

# Audio in 2110 facility and across WAN

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# My family is expanding: granddaughter & time ❤️



Time is important!

ST2110 uses a PTP Epoch time of 1<sup>st</sup> January 1970

PTP: 38 billion frames\* = 74286 billion audio samples

**Andy:**

41 billion frames\* since his epoch! (52 years) = 78728 billion audio samples \*\*

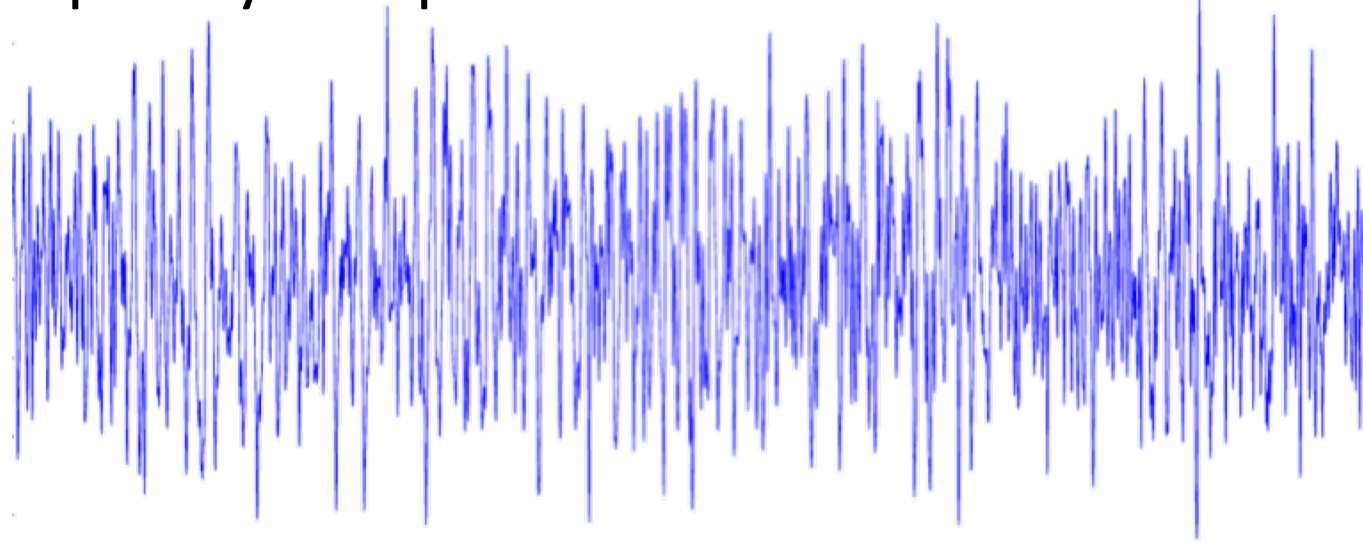
**Esther:**

790 million frames\* since her epoch! (12 months) = 1514 billion audio samples\*\*

\*25fps \*\*48kHz

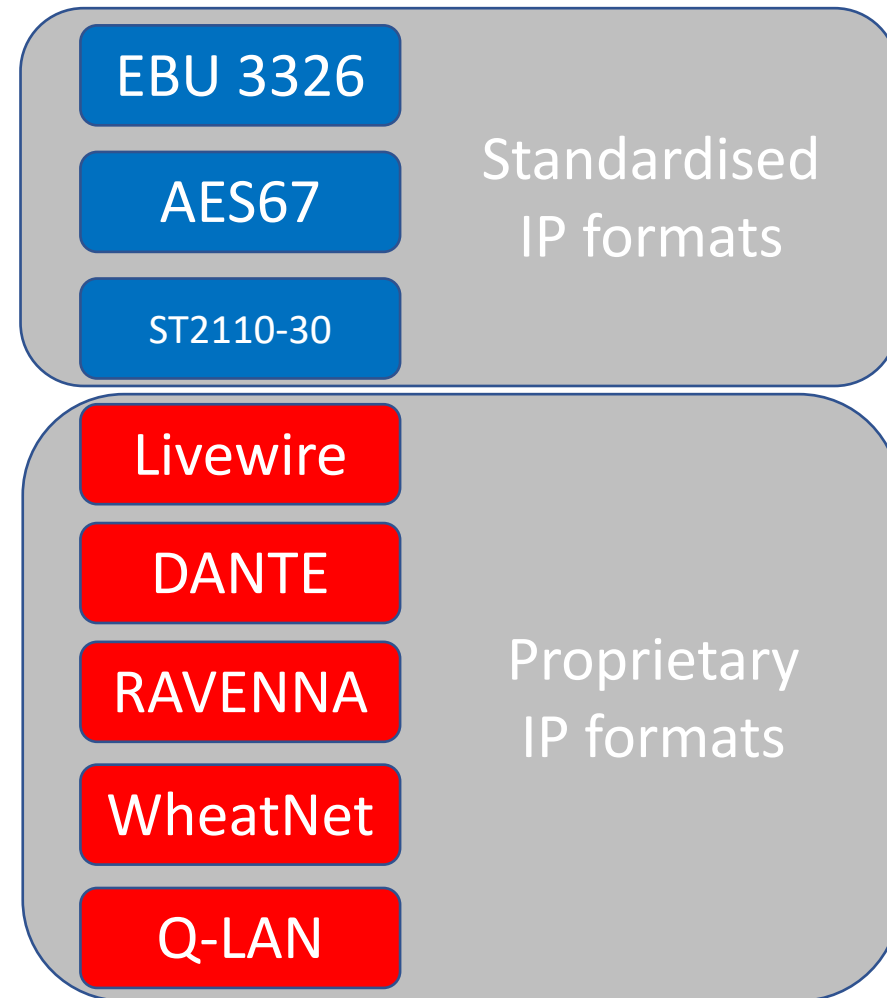
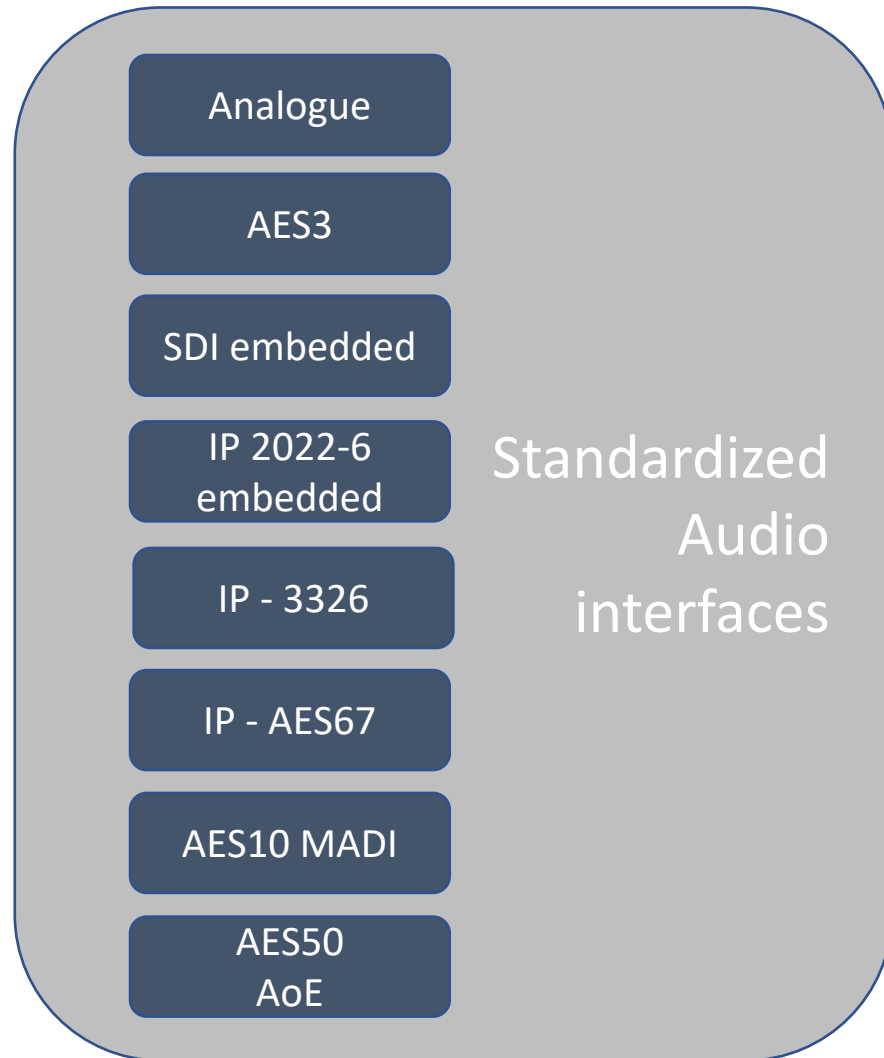
# Audio – the most important bit!

