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Pavilion at AES NY 2022

Alliance for IP Media Solutions

AES67 WAN Transport Utilizing the Cloud

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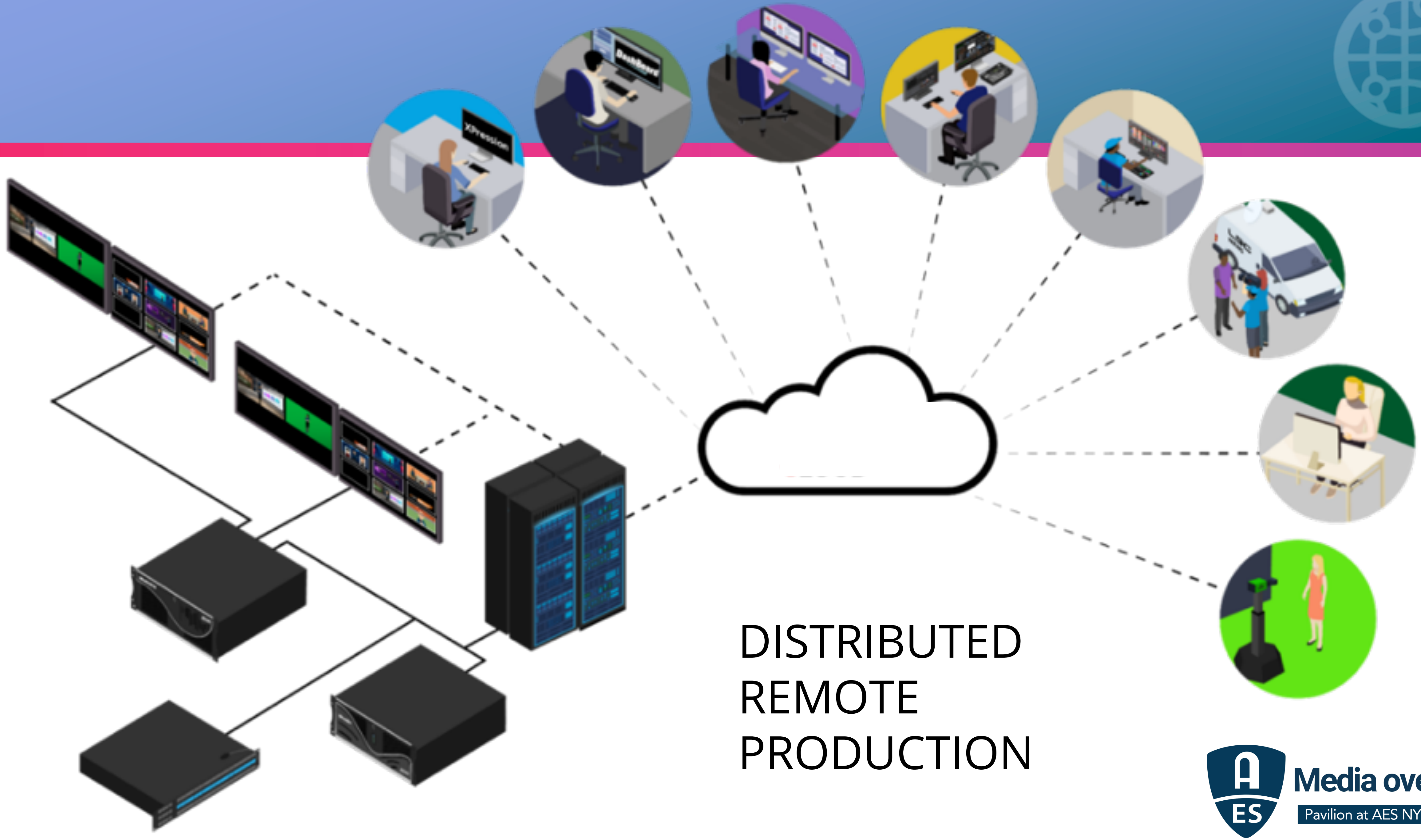
TRADITIONAL REMOTE PRODUCTION

