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CISCO
The bridge to possible

The Road to Wi-Fi 6/6E

Contents

What is Wi-Fi 6?

Quite simply, Wi-Fi 6 is a new wireless standard, also called 802.11ax, that is making big waves in network connectivity and user experience improvements. Here's what you need to know.

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It's all about access

Access to applications. Access to data. Access to services. Your network has the power to reliably deliver access to data and applications to the right users across your organization. But what happens when the demand for mobility continues to increase? New advances in technologies such as the Internet of Things (IoT), 5G, and Wi-Fi 6/6E are addressing the need for more mobile access. As a result, the way we've built networks in the past is changing for businesses of every size.

Not only that, but hybrid work is becoming the new normal, letting everyone and everything connect from everywhere. Hybrid work empowers people to work from home, the office, and anywhere in between, safely and securely at any time. An intelligent network is critical to creating a workplace where employees and customers can feel safe and be productive. As the workforce becomes more geographically distributed, the workplace is undergoing transformation as well, with more immersive applications, more deployment of IoT devices, and an increased focus on meeting sustainability goals. Cisco secure networking solutions provide your customers with a way to protect their workforce so they can collaborate and engage wherever they choose to work.

The Cisco Catalyst Wireless family continues the hybrid journey where organizations are forced to merge business processes, insight and controls into a single environment. By leveraging new technologies—like Wi-Fi 6E—to reliably and securely enable immersive apps, the Cisco Catalyst Wireless family allows the hybrid work experience to run smoothly.

When everyone and everything is connected, work is no longer a place we go, it's what we do.

Wi-Fi 6 is leading the charge

Wi-Fi 6 has opened up new possibilities for wireless and hybrid work. Improved speed, capacity, and control not only support existing applications with greater performance and improved experiences but also drive new innovations that change the way people work.

Wi-Fi 6 began its ramp-up in 2019, and although the standard was ratified in September of that year, Samsung launched a Wi-Fi 6 device early in February 2019. Cisco worked with Samsung behind the scenes to validate that Wi-Fi 6 actually delivers faster connections, more capacity, and longer battery life.
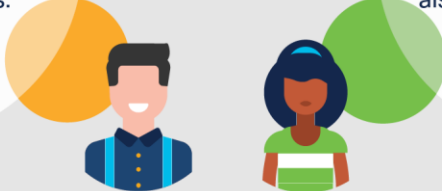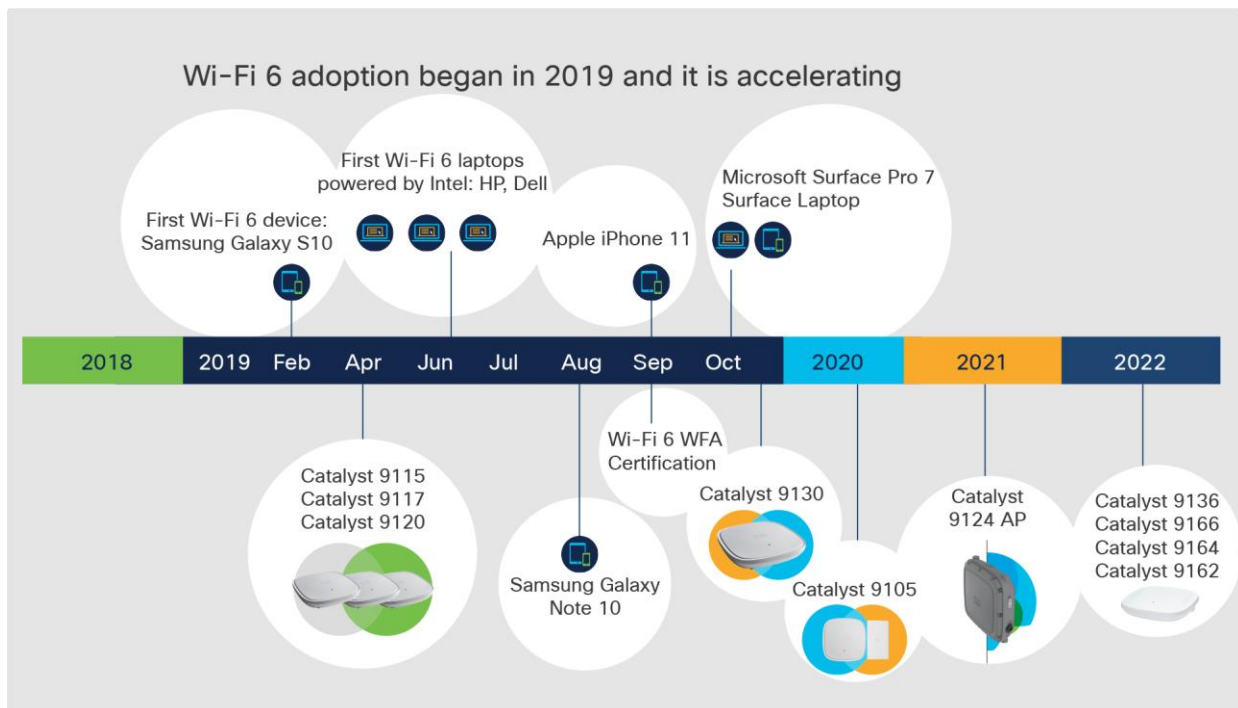

Figure 1.
Outlines the adoption of Wi-Fi 6 starting in 2019 and continuing with the extension to Wi-Fi 6E in 2022.

In order to take advantage of all of the benefits of Wi-Fi 6, you will need a Wi-Fi 6-capable network. This includes both access points and Wi-Fi 6 clients. The market will soon start seeing large numbers of mobile devices that support Wi-Fi 6. Therefore, it is important to prepare your network for the new standard so you will be ready to gain all the benefits that Wi-Fi 6 offers.

What's the big deal?

Nancy asks,

I'm not sure if my network really needs to go to Wi-Fi 6. Sure, there are a few hiccups here and there, but for the most part I think we're good. Why should I upgrade?

Let's start with two basic facts: we are more dependent on the network than ever before and Wi-Fi 6 gives us more of what we need. It is a more consistent and dependable network connection that can deliver speeds up to four times faster than 802.11ac Wave 2 with four times the capacity. This standard provides a seamless experience for clients and enables next- generation applications such as 4K/8K streaming HD, Augmented Reality (AR) and Virtual Reality (VR) video, and more device and IoT capacity for high-density environments such as university lecture halls, malls, stadiums, and manufacturing facilities.

Wi-Fi 6 also promises reduced latency, greater reliability, and improved power efficiency. With higher performance for mobile devices and the ability to support the IoT on a massive scale (IoT use has been trending upward lately and is now also called "the new mobile"), Wi-Fi 6 helps improve experiences across the entire wireless landscape. Wi-Fi 6 also offers improved security, with WPA3 and improved interference mitigation providing a better quality of experience.

The last upgrade to 2.4 GHz was over 10 years ago, so if that's when you last upgraded your network, it's probably time to make the move to Wi-Fi 6, simply to catch up with the recent technology changes. According to the 2019 Cisco Visual Networking Index, there will be higher data rates, with 12.3 billion mobile devices in 2022. IoT will be 50 percent of global connected devices by 2022. At the same time, there has been a 27.4 percent average increase in security breaches since 2017, so you want to ensure that your protection is up to date.

Thomas says,

I can cut a few corners and save some money by being one standard behind. It's not that big a deal, right?

In addition to these compelling reasons, the following are the more significant benefits you can experience when you move to Wi-Fi 6:

- Higher capacity: Four is the new magic number. Attach up to four times more devices than under previous standards through features such as Orthogonal Frequency-Division Multiple Access (OFDMA) and Multiuser Multiple-Input Multiple-Output (MU-MIMO). Wi-Fi 6 communicates in parallel with devices, whereas existing standards communicated with only one device at a time. The increased capacity is essential because the volume of mobile data traffic is expected to grow up to four times in just the next four years alone.

- Improved power efficiency. Using Target Wake Time, client devices that support the Wi-Fi 6 standard may consume two-thirds less power. This means that batteries in products such as smartphones, laptops, tablets, and IoT devices can last longer, which makes it the ideal standard.

- Reduced data latency by optimizing packet scheduling, which is ideal for voice, video, and gaming applications.

- Greater IoT coverage by bringing the benefits of Wi-Fi 6/6E to the 2.4-GHz band.

- Increased speed. Get up to four times the throughput, on average, in congested wireless environments.

- Improved security. With an extension of security to the infrastructure, the new security features allow for better interference and rogue detection and enhanced threat detection with Cisco Encrypted Traffic Analytics (ETA). Wi-Fi Protected Access 3 (WPA3) is certified with Wi-Fi 6 and provides a greater value proposition than WPA2 for enterprise Wi-Fi networks. It offers enhanced security for open Wi-Fi networks with encryption of unauthenticated traffic, robust password protection against brute-force dictionary attacks, and superior data reliability for sensitive information with 192-bit encryption.

The added benefit of OFDMA

OFDMA is a type of frequency-division multiplexing that can use subcarriers more efficiently than Orthogonal Frequency-Division Multiplexing (OFDM) when it comes to transporting data. Previously, when using OFDM, each user got one time slot, or a whole bandwidth channel. Users needed to wait in line before they were able to deliver their packets. As more clients joined, it took longer for packets to be delivered, resulting in lag time and people waiting to transport data.

OFDMA provides a more regular and consistent packet delivery than OFDM, and users don't have to wait as long.

