

Hearing HotSpot™ Network Guide

FOR CONSULTANTS AND IT PROFESSIONALS



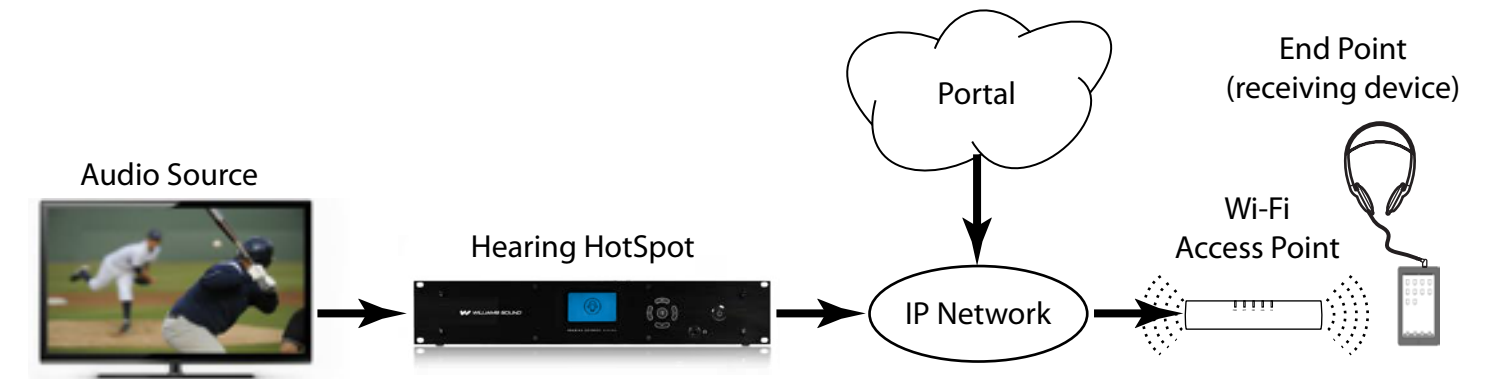
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Description

A typical Hearing HotSpot system consists of the following segments: Audio Source, Hearing HotSpot Server, IP Network (including Wi-Fi), and receiving device (end point).

Hearing HotSpot receives live audio from sources such as TVs, cable receivers, satellite receivers, broadcast, microphones, sound systems, etc. Hearing HotSpot Server then encodes the audio onto an IP Network for the purpose of distribution through the Wi-Fi network to smartphones and tablets.



Audio Segment

Audio is taken from the source (TV's, Cable, Satellite, Live, Sound Systems, etc.) and brought into the Hearing HotSpot Server via Analog or Dante. The Hearing HotSpot server encodes and broadcasts the audio over the IP network.

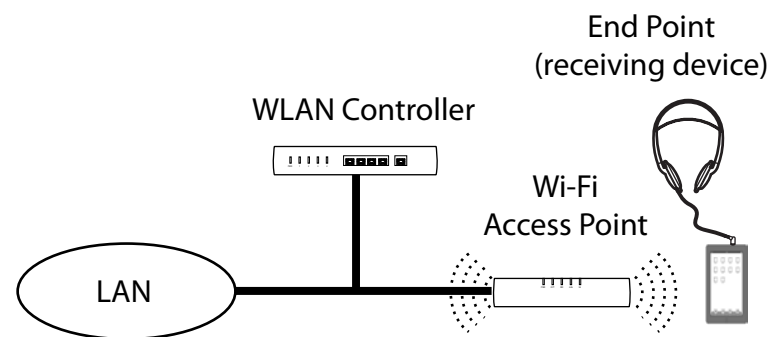


IP Network (Wired)

The network is an Ethernet network consisting of cabling, switches and routers. The Hearing HotSpot Server includes a built in router/switch.

Wi-Fi Network

The Wi-Fi Network consists of Wireless Local Area Network Controllers, (WLANC), and/or Wi-Fi Access Points, (APs). Enterprise level Wi-Fi APs are usually controlled by WLAN controllers. Ruckus Wireless Networks are preferred based on proven performance but other enterprise level Wi-Fi equipment may also work if properly configured for use with Hearing HotSpot. The Wi-Fi network also includes the end point devices, smart phones and tablets with the Hearing HotSpot App installed.



Audio Requirements

The analog models of the Hearing HotSpot Server accept balanced or unbalanced audio via terminal block connectors and is optionally either stereo or monaural. The server has expansion cards of 8 channel monaural/4 channel stereo and can hold up to 4 cards per server for a maximum of 32 analog channels per server.

