

Integrated Sensing and Communication

Why physical detection is becoming a network-scale capability





Executive summary

Mobile networks are starting to do something they were never built to do—see. Integrated Sensing and Communication, or ISAC, adds physical-world awareness to infrastructure historically designed to carry information, enabling a network to detect and track objects even when those objects aren't connected to it.

That shift is arriving as the airspace above critical locations becomes harder to manage. Reported drone activity has risen at NFL games, near airports, and around U.S. military installations. The figures come from different reporting systems and periods, but the operational signal is consistent. Security teams are being asked to understand more activity, and more quickly, across environments where detection remains uneven.

Detection matters because it buys time. A venue can't protect a crowd from an object it hasn't seen. An airport cannot evaluate an incursion it hasn't detected. A utility operator can't investigate activity approaching exposed infrastructure without first knowing it's there. ISAC doesn't replace the people, procedures, or authorities responsible for responding. It strengthens the awareness every response depends on.

ISAC requires sensing-capable radio equipment, processing, coordination, and integration. Its deployment model enables carriers to integrate sensing into network infrastructure and coordinate observations across multiple sites instead of installing a separate sensor system at each location.

Network sensing extends the role of carrier infrastructure from carrying information throughout the physical world to producing information about it. The fiber, wireless infrastructure, and network modernization that support AI and other data-intensive services can also provide part of the foundation for sensing. A site's awareness depends on the network around the radio as well as the radio itself.

This paper examines what ISAC is, why airspace awareness is becoming a network question, where the technology may create value, and what separates a demonstration from a supportable service. It introduces six requirements spanning radio and spectrum, sensing equipment, site geometry, standards, processing, and service delivery. It then connects those requirements to the broader evolution of the AI-grade network.

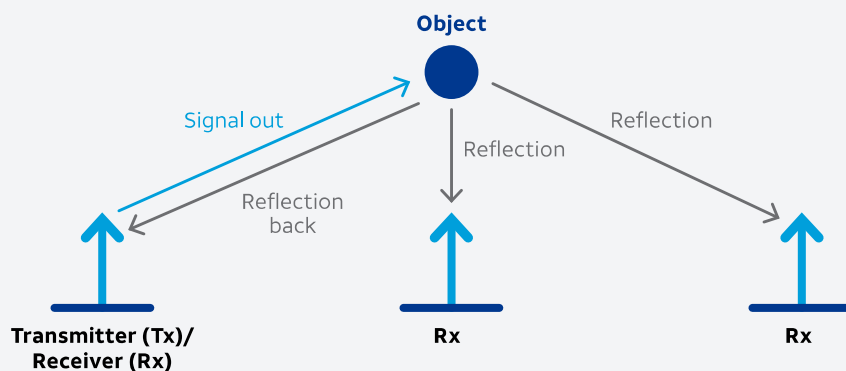
What is Integrated Sensing and Communication?

ISAC brings together two technologies that evolved side by side. Radar uses reflected radio signals to understand the physical environment. Mobile networks use advanced radio systems to communicate with connected devices. ISAC combines the two, so the network can sense its surroundings and communicate.

The basic mechanism is easy to describe. A radio signal leaves an antenna, interacts with an object, and produces a reflection that a receiver can measure. The signal return time helps estimate distance. Frequency changes reveal motion. Measurements across an antenna array help determine direction. Together, those observations enable a sensing system to detect and track movement within the area it can effectively observe.¹

How network sensing reads an object

Illustrative multistatic example:
one transmission, reflections measured at several sites



Sensing-capable sites, synchronized and coordinated

Range

Signal travel time

Velocity

Doppler shift in the reflected signal

Direction

Multi-antenna processing

Two different dimensions improve that picture. Antenna aperture affects how precisely an individual site can distinguish direction. Network geometry determines how many viewpoints the system can combine. A larger array can sharpen what one site sees, while multiple coordinated sites can reveal an object from different angles. ISAC can benefit from both, but they offer different advantages.

ISAC can use monostatic, bistatic, or multistatic sensing. Monostatic sensing places the transmitter and receiver at the same node. Bistatic sensing locates them at different sites. Multistatic sensing extends that model by coordinating observations across multiple transmitters, receivers, or both. Ericsson's current approach emphasizes multistatic sensing so the network can observe the same area from multiple perspectives.²



What is Integrated Sensing and Communication? (continued)

The advantage of multistatic sensing is geometry. An object that reflects weakly toward one site may be more visible from another. Ericsson describes its multistatic approach as the ability to improve detection probability, localization accuracy, and resilience compared with a single co-located transmitter and receiver. The July 2026 demonstration at AT&T Stadium in Arlington, Texas put that architecture into practice by combining observations from three synchronized tower sites through a shared sensing and fusion system.³

Turning an existing tower into a sensing site can require more than software. Hardware requirements depend on the target, environment, spectrum, and performance expected. Implementation requires sensing-capable radio equipment and dedicated processing, making ISAC a network investment with physical and software requirements.

