



RAVENNA 2020 Webinar Series

(The “Remote” Sessions)

RAVENNA takes it to the Cloud – Intercontinental Remote Production Demo utilizing RAVENNA & AWS

Tue, Dec 15, 2020 - 15:00 h (CET)

Bill Rounopoulos & Angelo Santos, Ross Video

Nicolas Sturmel, Merging & Claudio Becker-Foss, DirectOut



Andreas Hildebrand, RAVENNA Technology Evangelist

- more than 25 years in the professional audio / broadcasting industry
- graduate diploma in computer science
- R&D, project & product management experience
- member of AES67 TG and ST2110 DG



ALC NetworkX GmbH, Munich / Germany

- established 2008
- R&D center
- developing & promoting RAVENNA
- Partnerships with > 40 manufacturers

RAVENNA

- IP media networking technology
- designed to meet requirements of professional audio / broadcasting applications
- open technology approach, license-free
- fully AES67-compliant (*built-in*)





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Ottawa

AWS Virginia

DirectOut
TECHNOLOGIES

AWS Frankfurt

Mittweida

Lausanne

Grenoble

MERGING
AUDIO FOR THE NETWORKING AGE

Global AES67 over WAN Demo

- 2 continents
- 4 sites
- 3 RAVENNA partners

PURPOSE

We embarked on this proof-of-concept demo to answer the following questions:

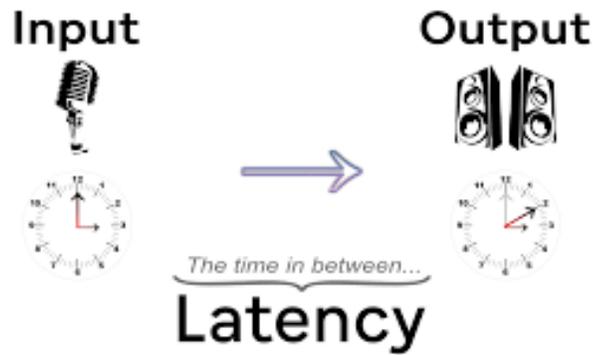
- Can RAVENNA / AES67 traffic be sent over the public infrastructure?
- Across long distances?
- And maintain interoperability between companies?
- How?
- What challenges need to be overcome?

SOME BACKGROUND ON RAVENNA & AES67

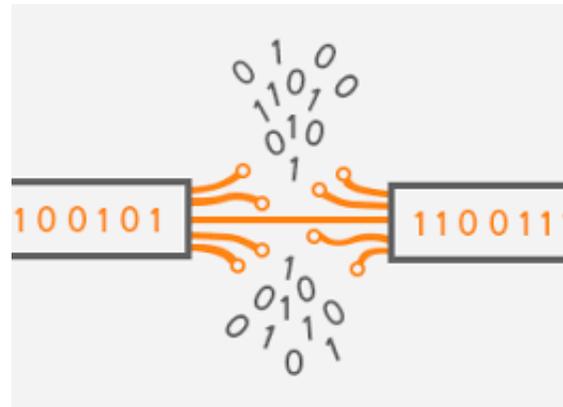
- Designed for local area networks synchronized to PTP that don't drop packets
- Now used over long distances in WAN applications across private dedicated infrastructures usually between sites connected by fiber (even though it was not contemplated by the standard)
- Public or "best-effort" networks tend to be congested and suffer from packet loss and increased latency due to re-transmissions

PUBLIC INFRASTRUCTURE CHALLENGES

Latency and Packet Jitter



Packet Loss



Timing and Synchronization

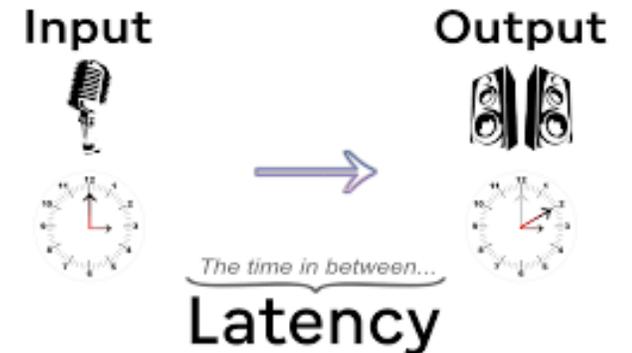


CHALLENGE: LATENCY AND PACKET JITTER

- RAVENNA receivers are designed to handle increased packet jitter & latency
- Large buffers along with other techniques can compensate for added delay
- RAVENNA specifies receiver buffers must handle a minimum delay of 20 msec; AES67 only requires 3 msec, but also recommends 20 msec
- Most well-designed RAVENNA solutions have even bigger buffers
- The AES Standard Committee working group SC-02-12-M is focused on AES67 over WAN; a key recommendation is to increase the buffer size within devices
- Solutions can also be manually tuned to the network delay

