DYNO

USER GUIDE

December 2022

Table of Contents

Welcome to BirdDog 2

Using This Guide 2

Dyno Interface Overview 4

Using Dyno 5

- Device 7
- Network 8
- Processor Utilization 9
- Preview Monitor 9
- Testing 10
- Test Output 11
- Interpreting Results 11

Glossary 13

Copyright

Trademark Acknowledgment

BirdDog and other BirdDog trademarks and logos are the property of BirdDog Australia. Other trademarks, company names and product names contained in this manual are the property of their respective owners.

- NDI® is a registered trademark of NewTek, Inc.
- Microsoft, Windows, ActiveX, and Internet Explorer are registered trademarks of Microsoft Corporation in the U.S. and/or other countries.
- HDMI, the HDMI logo and High-Definition Multimedia Interface are the trademarks or registered trademarks of HDMI Licensing, LLC in the United States and other countries.
- Other trademarks, company names and product names contained in this manual are the property of their respective owners.

IMPORTANT INFORMATION

Legal Notice

The contents of this document are subject to change without prior notice. Updates will be added to the new version of this manual. We will readily improve or update the products or procedures described in the manual.

Best effort has been made to verify the integrity and correctness of the contents in this document, but no statement, information, or recommendation in this manual shall constitute formal guarantee of any kind, expressed or implied. We shall not be held responsible for any technical or typographical errors in this manual.

The product appearance shown in this manual is for reference only and may be different from the actual appearance of your device.

Due to uncertainties such as physical environment, discrepancy may exist between the actual values and reference values provided in this manual.

Use of this document and the subsequent results shall be entirely on the user's own responsibility.

Welcome to BirdDog

Thank you for using Dyno. We hope you enjoy the diagnostic window into your NDI network that this application provides.

Using This Guide

Dyno is powerful and sophisticated software, so please read this guide before use and retain for future reference.

We're Invested In Your Success

At BirdDog, we pride ourselves on being approachable and easily contactable. We'd love to hear from you.

Dan Miall

Co-Founder and CEO
dan@bird-dog.tv

Eamon Drew

Co-Founder and CMO
eamon@bird-dog.tv

Welcome to the Future

What is NDI®?

NDI® (Network Device Interface) is a high-quality, low-latency, frame-accurate standard that enables compatible devices to communicate, deliver, and receive high definition video over your existing Gigabit Ethernet network.

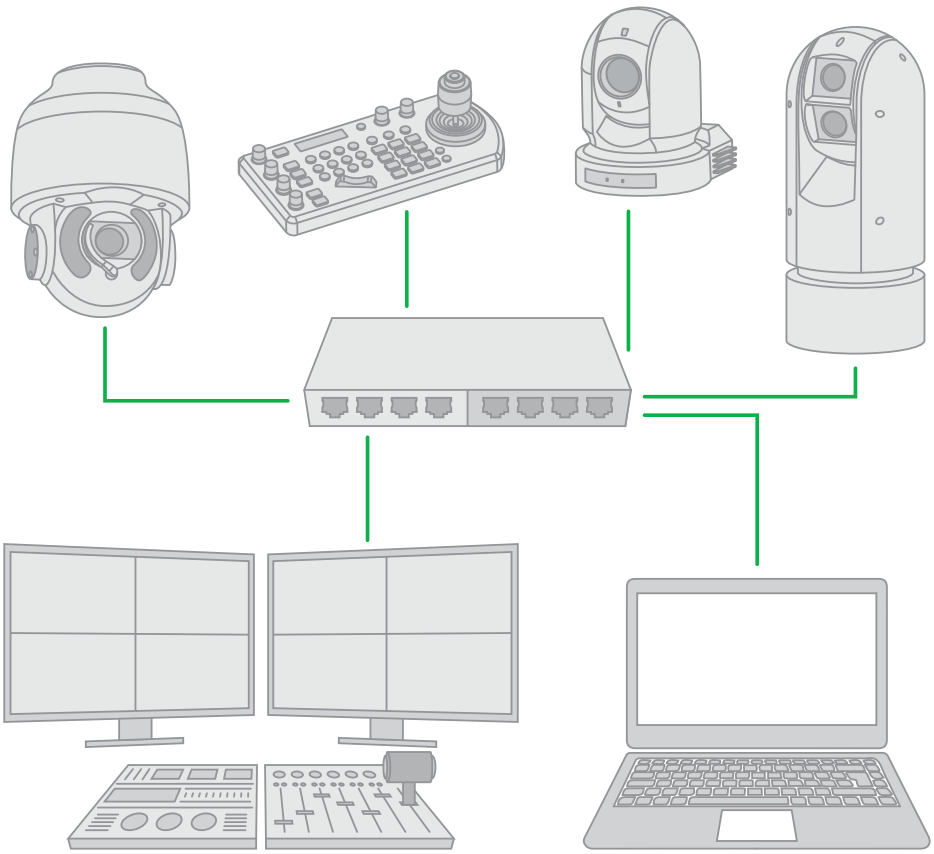
Operating bi-directionally, NDI devices can be auto-detected, powered and controlled over the same Ethernet cable used to send the video and audio. Even fill and key alpha channel information, as well as Tally, can be sent over this same cable. If you have a Gigabit network, you have the potential for a streamlined, interconnected, video production environment.

