Microwaves&RF

ENDEAVOR BUSINESS MEDIA

SPECIAL REPORT

WIRELESS TECHNOLOGIES MAKING GOOD ON PROMISES

Table of Contents

In 2026, The Way Forward for Wireless Tech Becomes Clearer

Our 2026 Technology Forecast finds numerous wireless technologies taking steps into the future. The cumulative effect: smarter factories, cities, homes, and much more.

By ***David Maliniak,*** **Executive Editor,** ***Microwaves & RF***

IN HIS TECHNOLOGY FORECAST ARTICLE IN THIS EBOOK (p. 2), Spirent's Steve Douglas alludes to promises that the telecommunications industry has been making for years now. "5G is going to change how the world works," Douglas writes. We've been promised a world in which "smart everything" will give us more efficient factories. Urban traffic problems would be unsnarled by automated management powered by cameras and sensors. At home, new generations of Wi-Fi would trim the latencies imposed by routers to make the IoT-centric smart home operate seamlessly.

2026 finds us on the verge of all these promises being kept even as the industry lays the groundwork for even more innovation in years to come. Douglas's article reveals the future for 5G Standalone networks in which the last vestiges of 4G cellular technologies are finally laid aside. 5G Standalone, in turn, ushers in the age of 5G-Advanced, which will use Reduced Capability (RedCap) functionality to support simpler IoT devices and tighten the links between terrestrial and non-terrestrial networks.

On the military/aerospace front, Finwave's Michael Guyonnet and Hussein Ladhani describe the benefits to tactical communications of software-defined radio (SDR) powered by GaN-on-Si power amplifiers (p. 7). GaN-on-Si facilitates the melding of ruggedized SDR-based field radios with broadband small-cell technologies. The flexibility of SDR architectures will bring support for a wide array of waveforms in a single reconfigurable system.

At home, Sivaram Trikutam of Infineon Technologies explains how Wi-Fi 7's broad adoption will mean a more capable, secure, and energy-efficient IoT ecosystem (p. 5). Wi-Fi 7's Wi-Fi Aware functionality will open the way to a host of new peer-to-peer (P2P) use cases, enabling smartphones—regardless of their operating systems—to connect to IoT devices without joining the same Wi-Fi network.

The overall picture painted by this 2026 Technology Forecast eBook is one in which numerous wireless technologies are taking steps forward to fulfill their long-touted promise. We hope you learn how these technologies can help you in future design projects of your own.

CHAPTER 1

2026 Technology Forecast: 5G Standalone Finally Delivers the Goods

In 2026, 5G Standalone (5G SA) will fulfill its promise, taking 5G to the next level of services and capabilities as operators implement true cloud-architected 5G cores.

STEVE DOUGLAS, Head of Market Strategy, *Spirent Communications*

ID 195157091 © Kanawat | Dreamstime.com

We've heard the promises for years. The telecommunications industry said 5G would change how the world works. They told us factories would become highly automated, and cities would manage their own traffic. While our phones deliver immersive experiences, that deep industrial shift has felt far away.

It all changes in 2026. The prediction is simple: 5G Standalone (5G SA) with incremental additions of 5G-Advanced capabilities will become the default way to power the next wave of services that make money. This isn't just a small update. It's the moment the network stops leaning on older 4G gear and starts working the way it was intended.

The Move to a True 5G Cloud-Architected Core

To see why 2026 is different, look at how networks are built. Until now, many operators have used Non-Standalone architectures. They installed 5G radios but kept the 4G core to handle traffic. It was a half-step. It offered speed, but it could not handle the complex demands of industry.

5G SA changes the foundation. It uses a service-based, cloud-architected core that lets operators deliver services with greater control and automation. By 2026, most big operators will have moved to these standalone cores.

This matters because a cloud-architected network lets carriers do more than just sell connections. It's the block they need to build the specific services that were promised for so long. The network becomes a platform they can program.

New Revenue in Logistics, Consumer, and Transportation

We don't have to guess what this looks like. We can already see what works for the leaders in the field. They're finding ways to improve their business models right now *(see figure)*.

Consider, for instance, the logistics industry. At a major port in China, operators use 5G-Advanced tools combined with automated vehicles to move cargo. The results are real. They see 30% cost savings. Even better, they cut the time to unload cargo from four hours to 15 minutes.

Consumer markets are shifting, too. Think about the people who stream live video online. These creators use 5X as much data as the average person. They need fast upload speeds just as much as download speeds. Operators now sell packages with specific upload tiers and latency guarantees to these users. This strategy lifts the average revenue per user 3X to 4X.

Even airports are using the network in new ways. They employ 5G-Advanced radio sensing capabilities to find drones near the runway. These systems have a 99% detection rate.

These aren't tests. They're real situations in today's world, and they need the flexibility of SA cores to work.