Here's another way to put it. With OFDM, any time a user would request a data packet, it would essentially send out one truck to meet each request of that single user, which isn't very efficient. OFDMA is different, as one truck is used to deliver the packet to individual users in one round. This way is far more efficient and takes less time. Figure 2 illustrates the difference between OFDM and OFDMA.
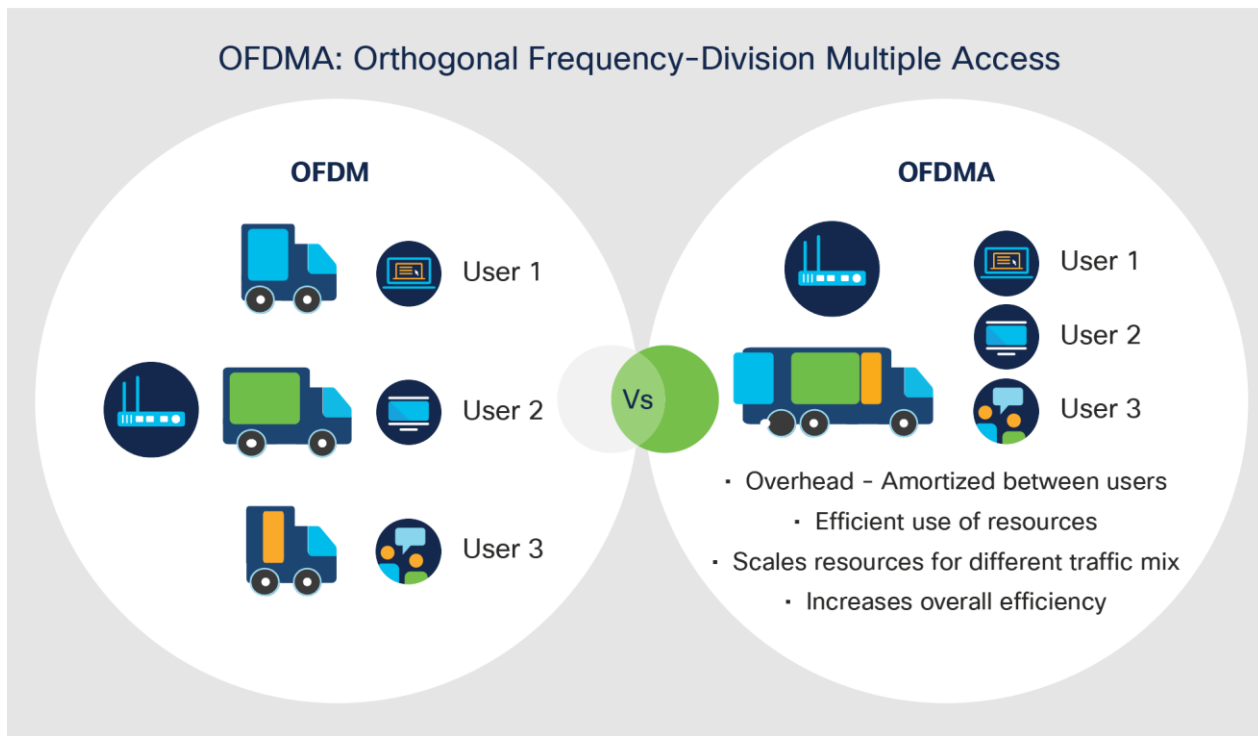

Figure 2.
Comparison of OFDM and OFDMA

All Cisco Wi-Fi 6 products use OFDMA. As a result, your network will be faster, and most importantly, your users will have a better experience.

What is Wi-Fi 6E?

Waiting in line is the most time-consuming and boring thing that you do every day. And it happens just about everywhere. At the airport where you take off your shoes and furiously push your luggage through the scanners, hoping that you'll make your flight on time. Or during lunch where you're stuck standing in a long line for food, hoping that you'll get something to eat before passing out due to hunger. Or even in the office lobby where you crane your neck and stare at the numbers as the elevator slowly makes its way to you. No one ever has any fun on standby.

Imagine, if you can, eliminating that waiting time.

Getting ahead of the line is the greatest. Whether it's with a FastPass at an amusement park, VIP access at a concert or sporting event or jumping on the express train instead of the local, bypassing the line makes your life easier and more fun.

Wi-Fi 6E means never having to wait for your data. The solutions to the everyday problem of waiting in line—either for TSA at the airport, an express elevator at the office, or back-cuts in the lunch line—is what Wi-Fi 6E is. It's the FastPass, the VIP access, the express train to data.

With a Wi-Fi 6E device, your customers are going to get their data faster than ever. But how does it work? At its base, Wi-Fi 6E is simply an extension of Wi-Fi 6 into the 6-GHz spectrum. Since the spectrum is new and accepts only Wi-Fi 6E devices, it doesn't have any of the old issues currently clogging up current networks. It offers better:

- Capacity
- Network reliability
- Security with mandatory WPA3

Nancy asks,

So is this a new technology or standard?

It's neither, really. The key thing to know is that Wi-Fi 6E is not an entirely new standard, but an extension. However, it's still incredibly important. When it comes to your Wi-Fi network, Wi-Fi 6E is a quantum leap in terms of capacity, reliability, and security, not to mention sustainability.

Let's review what Wi-Fi 6E brings to the table:

- **Capacity:** The addition of more spectrum provides an increase in network speed. Wi-Fi 6E is important because it provides that additional bandwidth needed in the open space of that new spectrum. This gives your customers the ability to support a dense environment while keeping device performance running at a high level. The additional spectrum—1200 MHz worth or 59 new channels, the largest Wi-Fi spectrum expansion ever—offers more nonoverlapping channels. Wi-Fi 6E can support a dense IT and IoT environment with no degradation in performance.

  Higher throughput means more channels in the 80-MHz and 160-MHz spectrum supported. This allows users to send and receive data at the highest possible speeds, thanks to the wider channels—at rates more than 1 Gbps. The new 6-GHz band employs fourteen 80-MHz and seven 160-MHz channels. In comparison, today's 5-GHz band uses only six 80-MHz and two 160-MHz channels. That's an increase of more than 100% in 80-MHz and 300% in 160-MHz channels. These additional channels mean that any spectrum congestion you're currently experiencing will likely be gone. It's like the highway analogy: the more lanes you have open, the easier it is for traffic to get through. And that means data is getting to your devices faster, which means faster download speeds and better support for bandwidth-hungry technologies like VR.

- **Reliability:** The new greenfield spectrum allows the 6-GHz band to be dedicated to truly mission-critical applications that need the latency and speed, and with only Wi-Fi 6E devices on the network, the network speed improves.

  No longer will the traditional excuses for staying tethered to the wire—such as wireless connections being prone to radio interference—be applicable. For business-critical applications, this is a major gain for industries as disparate as retail, health care, and finance, as all will benefit greatly from additional reliability and predictability.

  Wi-Fi 6E provides a new standard of reliability and predictability of connection that shortens the gap between wireless and wired connections. This reliability comes with less interference and more efficiency due to Wi-Fi 6E devices not having to share the 6-GHz spectrum with any devices that are not Wi-Fi 6E capable. Devices from Wi-Fi 1 (802.11b) through Wi-Fi 6 (802.11ax) are not supported on 6 GHz.

- **Security:** WPA3 is a mandatory requirement for the Wi-Fi 6E network, and this secures the network more than ever. Not only that, but since only Wi-Fi 6 products will be using this network, there are no legacy security issues to deal with here. But what is WPA3 and what does it do? 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.

Cisco Wi-Fi 6/6E solutions

Hybrid work

You already have a business continuity plan in place, and during the last few years you may have had to use it. What many businesses have found is that their business continuity plan wasn't as airtight as they thought, so they had to improvise on the fly. Some of these decisions worked, others not so much.

The Cisco Catalyst Wireless family meets the demands for users returning to work by delivering on sustainability and safety goals through an unparalleled user experience with ubiquitous connectivity. The new Catalyst Access Points deliver choice and flexibility with a cloud-based and on-premises management mode resulting in a future-proofed access solution. As the workspace becomes more connected, Catalyst Wireless becomes the hub that underpins immersive applications, smart buildings, digital collaboration space and business critical IoT devices that are now transforming the network.

The Cisco Remote Workforce Network extends corporate policies and security to home offices for a seamless corporate experience that meets the various needs of remote employees and IT administrators. With plug-and-play Cisco wireless access points, remote employees can connect securely to a corporate Wi-Fi or wired network with enterprise-class identity-based policies and seamlessly onboard their wired and wireless corporate-issued and personal devices. They get an optimized cloud application experience via Cisco Application Visibility and Control (AVC), Quality of Service (QoS), and Cisco Umbrella DNS layer security to protect them from threats and detect compromised connections.

Network insights with artificial intelligence, machine learning, and machine reasoning

With networks getting so big and complex, it's difficult to keep up with their growth. With Artificial Intelligence (AI), Machine Learning (ML), and Machine Reasoning (MR) technologies, your network can get smarter with algorithms and deep learning that compare your network to tens of thousands of other networks all over the globe. These insights apply the cumulative experiences of thousands of to solve your network issues. Cisco DNA Center's assurance capabilities use AI/ML/MR insights to help you to reduce the complexities of your network with your network.

Cisco has the largest data lake to draw upon when it needs to find solutions. Quick and accurate, the AI/ML/MR reservoir is drawn upon by Cisco DNA Center to assist your IT teams with the correct remediation. The AI/ML capabilities of Cisco DNA Center search through the seemingly endless supply of data to find the right insights to answer your network question. This means that with solutions suggested by the Cisco DNA Center AI, your junior IT team members can be fixing the network while your senior team members are tackling the truly tough things.

With AI-based intelligence, IT can manage the network more efficiently, taking advantage of automation to save both time and money.

After an alert is sent to your team, they will see the issues—ranked in terms of priority—followed by the root causes and the steps taken to reach a solution. All of this is done proactively before the issue escalates to a major catastrophe.

With Cisco's broad portfolio of access networking stack along with powerful network controller and management dashboard in DNA Center, IT can plan for a secure, seamless transition to a hybrid work model providing an unparalleled experience for users while scaling the network for device growth. With the ability to view the overall health of the network, clients, and applications, DNA Center provides IT with the right tools to gain an understanding of the status of the network using this insight to identify and correct any root causes that may be related to a poor client experience.

Whether a customer deploys a physical appliance, a virtual appliance for VMware ESXi, or AWS, IT will benefit from:

- Unparalleled application experience: deep visibility & AI intelligence to optimize the experience as well as automation making it easier for tasks such as software rollouts and updates.
- Zero Trust networking: securely connect everyone and everything and minimize attack surface through comprehensive visibility, segmentation, that continuous monitoring for threats and anomalies.

