Optimizing Windows for AoIP

For Microsoft Windows versions 7 through 11

Audio over IP (AoIP) is the transportation of digital audio via local or wide area networks using the Internet Protocol. Due to the very nature of ethernet, there are numerous obstacles to the efficient transport of audio (and video) over networks. This guide will help you optimize Windows machines that use the Wheatnet AoIP driver to play and record audio without the need for messy audio cables and bulky sound cards that won't even fit in many modern small-footprint computers.

First, let's agree that no amount of optimization of the Windows OS will overcome issues that arise from ethernet switches that aren't configured properly or just aren't up to the task of network audio. Wheatstone recommends Cisco core switches and edge switches for your AoIP network. These have been tested in Wheatstone's lab and found to be suitable for transporting network audio when properly configured.

Below are the current recommendations for Cisco ethernet switch settings. Of considerable importance are the settings related to the Internet Group Management Protocol (IGMP). IGMP manages the multicast streams which are the heart of network audio, and the recommended settings ensure that these streams go only to the devices that need them. If all the streams went to every device, even the gigabit NICs that we recommend for all computers and that are used on our I/O blades would be flooded with too much IP data and would drop packets, resulting in pops, clicks and/or dropouts in the audio.

Recommended Ethernet Switch Settings

IGMP Snooping Querier Config
ip igmp snooping querier
ip igmp snooping querier max-response-time 25
ip igmp snooping querier timer expiry 205

Access ports look like this (OS version prior to 15.0):
switchport mode access
switchport nonegotiate
switchport block multicast
spanning-tree portfast
no ip igmp snooping tcn flood

Trunk ports look like this (OS version prior to 15.0):
switchport trunk encapsulation dot1q (Only core switches)
switchport mode trunk
switchport nonegotiate
switchport block multicast
no ip igmp snooping tcn flood

Access ports look like this (OS version after 15.0):
switchport mode access
switchport nonegotiate
spanning-tree portfast
no ip igmp snooping tcn flood

Trunk ports look like this (OS version after 15.0):
switchport trunk encapsulation dot1q (Only core switches)
switchport mode trunk
switchport nonegotiate
no ip igmp snooping tcn flood

Our Blade-3 manual includes all of this information and recommends the Cisco 3650 or 3850 model switches to be used for the core stack, and the 2960 for edge switches. (Edge switches are the ones you place in your studios which then connect back to the core stack via "trunk" ports.)

The switches recommended in the Blade-3 manual have, as of the date of this document, been assigned end-of-life status by Cisco and have been replaced by the Cisco 9000 series (core stack) and 1000 series (Edge). These are the currently recommended switches (see Blade-4 manual) and are the ones Wheatstone will use and pre-configure for you if you purchase your switches from us along with your system.

A word about Wheatstone Blade and Surface NICs

Wheatstone's I/O Blades include Gigabit network interfaces. This allows each Blade to receive and transmit the many multicast audio streams, as well as meter and control packets, needed to operate an efficient AoIP system. Because your ethernet switches use IGMP snooping, each Blade will receive only the streams that it has "subscribed" to. A system can have thousands of audio streams, and with the default .25ms packet timing, that's about 4,000 UDP packets per second per audio stream. So you can see how important it is to limit the streams to those needed by the Blade rather than just letting every stream go to every destination in the system.

Our surfaces, for the most part, have 10/100 NICs. But since they are primarily control surfaces, the only audio streams they need are for the built-in headphone jack and the cue speakers. Everything else the surface needs is in the form of control and meter data. However, if IGMP snooping isn't enabled on your

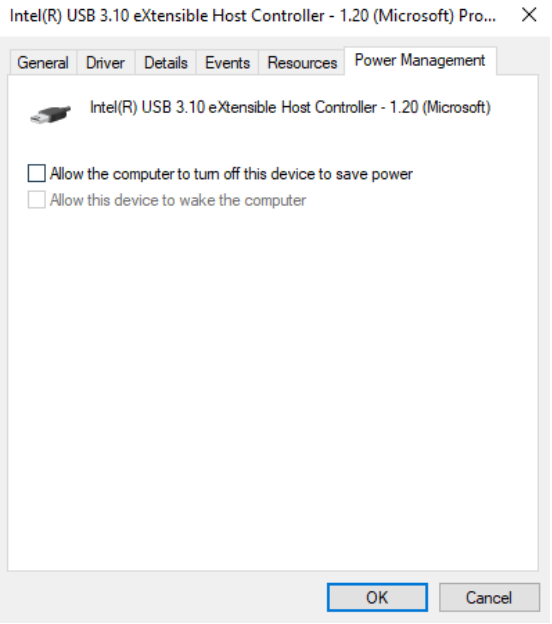
core switch, the port that the surface is plugged into will be flooded with multicast packets and will almost certainly result in problems such as sluggish controls and meters, possible distortion in your headphone and cue audio and maybe even crashing of the surface itself.

