Quint@s Quinze

Sua série de webinars favorita está
de volta e totalmente repaginada!

Conheça o novo

Quint@s Quinze

Quint@s Quinze

Wi-Fi6: inovação e alta eficiência em redes wireless de nova geração

Flavio Correa, Solutions Architect, CCIE

Felipe Amorim, Solutions Architect, CCIE

https://community.cisco.com/t5/comunidade-da-cisco/ct-p/comunidade-portugues

Flavio Correa

Felipe Amorim

01 Tecnologias de Acesso Wireless de última geração: Wi-Fi6 e 5G

02 Entenda por que o Wi-F6 representa uma revolução para as redes 802.11

03 Impactos na arquitetura de acesso e considerações para migração ao Wi-Fi6

Quint@s Quinze

Tecnologias de Acesso Wireless de última geração: Wi-Fi6 e 5G

Today's campus is wherever we work

And faces growing IT complexity

Higher data rates
12.3 billion mobile devices in 2022 at 12% CAGR[1]

IoT goes mainstream
IoT will be **50%** of global connected devices by 2022[2]

Growing threats
27.4% average increase in security breaches in 2017

[1, 2] Cisco VNI™ data

A modern campus requires a new network

Mobile first

Cloud driven

AI optimized

New Workplace needs for a Mobile Hybrid Workforce

Best Mobile Experience

Pervasive mobility at office spaces to accommodate a Hybrid Workforce

Intelligent Infrastructure

Use of the latest technologies to keep the business running with maximum visibility, simpler operations and safer

Increase Security Capabilities

Cisco Zero Trust for Workplace to handle more user and IoT in a intelligent and secure manner

Wireless Technologies are key to run the business and critical APPs

Indoor Enterprise

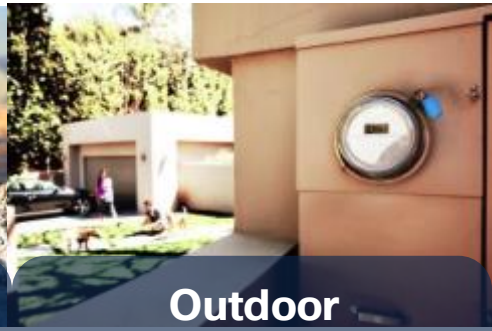
Wi-Fi / BLE

Smart Buildings

ZigBee / Thread

Industrial

Wi-Fi / Wired / 5G



Outdoor

LoRaWAN / 5G

Sensors | Devices | Machines

Challenges

Users

Manage

Secure

Interpret

Polling Question 1

- Em quais tecnologias wireless sua empresa planeja investir nos próximos 2 anos?

A. Wi-Fi6
B. 5G
C. LoRaWAN
D. Wi-Fi6 and 5G
E. Wi-Fi6, 5G and LoRaWAN

5G and Wi-Fi6 are complementary technologies

Private 5G	Judgement	Wi-Fi 6 (802.11ax)
Mission-critical applications requiring ultra-low latency, or broad geographic coverage		Applications focused on capacity, client density, mobility, “guest” access, BYOD
Wide Area Coverage Large indoor and outdoor coverage (10K+ sqft per cell)	**Automated Guided Vehicle** Eliminate Interference Roaming delays of ≤ 50ms w/ 5G	**Digital Health** Advanced care Tele-medicine and mobile health
Process Automation HA & SLA Five-9’s to Six-9’s E2E latency ≤10ms	**Enhanced Mobile Broadband** 2Gbps+ download immersive experience	**Digital Campus** AR/VR/ MR-based Education E-learning

Performance | IOT Scale | Capacity | Security

Other considerations

Device ecosystem
5G IoT device availability expected to be limited until 2025

Spectrum
Added complexity and cost to acquire licensed spectrum for 5G

Operations
Currently higher operational complexity for 5G compared to Wi-Fi

Cost
Unlikely that 5G devices and infrastructure will be cheaper than Wi-Fi anytime soon

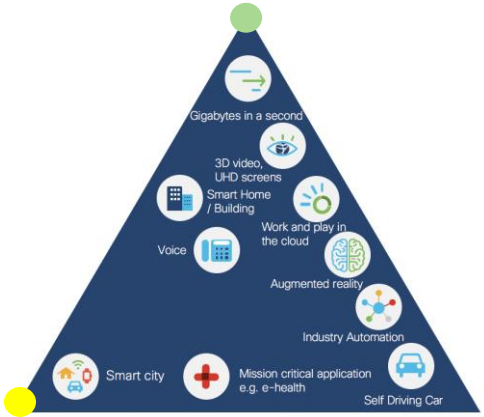
Application and business model needs drive choice

Two next-generation wireless technologies

5G

enhanced Mobile Broadband (**eMBB**)

Extreme high data rates, low latency and high coverage



massive Machine Type Communications (**mMTC**)

Large amount of connections, low volume of data, long battery life

Ultra-reliable and low latency communications (**URLLC**)

High availability, very-low / predictable latency

6

Higher data rates

- 1024-QAM for up to 9.6 Gbps per radio and single-antenna speeds of 1.2 Gbps
- 8x8:8SS
- Enables next-generation 4K/8K and AR/VR video

Reduced latency and greater reliability

- Scheduled uplink and downlink OFDMA for deterministic "cellular-like" latency, reliability, and QoS
- Optimized for IoT scale with hundreds of devices per AP

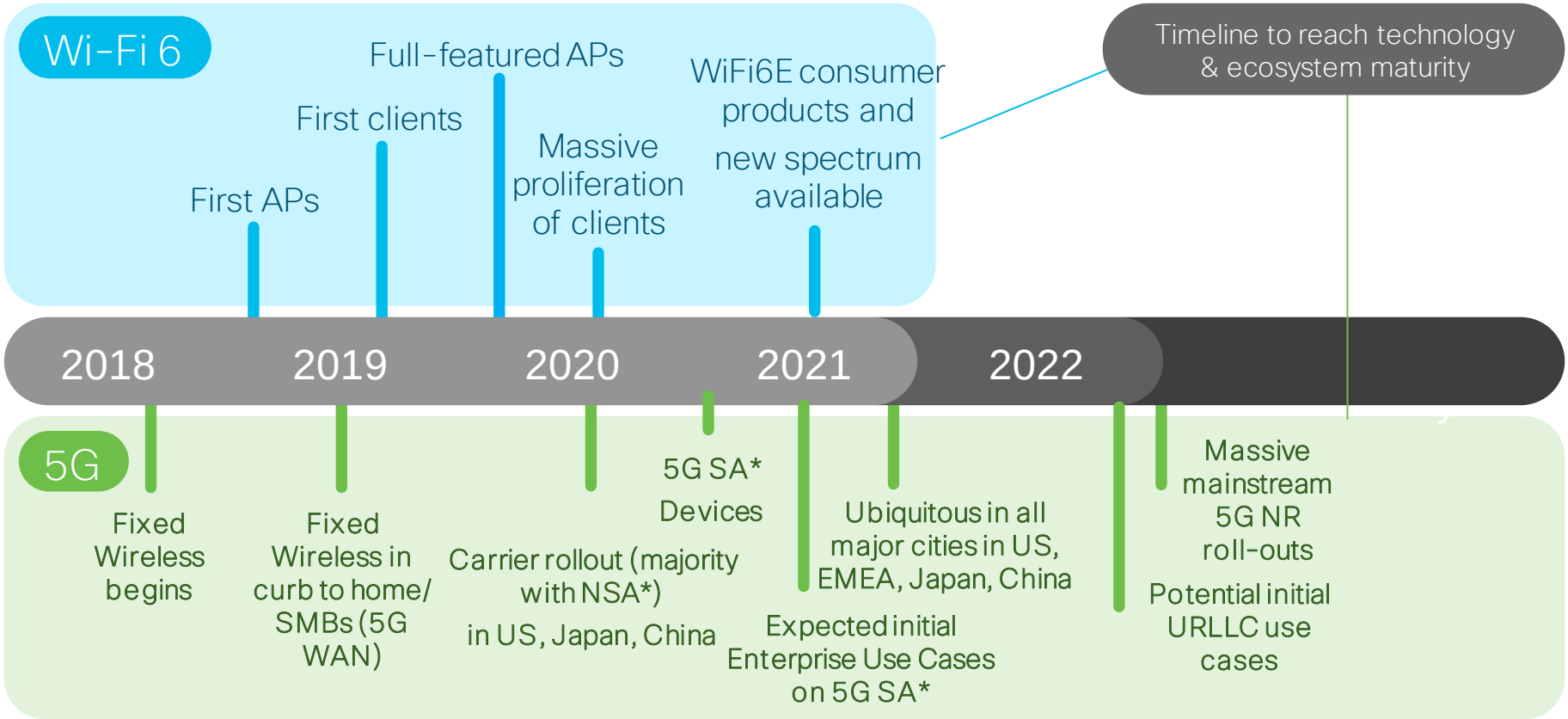
Increase in overall network capacity

- 3x to 4x more throughput than 802.11ac via OFDMA
- Up to 4x capacity gain in dense scenarios with BSS coloring
- Multiuser MIMO gains on all client types

Improved power efficiency

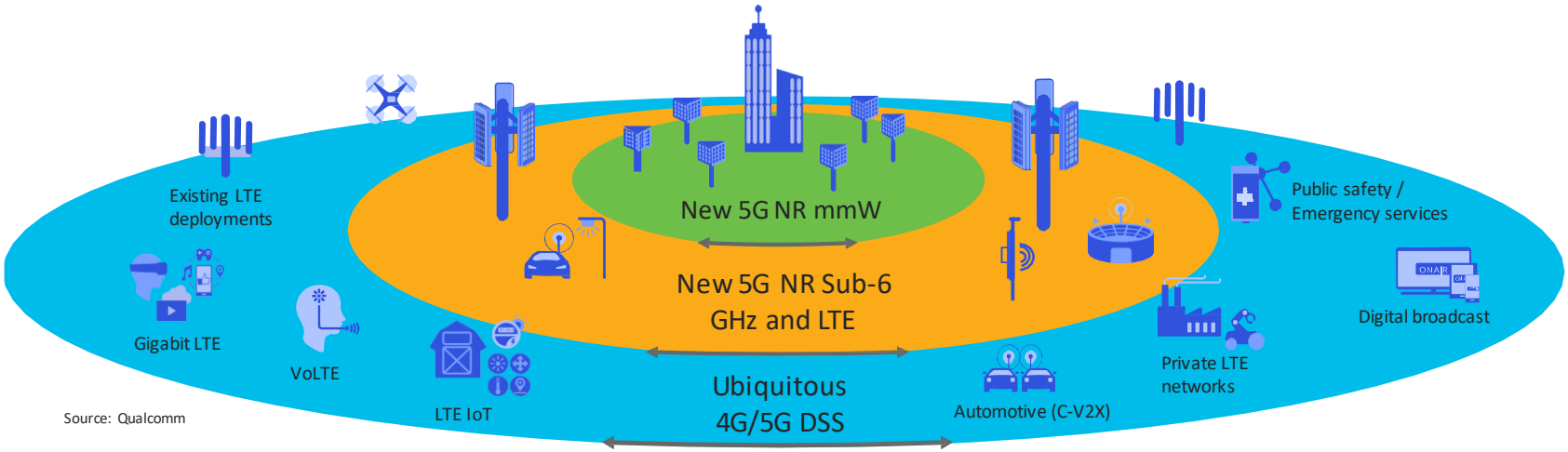
- Up to 3x better battery life with Target Wake Time (TWT)
- New coding structure and signaling procedures for better transmit and receive efficiency

