

High Speed I/O SDI-NDI® Transport Platform

With up to thirty two 3G-SDI ports and four to twelve 10 Gbps Ethernet ports, the DenzCoder High Speed I/O SDI-NDI Conversion Platform can decode/translate up 32 pairs of simultaneous 1080p60 feeds between SDI and NDI, in either direction. And, it has the additional capability to transport those incoming and/or outgoing streams over the public Internet with perfect accuracy, using the RIST error correcting protocol. *Just add bandwidth!*

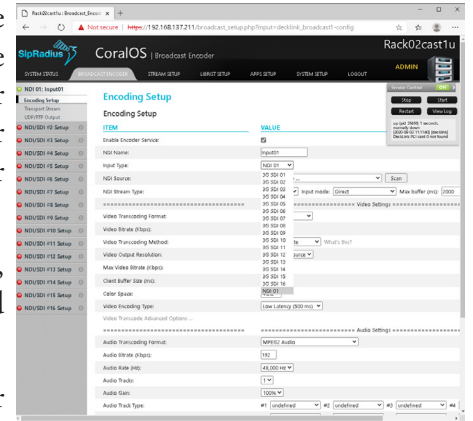
Note also that every input can have multiple outputs, enabling multiple sources, multiple destinations and multiple-site workflows for the widely scattered and pandemic-isolated working environments of today require.

The Denz I/O Platform molds and organizes your current workflow, merging your networked NDI systems with your SDI infrastructure. It integrates feeds from previously incompatible devices across the network for switching, streaming and fast delivery.

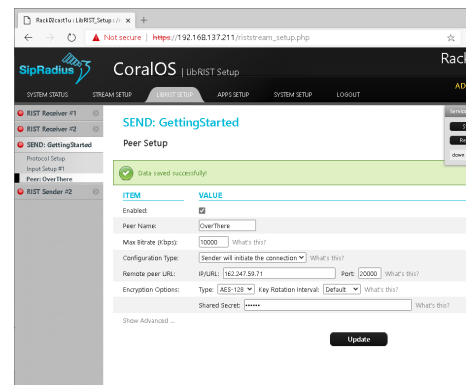
- Convert 4 or 8 3G SDI 1080p/60 (1RU), or 4 to 32 3G SDI 1080p/60 (2RU) to an equal number of NDI sources for input, output, or combination of both.
- Four 10Gbps Ethernet plus an optional two or four more (on the 1u; up to eight additional for a total of twelve, are available on the 2u).
- Format and resolution independently configurable per channel.
- Multiple IP outputs per channel, providing the ability to simultaneously output to both SDI and to relay to other networks (such as to a remote control room) for maximum flexibility in workflow planning.
- Time-synchronize multiple streams from multiple sources when paired with other members of the DenzCoder line.
- Perfect packet-by-packet reproduction and fast transport of remote program content using the RIST protocol. Specially designed to optimally use small buffers, RIST adds delay based only upon a small number of multiple round trip times, low enough to make live remotes feasible... and of perfect quality. We license RIST by the number of senders and receivers, and will consult with you regarding the right number of licenses. The operating system provides GUI configuration of the RIST connectors, and facilitates the application of advanced parameters such as multiple paths, encryption, etc.

By bringing SDI, NDI and RIST together, in all possible combinations, the Denz I/O Platform can help you mediate between your existing infrastructure and your emergent technologies, wherever they may be located.

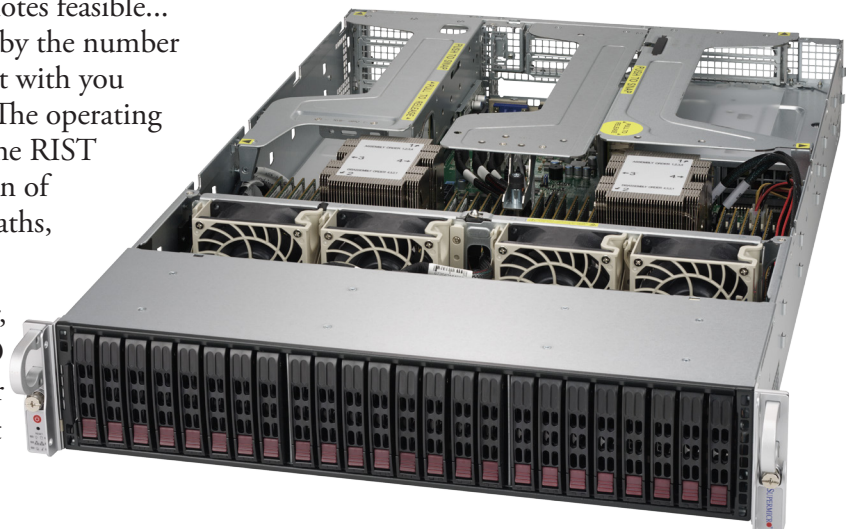
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- SDI/NDI output formatting and configuration provides a wide range of advanced options and controls that can be implemented quickly for fast acquisition as well as meticulously fine-tuned for the most demanding professional requirements.