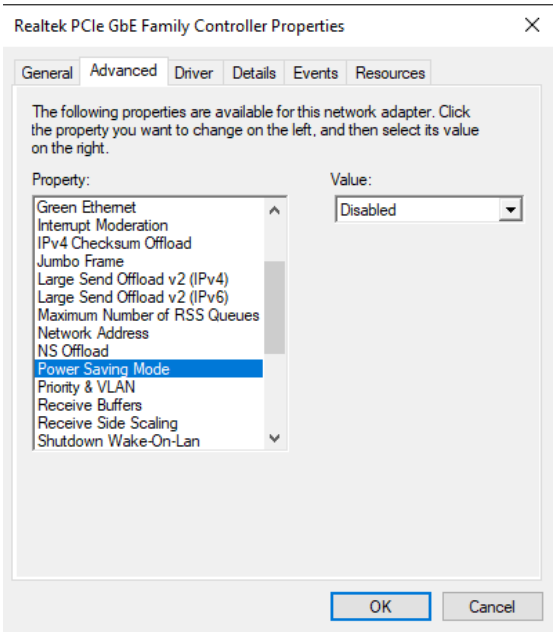
WNIP Audio Driver for Windows

When installing the WNIP AoIP driver on a Windows machine, there are numerous “tweaks” that need to be made in order for the AoIP packets to be transmitted and received without loss. Many of these result from Microsoft’s efforts to “save energy” and others result from an attempt to increase security and minimize the possibility of attacks on Windows systems.

Since the computers that you use for streaming network audio are critical systems, we will need to defeat the “power saving” features, and since these computers are usually either not connected directly to the internet or are protected by a hardware firewall, we can defeat those Windows security features that have a direct negative impact on audio performance. It’s up to you to ensure the security of your network and that’s outside the purview of Wheatstone, but none of the tweaks that we suggest will put a properly-secured network at risk.

In particular, you should embark on a search-and-destroy mission for all power-saving features of Windows that apply to either USB root hubs/host controllers or network interfaces.





Check everything in Device Manager for such settings. More detailed information on these settings is in the WNIP Driver Install Guide (see the end of this document).

Windows Defender Firewall

We recommend disabling the Windows Defender Firewall as it blocks many of the ports used by the Wheatstone AoIP system by default. If you cannot disable the firewall, you will need to enter rules to allow inbound traffic on the following UDP ports (no need to change anything on the outbound side):

Ports used by Wheatnet System
23000 Telnet to Play Service
33333 Voxpro UDP Control Messages
50000 GUI Connect
50100 Metronome Multicast Stream
51000 Web/XML Multicast Stream
51003 New License Server
52000 Announce Channel Multicast Stream
52002 Meter Multicast Stream
55776 Automation Control Interface
60000 Surface Channel

Alternatively, you can follow the instructions in the WNIP Driver Install Guide (included at the end of this document) for setting the WNIP NIC to Private and then unbind the firewall from the NIC used for the Wheatstone network.

Anti-Virus Software

Wheatstone also recommends disabling any virus-protection software on the machine. Even if you "whitelist" all of our programs and network traffic, future updates to the virus definitions can cause an abrupt halt to your audio which, of course, will happen at the most inopportune time. If you can't disable it, whitelist all of the various programs used by your Wheatstone network.

Installing a WNIP Driver

When installing a WNIP driver on a computer for the first time, please follow the instructions in the document titled *WNIP Driver Install Guide*. This guide is included at the end of this document as Appendix 1.

The settings included in the Install Guide are critical to a robust, efficient and artifact-free AoIP system.

Network Interface Card (NIC) tweaks

Many of the tweaks listed here require administrative rights so it's best to just log on as an administrator when performing these adjustments. You may still be asked by Windows to "approve" certain changes but if you are logged on as an admin you won't need to enter your credentials each time.

The NIC is the heart of the AoIP system. It is responsible for sending and receiving audio packets and has a number of settings that, if not optimized for network audio, can disrupt your programming. Microsoft has a habit of changing settings for you (they are trying to "help" you) when updates are applied to your system so even though you go through this document carefully and tweak every setting, it's possible you may have to do this again. And again. So keep this document handy.

With the use of multi-core CPUs several new Property Settings are available for Network Interface Cards (NICs) used to stream audio with a WheatNet-IP network. When properly set, these will improve NIC performance with streaming audio.

For Win7, we recommended setting the NIC binding priority so the WNIP NIC always got top priority, but this capability was eliminated in Win10. One can, by manually setting the NIC Metric to 5, somewhat reinstate this behavior.

The NIC Metric and other new settings are made in the Ethernet Adapter Options window. Press the Windows key & x and Network Connections or open the Windows Settings and select the Network & Internet panel to get that window. Click on Ethernet and in that window select the Related Setting: Change Adapter Options which then lists all your network adapters. Right click on the adapter connected to your WNIP Network and select **Properties**.

To set the NIC Metric, select **Internet Protocol Version 4** and select **Properties**. In the window that opens, select **Advanced**, then uncheck Automatic metric and enter **5** into the Interface metric: entry box. 5 is the most appropriate setting for gigabit network links according to Microsoft's documentation.

