative ecosystems.

Network APIs (Application Programming Interfaces) enable developers to seamlessly integrate advanced 5G network capabilities into their applications. These standardized interfaces allow applications to communicate and interact with mobile networks, unleashing a new era of innovation.

All participants within this dynamic ecosystem stand to gain: CSPs extend developer access to their network attributes, developers craft novel application experiences, and enterprises unveil innovative products and services. This synergy can be achieved if networks become responsive to application requirements.

Public network services provide best-efforts throughput. In sunny-day scenarios, this is enough to enable users to have good experiences with the applications they use in their business and personal use.

The problems arise at times of congestion when networks can become strained. This is when uplink and downlink speeds may reduce to least common denominator rates and this is when network latency tends to increase.

This is where Quality on Demand helps. The network telecom operators are open for business. Their 5G networks are nimble enough to respond to requests from your applications through standardized API calls.

In time-sensitive situations when the network is congested but your application cannot sustain a delay, you can instruct the network to boost network quality in real-time.

Did you know that you can request a network quality improvement on demand with Network as Code ?

The flexibility and willingness of network providers to respond to your application requirements is a new industry-wide development. However, 5G-era networks are complicated to interface with.

This is where Network as Code comes in. We aggregate access to network operators from around the world and we present a simplified interface to your developers.

Aligned to global standardization initiatives like GSMA Open Gateway Initiative (OGI) and Linux Foundation's CAMARA initiative, Network as Code APIs offer unified API access to real time network quality improvements across global networks.

Network as Code Quality on Demand often works together with:

Location
verification
and
geofencing

Number
verification

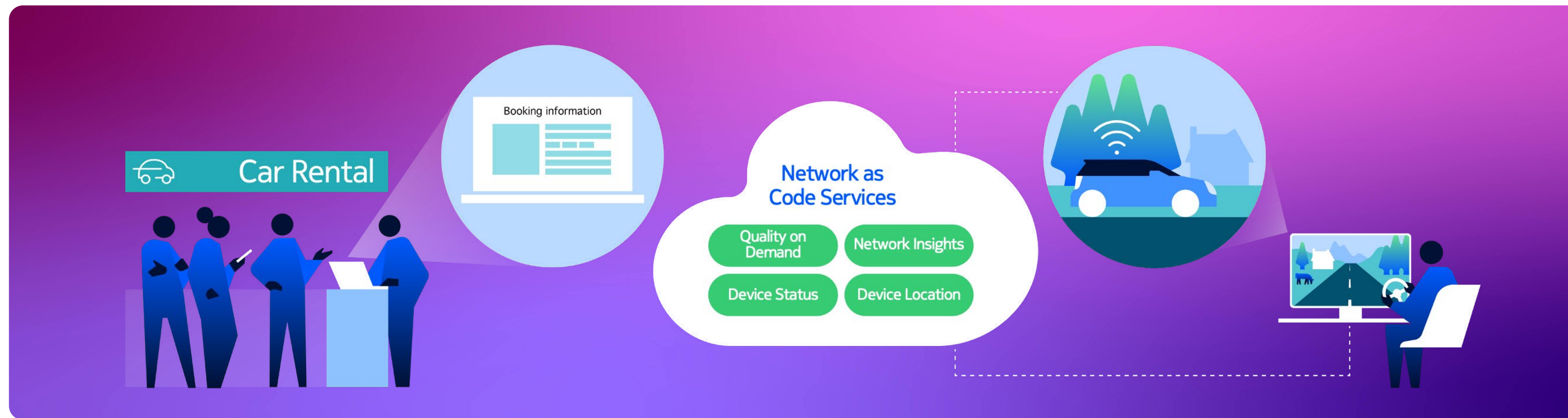
Device
location

Network
insights

Device
status

Population
density

Remote tele-driving with Quality on Demand



Remote operations of automobiles is an emerging market space. This differs from fully autonomous vehicles. With remote tele-driving, a human driver operates the vehicle remotely. The remote tele-driving station consists of an automobile cockpit with windshield, seat, pedals, steering wheel etc. to drive a car and relies upon high quality network connectivity between the driven vehicle and the remote tele-driver.

An example use-case would be a rental car service that offers to deliver the rented car to the renter where they are.