- libRIST configuration allows for multiple receivers, multiple streams per RIST connector, AES encryption, and even compression.



System Overview SDI/NDI I/O

SDI Input/Output

- 1RU form factor: one card, four or eight ports, PCI-E 3.0 x8
- 2RU form factor: up to four cards, four or eight ports each, PCI-E 3.0 x8
- 720p50, 720p59.94, 720p60, 1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60, 1080PsF23.98, 1080PsF24, 1080PsF25, 1080PsF29.97, 1080PsF30 1080i50, 1080i59.94, 1080i60
- SMPTE 259M, SMPTE 292M, SMPTE 296M, SMPTE 372M, SMPTE 425M, ITU-R BT.656 and ITU-R BT.601
- RP 188/SMPTE 12M-2 and closed captioning.
- Television standard sample rate of 48 kHz and 24 bit
- 8, 10, 12-bit RGB 4:4:4 in all modes up to 1080p30 and 8, 10-bit YUV 4:2:2 in all modes. 12-bit RGB 4:4:4 only supported in playback.
- 8, 10, 12-bit RGB 4:4:4 in all modes up to 1080p30 and 8, 10-bit YUV 4:2:2 in all modes. 12-bit RGB 4:4:4 only supported in playback.
- REC 601, REC 709 Color Spaces
- 16 channel audio

NDI Input/Output

- NDI SDK Version 3.8
- NDI Discovery (in Web GUI)
- NDI HX Protocol 8–20 Mbps

Hardware

- Dual Socket P (LGA 3647) 2nd Gen Intel® Xeon® Scalable Processors
- Up to 28 Cores per socket
- Up to 6TB Memory total
- Intel® C621 chipset
- 6 Gbps SATA 3
- 4 RJ45 10 Gbps LAN (can be bonded; plus 1 IPMI)
- Optional: Intel 10Gbps PCI, 2 or 4 port; 1RU: 1 slot; 2RU: 2 slots available
- 750W (1u)/1000W (2u) Redundant Power Supplies
- Dimensions: 437 x 43 x 724 mm (1RU), 437 x 89 x 723 mm (2RU)
- *NOTE: System images/installer available for customer supplied hardware or virtual machines. VMs can be hosted in commercial mega cloud vendors, or your own NOC. In both cases, Denz can consult with the customer beforehand to verify the physical or virtual hardware configuration prior to sale.*

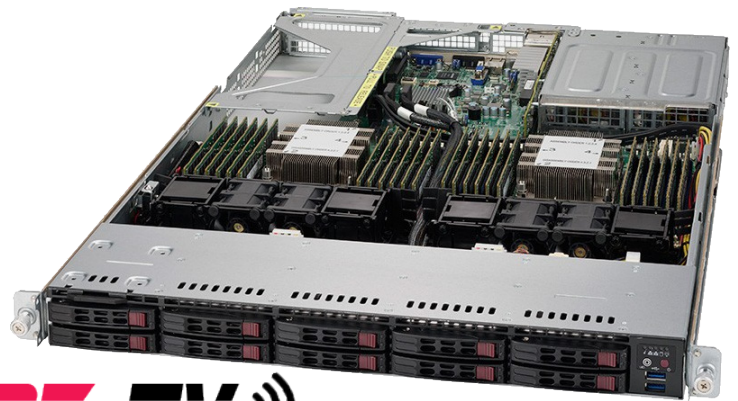
How RIST Works

RIST stands for Reliable Internet Streaming Transfer protocol. Its reason for being is that the Internet is a patchwork of equipment of constantly changing routes of variable quality. Internet packet loss normally runs somewhere between .01% and 1% on even the best quality networks.

To avoid these losses, important protocols such as mail, worldwide web and others rely on the tcp protocol. It provides a mechanism for confirmation that each packet was received. But this adds a huge overhead in messaging, and it automatically cuts speed severely at the very first error. HLS/DASH browser hosted videos try to solve this by requesting very small chunks of media and storing them in a fairly large buffer.

The alternative is the udp protocol, which RIST uses. The sender shoots out the packets as fast as it can without waiting for confirmation. There is no confirmation, and packets can be lost. But RIST also adds an error correction process. RIST tags each packet with a sequence number and a time stamp. The receiver checks that it has every number in the sequence. If it skips one, it tells the sender to re-send it, even as additional packets arrive -- it never stops. DenzTV's implementation of RIST additionally leverages the specification to ensure proper time synchronization of the streams and jitter control. This is especially important when moving large numbers of h.264 (or other) encoded streams over the Internet.

Given a short buffer time, the receiver has time to insert a resent missing packet before handing it off to a viewer or writing it to file. RIST therefore is the fastest and most efficient way to copy files over the Internet.



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