AES67 beyond the LAN

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- Live concerts with musicians apart
- Monitoring
- Voice over in multiple languages
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AES-R20-2021

With the increasing demand of WAN communications in AES67/ ST2110-30 networks, mostly due to COVID-19, the AES SC-02-12M, standard comité group on AES67 development started a project to issue recommendations:

- What can I do with my AES67 devices ?
- What can I add to my network to strengthen the connection ?
- What should manufacturers add to the equipments ?

The report was published September 25th 2021

AES-R20-2021

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- Academics
- Manufacturers
- System integrators
- Users

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Best Practices

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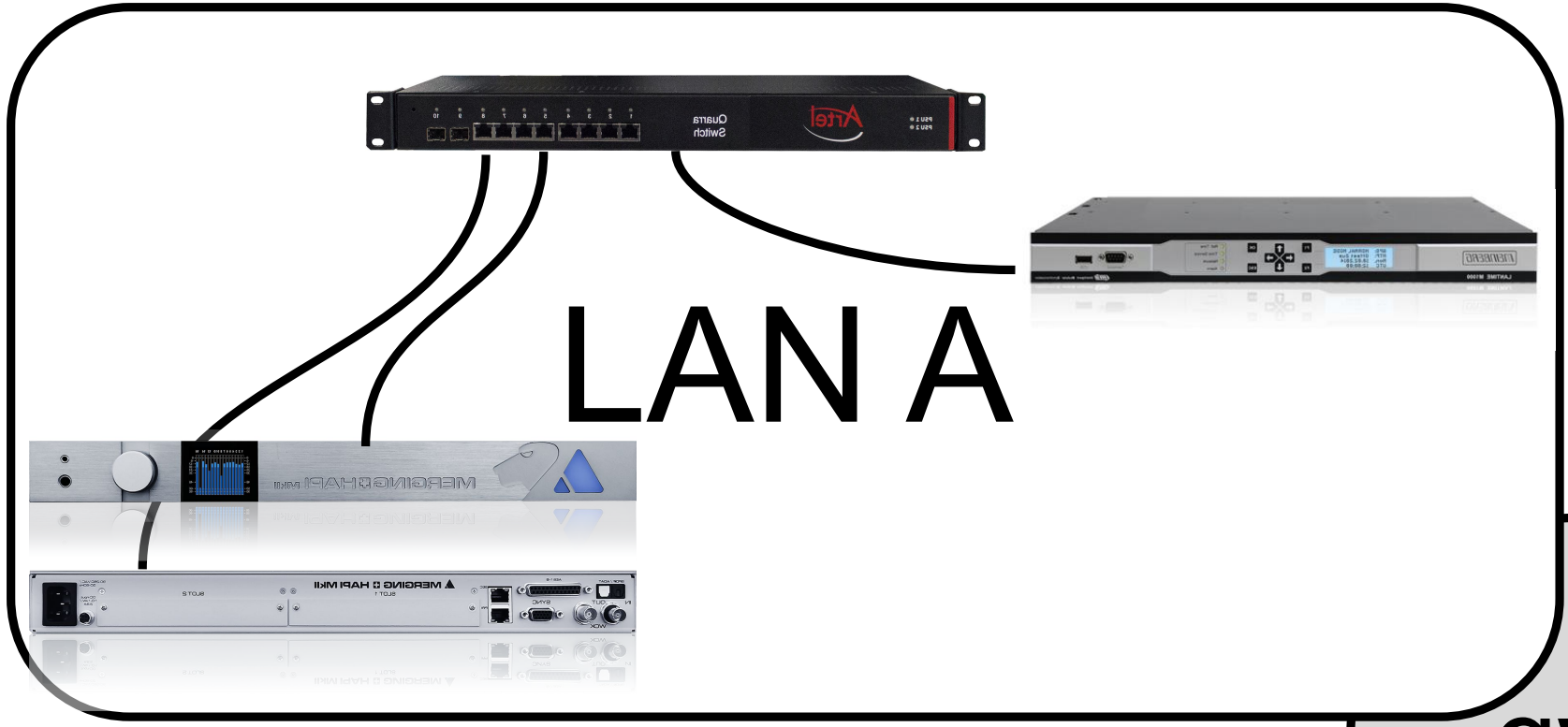