This would be a value-added service that eliminates the need for the renter to journey to the rental car facility. Upon booking the rental car delivery service, the renter waits at their home or workplace and the car is driven to them. Once the car arrives, the renter hops into the driver seat and takes full control of the car to use as they need.

When the renter is ready to hand back the vehicle they close out their rental on the app and the car is remotely driven away by the rental car service.

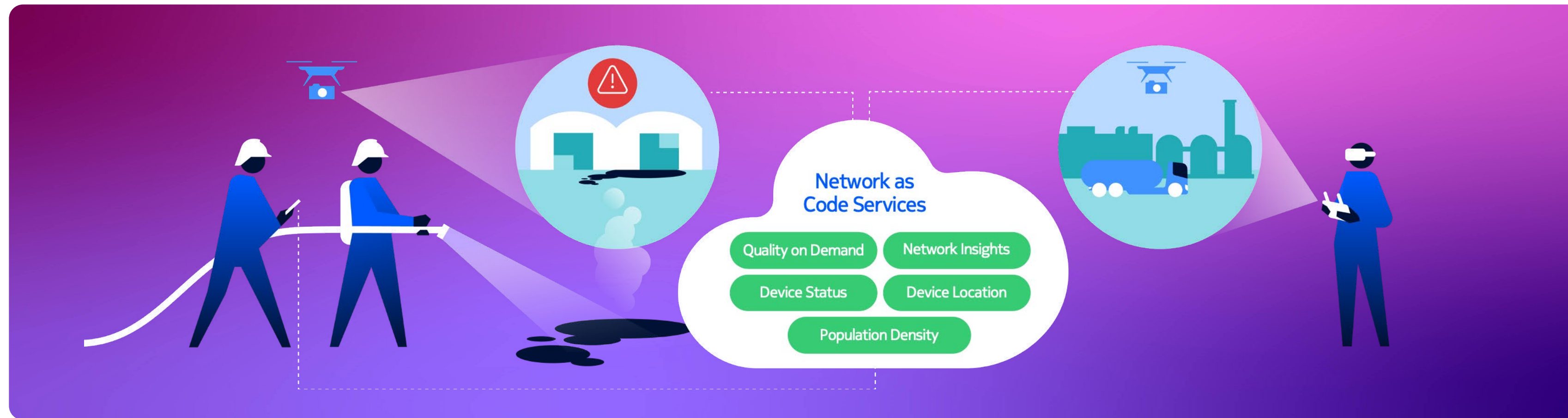
When the vehicle is being remotely tele-driven, it is important for the onboard hi-resolution cameras to stream clearly to the tele-driver. Leveraging Quality on Demand, the tele-driving application interacts directly with the mobile network through programmable APIs and when network quality improvement is required, it is delivered by the telecom network in real-time. Especially in areas of network congestion and high traffic utilization, this can be a difference-maker for a viable service offering from the rental car agency.

The “Quality-On-Demand” (QoD) API provides a programmable interface for developers to request stable latency or prioritized throughput managed by networks. In this case, this API abstracts the complexity of underlying network technologies, enabling the remote tele-driving application developers to request the network performance required to maintain safe operations of the vehicles.

The “Location Retrieval” API provides the location of a mobile line as detected by the mobile network operator. The request can specify the maximum acceptable age of the location data. In this case, the mobile network location of the vehicle can be triangulated with GPS location information for more accurate location details.

The “Device Reachability Status” API allows API consumers to query the connectivity status of a device on a mobile network. The API reveals whether the device is reachable via SMS, data (mobile internet), or both, enabling the tele-driving application to validate session connectivity status of the SIMs used in the vehicles while in transit.

Remote drone operations with Quality on Demand



The global market for Drone Inspection and Monitoring was valued at US\$16.4 Billion in 2024 and is projected to reach US\$38.2 Billion by 2030, growing at a CAGR of 15.1% from 2024 to 2030¹.

Benefits of Drone Inspection:

- Operational efficiency and cost savings
- Safety: minimize worker exposure to dangerous environments
- Improved data capture leading to more accurate and timely decisions

- Regulatory progress is a crucial factor influencing market growth, with aviation authorities worldwide establishing guidelines that facilitate safe and efficient drone operations.

Primarily affecting the real-time communication to the drone during flight, the telecom network availability and performance matters.

Take an example of a first-responder emergency situation. Network congestion is a natural problem during disaster events. Take an example of a first-responder emergency situation where drone-based capture of hi-resolution video is needed.

