

Audio Point

Distribution of:

- Digital Signage audio to customer smartphones in step with video playback
- Announcements to subscribed customers

HowTo v1.2

Components:

Barix Instreamer	V 4.03 or later
Audio Signage app iOS	V 1.2
Audio Signage app Android	V 1.3
Wireless Access Point	
Released	2015

Revision Table

Date	Version	Who	Change
07/11/14	1.0	DAG	First version
20/2/15	1.1	DAG	Updated to app v1.3 features
26/11/15	1.2	DAG	Minor correction: Instreamer version

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1 Introduction

1.1 About Audio Point and Audio Signage

Barix Audio Point is a system for superfast delivery of audio from digital signage players or other sources to listeners using their BYOD smartphones. Users experience the audio in sync with the action on the screen.

Audio Point is designed to give screens a voice in shops, airport lounges, gyms and anywhere else screens are found.

Audio Signage is the smartphone app that works with the Instreamer to reproduce the audio on the user's device.

Digital Signage has revolutionized how information is presented to customers; used for advertising and for informational purposes it is a great success, but Digital Signage is not perfect!

- With the screen volume turned up, DS competes with background audio in retail environments, or disturbs the calm in an airport lounge.
- With the volume off, or very low, the effectiveness of the signage is greatly reduced.

Audio Point enables customers to opt in, using their BYOD mobile to elect to listen, for example if an advert has caught their eye and they want to find out more, or to hear the breaking news commentary in the lounge.

The solution is based on a Barix Instreamer, that generates a low-latency audio stream for real-time streaming to consumers. Consumers inside a store, or looking at a window display can receive the audio on their Wi-Fi-enabled mobile devices.

The end-to-end architecture requires a Barix Instreamer for the audio signal, which sends high-quality, low-latency streams as a multicast transmission, streaming it direct to the user via a Wi-Fi access point. Consumers access the stream using the Audio Signage app.

1.2 Audio Point main features

- Low-latency, high-quality audio streams: contact Barix for information about setting up multiple, licenced channels. 'Off the shelf' a single channel is supported.
- Minimal infrastructure requirements at businesses
- Simple to set up and use
- Configure whether ads are shown for a channel
- Customer branding of the app
- Automatic recognition and dynamic listing of available channels
- QR code scan for channel selection
- API available to integrate Audio Point functionality within your own Apps

2 Audio Point system components

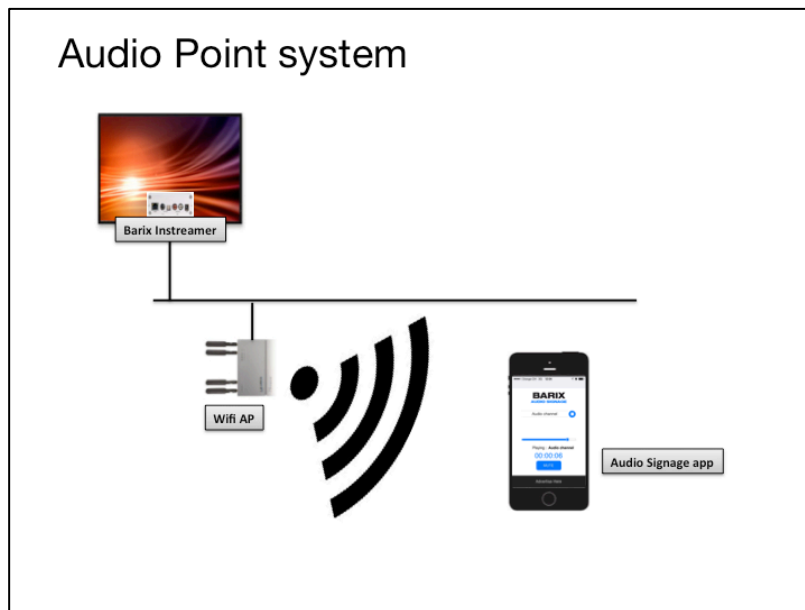


Figure 1 system diagram

2.1 Audio source

The audio source could be a digital signage player, information point ... anything with an analog audio output! The audio source signal is fed into a Barix Instreamer.