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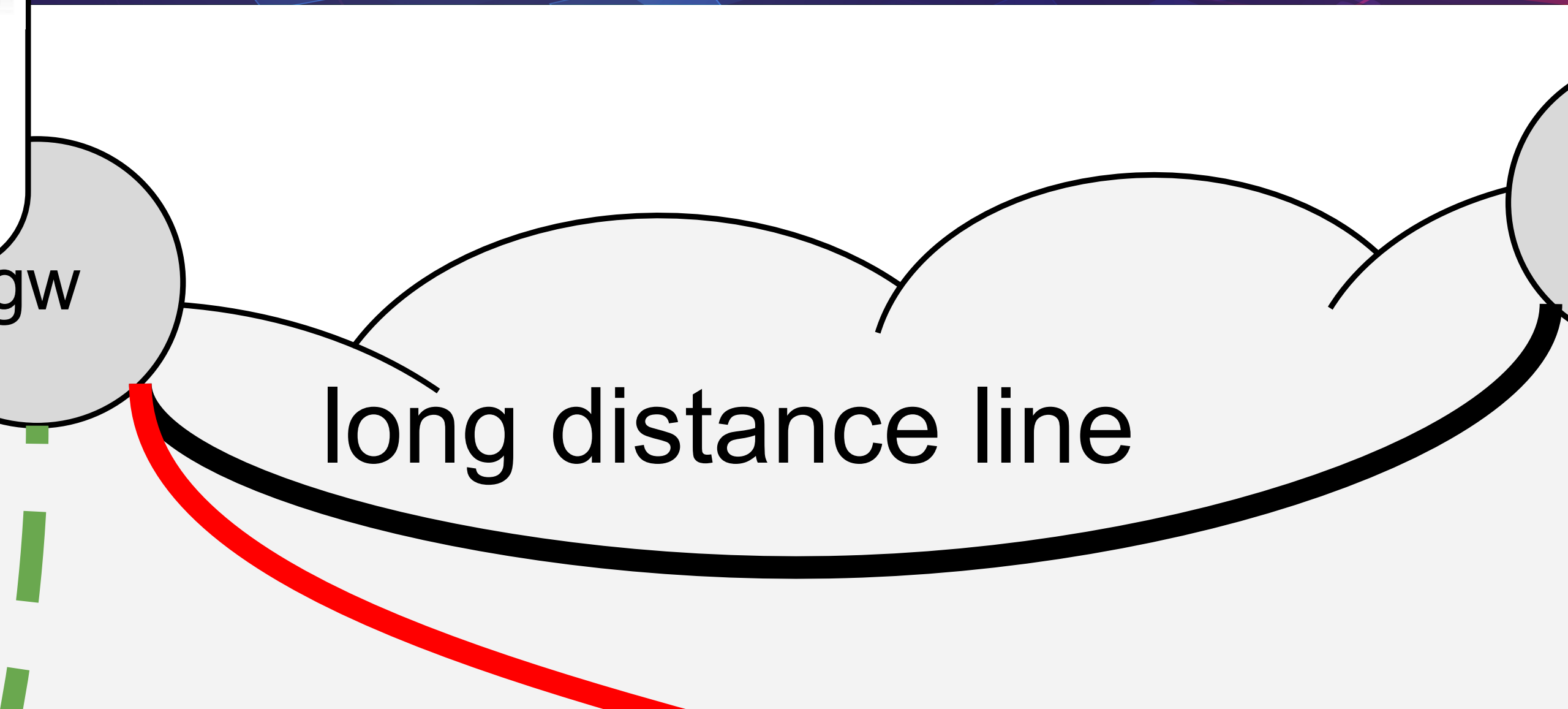

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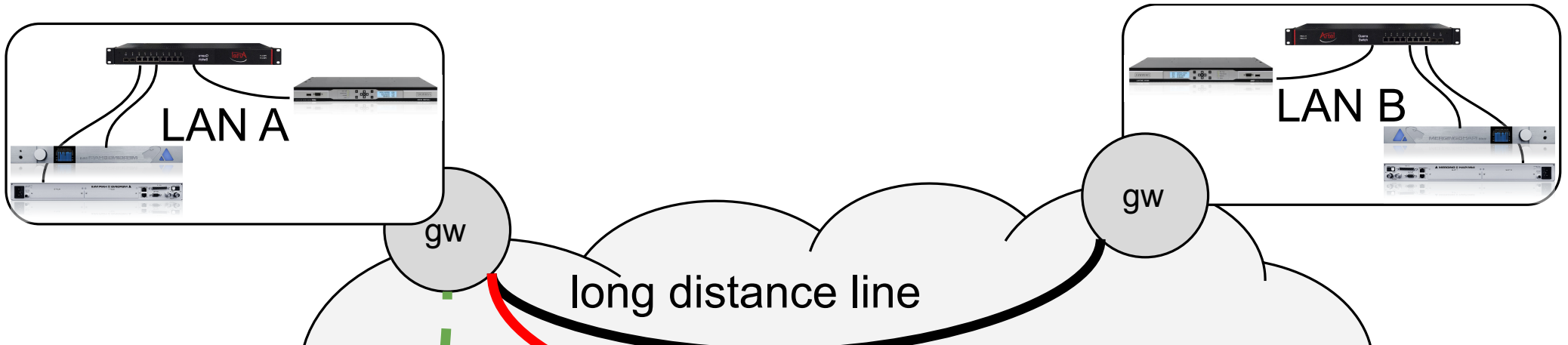

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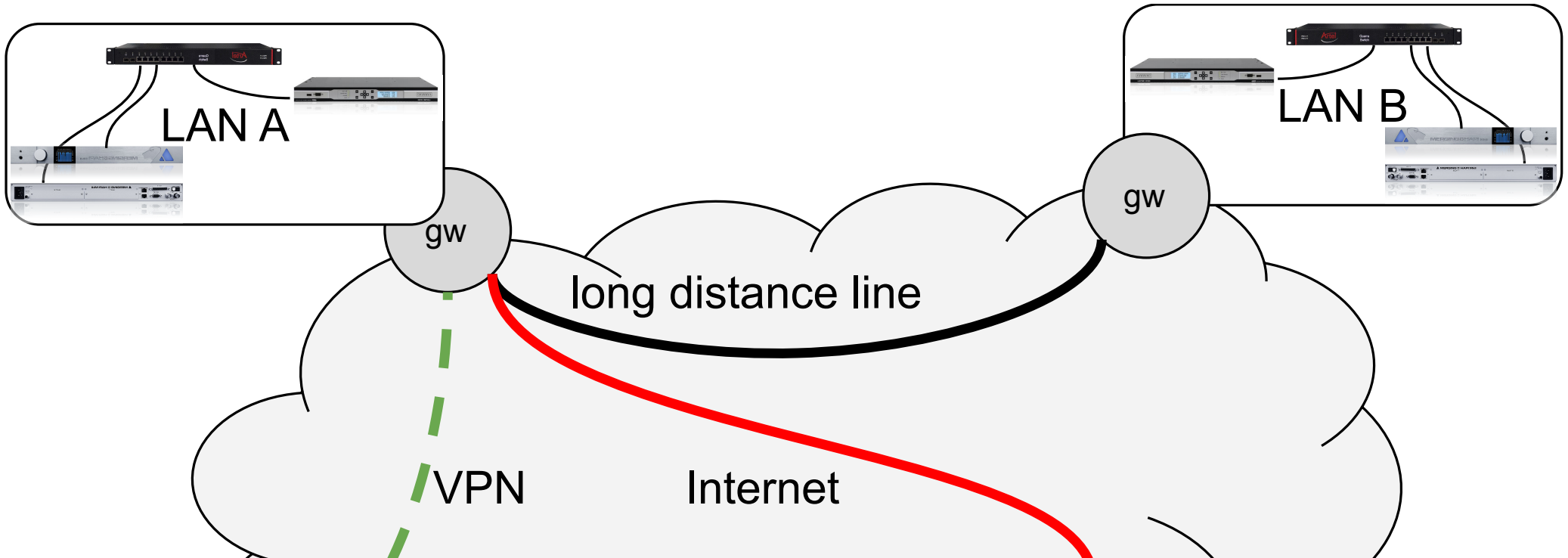

