WIRELESS AV INSTALLATIONS TODAY AND INTO THE FUTURE

By Perry Sun

Among the predominant audiovisual (AV) trends over the past several years has been the wireless presentation of AV content from a smartphone, tablet, or laptop. Wireless AV is a natural extension of the mobile devices used in the daily lives of consumers. At home, consumers are accustomed to using Chromecast, Roku, or Apple TV to cast from their phones to their TVs.

Consequently, there is increasingly an expectation for the same capability in workplaces, schools, and other commercial settings. Wireless AV is part of the popularized practice of people bringing their own devices, also known as bring your own device (BYOD), into AV systems for presentation and collaboration.

As wireless AV installations are destined to grow, it is important to explore the use of wireless AV, its relevance in today's pro AV applications, and an overview of the many important considerations for successful integration into commercial installations.

WHERE WIRELESS AV IS COMMONLY USED

There is a wide range of environments where wireless AV may be in use. Wireless is frequently an appealing option for newer installations due to its simplicity. Presenters expect a wireless and cable-free connection from their mobile devices. The simplicity consists of a cost-friendly system of a wireless presentation device (i.e., a wireless presentation system or platform), a display, and the user preference for presenting—requiring the installation of only a single high-definition multimedia interface (HDMI) cable versus the many cables associated with legacy systems (Figure 1). Wireless AV can be incorporated into a legacy system by adding a wireless presentation device to a switcher or display.

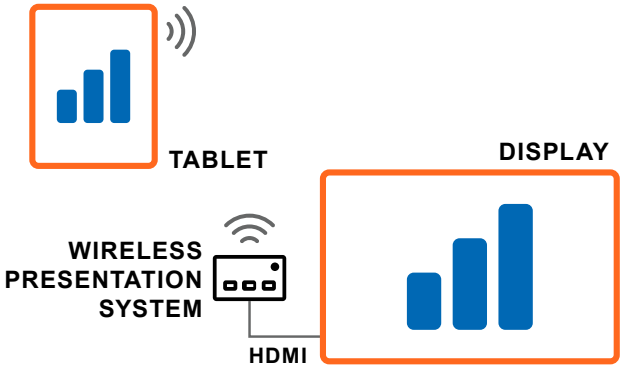

FIGURE 1: Due to its simplicity, wireless AV is an appealing option for newer installations.

Environments where wireless AV are commonly used include the following:

- *Open Gathering Areas for Ad Hoc Meetings and Collaboration*
  There is an emerging trend to provide open areas throughout workplaces and other facilities where small groups of colleagues or students can spontaneously gather to present and collaborate. Wireless AV is naturally an ideal option for integration, since no equipment will be visible to anyone.

- *Huddle Rooms*
  Wireless AV systems have been very popular in huddle rooms, especially before the COVID-19 pandemic. However, in the move beyond the pandemic, it is expected that many huddle rooms will be converted to offices, at least temporarily.

- *Conference Rooms and Large Meeting Spaces*
  In these settings, wireless is usually incorporated into a larger AV system anchored by a switcher or matrix switcher. Existing systems can easily be upgraded by adding a wireless presentation device, allowing facility owners to preserve their AV technology investments.

- *Classrooms and Other Instructional Settings*
  Wireless BYOD can facilitate class participation with one or more students sharing their content with everyone. A key benefit is that students can present right from their seats or desks rather than having to take turns getting up and connecting their laptops at a designated location.

WHY WIRELESS AV MATTERS TODAY

For workplaces and educational institutions, wireless AV can be beneficial in the context of the COVID-19 pandemic. It can be an important aspect of the overall solution to address challenges associated with the gradual transition of workers back to offices and students returning to classrooms.

Wireless BYOD can help minimize potentially unsanitary physical contact with equipment in the room, such as a touch panel or button keypad. Furthermore, the presenter would only need to interact with the mobile device in hand without needing to handle an AV cable.