With the introduction of NDI 5, you can now securely share network sources between remote sites anywhere in the world - on a single network port. Even a smartphone can be a NDI source.

Transitioning to NDI® can also occur gradually. Existing SDI or HDMI signals can easily be converted to an NDI® stream and piped where required on your network and then converted back only at the necessary endpoints.

BirdDog has been on the NDI® journey since the very beginning, and Dyno is just one of our products designed to take advantage of the features and potential of NDI®.

For more information on NDI®, please refer to this page on our website.



Dyno Interface Overview

Dyno is your diagnostic window into your NDI® network. Test your network speeds with a single NDI® stream, check performance and stability when dropping multiple NDI® streams onto the network, and confirm your network is capable of delivering rock solid NDI® to your NDI® hardware and software receivers.

All wrapped in a beautiful interface with dynamic visual feedback.

1. NDI Sources information. Choose the type of test, source to be monitored and view key information about the source video.
2. Test Output. Displays important test readout information.
3. Device (core information about your host computer), System (Windows version, build and instruction set) and Network (network adapter info) tabs.
4. Processor Utilization. Shows real-time display of the CPU and GPU performance.
5. Preview. Select the source to preview.
6. Test. Set the test period, start the test and view the test progress meter.

Using Dyno

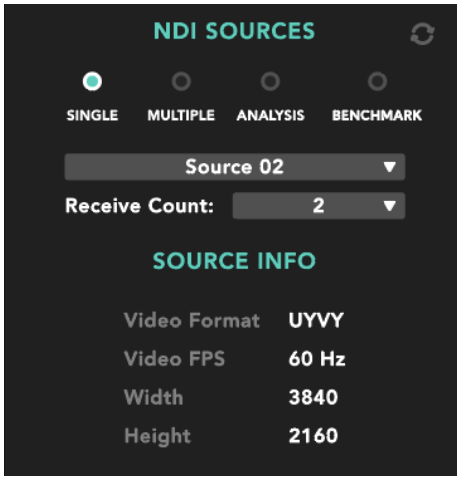
NDI® Sources

Select the type of test you wish to perform (Single, Multiple, or Analysis) and the NDI® sources for the test.

When Dyno is launched, it automatically scans your network for available NDI® sources and populates the source dropdown list. Click the refresh icon to refresh this. You can then select the source whose metrics you wish to display on the preview monitor.

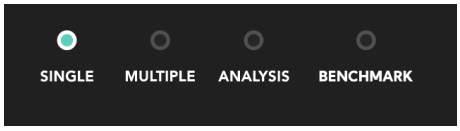
When performing a multiple test, Dyno simultaneously receives multiple NDI® sources. Select the number of streams from the Receive Count dropdown.

Source Info displays key information about the currently selected NDI® source.



Test Modes

Dyno is a complete suite of tests for verifying NDI® performance on your network. Various aspects, including your overall network infrastructure and the quality of the received NDI® source can be tested and evaluated. Detailed below are the options for each of the three test modes: Single, Multiple and Analysis.



For more information on interpreting the test results, refer to Interpreting Results.

Single

Single test mode is used for benchmarking a single source delivering multiple NDI® streams. By default, the test will request a single stream from the NDI® source. Scaling up the number of concurrent sources will reveal the performance ceiling for the NDI® source. To increase the amount of receive streams from a single device, make a selection from the Receive Count dropdown list.

