Lumens®

Mini Guidebook

Vol. 01

NDI®

What is NDI|HX3?
NDI 5 in ProAV

What is NDI|HX 3?

NDI®|HX3 is the latest version of the NDI protocol. HX3 is expected to be the NDI format of choice for the vast majority of users in live events, live video production, AV, conference production, remote production, and streaming.

NDI® is a video-over-IP protocol that makes video streams sharable, visible and accessible over the network. It is popular for bi-directional audio-video transport and IP production. NDI is available in two main formats – NDI|HX and full NDI. NDI|HX employs H.264 or HEVC encoding/decoding to reduce bitrates significantly, so it is ideal when network bandwidth is limited, producing high-quality video streams at low data rates. NDI®|HX3 now delivers extremely high video quality with minimal latency. It achieves this at the cost of a slightly higher bandwidth – but still only a fraction of the headroom needed for full NDI.

*NDI® is a registered trademark of the Vizrt Group.

What's the Difference Between HX2, HX3, and High Bandwidth?

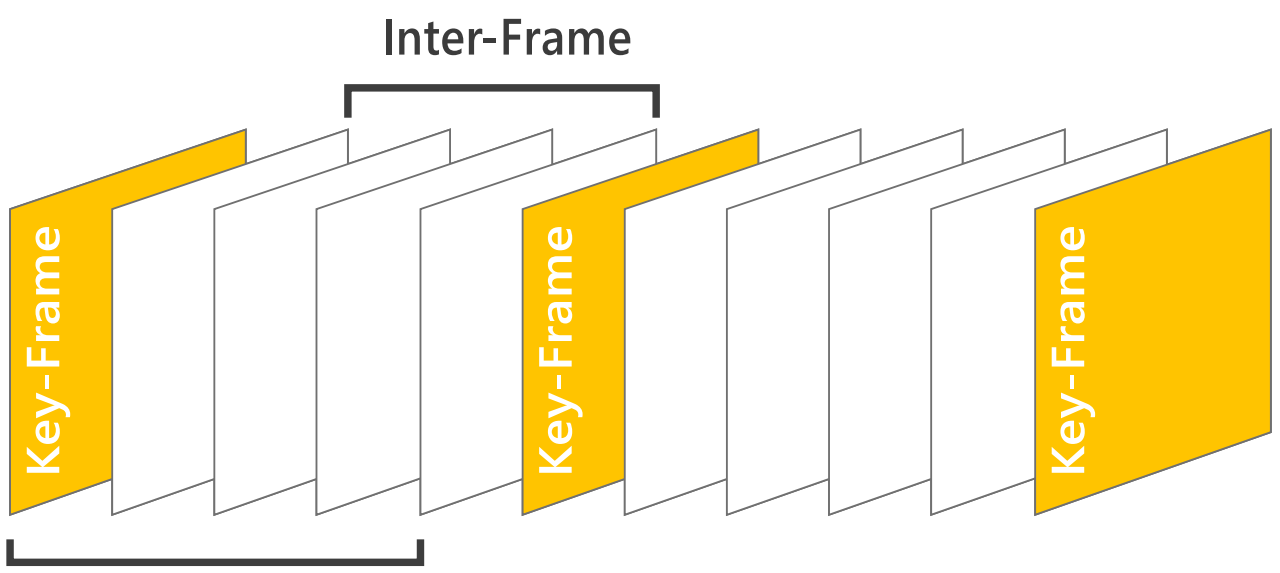
While NDI|HX provides high-quality videos using efficient encoding algorithms, NDI High Bandwidth uses the full bandwidth to produce 125mb/s HD and 250mb/s UltraHD video streams.

With the arrival of HX3, users requiring the ultimate video quality have a new option: NDI|HX3 produces visually lossless video, with very low latency. In picture quality and delay, it is now essentially indistinguishable latency from NDI High Bandwidth.

