

Configure and Verify Wi-Fi 6E Band Operations and Client Connectivity

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Introduction

This document describes how to configure Wi-Fi 6E Band Operations and what to expect on different clients.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco Wireless Lan Controllers (WLC) 9800
- Cisco Access Points (APs) that support Wi-Fi 6E.
- IEEE Standard 802.11ax.
- Network tools: Wireshark

Components Used

The information in this document is based on these software and hardware versions:

- WLC 9800-CL with Cisco IOS® XE 17.9.3.
- APs C9136, CW9162 and CW9166.
- Wi-Fi 6E Clients:
 - Lenovo X1 Carbon Gen11 with Intel AX211 Wi-Fi 6 and 6E Adapter with driver version 22.200.2(1).
 - Netgear A8000 Wi-Fi 6 and 6E Adapter with driver v1(0.0.108);
 - Mobile Phone Pixel 6a with Android 13;
 - Mobile Phone Samsung S23 with Android 13.
- Wireshark v4.0.6

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background Information

The key thing to know is that Wi-Fi 6E is not an entirely new standard, but an extension. At its base, Wi-Fi 6E is an extension of the Wi-Fi 6 (802.11ax) wireless standard into the 6-GHz radio-frequency band.

Wi-Fi 6E builds on Wi-Fi 6, which is the latest generation of the Wi-Fi standard, but only Wi-Fi 6E devices and applications can operate in the 6-GHz band.

Since the 6-GHz spectrum is new and accepts only Wi-Fi 6E devices, it does not have any of the old issues that clog up current networks.

It offers better:

â—◆ **Capacity:** In US defined by FCC, there is additional spectrum of 1200 MHz worth or 59 new channels. The new 6-GHz band employs fourteen 80-MHz and seven 160-MHz channels. Other countries can have different spectrum amount allocated for WiFi 6E. Please check [Countries Enabling Wi-Fi in 6 GHz \(Wi-Fi 6E\)](#) for updated info on country adoption of WiFi 6E.

â—◆ **Reliability:** Wi-Fi 6E provides a new standard of reliability and predictability of connection that shortens the gap between wireless and wired connections. Devices from Wi-Fi 1 (802.11b) through Wi-Fi 6 (802.11ax) are not supported on 6 GHz.

â—◆ **Security:** Wi-Fi Protected Access 3 (WPA3) is a mandatory requirement for the Wi-Fi 6E network and secures the network better than ever. And since only Wi-Fi 6 products are to use this network, there are no legacy security issues to deal with. WPA3 provides new authentication and encryption algorithms for networks and furnishes fixes for issues that were missed by WPA2. It also implements an additional layer of protection from deauthentication and disassociation attacks.

6 GHz Band – Total Spectrum 1200 MHz



5 GHz Band – Total Spectrum 500 MHz (180 MHz without DFS)



2.4 GHz Band – Total Spectrum 80 MHz



Comparison of 2.4, 5 and 6 GHz wifi spectrum and channels

For additional background information about Wi-Fi 6E, please check our [Wi-Fi 6E: The Next Great Chapter in Wi-Fi White Paper](#).

There are various managements and changes in Wi-Fi 6E. In the Verification section of this document, there is a small description of some of these enhancements accompanied by the verification in the real environment.

Wi-Fi 6E Security

Wi-Fi 6E uplevels security with Wi-Fi Protected Access 3 (WPA3) and Opportunistic Wireless Encryption (OWE) and there is no backward compatibility with Open and WPA2 security.

WPA3 and Enhanced Open Security are now mandatory for Wi-Fi 6E certification and Wi-Fi 6E also requires Protected Management Frame (PMF) in both AP and Clients.

When configuring a 6GHz SSID there are certain security requirements that must be met:

- WPA3 L2 security with OWE, SAE or 802.1x-SHA256
- Protected Management Frame Enabled;
- Any other L2 security method is not allowed, that is, no mixed mode possible.

To know more about detailed information about WPA3 implementation in Cisco WLANs, including client security compatibility matrix, please feel free to check the [WPA3 Deployment Guide](#).

Cisco Catalyst Wi-Fi 6E APs

```
Device (config)# wireless profile multi-bssid multi-bssid-profile-name
Device (config-wireless-multi-bssid-profile)# dot11ax downlink-mumimo
```

Configure Multi-BSSID in the RF Profile (GUI)

Step 1 - Choose Configuration > Tags & Profiles > RF/Radio.

Step 2 - In the **RF** tab, click **Add**. The Add RF Profile page is displayed.

Step 3 - Choose the **802.11ax** tab.

Step 4 - In the **Multi BSSID Profile** field, choose the profile from the drop-down list.

Step 5 - Click **Apply to Device**.

The screenshot shows the Cisco Catalyst 9800-CL Wireless Controller GUI. The main content area is titled 'Configuration > Tags & Profiles > RF/Radio'. It features a navigation sidebar on the left with options like Dashboard, Monitoring, Configuration, Administration, Licensing, and Troubleshooting. The main area has a 'RF' tab selected, showing a table of RF profiles. The table has columns for 'State', 'RF Profile Name', and 'Band'. The 'default-rf-profile-6ghz' profile is highlighted. Below the table are navigation controls. On the right, the 'Edit RF Profile' sidebar is open, showing tabs for 'General', '802.11', 'RRM', and 'Advanced'. The 'Multi BSSID Profile' field is visible in the configuration page.

State	RF Profile Name	Band
<input type="checkbox"/>	default-rf-profile-6ghz	6 GHz
<input type="checkbox"/>	Low_Client_Density_rf_5gh	5 GHz
<input type="checkbox"/>	High_Client_Density_rf_5gh	5 GHz
<input type="checkbox"/>	Low_Client_Density_rf_24gh	2.4 GHz
<input type="checkbox"/>	High_Client_Density_rf_24gh	2.4 GHz
<input type="checkbox"/>	Typical_Client_Density_rf_5gh	5 GHz
<input type="checkbox"/>	Typical_Client_Density_rf_24gh	2.4 GHz

Configure Multi-BSSID in the RF Profile (CLI)

```
Device# configure terminal
Device(config)# ap dot11 6ghz rf-profile rf-profile-name
Device(config-rf-profile)# dot11ax multi-bssid-profile multi-bssid-profile-name
```

Creation of Multiple SSIDs

To verify the MBSSID feature, you must have various SSIDs enabled and pushed to the APs. In this verification, three SSIDs are used:

Cisco Catalyst 9800-CL Wireless Controller 17.9.3

Welcome admin

Configuration > Tags & Profiles > WLANs

+ Add × Delete Clone Enable WLAN Disable WLAN

Selected WLANs : 1

<input type="checkbox"/>	Status	Name	ID	SSID
<input type="checkbox"/>	⬆️		1	
<input type="checkbox"/>	⬆️		2	
<input type="checkbox"/>	⬆️		3	
<input type="checkbox"/>	⬆️		4	
<input type="checkbox"/>	⬆️	wifi6E_test	5	wifi6E_test
<input checked="" type="checkbox"/>	⬆️	wifi6E_test_01	6	wifi6E_test_01
<input type="checkbox"/>	⬆️	wifi6E_test_02	7	wifi6E_test_02

Verification

To verify if the configuration is in place issue the commands shown here:

```
<#root>
```

```
WLC9800#
```

```
show ap rf-profile name default-rf-profile-6ghz detail | b 802.11ax
```

```
802.11ax
```

```
OBSS PD : Disabled
Non-SRG OBSS PD Maximum : -62 dBm
SRG OBSS PD : Disabled
SRG OBSS PD Minimum : -82 dBm
SRG OBSS PD Maximum : -62 dBm
Broadcast Probe Response : Disabled
FILS Discovery : Disabled
Multi-BSSID Profile Name :
```

```
MBSSIDprofile_test
```

```
NDP mode : Auto
Guard Interval : 800ns
PSC Enforcement : Disabled
```

```
WLC9800#
```

```
WLC9800#
```

```
show wireless profile multi-bssid detailed MBSSIDprofile_test
```

```
Multi bssid profile name :
```

```
MBSSIDprofile_test
```

```
-----
Description :
```

802.11ax parameters
 OFDMA Downlink : Enabled
 OFDMA Uplink : Enabled
 MU-MIMO Downlink : Enabled
 MU-MIMO Uplink : Enabled
 Target Waketime : Enabled
 TWT broadcast support : Enabled

WLC9800#

Here is what you can see in the OTA captures when using Single BSSID:

The screenshot shows a Wireshark capture of 802.11 Beacon frames. The packet list pane displays a series of beacon frames, all originating from the same source MAC address (0:200000:cisco_dd:00:1c) and destined to the broadcast address (ff:ff:ff:ff:ff:ff). The packet details pane on the right shows the structure of a beacon frame, with the SSID parameter set to "wifi66_test".

No.	Time	Delta	Source	Destination	Protocol	Length	Channel	Signal strength	Info
1	2023-06-09 13:23:33.268918	0.000000	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1731, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
2	2023-06-09 13:23:33.473811	0.204853	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1734, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
3	2023-06-09 13:23:33.576215	0.102404	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 88 dBm		Beacon frame, Ss=1735, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
4	2023-06-09 13:23:33.678408	0.102245	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1736, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
5	2023-06-09 13:23:33.780946	0.102406	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1737, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
6	2023-06-09 13:23:33.883425	0.102479	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1738, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
7	2023-06-09 13:23:33.985827	0.102402	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1739, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
8	2023-06-09 13:23:34.088215	0.102388	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1740, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
9	2023-06-09 13:23:34.190606	0.102391	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 88 dBm		Beacon frame, Ss=1741, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
10	2023-06-09 13:23:34.293039	0.102433	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1742, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
11	2023-06-09 13:23:34.395167	0.102328	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1743, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
12	2023-06-09 13:23:34.498251	0.204884	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1745, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
13	2023-06-09 13:23:34.702408	0.102229	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1746, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
14	2023-06-09 13:23:34.804970	0.102490	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1747, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
15	2023-06-09 13:23:35.009917	0.204847	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1749, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
16	2023-06-09 13:23:35.112270	0.102453	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1750, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
17	2023-06-09 13:23:35.214642	0.102372	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1751, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
18	2023-06-09 13:23:35.316963	0.102321	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 88 dBm		Beacon frame, Ss=1752, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
19	2023-06-09 13:23:35.419339	0.102376	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1753, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
20	2023-06-09 13:23:35.521836	0.102497	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1754, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
21	2023-06-09 13:23:35.624107	0.102271	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 88 dBm		Beacon frame, Ss=1755, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
22	2023-06-09 13:23:35.726573	0.102466	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1756, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
23	2023-06-09 13:23:36.033708	0.307207	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 88 dBm		Beacon frame, Ss=1759, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
24	2023-06-09 13:23:36.136109	0.102329	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1760, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
25	2023-06-09 13:23:36.238561	0.102452	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1761, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
26	2023-06-09 13:23:36.340983	0.102422	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 88 dBm		Beacon frame, Ss=1762, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
27	2023-06-09 13:23:36.443393	0.102418	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1763, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
28	2023-06-09 13:23:36.5451208	0.207815	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 92 dBm		Beacon frame, Ss=1765, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
29	2023-06-09 13:23:36.751501	0.102293	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 91 dBm		Beacon frame, Ss=1766, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
30	2023-06-09 13:23:36.856275	0.102774	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1767, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
31	2023-06-09 13:23:36.958344	0.102669	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1768, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
32	2023-06-09 13:23:37.060687	0.102343	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1769, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
33	2023-06-09 13:23:37.265594	0.204907	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1772, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
34	2023-06-09 13:23:37.368188	0.102594	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1772, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
35	2023-06-09 13:23:37.572795	0.204607	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1774, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
36	2023-06-09 13:23:37.675106	0.102311	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1775, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
37	2023-06-09 13:23:37.777598	0.102484	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1776, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
38	2023-06-09 13:23:37.982432	0.204862	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1778, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
39	2023-06-09 13:23:38.084776	0.102344	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1779, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
40	2023-06-09 13:23:38.187243	0.102467	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1780, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
41	2023-06-09 13:23:38.291985	0.204742	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 90 dBm		Beacon frame, Ss=1782, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"
42	2023-06-09 13:23:38.494294	0.102389	Cisco_dd:00:1c	Broadcast	802.11	358	69 - 89 dBm		Beacon frame, Ss=1783, Pw=0, Flags=.....C, B1=100, SSID="wifi66_test"

Here is what you can see in the OTA captures when using Multiple BSSIDs:

The screenshot shows a Wireshark capture of beacon frames. The main pane displays a list of frames with columns for No., Time, Delta, Source, Destination, Protocol, Length, Channel, Signal strength, and Info. The details pane on the right shows the structure of a beacon frame, including tags for SSID, Traffic Indication Map (TIM), Country Information, Power Constraint, RSN Report, and Multiple BSSIDs. The SSID tag is highlighted, showing a list of BSSIDs.

AP Discovery by Wireless Clients

Discovery is the process where a client device, on power-up or when it enters a building, finds a suitable access point to connect to.

