Wi-Fi 8: Advancing wireless through ultra-high reliability

PART 1: Discover the key innovations behind Wi-Fi 8 and why they matter

Qualcomm

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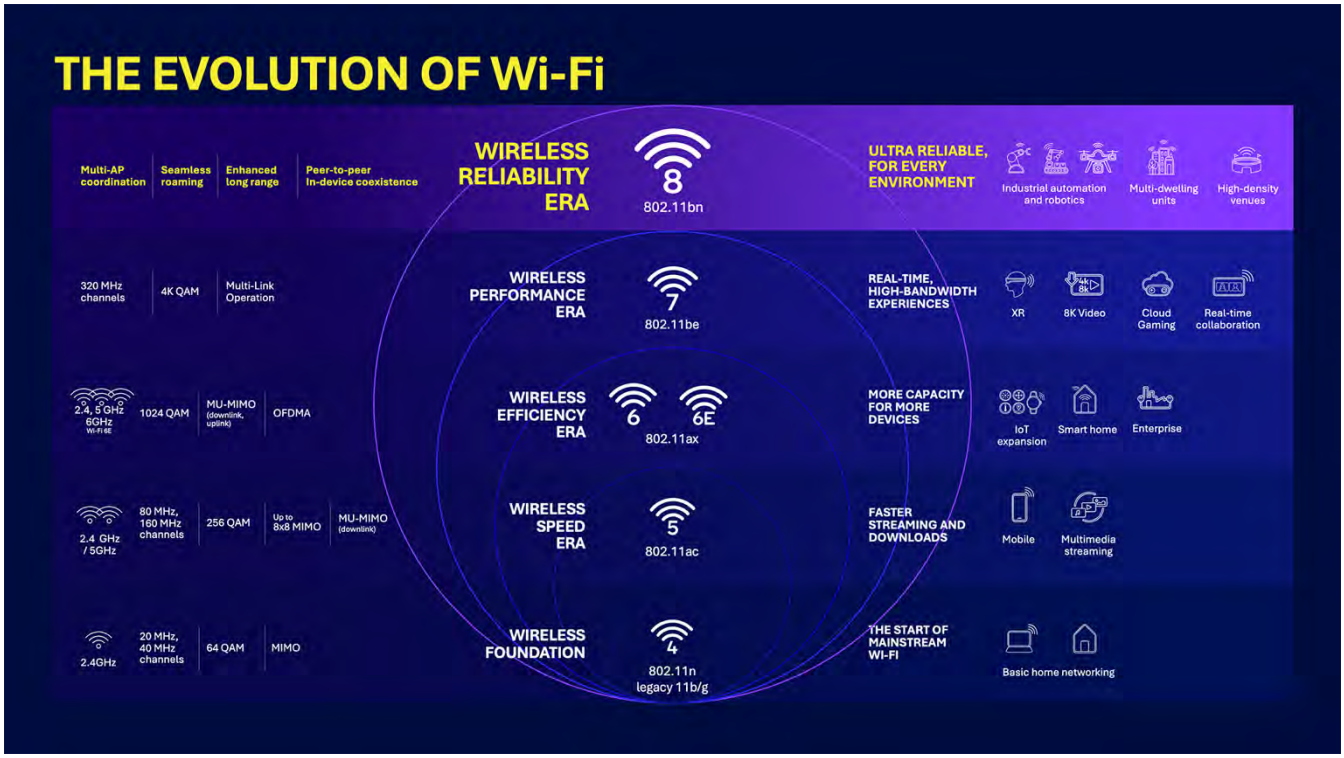
What you should know:

- Wi-Fi 8 is being defined to prioritize reliable performance in challenging real-world conditions, enhancing connectivity even in congested, interference-prone and mobile environments.
- Wi-Fi 8 introduces breakthrough innovations like seamless roaming, edge performance optimization and multi-access point coordination — designed to deliver wired-grade reliability for mission-critical applications in enterprise, home and large-scale venues.
- Expected to be finalized in 2028, IEEE802.11bn will serve as the foundation for Wi-Fi 8 — with Qualcomm playing a key role in shaping the standard, driving innovation and enabling the technologies behind it.



