STUDER v roce 2024

ABEX – Morava Montreux

2024

Měřicí & Studiová Technika

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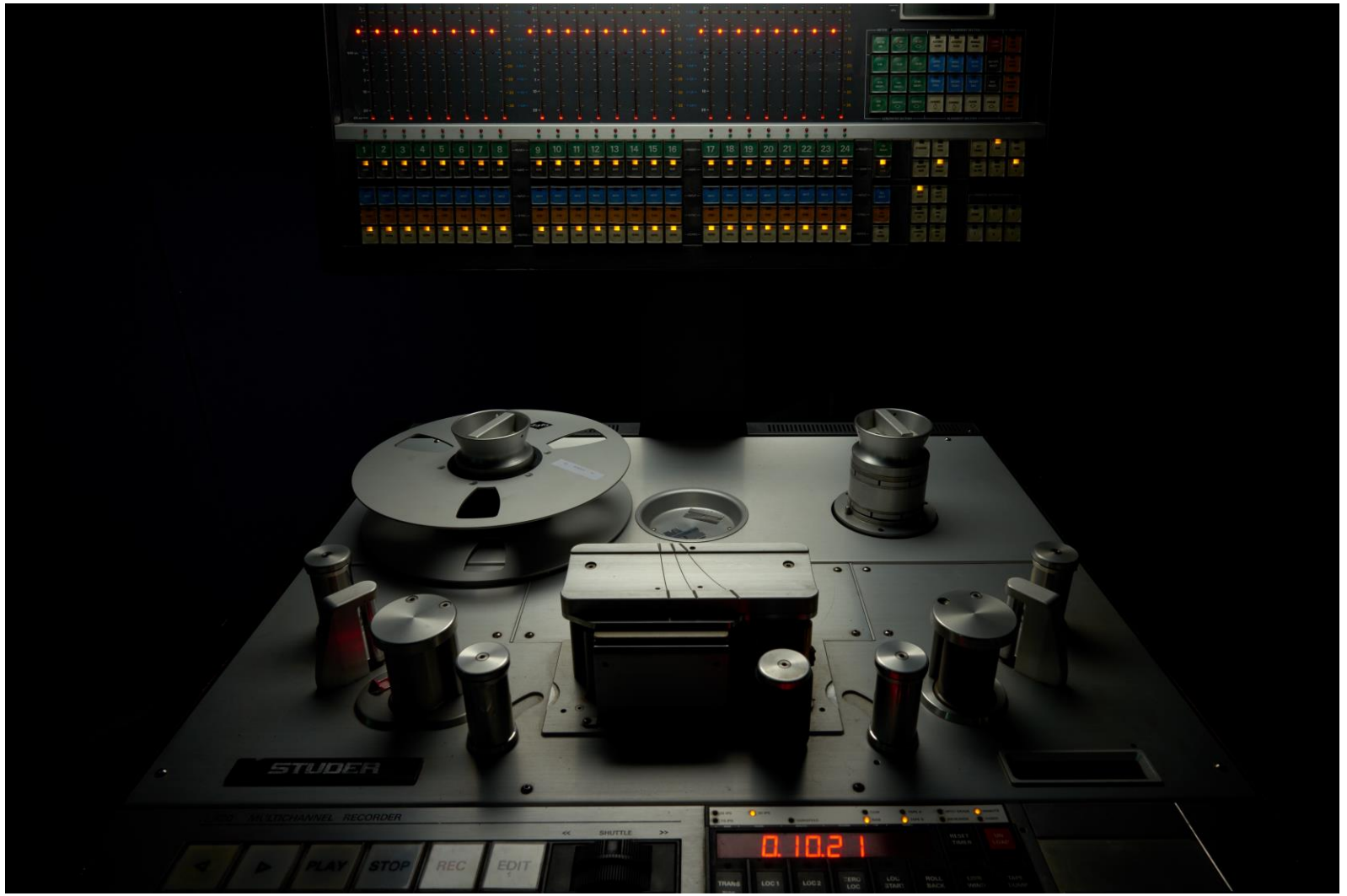
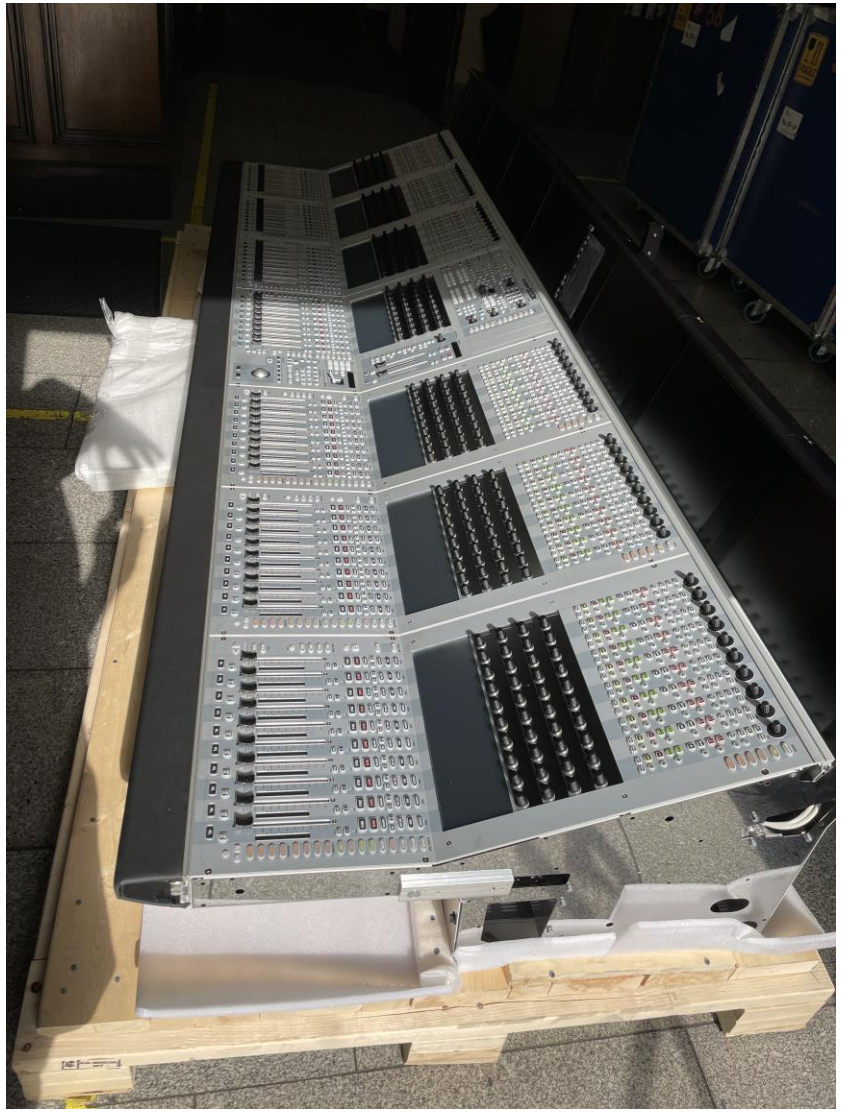
STUDER – historie a současnost



Zvuková režie v Rudolfinu



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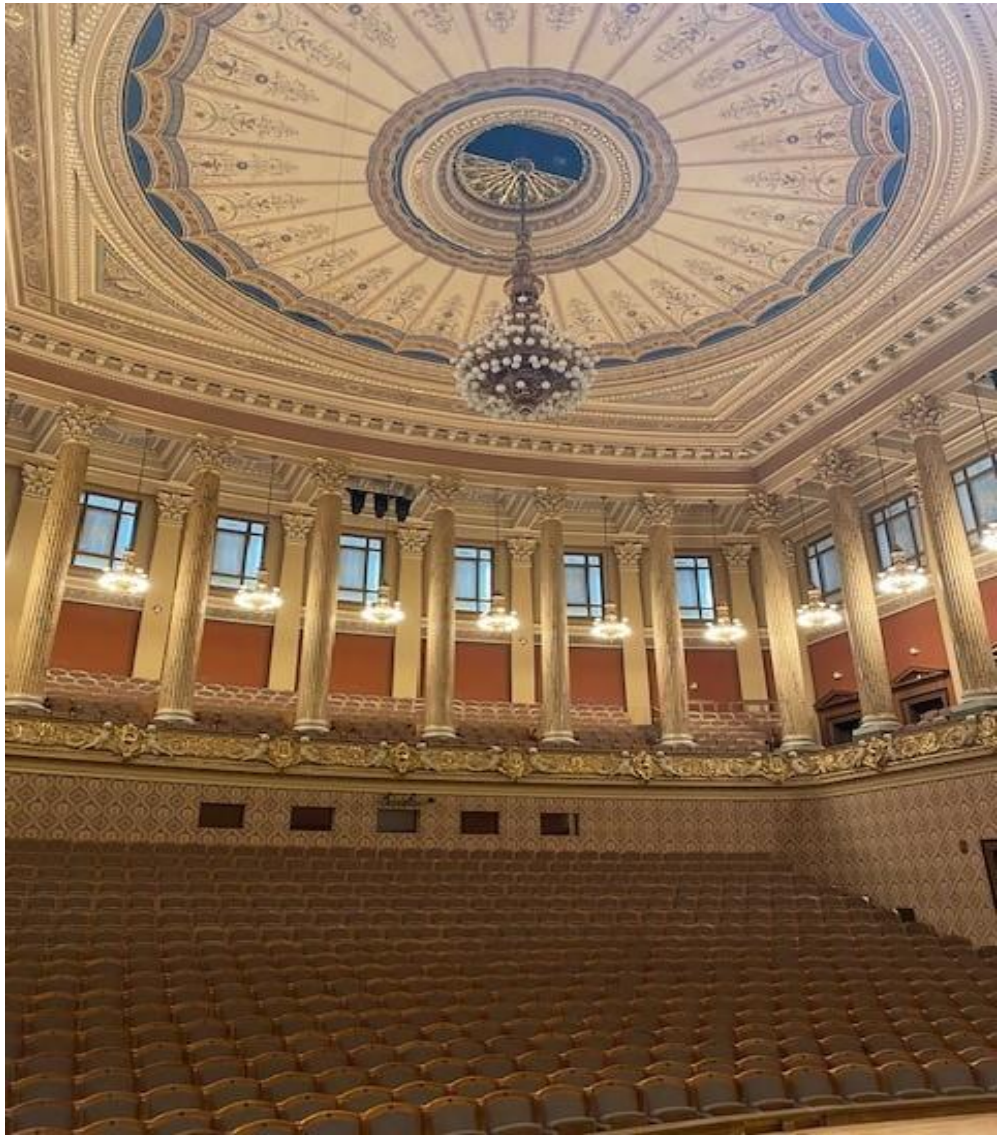