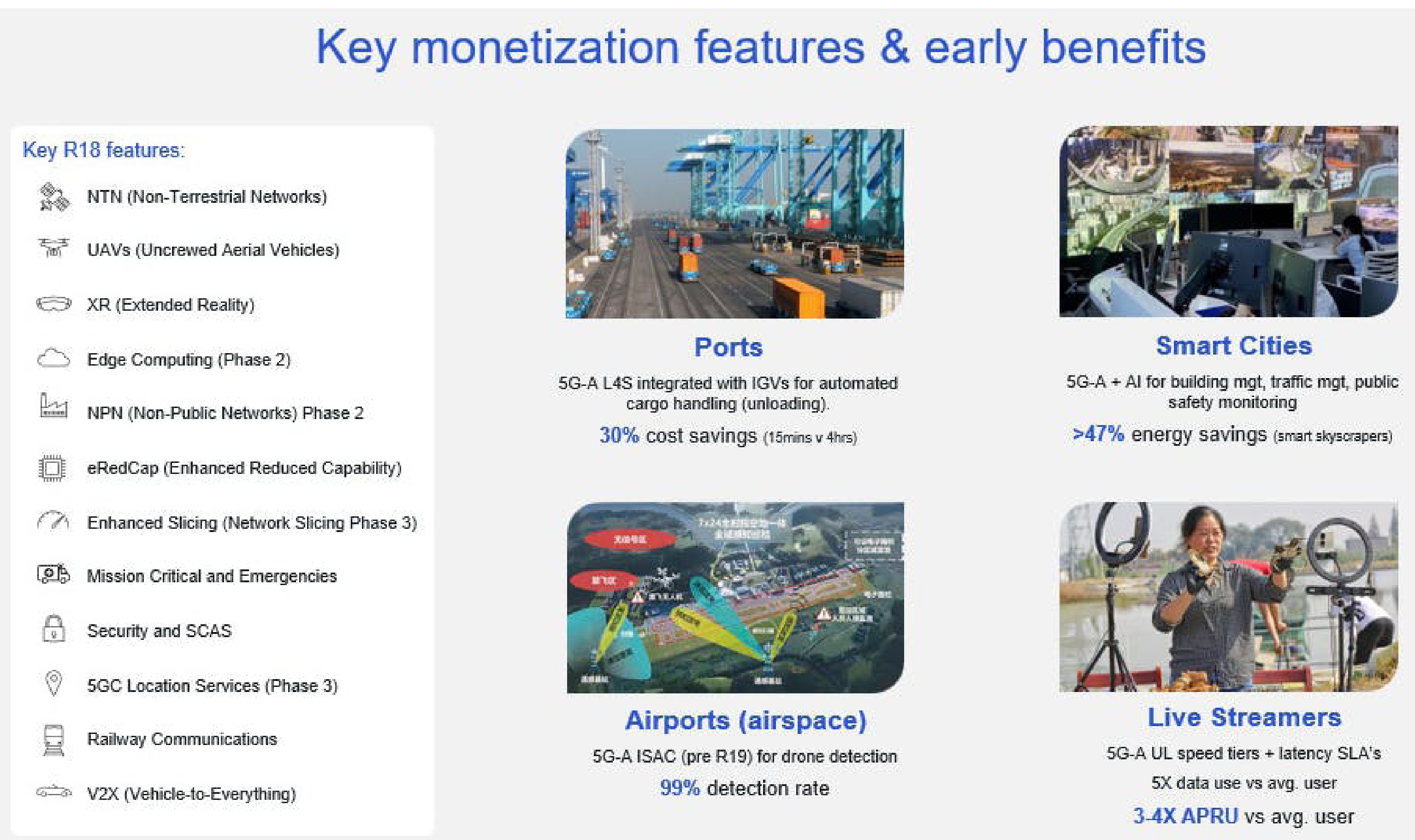
Setting the Stage for 5G-Advanced

The move to 5G SA also lays the ground for 5G-Advanced. With the specifications for 3GPP Release 18 frozen, and Release 19 about to be frozen, we can see what's possible. Release 18 makes 5G networks more responsive, efficient, and relevant to industries.

Three specific areas will likely take priority in 2026:

1. Simpler IoT devices (eRedCap)

You may know about RedCap, or "Reduced Capability." The next step is enhanced RedCap (eRedCap). It supports IoT devices that need less bandwidth and power. Think of parking meters, industrial sensors, or wearables that need to run for years without a battery charge. This tech is key for logistics and automated cities. First movers are looking to launch this late



Now that the specifications of 3GPP Release 18 are frozen, 5G SA brings considerable new revenue opportunities to network operators in port operations, smart cities, airports, and live streaming. Spirent this year, with mass scaling expected over the next 24 months.

2. Connections from space (non-terrestrial networks, or NTNs)

The network is going to the sky. 5G-Advanced brings tighter ties with satellites. This is big for keeping coverage in remote areas and for tracking shipments. While fully compliant satellite networks are still in their early stages, momentum is strong for services that switch between ground towers and satellites.

3. Better railways

Trains are ditching their old Global System for Mobile Communications – Railway (GSM-R) systems for a new future-proof setup called Future Railway Mobile Communication System (FRMCS). 5G-Advanced significantly improves rail communications. It offers reliable connections for trackside networks and high-speed mobility. Trials are starting now, with major changes targeted between 2030 and 2035.

Network Slicing Makes Sense with a Programmable SA Core

One of the biggest business shifts comes from network slicing. This idea makes more sense with a programmable SA core. It allows operators to create virtual networks that fit exact needs.

A port authority can expect certain performance levels for its logistics apps. Outside broadcasters can receive pop-up time and location-based slices for sports events, parades, and news events. A utility company can get a dedicated and highly resilient connection for its power grid. Every customer gets exactly what they need without hurting other services on the network.

The Race to Implement 5G SA is On

The money makes sense, too. Moving to a new core costs money upfront, but the benefits add up fast. Automated management brings efficiency and new ways to make money.

Operators are always looking for new abilities, and 2026 will bring plenty. We estimate that 86 operators around the world have already launched 5G SA. Another 20 to 40 more plan to upgrade in 2026.

The question is not whether this change will happen, because it's already in motion. The question is which telecom company will take the lead. The early leaders that have their SA offerings ready are putting themselves ahead. They're getting the business that their competitors can't even handle.

We spent years talking about what 5G could do. In 2026, thanks to the Standalone core, we will stop talking about the future and start working with the results.