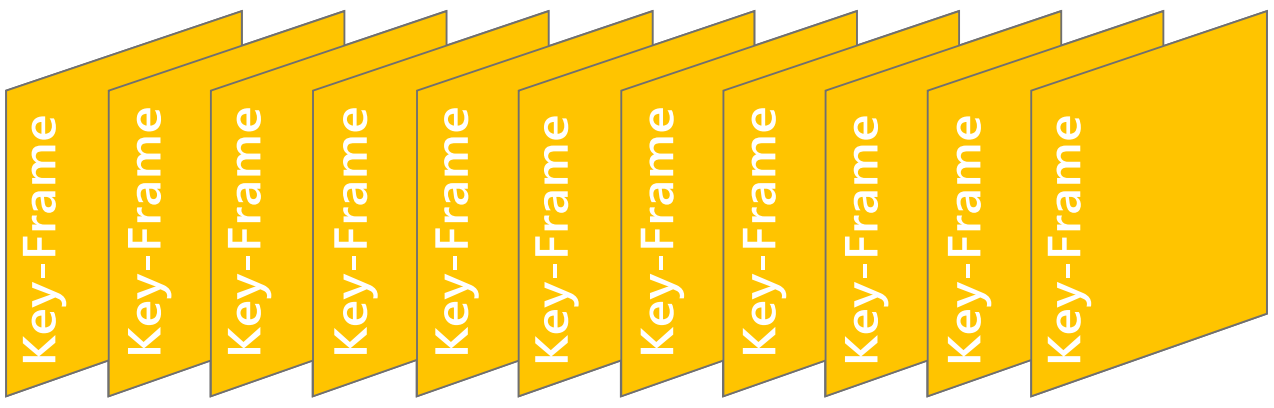
	NDI|HX 2	NDI|HX 3	NDI High Bandwith
Quality	Good	Great	Great
Bandwidth	Low (~18 Mbps)	Medium (~80 Mbps)	High (~250 Mbps)
Latency	Medium	Very Low	Very Low
Requires FPGA	No	No	Yes
GOP	60	1 or 2	1

What is GOP?

HX3 employs GOP technology to deliver this step change in video quality. So, what is GOP? Compressed video streams consist of a consecutive series of GOP (groups of pictures). The GOP contains key-frames and inter-frames within encoded bitstreams. Key-frames (also known as I-frames) have the picture's complete information, describing all the frame's details. An inter-frame (p-frame or b-frame) only describes the part of a picture that has changed. That's how compression technology gets rid of redundant information and reduces the required bandwidth. In a nutshell, more keyframes mean more data and higher picture quality, while more inter-frames mean less data and a slight loss of video quality. As well as delivering higher image quality, keyframes require less computational processing, so the fewer inter-frames, the lower the latency.



NDI® | HX3



NDI|HX3 doesn't require an FPGA.

Why is this important?

Whereas NDI requires an FPGA, NDI|HX3 has no such requirement. This is very important! An FPGA is a programmable hardware device or chip. It's an extremely flexible electronic component that can be programmed to achieve virtually any digital function. However, an FPGA contains millions of Logic-Blocks that require high power consumption and generate heat. The cost of an FPGA is also expensive.

NDI|HX3 supports ARM-based devices. An ARM-based solution is very widely used and is low cost. It makes it possible to run NDI|HX3 on most hardware devices including mobile devices and affordable cameras.

	FPGA Device	Arm-based Device
High Thermal Issue	High	Low
Power Consumption	High	Low
Reliability	Medium	High
Cost	High	Low
Flexibility	Very High	Medium
Commonly Used	Medium	Very High

The Art of NDI|HX3

NDI|HX3 delivers the perfect balance of bandwidth and quality. Previously, users appreciated the video quality of full NDI, but many networks were unable to cope with high data rates.

Conversely, NDI|HX and NDI|HX2 were ideal in terms of bandwidth, but with a small sacrifice in terms of image quality.