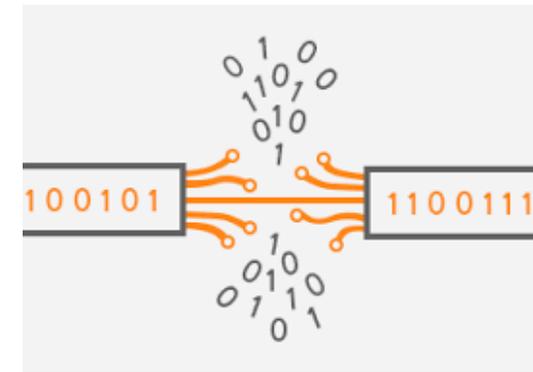


Increased latency of the public network can be handled by RAVENNA



CHALLENGE: PACKET LOSS

Leverage transport protocols designed for reliable transmission of media over lossy networks with low latency and high quality



- Secure Reliable Transport (SRT)
 - Open source protocol developed by Haivision and backed by the SRT Alliance
- Zixi
 - Widely used proprietary solution developed by company of the same name
- Reliable Internet Stream Transport (RIST)
 - An open source, open specification protocol intended to be more reliable than SRT and an alternative to proprietary solutions like Zixi, VideoFlow, Qvidium etc.

 *We are using SRT for the proof-of-concept demo but any of these will work*

CHALLENGE: TIMING AND SYNCHRONIZATION



- At each location, a PTP GM running SMPTE 2059 profile is synchronized to GPS
- The equipment at each site is locked to PTP locally
- PTP packets are not sent across the WAN as this is not currently practical (packet jitter is too high)
- AWS Time Sync Service is used and is delivered over Chrony locked to GPS



Since the PTP GM at each location and AWS Chrony are GPS-locked, synchronization is maintained across the WAN



HiGH **IMPACT**
EFFICIENCY

Easily scales in cost effective manner on off-the-shelf hardware
Uses DashBoard, making it simple to deploy and control applications

CELEBRATING 10 YEARS
RAVENNA
AES67 & ST 2110 built-in

SOFTGear **NORTH AMERICA- SOFTGEAR PLATFORM**

- S/W-based signal processing
- Modern OS-level virtualization architecture
- On-prem, private cloud, future public cloud use
- Ross and 3rd party microservices
- Quickly scales in cost effective manner
- Easy migration and redundancy
- Ultimate flexibility



nielsen



orban

DashBoard

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ROSS
LIVING LIVE!



HiGH IMPACT EFFICIENCY

Flexible AES audio-over-IP conversion wherever you want it
Cost effectively and effortlessly satisfy your AES audio IP conversion needs



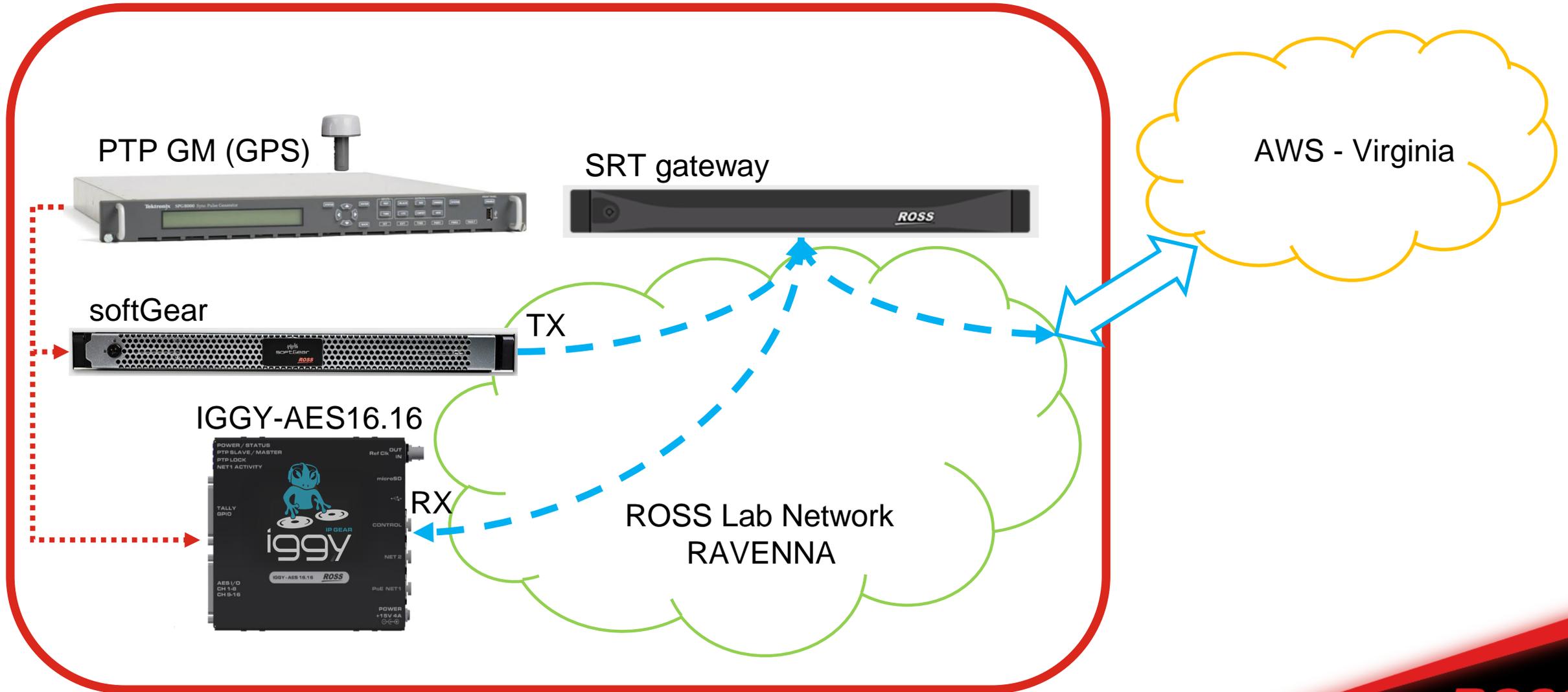
COMPACT AES67/ 2110 TO AES3 AUDIO BRIDGE