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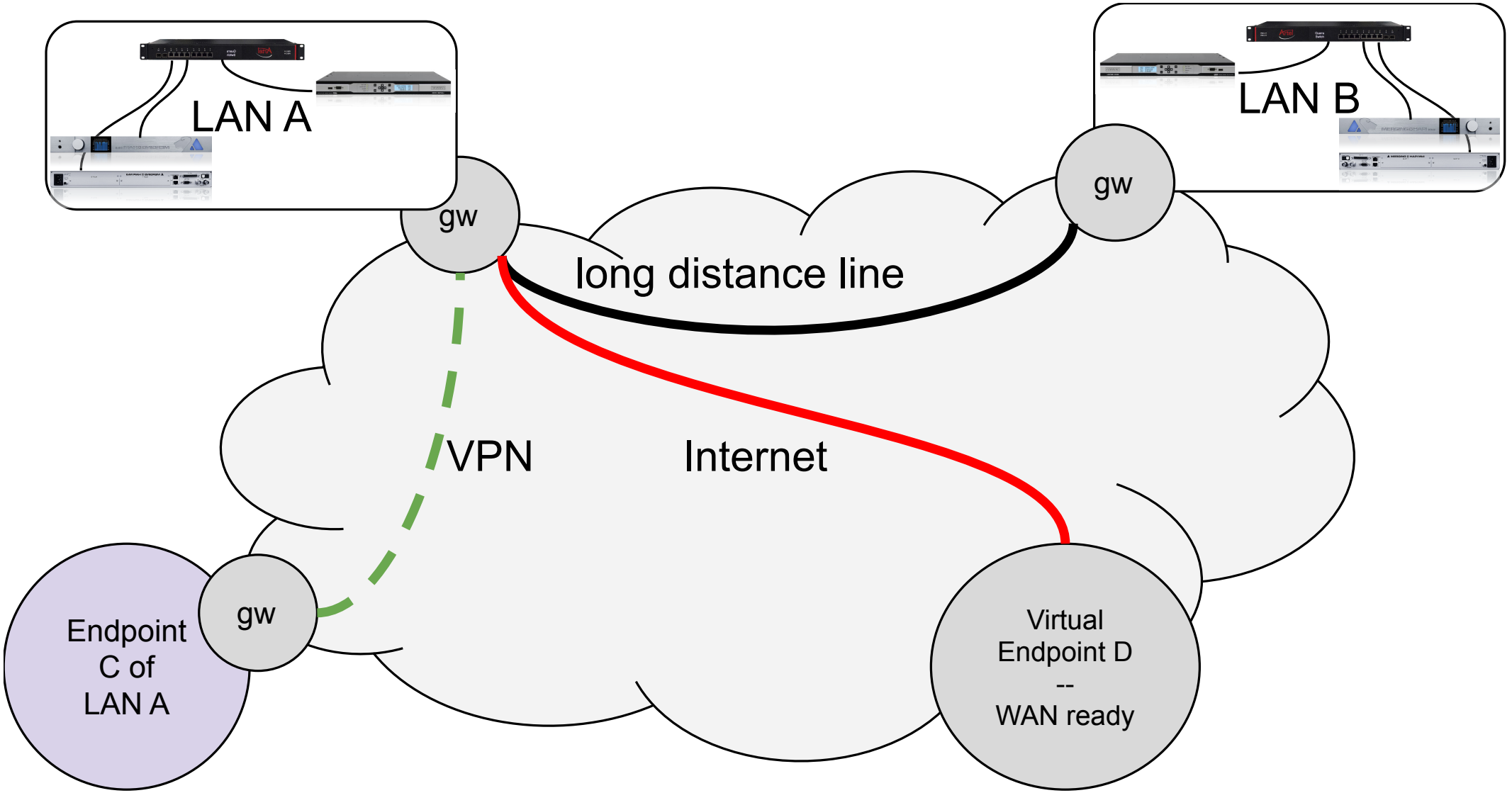

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  - Protocol limitations
- Cloud
  - L3++
  - Fast
  - Small
  - Very few control on infrastructure
  - Sharing traffic
  - Sharing platforms (VM)