However, ISAC isn't a response capability. It can detect an object, estimate where it is and how it is moving, and potentially help classify it. It doesn't determine whether the object is a threat, and it doesn't disable or remove it.

A detected object isn't automatically a drone. A drone isn't automatically a threat. The system's value begins with awareness. The decision about what happens next belongs to the people and procedures responsible for a site or area.

That distinction also separates ISAC from cooperative identification and tracking. Systems such as Remote ID depend on an object broadcasting information about itself. Reflection-based sensing doesn't require that cooperation. A disconnected, unidentified, or deliberately silent object can still create a measurable radio reflection.

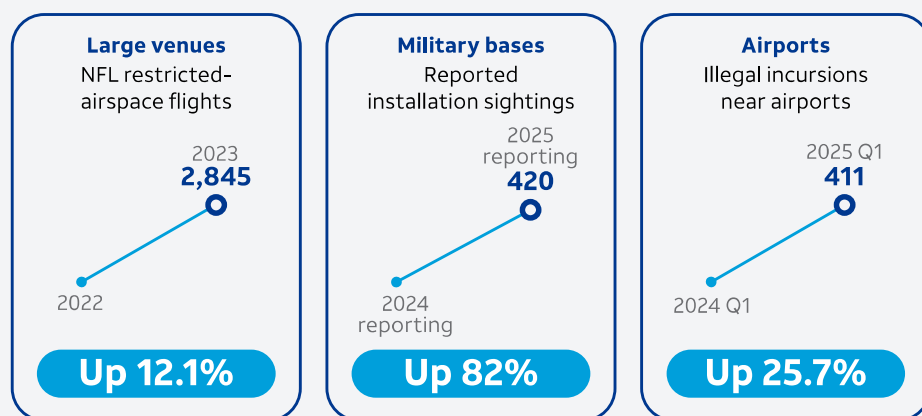
Why airspace awareness is an infrastructure problem

Reported drone activity has risen across several environments where authorities already carry responsibility for safety, continuity, or security. The underlying figures come from different reporting systems and periods. These figures should be read as separate operational indicators rather than a single growth curve.

At large venues, NFL reporting cited 2,845 unauthorized drone flights into restricted airspace in 2023, up from 2,537 in 2022.⁴ Airports recorded 411 illegal drone incursions in the first quarter of 2025, up from 327 during the same period in 2024.⁵ U.S. military installations recorded more than 400 sightings over approximately one year, an increase of 82 percent from the prior reporting period in 2024.⁶

The rise in drone activity, sector by sector

Three different counts from three different sources.
Read each panel on its own.



Additionally, in 2026, one of the world's biggest sporting events demonstrated the scale of coordination that airspace security can demand. Across 11 U.S. cities, agencies seized more than 700 unauthorized drones during a federally supported counter-drone operation.⁷

Detection creates time to act

When protecting an airspace, the practical gap comes down to awareness. An operator cannot assess an approaching object it hasn't detected. Earlier awareness gives security and infrastructure teams time to verify what is happening, protect people or equipment, and escalate through established procedures.

The appropriate action varies by environment. It may mean pausing activity and holding a crowd in place at a venue, deciding whether operations need to change at an airport, or dispatching personnel and protecting exposed equipment at a utility or industrial site. Each response begins with reliable detection.

ISAC addresses this awareness layer. Its operational value will depend on how consistently it detects, tracks, and helps classify objects under the conditions that matter at a particular site.

Where network sensing may create value

Potential use cases are emerging where low-altitude awareness is valuable, detection remains uneven, and delayed information carries a high cost.

Unmanned aerial vehicle (UAV) monitoring and the protection of transportation, industrial automation, and critical infrastructure are among the potential use cases for ISAC. Each would require its own performance targets, deployment design, operational integration, and service model.⁸

Environment	Operational need	Potential role for network sensing
Large venues	Understand activity above crowds and temporary flight restrictions	Add persistent awareness across a defined event area
Airports	Detect and evaluate objects near runways and restricted airspace	Provide another sensing layer for low-altitude activity
Critical infrastructure	Monitor exposed substations, industrial sites, and perimeters	Extend observation across distributed or difficult-to-monitor locations
Transportation	Observe movement around roads, intersections, railways, or logistics sites	Complement local cameras and onboard sensors with a wider view

Where does network sensing add the most value?

Network sensing doesn't have to be deployed everywhere. A single facility with the budget and operating model for purpose-built radar may be well served by dedicated sensing. Network sensing earns its place when the value depends on the use case, the area to cover, the sensing geometry, and the performance required. Some deployments may use a small number of well-placed sites. Others may coordinate sensing across a wider area or combine it with other sensor sources. The network gives operators the flexibility to put sensing capability where it's most useful and scale it from there.