AES 16.16 16 AES3 channels in/ out

- IP Bridge that adapts to any environment
- Unparalleled channel density
- Broad interoperability
- Robust, w/ redundancy in its DNA



ROSS SETUP



ROSS SETUP



Dashboard by Ross Video

File Edit Layouts Views Window Help

PanelBuilder Edit Mode

Switchboard Global Labels

Mem: Current User: (none)

Basic Tree View

- BAP
- Frame
- Loudness-Control
- NWE-IP
- NWE-IP
- NWE-IP-101
- Dashboard Services

Slot 6: AES67 Player

Card state: OK

Connection: ONLINE

Product: AES67 Player

Orchestration Performance Status

Supplier: Ross Video, Limited

Product Name: AES67 Player

Version: 1.1.0

Build Timestamp: Mon Mar 23 15:00:03 UTC 2020

SDP SDK Version: 1.1.2

Signal Source

Ethernet Interface: NET1

IP Address: 239.111.48.106

Port: 5004

Ethernet Interface 2: NET2

IP Address 2: 239.111.48.106

Port 2: 5004

Audio Channels: 2

Codec: L24

Source File: Ross_demo_BACH.raw

Total Samples: 103032371

OK

Apply Changes

Packet Time: 1000us

Timestamp Option: Adjust from current

Timestamp Adjustment: 0

Source: Input

Tone Gen Freq: 1000

Stream: Disabled Enabled

Refresh Upload Reboot Close

Welcome Initial Setup Connections Presets Audio Gain Advanced

Advanced Settings and Status

ROSS

Status Device Setup Ethernet I/O Receivers Destinations Senders Discovery Timing TSL/Rosstalk Alarms Logs

Status

X-Connect

NET Bandwidth Allocation*

NET 1: 3.3 Mb/s

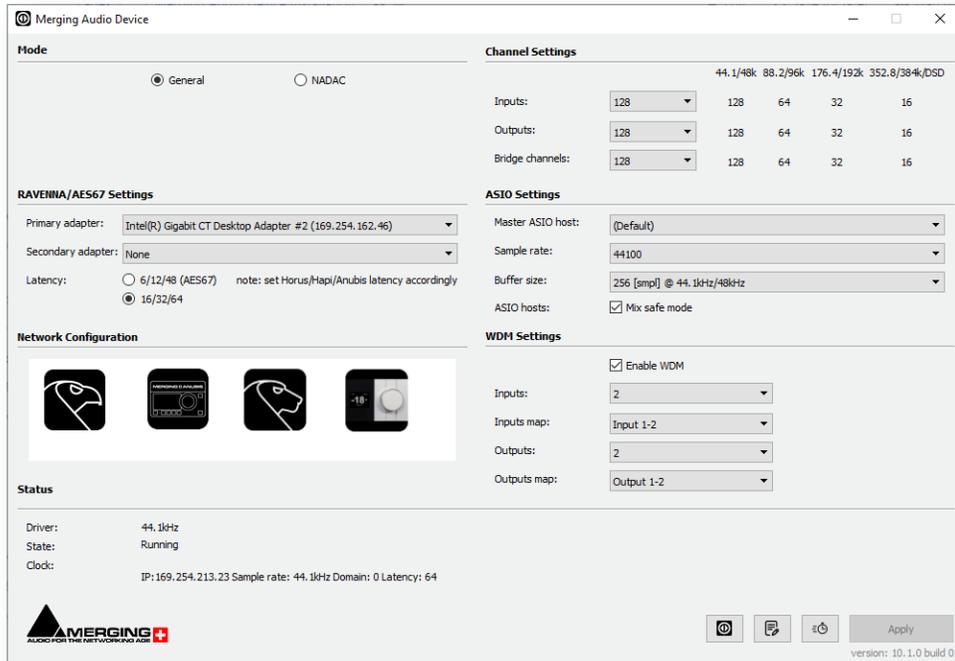
NET 2: 0.0 b/s

*Bandwidth allocation bars represent allocated bandwidth only. They are not a reflection of actual traffic on the link.