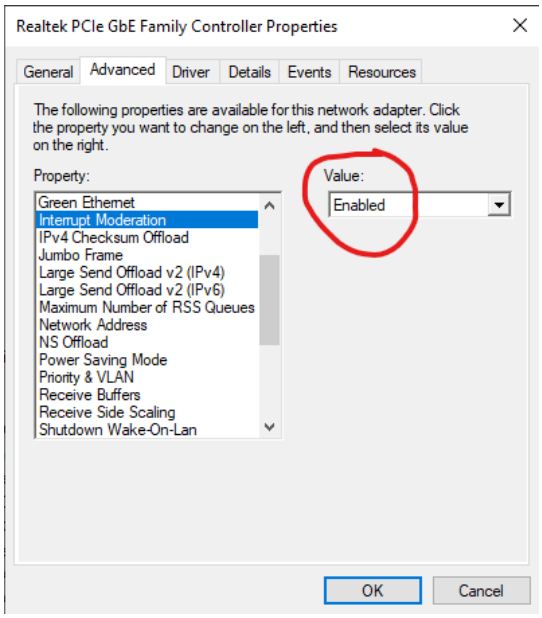
To set the new Properties, click **Configure** (shown at right). In the window that opens, select the **Advanced** tab, which is shown below right. If not all four settings are listed, select the **Driver** tab, and select **Update Driver** to see if there is a newer driver available. **Note**: Verify the Driver Provider is the NIC's OEM and not Microsoft since the OEM driver will result in better NIC performance.

Interrupt Moderation

Click to highlight the property *Interrupt Moderation* and set the Value to **Enabled**.

Interrupt Moderation Rate

Click to highlight the property *Interrupt Moderation Rate* and set its Value to **Adaptive**.



Maximum Number of RSS Queues

Highlight the Property *Maximum Number of RSS Queues* and set this Value to equal the number of CPU cores in the PC. For example, if the PC is an i7 with four physical cores, select **4 Queues**. But in no case should you select a queue number higher than the actual number of cores in the PC or else your performance will suffer.

Receive Side Scaling

Highlight the property *Receive Side Scaling* and set the Value to **Enabled**.

Important Notes:

If any of these Properties are not listed, even with an updated NIC driver, that NIC may not be appropriate for use with streaming audio although you may see some improvement by adjusting the Properties which are available.

PCs with a single core will not support a 24-channel audio driver, whereas a modern i7 quad-core PC will be expected to only have about 30% utilization even with 24 active receive channels.

The PC's built-in Ethernet adapter, included on many Intel motherboards, typically supports at least 2 RSS Queues. Server-grade NICs, such as the Intel 82576 dual NIC PCIe card, can support 8 or more queues. **Wheatstone recommends a server-grade NIC for best performance.**

It must be emphasized that the RSS Queues number should never exceed the number of physical cores. The core number advertised for some PCs include hyper-threaded cores. It's the number of actual physical cores which is the only number that matters when it comes to the RSS Queues setting.

After changing your adapter settings, the PC must be rebooted or the WheatNet IP Transport service must be stopped and restarted.

SMB Multi-Channel

The latest Windows enhancement that has been found, in some cases, to negatively impact AoIP performance is SMB-Multichannel. This is actually an enhancement to the SMB networking protocol, which provides file and print services for computers across multiple platforms.

With the release of SMB 3.0, SMB Multichannel has been turned on by default in Windows server products. The feature has been available (and enabled) on the client side since Windows 8, but it does nothing if there are no connections to a server that implements the feature.

This feature allows for multiple network adapters to participate in file copies in order to speed up transfers. If a client has multiple NICs and there is a route available then both NICs can participate in file transfer with multiple TCP connections, thus getting the file from server to client or vice versa more quickly with a higher apparent throughput than is normally available on the network.

If any computer or other device in your WNIP network has a "leg" in another network such as your office network or a playout system (Wide Orbit, Enco, AudioVault etc) that includes a computer running Windows Server 2012 or newer, it is possible that the server will discover the NICs on your WNIP network such as those on your computers running the Wheatstone AoIP driver. If both the server and client have the SMB Multichannel feature enabled (they are enabled by default on both), the server can take advantage of any NICs it finds in your WNIP network and rope them into file transfer service to enable faster transfers to and from client machines. The additional load of traffic on your audio NICs could be enough to cause dropped packets, thus the detrimental audio artifacts we are trying to avoid, especially with large file transfers.

Thus, the SMB Multichannel feature should be disabled on all of your client machines that run the Wheatnet AoIP driver. It is up to you whether to disable it on the server side, but disabling it on the client will ensure that the computer will not be asked to participate in this activity.

To disable this feature on your client computers running our AoIP driver, start a Windows Powershell session (simply type the word powershell into the Windows search box and start the Powershell app or ISE) and enter the following command:

```
Set-SmbClientConfiguration -EnableMultiChannel $false
```

This will disable the service on the client.

Windows Spectre Security Update

The final tweak we will talk about is the result of an update released by Microsoft in 2018 (KB4073757) that seeks to protect against two attacks that can steal "secrets" such as passwords and other sensitive data from programs running on modern-day processors. In order to provide this protection, Windows must spend more time examining each network packet for evidence of the Spectre or Meltdown attacks.

This additional inspection means that NICs are not able to process as many audio packets as they were able to do previously.

The Spectre update can be a cause of serious audio artifacts on some computers. Not all computers seem to be affected equally. If you have pops, clicks, dropouts or unexplained digital distortion in your

audio, it could be due to the inability of your computer to process all of the 4,000 packets per second that it receives for each audio stream to which it is subscribed.

A document titled *Windows 10 Driver Notes* (rev 110521A) is included at the end of this document as Appendix 2. It describes a method to determine if your computer is being negatively affected by the Spectre update and what to do if it is. The solution consists of sending fewer packets to the driver installed on the computer to decrease its workload. This can be done without negatively affecting the audio quality.

Please read Appendix 2 for details on the Spectre update problem.