Programmability with Cisco RF ASICs

Programmable RF Application-Specific Integrated Circuits (ASICs) are custom-developed to provide you with real-time analytics as well as a platform for future innovation and capabilities. RF ASICs are embedded on mission-critical access points such as the Cisco Catalyst 9120, 9130 and 9124 Series and can perform advanced RF spectrum analysis. They can deliver significant features, such as:

- Cisco CleanAir technology to mitigate the impact of wireless interference and protect performance.
- Cisco Wireless Intrusion Prevention System (wIPS) to detect, locate, mitigate, and contain wired and wireless rogues and threats at Layers 1 through 3.
- Dual-filter Dynamic Frequency Selection (DFS) detection to avoid interference for optimal performance.

Combined with Cisco DNA Center's assurance capabilities, this gives you radio frequency visibility and intelligence to help you run your networks better. And that's not all. More new and exciting features are in development.

Thomas says,

When you say IoT, don't you just mean video cameras and thermostats? What other uses are available for IoT?

IoT gateway support

Cisco offers multilingual support and application hosting of IoT protocols to better support IoT service and expansion.

How are Cisco IoT gateways used best? Here are some use cases to get you thinking:

- **Safeguard oil and gas pipeline operations**. Increase operational efficiency and decrease downtime for natural gas pipelines and processing plants. Highly secure, rugged Cisco IoT gateways simplify connecting and managing remote gas turbines, diesel engines, and sensors. They also offer faster insights to help you solve problems quickly and limit expensive repairs.
- **Secure financial transactions and manage assets.** Reduce the expense of managing thousands of remote ATMs, while enhancing asset and data security and improving the customer experience. Cisco IoT gateways facilitate more secure, reliable cellular connectivity to automate cash management, as well as optimize video surveillance with intelligent data processing at the edge for faster response.
- **Improve safety and regulate traffic.** Optimize traffic management with roadside connectivity for traffic signal controllers, motion sensors, video encoders, and cameras. Cisco IoT gateways provide reliable, real-time insights to regulate traffic flow and conditions, detect violations, and improve motorist and pedestrian safety at intersections.

Make your building smart: the IoT gateway helps make a smart building's converged IT/OT network smarter by not only collecting data but also acting on that data to offer the real value to owners and tenants.

Sustainability: As more and more organizations try to increase their sustainability and keep their carbon footprints to a minimum, the Wi-Fi 6E Catalyst 9136 and 9166 Series Access Points can help to do just that. Paired with Cisco Spaces, the Catalyst access points receive data on your organization's environment. For example, when it comes to temperature, through its data gathering, it can deduce that the air conditioning is too cold in certain rooms. You can adjust the temperature so that it's set to a climate that's more temperate, saving the company money and, more importantly, saving energy.

The environmental monitoring market is expected to grow at a compound Annual Growth Rate (CAGR) of 7.5% from 2019 to 2025, to reach $21.08 billion by 2025. The global air quality monitoring systems market is projected to reach $6 billion (USD) by 2025, from $4.3 billion (USD) in 2019, or a CAGR of 5.6%. The global workplace safety market is expected to grow at a CAGR of 10.4% from 2020 to 2025 and reach $19.9 billion by 2025. In the United States, legislation is being enacted from coast to coast to make sure air quality is regulated in classrooms. Having an access point that can measure all of these things will be a boon to your network. You won't have to buy new equipment, you won't have to deploy new equipment, and another device won't eat bandwidth on your network. All of those tasks are accomplished with the Catalyst 9136 Series.

Cisco Intelligent Capture

Intelligent Capture is a built-in, enhanced issue detection and root-cause-analysis feature available on Cisco Catalyst 9120, 9130, 9136, 9162, 9164, and 9166 Series Access Points. It is software that can track more than 240 anomalies and instantaneously review all packets on demand, emulating the onsite network administrator. With this data, administrators can make more informed decisions on their networks. The software "senses" all packets instantaneously and sends the information back to Cisco DNA Center for deep analysis, making it easier to fix the problem. This way, IT can find any issues in record time. Intelligent Capture also provides live and in-service capture of onboarding failures with Packet Capture (PCAP), a spectrum analyzer for analyzing interference sources, and on-demand access point statistics for Wi-Fi troubleshooting.

Cisco DNA Center assurance with Active Sensor

One of the challenges of wireless is planning for changing levels of demand. A conference or event can introduce a sudden jump in device density or increase expectations for application performance. Cisco DNA Center assurance with Active Sensor is a compact wireless device that allows you to test real-world client experiences to validate that performance will meet your expectations in any environment.

Cisco DNA Center assurance with Active Sensor can be plugged in anywhere. Other sensor products are often at ceiling level, sometimes providing IT with a less-than-accurate network assessment, since most clients are at eye level. When installed at the level where most mobile devices are apt to be, the Active Sensor allows for a better understanding and a more comprehensive simulation of real clients.

The Active Sensor validates end-user experience and allows for speed tests to check cloud application performance and connectivity. It also provides IP SLA tests for real-time AppX assessment of VoIP applications.

The Active Sensor reports data to Cisco DNA Center, where it is used along with assurance data from clients. It comes with multiple powering options, including:

- Direct AC power plug
- Power over Ethernet (PoE)
- Micro USB power

The Aironet Active Sensor makes troubleshooting easier and enhances the context shown in Cisco DNA Center assurance. Cisco DNA Center assurance puts your data to work; provides you with 360-degree contextual insights across users, devices, and applications; and helps ensure better network performance with real-time and historical data analytics to learn, adapt, and even detect problems before they happen.

Nancy asks,

The one problem that I have is that I'm always manually adjusting our access points to make sure the radios are able to handle the influx of devices coming into the boardroom. I'm looking for something that can do that automatically.

Flexible Radio Assignment

Cisco Catalyst 9120, 9130, 9162, 9164 and 9166 Series Access Points offer Flexible Radio Assignment (FRA). FRA is a Cisco innovation designed to provide a better mobile user experience for high-density networks by automatically detecting when the coverage in the 2.4-GHz band is oversaturated. Once the detection is made, FRA intelligently determines which access points should change their dual-band radios from 2.4 GHz to 5 GHz. Simply viewed, a single physical access point now acts as two 5-GHz access points, resulting in lower channel utilization and a better user experience. The access point performs this function while still monitoring the network for security threats and RF interference that may affect performance.

FRA has three different modes of operation for access points that are Wi-Fi 6:

- Default operating mode, which serves clients on both 2.4-GHz and 5-GHz bands.

- Dual 5-GHz mode, which serves clients on both 5-GHz radios.

- Wireless security monitoring, which scans both 2.4-GHz and 5-GHz modes for security threats while also serving 5-GHz clients.

For Wi-Fi 6E devices, the modes are a bit different:

- Tri-radio mode: One 4x4 6-GHz radio, one 8x8 5- GHz radio, and one 4x4 2.4- GHz radio.

- Quad-radio mode: One 4x4 6-GHz radio, dual 4x4 5-GHz radios, and one 4x4 2.40-GHz radio. With four total 4x4 radios (quad-radio) inside the access point, client device capacity can be increased on demand.

The access point's default mode is tri-radio with 8x8 5 GHz and 4x4 for 6 GHz and 2.4 GHz. It has the ability to split the 8x8 radio into two separate 4x4 5-GHz radios through a future software upgrade, thereby enabling the benefits of FRA while allowing the 2.4- and 6-GHz radios to remain active.

FRA isn't strictly for workplace environments. It can be used in nearly any instance where a large group of people gather. Whether it's in an educational setting, a hotel lobby, or a hospital, FRA is a boon to any wireless network.

From Bring-Your-Own-Device (BYOD) to IoT devices, the proliferation of wireless items brings a new host of challenges as bandwidth-intense applications grow. FRA rises to these challenges and augments your wireless network to do more without making your job difficult.
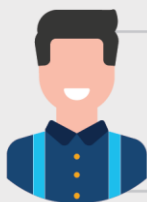
Thomas says,

I'm not sure whether I want an on-premises or cloud-managed network. What should I do?

The Cisco Catalyst 9166, 9164, and 9162 Access Points have made this question a non-question. These access points allow you to choose which deployment you want—on premises or cloud—without having to purchase new hardware. In other words, the number one name in networking joins the number one name in cloud-managed networks as Cisco Catalyst and Cisco Meraki become one.

What does this mean? The Catalyst 9166, 9164, and 9162 are incredibly flexible and can be managed under any operational model. Not only that, but these access points provide your network with advanced investment protection. Want to experiment with cloud deployment or on-premises? You can do either now—and you won't need to buy and deploy brand new hardware to go from one deployment to the other. With all these Wi-Fi 6E access points, you have the ability to deploy your network today (either on-premises or cloud) the way you want, and if you want to change it up, you're able to do that too.

These access points are among your first steps in transforming your current network into a hybrid one.

Cisco CleanAir technology

Did you know that 80 percent of companies report problems with radio frequency interference (RFI)? Cisco CleanAir technology provides proactive protection against RFI and takes automatic action to avoid current and future interference. In other words, CleanAir technology uses silicon-level intelligence to create a spectrum-aware, self-healing, and self- optimizing wireless network that mitigates the impact of wireless interference and offers performance protection for your network.

What does CleanAir technology do? It:

- Discovers. CleanAir provides continual systemwide discovery without affecting performance.
- Decides. It takes automatic action to avoid current and future interference, with full history reporting.
- Identifies. CleanAir accurately and quickly identifies the source, location, and scope of the interference.
- Secures. It detects rogue access points and other devices that affect security and customizes alerts.

CleanAir technology correlates sources of interference across the network, supporting intelligent decisions and policies for faster troubleshooting and automatic RFI avoidance. CleanAir technology makes it easy for network administrators to assess service disruptions, receive notices about performance degradation, research resolutions, and quickly act to improve network performance. The CleanAir solution is part of the industry's most adaptive, reliable, and high-performance wireless network—a network that has the ability to adjust automatically to changes in its environment, without the need for time-intensive or costly human intervention.

