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CTO technology trends 2025: Key trends driving the next wave of mobile technology

Charting the future of innovation

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As industries worldwide accelerate their digital transformation, mobile networks are facing unprecedented demands. From immersive applications to digital twins, autonomous operations and AI-powered decision-making, tomorrow's services will require connectivity that is faster, smarter and far more adaptable than ever before.
To meet these needs, mobile infrastructure will evolve – becoming autonomous, scalable and deeply integrated with the broader digital ecosystem. A digital stack that combines advanced connectivity with resilient clouds and artificial intelligence will play a key role, particularly with respect to the scalability of emerging applications.

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Over the past year, there has been significant progress in the evolution toward more tailored, reliable and intelligent mobile experiences. Advancements in the development of the horizontal architecture have played a key role. We now see increasing adoption of horizontally layered platforms that separate infrastructure from service logic. This architectural evolution has enhanced the agility of mobile networks, allowing features and services to be deployed more flexibly and independently across cloud environments and enabling innovation at a faster pace. Communication service providers (CSPs) can now more easily expose network capabilities through standardized application programming interfaces (APIs), laying the groundwork for dynamic, customer-centric service delivery.

Future mobile networks must meet the requirements of multiple stakeholders, ranging from individual consumers and enterprise clients to national governments. This means networks must not only be technically advanced, but also trusted, resilient and adaptable to varying regulatory and operational environments. At the same time, these networks can address a multitude of new business models.

Enterprises are increasingly demanding seamless integration between their digital systems, which requires an adaptable and flexible infrastructure. Governments need secure and sovereign solutions for critical services. Consumers expect seamless, high-performance experiences regardless of device or location. Mobile networks that are built around openness, autonomy and cost efficiency are uniquely positioned to meet all these demands.

Three megatrends driving technological evolution

Electrification, automation and digitalization are shaping the future of nearly every sector of the economy, from logistics to health care. Each of these relies fundamentally on mobile, cloud and artificial intelligence (AI) technologies to create a fully scalable digital stack. Electrification requires ultra-reliable, low-latency connectivity to manage distributed energy systems and ensure real-time responsiveness. Automation in sectors such as manufacturing, logistics and urban infrastructure depends on high-speed, deterministic communication to orchestrate machine-to-machine interactions and autonomous decision-making. Digitalization – the widespread transformation of processes, services and experiences into digital formats – requires scalable data infrastructure, seamless cloud integration and context-aware AI.

Mobile technology acts as the connective tissue between the three megatrends, enabling data to flow securely and efficiently and thereby bridging physical and digital worlds. Without high-performance mobile networks, the promise of smart factories, autonomous logistics or personalized public services would be out of reach.

Scaling digital transformation through mobile innovation

It is critical to understand that mobile connectivity does much more than support digital transformation – it also makes it scalable. Mobile connectivity unlocks the full potential of cloud and AI by delivering the responsiveness, coverage and programmability required to support advanced applications. In doing so, mobile networks unlock value not only for CSPs but also for enterprises, governments and consumers across sectors.

Consider, for example, a global logistics company deploying AI-powered predictive maintenance across its fleet. The insights rely on mobile networks to transmit real-time operational data from vehicles, analyze it in the cloud and push updates or alerts instantly to maintenance crews. This kind of cross-sector innovation hinges on the scalability and responsiveness of next-generation mobile systems.

Ericsson's vision for next-generation mobile networks

To meet the demands of the future, we are designing the next generation of mobile networks to be open, autonomous and energy-efficient. Standardized APIs will utilize the capabilities of the network to deliver the openness required to support business innovation. Programmability will make it possible for CSPs to tailor network behavior to meet the needs of specific use cases dynamically, in real time. Our commitment to energy efficiency will ensure minimal power consumption even with increasing performance demands.

