



SONY

neVion

Whitepaper:

NETWORKED LIVE

**Remote production
(REMI) solution**

October 2026

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Introduction

Remote production is business critical

Remote production (or REMote Integration REMI) is important to broadcasters and media companies because it enables facilities, equipment and staff to be shared across productions, lowering cost and environmental impact while at the same time improving efficiency.

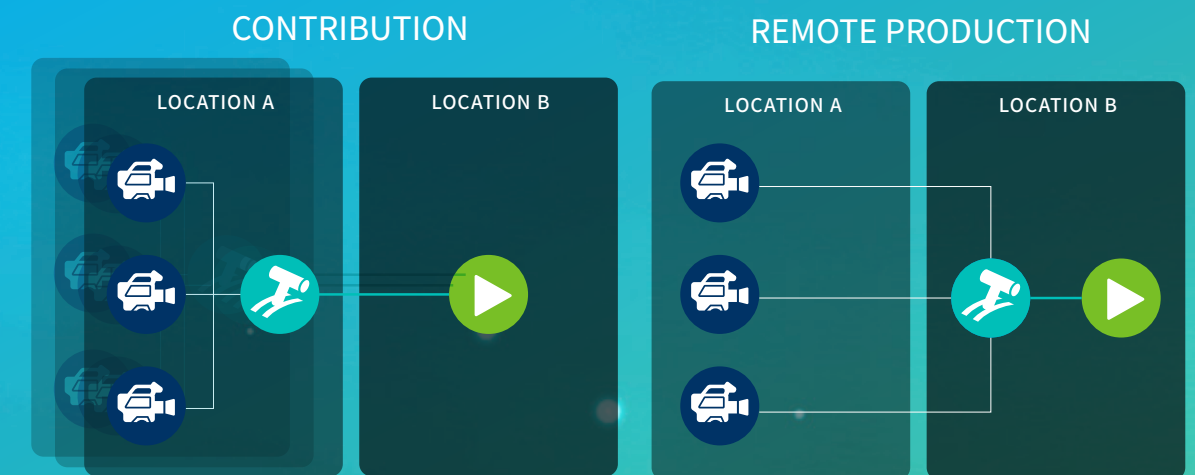
Remote production rests on efficient transport and control

Together with remote equipment control, low-latency transport is essential to REMI because delay affects switching, camera shading, replay, intercom and overall production timing.

A strong solution therefore needs efficient bandwidth use, resilient transport, precise synchronization and compression that preserves quality and keeps delay low enough for real-time workflows.

This document provides an overview of how Sony's Networked Live Remote Production solution delivers on all this - both effective remote control of production equipment and efficient media transport.

Note: This document focuses on ground-based remote production workflows. The emerging software and cloud-based workflows are also supported by Networked Live and are the subject of a separate document.



Contribution vs. Remote Production

Live contribution refers to the real-time delivery of produced signals from the field to a central facility, while remote production uses multiple incoming signals from the field to produce centrally. Although both rely on similar media-transport methods, remote production involves a wider set of requirements, since it spans the entire production workflow, while contribution is limited to the actual transport and control of signals between sites.

Solution overview

About Networked Live

Sony's Networked Live is an ecosystem of integrated solutions, products, services and partners that simplifies the transition to more agile and cost-effective distributed (on-prem, cloud and hybrid) operations.

Networked Live is designed to work seamlessly with existing equipment, familiar control surfaces and systems, and third-party technologies. Built with security at its core and backed by unmatched experience and expertise, Networked Live enables an incremental migration that protects investments and supports scalable growth.

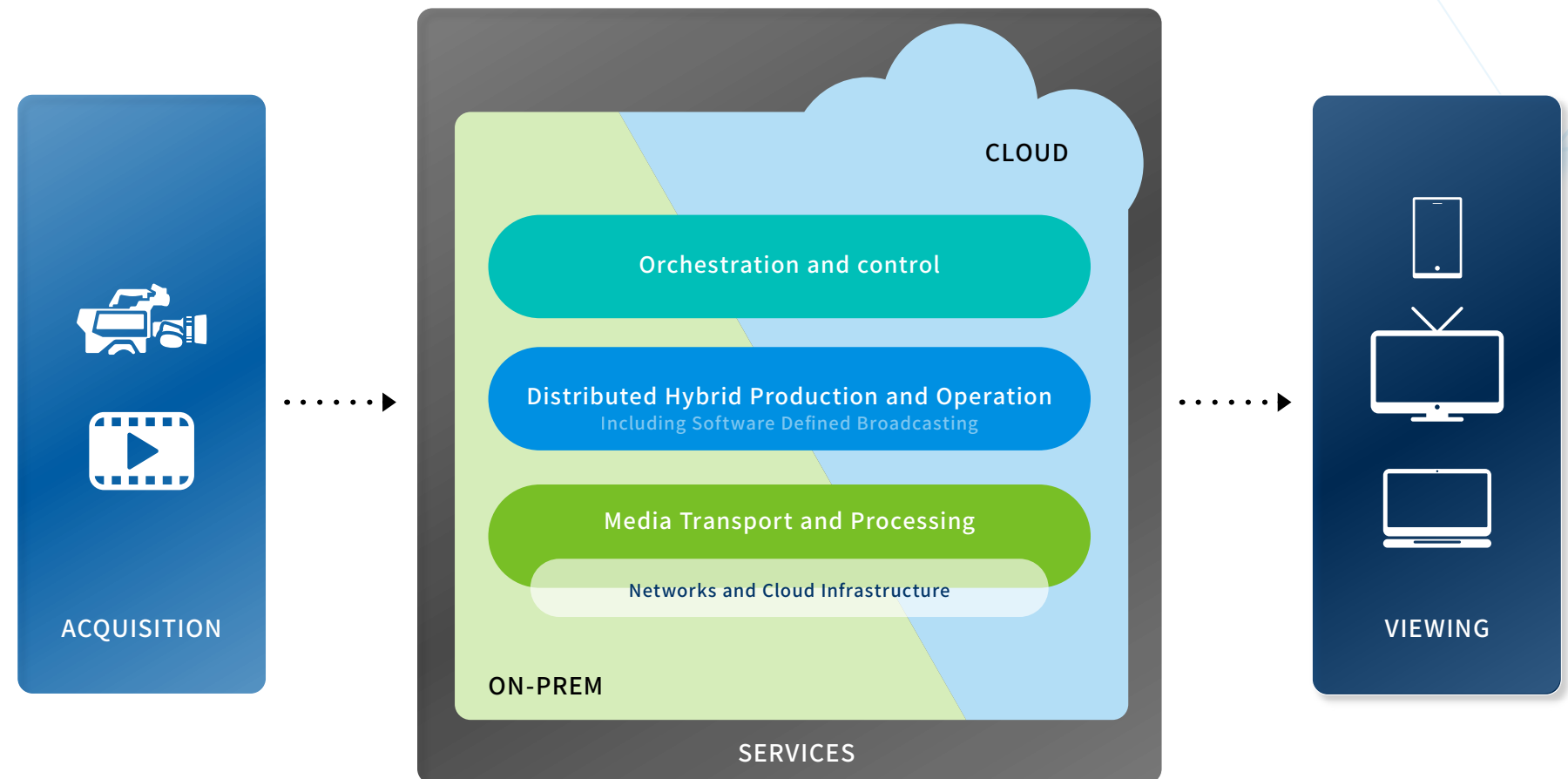
Through Networked Live, Sony provides workflow transforming solutions for facilities, contribution, remote production and more.