Network Layer Patch

Another recent Windows update has increased the likelihood of audio delays in Audio-Over-IP systems and Wheatstone has developed a simple executable patch that will mitigate this. It simply changes some network stack settings so that the latency in receiving the metronome (the Wheatstone Blade clock ticks) is reduced. This latency is the main cause of the audio driver issues caused by the update in question.

This update does not disable any security patches but simply adjusts some network parameters. You can retrieve the patch from the link below:

Instructions:
https://wheatstone.box.com/s/b3ql70wq3wbjqoz8mbyodgp0wzq363as

Patch Executable:
https://wheatstone.box.com/s/j8qbxft30mr6d2uez70ysh74ow12runo

Windows Changes

As mentioned above, Windows is not above reversing any of the changes that you make to your system to optimize its performance. When you have problems with audio, it is a good idea to re-check all of the settings mentioned in this document to see if they have been reverted back to default by a Windows update. The two most commonly reverted changes are:

Sample rate

Windows defaults to a 48k sample rate for sound devices. Many radio stations use 44.1k as the house standard so when this changes it makes all your audio play back about 10% slower than normal. Certain Windows updates will revert this setting.

Power-saving

Power-saving settings also get reverted occasionally by Windows updates and could result in your driver "going to sleep" at times. Same for USB devices such as license dongles and Voxpro control panels. If you experience an issue where something stops working for no apparent reason and then just starts working again on its own, suspect these settings.

APPENDIX 1

WNIP Driver Install Guide

Wheatstone Corporation

WheatNet-IP Driver Installation Guide

Prepare Windows for Installation (Win7 and Win10) Local Admin rights required!

1. Set Ethernet card to Private
   a. Launch Local Security Policy
      - Win7 – Control Panel, Administrative tools, Local Security Policy
      - Win10 – Start, Settings, About, Additional Administrative Tools

   b. Choose Network List Manager Policies
   c. Double-click All Networks
      - Network Location – Check user can change location
      - Click OK

   d. Double click Unidentified Networks
      - Location Type – Check Private
      - User Permissions – Check User can change location
      - Click OK

   e. Double-click Identifying Networks
      - Location Type – Check Private
      - Click OK.

2. Configure Ethernet Adapter for WheatNet-IP
   a. Open Network Sharing Center
   b. Click Change Adapter Settings
   c. Right-click on target Network Interface
      - Rename
      - Give descriptive name ie… WheatNet-IP xxx.xxx.xxx.xxx where xxx.xxx.is the IP Address you are going to assign to this network interface.

   d. Right click Network Interface and select Properties
      - Uncheck Ipv6 protocol
      - Change Ipv4 Settings - Manual
        – Type IP address to be used
        – Type Subnet Mask
        – Leave Default Gateway and DNS empty
      - Click Apply and OK

e. Right-click Network Interface and select Properties again
    - Click Configure next to the Adapter Identification
    - Click the Power Management tab
        - Disable all power Management Features (uncheck).

3. Configuring Windows Firewall
    a. Open Windows Firewall from Control Panel
    b. Click Advanced Settings
    c. In the Overview Pane, click Windows Firewall Properties
    d. Select Tab for Private Profile
        - Protected network connections – Click customize
        - Uncheck your WheatNet-IP Network Interface
        - This unbinds the NIC from the Firewall.
        - Click Apply then OK.
        - Repeat for the Public and Domain profiles, optionally if desired.
4. Disable Power Options, to keep PC from going to sleep mode or shutting off hard drives/monitor etc.
5. Turn off UAC (Requires Local Admin rights)
    a. Type UAC in the search field on the task bar. If the search field is not visible, right-click the Start Button and choose Search.
    b. Click Change User Account Control Settings in the Search Results
    c. To turn off UAC
        - Drag slider down to Never notify, click OK
        - If prompted confirm your selection
        - Restart computer to apply this setting.
6. Connect the Configured Network Interface to the WheatNet-IP Ethernet Switch
    a. Failure to complete this step, will cause the driver to fail to start after installation. The Driver requires the network interface to be active in order to function properly.

Installing the WheatNet-IP Driver

See also our documents on Driver Installation and our YouTube instructional video.

1. Install the WheatNet-IP Driver to the PC.
2. If using the USB Dongle for Licensing
    a. Install the Dongle after the Install package completes
    b. After connecting the USB Dongle-
        - Open Device Manager and expand Universal Serial Bus Controllers
        - Right-click on each USB HUB listed and select Properties

- Disable Power Management
- Right-click on the USB Security Device and select Properties
- Disable Power Management.

3. After Installation, open Windows File Explorer, and navigate to *C:\Program Files (x86)\Wheatstone\Wheatnet IP\Driver*
   a. Right-click on the file *e2winctl.exe* and select Properties
   b. Click the Compatibility tab
   c. Privilege Level – Check Run as Administrator
   d. Click Apply then OK
   e. This step ensures when the Configure WheatNet-IP app is opened that it has enough rights to make registry key changes when changes are made in the app. If you do not complete this step, any changes made to the driver config will not be retained during a restart of the PC or the WheatNet-IP Transport Service.
4. Note, if using a USB License key, ignore the message in the config applet that a Software key is not found. This is Normal…you are using a Hardware (USB) Key and not a Software License.
5. If using a Software License Key, click Update License and paste your license key into this field. Click OK and Apply. This will cause the WheatNet-IP Service to restart and should report the number of channels in the license key.
6. Bind the WheatNet Driver to the correct Network Card.
7. Set the BLADE ID.
8. Set the Channel Count.
9. Note that Sample Rate has been removed from the Config GUI.
10. Once installed and configured Restart PC
    a. In some cases, the full channel count will not appear in windows sounds control panel until a restart is completed.
11. Correct/Check Sample Rates (WDM versions only)
    a. Open Windows Sounds Control Panel
    b. Click Playback Devices
    c. For each WNIP Device right-click and select Properties
    d. Click the Advanced Tab
    e. Set the Sample Rate to match your BLADE System 44.1k or 48k
    f. Click Apply and OK (Repeat for each channel)
    g. Click the Record Devices Tab
    h. Repeat the steps completed on Playback devices above.
12. ASIO Drivers will not create devices in the Windows Sounds Control Panel.