Timeline of Wi-Fi 6 and 5G availability



*Non-Standalone/ Standalone

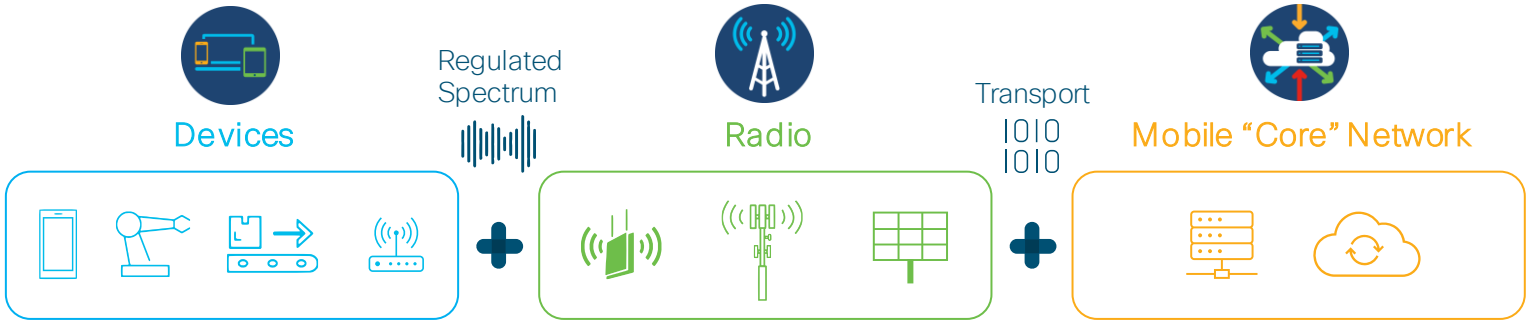
5G NR Requires Spectrum



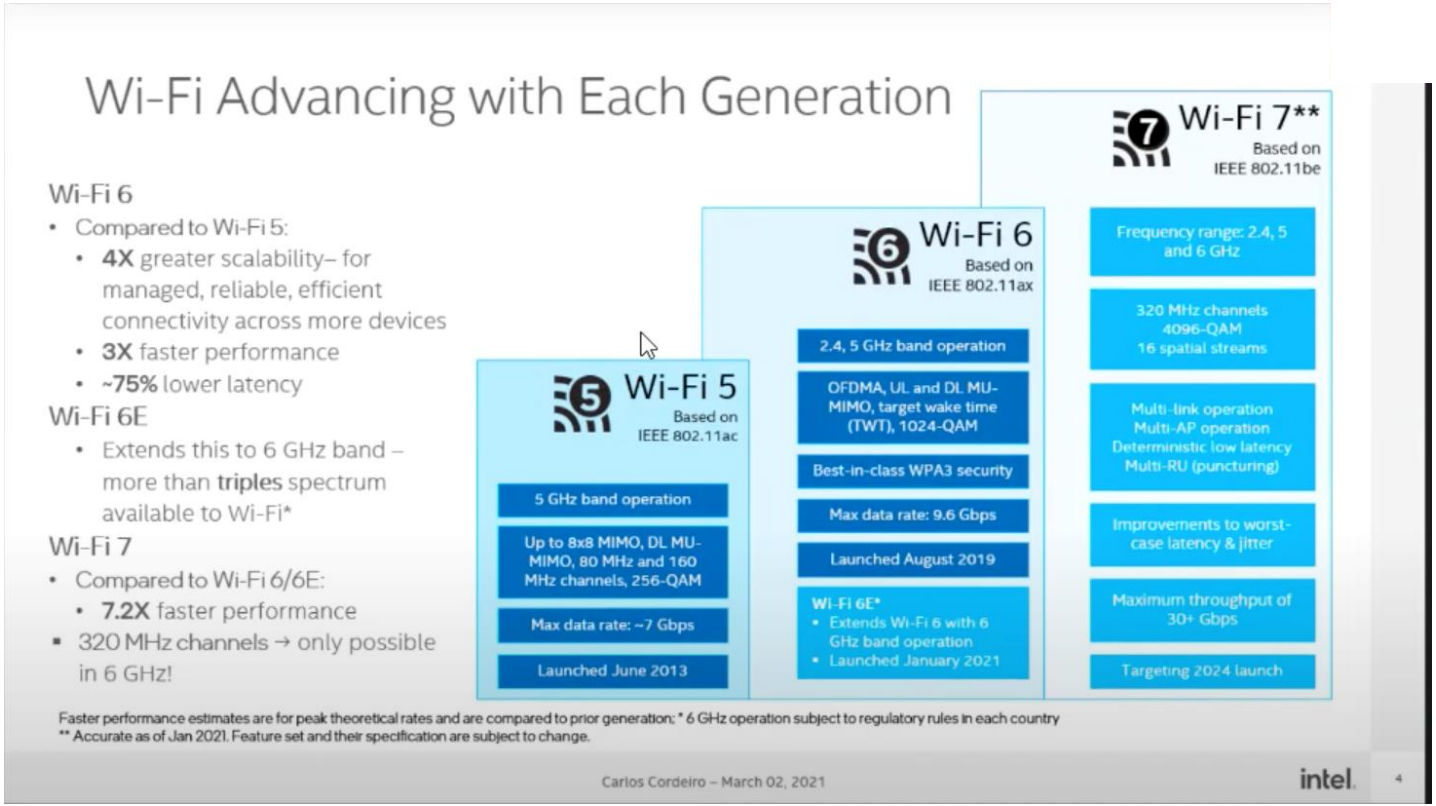
	Low Band (< 1GHz FR1)	Mid Band (1 - 6GHz FR1)	High Band (mmWave FR2)
Coverage	High	Medium	Low
Throughput	Low	Medium/High	High
5G Data Rates	*2-300Mbps*	*1-2Gbps*	*10+Gbps*

What is Private 5G?

A private network that is built using 3GPP 5G technology, dedicated to carrying traffic from a specific entity (e.g., an enterprise or public sector agency) in regulated radio spectrum



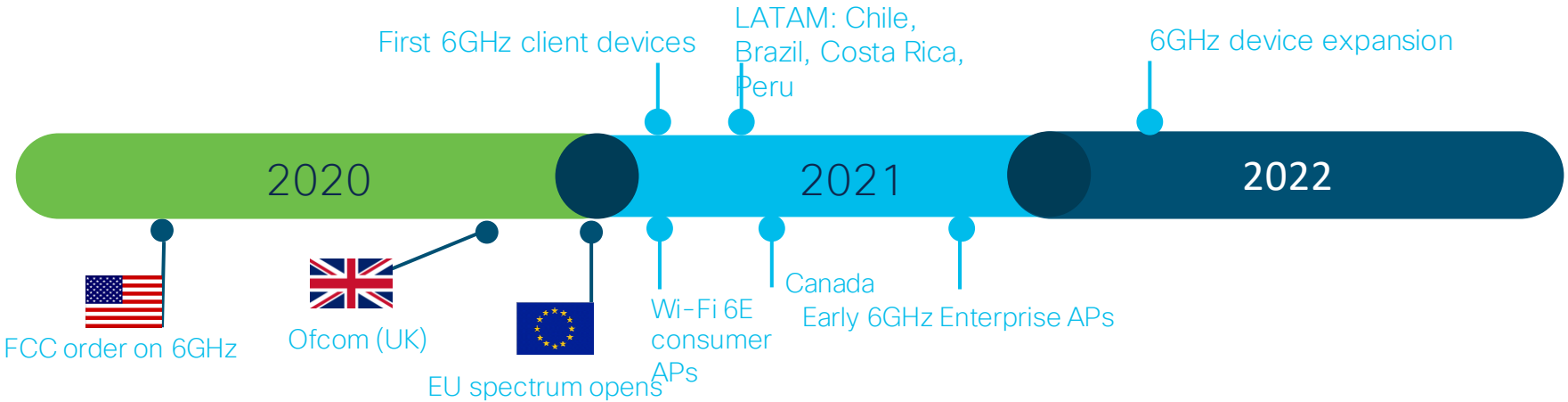
Wi-Fi will continue to evolve....



Source – Intel WiFi Now Event 2021 – Carlos Cordeiro – CTO – presentation

Wi-Fi 6 is now!

Wi-Fi 6E predicted market adoption and likely to follow prior generations



Clean Spectrum

Additional 1.2GHz with no interferences

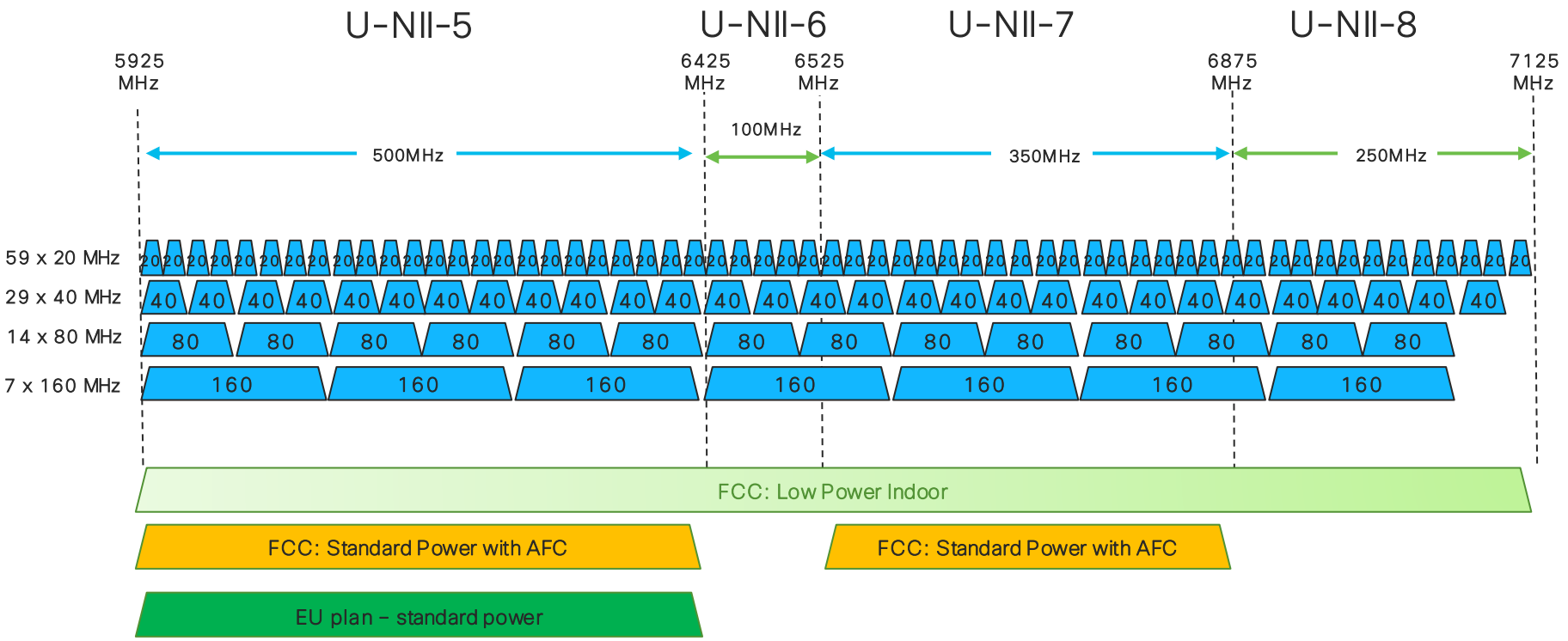
High Throughput

Wider channels (>1 Gbps)

Ultra-low latency

Wi-Fi 6E only devices (no legacy)

6 GHz – New Spectrum Availability



Entenda por que o Wi-F6 representa uma revolução para as redes 802.11

Polling Question 2

- Porque o Wi-Fi6 representa uma revolução para o padrão 802.11?