Proven remote production solution

The Networked Live Remote Production solution combines Sony's live production experience with Nevion's expertise in IP media transport, processing and orchestration. It is widely used worldwide from regional productions to major sports and esports events.

The optimum production resources, anywhere, anytime

Networked Live is designed to allow production staff, production facilities and processing power (people, places, processing – the 3Ps) to contribute to the live production workflows from wherever it makes most sense, i.e. at the venue, in a central facility, in a data center, in the cloud or even away from any production location. This gives broadcasters greater production flexibility, lower costs and more efficient use of teams across multiple productions.



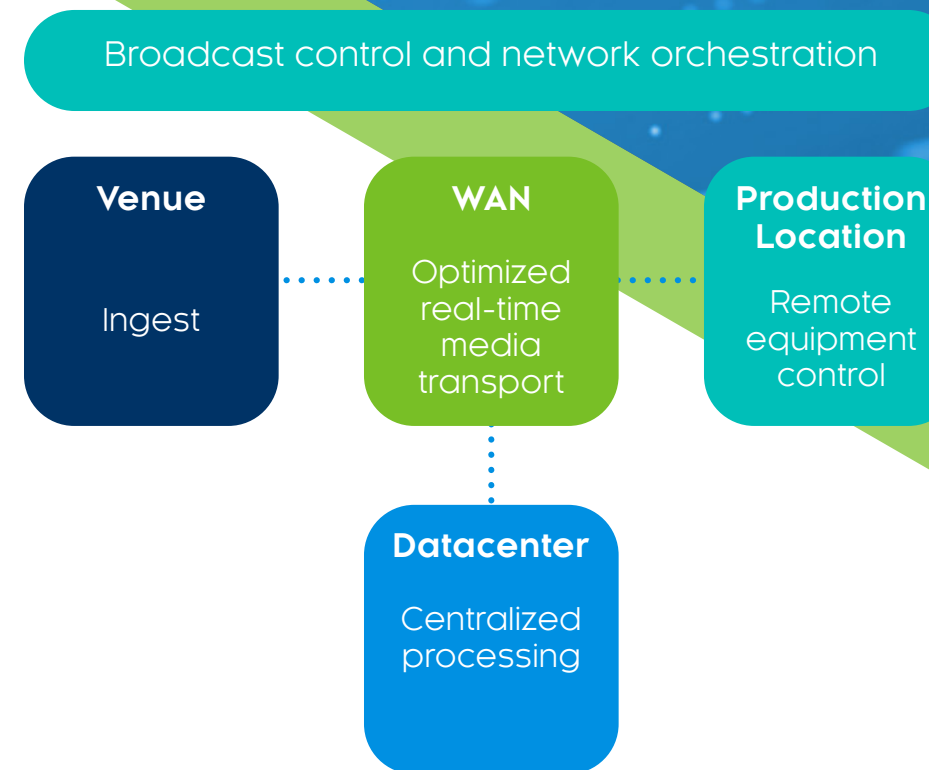
World-beating production equipment

While Sony is renowned for its broadcast cameras and displays, Networked Live extends this with a portfolio of production equipment and systems, including switchers and replay servers.

Putting production teams in control

Featuring the world's leading orchestration and broadcast control platform, VideoPath, the Networked Live Remote Production solution enables resources, including cameras, switchers, routing, replay, media processing and network services to be seamlessly integrated into the live operational workflows. Operators can work remotely through familiar hardware panels, web interfaces or software-defined control surfaces.

Device	Remote control function
Robotic & PTZ Cameras	Adjusting pan, tilt, zoom, focus and preset positions via joystick controllers off-site.
Camera Control Units (CCUs)	"Shading" cameras, i.e. adjusting iris, white balance, black levels and color tint.
Video Switchers	Triggering camera switches, transitions, or routing signals.
Audio Consoles	Adjusting faders, gain, EQ and muting channels on remote stage boxes at the venue.
Tally & Intercom Systems	Sending tally light signals to camera operators and facilitating zero-delay talkback between director and field crew.
Replay servers	Typical replay server actions, including record, play, pause, etc.
Media nodes	Remote configuration and monitoring.
Network switches	Dynamic routing of media flows, with full protection and bandwidth management.