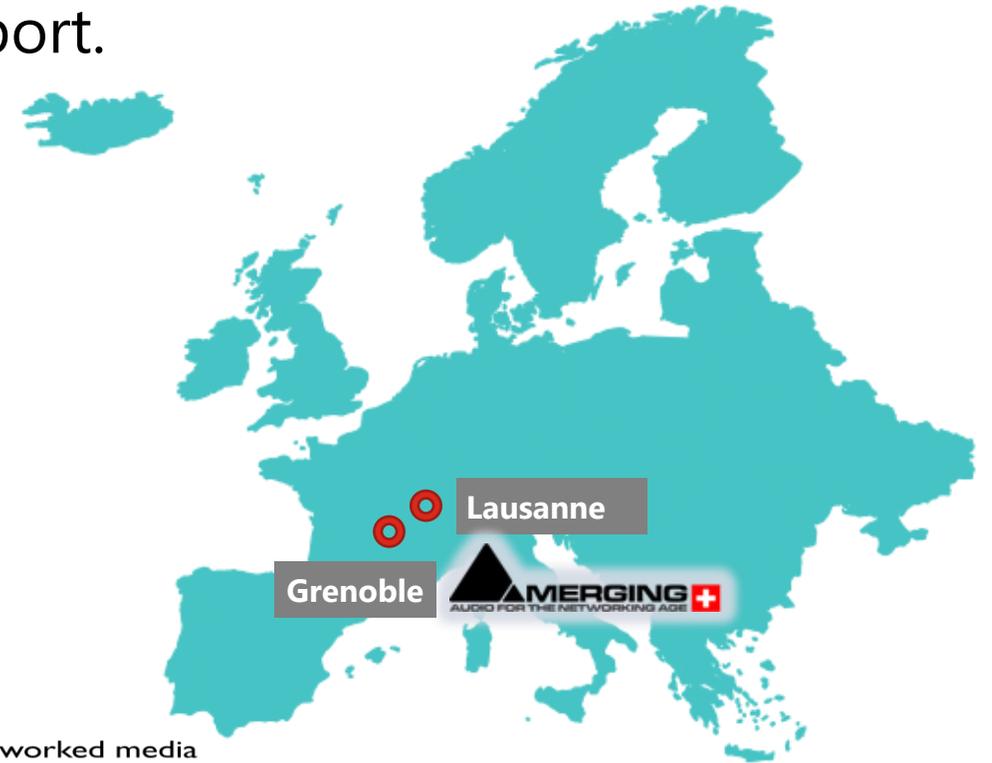
Status	Name	Disconnect
AES A: OK	Destination 1	Disconnect
Audio: OK	From_WAN.audioA	239.1.1.135 5004 NET 1 20000
AES B: Not In Use	Destination 2	Disconnect

Refresh Upload Reboot Close

MERGING AUDIO DEVICE



ASIO RAVENNA/AES67 driver, VM ready, with NMOS, ST2110-30 and ST2022-7 support.