A. Higher Speeds / More Throughput

B. Larger Coverage / Better Tx Power and Sensitivity

C. More Efficient / Lower Latency

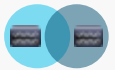
Wi-Fi 6 - Enhancements

For your reference

Uplink and Downlink Orthogonal Frequency Division Multiple Access (OFDMA): Increases network efficiency and lowers latency for high demand environments

Packet latency improvements

Multi-User Multiple Input Multiple Output (MU-MIMO): allows more data to be transferred at once and enables an access point to transmit to a larger number of concurrent clients at once



Channel Reuse With BSS Color

Parallel processing: enables greater capacity by allowing MU-MIMO and OFDMA to function in UPLINK and DOWNLINK mode

Parallel transmissions

1024 Quadrature Amplitude Modulation Mode (1024-QAM): increases throughput in Wi-Fi devices by encoding more data in the same amount of spectrum

Faster Speed more Radios and 1024 QAM

Target Wake Time (TWT): significantly improves battery life in Wi-Fi devices, such as Internet of Things (IoT) devices

Better Battery Life

www.cisco.com/c/en/us/products/collateral/wireless/white-paper-c11-740788.html

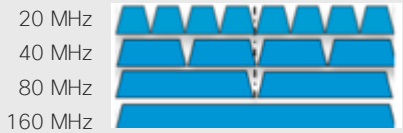
802.11ax is all about high efficiency wireless

These improvements are Wi-Fi 6 enhancements to make every microsecond "On THE AIR" matter.

- .11ax High Efficiency Wireless (HEW) is all about optimizing the time spend "ON THE AIR" and how much information is on the air during any given Micro Second "uS"
- Four things determine Air time efficiency
  1. **Data rate (Modulation density)** or **QAM** – (how many Bit's per Radio Symbol) 64 QAM is more robust but 1024 QAM is a lot faster
  2. **Number of spatial streams and spatial reuse** (introduction of OFDMA and Resource Units) and UL/DL MU-MIMO
  3. **Channel bandwidth** – How Many frequencies can we modulate at one time
  4. **Protocol overhead** – Preamble/Ack/BA, Guard Interval "GI" etc.

Modulation density gains

Wi-Fi channel width



Note: Channel Bonding reduces range as the power is spread out with each additional 20 MHz adding a 3 dB penalty in SNR and the greater the QAM the harder it is for the receiver to decode therefore it is more sensitive to noise.

For your reference

.11ax data-rate chart for 1 spatial stream

New 1024 QAM introduces a 25% performance in throughput with single Radio

MCS Index	Modulation type	Coding Rate	Data rate (in Mb/s)							
			20 MHz channels		40 MHz channels		80 MHz channels		160 MHz channels	
			1600 ns GI	800 ns GI	1600 ns GI	800 ns GI	1600 ns GI	800 ns GI	1600 ns GI	800 ns GI
0	BPSK	1/2	4[1]	8.6	8[1]	17.2	17[1]	36	34[1]	36[1]
1	QPSK	1/2	16	17.2	33	34.4	68	72.1	136	144
2	QPSK	3/4	24	25.8	49	51.6	102	108.1	204	216
3	16-QAM	1/2	33	34.4	65	68.8	136	144.1	272	282
4	16-QAM	3/4	49	51.6	98	103.2	204	216.2	408	432
5	64-QAM	2/3	65	68.8	130	137.6	272	288.2	544	576
6	64-QAM	3/4	73	77.4	146	154.9	306	324.4	613	649
7	64-QAM	5/6	81	86	163	172.1	340	360.3	681	721
8	256-QAM	3/4	98	103.2	195	206.5	408	432.4	817	865
9	256-QAM	5/6	108	114.7	217	229.4	453	480.4	907	961
10	1024-QAM	3/4	122	129	244	258.1	510	540.4	1021	1081
11	1024-QAM	5/6	135	143.4	271	286.8	567	600.5	1134	1201

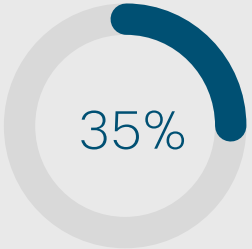
Up to **1.2Gb with 1 radio**, up to 10 Gb* with 8 radios @ 160 MHz

*Devices were presented at CES 2018 with a top speed of 11Gbit/s

[1]Source https://en.wikipedia.org/wiki/IEEE_802.11ax

1024-QAM 40 MHz channel

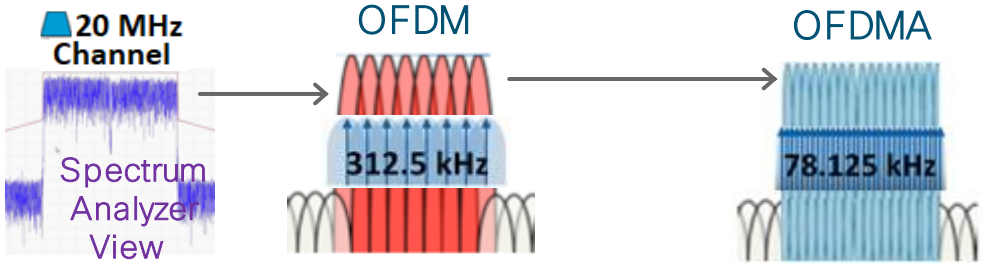
Single-antenna devices (smart-phone) should see MCS10-11 (Gigabit speeds)



faster than 11ac

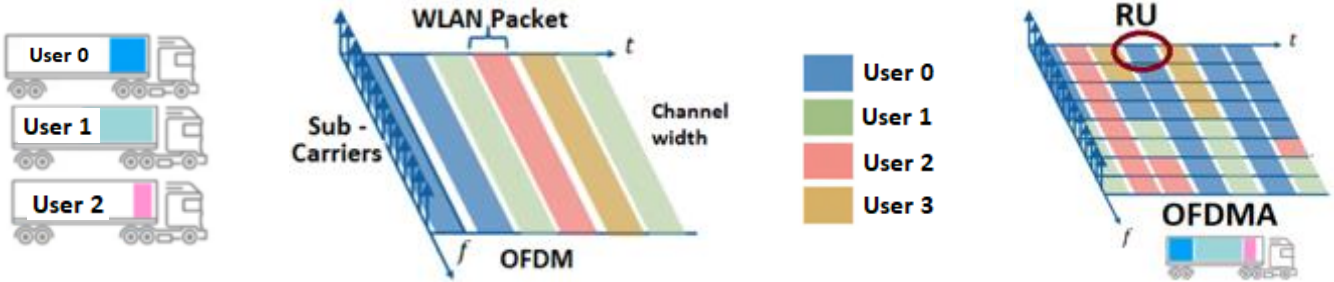
Understanding an OFDM and OFDMA

Both divide into sub-channels (carriers) but **OFDMA has more** and the concept of **resource units**.

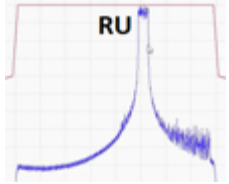


OFDMA divides the same 20 MHz spectrum into many more smaller subcarriers that can carry small packets faster.. Using Resource Units (RU) it allows each subcarrier to handle multiple users

OFDM divides the available spectrum into sub-channels that can be independently modulated and demodulated but each subcarrier has data for only one user at a time - OFDMA = more users at a time.



[20 MHz]



Spectrum efficiency

All packets big and small get processed MUCH FASTER

Understanding OFDMA resource units

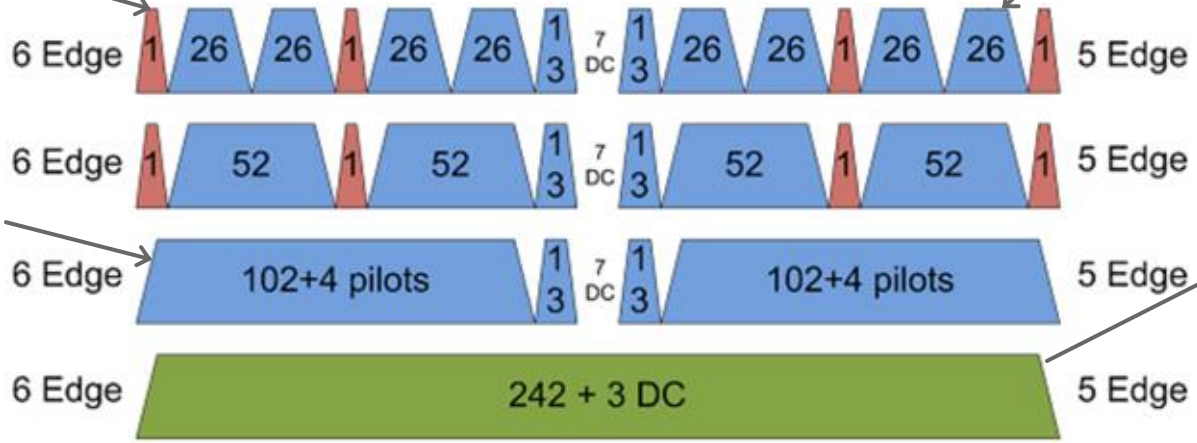
For your reference

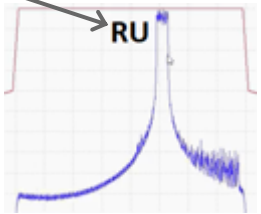
Each RU can be a different modulation scheme or coding rate determined by control information, scheduling etc.

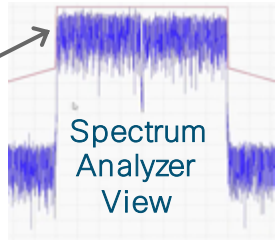
Up to 9 users per 20 MHz
Tiny RUs ideal for IoT

RU's are indexed

20 MHz Channel RUs







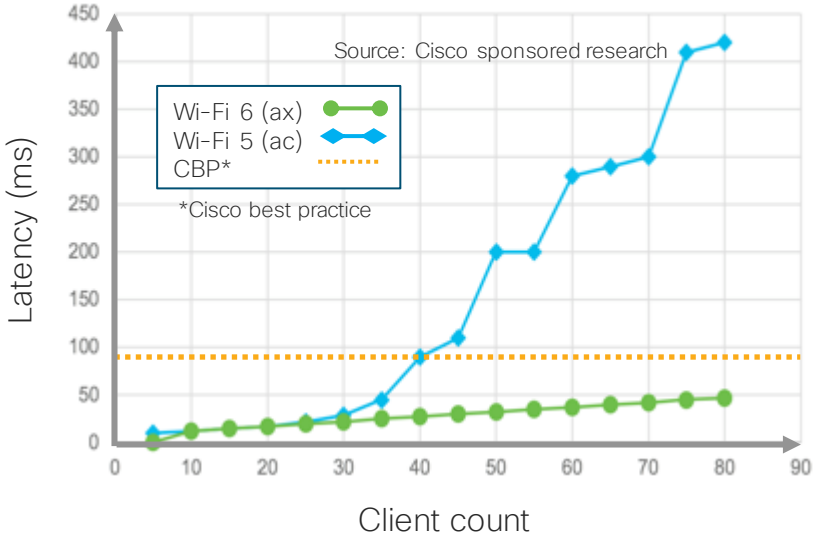
20 MHz

httsp://www.ni.com/white-paper/53150/en/

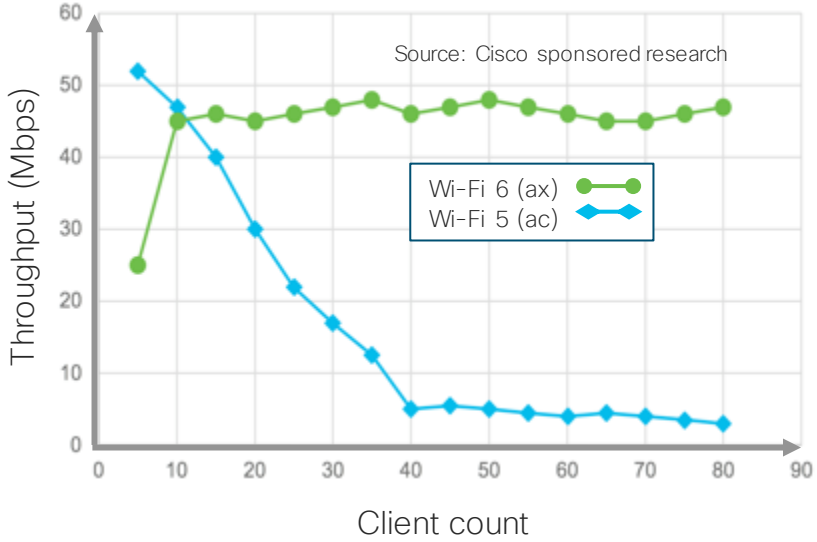
802.11ax (OFDMA) provides determinism at scale:

Enabling high-quality voice/video/data services cost effectively

Linear **VOICE** delay



Consistent **DATA** throughput



Wi-Fi 6 is not only cost-effective and ubiquitous but is now capable of delivering SLAs

Increasing capacity with MU-MIMO

Multi-User MIMO (MU-MIMO) introduced 11ac wave-2

How does it work? Why is it an advantage?

Some folks like to use the analogy of "Hub" and "Switch" SU ver. MU (not exactly accurate) but in MU-MIMO Clients are able to benefit in the **downstream link** for higher aggregate throughput by essentially **"tuning out"** (nulling) portions of the RF to better decode their traffic reducing interference.

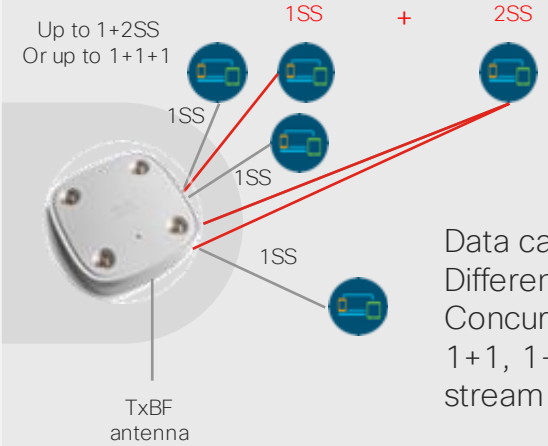
This is Single-User MIMO

Each Frame is sent to one client at a time

Multiple Streams to 1 client

Spatial Streams are limited to The # of receivers on the client any additional radios on the AP are used for beamforming

This is Multi-User MIMO



Data can be directed to Different clients in Concurrent streams in a 1+1, 1+1+1 or 1+2 stream combination

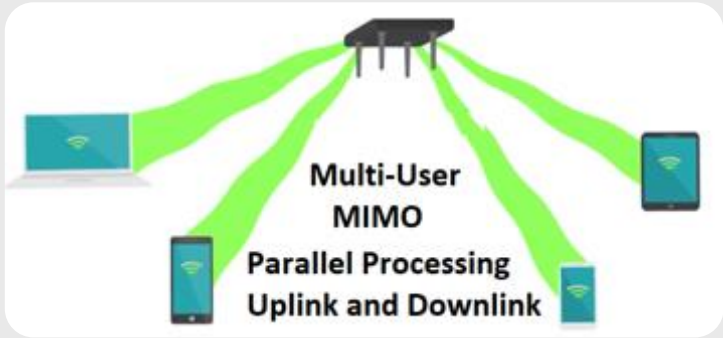
Max 3SS simultaneously

Wi-Fi 6 enhancements to Multi-user MIMO

The previous slides for .11acW2 holds true for .11ax
However there are **NEW** supported features:

- MU-MIMO is now supported in Uplink
- 8 MU-MIMO transmissions (users in a group) up from 4
- AP calculates a channel matrix for each user and simultaneous steer beams to different users (creating groups and managing)
- Each MU-MIMO transmission may have its own MCS rate
- MU and SU-MIMO is decided by AP w/MU- favoring larger packets

Improves latency



Wi-Fi 6 Catalyst C9100AX APs – MU-MIMO

C9105AXI/W	C9115AXI/E	C9120AXI/E	C9130AXI/E
2x1ss	2x2ss, 4x1ss	2x2ss, 4x1ss	3x2ss

2x1 SS

2x2ss per Tx

3x2ss per Tx!

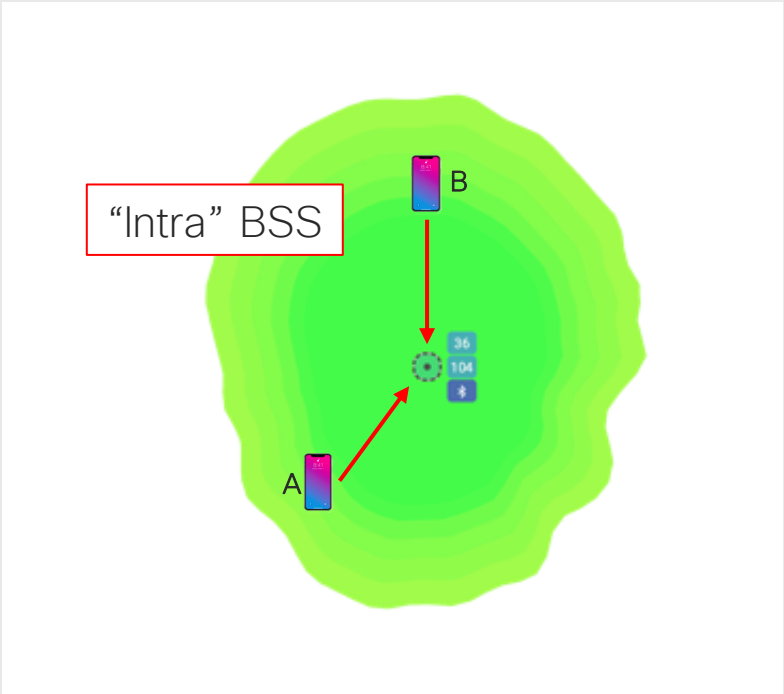
NOTE: A ”User” is a single Station or radio communicating with an Access Point

Spectrum reuse and BSS-Coloring

Wi-Fi Contention and Spatial Reuse

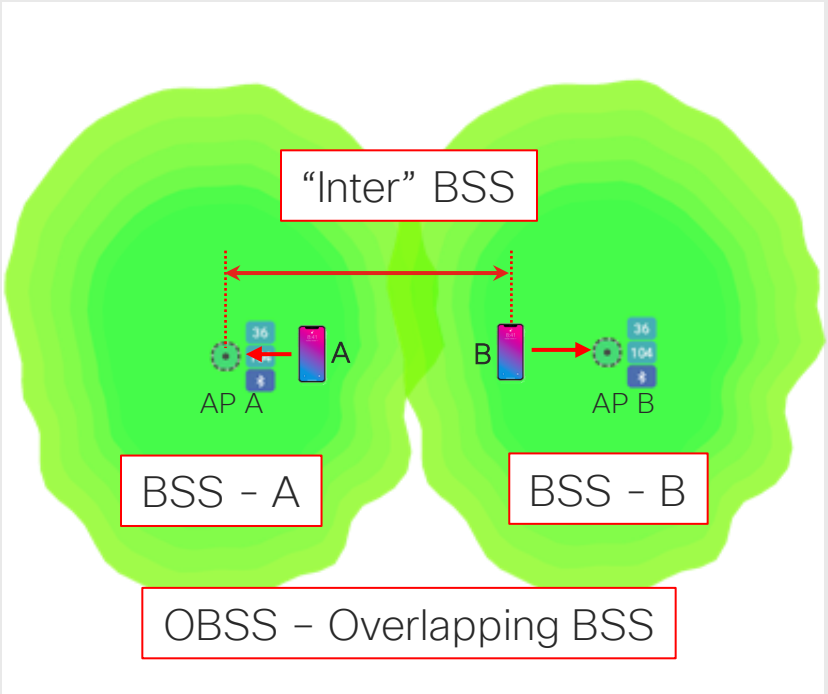
Why is BSS coloring important?

- Two stations associated to the same AP can not both talk to the same AP at the same time, they will “Interfere” with one another at the AP’s receiver
- To prevent this Wi-Fi uses a “contention mechanism” – CCA (Clear Channel Assessment)
- If Sta A listens to the channel – and can hear anyone at or above -82 dBm – then the channel is in use and Sta A must back off and try again
- In this way – stations will all take turns using the channel and avoid harmful or destructive interference
- An AP and all the Stations associated to it are considered a BSS as all the stations



Wi-Fi Contention and Spatial Reuse
Why is BSS coloring important?

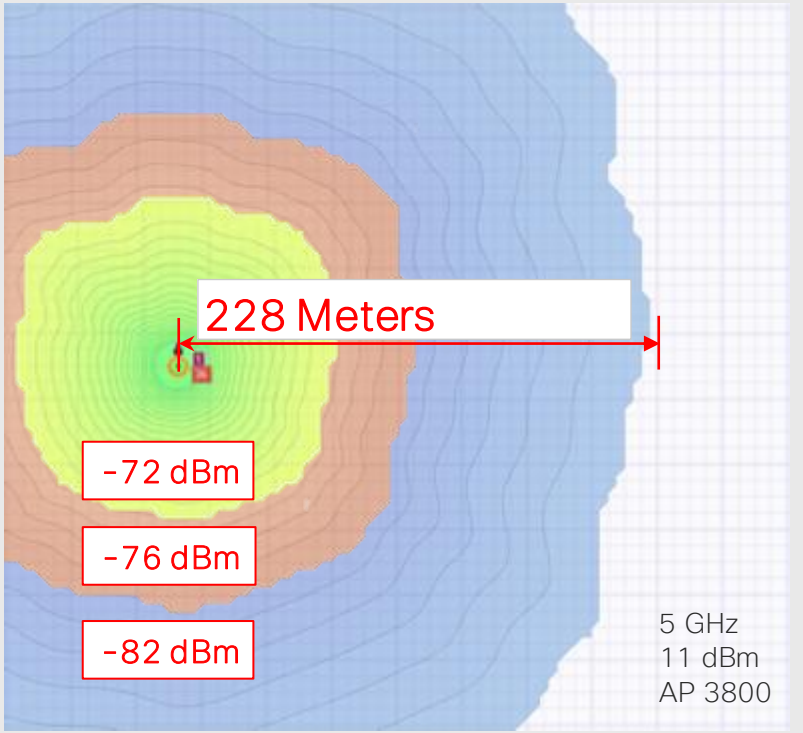
- What if 2 Sta's are talking to two different AP's on the same channel but are close enough to hear one another
- In Wi-Fi 1-5, this still causes all stations that are close enough to hear one another above -82 dBm to back off and take wait for a clear channel
- Realistically though, Sta A and Sta B are close enough to their respective AP's to both Tx at the same time without interfering at their intended receivers
- AP A is far enough from Sta B, and AP B is far enough from Sta A that both transmissions would be successful without one interfering with the other
- In Wi-Fi 1-5 though – there is only the Channel defined as a shared medium, there is no concept of individual BSS's
- BSS A and B form an Overlapping BSS or OBSS