Efficient low-latency media transport

Networked Live supports uncompressed SMPTE ST 2110, JPEG XS, HEVC and even HEVC ULL (ultra-low latency), allowing users to balance picture quality, latency, bandwidth usage and network cost to best suit their production needs.

Software-defined flexibility

Networked Live increasingly uses software-defined and cloud-ready technologies to make remote production less rigid. These technologies allow underlying platforms to be rapidly configured, reconfigured or repurposed to match the needs of each production.

Services to help

Sony and Nevion support customers before, during and after deployment, with professional services, integration expertise and support services that help reduce risk and enable an incremental migration to remote production.

The level of service can be tailored to needs, including all the way to remote monitoring of the infrastructure.

Solution benefits

Produce more, with greater flexibility

Networked Live lets broadcasters use people, facilities and processing wherever they make most sense: at the venue, in a central facility, in a data center, in the cloud or remotely.

This allows teams to share control rooms, replay, switching, processing and specialist operators across productions, helping them cover more events without duplicating infrastructure at every site.

Lower cost and reduce risk

By reducing the need to move large crews, trucks and equipment to every venue, Networked Live helps lower travel, logistics and on-site operational costs, as well as reduce the environmental impact of production. Its pre-integrated products, open standards-based architecture and proven interoperability also reduce integration risk, helping to minimize project issues, delays and the associated costs. It also supports gradual modernization, allowing broadcasters to start small, protect existing investments and scale without needing costly rip-and-replace projects, thereby also further reducing risks.

Improve efficiency, quality and adoption

With centralized orchestration, low-latency transport, familiar control interfaces and software-defined workflows, Networked Live makes productions faster to set up, operate and reconfigure. Sony and Nevion's integration expertise, training and support help reduce complexity, speed adoption and maintain consistent production quality across more live events.

Solution product building blocks

The Networked Live remote production solution is built around several products.

Media transport and orchestration



VideoPath

VideoPath is an industry leading media orchestration platform which uniquely combines broadcast control, network and cloud orchestration, and monitoring capabilities, that can be deployed together or individually. This vendor-agnostic and highly scalable system supports hybrid workflows across ground (SDI and IP) and cloud – enabling a smooth migration towards modern workflows.

For more information:

nevision.com/videoipath/



Virtuoso

Virtuoso is a standards-based, software-defined media node that enables remote production by providing reliable, ultra-low-latency transport, processing, adaptation, monitoring and protection of video, audio and data across LAN, WAN, cloud-connected workflows.

For more information:

nevision.com/virtuoso/



NXL-ME80

The NXL-ME80 is a compact, 1U half-rack Media Edge Processor designed for remote and distributed live productions. It acts as a gateway between LAN and WAN, utilizing ultra-low latency (ULL) HEVC compression to transmit broadcast-quality video streams across limited network bandwidth.

For more information:

pro.sony/products/media-transport/nxl-me80



eMerge

The eMerge IP media fabric is a portfolio of high-capacity IP switches carefully engineered to fulfil specific broadcast requirements for both LAN and WAN networks. eMerge can work in SDN (software defined network) mode for SMPTE ST 2110 networks, fully orchestrated by VideoPath media orchestration platform, and can also operate in enterprise mode utilizing PIM and IGMP protocols.

The switches' advanced features, such as flexible programming of NAT rules, give unprecedented control of media flows in the network.

For more information:

nevision.com/merge/

Note: Networked Live also includes MOXELA, the software-native media processing platform. Software and cloud-based production is the subject of a separate document.

Camera connectivity and control



HDCE-TX30 and HDCE-TX50

The HDCE-TX30 and HDCE-TX50 are compact IP camera extension adaptors designed to connect Sony's system cameras directly to IP networks (such as SMPTE ST 2110) for live broadcast and remote production (REMI) workflows.

In traditional broadcasting, a system camera connects via a rugged hybrid fiber cable directly to its own Camera Control Unit (CCU) on-site. With the HDCE-TX30 and HDCE-TX50, there is no need to bring CCUs to the venue.

For more information:

pro.sony/products/camera-control-unit/hdce-tx30
pro.sony/products/camera-control-unit/hdce-tx50



CNA-2

The CNA-2 is a compact network adapter designed to manage, monitor and control Sony studio and system cameras across multi-camera, multi-site live productions. It enables remote camera adjustments from any PC or tablet.

For more information:

pro.sony/products/camera-control-unit/cna-2

Note: Networked Live also includes the software switcher M2L-X. Software and cloud-based production is the subject of a separate document.

Production equipment and systems



MLS-X1

The MLS-X1 is a modular, scalable live production switcher designed for UHD and HD. It dynamically links multiple hardware units over a network, letting broadcasters reconfigure resources on the fly without replacing the system core. It supports both IP and SDI interfaces for hybrid operations.

For more information:

pro.sony/products/video-switchers/mls-x1



HawkReplay

HawkREPLAY (or Hawk-Eye Replay), is an advanced broadcast and officiating system used in professional sports to capture and review live action. It seamlessly synchronizes multi-angle camera feeds, enabling instant reviews for referees, broadcasters and medical teams.

