

Wi-Fi 7 for the Enterprise

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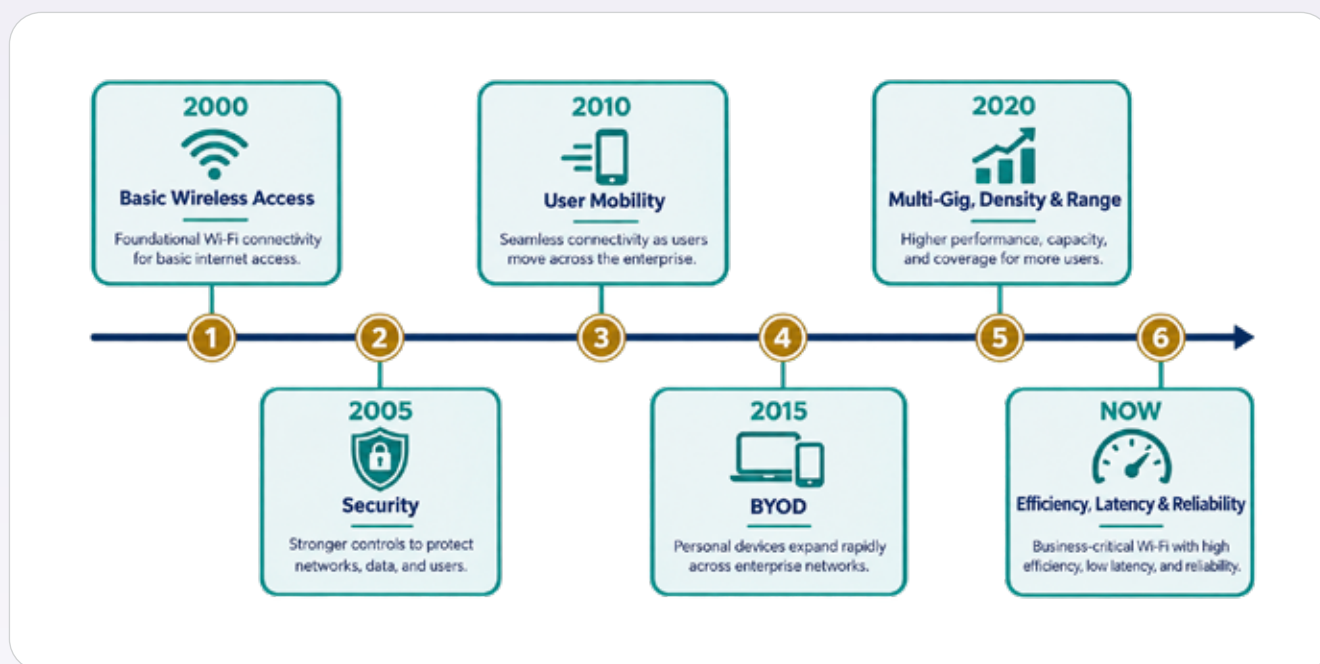
Executive Summary

Enterprise Wi-Fi requirements have evolved dramatically over the past two-and-a-half decades, from basic wireless access in the early 2000s to today's demands for high efficiency, low latency, high reliability, high client density, extended range, multi-gigabit link rates, seamless user mobility, and robust security. In response, Wi-Fi has evolved considerably over the years, and Wi-Fi 7 (IEEE 802.11be) is the latest iteration in this journey. This white paper explains what Wi-Fi 7 is, why it matters for enterprises, where it delivers the greatest impact, and how IO by HFCL, HFCL's enterprise networking solution, brings Wi-Fi 7 to market with a unified, AI-driven management platform.

This paper is organized in three parts: first, the technical foundations of Wi-Fi 7 and how they differ from prior generations; second, the resulting enterprise benefits and the industry verticals where they matter most; and third, the IO by HFCL solution components that put these capabilities into production networks.