view this article online

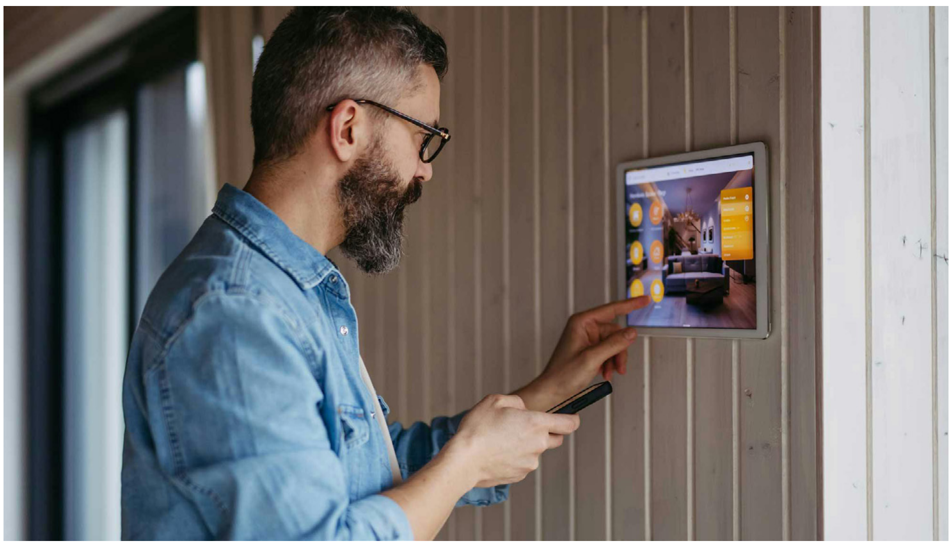
BACK TO TABLE OF CONTENTS

CHAPTER 2

What's Next for Wi-Fi: Key Trends for 2026

In 2026, several key developments will impact Wi-Fi, from wider Wi-Fi 7 infrastructure adoption to new peer-to-peer capabilities and advances in sensing and locationing.

SIVARAM TRIKUTAM, SVP of Wireless Products, *Infineon Technologies*



Getty Images_2098739132

Wi-Fi continues to evolve as new standards, security requirements, and device capabilities reshape how designers build connected products. 2026 will see several key developments, from wider Wi-Fi 7 infrastructure adoption to new peer-to-peer (P2P) capabilities and advances in sensing and locationing. The growing focus on post-quantum cryptography (PQC) and improved power efficiency will also impact next-generation IoT designs.

Together, these trends signal a more capable, secure, and energy-efficient Wi-Fi ecosystem in the year ahead.

Wi-Fi 7 Will Become Mainstream

Wi-Fi 6 introduced orthogonal frequency-division multiple access (OFDMA), shifting Wi-Fi's design priorities from chasing peak data rates to improving overall network efficiency. It answered a simple question: Why build a faster car if it's stuck in traffic all the time?

Wi-Fi 7 extends that shift with Multi-Link Operation, which improves connection robustness and reduces latency. The feature is already available in most high-end smartphones and PCs, yet its benefits haven't been fully realized because access points (APs) and routers are still catching up.

Today, only expensive, high-end models support Wi-Fi 7. In 2026, adoption will broaden across APs and routers at all price points, while ISPs begin rolling out Wi-Fi 7 as the default option.

Wi-Fi Aware Will Create New P2P Use Cases

The traditional Wi-Fi model requires devices to communicate through an AP or router. Device-to-device communication has long been possible through neighborhood area networking (NAN), though adoption has been limited. This is expected to change in 2026. With Apple iOS now supporting Wi-Fi Aware, the door opens for a broader set of peer-to-peer use cases.

Smartphones will be able to communicate directly across iOS and Android ecosystems. They will also be able to connect to IoT devices such as printers, appliances, and door locks without joining the same Wi-Fi network. On top of that, Wi-Fi Aware's certified peer connections support one-touch onboarding, allowing personal devices, such as healthcare and medical monitors, to join a network simply by opening an app.

Getting Ready for PQC

As Wi-Fi connects more IoT devices to the internet, the attack surface expands, increasing the risk of botnets, lateral movement, supply-chain attacks, and similar threats. Hardware root of trust, secure onboarding and updates, and per-device attestation will become baseline expectations for IoT devices. While these measures address today's security challenges, we're approaching a point where quantum computers could break current cryptographic protections. In 2026, device manufacturers will begin preparing for next-generation security through PQC.

PQC uses new classes of mathematical problems, such as lattice-based schemes that remain resistant to quantum attacks. Standards bodies have approved PQC algorithms so that device makers can begin migrating away from RSA (Rivest–Shamir–Adleman) and ECC (elliptic curve cryptography) well before quantum computers can defeat them.

Wi-Fi for Sensing and Locationing

Wi-Fi's role in sensing and locationing has been discussed for years. But because the underlying technologies weren't mature or reliable enough for large-scale use, broad deployment of these applications remained limited.

That's beginning to change. Several key protocols are now available: 802.11mc for basic locationing, 802.11az for improved three-dimensional positioning, and 802.11bf for exchanging channel state information to enable presence and motion detection. With microcontrollers that integrate edge-AI acceleration now widely available, the conditions are in place for the industry to build and deploy multi-modal sensing and locationing applications at scale.

Increase in the Number of Battery-Operated Devices

Improvements in both active and standby power consumption of Wi-Fi system-on-chip (SoC) devices are reducing the energy requirements of connected products. New features in Wi-Fi 6 and Wi-Fi 7 further lower power usage for always-on operation, which will ramp up the number of battery-powered Wi-Fi-connected devices. These devices are generally easier for DIY users to install, further accelerating adoption.

view this article online

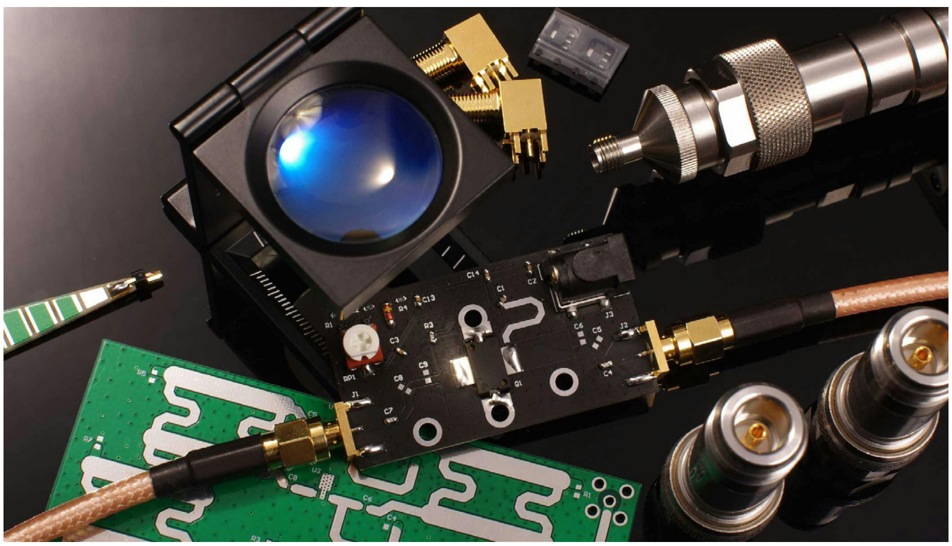
☞ BACK TO TABLE OF CONTENTS

CHAPTER 2

Can GaN-on-Si Meet Changing Needs in Military and Commercial RF Amplifiers?