Zvukovývůz v ČT

Hudební studio v ČT

CNN Prima TV

CNN Prima TV

OTN SK6 ČT

VISTA BRAVO

New Style Optional Meterbridge

- Lower cost “Vista” Meterbridge
- Same Vista Meterbridge feature set
- Running on VUE edge Pro and packaged with a 15" monitor

MAGNUM-OS

BRAVO ⟷ VISTA BRAVO

- Pre-Production & Audio Ingest to Bravo Studio
- Fully integrated with Bravo Studio (Cloud & On Prem) for tactile control of audio mixing processing within Bravo Production Suite

VISTA 1 CARBON

- All-in-One Compact Console
- Cost-effective, compact

VISTA 1 CARBON

- Advanced Built In DSP engine
- Configurable I/O starting with 16 Mic/Line in and 16 Line out
- Redundant power supplies
- All IO and DSP is the same for 22 and 32 fader versions
- Enough processing for up to 140 MEQs
- ST2110 capable with 570EMR or 9821EMR audio gateways

VISTA V & VISTA X

- Fully Configurable
- Powerful - 1100 MEQ, 6000+ I/O
- Quad Star technology provides the level of redundancy demanded by today's world of high-pressure and broadcasts.
- Quad Star utilizes four processors to achieve unprecedented levels of redundancy in the control surface.
- Quad Star is featured in all Vista X and Vista V console surfaces
- Powered by Infinity Core Processing

VISTA QUAD STAR

VISTA V

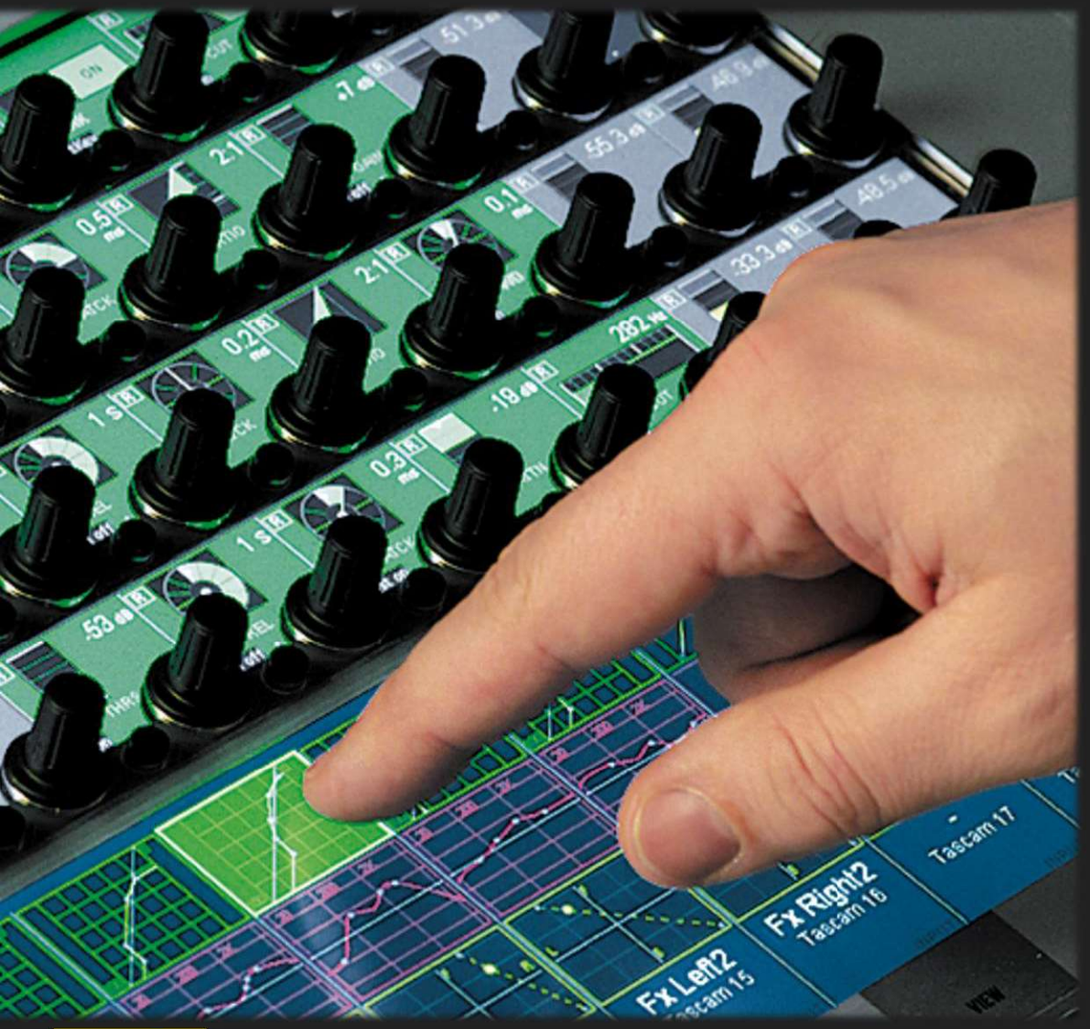
32 - 52 Faders

VISTA X

32 - 72 Faders

VISTONICS

Free your mind to mix



- World renowned Studer patented user interface
- Simple and intuitive, Streamlines the mixing process
- Focused Attention…..

  …. Where you look, is where you touch, is where you control
- Integrated rotary controls and buttons within flat-screen displays bring together visualization and operation
- Color Coded
- Sound engineers can quickly adapt during live, high-pressure productions
- Provides access to expanded parameters and control of specific audio elements
- Increases the control capabilities of each channel without requiring dedicated console surface space
- No need to scroll through pages of control options.
- Vistonics provides everything you need at your fingertips

FADERGLOW

Enrich your mix

- Assign colors to channels or busses for effortless channel layout and management
- Quickly identify important sources
- Dramatically improve reaction time
- Reduce the stress that often accompanies live productions

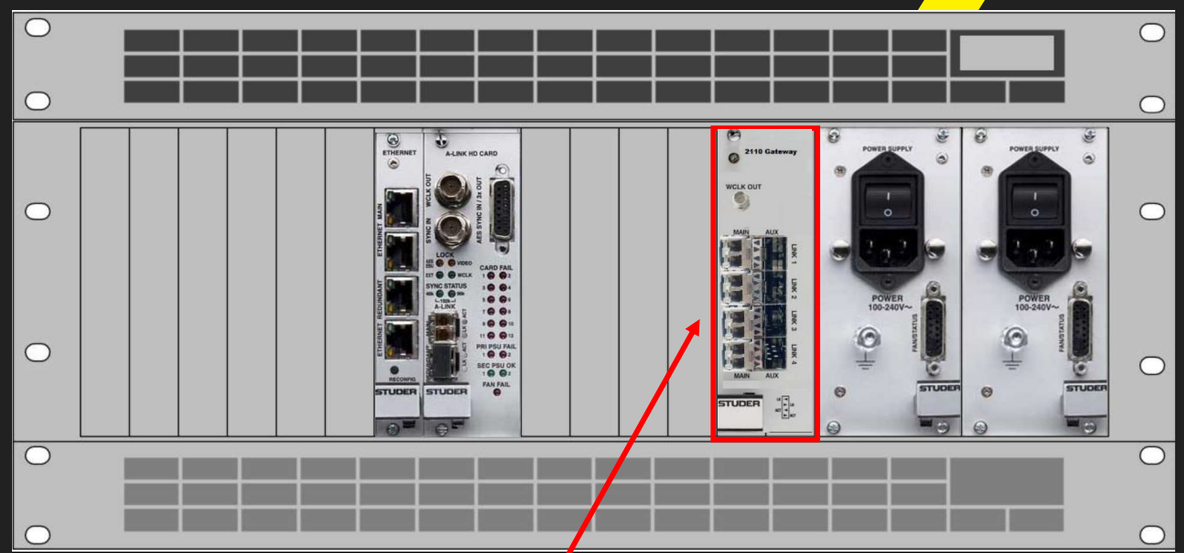
evertz

D23m-2110-GATEWAY

DIGITAL I/O SYSTEM

- Ease the transition to IP….
- Allows D23m to be edge device on ST2110-30 network
- Double width D23m card
- D23m I/O frames only
- Compatible with existing D23m I/O Frames
- SFP-based 2110 to ALINK bi-directional interface and translation
- 256 bi-directional channels
- Includes Word Clock output that is locked to the 2110 PTP clock
- 10 available single width slots in D23m with IP-BRIDGE

- Available Q1 2024



D23m-2110-GATEWAY card position

Synchronizace v IP

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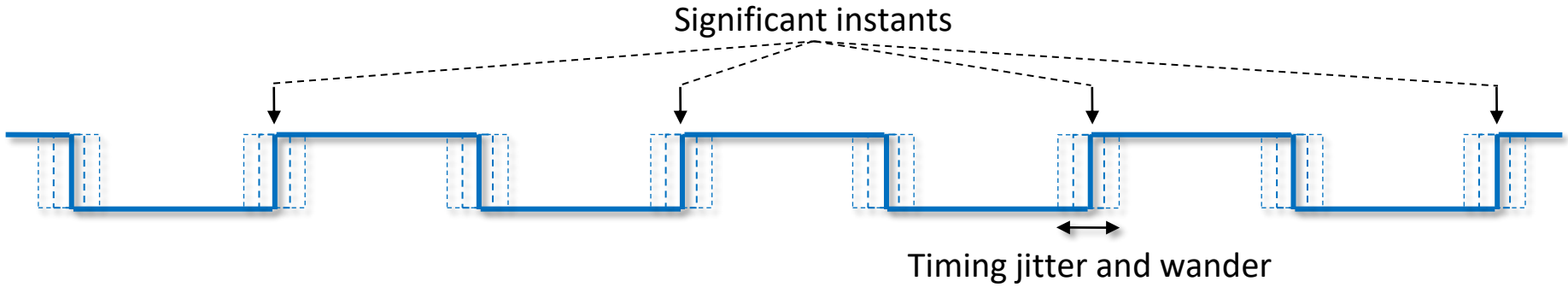
Frekvenční a fázová synchronizace