Size matters

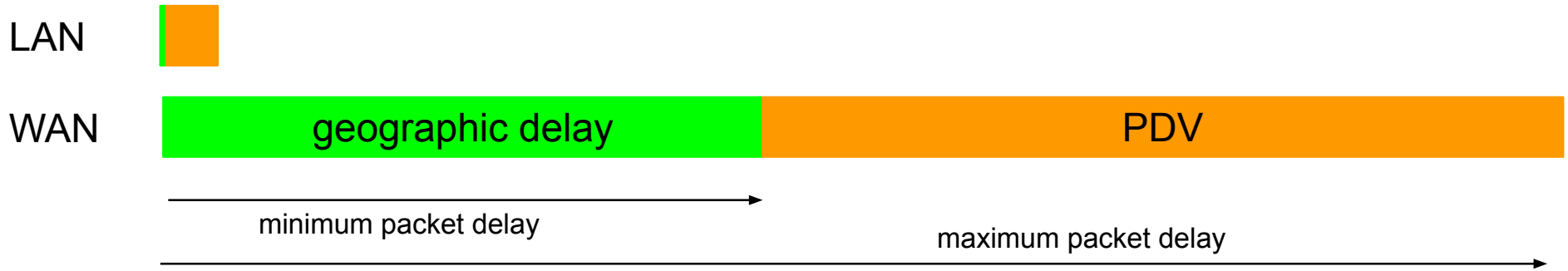
- Scale of the network can be 10,000 times bigger or even more.
- New it equipments will a role in the network, and they may not be designed for high real time traffic
  - Packets can be delayed or sent out of order (jitter)
  - Packets can be lost

- « I know when data enters my ethernet network but not when (and if) i gets out »

Delay and jitter

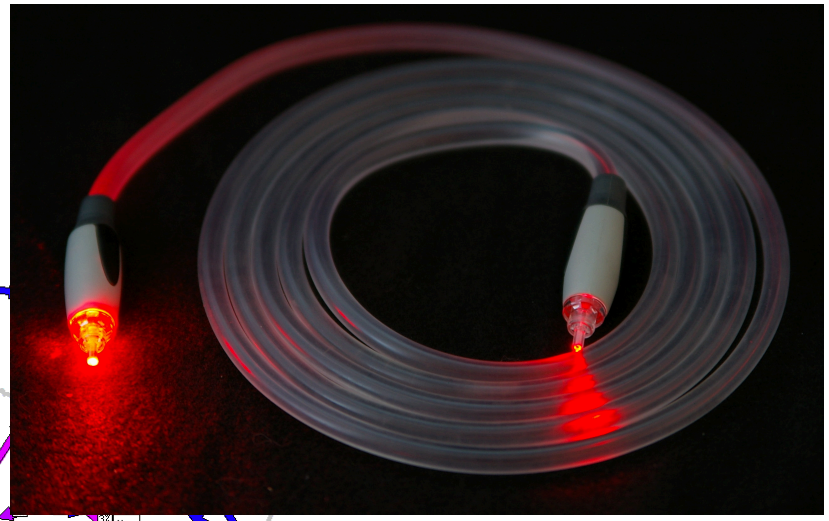
Geographic delay vs Variable delay

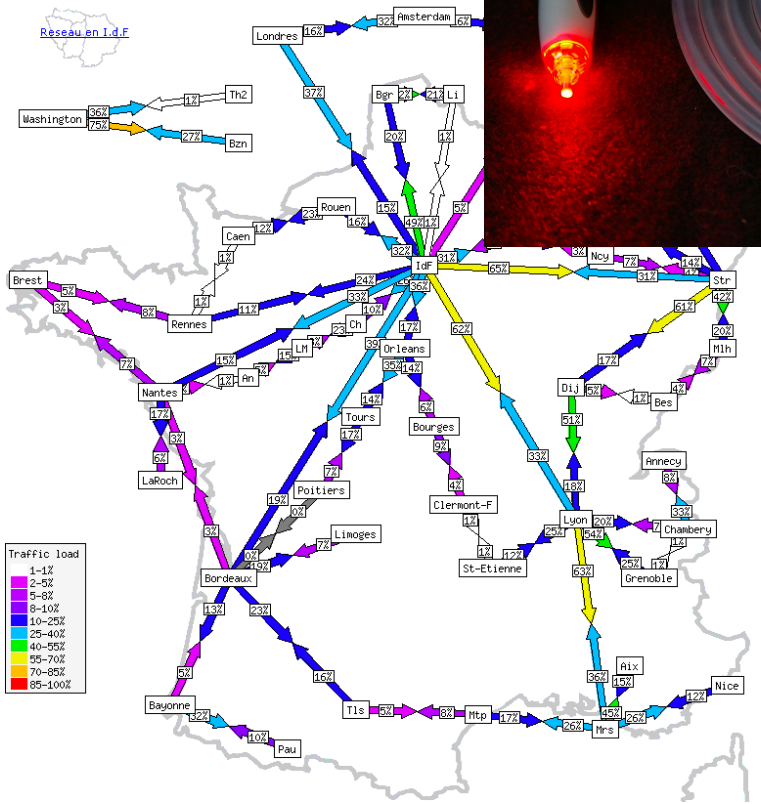
- 100000 times 125us is 12,5 seconds
- it does not mean you have 12,5 seconds (one trip) of latency.
- While on the LAN, 90% of the delay is due to PDV (jitter), on the WAN it is much less (down to a few % on awesome networks)
- However, the geographic delay will be noticeable very quickly and will require mitigation.