As military and commercial communications converge around SDR, networks demand broadband, multi-band, highly linear RF amplification that legacy technologies can no longer support. GaN-on-Si is emerging as the most practical solution.

MICHAEL GUYONNET, VP Marketing, *Finwave Semiconductor*
HUSSAIN LADHANI, Senior Staff Engineer, *Finwave Semiconductor*



Dreamstime_Audrius-Merfeldas_213120704

In 2026, the modernization of military and government tactical communications is being shaped by a powerful technological convergence: the blending of traditional ruggedized radio systems with commercial broadband small-cell technology. This shift is unified under the flexible architecture of software-defined radio (SDR).

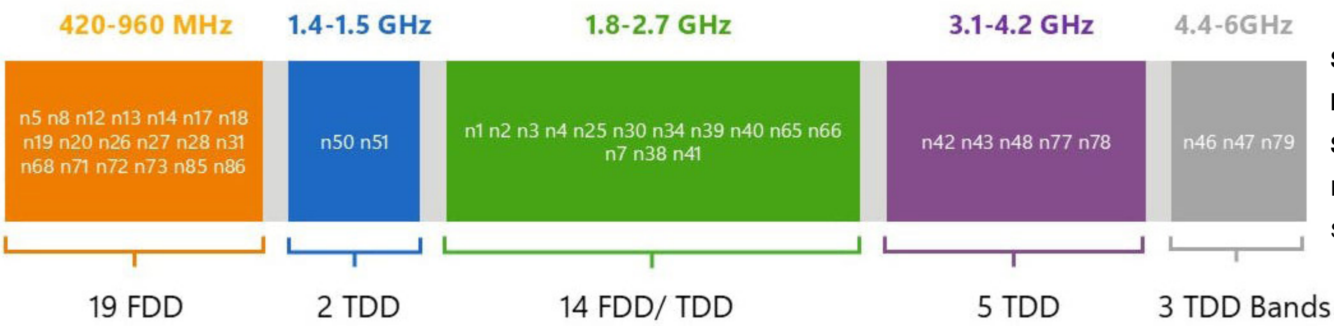
As military and government safety operations demand greater mobility, higher data throughput, and improved network adaptability, the limitations of legacy systems are becoming stark. Legacy narrowband radios are now giving way to SDR-based platforms capable of supporting a vast range of waveforms — from legacy TETRA, DMR, and P25 to modern OFDMA standards — all within a single, reconfigurable system.

This transition requires hardware that can span an impressive frequency range, covering more than 40 LTE bands below 6 GHz *(see figure)*. To fully realize the potential of this architectural shift, not only must there be an evolution in the RF front-end topology, but also in the underlying technologies, especially in the RF power amplifier space.

The Tactical Edge: Small Cells and Multi-Band Repeaters

The modernization of tactical networks extends beyond the individual soldier's handset. To ensure reliable connectivity in contested or obstructed environments, such as urban canyons or ship interiors, the infrastructure itself must undergo an evolution. This drives the convergence of military specifications with commercial small-cell and repeater technology.

Legacy repeaters were often static, single-band "dumb pipes," capable of amplifying only a specific frequency range (e.g., UHF or L-band). In the modern SDR paradigm, these fixed nodes are being replaced by agile,



Shown are wireless band segments for SDR applications. Finwave Semiconductor

multi-band small cells and repeaters having the following attributes:

- **Spectrum agility:** By leveraging the same SDR architecture as the handheld units, modern repeaters can dynamically reconfigure across the spectrum from 420 MHz to 6 GHz. As a result, a single piece of hardware can serve as an LTE small cell at one moment and a legacy P25 relay the next, adapting instantly to mission needs.
- **Cross-banding capabilities:** SDR-based repeaters enable "cross-banding," which implies receiving a signal at a lower frequency (for better penetration) and re-transmitting it on a higher frequency (for capacity), seamlessly bridging disparate networks.
- **Hardware unification:** This convergence means the RF front-end challenges apply universally. Whether for a portable radio or a tactical small-cell repeater, the hardware must handle the same wider bandwidths and complex waveforms, reinforcing the need for the advanced amplification technologies discussed in the next section.

GaN-on-Si Will Bring Convergence to RF Amplification

New generations of multi-band, multi-standard SDR systems require broadband, highly linear amplifiers capable of maintaining performance across all LTE and tactical frequency bands. Broadband power amplifiers (PAs) based on gallium-nitride (GaN) technology have become critical enablers of this transformation.

Unlike legacy silicon technologies, GaN is a "wide bandgap" semiconductor whose intrinsic properties offer superior efficiency, power density, and thermal reliability. These characteristics allow a single amplifier chain to support relatively wider frequency coverage while delivering the linearity and output power required for modern broadband waveforms.

To modernize tactical communications at scale, engineers have three distinct RF power transistor technologies available: LDMOS (high- or low-resistivity silicon substrate), GaN-on-SiC (silicon-carbide substrate), and GaN-on-Si (high-resistivity silicon substrate).

1. LDMOS: A Legacy Technology

Laterally diffused metal-oxide semiconductor (LDMOS) has been the workhorse technology for RF amplification for decades due to its low cost, competitive performance, and mature processes. For many years, LDMOS has enjoyed a monopoly as a cellular base station power-amplifier technology of choice. This has allowed its development to accelerate over that period, resulting in widespread adoption.