Architecture determines what the network can see

How a sensing system is configured shapes what it can detect and how confidently it can track it. The monostatic, bistatic, and multistatic arrangements described earlier differ in how transmitters and receivers are positioned and in the perspectives their measurements can provide. Those differences shape what the network can observe.

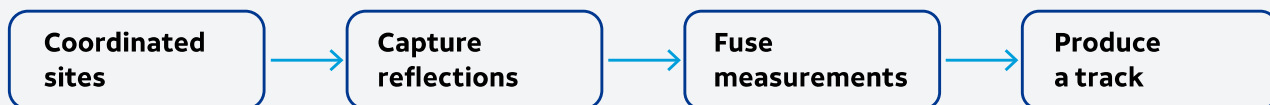
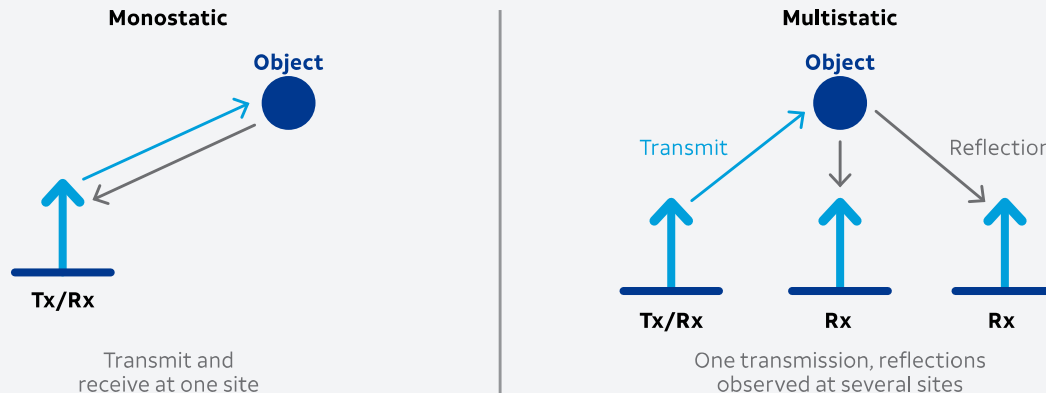
It matters most for small, low-altitude objects. Buildings, terrain, birds, and background clutter can make a drone hard to distinguish from a single viewpoint, and additional viewpoints can help separate a target from the clutter around it.²

Participating sites also need precise time and frequency synchronization, known positions, coordinated radio resources, and processing that can combine their measurements. The geometry among those sites is equally important. Viewpoints that are too similar may contribute little new information, while poorly positioned sites can leave important areas obscured.

Spectrum, bandwidth, target size, movement, and environmental clutter further influence what the system can resolve. Architecture therefore affects more than coverage. It shapes detection probability, localization error, false alerts, missed detections, update rate, confidence, and the time required to produce a result.⁹

One viewpoint and multiple viewpoints

Architecture changes the geometry available to detect and locate an object



Monostatic sensing uses one viewpoint. Multistatic sensing coordinates observations from several sites.

A live proof point in Arlington

In July 2026, AT&T and Ericsson used three synchronized tower sites near AT&T Stadium to detect authorized drone flights at approximately 300 to 400 feet. The configuration combined Ericsson's Massive MIMO (multiple-input multiple-output) radios with dedicated sensing and fusion servers and showed detection, tracking, and classification operating together on a live 5G network.¹⁰

The demonstration moves multisite network sensing beyond a laboratory concept. It also defines the boundary of the evidence. The results came from a controlled proof of concept at one location. A supported service would still need repeatable performance targets, operational integration, and a defined commercial model.

What network sensing requires

A sensing demonstration shows that a configuration can work under defined conditions. A supportable service must bring six requirements together around a specific site's needs.

Six connected requirements

What each must do and why it matters

1

Modernized radio and spectrum foundation

The spectrum, bandwidth, and antennas available to sensing set how far it can see and how precisely it can detect.

2

Sensing-capable equipment

Radios, compute, and software built to sense, not only to carry calls and data.

3

Site geometry and sensing topology

How sites are placed, synchronized, and combined sets what can be detected and located across an area.

4

Standards and capability evolution

A path from today's implementations to standardized capabilities, interfaces, and lifecycle support, so early work is not abandoned.

5

Processing and control architecture

Turning radio measurements into detections and tracks quickly enough to support a decision.

6

Service delivery and governance

Who can request sensing, how results are securely exposed, and the rules for authorization and data handling.

