CISCO Engage | Tech Day

The Wi-Fi Buffet

Key Topics: Overview and Updates

Secure Networking Track

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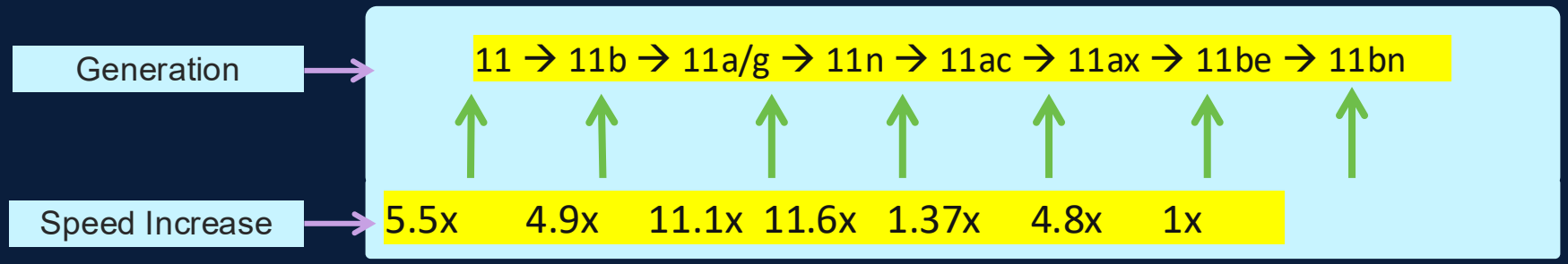
TODAY'S BUFFET

Staying high-level on some very deep topics…

- Wi-Fi 7 and historical perspective
- Key Wi-Fi 7 features, differentiators
- 6GHz and WPA3 considerations
- Global Use APs and AP portfolio
- Campus Gateway Architectures
- Wireless AIOps
- Synthetic Client Testing
- CURWB – Ultra Reliable Wireless Backhaul
- Location Tech and Use Cases
- AI Assistant

Wi-Fi History / Evolution

30 Years of Wi-Fi Technology Evolution



Breakdown of Wi-Fi generations: Wi-Fi "version" number, year ratified, standard name (b/g/n/ac/ax/be/bn), frequency bands, theoretical max bit rate, maximum channel width, max # of spatial streams, and the PHY technology in use.

Wi-Fi 1
1999
11b
2.4 GHz
11Mbps
22 MHz
HR-DSSS

Wi-Fi 2/3
2003/4
11a/g
2.4 / 5 GHz
54 Mbps
20 MHz
11a: OFDM
11g: ERP-OFDM

Wi-Fi 4
2009
11n
2.4 / 5 GHz
600 Mbps
40 MHz
4SS
MIMO
64 QAM
HT-OFDM

Wi-Fi 5
2013
11ac
5 GHz
1.7 Gbps 80 MHz
3.5 Gbps 160 MHz
8SS
DL MU-MIMO
256 QAM
VHT-OFDM

Wi-Fi 6
2019
11ax
2.4 / 5 GHz
4.8 Gbps 80 MHz
9.6 Gbps 160 MHz
8SS
UL/DL MU-MIMO
1024 QAM
HE-OFDMA

Wi-Fi 6E
2021
11ax
2.4 / 5 / 6 GHz
4.8 Gbps 80 MHz
9.6 Gbps 160 MHz
8SS
UL/DL MU-MIMO
1024 QAM
HE-OFDMA

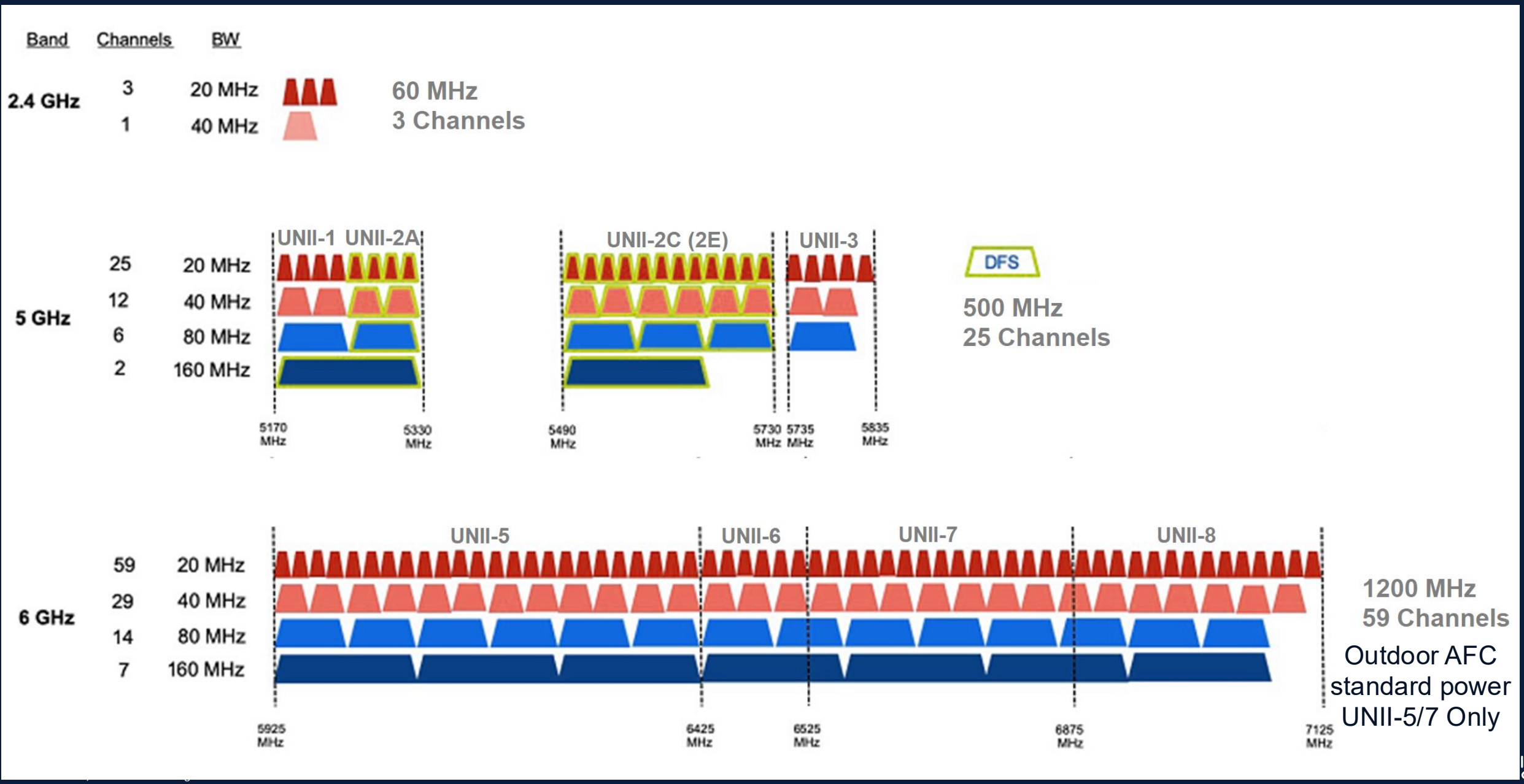
Wi-Fi 7
Late-2024
11be
2.4 / 5 / 6 GHz
23 Gbps 160 MHz
46 Gbps 320 MHz
16SS
UL/DL MU-MIMO
4096 QAM
MLO
EHT-OFDMA

Wi-Fi 8
2028-2029
11bn
2.4 / 5 / 6 GHz
23 Gbps 160 MHz
46 Gbps 320 MHz
16SS
UL/DL MU-MIMO
4096 QAM
MLO
UHR = Ultra High Reliability
MAPC = Multi AP Coordination