2.2 Barix Instreamer

The Instreamer takes an analog audio signal, digitizes it and sends it over the IP network as a multicast stream with very low delay (latency). The audio stream is referred to as a channel.

2.3 Wifi router/access point

Audio Point channels are distributed to listeners over a wifi network, as a multicast. The Instreamer and Access Point must be on the same network, which must support multicast routing. Configuration considerations of the router/access point are discussed in an appendix.

2.4 Audio Signage enabled smartphone

In order to listen to an Audio Point channel, the user needs a smartphone with an Audio Signage enabled app. The smartphone must be connected to the relevant network in order to get access to the audio.

Barix provides the "Audio Signage" app free of charge in Google Play and in the Apple App Store, which allows users to listen to the audio channel in an Audio Point installation.

When started, the app displays a flash screen, before displaying the available channel and giving the user the option to start playback.

2.5 Recommended smartphone OS versions

- iOS 7 and later
- Android 4.4.2 and later

3 Audio Point Installation Guide

Each Audio Point installation will differ, but the basics are the same in all cases:

- Ensure available network infrastructure, including wifi network
- Connect the Instreamer to audio source, network and power
- Configure the Instreamer
- Test the system using the Audio Signage app, fine tuning of audio levels

3.1 Connect up the Instreamer

The initial release of Audio Signage supports a single audio channel only. Connect an Instreamer to your desired analog audio source, to the network and power. If you are unsure how to do this, refer to the Instreamer’s Quick Install Guide.

3.2 Configure the Instreamer

Access the Instreamer UI, select “Configuration”, “Advanced Settings”, then set the parameters as shown:

- **Input Source:** Line Mono
- **Audio Format:** PCM / 24kHz 16bit mono little endian
- **Streaming Mode:** send always
- **Streaming Destination:**
 - **Connection Type:** RTP
 - **IP Address:** 224.9.9.99
 - **Port:** 4444

Then click “Apply” to save the changes; the device will reboot and then start sending a multicast audio stream to the default channel settings for the Audio Signage app.

The screenshot shows the 'INSTREAMER' configuration page with a navigation bar at the top containing 'HOME', 'CONFIGURATION', 'STATUS', 'DEFAULTS', 'UPDATE', and 'REBOOT'. The 'CONFIGURATION' tab is active. On the left, there are two tabs: 'Basic Settings' (selected) and 'Advanced Settings'. Below these are 'Apply' and 'Cancel' buttons. The main content area is titled 'BASIC SETTINGS' and is divided into three sections: 'AUDIO', 'STREAMING', and 'STREAMING DESTINATION'. Under 'AUDIO', 'Input Source' is set to 'Line mono' and 'Audio Format' is set to 'PCM / 24 kHz 16bit mono little endian'. Under 'STREAMING', 'Streaming Mode' is set to 'send always'. Under 'STREAMING DESTINATION', there is a table with three columns: 'Conn. type', 'Enter IP Address or Domain Name', and 'Port'. The 'Conn. type' is set to 'RTP', the IP address is '224.9.9.99', and the port is '4444'.

Conn. type	Enter IP Address or Domain Name	Port
RTP	224.9.9.99	4444

Access the Instreamer's Configuration web UI again, this time clicking on "Advanced Settings"; the network settings will be displayed:

- Set "Type of Service/DSCP" to 46; this will mark all packets sent by the Instreamer to be given priority by routers and APs that support ToS or DSCP.

Click on the "Apply" button again to save the change and restart the Instreamer with the new setting.