For more information:

www.hawkeyeinnovations.com/hawkreplay

Production functionality

Broadcast control

Overview

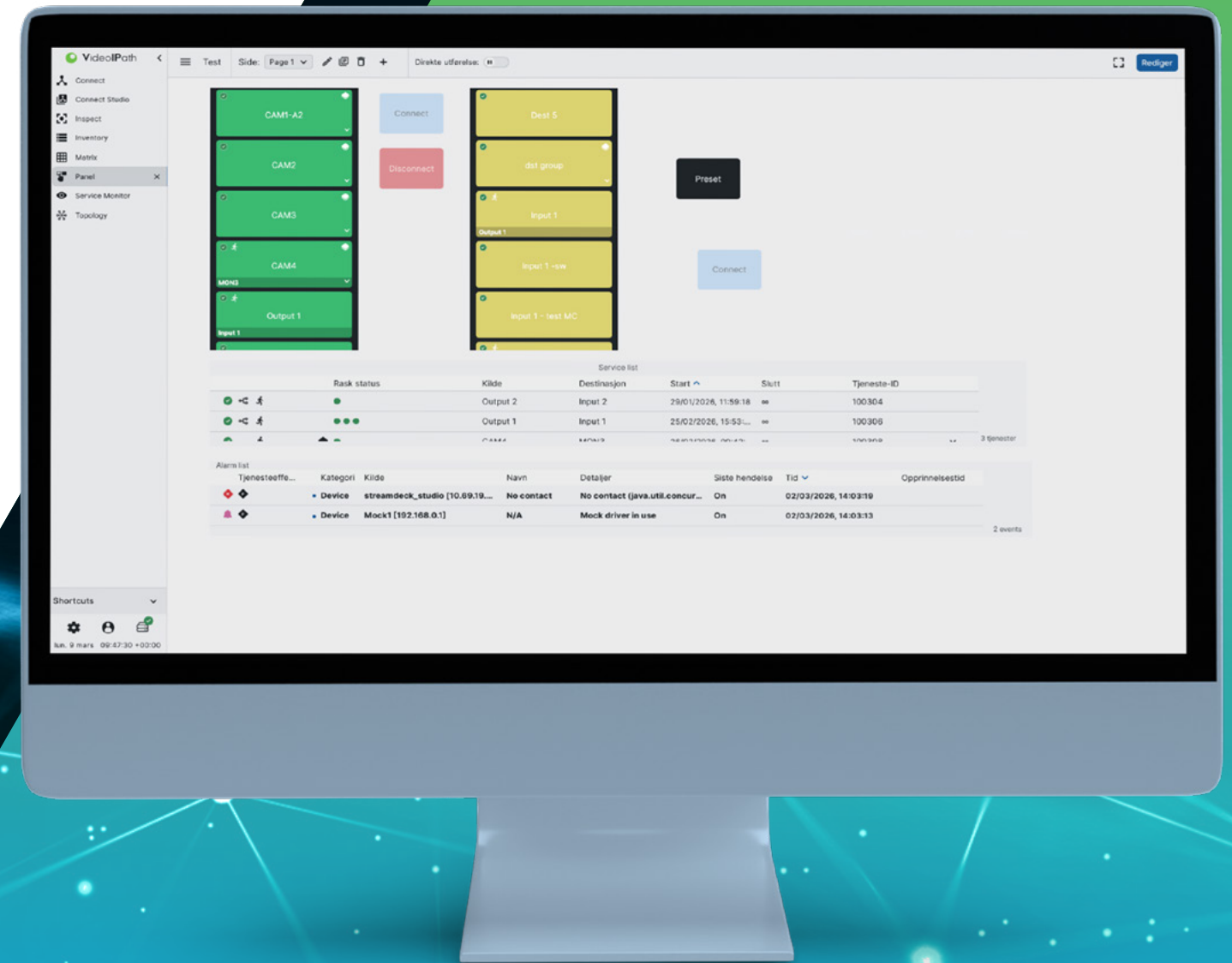
VideolPath broadcast control (Operate) provides the user-facing operational layer for Sony's Networked Live ecosystem, simplifying media routing, resource control and signal management across hybrid SDI, IP, WAN, 5G and cloud environments.

Key functions include routing and service orchestration, resource management, production setup, bandwidth-aware connections, monitoring, alarms and operational panels, enabling efficient multi-site production from a single control layer.

Centralized setup and control of workflows

In a typical REMI workflow, operators use VideolPath to set up and control the full production path without needing all production staff or equipment on site:

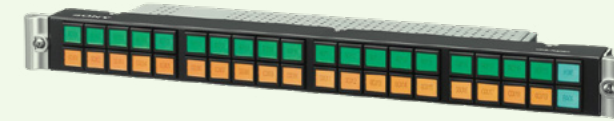
- **Intuitive media routing:** Switch video, audio and data via matrix views, software panels or hardware control panels.
- **On-the-fly parameter control:** Adjust device settings, including cameras, encoders and processing units, through customizable UI widgets.
- **Tally and GPI orchestration:** Manage tally, GPI triggers and preview indicators across distributed facilities.
- **Virtual endpoints and salvos:** Use virtual endpoints and aliases to create overlays on top of physical infrastructure, and macros to trigger complex setups with one action.
- **Vendor-agnostic integration:** Connect not only Networked Live products, but also third-party equipment via open protocols such as NMOS and Ember+, or proprietary interfaces where needed.





Control surfaces

VideolPath offers integration with the following broadcast hardware panels:



- **MKS-R Series Panels:** Control panels (such as the MKS-R4020 and MKS-R1620) that give operators physical button interfaces for routing, parameter control, and salvos.

- **Vision Switcher Panels:** Works alongside MLS-X1 switcher panels for production control and virtualized M/E switching.