There are ongoing efforts to reconfigure meeting rooms, classrooms, and open office areas to accommodate safe, distanced seating configurations. Such reconfigurations are likely to require some modification in existing AV system setups that may include repositioning or reallocating resources, such as displays. Wireless presentation devices can easily be brought in as needed to accommodate these needs and avoid running long cables that can be both an eyesore and an inconvenience.

In the future, wireless AV can continue to serve as an integral part of facility and technology planning, notably in the transition to permanent office and seating configurations that will be replacing the temporary measures implemented for the pandemic.

SOME CONSIDERATIONS FOR WIRELESS AV SYSTEM PLANNING

The following should be taken into account when preparing to specify AV systems with wireless capability for delivering video and audio.

- *Wireless Presentation Device*
  This can be a hardware appliance, an HDMI dongle (e.g., Google Chromecast), PC software, or even a display. Typically, professional integrators will prefer a hardware appliance designed for commercial AV applications due to a number of important reliability, security, integration, and presentation features not available in a consumer device such as an Apple TV.

- *Compatibility with Any Presentation Device*
  It should be expected that the wireless presentation system is able to accommodate whatever device a user may want to bring in, whether iPhone, iPad, Android, Chromebook, PC, or Mac. In other words, a wireless presentation system should be fully BYOD-friendly.

Wireless BYOD Connections

A wireless connection is possible through the following:

1. a USB dongle
2. a dedicated native app
3. the device's native wireless screen casting protocol (e.g., Apple AirPlay, Miracast for Windows, and Google Cast)
4. a web browser

A wireless presentation system may offer one or more of these interfacing options. Universal serial bus (USB) dongles allow quick and efficient connectivity for laptop users, but it can be expensive to replace if lost or damaged. Native apps are ideal when pre-authorizing devices for use in an organization but require installation and setup before a user can wirelessly share content. However, native apps allow for additional presentation or collaboration features that complement wireless casting.

Native screen mirroring offers the most straightforward approach to making a wireless AV connection since no prior setup is necessary beforehand, and it is ideal for both in-house and guest presenters. For laptop users, it is also possible to cast the screen from a browser with a web app or from the Chrome browser via Google Cast.

- *The Network Must be Reliable and Robust*
  Wireless presentation systems can be integrated into a LAN via Ethernet or Wi-Fi or operate as a standalone wireless network. The general expectation is that the network will reliably support multiple high definition (HD) video streams at a minimum 30 Hz frame rate. Wireless presentation systems can display up to four HD streams simultaneously on-screen and support additional streams placed in queue. Wireless 4K video streaming may also be possible in certain instances. Moreover, Wi-Fi 5 or IEEE 802.11ac networks can sufficiently accommodate multiple HD streams under good Wi-Fi signal conditions and coverage.

- *Consider Providing a Wired AV Input, "Just in Case"*
  Some professional wireless presentation systems include a video input, which can be HDMI or even HDBaseT (the global standard for the transmission of ultra-high-definition video and audio) for receiving AV from a remote location, such as a wall, table, lectern, or equipment rack. Having a wired input can be beneficial for laptop users preferring to use a cable, and it serves as a backup in the event of a problem establishing Wi-Fi connectivity.

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PROFESSIONAL AV FEATURES FOR WIRELESS SYSTEMS

There are several aspects of wireless presentation systems for commercial applications that clearly separate them from the variety of consumer screen casting solutions. As with conventional wired AV devices and systems, these distinguishing features are often essential for professional integration as well as for end users.

One such feature is the ability to display content from multiple presenters. Many products can show one or two mobile screens on a display, while others can show up to four wireless AV sources at the same time (Figure 2). The ability to have multiple participants simultaneously sharing their content on-screen can be a key advantage in education applications, while also enhancing collaboration sessions.

