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# Reliable connectivity: A foundation for multisite oil and gas operations

How private 5G networks enable safe, autonomous, and compliant operations across dispersed oil and gas facilities

# Contents



# Introduction

As oil and gas companies integrate more data-driven capabilities across their operations, the demand for reliable, scalable connectivity has never been greater. With operations spanning offshore platforms, pipelines, refineries, and remote sites, network requirements are becoming increasingly complex—while requiring mission-critical reliability.

Unlike other industries, oil and gas facilities cannot pause production to deploy or upgrade infrastructure. A single day of lost production can cost hundreds of thousands of dollars, making wireless solutions essential. Connectivity must be deployed with minimal disruption while meeting strict requirements for availability, redundancy, and performance. Equipment must also comply with intrinsically safe and hazardous-area certifications, adding further complexity to network design and deployment.

To remain competitive in today's rapidly evolving energy landscape—shaped by efficiency pressures, sustainability goals, and workforce challenges—operators need connectivity that is not only reliable but also consistent, adaptable, and scalable. Delivering seamless network performance across geographically dispersed assets is essential to maintaining operational efficiency, enhancing worker safety, and supporting long-term strategic initiatives.

As digital transformation accelerates, oil and gas companies are implementing advanced monitoring systems, connecting field personnel, and deploying smart tools that rely on uniform network performance across multiple sites. Rolling out these technologies at scale requires more than just high-speed bandwidth—it calls for reliability and repeatability.

Conventional connectivity solutions such as Wi-Fi often struggle to meet the coverage, mobility, and environmental demands of oil and gas operations. Steel platforms and dense machinery create deep multipath interference and dead zones that leave critical sensors and control rooms without reliable coverage. Private 5G networks provide the speed, security, and flexibility required for advanced applications—ranging from predictive maintenance and real-time asset monitoring to AI-powered analytics and AR-enabled field operations. By aligning and consolidating IT (information technology) and OT (operational technology) under a single, scalable network, companies can enhance efficiency, improve safety, and strengthen their competitive advantage.

For enterprises with operations spread across multiple, sometimes remote sites, private 5G networks with multisite support offer a robust foundation for consistent, dependable connectivity. Engineered for demanding and diverse environments, they deliver the performance, security, and flexibility needed to support the full spectrum of oil and gas operations. The key is assessing each location's unique requirements and crafting a network design tailored to meet them.

# Multisite oil and gas environments: One challenge, many configurations

In oil and gas, operations span extraordinarily diverse environments. A multisite environment can take many shapes—from a vast offshore production hub with multiple platforms and vessels to an integrated global network of refineries, pipelines, storage terminals, and remote field sites. This complexity means there's no one-size-fits-all approach to connectivity. Some operators require wide-area, always-on coverage across large facilities; others need highly targeted deployments that bring advanced connectivity directly to critical assets in the field.

Adding to the challenge, not all operations share the same level of digital maturity. Legacy IT systems, siloed OT networks, and aging infrastructure can create roadblocks when introducing new processes, analytics tools, and automation technologies. In a sector where downtime is costly and safety is paramount, mobility and flexibility are no longer "nice-to-have"—they're mission-critical. Traditional wired or Wi-Fi networks often can't meet these demands at the necessary scale or reliability.

Regardless of site configuration, oil and gas operators face a common set of connectivity challenges:

### Fragmented operations and lack of standardization:
Different network solutions across sites make centralized management and scaling difficult, driving up costs and complexity.

