

Mist Wi-Fi 7 Guide

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Mist Wi-Fi 7 Guide

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About This Guide

Use this guide to familiarize yourself with Wi-Fi 7's new and updated features. We provide a high-level view, a look at what's changed, and then a look at Wi-Fi 7 features in detail. You can also get some helpful tips about network design, choosing the right AP, and configuring Wi-Fi 7 in Mist.

Documentation Conventions

For information about the notice icons and text and syntax conventions used in the documentation, see [Documentation Conventions](#).

1

CHAPTER

Wi-Fi 7 Fundamentals

SUMMARY

Use the information in this topic to help you find what you want to know about Wi-Fi 7. You can choose from the top tasks below, or simply scroll through the guide from top to bottom.

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The IEEE 802.11be Extremely High Throughput (EHT) standard, more commonly known as Wi-Fi 7, introduces new features and delivers several major improvements over Wi-Fi 6 and Wi-Fi 6E. Check out the video below for a discussion of Wi-Fi 7 with Peter MacKenzie and Wes Purvis.



Video: [Introducing the Power and Scale of Wi-Fi 7](#)

What Do You Want to Do?

Table 1: Top Tasks

If you want to...	Use these resources:
Get an overview of Wi-Fi 7 features <i>See a bulleted list of new and updated features in Wi-Fi 7.</i>	"Wi-Fi 7 Introduction" on page 3
Learn what changed between the Wi-Fi 6 and Wi-Fi 7 standards <i>Compare how the common features changed between the Wi-Fi 6 and Wi-Fi 7 standards.</i>	"What Changed—Wi-Fi 6E to Wi-Fi 7" on page 4
See Wi-Fi 7 features in detail <i>EHT, wider channels, MLO, 4k QAM, and more.</i>	"Wi-Fi 7 Features in Detail" on page 6
Get some design reminders for Wi-Fi 7 networks <i>See the things to keep in mind when planning to implement or upgrade a wireless network using Wi-Fi 7.</i>	"Network Design for Wi-Fi 7" on page 22
Choose the right AP <i>See a quick comparison of the Wi-Fi 7-capable APs.</i>	"Choose the Right Access Point" on page 26
Configure your Wi-Fi 7 AP in Mist <i>Learn how to enable Wi-Fi 7 on your wireless networks.</i>	"Configure Wi-Fi 7 in Mist" on page 38

Wi-Fi 7 Introduction

SUMMARY

Use this topic to get a quick, high-level introduction to the key features in Wi-Fi 7.

The IEEE 802.11be Extremely High Throughput (EHT) standard, more commonly known as Wi-Fi 7, introduces new features and delivers several major improvements over Wi-Fi 6 and Wi-Fi 6E.

Wireless (Wi-Fi) networking has undergone several updates since its original introduction. Each update has included some combination of improved speed, increased throughput, increased range, increased security, and other improvements.

The following lists the most significant features that changed or were introduced with the Wi-Fi 7 update.

Wi-Fi 7 (802.11be)

- Extremely High Throughput (EHT)—potentially offers speeds up to 46 Gbps on the 6 GHz frequency band.
- 320 MHz Channels—double the maximum channel width compared to Wi-Fi 6, providing increased bandwidth.
- Multi-Link Operation (MLO)—allows devices to connect across multiple frequency bands simultaneously, improving reliability and speed.
- Improved MU-MIMO—supports more simultaneous data streams for enhanced multi-device performance.
- Improved OFDMA—further optimizes network capacity and efficiency.
- Multi-Resource Unit (Multi-RU)—allows transmission on more than one RU
- Preamble Puncturing—allows partial channel use when interference is present.
- Reduced Latency—enhanced features for gaming and real-time applications.
- Target Wake Time (TWT) Enhancements—further improvements in power efficiency for IoT and battery-powered devices.

- Support for New Modulation Schemes—incorporates advanced modulation techniques for higher data rates.
- Integrated Wireless Security—this security posture is a shift from previous Wi-Fi standard upgrades that focused on physical layer and MAC features only. Wi-Fi 7 Security enhancements include:
 - Mandatory WPA3 adoption
 - Updated requirements for 6 GHz operation
 - Stricter compliance for device interoperability around authentication and encryption
- Backward Compatibility—Backward compatibility enables a Wi-Fi 7 network to support legacy client devices. Enabling legacy clients to connect to your Wi-Fi 7-capable network has implications for the network and newer client devices.

These features represent the progression in Wi-Fi technology, focusing on faster speeds, increased capacity, improved efficiency, improved security, and better support for multiple devices and applications.

What Changed—Wi-Fi 6E to Wi-Fi 7

SUMMARY

Use this topic for a quick view of how common features changed between Wi-Fi 6E and Wi-Fi 7.

Wi-Fi 6E and Wi-Fi 7 both take advantage of the 6 GHz band. However, Wi-Fi 7 is based on the IEEE 802.11be standard while Wi-Fi 6E is based on IEEE 802.11ax. Backward compatibility enables devices from previous generations to connect to a Wi-Fi 7-enabled SSID. The following table shows a quick comparison between Wi-Fi 6E and Wi-Fi 7.

Table 2: Wi-Fi 6E and Wi-Fi 7

	Wi-Fi 6E	Wi-Fi 7
Corresponding IEEE standard	802.11ax	802.11be

Table 2: Wi-Fi 6E and Wi-Fi 7 (Continued)

	Wi-Fi 6E	Wi-Fi 7
Use of 6 GHz band	Yes	Yes
Key features	Up to 1200 MHz additional unlicensed spectrum* Up to seven 160 MHz channels Dependent on local regulations Up to 1024 QAM data rates WPA3 is required for 6 GHz and optional for 2.4 and 5 GHz	All the features of Wi-Fi 6E plus: Maximum 320 MHz channels MLO for aggregating channels Spectrum puncturing to minimize channel interference WPA3 is required for all bands.
What you should know	Full or partial usage of the 6 GHz band varies by country. Standard Power and an automated frequency system are required for outdoor use.	Full or partial usage of the 6 GHz band varies by country Standard Power and an automated frequency system are required for outdoor use. Use of 4096 QAM data rates requires a high signal-to-noise (SNR) and requires that the device be placed within several feet of an AP. In most cases, AP coverage models do not allow for enough available channels to support 320 MHz today so smaller channels are in use instead.

* The amount of additional spectrum available in 6 GHz depends on the wireless regulatory domain. In the United States, the full 1200 MHz of additional spectrum is available. In Europe and other regulatory domains, there is less additional spectrum available in 6 GHz.

A View of How Wi-Fi 7 Works

SUMMARY

Read this topic for a brief overview of how Wi-Fi 7 uses some of the new and updated features.

Wi-Fi 7 represents the next evolution in wireless networking technology. Wi-Fi 7 is likely to redefine user experiences in high-density environments like large campuses, stadiums, airports, and conference centers, and support bandwidth-intensive applications like streaming video, AR, and VR.

Wi-Fi 7 enhances connectivity by integrating several innovative features that push the boundaries of wireless technology:

- **320 MHz Channels**—Exclusive to the 6 GHz band, these channels double the throughput capabilities compared to Wi-Fi 6E. This enhancement facilitates multi-gigabit speeds, propelling the performance of Wi-Fi networks to new heights.
- **Multi-Link Operation (MLO)**—MLO is a pivotal feature that allows devices to utilize multiple Wi-Fi bands simultaneously. MLO not only boosts throughput by distributing traffic more efficiently but also enhances reliability and decreases latency, which is critical for applications requiring consistent and robust connectivity.
- **4K QAM (Quadrature Amplitude Modulation)**—Wi-Fi 7 leverages 4K QAM to deliver a 20% increase in transmission rates over 1024 QAM in Wi-Fi 6. This higher modulation scheme propels data throughput, achieving greater efficiency over the airwaves.
- **512 Compressed Block Acknowledgment (BlockAck)**—This feature reduces overhead and boosts effectiveness by efficiently handling acknowledgments, supporting higher data rates, and improving overall network performance.
- **Multiple Resource Units (MRU) allocation**—Enhanced flexibility in spectrum resource scheduling is another significant advancement, allowing for better spectrum efficiency critical in dense network environments.