1. The Evolution of Enterprise Wi-Fi Requirements

Today's enterprises need to support a large number of concurrent clients with high throughput and low latency. Higher reliability is essential for mission-critical applications, and robust security combined with seamless mobility is now a baseline expectation rather than a differentiator.



2. The Road to Wi-Fi 7

Wi-Fi technology has undergone significant transformation since its introduction, with peak data rates multiplying generation over generation. This has been achieved through a combination of higher-order modulation schemes, multi-user and multi-stream transmission techniques, additional spectrum, and increasing channel bandwidth.

Generation	Standard	Year	Key Advances	Approx. Peak Rate (Gbps)
Wi-Fi 1 & 2	802.11a/b	1999	OFDM in 5 GHz; OFDM in 2.4 GHz	0.054
Wi-Fi 3	802.11g	2003	WPA security; faster data rates; better range and reliability	0.054
Wi-Fi 4	802.11n	2009	Dual-band operation; SU-MIMO (4x4); 40 MHz channels	0.6
Wi-Fi 5	802.11ac	2013	Dual-band operation; SU-MIMO (8x8); 160 MHz channels	6.9
Wi-Fi 6/6E	802.11ax	2021	OFDMA, MU-MIMO; 8x8 UL/DL; BSS Coloring; TWT; 6 GHz band	9.6
Wi-Fi 7	802.11be	2024	320 MHz channels; 4K-QAM; Multi-Link Operation (MLO); 16x16 MIMO	46 (up to 16x16 MIMO)

Peak PHY data rates by Wi-Fi generation (Wi-Fi Alliance / IEEE 802.11 generational data).

3. Wi-Fi 7 (802.11be): Technical Foundations

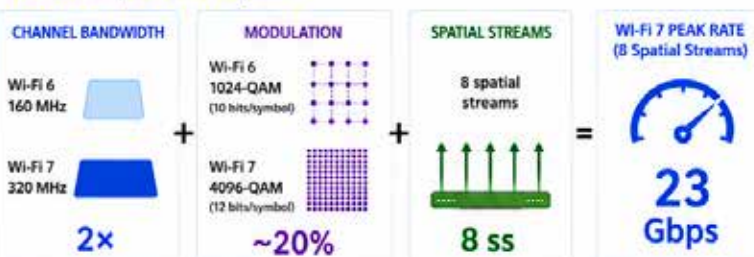
Wi-Fi 7 builds on the Wi-Fi 6/6E foundation with four principal technical advances: higher peak data rate, preamble puncturing, multi-Resource Unit (multi-RU) allocation, and Multi-Link Operation (MLO).

1 4.1 PEAK DATA RATE

Wi-Fi 7 roughly doubles peak throughput relative to Wi-Fi 6 through wider channels and higher-order modulation.

- **2x** increase in peak rate from 160 MHz to 320 MHz channel bandwidth.
- **~20%** increase from higher-order modulation using 4K-QAM.
- 320 MHz channel, 4K-QAM, and 8 spatial streams deliver **23 Gbps** peak rate.

How Wi-Fi 7's peak rate is composed

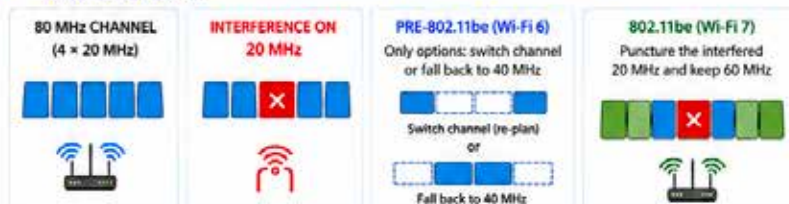


★ A theoretical 46 Gbps is achievable with 16 spatial streams. This configuration is defined within the scope of the 802.11be standard but is not included in the current Wi-Fi Alliance certification specification for Wi-Fi 7 products.

