NOKIA

MulteFire
private wireless

Unlock unlicensed spectrum
with the first complete MulteFire
4.9G/LTE private wireless solution

What is MulteFire?

MulteFire is an innovative technology that supports the creation of cellular-based wireless networks that operate in unlicensed global 5 GHz spectrum. Combining high performance with simple deployment and operations, it enables enterprises of all sizes to deploy LTE-based private wireless networks without worrying about spectrum availability and regulatory consent.

Based on 3GPP 4G/LTE standards, MulteFire delivers performance, quality and security similar to traditional 4G/TD-LTE networks but without the need of costly licensed spectrum. It coexists easily with Wi-Fi deployments in the same band and meets the requirements of Industry 4.0 applications. MulteFire, operating without the need for licensed spectrum, does not have to bear the costs for radio optimization and integration into an existing licensed spectrum network.

MulteFire opens new opportunities for industries and communication service providers (CSPs) by making it possible to use a large spectrum of up to 450 MHz of bandwidth that is easy to access and available in most countries worldwide.

Key benefits of MulteFire

- High performance with no need for licensed spectrum
- Carrier-grade quality, security and availability
- High network capacity, coverage and range
- No spectrum cost
- Simple, rapid deployment with no need for integration with the existing network
- Efficient coexistence with other spectrum users, including Wi-Fi

MulteFire: An opportunity for industries and CSPs

MulteFire enables you to explore new possibilities

For example, MulteFire offers an easy way to add capacity and reduce spectrum cost by deploying access points to complement existing private wireless networks. It can give you more connectivity options if you operate in a country that has limited LTE spectrum for industry verticals. If licensed spectrum and bandwidth are too expensive, MulteFire can offer you an affordable path to connectivity.

MulteFire also makes it easy to set up temporary wireless networks for a diverse range of scenarios, from itinerant events

and construction sites to broadcasting and emergency response. With MulteFire, an event services company could quickly deploy broadband communication systems anywhere without having to request LTE spectrum or live with the limitations of Wi-Fi. A construction company could use MulteFire to provide dedicated, consistent, high-performance connectivity to workers at zero cost.

CSPs can benefit from MulteFire, too. They can use it to expand private wireless offers without heavy integration with the public network and without sharing capacity.

Putting MulteFire specifications to work

Our MulteFire private wireless solution is the product of a journey that started when we co-founded the MFA in 2015. The Alliance's first objective was to build a 3GPP standards-based specification that would make LTE/4G compliant for use in global 5 GHz unlicensed spectrum, ensure coexistence with Wi-Fi and meet the performance demands of Industry 4.0 applications.

The resulting MFA 1.0 specification defines several key capabilities, including Listen Before Talk (LBT) functionality which ensures that MulteFire can coexist with neighboring Wi-Fi.