In the world of wireless connectivity, speed has long been the headline feature. Wi-Fi 7 pushed the boundaries of peak performance, delivering exceptional throughput and low latency. But as AI becomes more deeply woven into the systems that shape how we live and work — as real-time responsiveness becomes essential to everything from automation to collaboration, and as users and devices demand seamless connectivity on the move — expectations for wireless connectivity are shifting.

Wi-Fi 8 marks a fundamental pivot — moving beyond peak speeds to prioritize reliable performance in challenging real-world conditions. It's designed to deliver consistent, low-latency and near-lossless connectivity even in highly congested, interference-prone and mobile environments.

Building on over two decades of wireless innovation, Wi-Fi 8 refines and extends the capabilities of its predecessors to meet the demands of mission-critical, AI-driven systems and dynamic use cases. It's designed to bring Wi-Fi closer than ever to the reliability and responsiveness of wired infrastructure.

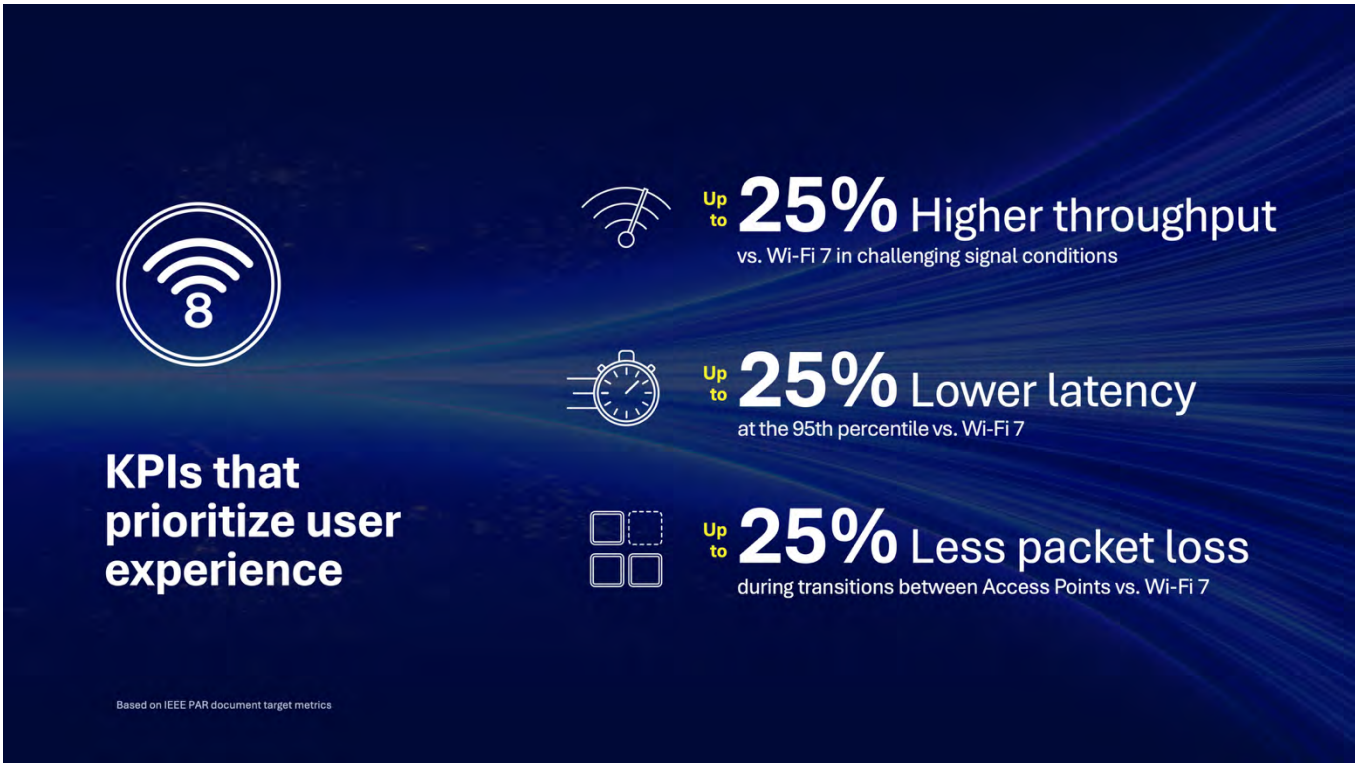
Elevating Wi-Fi to new heights: Introducing IEEE802.11bn