2 4.2 PREAMBLE PUNCTURING

Preamble puncturing lets a Wi-Fi 7 AP exclude an interfered sub-channel and continue using the rest of the band, preserving capacity.

Preamble puncturing lets a Wi-Fi 7 AP retain 60 MHz of an 80 MHz channel instead of falling back to 40 MHz.



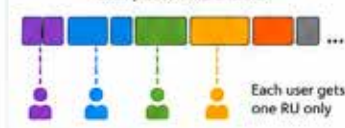
3 4.3 MULTI-RU ALLOCATION

Wi-Fi 6 assigns one fixed-size RU per user. Wi-Fi 7 can combine multiple RUs for a single user, improving efficiency and enabling application-aware allocation.

RU SIZES (tones)

- 26-tone
- 52-tone
- 106-tone
- 242-tone
- 484-tone
- 996-tone

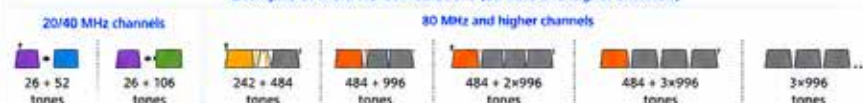
Wi-Fi 6 (802.11ax) — Single RU per User
Example: 80 MHz Channel



Wi-Fi 7 (802.11be) — Multi-RU per User
Example: 80 MHz Channel



Examples of Multi-RU Combinations (80 MHz and higher channels)



Multi-RU works with preamble puncturing in OFDMA mode.

4 4.4 MULTI-LINK OPERATION (MLO)

The three Wi-Fi 7 MLO modes

Prior to Wi-Fi 7, a client connected over a single band and link. MLO allows a client to connect across multiple bands and links simultaneously. Wi-Fi 7 defines three operating modes.



4.4.1 MLSR (Multi-Link Single-Radio)
One radio, multi-band client; uses one link at a time.



4.4.2 eMLSR (Enhanced Multi-Link Single-Radio)
One radio; senses all links (2.4/5/6 GHz) and uses one link at a time with very fast switching.



4.4.3 MLMR (Multi-Link Multi-Radio)
Multi-radio client; uses all available links at the same time.



MLMR operation: asynchronous vs. synchronous.



4. Wi-Fi 7 for the Enterprise: Business Impact

The technical capabilities described above translate directly into three categories of enterprise benefit: higher capacity and client density, greater efficiency and reliability, and lower latency.

4.1) High Capacity and Client Density

Wi-Fi 7 Capability	Key Advances
320 MHz channel	Twice the throughput compared to Wi-Fi 6.
4K-QAM	20% increase in peak throughput; less airtime for the same amount of data, supporting more concurrent users.
MIMO	More users can be multiplexed in a frame using MU-MIMO, and more users can be scheduled in a frame overall.