OUTSIDE BROADCAST VAN

REMI MODEL



DISTRIBUTED REMOTE PRODUCTION

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Global AES67 over WAN Demo

- 2 continents
- 3 companies
- 4 sites

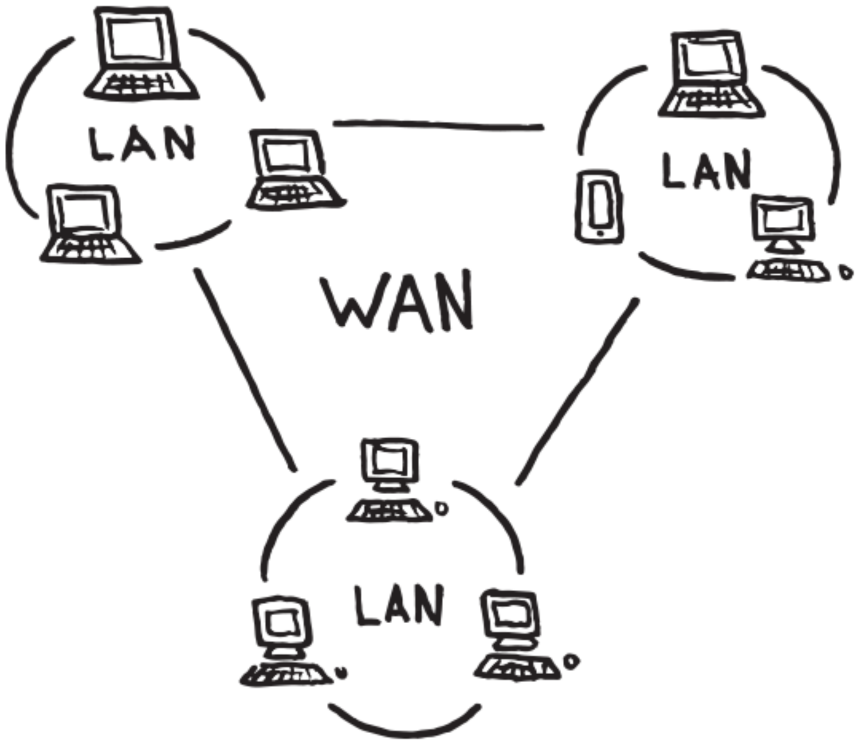
PURPOSE

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

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

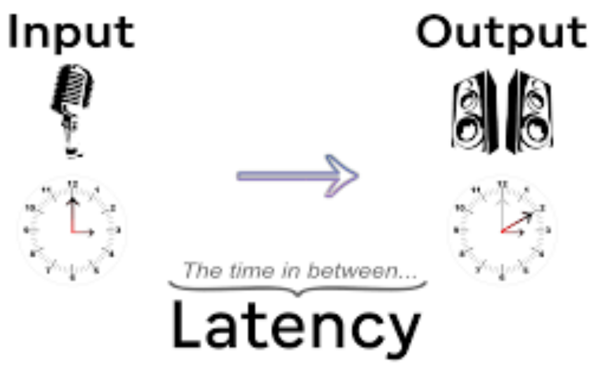
SOME BACKGROUND ON AES67

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

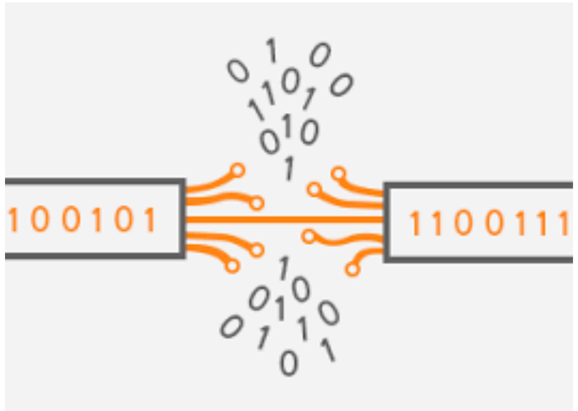


PUBLIC INFRASTRUCTURE CHALLENGES

Latency and Packet Jitter



Packet Loss

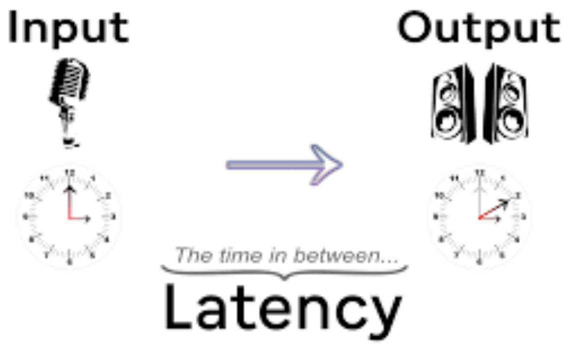


Timing and Synchronization

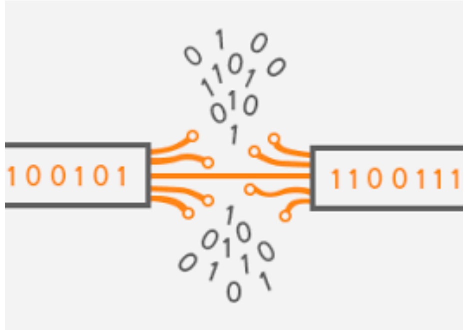
CHALLENGE: LATENCY AND PACKET JITTER

- RAVENNA receivers are designed to handle increased packet jitter & latency
- The large receiver buffers 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 AES67 and 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 the larger buffers used in well-architected AES67 and RAVENNA solutions



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)

Since the PTP GM at each location is locked to GPS, synchronization is maintained across the WAN