These design principles unlock a new range of benefits, including enhanced reliability, availability and speed. They enable support for mission-critical use cases like rail control, assisted remote surgery and logistics. Intent-based management and control empower CSPs to adapt network resources dynamically, improve performance and reduce operational overhead by introducing a higher degree of autonomy in their networks. Priority-based, secure, tailored services allow for granular quality-of-service management, which is crucial in applications that deal with public safety, financial transactions or industrial automation.

Transformative network APIs

Perhaps the most transformative shift underway is the evolution of mobile networks into platforms through the introduction of standardized network APIs that enable developers to directly interact with network features such as latency, speed and location. By exposing these features through secure APIs, mobile networks become a canvas for innovation. Developers can create powerful new applications that are both context-aware and latency-sensitive, with the ability to respond to real-world conditions. This dramatically broadens the innovation ecosystem and lowers the barrier for new services to emerge, especially in high-value sectors such as finance, logistics, health care and manufacturing.

Spotlight on Aduna, a strategic partnership for network APIs

To ensure that our vision materializes on a global scale, Ericsson is collaborating closely with the world's leading CSPs in a joint venture called Aduna. Together, we have launched a global aggregator platform for network APIs that is designed to support a wide variety of applications with high availability, geographic reach and performance consistency. In its role as an aggregator, Aduna is positioned between CSPs and application developer platforms such as Vonage and Google Cloud.

Examples of anticipated use cases include:

- banking, where it will enable secure mobile transactions with network-verified user location and user ID to reduce fraud and simplify transactions
- emerging applications with Quality on Demand to power augmented reality/virtual reality collaboration, remote maintenance and smart city services.

Aduna

Aduna is an innovation catalyst that acts as both a showcase and accelerator for API-driven development, illustrating how standardized network APIs can be integrated into diverse application environments, driving rapid prototyping and adoption across the ecosystem. The goal is to unlock the full potential of mobile networks by transforming them into a global platform that can be used by both developers and enterprises to build new, differentiated services across sectors. From banking and logistics to manufacturing and immersive applications, Aduna is laying the groundwork for cross-industry innovation on a global scale.

Four emerging technology trends

As mobile networks evolve to meet the demands of a hyper-connected, data-intensive future, four emerging technology trends are set to redefine the telecommunications landscape:

1. Agentic AI is transforming operations and value creation through autonomous, goal-driven software agents.
2. Integrated sensing and communication (ISAC) is merging connectivity with sensing capabilities, opening up new services and use cases.
3. Optical and wireless innovations are driving end-to-end performance gains in speed, latency and energy efficiency.
4. Quantum computing is unlocking new computational powers to solve complex optimization and AI challenges.

These four trends are driving a shift toward intelligent, adaptive and highly capable next-generation mobile networks.

TREND #1: Agentic artificial intelligence is transforming the telecom value chain

The emergence of agentic AI marks a fundamental shift in how intelligent software systems are built and deployed. These AI agents can perceive their environment, make decisions and act to accomplish complex goals – often autonomously and in real time. What distinguishes them from earlier generations of AI is their capacity to continuously learn from contextual interactions, adapt to user preferences and operating environments, and collaborate with other agents to achieve more sophisticated outcomes. This collective intelligence enables proactive, hyper-personalized services at scale and across domains.