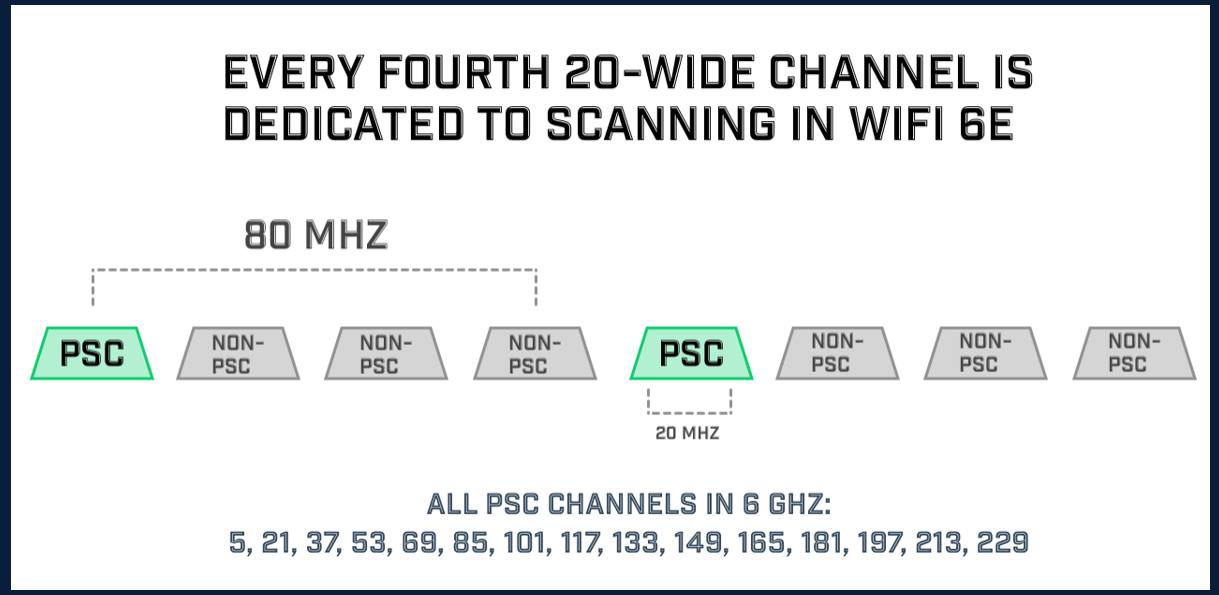
Tri-Band 2.4 / 5 / 6 GHz

6 GHz Game Changer

How the 6GHz Spectrum Compares



6GHz Channels and Primary Scanning Channels



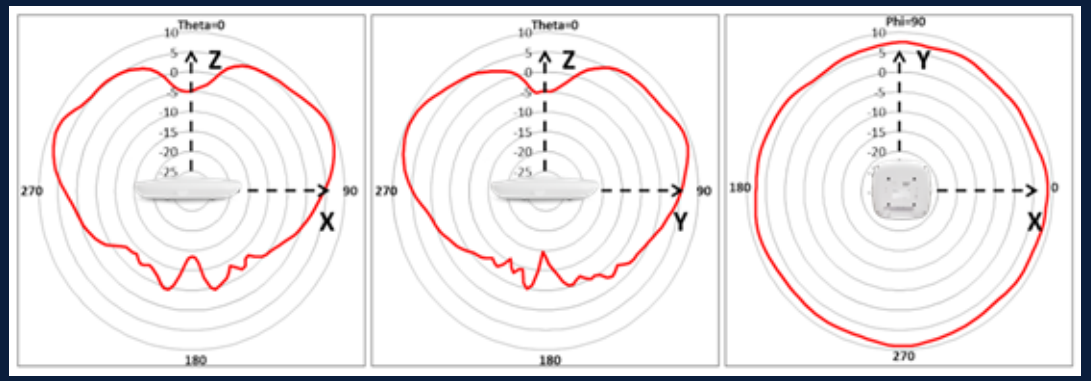
Find any channel's center frequency

5GHz band Fc = Channel x 5 + 5000 MHz
Ex: 36 x 5 + 5000 = 5180 MHz

6GHz band Fc = Channel x 5 + 5950 MHz
Ex: 101 x 5 + 5950 = 6455 MHz

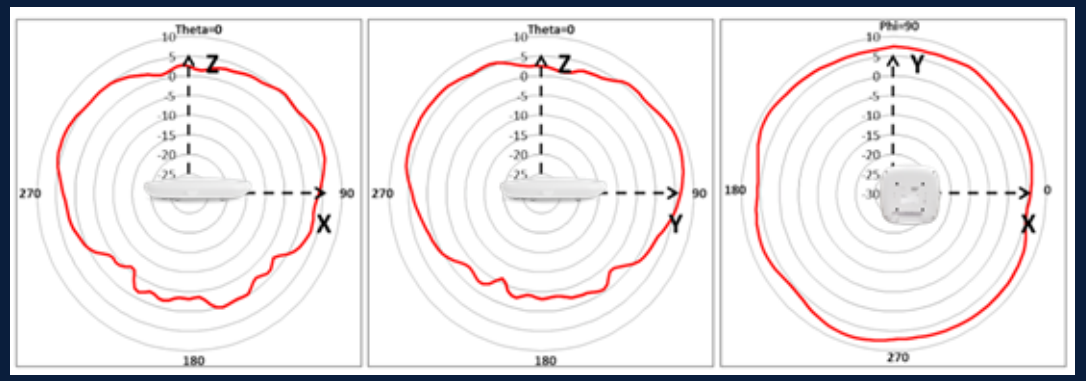
Coverage Between 5GHz and 6GHz Bands are Comparable

5 GHz



16 dBm @ 40MHz
19 dBm @ 80MHz
22 dBm @ 160MHz

6 GHz

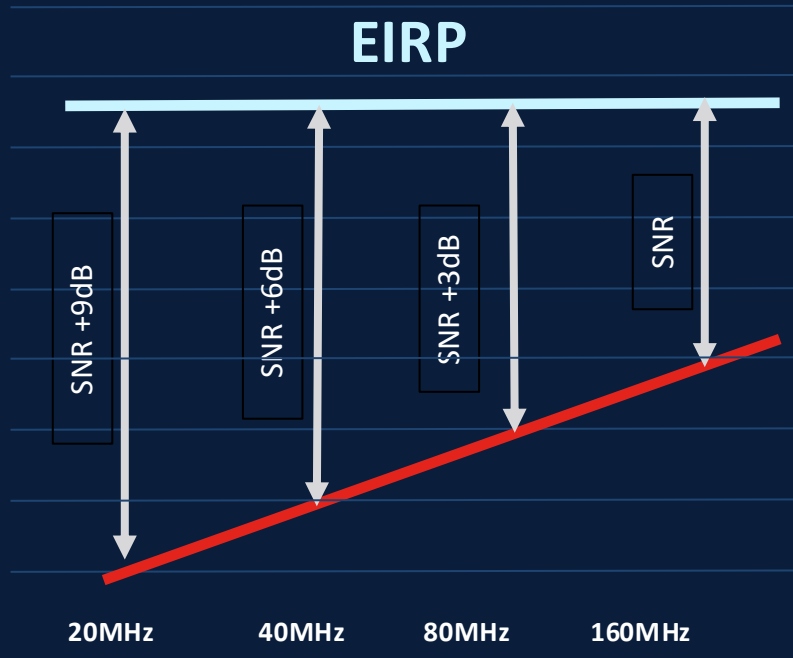


23 dBm @ 20MHz
23 dBm @ 40MHz
23 dBm @ 80MHz

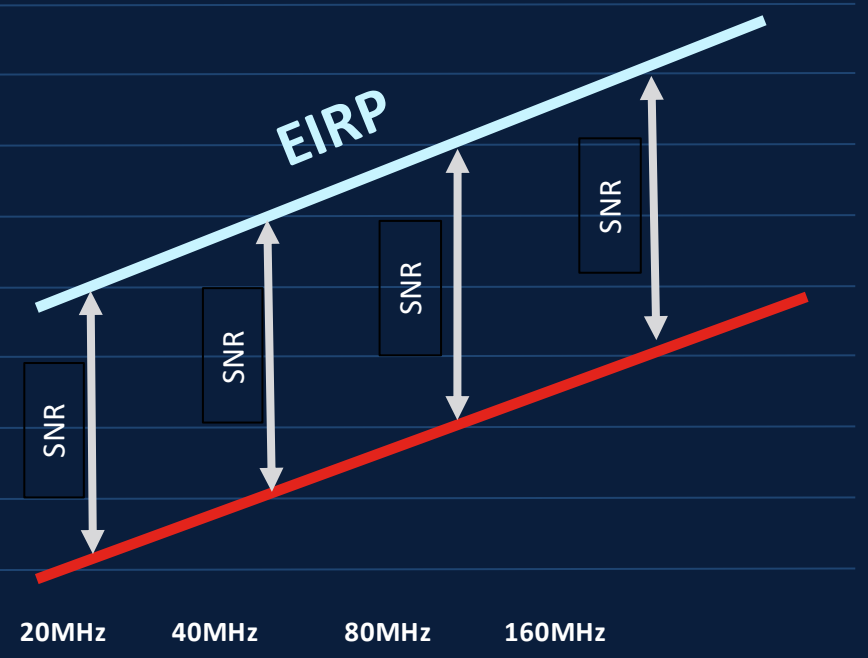
6GHz offers comparable coverage patterns for spaces surveyed for 5GHz, but it's NOT going to be exact! There are multiple caveats / considerations.
The physics say 1-2.5 dB, but there's more to it.

…And Power For All (EIRP vs PSD)

Constant EIRP
Effective Isotropic Radiated Power
SNR Penalty for wider channels
+3dB per 20MHz



Constant (PSD)
Power Spectral Density
LPI is 5 dBm/MHz PSD
+3dB max power per 20MHz



6GHz offers consistent transmission power regardless of channel width.
No regulatory “penalty” in 6GHz when doubling channel width.