802.11 contention mechanism
Listen before talk and the contention zone

- Using 11 dBm Tx power
  - Cutoff -82 dBm
  - Cutoff -76 dBm
  - Cutoff -72 dBm
- Managed today using:
    - High gain directional antenna's
    - RX-SOP (changing the start of packet threshold)
    - Data rates in use

See the Wireless High density client density design guide
https://cs.co/9001D47PT



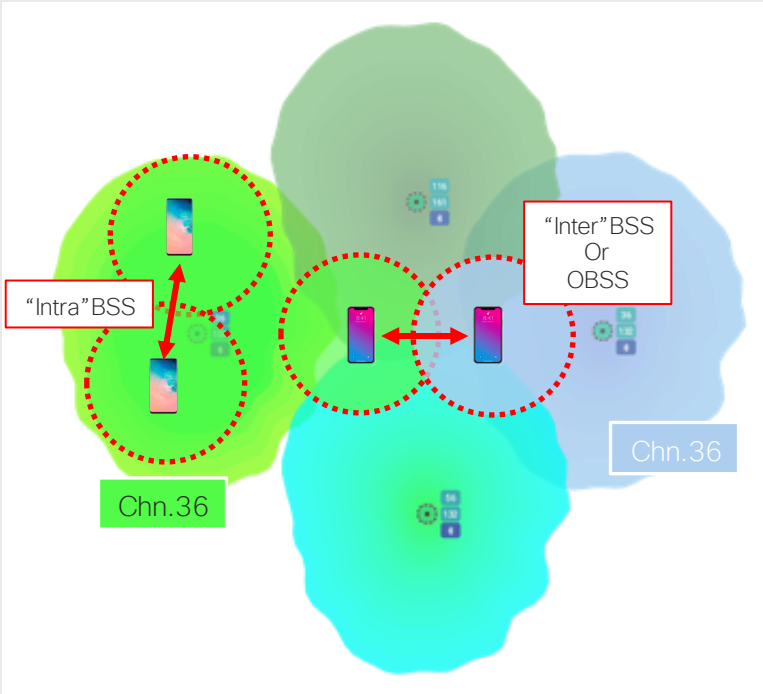
BSS Coloring – Spatial Reuse

Basic service set “BSS” and the overlapping basic service set “OBSS”

- All clients associated on a given AP are operating within the same BSS and will operate on the same BSS color (regardless of the SSID)
- Stations operating on a different AP, may have the same SSID and channel – but will be assigned a different color than mine.
- Each user (station) learns its BSS’s color upon association
- Stations detecting the same BSS color (intra-BSS)operate at the default (PD) CCA -82 dBm
- Stations detecting a different BSS color (Inter-BSS) *may be able to use a higher CCA threshold (lower contention i.e -81 to -62 dBm) through **OBSS-PD and re-use lost space

Every Client becomes a sensor reporting what they can hear from the floor – in realtime

*RRM will make the determination and assignment
**OBSS-PD Overlapping BSS – Packet Detection

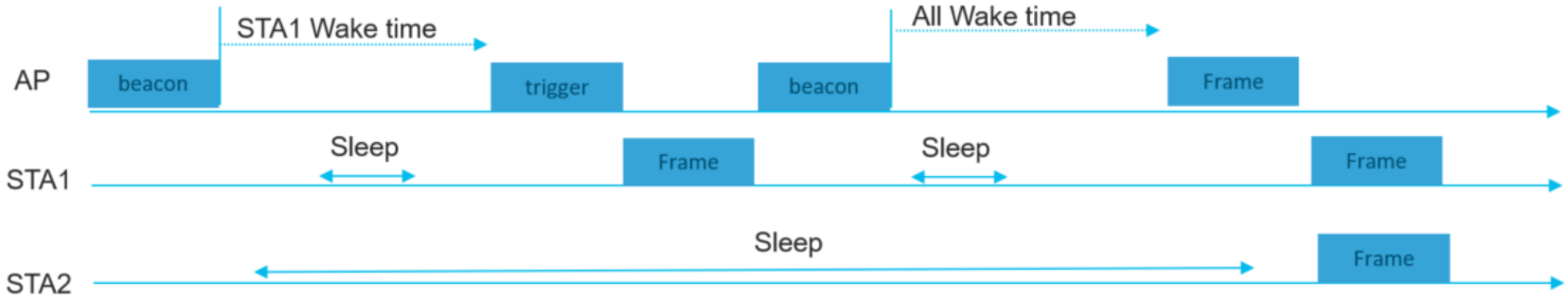


Saving Energy with Target Wake Time

For Your Reference

Target Wake Time – Putting Devices to Sleep

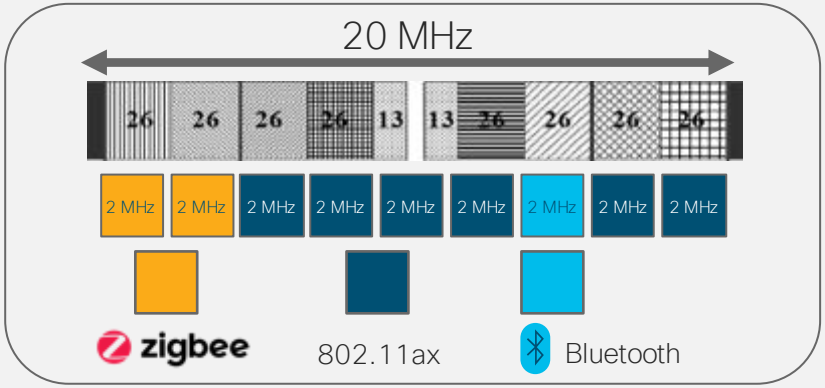
- With Target Wake Time (TWT), the AP can schedule phones and IoT devices sleep for long durations **(up to 5 years)** and then wake the individual device up.
- Devices can be configured to wake up as a group to communicate at the same time sharing the channel for increased network capacity and reduced battery drain.
- Use of BSS Color field and UL/DL flag in preamble to enable intra PPDU power Saving



802.11ax RU and target wake time benefits for IoT

Better battery life and co-existence via RF efficiency improvements

- 802.11ax RUs and TWT available in 2.4/5G GHz for IoT
- Thanks to 2 MHz channels, Coexistence with other 2.4 GHz IOT technologies is much more effective
- Any channel can be left blank (no 802.11ax) to allow other technologies to operate



Target wake time

Target Wake Time (TWT) provides an effective mechanism to schedule transmissions in time.

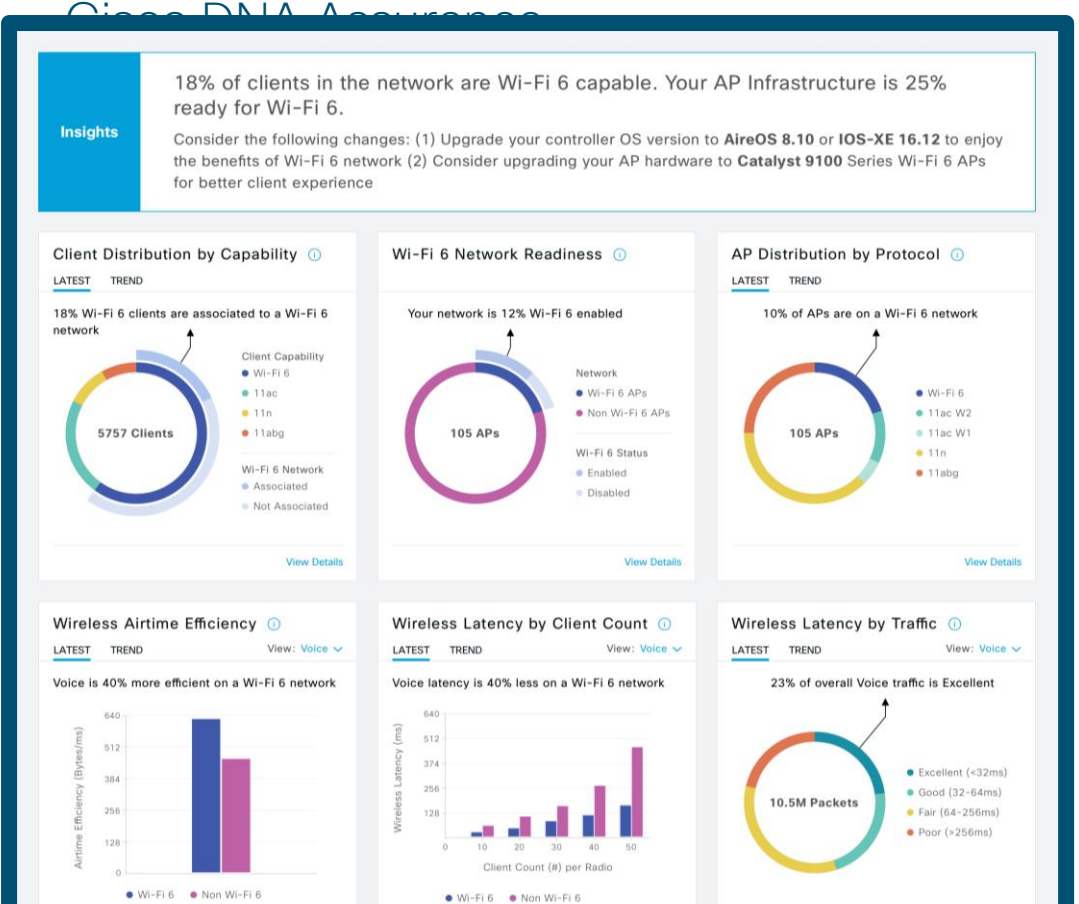
Phones and IoT devices can sleep conserving battery life and then wake to take advantage of multi-user transmissions, and coexist in high-density RF environments with ease.

Demo Time!

Wi-Fi6 Demo

Measure Wi-Fi6 Benefits with Wi-Fi 6 Analytics Dashboard

Cisco DNA Assurance



- Analytics on W-Fi 6 APs and devices
- Wi-Fi 6 readiness and benefits analytics
- Advanced wireless performance troubleshooting

Demo Time!

DNA Center Wi-Fi6 Analytics

Impactos na arquitetura de acesso e considerações para migração ao Wi-Fi6

Cisco Catalyst Wireless LAN Wi-Fi6 Access Point Portfolio

Purpose built and ready for any deployments!

Bluetooth 5 USB Wi Fi 6 CERTIFIED DNA Assurance with iCAP

Catalyst 9105

Most versatile AP for teleworkers, office, branch, dorm-room

Catalyst 9120

Powered by Cisco RF ASIC

Designed for mission-critical deployments with Dual 5GHz and integrated IoT radio

Catalyst 9115

Ideal for small to medium deployments with dual radio architecture

Catalyst 9130

Powered by Cisco RF ASIC

Industry-best Wi-Fi 6 AP with 8x8, tri-radio architecture and full iCap. Industry-only 8x8 AP with external antennas

Powered by Cisco RF ASIC

Catalyst 9124 Outdoor Wi-Fi 6

Internal omni, internal directional and external antenna SKU's
4x4:4 on 2.4GHz and 5 GHz, IOT Ready
2.5G Ethernet in, 1Gig PoE out, SFP port, DC-power in30 dBm Tx power (same as 1572),

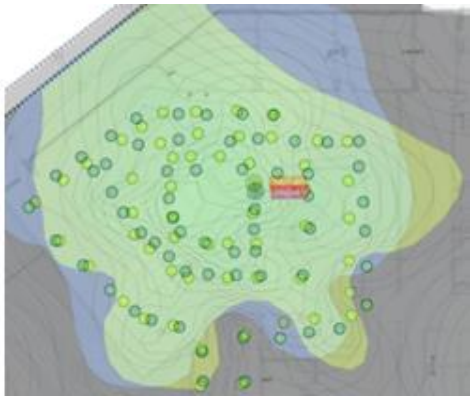
Design/Deployment Migration considerations

- **1:1 AP replacement** assumes the AP was originally installed in optimal place.
- Catalyst AX APs **use same mounting brackets** as previous generations.
- **Did the requirements change?** Is there a need for **location** or **IoT**?
- Don't **"Salt & Pepper" old with new**, pick an area and keep like devices together.