‘Most of the complexity of a production environment is the audio’



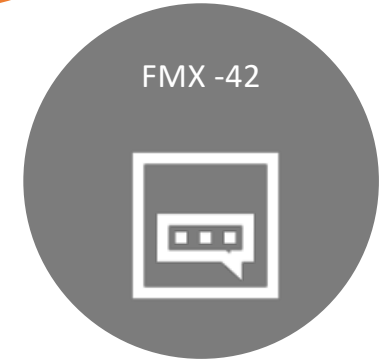
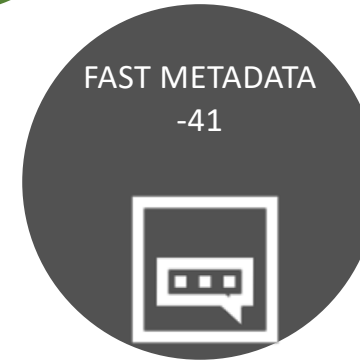
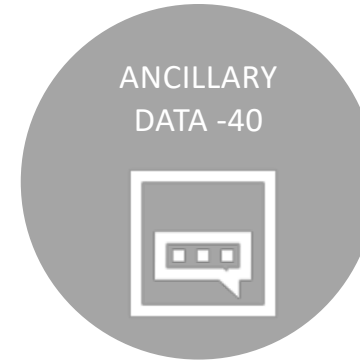
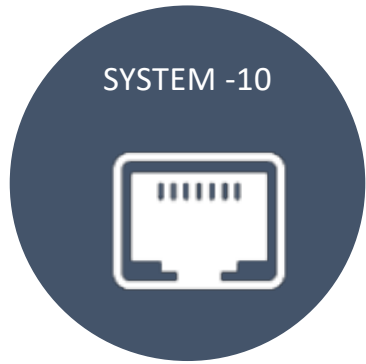
The Audio folks did IP first!