Wi-Fi 7 Features in Detail

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Wi-Fi 7 is the latest wireless networking standard, designed to significantly enhance Wi-Fi performance and capability. It builds upon the advancements made by previous standards like 802.11ax (Wi-Fi 6). Wi-Fi 7 introduces several key improvements designed to address the growing demand for faster, more reliable, and more efficient wireless connectivity.

The following sections provide more detail about each of Wi-Fi 7's new or enhanced capabilities.

Extremely High Throughput

Wi-Fi 7 aims to achieve a theoretical maximum throughput of up to 48 Gbps, which is a substantial increase compared to the 9.6 Gbps offered by Wi-Fi 6. The higher throughput is achieved through various technical enhancements, including wider channel bandwidths and more efficient data encoding.

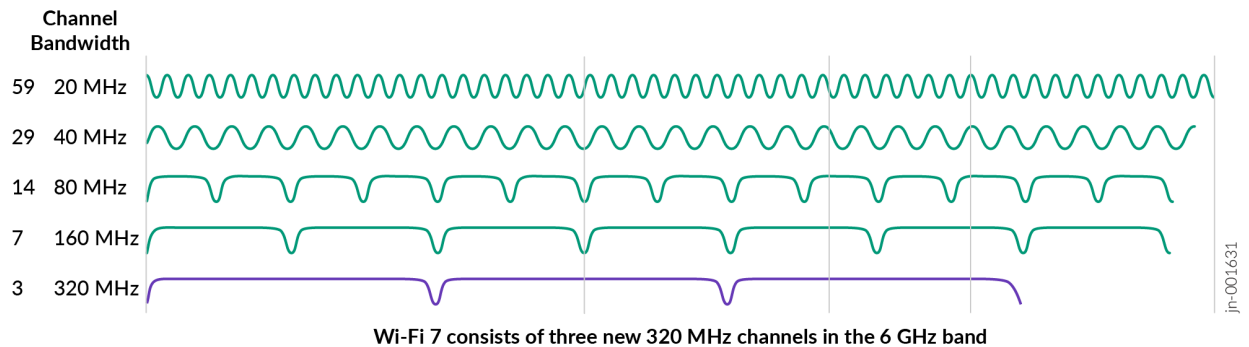


NOTE: The theoretical maximum throughput cannot be reached in real-world deployments. Factors such as SNR, attenuation, non-wi-fi interference, client device capabilities, antenna choice, building materials, transmit power, signal strength, and more contribute to reductions in maximum throughput.

Wider Channel Bandwidths

Wi-Fi 7 supports channel bandwidths of up to 320 MHz, double the 160 MHz maximum of Wi-Fi 6. Wider channels can transmit more data at one time, increasing overall network capacity and speed.

Figure 1: Channel Bandwidth



NOTE: Client device support for 320 MHz channel width varies widely.

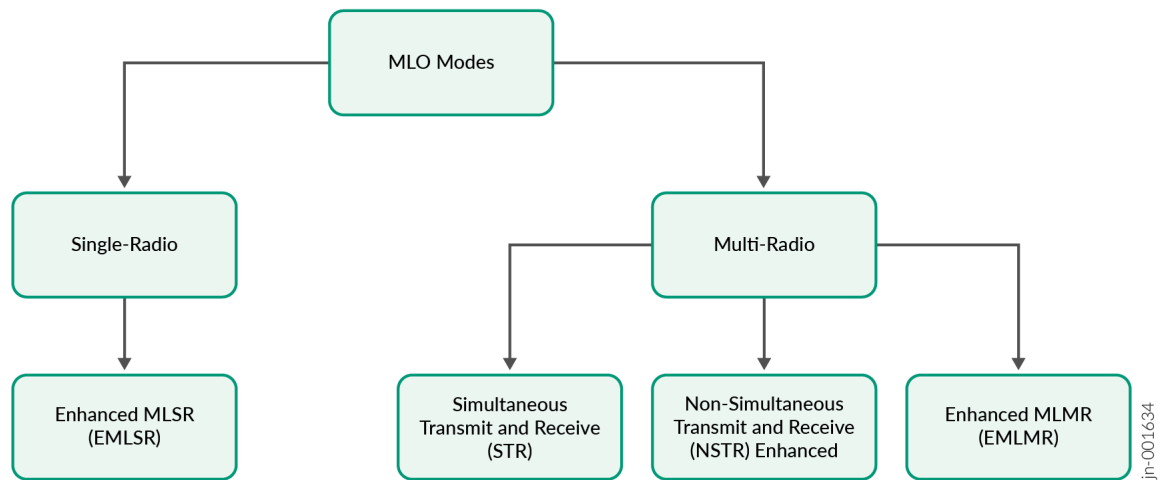
Multi-Link Operation (MLO)

- MLO enables a single client device to use multiple radios, each operating on different frequency bands, as part of one logical connection. Instead of treating 2.4, 5, and 6 GHz bands as separate associations (as in Wi-Fi 6 and Wi-Fi 6E), MLO aggregates the associations into a unified multi-link connection. These connections improve throughput, reduce latency, and increase reliability, especially as 6 GHz introduces cleaner spectrum and wider channels.

The core properties of MLO are:

- **One Logical Connection:** MLO presents multiple physical radios as a single unified link to upper layers.
- **Higher Throughput:** Data transmissions can occur on multiple links concurrently, if supported, thus increasing the total available bandwidth.
- **Lower Latency:** The AP and client choose the best link at any moment, avoiding congested channels.
- **Improved Reliability:** If one band becomes noisy or busy, the session continues smoothly on the better-performing link.
- **Security:** Each link still requires individual authentication, and MLO adds *synchronized replay protection* and *multi-link key management* to protect traffic across linked radios.

Figure 2: Multi-Link Operation Modes



Click the links below to go directly to a specific MLO-related feature or definition.

Link Behavior: Link Steering vs Link Switching

Link Steering (Dynamic Link Selection)

MLO allows intelligent, real-time selection of which link to use for each transmission. The AP and client evaluate:

- SNR
- Interference levels
- Channel load
- Bandwidth availability

Then the client and AP can choose the optimal link per packet or per traffic queue. Link steering is sometimes called *multi-link load balancing*.

Link Switching (Fast Failover Between Links)

Link switching is a reliability enhancement:

- If one link experiences interference, DFS events, or congestion, traffic instantly switches to another active link.

- Unlike traditional roaming, link switching occurs internally **without reassociation**, reducing latency and preventing application disruption.

This makes real-time apps like conferencing, AR/VR, and industrial automation far more resilient.

MLO Client Types

MLO implementation depends on how many radios the device has and how those radios operate. We describe MLO client types below.