Wi-Fi 7 – 802.11be

Wi-Fi 7 is Here, Now

A High-level 802.11be Teaser

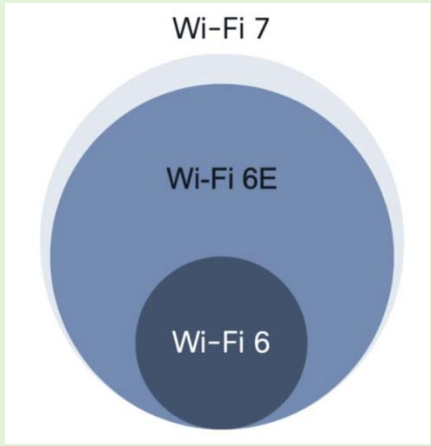
- IEEE 802.11be-2024 officially published ~July 2025
- Wi-Fi Alliance certifications began early 2024
- 11ax was (mostly) about efficiency (HE), 11be more about throughput (EHT) + deterministic latency
- Multi-Link Operation (MLO) – Use all three bands (aggregation, redundancy, load balancing)
- Up to 16 Spatial Streams (Yeah, right, good luck with that ☺)
- Preamble Puncturing – Mandatory in 6GHz, Optional in 5GHz, Minimum 80MHz channels
- 4K QAM Modulation – MCS 12 & 13 under pristine RF conditions
- 320 MHz Channel in 6GHz – 160 MHz channels in 5GHz, 20 MHz Channels in 2.4GHz
- Compressed Block ACK – Expanded MPDU aggregation window (256→512 MPDUs Per ACK)
- Multi-RU Capability (MRU) – One Client can Rx/Tx across multiple RUs simultaneously
- Triggered Uplink Access Optimization – Better performance for scheduling latency-sensitive apps
- Enhanced Security Features – WPA3 mandatory, improved ciphers and AKMs, beacon protection
- Backward compatibility preserved as always, but legacy security limits EHT and MLO

Handy IEEE timelines slide: https://www.ieee802.org/11/Reports/802.11_Timelines.htm

Wi-Fi 7, Ready for the Enterprise?? (Hint: It is now!)

- WiFi-7 products released and shipping (CW917x APs)
- The big paradigm shift is/was adopting 6GHz spectrum (Wi-Fi 6E, 11ax in 6GHz)
- WiFi-7 is now going mainstream in enterprise deployments
  - Client landscape rapidly evolved through 2025, accelerating in 2026
- Initially, WiFi-7 has marginal benefits in enterprise versus WiFi-6E
- Longer term, Wi-Fi 7 will future-proof for 7+ years (11bn coming 2029ish)
- Planning for WiFi-7:
  - ❑ Security upgrade (WPA3)
  - ❑ >30W per port (UPoE, UPoE+)
  - ❑ >1Gbps per port (2.5/5/10G mGig)
  - ❑ >10Gbps IDF uplinks (25/40G)
  - ❑ >1G ISP connections (10G)

Wi-Fi 7 isn't just about peak speed, but latency consistency and deterministic behavior: triggered uplink, MRU, MLO can matter more in real enterprise deployments than peak PHY rate.



Initial benefits of Wi-Fi 7 over Wi-Fi 6E in the enterprise was marginal compared to the jump from 6 to 6E.
As Wi-Fi 7 becomes mainstream the benefits increase proportionately.

Wi-Fi 7 without 6GHz = evolutionary
Wi-Fi 6E (6GHz) = revolutionary

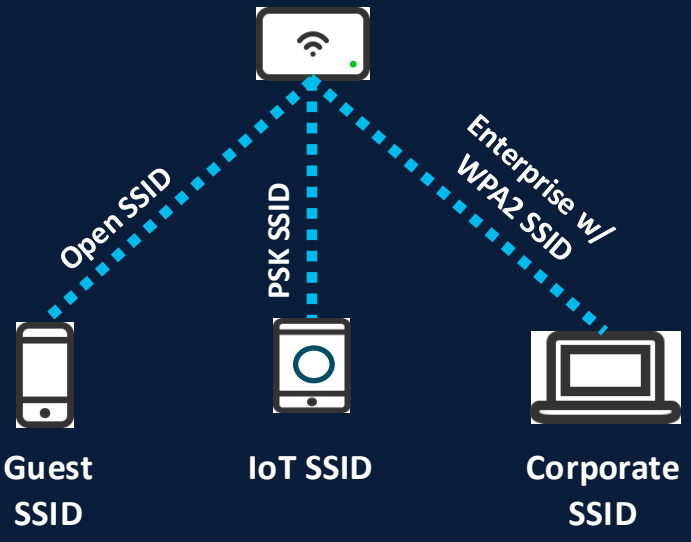
WPA3 Considerations

WPA3 Security is Mandatory in 6GHz

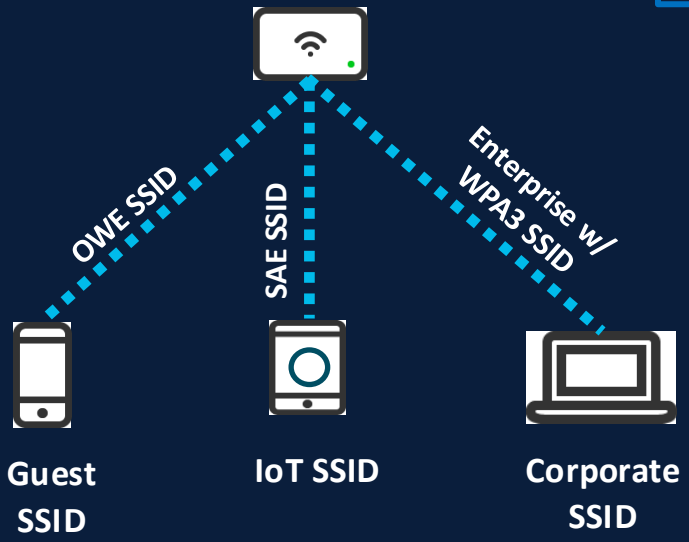
WPA2-Enterprise → WPA3-Enterprise (802.1X, EAP, RADIUS)
WPA2-Personal PSK → WPA3-Personal SAE
WPA2-Open → WPA3 OWE (aka Enhanced Open)

Security Mode	Standard / AKM	Encryption	Authentication Method	Cryptographic Strength	Cipher / Key Size
WPA2-Open	None	No	None	None (Cleartext)	None
Enhanced Open	OWE	Yes	None	Moderate (encrypted, unauthenticated)	AES-CCMP 128-bit
WPA2-PSK	PSK	Yes	Shared Passphrase	Moderate (vulnerable to offline attacks)	AES-CCMP 128-bit
WPA3-Personal	SAE	Yes	Password (SAE handshake)	Strong (eliminates offline attacks, forward secrecy)	AES-CCMP 128-bit
WPA2-Enterprise	802.1X (EAP)	Yes	EAP / RADIUS	Strong (depends on EAP method, PMF optional)	AES-CCMP 128-bit
WPA3-Enterprise	802.1X (EAP + PMF)	Yes	EAP / RADIUS	Very strong (PMF required, 192-bit suite optional)	AES-CCMP 128-bit, 192-bit option

Today's network
(2.4/5 GHz & WPA2)



Wi-Fi 7 enabled network
(tri-band & WPA3)



WPA3 Requires PMF, both APs and Clients
WPA3 not WPA2 backward-compatible

All bands leveraging MLO must have a common security AKM suite.

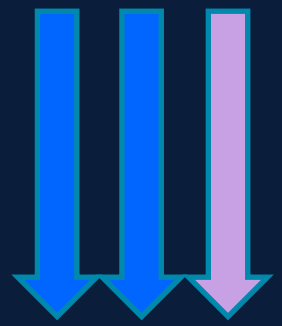
Originally: 5GHz and 6GHz SSIDs with Different Security

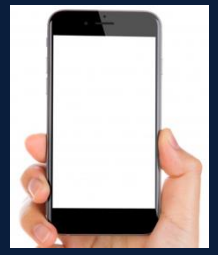
2.4 & 5 GHz Bands

- SSID: Employee
  - WPA2-Enteprise (802.1X)
- SSID: BYOD
  - WPA2-Personal (PSK)
- SSID: Guest
  - Open

6GHz Band

- SSID: Employee-6
  - WPA3-Enteprise (802.1X)
- SSID: BYOD-6
  - WPA3-Personal (SAE)
- SSID: Guest-6
  - Enhanced Open OWE





With Transition Mode SSIDs

2.4, 5, 6 GHz Bands

- SSID: Employee
  - WPA3-Enteprise (802.1X) Transition Mode
- SSID: BYOD
  - WPA3-Personal (SAE) Transition Mode
- SSID: Guest
  - Enhanced Open OWE SSID
  - Transition Mode (not supported, WPA3 forbids open SSIDs)

6GHz was the clean slate (ok, torque wrench) moment ☺

- WPA3 mandatory.
- PMF mandatory.
- No PSK.
- No Open auth.
- No OWE transition.
- No fallback.

6GHz intentionally meant to NOT carry forward 20+ year old legacy security mechanisms… WPA2 had a solid run!