# Lots of different audio interfaces and formats!

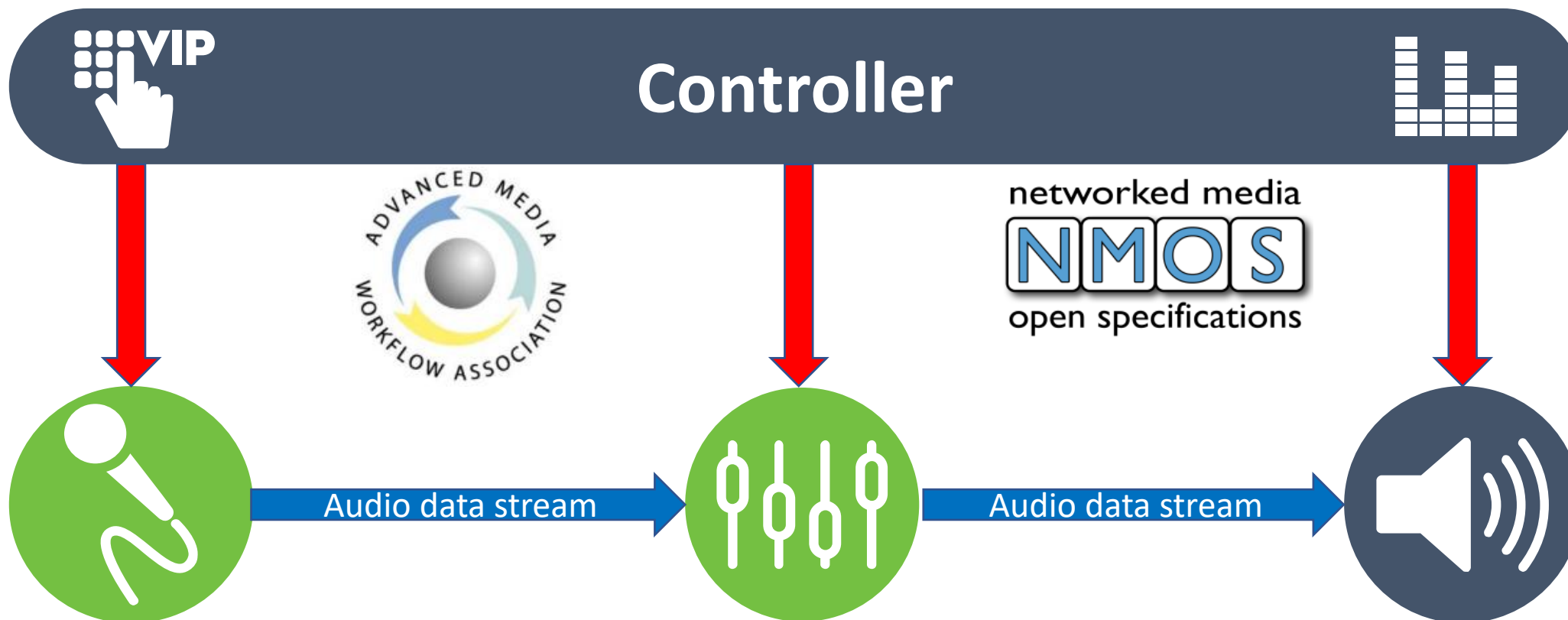




# SMPTE ST 2110 suite – so far!



Standardized data plane mature,  
control plane recently proven



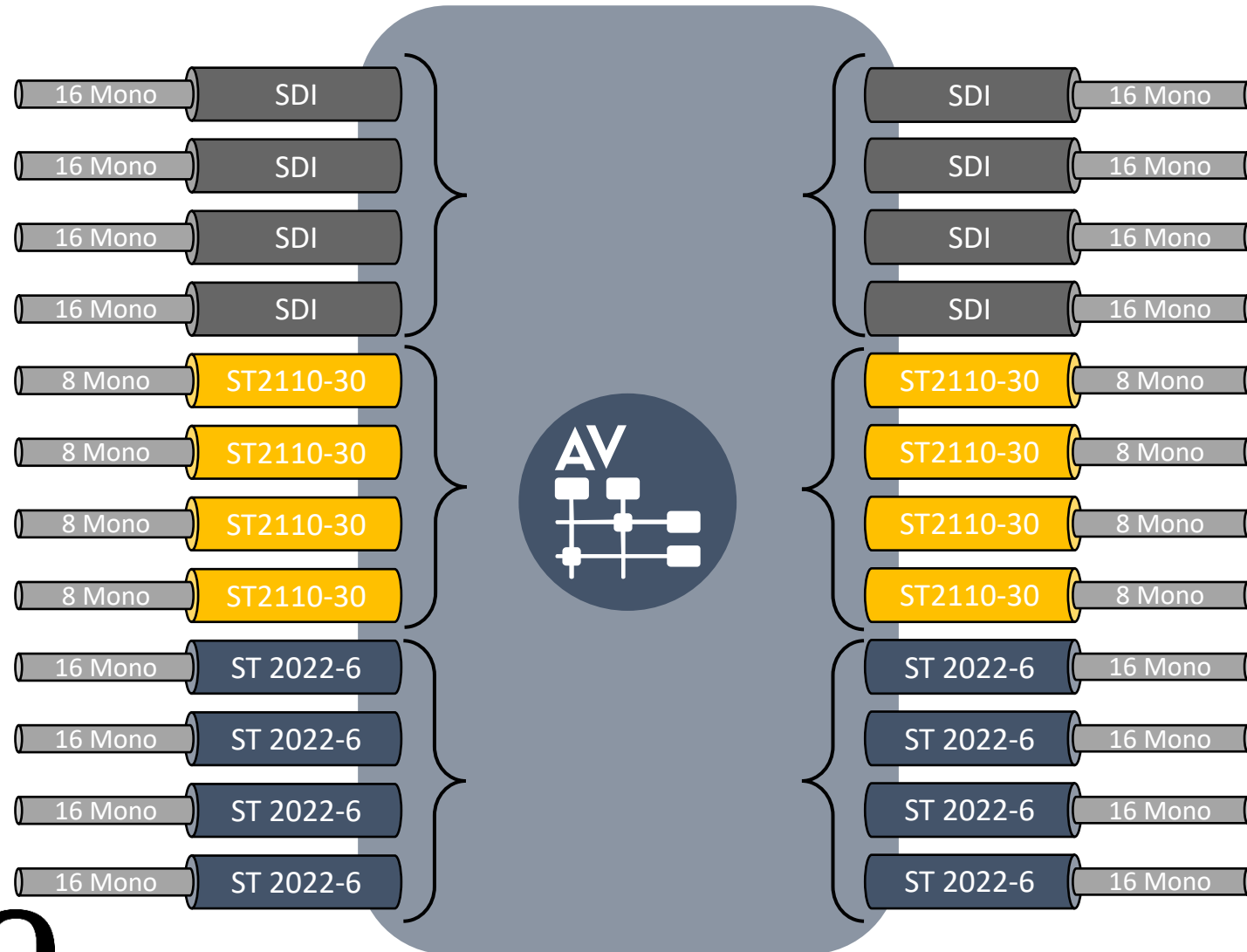
# Audio manipulation requirements

- Keep it all-IP – don't go back to baseband!
- Gain and delay control still needed
- Asynchronous (external) sources timing reconciliation (SRC)
- Flexible ST2110-30 channel density (1 – 64 channels)
- Full (per mono channel) shuffling capability
- Fully Orchestration configurable
- NMOS compliant
- All-IP processing

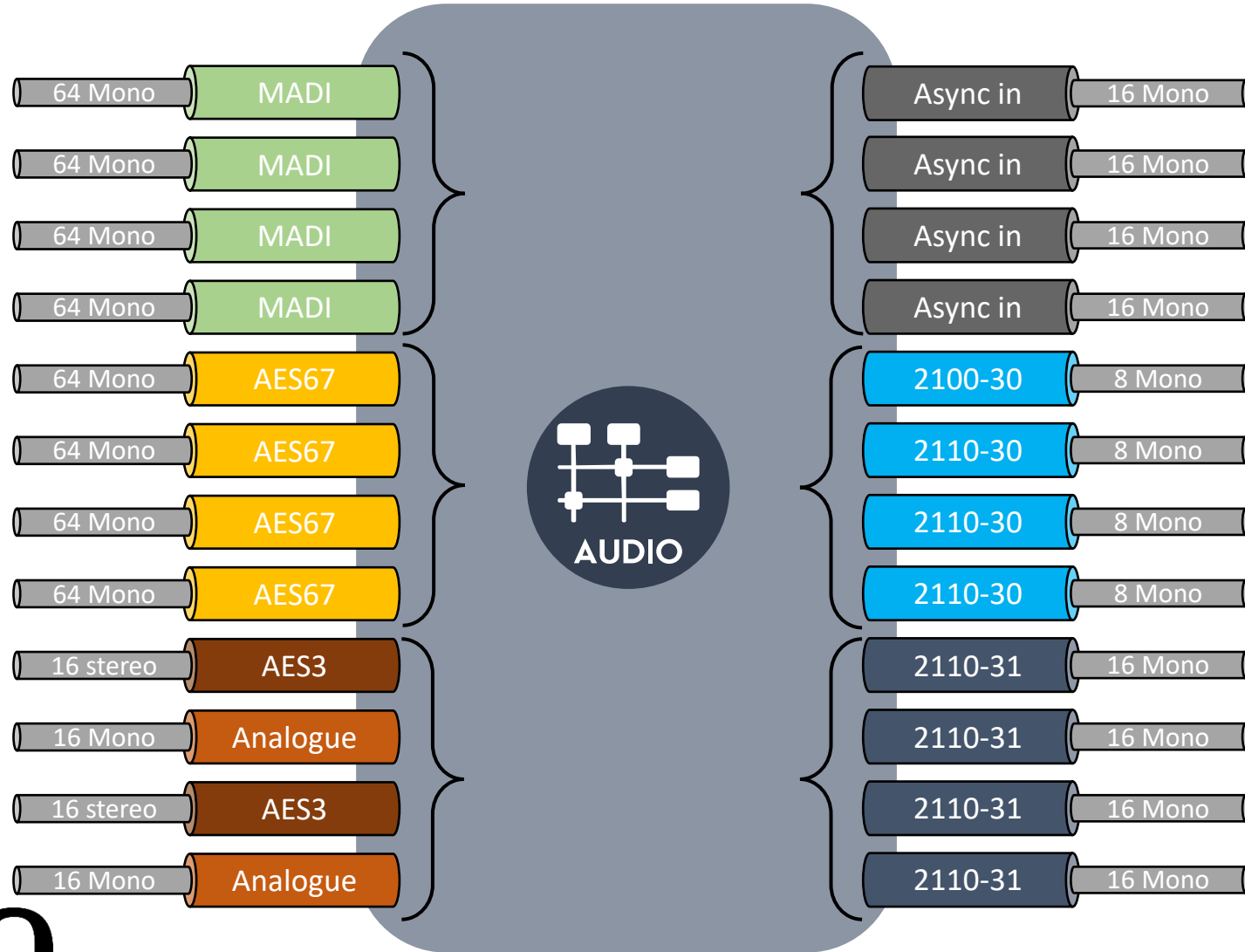
# Audio requirements drive scale in facilities and beyond



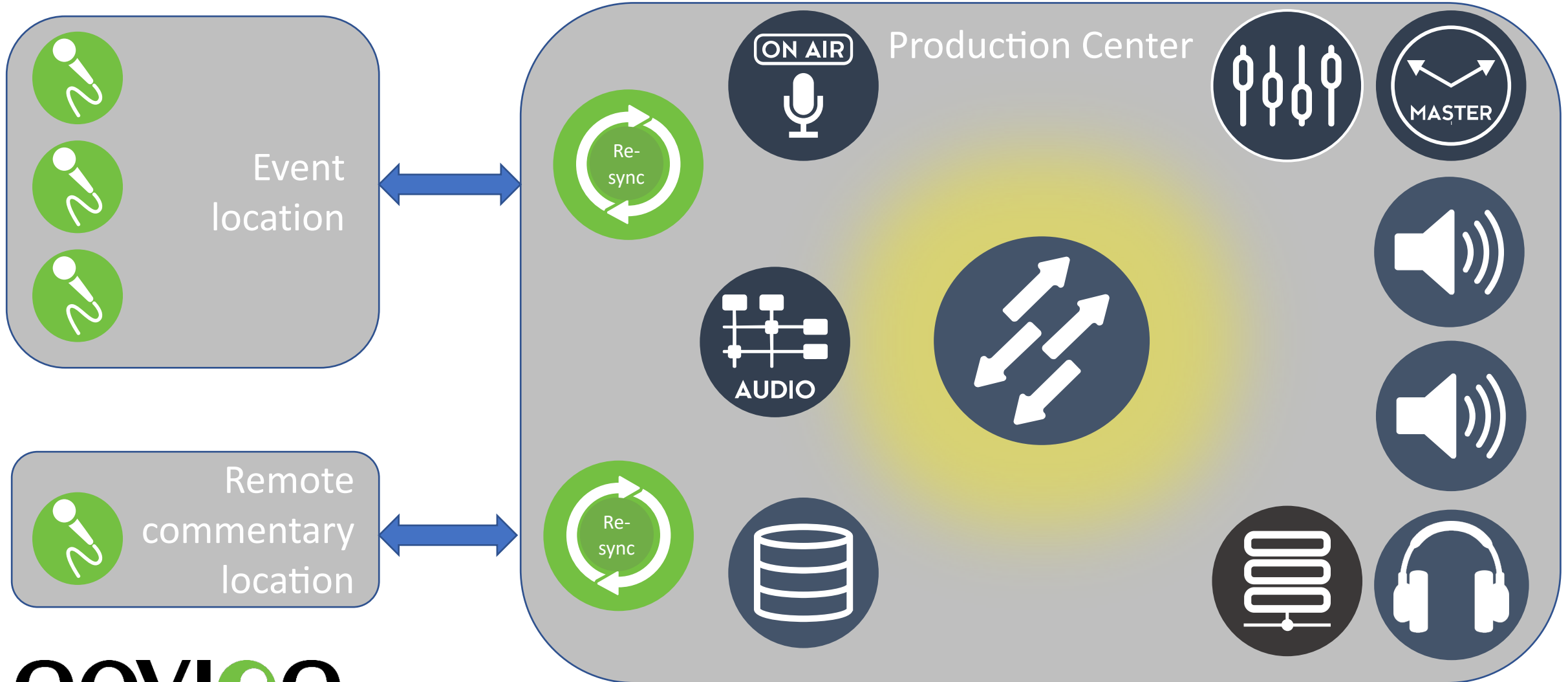
# Video-associated audio format interfacing