Wi-Fi standards are developed by a global group of engineers and technologists who collaborate within the IEEE802.11 standards body. Leading technology companies — including Qualcomm— are actively contributing to the development of the underlying standard for the next-generation Wi-Fi: Wi-Fi 8. This effort is being led by Task group IEEE802.11bn under the initiative known as 'Ultra High Reliability' (UHR).

UHR represents a bold vision to elevate Wi-Fi performance to new heights. The IEEE scope document that guides the development of the standard outlines a clear goal: to make wireless connections faster, more responsive and more robust.

With today's standards, Wi-Fi can claim impressive performance metrics: multi-gigabit throughput, sub-10 millisecond latency and packet loss rates below 0.1%. Even so, Wi-Fi 8 aims to go further by improving performance by a measurable leap not only compared to Wi-Fi 7, but by doing so in the most challenging scenarios. According to the IEEE scope document, Wi-Fi 8 will introduce:

- Up to 25% higher throughput in challenging signal conditions.
- Up to 25% lower latency at the 95th percentile of the latency distribution.
- Up to 25% fewer dropped packets during transitions between access points.



These enhancements are designed to support both isolated and overlapping network deployments, with a focus on environments characterized by congestion, interference, user mobility and coverage boundaries. The standard also introduces improvements in power efficiency, peer-to-peer communication and mobility — all critical for emerging applications.

Why Wi-Fi 8: The need for ultra-high reliability

As we look ahead to 2028 and beyond, Wi-Fi networks will need to support new classes of devices, greater mobility with those devices and mission-critical applications. Wi-Fi 8 is designed to rise to this challenge, delivering enhanced performance and reliability across a wide range of environments. This next-generation technology will be pivotal in enabling intelligent, mobile workspaces in enterprise settings; immersive and essential applications in connected homes; and seamless, high-density connectivity in public spaces. Just as importantly, Wi-Fi 8 is designed to support transformative trends, such as the proliferation of peer-to-peer device communications and the rise of AI-driven services, applications and devices.

Transformative trends:
Wi-Fi 8 as the foundational connectivity fabric

Beyond today's understood connectivity needs two trends are set to dramatically increase the density and dynamism required of local Wi-Fi networks.

- **The proliferation of personal device ecosystems:** AR glasses, health monitors and next-generation wearables are accelerating demand for high-throughput, low-latency peer-to-peer links. These devices often offload compute-intensive tasks to companion devices, requiring seamless, short-range wireless performance.
- **The rise in AI-driven systems:** Whether wearable, embedded in smart environments or autonomous, AI-driven systems demand reliable, low-latency connectivity to access edge or cloud-based AI for real-time inference. These intelligent systems are increasingly central to how we interact with the world around us.

Wi-Fi 8 is being defined to serve as the foundational connectivity fabric that enables these ecosystems to thrive.

Advancing Wi-Fi for real-world deployments: New capabilities with 802.11bn

Turning this vision into reality depends on the new capabilities being standardized in 802.11bn, which advance Wi-Fi performance across five critical dimensions that matter most in real-world deployments.