Moderator Mode

Together with multiple screen casting, some professional wireless presentation systems include a special mode that allows a designated moderator to control a presentation session when several people are participating. The moderator monitors the session through a web browser interface. The moderator mode works by placing newly connected presenters into a queue. The moderator then selects the presenters to be displayed on-screen with the rest remaining in queue. Throughout the course of the session, the moderator has the discretion to remove a presenter from display and add a new one from the queue.

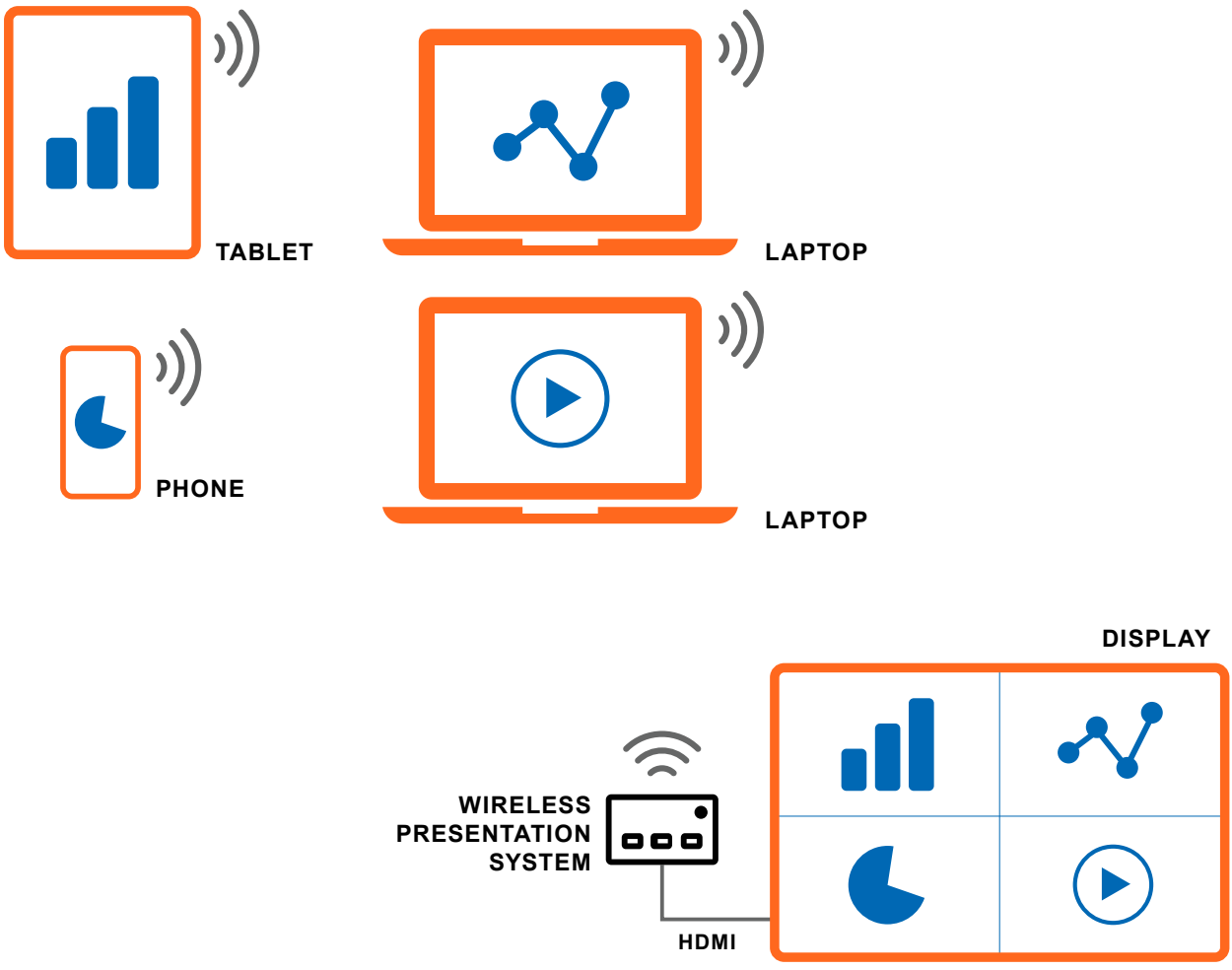

FIGURE 2: Wireless presentation systems can display content for up to four presenters.