However, the two leaders in legacy LDMOS — Infineon and NXP — have committed to end-of-life (EoL) for their products, leaving Ampleon as the sole remaining option. This has been attributed to poor demand and a less desirable fit for upcoming applications.

2. GaN-on-SiC: The Costly Performance Leader

Growing GaN crystals on a silicon-carbide (SiC) substrate creates the ultimate high-performance transistor technology. Because GaN transistors with high power density dissipate a large amount of heat in a small area (compared to LDMOS), the substrate technology plays an important part in heat removal. SiC is an excellent thermal conductor (3X better than silicon), enabling GaN-on-SiC devices to handle extreme heat and power density.

GaN-on-SiC is best used in high-power wideband radar, electronic-warfare (EW) jamming pods, and static macro base stations where cooling is managed and cost is secondary. However, SiC substrates are incredibly expensive and difficult to manufacture in large diameters (typically limited to 4- to 6-in. wafers). This keeps the cost per die area high, making it expensive to deploy in every soldier's handheld radio or in disposable drones, even though its performance can be the best among other technologies.

3. GaN-on-Si: The Strategic Convergence Solution

For widespread military modernization, GaN-on-Si has emerged as a solution. By growing GaN epitaxial layers on standard silicon wafers, manufacturers can process these chips in standard CMOS foundries using large-diameter (8 or 12 in.) wafers.

This year, for the first time, at least two major open foundries are offering RF GaN-on-Si processes for both design and production ramp-up. We will start seeing more products brought to the market leveraging these new nodes. The technology promises to have similar electrical performance as GaN-on-SiC because it uses nearly the same epitaxial structure, resulting in comparable device parameters. It is, however, operated at lower voltages to keep power dissipation manageable.

GaN-on-Si Poised to Serve Tactical SDR

For several reasons, GaN-on-Si is in position to serve the next generations of tactical SDR communications. For one, it leverages the global silicon supply chain, reducing costs to near-LDMOS levels while offering near-SiC performance. This makes it economically viable to put high-end broadband amplifiers in thousands of portable units.

For another, because the substrate is standard silicon, it opens the door to monolithic integration. Future designs can include the GaN PA and digital-front-end (DFE) control logic on the same die, drastically reducing the physical footprint. This is a critical factor for gear constrained by size, weight, and power (SWaP) concerns.

Finally, there's thermal performance: The power density of GaN-on-Si is roughly the same as GaN-on-SiC (for a given V_{DS}). While silicon is less thermally conductive than SiC, modern device thinning and layout techniques have closed the gap, allowing GaN-on-Si to easily handle the typical 5- to 50-W output power levels of handheld units and small cells.

view this article online

☞ BACK TO TABLE OF CONTENTS

CHAPTER 4

How Antenna-on-Package Tech Will Unlock RF Designs Across Markets in 2026

The benefits of AoP radar sensor technology will be apparent in a range of application types, reducing RF design complexity and freeing up design resources.

ROBERT TOLBERT, Product Marketing Manager, mmWave Radar Sensors, *Texas Instruments*

ID 111659942 © Viacheslav Iacobchuk | Dreamstime.com

Radio-frequency (RF) system design is inherently complex. Implementing a radar sensor-based design, whether for automotive, industrial, robotics, or medical applications, requires costly substrate materials, precise layout techniques, and an advanced level of RF design expertise.

Designing an extremely-high-frequency (EHF) radar sensor antenna on a printed circuit board (PCB) is even more challenging. Conventional radar sensors take up significant board area and require meticulous design to minimize losses, impedance mismatches, and environmental sensitivities while maximizing antenna performance. mmWave refers to the band from 30 to 300 GHz of the RF spectrum and is categorized by the International Telecommunication Union as an EHF technology.

How an AoP Architecture Simplifies RF Design

An antenna-on-package (AoP) architecture helps eliminate many of the design challenges by reducing the cost, complexity, and size of traditional sensor designs. As the name suggests, AoP integrates the antenna elements directly onto the package rather than the PCB *(Fig. 1)*. Incorporating the antenna elements on the package creates a multiple-input, multiple-output (MIMO) array capable of sensing objects and people with a wide field of view (FOV) in three dimensions and under diverse environmental conditions.

Because an AoP device helps resolve the complex design challenges of mmWave antenna design, designers no longer need to handle RF and antenna engineering in-house and can focus on building differentiated radar-enabled products without having radar design expertise.

High levels of integration place the RF front end, signal-processing chain, microcontroller, interfaces, and memory within a single AoP device. By combining advanced semiconductor technologies with real-time radar sensing, signal processing, and high-performance integrated antennas, AoP-based sensors provide accurate detection along with increased resolution and power efficiency.

This level of integration also boosts processing capabilities at the sensor edge, enabling more intelligent and compact radar systems.

AoP's Versatility Creates Greater Opportunities in RF Sectors

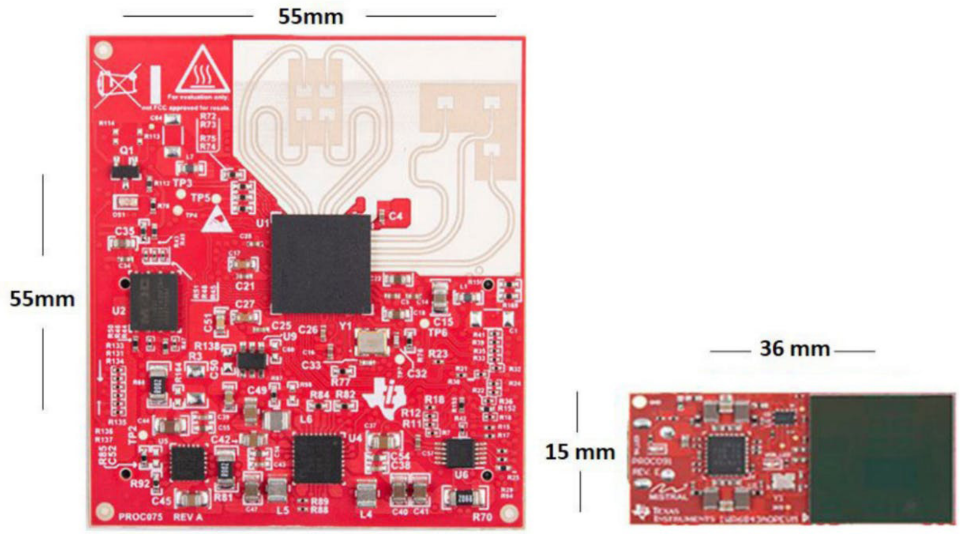
The band from 57 to 64 GHz (often referred to as the 60-GHz band) is the mmWave radar band with the most growth potential. The global 60-GHz market size reached $1.2 billion in 2024 and is expected to continue expanding to an estimated $3.5 billion by 2033 — an annual compound growth rate of 12.6%.