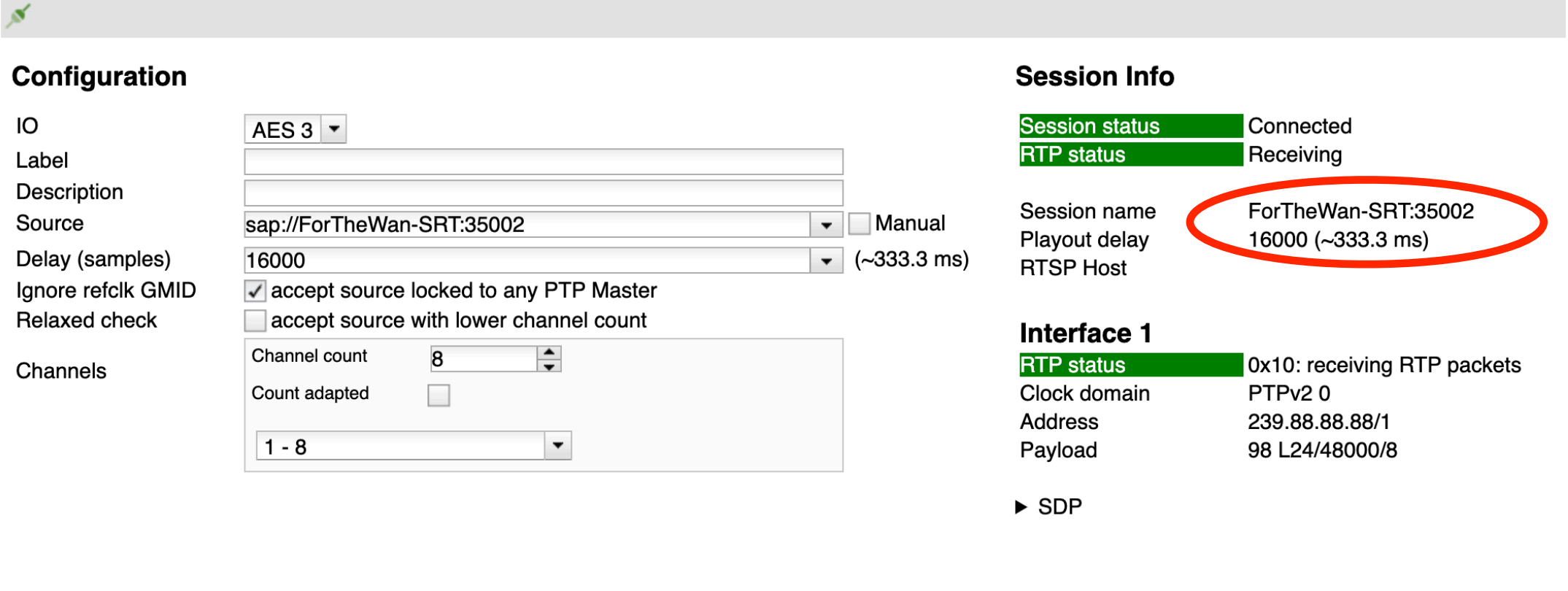
At least 5ms every 1000km

- Light travels at approximately 200 000 km/s in a fiber
- That’s 5ms for 1000km !
- On top of that, account for network topology





Example, through the internet from the cloud



PTP and Synchronisation

- Synchronisation between nodes using PTPv2 is a key feature of AES67 and ST2110
  - Node can create the media clock (sampling frequency) with high phase accuracy
  - Node know when a received sample has been sent on the network and can estimate latency
- However, classic PTP algorithm are not designed to handle large jitter. And PTP follower will hardly lock to the follower.

Synchronisation: solutions

- Use the syntonized mode (frequency only), who cares about phase anyway ?
- Relax the expected accuracy (do you really need sub-millisecond sync when you are kilometers away ?)
  - Use NTP or any other clock
- Use special boundary clocks with jitter rejection (👏 Meinberg)
- Use synchronisation out of the network, like GNSS-PTP leaders.

timing and sync

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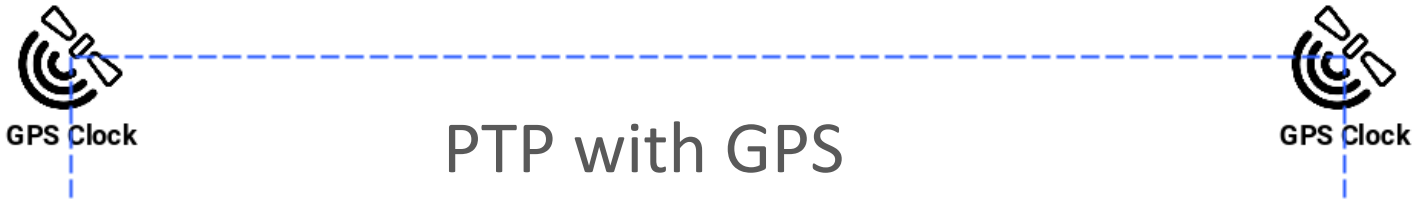