With the advent of version 3, NDI|HX is suitable for most modern IP networks, yet delivers superb video quality with minimal delay.

Does NDI 5 Support NDI|HX 3?

NDI 5 tools and applications offer users and administrators the ability to manage NDI networks, enhance creative workflows, monitor sources, control devices and connect users locally and remotely.

The great news is that NDI 5 Tools can natively decode NDI|HX3, including NDI Bridge. NDI|HX3 is supported in the current NDI SDK, and an Advanced SDK for NDI|HX3 is available.

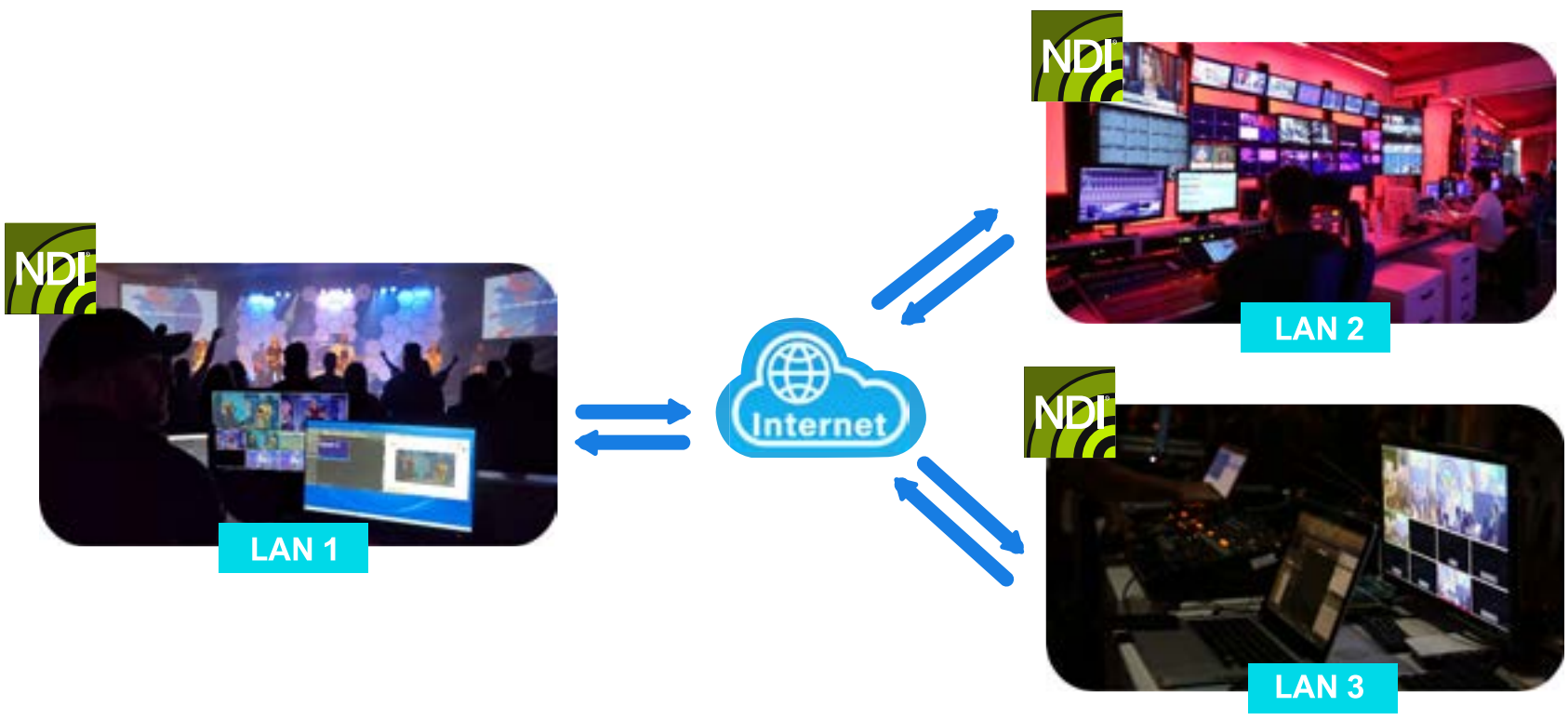
Enter NDI 5

Until the advent of NDI 5, the format was used overwhelmingly in event and broadcast production. This is not just because of NDI's heritage