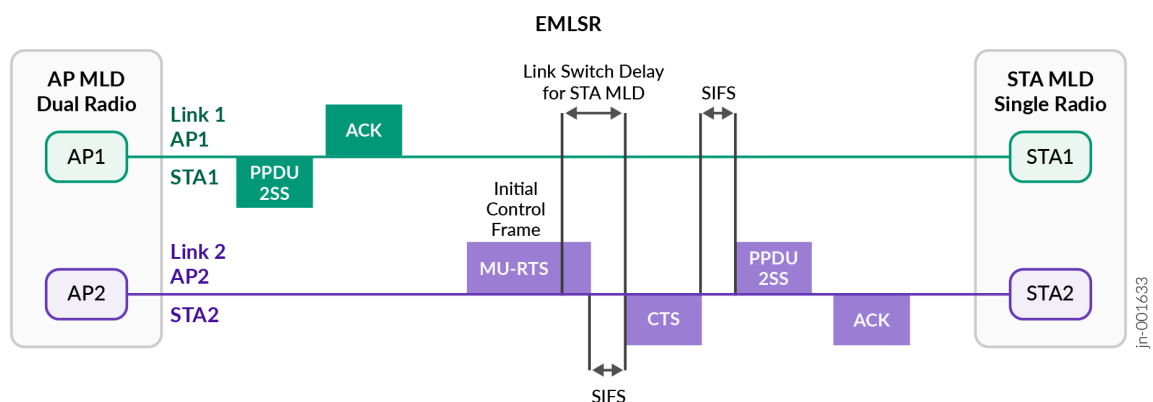
Multi-Link Single Radio (ML-SR)

- The device has one physical radio that can tune to different bands, but not simultaneously.
- Multi-link uses time-division to rapidly switch the radio between bands.
- Only one active link at a time, which provides some MLO benefits (faster switching, better reliability) but no concurrent throughput gains.
- Useful for low-power or small-form-factor devices.

ML-SR is mandatory for all Wi-Fi 7 clients.

Enhanced ML-SR (eMLSR)

- Improved scheduling and faster retuning.
- Still single-radio, still non-concurrent, but with lower switching overhead and better power efficiency.

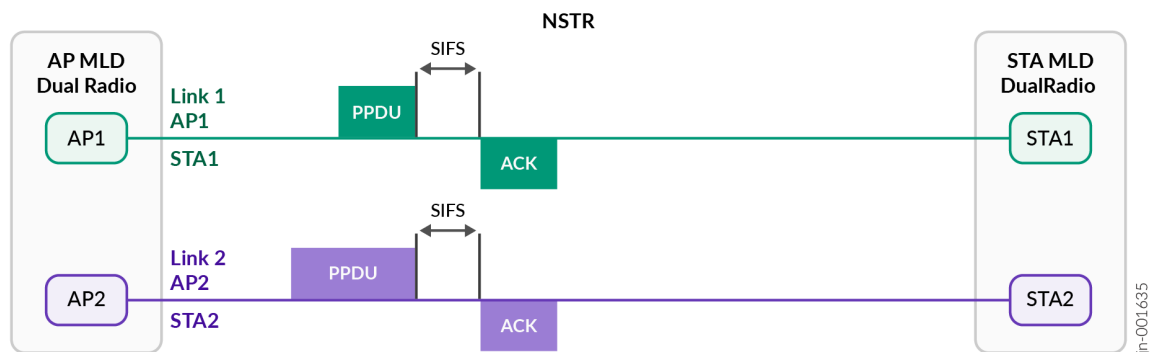


ML-MR – Multi-Link Multi-Radio

Devices have two or more radios, enabling simultaneous operation on multiple bands.

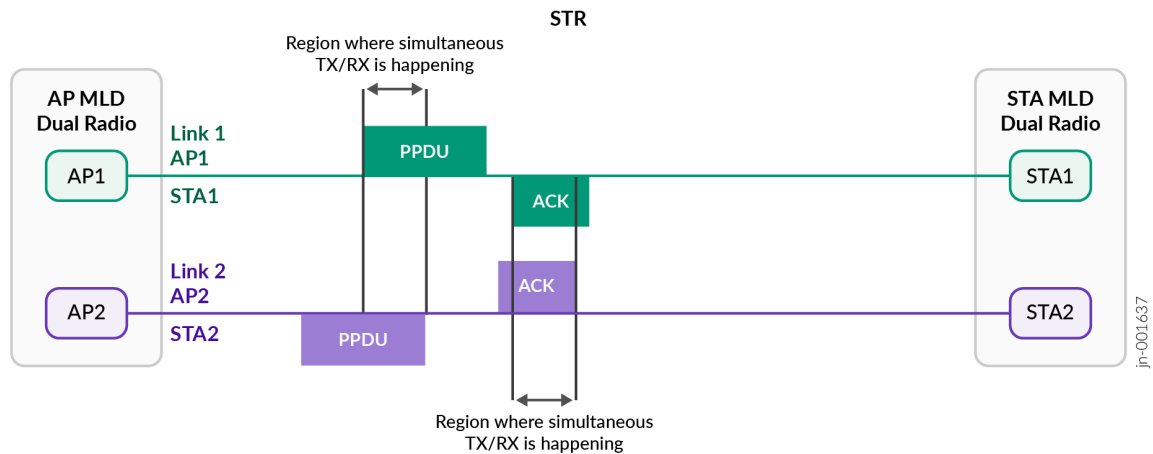
Two categories: Non-Simultaneous Multi-Radio (NSTR-MLMR) and Simultaneous Multi-Radio (STR-MLMR)

- The device has multiple radios which cannot transmit concurrently due to internal constraints such as local oscillator coupling, coexistence issues, or power envelope limits.
- Radios might be awake at the same time, but cannot fully transmit together.
- Provides better responsiveness than ML-SR, but still not full concurrency.



Simultaneous Multi-Radio (STR-MLMR)

- True concurrent MLO.
- Radios on 5 GHz and 6 GHz (or 2.4 + 6 GHz) can transmit/receive simultaneously.
- Provides the *full MLO promise*:
 - Higher throughput
 - Better latency
 - Robust load balancing



Important: STR-MLMR *is not mandatory* for Wi-Fi 7 clients and is currently limited to high-end devices due to cost, size, and power-consumption considerations.

Why Most Clients Only Support Two Links

While the Wi-Fi 7 standard *allows* triple-band operation (2.4 + 5 + 6 GHz concurrently), practical realities limit adoption:

- Devices rarely include three radios.
- Thermal and battery constraints.
- Vendor design tradeoffs (size, antenna count).
- 6 GHz is the primary performance band; vendors focus on **5 + 6 GHz** dual-radio designs.

Thus, MLO is most commonly implemented as **dual-band MLO**, not triple-band. Most Wi-Fi 7 clients deployed today operate as ML-SR or NSTR-MLMR devices. Full STR MLMR (simultaneous multi radio) operation is currently limited to a small subset of high-end clients for the reasons mentioned above. As a result, many real-world Wi-Fi 7 gains appear first as latency and reliability improvements rather than linear throughput scaling.

Table 3: Capability Summary

Feature	ML-SR	eMLSR	NSTR-MLMR	STR-MLMR
Radios	1	1	2+	2+
Simultaneous Multi-Band Tx/Rx	?	?	? (restricted)	?

Table 3: Capability Summary (*Continued*)

Feature	ML-SR	eMLSR	NSTR-MLMR	STR-MLMR
Latency Reduction	Moderate	Improved	Good	Best
Throughput Increase	None	None	Limited	Maximum
Power Efficiency	Highest	High	Medium	Lowest
Mandatory in Wi-Fi 7	Yes	No	No	No

The following table describes the capabilities of some example client devices.

Table 4: Client Device Capabilities

Client Device	Max MLO Links Supported	Supported MLO Mode(s)	3-Band (2.4 + 5 + 6 GHz) Simultaneous MLO?	Notes
Intel BE200	Advertises 3links, defaults to 2	eMLSR (Enhanced Multi-Link Single Radio)	No — single-radio mode allows multiple link <i>contexts</i> but only one active Tx/Rx at a time	Supports 3-link in registry-tweaked test setups but effectively functions as a 2-link under normal operation.
iPhone 16	3 links	MLMR (NSTR / Non-Simultaneous Multi-Radio)	Partial / Conditional — can support 3 links, but actual simultaneous Tx/Rx across all three bands depends on mode	Apple devices reportedly support 3-link MLO using NSTR (multi-radio) behavior.
Google Pixel 9 / Pixel series (Wi-Fi 7 models)	Reports multiple modes depending on the firmware	Claims NSTR MLMR in diagnostics, but not all modes are supported by APs	Uncertain / Vendor-dependent — varies by implementation	AP logs show Pixel reporting NSTR MLMR, but actual connection mode depends on AP/ client negotiation.
Windows 11 Wi-Fi 7 laptops (general)	Depends on adapter (often Intel BE200)	Same as adapter: commonly eMLSR	No — many Win11 builds initially restrict MLO features in Enterprise security mode	Support for MLO in WPA3-Enterprise requires OS + driver enablement ("Wi-Fi 7 Enterprise").