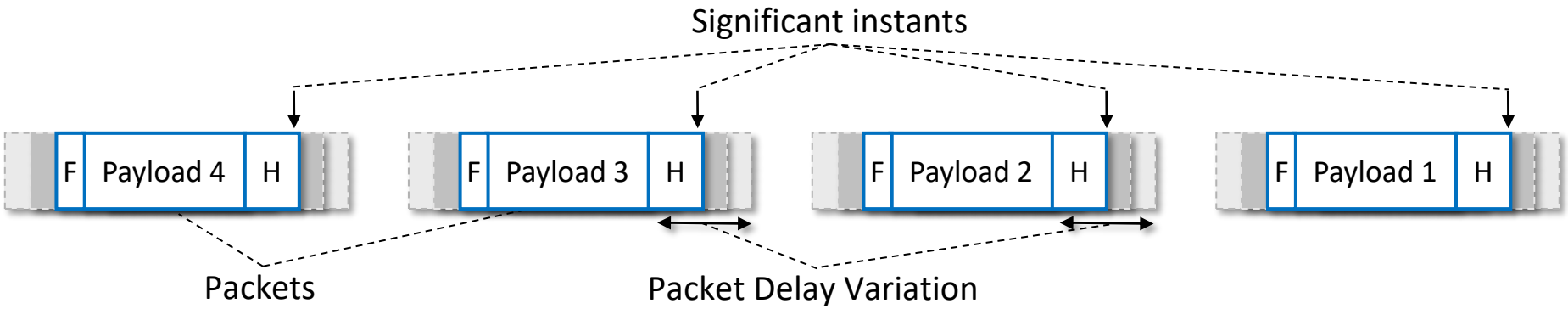
•Conventional timing (frequency) signal:

- A nominally periodic signal, generated by a clock:



•Packet timing signal:

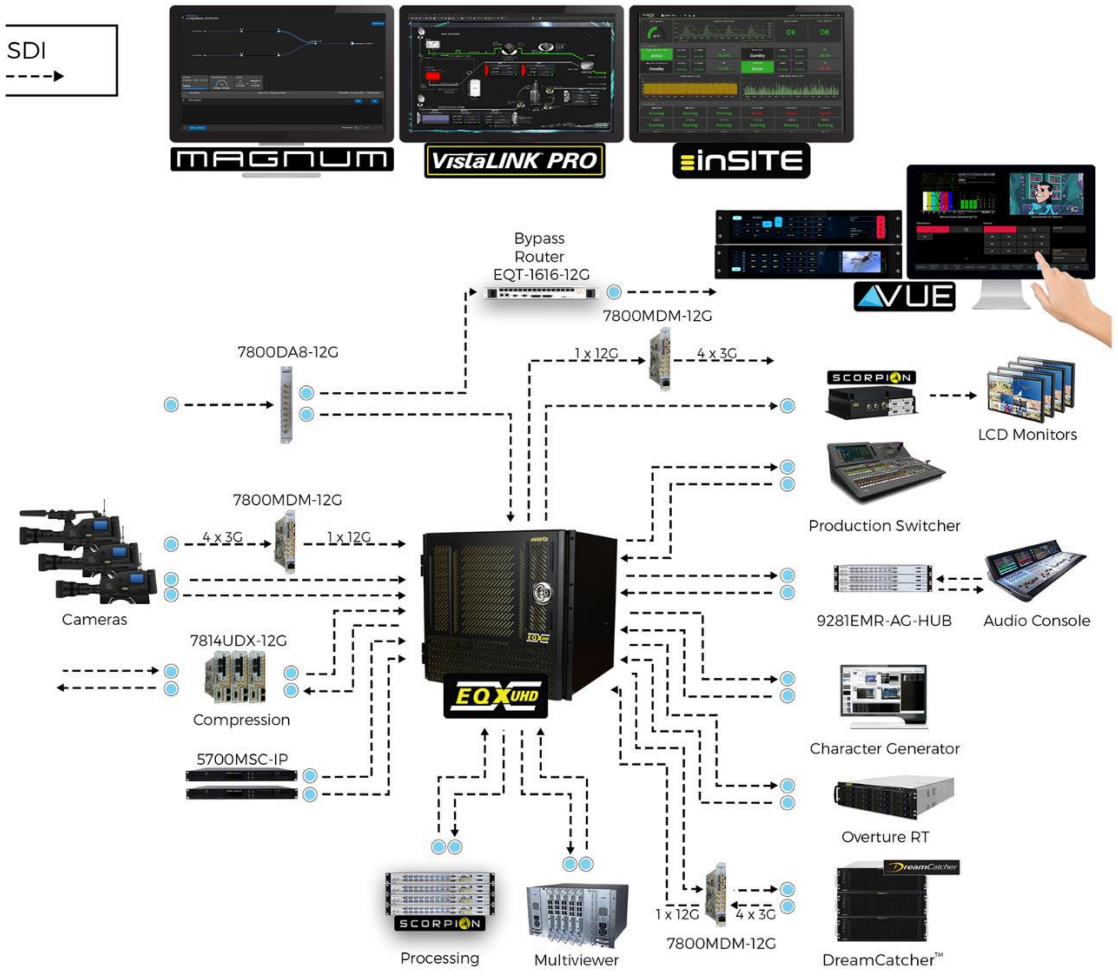
- A nominally periodic signal, generated by a packet master clock:

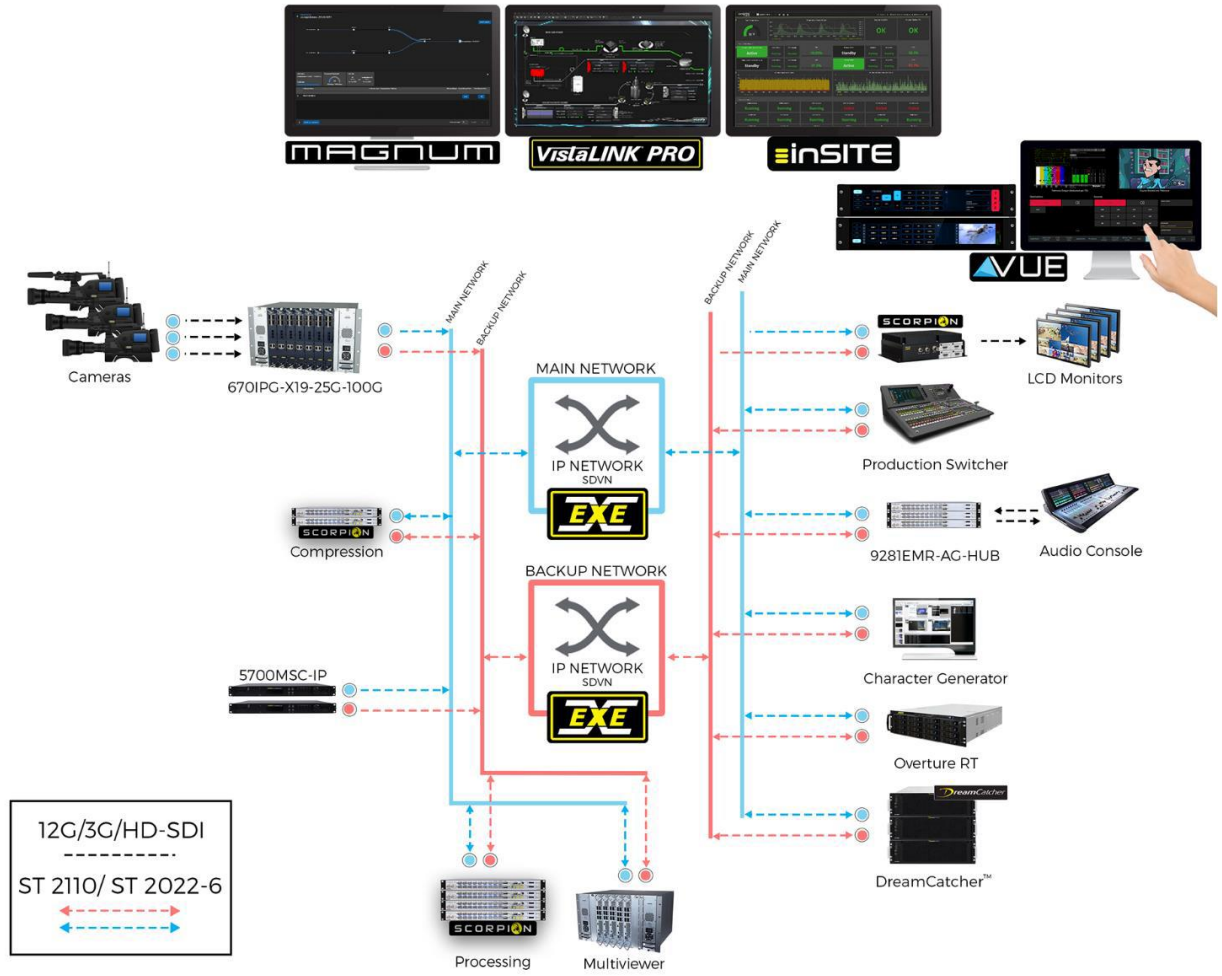


SDI over IP

12G SDI

UHD SDVN





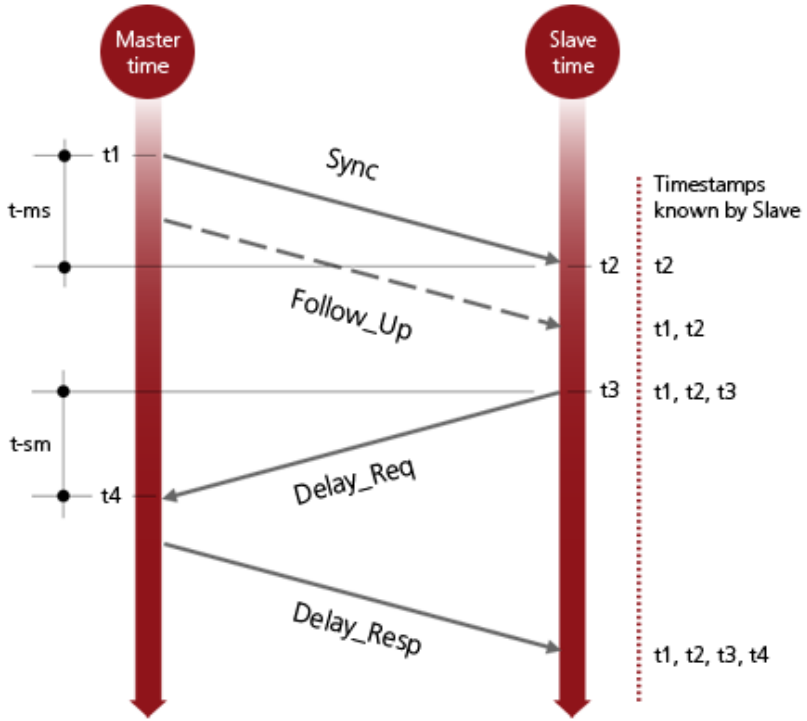
Precision Time Protocol (PTP) - IEEE 1588v2

SMPTE ST 2059-2: Synchronizing Professional Broadcast Networks

• Jakmile je ustanovena hierarchie Master/Slaver (BMCA) “Announce message“, může začít proces synchronizace hodin, pomocí výměny PTP zpráv, která se skládá ze dvou částí:

• Změřením “propagation delay“ mezi Mastrem a Slavem.

$$\frac{(t2 - t1) + (t4 - t3)}{2}$$



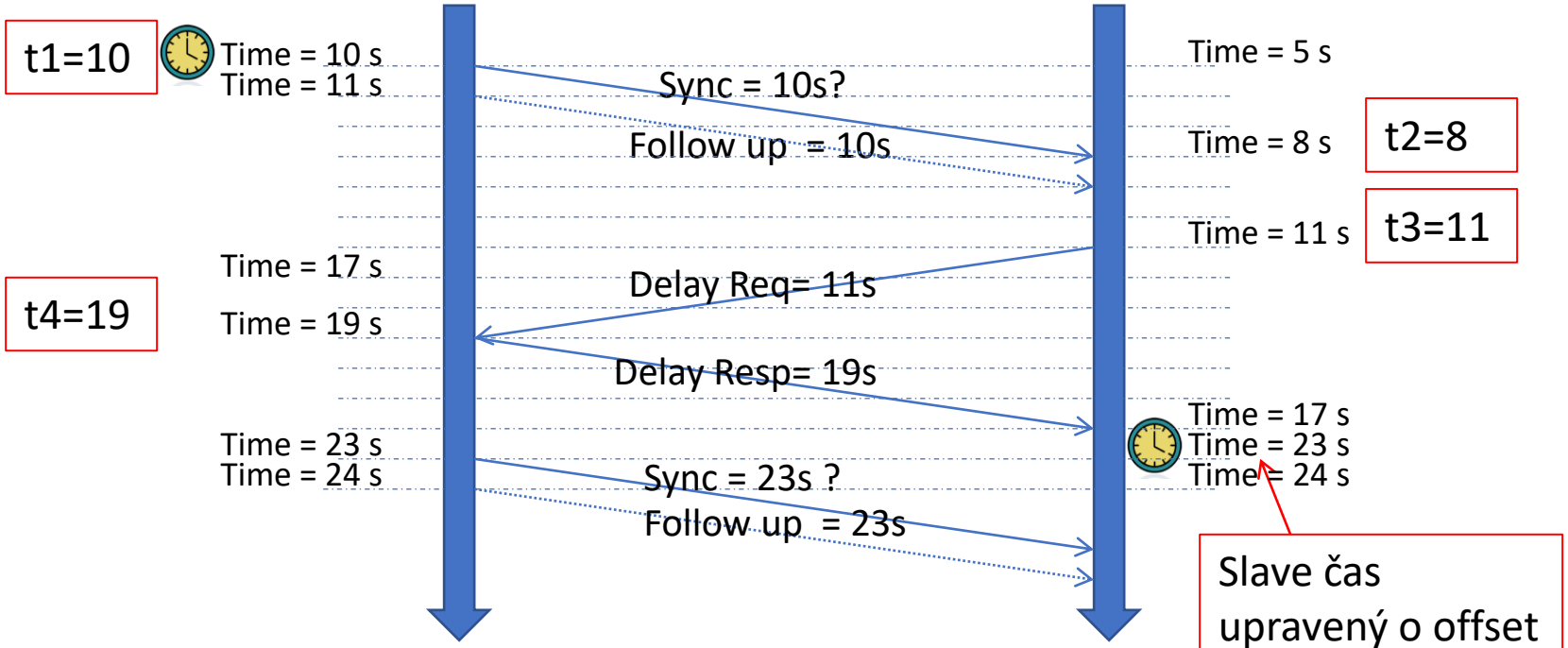
Sync Message obsahuje časovou značku kdy byla odeslaná Mastrem.

Delay_Req_Message je identická jako Sync Message, ale odeslaná Slavem, obsahuje časovou značku kdy byla odeslaná Slavem.

Delay_Resp_Message odeslaná Mastrem, obsahuje časovou značku kdy byla Delay_req_message doručená Mastru.

t1 = Master Time čas vyslání Sync Message.
t2 = Slave Time čas přijetí Sync Message.
t3 = Slave Time čas vyslání Delay_Req Message.
t4 = Master Time čas přijetí Delay_Req Message.

Precision Time Protocol (PTP) - IEEE 1588v2

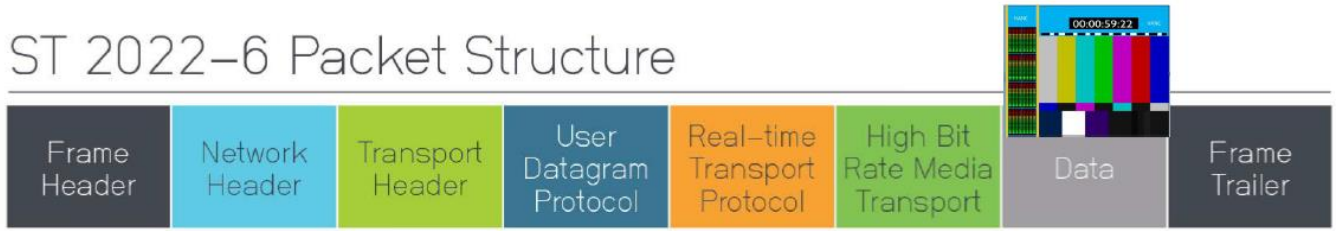


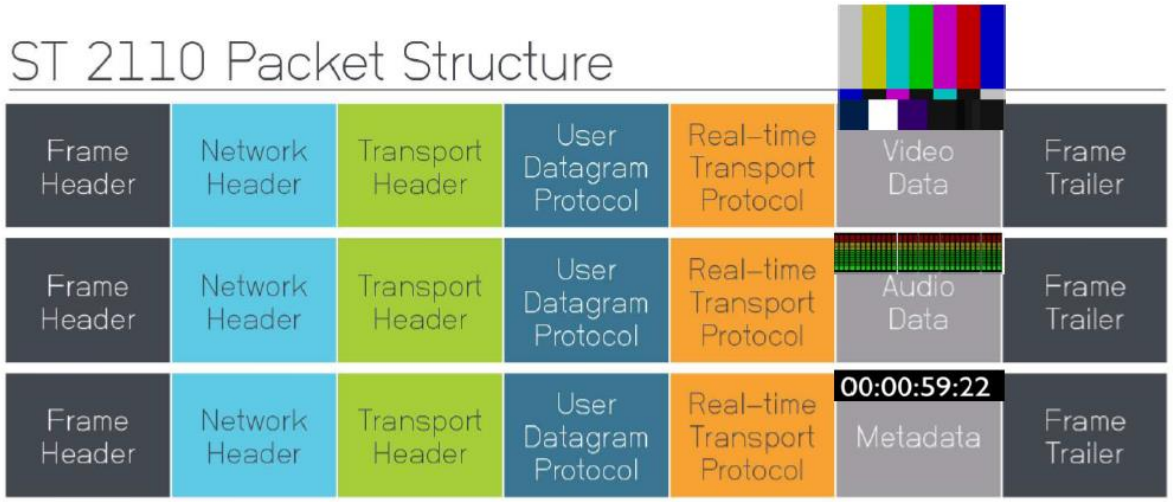
Delay = [(t2-t1) + (t4-t3)]/2 = [8-10) + (19-11)]/2 = 3
Offset = (t2-t1) – Delay = -5

Zpráva Sync resp. Follow Up udávají zpoždění Master->Slave (t-ms)
Zprávay Delay_req a Delay_resp udávají zpoždění Slave->Master (t-sm)

Jakákoliv asymetrie mezi (t-ms) a (t-sm) vnáší chybu do výpočtu korekce hodin!

ST2022 – ST2110





ST 2110 is great solution for :
- Large-Scale OB Trucks that need to support UHD
- Large-Scale audio/video routing systems with studios
- Distributed (Venue/Campus) Production Environments
- Where there is one PTP domain and an integrate Management System.