4.2) High Efficiency and Reliability

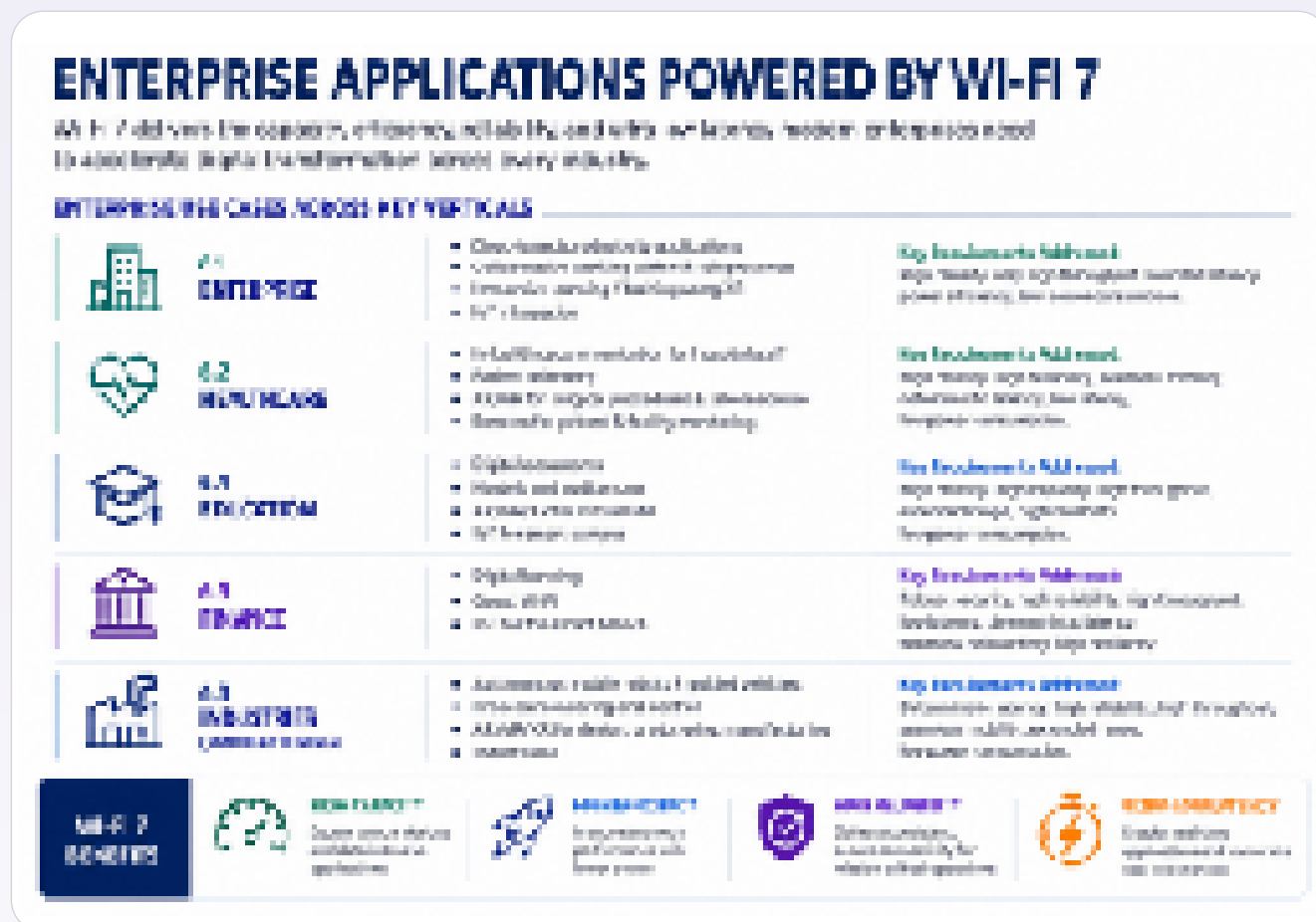
Wi-Fi 7 Capability	Key Advances
Multi-RU	Flexible resource allocation as per user and application needs; reduces resource wastage when load is low or medium.
Preamble Puncturing	Gracefully avoids narrow-band interference within a channel; increases the usable capacity of wideband channels.
MLO	Uses the best available link(s) based on availability, load, capacity, and application needs; provides implicit band steering of clients across radios by switching the active link.

4.3) Low Latency

Wi-Fi 7 Capability	Key Advances
320 MHz channels & 4K-QAM	Less airtime required per unit of data, resulting in lower round-trip times.
MIMO	More users multiplexed in the spatial domain, reducing overall latency.
Multi-Link Operation (MLO)	Faster channel access when multiple links are available, and the ability to use the best link for latency-sensitive traffic.
Multi-RU (combined with OFDMA)	Dynamic resource allocation matched to application requirements, resulting in more efficient airtime utilization and lower channel access delay.

5. Wi-Fi 7 Applications Across Industry Verticals

Because Wi-Fi 7's benefits (capacity, efficiency, reliability, and latency) map differently onto different use cases, its impact varies by industry. The figure below summarizes priority use cases and their corresponding Wi-Fi requirements across five verticals.