Some Important Notes on NDI® Sources

High Bandwidth, or Full NDI®, sources consume a significant amount of bandwidth. When anticipating the amount of NDI® streams a device can deliver there are several things to take into account:

- Available NDI® Bandwidth allowing headroom on your network. A 1 Gb Network connection can rarely deliver full 1Gb performance reliably over time.
- Sender processor performance.
- Receiver processor performance and other network activity on a shared network.

Embedded or 'hardware' NDI® encoders provide higher performance in terms of latency (delay from processing the video frame to delivering the NDI® on the network) but will not always be able to scale to deliver as many NDI® streams simultaneously owing to their embedded architecture with limited power characteristics. For large-scale installations with many receivers requiring video from a single source, it is still recommended to make use of a Multicast network sending architecture. Please consult your hardware manufacturer for details on enabling Multicast.

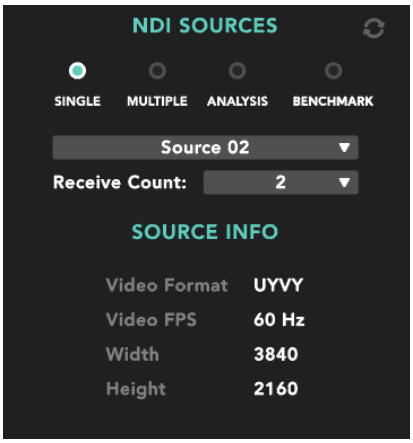
Multiple

Multiple test mode allows you to emulate a live production with multiple NDI® sources being received to a single computer. This can be useful if you plan on using an unfamiliar network for a live production as it will show you any unexpected performance over time.

Where Single test mode will provide valuable information about a single NDI® source, the Multiple test will display performance characteristics of your network infrastructure and receiving computer (the computer running Dyno). Increasing the number of discreet sources received by Dyno, creates additional load on your network switch hardware and CPU processing.

Within the Multiple test mode, you can expand the source selection panel to show additional details about each NDI® source on your network. These details include:

- Source host name
- Source NDI® stream name
- IP Address, Current Port
- Frame Size
- Frame Rate



When performing the Multiple test, it is useful to view the CPU utilization graph as well as the output data in the Progress Status section.

Analysis

This test utilizes the free NDI® Analysis test application available from NDI.tv/tools. This application provides valuable information about a single NDI® source including analytical information around its data rate and latency. In order to utilize the Analysis test, please install the free NDI® Analysis Tool.

Once this is installed, the Analysis test option in Dyno is enabled. Similarly to the Single test mode, you select the source you wish to test and duration of the test.

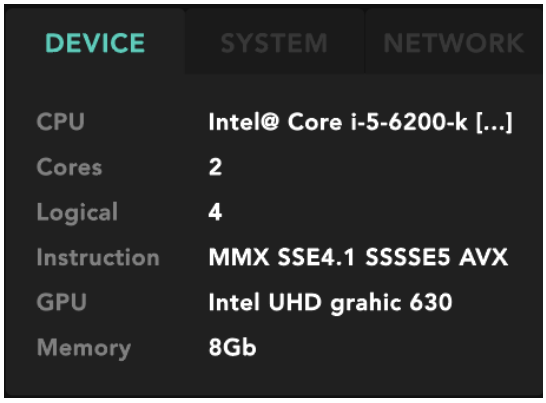
The results of the NDI® Analysis test are presented in a graphical form, which displays the following information:

- Average data rate
- Latency (Average, Minimum, Maximum)

For more details on the output data refer to the following Test Output section.

Device

The Device tab shows core information about your host computer.



Series of CPU and model number

Depending on the processor type, this will report if the processor is an Intel i5, i7, i9, etc, as well as the sub-model number. This will indicate the processor performance capabilities.

Number of Cores

A CPU has varying core counts representing the amount of individual processing units that are present. Depending on the processor you have installed in your host computer, this can be anywhere from 2 to 20+. Typically the higher core count the more processing capacity.

Number of Logical Cores

Modern processors are capable of handling multiple instructions simultaneously (sometimes referred to as Hyperthreading). Hyperthreading can expand the amount of processor performance the computer is able to deliver. If your CPU supports hyperthreading, or another form of logical processor scaling technology, it will report the number of virtual or accessible logical cores on your system. Intel processors typically feature twice the number of physical cores reported.

