ST2110 over WAN
Activity Working Group update

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My family is expanding: granddaughter & time

❤️

Time is important!

ST2110 uses a PTP Epoch time of 1st January 1970
PTP: 38 billion frames*

Andy:
41 billion frames* since his epoch!
(52 years)

Esther:
790 million frames* since her epoch! *(12 months)*

*25fps

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Key Activity Group Objective & timings

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

ST2110→WAN

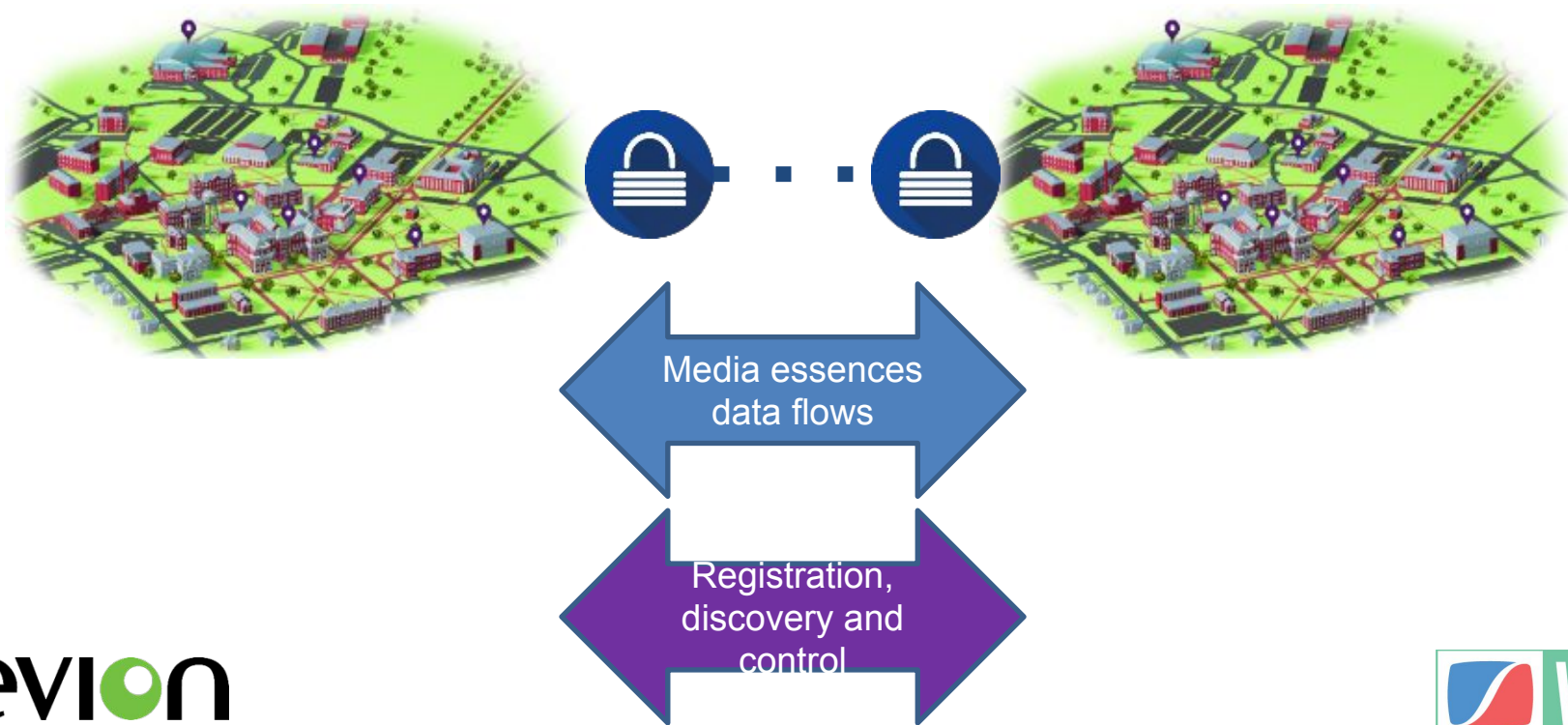Now almost there! Initial draft complete
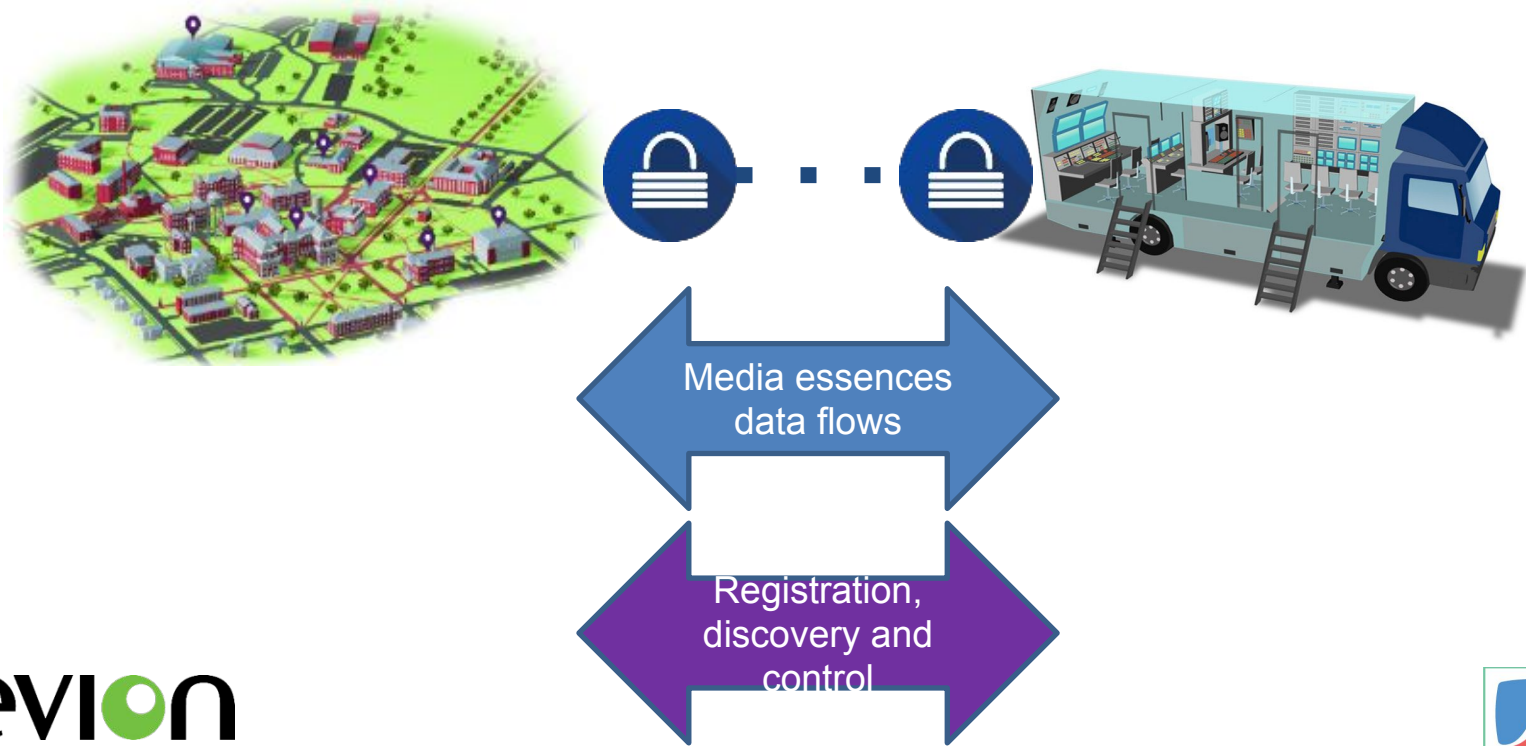
So what is this all about?

