ERICSSON

MINI-LINK 6000

Enabling 5G transport everywhere

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5G requires 5G transport

The transport infrastructure of your network is key in securing the best 5G performance for all those 200+ foreseen use cases which are enabled by 5G.

The radio evolution, introducing new interfaces and deployment architectures, drives the need for increased capacity and connectivity, lower latency, and support for increased traffic volume in 5G transport networks. Time and phase synchronization are crucial for high-performing radio traffic and support of TDD radio networks. Programmability, SDN capabilities and machine learning enable a high degree of automation in the whole network and reduce the overall complexity and thereby operational expenses.

Microwave solutions offer high capacity, low latency, low power consumption, and cost efficient transport and are excellent 5G transport solutions together with fiber deployments. High frequency bands like E-band, carrier aggregation, multi-band booster, and MIMO in the MINI-LINK 6000 portfolio will support the rapidly increasing capacity demand. Ericsson is committed to helping our customer plan and deploy 5G in all scenarios, and with our portfolio of 5G transport solutions you can build for 5G and beyond.

5G spectrum and new radio functionality drives backhaul capacity everywhere

New NR spectrum, better utilization of the available spectrum, and introduction of co-ordination services such as dual connectivity and RAN carrier aggregation increase the bandwidth and coverage leading to a higher demand for capacity in the transport network.

We see a strong continued need for microwave deployments; by 2030, around 50% of all radio site globally , excluding North East Asia, will be connect by microwave [1]. In 2027 E-band will stand for 25% of all new deployments [2]. The MINI-LINK 6000 portfolio is available for ubiquitous 5G transport with E-band and with traditional frequencies in both shorthaul and long haul. MINI-LINK 6000 provides 20 Gbps with E-band, 25 Gbps with Multi-band booster and with 25 GE interfaces transporting 5G in urban, suburban, and rural applications.

Increased need of high-capacity interfaces

The densification of radio sites as well as new radio interfaces drive the need for higher port density and higher capacity in microwave nodes to handle the new connections. The increased radio capacity in 5G along with the coordination functions will require high-capacity interfaces. MINI-LINK 6000 offers multiple 25 GE interfaces in one node.

Low latency required in 5G networks

Low latency is critical for coordination functions over the new radio interfaces in both non-stand-alone and stand-alone 5G deployments as well as for certain 5G use cases, such as critical IoT.

Microwave propagation has a very low latency, lower than fiber, making MINI-LINK 6000 a perfect fit for 5G transport.

Sync support in transport is key for TDD networks

Synchronization support in mobile backhaul is crucial for enabling TDD-based 5G radio networks and to guarantee radio performance. MINI-LINK 6000 can distribute frequency, phase, and time sync efficiently as part of the overall sync solutions for enhanced radio coordination and 5G use cases.

Network slicing and automated operations

The demand for guaranteeing service quality to all the various traffic types will increase. The shift from dominant mobile broadband to multiple services supported by network slicing drives the need to manage different QoS requirements and to do this dynamically. Intelligent, automated coordination between RAN, transport, and mobile core networks is central to any robust, sustainable 5G solution. MINI-LINK 6000 offers hierarchical QoS mechanisms and open SDN interfaces supporting both network slicing and a higher degree of automation.

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1 Ericsson Microwave Outlook 2023

2 Ericsson Microwave Outlook 2022

Key benefits with MINI-LINK 6000

Superior system gain enables longer hops, higher capacities, and smaller antennas

MINI-LINK has a market-leading system gain, up to 8 dB higher compared to other vendors. The higher system gain makes it possible to use higher modulations thus enabling increased capacity with the same link availability and antenna size. The additional capacity can be used to mitigate network bottlenecks, handle additional subscribers in the air interface, or add new RBS sites without affecting the existing microwave link. The superior system gain can also be used for longer hops. Alternatively, smaller antennas with maintained capacity can be used to reduce tower rental costs or to use the saved space to set up additional links.