There is also a Dante version of the Hearing HotSpot Server with 32-channel capability. On the Dante model, Ethernet port #3 is configured as a Dante port, accepting up to 32 streams of Dante audio.

Network Requirements

The Hearing HotSpot Server can be provided to work on an existing network or can be supplied with Ruckus access point/s and controller as a complete independent system. The Ruckus components have proven to give optimal results both for audio transmission and Wi-Fi coverage. The Hearing HotSpot Server and the access point/s along with a Wi-Fi controller, if necessary, are pre-configured for proper IP addressing and network processing. The WAN port needs to be connected to a local network or ISP that will provide Internet access for the Hearing HotSpot Server. Note: The Hearing HotSpot Server uses the Internet to retrieve content updates, software updates and licensing information. The system does not broadcast audio over the internet.

Standard Hearing HotSpot System

The Hearing HotSpot System can be used in small venues as a standalone system. It is comprised of a Hearing HotSpot Server and a Ruckus access point with Power of Ethernet (PoE) injector.

The Hearing HotSpot Server has its own router/switch built in. The Server has four Ethernet jacks on the rear. One of these jacks is the WAN port and is configured to receive a DHCP address from the local LAN or ISP to provide the Server and the Hearing HotSpot LAN with internet access. On the analog models, two of the other ports are configured as Hearing HotSpot LAN ports and the PoE injector will be connected to one of these ports. (On the Dante model port #3 is configured and reserved for Dante audio and may not be used for a LAN connection). The access point will be connected to the PoE injector. The Server and access point are devices on the Hearing HotSpot LAN. The Server has a static IP address of 192.168.128.2 and the access point has a static IP address of 192.168.128.3. The built in router/switch then assigns connected end points, (Wi-Fi connected devices), with IP address via DHCP server.

The Standard Hearing HotSpot System can also be configured for multiple access points for more Wi-Fi coverage. A Ruckus Zone Controller, WLAN Controller, will be added to the system to accommodate multiple access points.

Augmenting an Existing Network

A Standard Hearing HotSpot System can also be used to augment an existing system. Simply, this is connecting a standalone Wi-Fi network to another LAN. The Hearing HotSpot System would work and be configured normally but the WAN port would connect to an existing LAN. Wi-Fi interference with existing Wi-Fi would need to be considered and evaluated.

If a Hearing HotSpot System is to be used on an existing Network

The Hearing HotSpot Server can purchased without Wi-Fi components for the purpose of connecting to an existing network.

The network must pass Multicast traffic from the Hearing HotSpot Server to the APs. The APs must be able to deliver directed multicast to multiple end points simultaneously.

End points must be able to communicate with the server. The simplest approach is to have the Hearing HotSpot Server and the end points on the same subnet. This can be accomplished in smaller venues with smaller networks easily.

Likewise, the endpoints must not be isolated from the server. In a guest Wi-Fi environment it is usual to have the SSID connections "isolated" from the LAN. The Wi-Fi connections will need to have access to the Hearing HotSpot Server and vice versa. This can be accomplished either by creating acceptable routes from the Wi-Fi to the Hearing HotSpot server or by making the SSID non isolated from the LAN that the Hearing HotSpot Server is located on.

Access points are critical to optimal performance of the Hearing HotSpot user experience. There must be adequate Wi-Fi coverage to accommodate the space where users are expected to utilizing the Hearing HotSpot App. Signal strength should be kept strong in all areas required, no less than -60 dBm. User density must also be considered as different access points will allow different amounts of maximum client connections. The Wi-Fi network must be able to accommodate all users within the space with adequate bandwidth. Besides coverage area, signal strength is also impacted a great deal by frequency and co-channel interference. Interference mitigation is critical. Also, channel hopping by the access points can cause quick audio interruptions. It is preferable to use manually configured and stationary channels within the Wi-Fi network. APs and the network switches must be able to handle many multicast connections, many systems are defaulted to only a single or a few connections.

Keep in mind, encryption uses bandwidth and reduces the number of successful connections in a Wi-Fi environment and must be taken into account. Also, using the 5 GHz band only may improve performance due to less network interference but this will also eliminate devices that are only capable of utilizing the 2.4 GHz band or devices unable to recognize the higher channel frequencies within the 5 GHz band.

If making a Hearing HotSpot Server part of an existing network the Hearing HotSpot Server should be configured with a static IP address accommodated on the existing network. When purchasing the Hearing HotSpot Server this IP address should be stipulated so the Server can be configured from the factory. The Hearing HotSpot Server can be configured to receive a DHCP address from a DHCP server on the existing network but it NOT recommended. DHCP address change from time to time and the Hearing HotSpot Server needs to maintain a consistent address to function properly.