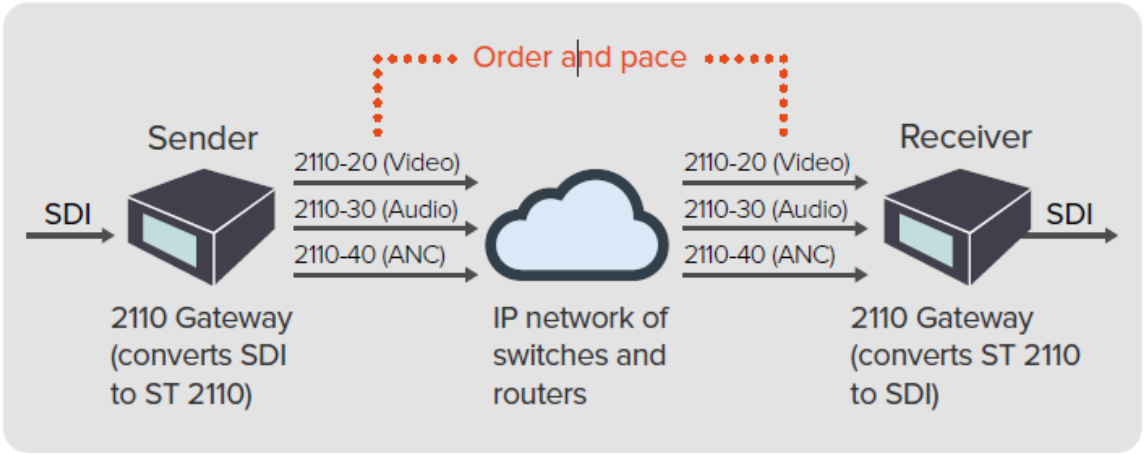
- ST 2110 is probably NOT the idealsolution for :
- Getting to and from ”the cloud”
- Cost-sensitive Long-Haul contribution links
- Distribution (network-to affiliate, etc.)
- Interchange between arms-length unrelated parties

Měřicí & Studiová Technika

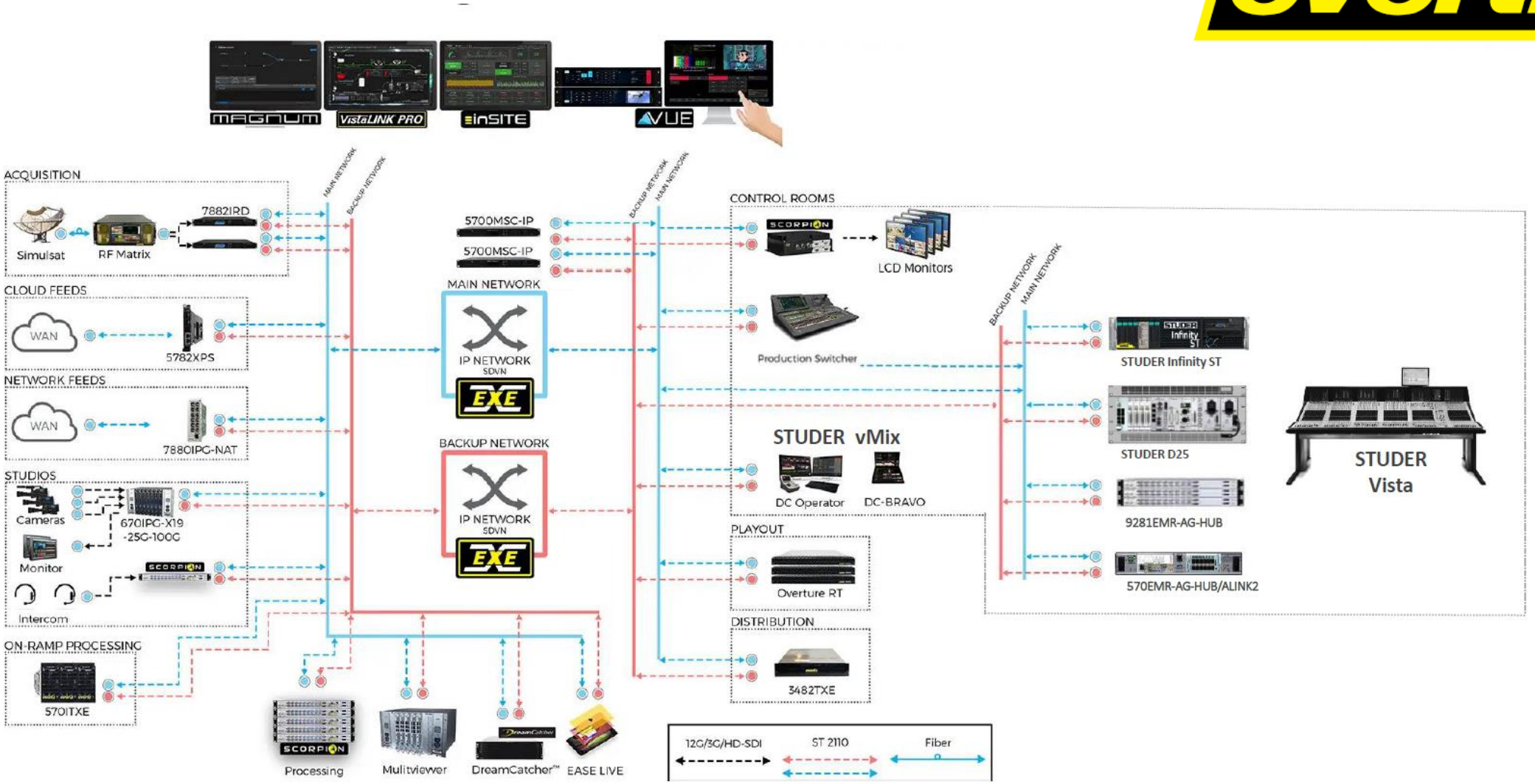
ST 2110

SMPTE (Society of Motion Picture and Television Engineers)

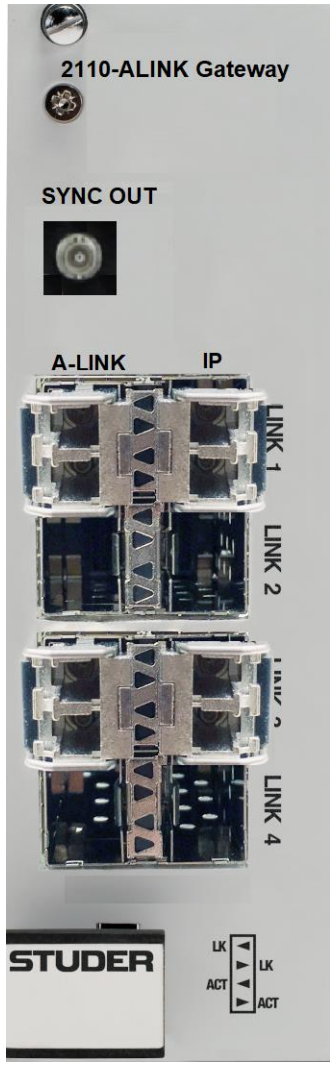
- **SMPTE ST 2110-10** — System Timing and Definitions. Covers the system as a whole, the timing model, and common requirements (e.g. UDP datagram sizes) across all essence types.
- **SMPTE ST 2110-20** — Uncompressed Active Video. Deals with the transport of uncompressed active video in ST 2110 systems, using Real-time Transport Protocol (RTP).
- **SMPTE ST 2110-21** — Traffic Shaping and Delivery Timing for Video. Specifies the timing model for senders and receivers of video RTP streams. Testing to this standard is the main focus of this article.
- **SMPTE ST 2110-22** — Constant Bit-Rate Compressed Video **JPEG-XS.**
- **SMPTE ST 2110-30** — PCM Digital Audio. Documents the use ofIP-encapsulated PCM audio in a manner compatible with AES67.
- **SMPTE ST 2110-31** — AES3 Transparent Transport. Specifies the transport of AES3 digital audio signals.
- **SMPTE ST 2110-40** — Ancillary Data. Documents the transport of SMPTE ST 291-1 Ancillary Data packets using RTP over an IP network.



SDI over IP


MAGNUM
VistaLINK PRO
inSITE
VUE
ACQUISITION
Simulsat
RF Matrix
7882IRD
CLOUD FEEDS
WAN
5782XPS
NETWORK FEEDS
WAN
7880IPG-NAT
STUDIOS
Cameras
Monitor
Intercom
670IPG-X19
-25G-100G
ON-RAMP PROCESSING
570ITXE
MAIN NETWORK
BACKUP NETWORK
5700MSC-IP
5700MSC-IP
IP NETWORK
SDVN
EXE
IP NETWORK
SDVN
EXE
CONTROL ROOMS
LCD Monitors
Production Switcher
STUDER vMix
DC Operator
DC-BRAVO
PLAYOUT
Overture RT
DISTRIBUTION
3482TXE
STUDER Infinity ST
STUDER D25
9281EMR-AG-HUB
570EMR-AG-HUB/ALINK2
STUDER
Vista
Processing
Mulitviewer
DreamCatcher™
EASE LIVE
12G/3G/HD-SDI
ST 2110
Fiber