# Audio-only format interfacing

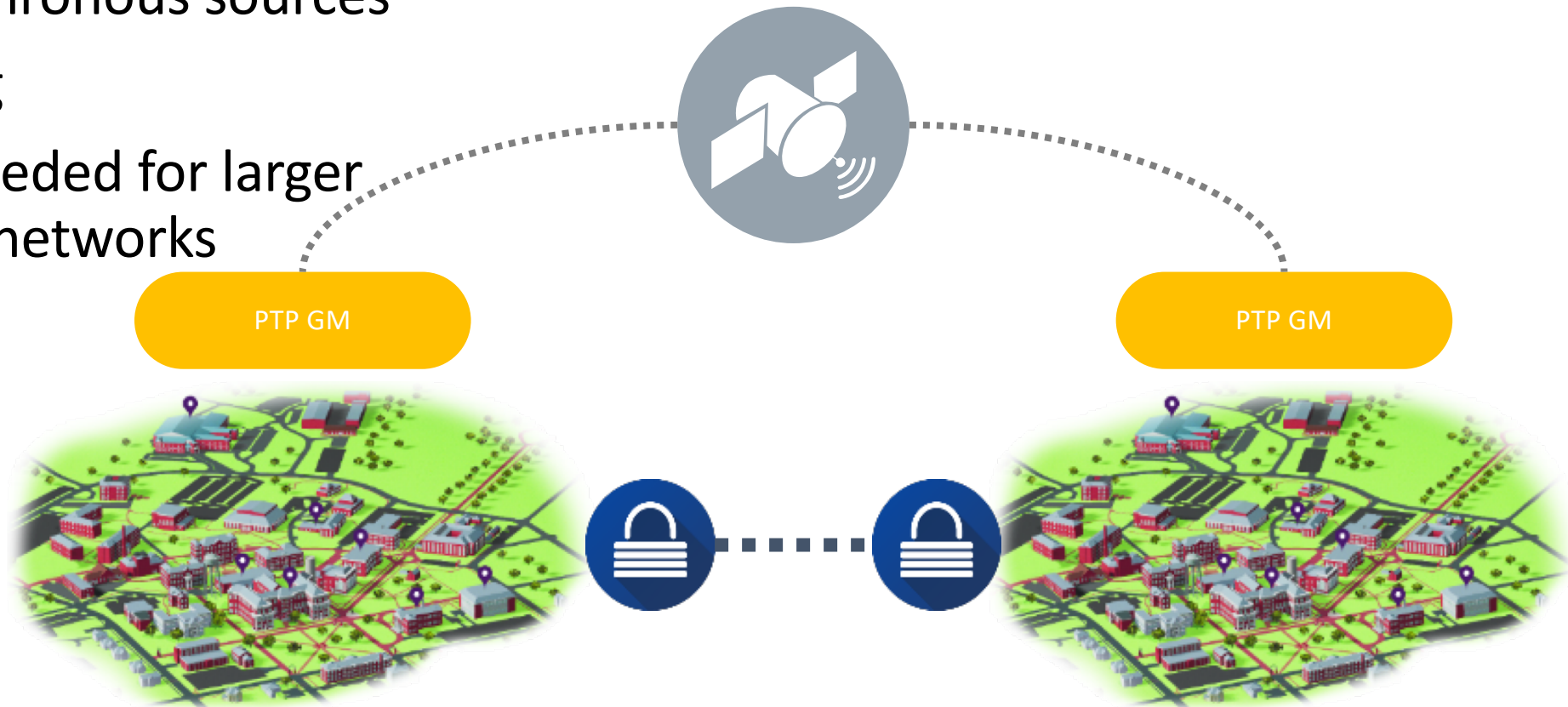


# Audio facility interconnects



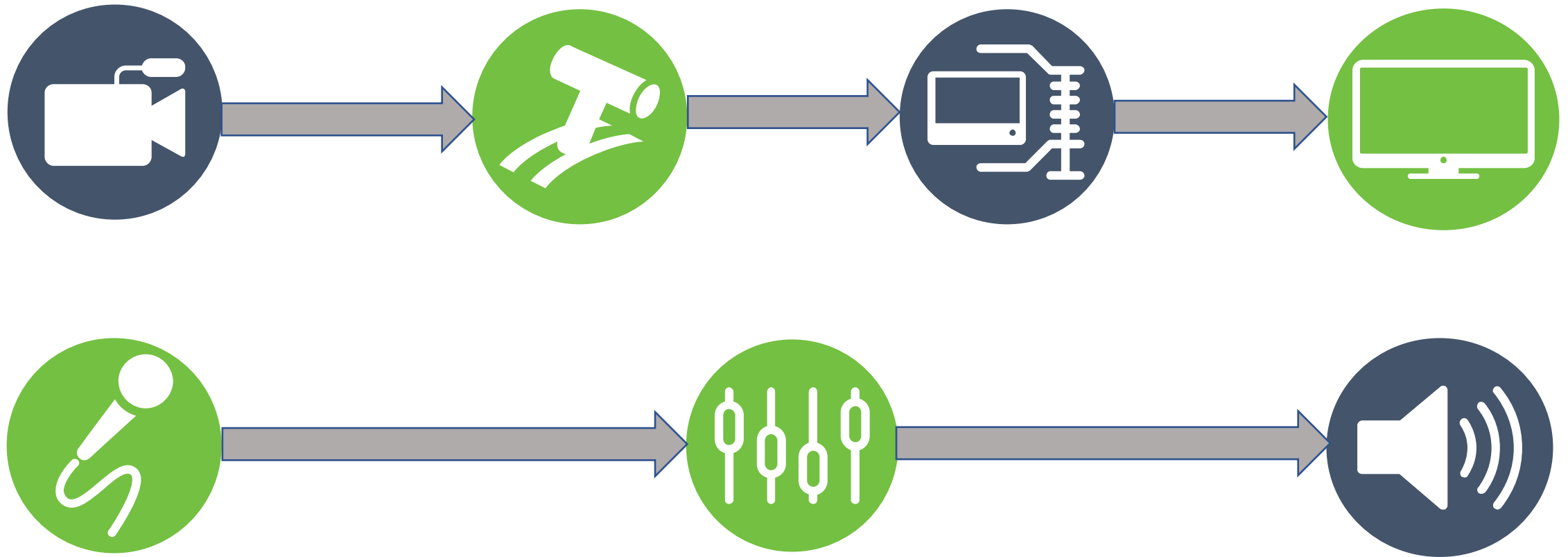
# Moving outside campus based audio production islands

- WAN connectivity involved
- Longer latencies
- (Potentially) Asynchronous sources
- Layer 2 too limiting
- Layer 3 (routed) needed for larger and multi-campus networks