WPA2 / WPA3 Truth Table

If WPA2 is anywhere in the beacon, Wi-Fi 7 stays in the parking lot ☺

	Band	Mode Advertised	WPA2 Allowed	PSK Allowed	OWE Transition Allowed	PMF Required	EHT / MLO Eligible
1	2.4 / 5 GHz	WPA2 Only	☑ Yes	☑ Yes	N/A	Optional	✗ No
2	2.4 / 5 GHz	WPA3 Transition (PSK + SAE)	☑ Yes	☑ Yes	N/A	Optional	✗ No (WPA2 present)
3	2.4 / 5 GHz	WPA3 Only (SAE or Enterprise)	✗ No	✗ No	N/A	Required	☑ Yes
4	2.4 / 5 GHz	OWE Transition	N/A	N/A	☑ Yes	Required for OWE	✗ No
5	6 GHz	WPA3 Only (SAE or Enterprise)	⊘ Not Allowed	⊘ Not Allowed	⊘ Not Allowed	Required	☑ Yes
6	6 GHz	OWE (Enhanced Open)	⊘ Not Allowed	⊘ Not Allowed	⊘ Not Allowed	Required	✗ No (OWE cannot support MLO/EHT)
7	6 GHz	WPA3 Transition	⊘ Not Allowed	⊘ Not Allowed	⊘ Not Allowed	Required	⊘ Not Allowed

Row 1: 2.4/5 GHz WPA2 Only = Legacy security: WPA2 and PSK allowed, PMF optional, but no Wi-Fi 7 EHT/MLO capability.

Row 2: 2.4/5 GHz WPA3 Transition (PSK + SAE) = Mixed WPA2/WPA3 AKMs, PMF optional, supports legacy clients but disqualifies EHT/MLO.

Row 3: 2.4/5 GHz WPA3 Only (SAE or Enterprise) = WPA3-only with mandatory PMF, no PSK, and fully eligible for EHT/MLO.

Row 4: 2.4/5 GHz OWE Transition = Open + hidden OWE dual-broadcast, PMF required for OWE clients, but not eligible for EHT/MLO.

Row 5: 6 GHz WPA3 Only (SAE or Enterprise) = Clean-room model: no WPA2 or PSK or transition modes, PMF required, fully EHT/MLO capable.

Row 6: 6 GHz OWE (Enhanced Open) = Encrypted guest access only, no WPA2/PSK/transition allowed, PMF required, not EHT/MLO capable. **Note: 11be clients can join a 6GHz OWE SSID, but without EHT / MLO, it falls back to HE rates, EHT requires WPA3 AKMs, not just encryption.**

Row 7: 6 GHz WPA3 Transition = Not permitted by spec: WPA2, PSK, and transition modes are forbidden in 6 GHz.

Note: This table is ideal-world by spec, vendor neutral, independent of firmware. Reality is different!

cisco

Cisco Global Use APs

Cisco’s Fully Converged Wi-Fi 7 APs (CW917x)

Global Use AP: Simple ordering, licensing, deployment

- AP detects boot mode (should it run Meraki or WLC/CatC)
- AP determines regulatory domain

Unified Licensing (including Cisco Spaces)

- No mandatory license attach, all cription based
- Can get online pre-activation for functional attach
- No shutdown, not even in Meraki, management-disabled

Converged, Sustainable Product Experience

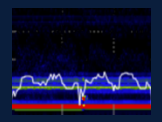
- Converged purchasing, unboxing, RMA experiences
- 10-pack bundles, no plastic bags anywhere, “guide-me” options to select or opt-out of accessories such as brackets

Management flexibility

- APs may be ed bidirectionally without support tickets
- Single inventory, Dashboard as PnP tool, simple reset process

Wi-Fi 7 Portfolio Covering Every Operational Scale

CleanAir® Pro



Dedicated Scanning Radio
Full time WIPS and Spectrum Analysis

Dedicated IoT Radio

CW9172H

6 Spatial Streams
Wall-plate Hospitality
Wired ports, PoE pass-thru

CW9174E

8/10 Spatial Streams
External antenna options

CW9176D1

12 Spatial Streams
Integrated Directional
UWB

CW9179F

16 Spatial Streams
LPV / Stadium
Beam switching and backfill

CW9171I

4 Spatial Streams
Omnidirectional

CW9172I

6 Spatial Streams
Omnidirectional

CW9174I

8/10 Spatial Streams
Omnidirectional

CW9176I

12 Spatial Streams
Omnidirectional
UWB

CW9178I

16 Spatial Streams
Omnidirectional
UWB

Wi-Fi 7 | Global Use AP | Unified License | mGig Uplinks | AI Optimized

Wi-Fi 7 Software Support Matrix

IOS-XE 17.18.1 or later Catalyst Center 2.3.7.10+ / 3.1.5+	 CW9179F	MR 31.1.7 or later
IOS-XE 17.15.2 or later Catalyst Center 2.3.7.6 (for configuration) Catalyst Center 2.3.7.9 (for maps & assurance)	 CW9178I CW9176I & D1	MR 31.1.5.1 or later
IOS-XE 17.18.2 or later Catalyst Center 2.3.7.11 / 3.2.3	 CW9174I & E	MR 32.1.5 or later
IOS-XE 17.15.2b or later Catalyst Center 2.3.7.10	 CW9172I	MR 31.1.5.1 or later
IOS-XE 17.17.1 or later Catalyst Center 3.1.3	 CW9172H	MR 31.1.6.1 or later
IOS-XE 17.18.2 or later Catalyst Center 2.3.7.11 / 3.2.3	 CW9171I	MR 32.1.5 or later

Think of this not as a compatibility chart, but a planning checklist to have software compatibility pre-positioned

Campus Gateway

Centralized, Cloud-Managed, Large-Scale Wireless

Complete Architectural Portfolio, Only From Cisco

Cloud-managed Cisco Campus Gateway

Architecture	Customer Managed	Hybrid Management	Cloud Management
Centralized	Local Mode	Cloud Connected Controllers	Campus Gateway
Distributed	Flex Connect		Traditional Meraki

Reasons to Consider Campus Gateway

Why go with centralized cloud-managed large-scale wireless overlay with CG?

Services at Scale

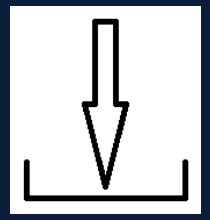
- Large scale roaming across L3 boundaries
- Fast roaming across a large domain >300 APs
- Campus-wide mDNS gateway functionality

Wired Network Design

- Don’t want to re-work the underlay wired design
- Want to simplify VLAN/subnet design at the access layer
- Want to simplify DHCP scope design

Policy

- Single policy (QoS, ACL, etc) enforcement point for wireless traffic
- Single NAS to be configured in AAA server (not every single AP)
- Simple way to handle BUM traffic

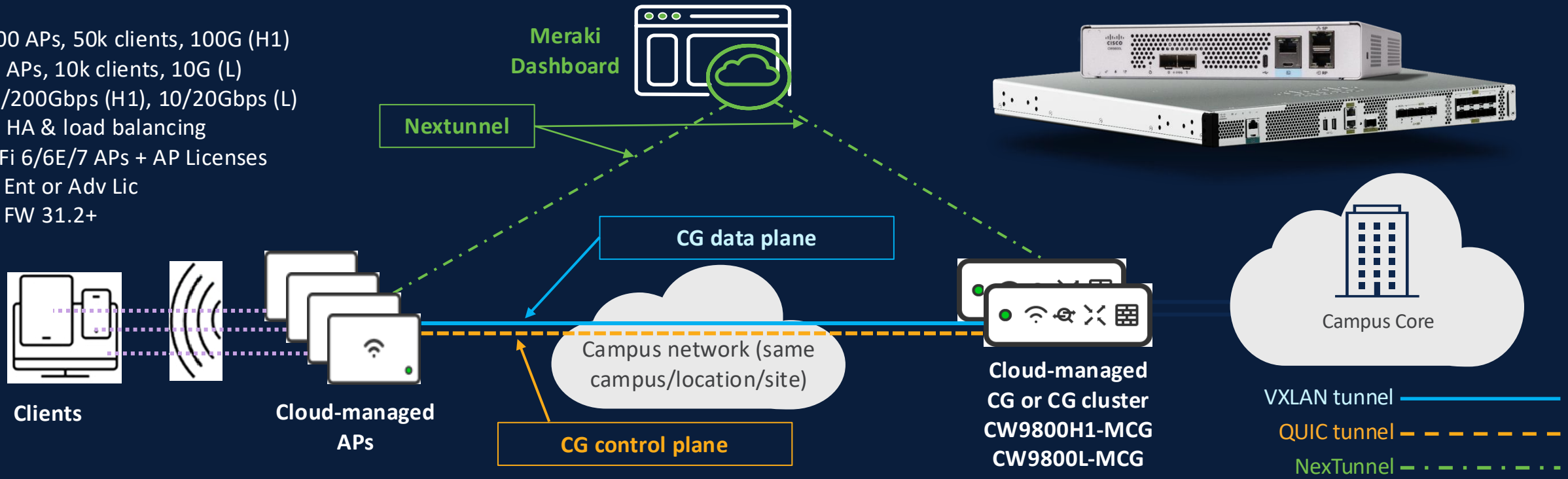


Performance

- Optimized for north-south traffic
- Centralized aggregator is not a bottleneck
- No latency impact for any “trombone” network effect

Cisco ~~Meraki~~ Campus Gateway – Topology & Connectivity

5,000 APs, 50k clients, 100G (H1)
500 APs, 10k clients, 10G (L)
100/200Gbps (H1), 10/20Gbps (L)
A/A HA & load balancing
Wi-Fi 6/6E/7 APs + AP Licenses
MR Ent or Adv Lic
MR FW 31.2+