Driver Signing Issues

Some PC's are not typically connected to the Internet and as such do not receive regular windows updates. These PC's may have an issue creating the audio devices after installation. Microsoft deprecated SHA-1 driver signing, in favor of SHA-2. Due to this you may need to update these PC's with Windows Update or apply specifically this patch

https://technet.microsoft.com/en-us/library/security/3033929

Common Problems and Troubleshooting Issues

Sometimes the Drivers will not startup correctly. This can be due to a variety of reasons. Divide the problem into 3 parts: WheatNet-IP software, Windows, Network.

Check the WheatNet-IP Software

1. Open the Configure WheatNet-IP Driver app. Ensure correct Network Interface is selected.
2. Check/Restart the WheatNet-IP Transport Service.
    a. In some cases, the service will fail to start, however appear to be "started" in the Services Management console***
        • After PC restart, No Audio, or Drivers not working
            – This is due to the Service starting before the Network interface is ready.
                ^ Restart the Service to correct
            – Work around issue with changing the Start up Type of the Service
                ^ Delayed Start Automatic
                ^ Manual
                ^^ Manual would require a batch file or power shell script in startup or some other method to call the service to start.
3. Confirm the PC BLADE appears in Navigator
    a. If the Service is running but the PC BLADE is not listed
        • Check Windows Firewall is either disabled on the Network interface or otherwise program to allow the appropriate traffic.

Check Windows Sound Control Panel (WDM versions only)

1. Open Windows Sounds control panel
2. Select Playback tab
    a. Right-click WNIP Output Device and select Test
        • This will play a short test tone fired on both channels (L and R)

b. If the test tone fails to play or modulate the meters, check the Sample Rate settings for each device to ensure matched to the WheatNet-IP BLADE System Rate

c. If you get an error message that the device is in use, check the clock settings for each device to ensure match to system rate.

3. In some cases it may be necessary to remove the WNIP Devices

a. Contact Tech Support for details on removing and reinstalling WNIP Devices.

Check Network Components

1. Check that Network Cable securely connected to NIC in PC.
2. Check that Network Cable securely connected to Switch Port.
3. Check Switch for required configuration for WNIP
   a. Global IGMP setup correctly?
   b. Proper Vlan and IP Address assigned
   c. Switch Port Configuration
      • Consult Wheatstone Switch Configuration Document for your particular switch.
4. Ensure Switch is connected to other WNIP Switches Properly
   a. Trunk Port to Trunk Port
      • Consult Wheatstone Switch Configuration Document for your particular switch
5. Check for the updated Windows Drivers for the NIC
   a. Always use Manufacturer Drivers and not Windows drivers via Windows Update.
6. Some Network Cards just may not work or work intermittently****
   a. Ensure latest manufacturer Windows Driver installed.
   b. Disable Power Management. (See above)
   c. Try a different Network Interface Card.

In order for the Driver to start properly, it must have a network connection and it must be able to communicate with the Route Master and Clock Master BLADE within the WNIP network in order to function.

*** This condition is prevalent in newer PC's with faster SSD Hard Drives but not necessarily exclusive to them. This condition occurs when the OS starts the Service before the Networking components are started or ready.

**** Wheatstone does not recommend any specific Network Cards. Requirements are that they can operate at Gigabit Speed, and are supported by the Operating System.

Getting Help Beyond Using This Document

If you are having issues and cannot resolve them with the help of this document, you are invited to contact Wheatstone Support at the following:

Email – techsupport@wheatstone.com
Phone – 1-252-638-7000

APPENDIX 2

Windows 10 Driver Notes

Using 1ms packet timing

Overview:

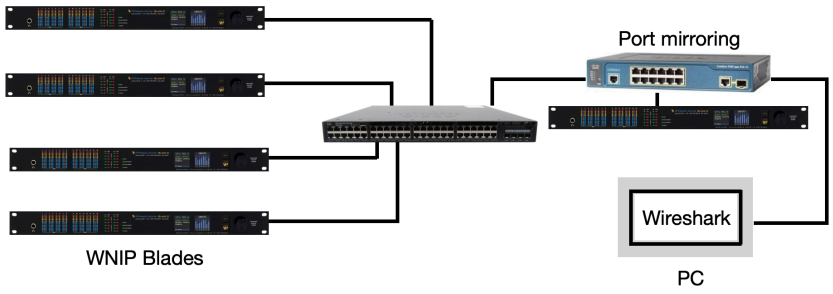
With the advent of the Spectre class of security updates to the Microsoft Windows operating system, the network interfaces on Windows computers have suffered significantly degraded performance.

This issue is widespread, affects many different applications, and is particularly noticeable in environments such as WNIP that use constant low latency, low data count packet streams.