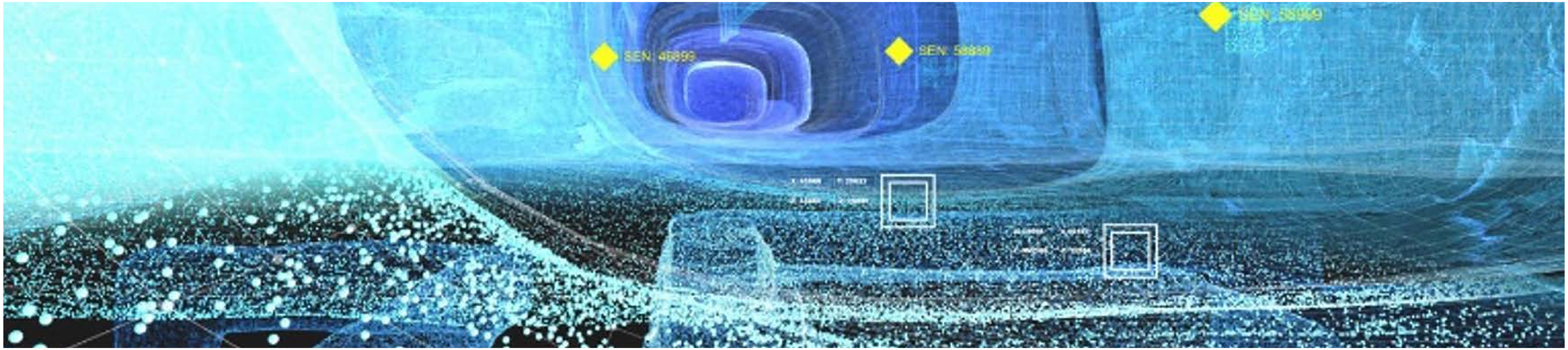
Agentic AI will enable a new layer of interaction across the digital economy. CSPs are uniquely positioned to support this shift because of their ability to deliver low latency, data sovereignty and security that extends beyond what global cloud platforms can offer. These capabilities will enable CSPs to offer tailored user experiences such as services on demand at scale, using edge-hosted infrastructure that is optimized for agent-based computing. This opens up new AI-native value chains, where enterprises and developers can deploy intelligent agents on the same edge infrastructure to exchange data or even drive operational decisions by autonomously negotiating service level agreements. Future AI marketplaces could emerge, offering registration, authentication and differentiated connectivity services to agents, enabling everything from secure inter-agent communication to closed-group interactions.

Traditional network management models are becoming increasingly ill-suited to the complexity of 5G and the coming wave of 6G. For the telecom sector, agentic AI promises to radically transform both network operations and service innovation. AI in networks and Autonomous Networks Level 4 will be used to drive service innovation to create tailored user experiences at scale. Embedding AI agents directly into these architectures can enable networks to self-optimize, predict and preempt faults and dynamically manage traffic and spectrum resources in real time.

As networks become increasingly autonomous, agentic AI will be central to programmable, interoperable architectures, where intelligent agents can actively orchestrate both infrastructure and services on demand. Beyond network operations, AI agents are accelerating research and development in everything from circuit and protocol design to new architecture exploration – offering a significant boost to innovation cycles.

As interoperability protocols for agent-to-agent communication and AI model context protocols gain traction, we can also expect an expansion into embodied, context-aware agent systems that will lay the groundwork for intelligent machines in robotics, spatial computing and industrial automation. Telecom infrastructure will be required to support these agents with contextual awareness and seamless coordination.

In this vision, telecom networks evolve into intelligent platforms that support not just connectivity, but cognition and autonomy. By embracing agentic AI, CSPs can increase efficiency, unlock new revenue models and play a central role in enabling the next generation of digital applications and services.



TREND #2: Integrated sensing and communication to deliver sensing capabilities at scale

The future of mobile networks will be shaped not just by their ability to transmit data, but also by their capacity to perceive and interpret the physical world. Integrated sensing and communication (ISAC) is a paradigm shift that merges these traditionally separate functions, allowing mobile infrastructure to serve both as a connectivity layer and a distributed sensing platform. This convergence opens the door to entirely new use cases and new value propositions for networks, enterprises and governments, as well as for CSPs.

Unlike standalone sensing systems, which require dedicated infrastructure and spectrum, ISAC makes use of the existing mobile network fabric – including base stations and transport layers – to deliver sensing capabilities at scale. The use of existing infrastructure offers both cost and operational efficiencies, and it significantly broadens the reach of sensing applications. As ISAC matures, telecom networks will be able to support services such as motion detection, environmental mapping, interference monitoring and radio frequency signal classification, all from the same physical layer that carries communications traffic.