Instruction Set supported

Modern CPU's support various acceleration methods which are referred to as Advanced instruction sets. NDI® takes advantage of many of these to process NDI® more efficiently, placing less burden on the CPU by offloading complex tasks to one of many Advanced Instruction set accelerators. Of particular importance for best performance are: AVX - SSE - SSSE.

GPU Processor

Dyno will detect the installed GPU (Graphics Processing Unit) in your computer. You can expect substantially different performance when receiving and displaying NDI® depending on the GPU you have installed. Modern Intel processors come with an internal GPU which is often reported as Intel UHD or Intel IRIS graphics. While Intel internal GPU processors can display video and applications well, higher performance 3rd Party GPUs are available, such as NVIDIA.

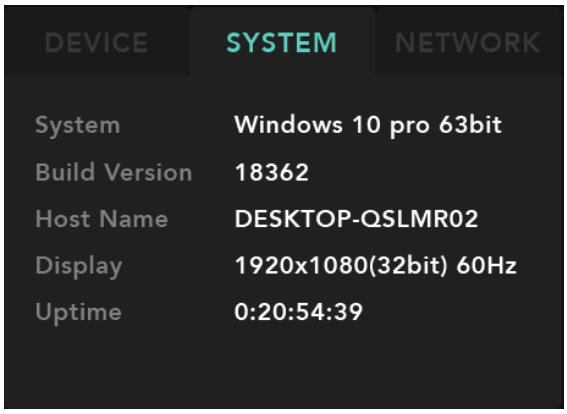
The CPU Processor item will report the manufacturer and model of your GPU installed.

Memory capacity

Memory is important for performance intensive applications such as NDI® video processing, and this section reports the amount of physical memory is installed in your computer.

System

This will confirm the version of Windows you have installed on your computer and the instruction-set (i.e., Windows 10 Pro 64-bit). As some versions of Windows 10 do not support all features, this allows you to verify you are running the desired version of Windows.



Build Version

Occasionally updates to windows can cause undesired results. More recent versions of Windows are defined by their Build Version. If you are troubleshooting a recent issue, it may be worth checking the Windows Build Version to verify compatibility.

Host Name

Every computer on a network has a Host Name identifier which allows communication with other computers. All NDI® sources are presented in the format of: Host Name (NDI® Stream Name).

Display

Shows the current screen resolution and refresh / frame rate. Video not playing smoothly on your monitor may indicate a frame rate mismatch between the incoming video source and the display rate.

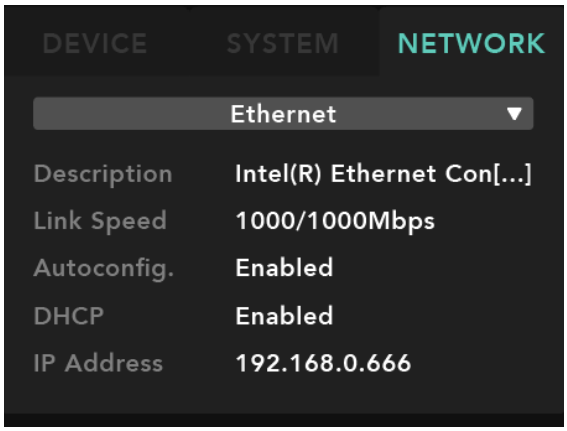
Uptime

Computer problems may become exacerbated over time. Uptime shows you how long it has been since this computer was last re-booted. If you see a problem on your computer when receiving NDI®, it may be worth comparing results straight after a re-power, and again after an extended period of uptime.

Network

The Network tab shows current data for your network adapter. There is a dropdown selector which allows you to cycle between all your network adapters should you have multiple network adapters installed.

Since NDI® is a network defined protocol, it is recommended to verify base connectivity and status in this tab before undertaking any tests



Description

Displays the manufacturer and model number of the Ethernet adapter. As some vendors recommend using certain brands of network adapter for performance reasons, this allows you to verify the network adapter in use is the intended one.

Link Speed

Network connectivity is generally set to 'auto negotiate'. This can mean that, at times, the network speed may not be connected at the desired (full) speed. Link Speed shows you the currently negotiated network speed. For NDI® applications, 1000Mbps (1Gb) or 10000Mbps (10Gb) are desired.

Auto-configuration

If you have a link speed set to a specific rate rather than auto negotiated it will be displayed here.

DHCP

Many networks operate using a DHCP (Dynamic Host Configuration Protocol) server to allocate each network device a unique IP address. If your current network configuration is set to acquire an IP address via DHCP or Static IP, it will be displayed here.