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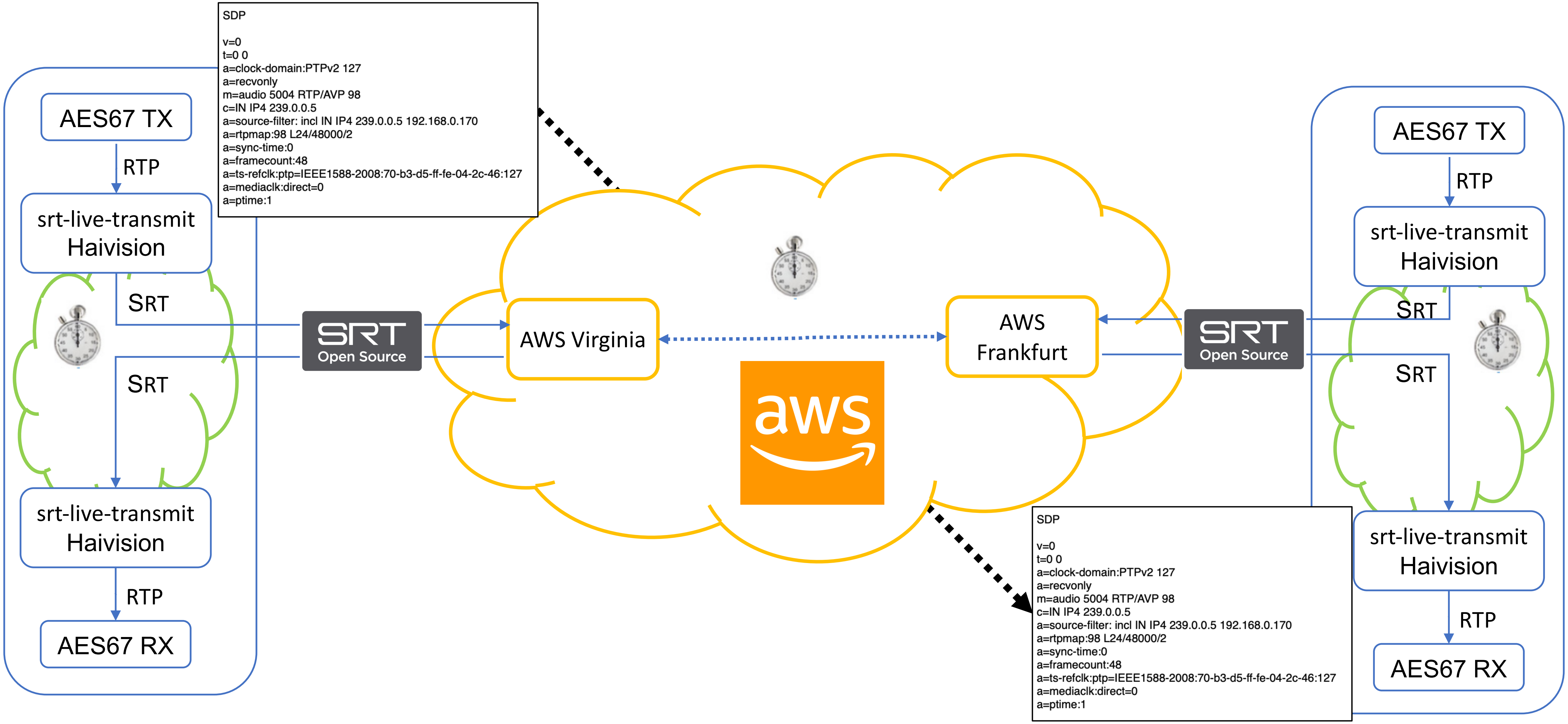
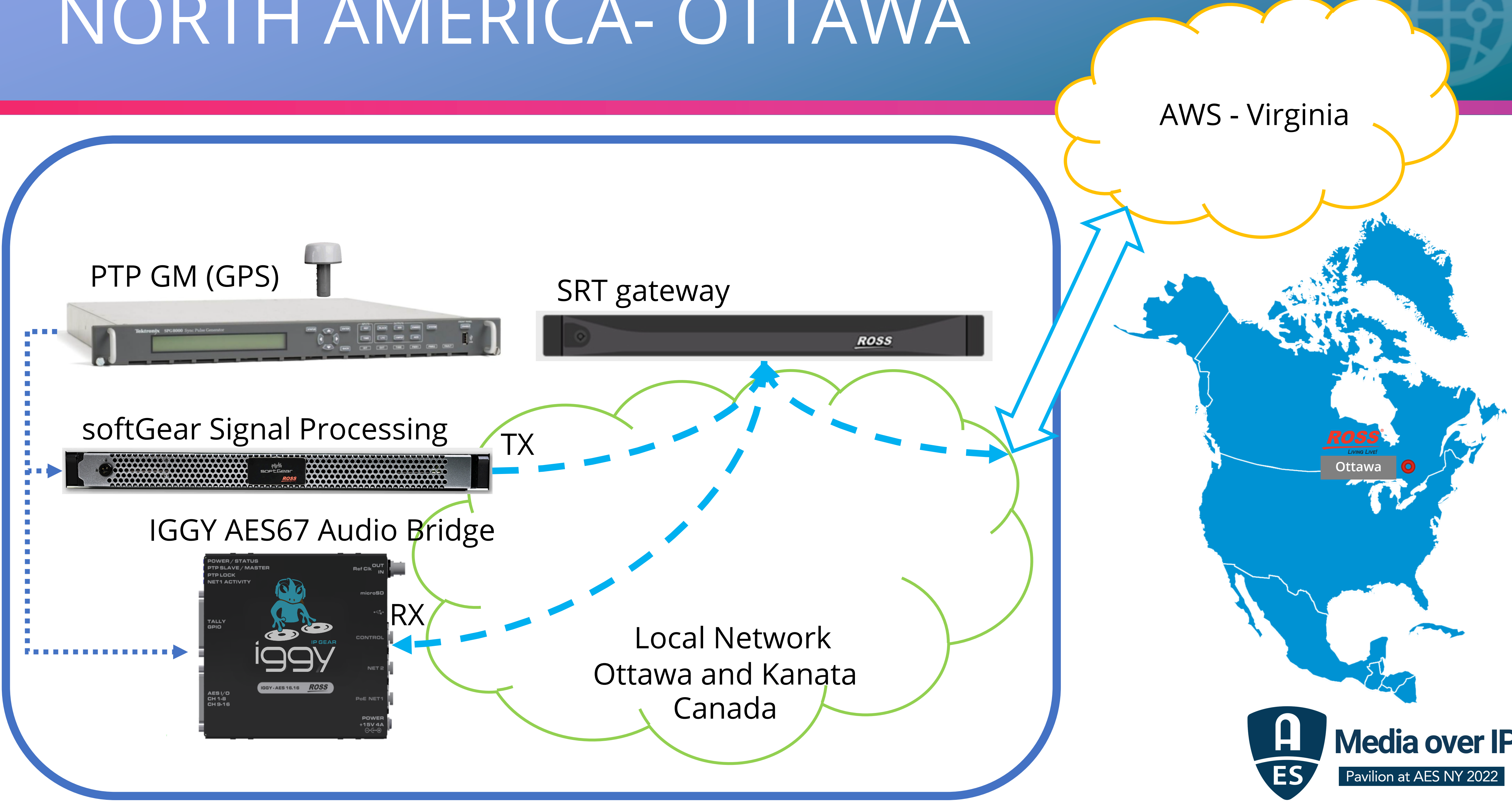
BIG PICTURE SUMMARY OF AES67 OVER WAN DEMO



