Always best connected

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Agenda

• About Wi-Fi Alliance®
• Managed Wi-Fi® networks
• Upcoming capabilities
Wi-Fi Alliance Introduction

- The worldwide network of 800+ companies that brings you Wi-Fi
- Defines Wi-Fi
- Drives industry growth
- Continued innovation

- Nine billion devices in use
- Three billion shipments per year
- Carries more than half of the internet’s traffic
Managed Wi-Fi networks
Wi-Fi CERTIFIED Vantage™ delivers enhanced managed network capabilities:

mobility, manageability, and performance
Wi-Fi Vantage™
Common approach to improve the managed Wi-Fi network experience

**Mobility**
Steering and transition mechanisms bring seamless user experience:
- Accessing networks
- Inter-network roaming
- Transitioning to and from Wi-Fi to cellular networks

Technologies:
- Wi-Fi CERTIFIED Agile Multiband™
- Wi-Fi CERTIFIED Optimized Connectivity™

**Manageability**
Better understanding of network environment and:
- Allocation of resources
- Provisioning
- Authentication
- Intra-network roaming

Technologies:
- Wi-Fi Agile Multiband™
- Wi-Fi Optimized Connectivity™
- Wi-Fi CERTIFIED Passpoint®

**Performance**
High level performance in very dense environments:
- MU-MIMO
- Higher data rates
- Dual-band capability

Technologies:
- Wi-Fi CERTIFIED™ ac
Wi-Fi Agile Multiband: efficient use of spectrum and network resources

• Based on IEEE 802.11k, v, r, u and Wi-Fi Alliance technologies
• Helps devices manage resources and respond to changing conditions
  – **Dynamic monitoring**: client and AP collect and exchange information about the Wi-Fi radio environment to evaluate the best possible connection
  – **Intelligent steering**: mechanisms allow AP to guide client device to recommended band, channel, or AP to balance network traffic or meet other management needs
  – **Fast transitions**: enables devices to connect quickly with WPA2™ security when roaming to improve experience with latency sensitive applications

• **Agile Multiband highlights**
Wi-Fi Optimized Connectivity: enhanced network connectivity when roaming

• Based on IEEE 802.11ai (Fast Initial Link Setup) and Wi-Fi Alliance technologies. It requires Wi-Fi Agile Multiband as a prerequisite and extends its benefits in dense environments.

• Helps devices remain always best connected
  – **Optimized network discovery**: Improved scanning enables client devices to quickly discover available APs and networks.
  – **Optimized authentication**: Reduced overhead enables faster initial authentication to Wi-Fi networks.
  – **Link quality assessment**: Metrics help client devices quickly determine the AP or network providing the best connection.
  – **Efficient transmissions**: Allows devices to spend less time responding to network management traffic and more time moving user data.

• For more information, including a technology overview and technology highlights, please visit: [https://www.wi-fi.org/discover-wi-fi/wi-fi-vantage](https://www.wi-fi.org/discover-wi-fi/wi-fi-vantage).

• **Wi-Fi CERTIFIED Optimized Connectivity™** enhances Wi-Fi® roaming experience.
Wi-Fi Optimized Connectivity
Network discovery optimizations

Optimized discovery: Channel scanning prioritization

• AP Channel Report: AP performs periodic off-channel scan and broadcasts (in beacon) a list of channels on which it found another BSS, to help client devices prioritize their own channel scanning priorities

• Reduced Neighbor Report: AP broadcasts (in beacon) basic information about other BSSs it is operating on different bands, and optionally other neighboring BSSs, to help client devices optimize channel scanning

• Non-overlapping channels: APs operate on non-overlapping channels in 2.4 GHz when using automatic channel selection, to improve client device average AP discovery time and allow improved medium sharing
Wi-Fi Optimized Connectivity

Connect quickly

Fast transition and authentication

• Fast BSS transition from Wi-Fi Agile Multiband

• FILS Shared Key Authentication: Fast authentication to any AP that is served by a common AAA server, based on a previous WPA2-Enterprise authentication, enabling fast initial connection to a Wi-Fi network, fast network switch from cellular to Wi-Fi, and fast switch between Wi-Fi networks

• FILS Higher Layer Protocol: Fast IP address assignment by encapsulating DHCP exchange within association request/response, avoiding IP connectivity outage in roam or network switch using FILS authentication
Wi-Fi Optimized Connectivity
Always best connected

When and where to roam

• Network assisted steering features from Wi-Fi Agile multiband

• Estimated Service Parameters: APs broadcast (in beacon) estimate of expected airtime available to a newly joining client device, so that clients can estimate over-the-air throughput achievable for each candidate AP (in same or different networks) and choose the best connection

• Reduced WAN metrics: APs broadcast (in beacon) the available backhaul capacity, so that clients can take this into account in estimating end-to-end connection quality for each candidate AP

• RSSI-based association rejection: APs are configurable to reject association by a client device if RSSI is below a configurable threshold,
Wi-Fi Optimized Connectivity

Efficient transmissions

Low-overhead scanning

• FILS Discovery frames: APs broadcast “mini beacons” providing basic information about a BSS including BSSID, hash of SSID (Short SSID), and time of next full Beacon frame to allow client devices to discover the best AP quickly using passive scan instead of sending probes.

• Broadcast Probe response: APs requested to send probe responses send them, to the broadcast address so any other client devices that are listening may also receive them, avoiding retransmission overhead.

• Probe deferral and suppression: Client devices passively listen for at least 15 ms on each channel when scanning, receiving FILS Discovery frames, Beacons and (broadcast) probes. If the client subsequently needs to send a probe request (e.g. to scan legacy APs), it indicates the SSIDs or BSSIDs of APs from which it already has received information, in order to suppress probe responses from those APs.

• Beacon / probe minimum transmission rates: The out-of-box rate setting is of 5.5 Mbps or higher, to minimize transmission of long inefficient beacons and probes at 1 and 2 Mbps rates.
Upcoming capabilities
Wi-Fi Protected Access®

Evolving security to meet changing needs

• New features for WPA2™
  – Use of Protected Management Frames
  – Enhanced vendor security implementation validation
  – Minimum 128-bit security

• Introducing WPA3™
  – More protection for users regardless of password complexity
  – Easier, secure onboarding of IoT devices to Wi-Fi networks
  – Higher level protection in open networks
  – Minimum 192-bit security for sensitive environments

Wi-Fi Security highlights
Device provisioning

**A simple and secure way to configure Wi-Fi devices**

- For IoT and smart home devices without a user interface
- Simplifies the process of adding devices to a secure Wi-Fi network through use of QR codes
- Supports legacy devices
- Based on Device Provisioning Protocol (DPP) technology
Wi-Fi CERTIFIED ax

**Made for a new era of extremely demanding Wi-Fi**

- **Enhancements**
  - Better coverage, more density, increased capacity
  - Improved performance at the edge, even among overlapping networks
  - Enhanced power efficiency
  - Latest security (WPA3)

- **New protocols and mechanisms such as**
  - Resource scheduling OFDMA
  - UL MU-MIMO
  - Dual carrier modulation
  - 1024 QAM

- **2.4GHz and 5GHz operation with backward compatibility**
Let’s continue the conversation
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Thank you!