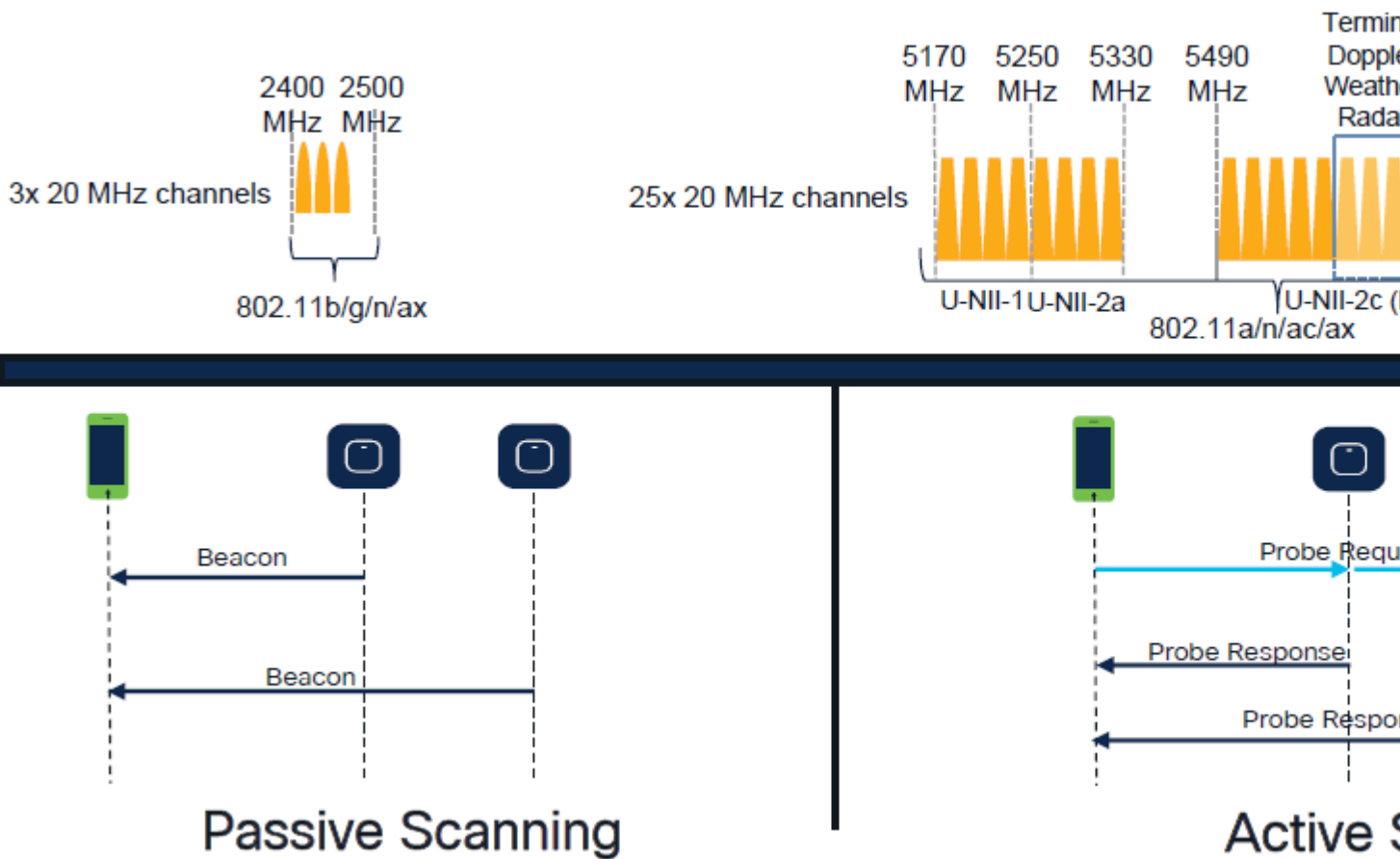
The simplest way to perform discovery, used by most client devices today, is to scan channels in turn by the transmission of one or more probe requests, it then listens for responses from access points in the area, examines the probe responses to see if any of the SSIDs match profiles in the client, then steps to the next channel.

This has three drawbacks:

- it takes significant time, which can affect application performance while the radio is away from its serving channel;
- it requires many probe request and response frames on the air, which reduces airtime efficiency;
- it affects client battery life.

The time “ in the order of 20 msec per non-DFS channel or up to 100ms on DFS channel “ is already an issue in the 5 GHz band. It becomes more significant when we realize that a Wi-Fi 6E client can have to scan every one of the 59 possible 20 MHz channels in the band to discover all available access points.

The legacy methods aka Passive Scanning and Active Scanning, do not scale on 6GHz. On 2.4 and 5Ghz, it is used the "hunt-and-see" method to scan BSSIDs or for APs, either by Passive Scanning or Active Scanning:



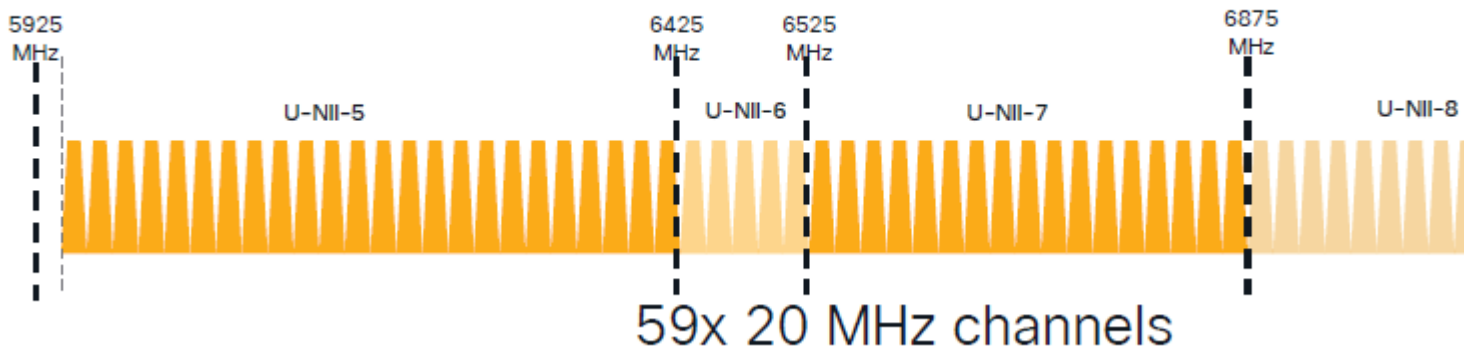
Traditionally, wireless devices communicate with access points in a specific exchange of information. Client devices use an active “hunt-and-see” approach to scan for nearby APs.

This active scanning approach involves the send of *probe request* frames along the 2.4 GHz and 5 GHz frequency spectrum. An AP would respond with a *probe response* frame that contains all the necessary basic service set (BSS) information to connect to the network.

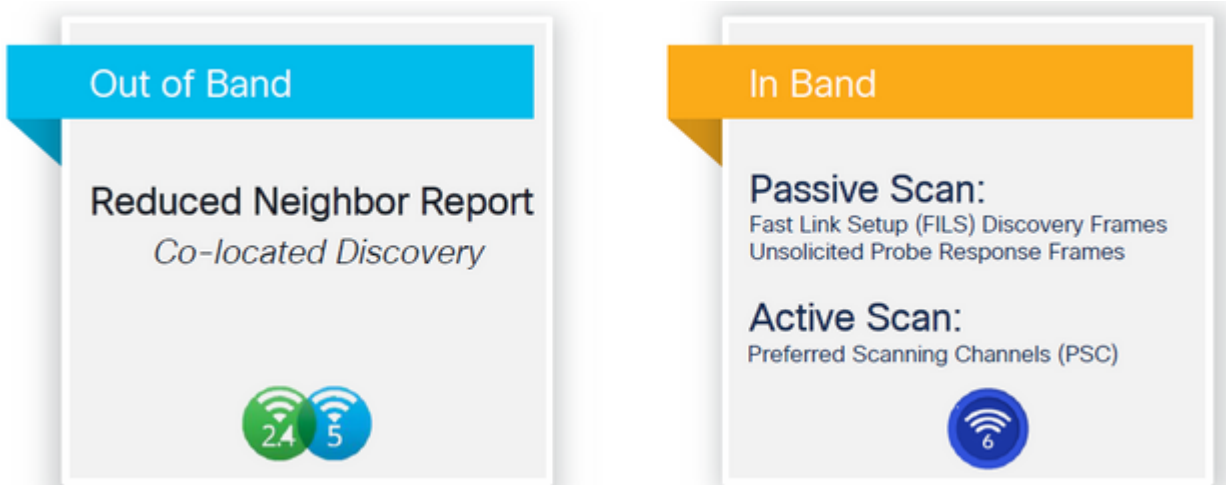
This information would consist of SSID, BSSID, channel width, and security information among other things.

This active “hunt-and-see” approach to network connectivity is no longer necessary and is actually discouraged in Wi-Fi 6E on the 6 GHz band because it is now inefficient to broadcast the same probe requests over so many channels.

Wifi clients can send only Probe Requests on 20 MHz channels, and on 6Ghz there are up to 59x20MHz, which means that the client would need to scan all 59 channels that sums to ~6 seconds to passive scan all 59 channels:



On Wi-Fi 6E, there are new AP Discovery Mechanisms:



At the time of writing this document, the windows/intel and android clients tested supported FILS and broadcast probe responses, however it was not the same across Apple and some Android clients which can possibly not support FILS or broadcast probe responses. Due to this problem a preferred scanning channel (PSC) is considered more relevant. However as currently different wireless client vendors are possible to not be fully compatible with wifi 6 scanning, it can not be an ideal approach to configure only 6ghz wlan/ssid.

Note: If you want to make sure to know what discovery mechanism each client supports, you should reach to wireless client vendor support.

So based on wireless client vendor support, currently it is possible to be relevant to have an out-of-band discovery with 2.4/5Ghz enabled for a RNR /Reduced Neighbor Report option wherein wireless clients can discover a 6Ghz SSID on an AP by listening to RNR Information Element included in the 2.4/5Ghz beacons from that AP.

It very unlikely that you have a WLC and AP providing ONLY 6GHZ WLAN, and most likely there are other WLANs being broadcasted. Taking this into account its recommended to use those legacy bands to advertise the 6GHZ only WLANs, in the RNR information element, for client devices that do not support In-Band discovery mechanisms.

In the end there is no added configuration burden because the RNR is a feature already supported by Wi-Fi

No.	Time	Delta	Source	Destination	Protocol	Length	Channel	Signal	Info
5617	2023-06-09 14:37:58.724295	0.000000	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -27 dBm	0dBm	Probe Response, SNI=698, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
5620	2023-06-09 14:37:58.726614	0.001319	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -27 dBm	0dBm	Probe Response, SNI=691, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
124.	2023-06-09 14:38:07.897585	17.171971	Cisco_13:80:ef	IntelCor_d2...	802.11	484	64 -28 dBm	0dBm	Probe Response, SNI=692, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
125.	2023-06-09 14:38:08.064431	0.166326	Cisco_13:80:ef	IntelCor_d2...	802.11	484	64 -27 dBm	0dBm	Probe Response, SNI=693, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
125.	2023-06-09 14:38:08.064436	0.000525	Cisco_13:80:ef	IntelCor_d2...	802.11	484	64 -28 dBm	0dBm	Probe Response, SNI=693, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
125.	2023-06-09 14:38:08.064470	0.000434	Cisco_13:80:ef	IntelCor_d2...	802.11	484	64 -28 dBm	0dBm	Probe Response, SNI=693, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
125.	2023-06-09 14:38:08.065428	0.000550	Cisco_13:80:ef	IntelCor_d2...	802.11	484	64 -28 dBm	0dBm	Probe Response, SNI=693, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
133.	2023-06-09 14:38:18.728889	2.663009	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -27 dBm	0dBm	Probe Response, SNI=694, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
133.	2023-06-09 14:38:18.728890	0.000401	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -28 dBm	0dBm	Probe Response, SNI=694, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
133.	2023-06-09 14:38:18.729928	0.001038	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -27 dBm	0dBm	Probe Response, SNI=695, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
133.	2023-06-09 14:38:18.730449	0.000521	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -28 dBm	0dBm	Probe Response, SNI=695, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"
134.	2023-06-09 14:38:18.732737	0.002288	Cisco_13:80:ef	WistronM_b7...	802.11	484	64 -27 dBm	0dBm	Probe Response, SNI=696, Freq=, Flags=.....C, BI=100, SSID="wifi6e_test"

```

> Frame 5617: 484 bytes on wire (3872 bits),
> Ethernet II, Src: Cisco_0d:70:137 (00:0f:1d:0d:70:13:7), Dst: IntelCor_02:00:10:00:00:00 (02:00:10:00:00:00:00:00)
> Internet Protocol Version 4, Src: 192.168.1.1, Dst: 192.168.1.1
> User Datagram Protocol, Src Port: 5555, Dst Port: 5555
> 802.11 radio information
> IEEE 802.11 Probe Response, Flags: .....C, BI=100, SSID="wifi6e_test"
  > Fixed parameters (12 bytes)
  > Tagged parameters (382 bytes)
    > Tag: SSID parameter set: "wifi6e_test"
    > Tag: Supported Rates 6, 9, 12(1), 18(1), 24(1), 36(1), 48(1), 54(1)
    > Tag: OS Parameter set: Current Channel
    > Tag: Country Information: Country Code: 00, Power Constraint: 3
    > Tag: TPC Report Transmit Power: 18
    > Tag: RSN Information
    > Tag: QoS Load Element 802.11e CC: 0
    > Tag: HT Enabled Capabilities (5 octet)
    > Tag: HT Capabilities (802.11n 01.10)
    > Tag: VHT Information (802.11n 01.10)
    > Tag: Extended Capabilities (11 octet)
    > Tag: VHT Capabilities
    > Tag: VHT Operation
    > Tag: Tx Power Envelope
    > Tag: Reduced Neighbor Report
      Tag Number: Reduced Neighbor Report
      Tag length: 43
      > neighbor AP Information
        > neighbor AP Information
          .... .. .. .. .. = THTT In
          .... .. .. .. .. = THTT FI
          .... .. 0010 .. .. = THTT In
          0000 1101 .. .. .. = THTT In
          Operating Class: 134
          Channel Number: 6
          > THTT Information
            Neighbor AP THTT Offset: 2
            BSSID: 3891b71380e8
            Short SSID: 0x52e5c0d0
            > BSS Parameters: 0x4c
            PSD Subfield: 10.0 dBm/MHz
          > THTT Information
            Neighbor AP THTT Offset: 2
            BSSID: 3891b71380e7
            Short SSID: 0xc2740e7
            > BSS Parameters: 0x44
            PSD Subfield: 10.0 dBm/MHz
          > THTT Information
            Neighbor AP THTT Offset: 2
            BSSID: 3891b71380e7
            Short SSID: 0xa6ef6825
            > BSS Parameters: 0x46
            PSD Subfield: 10.0 dBm/MHz

```

In-Band

In-band discovery is used for communication between 6 GHz devices, and there are three methods of in-band discovery:

- **Fast Initial Link Setup (FILS)** and **unsolicited probe response (UPR)** frames are two passive methods of in-band discovery. Itâ€™s FILS or UPR and not both. 6 GHz Discovery Frames are needed only if 6 GHz is the only radio that is operational.
- **Preferred Scanning Channels (PSC)** is an active method of in-band discovery. Wireless clients probe only PSC channels; scans Non PSC if it detects from RNR.