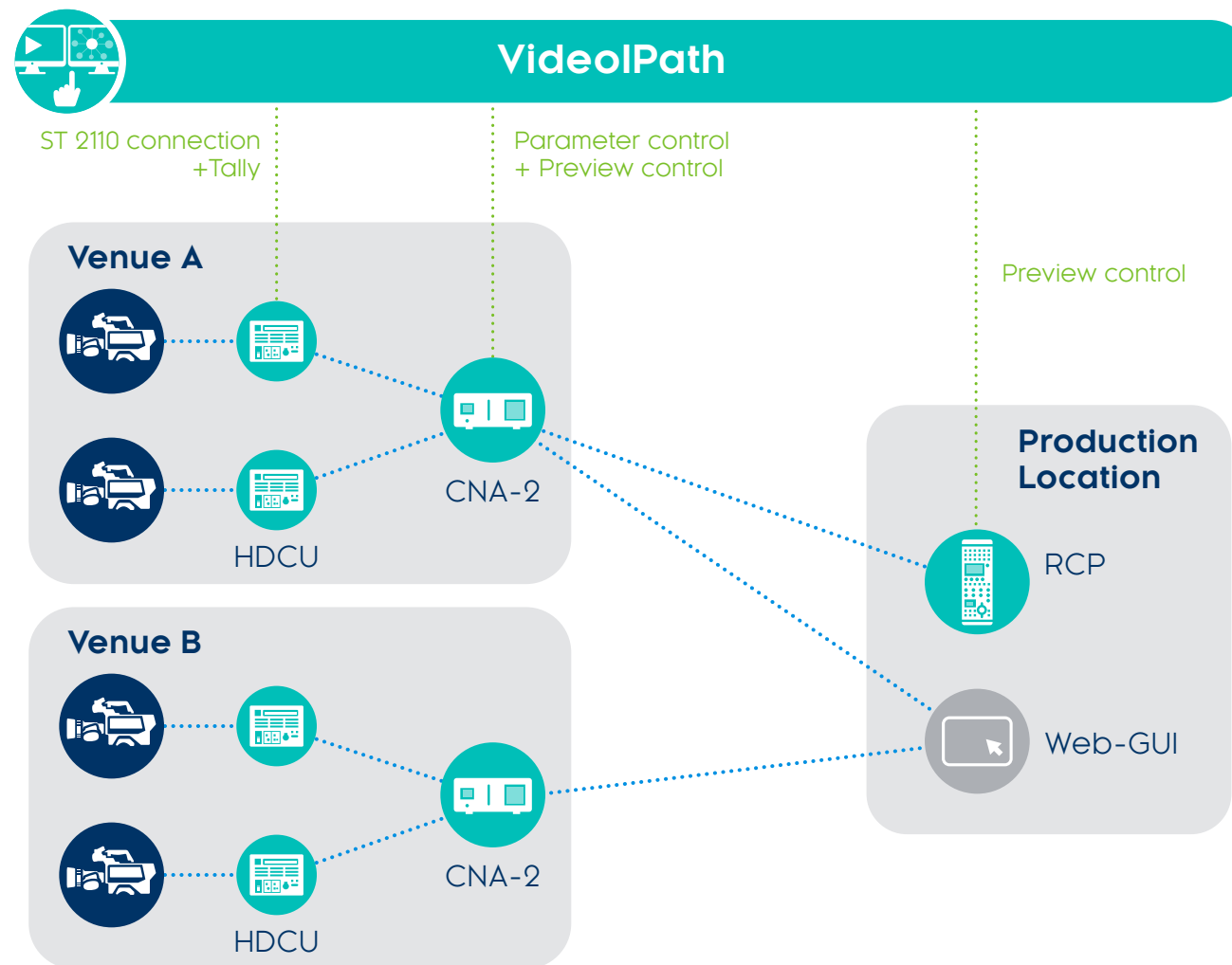
- **RCPs:** Integrates with Sony Remote Control Panels (RCPs) for camera shading, tally and parameter control.

- **Third-party control panels** such as Elegato StreamDeck Studio for routing, parameter control and salvos.

Build for modern dynamic multi-site production

Traditional broadcast control systems were built for static, local infrastructures, making them less suited to REMI workflows across venues, facilities and cloud environments. VideolPath addresses this by combining familiar broadcast control with intelligent orchestration.

Remote control of cameras



The CNA-2 links on-site cameras with off-site engineering teams, allowing them to monitor, control and paint cameras remotely instead of working from an OB truck. Of course, the on-site team can still take over if needed.

Web-based and software-defined control panels

The CNA-2 offers software-based camera control for remote production, replacing MSU and RCP hardware with browser-based WEB-MSU and WEB-RCP options. Operators can adjust camera color, gamma, files and remote-control functions from a PC or tablet, with WEB-RCP supporting up to 12 cameras per interface. CNA-2 also remains compatible with physical RCPs such as the RCP-3500.

Multi-site and global fleet management (GMCS)