Across these verticals, Wi-Fi 7 delivers four consistent benefits: high capacity (supports more devices and data-intensive applications), high efficiency (improves network performance with lower power), high reliability (delivers consistent, secure connectivity for mission-critical operations), and ultra-low latency (enables real-time applications and immersive user experiences).

6. IO by HFCL: Leading the Way in Wi-Fi 7 Innovation

6.1) Enterprise Solution Components: One Network, Complete Connectivity, Management & Security

Device Portfolio

- ✓ Wi-Fi 6 and Wi-Fi 7 indoor and outdoor access points for reliable, high-density wireless connectivity.
- ✓ Managed, PoE/PoE+ commercial and industrial switches for secure, scalable wired connectivity.

Flexible User Onboarding: Control Access and Protect the Network

- ✓ AAA: Authentication, Authorization, and Accounting for secure identity-based network access and policy control.
- ✓ Captive Portal: Simplified user onboarding and controlled guest access with customizable engagement capabilities.
- ✓ Firewall: Advanced network security to protect users, applications, and infrastructure from network threats.

6.2) IO Canvas: A Unified Cloud Network Management System

IO Canvas provides single-pane-of-glass management for both access points and switches, through a vendor-agnostic controller powered by TIP OpenWiFi:

- ✓ Customizable deployment choices tailored to customer needs.
- ✓ A built-in captive portal for guest Wi-Fi, alongside seamless integration with third-party captive portals and Network Access Control (NAC) systems.
- ✓ An intuitive UI/UX for configuration and monitoring.
- ✓ A highly scalable, centralized Network Management System (NMS) with combined wired and wireless visibility.

6.3) AI-Driven Network Assurance

Without AI-driven tooling, large-scale network operations tend to be inefficient. IT teams spend the majority of their time gathering information rather than providing suggestions or resolutions, often without meaningful network insights, driving up operational expense. IO Canvas integrates a purpose-built AI engine to invert this ratio, delivering:

- ✓ 24/7 predictive network analytics
- ✓ Easy troubleshooting
- ✓ Simplified insights
- ✓ Network maintenance without requiring subject-matter-expert (SME) intervention for every issue
- ✓ Reduced operational expense

Without AI	With IO Canvas AI Engine
Difficult to manage large-scale networks	24/7 predictive network analytics
Inefficient operations	Easy troubleshooting
Most time spent gathering information rather than resolving issues	Simplified insights
No network insights	Network maintenance without SME intervention
High operational expense	Reduced operational expense

6.4) 6.4 HFCL Product Portfolio

The IO by HFCL portfolio spans indoor and outdoor Wi-Fi 6/7 access points and PoE/non-PoE switches, unified under IO Canvas management and backed by HFCL's broader networking heritage: from passive optical components to active networking products, deployed across more than 60 countries.

7. Conclusion

Wi-Fi 7 represents the most significant leap in enterprise Wi-Fi capability since the introduction of OFDMA and MU-MIMO in Wi-Fi 6. Wider 320 MHz channels, 4K-QAM, preamble puncturing, multi-RU allocation, and Multi-Link Operation combine to more than double peak throughput while materially improving efficiency, reliability, and latency: the exact requirements enterprises have been accumulating over the past two-and-a-half decades.

But radio-layer performance is necessary, not sufficient. Enterprises need unified visibility across multi-vendor, hybrid networks; AI-driven assurance that reduces mean time to resolution; and a device portfolio that lets them adopt Wi-Fi 7 at the pace their client ecosystem allows. IO by HFCL is built to deliver exactly this combination: pairing a Wi-Fi 6/7 hardware portfolio with the TIP OpenWiFi-based IO Canvas platform and AI-driven network assurance, so that enterprises can capture the full value of Wi-Fi 7, not just its headline data rate.

Get Your Network Assessment Done Today

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