The implications are far-reaching. Urban infrastructure could be augmented with real-time environmental awareness; critical infrastructure could benefit from persistent monitoring; and industrial automation systems could gain new sensory inputs for robotics, logistics and safety systems. Consumer-facing applications may include fall detection, vehicle tracking and drone regulation. These services can be layered on top of existing mobile networks, accelerating deployment timelines and return on investment. Importantly, ISAC also strengthens the performance of the communication function itself. By sensing how signals propagate through different environments, networks can dynamically optimize beamforming, interference management and cell shaping. This feedback loop enhances reliability and efficiency – two key metrics as networks evolve to meet 6G performance targets.

However, realizing ISAC's potential requires addressing several challenges. Technological barriers vary by use case; for example, detecting airborne objects is relatively straightforward due to the Doppler effect, while high-resolution environmental mapping is more complex. There is also a need for advanced signal processing algorithms, such as clutter suppression and for new standardized APIs that expose sensing data to external applications or fusion engines.

ISAC is already gaining traction in industry and standardization bodies like the 3GPP (3rd Generation Partnership Project), where early study items for 6G are being shaped. With the right focus on interoperability, infrastructure reuse and intelligent orchestration, ISAC could become a foundational element of next-generation networks – turning telecom infrastructure into an intelligent, multisensory platform.

By embedding the ability to sense into the very fabric of mobile networks, CSPs will not only improve service quality but also open up new markets and services that rely on real-time awareness of the physical world.

TREND #3: Optical and wireless innovations for ultra-fast connectivity

Optical components play a major role in enabling ultra-high-speed and low-latency data transmission. Optical radios that combine the capacity of optical fiber with the flexibility of radio transmission make it possible to deliver advanced wireless access over optical backbones. The integration of optical backbones with leading mobile technologies (5G and beyond) allows for vastly increased bandwidth, reduced latency and more stable connections for users. It is also possible to create hybrid infrastructures by blending wireless access with advanced optical networking.

The ongoing explosion in data traffic, fueled by AI-driven applications and real-time digital services, is placing immense demands on telecommunications infrastructure. This growth is not just a question of throughput; it is a matter of energy efficiency, latency and the ability to support diverse computing workloads across distributed architectures. Meeting these requirements calls for a foundational transformation of both networking and computing paradigms.

A holistic shift to a data-centric infrastructure (DCI) model redefines where and how computing happens. Instead of relying on centralized data centers, DCI enables intelligent data processing across a distributed fabric that spans clouds, edges and user premises. This approach allows networks to dynamically position processing power close to where data is generated and consumed – minimizing latency and improving energy efficiency. It also gives service providers the flexibility to build data pipelines that are both high-performance and cost-effective.

Optical networking plays a crucial role in enabling this distributed vision. Current interconnect technologies often introduce significant inefficiencies due to the volume and complexity of data they must handle. An all-photonic network addresses these challenges by using direct optical paths between endpoints, allowing for deterministic performance with drastically reduced energy usage and latency. This architecture means CSPs can integrate photonic network functions with precision and implement dynamic network control.

TREND #4: Quantum computing for telecom optimization is on the horizon

As mobile networks become increasingly intelligent with more diverse capabilities, their underlying computational demands are expanding rapidly. Future mobile systems will not only carry vast amounts of data but will also be expected to deliver ultra-low latency, extreme reliability and real-time responsiveness for increasingly AI-driven applications. This will require solving optimization problems that push the boundaries of classical computing – from network resource allocation to protocol design to predictive analytics. Quantum computing is poised to complement traditional computing architectures in meeting these challenges.

In the current era of NISQ (Noisy Intermediate-Scale Quantum) devices, we are exploring how quantum-inspired and hybrid quantum-classical approaches can unlock new efficiencies. Early use cases show promise in using quantum algorithms for network optimization and machine learning tasks. Tensor decomposition and other quantum-inspired methods, for example, are already proving useful in modeling and simulating complex network behaviors that are computationally intensive for classical compute systems.

