Five Must Dos for a successful Wi-Fi 7 migration

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Alcatel·Lucent Enterprise

Overview

Introduced in 2013, Wi-Fi 5 (802.11ac) brought significant improvements to wireless networks across various sectors, including businesses, educational institutions, hospitals and transportation hubs. As technology advanced, the introduction of Wi-Fi 6 (802.11ax) and Wi-Fi 6E has offered even greater benefits, leading to quicker adoption rates. Now, Wi-Fi 7 (802.11be) promises to revolutionize wireless connectivity further with unprecedented speed, efficiency and capacity enhancements.

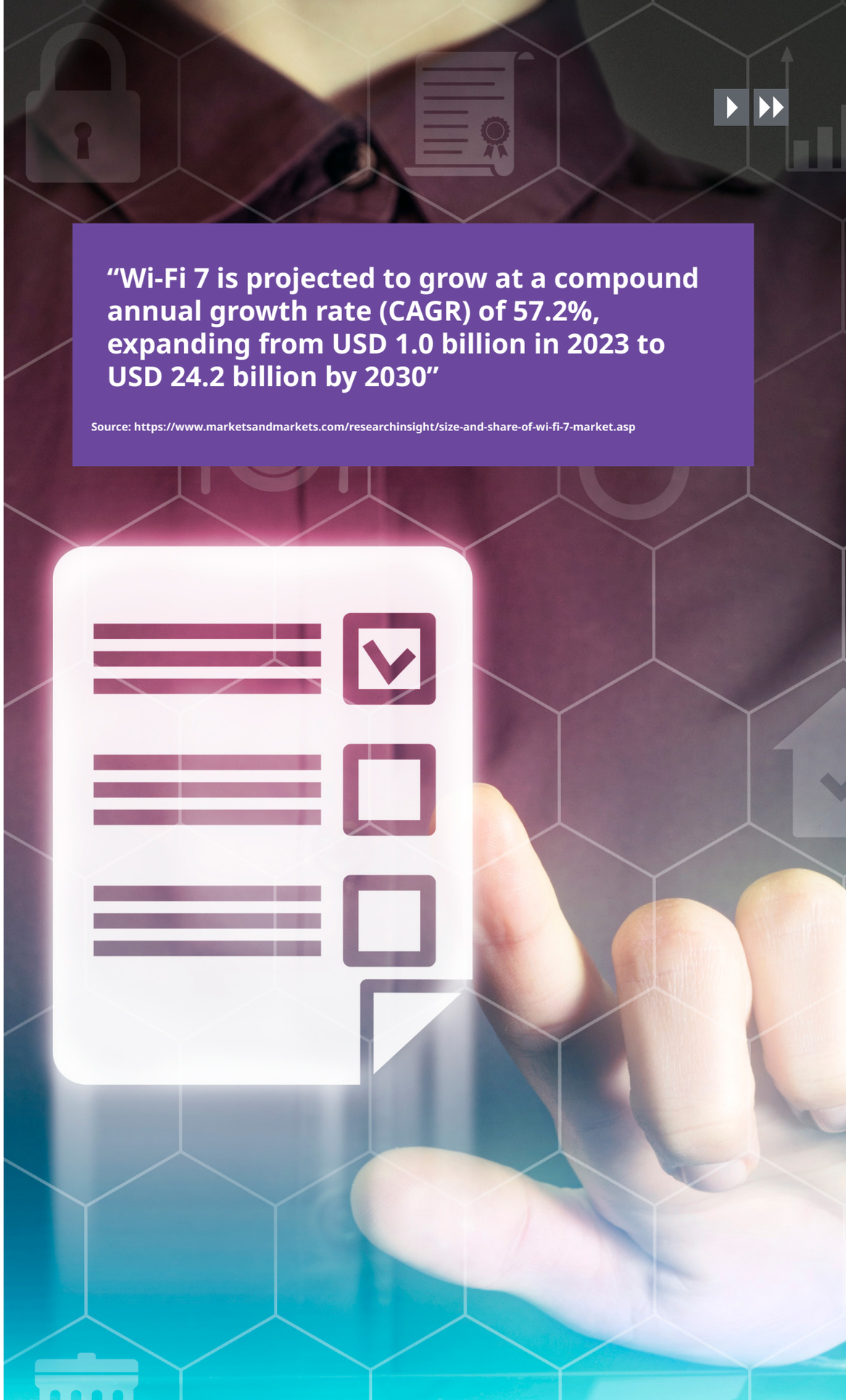
Wi-Fi 6 introduced features like BSS Coloring for improved network efficiency, OFDMA and MU-MIMO for better spatial stream usage and Target Wake Time (TWT) for extended device battery life. These advancements made Wi-Fi 6 ideal for environments with high device density and bandwidth-intensive applications.