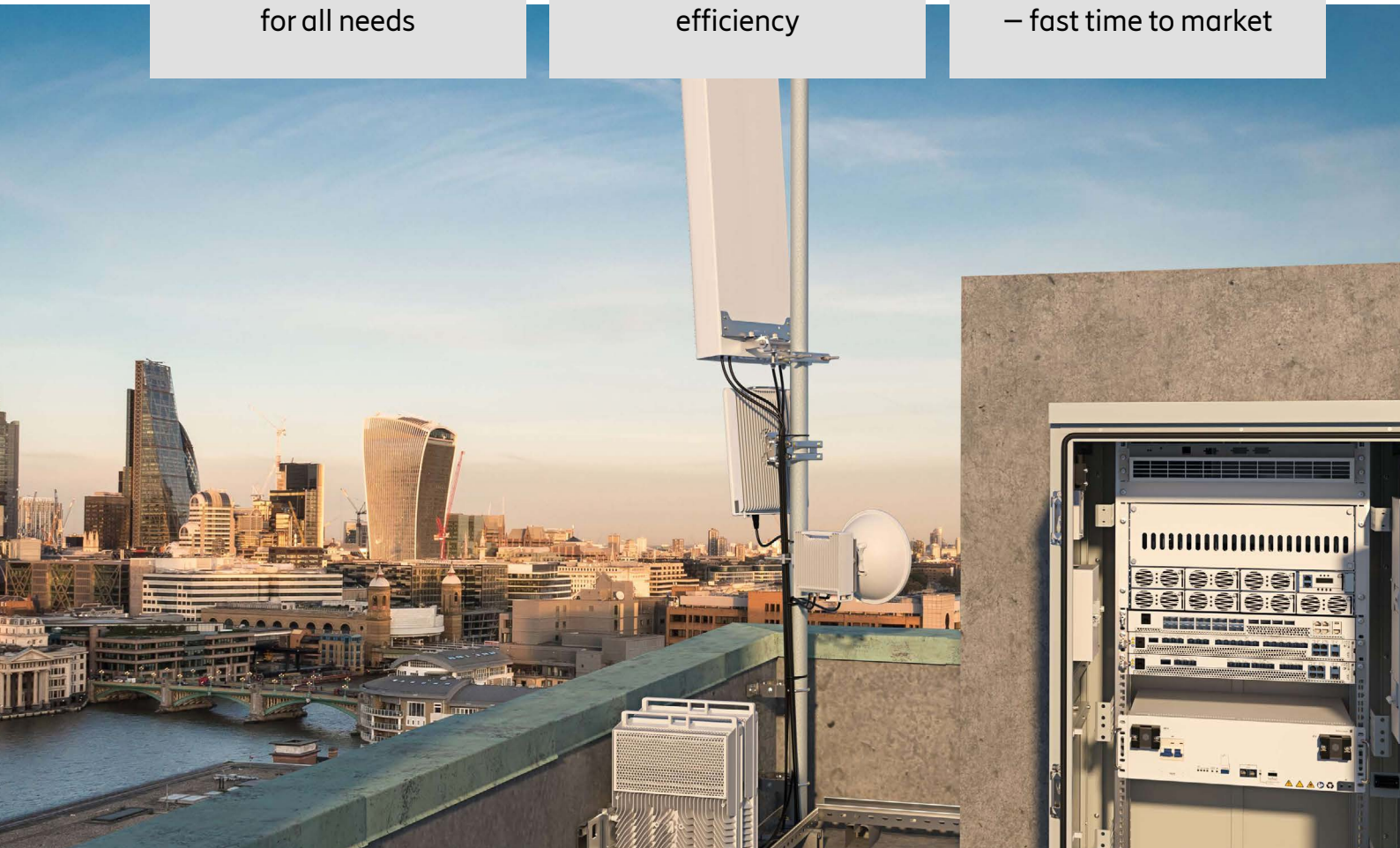
Superior power efficiency enables considerable cost reductions

MINI-LINK has the best power efficiency in the microwave market today (40% lower power consumption than the industry average). Such power efficiency translates into considerable cost reductions to our customers and a substantially reduced OPEX. Additional power savings can be achieved with software features like Traffic- aware power save (TAPS) and Radio deep sleep. With TAPS, MINI-LINK automatically adapts the output power to fit the required capacity, saving on power when high capacity isn't required. Savings can reach up to 30% of the radio power consumption. Radio deep sleep allows one or several radios in a multi-carrier hop to be shut down, during a certain time window, when the radio isn't needed to cover the required capacity. For a 4+0 hop this could save up to 25% of the radio power consumption. TAPS and Radio deep sleep can also be combined for maximum savings.

