



# The evolution of 5G radio sites



# Introduction

At Ericsson we create end-to-end solutions for the construction of 5G radio sites that are both future-proof and cost-effective: sites serving as the cornerstones of mobile networks that will operate profitably. By developing our site solutions alongside the other building blocks included in the Ericsson Radio System (ERS), we can offer an exceptional solution in the shortest possible installation time. This not only helps service providers maintain cutting-edge infrastructure that meets today's networking needs, but it also accounts for potential future expansion and growth.

## The market demand for flexibility, capacity and control

Three new generations of wireless technology have been introduced in little more than a decade. Subscribers' hunger for mobile broadband is as insatiable as ever, and the stream of fresh, increasingly complex mobile use cases and applications entering the market seems never-ending. Connected cars, mission-critical connectivity, and new virtual or augmented reality sport and gaming applications are among the latest on offer.

Total global mobile data traffic continues to increase. It is now expected to reach 131 exabytes (EB) per month by the end of

2024. We estimate that by then, the 5G subscription figure will have hit the 1.9 billion mark, and 35 percent of mobile traffic will be carried by 5G networks. We also foresee that up to 65 percent of the global population could be covered by 5G at that same point – which would make it the fastest generation of mobile technology ever to be rolled out on a global scale.

This phenomenal growth is placing significant new demands on service providers and networks alike. It is creating a pressing need for additional capacity and functionality, as well as increasingly complex radio sites

– especially for 5G. This in turn has prompted a call for the expansion of traditional tower and rooftop sites, as well as for the establishment of new smaller-cell sites at street level. A clear picture of the capabilities, capacity and performance of sites at any given time will be required to ensure their efficient operation and management. A fast, effective response to overloads, faults and failures will also be necessary to maintain service performance with minimal "manual" effort.





## What is the solution?

### General

Our future-proof approach to 5G site construction at Ericsson translates directly into considerable capex savings for the service provider. While their existing network investments can be reused, Ericsson's commitment to telecom-grade reliability reduces opex for them at the same time. The most robust products are carefully selected to ensure years of effective operation. Furthermore, our products and solutions can be customized to overcome the most complex installation challenge.

As a solid foundation for the Ericsson Radio System, the ERSS makes seamless and easy network evolution a reality from the ground up. It contains everything needed to effectively design, deploy, install, and manage a radio site.

With all Ericsson Radio Site System (ERSS) products, the service provider is assured:

- fast time to market through the rapid installation and integration of our verified solutions
- ERS design, which ensures the effective interworking of all components, limiting the need for testing, and minimizing time to revenue
- reliability and years of high performance
- connectivity, enabling remote management of active site components such as power systems to enhance reliability and safety, but also to minimize truck rolls and reduce maintenance costs

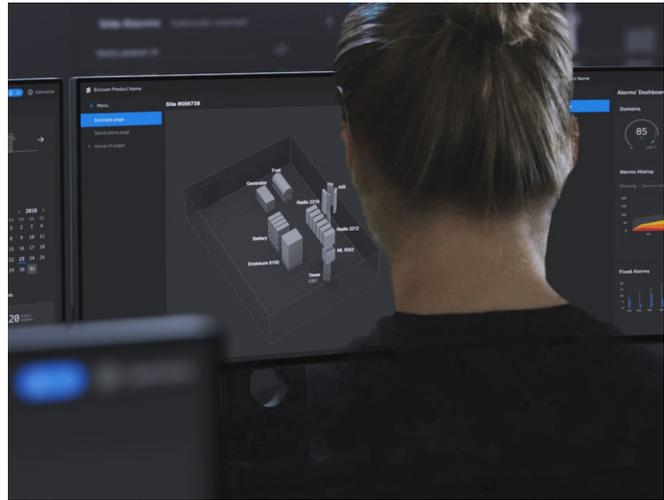
## Smart connected sites: providing full control

The Ericsson Smart Connected Site is the unified way to integrate active and passive ERSS products intelligently. Digitalization delivers the full benefits of artificial intelligence (AI) and automation, enabling highly efficient network management through one single operation and maintenance (O&M) tool: the Ericsson Network Manager (ENM).

This tool gives the service provider a broad overview, real-time insights into, and unprecedented control of their network, ensuring its stability, security and effectiveness.

Among the service provider's most critical assets, the 5G site requires the same level of protection as other O&M data streams

to prevent intrusion and illegal hacking. Security can be further enhanced through the integration of wireless locking systems, digital CCTV cameras, and other surveillance systems.



## Antenna systems: for high-performance radio networks

Ericsson's antenna systems are among the most crucial parts of any radio access network. The performance of the various components of the system ultimately determines the effectiveness of the radio site, and a poor-quality antenna system

can severely reduce the performance of the radio network. With multiple frequencies and technologies now co-existing on the modern radio site, there is a high demand for effective antenna system solutions given their complexity today.

As an integral part of the ERS, the Ericsson Antenna System includes a full range of high-quality, high-performance products including: passive antennas, active antennas, filters and combiners, tower-mounted amplifiers, feeder systems, and accessories.