Progress is also being made on the hardware front. Superconducting circuits, trapped ions and photonic quantum processors each offer different advantages in coherence, error rates and scalability. A key area of focus is quantum error correction – an important step toward building fault-tolerant quantum computing. Two main strategies are emerging: one that emphasizes scaling up hardware first and adding error correction later and another that integrates error correction from the outset to ensure long-term reliability and performance.

Hybrid quantum-classical architectures will be essential in the near to mid-term, especially in telecom environments where real-time responsiveness and large-scale system integration are critical. These architectures rely heavily on advanced interconnects – both optical and superconducting – to bridge quantum and classical components efficiently. In the context of telecom data centers, this means preparing for a future where quantum co-processors can be embedded into traditional infrastructure to accelerate specific workloads such as traffic engineering, spectrum management and signal detection.

Thermal management is another important consideration. The use of cryogenic refrigeration systems, such as dilution refrigerators, remains necessary for maintaining qubit stability. Fortunately, recent innovations are making these systems more compact, efficient and easier to integrate – reducing their energy footprint and operational overhead. At Ericsson, we are actively exploring these advances and working closely with academic partners to evaluate quantum technologies across hardware, algorithms and application domains. This collaborative approach ensures that as quantum computing matures, the telecom sector will be ready to harness its potential to drive new levels of network intelligence, performance and security.

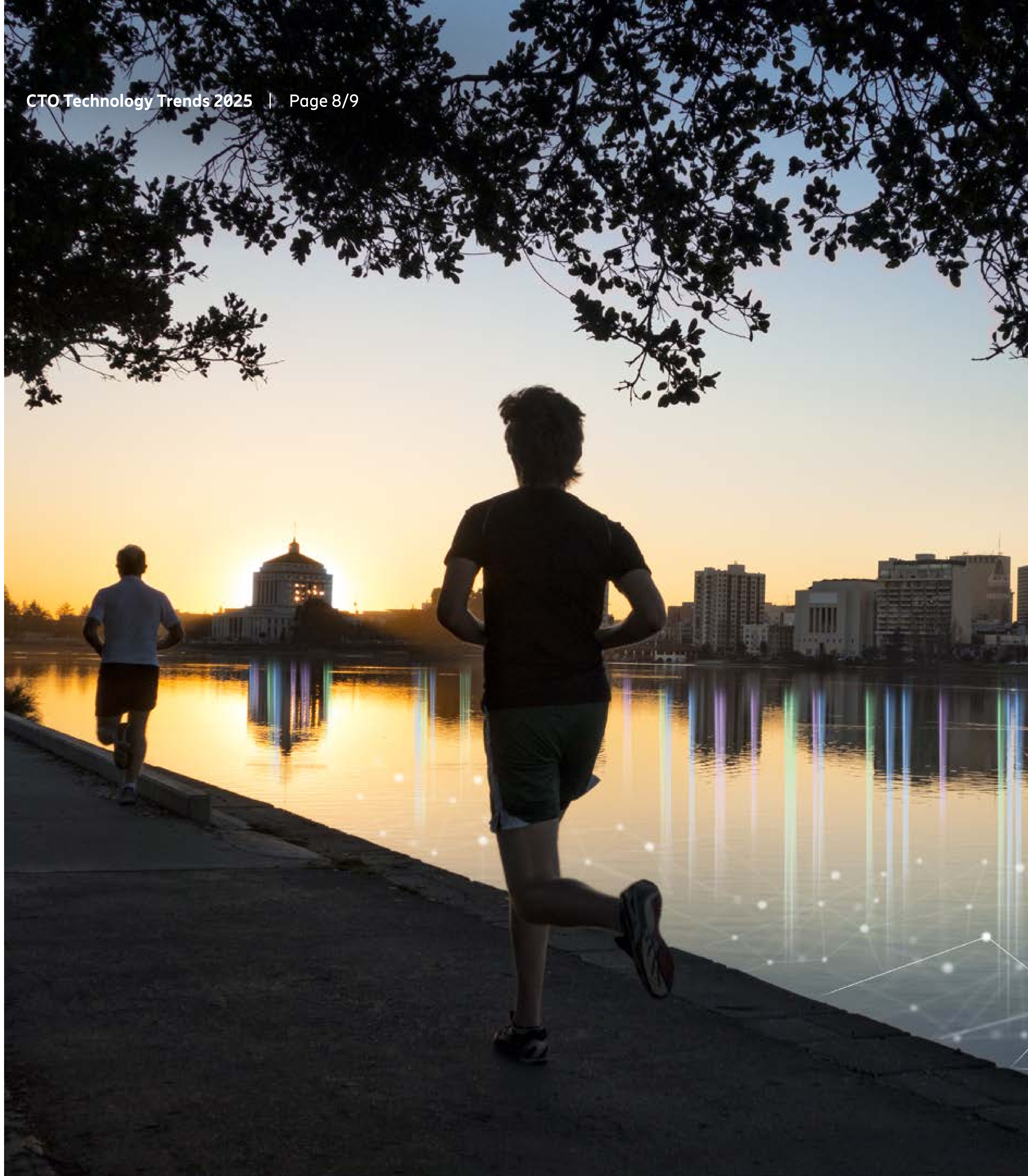
Quantum computing may still be in its formative stages, but its trajectory is clear. For CSPs navigating the next frontier of AI-driven networks and increasingly complex service ecosystems, engaging with quantum technologies today could yield significant competitive advantages tomorrow.