Extensive portfolio for all needs

Superior power efficiency

Ease of deployment – fast time to market



MINI-LINK 6000

MINI-LINK 6000 enabling ubiquitous 5G transport

With unmatched flexibility, MINI-LINK 6000 provides the right solution for each part of the network, all deployment scenarios and site types, enabling sound investments in line with the service providers' needs. The portfolio offers both split mount and all outdoor shorthaul as well as long haul solutions covering the complete microwave spectrum from 5 up to 80 GHz. MINI-LINK 6000 offers advanced packet functionality including advanced sync and L3 VPN, using IP/MPLS, as well as L2. All network scenarios are supported with superior performance combined with the lowest possible cost of ownership.

Split mount shorthaul

With best-in-class radio link units, split mount shorthaul provides high capacity in all frequencies with superior system gain and power efficiency.

The MINI-LINK 6600 family provides the highest node capacity in the smallest form factor with fixed and semi-modular nodes. MINI-LINK 6600 supports multiple radio links with a capacity of up to 5 Gbps in traditional frequencies and 20 Gbps with E-band. Using high modulation schemes, 8k QAM, XPIC, carrier aggregation, MIMO, Multi-band booster, wide channels like 224/2000 MHz, low latency, and multiple 25 GE interfaces ensures deployment flexibility and future-readiness.

World's smallest high power radios

MINI-LINK 6363
- Single carrier radio - 1T1R
- Capacity up to 1.2 Gbps
- 1k QAM
- 80 GHz

MINI-LINK 6364
- Dual carrier radio - 1T1R with Carrier aggregation
- Capacity up to 2.4 Gbps
- Sub-band free
- 8k QAM
- 13, 15 & 18 GHz

MINI-LINK 6365
- Dual carrier radio - 1T1R with Carrier aggregation
- Capacity up to 2.5 Gbps
- 8k QAM
- 6-42 GHz

MINI-LINK 6321
- Quad carrier radio - 2T2R with Carrier aggregation
- Capacity up to 5 Gbps
- 4k QAM
- 6-42 GHz platform

Fixed and semi modular nodes

MINI-LINK 6651/4
Compact 10 Gbps multi-band booster node
- 2 carriers
- Up to 44 Gbps switch capacity
- 1 GE and 10 GE interfaces

MINI-LINK 6651
Compact end-node
- 1 or 2 carriers
- 14.5 Gbps switch capacity
- 1 GE and 2.5 GE interfaces

MINI-LINK 6654
Small aggregation node
- Up to 6 radio links and 6 directions
- 44 Gbps switch capacity
- 1 GE and 10 GE interfaces

MINI-LINK 6655
Medium aggregation node
- 10 radio links in 8 directions
- 44 Gbps switch capacity
- 1 GE and 10 GE interfaces

Modular nodes using plug-in cards

MINI-LINK 6691
Small aggregation node
- Up to 4 radio links in 4 directions
- Up to 90 Gbps switch capacity
- 1 GE, 10 GE and 25 GE interfaces

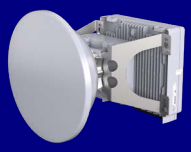
MINI-LINK 6693
Medium aggregation node
- Up to 8 radio links in 7 directions
- Up to 90 Gbps switch capacity
- 1 GE, 10 GE and 25 GE interfaces

MINI-LINK 6694
Medium aggregation node
- Up to 8 radio links in 8 directions
- 90 Gbps switch capacity
- 1 GE, 10 GE and 25 GE interfaces
- NPU Protection

MINI-LINK 6692
Large aggregation node
- Up to 16 radio links in 15 directions
- 176 Gbps switch capacity
- 1 GE, 10 GE and 25G E interfaces
- NPU Protection

All outdoor shorthaul

MINI-LINK all outdoor products offer Gbps capacities using traditional frequencies (6–42 GHz), and up to 20 Gbps capacities with E-band 70/80 GHz.
As the name indicates, they provide a compact all-outdoor solution for sites where indoor space is limited.



