Wireless Technology Overview

Wireless technologies have become the desired connectivity for many users in places as diverse as corporate offices to schools, due to the flexible placement of audio/video equipment and ease of installation. As a result of the increasing demand for wireless technologies to support multiple signal types, a number of wireless technologies are now available. With so many options, it is sometimes difficult to determine the appropriate solution for a particular application. Each technology offers certain advantages and unique limitations that must be assessed in order to determine the appropriate solution.

802.11n (WiFi)

The standard 802.11n, also known as WiFi or Wireless N, has been widely popular for wireless networking and has set the bar for users’ expectations with other wireless technologies. Although WiFi works great for networking, it does have some limitations when considering it for use with audio/video signals.

WiFi technology has the advantage of reaching great distances. Typically, users can expect a range of up to 100ft maximum. In addition to excellent range, WiFi has been very successful with computer networking because it is not dependent upon line of sight between the transmitter and computer. This means that the access point can be placed in a single location of a building and provide signal coverage to multiple rooms. Users with wireless Internet available at home or their place of work are most likely using an access point that uses 802.11n technology.

On the other hand, WiFi has several limitations that affect its performance with regard to audio/video signals. 802.11n has a limited bandwidth rate of about 3Gbps in ideal conditions, with results typically around 450Mbps or less considering range and structural interference. The low bandwidth of this technology can limit features and quality of digital signals such as HDMI. To allow HDMI to be distributed over 802.11n technology, both video and audio are compressed. This means that some of the data is removed to reduce its overall size. When information is removed, the quality is affected, resulting in less than optimal video that you see on a display.

In order to keep the quality intact, some 802.11n solutions will “buffer” the audio and video information. In this case the signal is delayed to the source, as the wireless device stores enough information in advance to compensate for signal loss. The process of buffering can cause undesired effects in real-time applications such as a classroom environment, when the instructor needs to navigate the desktop. The delay from buffering will result in poor timing from when a user moves the mouse cursor, until the actual movement is observed on the screen.

Since WiFi can cover multiple rooms and floors of a building, there is the potential for interference when used in environments with multiple access points. For example, in a school environment where several access points may be installed, interference between the signals can crowd the frequency band. This ultimately leads to complications such as signal interference, which can disrupt a teacher’s lesson plan.

The limitations of 802.11n technology does not make it an ideal solution for computer applications in classroom due to the delay caused by buffering; however it may be beneficial for audio/video equipment such as DVD and Blu-ray players.

UWB

Ultra Wideband or UWB was recently introduced into the computer and audio/video markets as a wireless solution. UWB has the advantage of achieving a fast data rate of 480Mbps. This makes it ideal for low bandwidth signal distribution such as VGA connectivity. Unlike 802.11n technology, UWB does not require buffering of incoming data, which makes it a great solution for real-time applications such as transmitting a slide presentation from computer to display, or sharing non-graphic intensive documents and materials.
However, UWB is limited in range and lacks the ability to penetrate walls or floors. Most wireless solutions using this technology require that the source device and display be located no more than 30ft apart and be located within the same room. While this is ideal for use in classrooms, it is not designed for users who want to share information from room to room or at great distances.

Because UWB operates in a frequency range of 3.1GHz to 4.8GHz, it will not interfere with WiFi used for networking. Also, most UWB devices utilize a PIN association between the transmitter and receivers. This means that multiple UWB devices can be used in the same proximity and will not interfere with each other. This provides added security and streamlined operation where multiple wireless devices may be used in the same area or close to each other.

**60GHz**

60GHz is a fairly new wireless technology that is backed by the WirelessHD Consortium and provides the best overall solution for wirelessly transmitting high definition audio/video. 60GHz has five times more spectrum available than other available wireless technologies, and offers data transmission rates higher than other technologies.

The WirelessHD specification has the ability to achieve up to 28 Gbps. This means it has the ability to transmit high definition audio/video from DVDs, Blu-rays or gaming systems without compressing the data. Further, it supports 1080p. The line of sight limitation differs from that of UWB. Testing has shown that the signal transfer will occur up to 75ft in room line of sight and 30ft with an interrupted line of sight. Because of the band in which it operates it is immune from WiFi devices, microwave ovens and cordless phones.

### Summary of Wireless Technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>Range</th>
<th>Frequency</th>
<th>Bandwidth</th>
<th>Best Application</th>
<th>Requires Line of Sight?</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11n (WiFi)</td>
<td>100ft</td>
<td>5.8Ghz</td>
<td>450Mbps</td>
<td>Computer Networking</td>
<td>No</td>
</tr>
<tr>
<td>UWB</td>
<td>30ft</td>
<td>3.1-4.8Ghz</td>
<td>480Mbps</td>
<td>Computer VGA and HDMI</td>
<td>Yes</td>
</tr>
<tr>
<td>WirelessHD</td>
<td>30ft</td>
<td>57-64Ghz</td>
<td>4Gbps</td>
<td>DVD and Blu-ray Players</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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