The MulteFire 1.0 specification enables the full range of LTE services, including voice, high-speed mobile broadband data, user mobility and security. MulteFire 1.1 expands the potential of the IIoT by supporting expanded business opportunities, access to new spectrum bands and a broader range of services, including enhanced Machine Type Communication (eMTC) and Narrowband IoT (NB-IoT).
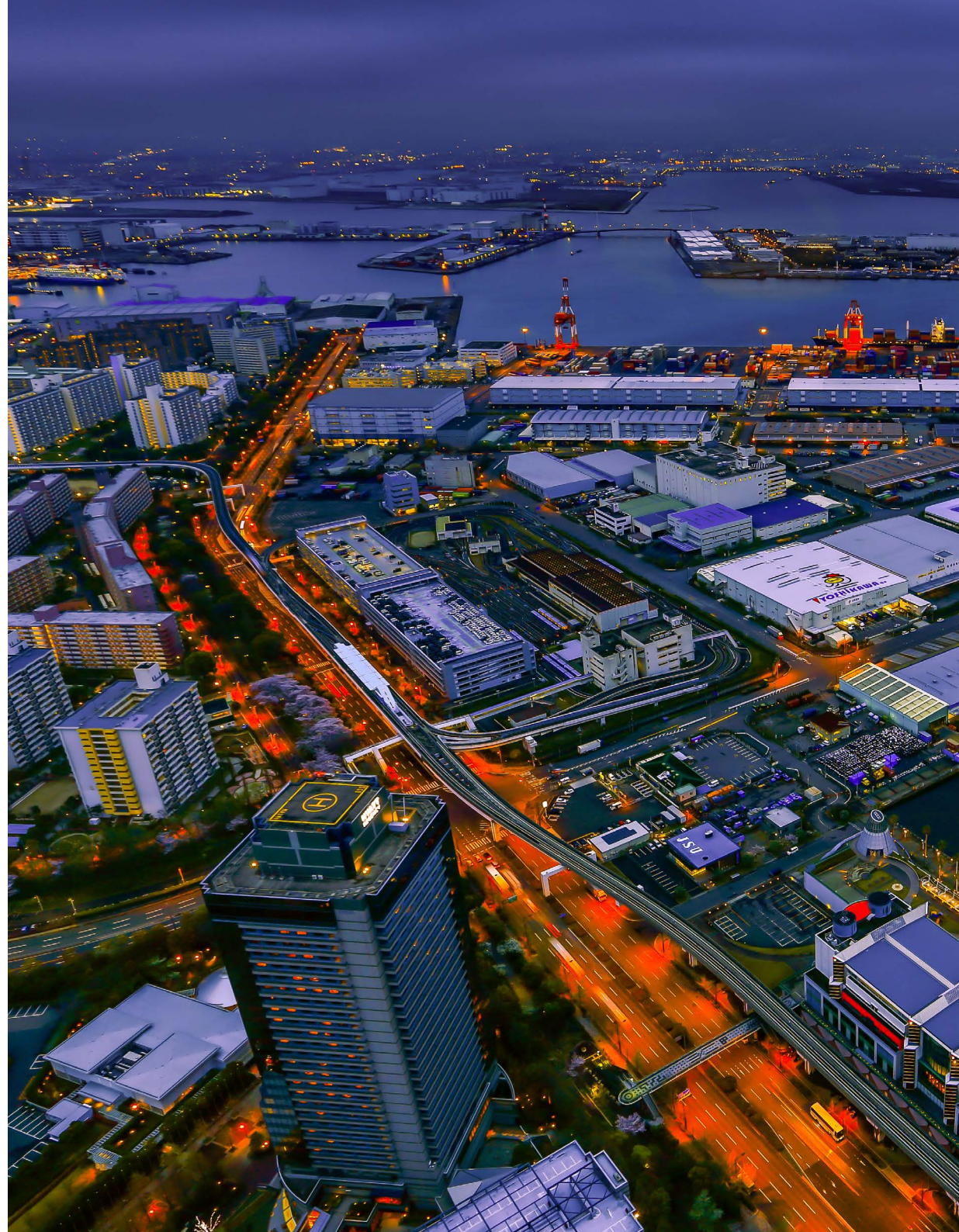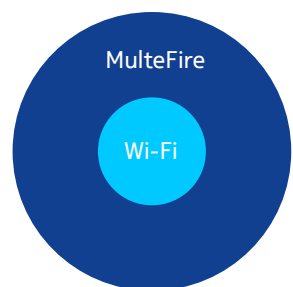
# MulteFire: Using Wi-Fi bands for business-critical connectivity

MulteFire technology meets stringent requirements for coverage, performance, security and mobility. It is an ideal choice for providing wireless connectivity for your business-critical industrial applications, including operational technology (OT).

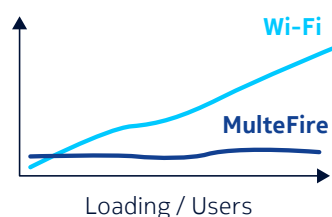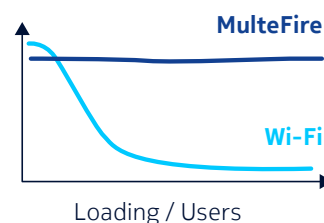## Wide and deep coverage