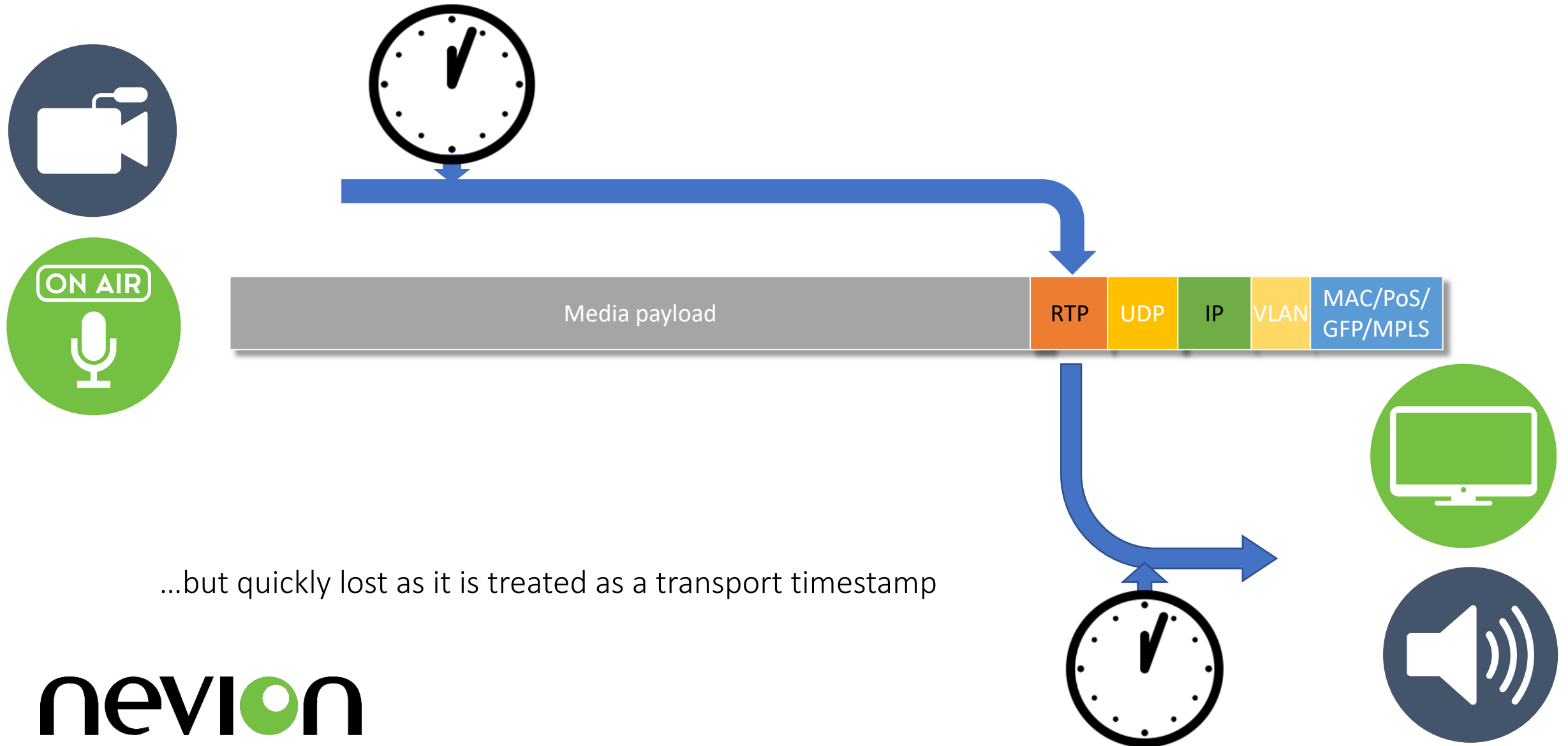




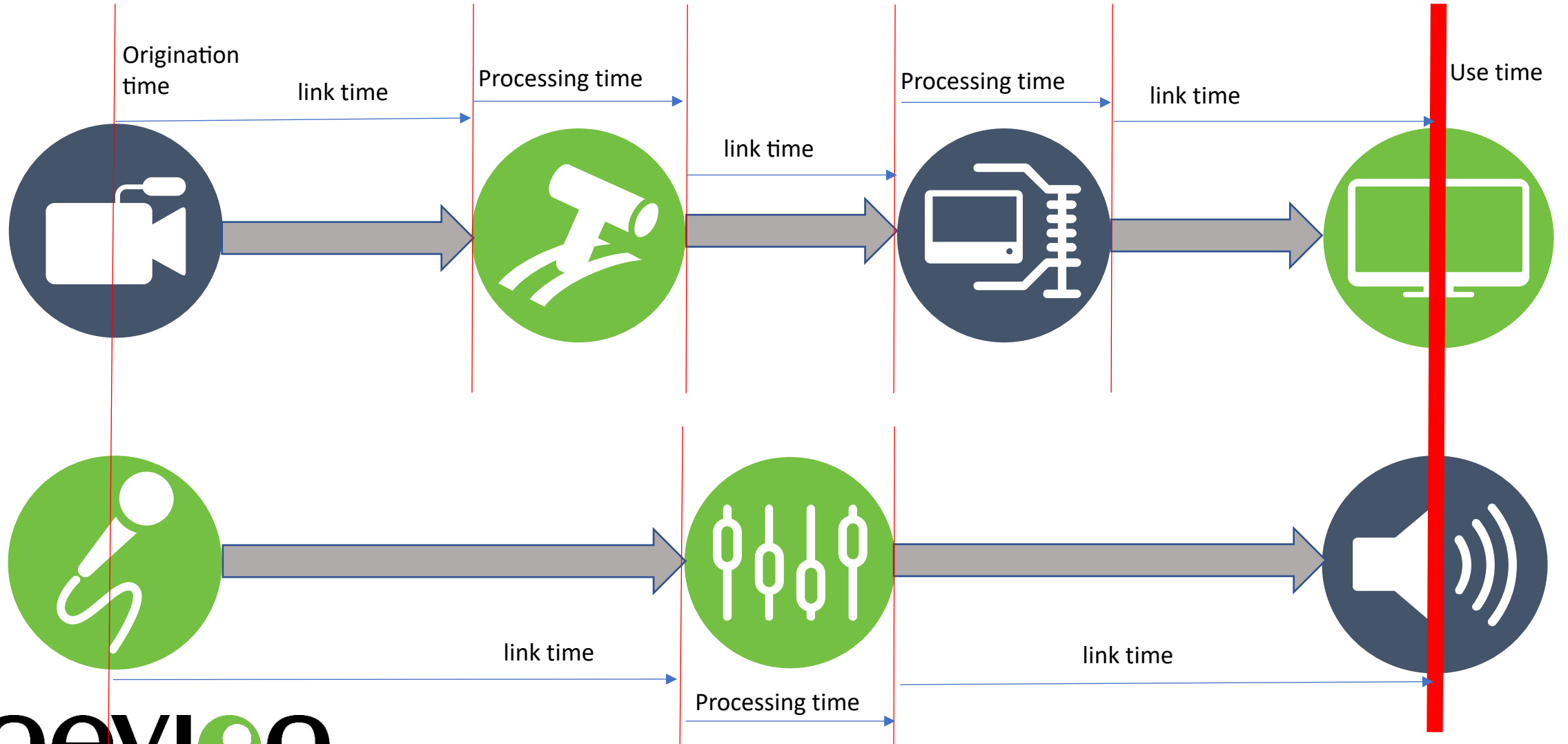
# From link-based IP systems to end-to-end IP systems