MINI-LINK 6366
Flexible outdoor solution for integrated or separate mount
- 2.5 Gbps over 2 carriers
- 6-80 GHz
- 9.5 Gbps switch capacity,
- 1 GE and 2.5 GE interfaces
- XPIC and Multi-band booster

MINI-LINK 6371
All outdoor solution for 5G capacities
- 2.5 Gbps over 2 carriers,
- up to 5 Gbps over 4 carriers
- 10 Gbps with Multi-band booster
- 6-80 GHz
- 8k QAM
- 35 Gbps switch capacity,
- 1 GE and 10 GE interfaces
- XPIC, Carrier Aggregation and Multi-band booster, prepared for MIMO

MINI-LINK 6352
High capacity E-band radio
- Single carrier radio - 1T1R
- Up to 10 Gbps capacity
- XPIC enabling up to 20 Gbps
- 21 dBm output power
- 3x10/1 GE interfaces
- hRLB extension with MINI-LINK 6600 as Master
- Multi-vendor bonding with legacy equipment

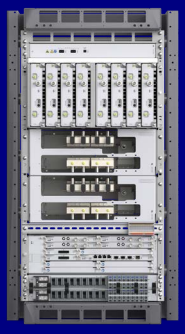
MINI-LINK 6355/56
High power & high capacity E-band radio
- Single carrier radio - 1T1R
- Up to 10 Gbps capacity
- With RLB up to 20 Gbps
- 24 /26 dBm output power
- 3x25/10/1 GE interfaces
- Up to 25 Gbps Multi-band Booster with hRLB
- Layer 1 multi-vendor bonding with legacy equipment
- Built-in power feeding to Sway Compensation Antennas

Long haul

The product family provides market-leading capacities, up to 10 Gbps over 35 km/22 miles with 4096 QAM. Sucessfull deployment of links over more than 150 km/90 miles with 2-4 Gbps. Support is provided for L2 and L3, hRLB, five 10 GE interfaces, low latency, as well as phase and time sync. The product family contains large rack-mounted units for high capacities, compact and super compact units, as well as split mount implementations.

MINI-LINK 6291
Split implementation
- 2-16 channels
- 90 Gbps switch capacity
- Up to 10 Gbps link capacity
- Carrier aggregation, Multi-band booster and hRLB support

MINI-LINK 6251
Super compact
- 2-8 channels
- Up to 90 Gbps switch capacity
- Up to 4 Gbps link capacity
- Carrier aggregation, Multi-band booster and hRLB support



MINI-LINK 6252
Compact
- 2-16 channels
- 90 Gbps switch capacity
- Up to 10 Gbps link capacity
- Carrier aggregation, Multi-band booster and hRLB support

MINI-LINK 6262
Rack mounted
- 2-16 channels
- 90 Gbps switch capacity
- Up to 10 Gbps link capacity
- Carrier aggregation, Multi-band booster and hRLB support

Antennas and accessories

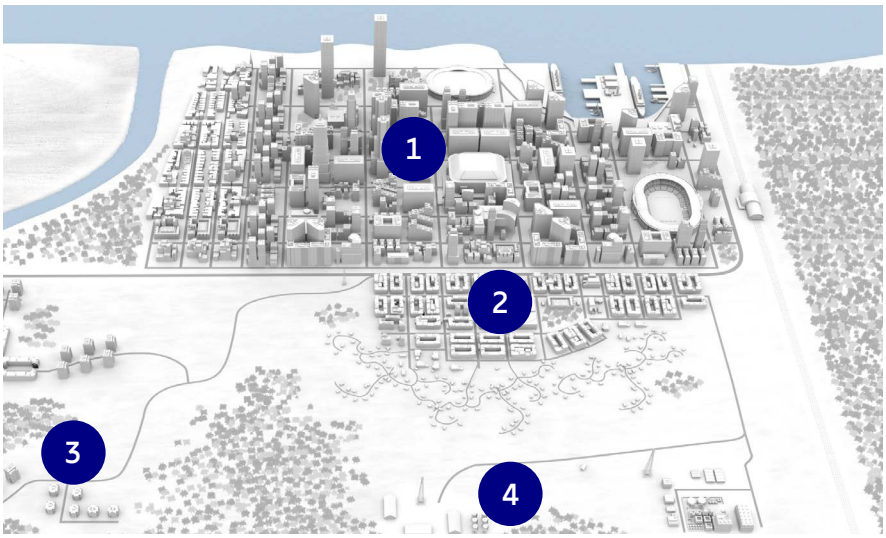
A wide range of antennas and accessories are available to support our different microwave solutions. The antennas size from 0.1 m/5 in up to 3.7 m/12 ft and support different frequencies from 5 GHz up to 80 GHz. Multi-band antennas are available facilitating fast and cost-efficient rollout of multi-band booster deployments over one antenna, while reducing tower rental costs.
Sway Compensation Antennas are also available for handling tower movements due to sunflower effect or wind impact, as well as enabling larger antennas and longer hops.