Environment

Since the Hearing Hotspot system uses Wi-Fi as it's medium for transmission, care should be taken to minimize obstructions between the access point and user devices. The more numerous or significant the obstructions, the less consistent the performance will be. Placement of the access point(s) and having enough coverage (adding additional access points) needs to be evaluated and designed into the system.

It is strongly recommended to have the site evaluation and wi-fi equipment configuration developed and implemented by a professional wi-fi implementation company.

Details

The end point, (Hearing HotSpot App), discovers if there is a Hearing HotSpot Server on the network by sending join request on multicast address 239.192.0.11. The multicast group range starting at 239.192.0.8 must be kept available and allowed on the network.

The Hearing HotSpot Server then accepts the connection of the end point.

When the Hearing HotSpot App selects a channel the server begins to stream the audio on that channel to the device. The access point should be configured for directed multicast or multicast to unicast conversion. Refer to the AP/Wi-Fi manufacturer's documentation.

The network should support: IGMP, IGMP Snooping, Multicast, and Multicast Direct.

The network and SSID should also be configured for Voice or Premium QOS, (or other priority QOS depending on Manufacturer). The Hearing HotSpot uses similar settings as most VOIP configurations.

Hearing HotSpot Internal Router - Factory Configuration

The router in the Hearing HotSpot (HH) is configured to accept a DHCP address on the WAN port (the WAN is the port connected to local LAN or ISP to get on the internet). The router is configured to be a DHCP server on the HH network. It is capable of /24 notation network, (class C), and can handle 254 address. The configuration reserves .1 to .6 for static addresses, and .0 and .255 are also reserved for the network. If more are needed then the built in DHCP server needs to be disabled, and a DHCP server added to the network (a network should only have 1 DHCP server).

If connecting the HH to an existing network, a different Ethernet interface to the HH would be required, and the existing network would have its own DHCP server.

Specifications

Router	Ports	HTTP Port 80 used for the HHS Server to contact the Licensing Server
Operating System	End Point (receiving device)	Apple iOS 6.0 or newer Android 4.2 or newer Blackberry/Windows currently not supported
Bandwidth	Initial App Connect ⁱ	Skin (custom background) typical = 282 Kb per device Banner typical = 217 Kb per device
	Extra Content Delivery ⁱⁱ	Coupon typical = 217 Kb per coupon per device first access PDF typical = 1141 Kb per PDF per device first access
	Audio	Wired Bandwidth = 8.4 Kbs/S per configured channel ⁱⁱⁱ Wi-Fi Bandwidth = 11.6 Kbs/S per connected channel ^{iv}

ⁱ After connecting to the Hearing HotSpot SSID, when the Hearing HotSpot App is launched there is an initial connection that will download "background" and "banner" content to the device. This initial connection happens once per device per session.

ⁱⁱ The Hearing HotSpot server holds extra content in the form of PDFs and coupon graphics. This content is accessed via the Hearing HotSpot App menu button. This extra content is downloaded to the device upon selecting the content from the menu in the App. Example: From the menu if a PDF is selected to view, that is when the PDF will be downloaded to the device.

ⁱⁱⁱ The number of configured channels is the number of channels selected from the Audio Streaming Applet within the server. This can be different from the authorized number of channels per the license agreement. Example: If the license is authorized for 16 channels the server can be configured to use any number 16 or less, i.e. 8 at any particular time. Only the number of configured channels will show in the Hearing HotSpot App.

^{iv} Connected channels are any channel that has at least one device actively playing the channel, (joined to the Multicast Group). It does not matter how many devices are joined to a particular channel, it is connected if one or many devices are joined.

Example: Typical Cisco network equipment settings

Besides the basic network requirements described up to this point, here is an example of typical Cisco settings.

Configuration WLC

Wireless > Media Stream > General > Multicast Direct: enable

WLANs > [select WLAN] > QoS Tab > Multicast Direct: Enabled

WLANs > [select WLAN] > QoS Tab > Quality of Service: platinum

Streams groups can be created: Wireless > Media Stream > Streams

Notes:

Following settings do not work with certain, (special), android builds.

WLANs > Security Tab: Fast Transition: checked

WLANs > Security Tab: Auth: FT PSK

Possible settings:

Controller > Multicast > Enable Global Multicast Mode = selected

Controller > Multicast > Enable IGMP Snooping = selected

Multicast groups: (these groups must be available)

239.192.0.8 – 239.192.0.254



A Division of Williams AV

info@williamssound.com / www.williamssound.com
800-843-3544 / INTL: +1-952-943-2252

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