ST2110-30 IP Gateway for D23m I/O frames

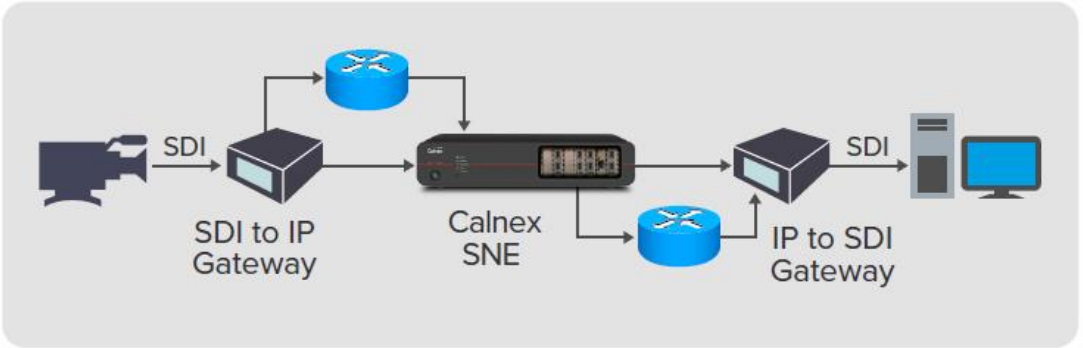


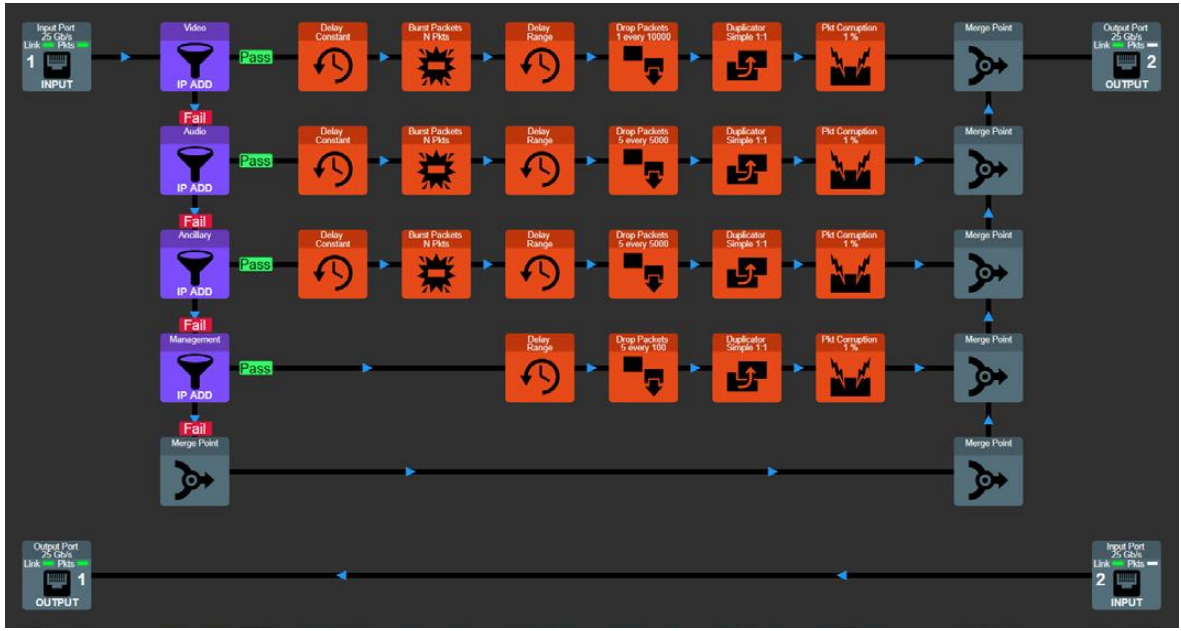
- **Does not affect D23 I/O count**
- Converts **SMPTE 2110-30** to Studer A-Link
- Seamless integration
- Provides 768 inputs and outputs
- D23 Sync derived from **PTP** or local master clock
- **Redundancy** capable
- **IS04 & IS05 NMOS** compliant.
- Allows D23 to be stand-alone as ST2110-30 audio edge device
- **Fits directly into D23 frame**
- Available Q1 2024.
- Can be retrofitted into any existing D23

Part # D23m-2110-ALINK

How to test video to SMPTE ST 2110

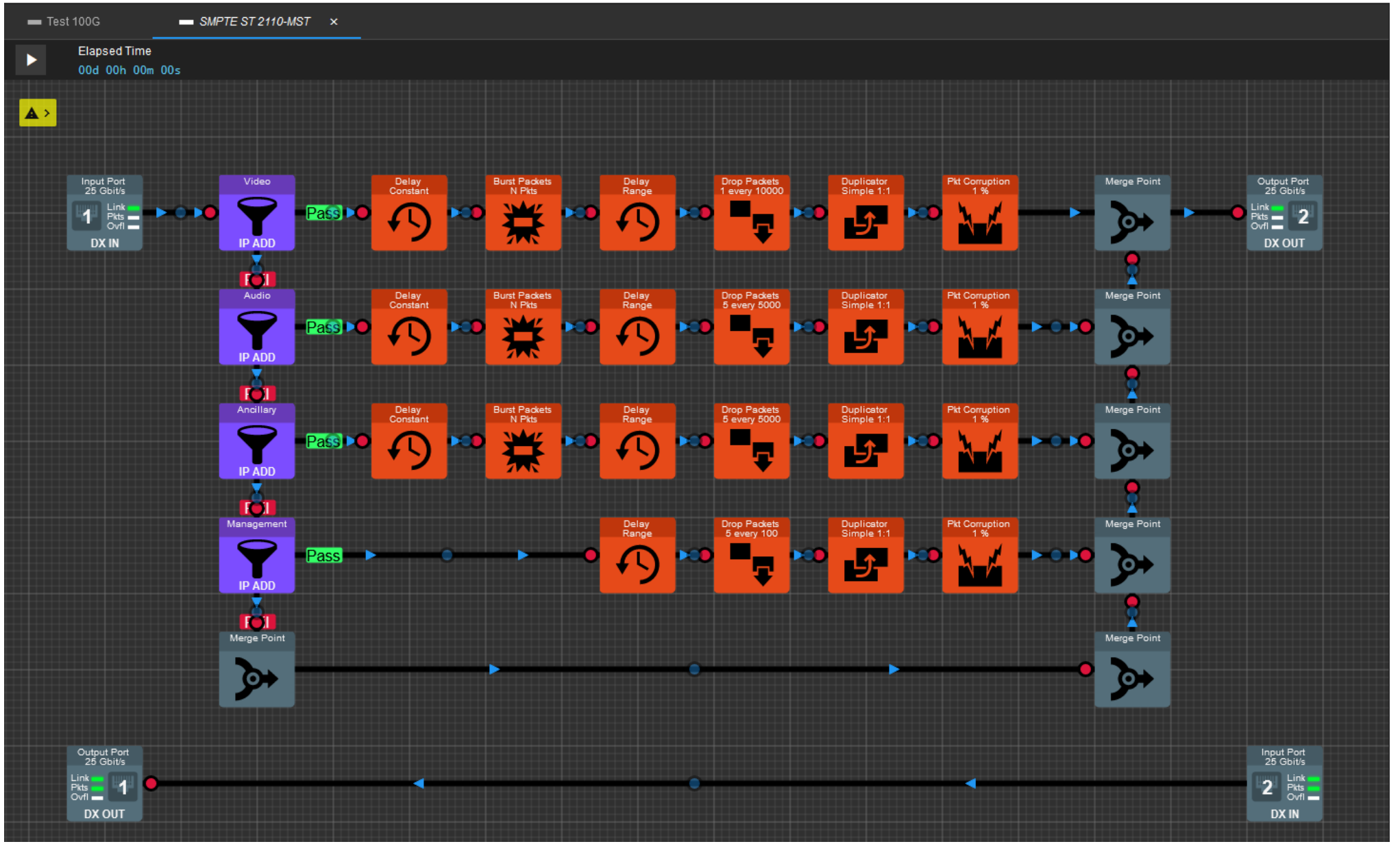
- **Delay** — usually due to physical link length or processing delays introduced by network elements. Introducing delay can also be useful for testing the essences' re-alignment mechanism.
- **Packet loss** — commonly caused by network congestion or as a result of packet corruption, since if the CRC becomes invalid, astore-and-forward switch will drop the packet.
- **Packet corruption** — can be due to a dirty fiber or poor connection, among other causes. Cut-through switches do not perform any CRC error-checking, so error-checking needs to be performed by the receiver.
- **Bursty conditions** — the Calnex SNE's Burst Packets mode can be very useful for testing that your buffer size is sufficient.
- **Reordered packets** — on a LAN, the reordering of packets should be rarely seen, but over WANs there are more likely to be multiple routes that packets could take, making reordering more common.
- **Packet duplication** — may occur as a result of misconfiguration (e.g. two streams of data being sent to the same destination by mistake) or some other network issue.
- **Jitter and packet delay variation** (PDV) — this is usually introduced as a result of traffic passing through multiple routers in transit from the source to the destination. Each router will contain some amount of buffer, and these will vary between routers in each of the network "hops".





Měřicí & Studiová Technika

How to test video to SMPTE ST 2110



How to test video to SMPTE ST 2110

OSA5412

SMPTE ST2059-2

SNE X

ST2110-20
ST2110-30
ST2110-40

QxP

Generator

Video standard	4096x2160 p 50 YCbCr:422:10 BT709 SDR
Test pattern	100% Bars

Reference	PTP, locked (Frequency And Phase Locked), stable

IP Receive - Flows

Analyser Interface: Seamless E+F

Multicast Requests: 2/2 joins sent

SFP E	Protocol	Dst IP	Src IP	Bandwidth

SFP F	Protocol	Dst IP	Src IP	Bandwidth
ANC	2110-40	239.9.40.1:5178	192.168.0.3:5178	23.880 kbps
AUD 2	2110-30	239.9.30.3:5178	192.168.0.3:5178	5.040 Mbps
AUD 1	2110-30	239.9.30.1:5178	192.168.0.3:5178	9.649 Mbps
VID	2110-20	239.9.20.1:5178	192.168.0.3:5178	9.276 Gbps

SFP E - PTP Info

Active System Reference

GM Info | Qx Status | Messaging

Domain	0
Leader ID	00:18:63:FF:FE:03:1D:24
Priority 1	128
Priority 2	128
Clock Class	248
Clock Accuracy	< 100 ns
Variance	65535
Clock Source	Atomic Clock
PTP Time	2024-05-17 07:01:46 (TAI)

SFP E : PTP frequency and phase locked

SFP F - PTP Info

Standby System Reference

GM Info | Qx Status | Messaging

Domain	0
Leader ID	00:18:63:FF:FE:03:1D:24
Priority 1	128
Priority 2	128
Clock Class	248
Clock Accuracy	< 100 ns
Variance	65535
Clock Source	Atomic Clock
PTP Time	2024-05-17 07:01:46 (TAI)

SFP F : PTP frequency and phase locked

IP Transmit

Reference: PTP SFP E

SFP E: 9.291 Gbps (92%) SFP F: 0 bps (0%)