# Absolute time of origination is captured in AES67/ST2110-30



# Reconciling essence timings for use

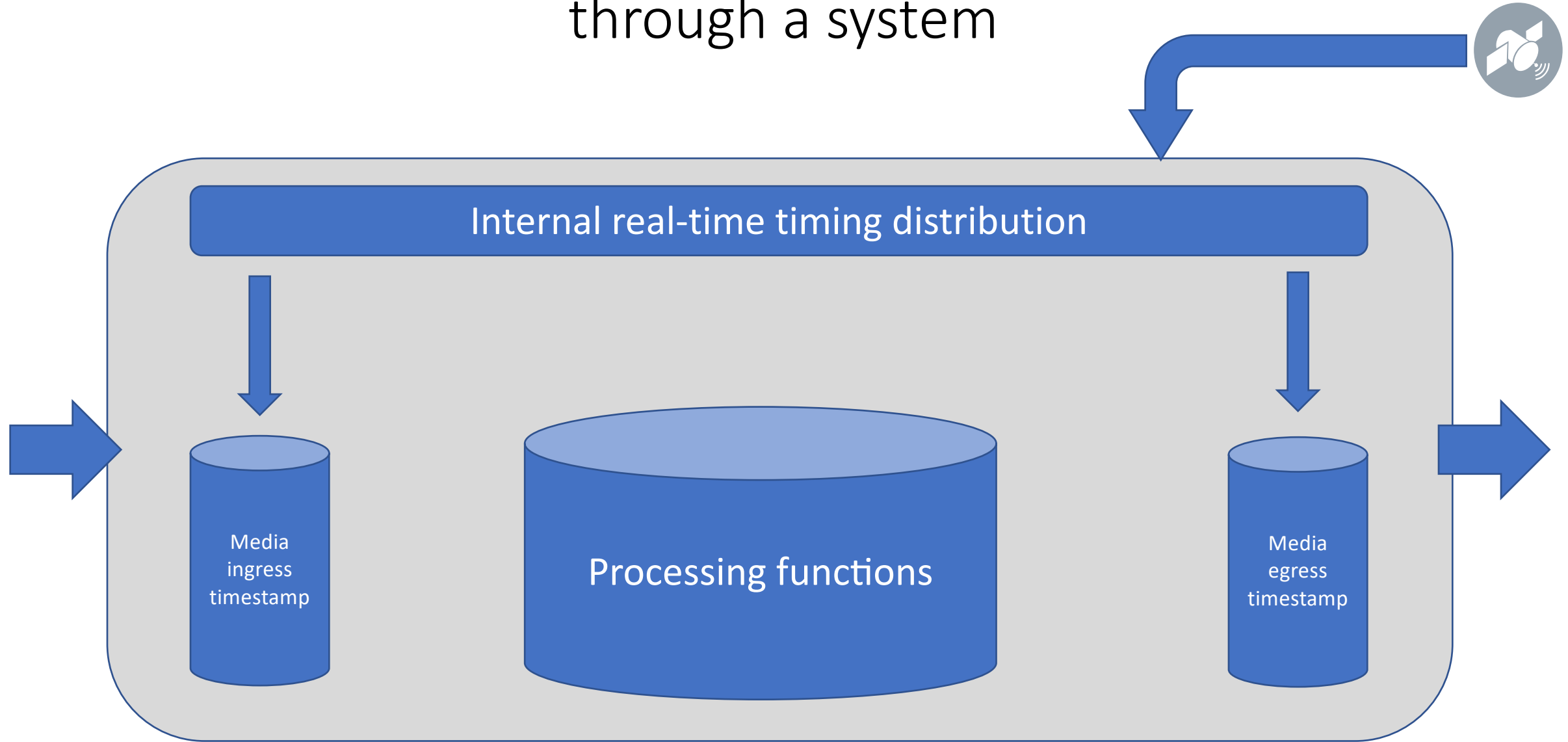


# Why are we in the current approach?

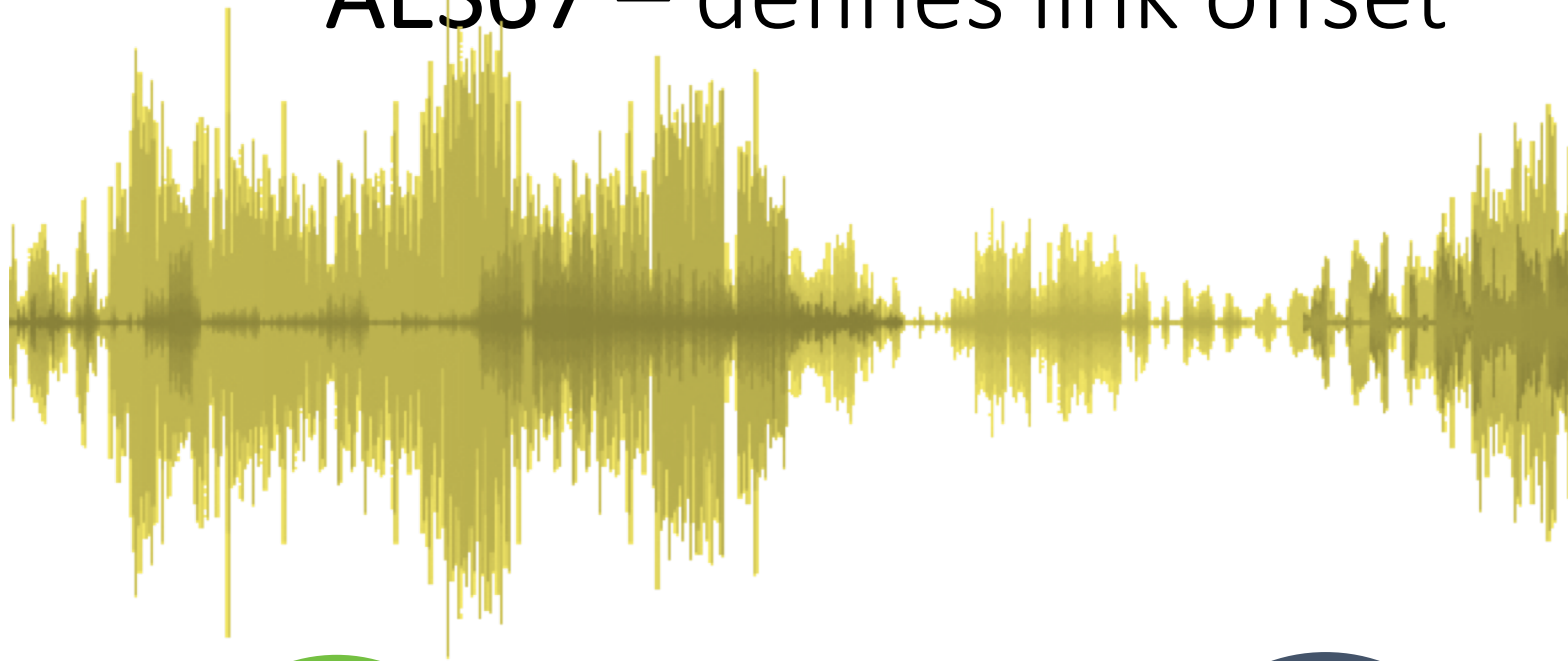
- ST2110 doesn't (yet) actually specify using timing for end2end ☹️  
- but it is coming!



# Device internal architecture tracking moments of time through a system



# AES67 – defines link offset



link time



PTP holdover is capable of being very long – let's make it so!