>2x cell range = >4x coverage area

MulteFire

Wi-Fi

1 extra wall of penetration

MulteFire
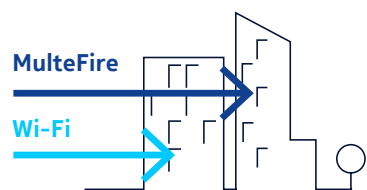
Wi-Fi

Predictable performance*

Stable latency

Wi-Fi

MulteFire

Loading / Users

Stable cell throughput

MulteFire

Wi-Fi

Loading / Users

*Wi-Fi 6 bring some capacity + latency stability improvements

Military grade security

Wi-Fi
WPA2/3
compromised

3 GPP defined security
SIM authentication
E2E encryption

High speed mobility

Wi-Fi
Up to 15 sec latency on fast hand-over

MulteFire
Smooth hand over up to 350kph

Figure 1: MulteFire meets the demands of critical OT use cases
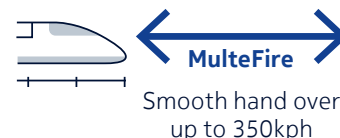
Predictable performance

To succeed with Industry 4.0, you need to connect your assets with wireless networks that can ensure predictable performance. Although MulteFire and Wi-Fi operate in the same frequency bands, only MulteFire meets this need.

MulteFire provides stable latency and multi-user throughput as loads increase and more users, devices and machines are connected to the network. It also maintains this stability during handovers between access points, which is critical for applications that require mobility.

Improved coverage

Industrial sites are complex environments and radio planning can be a big challenge. Limiting the number of access points keeps cost low and delivers the required coverage. Our field tests have shown that MulteFire devices can connect to the network at distances more than 700 m from an access point located behind a window, thanks to smart LTE radio scheduling mechanisms. With Wi-Fi, this range shrinks to about 200 m.

Strong security

MulteFire provides military-grade security with built-in LTE features that are suitable for mission-critical networks, including SIM-based authentication, cyphering and end-to-end encryption. When you deploy MulteFire in a private wireless network, it keeps all your data on-premises and independent of the surrounding network infrastructure. This is important for Industrial Internet of Things (IIoT) applications that require local deployment to reduce end-to-end latency.

Seamless mobility

Wireless mobility is a must when you need to provide reliable connectivity for vehicles, robots and machines. MulteFire helps you meet this need by supporting seamless handovers at speeds up to 350 km/h – unlike Wi-Fi, which was not designed with mobility in mind.

An easy-to-deploy, all-in-one MulteFire access point

The Nokia Flexi Zone MulteFire Outdoor Pico BTS is a compact, all-in-one indoor/outdoor access point that includes baseband and radio and antennas in one box. This high-performance access point runs on LTE band 240. It complies with MulteFire radio specifications and is certified by the MulteFire Alliance (MFA).
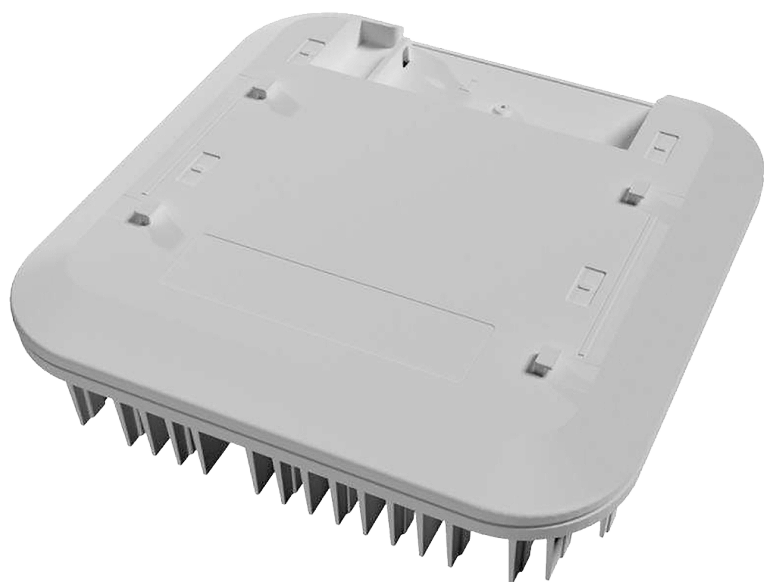
Nokia Flexi Zone MulteFire Outdoor Pico BTS

Our small access points are recognized as the industry's leader by GlobalData and IHS Markit.