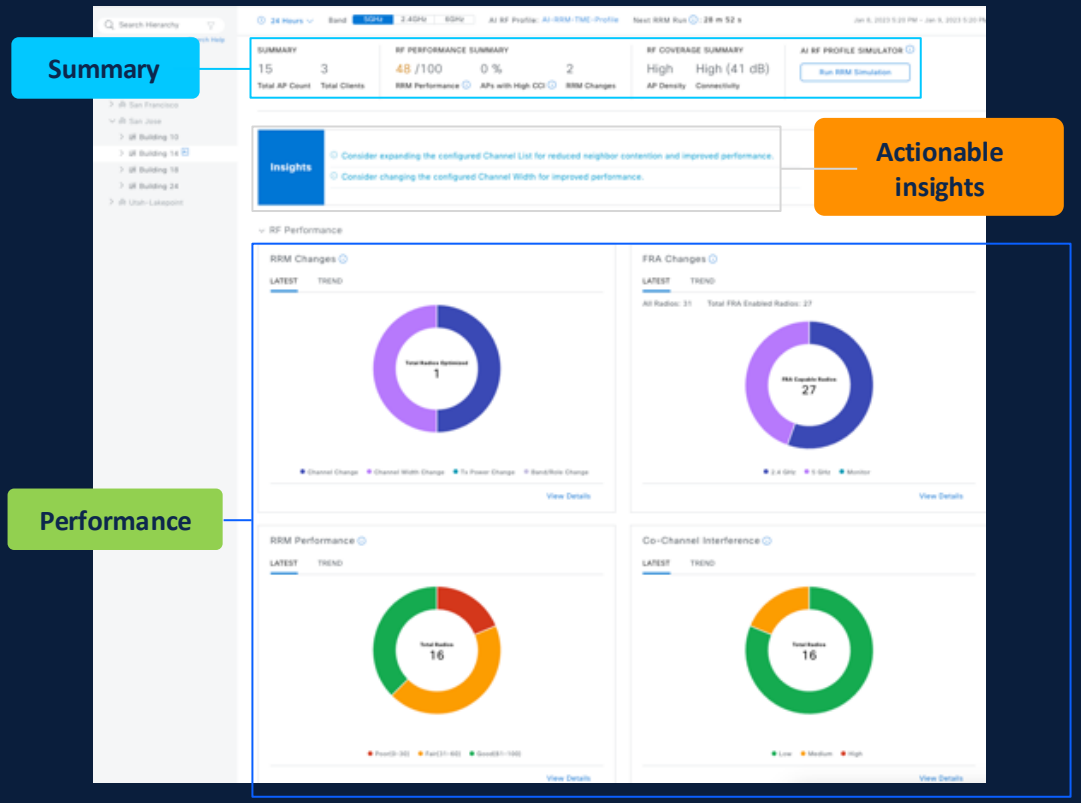


- CG natively managed by the cloud, same as APs via Meraki Dashboard
- Encrypted L3 control and data plane tunnels form automatically
- SSID switching type co-existence (bridge and concentrated modes on same APs)
- Single (one-armed) uplink (with LAG) and single logical uplink (at launch)
- One CG (or CG cluster) per network, two CGs per cluster (at launch), same site <20ms RTT

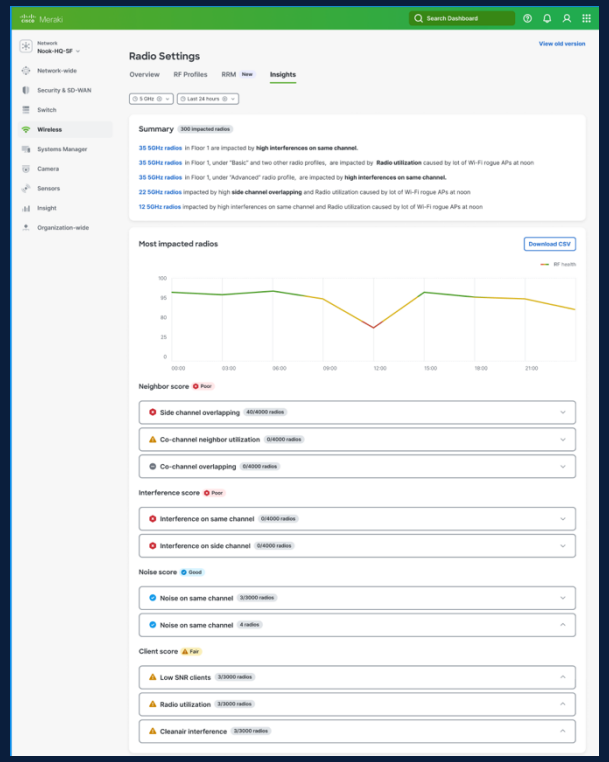
Wireless AIOps

AI-Enhanced RRM is AI that Powers RF Optimization

Catalyst Center



Meraki

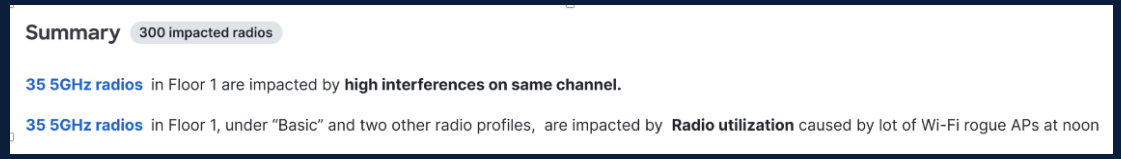


Impacted Radio Trends

Download Raw data for serviceability

Identify what's the most prevalent root cause of the impact

- Neighbor score
- Interference score
- Noise score
- Client score



Trend-based RRM services at any scale with FRA, enhanced auto busy-hour for after-hours optimization, AP neighbors (RF visualization) and predictive RF insights and recommendations.

AI-Enhanced RRM – Real-world Customer

Interference Lowered on 2.4 GHz and Client Capacity Increased on 5 GHz

Deployment highlights

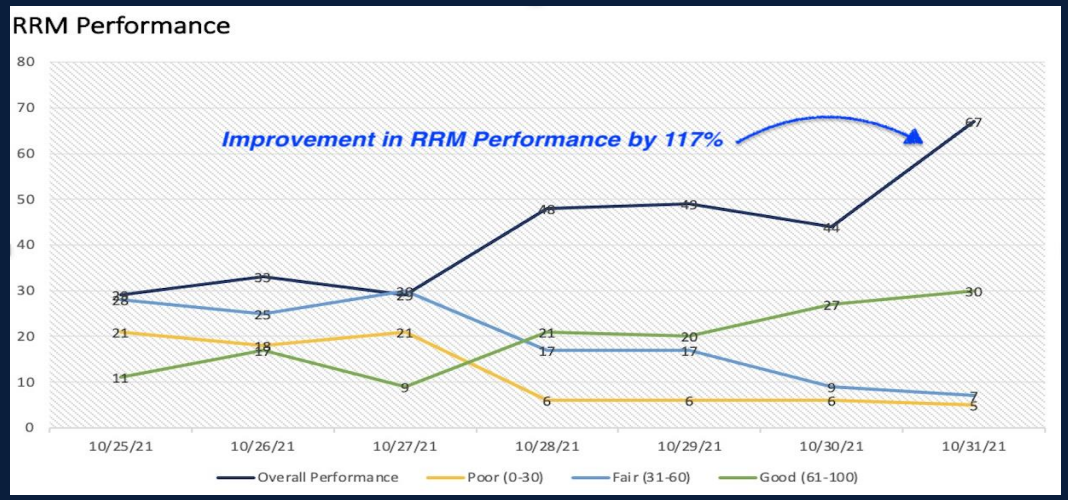
- **Location:** University building
- **Network:** 63 APs in high density
- **Client count:** Peak 639, average 430, 90% are on 5 GHz

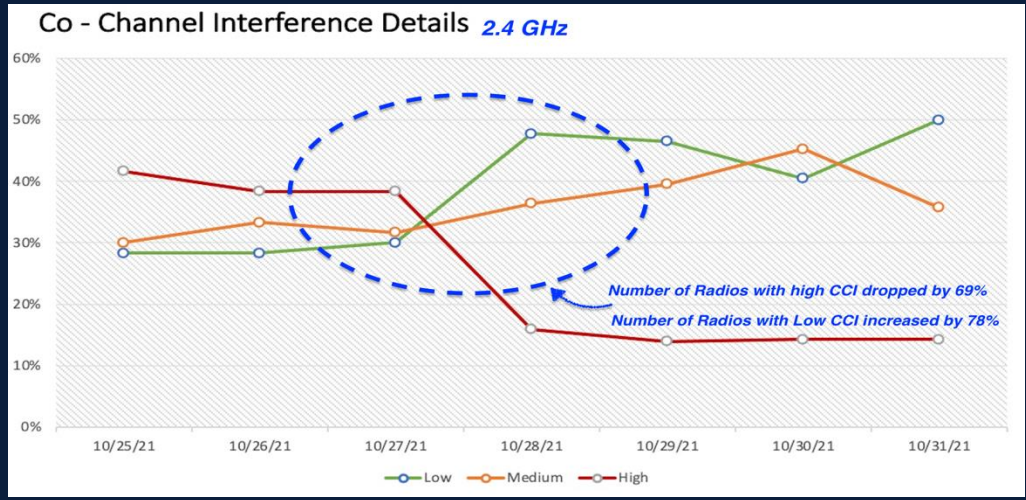
Before AI-Enhanced RRM

- **2.4-GHz pain point:** High interference
- **5-GHz pain point:** Low capacity, since 90% of endpoints are there