Network congestion could compromise this. Leveraging Quality on Demand, the drone operations application can interact directly with the mobile network through programmable APIs and when network quality improvement is required, it is delivered by the telecom network in real-time. Telecom network companies are working closely with government and safety organizations to allocate sufficient capacity for these situations and now we have the Quality on Demand API to activate that capacity in real-time.

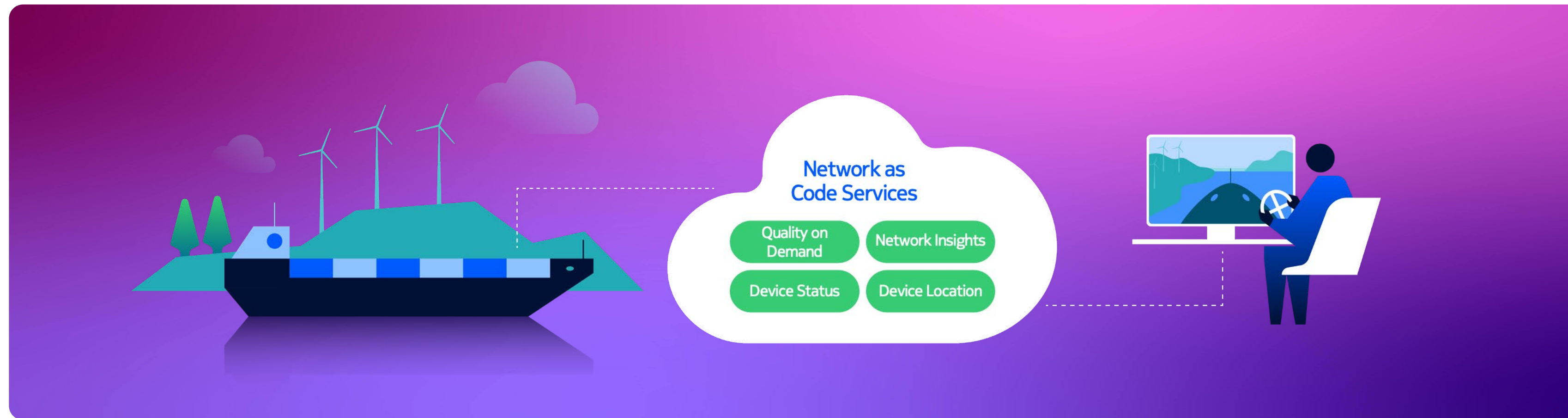
The “Quality-On-Demand” (QoD) API provides a programmable interface for developers to request stable latency or prioritized throughput managed by networks. In this case, during the drone flight, this API enables the drone operations system to interact with the network to request the performance required to maintain safe flight missions of the drones.

The “Location Retrieval” API provides the location of a mobile line as detected by the mobile network operator. In this case, the location of the drone can be tracked within the mobile network for more precise location and to integrate with network performance projections for more precise re-routing actions if required.

The “Population Density” API enables developers with the capability to get dynamic population density data in a specific area for a specified date & time.

Provides data that BVLOS flights need to meet regulations and to identify if the ground risk class for a given drone flight is acceptable for the time of the flight, or if an alternative time should be considered to lower the risk.

Remote vessel operations with Quality on Demand



The European inland navigation sector is facing a significant labour shortage. This shortage could jeopardize the ambitious goals of modal shift in favor of this mode of transport².

Recognizing this emerging problem, Seafar, a shipping entity in Antwerp, provides a service to remotely operate vessels in crew-reduced configurations. One step to gain authorization to operate this service is to demonstrate how commercial telecom network services can provide the required connectivity.

Seafar worked with Telenet, a telecom network service provider in Antwerp to demonstrate their service where licensed captains could operate vessels remotely from Seafar's off-shore control facility. The Telenet network provided the connectivity from the off-shore control facility to the vessels throughout the port of Antwerp inland waterways. In sunny-day conditions, the service operated perfectly to the satisfaction of regulators and authorities.

The testing also included the generation of congestion into the network to simulate the effect on the up-link transmission of the hi-resolution video feeds used to remotely operate the vessels. In coordination with Nokia, the vessel operation application was programmed to make an API call to the network to request Quality on Demand and the Telenet network responded in real-time. This eliminated any impact that network congestion, reduced up-link and increased latency would have on the successful remote operations of the vessels.