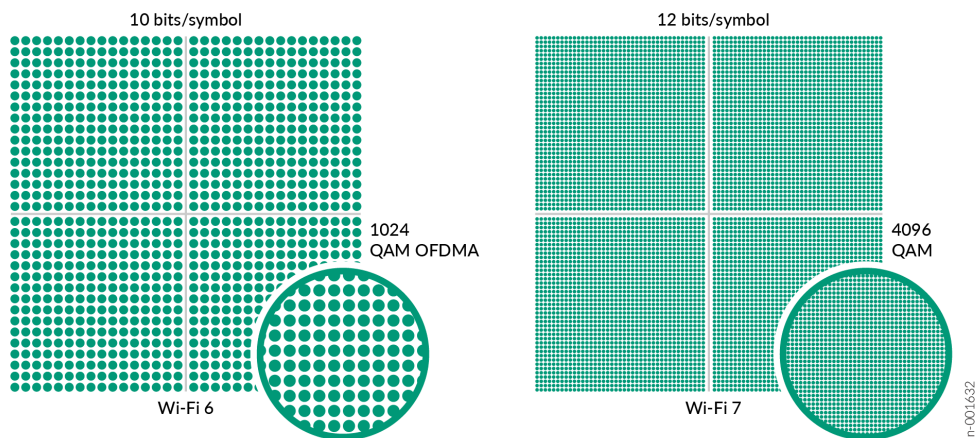
Table 4: Client Device Capabilities *(Continued)*

Client Device	Max MLO Links Supported	Supported MLO Mode(s)	3-Band (2.4 + 5 + 6 GHz) Simultaneous MLO?	Notes
General Wi-Fi 7 STA devices	1–3 links depending on radio architecture	All STAs must support MLSR ; others are optional	Not required by spec , optional only	802.11be mandates MLSR only for clients. Multi-radio simultaneous operation is optional.

Improved Modulation Through 4096-QAM

4096-QAM significantly increases the amount of information encoded into each modulation symbol—12 bits per symbol compared to 10 bits with 1024-QAM. While 2 bits might seem like a small theoretical change, in practice it offers several important advantages for dense enterprise deployments.

Figure 3: 1024 vs 4096 QAM



Higher Throughput in High-SNR Conditions

4K-QAM leverages clean RF conditions to push maximum physical layer rates, resulting in:

- Higher per-client throughput

- Better performance for bandwidth-intensive applications like 4K and 8K video, real-time collaboration, and large image transfers
- More efficient use of wide channels such as 160 and 320 MHz

Because Wi-Fi 7 adds 320-MHz channels and MLO, having higher-order modulation becomes even more valuable—every spatial stream and every link can carry more bits when conditions are favorable.

Improved Spectrum Efficiency

Higher-order QAM allows more data in the same spectral footprint, which is particularly useful in:

- High-density enterprise floors
- Stadiums and arenas
- Campuses with many 6 GHz-capable devices
- Environments where spectrum reuse is tightly engineered

4K-QAM allows APs to take advantage of the cleaner 6 GHz band, where the noise floor is lower, and interference is reduced.

Shorter Transmission Durations

Because more bits are packed into each symbol, transmissions complete faster. Shorter PPDU durations deliver:

- Lower airtime consumption
- More available airtime for other clients
- Reduced contention in dense deployments

Complementary to Other Wi-Fi 7 Features

4K-QAM is not a standalone improvement—it provides synergies with:

- MLO
- 320-MHz channels
- Multi-RU (MRU) allocations
- Hybrid Automatic Repeat Request (HARQ)
- 16 spatial streams across the AP infrastructure

Together, these features allow Mist APs to sustain higher data rates more reliably, especially in clean 6 GHz deployments.

Multi-RU

This feature was optional in Wi-Fi 6e, but is standard in Wi-Fi 7. Multi-RU provides a way to make more efficient use of RUs. RUs are small slices of wireless RF that provide a way to concurrently support multiple users in heavy traffic. Wider channels contain more RUs, and multi-RUs let a single user leverage more than one RU in order to support more clients by providing more granular scaling support within the channels.

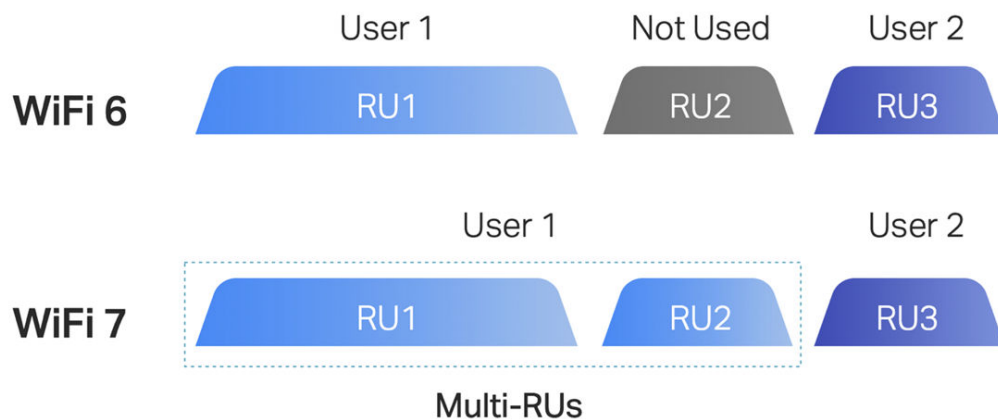
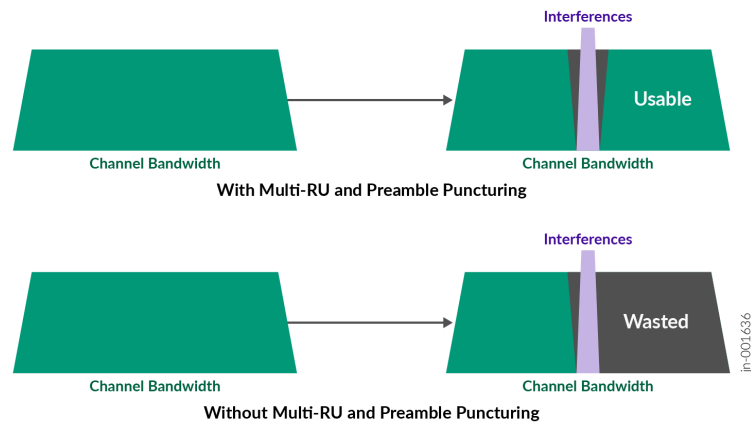


Image credit: TP-Link

Preamble Puncturing

In environments where parts of the spectrum are unusable due to interference or regulatory restrictions, preamble puncturing allows the Wi-Fi device to skip certain subcarriers within the channel. If a part of the channel is affected by interference, the preamble and subsequent data packets can avoid these subcarriers, allowing the remaining usable subcarriers to be used effectively.



Enhanced MU-MIMO

Wi-Fi 7 improves MU-MIMO technology by supporting up to 16 spatial streams, compared to 8 spatial streams in Wi-Fi 6. This increase allows more devices to communicate with an AP simultaneously, improving network efficiency and user experience in environments with many connected devices.