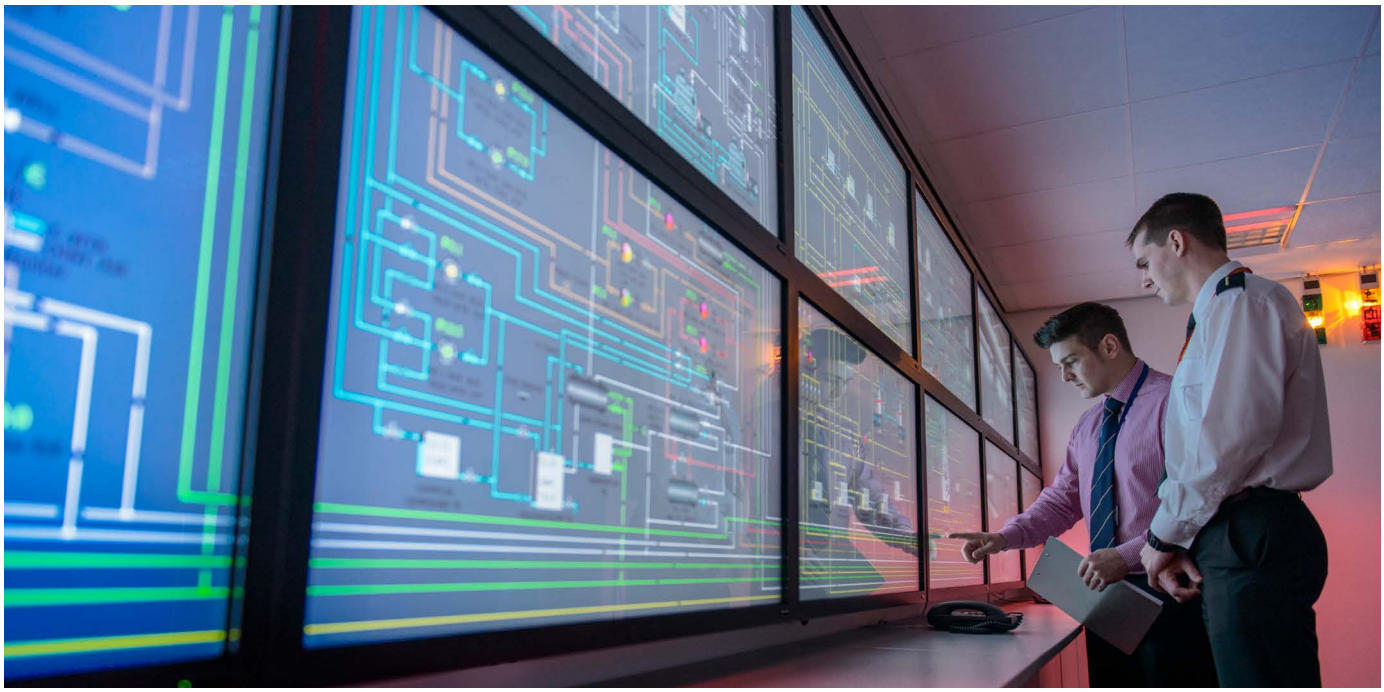
### High latency and inconsistent real-time data access:
Applications such as remote operations, predictive maintenance, and environmental monitoring require ultra-reliable, low-latency connectivity.

### Increased security risks:
Disconnected systems can lead to inconsistent security enforcement and higher exposure to cyber threats.

### Complex and costly network management:
Operating separate IT and OT networks across multiple sites adds overhead and slows response times.

### Limited scalability:
As companies expand exploration zones or add new sites, outdated network infrastructure struggles to keep pace.

### Reduced innovation and competitive disadvantage:
Poor connectivity slows the adoption of next-generation capabilities such as AI-driven asset optimization, AR-assisted field operations, and autonomous inspection systems.



# Why oil and gas operators need a unified approach to IT and OT

As the energy sector pushes toward fully connected operations, the convergence of IT and OT is no longer optional—it's foundational to safe, efficient, and scalable operations. This challenge is especially acute in complex, multisite environments that span offshore platforms, onshore facilities, pipelines, and remote assets. When IT and OT remain siloed, operators face increased cybersecurity risk, fragmented visibility, inconsistent performance, and greater operational complexity across critical functions such as network security, workload distribution, automation, and remote operations.

Security and access control are traditionally IT-led functions, while OT manages operational systems such as SCADA, drilling automation, and pipeline monitoring. Today, these domains are deeply intertwined. Autonomous inspection robots and connected tools, for example, must move seamlessly across sites and environments without manual reconfiguration or connectivity gaps. Achieving this level of integration requires a unified, secure, and flexible network foundation.

