# OUTSIDE BROADCAST – Audio Over IP (AoIP)

This is to provide a basic understanding of remote broadcasting using an internet connection. Audio over IP (AoIP) is not to be confused with Voice over IP (VoIP) services like Skype®. VoIP is designed specifically for voice and will only connect using a narrow audio bandwidth in mono whereas AoIP will convey a wider audio bandwidth and so providing a better hi-fidelity sound (in most cases in stereo).

When we connect to a remote, the analogue audio is converted to digital data and sent to the other end. This in turn is converted back to analogue audio. The conversion from analogue to digital, transferred through the internet and converted back to analogue causes delay (latency). And the more data (hi-fidelity stereo) is likely to take longer to convert and transfer and so there will always be a form of delay with all connections.

The conversion from analogue to digital and back to analogue audio is done by Codec's. There are different Codec's and some will convert audio faster than others. If you are computer savvy, you will know that a large audio WAV file will convert to a smaller MP3 file (with a slight drop in quality). Codec's will convert audio to a more manageable size (and different quality) and send it down-the-line. So some Codec's like OPUS are more favourable than others for outside broadcasting.

The equipment we use can vary. Put simply there is a basic mixer, a digital audio interface and some computer device that will convert and send the audio to the other end. There are some self-contained OB reporter units that will have everything built in – and can be very expensive. Alternatively it can be done much cheaper with some bits of kit.
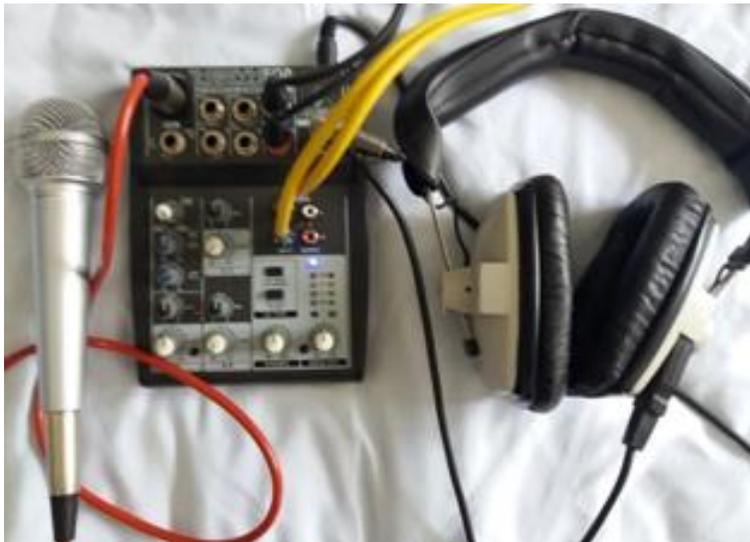
Pic: A simple Behringer Xenyx 502 mixer with mixer output going to external USB interface and the studio return going to "Tape monitor" input. The USB audio interface is then connected to a laptop.

In this example we have the following kit available using Cleanfeed®:

- A basic small mixer (Behringer Xenyx 502)
- A Behringer USB Audio interface (Behringer UCA202 –not pictured)
- A laptop with Google Chrome as default web browser (not pictured)

Our laptop has Google Chrome and a URL link to the studio using Cleanfeed®. Cleanfeed® is a web based AoIP service. As it uses Google Chrome (port 80 web browser) most firewalls will allow connecting without any blocking issues.

As the laptop soundcard is very basic and normally doesn't allow line level inputs, we shall use the Behringer USB Audio interface. This connects our mixer to the laptop. Some small mixers may have a USB interface built in like the Behringer Q802 USB mixer pictured below.

Pic: A Behringer Q802USB with built in USB audio interface which will connect directly to the laptop

So connecting up....................

1. Connect USB audio interface to mixer and laptop. Try to ensure there is a Mix-Minus or cleanfeed between the mixer and the audio interface. You don't want the studio audio sent back down the line to the studio! So ideally the mixer output is connected to the USB audio interface line in and the USB audio interface line out is connected to the "tape monitor" input on the mixer.
2. Set up your microphones and headphones as usual.
3. Boot up the laptop and click on your Cleanfeed® link to open Google Chrome and connect to the studio.
4. Click on the cog wheel and ensure the default audio in/out is set to the USB audio device.
5. *To hear the studio at the same time as your headsets, you could use the FX/AUX Send to the studio and have the studio return on an ordinary line in channel – just remember NOT to FX/AUX send the studio back to the studio! More about this below.........

A note about mix-minus/cleanfeed

It is imperative that the studio and the remote end provide a cleanfeed of each other's audio. This will prevent audio being re-broadcast around and around and around…..

The studio connection should already have a cleanfeed audio connection. This means that the studio will send all audio with the exception of the remote. You need to do the same with the remote mixer.

This will depend on the remote mixer. The audio sent from the remote mixer must not include the studio audio – so we could use the "tape monitor" input to monitor the studio audio. This isn't ideal as we may lose the ability to hear ourselves when the "tape monitor" button is depressed.

What we could do is have the studio audio from the USB interface input on a normal line channel of the mixer. We then send our Mic channels via an FX/AUX send back to the studio end (via the USB interface), but not the studio return channel. This will allow the headsets to hear the mixer along with the studio return. The studio should only get what is being sent via the FX/AUX audio bus. The remote end can also hear any "talkback" from the studio without it being broadcast live on air – handy if doing sports commentary.

Four wire method/Four circuit method

The very old style of outside broadcasting on the telephone network was done by "four-wire". This would produce two-way audio in quality. The studio received the remote audio but could also talk back to the remote end.

Complex outside broadcasts may require four audio circuits. Our four audio circuits (also known as Programme and Control Line circuits):

- REVERSE PROGRAM -Studio cleanfeed audio sent to the remote. This may be used to feed a PA system so the audience can hear the station output. Local audio would be mixed in to prevent hearing delay.
- CUE/TALKBACK - Studio cleanfeed broken with talkback to presenter's headphones.
- PROGRAM - Remote audio sent to the studio.
- REVERSE CUE/OPEN TALKBACK - Remote talkback giving the ability for the remote producer/engineer to talk privately to the studio.

This would allow the studio to receive the remote audio and also send the station output to the remote end for the audience via a PA system (mixed locally with the remote audio due to OB latency).

The remote end would send audio to the studio but have the ability to hear talkback from the studio which wouldn't be broadcast on-air (or to the remote audience).

This would be useful for complex large outside broadcasts but would require a lot more OB kit.

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