

AES67 and Axia iQx

Improving Audio Latency

15 May 2019, Cleveland Ohio, USA

Introduction

This document is written for iQx configurations that have noticeable echoes or delays in the headphones when talking into a microphone. An important characteristic to remember about the iQx is that it's primarily an AES67 console using the AES67 standard. While Livewire+ is AES67 compliant, AES67 uses a different style of clocking from Livewire. There are some adjustments to the configuration of the audio interfaces and the console system, as well as software updates, that can improve the latency of audio over the network. This document is intended to provide understanding and guide the user through the steps to improvement.

xNode Software and PTP clocking

As mentioned, an AES67 network requires a different clocking mechanism than Livewire. It is known as PTP and scientifically, as IEEE 1588. In the xNode, we use both of these names to ensure that there isn't any confusion. You will need to have a source of PTP on your network, if you already have xNodes providing Livewire clocking on the AoIP network, you won't need any additional hardware to implement the PTP clock master. However, you'll need to be sure to download and run xNode version 2.2.2 (or newer) before proceeding.

This software can be found here: <https://www.telosalliance.com/Axia/xNodes>

This version of xNode has the ability to generate a PTP clock and Livewire clock simultaneously and provide it to the rest of the network. This version of xNode can also slave to either a Livewire or a PTP clock. This is to preserve the function of any equipment operating in a native Livewire environment. Unlike Livewire clocking, PTP clocking can be separated into what is called "Domains." This way multiple PTP sync clocks can be present on the network. The domain can be set from domain 0 (default) up to domain 127. It's important to understand this and to understand that all devices are set to the same domain. Generally speaking, if the option to change the domain does not exist, you should assume it's using domain 0.

Let it also be noted that the master xNode (Livewire or PTP) should **not** be connected to an edge switch, but should have a home run to the central (core) Ethernet switch.

Configure a PTP Clock Master

Clock Mode: Once the 2.2.2 or higher software has been installed and is running on the xNode, you will need to log into the xNode’s Synchronization and QoS page of the web GUI and behold the changes. You’ll notice some new items in the Clock Mode dropdown list. The new items in the list all pertain to PTP/IEEE 1588 clocking discussed here. To establish a PTP master and to maintain Livewire clock master, set this xNode to **PTP/IEEE 1588 ARB clock class 248 + Livewire Primary master**.

If there is already a PTP master on the network and if this xNode is handling AES67 audio, you’ll want to set the xNode to **PTP/IEEE 1588 slave only**.

For Livewire master where there is no AES67 streams involved, the rules established throughout the course of Axia’s life-span apply and do not fit the scope of this paper.

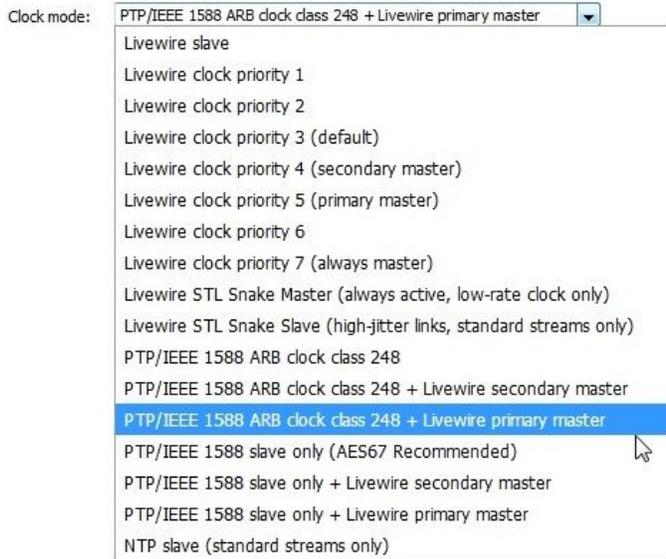
PTP Domain Number: The next thing to do is to select a domain for the PTP clock. In AES67, there are 128 domains to which clocking can be assigned. This allows for multiple PTP clocks to be present on the same network. Domain 0 is the default, but this is where you configure a domain if it’s not 0. This setting is also found in the iQx’s SYNCHRONIZATION page.

All other settings in the xNode’s Synchronization section of this page can be left to default settings.

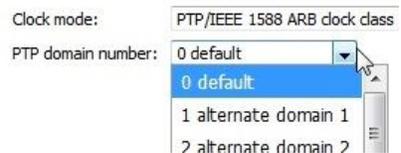
AES67 Link Offset: This setting controls an audio packet offset. The units are in milliseconds and the default is “3.” To further decrease latency, this can be set to “2.” Don’t forget to apply your changes.

Notes about NTP: The NTP Server field in the SYSTEM page and the NTP SLAVE clock mode in the synchronization section are for Fraunhofer labs’ use only. This reference to NTP does not mean the xNode shall know what time it is. This doesn’t exist in the xNode. This is used for syncing clocking within the xNode. This is currently not supported and there are currently no instances of this

Synchronization:



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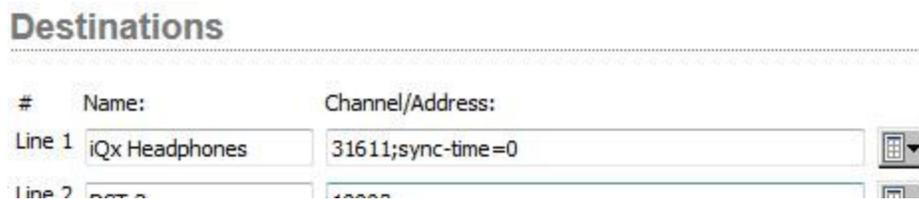
AES67 / Standard Audio Streams:

AES67 Link Offset [ms]: (2 - 20; default 3)

operating in the field. External clock syncing is best done with a 3rd-party GPS based PTP grand-master clock.

More xNode Tweaks

In addition to tuning up the PTP clock, there is another time base adjustment that isn't exposed to the user but can be adjusted by entering a special command into the destination channel field in the xNode. First, navigate to the xNode's DESTINATIONS page. For all the streams that are coming into the xNode's destinations via AES67, add the following suffix to the channel number: `;sync-time=0`. In this example, the headphone feed from the iQx is at channel 31611 and it's located at destination 1. So we enter, `"31611;sync-time=0"`:



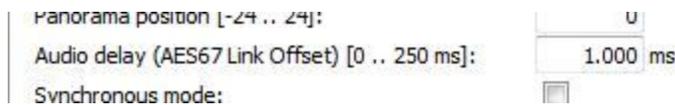
Remember to do this for any of the destinations that are receiving a stream from an AES67 device.

iQx Source Audio Delay Setting

In addition to xNode updates and adjustments, you'll want to make sure the iQx software is up to date. Remember to reboot after updating. Find the latest version on our website here:

<https://www.telosalliance.com/Axia/iqx-aoip-broadcast-audio-console>

Then go to a source profile in the iQx's web GUI. Here you will find an item called **Audio delay (AES67 Link Offset)**. The units are in thousandths of a millisecond with a range of 0-250ms. This setting performs a double purpose. It can be used to delay audio playout to align with video and can be used to adjust buffer. It defaults to a value of 1.000ms. With a high-performance network and a source device that has tight timing (as from an xNode), this default may be reduced to a minimum of 0.0ms. If the network is somewhat jittery, and the setting of 0ms causes audio clicks or pops, the next setting to try is 0.25ms. And so on, up to higher numbers adding back buffering and latency.



iQx: Checking for good SYNC

An important thing to keep an eye on is the status of clock sync. The SYNCHRONIZATION page in the iQx's GUI gives you a status indication. We want to see **SYNC** in green.