Asset Management

An important feature of any AV system today is asset management, which is the ability to configure, monitor, and manage AV devices and system installations. There may be a multitude of wireless presentation systems throughout a facility, possibly even spanning multiple buildings across a campus. For this reason, it is essential to be able to service all these installations from a centralized portal, typically a web browser (Figure 3). Asset management allows streamlined setup and configuration of new products, device monitoring to ensure uptime, alerts whenever a problem is detected (e.g., usually a disconnection), and managing firmware updates. Many asset management systems also include help-desk functions to facilitate live technical support for end users.

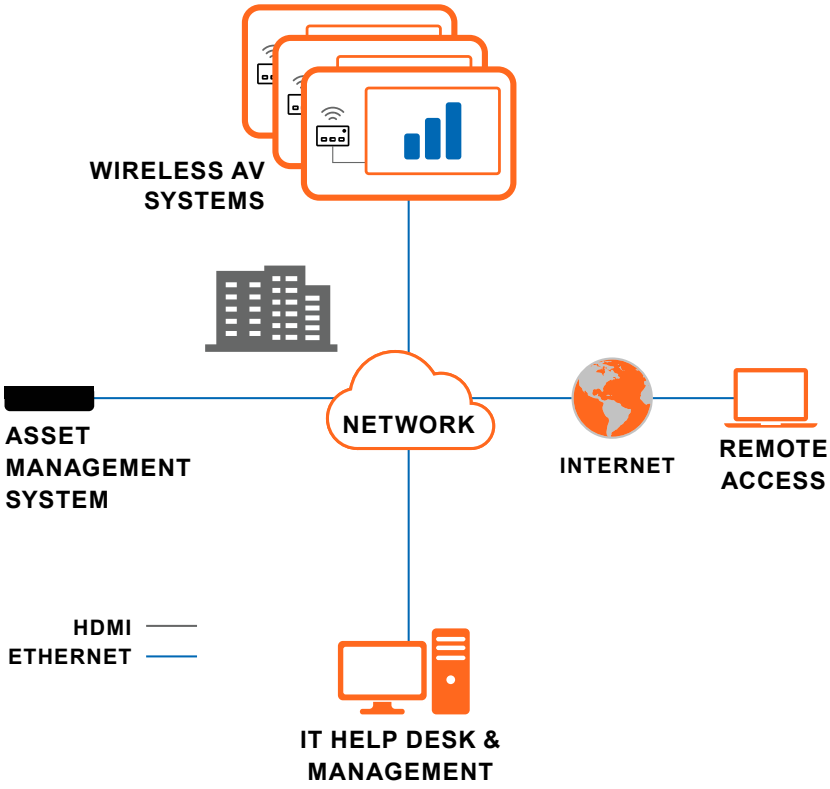

FIGURE 3: Asset management is essential for centrally managing wireless AV system installations throughout a facility.

Convenience Features

Other aspects of a commercial wireless AV system are intended to provide operational convenience for end users. More specifically, the system should be as effortless to engage as possible with presenters only having to interact with their own devices. A wireless presentation device may have the ability to automatically power up and shut down displays based on a preprogrammed schedule of designated times and days. Some can also work with an occupancy sensor to trigger display powering.

Operational convenience for end users also means not having to fiddle around with button controls or read through documentation. For this reason, a professionally-designed wireless presentation system will display a welcome screen that provides brief but intuitive instructions for a presenter to connect to the wireless presentation system—from logging onto the Wi-Fi network to initiating screen casting from the mobile device's operating system. The welcome screen may also display a PIN security access code (Figure 4).