Advances in integrated system-on-package (SoP) solutions such as AoP offer a high degree of sensing accuracy and reduce design barriers for many developers. Other market drivers include the rapid adoption of AoP-based radar designs across diverse industry sectors and the convergence of AoP technologies with artificial intelligence and machine learning.

Let's look at the benefits of AoP in several different sectors and types of end equipment.

How AoP Advances Smart Homes and Buildings

Building automation — particularly smart homes *(Fig. 2)* and more efficient buildings — is the biggest non-automotive application for



1. A radar sensor with antenna on PCB (left) is compared to an AoP radar sensor (right). Texas Instruments

mmWave radar, and specifically AoP technology. Almost any connected device in a home can be made smarter by integrating more accurate presence, motion, and position sensing.

Some home and building products that would benefit from radar-based AoP technology include automatic doors, locks and keypads, lights, fans, appliances, indoor air-conditioning units, thermostats, TVs, and video doorbells. Being more aware of whether someone is in a room helps connected devices be more efficient and useful.

For example, lighting systems could use radar to adjust brightness based on actual presence, reducing energy waste compared to passive infrared motion sensors, which can't easily measure small movements.

Smart thermostats and heating, ventilation, and air-conditioning controls are able to sense activity levels, ensuring efficient heating and cooling for improved comfort and thereby potentially lowering energy costs. Security devices could also benefit from accurate intrusion detection and perimeter monitoring without capturing images, preserving user privacy.

AoP Sensors Make for Smarter Robotics

In robotics, AoP sensors for embedded gesture-controlled human-machine interfaces enable presence detection, classify hand gestures, and send the information to a processor. AoP saves space over PCB-based radar antennas because AoP-based designs can fit into small enclosures within autonomous guided vehicles, delivery robots, or small robotic arms.

The wider FOV and advanced processing contained in some AoP radar designs make it possible to incorporate environment sensing into robot systems. They also enable machines to make smarter decisions based on 3D detection of people and objects.

In Automotive Uses, AoP Sensors Deliver Versatility

To meet regulatory requirements specified by the European New Car Assessment Programme, automotive designers must use 60-GHz AoP sensors to accurately detect children and pets left inside vehicles. The very small form factor makes it possible to seamlessly integrate AoP sensors into different vehicle interior designs.

In addition, the placement of the sensors in a vehicle can detect intruders, enhance seat-belt reminders, detect driver fatigue or sleepiness, and monitor occupant conditions for enhanced comfort and airbag deployment.

The near-field sensing capabilities provided by 77-GHz AoP sensors can enable door and trunk obstacle detection. Furthermore, the sensors are able to detect parked cars and objects through entry-level blind-spot detection and comply with the functional-safety-related design requirements specified in International Organization for Standardization 26262, to Automotive Safety Integrity Level B.

AoP Sensors, AI, and the Internet of Medical Things

In healthcare applications, AoP radar devices can detect subtle changes in respiratory and heartbeat patterns, offer continuous sleeveless blood-pressure monitoring, and aid in the assessment of sleep-disordered breathing. When combined with the Internet of Medical Things and artificial intelligence, AoP radar provides noninvasive real-time monitoring of a patient's condition (such as heart and breathing rates) and enables analysis of intricate changes in collected data.

Contactless radar is sensitive enough to monitor the cardiopulmonary activities of premature infants with-

2. Shown is a conceptual modern home using radar in various applications. Texas Instruments out harming delicate skin. AoP-based systems can offer early warnings about irregular breathing rhythms that cause blood oxygen values to drop.

Finally, for aging populations, AoP-based systems offer continuous and noninvasive remote patient monitoring. The small-form-factor devices can detect the presence of chronic diseases, measure vital signs, and capture variations in responses that predict the onset of serious conditions. Radar-based smart sensors offer solutions for detecting falls and other events related to body movements.

AoP Radar Devices Free Up Design Resources

The Internet of Things is connecting and opening the door to even smarter devices. Radar sensors enable product developers to meet demand, while the need for accurate sensor data will lead to more applications for AoP radar devices. By eliminating the need to design a PCB-based antenna, reducing the size of designs, and increasing time-to-market, AoP can help expand the use of radar while allowing for system innovations elsewhere.

The design simplicity translates into lower signal losses, zero board-routing losses, and improved accuracy and range performance without the need for RF expertise. Meanwhile, the extremely small form factor will help unlock a range of new and more useful products with a small sensor footprint.