The six requirements above depend on each other. A site with the right spectrum and equipment can produce a good reflection. However, it takes several synchronized sites to see an object hidden from any one of them. The reflections then have to be combined and turned into a track quickly, or the information arrives after it's no longer needed. A deployment built ahead of the standard needs a clear path and the result has to reach someone authorized to act on it. All six requirements have to be in place for a specific site before a demonstration becomes a service.

The Arlington demonstration is the reference point for the first five requirements. Ericsson supplied the multistatic architecture, the sensing-enabled radios, and the fusion servers.¹⁰ AT&T supplied the sites, the mid-band spectrum, and the live 5G network, which sits on what AT&T describes as the nation's largest wireless network.*



Standards, deployment, and commercial models shape what comes next

Early ISAC implementations are emerging on 5G cellular technology. Those deployments will shape the capabilities, interfaces, and operating models that mature into a broader standardized 6G ecosystem in the early 2030s.

Work surrounding these standards has moved beyond exploration alone. Release 19 from the 3rd Generation Partnership Project (3GPP) includes a published technical specification defining functional and performance requirements for ISAC. Release 20 expands sensing studies over 5G and begins broader 6G work. Release 21 is expected to introduce the first normative 6G ISAC specifications covering waveforms, architectures, and protocols.¹¹

This sequence allows useful network sensing to develop before the broader ecosystem is complete. Early implementations can address a defined environment and performance need while the industry continues developing common architectures and interoperability.

Deployment models will vary. Sites, spectrum, antennas, radio hardware, and signals can be shared to different degrees, while some environments may require dedicated sensing signals, equipment, or processing to deliver the necessary performance.¹

The work underway now shows that multisite sensing can run on a live 5G network. Next is the move from a demonstrated capability to repeatable deployments built around defined use cases, measurable performance, and clear service requirements.

The commercial model will be worked out the same way to determine which use cases carry enough value to support a service and on what terms.

*Compares cellular networks, excluding satellite.

ISAC expands the role of the AI-grade network

AI is changing what enterprises need from their networks. Workloads are becoming more dynamic, computing is spreading across cloud and edge environments, and decisions increasingly depend on data moving quickly between applications, models, agents, and people. The network provides the visibility, control, and coordination that connect those moving parts.

ISAC points to a parallel shift in carrier infrastructure. Networks already move information among people, devices, applications, and computing environments. With sensing, the physical environment becomes another source of information. ISAC isn't part of an AI-grade network by definition. It draws on many of the same foundations and it still needs sensing-specific equipment and processing on top of them.

Those foundations are the ones associated with an AI-grade network. Programmable infrastructure can coordinate radio resources and select the sites needed for a sensing request. High-capacity transport can move measurements to the systems that process and combine them. Distributed computing can turn measurements from several locations into usable detections and tracks. AI can support tasks such as classification, pattern recognition, and anomaly detection when the implementation and training data support them. AT&T's continued development in fiber, wireless infrastructure, and distributed compute could provide part of the foundation on which future sensing services could be built.

With ISAC, awareness of the environment around a site comes from the network, not from another system the site has to run on its own.

Rather than relying only on connected devices or dedicated sensors, the network itself can contribute observations of its surroundings, used on their own or combined with other sensor sources. The result is a network that contributes context alongside connectivity, whether that is an unidentified object approaching a protected area, another view of movement around an intersection, or awareness added to an industrial site's local sensors.

ISAC makes one possible future of the AI-grade network tangible. The network carries information, coordinates distributed infrastructure, and helps turn physical-world signals into context people and systems can use. That context's value comes from what it enables: seeing change sooner, understanding it faster, and making better-informed operational decisions.

A closing thought: awareness changes what's possible

Conclusion

The most important measure of ISAC may be the time between an object entering an area and an authority understanding that it's there. Earlier awareness gives teams room to confirm what they're looking at and act before the moment passes.

That's why detection matters across stadiums, airports, industrial sites, transportation systems, and critical infrastructure. Each environment has different risks and response requirements. All of them depend on reliable awareness arriving early enough to be useful.

ISAC offers a new way to build that awareness. Coordinated radio sites can observe an area from multiple perspectives, combine their measurements, and deliver information about an object that may not be connected to the network. The capability requires real investment, clear performance targets, and integration with the systems and teams responsible for the site.

Early deployments will shape what follows. They will reveal where network sensing performs well, how to combine shared and dedicated resources, and which use cases create enough value to support a service. Those lessons will influence standards, deployment models, and customer expectations.

That's also where the network comes back in. A radio can produce a reflection on its own. Turning it into something a security team can act on takes several sites with a view of the same area, data transport to move what they see, computing to combine it into a track, and a way to get the result to the people responsible for the site. That is the infrastructure that makes sensing worth having.

ISAC's defining achievement will be simple—giving people more time to understand what's happening before they must decide what to do.

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