The welcome screen usually can be customized with user-specified messaging and a static or motion background. It will always be visible to people first entering the room and displayed on-screen as the default whenever no one is actively sharing content to the screen. Additionally, some wireless presentation systems can display information from a room scheduling system.

FIGURE 4: Incoming presenters are greeted with a welcome screen and instructions for sharing content to the display.

SOFTWARE-BASED PLATFORM BRINGS ENHANCED PRESENTATION CAPABILITIES

Wireless presentation systems are built on software-based platforms. This enables development of a range of features beyond wireless screen casting that can enhance presentation and collaboration. Such features would otherwise be cost prohibitive or not be possible to bring into traditional wired AV products. A software-based platform also makes a wireless presentation device evergreen, providing the ability to incorporate future capabilities. The additional enhancement features further enhance return on investment (ROI) in a product that provides functionality well beyond wireless AV.

Some of the possible enhancement features in a wireless presentation system include the following:

- *Media Player*
  Wireless presentation systems are very popular in educational institutions. A key feature beneficial to instruction is playback of locally stored images and video serving as multimedia aids. Some systems can also play back content over the network or from an online platform, such as YouTube.

- *Live Online Streaming*
  Another feature ideal for education is the ability to stream live instruction over YouTube or another online platform for remote access by students in a distance learning class session. Live streaming can also be ideal for corporate and many other applications.

- *Local Streaming*
  A wireless presentation system receives video streams from mobile devices. Some can also deliver stream video over a local network to other wireless presentation devices or third-party decoders. This feature can be utilized in an overflow scenario with presentation content in the main venue delivered to an additional room for extra seating capacity. Video streaming is also applicable in an active classroom, sharing content between wireless presentation devices installed at student pods and the instructor's station.

- *Digital Signage*
  There are wireless presentation devices that can play content from third-party digital signage platforms. This feature can significantly enhance the ROI of wireless AV systems by allowing the devices to serve as display signage players when not actively in use for wireless BYOD applications.

Remote Collaboration

Wireless presentation systems may include software-based features that enable hybrid setups for collaboration between local attendees and virtual remote participants. One such feature is content sharing via remote access from a web browser. Another feature is wireless USB, which when combined with wireless AV, enables video conferencing for businesses and distance learning applications for educational institutions. Wireless USB transmission allows a mobile device to wirelessly access a USB peripheral, such as a camera or soundbar. However, with wireless AV plus USB transmissions, there may be performance and reliability issues associated with latency, network bandwidth limitations, and compatibility problems with some laptops.

Alternatively, a wireless presentation can be integrated with a wired AV system equipped for video conferencing (Figure 5).

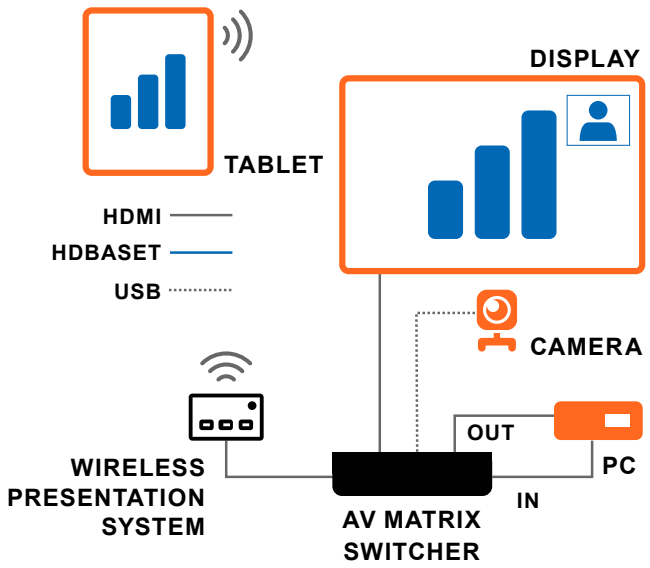

FIGURE 5: Wireless presentation can be combined with an AV system equipped for video conferencing.