networked media
NMOS
open specifications



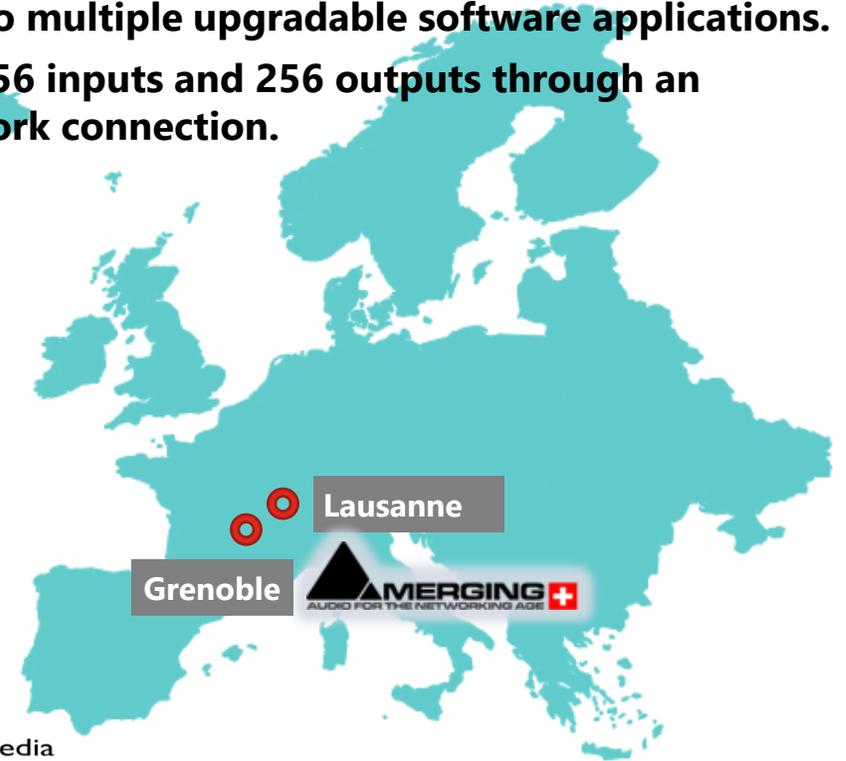
MERGING ANUBIS



Compact AD/DA interface with 4 analog inputs (2 MicPre/Line and 2 Instrument/Line), 4 analog outputs, 2 independent headphones, GPIO and MIDI.

Internal low latency mixing engine operated through a large touch monitor giving access to multiple upgradable software applications.

I/O expandable up to 256 inputs and 256 outputs through an AES67/RAVENNA network connection.

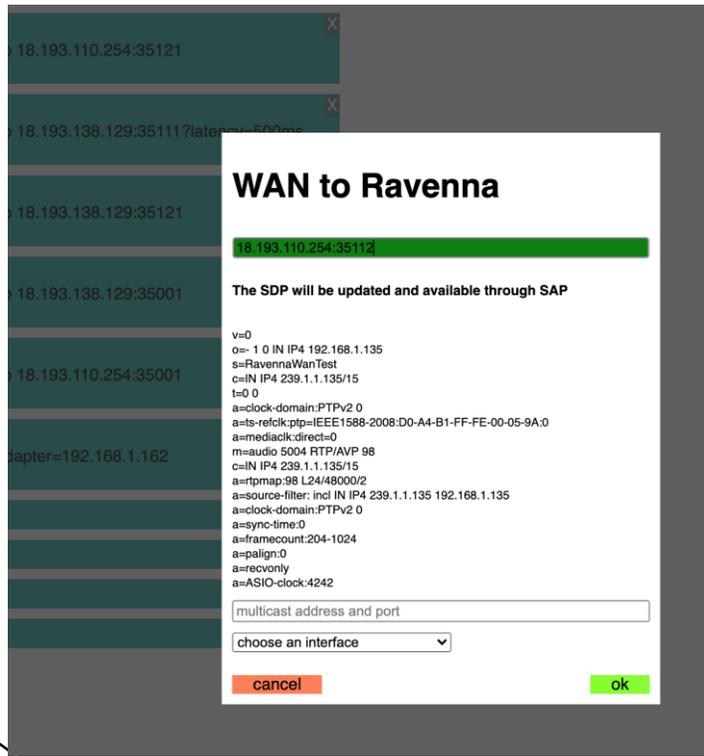
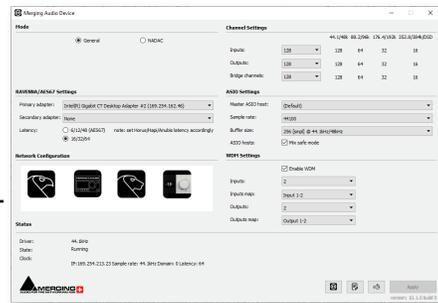


MERGING SETUP



RAVENNA LOCAL AERA NETWORK

Gateway



AWS Relay Server

Relay server and gateway can do SDP transport and translation



MERGING SETUP

Configuration

IO: Stream

Label:

Description:

Source: manual://RavennaWanTest Manual

```
v=0
o=- 1 0 IN IP4 192.168.1.135
s=RavennaWanTest
c=IN IP4 239.9.9.1/15
t=0 0
a=clock-domain:PTPv2 0
a=ts-refclk:ptp=IEEE1588-2008:D0-A4-B1-FF-FE-00-05-9A:0
a=mediaclock:direct=0
m=audio 5004 RTP/AVP 98
c=IN IP4 239.9.9.1/15
a=rtpmap:98 L24/48000/2
a=source-filter: incl IN IP4 239.1.1.135 192.168.1.135
```

Apply

Delay (samples): 16000 (~333.3 ms)

Ignore refclk GMID: accept source locked to any PTP Master

Relaxed check: accept source with lower channel count

Channels: Channel count: 2, Count adapted:

Session Info

Session status: Connected

RTP status: Receiving

Session name: RavennaWanTest

Playout delay: 16000 (~333.3 ms)