NORTH AMERICA- OTTAWA



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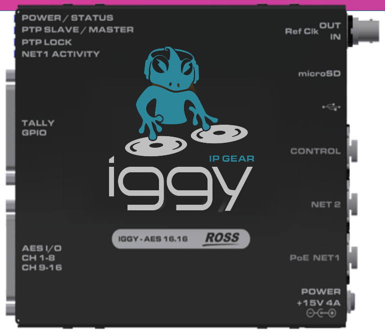
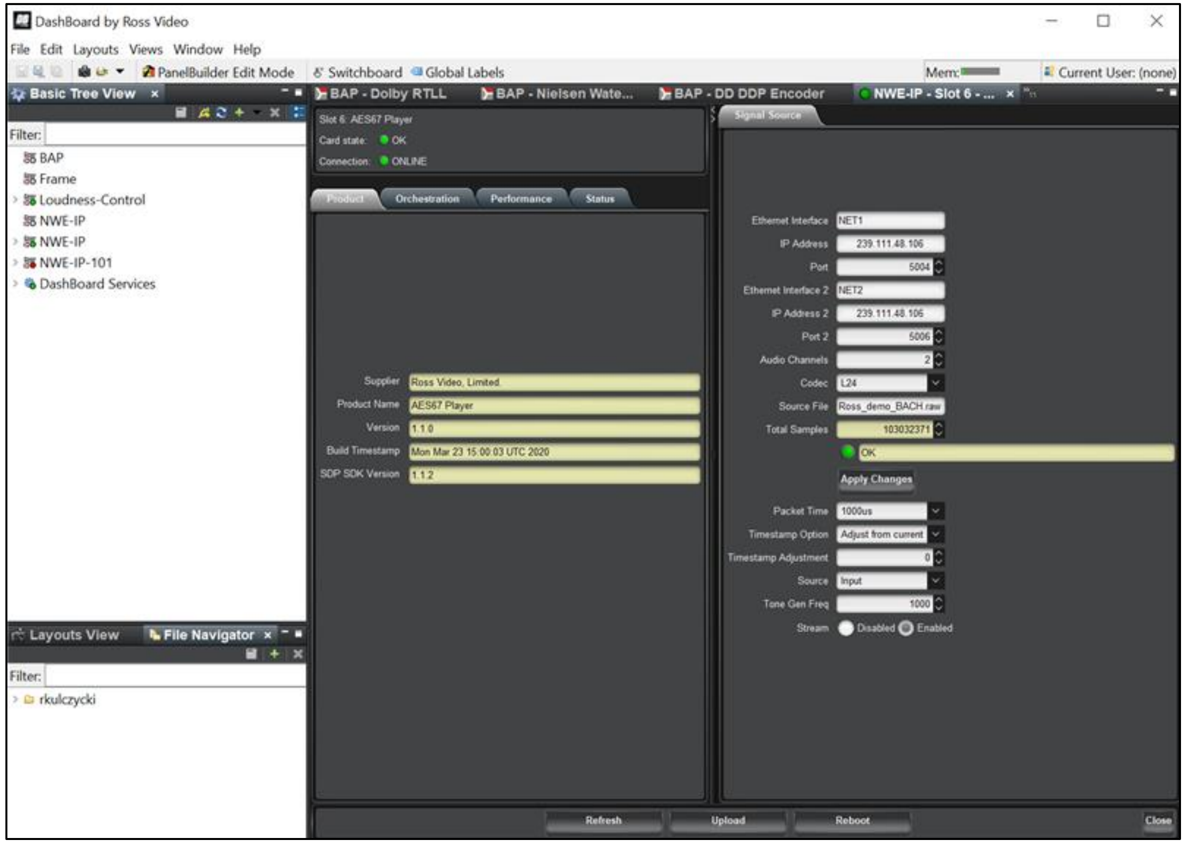
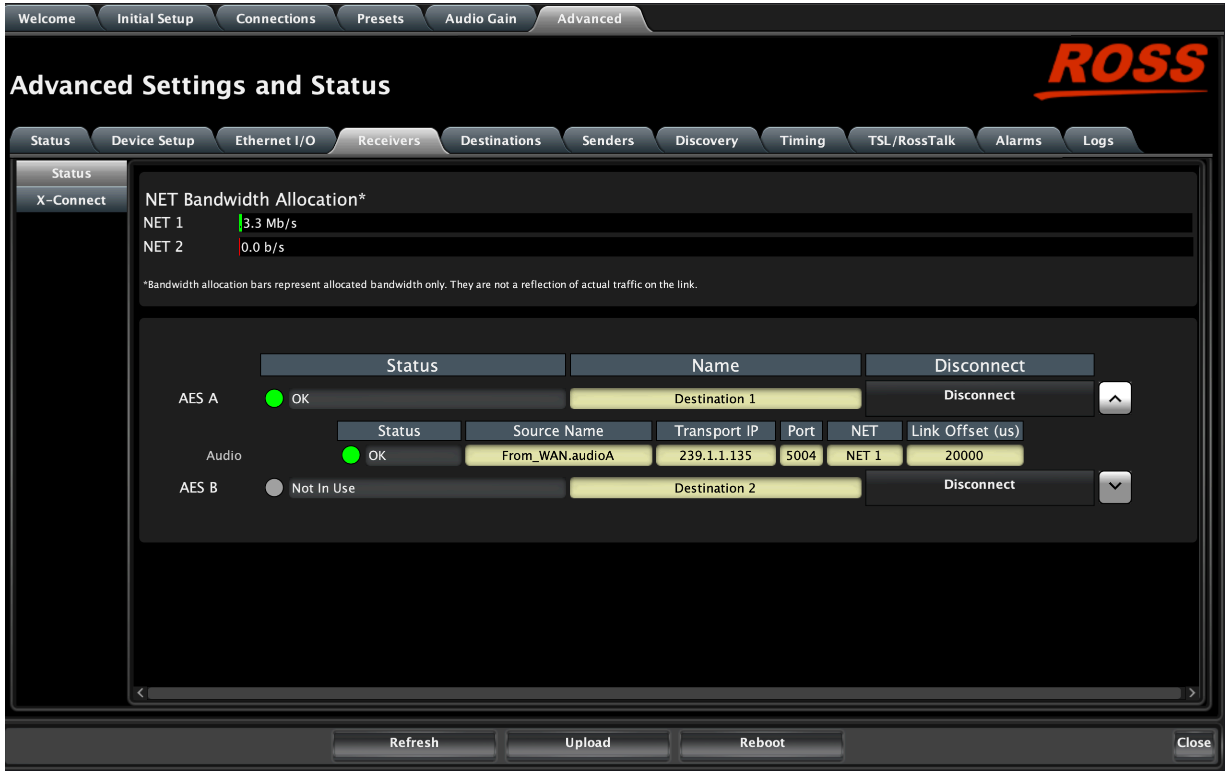
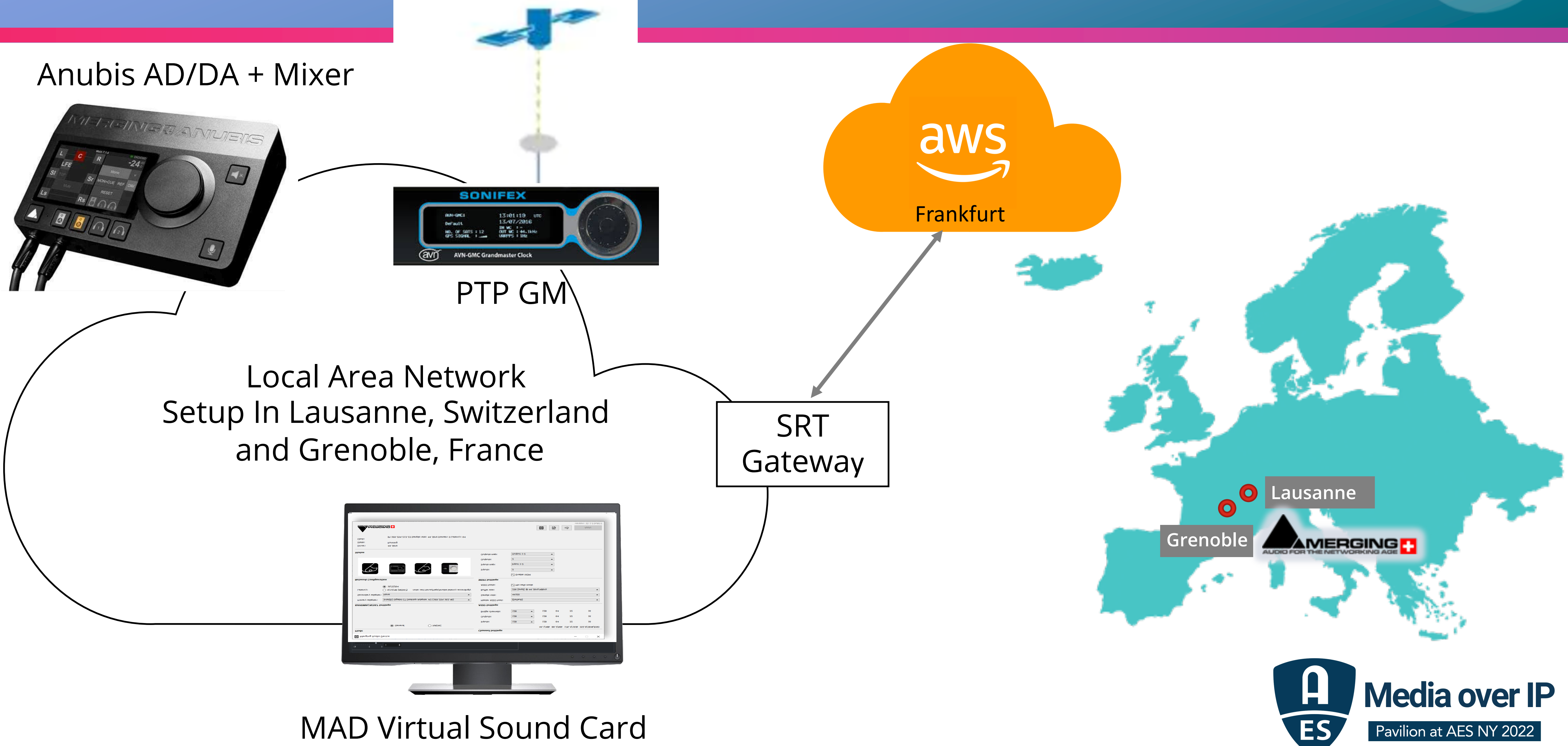
OTTAWA SETUP