This combines the wireless BYOD presentation capability with USB peripheral access for video conferencing applications. A PC with a USB video capture module allows a wireless BYOD source to be shared with near-end attendees in the room, and it can also be sent out to far-end participants in a video conferencing session.

NETWORK CONSIDERATIONS FOR WIRELESS AV

Network Security

Wireless presentation systems, as with most network-equipped pro AV products, can be accessed over internet protocol (IP) for setup, configuration, and management. The same general security practices apply, including the use of strong passwords, limiting network access to an authorized administrator, secure shell (SSH) for command line access, IEEE 802.1X for conditional network port-level access, and enforcing HTTPS or WebSocket/TLS for web-relevant traffic.

Professional wireless presentation systems are specially designed and equipped to enable a variety of network configurations to meet IT security policy. Figure 6 illustrates three of the most likely scenarios to be deployed in a commercial organization. The most restrictive would be just an Ethernet LAN connection to the wireless presentation device. Also possible is Ethernet and use of the device's built-in Wi-Fi to serve as a local wireless access point. Finally, the wireless presentation device can provide its own isolated Wi-Fi network with no connection to the facility's LAN.

It is worth noting that as an alternative to wireless AV, the Miracast protocol includes a special Ethernet mode that allows wired AV transmission over the LAN from an Ethernet-connected laptop.

For additional network security measures, a wireless presentation system should include a configurable firewall, which can be used to restrict incoming and outgoing network traffic. This can be individually set for the Ethernet and Wi-Fi network interfaces. Additionally, the firewall can be set to keep Ethernet network traffic separate from the internal Wi-Fi network.

Another consideration for network security is ensuring wireless AV transmissions are encrypted in order to be sure data cannot be accessed while being transmitted from a mobile device. Encryption with AES-128 is usually a requirement for native OS wireless transmission protocols, such as AirPlay. Over Wi-Fi, WPA2-PSK should be employed to ensure Wi-Fi signals are encrypted as well.