Network architecture plays a critical role in enabling this convergence. Depending on operational requirements, multisite oil and gas deployments can leverage:

- Centralized architectures with remote radio access for wide-area assets
- Hybrid models combining centralized control with local breakouts for responsiveness
- Fully localized deployments for time-critical or safety-sensitive operations

Each approach ensures that application processing and connectivity are aligned to site-specific demands—without compromising consistency, performance, or security.

# Unlocking operational excellence with private 5G

In oil and gas, every second matters—and every connection counts. Private 5G gives operators the backbone to seamlessly connect offshore platforms, onshore processing plants, and remote infrastructure.

By standardizing network architecture across all locations, companies can reduce complexity, simplify operations, and accelerate digital initiatives. With its advanced radio capabilities, private 5G delivers reliable performance even in harsh environments, while flexible deployment options support both centralized and localized operational needs.

Some sites require ultra-low latency for safety systems, robotics, or autonomous inspections. Others need wide-area, highly reliable coverage for asset tracking, environmental monitoring, and workforce communications. Private 5G supports all of these requirements within a single, consistent platform.

Ericsson Private 5G combines this flexibility with built-in security, powerful radio performance, and support for diverse geographies and regulatory environments—making it well suited for global oil and gas operations. With private 5G as the foundation, operators can ensure that every site—from deepwater rigs to downstream facilities—is connected, secure, and ready to scale.

# Finding the right network architecture for diverse environments

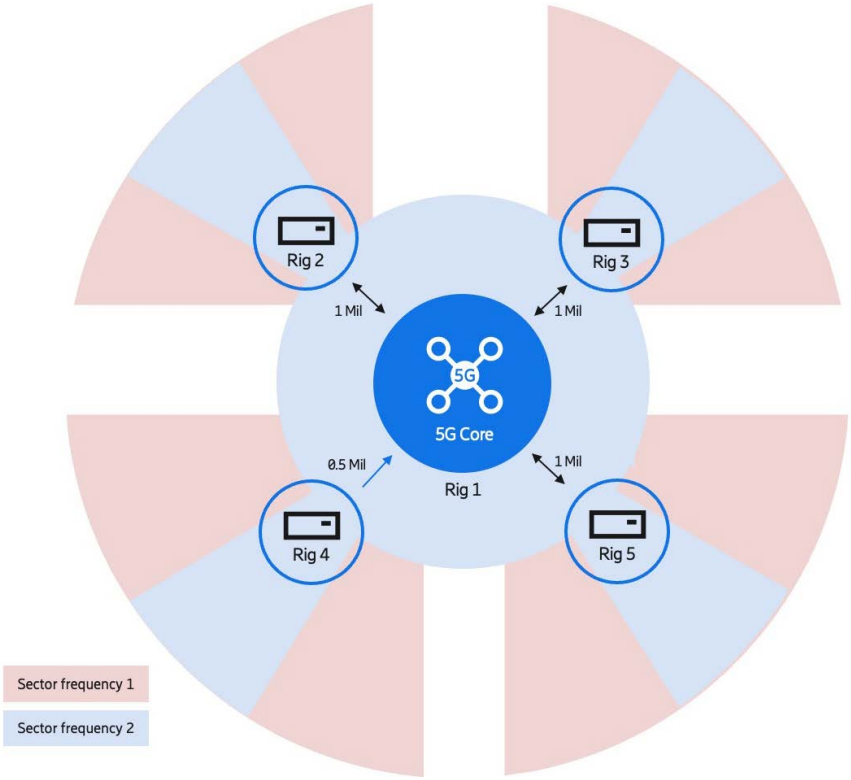
Private 5G supports three multisite deployment models, each designed to meet specific operational requirements while maintaining consistent security and performance standards.

## Centralized architecture: Cost-efficient connectivity

In this model, remote sites with radio access network only route all traffic to centralized core functions. This approach supports applications such as wellhead monitoring, tank sensing, and basic communications while enabling centralized management. With built-in local survivability and extremely reliable transport, the architecture is particularly well suited for multisite deployments designed to withstand downtime.