RTSP Host:

Interface 1

RTP status: 0x10: receiving RTP packets

Clock domain: PTPv2 0

Address: 239.9.9.1/15

Payload: 98 L24/48000/2

► SDP

DIRECTOUT EQUIPMENT



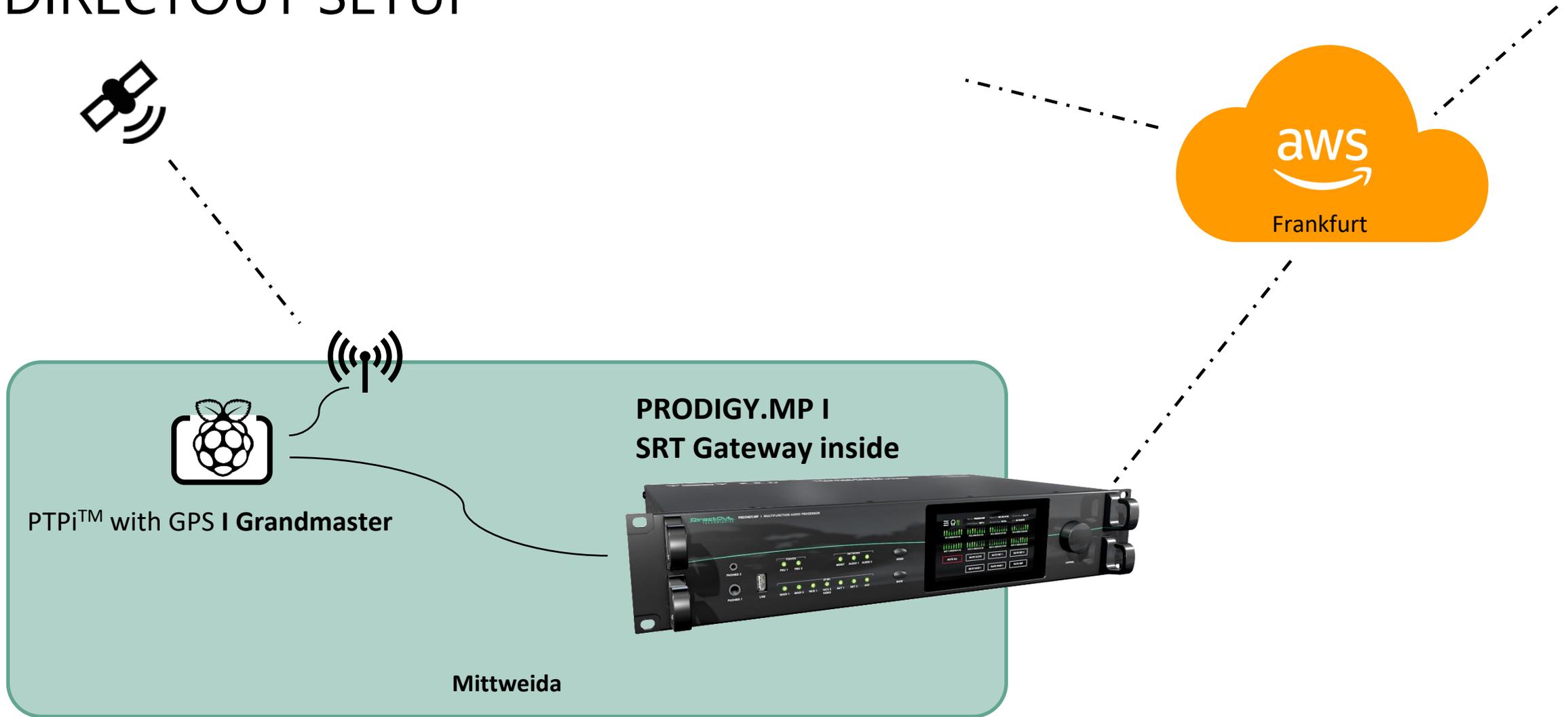
PRODIGY.MP + RAV.IO



+



DIRECTOUT SETUP



DIRECTOUT SETUP

01 - INPUT STREAM SETTINGS

Activate Stream:

Stream Input: Stream state offset max (samples): **19788**

Backup Stream: Stream state offset min (samples): 15815

Backup Stream Timeout: Stream state ip address src NIC 1: -

Stream name: Stream state ip address src NIC 2: 239.67.2.1

Stream state messages:

Stream state offset max (samples):

Stream state offset min (samples):

Stream state ip address src NIC 1:

Stream state ip address src NIC 2:

Offset fine:

Offset in samples (458.33 ms): **22000**

Start channel: 1

Discovery protocol: Manual configuration

Stream name (manual): Ottawa

Number of channels: 2

RTP payload ID: 98

Audio format: L24

Media offset: 0

Ottawa

NIC 1	NIC 2
Dst IP address: 239.1.1.4	Dst IP address: 239.67.2.1
SMM (Source Specific Multicast): <input type="checkbox"/>	SMM (Source Specific Multicast): <input type="checkbox"/>
Src IP address: 0.0.0.0	Src IP address: 172.16.120.201
RTP dst port: 5004	RTP dst port: 5004
RTCP dst port: 5005	RTCP dst port: 5005

01 - INPUT STREAM SETTINGS

Activate Stream:

Stream Input: Stream state offset max (samples): **14893**

Backup Stream: Stream state offset min (samples): 13009

Backup Stream Timeout: Stream state ip address src NIC 1: -

Stream name: Stream state ip address src NIC 2: 239.67.2.1

Stream state messages:

Stream state offset max (samples):

Stream state offset min (samples):

Stream state ip address src NIC 1:

Stream state ip address src NIC 2:

Offset fine:

Offset in samples (333.33 ms): **16000**

Start channel: 1

Discovery protocol: Manual configuration

Stream name (manual): Lausanne

Number of channels: 2

RTP payload ID: 98

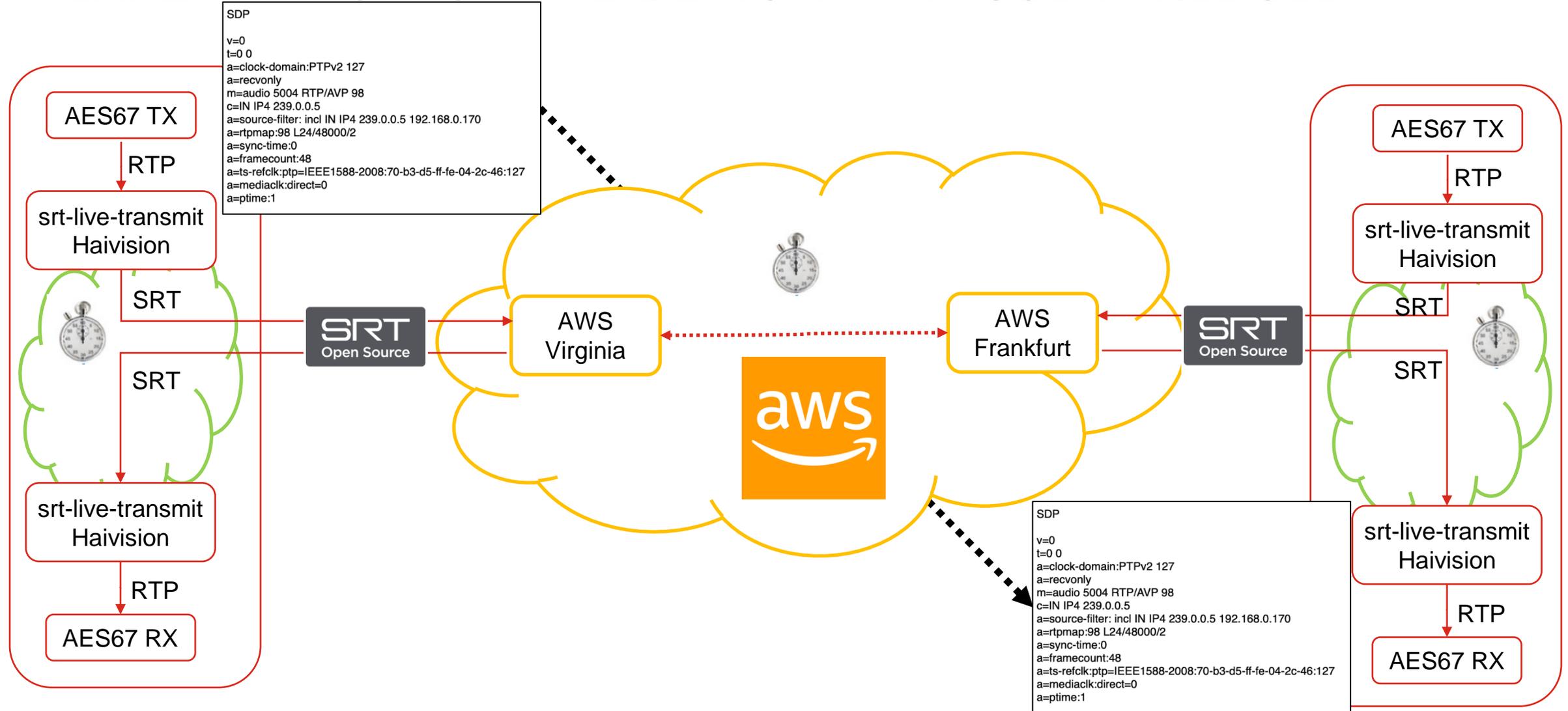
Audio format: L24

Media offset: 0

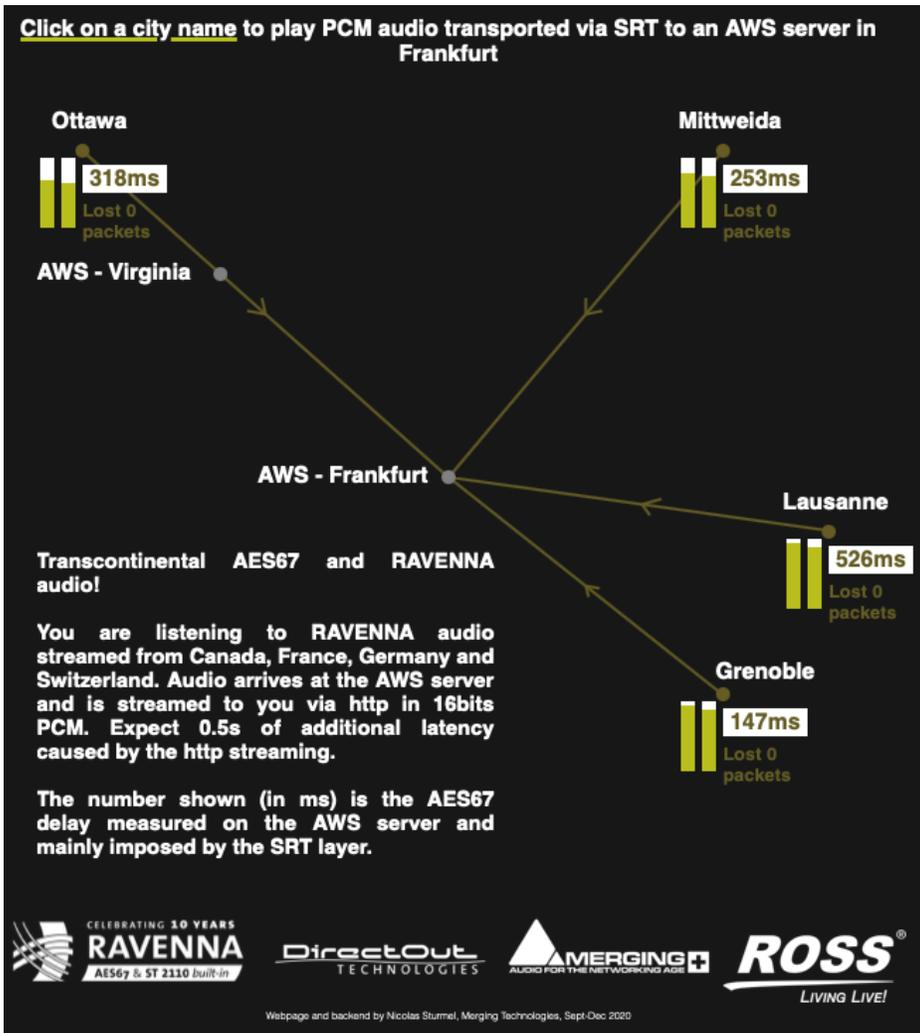
Lausanne

NIC 1	NIC 2
Dst IP address: 239.1.1.4	Dst IP address: 239.67.2.1
SMM (Source Specific Multicast): <input type="checkbox"/>	SMM (Source Specific Multicast): <input type="checkbox"/>
Src IP address: 0.0.0.0	Src IP address: 172.16.120.201