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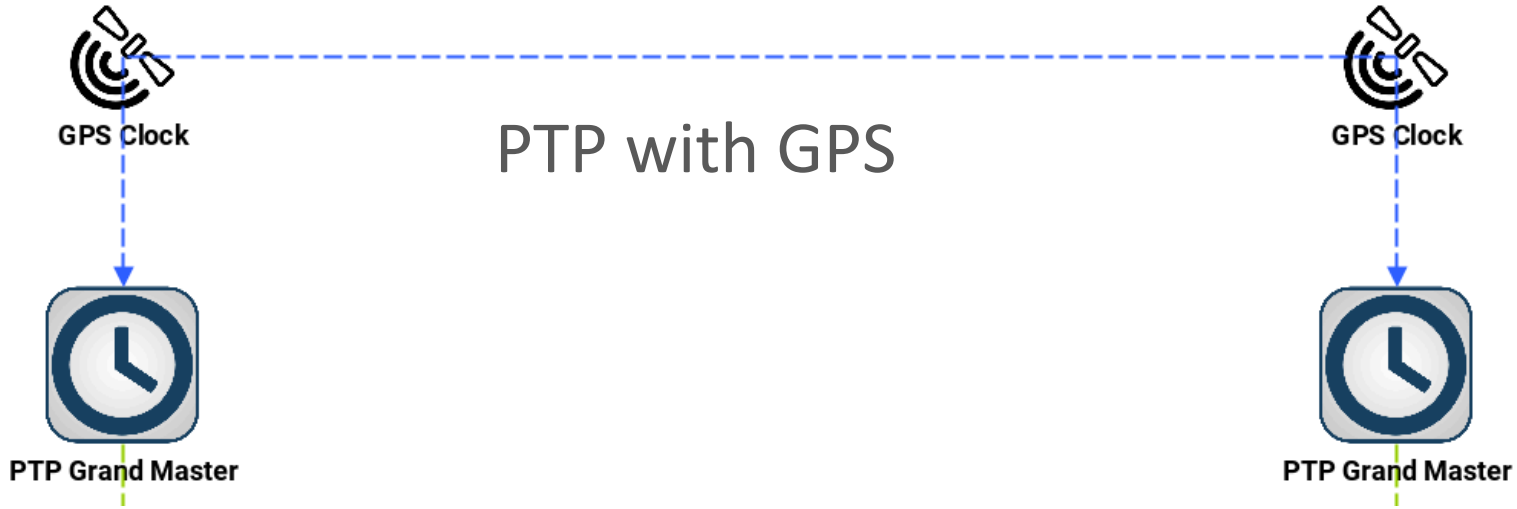

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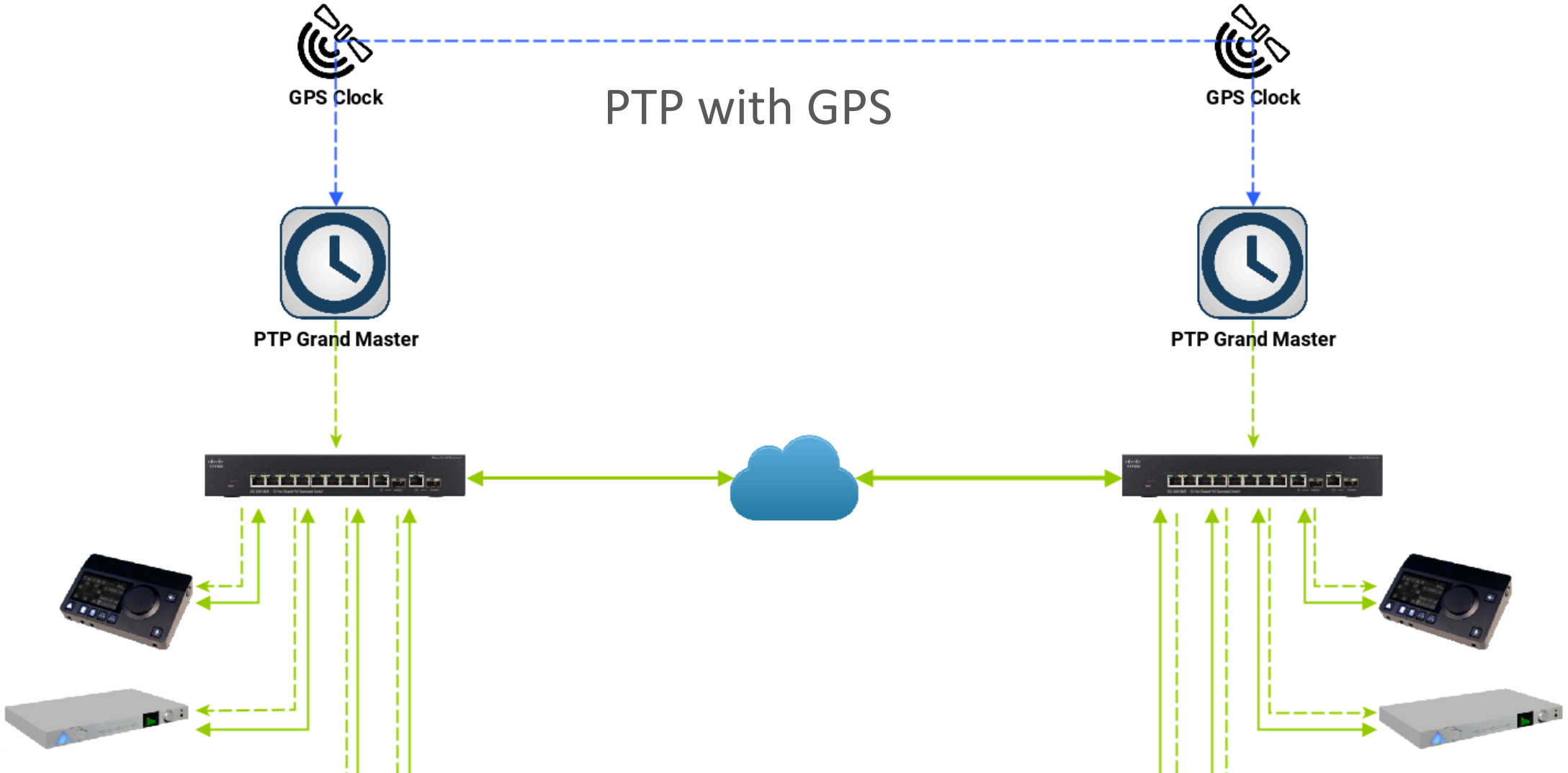
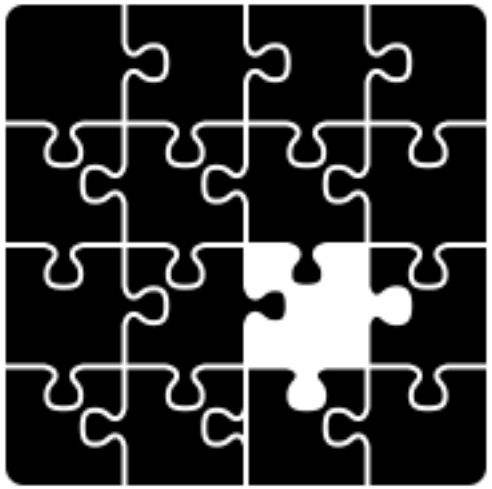