Key user scenarios:

- Event remote production connectivity
- Intra-company facilities connectivity
- Inter-company facilities connectivity

Two layers of focus – data and control

Media essences data flows

Registration, discovery and control

Differing levels of federation

Media essences data flows

Registration, discovery and control

Activity Group Team represents:

- Vendors:

Nevion, Imagine, GV, Evertz, Netinsight, Matrox, Medialinks, Mellanox, Packetstorm, Intopix, Sony, Artel
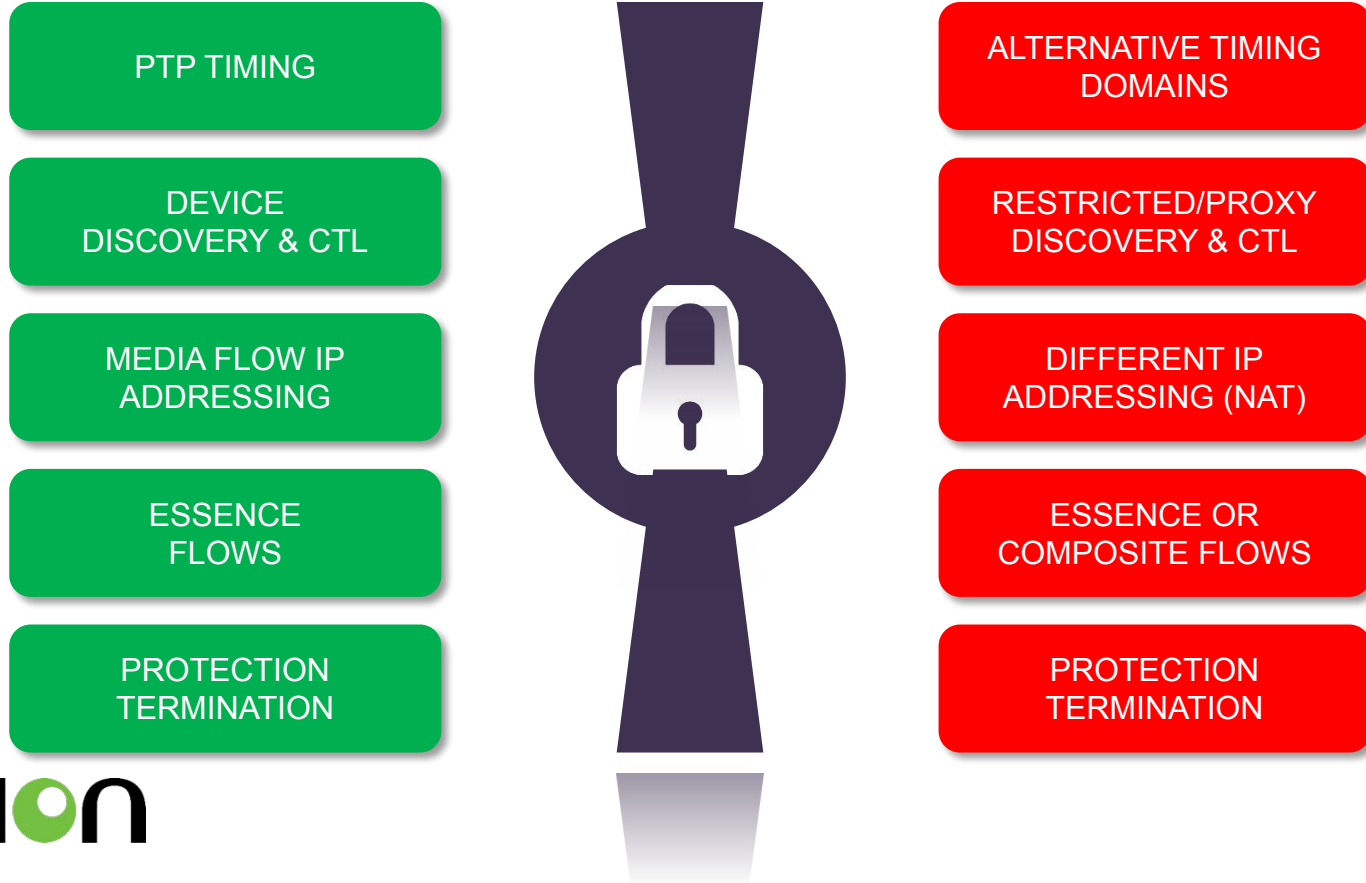
- Users:

Disney DTCI, BBC, ESPN, AT&T, Century Link, Zayo, IRT, AWS
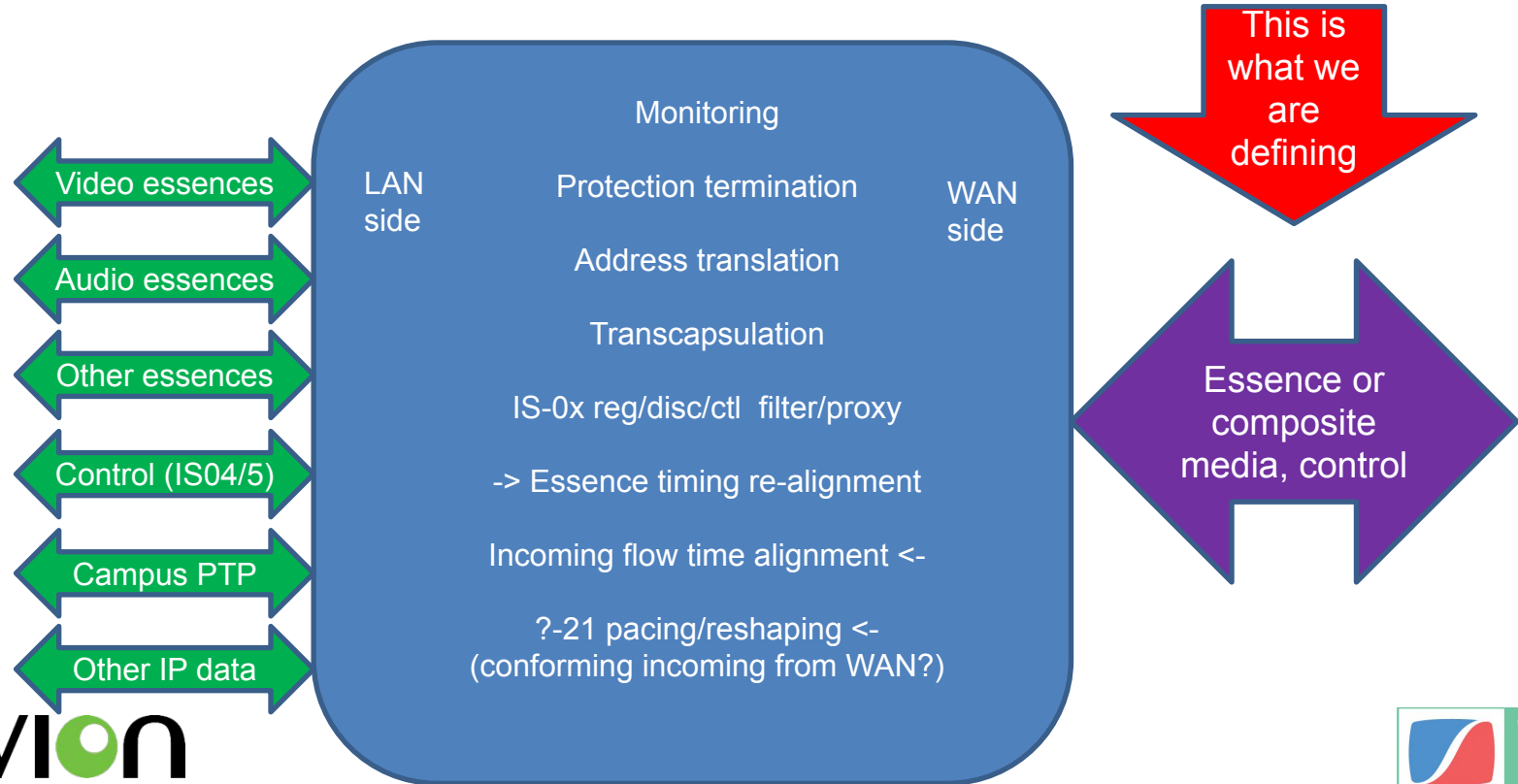
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ST2110 over WAN - tasks

- Flow protection ✓
- Flow trunking ✓
- Essence alignment ✓
- Low latency handling ✓
- Compression ✓

- Protection of other data flows ✓
- Security ✓
- Wan timing ✓
- Associated control (NMOS) filtering and border proxying ✓

The IP facility media **edge**

| PTP TIMING | ALTERNATIVE TIMING DOMAINS |

| DEVICE DISCOVERY & CTL | RESTRICTED/PROXY DISCOVERY & CTL |

| MEDIA FLOW IP ADDRESSING | DIFFERENT IP ADDRESSING (NAT) |

| ESSENCE FLOWS | ESSENCE OR COMPOSITE FLOWS |

| PROTECTION TERMINATION | PROTECTION TERMINATION |

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What we are talking about:

Video essences

Audio essences

Other essences

Control (IS04/5)

Campus PTP

Other IP data

LAN side

WAN side

Monitoring

Protection termination

Address translation

Transcapsulation

IS-0x reg/disc/ctl filter/proxy

-> Essence timing re-alignment

Incoming flow time alignment <-

?-21 pacing/reshaping <-
(conforming incoming from WAN?)

This is what we are defining

Essence or composite media, control
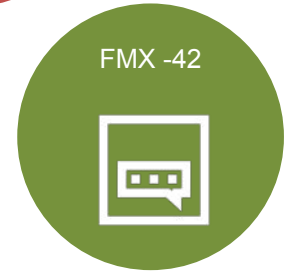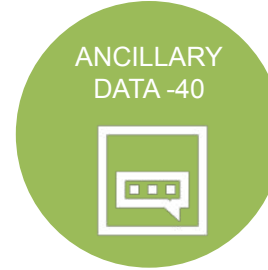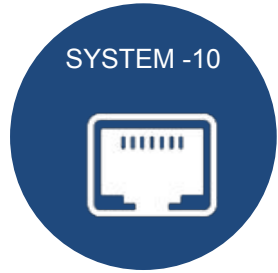
Securing the facility edges – both data and control plane

SMPTE ST 2110 suite – so far!