The screenshot shows the Instreamer Configuration web UI. At the top, there is a navigation bar with tabs: HOME, CONFIGURATION, STATUS, DEFAULTS, UPDATE, and REBOOT. Below the navigation bar, the title "INSTREAMER" is displayed. On the left side, there is a sidebar menu with the following items: Basic Settings, Advanced Settings (highlighted), Network, Audio, Streaming, I/O & Serial, Control & SNMP, and Security. Below the sidebar menu, there are two buttons: "Apply" and "Cancel". The main content area is titled "NETWORK SETTINGS" and contains the following configuration options:

- Use SonicIP[®]**: Yes No
- IP Address**: 0 . 0 . 0 . 0
- Netmask**: 0 . 0 . 0 . 0
- Gateway IP Address**: 0 . 0 . 0 . 0
- Primary DNS**: 0 . 0 . 0 . 0
- Alternative DNS**: 0 . 0 . 0 . 0
- DHCP Host Name**: [Text Input Field]
- Web Server Port**: 0
- Type of Service/DSCP**: 46

3.3 Check that all devices are operating

Once the system has been put together and configured, the last step is to verify that everything is working and to fine tune the Instreamer audio gain settings, depending upon the system performance.

By default the Audio Signage app v1.0 expects the audio channel to be sent by RTP multicast, address 224.9.9.99:4444

Once the Instreamer is set up, simply connect the phone to the correct wifi network, start the Audio Signage app and press 'play': the audio from the source connected to the Instreamer will start playing via the phone.

3.4 Adjusting audio channel volume

If the volume of the App playback is not ideal, or the audio is distorted because the Instreamer input is being overdriven, then it will be necessary to adjust the input audio gain on the Instreamer.

Access the Instreamer UI, select "Configuration", "Advanced Settings", "Audio", then adjust the "A/D Amplifier gain" appropriately.

4 Appendix: Wifi Considerations

4.1 wifi network points to consider:

- The Instreamer and wifi router / access point must be connected on the same subnet. Audio Point uses multicast to send the audio, best results will be achieved on a single subnet. Any network infrastructure must forward the multicast traffic / not block it.
- If possible, restrict the wifi to support of 802.11n or later versions. Use of earlier wifi technologies may cause performance issues.
- If the access point supports it, restrict support for lower data rates
- The network must support DHCP, to provide IP addresses to the smartphones.
- The encoding of a single channel needs circa 400kbps
- The audio is streamed and played with very low latency, therefore minimizing end-to-end network jitter is critical and must be reliably below 10ms. A jitter of above 20ms will cause artifacts in the audio stream.
- Access Point/Router models that provide simultaneous support for both 2.4 and 5GHz bands should be used, using the same SSID for convenience.
- Perform a wifi scan in the area that is to have the Audio Point listeners and identify the best channels to use for the Audio Point wifi network. As this can change over time, it is recommended to perform such a scan regularly to keep best performance.
- Most APs and routers have a country setting that is used to automatically ensure compliance to local wifi regulation; note that a generic “EU/Europe” setting can be less effective than setting the specific country as within the EU the regulations can vary.
- Use Band steering to direct more modern devices to the 5GHz channel
- QoS: the network audio stream from the Controller to the listener has a QoS value of ASCII 46 set at the packet level (High Priority / Expedited Forwarding). If the AP / Router supports QoS, then this should be configured.
- If the AP / Router supports it (e.g. Cisco commercial APs) configure audio (UDP unicast traffic) to have the highest priority.
- Limit the bandwidth used by the channels to 20MHz to limit the potential for interference.

4.2 Improving wifi performance

If the playback of the app suffers from audio breaks, this is typically due to either being out of range from the access point, or from a ‘congested’ wifi space. Scanning the environment using “Netstumbler” or “iStumbler” will show how congested the local airspace is. If there are many overlapping networks, then the access point will need to be configured appropriately – typically by selecting the least congested channel and limiting the ‘spread’ of their signal.

When trying to solve network issues, it can be useful to eliminate individual components from the investigation. The Instreamer can be replaced by using the `ffmpeg`¹ tool on a PC installed on the network. A suitable stream can be sent to the app as follows, simply substitute a valid name for “filename.mp3”

```
ffmpeg -re -i filename.mp3 -ac 1 -ar 24000 -acodec pcm_mulaw -f rtp rtp://224.9.9.99:4444
```

If playback from the app continues to suffer because of network congestion, the “frame-forwarder” tool can be used; contact Barix to find out more.

¹ `ffmpeg` can be downloaded from <https://www.ffmpeg.org/download.html>

5 Legal Information

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