Cisco CleanAir Pro

Taking proactive protection against RFI to the next level, Cisco CleanAir Pro has 15 years of innovation and excellence. Much like its predecessor, Cisco CleanAir Pro protects your network and makes sure that it runs smoothly and without any interference.

The main difference between the two software versions is that Cisco CleanAir Pro is optimized for the new 6-GHz spectrum, but there are other differences too:

- Full support for the 2.4-, 5-, and 6-GHz bands
- Multiradio architecture
- AI/ML-driven scan radio that decodes HE frames
- ML-based interferer classifications on the AP

Application Hosting

Modern networking technology isn't just getting faster, it's also getting smarter, thanks to Application Hosting. Hosting applications right on your wireless hardware can make it easier to deploy new solutions while protecting your current technology investments. Now you can turn your network into a powerful IoT platform, with your access points acting as the connectivity layer for tags, devices, and more, which cuts down on time and expense. Third-party applications are built on an open, standards-based container architecture that makes it easier to create, deploy, and run applications like ThousandEyes on switches or access points. With Application Hosting, Cisco has eliminated the overlay network. No longer do you need to install or manage that layer in order to have access to your applications.

Mission-critical network

The network is creating new opportunities for changing the way we work to become more efficient. Forward-thinking organizations are investing in wireless networks to facilitate those opportunities for efficiency, innovation, and growth. As these organizations transition to digital-ready networks, they require advanced features and security.

Mission-critical networks require advanced capabilities

The approach of Wi-Fi 6 is creating anticipation for what's possible. And we want you to be able to tackle all of the excitement head-on. When you upgrade your wireless network to the latest Cisco solutions, you'll be prepared for Wi-Fi 6 so you can support more bandwidth-intensive applications, more IoT devices, and more clients. You'll also be able to offer advanced wireless capabilities that go well beyond traditional networking.

Automated, secure onboarding across the entire network

Cisco Software-Defined Access (SD-Access) gives you a single network fabric from edge to cloud and allows you to set identity-based policy for users, devices, and things. Provide access to any application, without compromising on security, while also gaining insight into any attempt to access your network. Automatic segmentation of users, devices, and applications means you can deploy and secure services faster.
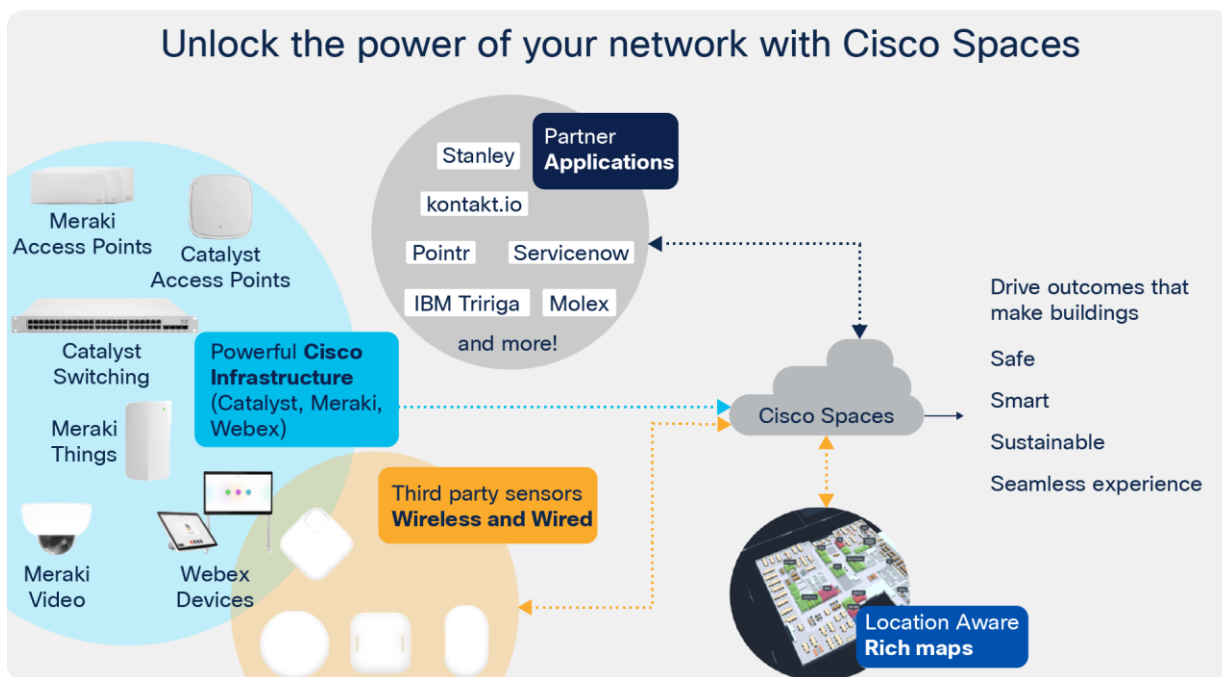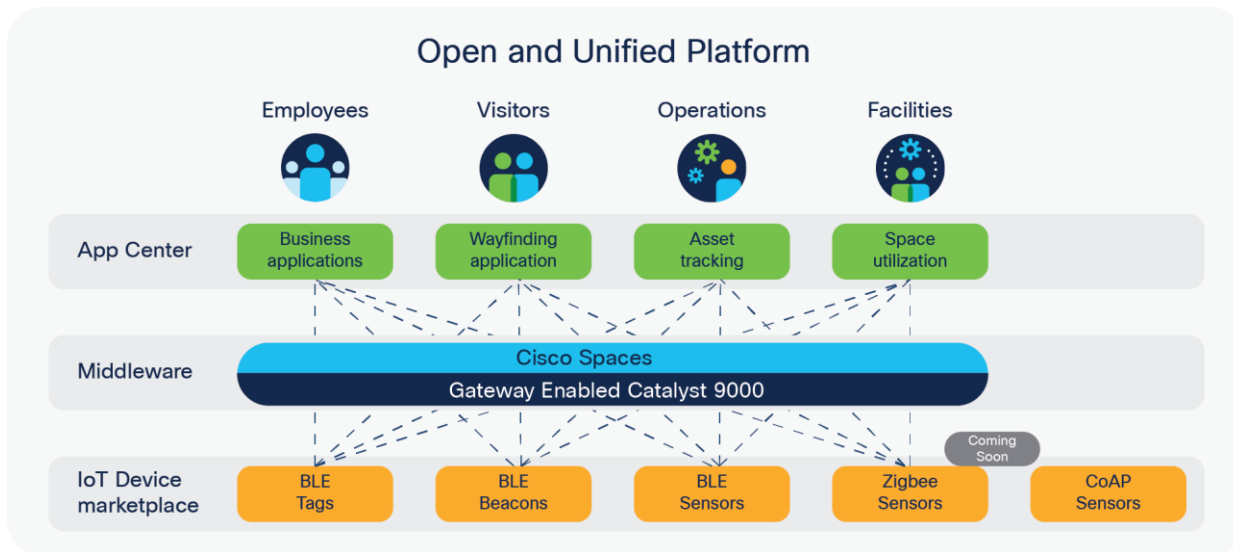
Business insights

Figure 3.
A detailed example of an open and unified platform

Industry outcomes with location-based services

You're already invested in wireless. Cisco Spaces takes it one step further to extend your wireless beyond connectivity and digitize your physical spaces with location-based insights. Cisco Spaces provides a simple, scalable, and standardized approach to provide rich location analytics, business insights, customer engagement toolkits, asset management, location data APIs, and more.

Cisco Spaces Indoor IoT Services enables a multivendor, multi-use case platform with multiple supported partner applications and IoT Device Marketplace. With gateway-enabled Catalyst Wi-Fi 6 access points, customers can deploy end devices, such as BLE beacons and tags, and advance industry use cases such as asset management, environmental monitoring, wayfinding, and more. Customers can realize these outcomes at scale, at a lower TCO and with a unified support model across partner apps and end devices.

Frictionless roaming

Nancy asks,
A few months ago we sent out a survey to all of our users asking them their opinions about the Wi-Fi network. The one thing that kept coming back to us was that when their connections dropped on walks between buildings, they had a difficult time getting that connection back. OpenRoaming seems like a great solution to that problem. What's it all about?
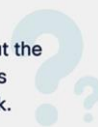
Cisco is a founding member of the WBA Federation. OpenRoaming lets mobile users automatically and seamlessly roam between Wi-Fi and cellular networks, including Wi-Fi 6/6E and 5G. OpenRoaming is part of efforts by Cisco, together with other industry leaders, to break down the barriers between cellular networks to support connectivity everywhere with seamless onboarding, more choices for access, and more secure connections.

Thomas says,
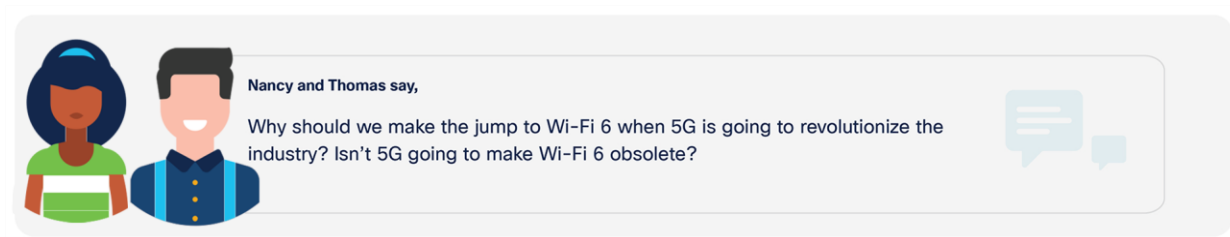We have to improve our guest access. Does OpenRoaming do that?

With OpenRoaming, users can get online seamlessly and automatically after signing in just once using a trusted identity provider. The service is secure and fast, and users don't have to guess which Wi-Fi network to use or suffer through a pop-up captive portal again. They are connected wherever they go so they can download, stream, video chat, and game to their heart's desire. Benefits of OpenRoaming include:

- Seamless connectivity between Wi-Fi and LTE/5G
- Simplified Wi-Fi guest access
- Significant increases in your Wi-Fi attach rate onsite
- Better engagement with customers through Wi-Fi, Cisco Spaces, and loyalty apps
- Ability to take back ownership of your customers' data through Wi-Fi and drive the power of analytics
- Offloading of traffic from cellular to Wi-Fi

Wi-Fi 6/6E versus 5G

I know what Wi-Fi 6/6E is, but what is 5G all about?