in the media industry. It's also because of specific AV requirements, many of which have now been addressed in NDI Tools, version 5. Now, NDI offers AV managers an enhanced AV over IP technology.

NDI Bridge

Conquer the Wide Area Network

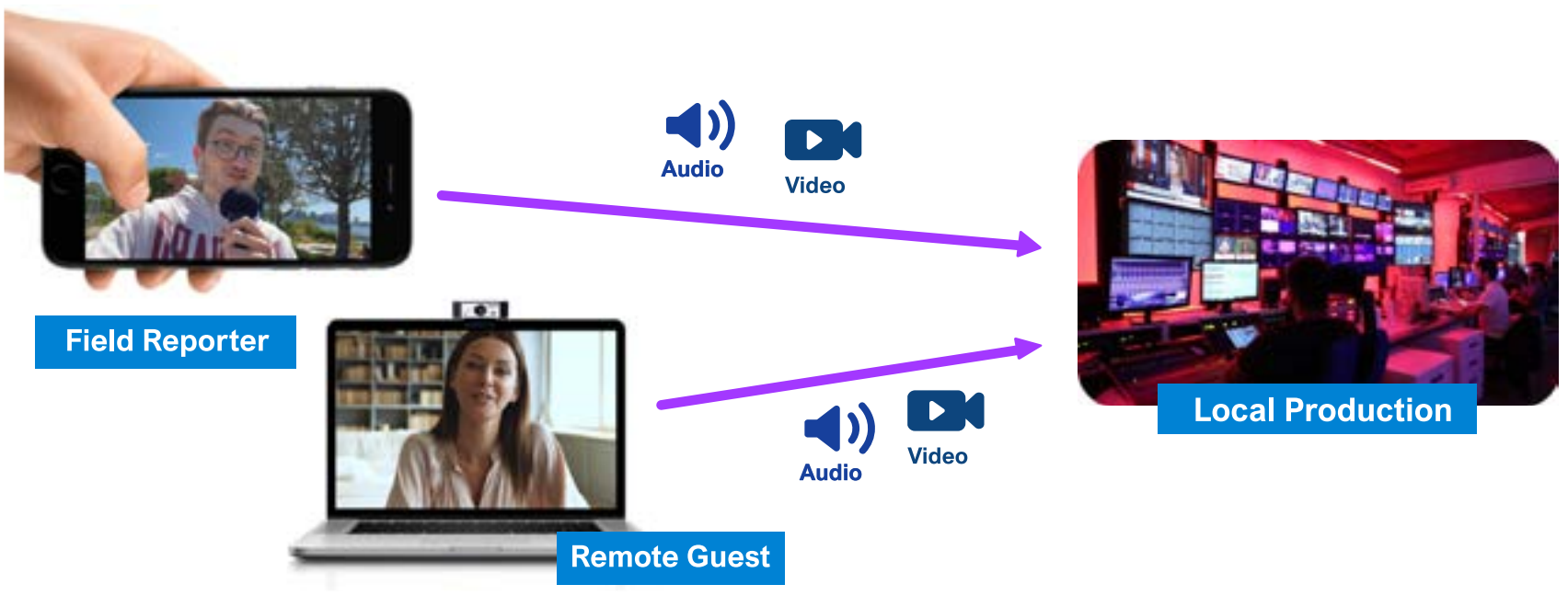
Firstly, NDI now takes video over IP beyond the LAN. Where organizations run a wider area network and remote facilities, the new NDI Bridge allows AV technicians to share a secured connection between independent networks, that might be linked only using the public Internet. NDI Bridge connects not just device to device but entire networks. NDI 5 moves audio and video across WANs and Wi-Fi networks to deliver a smooth, reliable AV experience.