The net result is that Windows PCs that have the Spectre class of updates can no longer process the same volume of audio streams as they were capable of prior to the operating system update. The primary symptom observed is that after the Windows update, audio drop outs will start occurring in streams as more streams are enabled on the PC.

The issue is inherent in the Windows network interface itself and has nothing to do with the operation of the WNIP audio driver and in fact can be observed in PCs that don't even have the WNIP audio driver installed.

Description:



The WNIP system is a high performance, low latency AoIP system. WNIP uses uncompressed (24 bit) audio data with a default .25 ms packet timing. Each WNIP audio packet includes 12 samples of 24 bit audio data, resulting in a 48,000 samples per second sample rate / 12 samples per packet = 4000 packets per second per stream.

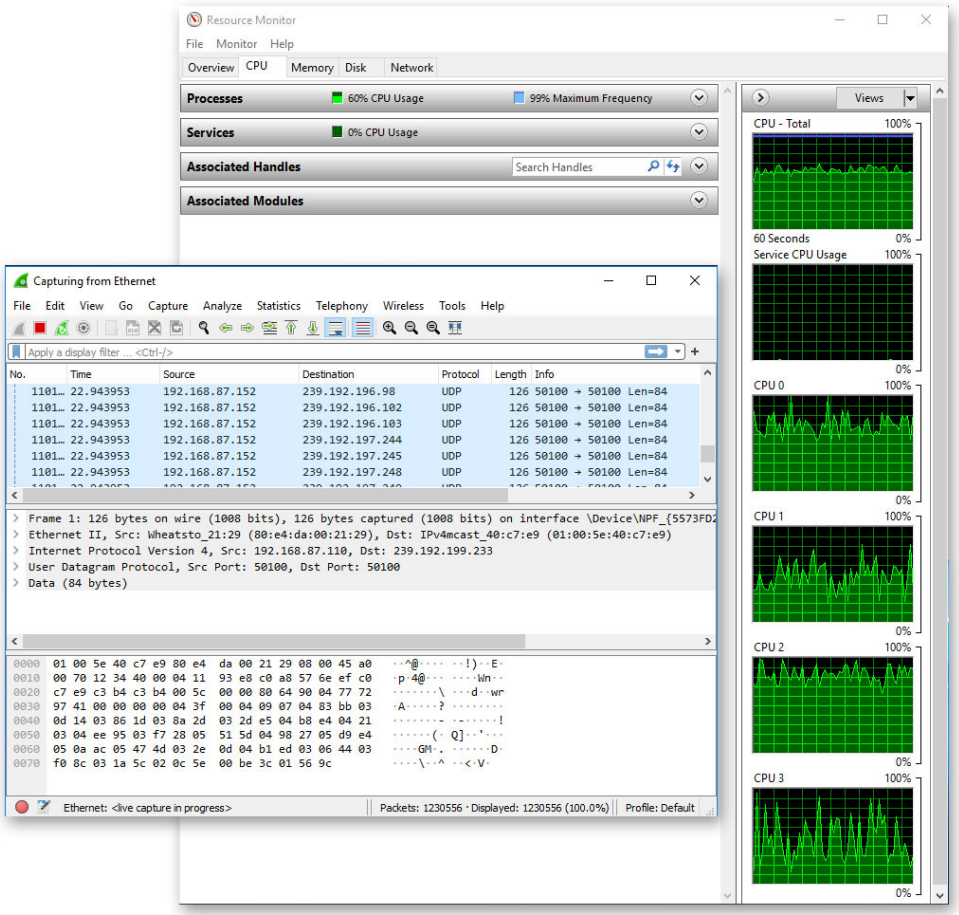
As streams are added, the total packet rate increases by 4000 packets per stream X a maximum of 24 channels = 96,000 packets per second.

After the update, this packet rate will put a heavy workload on the PC network interface and cause it to start losing packets, resulting in the audio drop outs you can hear. The degree to which this occurs is dependent on the ability of the particular PC and network interface to ingest these packets, with lower power PCs more susceptible to the problem.

An experiment was devised to quantify this issue, using a PC with the Windows operating system updated. No audio drivers were installed on the PC and no applications were running other than Wireshark network analysis. The PC was connected to a WNIP audio system which allowed us to control the number of audio streams directed to the PC network interface and hence ingested by Wireshark via a switch with port mirroring. The Blade connected to this switch could request the streams needed and due to the port mirroring on the switch they would also appear at the PC.

Results:

After running this experiment, data was taken from the PC using the performance monitor capabilities of the Task Manager utility in Windows. These results are shown here, indicating that the CPU on this PC is running at near 100% utilization just ingesting the network packets from the audio streams. This with no audio drivers and no applications other than Wireshark running. It was noted that just moving the mouse would create enough extra CPU usage to reach 100%.



Work Around:

Since clearly under the updated Windows operating system the issue is the workload required to ingest these packets, any mitigation efforts would involve reducing this workload. We have come up with 3 strategies that can be used.

1). First the obvious one; roll back the Windows OS to pre- Spectre release versions. This is will be effective but of course will lose the security benefits that the newer OS includes. For PCs that have no exposure to the Internet, this may be a viable approach, but is not advisable for general purpose PCs that have Internet connections.