Tx | VID | AUD1-2 | AUD3-4 | ANC | MON

SFP E	Protocol	Dst IP	Src IP	Bandwidth
VID	2110-20	239.9.20.1:5178	192.168.0.3:5178	9.276 Gbps
AUD1	2110-30	239.9.30.1:5178	192.168.0.3:5178	9.648 Mbps
AUD2	2110-30	239.9.30.3:5178	192.168.0.3:5178	5.040 Mbps
ANC	2110-40	239.9.40.1:5178	192.168.0.3:5178	24.800 kbps

SFP F	Protocol	Dst IP	Src IP	Bandwidth

SFP IP Network

IGMP: Max V3

	SFP E	SFP F
Carrier Signal	Present	Present
Interface	Up	Up
MAC Addr	00:1F:7F:01:57:4C	00:1F:7F:02:57:4C
IP Addressing Mode	Static	Static
IP Addr	192.168.0.3 / 24	192.168.0.4 / 24
Gateway	192.168.0.99	192.168.0.99
DNS IP Addr	192.168.10.1	192.168.10.1
Total Tx pkts	579867767	808
Total Rx pkts	26792	579063627

SFP E :

SFP F :

Analyser - 2110 Format Setup

Analyser Interface: Seamless E+F

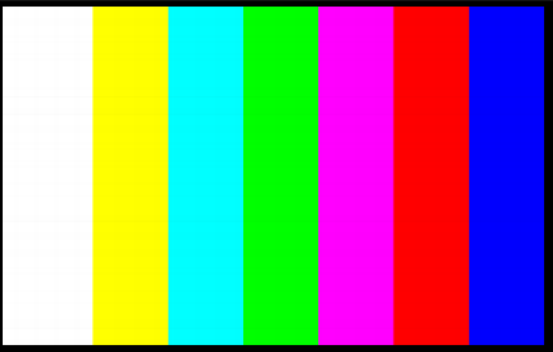
VID | AUD

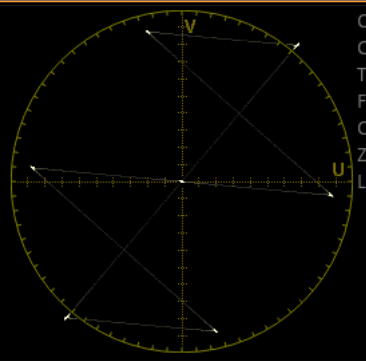
	Auto	SDP	Override
AUD1 Packet Time	1 ms		1 ms
AUD1 Channels	8 Ch		2 Ch
AUD2 Packet Time	1 ms		1 ms
AUD2 Channels	4 Ch		2 Ch
AUD3 Packet Time			1 ms
AUD3 Channels			2 Ch
AUD4 Packet Time			1 ms
AUD4 Channels			2 Ch

SFP E - Network Stats

Link Speed: 10Gb FEC Mode: NO-FEC

	Rx Cumulative	Tx Cumulative
Packets:	26792	579867767
Good Packets:	26792	579867767
Bytes:	2463758	778855777922
Bad FCS:	0	N/A
Multicast:	26755	579867732
Unicast:	8	16
Broadcast:	29	19
VLAN:	0	0

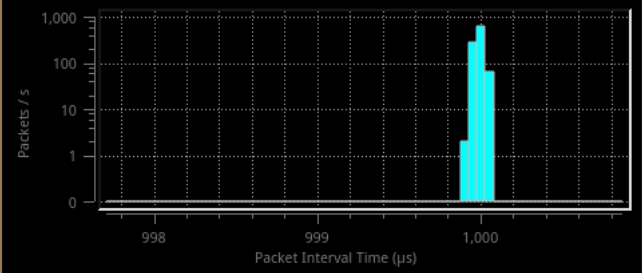




Col Sp: Rec.709
Curve: SDR-TV
Targets: Off
Filter: Tech
Centre: Origin
Zoom: 1.00
Line: All

IP Receive - Interpacket Timing

AUD 1: [SFP E+F]



SFP E Min: Mean: Max:

SFP F Min: 999.926µs Mean: 999.998µs Max: 1000.054µs

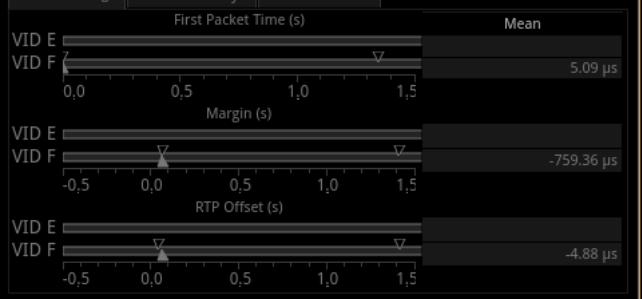
Qx Network & Automation

Interface	Up
MAC Address	00:1F:7F:00:57:4C
IP Addressing Mode	Static
IP Address	192.168.0.55 / 24
Gateway	192.168.0.1
Default Gateway	192.168.0.1
DNS Server	
mDNS Server	qx-022348.local
REST API	Listening on port 8080
VNC Server	1 Connection

Video Timing & System Reference

REF: PTP SFP E

Video Timing | Media Latency | Ext Ref vs PTP



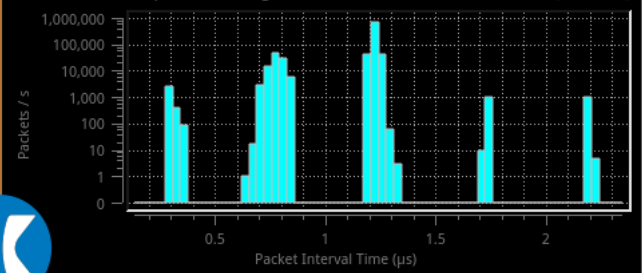
Ancillary Status - Grid

List View

S353 MPEG Recoding	S305 SDTI	S348 HD-SDTI	S427 Link Encryption
S352 Payload ID	S2016-3 AFD	S2016-4 PAN	S2010 ANSI/SCTE
S2031 DVB/SCTE	S2056 MPEG TS	S2068 3D Packing	S2064 Lip Sync
ITU-R BT.1685	OP47 Caption	OP47 VBI/WST	ARIB-TR-B29
RDD18 Metadata	RP214 KLV Metadata	RP223 UMID/ID	S2020 Audio
S2051 Two Frame	RDD8 WSS	RP215 Film Codes	S12M-2 V-TCode
EIA-708 Caption	EIA-608 Caption	RP207 Program	S334-1 Data
RP208 VBI Data	Mark Deleted	S299-2 3G Audio	S299-1 HD Audio
S272 SD Audio	S315 Camera Pos	RP165 EDH	S12-3 HFR TCode
S2103 Generic Time	S2108-1 HDR/WCG		

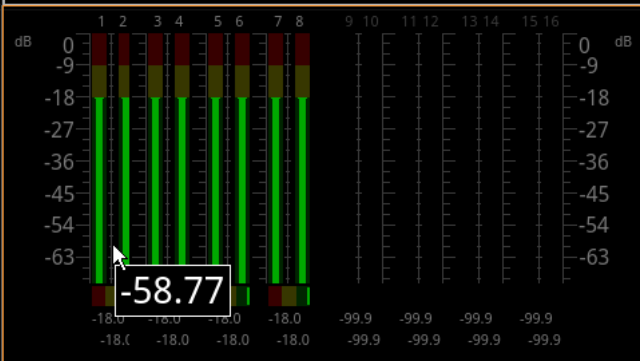
IP Receive - Interpacket Timing

VID: [SFP E+F]



SFP E Min: Mean: Max:

SFP F Min: 0.272µs Mean: 1.157µs Max: 2.222µs



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IP Receive - Flows

Analyser Interface: Seamless E+F

Multicast Requests: 2/2 Joins sent

SFP E	Protocol	Dst IP	Src IP	Bandwidth

SFP F	Protocol	Dst IP	Src IP	Bandwidth
ANC	2110-40	239.9.40.1:5178	192.168.0.3:5178	24.576 kbps
AUD 2	2110-30	239.9.30.3:5178	192.168.0.3:5178	5.030 Mbps
AUD 1	2110-30	239.9.30.1:5178	192.168.0.3:5178	9.630 Mbps
VID	2110-20	239.9.20.1:5178	192.168.0.3:5178	9.123 Gbps

SFP E - PTP Info

Active System Reference

GM Info | Qx Status | Messaging

Domain	0
Leader ID	00:18:63:FF:FE:03:1D:24
Priority 1	128
Priority 2	128
Clock Class	248
Clock Accuracy	< 100 ns
Variance	65535
Clock Source	Atomic Clock
PTP Time	2024-05-17 07:05:41 (TAI)

SFP E : PTP frequency and phase locked

SFP F - PTP Info

Standby System Reference

GM Info | Qx Status | Messaging

Domain	0
Leader ID	00:18:63:FF:FE:03:1D:24
Priority 1	128
Priority 2	128
Clock Class	248
Clock Accuracy	< 100 ns
Variance	65535
Clock Source	Atomic Clock
PTP Time	2024-05-17 07:05:41 (TAI)

SFP F : PTP frequency locked, not phase locked

IP Transmit

Reference: PTP SFP E

SFP E: 9.291 Gbps (92%) SFP F: 0 bps (0%)

Tx | VID | AUD1-2 | AUD3-4 | ANC | MON

SFP E	Protocol	Dst IP	Src IP	Bandwidth
VID	2110-20	239.9.20.1:5178	192.168.0.3:5178	9.276 Gbps
AUD1	2110-30	239.9.30.1:5178	192.168.0.3:5178	9.648 Mbps
AUD2	2110-30	239.9.30.3:5178	192.168.0.3:5178	5.040 Mbps
ANC	2110-40	239.9.40.1:5178	192.168.0.3:5178	24.800 kbps

SFP F	Protocol	Dst IP	Src IP	Bandwidth

SFP IP Network

IGMP: Max V3

	SFP E	SFP F
Carrier Signal	Present	Present
Interface	Up	Up
MAC Addr	00:1F:7F:01:57:4C	00:1F:7F:02:57:4C
IP Addressing Mode	Static	Static
IP Addr	192.168.0.3 / 24	192.168.0.4 / 24
Gateway	192.168.0.99	192.168.0.99
DNS IP Addr	192.168.10.1	192.168.10.1
Total Tx pkts	782757238	1043
Total Rx pkts	67269593	848144492