Target Wake Time (TWT) Enhancements

Building on the TWT feature introduced in Wi-Fi 6, Wi-Fi 7 offers more advanced scheduling capabilities that helps reduce power consumption and optimize bandwidth usage. These scheduling improvements are particularly beneficial for battery-powered IoT devices.

Improved OFDMA

OFDMA is further refined in Wi-Fi 7, allowing more granular resource unit allocation to accommodate varying traffic patterns and improve network efficiency. Other Wi-Fi 7 enhancements also provide benefits for OFDMA, even though not specifically listed as OFDMA features:

Table 5: OFDMA Enhancements and Benefits

Category	Enhancement	Benefit
Spectrum Use	320 MHz channels, enhanced puncturing	More RUs, more usable spectrum under interference
RU Allocation	Multi-RU assignment (MRU)	Higher throughput, better spectral efficiency
Multi-Link	OFDMA across multiple links	Lower latency, reliability, and traffic steering

Table 5: OFDMA Enhancements and Benefits *(Continued)*

Category	Enhancement	Benefit
Scheduling	Faster uplink and downlink OFDMA cycles	Reduced jitter and contention
Uplink Efficiency	Improved Trigger-Based OFDMA	More clients per uplink burst, stronger reliability
PHY Efficiency	4K-QAM	More bits per tone/RU
Coordination	EHT-specific RU structures	Efficient operation in complex RF environments

Security

In Wi-Fi 7, security is a primary consideration. In fact, many of the feature enhancements available in Wi-Fi 7 will not function if the WLANs or clients lack the proper security features.

Table 6: Required Security Features in Wi-Fi 7

Security Requirement	Description (per standard / WFA)	Benefits for Use	What if Clients Don't Support It?
WPA3 or OWE (mandatory for any WLAN with Wi-Fi 7 enabled)	Wi-Fi 7 requires WPA3 or OWE on all bands where Wi-Fi 7 is enabled.	Ensures modern encryption, eliminates legacy weaknesses; protects open networks through OWE.	Legacy clients (WPA2-only) cannot connect unless you disable Wi-Fi 7 or 6 GHz on the SSID or provide a fallback SSID.
Protected Management Frames (PMF)	Required for all Wi-Fi 7 networks. PMF encrypts and authenticates management frames.	Prevents deauthentication spoofing, channel-switch attacks, and other management-frame exploits.	Older clients might not associate; mixed environments require careful SSID design (such as dual SSIDs or transition modes).
GCMP-256 Cipher (mandatory on every Wi-Fi 7 BSS)	Wi-Fi 7 mandates GCMP-256 for data encryption regardless of security mode.	Stronger confidentiality, integrity, and replay protection vs. CCMP-128. Required for EHT data rates.	Non-GCMP-256 clients fall back to older ciphers, like CCMP-128, and might lose access to Wi-Fi 7 capabilities, including MLO and EHT throughput.

Table 6: Required Security Features in Wi-Fi 7 (*Continued*)

Security Requirement	Description (per standard / WFA)	Benefits for Use	What if Clients Don't Support It?
Beacon Protection	Mandatory safeguarding of beacon frames to prevent spoofing and impersonation.	Hardens the network against beacon-spoof attacks that can mislead clients or disrupt service.	Older clients might ignore protected beacons or behave inconsistently when roaming.
SAE-GDH and FT-SAE-GDH (AKM 24 & 25)	New authentication and key-management suites for Wi-Fi 7, enabling per-MLD (multi-link device) authentication.	Synchronizes keys across MLO links, enabling stable, secure multi-link sessions.	Non-Wi-Fi 7 clients continue using legacy AKMs (8 or 9). These clients cannot benefit from secure multi-link authentication and will lose MLO and Wi-Fi 7 data-rate capabilities.
OWE for Open Networks	Required option for Wi-Fi 7 Open SSIDs; provides encrypted password-less connectivity.	Encrypts open traffic without passwords. Reduces passive eavesdropping.	Many guest and IoT clients still lack OWE support, requiring OWE transition mode or a parallel legacy guest SSID.
H2E (Hash-to-Element) for WPA3-Personal	Mandatory for WPA3-SAE on Wi-Fi 7 6 GHz to eliminate dictionary-attack vulnerabilities in legacy SAE.	Stronger password-element generation, fixing earlier SAE weaknesses.	Older WPA3-SAE clients using "Hunting and Pecking" cannot authenticate on 6 GHz or Wi-Fi 7 SSIDs.
Mandatory PMK synchronization for MLO	Wi-Fi 7 requires unified key hierarchy across all links for MLO to work securely.	Ensures secure, low-latency MLO performance with a single PMK across all links.	Clients lacking MLO-compatible key mgmt cannot use multi-link and fall back to single-band association.

Wi-Fi 7 is optimized for *consistent capacity, lower latency, and reliability under load*, not just higher peak physical layer rates. Features such as MLO, MRU, enhanced scheduling, and mandatory security are designed to maintain performance as client counts and traffic diversity increase.

Backward Compatibility in Wi-Fi 7

Backward compatibility is a core design principle of Wi-Fi 7 (802.11be). A Wi-Fi 7 AP can serve older clients (Wi-Fi 6/6E/5, and so on) on the same network. This makes upgrades easier and protects existing device investments, but it also introduces performance and design tradeoffs. Below is a table depicting benefits and design considerations in regard to the various aspects of backward compatibility.

Table 7: Backward Compatibility - Benefits and Considerations

Aspect	Benefits	Design Considerations
Device & Investment Protection	Backward compatibility lets existing Wi-Fi 4/5/6/6E clients connect to new Wi-Fi 7 APs, avoiding forced device refreshes and extending the life of legacy hardware.	Legacy clients might prevent you from fully realizing Wi-Fi 7's potential for years, delaying ROI on high-end features.
Migration & Deployment	Enables gradual, phased migration to Wi-Fi 7. You can upgrade APs or specific areas without wholesale changes or client replacement.	Network designs often end up optimized for legacy compatibility instead of being fully tuned to Wi-Fi 7 capabilities (such as channel plans, client mix).
User Experience & Continuity	Minimizes disruption because users' older devices continue working when APs are upgraded, thus reducing support tickets and business risk.	Mixed-client environments can create inconsistent user experiences. Wi-Fi 7 devices might perform very differently depending on how many legacy devices share airtime.
Ecosystem & Interoperability	Ensures interoperability across vendors and generations, simplifying procurement and operations in heterogeneous environments.	Maintaining multi-generation interoperability increases protocol complexity and testing burden, which can mask bugs and edge cases in complex client mixes.
Capacity & Spectrum Use	Backward compatibility still allows you to consolidate onto fewer SSIDs and shared infrastructure, rather than running completely separate networks for old vs. new clients.	Legacy devices don't support Wi-Fi 7 efficiency features such as advanced OFDMA scheduling, MLO optimizations, and 4K QAM. Airtime is less efficiently used when legacy devices are present.
Operational Costs	Reduces immediate CapEx and can reduce OpEx by simplifying network segmentation vs. maintaining separate, old vs. new, infrastructures.	Operational tuning becomes more complex. You might need band steering, per-SSID policies, and careful QoS to keep legacy devices from degrading overall performance.

Table 7: Backward Compatibility - Benefits and Considerations (*Continued*)

Aspect	Benefits	Design Considerations
Performance for Modern Clients	Allows high-end Wi-Fi 7 clients to benefit from new features where airtime is available, without abandoning older devices.	Legacy clients often dominate airtime at lower data rates, which can significantly cap throughput and latency improvements that Wi-Fi 7 would otherwise deliver.
Security & Policy	Easier centralization of security policies on one infrastructure (such as single WPA2/WPA3 transition SSID supporting a range of devices).	Supporting older security modes or ciphers for backward compatibility can weaken the overall security posture compared to a pure Wi-Fi 7 or WPA3-only design.