2) Secondly, lower the number of packet streams ingested by the PC. Many users do not realize that if the PC simply has a connection to an audio source it will be forced to ingest the stream packets, even if it is not in use or has no audio content. Frequently connections are left in place which are not actually in use. Making connections only to streams actually in use will reduce the packet ingest workload.

3) Thirdly, reduce the number of packets ingested by changing the stream packet timing. In order to comply with the AES67 AoIP standards, WNIP provides a mechanism to selectively create audio streams with 1ms packet timing. By using 1ms streams, The PC has additional time available to ingest the audio data in a packet before the next packet needs to be read. With 1ms packet timing each stream has 48 samples per packet (4 times as much as .25ms streams) yielding 48,000 samples per second / 48 samples per packet = 1,000 packets per second. Yes the total number of samples is the same, but the Windows OS is more efficient using the relaxed packet rate.

There are two components to this strategy. First, enable 1ms packet streams by selecting the desired source stream in Navigator and checking the “enable 1ms translation” box on the signals of interest.

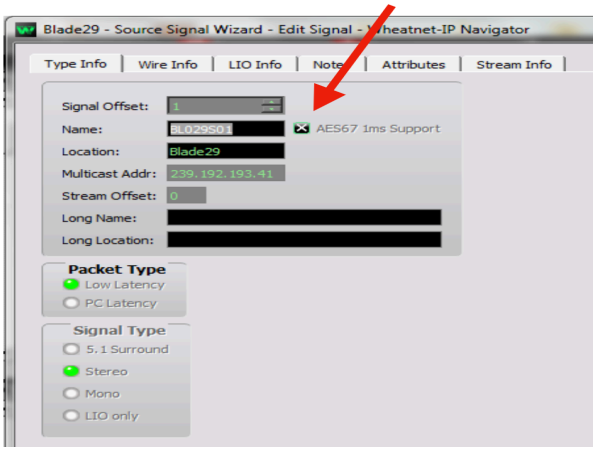
1) Launch the Navigator configuration software and connect to the WNIP system if not already running.

2) Select the desired audio source stream by right-clicking on its name in the crosspoint grid.

3) Choose the “Modify Signal” drop down menu item.

4) Proceed to the Blade admin Tab and click on the “AES67 1ms Support” check box. This process will create a duplicate audio stream of the desired source but with 1ms packet timing. The original .25ms stream will still be available for live, low latency applications.

5) Repeat this process for any other streams intended to be ingested on the WindowsPC.



Note: if this selection is greyed out and unavailable, that means either the signal is currently connected or the resources for this function have not been allocated. Enable these resources here on any available Blade not using Utility Mixers.

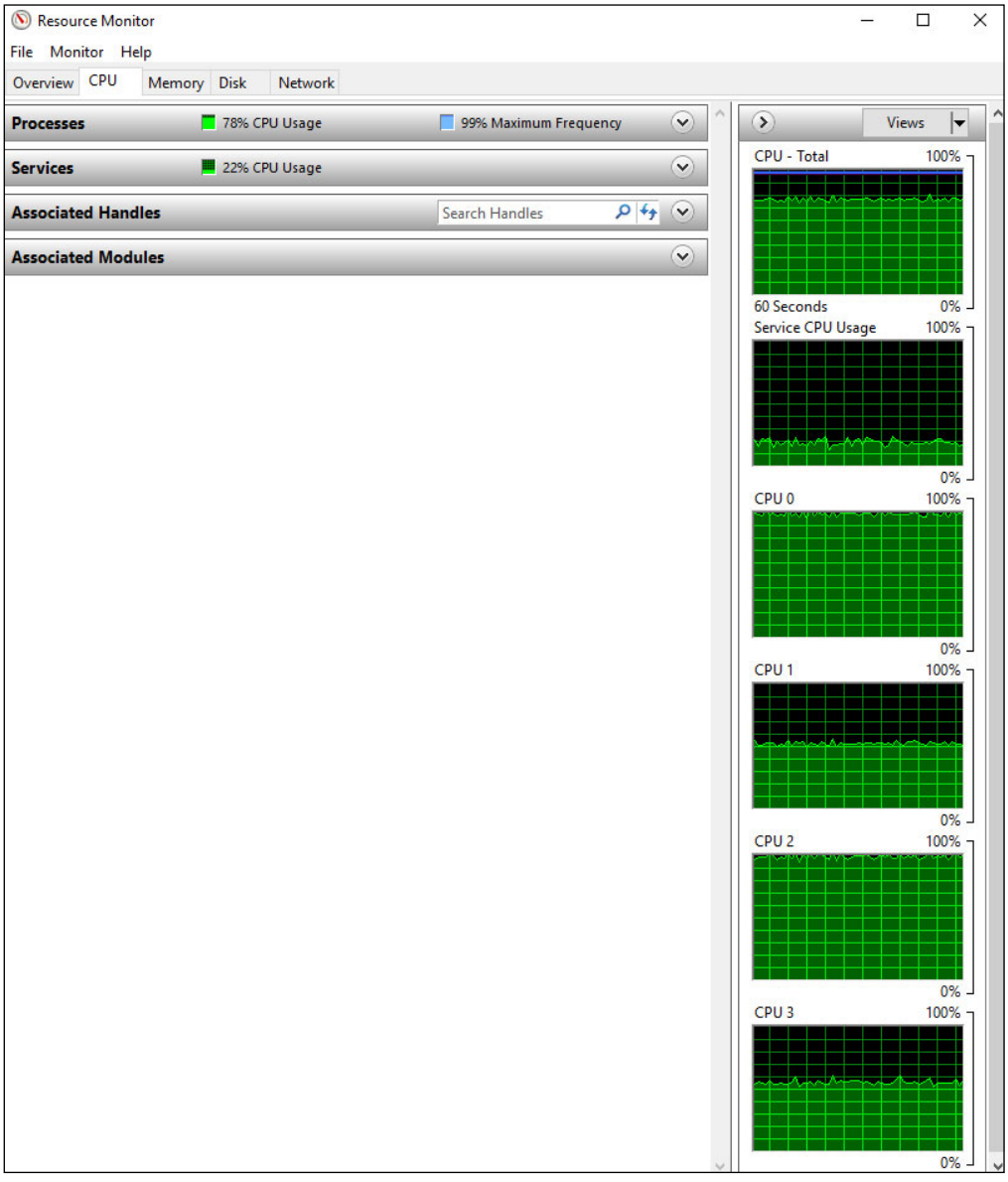
Once the 1ms streams have been created they will be available for the Windows PC. To use them, install version 3.7.8 of the WNIP audio driver.