SYSTEM -10

VIDEO -20

AUDIO -30

ANCILLARY DATA -40

TIMING -21

COMPRESSED VIDEO -22

AES3-32 bit AUDIO -31

2022-8 COMPOSITE

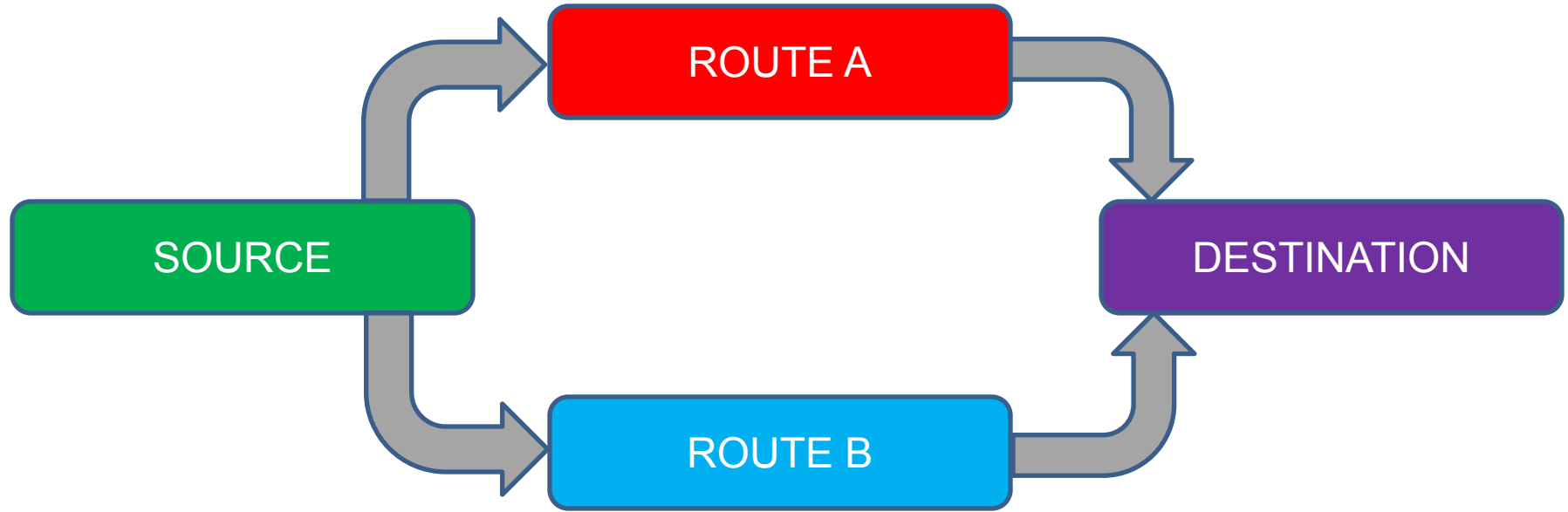MULTI-PART VIDEO -23

SD VIDEO -24

FAST METADATA -41

FMX -42

Flow protection #1
- SMPTE2022-7 based

Flow protection #2
FEC – ST2022-5 based
constrained to LxD product of 100 maximum
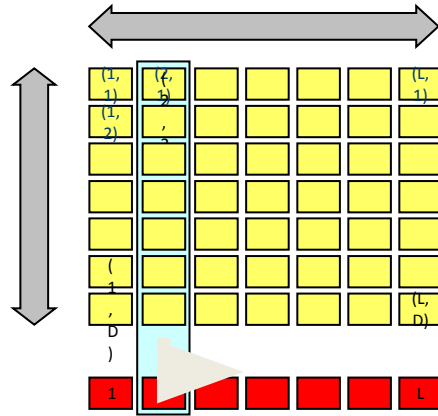
Trunking essences
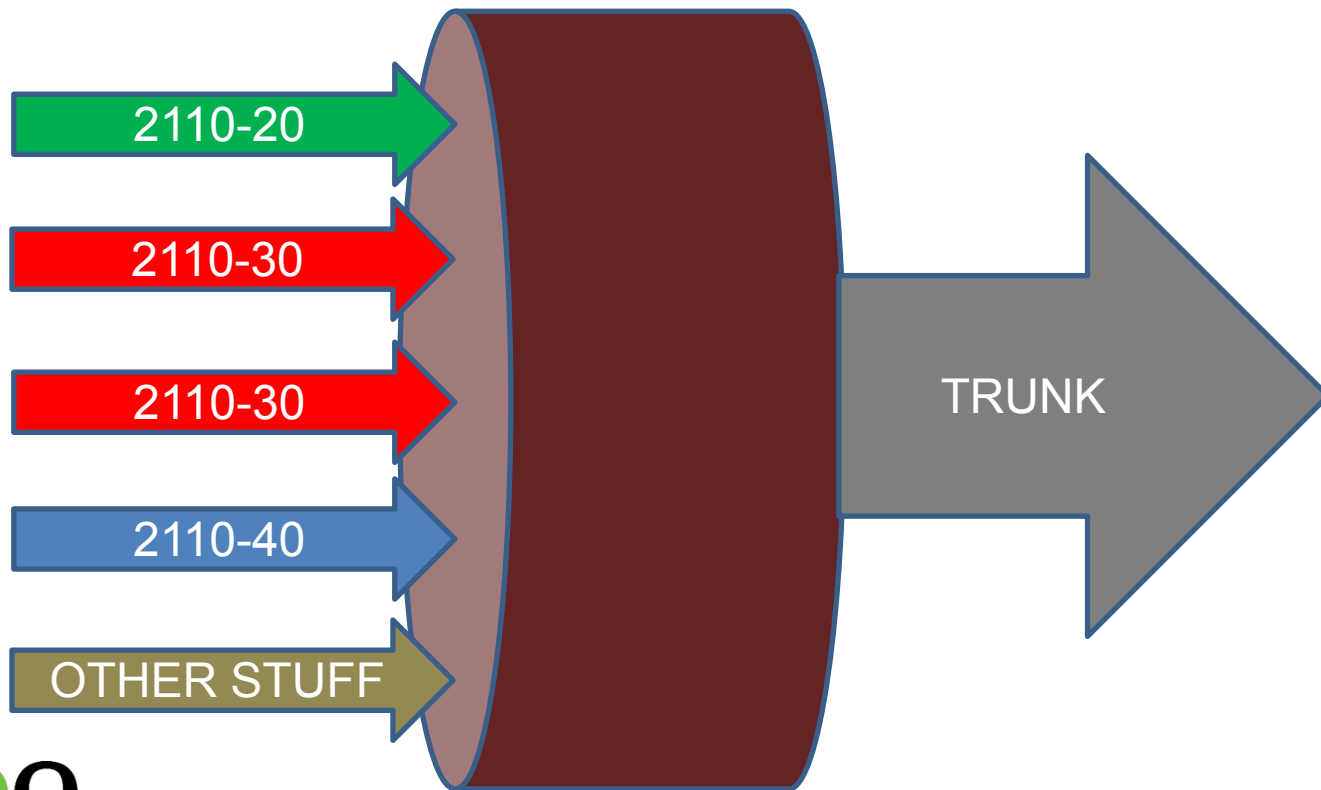
Trunking encapsulation