# Going off-campus – the IP facility media edge

PTP TIMING

DEVICE  
DISCOVERY & CTL

MEDIA FLOW IP ADDRESSING

ESSENCE  
FLOWS

PROTECTION  
TERMINATION



ALTERNATIVE TIMING  
DOMAINS

RESTRICTED/PROXY  
DISCOVERY & CTL

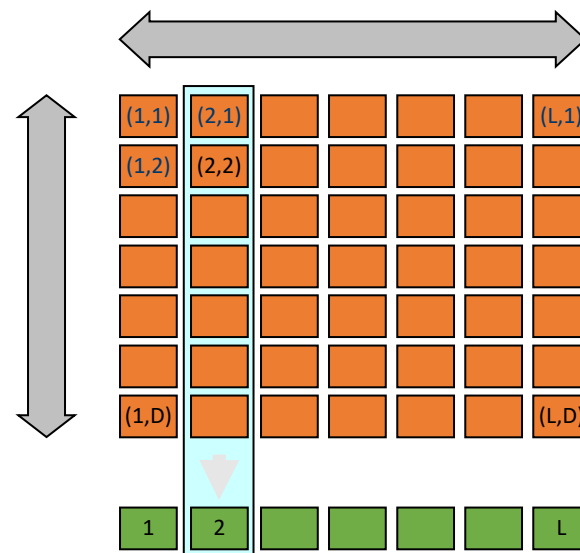
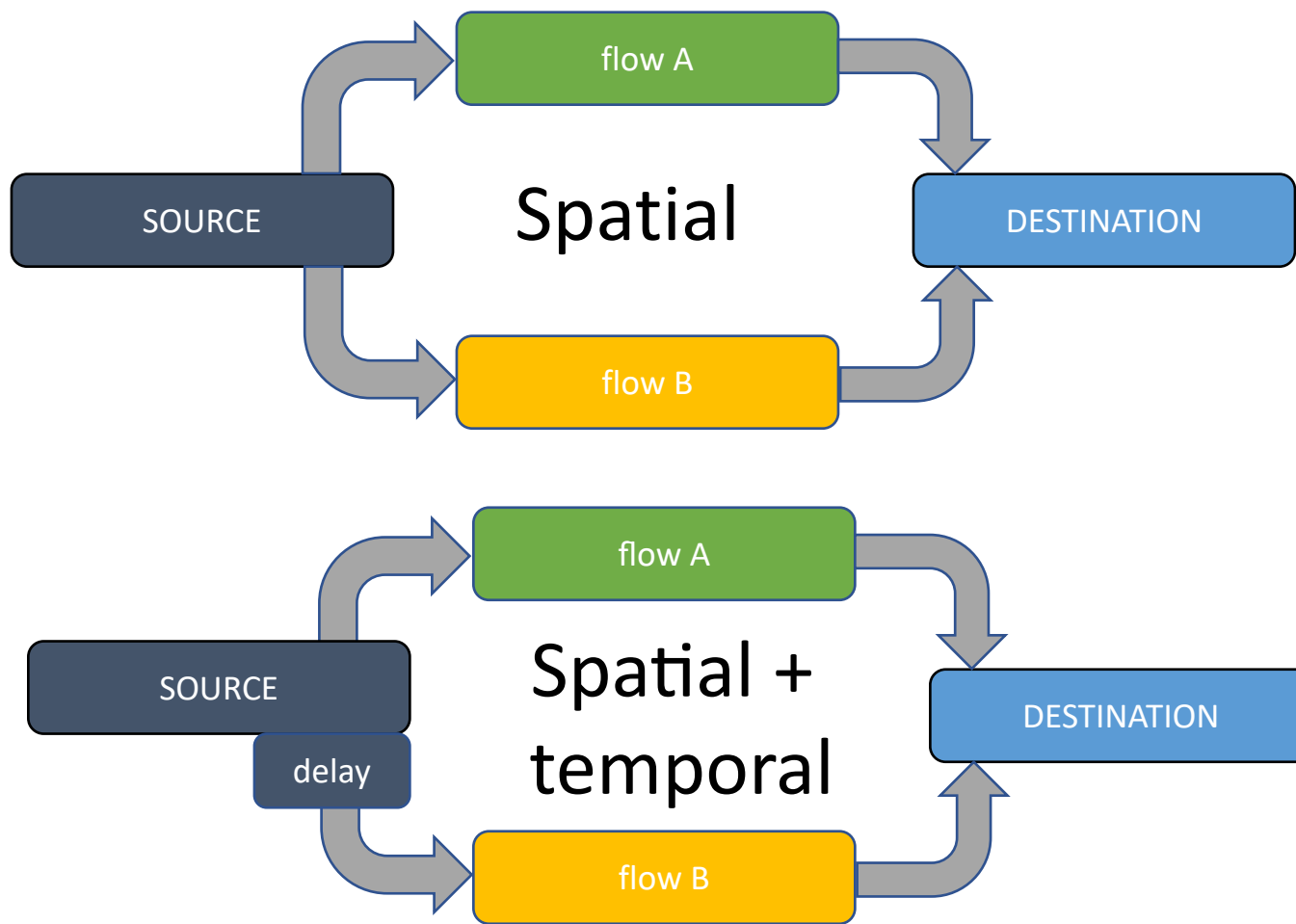
DIFFERENT IP ADDRESSING  
(NAT)

ESSENCE OR  
COMPOSITE FLOWS

PROTECTION  
TERMINATION



# Protection – on and off campus – video & audio



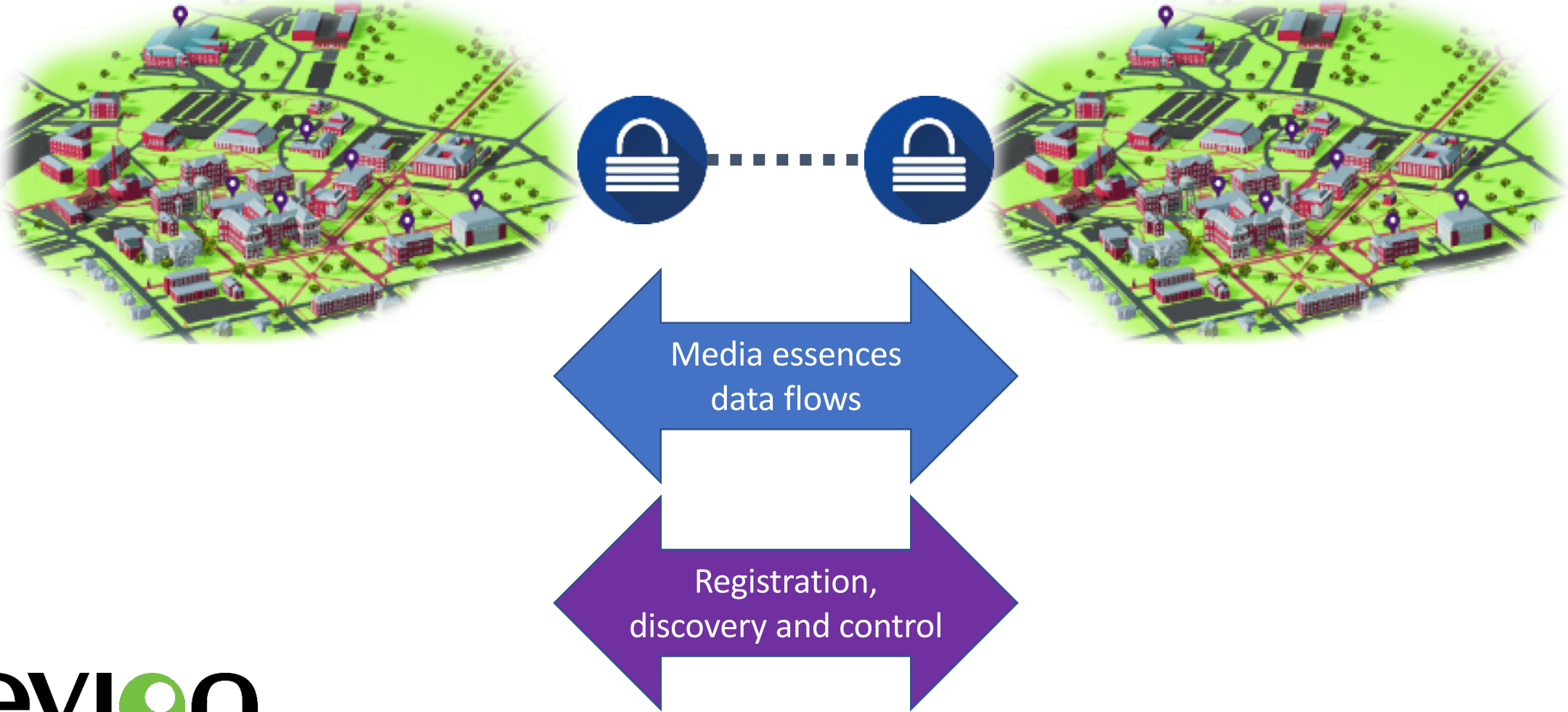
FEC

n	n+1	n+2	n+3
n+4	n+5	n+6	n+7
n+8	n+9	n+10	n+11
n+12	n+13	n+14	n+15
n+16	n+17	n+18	n+19
n+20	n+21	n+22	n+23
n+24	n+25	n+26	n+27
n+28	n+29	n+30	n+31
n+32	n+33	n+34	n+35
n+36	n+37	n+38	n+39
n+40	n+41	n+42	n+43