If your network is set to Static IP, it is important that you have configured every NDI® device on your network to have a unique IP address within the same subnet. For more information on network configuration, please consult a network professional.

IP Address

Displays the current IP address of the computer running Dyno.

Subnet

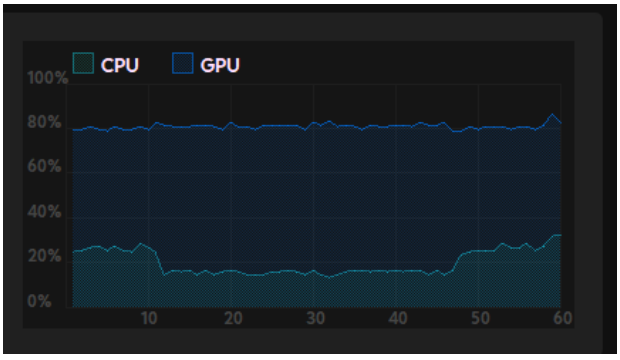
Displays the current Subnet of the computer running Dyno.

Gateway

Displays the current Gateway address of the computer running Dyno.

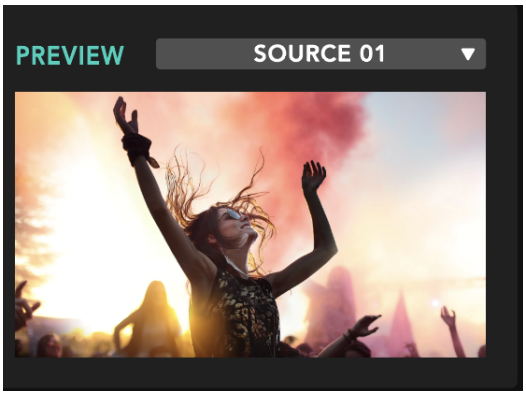
Processor Utilization

This chart is a real-time display of CPU and GPU processor utilization. It is always operational and can show peaks and troughs in system performance. For more detailed information it is recommended to refer to the machine Windows Task Manager.



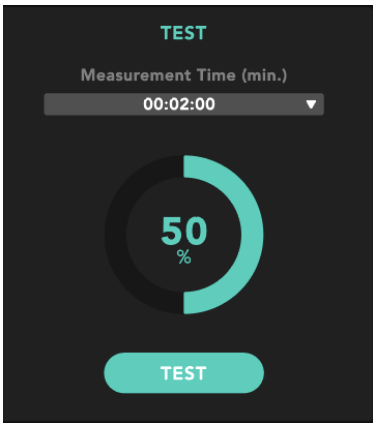
Preview Monitor

When running an active test on Dyno, the preview monitor will show you the incoming video. This allows you to visually confirm the incoming video is correct and being received. When running in Multiple test mode, you are able to select your monitored source from the dropdown Source menu.



Testing

Select the desired measurement time and click the TEST button to begin the test. The test progress meter updates in real-time.



Data Display Options

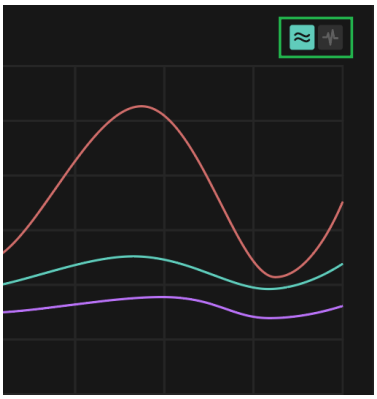
The graphical output in the Progress Status section of Dyno allows you to present the data in slightly different ways.

Filtered or Raw data

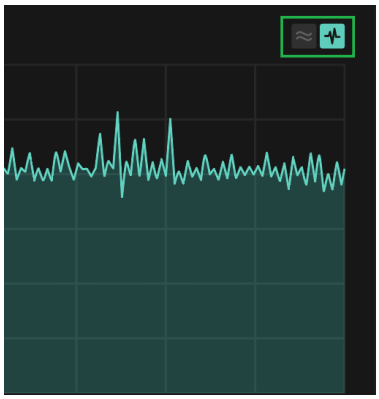
Click the Display Mode button to chose either a Filtered or Raw display. By default all graphs are set to Filtered. This averages the data over the preceding second and draws a smooth graph of the received data. This is recommended for general verification of sources.