TRUNK HEADERS

Original packet

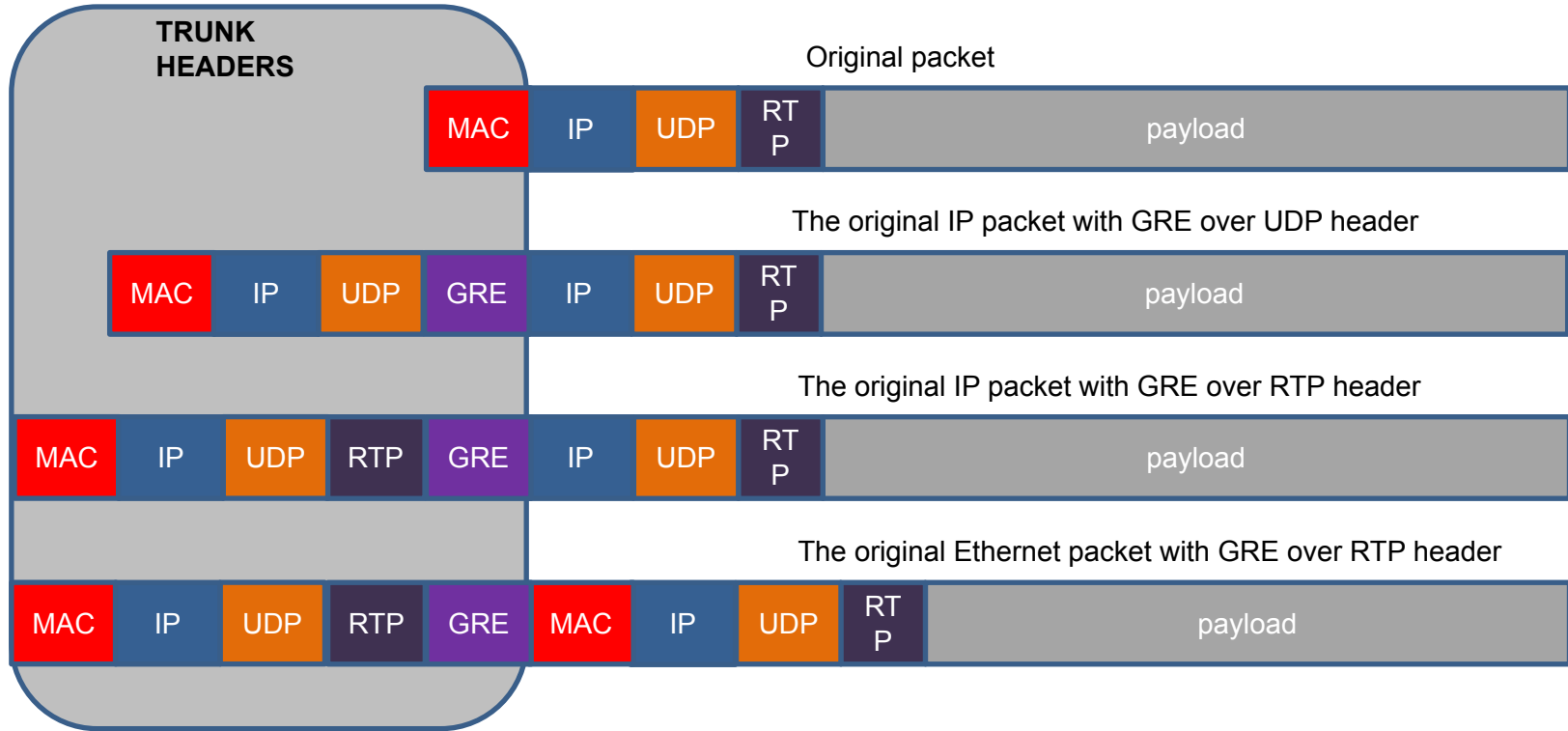| MAC | IP | UDP | RTP | payload |

The original IP packet with GRE over UDP header

| MAC | IP | UDP | GRE | IP | UDP | RTP | payload |

The original IP packet with GRE over RTP header

| MAC | IP | UDP | RTP | GRE | IP | UDP | RTP | payload |

The original Ethernet packet with GRE over RTP header

| MAC | IP | UDP | RTP | GRE | MAC | IP | UDP | RTP | payload |

GRE over RTP

RTP HDR	RTP SN	RTP TSTP	RTP SSRC	RTP SNE	RTP ID	GRE HDR	GRE PTY	Payload (IP or Ethernet)