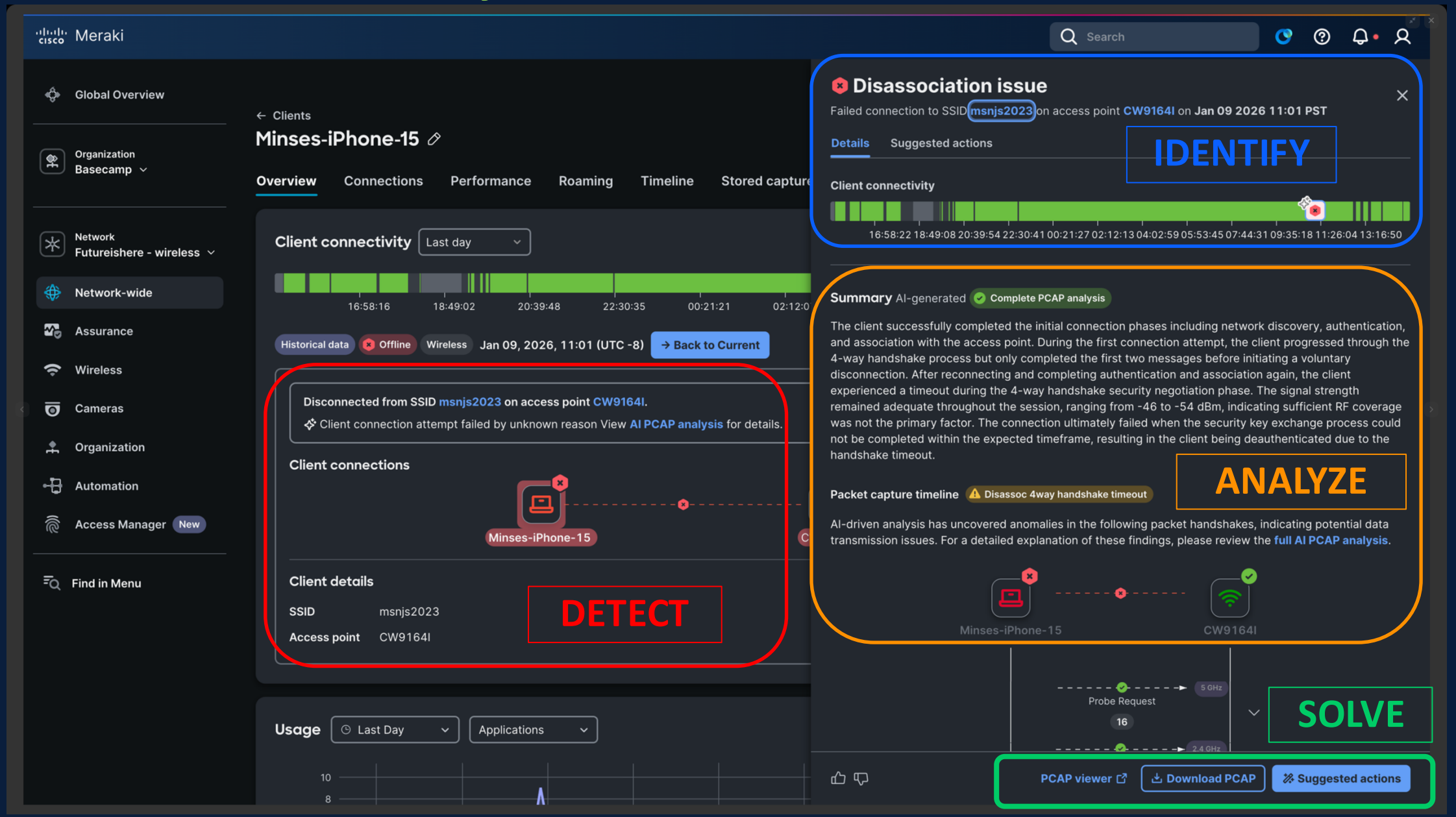
After AI-Enhanced RRM

- **Optimization:** 61% of 2.4-GHz radios changed to dual 5 GHz or monitor mode
- **2.4-GHz outcome:** Co-Channel Interference (CCI) dropped by 33% for 2.4 GHz
- **5-GHz outcome:** 5 GHz improved with an increase of 8 dB in Signal-to-Noise Ratio (SNR)





New: AI Packet Analyzer within Proactive PCAP



Synthetic Testing

Wireless synthetic testing

Convert access points into synthetic clients to run network and application tests...and more.

1

Accelerate Issue Resolution

Reduce MTTR by quickly identifying issues, understanding root causes, and resolving them faster with network baselining and validation along with actionable insights.

2

Proactively Assure Readiness

Validate infrastructure performance with scheduled synthetic tests, catching issues early – before users connect and after configuration changes occur.

3

End-to-End Visibility

Track application performance from AP to cloud, monitor unmanaged devices, and run natively on Cisco Wi-Fi APs – no additional hardware required.

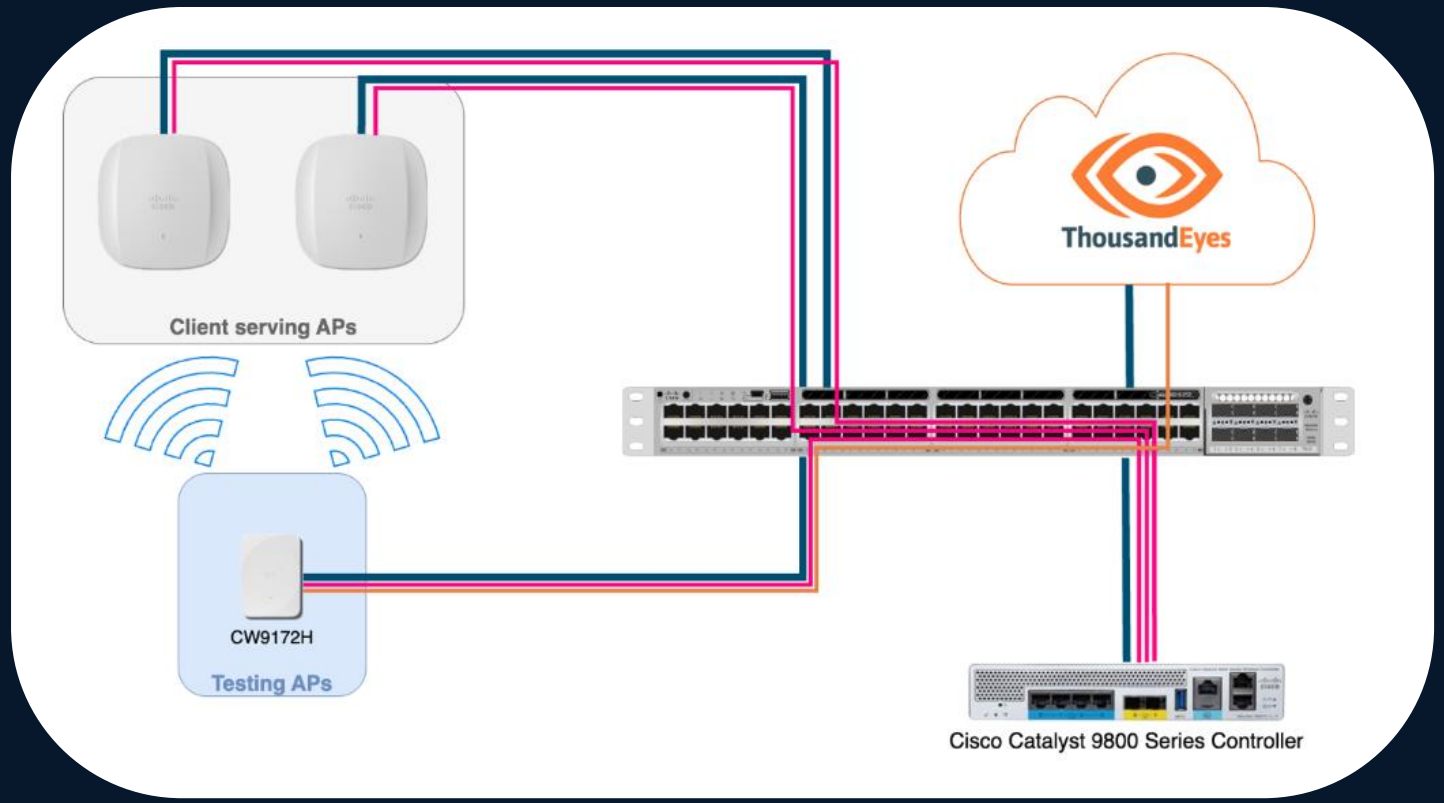
Wireless synthetic testing – on prem

Dedicated AP as a client

Deploy Wi-Fi 7 wall plate AP (CW9172H) as dedicated synthetic clients that mimic the RF seen at the client level.

