Wi-Fi 6 and Cabling Requirements

By DIGISOL Systems Limited

This documents discusses backbone cabling system and also how usage of fiber in backbone has revolutionized the data transmission in current age.

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Introduction

Technology is advancing and Wi-Fi is about to get faster. Current technologies demand for faster internet. As we use applications that consume data and demand higher bandwidths the need for Wi-Fi 6 is growing.

In the past, Wi-Fi access points, routers, and other devices were identified by letters and numbers, such as “802.11ac” or “a/b/g/n”, that corresponded to a specific IEEE 802.11 wireless Standard. In 2018, the Wi-Fi Alliance re-branded and simplified Wi-Fi references as follows

- Wi-Fi 1: 802.11b (1999) – 11 Mbps
- Wi-Fi 2: 802.11a (1999) – 54 Mbps
- Wi-Fi 3: 802.11g (2003) – 450 Mbps
- Wi-Fi 4: 802.11n (2009) – 800 Mbps
- Wi-Fi 5: 802.11ac (2014) – 1.3 Gbps
- Wi-Fi 6: 802.11ax (2019) – 5 Gbps and more

Wi-Fi 6, or 802.11ax is the newest version of the 802.11 standard for wireless network transmission. It has the capability to provide 9.6 Gbps of speed which is quite higher as compared to the 3.5 Gbps speed on Wi-Fi 5.

Wi-Fi 6 is a great improvement in wireless connection as more than speed it is about providing improved network connection for a bunch of connected devices. On an average homes have at least 8-9 Wi-Fi devices that include mobile devices, HD video and multimedia supporting devices etc. Various firms have predicted they will hit at least 60-90 devices connected via Wi-Fi on average within several years. with so many devices connected on your network , there is a lot of load on the routers, hence gadgets that demand higher speed have to compromise with slower network speeds hence the solution is Wi-Fi 6 that allows dozens of Wi-Fi devices to be connected on a single network.

As Wi-Fi becomes the primary choice to connect networks wireless LAN equipment will play an important role in minimizing bottlenecks and congestion, increasing capacity, and reducing latency. This also brings us to an important aspect of cabling that can support the bandwidth requirements.

Growth for Wi-Fi 6 solutions will be explosive; with IHS Markit™ estimating IEEE 802.11ax-enabled device shipments to reach 193 million units in 2021. Specifying products that are part of the Wi-Fi Alliance® Wi-Fi CERTIFIED 6™ program is a recommended way to ensure that wireless products meet IEEE 802.11ax standards for interoperability and security.

Wi-Fi 6 Transmission Speed

Wi-Fi 6 uses the technology of Radio transmission. It uses 4 or 8 bonded 20 MHz channels that support maximum throughput of 600.5 Mb/s and 1201 Mb/s, respectively. Wi-Fi 6 can accommodate up to eight antennas and their associated spatial streams providing a throughput of 9.61 Gbps.

On an average throughput in dense deployment environments is four times faster in Wi-Fi 6 than in Wi-Fi 5. Like Wi-Fi 5, Wi-Fi 6 wireless transmission utilizes the techniques of beamforming to concentrate signals and transmitting over multiple send and receive antennas to improve communication and minimize interference (often referred to as multiple input, multiple output or MIMO).

The signal associated with one transmit and one receive antenna is called a spatial stream and the ability to support multiple spatial streams is a feature of Wi-Fi 6 just like its predecessors Wi-Fi 4 and Wi-Fi 5.

OFDMA is a new feature with Wi-Fi 6 that gives your router the ability to serve multiple clients at once within a single channel. More specifically, OFDMA allows your router to divide whatever channel it's using to send its signals on the 2.4 or 5GHz frequency band into smaller frequency allocations called resource units, or RUs. Each one of these RUs give your router another avenue with which it ca transmit information, reducing latency.

Cabling Requirements

The key design strategies to ensure that the cabling system of an organization supports Wi-Fi 6 are as below:

1. Category 6A or higher performing horizontal cabling connecting each wireless access point (WAP) or router to facilitate connection of devices into a network with two ports or having greater than 5 Gb/s data rates.

2. Deploying two category 6A channels to access points is the only way to achieve multi-1 Gb/s link aggregation needed for immediate support of 1.3 Gb/s to 3.5 Gb/s 802.11ac Wave 1 and Wave 2 implementations, as well as multi-10 Gb/s link aggregation for future Wi-Fi 6 high-efficiency implementations.