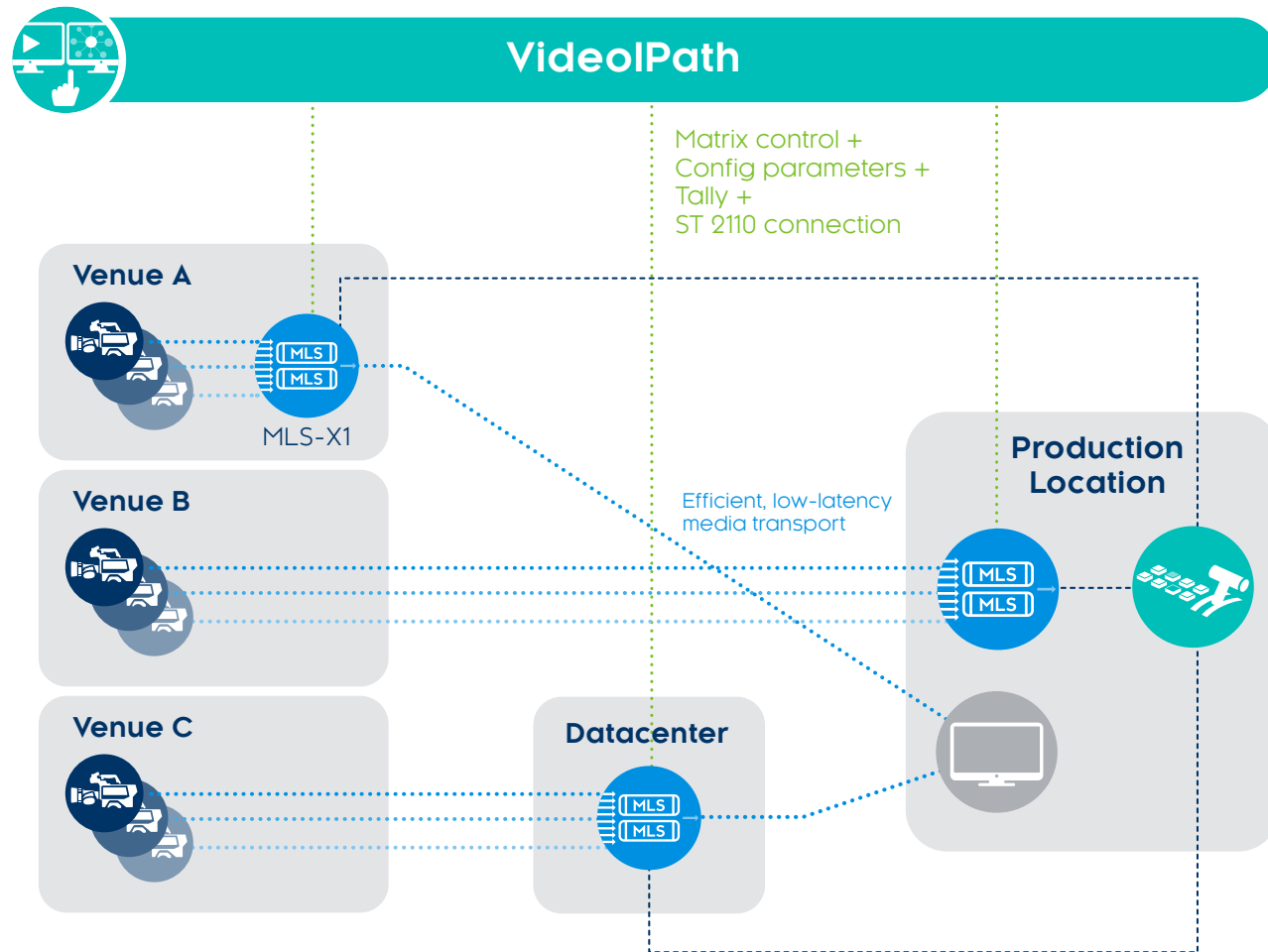
With the Global Multi-Camera System protocol (GMCS), the CNA-2 supports large-scale remote operations by grouping camera fleets into logical domains across venues or studios, while enabling centralized updates to settings, formats and HDR/SDR parameters across the network.

Multi-site and multi-production management with VideolPath

CNA-2 integrates tightly with VideolPath to provide camera domain, CCU and RCP assignment, as well as parameter control through customizable panels.



Video switching from anywhere



Resource sharing and distributed processing

The MLS-X1 switcher decouples processing from the venue, allowing nodes to sit on location, in a central facility or in a data center, while cameras stay on site and operators work from anywhere.

Multiple MLS-X1 units can be networked and grouped dynamically, pooling resources for larger multi camera events or splitting them into smaller logical switchers for separate productions.

Integrated operational control

MLS-X1 operators can work remotely from the processing hardware, using an ICP-X panel for control while in parallel assistants trigger macros, snapshots and crosspoints from the Virtual Shot Box on a secured PC or tablet. The on-site crew can still take over if needed.

Native IP infrastructure (SMPTE ST 2110)

MLS-X1 supports native 100G SMPTE ST 2110 IP interfaces, ingesting uncompressed or lightly compressed streams from remote sites without bulky baseband conversion. Its SignalXChange feature allows logical switchers to share signals across the network, reducing duplicate routing between locations.

Ultra-low latency processing

MLS-X1 combines FPGA-based processing, GPU acceleration and traditional switcher architecture. The FPGA delivers deterministic, ultra-low-latency processing regardless of the complexity of the show, while the GPU provides the flexibility to support future capabilities. Networked Live low-latency transport keeps remote production close to real time.

Multi-production management with VideoPath

MLS-X1 integrates tightly with VideoPath for fast matrix switching, parameter control, setup recall, tally and SMPTE ST 2110 connectivity, simplifying configuration between productions.

Replay operations



HawkREPLAY is a remote-first broadcast and instant replay solution that uses Hawk-Eye's SMART technology to frame-synchronize live feeds, enabling multi-angle clipping and slow-motion replays from almost anywhere.

Remote operator surface

HawkREPLAY lets replay operators control servers in a data center from a central control room, or even from home, over standard public internet connections with ultra-low latency.

Centralized ingest and scalable processing nodes

HawkREPLAY reduces the on-site footprint by using compact 2RU servers in a data center or cloud to ingest camera feeds, giving operators access to centralized ingest from anywhere to pull clips.