Wi-Fi 6E extended these benefits to the 6GHz band, providing additional spectrum and reducing congestion. This is particularly beneficial in crowded environments like stadiums, campuses and airports.

Wi-Fi 7 is set to deliver a substantial leap in performance, with speeds up to 46 Gbps, Multi-Link Operation (MLO) for enhanced reliability and wider channel bandwidths. Features like 4096-QAM, 16x16 MU-MIMO, Preamble Puncturing and Automatic Frequency Coordination (AFC) are designed to meet the growing demands of IoT, AR/VR and ultra-high-definition streaming.

This combination of features provides all the essential elements to support bandwidth-hungry applications and clients in dense environments such as stadiums, college campuses, lecture halls, hotel lobbies, hospital waiting rooms, airports, train stations, conference centers and K-12 schools, as well as address enterprise business demands.

However, Wi-Fi 7 environments require more than just high-performance APs. All that wireless traffic must get dropped on a wire somewhere. So, the question is, how will you prepare your network to deliver exceptional performance?



Wi-Fi 6/6E vs. Wi-Fi 7: What's the difference?

Wi-Fi 6 introduced several key features to enhance wireless performance, such as Orthogonal Frequency-Division Multiple Access (OFDMA) for efficient bandwidth use, Target Wake Time (TWT) for reduced power consumption and extended battery life and improvements in speed, range, client capacity, outdoor coverage and security.

Wi-Fi 6E builds on Wi-Fi 6 by extending these features into the 6GHz band, offering up to 14 additional 80MHz channels or seven 160MHz channels. This added spectrum minimizes network overlap in dense areas and improves connectivity by eliminating legacy device interference. It also mandates Wi-Fi Protected Access 3 (WPA3), ensuring higher security for 6GHz traffic.

Wi-Fi 7 will further revolutionize wireless connectivity with speeds up to 46 Gbps, nearly five times faster than Wi-Fi 6E. It introduces Multi-Link Operation (MLO) for simultaneous use of multiple frequency bands, 4096-QAM for higher data rates and 16x16 MU-MIMO, doubling spatial stream capacity. Wi-Fi 7 also supports three 320MHz channels, doubling the capacity of Wi-Fi 6/6E and offers advanced features like Preamble Puncturing and Restricted Target Wake Time (r-TWT) for better spectrum use and battery life. Preamble Puncturing feature allows flexible spectrum use, ensuring transmission efficiency even in the presence of interference, while r-TWT improves battery optimization by better coordinating wake intervals, advancing the TWT feature from Wi-Fi 6.

Wi-Fi 7's enhanced bandwidth and capacity are critical for bandwidth-intensive, low-latency applications such as high-definition video streaming, virtual reality gaming, remote education and medical consultations.

Following are the five must dos that we believe can help you navigate deployment and ready your network for Wi-Fi 7 migration.