### Passive antennas

Our portfolio includes:

- indoor and outdoor antennas with up to 24 ports
- hybrid passive/active antenna integration solutions
- new platform architecture (378mm, 448mm and 488mm)
- the first global antenna in an ultra-compact platform: 2G to 5G, from 698-3800MHz
- a unique vortex generator, reducing wind load by up to 60 percent
- weight reduction of up to 30 percent

### Active antennas

The items in our portfolio offer the following benefits:

- smallest footprint
- minimal feeder loss
- energy efficiency

Ericsson's Massive MIMO with advanced beamforming solution:

- is based on many individual antenna elements
- boosts network capacity



## Integrated site solutions: for easy expansion and installation

Current telecom infrastructure needs ramping up to address the predicted growth in global mobile data traffic. This is creating a need for increased mobile network densification, as well as the tighter integration of products on traditional macro sites and small cells. Service providers need more site options, presenting a significant site acquisition challenge. With macro site installation already close to the limit, gaining approval for a new site is a nine- to 22-month process. Meanwhile, the requirements for camouflage and multi-application sites are becoming increasingly stringent

At Ericsson we have addressed these challenges by producing integrated site solutions that cover a variety of expansion and installation options such as: RAN macro sectors, strand mounts, lightpole sites, zero sites,

street furniture sites, and vault sites. These facilitate site acquisition and reduce site rental costs by enabling service providers to share site space, use existing infrastructure, or fit more radio capacity into their existing footprint.

Ericsson Integrated Site Solutions comprise a combination of cost-efficient, high-performance ERS products. The service provider benefits from fast time to market, easy installation, and a higher level of product and infrastructure integration. With our complete overview of each solution and in-depth ERS product knowledge – including thermal behavior, radio frequency and antenna patterns along with material needs, camouflage and compact integration – we can ensure exceptional performance and a very high level of integration.



## Installation and distribution system: offering speed and flexibility

Our installation and distribution system product portfolio is divided into the following categories:

- Optical plug-ins (small form-factor pluggables or SFPs)
- Cables and connectors
- Mounting
- Grounding, surge and overvoltage protection
- Generic installation material

The product range enables a complete ERS installation for any site type – whether on a tower, mast, rooftop, in the street or indoors. All products are designed for speedy deployment, have been verified and tested with the related nodes, and are cost-effective and easy to install.

The radio distribution products have been complemented with multi-fiber power cables, for example, enabling quicker installation and limiting opex.

Most of the products that have been used for 4G installations can also be used for 5G.



## Network Synchronization: for access, transport and core networks

The objective of Network Synchronization is to ensure the distribution of common reference timing signals of the required quality to the network elements. This will help to control their operations and meet the relevant requirements.

LTE and 5G networks and services have generated new requirements for the delivery of accurate **phase synchronization** among adjacent base stations so they can share radio resources in a coordinated manner.

Base stations should also provide a **time synchronization** reference (also known as time of day) to make them aware of what the actual time is and thus capable of correlating events.

We have a complete network synchronization solution – including hardware and software – for access, transport and core networks. Our products provide support for all the relevant synchronization options: for example, Global Navigation Satellite System (GNSS), Synchronous Ethernet (SyncE), Network Time Protocol (NTP), and Precision Time Protocol (PTP).

In the access network, our solution is based on the use of the Baseband or Router R6000 as grandmaster with our GNSS solution as synchronization input.

The Ericsson Global Navigation Satellite System (GNSS) has several benefits:

- It can use most of the existing satellite systems and constellations.
- It is integrated into the Ericsson Management System.
- It is integrated into Ericsson RAN.
- It is a robust end-to-end solution.
- A simple product, it is easy to install.