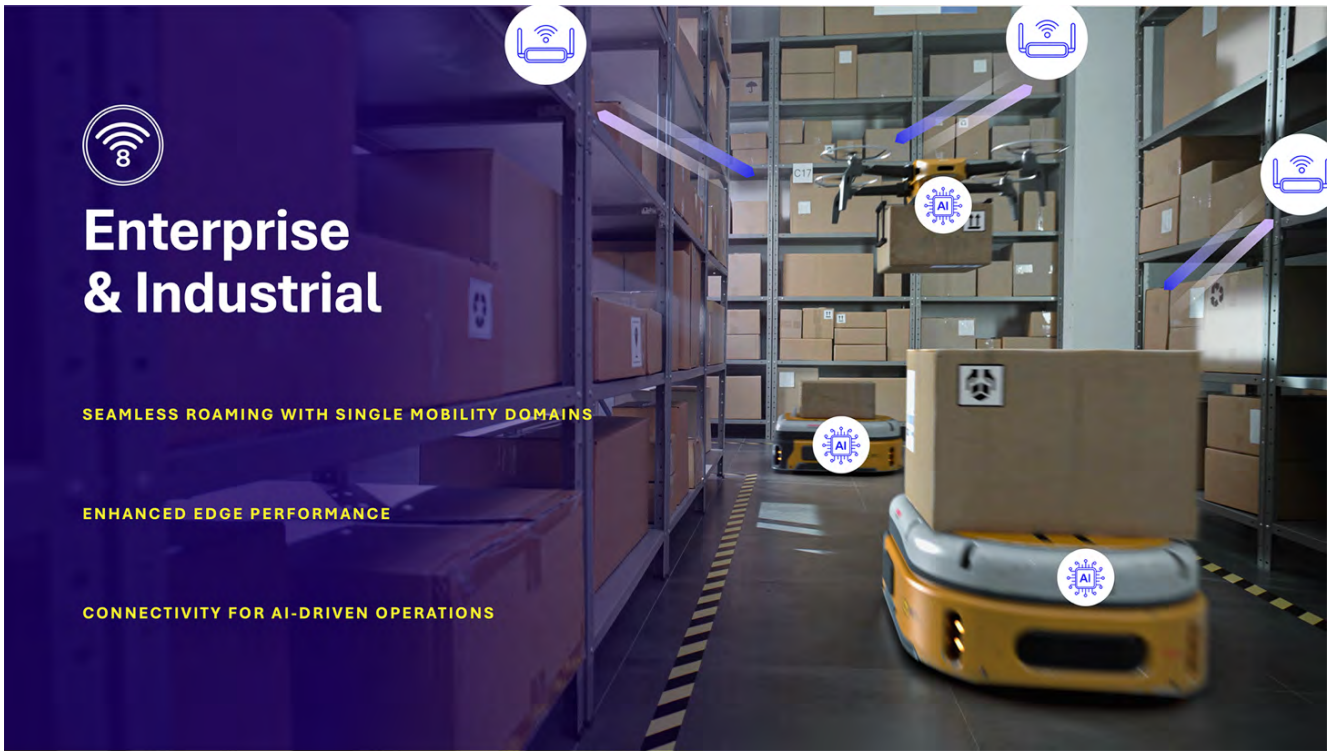
- **Seamless roaming:** 802.11bn introduces a transformative approach to mobility through the concept of Single Mobility Domains, enabling seamless roaming across multiple access points. This allows devices to provide a “once connected, always connected” experience by maintaining continuous, low-latency connections as they move — without the interruptions or packet drops caused by traditional handoffs.
- **Reliable coverage at the edge:** Another important innovation vector in the 802.11bn standard is the focus on enhancing edge performance — the ability of a Wi-Fi network to maintain reliable, high-quality connectivity for client devices operating under non-ideal signal conditions. This is especially important for client devices operating at the outer boundaries of AP coverage or in environments with signal degradation due to distance, interference or power limitations. The standard addresses these challenges with a range of physical layer enhancements that work together to strengthen performance at the edge.