view this article online

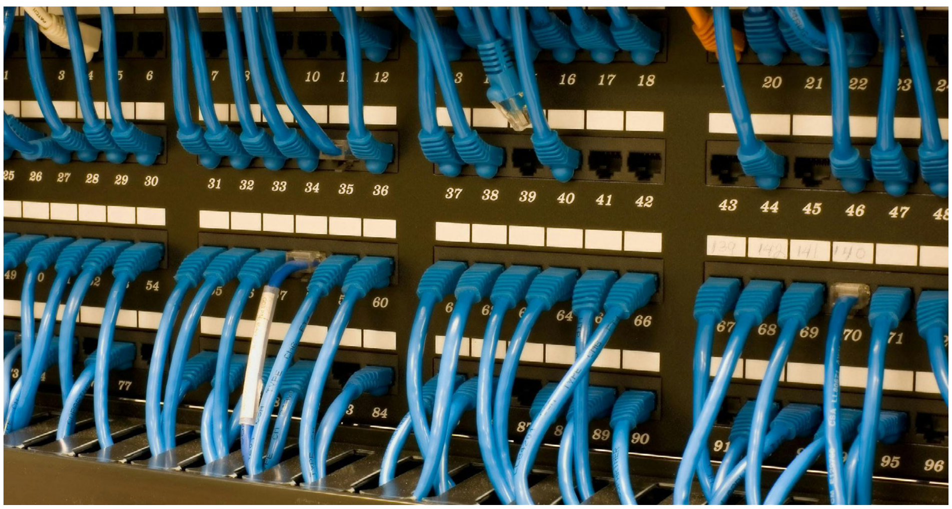
☞ BACK TO TABLE OF CONTENTS

CHAPTER 5

2026 Ethernet Forecast: Full Speed Ahead

AI continues to be a driving force for Ethernet developments. This article forecasts the opportunities and challenges Ethernet technology will face in 2026 to keep up with the AI demand.

DAVID J. RODGERS, Ethernet Alliance President and Events & Conferences Chair, *Ethernet Alliance*
PETER JONES, Chair, *Ethernet Alliance*



Dreamstime_Nikm_762111

In 2026, Ethernet's trajectory will be influenced by AI, rapid progress in standards and signaling technology, and its continued move into markets and applications beyond the data center. The convergence of these three factors suggests a time of expansion and innovation unlike any seen before. What follows explores how these forces will shape Ethernet throughout 2026.

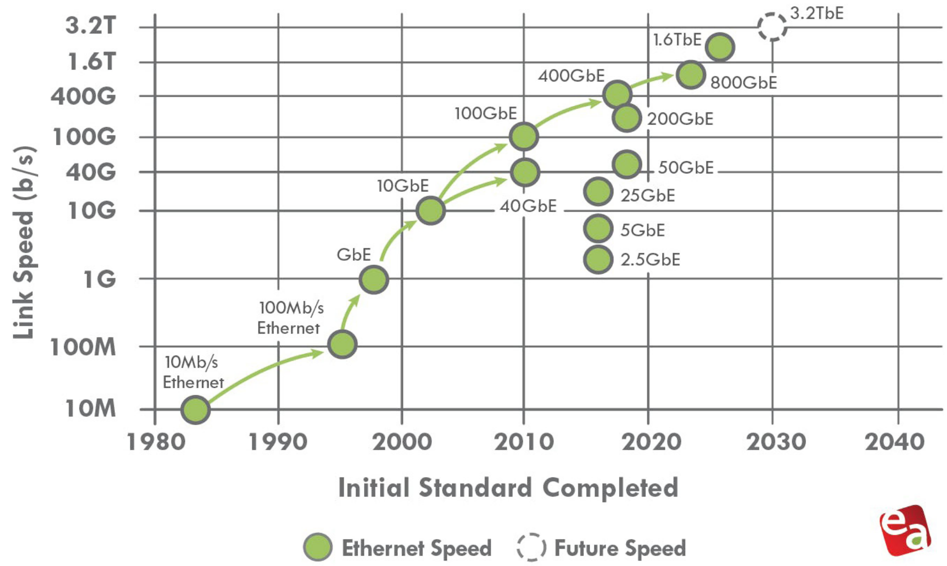
Escalating Ethernet

It should come as no surprise that Ethernet development continues to accelerate at an unheard-of rate. Even though IEEE 802.3 is still refining 200G/lane signaling specifications, consensus building around 400G/lane is well underway. What once felt like long-term planning is now happening in parallel.

With this exponential advancement, Ethernet has overtaken other interconnect technologies like Infiniband, making it the leader in "scale-out" AI networking. Connecting key AI functional blocks demands reliable, scalable, and interoperable products sourced from a broad and competitive market. Luckily, that openness and interoperability are at the heart of Ethernet's value proposition.

But the high-profile, high-speed hyperscale market is only the tip of the Ethernet iceberg. Momentum is building behind widely supported initiatives such as UA Link, Ultra Ethernet, and OCP's SUE-T and ESUN projects, fueling the world's unrelenting appetite for faster speeds. Add in the phenomenal proliferation of IoT devices — each with its own wired or wireless connection — across enterprise, industrial, and edge environments, and you've got the urgent need for an even more stable, predictable, and resilient Ethernet ecosystem.