EUROPE- LAUSANNE AND GRENOBLE



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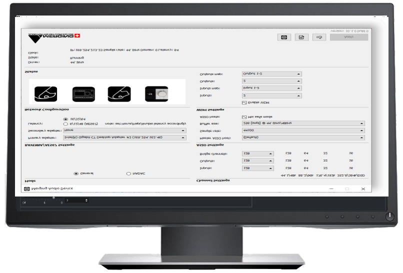
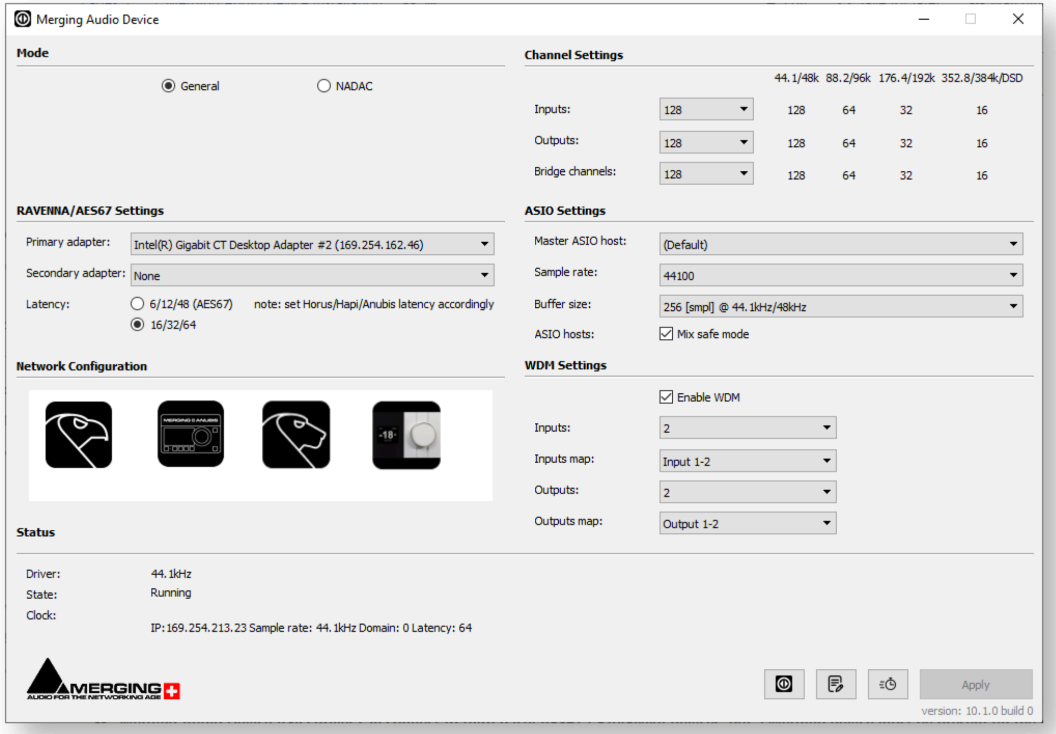
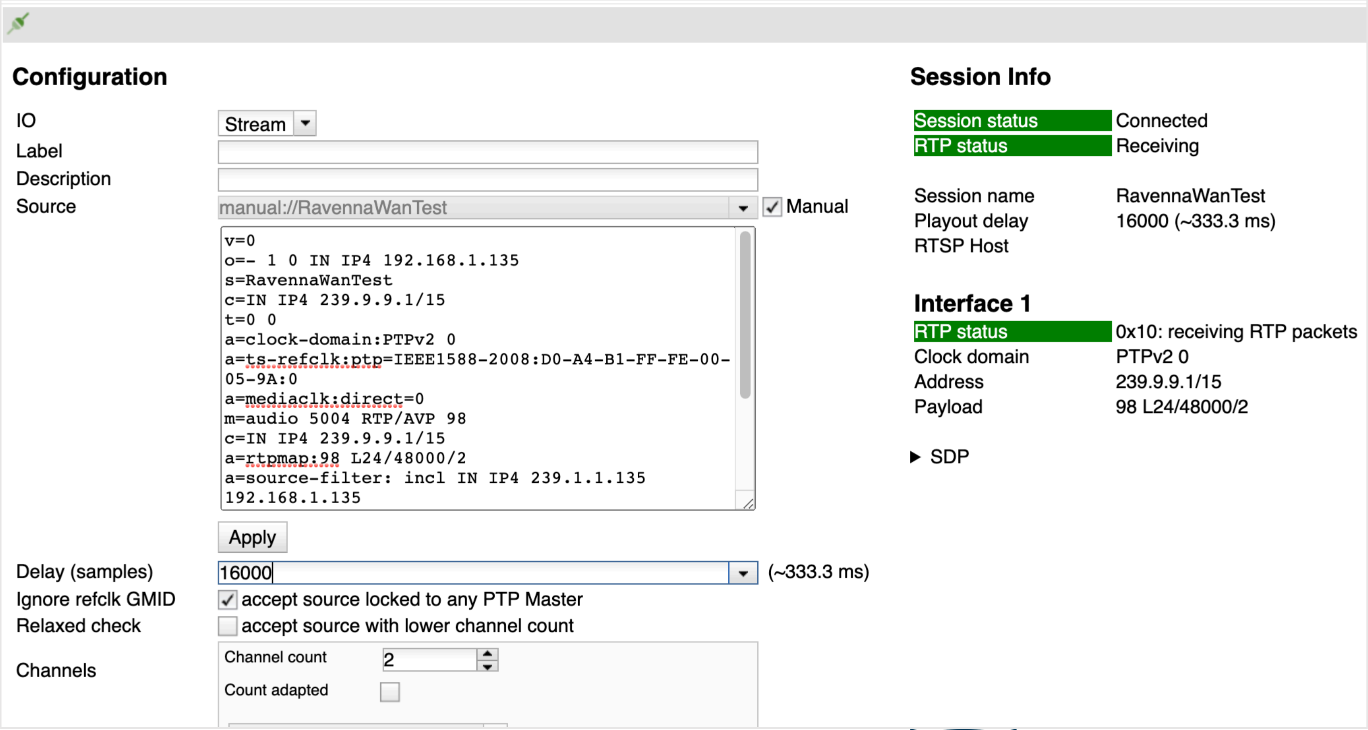
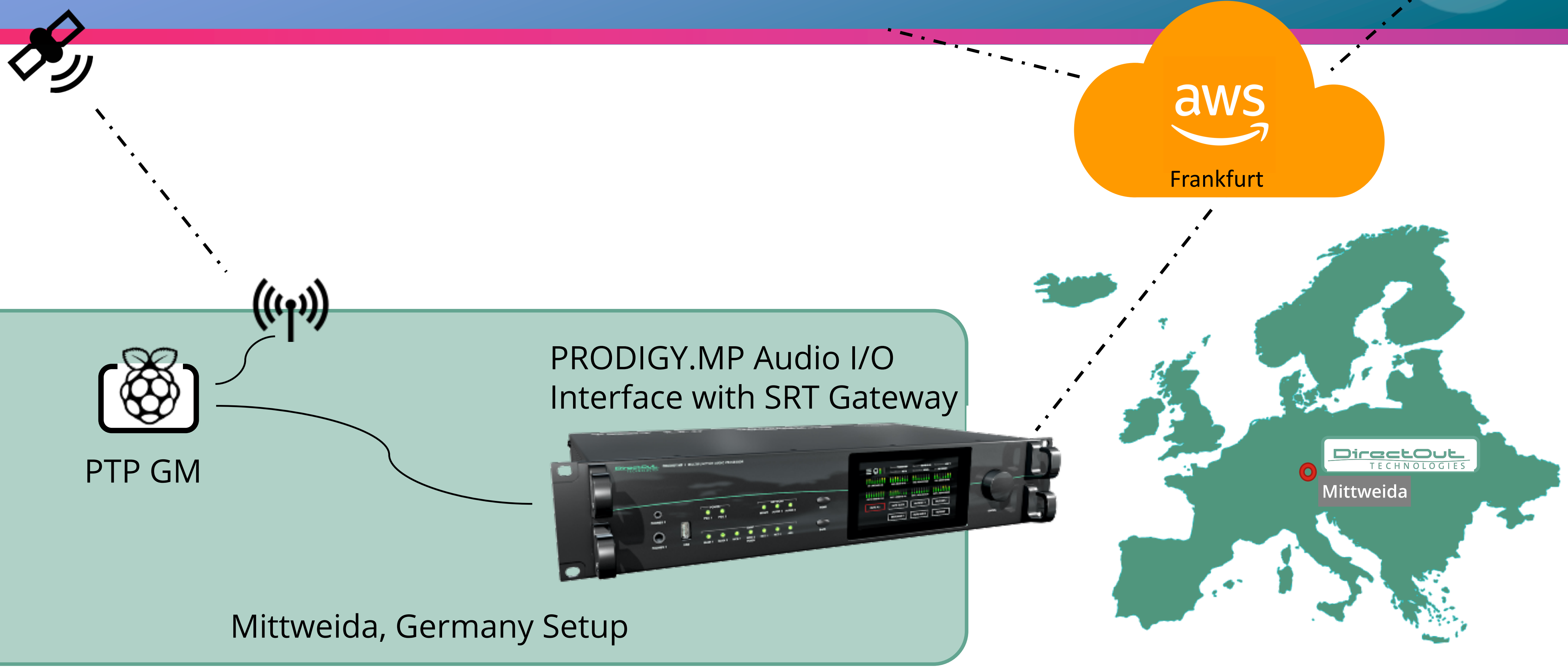
LAUSANNE AND GRENOBLE SETUP