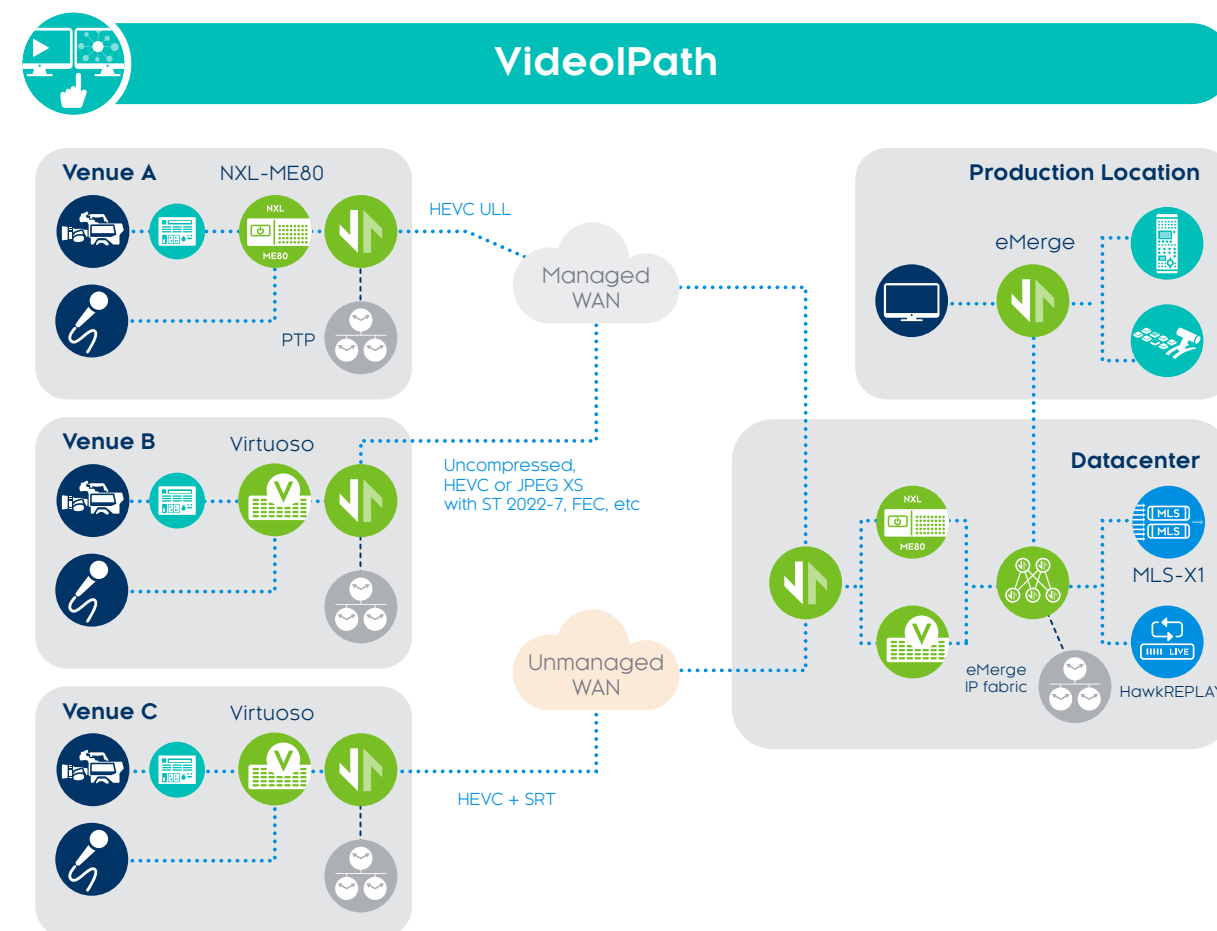
Data-driven automation

HawkREPLAY uses real-time tracking data to automate workflows, auto-tagging and clipping live action for fast delivery to editors and social teams so smaller crews can manage more content.

Site and equipment connectivity

The Networked Live solution includes both low latency media transport and media flow orchestration.

Overview



Virtuoso or NXL-ME80 act as the media edge nodes between local production environments and the transport network. They ingest media and data signals at the venue or facility, transport them efficiently (including conversion, compression, encapsulation, protection, monitoring and synchronization), and then reverse the process at the receiving side to deliver signals in the format required by the local production workflow.

eMerge can provide the high-capacity IP media fabric between venues, facilities, data centers and cloud networks, carrying media and VLAN-based data services under VideoPath orchestration.

Details are provided in the following sections.

Media transport

Ingest and egress

The Networked Live remote production solution can handle video, audio and data feeds in a variety of formats, including:

- **Video** (SDI or ST 2110)
- **Transport stream** (ASI or TS over IP)
- **Digital audio** (AES3 or MADI)
- **Data** (VLAN)

Encoding and decoding

In remote production, latency is often the critical factor, alongside picture quality, reliability and control responsiveness.

Camera feeds, return video, audio, intercom, tally and control signals must move between venue and facility almost as if they were local. Uncompressed media offers the lowest latency, but bandwidth, cost and network constraints often make compression necessary.

Networked Live offers options for different network capacities, quality needs, latency targets and transport environments, including:

- **JPEG XS:** Virtuoso offers visually lossless, ultra-low-latency compression for high-quality HD and UHD/4K over managed WAN, campus and facility networks.
- **HEVC ULL:** NXL-ME80, and soon Virtuoso, provide ultra-low-latency HEVC for lower-bitrate workflows over limited WAN, 5G, public internet or unmanaged networks.
- **Uncompressed ST 2110 (over WAN):** Virtuoso supports uncompressed SMPTE ST 2110 where managed bandwidth is available and minimum latency is required, such as production facilities, venues and dedicated high-capacity networks.

Virtuoso and NXL-ME80 address different remote production needs, with the two products also able to work together in end-to-end workflows: Virtuoso supports a broad range of transport, processing and protection options, while NXL-ME80 provides compact HEVC ULL capability for bandwidth-constrained or remote deployments.

Transport and protection

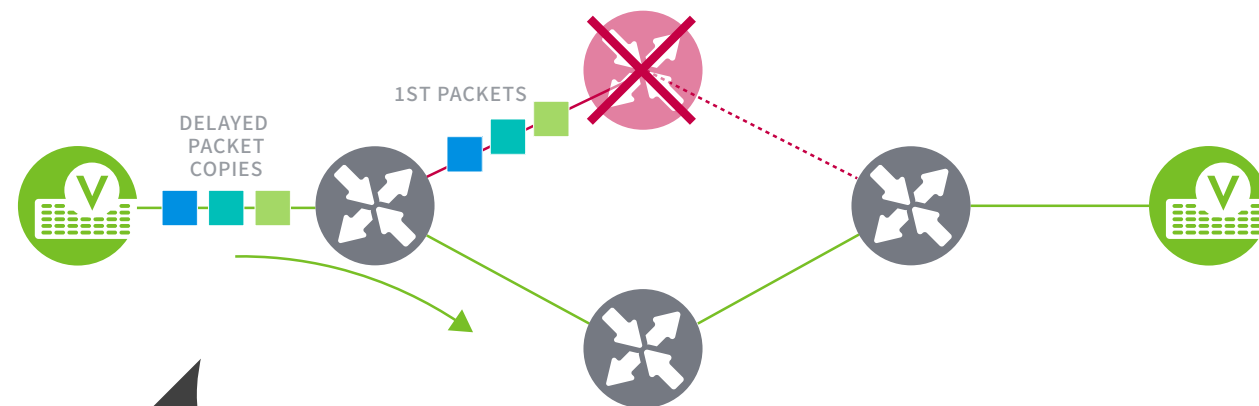
WAN workflows typically use TS over IP for venue-to-facility, facility-to-cloud and backup links. SMPTE ST 2110, often with JPEG XS, can also be used on engineered media WANs, but is less suited to unmanaged links because separate media essences must stay synchronized end to end.