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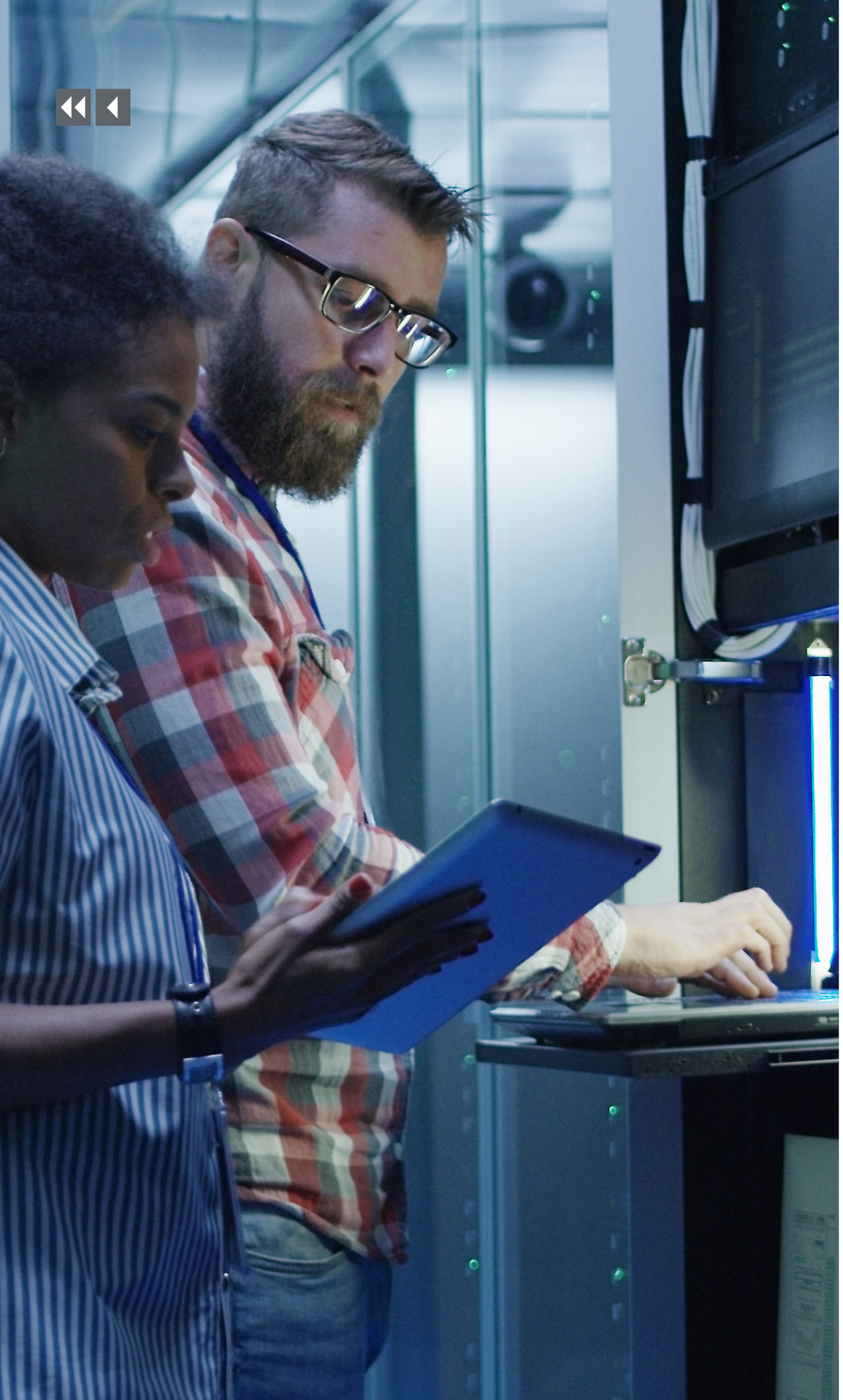

Five must dos

1 Conduct an edge switch inventory to ensure your switches support PoE+ and Multi-Gig

Wi-Fi 7 Access Points (APs) require more power to unleash their full potential. These APs have added more capabilities and are more feature-rich and they support 5 Gbps and 10 Gbps multigig uplinks, for which an additional power requirement is needed. Make sure your switches support 802.3at, Power over Ethernet + (PoE+) to deliver 30W per port, or even 802.3bt, Hi-PoE to deliver up to 100W per port, to ensure the Wi-Fi 7 APs are fully operational. If you have to install an access point on an 802.3af port, the AP will still work (in most cases), but at a reduced capacity. To fully benefit from supporting more spatial streams and higher speeds, it is recommended that PoE+ or Hi-PoE be available for the new APs. If you find your edge switching doesn't support PoE+ or Hi-PoE, it's a good time to replace your switches. The additional dense client support and additional bandwidth is best used when operating at full capability, per the PoE+ and Hi-PoE recommendation.