”To enable effective transport of ST2110 media flows and associated control data across Wide Area Networks *in an interoperable manner.*”

ST2110 → WAN

# ST2100-WAN AG - two layers of focus – data and control



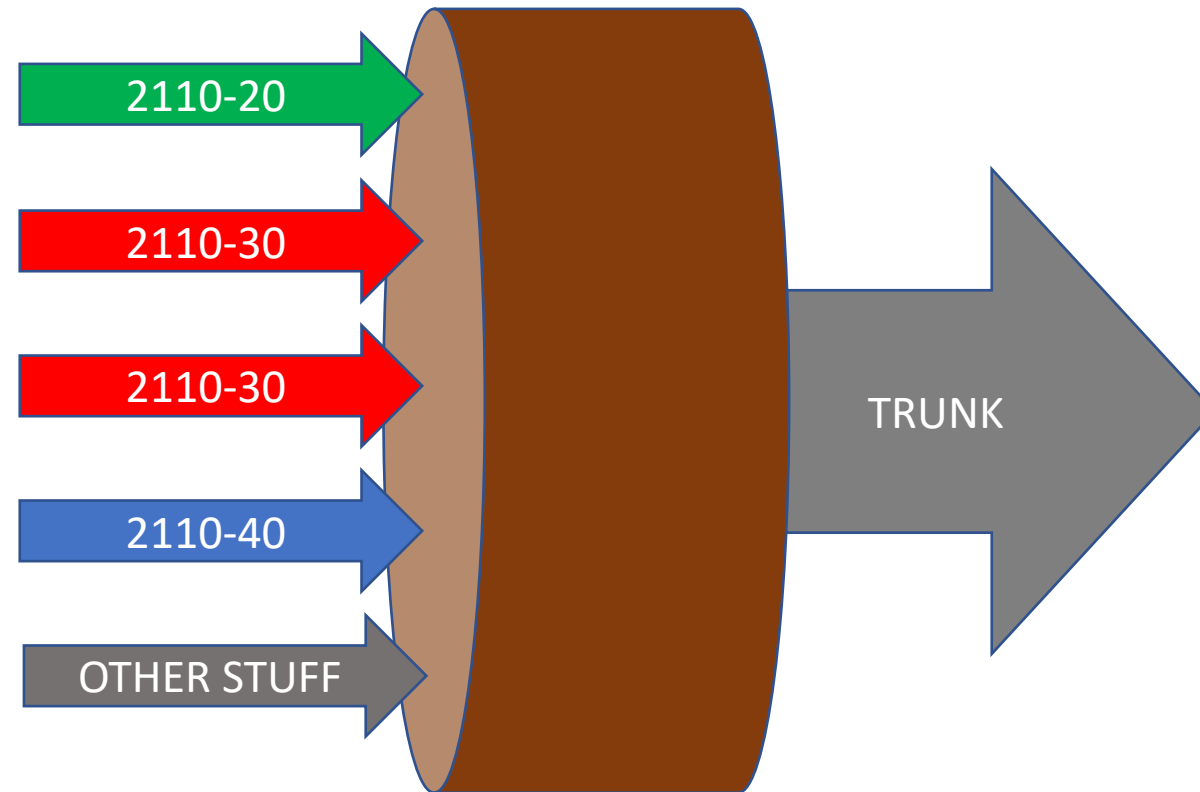
# ST2110 over WAN for inter-facility & OBs



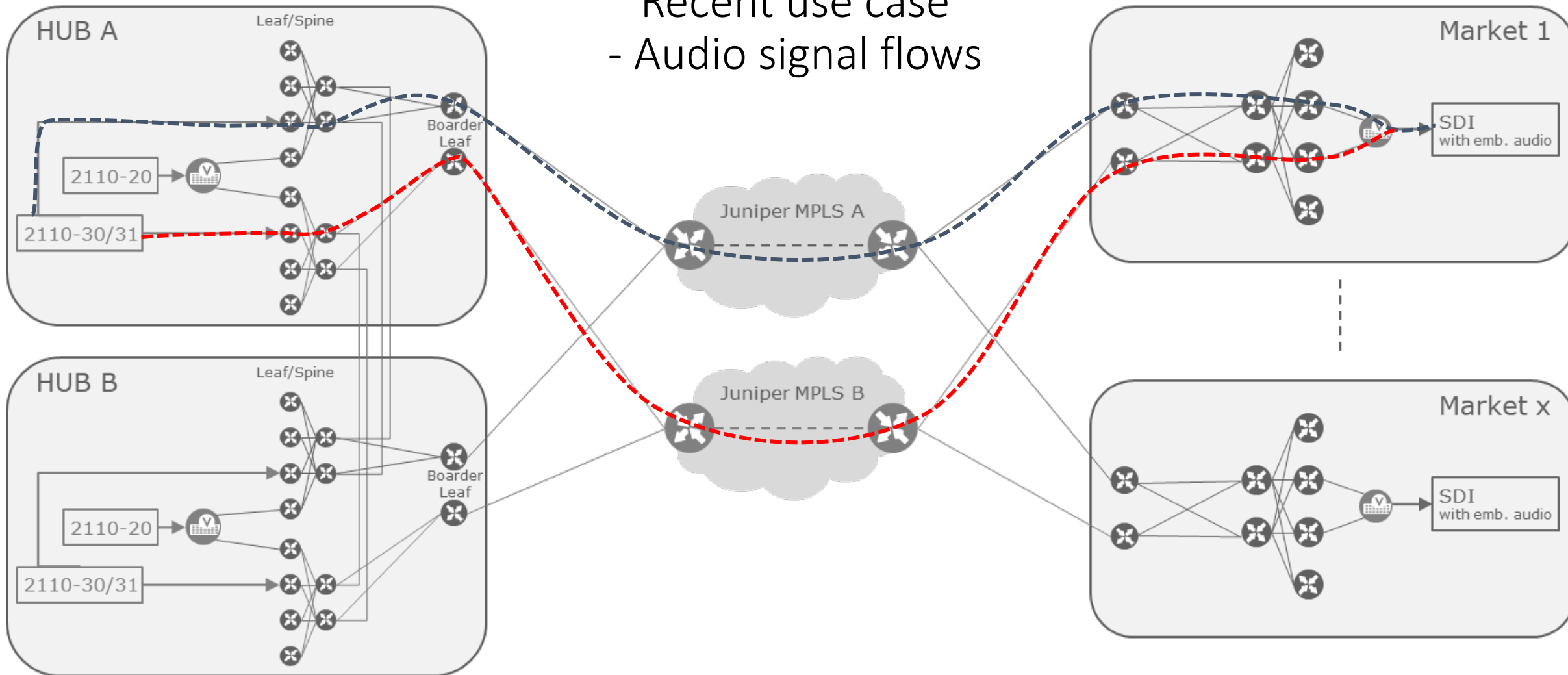
- Flow protection ✓
- Flow trunking ✓
- Essence alignment ✓
- Low latency handling
- Format conversion
- Compression ✓
- Protection of other data flows ✓
- Security
- PTP trunking
- Wan timing
- Associated control (NMOS) filtering and border proxying

Next  
topic

# Trunking 2110 essences



## Recent use case - Audio signal flows



# Conclusions



- Audio is incredibly important
- Audio is always the most complex part of the system
- Full standards compliance is essential
- The standardized control layer is less mature – but all parts are now there
- Standards now provide capability for L3 wide-area data & control planes
- Keeping the audio signal flow All-IP is crucial to gain full benefit
- Flexibly audio manipulation in the IP domain is crucial

# Thank You

If you are in the UK, do come  
and join me for a nice cup of tea!

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