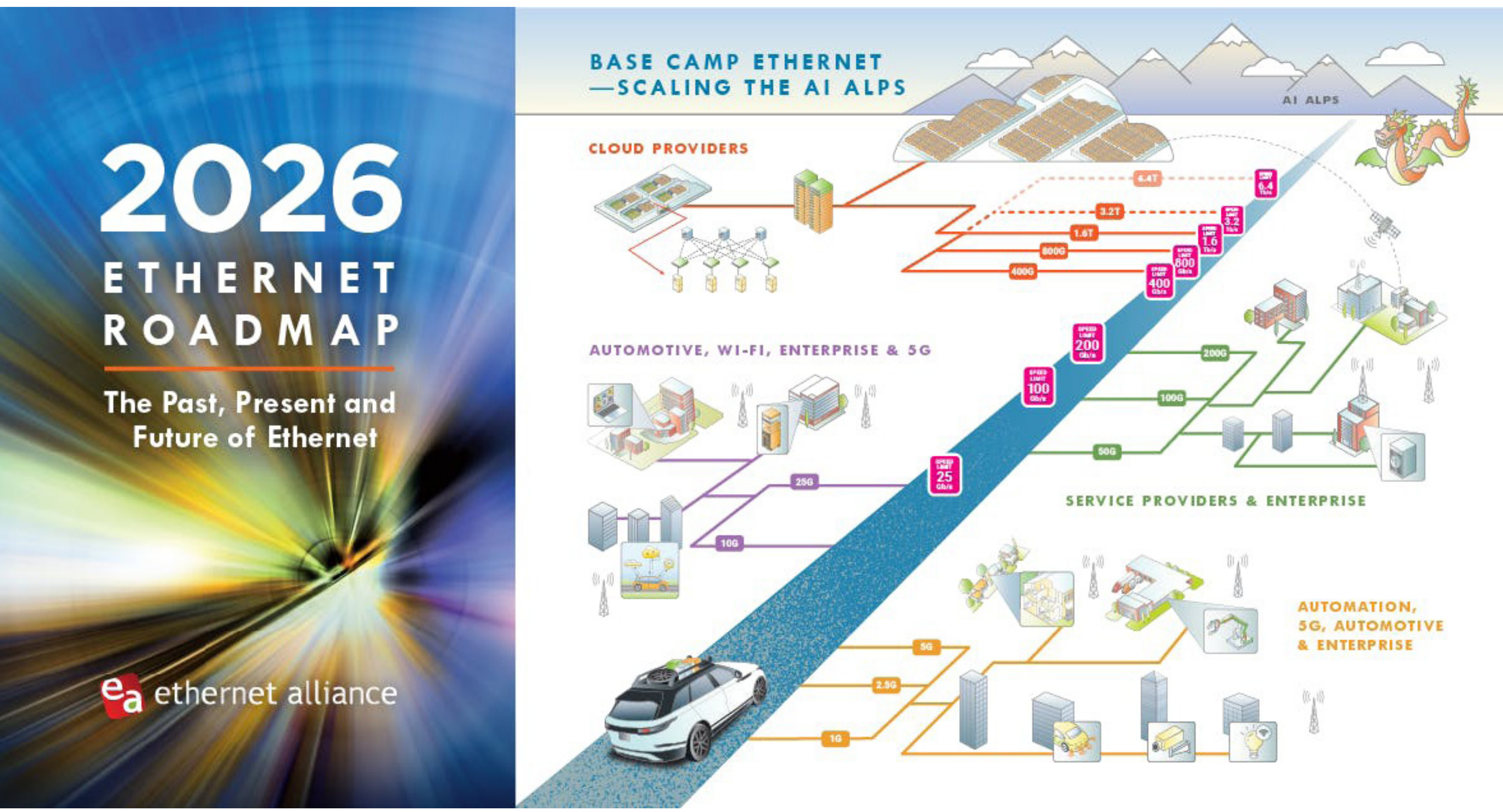
Despite the swift pace of Ethernet standards development, the hyperscale market is moving forward in advance of ratified global standards. As revealed during the Ethernet Alliance's recent *Technology Exploration Forum 2025 (TEF 2025): Ethernet for AI*, there's a near-insatiable demand for high-speed, low-latency interconnects that can support booming AI and ML compute workloads.



1. The past, present, and future of Ethernet speeds depicted in the Ethernet Alliance's 2026 Ethernet Roadmap. Ethernet Alliance

Hyperscalers will persist in actively pursuing customized solutions for intra-data-center optimization. However, interconnects spanning disparate physical locations will continue to rely on a robust catalog of stable, interoperable standards-based solutions.

The [Ethernet Alliance](#) [2026 Ethernet Roadmap](#) illustrates the balance between near-term innovation and long-term interoperability. Instead of focusing on a single outcome, it captures how the ecosystem is seeking continuous improvement in speed, reach, power efficiency, and deploy-



2. The Ethernet Alliance's 2026 Ethernet Roadmap details Ethernet's expanding role in AI, automotive, enterprise, cloud, manufacturing, and next-gen connectivity. Ethernet Alliance ment models while maintaining broad compatibility. The roadmap underscores Ethernet's evolution not just at the hyperscale core, but across the full range of applications that increasingly depend on it.

Scaling for What Comes Next

The 2026 Ethernet forecast is simple: AI, more AI, and even more AI.

The constraints shaping Ethernet's next phase aren't theoretical. They're physical, financial, and logistical:

- AI data centers and AI CPU orders are now being measured in gigawatts of power consumption.
- Leading semiconductor manufacturer TSMC estimates it can meet only a fraction of current demand for advanced-process devices.
- Wall Street thinks AI-driven hyperscaler capital spending may exceed $520B in 2026.
- The 10th most populous U.S. state, Michigan, just approved a contract to provide up to 1.4 GW for a single data center.
- Large power transformers required to support data center power demand are facing lead times exceeding two years.

Against that backdrop, Ethernet's presence in data centers continues to swell, with switch orders doubling between 2022 and 2025. Ethernet has moved ahead of InfiniBand in AI back-end networking, a trend that looks to be unstoppable at this point. Vendors are increasingly targeting scale-up networks previously dominated by proprietary interconnects, while 1.6-Tb/s switches are expected to ship in volume in 2026. And this may even end up being the year that co-packaged optics (finally!) gain ground.

On the standards front, IEEE 802.3 expects to complete IEEE 802.3dj, covering 200 Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s, by late 2026. At the same time, a 400-Gb/s/lane Signaling Call For Interest (CFI) is already scheduled for March.

There's active debate surrounding modulation approaches, but assuming PAM-6 for the moment and ignoring coding overhead, the math quickly becomes sobering. PAM-6 provides roughly 2.5 bits per symbol, implying symbol rates on the order of 160 GHz for 400G per lane. My friends in the SerDes and connector space tell me that at a wavelength of 0.12 mm, board and component design can get challenging pretty fast.

In other news, Ethernet's growth remains broad-based:

- The enterprise switch market is expected to exceed $30B in 2026.
- The industrial Ethernet market is expected to surpass $12B in 2025, with compound growth greater than 7% through 2032.
- Automotive Ethernet is projected to easily cruise on by the $3.3B mark in 2025 to $29.4B and a CAGR of more than 24% by 2035.

So, what's the bottom line? Ethernet is on the cusp of unprecedented growth, thanks especially to AI data center networks. Simultaneously, it remains the linchpin of enterprise, mobile, and home networking, with steady — if not vigorous — expansion across all three. It's also extending laterally into major segments such as industrial automation and automotive systems, while taking flight in emerging markets and applications, such as drones and spacecraft.

Never bet against Ethernet.

view this article online

BACK TO TABLE OF CONTENTS