SFP E :

SFP F :

Analyser - 2110 Format Setup

Analyser Interface: Seamless E+F

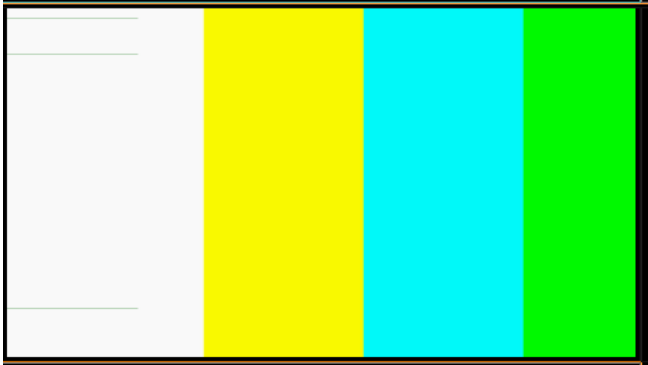
VID | AUD

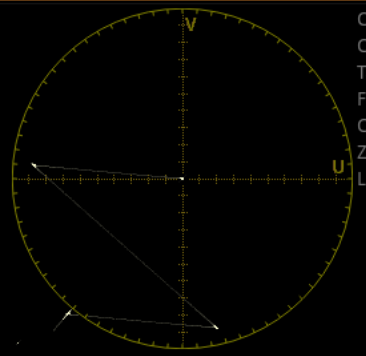
	Auto	SDP	Override
AUD1 Packet Time	1 ms		1 ms
AUD1 Channels	8 Ch		2 Ch
AUD2 Packet Time	1 ms		1 ms
AUD2 Channels	4 Ch		2 Ch
AUD3 Packet Time			1 ms
AUD3 Channels			2 Ch
AUD4 Packet Time			1 ms
AUD4 Channels			2 Ch

SFP E - Network Stats

Link Speed: 10Gb FEC Mode: NO-FEC

	Rx Cumulative	Tx Cumulative
Packets:	67269593	782757238
Good Packets:	67269593	782757238
Bytes:	5922905231	1051731059007
Bad FCS:	0	N/A
Multicast:	35524	782757200
Unicast:	67234033	16
Broadcast:	36	22
VLAN:	0	0

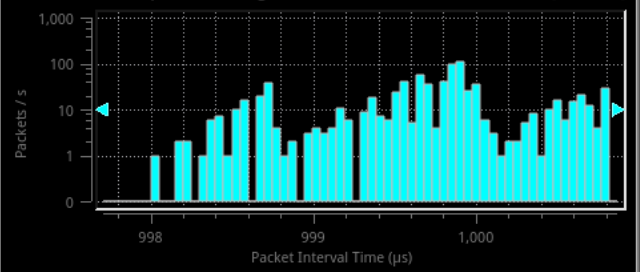




Col Sp: Rec.709
Curve: SDR-TV
Targets: Off
Filter: Tech
Centre: Origin
Zoom: 1.00
Line: All

IP Receive - Interpacket Timing

AUD 1: [SFP E+F]



SFP E Min: Mean: Max:

SFP F Min: 997.664µs Mean: 1001.001µs Max: 1999.452µs

Qx Network & Automation

Interface	Up
MAC Address	00:1F:7F:00:57:4C
IP Addressing Mode	Static
IP Address	192.168.0.55 / 24
Gateway	192.168.0.1
Default Gateway	192.168.0.1
DNS Server	
mDNS Server	qx-022348.local
REST API	Listening on port 8080
VNC Server	1 Connection

Video Timing & System Reference

REF: PTP SFP E

Video Timing | Media Latency | Ext Ref vs PTP

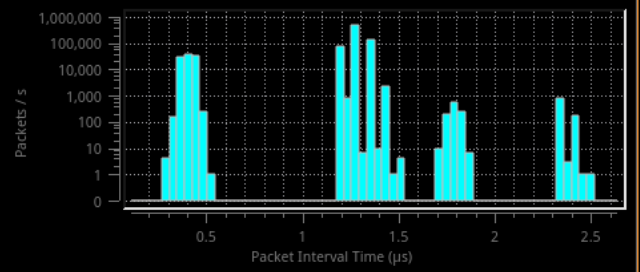
Ancillary Status - Grid

List View

S353 MPEG Recoding	S305 SDTI	S348 HD-SDTI	S427 Link Encryption
S352 Payload ID	S2016-3 AFD	S2016-4 PAN	S2010 ANSI/SCTE
S2031 DVB/SCTE	S2056 MPEG TS	S2068 3D Packing	S2064 Lip Sync
ITU-R BT.1685	OP47 Caption	OP47 VBI/WST	ARIB-TR-B29
RDD18 Metadata	RP214 KLV Metadata	RP223 UMID/ID	S2020 Audio
S2051 Two Frame	RDD8 WSS	RP215 Film Codes	S12M-2 V-TCode
EIA-708 Caption	EIA-608 Caption	RP207 Program	S334-1 Data
RP208 VBI Data	Mark Deleted	S299-2 3G Audio	S299-1 HD Audio
S272 SD Audio	S315 Camera Pos	RP165 EDH	S12-3 HFR TCode
S2103 Generic Time	S2108-1 HDR/WCG		

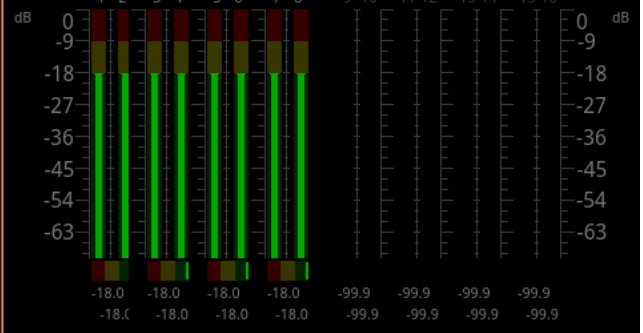
IP Receive - Interpacket Timing

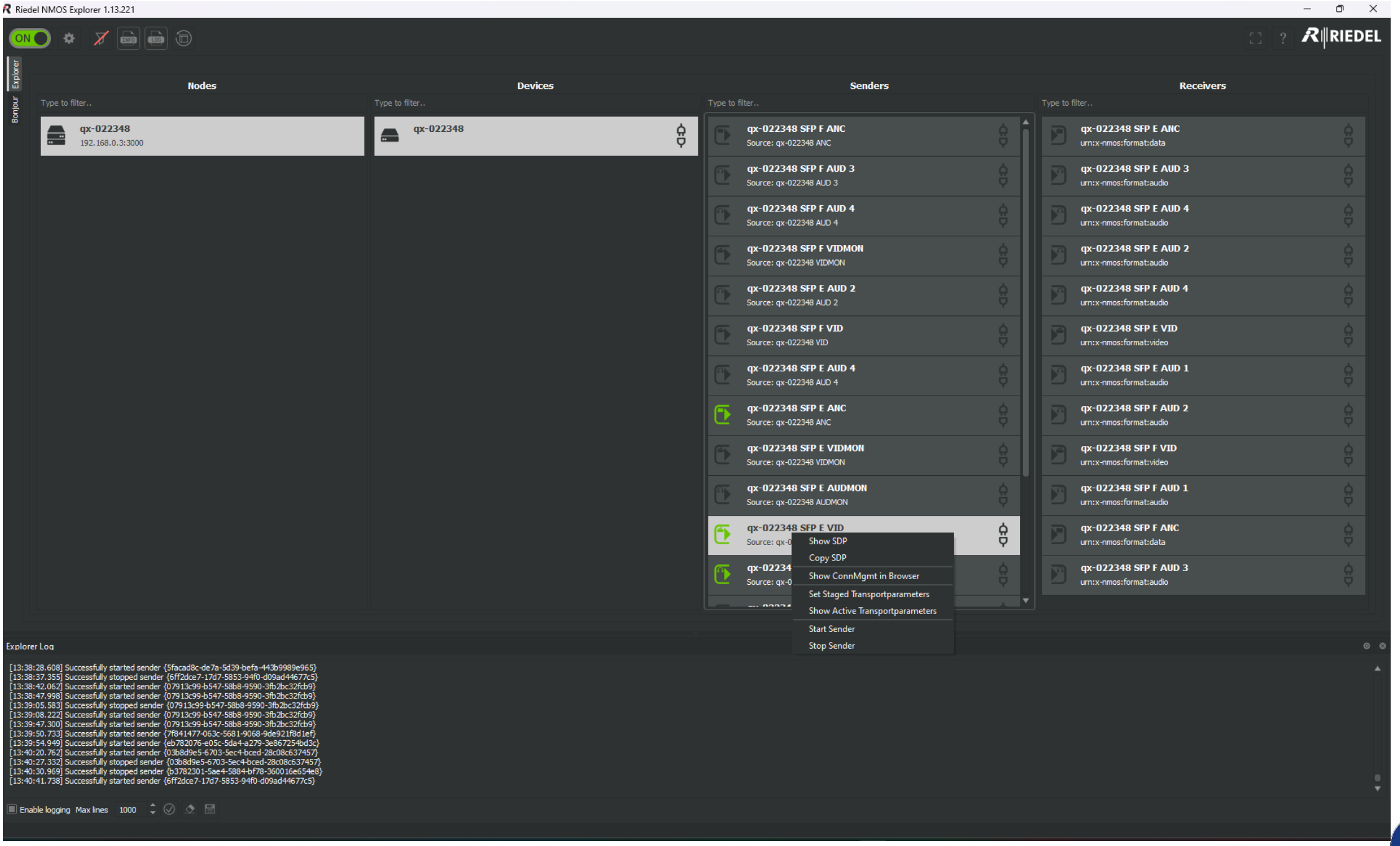
VID: [SFP E+F]



SFP E Min: Mean: Max:

SFP F Min: 0.277µs Mean: 1.176µs Max: 2.479µs





VeEX
The Verification Experts

Calnex

TX340S

Sentinel

Sentry