## Hybrid architecture: Low latency with centralized control

Multisite deployments with edge computing provide local processing while maintaining centralized control (local UPF required). This approach enables safety monitoring, local control systems, and analytics with reduced latency across multiple sites. While sites with local redundancy can continue critical operations during communication outages and preserve enterprise oversight, the RAN will stop operating if connection to the central core is lost. This makes the model best suited for multisite processing facilities requiring local optimization, especially for non-critical use cases.




- Multi-location sites lets enterprises deploy basebands and radios in different locations than the network controllers.
- Remote basebands can be connected to the network controllers through a customer-managed switched or routed transport network.
- To fit into the enterprise IP plan, IP addresses of the radio ports on the network controllers are configurable in the NMP during installation.
- This deployment model requires a highly reliable transport network between the main and remote locations with minimal latency.

Figure 2: Centralized network architecture for multisite deployments that can survive downtime and provide reliable transport.

## Fully localized architecture: Maximum autonomy

Multisite operations with full survivability ensure continuous operations even if connectivity between sites is lost. These sites host both IT and OT applications locally, enabling full operational independence and self-sufficiency through local control plane and subscriber database deployment. Deployments can manage devices, process data, and maintain services independently. This model is ideal for operators with offshore platforms, critical production facilities, or remote operations where downtime is unacceptable.

The right choice depends on operational priorities, safety requirements, and economic considerations across dispersed operations. Most operators begin with centralized architectures for cost efficiency, then deploy edge computing or full autonomy based on specific site needs and application requirements.

| Option | Value | Ericsson Hardware Example |
|---|---|---|
| **Remote site with RAN only** | **Option1**<br>Most cost-effective solution. In this case there is no need to deploy a dull private 5G system in all locations, only RAN is deployed in remote locations. In addition, there is no need to run multiple long fibers between Basebands and Radio Units. | **Main location:**<br>• Network Controller pair<br>• Single or Redundant Router 6675<br>• Single or redundant GNSS kit<br><br>**Main or additional locations:**<br>• Baseband<br>• Radio<br>• Dot/Antenna |
| | **Option 2**<br>Same as Option 1, except organizations can use their own transport network. They save an fiber cost between private 5G Router and Basebands. | **Main location:**<br>Network Controller pair<br><br>**Main or additional locations:**<br>• Baseband<br>• Radio<br>• Dot/Antenna<br>• GNSS kit per location (plans to support PTP to remove GNSS kit) |
| **Remote site without survivability** | Relatively cost-effective solution than a standard Network Controller for locations that need local breakout. Remote location system stops working if transport network between sites fails. | **Main location:**<br>• Network Controller appliance pair<br>• Single or Redundant Router<br><br>**Main or additional locations:**<br>• Remote UPF appliance pair |
| **Remote site with survivability** | Premium solution for locations that need self-sufficiency—local breakout plus local control and authentication. Remote location system continues working even if transport network between sites fails. | **Main location:**<br>• Network Controller pair or NC as SW redundant instances (single instance late)<br>• Baseband<br>• Radio<br>• Dot/Antenna<br>• GNSS kit<br><br>**Additional locations:**<br>• Same as main location |

Figure 3: Comparing centralized, hybrid, and fully localized architecture options.

# Real-world examples transforming operations

Across the industry, private 5G is enabling measurable improvements in three key operational areas:

## Enhanced safety and asset protection

Operators deploy comprehensive gas detection and quantification systems using wireless cameras positioned anywhere network coverage exists, enabling monitoring of previously inaccessible areas. Intelligent thermography and flame detection systems provide continuous surveillance, while autonomous robotic inspection systems conduct facility patrols without human intervention. These systems eliminate human exposure to hazardous environments while increasing inspection frequency and consistency through camera-as-sensor technology.

## Operational efficiency through digitalization

Connected worker applications enable augmented reality (AR) for remote expert assistance, mobile human-machine interfaces for real-time equipment interaction, and enhanced communication systems for coordination. Digital twins support predictive maintenance and asset performance optimization, replacing manual and paper-based processes with automated digital workflows.