Key features and capabilities

- Proven plug-and-play installation
- High performance and capacity in a small form factor
- Deployable indoors or outdoors
- Carrier-grade software based on 3GPP standards
- Dynamic flexible DL/UL ratio depending on demand
- Flexible backhaul, power and sync solutions.

An industrial device that brings private wireless to the masses

The Nokia Industrial MulteFire router 700 is the world's first certified MulteFire device.

This MFA-certified field router receives LTE connectivity from MulteFire access points and acts as a modem to connect industrial assets using USB or Ethernet. Together, the router and access points let you connect a growing range of IoT and digital assets to support a variety of industrial applications.

The router's rugged design and small size give you the flexibility to bring connectivity exactly where you need it. For example, you can embed the MulteFire router 700 in vehicles or robots. You can also use it to enable remote control and mobile connectivity for video cameras and machines.

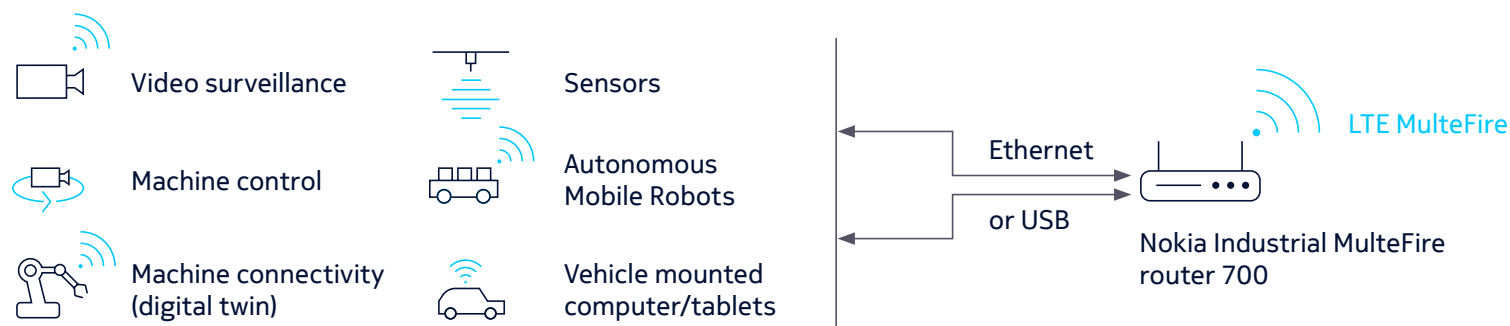**Nokia Industrial MulteFire router 700**

Figure 2: Applications enabled by Nokia MulteFire router 700

Key features and capabilities

- Acts as a MulteFire modem to connect industrial assets via Ethernet and USB
- Ruggedized IP54 device (dustproof and waterproof)
- Web user interface for easy network configuration

A complete, integrated MulteFire 4.9G/LTE private wireless solution

Offered as a service, our solution combines a cloud-based operations and management (O&M) architecture with an on-premises Nokia Digital Automation Cloud (DAC) deployment that includes MulteFire devices and access points, backhaul/transport platforms, an edge cloud server and a customer portal.

Nokia DAC gives you more control over your private wireless network by providing plug-and-play connectivity for all your assets and a powerful management portal that makes it simple to deploy applications and software updates. It ensures data security, confidentiality and reliability with an edge cloud application framework that processes all your data locally, without exposing it to external systems or public clouds.