High Priority Location Coverage

Deploy APs as synthetic clients in your high priority, mission critical locations and gain a baseline understanding of expected client experience.



At launch
WLC & TE Dash

CW9172H +
TE endpoint agent

Ceiling AP

Beta
Q3 CY25

Wireless synthetic testing

Convert access points into synthetic clients to run network and application tests...and more.

1

Accelerate Issue Resolution

Reduce MTTR by quickly identifying issues, understanding root causes, and resolving them faster with network baselining and validation along with actionable insights.

2

Proactively Assure Readiness

Validate infrastructure performance with scheduled synthetic tests, catching issues early – before users connect and after configuration changes occur.

3

End-to-End Visibility

Track application performance from AP to cloud, monitor unmanaged devices, and run natively on Cisco Wi-Fi APs – no additional hardware required.

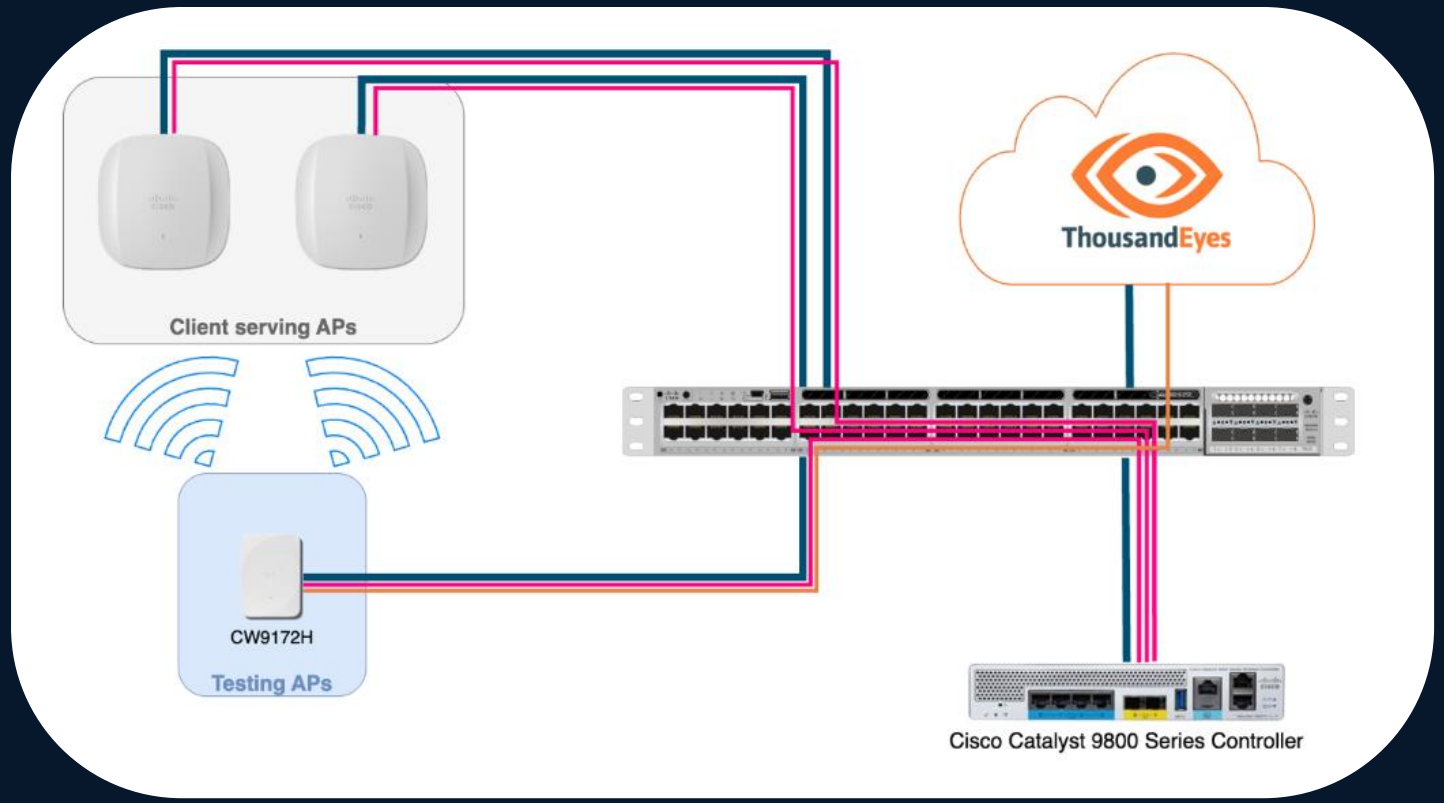
Wireless synthetic testing – on prem

Dedicated AP as a client

Deploy Wi-Fi 7 wall plate AP (CW9172H) as dedicated synthetic clients that mimic the RF seen at the client level.

High Priority Location Coverage

Deploy APs as synthetic clients in your high priority, mission critical locations and gain a baseline understanding of expected client experience.



At launch
WLC & TE Dash

CW9172H +
TE endpoint agent

Ceiling AP

Beta
Q3 CY25

Wireless synthetic testing - cloud

Integrated Service Assurance

Transform your APs, switches, and SD-WAN routers to test network availability and connectivity.

Leverage Existing Hardware

Take advantage of the infrastructure you already have deployed to provide automated test coverage across your entire network.

End-to-End Tests

Receive extra context into network events from client onboarding, connectivity (wireless, LAN, WAN) and network services tests.

Cloud first
in Meraki Dashboard

Scanning radio at launch

Ceiling AP

Beta
Q3 CY25

Location Tech & Use Cases

SOFTWARE PLATFORM

CISCO SPACES | The OS for Smart Spaces

Foundational building blocks to build, manage and scale smart spaces

Indoor Location

X-Y location of people and devices Wi-Fi, BLE, UWB

Multi-sensor Connect

Onboard, manage and get telemetry from IoT sensors. Open Device & partner ecosystem

AI-Maps

Intuitive maps for spatial context. Rich meta data for multiple use cases

Occupancy

Presence & people count across building, floor, room, desk

Wi-Fi Onboarding

Seamless connect to Wi-Fi with Captive Portal, SDK, OpenRoaming

Apps & APIs

Cloud dashboard with Apps, APIs

Cisco Spaces Platform

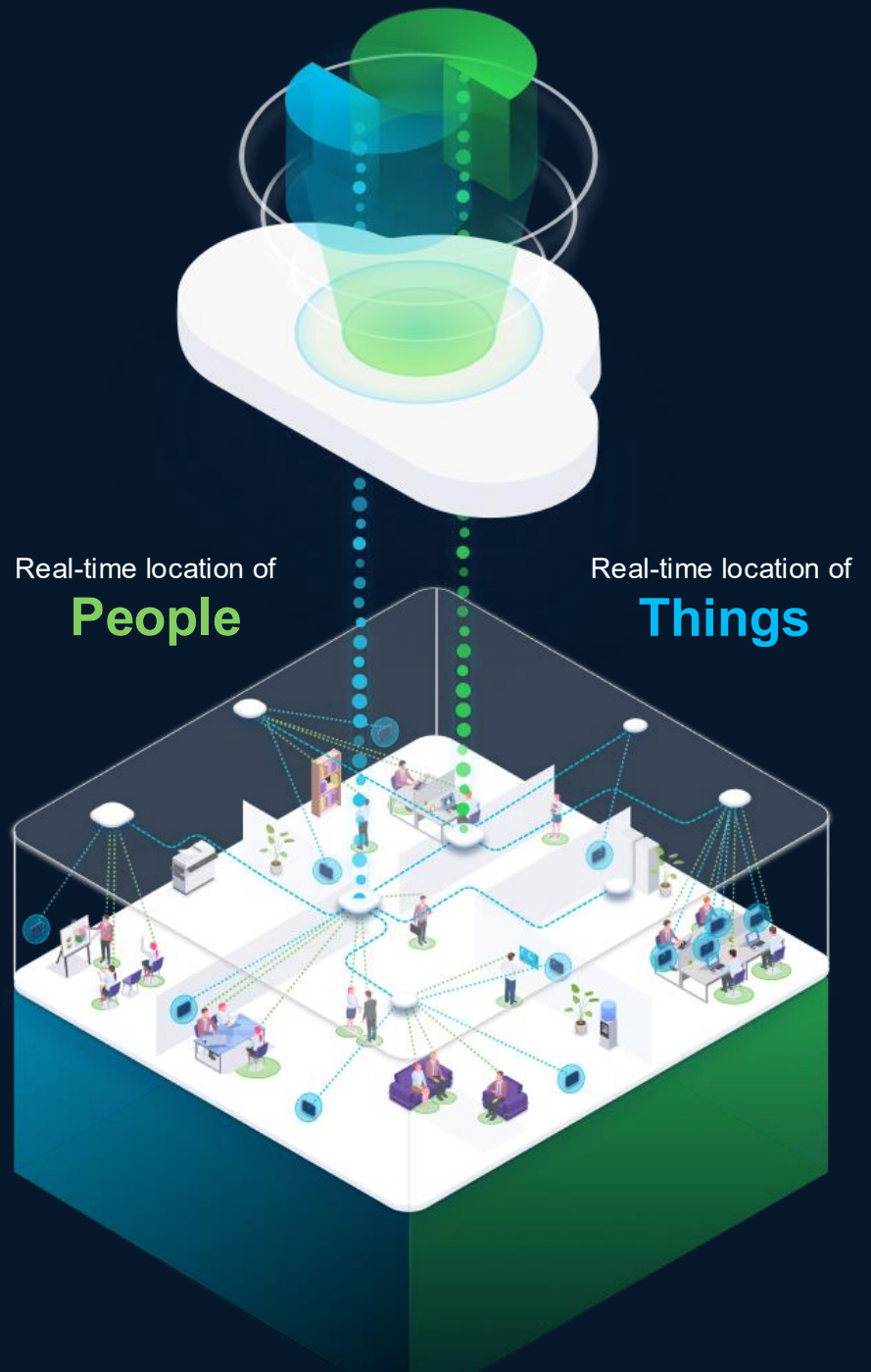
Indoor Location

Understand real-time location of people and things in your building

Multi-tech location engine delivers a common framework for Wi-Fi, Bluetooth Low Energy (BLE), & Ultra-Wideband (UWB) technologies