Loosing packets

stream reliability

- Loosing a packet (or having it delayed over the configured link offset) is rare on a LAN, not an a WAN: network congestion, link failure... are bound to happen.
- Here, AES67-2018 does not provide any answer, but ST2110-10 does by using ST2022-7, a multi-path redundancy.
- Other techniques such as FEC, SRT or RIST can also be used



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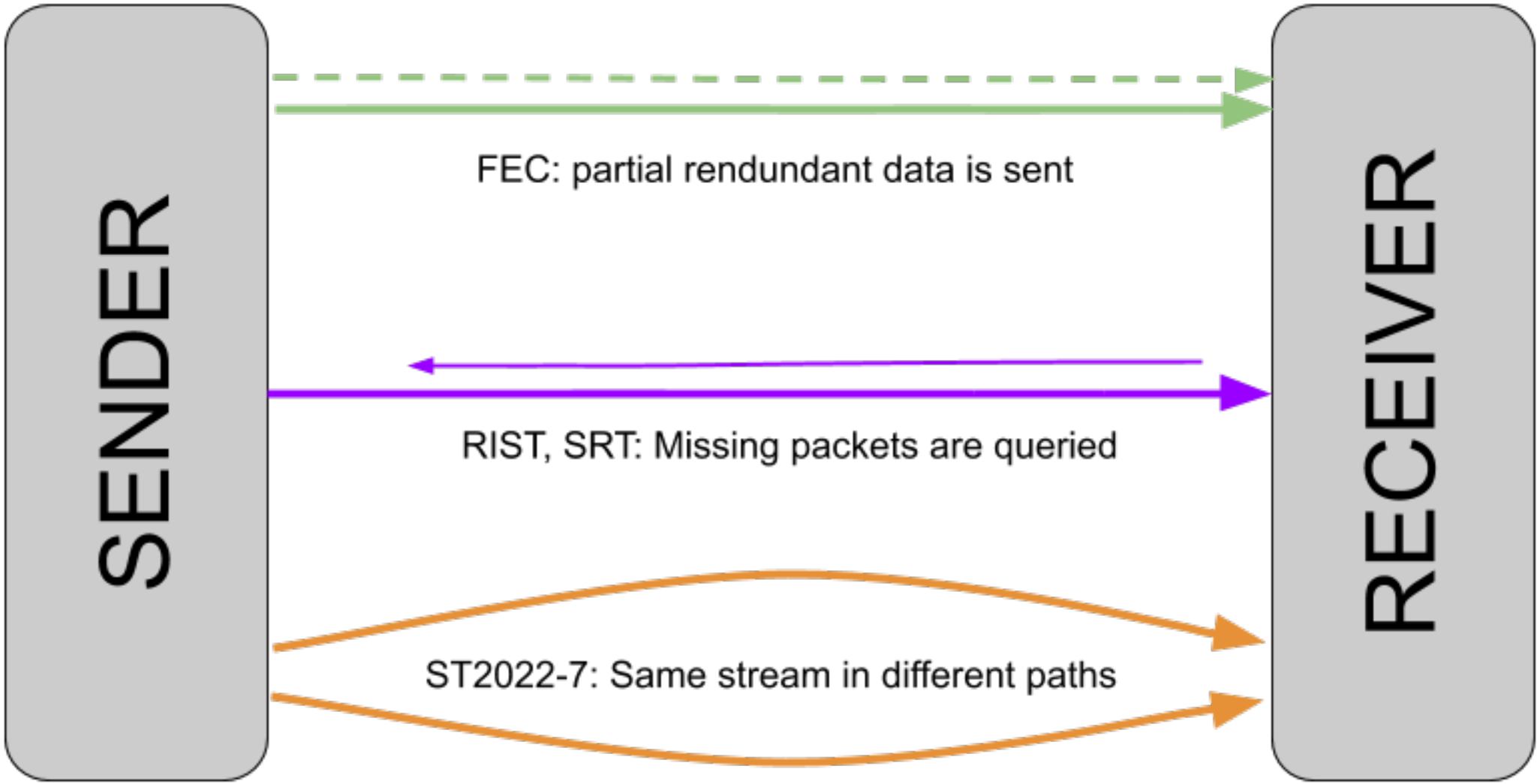
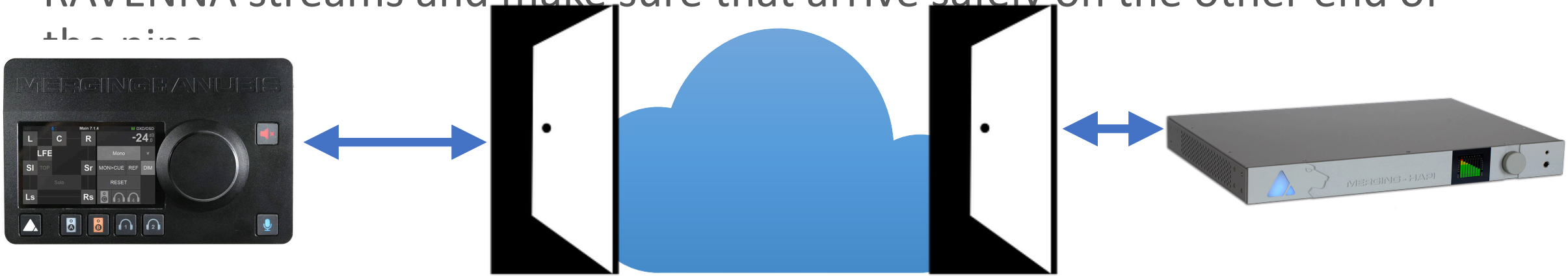