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|V=2|P|X|   CC    |M|     PT      |          sequence number      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           timestamp                            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|            synchronization source (SSRC) identifier            |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|    Sequence Number Extension    |       Flow Identifier         |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|C|  |K|S| Reserved0      | Ver |        Protocol Type           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|            Encapsulated payload (Ethernet or IP packet)        |
|                         ....                                   |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
```
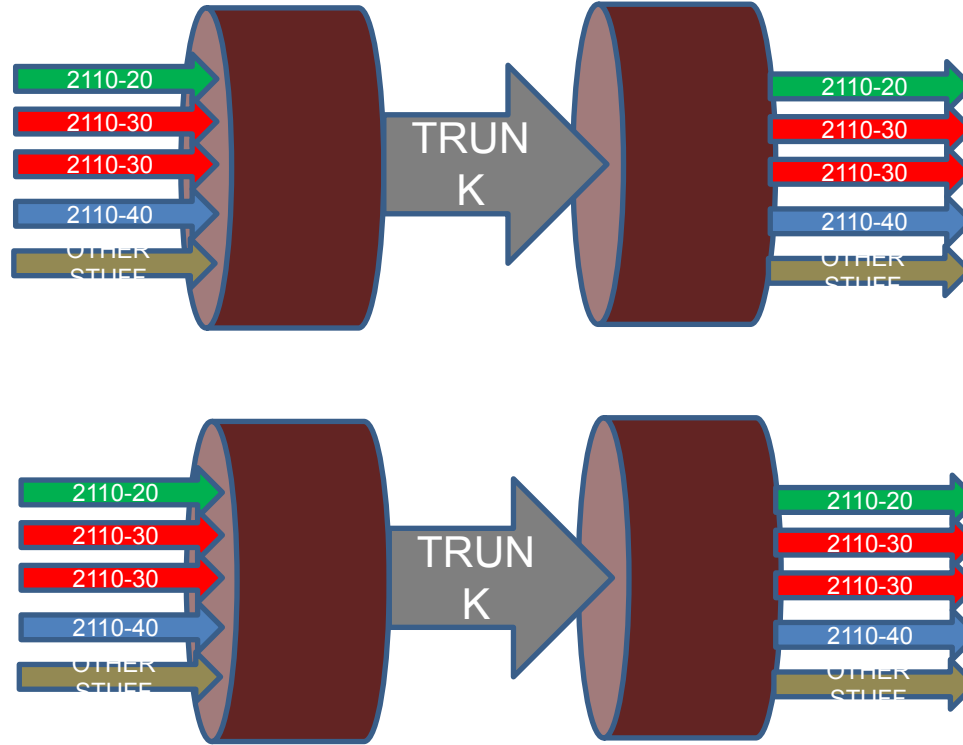
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2022-7 protection
at essence or trunk

Protection of other data

Absolute time of origination is captured in ST2110-20/30/40