- **Smarter coordination for dense deployments:** In high-density environments, such as enterprise campuses, apartment buildings and public venues, Wi-Fi networks can face challenges with overlapping signals and airtime contention. These conditions can lead to latency spikes, degraded throughput and overall user experience. Wi-Fi 8 tackles this head-on with one of its most important innovations: multi-AP coordination. By enabling APs to operate collaboratively rather than independently, Wi-Fi 8 introduces a smarter, more efficient way to access the medium and share resources between access points, providing a consistent user experience.
- **Improved in-device coexistence:** Modern devices increasingly integrate multiple radios (Wi-Fi, Bluetooth, UWB), creating new coexistence challenges, such as disruptions on one technology while the shared antenna is used for another technology. Wi-Fi 8 introduces improved in-device coexistence to ensure smoother operation when multiple radios share antennas or spectrum, gracefully handling the temporary outages when the antenna is used for another technology.
- **Smarter energy use:** As W-Fi becomes more central to everyday life, power efficiency is critical for extending battery life of client devices and mobile APs and reducing energy consumption of fixed APs and residential gateways. Wi-Fi 8 introduces new features that make wireless connectivity more energy-aware without compromising responsiveness.

Where Wi-Fi 8 will make the biggest impact

Wi-Fi 8 is poised to transform wireless performance across the environments that need it most.

- **Enterprise connectivity — enabling intelligent, mobile workspaces:** From smart factories and hospitals to logistics hubs and corporate campuses, enterprise environments are entering a new era of mobility, intelligence and automation. Wi-Fi 8 is designed to deliver the reliability and performance of wired infrastructure, with innovations that allow a new class of mission-critical use cases — such as collaborative robots, industrial automation systems, drones and autonomous-guided vehicles (AGVs) to operate without interruptions — even while in motion. This marks a fundamental shift. Wi-Fi is no longer just a convenience layer, but the core infrastructure enabling real-time decision-making, autonomous operations and AI-driven workflows at scale.



- **Home connectivity — powering immersive and critical home applications:** The connected home is evolving into a platform for immersive and increasingly essential services. From predictive automation to real-time health monitoring, these services increasingly rely on AI to become context-aware, predictive and responsive, placing unprecedented demands on residential wireless networks. Wi-Fi 8 will make it possible to deliver these experiences consistently, even in high-density settings like multi-dwelling units (MDUs), where interference and congestion have traditionally limited performance.

- **Public spaces — delivering seamless mobility in high-density environments:** Venues like airports, stadiums and transit hubs are evolving into hyper-connected environments. Users will expect uninterrupted access to services including live video sharing, augmented reality (AR) navigation, real-time translation and immersive visitor experiences while on the move. These venues increasingly rely on wireless infrastructure to support critical safety systems, video surveillance, sensor networks, emergency communications and real-time tracking of people and assets. Wi-Fi 8 will be essential to delivering seamless mobility and consistent performance, enabling users to stay connected while moving through expansive spaces and ensuring that critical operations run smoothly, even during peak usage times.

The road ahead

The development of the 802.11bn standard is a collaborative effort within Working Group 802.11, involving an unprecedented number of contributors. Steady progress is being made with high-level consensus already achieved on a significant portion of the new standard, while other elements remain under discussion. Going forward, the 802.11bn task group will be busy finalizing a solid and high-quality basis of the future Wi-Fi 8 generation — a generation that is again anticipated to be used in billions of devices in the next decade.

As the standard continues to evolve, Qualcomm remains at the forefront — driving innovation, shaping the specification and delivering the technologies that will bring this vision to life.

About the author

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Rolf De Vegt is currently VP of Technical Standards at Qualcomm Technologies, Inc. With over 30 years of telecommunication and semiconductor industry experience, he leads technology standard development for key technologies in the connectivity semiconductor business unit and leads Qualcomm participation in IEEE802.11 standardization.

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