Think of 5G as the Wi-Fi 6 equivalent in the mobile broadband world. As Wi-Fi 6/6E is replacing 802.11ac (Wi-Fi 5), 5G is replacing 4G.

Nancy and Thomas say,

Why should we make the jump to Wi-Fi 6 when 5G is going to revolutionize the industry? Isn't 5G going to make Wi-Fi 6 obsolete?

However, the most important thing to note is that both 5G and Wi-Fi 6/6E are built from the same foundation and will coexist to support different use cases. This is not a matter of choosing one over the other. Both 5G and Wi-Fi 6/6E promise to dramatically improve wireless experiences for mobile workers and the enterprise. They will both provide higher data rates to support new applications and increases in network capacity, as well as offer the ability to connect more devices.

Deployed over wireless devices beginning in 2019, 5G is an advanced way of connecting a wireless device to a network without using Wi-Fi. 5G has a much more massive scale than previous standards of 3G and 4G, allowing for AR/VR.

How does Wi-Fi 6/6E compare to 5G?

Both Wi-Fi 6/6E and 5G are critical to the future of wireless, but Wi-Fi 6/6E will continue to be the preferred and primary wireless access in the enterprise, especially for indoor networks. This is because technologies such as smart buildings, indoor enterprises, industrial organizations, and IoT need varying degrees of network connection sophistication that only Wi-Fi 6 can provide. All of these technologies have a common set of problems: onboarding, lifecycle management, security, and data interpretation that can only be solved via a Wi-Fi 6/6E solution. In addition, Wi-Fi 6/6E is a reasonable choice—from a cost standpoint to deploy, maintain, and scale—making it an ideal system for indoor wireless connectivity. This is especially true in areas where access points will serve more users, such as stadiums, concert halls, and convention centers.

On the other hand, 5G might be the designated choice for devices outside an indoor network. With higher speeds and improved capacity, both 5G and Wi-Fi 6/6E can improve outdoor connectivity. However, certain use cases—such as riding on a bullet train at 200 miles an hour or traveling in a car on the highway—will make 5G the preferred method for outdoor networks.

This is not a binary situation, Wi-Fi 6/6E and 5G are suitable for many industries. Both Wi-Fi 6/6E and 5G offer exciting opportunities to connect more devices reliably via wireless. This is important for mission-critical IoT devices being used in manufacturing automation, healthcare, energy, and many other industries. Wi-Fi 6/6E and 5G will also offer enhanced mobile broadband for immersive experiences via augmented and virtual reality. Although many industries will benefit from the enhanced mobile experience, industries such as hospitality, retail, and education will drive immersive experiences for their business.

Wi-Fi 6 use cases

Where are some of the best places to use Wi-Fi 6?

The use cases for a Wi-Fi 6 network are numerous and varied. Almost any organization could use faster connection, better battery life, and increased capacity, but there are certain places that may need it more than others.

For organizations that need full service provider carrier offload and IT/OT convergence, or where networks run in high-density environments such as classrooms and auditoriums and have a need for real-time applications such as enterprise-grade 4K/8K video or augmented or virtual reality, a Wi-Fi 6 network is paramount.

Figures 4 and 5 outline Cisco products used in Wi-Fi 6 use cases.
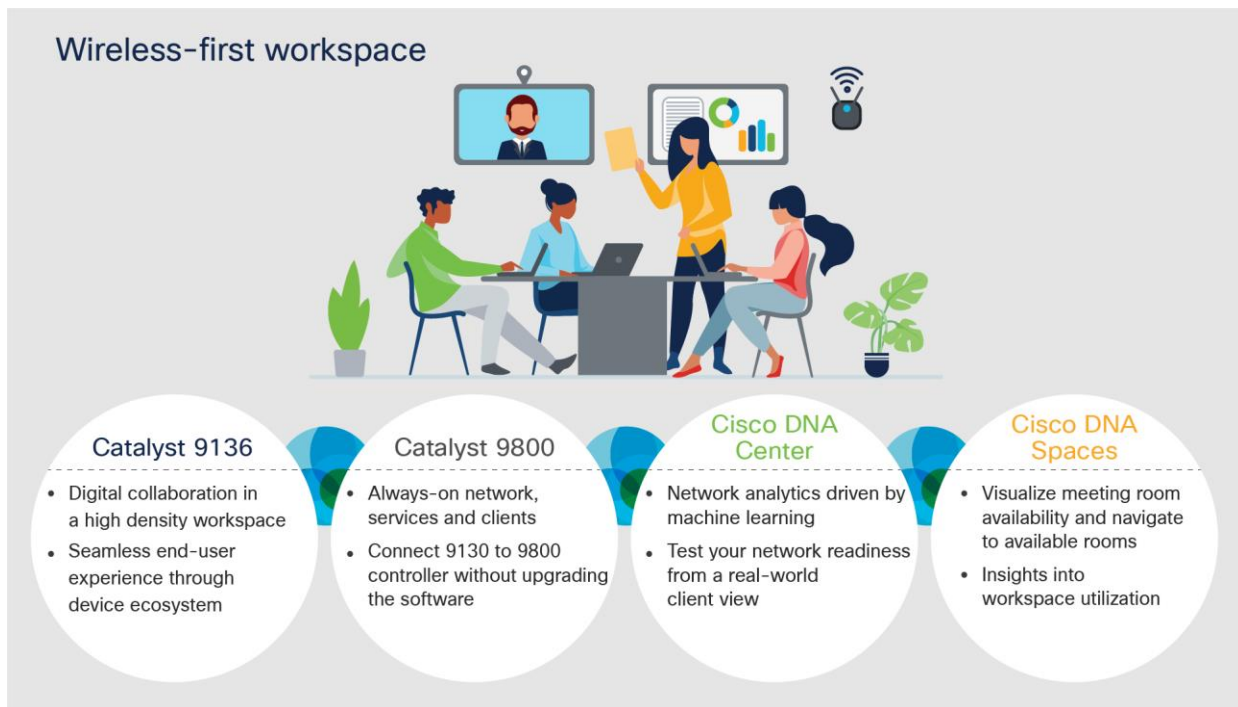

Figure 4.
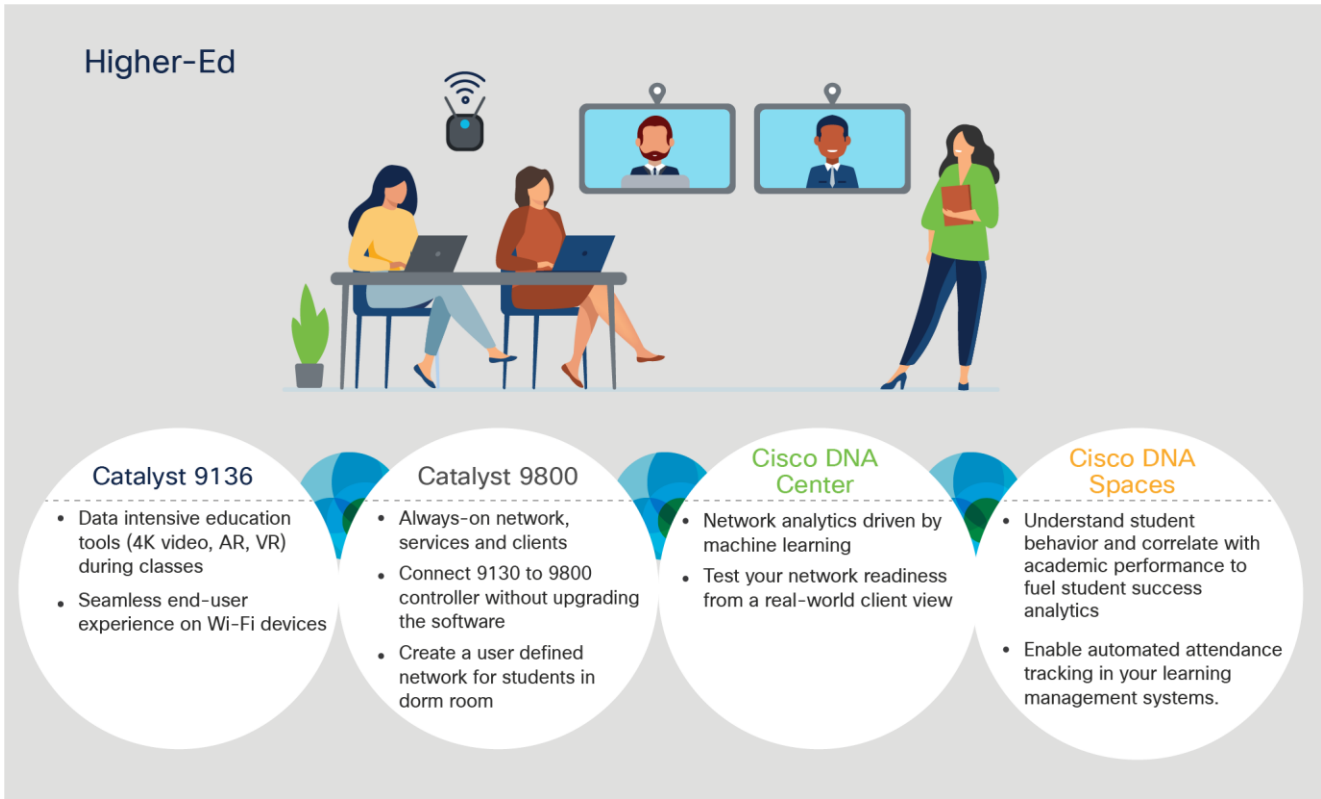Cisco Wi-Fi 6 products in an enterprise workspace

Figure 5.
Cisco Wi-Fi 6 products in a high-density environment

Thomas says,

This is all well and good, but what do customers have to say about Cisco Wi-Fi 6 products? How does it work in the real world?