Provides accurate indoor positioning for indoor location-based services (RTLS) use cases. Extend to customer and partner applications via a single API for multiple technologies

Industry Standard for Location



Integrated Wi-Fi and URWB infrastructure

Innovating beyond Wi-Fi boundaries

Ultra-Reliable Wireless Backhaul

Zero loss, seamless handoffs
Moving assets stay connected even at high speeds

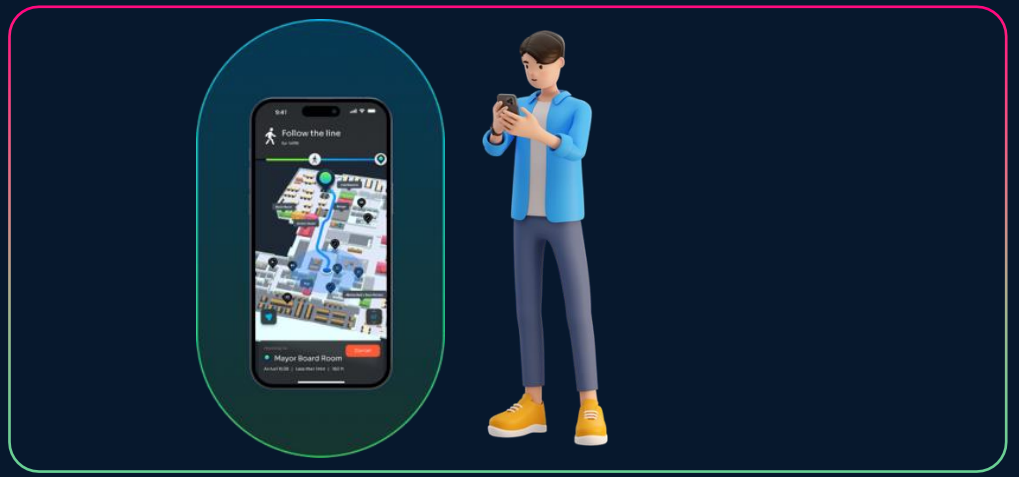
Ultra-low latency (<10 ms)
Real-time data transfer between assets and applications

Uninterrupted connectivity
Built-in replicated data paths for critical applications

Received Singal Strength (RSSI)

Accuracy 20-30’

Bluetooth Low Energy (BLE) RSSI



Accuracy 9-15’

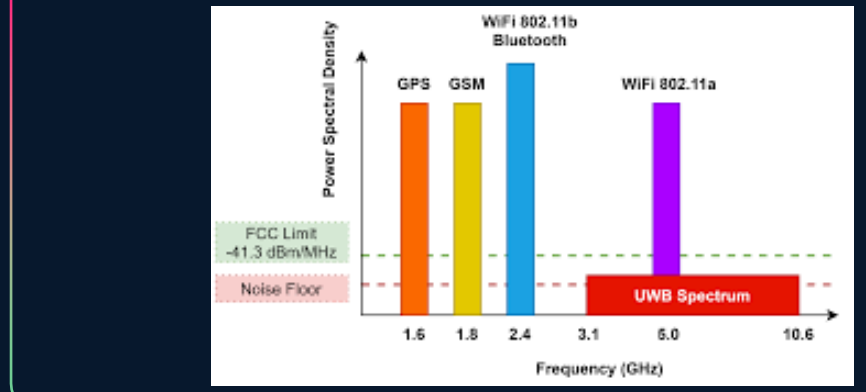
cisco SPACES

The OS for Smart Spaces

Fine Time Measurements (FTM, 802.11 mc)

Line of Sight 3-6’

Ultra Wideband (UWB, 802.15.4)



Accuracy 3”

AI Assistant

Cisco Agentic Ops for Network Management

The solution for key customer pain points

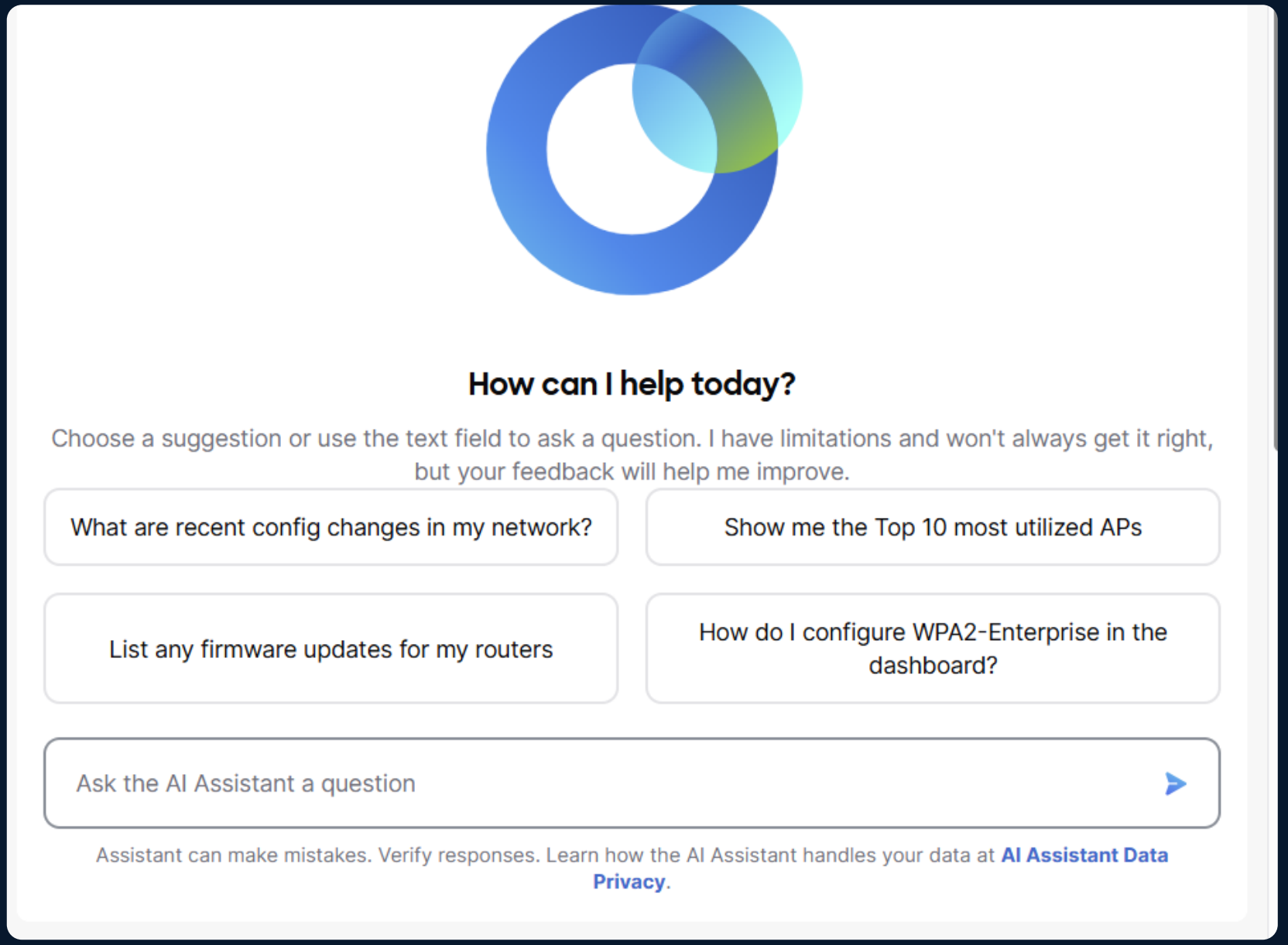
Empowering IT productivity
for increased IT skills and efficiency

Solutions that simplify
for seamless, painless network management

Enhancing visibility
for greater understanding and critical insights

AI Assistant Demo

- ✓ Troubleshooting
- ✓ Monitoring
- ✓ Configurations



CISCO Engage | Tech Day

Thank you