3. Installing a minimum 25 Gb/s capable multimode optical fiber backbone to support increased Wi-Fi 5 and Wi-Fi 6 uplink capacity.

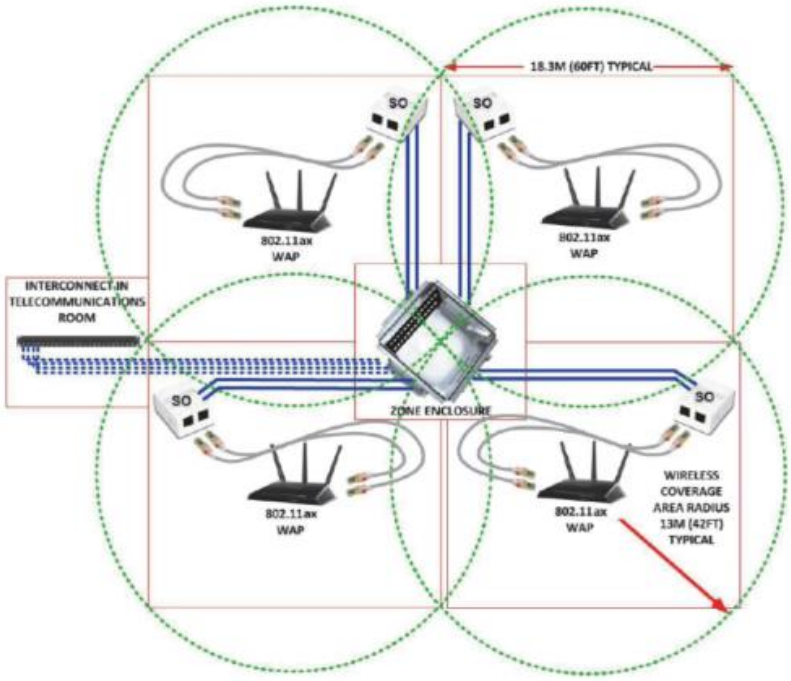
Using solid conductor cords, which exhibit better thermal stability and lower insertion loss than stranded conductor cords, for equipment connections in the ceiling or in plenum spaces where higher temperatures are likely to be encountered.

Most access points today are powered using PoE, and the more complex processing that occurs within a Wi-Fi 6 access points will require higher levels of PoE than we've seen for previous generations that primarily operated within the 30W of Type 2 PoE. Higher-end access points that aim to support both Wi-Fi 6 and Wi-Fi 6E may ultimately require 60 W Type 3 PoE.

Industry standards specifically recommend two Cat 6/class EA connections for wireless access points. If you're not planning to upgrade and are hoping to support the first wave of Wi-Fi 6 devices over existing Cat 5e or Cat 6, it's important to understand that not all existing Cat 5e and 6 cable plants will support 2.5/5GBASE-T to 100 meters, and they will need to be tested to ensure compliance.

To support usage of Wi-Fi 6 companies must work on upgrading their existing wireless access devices, client devices and the back end network and cabling infrastructure. To operate at a 5Ghz transmission band networks require relatively dense WAP coverage areas.

The service outlets, patch panels, and other connecting hardware used in the channel should comply with IEC 60512-99-0018 to ensure that critical contact seating surfaces are not damaged when plugs and jacks are unmated under Wi-Fi 6 remote powering current loads.



It is essential for organizations to design a Wi-Fi 6 supportive cabling infrastructure in a manner that it is not only robust in supporting the newer generation of Wi-Fi but also is backward compatible with Wi-Fi 5. Important thoughts around what kind of switches to use, server upgrades and supportive equipment must be considered to provide seamless network experience to users.

As 10BASE-T connections are available , it becomes crucial to provide enough spare port density at each wireless access point. This can be achieved by using category 6A zone cabling using service concentration points housed in zone enclosures. Zone cabling is highly flexible and enables rapid reconfiguration of coverage areas and conveniently provides additional capacity to accommodate next generation technology.

Conclusion

An evolution in technology forces consumers to stop and question legacy views about broadly deployed operating platforms or systems. The usage and success of Wi-Fi 6 depends on the architecture of each of the access points. From a cabling standpoint, CAT5 and CAT6, can be used to setup an efficient Wi-Fi 6 enabled infrastructure.

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