Evolve your network for 5G and beyond

1. Boost transport in dense urban areas

Use E-band or Multi-band to boost Microwave capacity for macro or street macros

Use E-band as wireless Fronthaul for eCPRI as a complement to fiber in C-RAN deployments.



2. Boost urban and suburban backhaul capacities

Extend E-band reach with higher output power, Multi-band and Sway Compensation Antennas.

E-band or Multi-band to FWA if fiber is not available

3. Evolve rural coverage and capacity

Increase capacity with 224 MHz channels, XPIC, Carrier aggregation and multi-carrier solutions

Increase microwave capacity with Multi-band to boost performance

4. Build for coverage and redundancy

Extend rural coverage with long haul solutions and use long haul for redundancy to fiber

MINI-LINK 6000 supports network evolution and expansion in a cost-efficient way. Flexibility is key when addressing backhaul challenges. Site-specific requirements, such as time-to-market considerations and the quality of available backhaul assets, will determine the best solution.

Supporting capacity evolution

As the 5G expansion continues, we can also see that microwave technology is keeping pace with needs. The increased use of the high-capacity E-band frequency and wider channels such as 224 MHz in traditional microwave bands shows that the microwave transport technology meets the current and future capacity needs of radio sites.

Carrier aggregation is used to increase capacity and coverage. With carrier aggregation, two separate channels can be supported by a single radio. This makes it possible to use the full capacity of adjacent and non-adjacent channels with one radio. This can be very useful when the spectrum is scattered and it is hard to get licenses for wide channels. The use of a single radio for two channels will reduce the tower footprint and the power consumption. It also allows for a scalable expansion of the network. Ericsson's quad carrier radio, a single box with 2 transceivers capable of carrier aggregation, handles 4 carriers, enabling maximum capacity with minimum foot print in traditional frequencies.

Line-of-sight MIMO can also dramatically increase the efficiency in utilizing the available spectrum.

Multi-band booster is a flexible way of catering for the 5G transport requirements. It combines the best characteristics of different frequency bands to boost capacities, unleashing the use of higher frequencies over longer distances and much wider geographical areas. Multi-band booster uses a low-band radio to provide a high-availability connection and combines it with a higher band, be it E-band or a traditional band, that provides a significant increase in capacity, but with a slightly lower availability. Priority traffic handling is applied. Ericsson's unique hierarchical Radio Link Bonding (hRLB) enables 25 Gbps Multi-band booster solutions with 99% traffic handling efficiency. These solutions are essential in supporting performance needs and will further increase the use of higher frequencies. A MINI-LINK node can handle up to 4x 10 Gbps Multi-bands links and with 25 GE interfaces it is all set for 5G and beyond. All Ericsson's E-band radios, MINI-LINK 6352, 6355 and 6356, are also capable of multi-vendor bonding with a 3PP traditional radio.

Flexible and modular solutions for any deployment scenario
The flexibility that can be achieved in the network thanks to software upgrades along with node and hop compatibility makes it possible to invest when and where necessary. This prevents the over-dimensioning of the network, which would translate into excessive costs.

The larger MINI-LINK nodes use plugin units, which make it easy to customize configurations and make future upgrades. By reusing existing MINI-LINK equipment, filling up empty slots, and just adding a new modem and radio, the savings can be up to 40%.

Advanced packet handling
MINI-LINK 6000 has integrated Ethernet Switching functionality and supports L3 VPN using IP/MPLS, thus reducing the cost and complexity by not needing external equipment. Hierarchical QoS enables the sharing of networks between several operators with multiple technologies as well as network slicing.

Industry-leading performance with Ericsson Radio System

Our portfolio of transport solutions is part of the Ericsson Radio System, ensuring a smooth evolution path with complete site solutions, shared air flow designs and maintenance features that ultimately reduce OPEX. Ericsson Radio System is designed to fit all site types and traffic scenarios, even as networks grow in scale and complexity, from 2G, 3G, 4G, and 5G, delivering industry-leading performance on the smallest site footprint with the lowest energy consumption.