The “Quality-On-Demand” (QoD) API provides a programmable interface for developers to request stable latency or prioritized throughput managed by networks. In this case, this API abstracts the complexity of underlying network technologies, enabling the remote vessel operations application to request the network performance required to eliminate delays for the most energy-efficient transit of the vessels through congested areas.

The “Location Retrieval” API provides the location of a mobile line as detected by the mobile network operator. In this case, the location of the vessel can be plotted together with hundreds of other connected devices in the harbor to enable the vessel operations system to enrich their maritime geo-fencing application accuracy.

The “Device Reachability Status” API allows API consumers to query the connectivity status of a device on a mobile network. In this case, the API enables the remote vessel operations system to ensure the live connection to the various on-board devices like the multiple hi-resolution cameras needed to provide clear visibility for the remote captain operators.

Social media livestreaming with Quality on Demand



Faster data speeds make for much easier and smoother social media posting. When you're on your own cable or fiber connection at home, that's one thing. But if you are live-streaming or posting time-sensitive photos and video files while you are mobile, 5G service is really helpful.

Hosting a livestream can require 300–500Mbps¹ and in a crowded place such as a music festival or a sports event, a congested network can make it difficult to even send DM (direct message).

When you consider that common 5G mobile plans offer rates from between 80 – 175 Mbps¹, in a non-congested network, it's obvious that things can get very difficult to live-stream on a congested network.

Let's consider a situation where a Social Media Influencer is attending an event. The perfect storm is a well-attended event; it has all the characteristics you want to build your follower community – the last thing you need is a congested network that causes your live-stream to suffer.

This is where Quality on Demand can help.

The modern 5G-era networks that telecom network operators have built are intelligent and have been set up with software-based APIs that enable applications to request top-up capabilities on demand. In this situation of this crowded event, the Social Media Influencer would have this API designed into their live-streaming application and if networks become congested, an API call activates a top-up for the time period required. A small price to pay to get that critical content posted!

The “Quality-On-Demand” (QoD) API provides a programmable interface for developers to request stable latency or prioritized throughput managed by networks. In this case, this API abstracts the complexity of underlying network technologies, enabling the Social Media streaming application to request the network performance required for high-quality video streaming – especially during high priority events where congestion delays may occur.

The “Location Retrieval” API provides the location of a mobile line as detected by the mobile network operator. In this case, the precise location of the streaming device within the crowded event space can be identified to enable the streaming platform to provide more meaningful perspective to the viewers.

The “Device Reachability Status” API allows API consumers to query the connectivity status of a device on a mobile network. This is important to determine if the influencer can be reached via SMS, and other mobile applications for the most timely interaction with their viewers during the live stream session.

Why Nokia?

The industry's leading network API platform designed for enterprise business-critical needs

ABI Research
ranks Nokia
overall leader
and top
innovator for
telco API
platforms

Nokia Network as Code is the industry's leading API platform for programmable connectivity enabling you to easily modify network bandwidth on-demand to support the unique needs of your applications

Since launching the Network as Code platform in late 2023, Nokia's ecosystem of 50+ Network as Code partners covers leading global networks including BT, Orange, Telefonica, Vodafone and US Majors.

Nokia's commitment to widespread API adoption extends beyond network-side aggregation -our ecosystem also includes hyperscalers like Google Cloud; Communications Platform as a Service (CPaaS) providers such as Infobip; large system integrators such as Global Logic and Wavemaker; vertical independent software vendors like Elmo; and the world's largest public API hub through Nokia's acquisition of Rapid.

Take advantage of extreme API performance and availability

Powered by best-in-class API hub technology from Rapid (now acquired by Nokia), Network as Code offers you guaranteed API performance and the highest API availability across the industry.

Our API technology has been reliably proven to execute in excess of 63 billion API transactions annually and is trusted by leading enterprises across the financial services, aviation, automotive, fleet, and telecommunications sectors.