In Networked Live deployments, Virtuoso, NXL-ME80 and eMerge provide the protection layer, with VideoPath orchestrating service setup, monitoring and restoration.

Virtuoso offers multiple protection options to match the network design, bandwidth, path diversity and latency budget, including SMPTE ST 2022-7, SRT, FEC, LDO and input switching to an alternative source or path.

The NXL-ME80 offers excellent protection options for remote production using SonyQoS that provides a unique low-latency retransmit mechanism combining ARQ, FEC and encryption. It also provides SMPTE ST 2022-7 style protection for LAN and WAN interfacing.

In managed IP networks, SMPTE ST 2022-7 is preferred where dual paths are available, enabling hitless reconstruction with minimal delay. On single-path or unmanaged networks, SRT, FEC, LDO or SonyQoS can be used depending on reliability, latency and bandwidth trade-offs.



LDO - Launch Delay Offset

LDO is a unique protection mechanism for single link transport. It works by sending IP packets twice, with a slight delay. The idea is that, if a network experiences a problem and needs to re-route automatically causing the packets to drop in the initial path, then the copies of the packets will go through on the new path. The delay between packets is set to exceed the path reconfiguration time of the network to ensure the new path is used by the copies.

Unmanaged networks

Remote production ideally uses WAN links with guaranteed bandwidth, low latency and service-level assurances. However, for smaller productions, temporary venues, backup paths or cloud contribution, unmanaged networks such as public internet or enterprise data services may be sufficient.

Networked Live supports unmanaged contribution with high compression (HEVC) and single-path protection (SRT, SonyQoS or LDO) where bandwidth is limited and dual paths are unavailable.

Unmanaged networks and technologies (e.g. SRT) add latency, that makes this low-cost approach more suitable for tier 2 and tier 3 events than latency-critical tier 1 productions.

SRT - Secure Reliable Transport

SRT (Secure Reliable Transport) is an open-source video streaming protocol designed to deliver high-quality, low-latency live video securely across unpredictable networks like the public internet. By combining the speed of UDP (User Datagram Protocol) transport with intelligent error recovery mechanisms like packet retransmission, SRT compensates for jitter, bandwidth fluctuations and packet loss without causing stream freezes. Additionally, built-in AES encryption ensures end-to-end content security during transmission.

SonyQoS

SonyQoS prioritizes time-critical media traffic across IP networks, helping protect live video and audio from congestion, jitter, packet loss and latency. This makes media flows more predictable and reliable, while allowing the same network to carry less time-sensitive traffic efficiently.

Video and audio processing

As well as providing reliable and secure transport, Virtuoso can also process video and audio before delivery to the facilities, including:

- **Video:** up, down and cross-conversion, plus color correction.
- **Audio:** shuffling, delay, mixing, summing, gain control and embedding.

This helps bridge multi-site workflows by synchronizing, format-converting and color-matching feeds before they reach the production facility.

Trust boundary

In remote and distributed production, a trust boundary separates trusted production networks from shared or untrusted transport networks such as WAN, 5G and third-party services.

Networked Live applies this at the media edge and network fabric: Virtuoso filters, normalizes and protects media streams; eMerge provides high-throughput isolation, and VideolPath orchestrates both layers for a clear, secure demarcation between local and remote environments.

Network orchestration

In Networked Live, VideolPath acts as both broadcast controller and network orchestrator.

For REMI workflows across venues, data centers, WANs, 5G and cloud, it manages connection lifecycles, network topology and transport reliability. It provides amongst others:

- **Automated end-to-end routing:** VideolPath automatically provisions network paths for SMPTE ST 2110, JPEG XS or HEVC streams between venues, data centers and control rooms.
- **Connection management:** VideolPath establishes IP connectivity across the media network using NMOS APIs or dedicated drivers developed by Sony, Nevion, partners or others.

- **Bandwidth management:** VideolPath selects suitable routes, checks WAN capacity and reserves bandwidth for requested media connections.
- **Redundancy control:** VideolPath provisions diverse paths and supports source protection, passive path provisioning and automatic rerouting for critical events.
- **Integrated cloud workflows:** VideolPath orchestrates signal flows not only between venues, data-centers and production facilities, but also into cloud processing environments such as AWS.

Software-based and cloud production

Networked Live also provides extensive software-native and cloud-based production, transport and orchestration capabilities. These are outside the scope of this document, but details can be found on the Sony website and a separate solution description.

Conclusion

Sony's Networked Live Remote Production solution gives broadcasters a practical path to more flexible, scalable and efficient live production.

By combining low-latency media transport, centralized orchestration, remote control, software-defined processing and proven production tools, it enables teams to produce more events from the same resources while reducing cost, complexity and on-site footprint.

At the same time, the industry is moving steadily towards software-defined broadcasting, with more flexible media architectures and DMF/MXL-style workflows beginning to emerge in the REMI space. Networked Live supports this evolution by combining dedicated, proven media infrastructure with software-defined products such as the M2L-X switcher, the MOXELA media platform, HawkREPLAY and of course the VideoPath orchestration platform. Software and cloud-based production is the subject of a separate solution paper.

Whether deployed across venues, central facilities, data centers or cloud environments, Networked Live helps organizations adapt production workflows to each event's needs without compromising operational control, reliability or quality. It provides the foundation for modern remote and distributed production, while supporting an incremental migration that protects existing investments.





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