Superior performance with common management from radio to core

Ericsson Network Manager (ENM) supports efficient 5G roll-out with end-to-end management of all network technologies from radio to core via a single platform, covering monitoring, provisioning, software management, and deployment.

The Ericsson Transport Automation Controller complements ENM by providing real-time transport network observability using AI and advanced automation. By utilizing frequent data collection on microwave link performance, it delivers capabilities such as AI/ML-driven analytics for microwave interference and signal fade detection, precise fault analytics, energy efficiency through radio deep-sleep, and service provisioning that is fast, error-free, and automated. These features boost network performance, making troubleshooting faster while expediting service delivery and reducing cost.

Together, ENM and the Transport Automation Controller offer a cohesive approach to network management, helping operators run their microwave network proactively and optimize reliability as connectivity demands grow.

MINI-LINK – the market leader

The market leader in microwave transmission

MINI-LINK is the market leader in microwave transmission, with 880 customers in 180 countries. MINI-LINK is in use in all the world's climate zones.

Ericsson has delivered over 5 million microwave radio units since the late 1970's.

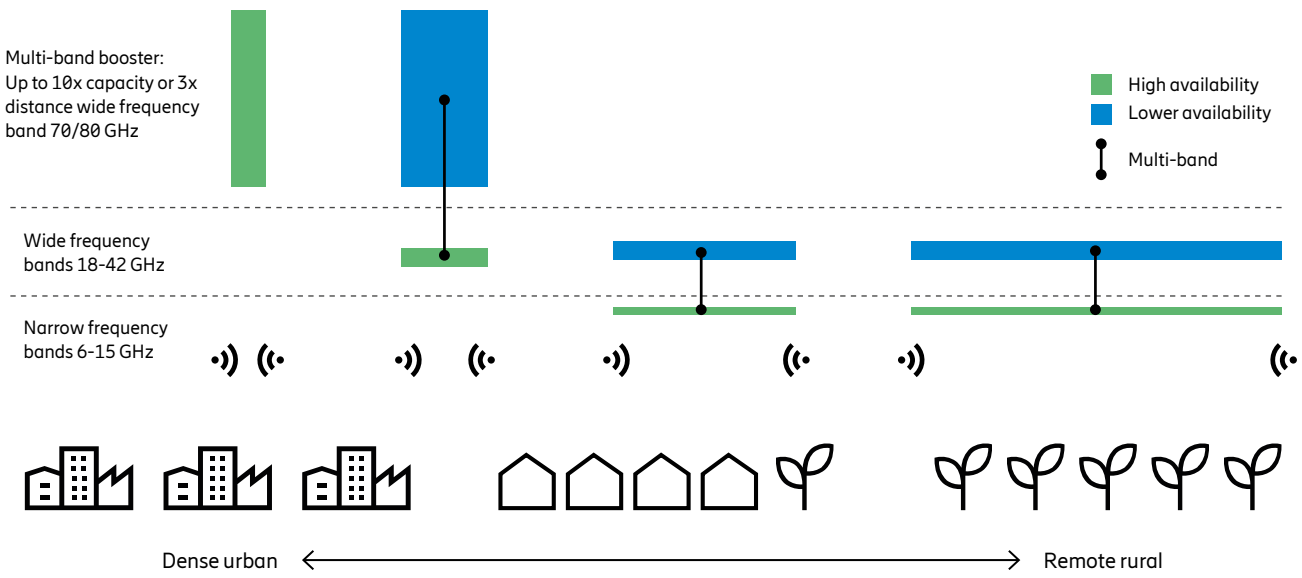
Mobile broadband over long distances with 4.1 Gbps over 128 km

A microwave hop of 4.1 Gbps over 128 kilometers is today successfully enabling Mobile Broadband on the distant Batanes islands in the northern Philippines.

E-band microwave produces fiber-like results with 100 Gbps over 1.5 km

Ericsson Reserach, together with Deutsche Telecom, has demonstrated fiber-like results for microwave in the E-band with achieving more than 100 Gbps over a 1.5-kilometer hop.

Multi-band booster: Up to 10x capacity or 3x distance



Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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