In Raw mode, every data point is displayed. If you are experiencing issues with a source, this can be useful in identifying regular spikes in data reception. In Raw mode, you can hover your mouse over the spikes in the graph to read the data point value.

Filtered

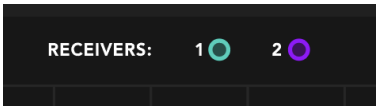


Raw



Isolating a Source in Multiple Test Mode

As you select multiple sources, they are assigned a color for the graphical output. Above each graph is a source selector which can be used to toggle each source on/off, or to display graphical data of all sources simultaneously.



Test Output

FPS

Video is generated by an NDI® source at a desired FPS (Frames Per Second) which is typically 25, 29.97, 30, 50, 59.94, or 60fps. As this video is sent over the network in NDI® and received by the computer, there will always be minor fluctuations. NDI® receiver applications and hardware have the ability to smooth out these minor fluctuations caused by network data transfers. However, this ability can only handle a certain amount of fluctuation.

Frame Length

This parameter shows the time for the frame to be received in milliseconds. It is normal for this data to display some fluctuation due to the data having to travel over a computer network. It is important that the frame length is predictable and within the boundaries of the desired FPS. The target frame length (ms) for each FPS are shown in the table on the right.

FPS Target	Frame Length (ms)
25	40.000
29.97	33.336
30	33.333
50	20.000
59.94	16.688
60	16.666

Data Rate

NDI® compresses video to transmit it over your network. There are many factors that affect the data rate of the NDI® stream, and the NDI® data rate can affect the video quality provided.

These are the target Data Rates for NDI® video for various video formats.

Video Format	Target Data Rate (Mbps)
720p	90
1080p/1080i	100
1080p 50/60	125
UHD 30	200
UHD 60	250

Latency

Like Frame Length, Latency is reported in the Analysis test as a window from Minimum, Average, Maximum. This window shows you the amount of variance in the NDI® stream being received. Predictable latency is key to a high-performance and reliable network.

Interpreting Results

FPS

Dyno reports the RAW data received to display minor variations in frame rates which will not affect overall video smoothness. It will also show large drops in frame rates, which may be indicative of network, source, or receiver issues.

When interpreting FPS, the AVERAGE FPS is recommended to be your guide to overall performance. If you see significant dips in a certain time frame within your test, it can provide you with a clue as to why a dip has occurred. For example: Has a scheduled data copy started? Is your system checking for updates?

Some NDI® sources optimize network performance by dynamically changing the frame rate. Notably, NDI® Scan Converter will not send any video frames when nothing has changed, which can result in variable FPS being reported by Dyno. This is expected behavior. Other applications that can provide variable FPS are:

- NDI® Signal Generator
- Adobe Premiere Pro
- Adobe After Effects
- Avid Media Composer

When experiencing FPS variations, troubleshooting steps should include:

Cause	Suggestion
Source is variable FPS	Varying FPS is expected
Single test with too many sources	When running a single test and the Receive count is set too high, variations in FPS may result – reduce receive count
CPU Utilisation	Verify your CPU utilisation is not excessive
Other 'zombie' receivers	Ensure you do not have other devices configured to receive the source simultaneously

Frame Length

When interpreting frame length results, you should expect the fluctuation to be no more than 2x the target frame length. Larger fluctuations, or repeated spikes, can put pressure on the receiver hardware or software to compensate and may result in increased latency or dropped frames.

When experiencing large frame length variations, troubleshooting steps should include:

Cause	Suggestion
Network links are all at full speed	Verify that all Ethernet links are operating at the desired speed (i.e., 1Gbps)
CPU Utilisation	When running the test, ensure that the computer CPU Utilisation is not overly high
Video Data Rate	If your device supports variable data rate, set it to NDI® Default or configure it to be the NDI® Target Data Rate
Jumbo Frames enabled	Ensure your network is not configured for 'Jumbo frames'
Other 'zombie' receivers	Ensure you do not have other devices configured to receive the source simultaneously

Data Rate

NDI® is a variable bitrate video format and it is normal to see data rate fluctuations. Excessively high, or suspiciously low data rates, may be a sign that a setting is incorrect on your source or there are dropped frames occurring on your network.

Some hardware-based encoders allow manual overrides of the NDI® target data rates. This can be useful in some circumstances but must be done with caution as it may cause decoders, or NDI® receivers, to provide undesirable results since they are designed for operation within the NDI® defined target data rate. It is always recommended to set your encoder device to the NDI® recommended data rate when benchmarking for stability.