While new Wi-Fi 6 features might be able to help mitigate a bad or poor design *NOTHING BEATS* reviewing what is in place now and *INSTALL IT RIGHT the 1st time* ☺

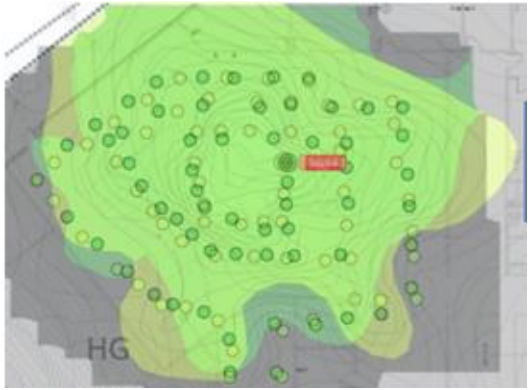
Upgrading Access Points 1:1 or another Survey?

Access Points have been designed with 1 for 1 replacement in mind!
The design goal is to maintain a uniform coverage cell between products but improve the connection experience (faster speeds, lower latency & less retries)



9115
3800

AP-3800 & 9115 4x4
9130 8x8



9130
3800

AP-3800 and

Can I use less AP's with Wi-Fi 6 / Catalyst AP's?

- With the amazing increases in capacity and decreased latency of Wi-Fi 6, will I need less AP's to cover the same area?
  - Today and for the foreseeable future you will still have a mixed client environment (Wi-Fi 5 and below), so nothing would change there
- History has shown that as the newer more capable Wi-Fi 6 clients start to populate your environment, new and amazing applications will also be driving up your capacity requirements
  - 4K Video – one way streaming =15-16 Mbps
  - Immersive AR/VR degrees – 300 Mbps – to 1 Gbps
- More devices will be using the coverage as well – we are at the beginning of the IOT age

Cisco Catalyst Does NOT require NEW Brackets

Compatible with all Aironet Access Points going back 12 years*

Part Number AIR-AP-BRACKET-1
Low profile ceiling bracket mounts flush to ceiling tiles

Part Number AIR-AP-BRACKET-2
Permits wall, ceiling and network / electrical box mounting

*Exceptions AP-1130, 1240, 1250 and those using Bracket-8

How many radios and antennas a Wi-Fi6 AP has?

Catalyst 9130AXI – Internal Antenna System

(4) Dual Band “Macro” antennas
2.4 GHz @ 4 dBi
5.0 GHz @ 5 dBi

(4) 5 GHz “Micro” antennas
5 GHz @ 5 dBi

(1) IOT antenna
2.4 GHz @ 2.5 dBi

(1) RF ASIC antenna
2.4 GHz @ 4.5 dBi
5.0 GHz @ 5 dBi

Dual 5GHz Radios increases the bandwidth consumption

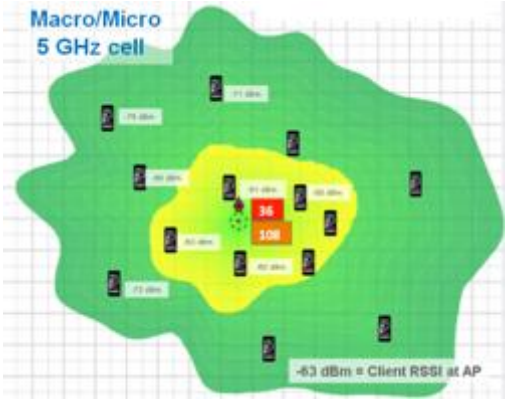
5 GHz is still more efficient than 2.4 GHz and Dual 5 GHz lowers channel utilization

Why does dual 5GHz matter with Wi-Fi 6 - A dual 5 GHz AP offers more cell coverage and flexibility options

Single 5 GHz channel

Single channel 36 utilization at 60%
(clients far away take longer airtime)

Take-away
Using dual 5 GHz
Means **Equal Client** Airtime
- Faster data-rates and
Less channel utilization



Dual 5 GHz channels

Using Micro/Macro (Dual 5 GHz)
Channel 36 @ 20% channel utilization
Channel 108 @ 24% channel utilization.

What about PoE requirements? Today PoE+ is enough

Reference

	AP Model	Power source	Power Type	2.4 GHz Radio	5 GHz Radio	Link Speed	USB	PoE Out	Power Draw
9130	C9130AXI / C9130AXE	802.3bt (UPoE)	UPoE	4x4	8x8	5G	ON	NA	30.5W
9130	C9130AXI / C9130AXE	802.3at (PoE+)	PoE+	4x4	8x8	5G	OFF	NA	25.5W
9130	C9130AXI	802.3at	PoE+	4x4	4x4	5G	ON	NA	25.4W
9130	C9130AXI / C9130AXE	802.3af	PoE	1x1	1x1	1G	OFF	NA	13.4W
9120	C9120AXI / C9120AXE	802.3at	PoE+	4x4	4x4	2.5G	ON	NA	25.5W
9120	C9120AXI / C9120AXE	802.3af	PoE	1x1	1x1	1G	OFF	NA	13.4 W
9120	C9120AXI / C9120AXE	802.3af	PoE	2x2	N	1G	OFF	NA	13.4 W
9120	C9120AXI / C9120AXE	802.3af	PoE	N	2x2	1G	OFF	NA	13.4 W
9115	C9115AXI / C9115AXE	802.3at	PoE+	4x4	4x4	2.5G	ON	NA	20.4W
9115	C9115AXI / C9115AXE	802.3af	PoE	2x2	2x2	1G	OFF	NA	15.4W
9105	C9105AXW	802.3bt	PoE+	2x2	2x2	2.5G	OFF	ON	30W
9105	C9105AXW	802.3at	PoE+	2x2	2x2	2.5G	ON	OFF	21.4W
9105	C9105AXW	802.3af	PoE	2x2	2x2	2.5G	OFF	OFF	14.9W
9105	C9105AXI	802.3af	PoE	2x2	2x2	1G	NA	NA	12.5W

If USB is enabled 5GHz will be reduced to 4x4

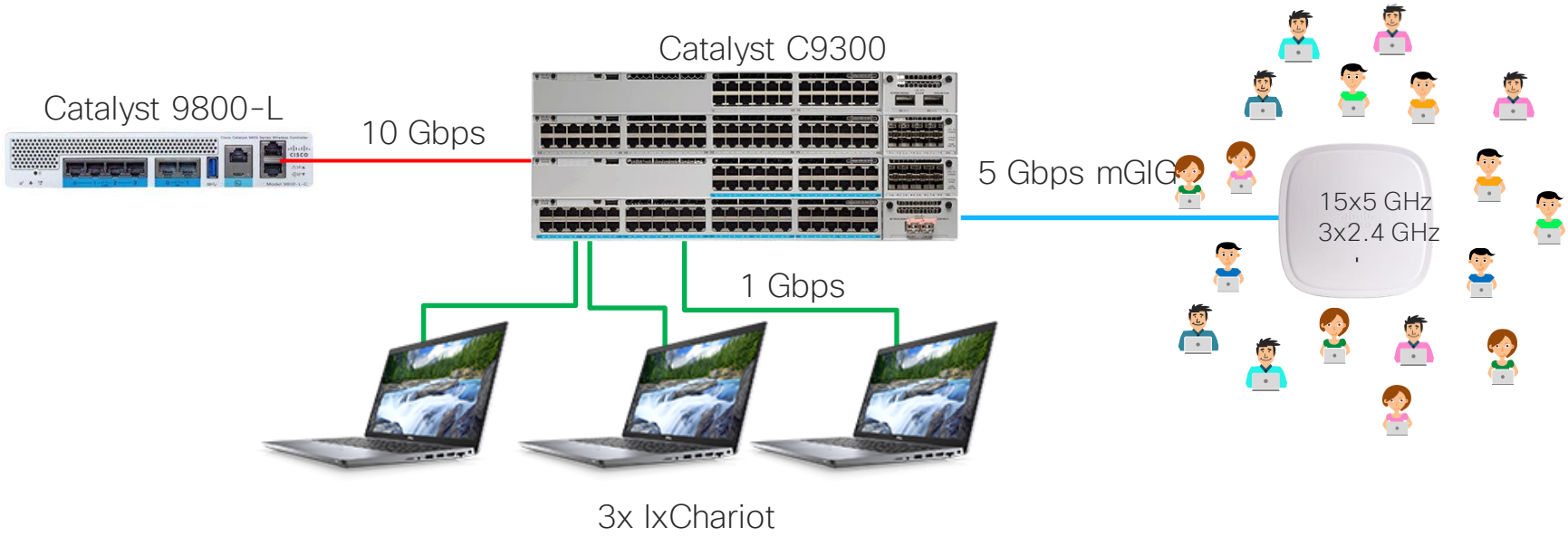
Multigigabit 2.5 or 5.0?

9115 & 9120 4x4
Multigigabit 2.5 Gbps

9130 8x8
Multigigabit 5.0 Gbps

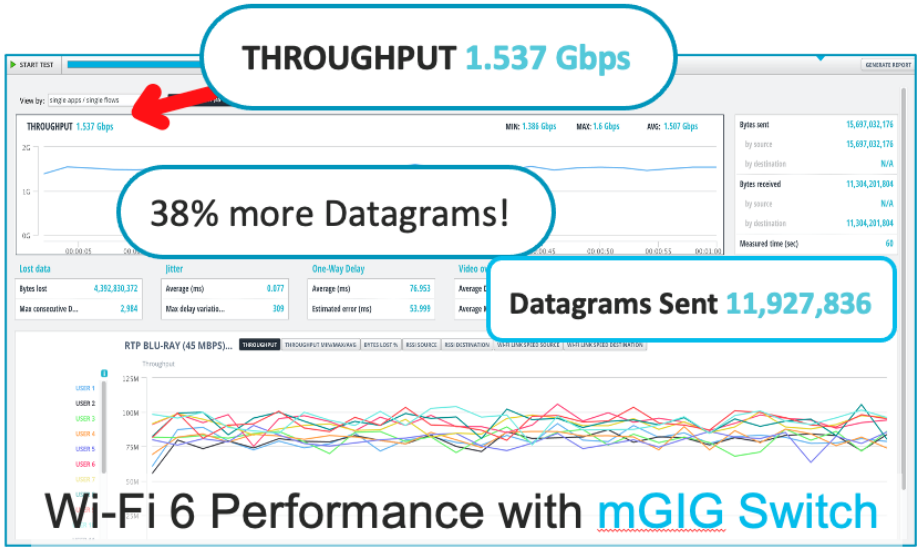
Generally speaking: 8x8 radio architecture will use mGig 5 Gbps and any RF architecture lower than 8x8 will likely use 2.5 Gbps.