## Environmental compliance and decarbonization

Advanced flare monitoring and detection systems support commitments to zero routine flaring through continuous surveillance and automated reporting. Gas detection and quantification networks enable real-time emissions monitoring and environmental compliance documentation. These comprehensive monitoring networks provide the continuous data collection required for regulatory compliance while enabling automated reporting capabilities.

Large-scale deployments demonstrate how unified connectivity across multiple sites enables centralized oversight while supporting local operational needs—even in the most challenging environments.

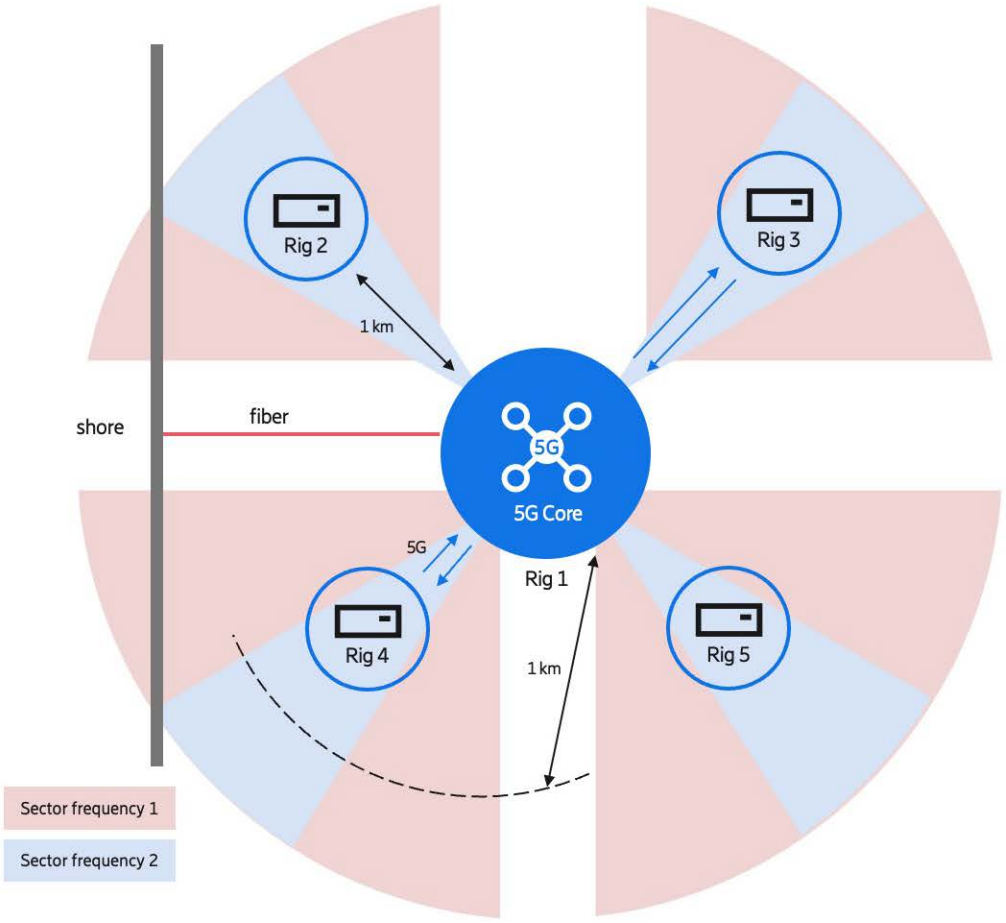



Figure 4: Private 5G deployment across an integrated oil and gas operation.

# The bottom line

As oil and gas operations become more digital, distributed, and data-intensive, reliable connectivity is no longer optional—it is foundational. Multisite environments demand networks that are secure, scalable, and capable of delivering consistent performance across vastly different operating conditions.

Private 5G provides a unified connectivity platform that supports IT/OT convergence, enables advanced digital applications, and scales across the entire enterprise. By choosing the right network architecture for each site, oil and gas operators can reduce complexity, improve safety, increase efficiency, and build a resilient foundation for future innovation.

In a sector where uptime, safety, and performance define success, private 5G is not just a network upgrade—it is a strategic enabler of operational excellence.

## About Ericsson

Ericsson enables communications service providers and enterprises 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 innovative 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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