Because of the additional bandwidth capacity supported by Wi-Fi 7 APs, you need to ensure your network is free of any bottlenecks, especially at the edge switches that connect to the APs. Wi-Fi 7 APs support 802.3bz to provide 2.5 Gbps and 5 Gbps speeds, or 802.3an to provide 10 Gbps over Ethernet cabling. If your LAN connectivity is limited to 5 Gbps, you can use Cat5e cabling, but Cat6 cabling is mandatory when 10 Gbps connectivity is required. Therefore, you also need to check your cable infrastructure and update if necessary to ensure your APs and switches will perform correctly.

In addition to checking the edge switches and the Ethernet cabling installation, it is also necessary to identify any bottlenecks from the edge to the distribution switches and all the way to the core. It is recommended that edge switches have at least 10 Gbps uplinks to the distribution switches. However, if you need to purchase new switches, 25 Gbps, 40 Gbps or even 100 Gbps uplinks to the distribution layer are recommended. Shortest Path Bridging (SPB) is a great technology to consider for improving the performance and efficiency of both the distribution and core networks.

2 Deploy a distributed wireless architecture

With a distributed wireless architecture, you save money because a controller is not required, nor is the associated maintenance. Migrating your network to a standards-based architecture with Wi-Fi 7 distributed architecture access points can save time and money and improve efficiency.

However, the value of a distributed architecture is not only cost savings, but also knowing your APs are robust enough to make decisions about air-time fairness, band-steering, auto-channel selection and auto-power selection. A distributed wireless architecture also eliminates a single point of failure and improves scalability as well as data latency. There are no additional packets flowing through your network causing congestion or having to rely on a central controller to make all the wireless decisions.

Wi-Fi 7 APs are powerful enough to make adjustments as required and they offer rogue detection. And, with security at the forefront of our networks, it is important to make sure your Wi-Fi 7 APs have a dedicated radio for scanning the network.

3 Employ a unified network management system

Ensure you have a network management system that can manage your wired and wireless infrastructure through a single platform. Unified management is essential for operational efficiency and to reduce IT workloads. It allows you to have a common interface to:

- Configure and push policies to wired and wireless devices
- Avoid duplication of work
- Minimize inconsistencies
- Have a centrally located device inventory
- Receive network performance alerts, analytics and heat maps and real-time network status

4 Choose the right access points

In terms of AP selection, you need to figure out the best device for the job. Some things to consider include:

- Number of clients the AP will support
- What the clients will access over the WLAN, for example: specific applications, HTTP, HTTPS, video, voice
- Whether you need outdoor access points or only indoor

In addition, you should consider the following AP features:

- Capabilities including MLO, Multi-RU allocation, 320MHz channels, OFDMA, UL-DL-MU-MIMO, TWT and BSS Coloring
- Support for new, emergent applications with demanding requirements for high-bandwidth and low-latency, such as 8K Ultra-HD video, AR/VR, the metaverse and others, which will perform better in the 6GHz band
- A dedicated scanning radio for always-on threat monitoring and advanced analytics
- An AP model that you can standardize on that has both an internal antenna and external antenna for flexible deployment options. Take into consideration the 6GHz regulations in your region. In some countries, APs with external connectors for 6GHz are not allowed.
- Support for secure and simple IoT deployment
- Wi-Fi Alliance certification

The right APs should provide you with the flexibility to meet your WLAN objectives, whether you're a K-12 school district, college campus, hospital, government, transportation or a business.

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5 Conduct a wireless site survey

After identifying the access points you need, it's highly recommended to conduct a physical wireless survey, particularly in challenging environments like older buildings, school campuses and critical areas such as hospitals. This survey involves measuring the actual RSSI (Received Signal Strength Indicator) and SNR (Signal-to-Noise Ratio) of an AP to determine optimal mounting locations and ensure seamless roaming with a network design based on real data, not predictions. Additionally, it's crucial to check the radio-frequency regulations in your region. In some countries, the 6GHz band is restricted to indoor use with integrated antennas, while in most countries, outdoor use is limited to very low power or requires Automatic Frequency Coordination (AFC). AFC manages daily channel and power usage and near critical services, it may prevent 6GHz radios from being enabled.