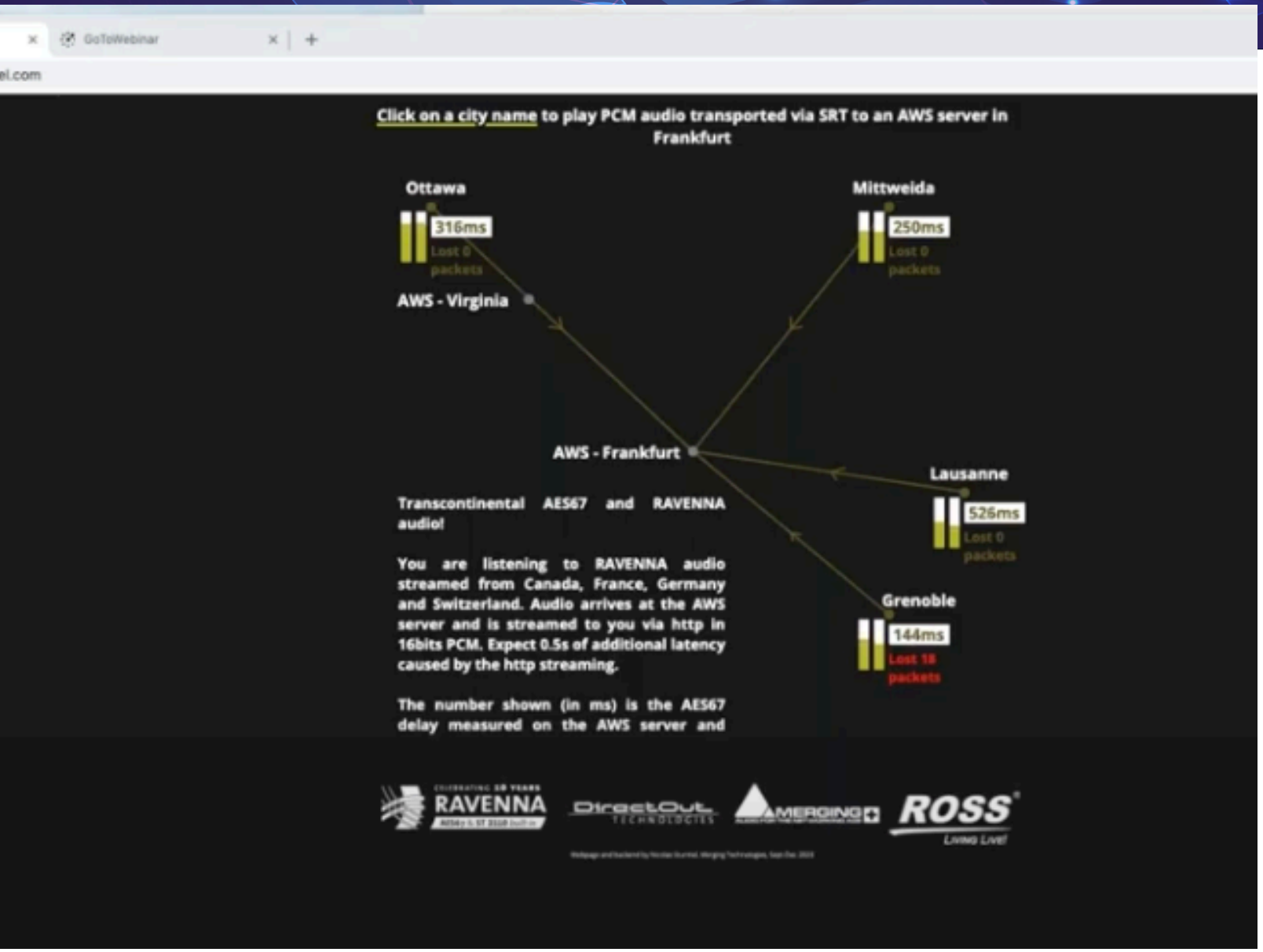
Using a gateway

Some companies are specialised in providing edge decides that will take RAVENNA streams and make sure that arrive safely on the other end of the pipe



Tunneling

A practical proof on concept (Dec 2020)



Stream transport via a SRT Gatway.

The Cloud and network contrains

- Using gateways to embed the media streams (e.g.: VPN)
- Using SIP with the classical NAT traversal technique
- Using unicast vs multicast (for both PTP and media)
- VXLAN, LAG, Encryption, QoS…

Conclusion

Widely used protocols like RTP and SDP allow AES67 and ST2110 to be easily transported on a large network.

But achieving high performance (low latency, high quality) requires care.

Often, the solution depends on the performances of the underlying infrastructures

Thank you

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