This can be obtained by sending an email to: techsupport@wheatstone.com

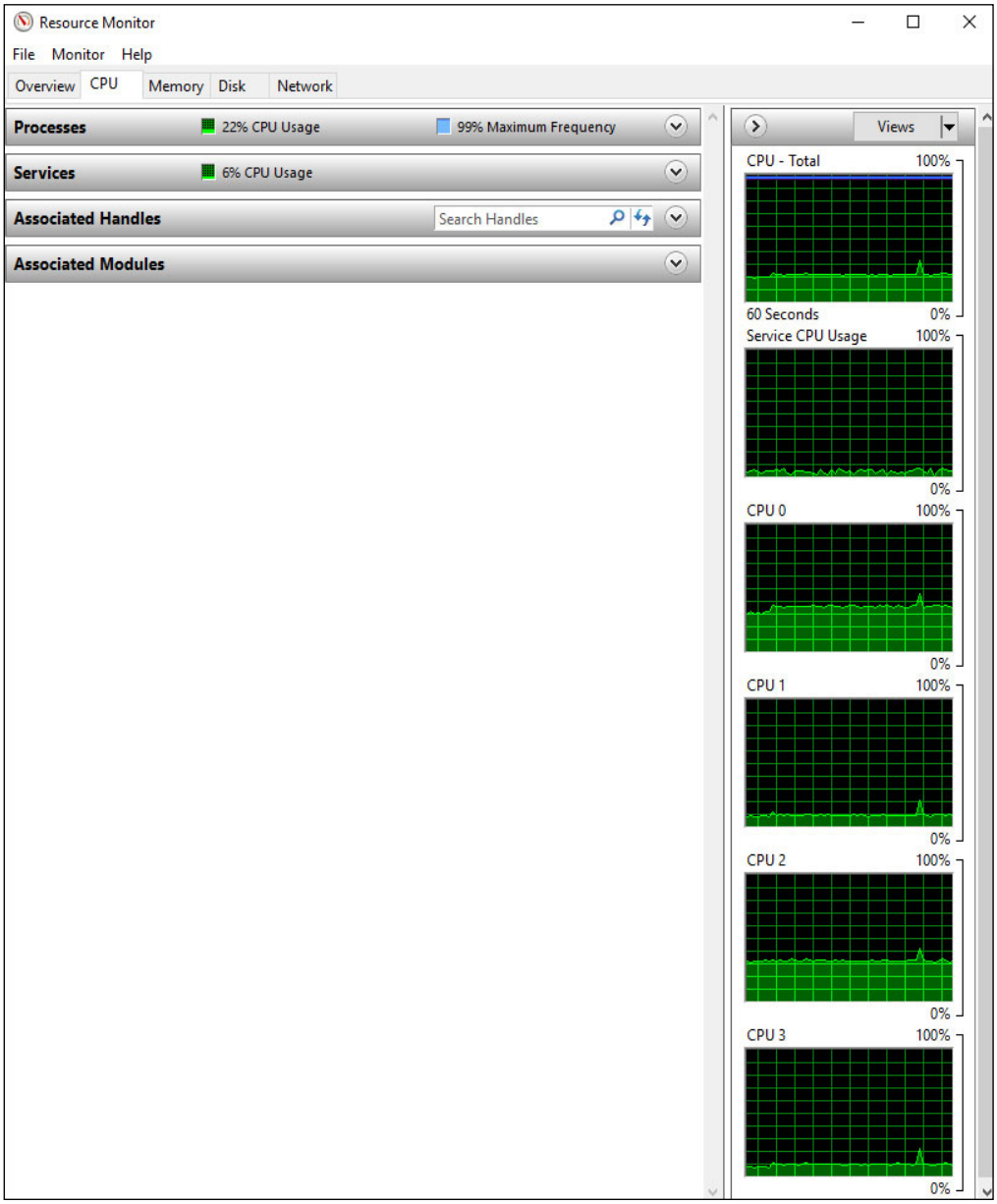
Version 3.7.8 of the WNIP driver will automatically choose the 1ms version of a source stream if it is available.

Results:

By using 1ms streams for ingest in Windows PCs running the Spectre class of Operating System updates, significant performance improvements have been found as shown below.



Windows PC with .25 ms streams



Same Windows PC with 1ms streams