Conclusion

The combination of advanced connectivity, resilient clouds and artificial intelligence (AI) creates a powerful digital stack that will help shape the future of nearly every sector of society. Mobile technology is entering a pivotal phase, evolving from its traditional role as a communications backbone to become a catalyst for intelligent cross-sector innovation. The emerging forces of agentic AI, integrated sensing and communication, optical and wireless breakthroughs, and quantum computing are expanding both the performance and purpose of mobile networks.

At the same time, architectural shifts toward autonomous horizontal platforms and open application programming interfaces – supported by initiatives like Aduna – are unlocking new flexibility, speed and developer-driven innovation. For communication service providers, this presents the opportunity to deliver trusted, dynamic and differentiated services that create new value chains across industries.

The next wave of mobile innovation is not just about performance gains; it is about reimagining what networks can do. At Ericsson, we see this as an opportunity to shape a more intelligent, resilient and sustainable digital future.



The author

As Group CTO, Erik Ekudden is responsible for Group Strategy and Technology. His extensive experience of working with technology leadership globally influences the company's strategic decisions and its investments in 5G, 6G, edge computing, artificial intelligence, augmented/virtual reality and the Internet of Things. Ekudden's leadership builds on his decades-long career in technology strategies and industry activities. He joined Ericsson in 1993 and has held various management positions in the company, including Head of Technology Strategy, Chief Technology Officer Americas in Santa Clara (US) and Head of Standardization and Industry. He is also a member of the Royal Swedish Academy of Engineering Sciences and the publisher of Ericsson Technology Review.

Further reading

- Ericsson Technology Review, Exploring the potential advantages of quantum computing in telecommunication networks ↗
- Ericsson Technology Review, Enhancing developer experience to accelerate network automation ↗
- Ericsson white paper, ICT energy evolution: Telecom, data centers, and AI ↗
- Ericsson white paper, Differentiated connectivity: Unleashing the full potential of 5G ↗
- Ericsson white paper, Intent-driven networks is a key step in the journey to autonomous networks ↗
- Ericsson white paper, From CPaaS to a global network API platform, enabling CSPs to monetize on 5G ↗