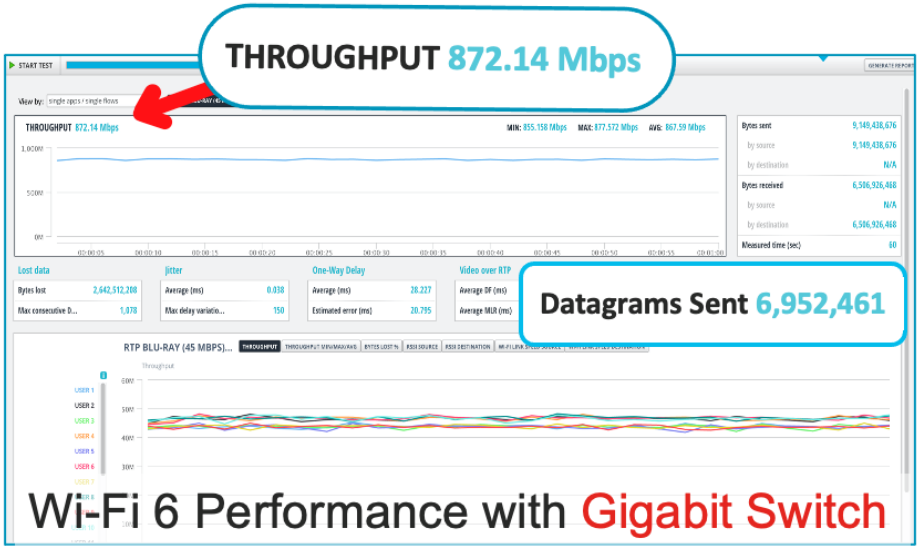
To mGIG or Not to mGIG, That is the Question….



Conclusion – Yes, you will need an mGIG Switch

It will be even more important in Wi-Fi6E and Wi-Fi7 due to wider channels





2.4 GHz @20 MHz w 3x2ss Intel AX200 / 5 GHz @ 80 MHz w 15x2ss Intel AX200

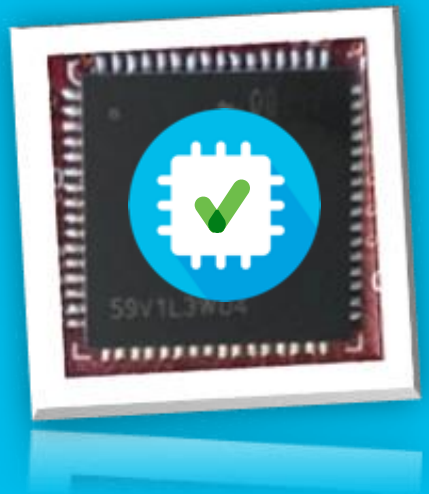
Why not make all of the APs Multigigabit 5.0?

- Not everyone needs 5 – 2.5 is a cost effective end-to-end solution and 2.5 is getting more traction in the industry.
- 9115 does not use dual 5 GHz so 2.5 Gbps is not required.
- 9120 in dual 5 GHz mode disables 2.4 GHz and doesn't approach 5 Gbps unless you are running 160 MHz which is not practical in the 5GHz band.
- Even 80 MHz channels which is not the norm tops off at under just 3 Gbps (and that assumes perfect conditions)
- Throughput is typically maxing at 60-70% of the actual RF data-rate, which also makes 2.5 Gbps acceptable.

Higher efficiency with Cisco RF ASIC

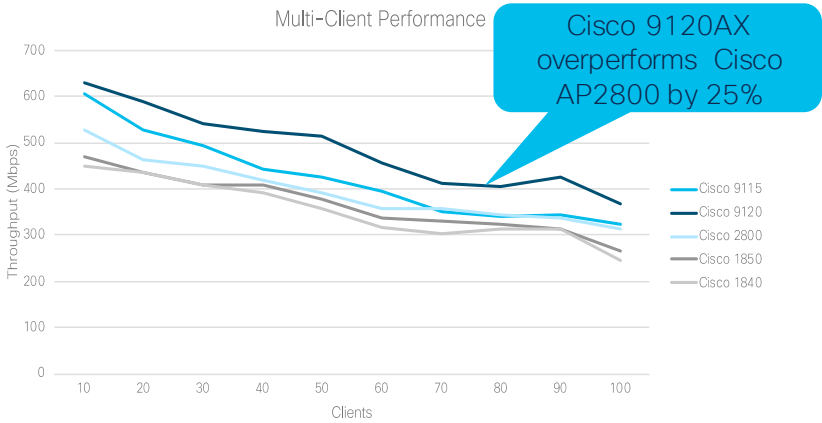
More throughput even with limited quantity of Wi-Fi6 clients

Cisco RF ASIC



- Off-channel RRM
- Dual Filter and Zero-Wait* DFS
- Clean Air
- aWIPS
- WIDS/Rogue Detection
- Fastlocate w/o perf. impact*

RF ASIC impact in Wi-Fi Performance even for non Wi-Fi6 clients



Cisco Innovation and benefits even for networks with low or no Wi-Fi6 clients available

Polling Question 3

- Que tecnologia de switching sua empresa utiliza atualmente para suportar sua rede Wi-Fi?

A. 100Mbps / PoE

B. 100Mbps / PoE+

C. 1Gbps / PoE

D. 1Gbps / PoE+

E. mGig / UPoE

9800 Wireless LAN Controller Portfolio

Cisco Catalyst 9800 Embedded Wireless*
100 APs, 2000 clients

Cisco Catalyst 9800 Embedded Wireless (SDA)
200 APs, 4000 clients

Cisco Catalyst 9800-L
250 APs, 5000 clients,
5 Gbps

Cisco ENCS

Cisco Catalyst 9800-40
2000 APs, 32,000 clients,
40 Gbps

Cisco Catalyst 9800-CL**
1000 APs, 10,000 clients

Cisco Catalyst 9800-80
6000 APs, 64,000
clients, 80 Gbps

Google Cloud

Amazon Web Service

KVM VMware

Cisco Catalyst 9800-CL
1000, 3000, or 6000 APs
10,000, 32,000 or 64,000 clients

*Supports Cisco FlexConnect® local switching only

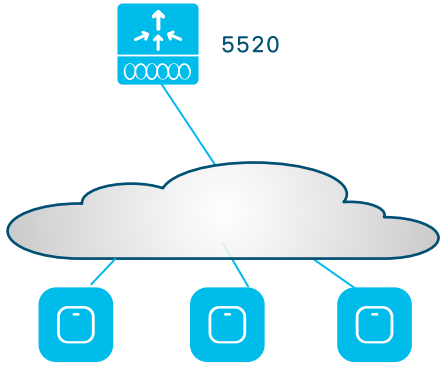
**Cisco Catalyst 9800 for public cloud: Cisco FlexConnect only

Up to 100 APs | Up to 250 APs | Up to 1000 APs | Up to 3000 APs | Up to 6000 APs

Small campus and branch | Medium-sized campus | Large campus

Flexible Architecture Deployments: Local Mode (Central Switching), Flex Connect (Local Switching), Fabric Mo

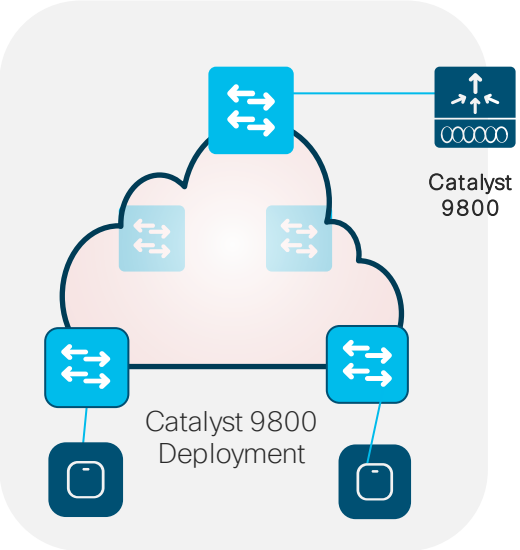
Do I need to migrate to 9800 WLC to have Wi-Fi6?

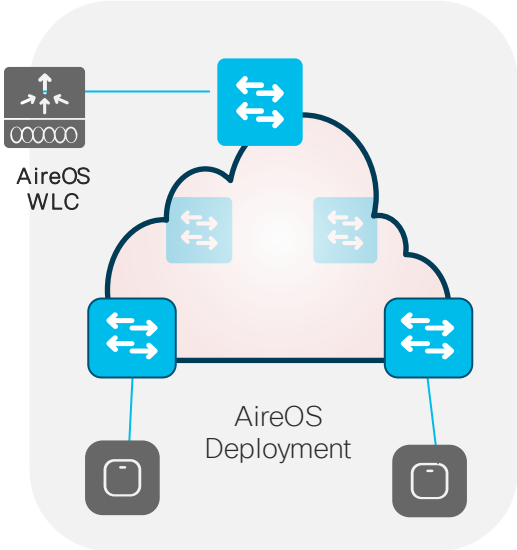


Mix of 802.11ac APs

- Customer can choose to start migrating APs first or add the C9800 first
- 11ax APs can be added to 5520 controller
- Existent licenses on 5520 can be used with Wi-Fi6APs to start the transition

How can I make my AireOS WLC work together with my 9800 WLCs?



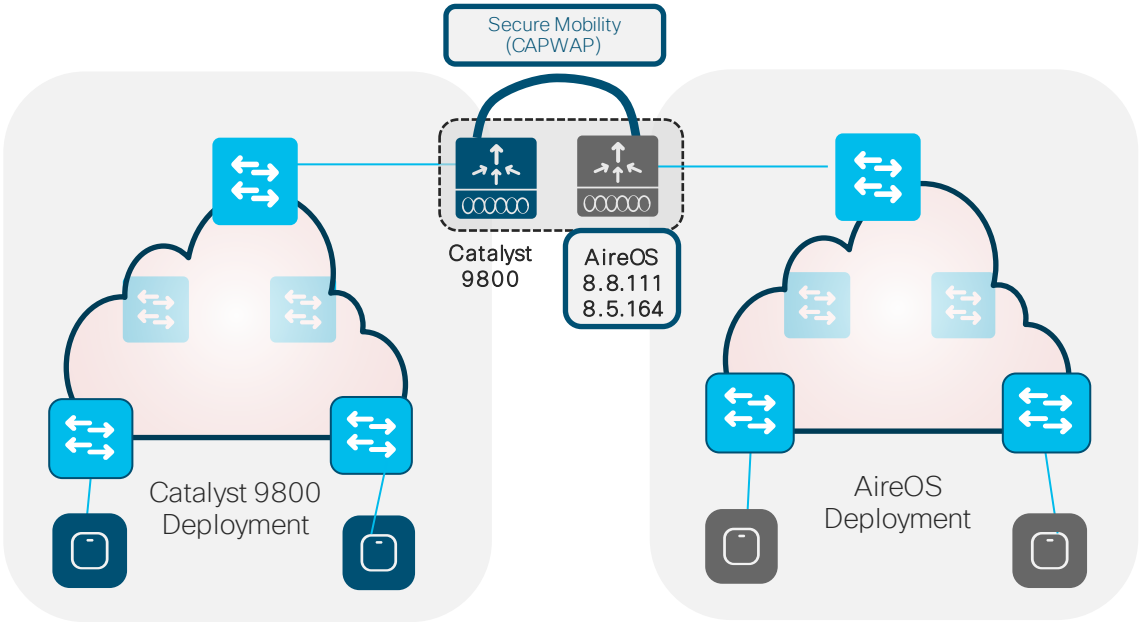


Primary questions:

- Is seamless roaming needed?
- Is a unique Dynamic Channel and Power plan needed across Controllers (Cisco RRM*)?
- Is Guest Anchor deployed?