Our solution's end-to-end O&M framework makes your life simpler with expert-led software, configuration, hardware resource and user management.
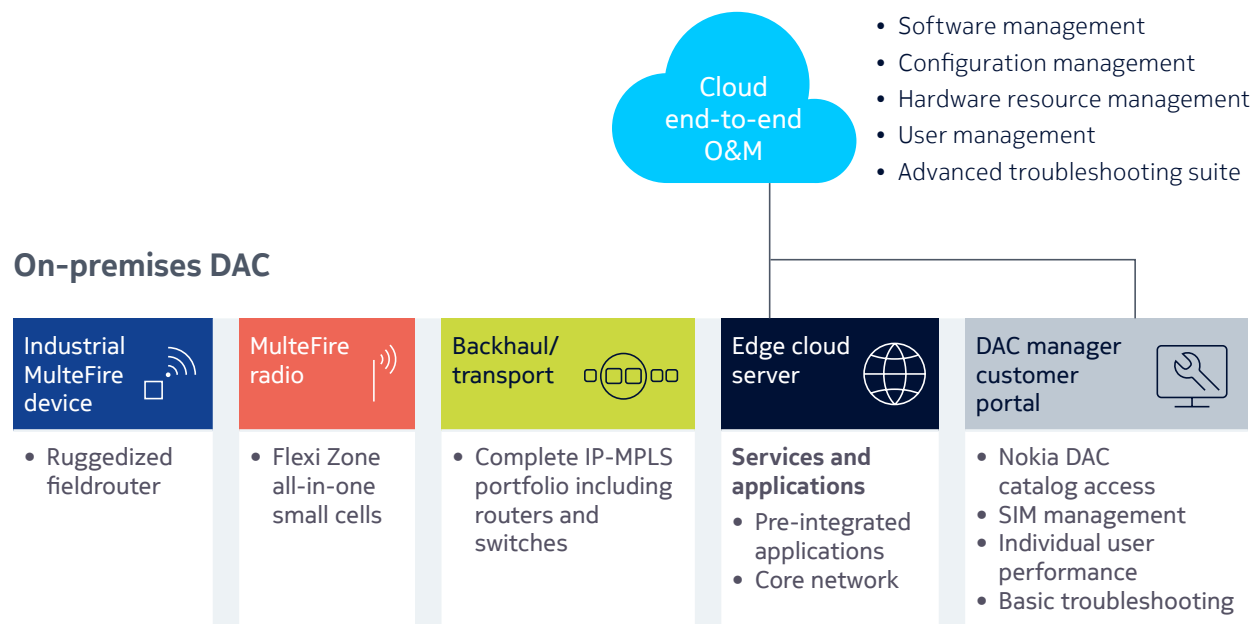
Cloud end-to-end O&M

- Software management
- Configuration management
- Hardware resource management
- User management
- Advanced troubleshooting suite

On-premises DAC

Industrial MulteFire device	MulteFire radio	Backhaul/ transport	Edge cloud server	DAC manager customer portal
• Ruggedized fieldrouter	• Flexi Zone all-in-one small cells	• Complete IP-MPLS portfolio including routers and switches	**Services and applications** • Pre-integrated applications • Core network	• Nokia DAC catalog access • SIM management • Individual user performance • Basic troubleshooting

Figure 3: Nokia MulteFire 4.9G/LTE private wireless solution

Why choose Nokia for MulteFire 4.9G/LTE private wireless?

- Plug-and-play connectivity, devices and applications
- Up to date and scalable solution using private wireless as a service
- Improved application performance with hybrid edge cloud architecture
- Embedded security and confidential data kept on site

Partner with the private wireless leader

Nokia is the undisputed global leader in private wireless networking. Today, more than 380 customers as of November 2021 across multiple industry segments, use our industrial-grade private wireless solutions as the foundation for Industry 4.0 success. These solutions provide the pervasive broadband connectivity they need to accelerate their digital transformation and make their operations more efficient, agile, resilient and sustainable.

Our end-to-end MulteFire solution is a key component of our private wireless offer. It provides everything you need to build a robust, reliable and secure 4.9G/LTE private wireless network. We support the solution with a comprehensive services offer that covers every key stage of your private wireless journey, from planning and design to deployment and maintenance.

Our MulteFire solution draws on dedicated research into industrial automation, edge computing and private wireless networking by Nokia Bell Labs. Its features and capabilities are driven by our work as a founding member of the MFA. We back the solution with a decade of experience that includes achievements such as the launching the first 4G/LTE private wireless solution in 2012, deploying the first standalone private 5G network in 2020, and our ongoing work with NASA to put private wireless on the moon.

Contact us

To find out more about how our MulteFire 4.9G/LTE private wireless solution can provide the connectivity you need to realize your Industry 4.0 ambitions.

NOKIA

About Nokia

We create technology that helps the world act together.

As a trusted partner for critical networks, we are committed to innovation and technology leadership across mobile, fixed and cloud networks. We create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Adhering to the highest standards of integrity and security, we help build the capabilities needed for a more productive, sustainable and inclusive world.