Remember that these are in-band discovery methods, which means that this only applies to Wi-Fi 6E clients that connect to wireless networks on the 6 GHz band.

FILS

FILS is part of IEEE 802.11ai Standard and addresses improvements in Network and BSS Discovery, Authentication and Association, DHCP and IP address setup.

FILS uses â€œdiscovery announcement framesâ€ which are essentially condensed beacon frames. Only crucial information is sent in a FILS frame: Short SSID, BSSID, and channel, for the AP to decide on the AP to connect.

If FILS is configured, the 6 GHz AP broadcasts an announcement discovery frame approximately every 20 milliseconds which consumes less air time and reduces probe request overhead.

Note: 6 GHz Discovery Frames are needed only if 6 GHz is the only radio that is operational. When other radios (2.4/5 GHz) are operational, clients detect 6 GHz presence from RNR IE.

Configure FILS Discovery Frames in the RF Profile (GUI)

Step 1 - Choose Configuration > Tags & Profiles > RF/Radio.

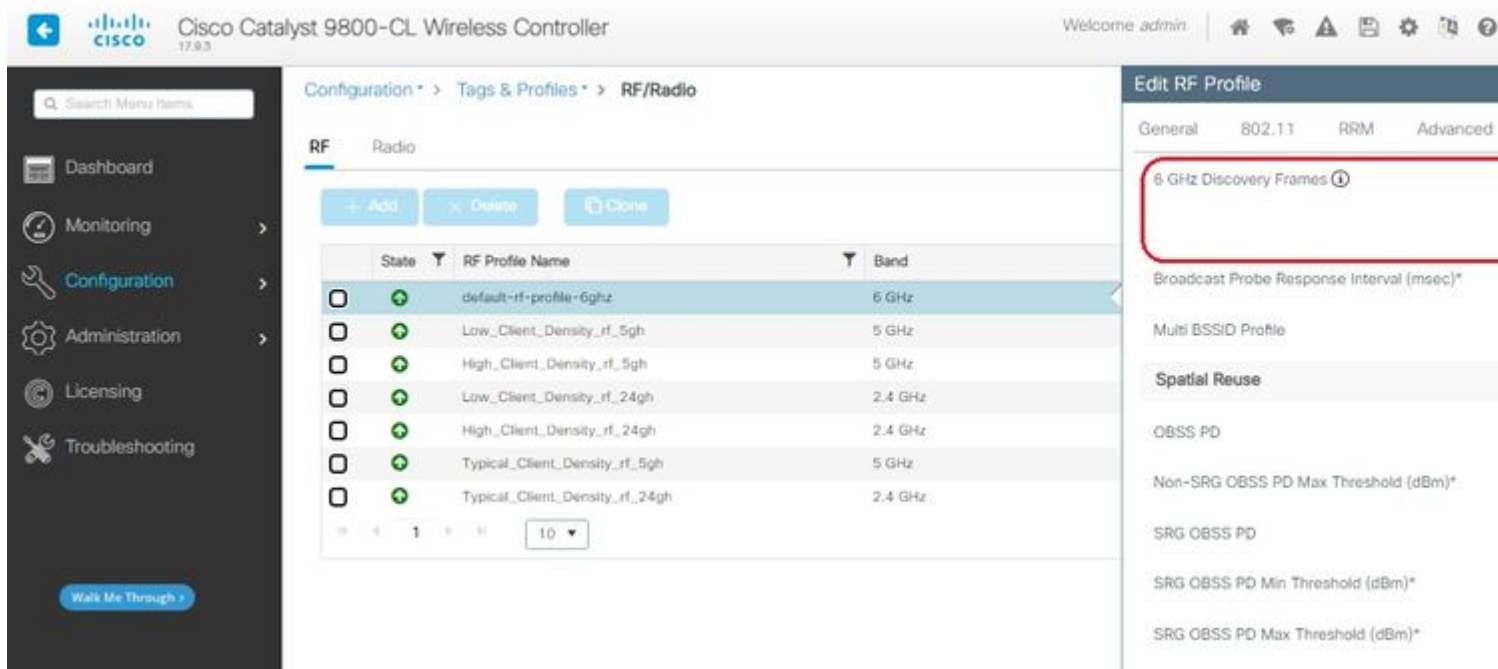
Step 2 - In the **RF** tab, click **Add**. The Add RF Profile page is displayed.

Step 3 - Choose the **802.11ax** tab.

Step 4 - In the **6 GHz Discovery Frames** section, click the **FILS Discovery** option.

Note: To prevent the transmission of discovery FILS frames when the discovery frames are set to **None** in the RF profile, ensure that you disable FILS discovery frames by either switch to the 5-GHz or the 2.4-GHz bands on the AP or by selection of the Broadcast Probe Response option.

Step 5 - Click **Apply to Device**.



The screenshot shows the Cisco Catalyst 9800-CL Wireless Controller GUI. The main navigation menu on the left includes Dashboard, Monitoring, Configuration, Administration, Licensing, and Troubleshooting. The main content area is titled 'Configuration > Tags & Profiles > RF/Radio'. The 'RF' tab is active, and a table lists various RF profiles. The 'default-rf-profile-6ghz' profile is selected, and its configuration is shown in the 'Edit RF Profile' panel on the right. The '6 GHz Discovery Frames' section is highlighted with a red box, and the 'FILS Discovery' option is selected. Other options in this section include 'Broadcast Probe Response Interval (msec)*', 'Multi BSSID Profile', and 'Spatial Reuse'. The 'Spatial Reuse' section includes options for 'OBSS PD', 'Non-SRG OBSS PD Max Threshold (dBm)*', 'SRG OBSS PD', 'SRG OBSS PD Min Threshold (dBm)*', and 'SRG OBSS PD Max Threshold (dBm)*'.

Configure FILS Discovery Frames in the RF Profile (CLI)

```
Device# configure terminal
Device(config)# ap dot11 6ghz rf-profile rf-profile-name
Device(config-rf-profile)# dot11ax fils-discovery
```

Verification

To verify if the configuration is in place issue the **show** command as shown here:

```
<#root>
```

```
WLC9800#
```

show ap rf-profile name default-rf-profile-6ghz detail | b 802.11ax

802.11ax

OBSS PD : Disabled
Non-SRG OBSS PD Maximum : -62 dBm
SRG OBSS PD : Disabled
SRG OBSS PD Minimum : -82 dBm
SRG OBSS PD Maximum : -62 dBm
Broadcast Probe Response : Disabled

FILS Discovery : Enabled

Multi-BSSID Profile Name :

MBSSIDprofile_test

NDP mode : Auto
Guard Interval : 800ns
PSC Enforcement : Disabled

Here is what we expect to see if we capture the wireless traffic over the air:

Table with columns: No., Time, Delta, Source, Destination, Protocol, Leng#, Channel, Signal str, Info. Includes a detailed packet capture analysis on the right showing IEEE 802.11 wireless management frame details like Public Action: FILS Discovery and Capability.

You can observe that the delta between frames is most of the times ~20ms, however sometimes you see ~40ms. After checking the frame sequence it was concluded that the sniffer AP was missing the capture of FILS frames sporadically.

UPR

An unsolicited probe response (UPR) frame contains *all* the same information sent in a beacon, that is, it carries multiple BSSIDs and contains all information needed for association.

If used, the 6 GHz AP broadcasts a full probe response frame every 20 milliseconds which helps avoid probe storms.

In 6GHz there are new probe restrictions:

- Clients cannot do blind probe, that is, broadcast destination address using wildcard SSID and BSSID are no allowed because broadcast probe requests and probes with wildcard SSID create probe storm and impacts performance;
- Clients must wait at least the duration of minimum probe delay interval (~20 msec);
- Probe Responses are always broadcast.

UPR is also known as Broadcast Probe Response and in the next section, you can see how to enable it.

Configure Broadcast Probe Response in RF Profile (GUI)

Step 1 - Choose Configuration > Tags & Profiles > RF/Radio.

Step 2 - In the RF tab, click **Add**. The Add RF Profile page is displayed.

Step 3 - Choose the **802.11ax** tab.

Step 4 - In the **6 GHz Discovery Frames** section, click the **Broadcast Probe Response** option.

Step 5 - In the **Broadcast Probe Response Interval** field, enter the broadcast probe response time interval in milli-seconds (ms). The value range is between 5 ms and 25 ms. The default value is 20 ms.

Step 6 - Click **Apply to Device**.

The screenshot shows the Cisco Catalyst 9800-CL Wireless Controller GUI. The breadcrumb navigation is Configuration > Tags & Profiles > RF/Radio. The 'RF' tab is selected, and the 'Radio' sub-tab is active. A table lists several RF profiles, with 'default-rf-profile-6ghz' selected. The '6 GHz Discovery Frames' section is highlighted with a red box, and the 'Broadcast Probe Response' option is selected. The 'Broadcast Probe Response Interval (msec)*' field is visible, with a value of 20 ms. Other fields like 'Multi BSSID Profile', 'Spatial Reuse', 'OBSS PD', and 'SRG OBSS PD' are also visible.

State	RF Profile Name	Band
<input type="checkbox"/>	default-rf-profile-6ghz	6 GHz
<input type="checkbox"/>	Low_Client_Density_rf_5gh	5 GHz
<input type="checkbox"/>	High_Client_Density_rf_5gh	5 GHz
<input type="checkbox"/>	Low_Client_Density_rf_24gh	2.4 GHz
<input type="checkbox"/>	High_Client_Density_rf_24gh	2.4 GHz
<input type="checkbox"/>	Typical_Client_Density_rf_5gh	5 GHz
<input type="checkbox"/>	Typical_Client_Density_rf_24gh	2.4 GHz

Configure Broadcast Probe Response in RF Profile (CLI)

```
Device# configure terminal
Device(config)# ap dot11 6ghz rf-profile rf-profile-name
Device(config-rf-profile)# dot11ax bcast-probe-response
Device(config-rf-profile)# dot11ax bcast-probe-response time-interval 20
```

Verification

To verify if the configuration is in place issue the **show** command as shown here:

```
<#root>
```

```
WLC9800#
```

```
show ap rf-profile name default-rf-profile-6ghz detail | b 802.11ax
```

```
802.11ax
```

```
OBSS PD : Disabled
```

```
Non-SRG OBSS PD Maximum : -62 dBm
```

```
SRG OBSS PD : Disabled
```

```
SRG OBSS PD Minimum : -82 dBm
```

```
SRG OBSS PD Maximum : -62 dBm
```

```
Broadcast Probe Response : Enabled
```

```
Broadcast Probe Response Interval : 20 msec
```

```
FILS Discovery : Disabled
```

```
Multi-BSSID Profile Name :
```

```
MBSSIDprofile_test
```

```
NDP mode : Auto
```

```
Guard Interval : 800ns
```

```
PSC Enforcement : Disabled
```

When UPR (Broadcast Probe Response) is used this is how it looks over the air:

No.	Time	Delta	Source	Destination	Protocol	Length	Channel	Signal	Info
4	2023-06-09 15:06:58.201915	0.000000	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1402, Fw=0, Flags=.....C, BI=100, SSID=wi
12	2023-06-09 15:06:58.224175	0.022260	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1402, Fw=0, Flags=.....C, BI=100, SSID=wi
14	2023-06-09 15:06:58.245193	0.022218	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1404, Fw=0, Flags=.....C, BI=100, SSID=wi
25	2023-06-09 15:06:58.263659	0.021264	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1405, Fw=0, Flags=.....C, BI=100, SSID=wi
28	2023-06-09 15:06:58.283984	0.020325	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1405, Fw=0, Flags=.....C, BI=100, SSID=wi
30	2023-06-09 15:06:58.304404	0.020420	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1407, Fw=0, Flags=.....C, BI=100, SSID=wi
35	2023-06-09 15:06:58.325183	0.020779	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1408, Fw=0, Flags=.....C, BI=100, SSID=wi
40	2023-06-09 15:06:58.345526	0.020574	Cisco_13:00:ec	Broadcast	002.11	505	5	-38 dBm	Beacon frame, SNI=1409, Fw=0, Flags=.....C, BI=100, SSID=wi
53	2023-06-09 15:06:58.365812	0.020286	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1410, Fw=0, Flags=.....C, BI=100, SSID=wi
55	2023-06-09 15:06:58.401589	0.035777	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1411, Fw=0, Flags=.....C, BI=100, SSID=wi
60	2023-06-09 15:06:58.449994	0.048055	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1412, Fw=0, Flags=.....C, BI=100, SSID=wi
68	2023-06-09 15:06:58.427288	0.017594	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1413, Fw=0, Flags=.....C, BI=100, SSID=wi
71	2023-06-09 15:06:58.447823	0.020535	Cisco_13:00:ec	Broadcast	002.11	505	5	-38 dBm	Beacon frame, SNI=1414, Fw=0, Flags=.....C, BI=100, SSID=wi
82	2023-06-09 15:06:58.468143	0.020320	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1415, Fw=0, Flags=.....C, BI=100, SSID=wi
87	2023-06-09 15:06:58.488894	0.020551	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1416, Fw=0, Flags=.....C, BI=100, SSID=wi
89	2023-06-09 15:06:58.509174	0.020480	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1417, Fw=0, Flags=.....C, BI=100, SSID=wi
97	2023-06-09 15:06:58.529726	0.020552	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1418, Fw=0, Flags=.....C, BI=100, SSID=wi
101	2023-06-09 15:06:58.550183	0.020452	Cisco_13:00:ec	Broadcast	002.11	505	5	-38 dBm	Beacon frame, SNI=1419, Fw=0, Flags=.....C, BI=100, SSID=wi
114	2023-06-09 15:06:58.570565	0.020382	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1420, Fw=0, Flags=.....C, BI=100, SSID=wi
117	2023-06-09 15:06:58.591895	0.020470	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1421, Fw=0, Flags=.....C, BI=100, SSID=wi
119	2023-06-09 15:06:58.611724	0.020649	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1422, Fw=0, Flags=.....C, BI=100, SSID=wi
127	2023-06-09 15:06:58.632000	0.020284	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1423, Fw=0, Flags=.....C, BI=100, SSID=wi
130	2023-06-09 15:06:58.652526	0.020458	Cisco_13:00:ec	Broadcast	002.11	505	5	-38 dBm	Beacon frame, SNI=1424, Fw=0, Flags=.....C, BI=100, SSID=wi
140	2023-06-09 15:06:58.673064	0.020418	Cisco_13:00:ec	Broadcast	002.11	458	5	-38 dBm	Probe Response, SNI=1425, Fw=0, Flags=.....C, BI=100, SSID=wi
143	2023-06-09 15:06:58.693526	0.020458	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1426, Fw=0, Flags=.....C, BI=100, SSID=wi
146	2023-06-09 15:06:58.713983	0.020457	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1427, Fw=0, Flags=.....C, BI=100, SSID=wi
154	2023-06-09 15:06:58.734465	0.020550	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1428, Fw=0, Flags=.....C, BI=100, SSID=wi
156	2023-06-09 15:06:58.754958	0.020493	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1429, Fw=0, Flags=.....C, BI=100, SSID=wi
168	2023-06-09 15:06:58.775500	0.020550	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1430, Fw=0, Flags=.....C, BI=100, SSID=wi
171	2023-06-09 15:06:58.795944	0.020336	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1431, Fw=0, Flags=.....C, BI=100, SSID=wi
176	2023-06-09 15:06:58.816389	0.020536	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1432, Fw=0, Flags=.....C, BI=100, SSID=wi
184	2023-06-09 15:06:58.836837	0.020607	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1433, Fw=0, Flags=.....C, BI=100, SSID=wi
187	2023-06-09 15:06:58.857494	0.020607	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1435, Fw=0, Flags=.....C, BI=100, SSID=wi
201	2023-06-09 15:06:58.877924	0.020430	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1436, Fw=0, Flags=.....C, BI=100, SSID=wi
212	2023-06-09 15:06:58.898394	0.020470	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1436, Fw=0, Flags=.....C, BI=100, SSID=wi
217	2023-06-09 15:06:58.918787	0.020393	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1437, Fw=0, Flags=.....C, BI=100, SSID=wi
226	2023-06-09 15:06:58.939279	0.020492	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1438, Fw=0, Flags=.....C, BI=100, SSID=wi
231	2023-06-09 15:06:58.959825	0.020446	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1439, Fw=0, Flags=.....C, BI=100, SSID=wi
242	2023-06-09 15:06:58.980259	0.020434	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1440, Fw=0, Flags=.....C, BI=100, SSID=wi
258	2023-06-09 15:06:58.980646	0.020387	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1441, Fw=0, Flags=.....C, BI=100, SSID=wi
253	2023-06-09 15:06:58.021254	0.020610	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1442, Fw=0, Flags=.....C, BI=100, SSID=wi
263	2023-06-09 15:06:58.041575	0.020319	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1443, Fw=0, Flags=.....C, BI=100, SSID=wi
267	2023-06-09 15:06:58.062276	0.020701	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1444, Fw=0, Flags=.....C, BI=100, SSID=wi
280	2023-06-09 15:06:58.082758	0.020482	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1445, Fw=0, Flags=.....C, BI=100, SSID=wi
283	2023-06-09 15:06:58.103117	0.020359	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1446, Fw=0, Flags=.....C, BI=100, SSID=wi
287	2023-06-09 15:06:58.123795	0.020678	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1447, Fw=0, Flags=.....C, BI=100, SSID=wi
296	2023-06-09 15:06:58.144406	0.020665	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1448, Fw=0, Flags=.....C, BI=100, SSID=wi
300	2023-06-09 15:06:58.164896	0.020436	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1449, Fw=0, Flags=.....C, BI=100, SSID=wi
312	2023-06-09 15:06:58.185664	0.020321	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1450, Fw=0, Flags=.....C, BI=100, SSID=wi
316	2023-06-09 15:06:58.205685	0.020421	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1451, Fw=0, Flags=.....C, BI=100, SSID=wi
321	2023-06-09 15:06:58.225988	0.020295	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1452, Fw=0, Flags=.....C, BI=100, SSID=wi
330	2023-06-09 15:06:58.246584	0.020524	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1453, Fw=0, Flags=.....C, BI=100, SSID=wi
333	2023-06-09 15:06:58.267056	0.020552	Cisco_13:00:ec	Broadcast	002.11	505	5	-36 dBm	Beacon frame, SNI=1454, Fw=0, Flags=.....C, BI=100, SSID=wi
345	2023-06-09 15:06:58.287383	0.020327	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1455, Fw=0, Flags=.....C, BI=100, SSID=wi
349	2023-06-09 15:06:58.307905	0.020603	Cisco_13:00:ec	Broadcast	002.11	458	5	-36 dBm	Probe Response, SNI=1456, Fw=0, Flags=.....C, BI=100, SSID=wi

```

> Frame 97: 458 bytes on wire (3664 bits), 458 bytes
> Ethernet II, Src: Cisco_08:00:0c:12:12:12 (00:0f:1d:0d:7d:33)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.15
> User Datagram Protocol, Src Port: 5555, Dst Port: 5555
> 802.11 radio information
> IEEE 802.11 Probe Response, Flags: .....C
> IEEE 802.11 Wireless Management
  > Fixed parameters (42 bytes)
    > Tagged parameters (356 bytes)
      > Tag: SSID parameter set: "wifi66_test_01"
      > Tag: Supported Rates (6(B), 9, 12(B), 18, 24, 36, 48, 54, 60, 66, 72, 84, 96, 108, 120, 132, 144, 162, 180, 200, 216, 240, 252, 270, 300)
      > Tag: Country Information: Country Code na, Channel 11, Priority 0
      > Tag: Power Constraint: 4
      > Tag: TPC Report Transmit Power: 17, Link Max Tx Power: 17
      > Tag: QoS Load Element 802.11e DCA Version 1
    > Tag: Multiple BSSIDs
      > Tag: Multiple BSSIDs (71)
      > Tag Length: 338
      > Max BSSID Indicator: 4
      > Subelement: Nontransmitted BSSID Profile
        > Subelement ID: Nontransmitted BSSID Profile
        > Length: 65
        > Nontransmitted Profile: 5302115000e7
        > Tag: Non Transmitted BSSID Capability
        > Tag: SSID parameter set: "wifi66_test_01"
        > Tag: Multiple BSSID Index
        > Tag: RSN Information
        > Tag: RSN extension (1 octet)
        > Tag: Vendor Specific: Cisco Systems, Inc.
        > Tag: Vendor Specific: Cisco Systems, Inc.
      > Subelement: Nontransmitted BSSID Profile
        > Subelement ID: Nontransmitted BSSID Profile
        > Length: 68
        > Nontransmitted Profile: 5302115000e7
        > Tag: Non Transmitted BSSID Capability
        > Tag: SSID parameter set: "wifi66_test_01"
        > Tag: Multiple BSSID Index
        > Tag: RSN Information
        > Tag: RSN extension (1 octet)
        > Tag: Vendor Specific: Cisco Systems, Inc.
        > Tag: Vendor Specific: Cisco Systems, Inc.
    > Tag: AN Enabled Capabilities (3 octets)
    > Tag: Extended Capabilities (11 octets)
    > Tag: HE Capabilities
    > EXT Tag: HE Operation
    > EXT Tag: HE 6 GHz Band Capabilities
    > EXT Tag: Spatial Reuse Parameter Set
    > EXT Tag: MU-EDCA Parameter Set
    > Tag: Vendor Specific: Microsoft Corp.: WPA/WPA2-Personal
    > Tag: Vendor Specific: Atheros Communications
    > Tag: Vendor Specific: Qualcomm Inc.
    > Tag: RSN extension (1 octet)
    > Tag: Tx Power Envelope
    > Tag: Tx Power Envelope
  
```

PSC

The third discovery method in Wi-Fi 6E, which is active, is Preferred Channel Scanning (PSC). This is actually the only method by which Wi-Fi 6E client devices are allowed to send probe requests.

With 1200 MHz of spectrum and 59 new 20 MHz channels, a station with a dwell time of 100 ms per channel would require almost 6 seconds to complete a passive scan of the entire band.

With PSC, client devices are limited to send probe requests on every fourth 20 MHz channel. PSCs are spaced 80 MHz apart, so a client would only need to scan 15 channels instead of 59.

The full list of 6 GHz PSC channels is 5, 21, 37, 53, 69, 85, 101, 117, 133, 149, 165, 181, 197, 213, and 229.



PSC channels

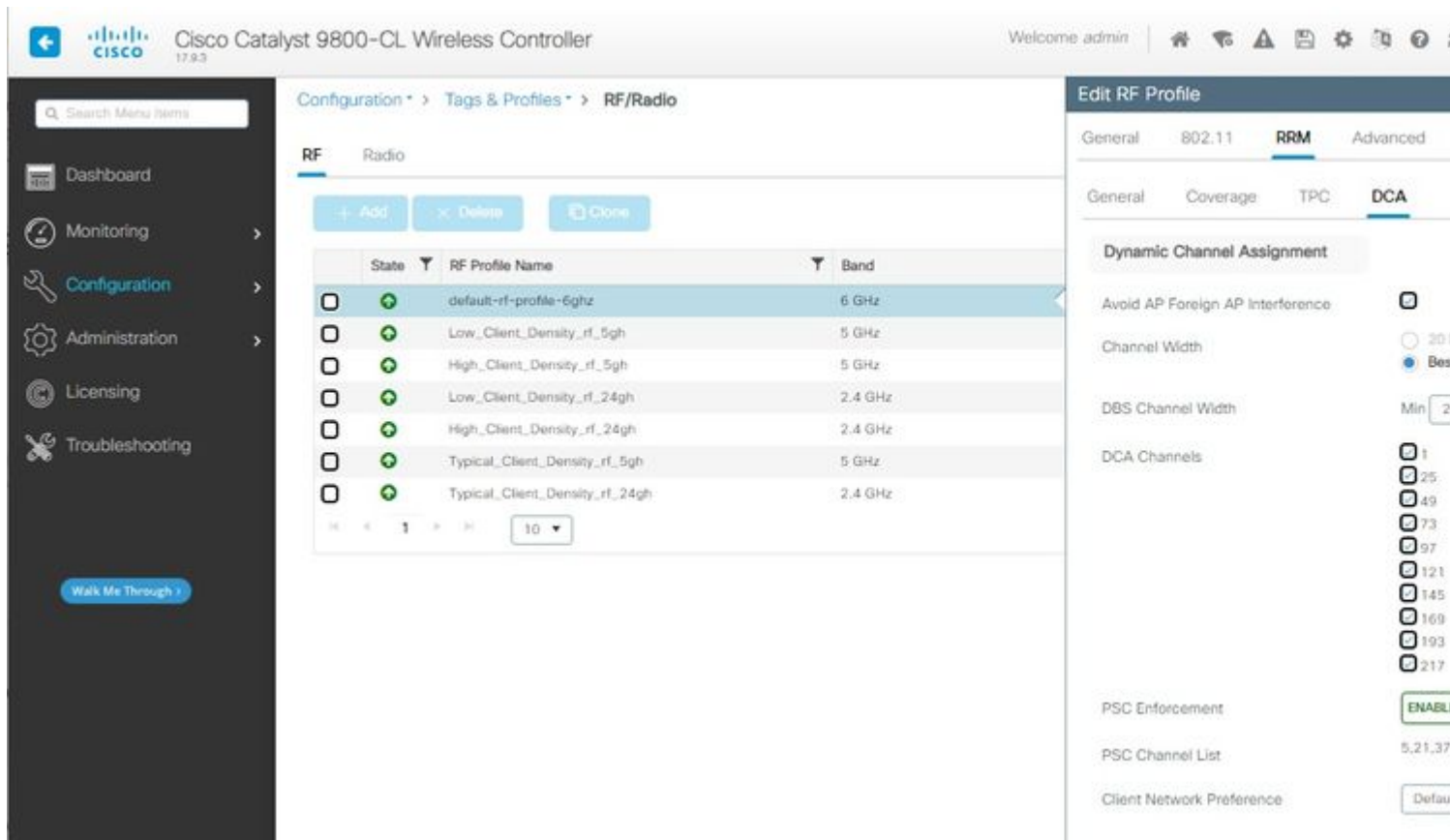
Configure Preferred Scanning Channels in the RF Profile (GUI)

- Step 1 - Choose Configuration > Tags & Profiles > RF/Radio.
- Step 2 - In the **RF** tab, click **Add**. The Add RF Profile page is displayed.
- Step 3 - Choose the **RRM** tab.
- Step 4 - Choose the **DCA** tab.