Here is what some Cisco customers had to say about their Wi-Fi 6 network:

"Striving toward the commitment of 'leading medicine' with state-of-the- art healthcare services, we need technology and infrastructure in place to deliver an always-on network. The Catalyst 9800 and 9100 provide a modular design to wireless configuration, flexibility in the separation of code between wireless LAN controller and access point, and the ability for rolling upgrades on the network. All these capabilities will allow us to securely scale and manage our network as quickly as our needs grow." – A major U.S. healthcare provider

"*We strive to offer a world-class student life experience with state-of-the-art campus facilities built on always-on infrastructure. We're delighted to pioneer Cisco's new wireless stack, which includes Cisco Catalyst 9100 access points and Cisco Catalyst 9800 controllers. It allows us to use Cisco's intent-based networking solution that ensures simplified operations, security, and reliability of our networks at scale." – A major U.S. university*

"*The Cisco Catalyst 9115 access points are shaping up to be a worthy successor to the Aironet access points. One customer regularly has over 400 clients connecting to Catalyst access points and they are performing great!" – A Cisco global partner*

Cisco DNA Center

Nancy asks,

I need management software that does more than just manage my network. I need something that is my eyes and ears when I'm not actively monitoring the network. What is available?

[Cisco DNA Center](#) is the management and command center for your network—both wired and wireless. Combining management, automation, analytics and assurance, and security, Cisco DNA Center simplifies network management and speeds innovation. With Cisco DNA Center, you're able to easily onboard, monitor, and manage all of your network devices from one central controller.

Along with the Cisco Catalyst family, Cisco DNA Center empowers IT to connects anyone and anything from anywhere seamlessly and securely. Thanks to innovations in automation, simplicity, and network insights, Cisco DNA Center creates a consistent orchestration across a wired and wireless network providing IT with business agility and operational efficiency.

Utilizing the world's largest networking data lake, Cisco DNA Center leverages AI-based automation to deliver unparalleled, real-time visibility and insights along with predictive networking solutions to drive an enhanced application and user experience. Cisco DNA Center offers an extensive ecosystem that that is open and extensible, integrating Cisco applications such as ThousandEyes as well as a variety third-party related applications. This ecosystem empowers IT to build customized, relevant applications quickly and confidently adding value to an existing network that will improve the end user experience and ease the complex world of multi-vendor integration. The Cisco DNA Center Virtual Appliance is designed to align with IT scaling needs as well as IT's preference to operate the management plane in a public cloud, or a virtual environment on premises or a colocation facility.

Thomas says,

Not only do I want a network that will find issues, but I want a network that will provide me with the correct fixes once it finds those issues. Cisco DNA Center does all of that!

Your network is full of a lot of untapped data that can be used to better your network. Use Cisco DNA Center to optimize and manage this information.

- Cisco DNA Center provides a single-pane-of-glass command center for both your wired and wireless network.

- Cisco DNA Center provides assurance capabilities that make it easy to troubleshoot issues and provide insight into your network through analytics.

- Cisco DNA Center provides a Trust Score Engine that continuously monitors endpoint devices for threats, enhancing zero-trust networks.

- Cisco SD-Access, a solution that is managed through Cisco DNA Center, provides automated, policy-based segmentation across your access network.

You can also use Cisco DNA Center to:

- Run an assessment to check your network's readiness for Wi-Fi 6/6E and receive reports on your access points, available bandwidth, and configurations.

- Employ AI/ML capabilities of Cisco DNA Center to analyze Wi-Fi access point performance in your network and determine which ones to upgrade to Wi-Fi 6/6E for maximum effect.

- Use Cisco DNA Center 3D Wireless Analyzer to get an immersive floor-to-ceiling view of your wireless coverage and plan for wireless changes using the "What If" tool.

- Use Cisco DNA Center to analyze each Wi-Fi client's connectivity metrics and take steps to improve mobile experiences.

- Deploy Wi-Fi sensors in your network for proactive testing and to help ensure the best user experience.

Assess Wi-Fi 6/6E readiness with Cisco DNA Center

The Wi-Fi 6/6E readiness dashboard in the Assurance menu of Cisco DNA Center looks through the inventory of all devices on the network and verifies device, software, and client compatibility with the Wi-Fi 6 standard. After upgrading, advanced wireless analytics will indicate performance and capacity gains as a result of the Wi-Fi 6/6E deployment. This is an incredible tool that will help your team define where and how the wireless network should be upgraded. It will also give you insights into the access point distribution by protocol (802.11 ax/ac/n/abg), wireless airtime efficiency by protocol, and granular performance metrics.

Wireless 3D Analyzer: A new way to visualize your Wi-Fi network

In addition to providing readiness for the latest Wi-Fi standards, Wi-Fi 6/6E, Cisco DNA Center features a Wireless 3D Analyzer that simplifies how to visualize your Wi-Fi network through a 3D immersive experience. With this tool, IT can simplify planning, monitor coverage, and troubleshoot for issues through deep analysis on key factors needed to maintain a growing wireless network.

The Wireless 3D analyzer includes:

- A first-person virtual walk though of the coverage area in 3D so IT can see if there are any coverage gaps.

- A "What-If" modeling and planning tool that allows IT to add, move, or change access points for future planning purposes.

- Interactive RF insights and analytics supplied in order to maintain a growing wireless network.

Cisco Wireless 3D Analyzer brings an innovative and simplified way to plan and monitor the wireless network as it evolves. It significantly reduces the manual operations required to optimize the ever-evolving radio coverage requirements and displays in a fully immersive 3D environment that correlates all the amazing data available in the Cisco wireless network.

CX services for Cisco DNA Center

With IT environments becoming more complex, rapidly changing technologies, and pressure to do more with less, you need expertise to move faster. Insights to take action quickly and scale. Best practices to empower your team to stay ahead for what's next.

For all of this to come together, we're transforming the way you work with Cisco. We're working with you to be more proactive and predictive, where expertise and insights are delivered at scale to accelerate your success.

With Cisco Success Track for Campus Network, we stay with you at every step through the entire lifecycle journey to help remove the barriers between you and your goals and get faster return on your Cisco DNA Center investment.

Cisco Success Track is a packaged service that connects you to Cisco expertise, insights, learning, and support to help you realize value faster with a new way of engaging with Cisco—through a one-stop, personalized digital experience with Cisco CX Cloud.

With Cisco CX Cloud, you get a contextual view of your IT environment and the guidance to predict better outcomes, faster.

Products

The power of the network lies in its infrastructure. When you build a strong infrastructure foundation with the right products, you'll be prepared to innovate and adapt to new capabilities. The Cisco Catalyst Wireless family offers Enterprise-class features found only in Cisco products allowing business and organizations to do more with their network and offer an always-connected and seamless Wi-Fi experience for their customers.

Cisco has been the wireless industry leader for years due to its envelope-pushing technological advances. The Wi-Fi6/6E wireless products–with enterprise-class features and functionality –continue that advancement of the traditional standards along with Cisco innovation. These features provide the ability to tackle your biggest needs. Whether it's updating the speed of your network so that your customers can access applications and their data quicker or strengthening network security, the Cisco Catalyst Wireless family has the tools to move your business forward.

As part of Access Networking, the Cisco Catalyst Wireless family provides solutions to help customers deliver the best IT experience by:

- Automating services for faster workflows giving IT more time to focus on business relevant tasks.

- Gaining visibility and insights of the network down to the device level for better troubleshooting and more efficient operational management.

- Providing policy-driven security for the campus network allowing for quicker on-boarding and mitigating the threat surface.

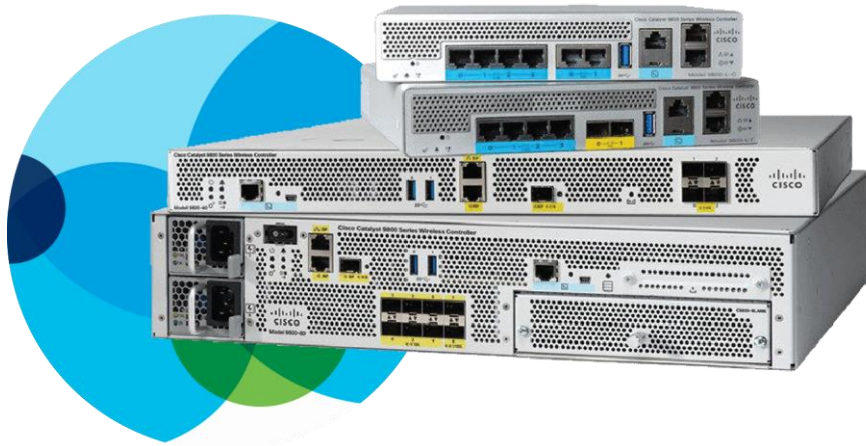## Cisco Catalyst 9800 Series Wireless Controllers

Figure 6.
Catalyst 9800 Series Wireless Controllers

Cisco Catalyst 9800 Series Wireless Controllers (Figure 6) combine the best of RF excellence with the benefits of Cisco IOS XE to deliver some of the industry's most reliable and secure controllers.

Nancy asks,

I want to be able to deploy my controllers where I want. What can Cisco do for me?

The Catalyst 9800 Series controllers are ready to deploy anywhere: on-premises, in the cloud, or embedded on a Cisco Catalyst access point. They provide high availability to keep services always on during planned and even unplanned events. And they have built-in security and support advanced security features such as Encrypted Traffic Analytics and secure segmentation with Cisco SD Access.

On top of that, they're compatible with the new Cisco Catalyst 9100 Access Points, which support Wi-Fi 6/6E. Also, Catalyst 9800 Series Wireless Controllers are the only controllers that support the Cisco Wi-Fi 6E access points.

The Catalyst 9800 Series wireless controllers are the next generation of controllers bridging the intent-based networking portfolio and offering deployment flexibility. Powered by Cisco IOS XE, the Catalyst 9800 Series controllers are always on, secure, and deployable anywhere. Software updates with no disruptions and rolling access point upgrades completely change the definition of "always on."