## Enclosure system: purpose-built for optimal performance

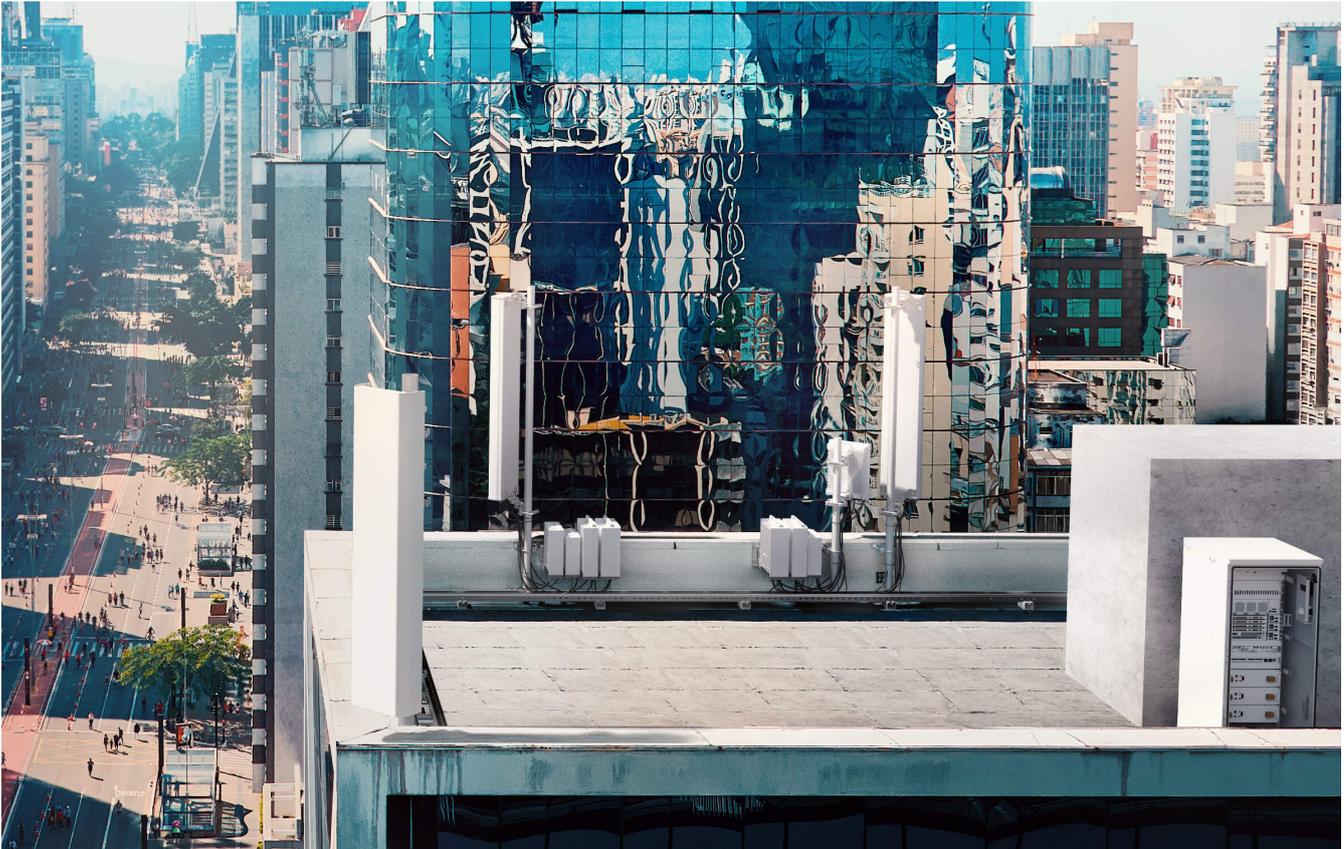
The Ericsson Enclosure and Power portfolio has been streamlined for 5G applications, offering features and functionalities that meet every service provider's needs during the construction of a radio site. The portfolio includes cabinets, racks, batteries and power systems for indoor and outdoor use, both for ground mounting and for pole and rail zero-footprint installations.

These vendor-agnostic solutions are designed for use with any type of 19-inch telecom rack but are tailor-made for our 5G products.

The ERS Enclosure offers the combined benefits of purpose-built design, cost-effectiveness and connectivity, which makes it the most TCO-friendly solution on the market. With all products streamlined and

specifically designed, the ERS Enclosure ensures optimal RAN performance.

While ERS Enclosures are integrated by default with ENM, they enable the introduction of many valuable features that will help lower opex for service providers. These include the provision of in-depth information relating to battery status, alarms, performance data and remote configuration of the system.



## Reliable power

The Ericsson Power System includes a wide range of solutions for efficient and scalable power distribution and energy storage for 5G expansion. These range from products attached to the radio itself, to products that are rail- or pole-mounted, to cabinet-based power systems run on electricity from the grid, or hybrid and solar energy.

The flexible energy-storage alternatives – including lead acid, lithium and sodium batteries – address every type of power grid available. Ericsson's Lithium energy storage solution is designed for high 5G network availability, including mission critical machine-type communication (MTC) applications. The energy storage solutions offer default connectivity for safety purposes and cost-efficient remote supervision.

The Ericsson Power System is remotely connected to ENM to minimize truck rolls and reduce maintenance costs. Battery performance is monitored through the network to calculate lifetime.

The combination of high-efficiency rectifiers, cost-effectiveness and remote connectivity means that the Ericsson Power System provides service providers with the most TCO-friendly solution on the market. Products are streamlined and specifically designed for powering 5G higher-order MIMO and advanced antenna technology.



# Ericsson Radio Site System portfolio

The Ericsson Radio Site System portfolio includes antenna systems, the enclosure system, power, integrated site solutions, the installation and distribution system, a variety of tools and site management.

## Enclosure and power system



Indoor and outdoor / pole and mast

## Antenna systems



Multiband / street – complete antenna system

## Integrated site solutions



Lightpole sites



Strand mounts



RAN macro sector



Vault sites

## Site management



ESC 02



ESC 03



SW



Sensors

## Installation and distribution system



Rails



SFP



Bracket



Multi cable

## Network synchronization



GNSS



Time servers

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency, and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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