You don't need to be a network expert

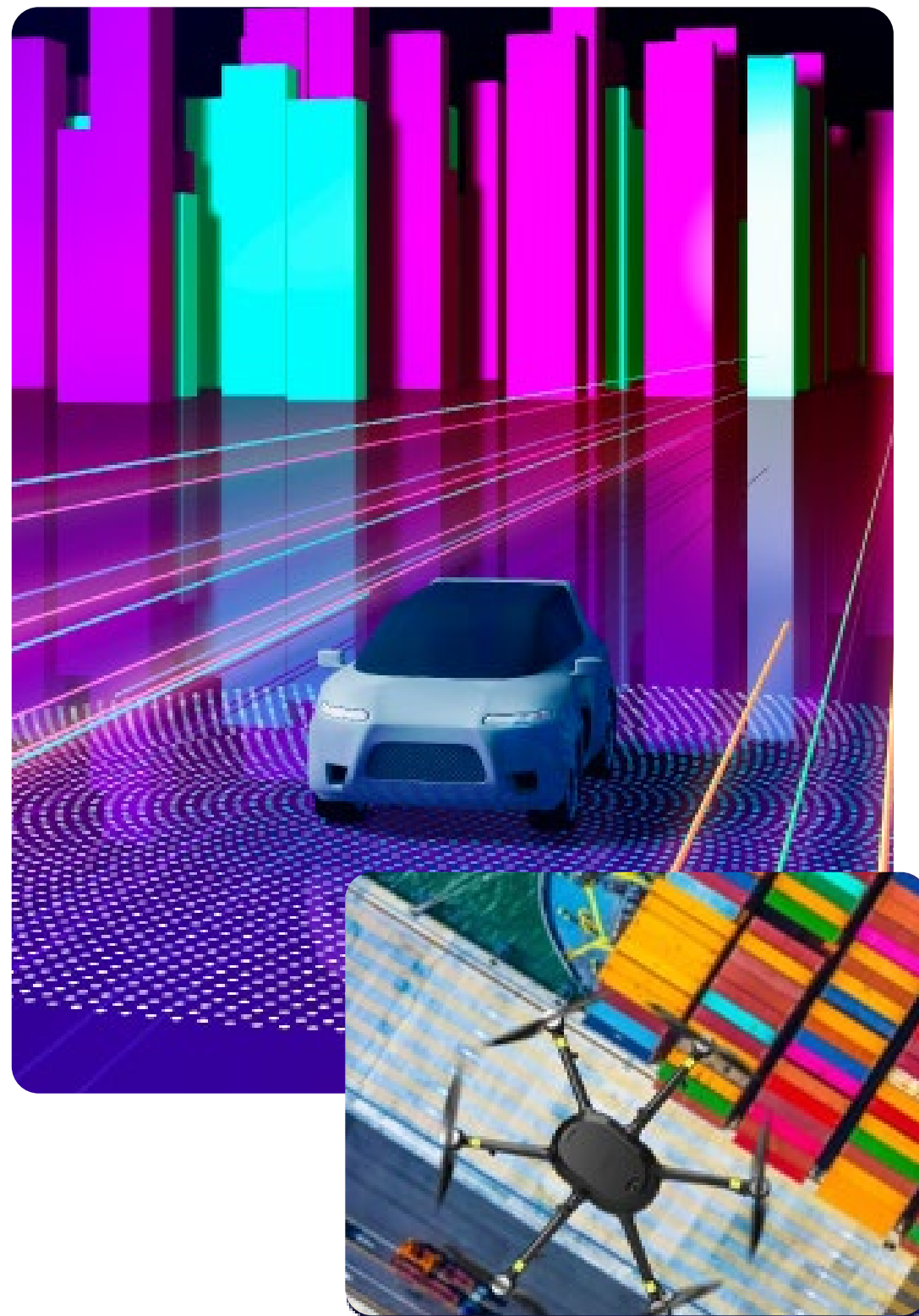
Designed 'developer-first' with a comprehensive developer portal, sandbox environment and GenAI-based code generation assistant, Network as Code makes it easy to embed network data, insights and specialized capabilities into your

application without needing you to interpret complex telecom parameters and data sources.

Flexible billing and charging models to suit your business needs

Whether you're a startup or a global enterprise, you can scale your API usage effortlessly with our transparent pricing. Our pay-as-you-go model means you only pay for the API calls you actually make—ideal for keeping costs low during early development or small-scale deployments. And when your needs grow, you can upgrade to a tiered subscription with customizable packages that fit your exact requirements.