Step 5 - In the **Dynamic Channel Assignment** section, select the required channels in **DCA Channels** section.

Step 6 - In the **PSC Enforcement** field, click the toggle button to enable the preferred scanning channel enforcement for DCA.

Step 7 - Click **Apply to Device**.



Configure Preferred Scanning Channels in the RF Profile (CLI)

```
Device# configure terminal
Device(config)# ap dot11 6ghz rf-profile rf-profile-name
Device(config-rf-profile)# channel psc
```

Verification

To verify if the configuration is in place issue the command as shown here:

```
<#root>
```

```
WLC9800#
```

```
show ap rf-profile name default-rf-profile-6ghz detail | b DCA
```

```
DCA Channel List : 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101,105,109,113,117,121,125,129,133,137,141,145,149,153,157,161,165,169,173,177,181,185,189,193,197,201,205,209,213,217,221,225,229,233,237,241,245,249,253,257,261,265,269,273,277,281,285,289,293,297,301,305,309,313,317,321,325,329,333,337,341,345,349,353,357,361,365,369,373,377,381,385,389,393,397,401,405,409,413,417,421,425,429,433,437,441,445,449,453,457,461,465,469,473,477,481,485,489,493,497,501,505,509,513,517,521,525,529,533,537,541,545,549,553,557,561,565,569,573,577,581,585,589,593,597,601,605,609,613,617,621,625,629,633,637,641,645,649,653,657,661,665,669,673,677,681,685,689,693,697,701,705,709,713,717,721,725,729,733,737,741,745,749,753,757,761,765,769,773,777,781,785,789,793,797,801,805,809,813,817,821,825,829,833,837,841,845,849,853,857,861,865,869,873,877,881,885,889,893,897,901,905,909,913,917,921,925,929,933,937,941,945,949,953,957,961,965,969,973,977,981,985,989,993,997,1001,1005,1009,1013,1017,1021,1025,1029,1033,1037,1041,1045,1049,1053,1057,1061,1065,1069,1073,1077,1081,1085,1089,1093,1097,1101,1105,1109,1113,1117,1121,1125,1129,1133,1137,1141,1145,1149,1153,1157,1161,1165,1169,1173,1177,1181,1185,1189,1193,1197,1201,1205,1209,1213,1217,1221,1225,1229,1233,1237,1241,1245,1249,1253,1257,1261,1265,1269,1273,1277,1281,1285,1289,1293,1297,1301,1305,1309,1313,1317,1321,1325,1329,1333,1337,1341,1345,1349,1353,1357,1361,1365,1369,1373,1377,1381,1385,1389,1393,1397,1401,1405,1409,1413,1417,1421,1425,1429,1433,1437,1441,1445,1449,1453,1457,1461,1465,1469,1473,1477,1481,1485,1489,1493,1497,1501,1505,1509,1513,1517,1521,1525,1529,1533,1537,1541,1545,1549,1553,1557,1561,1565,1569,1573,1577,1581,1585,1589,1593,1597,1601,1605,1609,1613,1617,1621,1625,1629,1633,1637,1641,1645,1649,1653,1657,1661,1665,1669,1673,1677,1681,1685,1689,1693,1697,1701,1705,1709,1713,1717,1721,1725,1729,1733,1737,1741,1745,1749,1753,1757,1761,1765,1769,1773,1777,1781,1785,1789,1793,1797,1801,1805,1809,1813,1817,1821,1825,1829,1833,1837,1841,1845,1849,1853,1857,1861,1865,1869,1873,1877,1881,1885,1889,1893,1897,1901,1905,1909,1913,1917,1921,1925,1929,1933,1937,1941,1945,1949,1953,1957,1961,1965,1969,1973,1977,1981,1985,1989,1993,1997,2001,2005,2009,2013,2017,2021,2025,2029,2033,2037,2041,2045,2049,2053,2057,2061,2065,2069,2073,2077,2081,2085,2089,2093,2097,2101,2105,2109,2113,2117,2121,2125,2129,2133,2137,2141,2145,2149,2153,2157,2161,2165,2169,2173,2177,2181,2185,2189,2193,2197,2201,2205,2209,2213,2217,2221,2225,2229,2233,2237,2241,2245,2249,2253,2257,2261,2265,2269,2273,2277,2281,2285,2289,2293,2297,2301,2305,2309,2313,2317,2321,2325,2329,2333,2337,2341,2345,2349,2353,2357,2361,2365,2369,2373,2377,2381,2385,2389,2393,2397,2401,2405,2409,2413,2417,2421,2425,2429,2433,2437,2441,2445,2449,2453,2457,2461,2465,2469,2473,2477,2481,2485,2489,2493,2497,2501,2505,2509,2513,2517,2521,2525,2529,2533,2537,2541,2545,2549,2553,2557,2561,2565,2569,2573,2577,2581,2585,2589,2593,2597,2601,2605,2609,2613,2617,2621,2625,2629,2633,2637,2641,2645,2649,2653,2657,2661,2665,2669,2673,2677,2681,2685,2689,2693,2697,2701,2705,2709,2713,2717,2721,2725,2729,2733,2737,2741,2745,2749,2753,2757,2761,2765,2769,2773,2777,2781,2785,2789,2793,2797,2801,2805,2809,2813,2817,2821,2825,2829,2833,2837,2841,2845,2849,2853,2857,2861,2865,2869,2873,2877,2881,2885,2889,2893,2897,2901,2905,2909,2913,2917,2921,2925,2929,2933,2937,2941,2945,2949,2953,2957,2961,2965,2969,2973,2977,2981,2985,2989,2993,2997,3001,3005,3009,3013,3017,3021,3025,3029,3033,3037,3041,3045,3049,3053,3057,3061,3065,3069,3073,3077,3081,3085,3089,3093,3097,3101,3105,3109,3113,3117,3121,3125,3129,3133,3137,3141,3145,3149,3153,3157,3161,3165,3169,3173,3177,3181,3185,3189,3193,3197,3201,3205,3209,3213,3217,3221,3225,3229,3233,3237,3241,3245,3249,3253,3257,3261,3265,3269,3273,3277,3281,3285,3289,3293,3297,3301,3305,3309,3313,3317,3321,3325,3329,3333,3337,3341,3345,3349,3353,3357,3361,3365,3369,3373,3377,3381,3385,3389,3393,3397,3401,3405,3409,3413,3417,3421,3425,3429,3433,3437,3441,3445,3449,3453,3457,3461,3465,3469,3473,3477,3481,3485,3489,3493,3497,3501,3505,3509,3513,3517,3521,3525,3529,3533,3537,3541,3545,3549,3553,3557,3561,3565,3569,3573,3577,3581,3585,3589,3593,3597,3601,3605,3609,3613,3617,3621,3625,3629,3633,3637,3641,3645,3649,3653,3657,3661,3665,3669,3673,3677,3681,3685,3689,3693,3697,3701,3705,3709,3713,3717,3721,3725,3729,3733,3737,3741,3745,3749,3753,3757,3761,3765,3769,3773,3777,3781,3785,3789,3793,3797,3801,3805,3809,3813,3817,3821,3825,3829,3833,3837,3841,3845,3849,3853,3857,3861,3865,3869,3873,3877,3881,3885,3889,3893,3897,3901,3905,3909,3913,3917,3921,3925,3929,3933,3937,3941,3945,3949,3953,3957,3961,3965,3969,3973,3977,3981,3985,3989,3993,3997,4001,4005,4009,4013,4017,4021,4025,4029,4033,4037,4041,4045,4049,4053,4057,4061,4065,4069,4073,4077,4081,4085,4089,4093,4097,4101,4105,4109,4113,4117,4121,4125,4129,4133,4137,4141,4145,4149,4153,4157,4161,4165,4169,4173,4177,4181,4185,4189,4193,4197,4201,4205,4209,4213,4217,4221,4225,4229,4233,4237,4241,4245,4249,4253,4257,4261,4265,4269,4273,4277,4281,4285,4289,4293,4297,4301,4305,4309,4313,4317,4321,4325,4329,4333,4337,4341,4345,4349,4353,4357,4361,4365,4369,4373,4377,4381,4385,4389,4393,4397,4401,4405,4409,4413,4417,4421,4425,4429,4433,4437,4441,4445,4449,4453,4457,4461,4465,4469,4473,4477,4481,4485,4489,4493,4497,4501,4505,4509,4513,4517,4521,4525,4529,4533,4537,4541,4545,4549,4553,4557,4561,4565,4569,4573,4577,4581,4585,4589,4593,4597,4601,4605,4609,4613,4617,4621,4625,4629,4633,4637,4641,4645,4649,4653,4657,4661,4665,4669,4673,4677,4681,4685,4689,4693,4697,4701,4705,4709,4713,4717,4721,4725,4729,4733,4737,4741,4745,4749,4753,4757,4761,4765,4769,4773,4777,4781,4785,4789,4793,4797,4801,4805,4809,4813,4817,4821,4825,4829,4833,4837,4841,4845,4849,4853,4857,4861,4865,4869,4873,4877,4881,4885,4889,4893,4897,4901,4905,4909,4913,4917,4921,4925,4929,4933,4937,4941,4945,4949,4953,4957,4961,4965,4969,4973,4977,4981,4985,4989,4993,4997,5001,5005,5009,5013,5017,5021,5025,5029,5033,5037,5041,5045,5049,5053,5057,5061,5065,5069,5073,5077,5081,5085,5089,5093,5097,5101,5105,5109,5113,5117,5121,5125,5129,5133,5137,5141,5145,5149,5153,5157,5161,5165,5169,5173,5177,5181,5185,5189,5193,5197,5201,5205,5209,5213,5217,5221,5225,5229,5233,5237,5241,5245,5249,5253,5257,5261,5265,5269,5273,5277,5281,5285,5289,5293,5297,5301,5305,5309,5313,5317,5321,5325,5329,5333,5337,5341,5345,5349,5353,5357,5361,5365,5369,5373,5377,5381,5385,5389,5393,5397,5401,5405,5409,5413,5417,5421,5425,5429,5433,5437,5441,5445,5449,5453,5457,5461,5465,5469,5473,5477,5481,5485,5489,5493,5497,5501,5505,5509,5513,5517,5521,5525,5529,5533,5537,5541,5545,5549,5553,5557,5561,5565,5569,5573,5577,5581,5585,5589,5593,5597,5601,5605,5609,5613,5617,5621,5625,5629,5633,5637,5641,5645,5649,5653,5657,5661,5665,5669,5673,5677,5681,5685,5689,5693,5697,5701,5705,5709,5713,5717,5721,5725,5729,5733,5737,5741,5745,5749,5753,5757,5761,5765,5769,5773,5777,5781,5785,5789,5793,5797,5801,5805,5809,5813,5817,5821,5825,5829,5833,5837,5841,5845,5849,5853,5857,5861,5865,5869,5873,5877,5881,5885,5889,5893,5897,5901,5905,5909,5913,5917,5921,5925,5929,5933,5937,5941,5945,5949,5953,5957,5961,5965,5969,5973,5977,5981,5985,5989,5993,5997,6001,6005,6009,6013,6017,6021,6025,6029,6033,6037,6041,6045,6049,6053,6057,6061,6065,6069,6073,6077,6081,6085,6089,6093,6097,6101,6105,6109,6113,6117,6121,6125,6129,6133,6137,6141,6145,6149,6153,6157,6161,6165,6169,6173,6177,6181,6185,6189,6193,6197,6201,6205,6209,6213,6217,6221,6225,6229,6233,6237,6241,6245,6249,6253,6257,6261,6265,6269,6273,6277,6281,6285,6289,6293,6297,6301,6305,6309,6313,6317,6321,6325,6329,6333,6337,6341,6345,6349,6353,6357,6361,6365,6369,6373,6377,6381,6385,6389,6393,6397,6401,6405,6409,6413,6417,6421,6425,6429,6433,6437,6441,6445,6449,6453,6457,6461,6465,6469,6473,6477,6481,6485,6489,6493,6497,6501,6505,6509,6513,6517,6521,6525,6529,6533,6537,6541,6545,6549,6553,6557,6561,6565,6569,6573,6577,6581,6585,6589,6593,6597,6601,6605,6609,6613,6617,6621,6625,6629,6633,6637,6641,6645,6649,6653,6657,6661,6665,6669,6673,6677,6681,6685,6689,6693,6697,6701,6705,6709,6713,6717,6721,6725,6729,6733,6737,6741,6745,6749,6753,6757,6761,6765,6769,6773,6777,6781,6785,6789,6793,6797,6801,6805,6809,6813,6817,6821,6825,6829,6833,6837,6841,6845,6849,6853,6857,6861,6865,6869,6873,6877,6881,6885,6889,6893,6897,6901,6905,6909,6913,6917,6921,6925,6929,6933,6937,6941,6945,6949,6953,6957,6961,6965,6969,6973,6977,6981,6985,6989,6993,6997,7001,7005,7009,7013,7017,7021,7025,7029,7033,7037,7041,7045,7049,7053,7057,7061,7065,7069,7073,7077,7081,7085,7089,7093,7097,7101,7105,7109,7113,7117,7121,7125,7129,7133,7137,7141,7145,7149,7153,7157,7161,7165,7169,7173,7177,7181,7185,7189,7193,7197,7201,7205,7209,7213,7217,7221,7225,7229,7233,7237,7241,7245,7249,7253,7257,7261,7265,7269,7273,7277,7281,7285,7289,7293,7297,7301,7305,7309,7313,7317,7321,7325,7329,7333,7337,7341,7345,7349,7353,7357,7361,7365,7369,7373,7377,7381,7385,7389,7393,7397,7401,7405,7409,7413,7417,7421,7425,7429,7433,7437,7441,7445,7449,7453,7457,7461,7465,7469,7473,7477,7481,7485,7489,7493,7497,7501,7505,7509,7513,7517,7521,7525,7529,7533,7537,7541,7545,7549,7553,7557,7561,7565,7569,7573,7577,7581,7585,7589,7593,7597,7601,7605,7609,7613,7617,7621,7625,7629,7633,7637,7641,7645,7649,7653,7657,7661,7665,7669,7673,7677,7681,7685,7689,7693,7697,7701,7705,7709,7713,7717,7721,7725,7729,7733,7737,7741,7745,7749,7753,7757,7761,7765,7769,7773,7777,7781,7785,7789,7793,7797,7801,7805,7809,7813,7817,7821,7825,7829,7833,7837,7841,7845,7849,7853,7857,7861,7865,7869,7873,7877,7881,7885,7889,7893,7897,7901,7905,7909,7913,7917,7921,7925,7929,7933,7937,7941,7945,7949,7953,7957,7961,7965,7969,7973,7977,7981,7985,7989,7993,7997,8001,8005,8009,8013,8017,8021,8025,8029,8033,8037,8041,8045,8049,8053,8057,8061,8065,8069,8073,8077,8081,8085,8089,8093,8097,8101,8105,8109,8113,8117,8121,8125,8129,8133,8137,8141,8145,8149,8153,8157,8161,8165,8169,8173,8177,8181,8185,8189,8193,8197,8201,8205,8209,8213,8217,8221,8225,8229,8233,8237,8241,8245,8249,8253,8257,8261,8265,8269,8273,8277,8281,8285,8289,8293,8297,8301,8305,8309,8313,8317,8321,8325,8329,8333,8337,8341,8345,8349,8353,8357,8361,8365,8369,8373,8377,8381,8385,8389,8393,8397,8401,8405,8409,8413,8417,8421,8425,8429,8433,8437,8441,8445,8449,8453,8457,8461,8465,8469,8473,8477,8481,8485,8489,8493,8497,8501,8505,8509,8513,8517,8521,8525,8529,8533,8537,8541,8545,8549,8553,8557,8561,8565,8569,8573,8577,8581,8585,8589,8593,8597,8601,8605,8609,8613,8617,8621,8625,8629,8633,8637,8641,8645,8649,8653,8657,8661,8665,8669,8673,8677,8681,8685,8689,8693,8697,8701,8705,8709,8713,8717,8721,8725,8729,8733,8737,8741,8745,8749,8753,8757,8761,8765,8769,8773,8777,8781,8785,8789,8793,8797,8801,8805,8809,8813,8817,8821,8825,8829,8833,8837,8841,8845,8849,8853,8857,8861,8865,8869,8873,8877,8881,8885,8889,8893,8897,8901,8905,8909,8913,8917,8921,8925,8929,8933,8937,8941,8945,8949,8953,8957,8961,8965,8969,8973,8977,8981,8985,8989,8993,8997,9001,9005,9009,9013,9017,9021,9025,9029,9033,9037,9041,9045,9049,9053,9057,9061,9065,9069,9073,9077,9081,9085,9089,9093,9097,9101,9105,9109,9113,9117,9121,9125,9129,9133,9137,9141,9145,9149,9153,9157,9161,9165,9169,9173,9177,9181,9185,9189,9193,9197,9201,9205,9209,9213,9217,9221,9225,9229,9233,9237,9241,92
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No.	Time	Delta	Source	Destination	Protocol	Length	Channel	Signal strength	Info
126.	2023-06-09 16:09:25.548710	11.134823	Netgear_48:70:95	Broadcast	002.11	166	5 -44 dBm	Probe Request, SN=1560, Fw=0, Flags=.....C, SSID="bllizzard"	> Frame 165651: 350 bytes on wire (2800 bits), 350
126.	2023-06-09 16:09:25.549666	0.000956	Netgear_48:70:95	Broadcast	002.11	166	5 -44 dBm	Probe Request, SN=1561, Fw=0, Flags=.....C, SSID="bllizzard"	> Ethernet II, Src: Cisco,dd:7d:37 (00:d:f:idd:7d:37)
126.	2023-06-09 16:09:25.550449	0.000783	Netgear_48:70:95	Broadcast	002.11	166	5 -44 dBm	Probe Request, SN=1562, Fw=0, Flags=.....C, SSID="bllizzard"	> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.1
126.	2023-06-09 16:09:25.551210	0.000781	Netgear_48:70:95	Broadcast	002.11	166	5 -44 dBm	Probe Request, SN=1563, Fw=0, Flags=.....C, SSID="bllizzard"	> User Datagram Protocol, Src Port: 5555, Dst Port: 5555
126.	2023-06-09 16:09:30.176341	4.625021	IntelCor_98:58:0f	Broadcast	002.11	168	5 -46 dBm	Probe Request, SN=1081, Fw=0, Flags=.....C, SSID="bllizzard"	> AirPeek/OmniPeek encapsulated IEEE 802.11
126.	2023-06-09 16:09:30.178753	0.002232	IntelCor_98:58:0f	Broadcast	002.11	168	5 -48 dBm	Probe Request, SN=1082, Fw=0, Flags=.....C, SSID="bllizzard"	> IEEE 802.11 Probe Request, Flags:C
127.	2023-06-09 16:09:32.923837	2.745264	IntelCor_98:58:0f	Broadcast	002.11	168	5 -51 dBm	Probe Request, SN=1100, Fw=0, Flags=.....C, SSID="bllizzard"	> IEEE 802.11 Wireless Management
127.	2023-06-09 16:09:32.925547	0.001710	IntelCor_98:58:0f	Broadcast	002.11	168	5 -53 dBm	Probe Request, SN=1191, Fw=0, Flags=.....C, SSID="bllizzard"	> Tagged parameters (260 bytes)
127.	2023-06-09 16:09:34.290608	1.364521	IntelCor_98:58:0f	Broadcast	002.11	168	5 -47 dBm	Probe Request, SN=1200, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: SSID parameter set: "wifi6e_test"
135.	2023-06-09 16:10:25.522319	51.232251	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1694, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag Number: SSID parameter set (0)