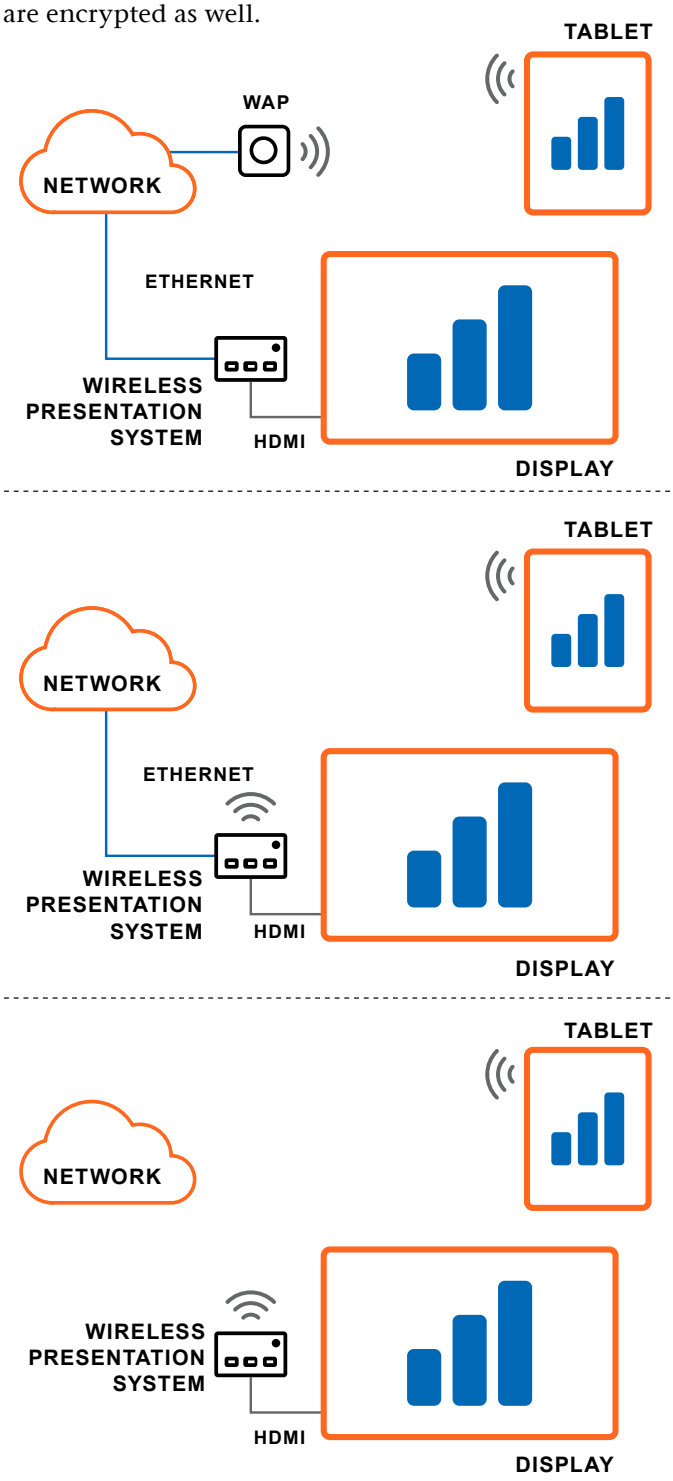

FIGURE 6: A wireless presentation system allows a variety of network configurations to meet IT security requirements.

For wireless BYOD presenters, the AirPlay and Miracast protocols allow for a mandatory PIN access code to be entered by the user before screen casting can begin. The PIN code is randomly generated and can be displayed on-screen, visible only to people in the room. For additional security, the PIN can expire after a period of time and then be auto-generated again.

Infrastructure

Robust and reliable Wi-Fi signal coverage will be essential wherever wireless presentation systems are to be installed. As previously stated, IEEE 802.11ac or Wi-Fi 5, the predominant wireless networking standard, is capable of accommodating multiple HD video streams under good Wi-Fi coverage and signal conditions.

Furthermore, Wi-Fi 6 and Wi-Fi 6E are expected to predominate over the coming years, and wireless presentation devices may be upgradable by replacing their Wi-Fi adapter modules. Facilities with Category 6A cabling will benefit from the ability to swap out for new wireless access points. Wi-Fi 6 and Wi-Fi 6E are expected to allow reliable transmission of multiple 4K video streams, as well as USB data for applications, such as video conferencing.

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For more detailed and comprehensive information about AV standards and installation best practices, it is highly recommended to refer to BICSI's *Telecommunications Distribution Methods Manual (TDMM),* 14th Edition.

CONCLUSION

Wireless AV is widely anticipated to be in strong demand for the foreseeable future, both immediately post-COVID and beyond. In the short to medium-term, there is going to be the need for a simple and cost-effective AV solution for open areas and reconfigured office and meeting spaces as workers return. Wireless can also help minimize physical contact with common surfaces.

Despite the growing popularity of wireless, wired AV systems will continue to be essential for complex signal distribution requirements in larger pro AV installations, especially those spanning rooms, floors, and entire facilities. Additionally, wired AV will be essential in supporting the continual evolution in video technologies, including the march toward 8k higher resolutions.