RTP dst port: 5004	RTP dst port: 5004
RTCP dst port: 5005	RTCP dst port: 5005

EXPLANATION OF THE DEMO WHAT USER WILL SEE



DEMO WEBPAGE



- A special version of *srt-live-transmit* is used for sending the RAVENNA payload to the local loop (on top of the regular behavior)
- Uses <https://github.com/nicolassturmel/aes67-web-monitor> to analyze the RAVENNA packets and stream the audio
- The audio is streamed with 1 s buffer at 16bit / 48khz, just to save bandwidth ;-)
- The rest is html and css...
- Live web site at: <https://www.ravenna-network.com/using-ravenna/remote-production/>

LESSONS LEARNED

- “Local only” PTP synchronization locked to GPS works fine
- There is packet loss but this can be managed via SRT
- Latency less than 1s
- Manual connections using SDP files
- Manual tuning of link-offset required
- Receivers need to have deep buffers or mechanisms to compensate for the network delay



FUTURE CONSIDERATIONS

- Transporting timing through the cloud
- RAVENNA Advertisements
- Automated handling of link-offset
- Other techniques, FEC & ST2022-7, to manage packet loss
- RIST open standard instead of SRT



More answers...



RAVENNA / AES67 / SMPTE ST 2110 Resources:

www.ravenna-network.com/using-ravenna/remote-production

www.ravenna-network.com/resources

Happy Holidays!

Contact information:

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CELEBRATING 10 YEARS
RAVENNA
AES67 & ST 2110 built-in

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