135.	2023-06-09 16:10:25.523084	0.000485	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1695, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag length: 11
135.	2023-06-09 16:10:25.523726	0.000922	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1696, Fw=0, Flags=.....C, SSID="bllizzard"	> SSID: "wifi6e_test"
135.	2023-06-09 16:10:25.525359	0.001633	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1697, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Supported Rates 6(0), 9, 12(0), 18, 24
144.	2023-06-09 16:11:25.561174	60.035815	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1828, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Extended Supported Rates SAE Hash to
144.	2023-06-09 16:11:25.562079	0.000959	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1829, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag Number: Extended Supported Rates
144.	2023-06-09 16:11:25.562892	0.000813	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1830, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag length: 1
144.	2023-06-09 16:11:25.563708	0.000816	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1831, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Supported Rates: SAE Hash to
149.	2023-06-09 16:11:56.063312	30.499604	IntelCor_98:58:0f	Broadcast	002.11	168	5 -54 dBm	Probe Request, SN=1254, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Extended Capabilities (11 octets)
149.	2023-06-09 16:11:56.065702	0.001547	IntelCor_98:58:0f	Broadcast	002.11	168	5 -56 dBm	Probe Request, SN=1255, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Interworking
151.	2023-06-09 16:12:07.176171	11.110469	IntelCor_98:58:0f	Broadcast	002.11	168	5 -47 dBm	Probe Request, SN=1316, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag: FILS Request Parameters
151.	2023-06-09 16:12:07.178494	0.002323	IntelCor_98:58:0f	Broadcast	002.11	168	5 -50 dBm	Probe Request, SN=1317, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag Number: FILS Request Parameters
152.	2023-06-09 16:12:15.968792	8.790298	IntelCor_98:58:0f	Broadcast	002.11	168	5 -52 dBm	Probe Request, SN=1380, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag data: 00ff
152.	2023-06-09 16:12:15.971826	0.002324	IntelCor_98:58:0f	Broadcast	002.11	168	5 -54 dBm	Probe Request, SN=1381, Fw=0, Flags=.....C, SSID="bllizzard"	> [Expert Info (Note/Unencoded): Dissecto
153.	2023-06-09 16:12:23.506243	7.532127	IntelCor_98:58:0f	Broadcast	002.11	168	5 -48 dBm	Probe Request, SN=1452, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag: HE 6 GHz Band Capabilities
153.	2023-06-09 16:12:23.508482	0.002329	IntelCor_98:58:0f	Broadcast	002.11	168	5 -50 dBm	Probe Request, SN=1453, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag Number: Element ID Extension (255)
154.	2023-06-09 16:12:25.504858	1.996376	Netgear_48:70:95	Broadcast	002.11	166	5 -44 dBm	Probe Request, SN=1962, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag length: 2
154.	2023-06-09 16:12:25.505716	0.000958	Netgear_48:70:95	Broadcast	002.11	166	5 -44 dBm	Probe Request, SN=1963, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag: HE 6 GHz Band Capabilities
154.	2023-06-09 16:12:25.506499	0.000783	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1964, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag Number: Element ID Extension (255)
154.	2023-06-09 16:12:25.507325	0.000826	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=1965, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag length: 2
154.	2023-06-09 16:12:25.508725	1.187574	IntelCor_98:58:0f	Broadcast	002.11	168	5 -52 dBm	Probe Request, SN=1524, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag Number: HE 6 GHz Band Capabili
154.	2023-06-09 16:12:25.510626	0.001547	IntelCor_98:58:0f	Broadcast	002.11	168	5 -54 dBm	Probe Request, SN=1525, Fw=0, Flags=.....C, SSID="bllizzard"	> Capabilities Information: 0x002e
155.	2023-06-09 16:12:29.708626	3.009900	IntelCor_98:58:0f	Broadcast	002.11	168	5 -46 dBm	Probe Request, SN=1586, Fw=0, Flags=.....C, SSID="bllizzard" 110 = Minimum MPOU S
155.	2023-06-09 16:12:29.715971	0.007345	IntelCor_98:58:0f	Broadcast	002.11	168	5 -49 dBm	Probe Request, SN=1587, Fw=0, Flags=.....C, SSID="bllizzard" 11 1 = Maximum A-MPOU
156.	2023-06-09 16:12:32.994794	3.278813	IntelCor_98:58:0f	Broadcast	002.11	168	5 -51 dBm	Probe Request, SN=1652, Fw=0, Flags=.....C, SSID="bllizzard" 10 = Maximum MPOU Le
156.	2023-06-09 16:12:32.997356	0.002379	IntelCor_98:58:0f	Broadcast	002.11	168	5 -54 dBm	Probe Request, SN=1653, Fw=0, Flags=.....C, SSID="bllizzard" 0 = Reserved: 0x0
157.	2023-06-09 16:12:37.063162	4.066086	IntelCor_98:58:0f	Broadcast	002.11	168	5 -46 dBm	Probe Request, SN=1694, Fw=0, Flags=.....C, SSID="bllizzard" 11 = SM Power Save
163.	2023-06-09 16:13:15.734428	42.671266	81e:b2:05:82:0e	Broadcast	002.11	132	5 -39 dBm	Probe Request, SN=494, Fw=0, Flags=.....C, SSID="wifi6e_test" 0 = TX Responder: 0x0
164.	2023-06-09 16:13:15.523210	5.787782	Netgear_48:70:95	Broadcast	002.11	166	5 -48 dBm	Probe Request, SN=2097, Fw=0, Flags=.....C, SSID="bllizzard" 0 = Rx Antenna Pat
164.	2023-06-09 16:13:15.523982	0.000772	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2098, Fw=0, Flags=.....C, SSID="bllizzard" 0 = Tx Antenna Pat
164.	2023-06-09 16:13:15.524998	0.001016	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2098, Fw=0, Flags=.....C, SSID="bllizzard"	00. = Reserved: 0x0
164.	2023-06-09 16:13:15.526167	0.001149	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2099, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag: Short SSID
165.	2023-06-09 16:13:12.557265	7.031898	Google_72:8a:66	Broadcast	002.11	358	5 -38 dBm	Probe Request, SN=13, Fw=0, Flags=.....C, SSID="wifi6e_test"	> Tag Number: Element ID Extension (255)
181.	2023-06-09 16:13:52.470230	19.512965	Google_72:8a:66	Broadcast	002.11	135	5 -45 dBm	Probe Request, SN=206, Fw=0, Flags=.....C, SSID="wifi6e_test"	> Ext Tag length: 4
187.	2023-06-09 16:14:05.067397	12.597367	Netgear_48:70:95	Broadcast	002.11	168	5 -50 dBm	Probe Request, SN=1749, Fw=0, Flags=.....C, SSID="bllizzard"	> Ext Tag Number: Short SSID (50)
187.	2023-06-09 16:14:05.069615	0.002318	Netgear_48:70:95	Broadcast	002.11	168	5 -53 dBm	Probe Request, SN=1750, Fw=0, Flags=.....C, SSID="bllizzard"	> Short SSID: 0x0d32e05
191.	2023-06-09 16:14:25.554976	20.485361	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2380, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Vendor Specific: Microsoft Corp.: WPS
191.	2023-06-09 16:14:25.555590	0.000614	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2381, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Vendor Specific: Wi-Fi Alliance: P2P
191.	2023-06-09 16:14:25.556589	0.000919	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2382, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Vendor Specific: Wi-Fi Alliance: HOTA
191.	2023-06-09 16:14:25.557345	0.000836	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=2383, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Vendor Specific: Microsoft Corp.: UNK
192.	2023-06-09 16:14:26.967711	1.418366	Netgear_48:70:95	Broadcast	002.11	168	5 -47 dBm	Probe Request, SN=1817, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Vendor Specific: Broadcom
192.	2023-06-09 16:14:26.970276	0.002565	Netgear_48:70:95	Broadcast	002.11	168	5 -49 dBm	Probe Request, SN=1818, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Vendor Specific: Wi-Fi Alliance: MULT

Samsung S23

No.	Time	Delta	Source	Destination	Protocol	Length	Channel	Signal strength	Info
620	2023-06-09 16:02:25.542689	0.000000	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=622, Fw=0, Flags=.....C, SSID="bllizzard"	> Frame 65924: 164 bytes on wire (1312 bits), 164 by
621	2023-06-09 16:02:25.543382	0.000773	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=623, Fw=0, Flags=.....C, SSID="bllizzard"	> Ethernet II, Src: Cisco,dd:7d:37 (00:d:f:idd:7d:37)
622	2023-06-09 16:02:25.544166	0.000784	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=624, Fw=0, Flags=.....C, SSID="bllizzard"	> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.1
624	2023-06-09 16:02:25.545262	0.001996	Netgear_48:70:95	Broadcast	002.11	166	5 -45 dBm	Probe Request, SN=625, Fw=0, Flags=.....C, SSID="bllizzard"	> User Datagram Protocol, Src Port: 5555, Dst Port: 5555
9421	2023-06-09 16:02:47.759564	22.213992	IntelCor_98:58:0f	Broadcast	002.11	168	5 -44 dBm	Probe Request, SN=181, Fw=0, Flags=.....C, SSID="bllizzard"	> AirPeek/OmniPeek encapsulated IEEE 802.11
9422	2023-06-09 16:02:47.761269	0.002105	IntelCor_98:58:0f	Broadcast	002.11	168	5 -46 dBm	Probe Request, SN=182, Fw=0, Flags=.....C, SSID="bllizzard"	> IEEE 802.11 Probe Request, Flags:C
128.	2023-06-09 16:02:51.445680	3.604339	Netgear_48:70:95	Broadcast	002.11	166	5 -52 dBm	Probe Request, SN=145, Fw=0, Flags=.....C, SSID="bllizzard"	> IEEE 802.11 Wireless Management
128.	2023-06-09 16:02:51.447805	0.002197	Netgear_48:70:95	Broadcast	002.11	166	5 -54 dBm	Probe Request, SN=146, Fw=0, Flags=.....C, SSID="bllizzard"	> Tagged parameters (74 bytes)
225.	2023-06-09 16:03:25.545589	34.097784	Netgear_48:70:95	Broadcast	002.11	166	5 -47 dBm	Probe Request, SN=756, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: SSID parameter set: wildcard SSID
225.	2023-06-09 16:03:25.545589	0.000000	Netgear_48:70:95	Broadcast	002.11	166	5 -47 dBm	Probe Request, SN=757, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Supported Rates 6, 9, 12, 18, 24, 36, 48
226.	2023-06-09 16:03:25.545589	0.000000	Netgear_48:70:95	Broadcast	002.11	166	5 -48 dBm	Probe Request, SN=758, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag: Extended Capabilities (11 octets)
226.	2023-06-09 16:03:25.545589	0.000000	Netgear_48:70:95	Broadcast	002.11	166	5 -47 dBm	Probe Request, SN=759, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag Number: Extended Capabilities (127)
414.	2023-06-09 16:04:02.310242	36.764653	Netgear_48:70:95	Broadcast	002.11	168	5 -44 dBm	Probe Request, SN=409, Fw=0, Flags=.....C, SSID="bllizzard"	> Tag length: 11
414.	2023-06-09 16:04:02.312552	0.002310	Netgear_48:70:95	Broadcast	002.11	168	5 -47 dBm	Probe Request, SN=410, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Capabilities: 0x04 (octet 1)
422.	2023-06-09 16:04:05.183773	2.871223	Netgear_48:70:95	Broadcast	002.11	168	5 -55 dBm	Probe Request, SN=534, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Capabilities: 0x08 (octet 2)
422.	2023-06-09 16:04:05.186947	0.002274	Netgear_48:70:95	Broadcast	002.11	168	5 -57 dBm	Probe Request, SN=535, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Capabilities: 0x0a (octet 3)
481.	2023-06-09 16:04:25.622592	20.436545	Netgear_48:70:95	Broadcast	002.11	166	5 -46 dBm	Probe Request, SN=890, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Capabilities: 0x01 (octet 5)
481.	2023-06-09 16:04:25.623258	0.000666	Netgear_48:70:95	Broadcast	002.11	166	5 -47 dBm	Probe Request, SN=891, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Capabilities: 0x04 (octet 6)
481.	2023-06-09 16:04:25.624368	0.001182	Netgear_48:70:95	Broadcast	002.11	166	5 -47 dBm	Probe Request, SN=892, Fw=0, Flags=.....C, SSID="bllizzard"	> Extended Capabilities: 0x00 (octet 7)
481.	2023-06-09 16:04:25.624869	0.000939	Netgear_48:70:95	Broadcast	002.11				

Steering Caution

Care needs to be taken at the AP to prevent such steering-unfriendly clients from getting blocked at the AP, in which case user intervention can be needed to restore the Wi-Fi connection.

User intervention can be as simple as toggling the Wi-Fi on/off. Clearly such user interventions are not desirable. Therefore, the design errs on the conservative side.

If a client cannot be steered or a steering attempt fails, the AP lets the client re-associate with the original band as opposed to risking the client being blocked from the AP for an extended period of time.

Since the client is only steered when idle, there is no interruption to the user traffic.

Configuring 6-GHz Client Steering in the Global Configuration Mode (GUI)

Step 1 - Choose Configuration > Wireless > Advanced.

Step 2 - Click the **6 GHz Client Steering** tab. Client steering is configurable per WLAN.

Step 3 - In the **6 GHz Transition Minimum Client Count** field, enter a value to set the minimum number of clients for client steering. The default value is three clients. The value range is between 0 and 200 clients.

Step 4 - In the **6 GHz Transition Minimum Window Size** field, enter a value to set the minimum window size of client steering. The default value is three clients. The value range is between 0 and 200 clients.

Step 5 - In the **6 GHz Transition Maximum Utilization Difference** field, enter a value to set the maximum utilization difference for steering. The value range is between 0 percent to 100 percent. The default value is 20.

Step 6 - In the **6 GHz Transition Minimum 2.4 GHz RSSI Threshold** field, enter a value to set the minimum value for client steering 2.4-GHz RSSI threshold.

Step 7 - In the **6 GHz Transition Minimum 5 GHz RSSI Threshold** field, enter a value to set the minimum value for client steering 5-GHz RSSI threshold.

Step 8 - Click **Apply**.

The screenshot shows the Cisco Catalyst 9800-CL Wireless Controller GUI. The top navigation bar includes the Cisco logo, the device name 'Cisco Catalyst 9800-CL Wireless Controller', and the user 'Welcome admin'. The main content area is titled 'Config' and shows the 'Advanced' configuration mode. The '6 GHz Client Steering' tab is selected, and the configuration page displays the following settings:

Field	Value
6 GHz Transition Minimum Client Count*	3
6 GHz Transition Minimum Window Size*	3
6 GHz Transition Maximum Utilization Difference (%)*	20
6 GHz Transition Minimum 2.4 GHz RSSI Threshold (dBm)*	-60
6 GHz Transition Minimum 5 GHz RSSI Threshold (dBm)*	-65

Configuring 6-GHz Client Steering in the Global Configuration Mode (CLI)