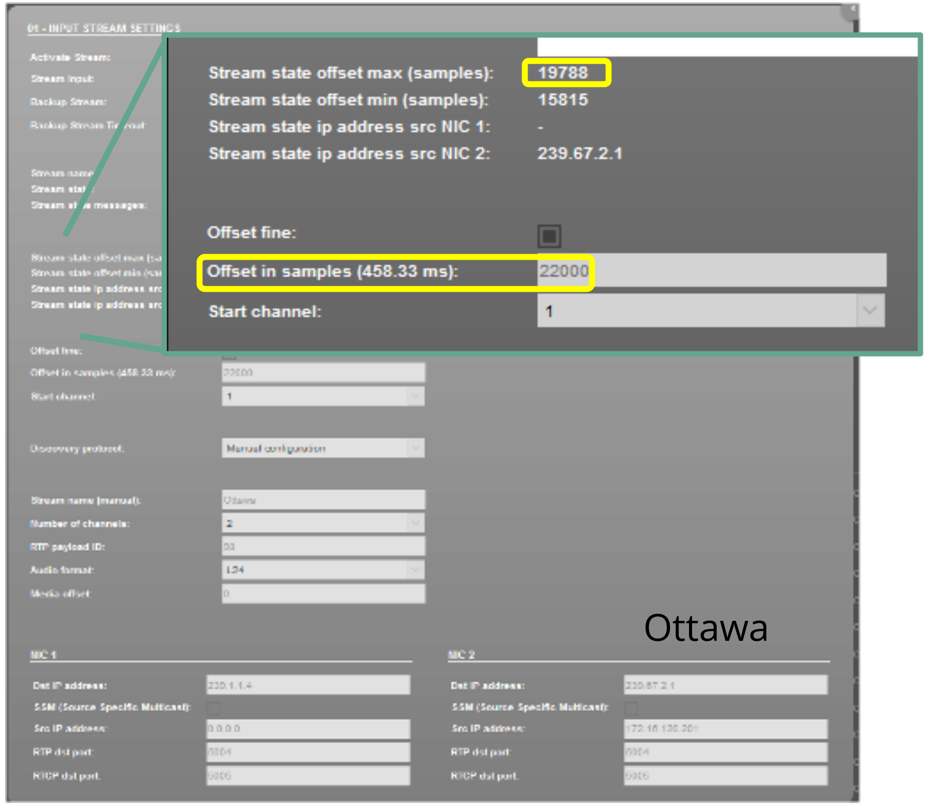


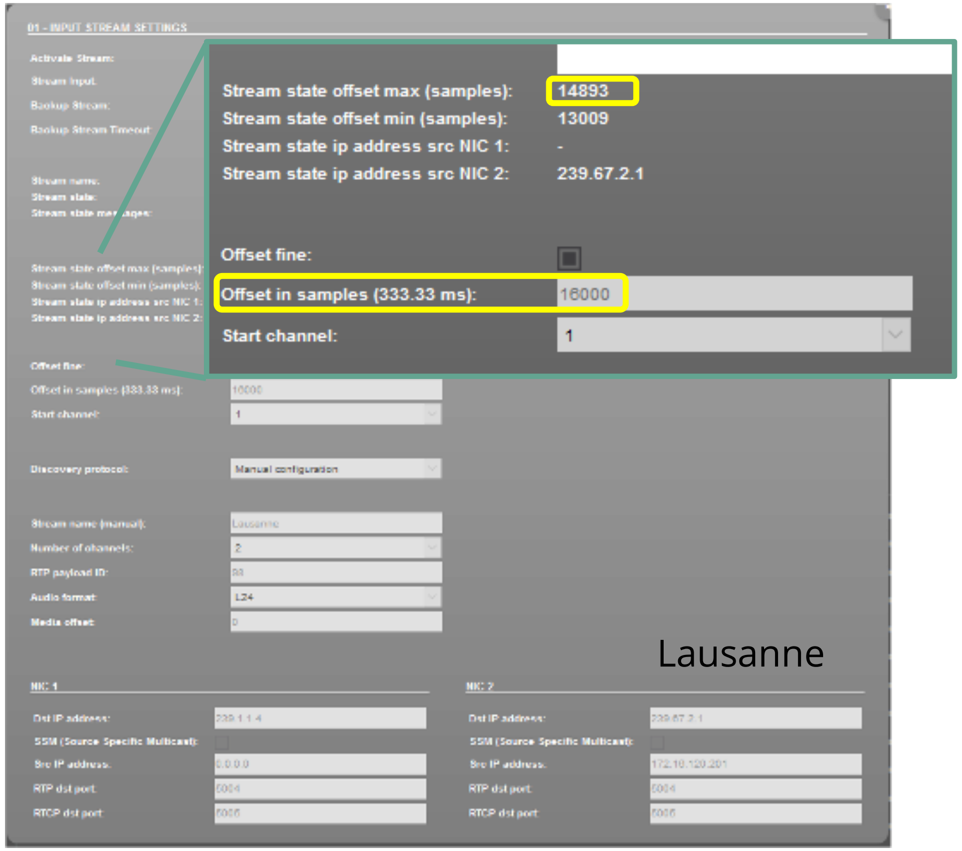


EUROPE- MITTWEIDA



MITTWEIDA SETUP





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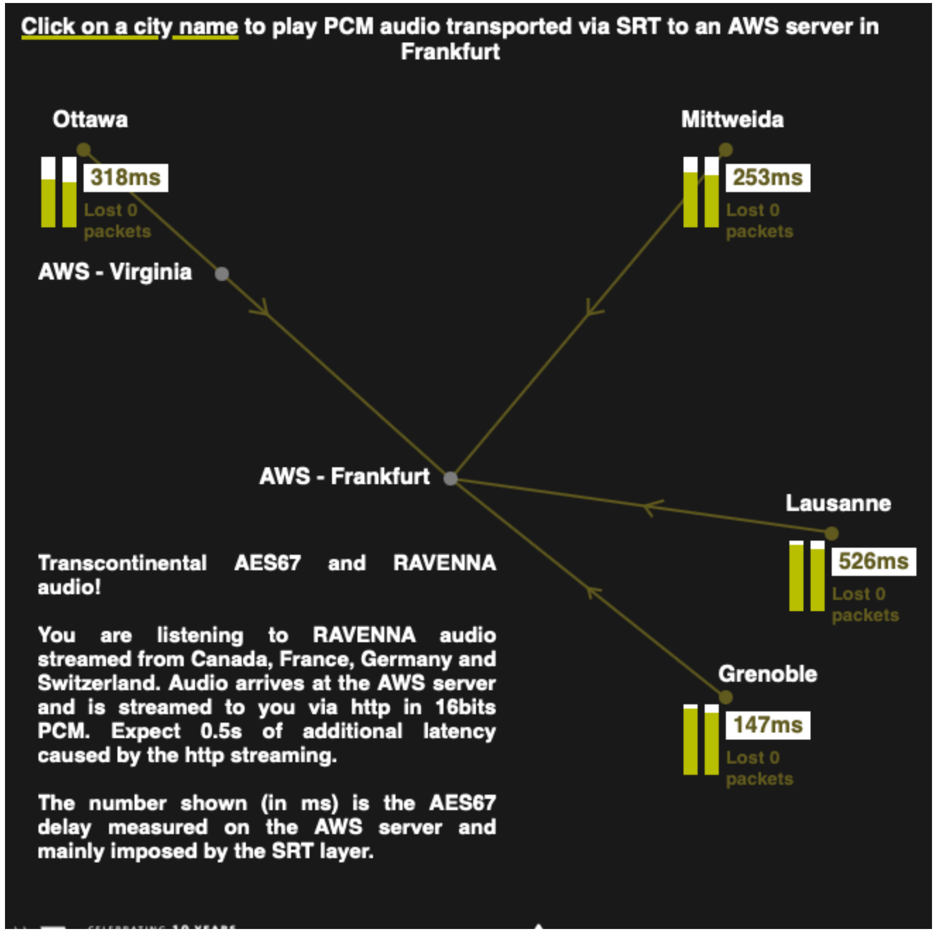
GLOBAL AES67 OVER WAN DEMO WEB PAGE



- A special version of srt-live-transmit is used to send the AES67 payload to the local loop (on top of the regular behaviour)
- Utilizes a monitoring application created by Nicolas Sturmel to analyze the AES67 packets and stream the audio: https://github.com/nicolassturmel/aes67-web-monitor
- The audio is streamed with a one second buffer at 16bit / 48khz, just to save bandwidth

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LESSONS LEARNED

- “Local only” PTP synchronization locked to GPS works fine
- There is packet loss but this can managed via SRT
- Latency ranged from 200 to 600 msec
- 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 or NMOS
- Automated handling of link-offset
- Other techniques, FEC & ST2022-7, to manage packet loss
- RIST open standard instead of SRT

QUESTIONS ?

AES NEW YORK AUDIO ENGINEERING CONVENTION

AIMS

THANK YOU!

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