Additional considerations when moving to Wi-Fi 7

Countries enabling 6GHz band

With connectivity demands growing steadily, many countries are making portions of the 6GHz band available for Wi-Fi. However, some countries and regions are more restrictive than others and organizations need to be aware of the status of the regulations in their region before starting a Wi-Fi 7 project[1].

- Countries including the US, Argentina, Brazil, Canada, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Peru, Saudi Arabia and South Korea, have already opened the entire 1200MHz of spectrum in the 6Ghz band (5925MHz to 7125MHz) for Wi-Fi 7, while other countries are still considering their options for adopting the full range of 6GHz spectrum.

Certified Wi-Fi 7 devices

Wi-Fi 7 certified products can fully utilize the advanced features of this standard, including access to the 6GHz band. Organizations planning Wi-Fi 7 deployments must consider the availability of certified APs and client devices. Wi-Fi 7 devices are just beginning to enter the market. Alcatel Lucent Enterprise will release its first Wi-Fi 7 indoor access points in Q3 and Q4 2024, followed by high-range and outdoor access points in 2025.

Managing 6GHz spectrum with AFC

In most countries, the 6GHz band is already used by incumbent mission-critical services such as public safety, cellular backhaul, satellite services and TV broadcast services. To ensure that 6GHz incumbents do not experience harmful interference from Wi-Fi systems, regulators have developed the Automated Frequency Coordination (AFC) system. This system manages spectrum usage requests for Standard Power APs, preventing interference with incumbent services in the 6GHz band.

Wi-Fi APs are categorized into two types based on their transmission power:

1. Low-power devices designed with limited transmission power. These include:
    - Low Power Indoor (LPI) APs, for indoor usage only. These devices cover typical indoor Wi-Fi installations, either enterprise-grade or residential.
    - Very Low Power (VLP) devices, which are portable and intended for personal wearables, usable both indoors and outdoors. This new category includes devices like virtual reality glasses connected to smartphones via Wi-Fi, which transmit larger amounts of data than Bluetooth.
2. Standard Power APs: Outdoor APs
    - AFC approval is required only for standard power devices, as these are more powerful and likely to cause interference. These APs have built-in GPS to report their geographical location and antenna type to the AFC system. The AFC system checks the available spectrum, ensures compliance with regulatory restrictions and identifies the best channels for the AP to use. It also calculates the maximum allowed power levels for safe operation and sends this information back to the AP.

In the US, the FCC has conditionally approved seven AFC system operators: Qualcomm, Broadcom, Federated Wireless, Sony, Comsearch, Wi-Fi Alliance and Wireless Broadband Alliance.

The Alcatel-Lucent OmniVista® 2500 Network Management System coordinates with AFC providers through the ALE AFC Proxy to exchange information and prevent interference. This integration ensures smooth operation and compliance with regulatory requirements.

[1]Check the up-to-date list of countries enabling 6Ghz band, published by the Wi-Fi Alliance®.

Summary

The key to success with most new technologies, including Wi-Fi 7, is implementing it in the timeframe that makes sense for your organization. We hope this step-by-step guide provides you with the information you need to install a robust, secure, adaptive, high-performing Wi-Fi 7-enabled network.

ALE offers both indoor and outdoor Alcatel-Lucent OmniAccess® Stellar Wi-Fi 6/6E and Wi-Fi 7 Access Points based on a distributed intelligence architecture, which can be managed on premises with Alcatel-Lucent OmniVista®2500 Network Management System or in the cloud with Alcatel-Lucent OmniVista Cirrus Network Management as a Service.

OmniVista is a unique platform to manage, provision and monitor all the network infrastructure including Alcatel-Lucent OmniSwitches, OmniAccess Stellar APs, UPAM NAC (Network Access Control) and all other value-added services. It sets a new IT experience standard with simple and powerful network management capabilities. The solution can scale and adapt to business requirements and offers advanced network visibility and control in order to make smart and faster decisions.

If you would like to speak to an ALE representative, please contact us.

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