Get started with Nokia Network as Code

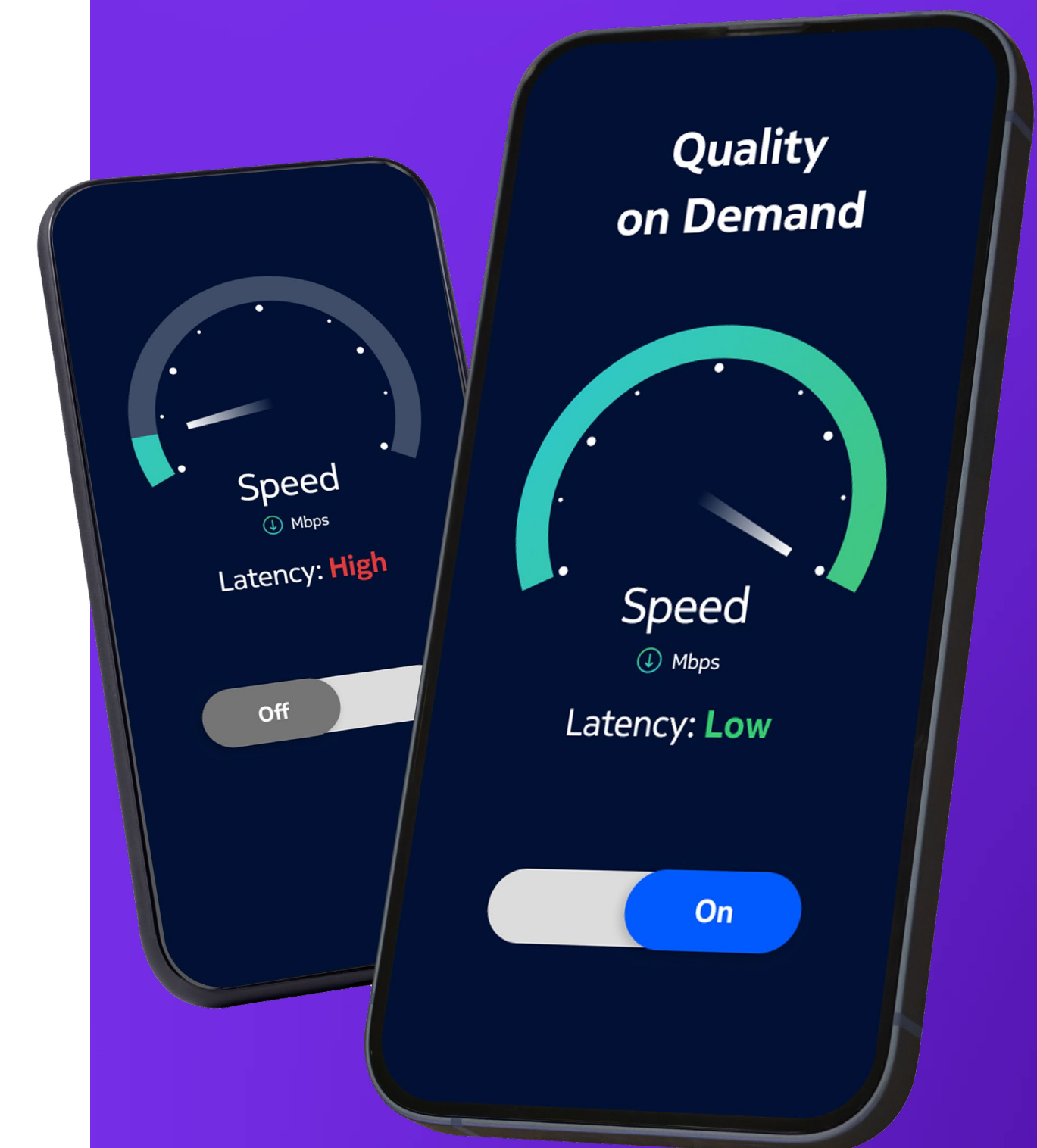


Quickly build ready-to-deploy use cases on our developer portal

- Comprehensive documentation, tutorials and sample code for every Network as Code API
- Google Gemini GenAI code generation assistant simplifies use case development for first time adopters
- Full featured sandbox environment to help you test and evaluate use cases across every network

Accelerate development with prefabs from Nokia and our partners

- Fully customizable consumer-grade UX
- Prefabs embedded with enterprise-class security
- Code and Ops freedom for extensive scalability
- Embeddable web components for third-party applications



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About Nokia

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.

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.

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