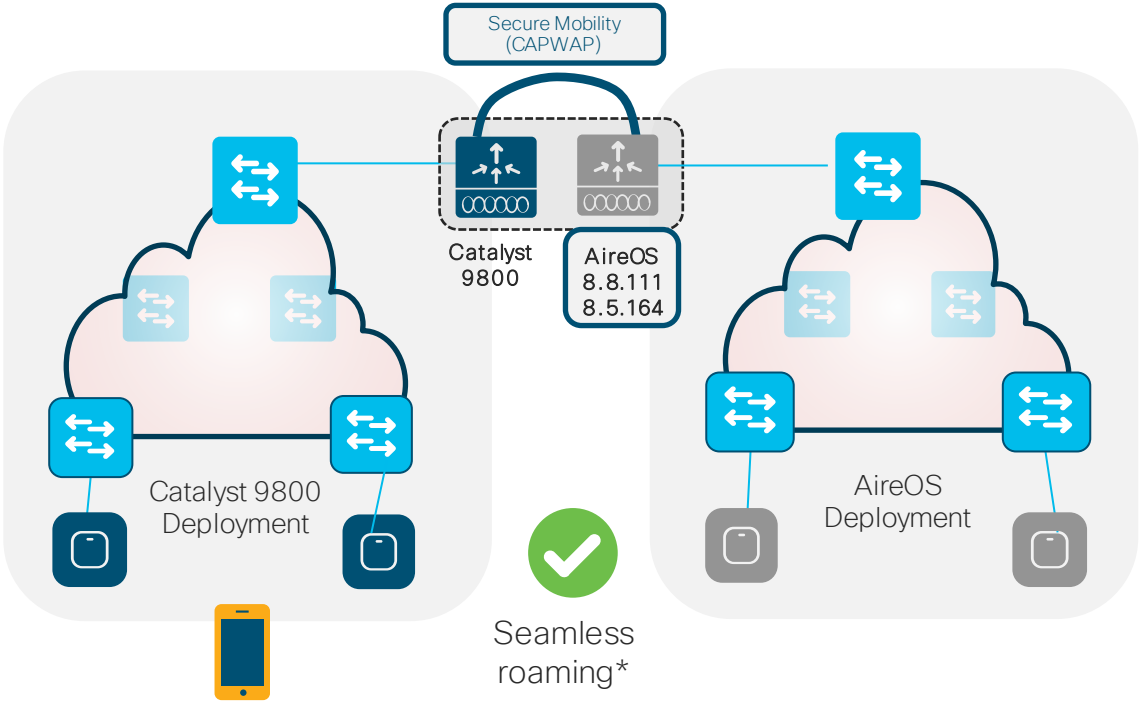
*Radio Resource Management

AireOS to C9800 migration – Roaming



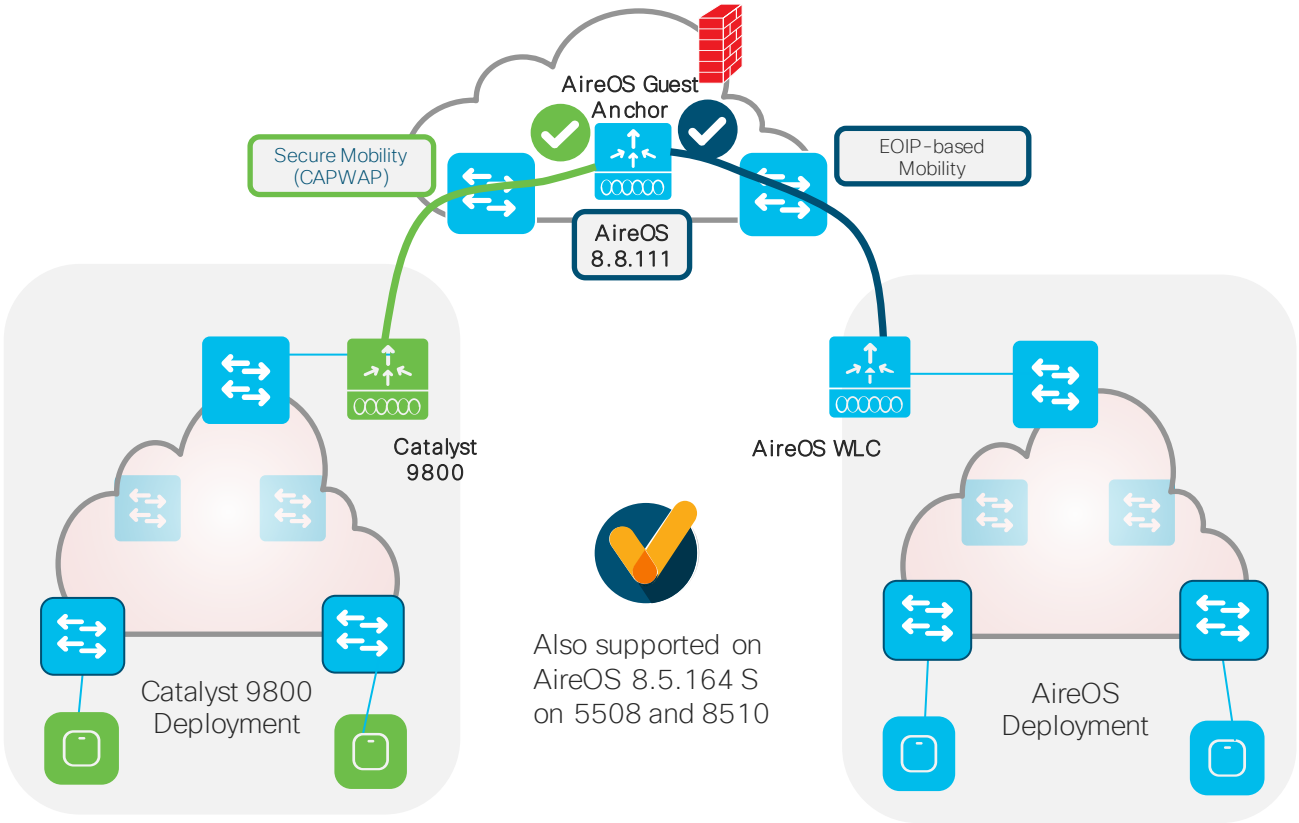
- Mobility Group provides seamless roaming between wireless controllers
- Mobility Group between AireOS and IOS-XE WLCs is only supported on:
  - 3504, 5520, 8540 with 8.8.111 and higher
  - 5508 and 8510 with 8.5.164 special
- This is because C9800 only support CAPWAP based mobility tunnels (Secure Mobility)
- Note: Secure Mobility is NOT supported on WISM2, 7510, 2500

AireOS to C9800 migration – Roaming



- All client roaming between AireOS WLC and C9800 are L3 roaming
- The client session will be anchored to the first WLC that the client has joined

AireOS to C9800 migration – Guest



- For Guest, AireOS WLC running 8.8.111 and higher can talk both tunneling protocols
- It can provide Guest Anchor functionalities for both the new C9800 based deployments and the legacy AireOS based network

Closing

Innovations with Wi-Fi6 from Cisco

Innovation beyond the standard

Spectrum intelligence and interference/rogue detection

Wireless intelligence:
Device analytics RF analytics location analytics

Built for IoT and security

Bluetooth  Zigbee 

Multilingual access points

Layer 1
RF snapshot

 IoT segmentation

Wireless ecosystem

Microsoft Apple Intel Samsung

End point interoperability

Facebook

1 billion users with Facebook

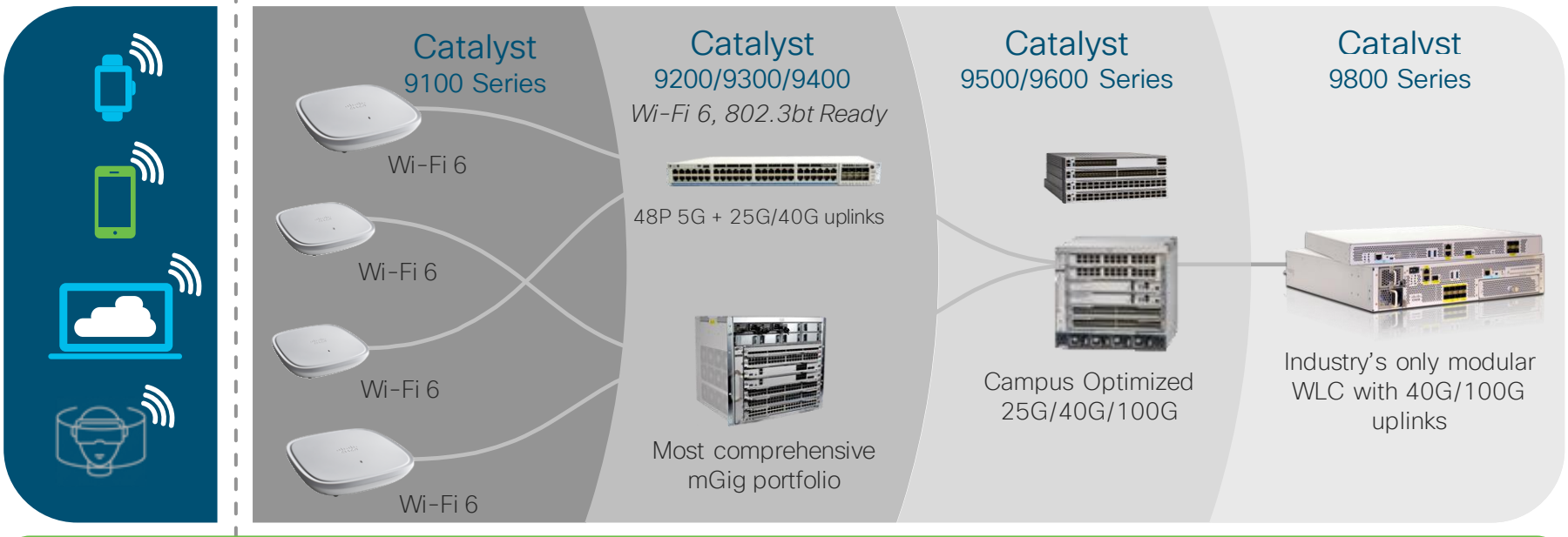
OpenRoaming consortium

Powered by next generation Cisco Catalyst wireless access

End-to-end Catalyst Access

Cisco DNA Center

Cisco DNA Spaces



The Full Experience End to End

Built for intent-based networking

Automation

Security

Analytics

New Workplace needs for a Mobile Hybrid Workforce

Best Mobile Experience

Intelligent Infrastructure

Increase Security Capabilities

Resilient, Secure, Intelligent

Cisco Catalyst APs

Cisco Catalyst WLCs

Cisco DNA Center

Cisco DNA Spaces

Meraki Wi-Fi 6

Closing remarks

- Wi-Fi6 is a revolution in the 802.11 industry as it brings not only more performance but also new service level capabilities like low latency, opening opportunities for new services never imagined before over Wi-Fi.
- Wi-Fi6 refresh will not only benefits new clients but also legacy clients due to Cisco RF ASIC new architecture. You can start with Wi-Fi today using your licenses and AireOS WLCs, and migrate when make sent to new Catalyst stack.
- Keep in mind that the Wi-Fi refresh cycle is much shorter than switching refresh. Wi-Fi6/ 6E / 7 are coming in the next 3 years and mGig and UPoE will be a requirement, consider deploying it in the next refresh.
- Innovations like Wi-Fi with Indoor IoT capabilities for density monitoring, smart alerts and asset management in smart offices, as well as Wi-Fi Analytics that helps operations team meet the SLAs expected and better understand the users experience and APPs, are innovations to consider in

Dúvidas?

Muito Obrigado!