Secure means increased threat detection in encrypted traffic and automated macro- and micro-segmentation. Finally, the ability to deploy on-premises, in either a private or public cloud, or embedded on an access point promises a freedom that no other controller currently offers.

Key benefits of Cisco Catalyst 9800 Series controllers:

- **Always on:** Driven by high availability, the ability to provide limited downtime during upgrades is a significant benefit of the Catalyst 9800 Series controllers. Bug fixes, access point deployment in multiple sites, network updates, and more can be deployed without impacting the operations of the networks.

Thomas says,

Nothing is worse than getting an update and having to shut down parts of—or the entire—network. Is this ever going to change?

With Cisco In-Service Software Upgrade (ISSU), network downtime during a software update or upgrade is a thing of the past. ISSU is a complete image upgrade and update while the network is still running. The software image—or patch—is pushed onto the wireless controller while traffic forwarding continues uninterrupted. All access point and client sessions are retained during the upgrade process.

With just a click, your network automatically upgrades to the newest software. Here's how it works: The backup Cisco Catalyst 9800 Series controller receives the new software that is pushed via the active Catalyst 9800 Series controller. Then the backup controller becomes active and takes over your network, while your previously active controller turns into the backup controller and processes the software upgrade. Using an intelligent RF-based rolling access point upgrade, all APs get upgraded in a staggered fashion without impacting any wireless session.

The active and redundant pair, running two different versions, still keep the network running.

Secure: According to a recent poll, nearly one-third of respondents have been victims of cybercrime. Not only that, but the industry average to detect a common threat can be up to 100 days. The Catalyst 9800 Series controllers are built around the idea that wireless becomes the strongest first line of defense. Thanks to built-in security features, the Catalyst 9800 Series controllers are ready to detect any threat and defend against any compromised infrastructure.

Can be deployed anywhere: Deploy anywhere to enable wireless connectivity everywhere. Whether on-premises, in a private or public cloud, or embedded on an access point, Catalyst 9800 Series controllers offer multiple deployment and scale options to best meet any organization's needs. It doesn't matter whether your deployment choice is on a private or a public cloud; the Catalyst 9800 Series is cloud-agnostic and allows for management and deployment anywhere. The wireless controllers can be deployed on VMware ESXi, KVM, and Cisco Enterprise Network Compute System (ENCS) in a private cloud or on AWS in a public cloud.

Cisco Catalyst 9800-L Wireless Controller: For small and medium-sized businesses, the Catalyst 9800-L is the ideal choice because it is feature-rich and enterprise-ready to power your business-critical operations and transform end-user experiences. Choose between copper and fiber uplinks. This choice gives you flexibility in your network. The Catalyst 9800-L supports up to 250 access points and 5000 clients and has 5-Gbps throughput.

Cisco Catalyst 9800-40 Wireless Controller: The Catalyst 9800-40 is a fixed wireless controller with seamless software updates for midsize and large enterprises. It supports up to 2000 access points and 32,000 clients and has 40-Gbps throughput.

Cisco Catalyst 9800-80 Wireless Controller: The Catalyst 9800-80 is a modular wireless controller with optional 100G modular uplinks and seamless software updates for large enterprises and campuses. It is feature-rich and enterprise-ready to power your business-critical operations and transform end-customer experiences. The Catalyst 9800-80 supports up to 6000 access points and 64,000 clients and has 80-Gbps throughput.

Cisco Catalyst 9800-CL Wireless Controller for Cloud: The Catalyst 9800-CL is the next generation of enterprise-class wireless controllers for cloud, with seamless software updates for distributed branches and midsize campuses to large enterprises and service providers. Multiple scale options with a single deployment package are available to best meet your organization's needs. The Catalyst 9800-CL is available to deploy on either a private cloud (as a virtual machine) or public cloud.

As opposed to previous virtual WLC offerings from Cisco, the Catalyst 9800-CL supports Cisco FlexConnect, as well as central switching, mobility anchor, and SSO. The Catalyst 9800-CL comes in three sizes:

- **Small:** Designed for distributed branches and small campuses supporting up to 1000 access points and 10,000 clients.
- **Medium:** Designed for medium-sized campuses supporting up to 3000 access points and 32,000 clients.
- **Large:** Designed for large enterprises and service providers supporting up to 6000 access points and 64,000 clients.

Cisco Embedded Wireless Controller on Catalyst Access Points: The Cisco Embedded Wireless Controller on Catalyst Access Points puts control right on the access point, delivering a cost-effective Wi-Fi 6/6E network that is easy to deploy and manage, without a dedicated physical appliance. It is best for distributed enterprises or organizations that want to upgrade to Wi-Fi 6/6E with minimal IT resources. Just answer a few simple questions using the WebUI or mobile application, and your wireless network is up and running.

Powered by Cisco IOS XE Software, the embedded wireless controller adds another choice to the Cisco Catalyst 9800 Series deployment options and provides a clear upgrade path as your network needs grow.

Cisco Catalyst 9100 Access Points

Figure 7.
Catalyst 9136 Access Point

Cisco Catalyst 9100 Access Points (Figure 7) prepare your network for the future of supporting, and going beyond, Wi-Fi 6/6E.

With users expecting an immersive experience, coupled with IoT becoming the new mobile, we are now more dependent on Wi-Fi than ever before. Cisco Catalyst 9100 Access Points, powered by Wi-Fi 6/6E technology and supporting Cisco's intent-based networking architecture, are ready for the growing user expectations, IoT devices, and next-generation cloud-driven applications.

With the ability to handle increased mobile traffic, as well as support IoT at scale, Cisco's first Wi-Fi 6/6E access points will expand wireless access with intelligence to provide a secure, reliable, high-quality wireless experience for all networks.

Moving to Wi-Fi 6/6E will allow your wireless network to support up to four times the capacity of previous standards, consume up to two-thirds less power on end devices that support the Wi-Fi 6 standard, and experience reduced latency, greater IoT coverage, and improved interference mitigation for better quality of experience. The Cisco Catalyst 9100 then goes beyond Wi-Fi 6/6E with programmable RF ASICs and other advanced capabilities.

Nancy asks,

With the new IoT devices that I'm planning on deploying in the new year, I'm hoping that I have a network that will have faster speeds. How do the Wi-Fi 6 access points compare?

Key benefits of Catalyst 9100 Access Points:

- **Reliability:** Always connected, always dependable; a seamless experience.

- **On-premises or Cloud:** Whether you choose to deploy and manage your network on-premises or in the cloud, you're able to launch both deployments with the Cisco Catalyst 9166, 9164 or 9162 Wi-Fi 6E Access Points. The great thing about these APs is that if you change your mind and want to switch up your network deployment, the Catalyst 916x Access Points give you the flexibility to change your mind. Go from on-premises to Cloud when you want.

- **Capacity:** The 802.11ax sends out more data to more clients than any other version of the 802.11 standard. Latency is reduced by 50 percent with more than 100 devices communicating at the same time. Both access points use OFDMA and MU-MIMO to help dole out resources for applications. For example, OFDMA is ideal for low-bandwidth applications and increases efficiency while reducing latency. For high-bandwidth applications, MU-MIMO increases capacity, resulting in higher speeds per user. Look at MU-MIMO as multiple trucks serving users simultaneously, while OFDMA is one truck serving each user.

- **Built-in environmental sensors:** A new feature unique to Cisco, added to the Wi-Fi 6E access points, these sensors measure temperature, air quality, and humidity. In addition to the data that the access points provide about the environment, they also avoid the constraint of an overlay network. In other words, customers won't have to deploy two devices—the Catalyst 9136 and 9166 Access Points do the job of both.

- **Smart AP feature:** Here the Wi-Fi 6E access point will automatically change its power consumption to reflect the load it currently has. For example, an access point operates on the radios provided to it irrespective of how many clients are connected. With Smart AP, if there is a small enough number of clients, the access point will automatically reduce the radio stream count, saving power.

- **Band Steering:** A feature that helps clients that are 6-GHz-capable to leave the 5-GHz radio and connect to the 6-GHz one. Why is this needed? Just because a 6-GHz radio is present doesn't mean the client won't keep using the 2.4-GHz or 5-GHz radios. The same problem occurred when we had clients preferring to connect to 2.4 GHz because it is usually a stronger spectrum than 5 GHz. With Band Steering, Wi-Fi 6E clients are automatically directed to connect to 6 GHz to take advantage of the benefits that that radio offers.

- **USB ready:** With a USB connection rate of 9W, there's no need to wonder whether the Catalyst 9136 can support a USB-enabled device—because it can! Our new USB connection rate is 9W, which is higher than the previous generation's AP (4.5W).

- **Bandwidth:** More applications can run at speeds up to four times faster than 802.11ac. With Spectrum Intelligence and interference and rogue detection, you can be sure that your network is clear of any issues that could hinder a seamless connection.

- **Enhanced features:** Cisco RF ASIC delivers Cisco CleanAir technology, wIPS, and DFS detection in addition to Fast Locate, available in the Cisco Catalyst 9120, 9130 and 9124 Series Access Points. The Catalyst 9100 Access Points also support Target Wake Time (TWT), which is a new power-saving mode that allows a client to stay asleep and to wake at prescheduled times to exchange data with the access point. The energy savings over 802.11n and 802.11ac are significant, with up to three to four times the savings provided by older standards. In addition, TWT improves power and battery efficiency in end devices like smartphones, tablets, and IoT devices.

- **Support for both PoE+ and PoE:** The Catalyst 9100 Access Points have a 15.4W PoE mode for efficiency and rarely exceed 30W. If that does happen, Multigigabit provides Universal Power over Ethernet (Cisco UPOE).

- **Secure connections for remote workers or the micro-office:** Any Cisco Catalyst access point can function as an OfficeExtend Access Point (OEAP). With an OEAP, an employee at home or in a temporary micro-office will have access to the corporate SSID and the corporate network without the need to set up a VPN or have any advanced technical know-how.

- **Addresses the growing IoT explosion:** The Catalyst 9100 Access Points also offer multilingual support and application hosting of IoT protocols such as Wi-Fi, BLE, and Zigbee.