Media payload	RTP	UDP	IP	VLAN	MAC/PCS/GFP/MPLS

…but is potentially lost as it is treated my many devices as a transport timestamp
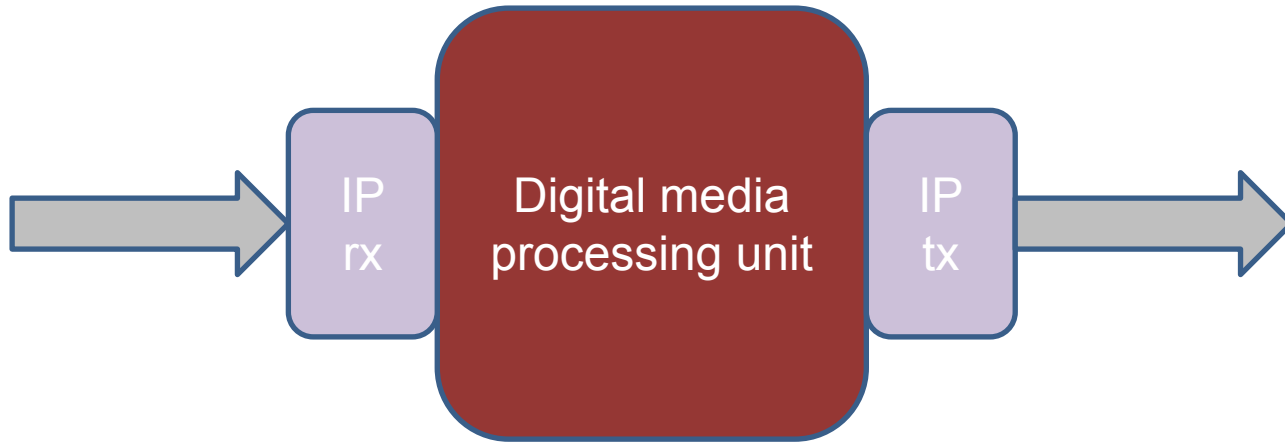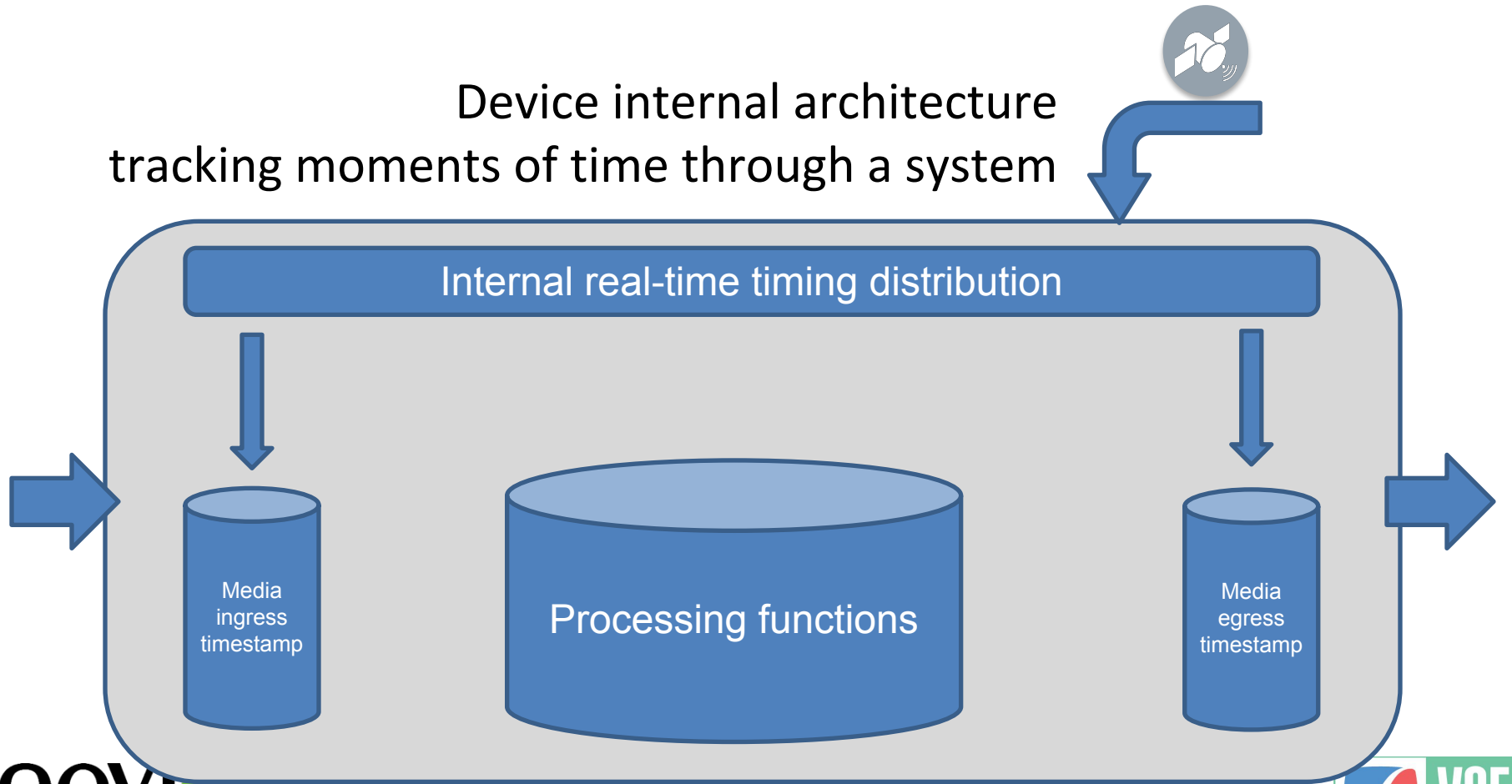
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Reconciling essence timings for WAN
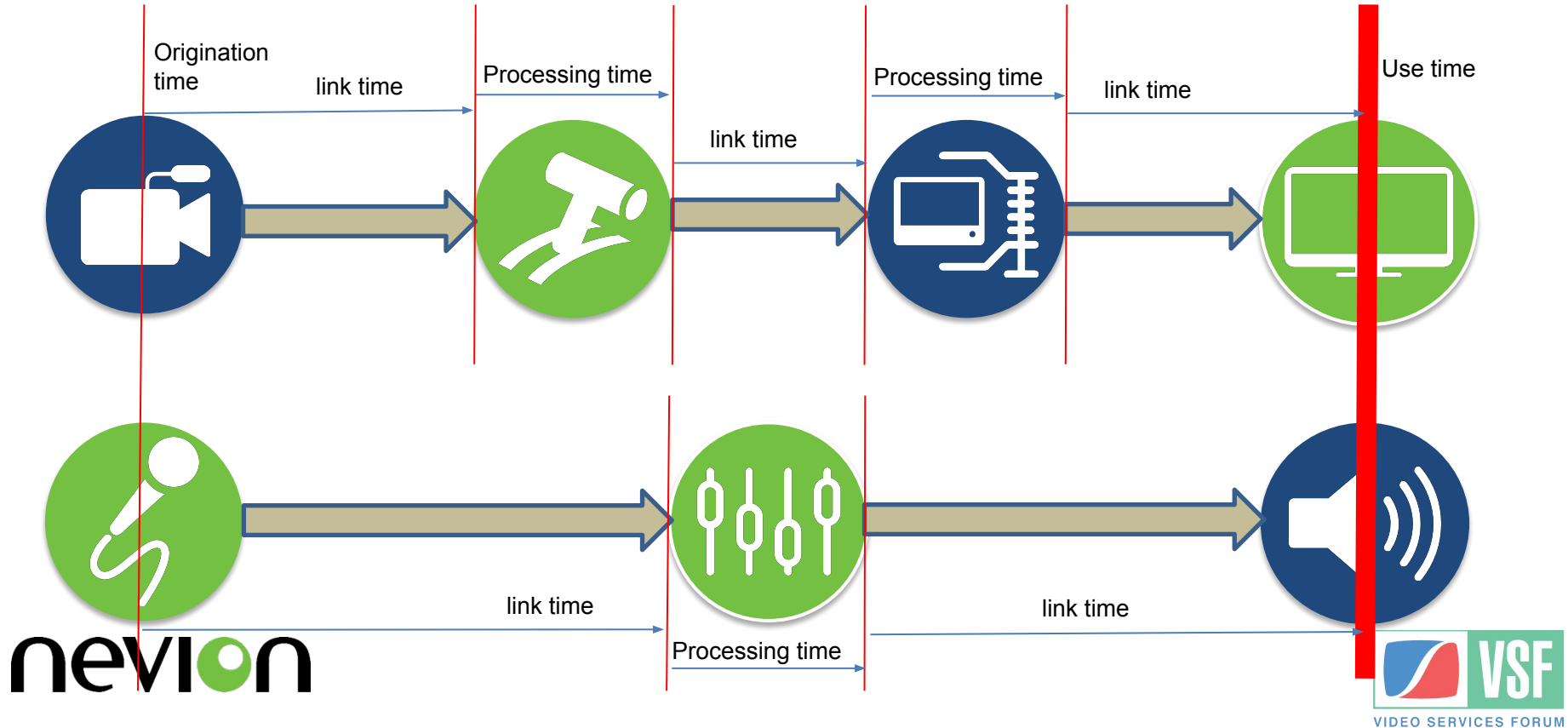
Why are we in the current approach?

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

Device internal architecture
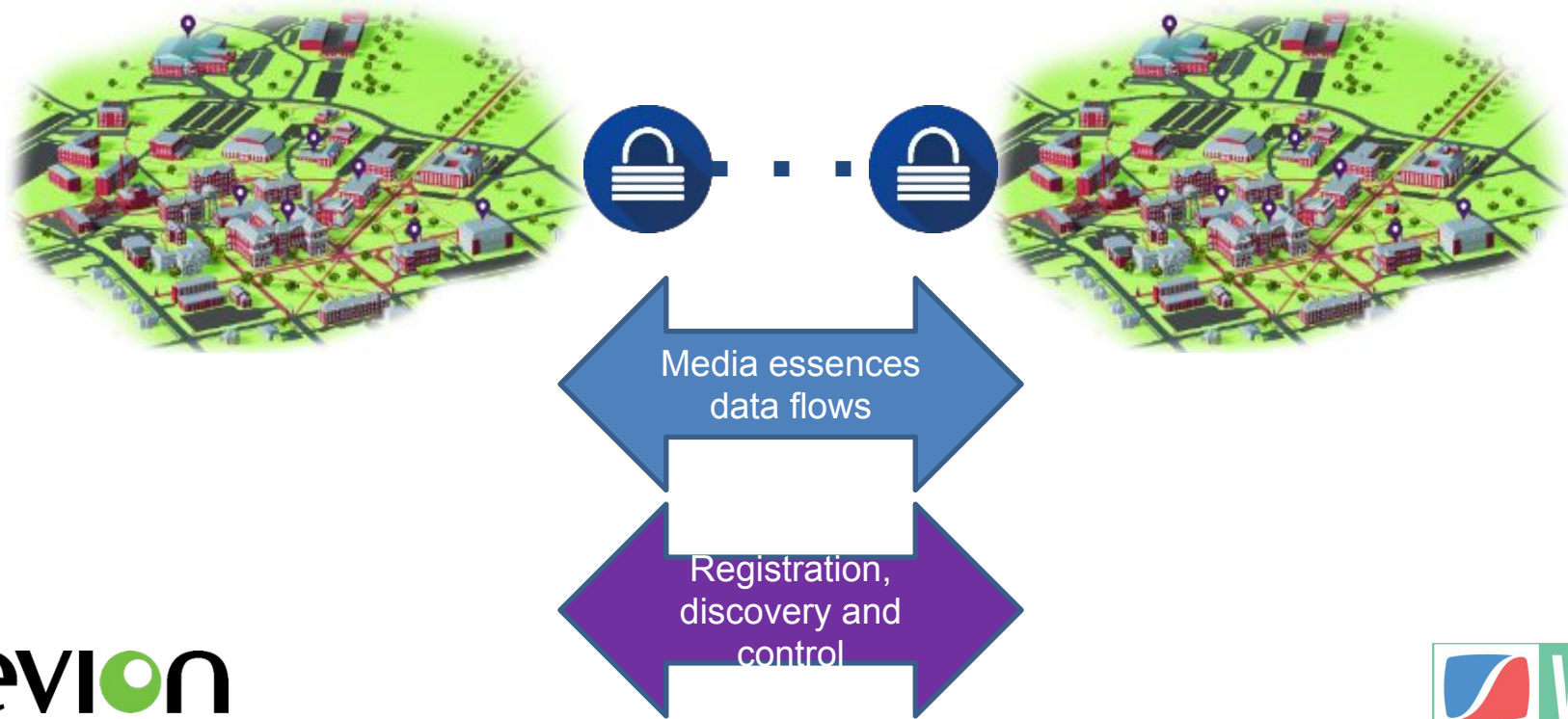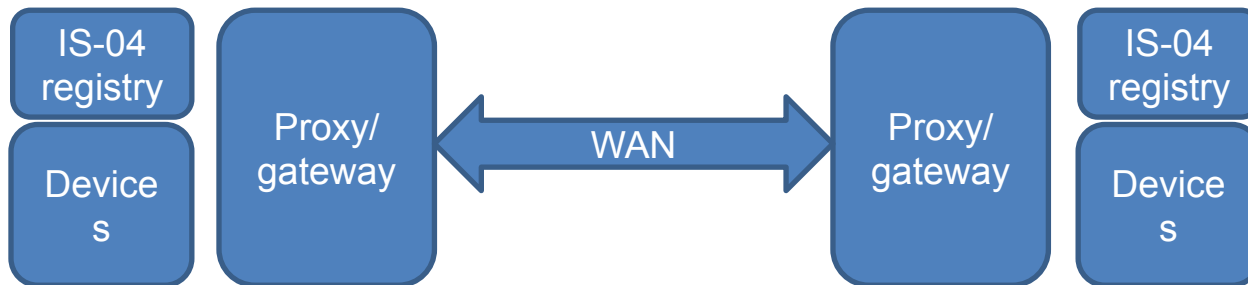tracking moments of time through a system

Internal real-time timing distribution

Media ingress timestamp

Processing functions

Media egress timestamp

Compression

LAN
uncompressed

WAN
compressed

JPEG2000 TR01
JPEG XS as 2110-22

Two layers of focus – data and control

THE CONTROL BIT:
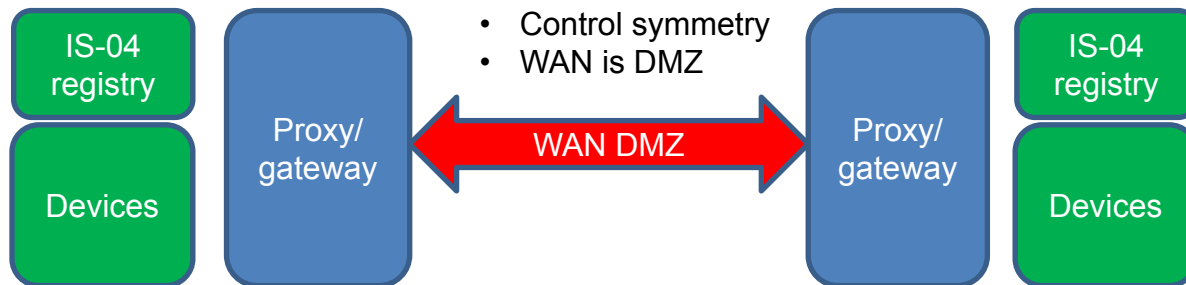## IS-04/5 discovery/registration/control transport proxy
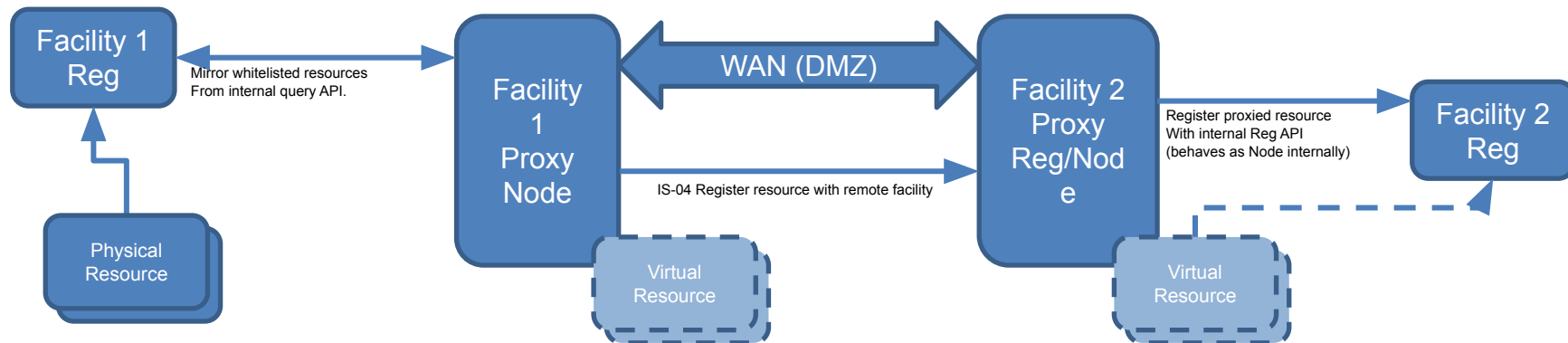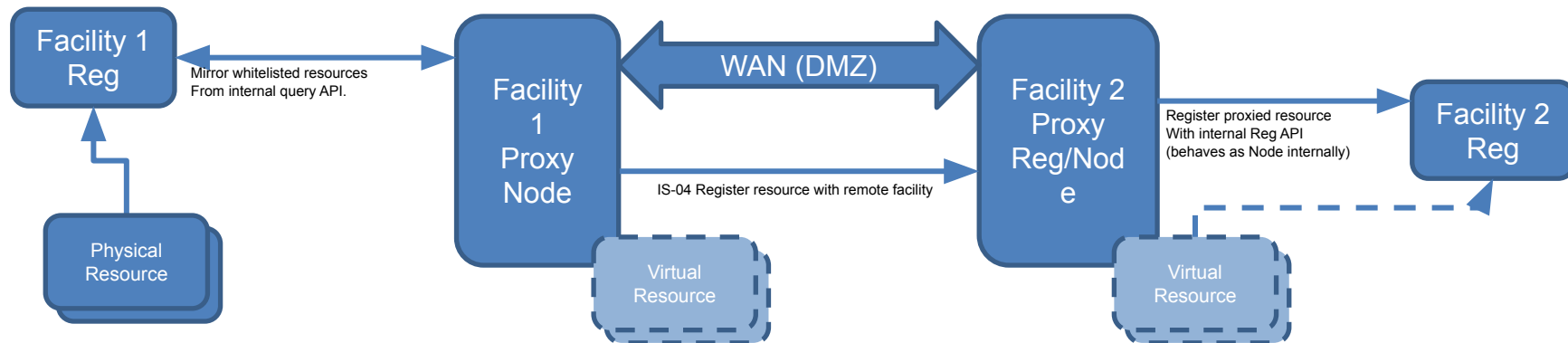