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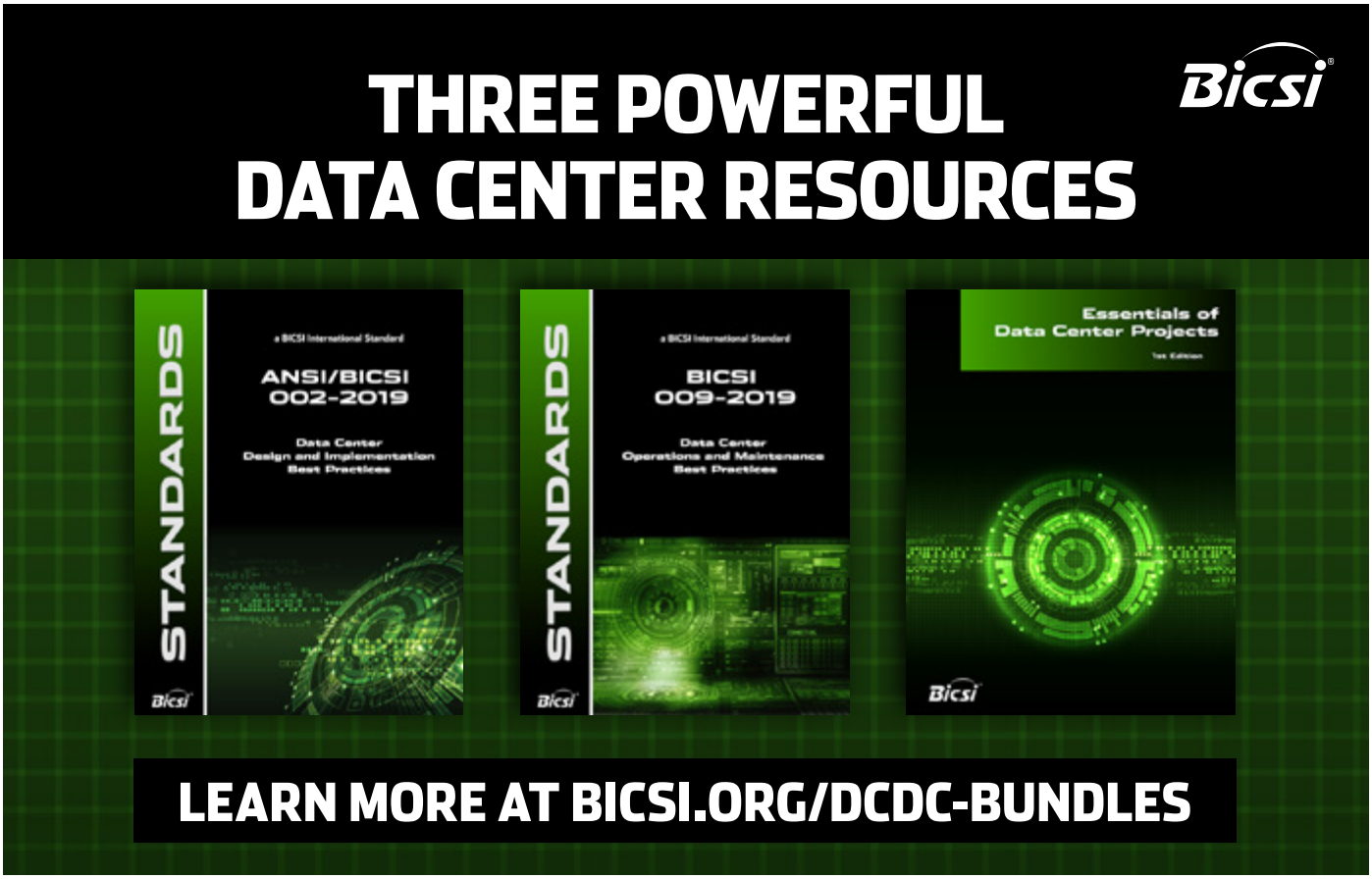
At Atlona, he has played and continues to play a key role in the launch of the company's AV over IP, USB video conferencing, wireless AV, and IP-based AV control product lines. As a former managing editor for Widescreen Review, he authored in-depth articles focusing on cinema and audio technologies. Perry can be reached via email at perry.sun@atlona.com.