- **Customizable with a programmable RF ASIC:** The Catalyst 9120, 9130 and 9124 Series Access Points have a custom RF ASIC and provide real-time analytics, which, when combined with Cisco DNA Center's assurance capabilities allow you to gain RF intelligence and visibility that can be analyzed and used to run your network more efficiently. The custom RF ASIC also has a dedicated third radio that is automatically enabled during high density scenarios. This goes along with delivering other features such as RF interference mitigation and rogue detection.

Catalyst 9100 Access Points

Cisco Catalyst 9105 Series Access Points: A solution for small to medium-sized organizations, the sleek Cisco Catalyst 9105 Series Access Points provide Cisco cutting-edge features at a lower price point. The access points support the Wi-Fi 6 (802.11ax) standard and offer two distinct mounting options (ceiling and wall), allowing for optimal organizational flexibility.

Cisco Catalyst 9115 Series Access Points: These access points can enable your infrastructure to handle increased mobile traffic. Ready for the next generation of wireless, Cisco Catalyst 9115 Series Access Points are flexible and scalable and support Wi-Fi 6.

Perfect for small to medium-sized networks, these access points have higher capacity, greater range, improved security, reduced latency, and better power efficiency.

Cisco Catalyst 9120 Series Access Points: The Catalyst 9120 Series scales to the growing demands of IoT while fully supporting the latest innovations and new technologies. Not only that, but it is the leader in performance, security, and analytics. The Catalyst 9120 Series Access Points support both OFDMA and MU-MIMO, delivering more predictable performance for advanced applications and IoT. Additionally, with up to 2.5 Gbps with NBASE-T and IEEE 802.3bz Ethernet compatibility, the 9120 Series can seamlessly offload network traffic without any bottlenecks.

Cisco Catalyst 9124 Series Access Points: The Cisco Catalyst 9124 Access Points completes your campus' Wi-Fi 6 (802.11ax) network. Connections won't drop when you walk from one building to another nor will your Wi-Fi attachment suffer when business needs bring you outside. The Catalyst 9124 offers the same resiliency, security and intelligence found in the Catalyst 9100 indoor access points but in a rugged, ready-for-anything-that-nature-throws-at-it case. It comes equipped with up to three radios 2.4GHz (4x4:4), 5GHz (4x4:4) and a built-in BLE radio, perfect for IoT deployments. The Catalyst 9124 employs Cisco RF ASIC allowing for next-gen Clean Air and provides OFDMA and MU-MIMO support for more efficient packet delivery.

Cisco Catalyst 9130 Series Access Points: For mission-critical enterprise organizations that will see the coming increase in mobile and IoT traffic, the Catalyst 9130 Series goes beyond the Wi-Fi 6 standard and employs a host of resilient, secure, and intelligent features. For stellar scale and performance, the Catalyst 9130 Series has four radios. It also includes Flexible Radio Assignment, allowing for an automatic frequency change when more devices log on to the network. The Catalyst 9130 Series is powered by a programmable RF ASIC that provides real-time analytics for a far more efficient network. Other features, such as integrated security, full Intelligent Capture, and more equip your network to deliver a superior wireless experience. To backhaul the data, the Catalyst 9130 Series is equipped with a 5-Gbps Multigigabit IEEE 802.3bz Ethernet port.

Cisco Catalyst 9136 Series Access Points: The Cisco Catalyst 9136 Series takes advantage of the 6-GHz band expansion to produce a network that is more reliable and secure, with higher throughput and capacity and less device interference. The Catalyst 9136 Series APs come with two 4x4 radios and one 8x8 radio as well as a host of other features. The access points also provide infrastructure investment protection: on your journey to Wi-Fi 6E, deploying a Catalyst 9136 Series AP provides you with full investment protection for your network when Wi-Fi 6E becomes a reality. It has built-in environmental sensors, a feature that measures temperature, air quality, and humidity. Also Band Steering, which helps clients that are 6-GHz capable connect to the 6-GHz radio instead of the 5-GHz or 2.4-GHz radios.

Cisco Catalyst 9166 Series Access Points: For mission-critical large and medium-sized organizations. Like the Catalyst 9136, the Catalyst 9166 Series has an environmental sensor. The AP has a dedicated radio for CleanAir Pro and can be run with Cisco DNA Center or the Meraki dashboard and provides stellar performance and flexibility. By combining the power of Catalyst with the simplicity of Meraki, the Catalyst 9166 Series Wi-Fi 6E access points give customers the flexibility of deploying their network on-premises or in the cloud.

Cisco Catalyst 9164 Series Access Points: Perfect for medium-sized and small organizations. The AP has a dedicated radio for CleanAir Pro and can be run with Cisco DNA Center or the Meraki dashboard. By combining the power of Catalyst with the simplicity of Meraki, the Catalyst 9164 Series Wi-Fi 6E access points give customers the flexibility of deploying their network on-premises or in the cloud.

Cisco Catalyst 9162 Series Access Points: Great for small organizations, this is the entry-level Cisco solution for Wi-Fi 6E access points. The AP has a dedicated radio for CleanAir Pro and can be run with Cisco DNA Center or the Meraki dashboard. By combining the power of Catalyst with the simplicity of Meraki, the Catalyst 9162 Series Wi-Fi 6E access points give customers the flexibility of deploying their network on-premises or in the cloud.

Cisco Aironet Active Sensor

One of the challenges of wireless is planning for changing levels of demand. A conference or event can introduce a sudden jump in device density or increase expectations for application performance. The [Cisco Aironet Active Sensor](#) is a compact wireless device that allows you to test real-world client experiences to validate that performance will meet your expectations in any environment.

Software licensing

Cisco Wi-Fi 6/6E wireless products require Cisco DNA software subscription licenses. These licenses are required for connecting any access points to the Catalyst 9800 Series Controllers, Cisco DNA Center (on-premises), or Cisco Spaces.

Cisco DNA software subscriptions are available in two tiers: Cisco DNA Essentials or Cisco DNA Advantage.

The licenses are purchased per access point and include embedded software support. Depending on the subscription tier chosen, a customer will get a perpetual feature stack, Network Essentials or Network Advantage, along with their subscription. The perpetual feature stack does not expire even if the subscription lapses. However, support for the software will lapse with the subscription. Note that Network Essentials and Network Advantage cannot be purchased as a standalone license, and come as part of the Cisco DNA software subscription.

Cisco Network Essentials and Network Advantage licenses enable wireless fundamentals such as 802.1X authentication, QoS, Plug and Play (PnP), telemetry and visibility, Single Sign-On (SSO), and security controls. These licenses are perpetual.

Cisco DNA software subscription licenses, mandatory at the time of hardware purchase, unlock Cisco DNA Center functionality, enabling controller-based software-defined automation and assurance in your network. The Cisco DNA Center controller is required to activate the Cisco DNA software capabilities. These term licenses are available in 3-, 5-, or 7-year subscriptions. When the Cisco DNA software subscription term expires, the Cisco DNA Center capabilities expire, but the perpetual Cisco Network Essentials or Network Advantage features remain in effect.

For a full list of features included in these licenses, view the [Cisco DNA Software for Wireless feature matrix.](#)

Cisco DNA Essentials

Cisco DNA Essentials subscription software, available in 3-, 5-, and 7-year terms, includes:

- Basic automation with PnP application, network site design, and device provisioning.
- Element management with Software and Image Management (SWIM), discovery, network topology, and AVC.
- Basic assurance with a health dashboard, an AP floor and coverage map, and predefined reports.
- Basic security and telemetry, including Flexible NetFlow.

Cisco Network Essentials perpetual software includes:

- Essential wireless capabilities for Wi-Fi 6 authentication, guest access, device onboarding, infrastructure and client IPv6, ACLs, QoS, VideoStream, smart defaults, Radio Resource Management (RRM), Spectrum Intelligence, BLE, USB, Cisco TrustSec, SGT Exchange Protocol (SXP), AP and client SSO, dynamic QoS, analytics, ADP, OpenDNS, mDNS, IPsec, and rogue management and detection.
- Optimized RF, which includes Flexible Radio Assignment (FRA), ClientLink, Cisco CleanAir Advanced, NG-HDX, and predictive and proactive RRM.
- DevOps integration, which includes PnP agent, NETCONF, and YANG data models.
- IoT optimized refers to identity PSK and enhanced device profilers.
- Telemetry and visibility include model-driven telemetry.

Cisco DNA Advantage

Cisco DNA Advantage subscription software, available in 3-, 5-, and 7-year terms, includes:

- Advanced automation with SD-Access, location PnP, and automated Identify Services Engine (ISE) integration for guest and third-party API integration.
- Enhanced security and IoT includes Encrypted Traffic Analytics (ETA).
- Policy-based workflows include EasyQoS configuring, and monitoring and policy-based automation.
- Assurance and analytics includes guided remediation, Apple iOS insights, proactive insight detection such as Aironet Active Sensor tests, Intelligent Capture, client location heatmaps, spectrum analyzer and application performance reports, and element management that shows patch lifecycle management.

Cisco Network Advantage perpetual software includes:

- High availability and resiliency with ISSU process restart, rolling AP upgrades, CLI patching, and AP service/device pack.
- Flexible network segmentation includes VXLAN.

Cisco Smart Licensing

Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure—you control what users can access. With Smart Licensing you get:

- **Easy activation:** Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more Product Activation Keys (PAKs).

- **Unified management:** My Cisco Entitlements provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.

- **License flexibility:** Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.

To use Smart Licensing, you must first set up a Smart Account on Cisco Software Central.

For a more detailed overview of Cisco licensing, go to cisco.com/go/licensingguide.

Conclusion

As we approach the deployment of Wi-Fi 6/6E and 5G, get ready to experience a sudden leap in wireless networking capabilities. Cisco is making it easy to refresh your wireless infrastructure to take advantage of everything Wi-Fi 6 has to offer and to go beyond the standards with additional capabilities.

Learn more about Cisco Wi-Fi 6 solutions and products and get started today.

Resources

5 Things to Know About Wi-Fi 6 and 5G

Cisco and Apple are tackling wireless together

Explore Cisco wireless LAN services

Learn more about Wi-Fi 6/6E

Printed in USA

C96-743491-09   10/22