Control layer

Single resource example – IS-04

Example – sharing a resource from Facility 1 into Facility 2

WAN considerations

- Authentication
- Address translation

Facility 1 Reg

Mirror whitelisted resources
From internal query API.

Physical Resource

Facility 1 Proxy Node

WAN (DMZ)

IS-04 Register resource with remote facility

Virtual Resource

Facility 2 Proxy Reg/Node

Register proxied resource
With internal Reg API
(behaves as Node internally)

Facility 2 Reg

Virtual Resource

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VSF
VIDEO SERVICES FORUM

Single resource example – IS-05

Example – controlling a sender in Facility 1 from Facility 2
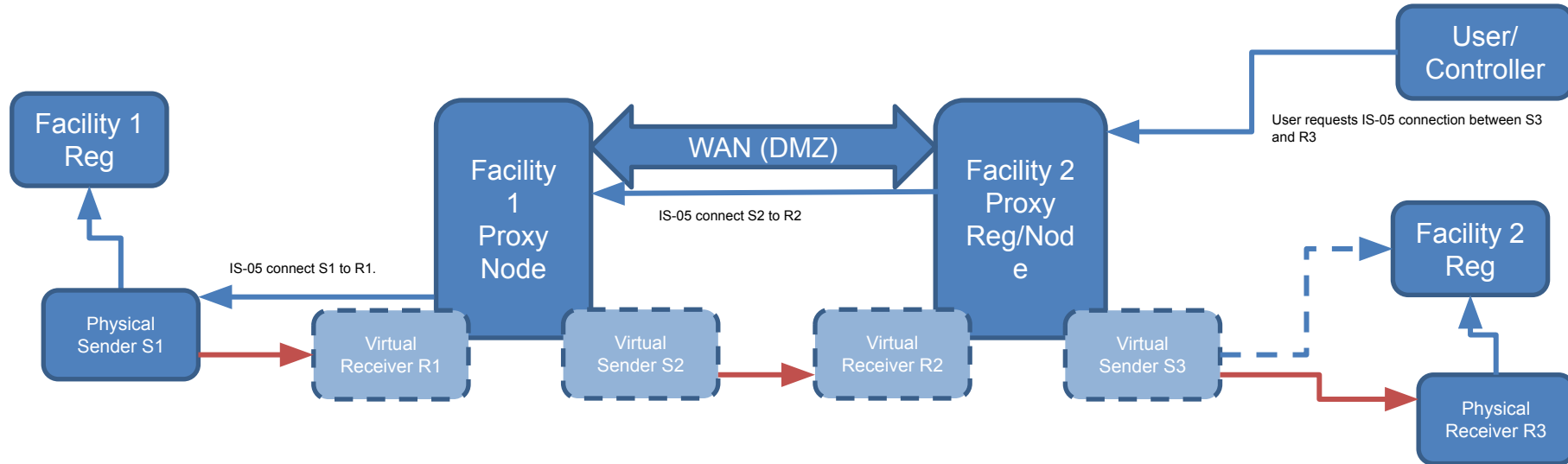
Summary

ST2110→WAN

Thank you to those who have been involved
There is still time for final input

vsf.tv

http://vsf.tv/SMPTE_ST_2110_over_WAN.shtml

You are welcome to come to the UK
for a really great cup of tea 😊

Thank you!

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