Latency

The Latency graph shows a window of the amount of time it takes to receive each NDI® frame from your NDI® source. The aim is to have a very narrow window between Minimum, Average, and Maximum as this indicates a very stable NDI® stream and network.

Cause	Suggestion
Network links are all at full speed	Verify that all Ethernet links are operating at the desired speed (i.e., 1Gbps)
CPU Utilisation	When running the test, ensure that the computer CPU Utilisation is not overly high
Video Data Rate	If your device supports variable data rate, set it to NDI® Default or configure it to be the NDI® Target Data Rate
Jumbo Frames enabled	Ensure your network is not configured for 'Jumbo frames'
Other 'zombie' receivers	Ensure you do not have other devices configured to receive the source simultaneously

Variable frame rate sources or very high CPU and/or network utilization can produce a wider window of latency. Large variations in latency place pressure on the decoder, or NDI® receiving software. This may affect video stream latency, or result in dropped frames. When experiencing large latency variations, troubleshooting steps should include the above investigation.

Glossary

Domain

A domain contains a group of computers that can be accessed and administered with a common set of rules. Domain can also refer to the IP address of a website on the Internet.

DNS

DNS (Domain Name System) is a system used by the Internet and private networks to translate domain names into IP addresses.

mDNS

mDNS (Multicast DNS) refers to the use of IP multicast with DNS to translate domain names into IP addresses and provide service discovery in a network that does not have access to a DNS server.

Ethernet

Ethernet, standardized as IEEE 802.3, refers to a series of technologies used to connect computers and other devices to a LAN (Local Area Network) or wide area network (WAN).

Firmware

Firmware is a class of software held in non-volatile memory that provides the low-level control for a device's hardware.

Gigabit Ethernet (GigE)

An Ethernet capable of transmitting frames at a rate of a gigabit per second. A Gigabit capable Ethernet network is recommended for NDI® production workflows.

IP

IP (Internet Protocol) is the communications protocol for the Internet, many wide area networks (WANs), and most local area networks (LANs) that defines the rules, formats, and address scheme for exchanging datagrams or packets between a source computer or device and a destination computer or device.

LAN

LAN (Local Area Network) is a network that connects computers and devices in a room, building, or group of buildings. A system of LANs can also be connected to form a WAN (Wide Area Network).

Mbps

Mbps (Megabits per second) is a unit of measurement for data transfer speed, with one megabit equal to one million bits. Network transmissions are commonly measured in Mbps.

NDI®

NDI® (Network Device Interface) is a standard allowing for transmission of video using standard LAN networking. NDI® comes in two flavors, NDI® and NDI®|HX. NDI® is a variable bit rate, I-Frame codec that reaches rates of around 140Mbps at 1080p60 and is visually lossless. NDI®|HX is a compressed, long-GOP, H.264 variant that achieves rates around 12Mbps at 1080p60.

PELCO

PELCO is a camera control protocol used with PTZ cameras. See also VISCA.

PoE

Power over Ethernet

Port

A port is a communications channel for data transmission to and from a computer on a network. Each port is identified by a 16-bit number between 0 and 65535, with each process, application, or service using a specific port (or multiple ports) for data transmission. Port can also refer to a hardware socket used to physically connect a device or device cable to your computer or network.

PTZ

Pan, tilt and zoom.

RJ45

A form of standard interface commonly used to connect computers onto Ethernet-based local area networks (LAN).

RS422, RS485, RS232

Physical layer, serial communication protocols.

Subnet

Subnet or subnetwork is a segmented piece of a larger network.

Tally

A system that indicates the on-air status of video signals usually by the use of a red illuminated lamp.

TCP

TCP (Transmission Control Protocol) is a network communications protocol.

UDP

UDP (User Datagram Protocol) is an alternative protocol to TCP that is used when reliable delivery of data packets in not required.

VISCA

VISCA is a camera control protocol used with PTZ cameras. See also PELCO.

WAN

WAN (Wide Area Network) is a network that spans a relatively broad geographical area, such as a state, region, or nation.

White Balance

White balance (WB) is the process of ensuring that white objects and by extension, all color, in your video are rendered accurately. Without correct white balance, objects in your video display unrealistic color casts.

WELCOME TO THE FUTURE.