```
Device# configure terminal
Device(config)# client-steering client-count 3
Device(config)# client-steering window-size 5
```

```
Device(config)# wireless client client-steering util-threshold 25
Device(config)# wireless client client-steering min-rssi-24ghz -70
Device(config)# wireless client client-steering min-rssi-5ghz -75
```

Configure 6-GHz Client Steering on the WLAN (GUI)

Step 1 - Choose Configuration > Tags & Profiles > WLANs.

Step 2 - Click Add. The Add WLAN page is displayed.

Step 3 - Click the **Advanced** tab.

Step 4 - Check the **6 GHz Client Steering** check box to enable client steering on the WLAN.

Step 5 - Click **Apply to Device**.

The screenshot displays the Cisco Catalyst 9800-CL Wireless Controller GUI. The main panel shows the 'WLANs' configuration page with a table of existing WLANs. The 'wif6E_test' WLAN is selected. The right-hand panel shows the 'Edit WLAN' configuration for 'wif6E_test', with the 'Advanced' tab active. The '6 GHz Client Steering' checkbox is checked and highlighted with a red box. Other settings like 'Max Client Connections' and '11v BSS Transition Support' are also visible.

Status	Name	ID
<input type="checkbox"/>		1
<input type="checkbox"/>		2
<input type="checkbox"/>		3
<input type="checkbox"/>		4
<input checked="" type="checkbox"/>	wif6E_test	5
<input type="checkbox"/>	wif6E_test_01	6
<input type="checkbox"/>	wif6E_test_02	7

Advanced configuration options:

- Coverage Hole Detection:
- Alronet IE:
- Advertise AP Name:
- P2P Blocking Action: Disabled
- Multicast Buffer: DISABLED
- Media Stream Multicast-direct:
- 11ac MU-MIMO:
- WiFi to Cellular Steering:
- Fastlane+ (ASR):
- Deny LAA (RCM) clients:
- 6 GHz Client Steering:**
- Max Client Connections:
 - Per WLAN: 0
 - Per AP Per WLAN: 0
 - Per AP Radio Per WLAN: 200
- 11v BSS Transition Support

Configure 6-GHz Client Steering on the WLAN (CLI)

```
Device# configure terminal
Device(config)# wlan wlan-name id ssid-name
Device(config-wlan)# client-steering
```

Verification

To verify if the configuration is in place issue the command as shown here:

```
<#root>
```

```
WLC9800#
```

```
show wireless client steering
```

Client Steering Configuration Information

```
Macro to micro transition threshold : -55 dBm
Micro to Macro transition threshold : -65 dBm
Micro-Macro transition minimum client count : 3
Micro-Macro transition client balancing window : 3
Probe suppression mode : Disabled
Probe suppression transition aggressiveness : 3
Probe suppression hysteresis : -6 dB
6Ghz transition minimum client count : 3
6Ghz transition minimum window size : 3
6Ghz transition maximum channel util difference : 20%
6Ghz transition minimum 2.4Ghz RSSI threshold : -60 dBm
6Ghz transition minimum 5Ghz RSSI threshold : -65 dBm
```

WLAN Configuration Information

WLAN Profile Name	11k Neighbor Report	11v BSS Transition
5 wifi6E_test	Enabled	Enabled
6 wifi6E_test_01	Enabled	Enabled
7 wifi6E_test_02	Enabled	Enabled

```
WLC9800#
```

```
show wlan id 5 | i Client Steering
```

```
6Ghz Client Steering : Enabled
```

Client Connectivity

In this section it is shown the process OTA of each client connecting to the WLAN.

The lab was with these conditions:

- Clients and APs were ~1 meter in line of sight without obstructions.
- All APs broadcasting WLAN with Channel Width of 160MHz and power level 1.
- The client devices were switched on the same VLAN as the iperf server.
- All APs connected via 1Gbps link.

6 GHz Radios

Total 6 GHz radios : 4

AP Name	Slot No	Base Radio MAC	Admin Status	Operation Status	Policy Tag	Site Tag	RF Tag	Channel
AP9166_0E.6220	2	7411.b2d2.9740	✓	➕	W6E_TestPolicy	TiagoHomePTAPs	default-rf-tag	160 MHz
AP9162_53.CA50	2	3891.b713.80e0	✓	➕	W6E_TestPolicy	TiagoHomePTAPs	default-rf-tag	160 MHz
AP9136_5C.F524	3	00df.1ddd.7d30	✓	➕	W6E_TestPolicy	TiagoHomePTAPs	default-rf-tag	160 MHz

Tests with AP 9166

NetGear A8000

Client details in WLC:

<#root>