Overall, 802.11be addresses the increasing demands for bandwidth, efficiency, and low-latency communication in modern wireless networks, making it suitable for high-performance applications and environments with dense device connectivity. The increased security framework helps ensure that the data traversing Wi-Fi 7 WLANs is safe from malicious actors.

2

CHAPTER

Network Design for Wi-Fi 7

SUMMARY

With numerous new features and enhancements, implementing Wi-Fi 7 requires revisiting your network design choices.

IN THIS CHAPTER

To see a video series on general wireless network design in Mist, see [Mist AI Wireless Network Design](#).



Deploying a Wi-Fi 7 network in an enterprise environment requires careful planning and consideration to ensure optimal performance, security, and scalability. Below is a list of Wi-Fi 7-based design considerations:

- **Compatibility and Interoperability**—Ensure backward compatibility with older Wi-Fi standards to accommodate legacy devices. Wi-Fi 7 operates in all three wireless frequencies and supports all previous Wi-Fi standards, providing backward compatibility.

Verify that all network components, including routers, switches, and client devices, support Wi-Fi 7 features. Even though Wi-Fi 7 is backward compatible, your network will perform better and have fewer problems if you ensure that wired network components and client devices support the latest technologies.



NOTE: Devices that do not adhere to all of the mandatory security features of Wi-Fi 7 cannot operate in Wi-Fi 7 mode.

- **Radio Spectrum Management**—Optimize the use of available spectrum, including the 6 GHz band, to minimize interference and maximize throughput. Ensure that you enable dynamic frequency selection (DFS) to mitigate interference from radar systems. Consider the careful use of band-steering within well-known, controllable environments to guide 5 and 6 GHz-capable devices to use those, less-crowded, frequencies. Consider ways to mitigate the effects of allowing older 2.4 GHz clients to connect to the network. Running a separate 2.4 GHz-only network could be an option that allows the 5 and 6 GHz clients on the other network to experience better performance.
- **Access Point Placement**—Conduct a thorough site survey to determine the optimal placement of access points, ensuring consistent coverage and minimizing dead zones. Consider the density of users and devices, and adjust access point placement accordingly. Remember that 5 and 6 GHz signals have a shorter range than 2.4 GHz signals. The shorter range may require you to place more APs in the covered environment. Also consider using APs with external antennas for 6 GHz mesh backhaul, to create precision coverage patterns, or in places where structures or building materials might block signals from integrated antennas. Consider using capacity-based wireless network designs rather than density-based designs. Capacity-based designs may require more APs, but could perform better. See "[Choose the Right Access Point](#)" on page 26 for more information.

- **Security**—Consider the implications for client devices of implementing robust security protocols, such as WPA3. Many Wi-Fi 7 features do not operate if the advanced security features are not enabled or supported. See ["Security" on page 18](#) for details.
- **Quality of Service (QoS)**—Implement QoS policies to prioritize critical applications and traffic types. Utilize Wi-Fi 7's improved latency and throughput capabilities to support real-time applications like video conferencing.
- **Network Scalability**—Design the network to accommodate future growth in devices and users. Consider a modular network architecture to facilitate easy expansion.
- **Power**—Implement energy-efficient technologies to reduce the power consumption of APs and client devices. Use PoE for APs to simplify deployment. Consider the implications of low-power indoor (LPI) and standard power (SP) APs.

Historically, 6 GHz APs operated under LPI rules only, limited to ~5 dBm/MHz PSD and restricted to indoor deployments to protect incumbents.

SP unlocks higher transmit power in the 6 GHz band (subject to regulatory control). SP enables greater coverage as well as outdoor and expanded indoor use cases.

- SP significantly increases cell size relative to LPI, reducing AP density requirements in some designs.
- However, higher EIRP introduces greater co-channel interference (CCI) risk, thus requiring tighter channel planning and RRM tuning.
- In Wi-Fi 7 with multi-link and wider channels, SP can enable fewer APs with wider channels, but only if interference is controlled.
- SP availability depends on country regulations and Automated Frequency Coordination (AFC) frameworks.
- You must explicitly configure the regulatory domain as US or Canada to enable SP.
- Not all APs support SP. Some models are LPI only, while others support LPI and SP. Some, such as the AP66 and AP66D are SP only. See [No Link Title](#)
- **Network Management and Monitoring**—Implement automated management systems for efficient network operations and troubleshooting. In other words, use RRM.

In the Mist portal, you can monitor Site Insights and Wireless Insights to provide detailed information about network performance and the client experience.

- **Client Device Support**—Ensure that client devices can take advantage of Wi-Fi 7 features, such as improved speed and reduced latency. Plan for device upgrades or replacements as necessary.

- **Environmental Factors**—Consider environmental factors such as building materials and layout that might affect signal propagation. Plan for mitigation strategies, such as additional APs, APs with external antennas, or signal boosters.
- **Cost Considerations**—Evaluate the TCO, including hardware, software, maintenance, and upgrades. Consider budget constraints and prioritize investments based on critical needs.
- **Testing and Validation**—Conduct thorough testing of the network design to validate performance under expected load conditions. Implement a pilot deployment to identify and resolve issues before full-scale rollout.

Considering these factors allows you to design and deploy a Wi-Fi 7-centric network that meets your performance, security, and scalability requirements.

RF Design for 6 GHz

We recommend using multi-band SSIDs that have both 5 and 6 GHz capabilities so that legacy clients can connect to 6 GHz using out-of-band (OOB) mechanisms. We also recommend using different channel widths for 5 and 6 GHz. For example, setting 5 GHz to 40 MHz and 6 GHz to 80 MHz on the same SSID helps clients remain on 6 GHz when roaming.

3

CHAPTER

Choose the Right Access Point

SUMMARY

Use this topic to compare the features available on Mist Wi-Fi 7 APs.

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- Choose the Right Access Point | 32
 - Ethernet Redundancy and Connecting the AP47 to the Network | 33
 - Power Options for the AP47 | 35
-

Choosing the right HPE Mist Networking AP depends on your specific environment, your requirements for performance, antenna type, and deployment location.

General Selection Principles for Wi-Fi 7 APs

Across all environments, Wi-Fi 7 AP selection should account for:

- **Radio density and mode flexibility** All HPE Mist Networking Wi-Fi 7 APs are tri-band, meaning the AP can operate on each of the 2.4, 5, and 6 GHz bands simultaneously. The differences start to appear in the number of spatial streams. In terms of spatial streams, APs are designated 2x2 or 4x4. 2x2 APs support 2 receive and 2 transmit streams, while 4x4 APs support 4 receive and 4 transmit streams. Because client devices normally have a maximum of two radios, a 4x4 AP can handle more clients at one time. Higher end APs have a multi-band radio that can operate in any of the three bands, which allows for dual-5 GHz or dual-6 GHz operating modes.
- **Antenna pattern suitability**—Integrated directional vs omni-directional vs external. See ["AP Antenna Type" on page 27](#)
- **Power availability**—IEEE 802.3at vs IEEE 802.3bt for full feature enablement. See [Table 8 on page 28](#)
- **Physical environment**—Attenuation, ceiling height, racking, wall materials, and so on. See ["AP Antenna Type" on page 27](#)
- **Client mix**—High-density user devices vs IoT-heavy deployments

AP Antenna Type

APs come with either internal omnidirectional antennas, internal directional antennas, or external antennas. Be sure to choose the right AP models for your deployment.

- **Internal Antennas**

Internal antennas provide omnidirectional coverage suitable for multi-client areas like schools, hotels, offices, and conference rooms. Use omnidirectional antennas where coverage is the primary goal, client density is low, and roaming behavior is not critical. APs with internal antennas appear clean and neat in the deployed space. With no extra hardware, these APs deploy easily. APs with Internal antennas are sometimes less expensive than APs with external antennas.