NDI Remote

Turn Your Smartphone into an NDI Video Source

With NDI Remote, external camera feeds can be connected to the Internet to contribute to a live broadcast. It's as simple as sharing a QR code or email-able link with a remote user who can click to join their Smartphone, webcam, or any camera that can stream via a web browser to live production. Using a technology called WebRTC, the connection is fast and stable, and the picture quality is good. With NDI Remote, up to 10 remote guests can contribute live video streams to live production.



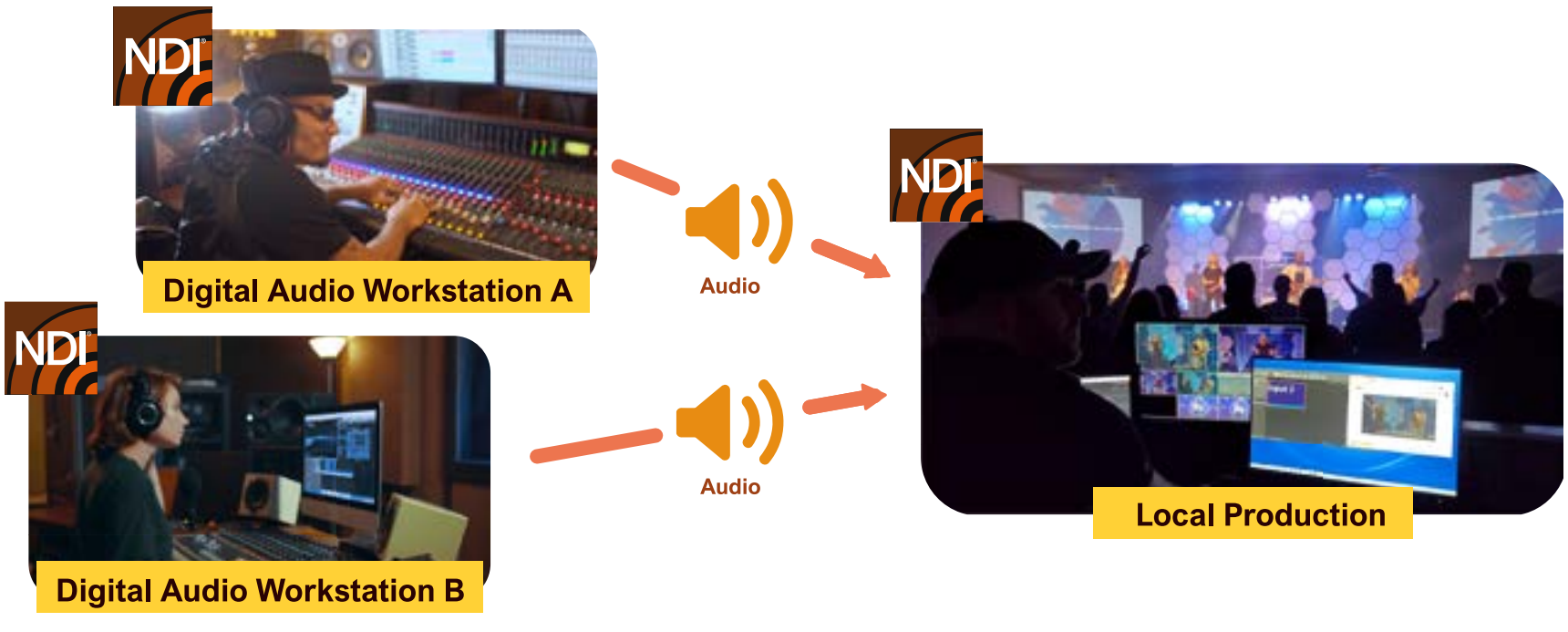
NDI Webcam Input

Version 5 also broadens NDI's appeal in the video conferencing and unified communications market. The Webcam Input app turns any Apple iOS or Google Android device (phone or tablet) into a source camera for Teams and Zoom sessions. This versatility sits well with the BYOD and BYOM trends that are well established in the corporate world.