```
#show wireless client mac-address 9418.6548.7095 detail
```

```
Client MAC Address : 9418.6548.7095
[...]
Client IPv4 Address : 192.168.1.163
[...]
AP MAC Address : 7411.b2d2.9740
AP Name: AP9166_0E.6220
AP slot : 2
Client State : Associated
Policy Profile : Policy4TiagoHome
Flex Profile : TiagoHomeFlexProfile
Wireless LAN Id: 5
WLAN Profile Name: wifi6E_test
Wireless LAN Network Name (SSID): wifi6E_test
BSSID : 7411.b2d2.9747
Connected For : 1207 seconds
```

```
Protocol : 802.11ax - 6 GHz
```

```
Channel : 69
```

```
[...]
Current Rate : m11 ss2
Supported Rates : 54.0
[...]
```

```
Policy Type : WPA3
```

```
Encryption Cipher : CCMP (AES)
```

```
Authentication Key Management : SAE
```

```
AAA override passphrase : No
```

SAE PWE Method : Hash to Element(H2E)

[...]

Protected Management Frame - 802.11w : Yes

EAP Type : Not Applicable

[...]

[...]

FlexConnect Data Switching : Local

FlexConnect Dhcp Status : Local

FlexConnect Authentication : Local

Client Statistics:

Number of Bytes Received from Client : 1026751751

Number of Bytes Sent to Client : 106125429

Number of Packets Received from Client : 793074

Number of Packets Sent to Client : 184944

Number of Policy Errors : 0

Radio Signal Strength Indicator : -44 dBm

Signal to Noise Ratio : 49 dB

[...]

Device Classification Information:

Device Type : Microsoft-Workstation

Device Name : CSCO-W-xxxxxxx

Protocol Map : 0x000029 (OUI, DHCP, HTTP)

Device OS : Windows NT 10.0; Win64; x64

Pixel 6a

Client details in WLC:

<#root>

#show wireless client mac-address 2495.2f72.8a66 detail

Client MAC Address : 2495.2f72.8a66

[...]

Client IPv4 Address : 192.168.1.162

[...]

AP MAC Address : 7411.b2d2.9740

AP Name: AP9166_0E.6220

AP slot : 2

Client State : Associated

Policy Profile : Policy4TiagoHome

Flex Profile : TiagoHomeFlexProfile

Wireless LAN Id: 5

WLAN Profile Name: wifi6E_test

Wireless LAN Network Name (SSID): wifi6E_test

BSSID : 7411.b2d2.9747
Connected For : 329 seconds
Protocol : 802.11ax - 6 GHz
Channel : 69
Client IIF-ID : 0xa000000a
Association Id : 33
Authentication Algorithm : Open System
[...]
Current Rate : 6.0
Supported Rates : 61.0
[...]
Policy Type : WPA3

Encryption Cipher : CCMP (AES)

Authentication Key Management : SAE

AAA override passphrase : No

SAE PWE Method : Hash to Element(H2E)

[...]

Protected Management Frame - 802.11w : Yes

EAP Type : Not Applicable

[...]

Session Manager:

Point of Attachment : capwap_90000025

IIF ID : 0x90000025

Authorized : TRUE

Session timeout : 86400

Common Session ID: 000000000000171BC51FF477

Acct Session ID : 0x00000000

Auth Method Status List

Method : SAE

Local Policies:

Service Template : wlan_svc_Policy4TiagoHome (priority 254)

VLAN : default

Absolute-Timer : 86400

Server Policies:

Resultant Policies:

VLAN Name : default

VLAN : 1

Absolute-Timer : 86400

[...]

FlexConnect Data Switching : Local

FlexConnect Dhcp Status : Local

FlexConnect Authentication : Local

Client Statistics:

Number of Bytes Received from Client : 603220312

Number of Bytes Sent to Client : 72111916

Number of Packets Received from Client : 461422

Number of Packets Sent to Client : 107888

Number of Policy Errors : 0

Radio Signal Strength Indicator : -45 dBm

Signal to Noise Ratio : 48 dB

[...]

Device Classification Information:

Device Type : Android-Google-Pixel

Device Name : Pixel-6a

Protocol Map : 0x000029 (OUI, DHCP, HTTP)

Device OS : X11; Linux x86_64

Samsung S23

Client details in WLC:

<#root>

#show wireless client mac-address 0429.2ec9.e371 detail

Client MAC Address : 0429.2ec9.e371

[...]

Client IPv4 Address : 192.168.1.160

[...]

AP MAC Address : 7411.b2d2.9740

AP Name: AP9166_0E.6220

AP slot : 2

Client State : Associated

Policy Profile : Policy4TiagoHome

Flex Profile : TiagoHomeFlexProfile

Wireless LAN Id: 5

WLAN Profile Name: wifi6E_test

Wireless LAN Network Name (SSID): wifi6E_test

BSSID : 7411.b2d2.9747

Connected For : 117 seconds

Protocol : 802.11ax - 6 GHz

Channel : 69

Client IIF-ID : 0xa0000002

Association Id : 33

Authentication Algorithm : Open System

[...]

Current Rate : 6.0

Supported Rates : 54.0

[...]

Policy Type : WPA3

Encryption Cipher : CCMP (AES)

Authentication Key Management : SAE

AAA override passphrase : No

SAE PWE Method : Hash to Element(H2E)

[...]

Protected Management Frame - 802.11w : Yes

EAP Type : Not Applicable

[...]

Session Manager:

Point of Attachment : capwap_90000025

IIF ID : 0x90000025

Authorized : TRUE

Session timeout : 86400

Common Session ID: 0000000000001713C518E305

Acct Session ID : 0x00000000

Auth Method Status List

Method : SAE

Local Policies:

Service Template : wlan_svc_Policy4TiagoHome (priority 254)

VLAN : default

Absolute-Timer : 86400

Server Policies:

Resultant Policies:

VLAN Name : default

VLAN : 1

Absolute-Timer : 86400

[...]

FlexConnect Data Switching : Local

FlexConnect Dhcp Status : Local

FlexConnect Authentication : Local

Client Statistics:

Number of Bytes Received from Client : 550161686

Number of Bytes Sent to Client : 5751483

Number of Packets Received from Client : 417388

Number of Packets Sent to Client : 63427

Number of Policy Errors : 0

Radio Signal Strength Indicator : -52 dBm

Signal to Noise Ratio : 41 dB

[...]

Device Classification Information:

Device Type : Android-Device

Device Name : Galaxy-S23

Protocol Map : 0x000029 (OUI, DHCP, HTTP)

Intel AX211

Client details in WLC:

<#root>

#show wireless client mac-address 286b.3598.580f detail

Client MAC Address : 286b.3598.580f
[...]
Client IPv4 Address : 192.168.1.159
[...]
AP MAC Address : 7411.b2d2.9740
AP Name: AP9166_0E.6220
AP slot : 2
Client State : Associated
Policy Profile : Policy4TiagoHome
Flex Profile : TiagoHomeFlexProfile
Wireless LAN Id: 5
WLAN Profile Name: wifi6E_test
Wireless LAN Network Name (SSID): wifi6E_test
BSSID : 7411.b2d2.9747
Connected For : 145 seconds

Protocol : 802.11ax - 6 GHz

Channel : 69

Client IIF-ID : 0xa0000001
Association Id : 35
Authentication Algorithm : Open System
[...]
Current Rate : 6.0
Supported Rates : 54.0
AAA QoS Rate Limit Parameters:
QoS Average Data Rate Upstream : (kbps)
QoS Realtime Average Data Rate Upstream : (kbps)
QoS Burst Data Rate Upstream : (kbps)
QoS Realtime Burst Data Rate Upstream : (kbps)
QoS Average Data Rate Downstream : (kbps)
QoS Realtime Average Data Rate Downstream : (kbps)
QoS Burst Data Rate Downstream : (kbps)
QoS Realtime Burst Data Rate Downstream : (kbps)
[...]

Policy Type : WPA3

Encryption Cipher : CCMP (AES)

Authentication Key Management : SAE

AAA override passphrase : No

SAE PWE Method : Hash to Element(H2E)

[...]

Protected Management Frame - 802.11w : Yes

[...]

Session Manager:

Point of Attachment : capwap_90000025

IIF ID : 0x90000025

Authorized : TRUE

Session timeout : 86400

Common Session ID: 000000000000171CC520478F

Acct Session ID : 0x00000000

Auth Method Status List

Method : SAE

Local Policies:

Service Template : wlan_svc_Policy4TiagoHome (priority 254)

VLAN : default

Absolute-Timer : 86400

Server Policies:

Resultant Policies:

VLAN Name : default

VLAN : 1

Absolute-Timer : 86400

[...]

FlexConnect Data Switching : Local

FlexConnect Dhcp Status : Local

FlexConnect Authentication : Local

Client Statistics:

Number of Bytes Received from Client : 335019921

Number of Bytes Sent to Client : 3315418

Number of Packets Received from Client : 250583

Number of Packets Sent to Client : 38960

Number of Policy Errors : 0

Radio Signal Strength Indicator : -54 dBm

Signal to Noise Ratio : 39 dB

[...]

Device Classification Information:


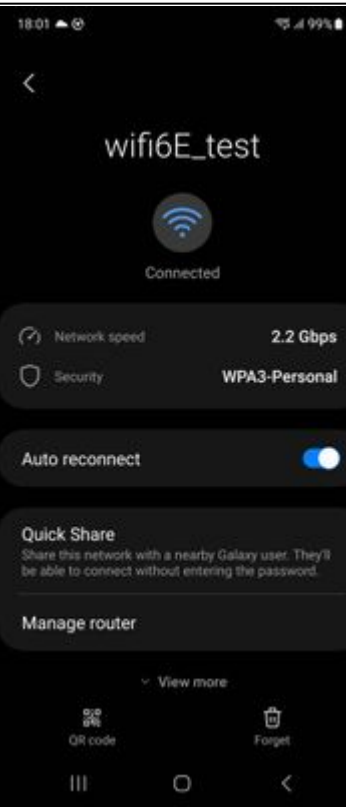
Device Type : LENOVO 21CCS43W0T

Device Name : CSCO-W-xxxxxxxx

Protocol Map : 0x000429 (OUI, DOT11, DHCP, HTTP)

Device OS : Windows 10

Here you can observe the network details provided by each client:

NetGearA8000	Pixel 6a	Samsung S23
<pre> Name: A8000_NETGEAR Description: NETGEAR A8000 WiFi 6 & 6E Adapter Physical address (MAC): 94:18:65:48:70:95 Status: Operational Maximum transmission unit: 1500 Link speed (Receive/Transmit): 1201/1201 (Mbps) DHCP enabled: Yes DHCP servers: 192.168.1.254 DHCP lease obtained: Monday, June 19, 2023 6:20:11 PM DHCP lease expires: Tuesday, June 20, 2023 6:20:11 PM IPv4 address: 192.168.1.163/24 IPv6 address: 2001:8a0:fb91:1c00:f6e7:e29c:f0e1:63ea/64, 2001:8a0:fb91:1c00:299c:6c3b:b3c0:59b6/12 IPv4 default gateway: 192.168.1.254 IPv6 default gateway: fe80::5afc:20ff:fe9e:59af%16 DNS servers: 2001:8a0:fb91:1c00::1 (Unencrypted) 192.168.1.254 (Unencrypted) DNS domain name: Home DNS connection suffix: Home DNS search suffix list: Network name: wifi6E_test </pre>		
<i>NetGearA8000 Client Details</i>	<i>Pixel6a Client Details</i>	<i>S23 Client Details</i>

Troubleshoot

The troubleshooting section of this document is aimed to provide general guidance on troubleshooting WLAN broadcasting issues rather than client specific problems that can occur when using any of the band operations explained in this document.

Note: Refer to [Important Information on Debug Commands](#) before you use debug commands.

To troubleshoot client connectivity issues, it is recommended to use these documents:

[Troubleshoot Catalyst 9800 Client Connectivity Issues Flow](#) .

[Understand Wireless Debugs and Log Collection on Catalyst 9800 Wireless LAN Controllers](#) .

For AP troubleshooting it is recommended to use this document:

[Troubleshoot COS APs](#)

For throughput calculation and validation, please check this guide:

[802.11ac wireless throughput testing and validation guide](#) .

Even though it was created when 11ac was released, the same calculations apply for 11ax.

Related Information

[What is Wi-Fi 6E?](#)

[What Is Wi-Fi 6 vs. Wi-Fi 6E?](#)

[Wi-Fi 6E At-a-Glance](#)

[Wi-Fi 6E: The Next Great Chapter in Wi-Fi White Paper](#)

[Cisco Live - Architecting Next Generation Wireless Network with Catalyst Wi-Fi 6E Access Points](#)

[Countries Enabling Wi-Fi in 6 GHz \(Wi-Fi 6E\)](#)

[Cisco Catalyst 9800 Series Wireless Controller Software Configuration Guide 17.9.x](#)

[WPA3 Deployment Guide](#)