- **Internal Directional Antennas**

Internal directional antennas, like the 60°x60° antenna in the AP47D, allow for the same ease of installation and clean finish as APs with omnidirectional internal antennas. These directional antennas are able to target the radio signals in specific directions with known coverage patterns. With a directional internal antenna, you can point the signal in the needed direction by rotating the AP on its mounting hardware.

- **External Antennas**

APs that support external antennas come with one or more connectors on the outside of the AP for attaching the antenna hardware. These external antennas allow you to customize the coverage pattern by aiming, or shaping, the radio signals through adjustment of the position and location of the antennas. This aiming capability also helps reduce co-channel interference along the path of the directed signal. Use directional antennas in open office areas that require multiple APs for capacity, where maintaining high MCS rates, predictable roaming, and balanced client distribution are key design objectives. External antennas allow you to place the AP in a protected location while placing the antenna in a harsh-weather location. You can often replace an antenna at a lower cost than replacing the entire AP. External antennas often provide higher adjustable gain than internal antennas.

Avoid reducing antenna transmit power as a substitute for cell control. Reducing the transmit power can force clients into lower modulation rates and negate the performance benefits of Wi-Fi 6 and Wi-Fi 7.

To see how changing from omnidirectional to directional antennas can affect Wi-Fi coverage and roaming, see: [Omni vs Directional](#)

Wi-Fi 7 APs

Wi-Fi 7 AP selection should be driven less by peak data rates (PDR) and more by antenna flexibility, radio mode options, and environmental fit. Aligning AP form factor and RF characteristics to the physical space delivers better outcomes than defaulting to a single AP model across all environments.

The table below compares the specifications of all the HPE Mist Networking-compatible Wi-Fi 7 APs.

Table 8: Wi-Fi 7 AP Features

Feat ure/ AP Mod el	AP17	AP27 /E	AP36/M	AP37	AP47/D/E	AP66	AP-723 H
Data shee t	AP17	AP27 /E	AP36/M	AP37	AP47/D/E	AP66	AP-723 H

Table 8: Wi-Fi 7 AP Features *(Continued)*

Feature/ AP Model	AP17	AP27 /E	AP36/M	AP37	AP47/D/E	AP66	AP-723 H
Deployment	Indoor Wall Jack or Desktop	Indoor Ceiling	Indoor Ceiling	Indoor Ceiling	Indoor	Indoor - Outdoor	Indoor Wall Jack or Desktop
Radios	• Tri Band 2x2 • Dedicated Scan • Dual IoT	• Tri Band 2x2 • Dedicated Scan • Dual IoT	• Tri Band 4x4 5GHz + 6 GHz & 2x2 2.4 GHz • Dedicated Scan • Dual IoT	• Tri Band 4x4 5GHz + 6 GHz & 2x2 2.4GHz • Dedicated Scan • Dual IoT	• Tri Band 4x4 • Dual 5 GHz + 6 GHz • Dedicated Scan • Dual IoT	• Tri Band 2x2 • Dedicated Scan • Dual IoT	• Tri Band 2x2 • Dedicated Scan • Dual IoT

Table 8: Wi-Fi 7 AP Features *(Continued)*

Feature/ AP Model	AP17	AP27 /E	AP36/M	AP37	AP47/D/E	AP66	AP-723 H
IoT Sensors	Pressure	Pressure					
	Temperature	Temperature	Pressure Temperature	Pressure Temperature	Pressure Temperature	Accelerometer	None
	Accelerometer	Accelerometer	Accelerometer	Accelerometer	Accelerometer		
Ethernet	• 10GbE PoE • 1GbE PSE • 2x1GbE	• 10GbE • 1GbE	• 10GbE PoE • 1GbE PSE	• 10GbE PoE • 1GbE PSE	Dual 10GbE PoE w/Failover	10GbE PoE	• 2.5GbE PoE • 2x1GbE

Table 8: Wi-Fi 7 AP Features *(Continued)*

Feature/ AP Model	AP17	AP27 /E	AP36/M	AP37	AP47/D/E	AP66	AP-723 H
PoE*	802.3bt PoE	802.3at PoE	802.3bt PoE	802.3bt PoE	802.3bt PoE	802.3at PoE	802.3bt PoE
6 GHz Power Class	LPI	LPI-AP27 SP-AP27 E	LPI-AP36 SP-AP36M	LPI	LPI-AP47/D SP-AP47E	SP	LPI
Performance	Up to 5.8 Gbps	Up to 5.8 Gbps	Up to 11.53 Gbps	Up to 11.53 Gbps	Up to 28.8 Gbps	Up to 9.38 Gbps	Up to 4.7 Gbps
Additional Docs	AP17	AP27	AP36	AP37	AP47	AP66	AP-723 H Installation Guide

*The AP-723 H is a dual platform AP. You can manage the AP-723 with Mist or Aruba Central.

**The PoE standards shown represent the power needed for full AP functionality.

Choose the Right Access Point

IN THIS SECTION

- [Access Point Ethernet Connections | 33](#)

Access Point Ethernet Connections

As shown above, many Mist APs have multiple Ethernet connections built in. The primary Ethernet (Eth0) interface in all our APs is the PoE-in interface. The Eth0 interface provides power to the AP. From there, the range of options for Ethernet connectivity from and through the APs varies by model.

The AP47 is our most capable, high-performance AP. The dual Ethernet capabilities of the AP47 deserve some special attention.

Ethernet Redundancy and Connecting the AP47 to the Network

The two 10 Gbps Ethernet ports on the AP47 not only provide PoE redundancy but also support redundant Ethernet links to ensure continued operation during infrastructure outages or upgrades in mission critical environments. The AP47 supports single uplink, dual uplink, individual uplink and downlink, and dual downlink connectivity.

Single Uplink

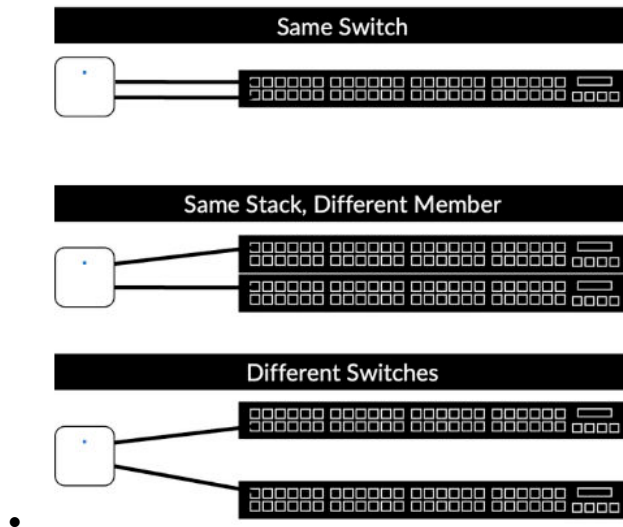
For single uplink we recommend that you connect Eth0 to the network uplink for simplicity and consistency. However, there is no restriction on using Eth1 to connect to the network uplink on an AP47.

If you enforce a MAC limit on your AP switch ports, such as when you tunnel traffic to a Mist Edge, you must configure the MAC limit to two or more.

Dual Uplink

If you leverage dual uplinks, here are a few good things to know:

- Connecting the AP47 to the network requires no switch configuration. You can connect the AP to the same switch or different switches. Ensure the L2 VLAN is the same on both switch ports so clients don't need to obtain new IP addresses if a failover occurs.