NDI Audio Direct

Set Free from Hardware Audio Mixer

NDI Audio Direct breaks the limitation of hardware wired audio mixer and give you a choice to use software-based audio solutions. NDI Audio direct brings virtually any audio software application into NDI workflow without any synchronization issues. NDI allows users to receive audio streams only rather than the whole NDI video stream. It will bring much flexibility and creativity with your production workflow.



NDI Screen Capture

NDI Screen Capture transforms any laptop or workstation into an IP source, as well as a shared creative resource on the network. In short, this gives KVM (keyboard, video, mouse) remote control of any workstation on the network. Quality is high, even supporting game streaming at 120Hz with virtually no latency.

NDI Access Manager

These tools, among many others, mean that NDI meets the needs of AV professionals better than ever. However, it is the arrival of NDI Access which delivers a new level of control over sources and groups of devices. With administrators now able to enforce access rights, and restrict particular groups of users from accessing certain NDI resources on the network. Combine this application with the rollout of a dedicated VLAN and security increases even further.

NDI in AV

With the advent of v5, NDI clearly widens its appeal to AV managers:

- Without the need to deploy KVM servers, transmitters, and receivers, AV departments can remotely control computers that are running IPTV applications, playout services, multiview displays, and video walls.
- NDI 5 enables AV teams to run AV networks in hospitals, law courts, and universities. Cameras, recording equipment, and streaming devices can be run on NDI AV networks that are now more secure than ever.
- AV teams can manage AV networks over the WAN or Internet, sharing resources as required with real-time global collaboration.

NDI 5 in Pro AV Application

Distance Learning and Lecture Ccapture

The new tools available in NDI v5 are a valuable addition. NDI Access Manager offers a new way of managing the visibility of devices (such as cameras, recorders, and encoders) on the network. The tool also allows network managers to set access rights to groups of equipment. This enhanced level of security prevents unauthorized access to lecture capture equipment and safeguards the recording and streaming process.

Third-party Production Services

The potential for NDI Bridge is huge, enabling AV and broadcast teams to work together and use specialist third-party production services no matter their location.

Political Rally

Crews can now adapt to remote production. They may have teleprompters, PTZ cameras, and sound devices on-site at a venue in Melbourne, Australia, being controlled and mixed at the production in Auckland, New Zealand. Titling and live graphics could be provided by a specialist service in Singapore, with the commentary team joining the production from a studio in Los Angeles, California.

House of Worship

PTZ cameras and microphones can be installed locally and controlled in a production studio – situated anywhere. Multiple houses of worship can be joined together to share various of each other's services communally all controlled from a single studio.

College Sports

Remote production is now an option, with the switcher and cameras controlled off-site. With NDI Bridge, there is no need for the director to be situated in the same city, state, or even country as the production kit.

Selected Lumens Cameras with NDI 5 Support

VC-A71PN 4K NDI®|HX PTZ Camera

- 4K 60fps
- 30x optical zoom
- Supports NDI®|HX
- Supports PoE+
- HDMI 2.0 / Ethernet

VC-A61PN 4K NDI®|HX PTZ Camera

- 4K 30fps
- 30x optical zoom
- Supports NDI®|HX
- Supports PoE+
- 3G-SDI / HDMI / Ethernet

VC-A51PN NDI®|HX PTZ Camera

- 1080 60fps
- 20x optical zoom
- Supports NDI®|HX
- Supports PoE+
- 3G-SDI / HDMI / Ethernet

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