- New AP47s arrive configured with dual uplinks in an active-standby configuration.
 - You can configure uplink, downlink and dual downlink (mesh relay) connectivity by manually configuring the port VLANs in the Mist portal.
- The AP47 employs passive failover detection based on link status and activity which results in three to five-second failover.
- The AP47 is capable of non-traffic-impacting (hitless) PoE failover when you use dual 802.3bt power sources.
- If you use two 802.3at or mixed 802.3at and 802.3bt power sources, the AP47 combines the received power for full functionality. The AP may brownout or reboot in the event it needs to reduce functionality due to a single power source failure.

AP47 Ethernet MAC Addresses

AP47 LLDP PCAP

Source	Destination	Protocol	Length	Port Description	Chassis Id
Mist_04:0f:7f	LLDP_Multicast	LLDP	213	eth0	Mist_04:0f:7e
Mist_04:0f:80	LLDP_Multicast	LLDP	213	eth1	Mist_04:0f:7e

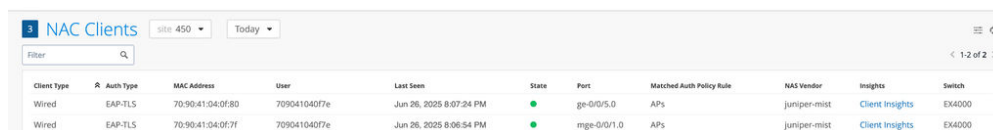
Port MACs Port AP MAC

```

Ethernet II, Src: Mist_04:0f:7f (78:90:41:04:0f:7f), Dst: LLDP_Multicast (01:80:c2:00:00:0e)
  (packet discarded, not processed)
  Chassis Subtype = MAC address, Id: 78:90:41:04:0f:7e
  Port Subtype = MAC address, Id: 78:90:41:04:0f:7f
  Time to Live = 120 sec
  Capabilities:
    Port Description = eth0
    System Description = Mist Systems 802.11be Access Point.
    Telecommunications Industry Association TR-41 Committee - Media Capabilities
    Telecommunications Industry Association TR-41 Committee - Inventory - Manufacturer Name
    System Name = 789041040f7e
  
```

- The AP47 uses three MAC addresses for Ethernet, because it supports multiple uplinks. The MAC address for the AP wireless interface is known as the AP MAC address, then each Ethernet port MAC address is incremented by 1. For example:
 - AP MAC Address = 70:90:41:XX:XX:7E

- AP Eth0 MAC Address = 70:90:41:XX:XX:7F
- AP Eth1 MAC Address = 70:90:41:XX:XX:80
- The AP47 uses the AP MAC address for switch virtual interfaces (SVIs) and IP communication, such as DHCP, ARP, DNS, NTP, AP Management, L2TPv3, and RADIUS.
- The AP47 uses the unique Ethernet port MACs for link-local packets, such as LLDP and Dot1x Supplicant.
- Connected switches use the AP47's multiple MAC addresses primarily when you configure switch-side MAC-based policies. For example:
 - To perform MAC authentication bypass (MAB) authentication against the APs, add both the AP MAC address and the port MAC addresses to your switch's MAB database,
 - If you leverage LLDP, the Chassis ID is the AP MAC address.
 - If you enforce a MAC limit on your AP switch ports, such as when tunneling traffic to a Mist Edge, set the MAC limit to two or more: one for the Ethernet MAC and one for the AP MAC.
- If you leverage 802.1X authentication against the APs with dual uplinks, both ports authenticate to the network independently of each other. Thus, two separate auths appear in your RADIUS server.



The screenshot shows the 'NAC Clients' interface with a search filter and a table of client data. The table has columns for Client Type, Auth Type, MAC Address, User, Last Seen, State, Port, Matched Auth Policy Rule, NAS Vendor, Insights, and Switch. Two rows are visible, both for 'Wired' clients with 'EAP-TLS' authentication.

Client Type	Auth Type	MAC Address	User	Last Seen	State	Port	Matched Auth Policy Rule	NAS Vendor	Insights	Switch
Wired	EAP-TLS	70:90:41:04:0f:80	709041040f7e	Jun 26, 2025 8:07:24 PM	●	ge-0/0/5.0	APs	juniper-mist	Client Insights	EK4000
Wired	EAP-TLS	70:90:41:04:0f:7f	709041040f7e	Jun 26, 2025 8:06:54 PM	●	mge-0/0/1.0	APs	juniper-mist	Client Insights	EK4000

Power Options for the AP47

The AP47 has dual 10 GbE multigigabit Ethernet ports, both of which support power over Ethernet (PoE) in.



The AP47 requires 802.3bt power (Class 6 - 60W) for full functionality. It requires approximately 29 Watts of power at the powered device (PD) for full Wi-Fi functionality. When powered by 802.3at power, the AP operates with reduced functionality. The three Wi-Fi radios operate at 2x2:2, or 4x4:4 with any two Wi-Fi radios enabled. The AP47 keeps the scanning radio, and the Bluetooth LE, GPS, and UWB radios active at all times, regardless of the power source.

Either or both of the ports can be used to power the AP using PoE. You can see the functionality differences below:

- **802.3bt Power Source**

- Single 802.3bt in – Full functionality
- Dual 802.3bt in – Full functionality

- **802.3at Power Source**

- Single 802.3at in – Reduced Wi-Fi functionality – Three 2x2 or Two 4x4
- Dual 802.3at in – Full functionality

- **Mixed Power Source**

- One 802.3bt in and one 802.3at in – Full functionality



NOTE: When two 802.3bt sources power the AP47, the device supports full Ethernet and PoE redundancy. When two 802.3at sources power the AP47, a power-sharing configuration is created, where the AP merges power from both ports to ensure full functionality.

In the power-sharing configuration, the AP maintains full Ethernet redundancy; however, it may experience a brownout or reboot if one power source fails. Internal testing has proven that brownouts or reboots are rare occurrences. To ensure maximum redundancy, use 802.3bt power sources.

Ensure you use 802.3bt or 802.3at compliant PoE switches or injectors to power the AP47.

See [PoE Requirements for HPE Mist Networking APs](#) for AP47 power requirements.

4

CHAPTER

Configure Wi-Fi 7 in Mist

SUMMARY

This document provides some high-level guidance about configuring Wi-Fi 7 in the Mist portal.

IN THIS CHAPTER

You can enable Wi-Fi 7's required features easily in the Mist portal simply by enabling Wi-Fi 7 in the WLAN definition. In fact, the portal is designed to help you take advantage of 6 GHz and Wi-Fi 7 by default.

In the Mist portal, you can configure WLANs directly on a per-site basis or using templates for fast, consistent application of wireless network features and policies across your entire organization. Regardless of whether you define your WLANs directly or within templates, the configuration is straightforward.

Today, there are two things to configure:

- The Security block of the WLAN form must have WPA3 or OWE selected as the **Security Type**. With WPA3 selected, you can select either Enterprise (802.1x) or Personal (SAE) as the authentication method. With OWE selected, you can enable OWE Transition and further enhance the security of the OWE WLAN with Wi-Fi 7 security; specifically GCMP256 and Beacon Protection.

Security ⓘ For other Security Types, disable 6 GHz and Wi-Fi 7

Security Type

WPA3 OWE

Enterprise (802.1X) Personal (SAE)

☒ Passphrase [Reveal](#)

☐ Multiple passphrases

☒ Enable WPA3+WPA2 Transition

☐ Enable Wi-Fi 7 Security ?

- The Wi-Fi Protocols block of the WLAN form must have Wi-Fi 7 **Enabled**.

Wi-Fi Protocols

Wi-Fi 6 ☒ Enabled ☐ Disabled

Wi-Fi 7 ☒ Enabled ☐ Disabled

Similar to WLAN configuration templates, RF Templates allow consistent application of radio-specific settings across all the sites in your organization.

For details about configuring WLANs and WLAN templates, see: [WLANs and WLAN Templates](#)

For details about radio settings, see: [Radio Management](#)