Video Services Forum

ST 2110 over WAN activity group

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http://vsf.tv/SMPTE_ST_2110_over_WAN.shtml

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

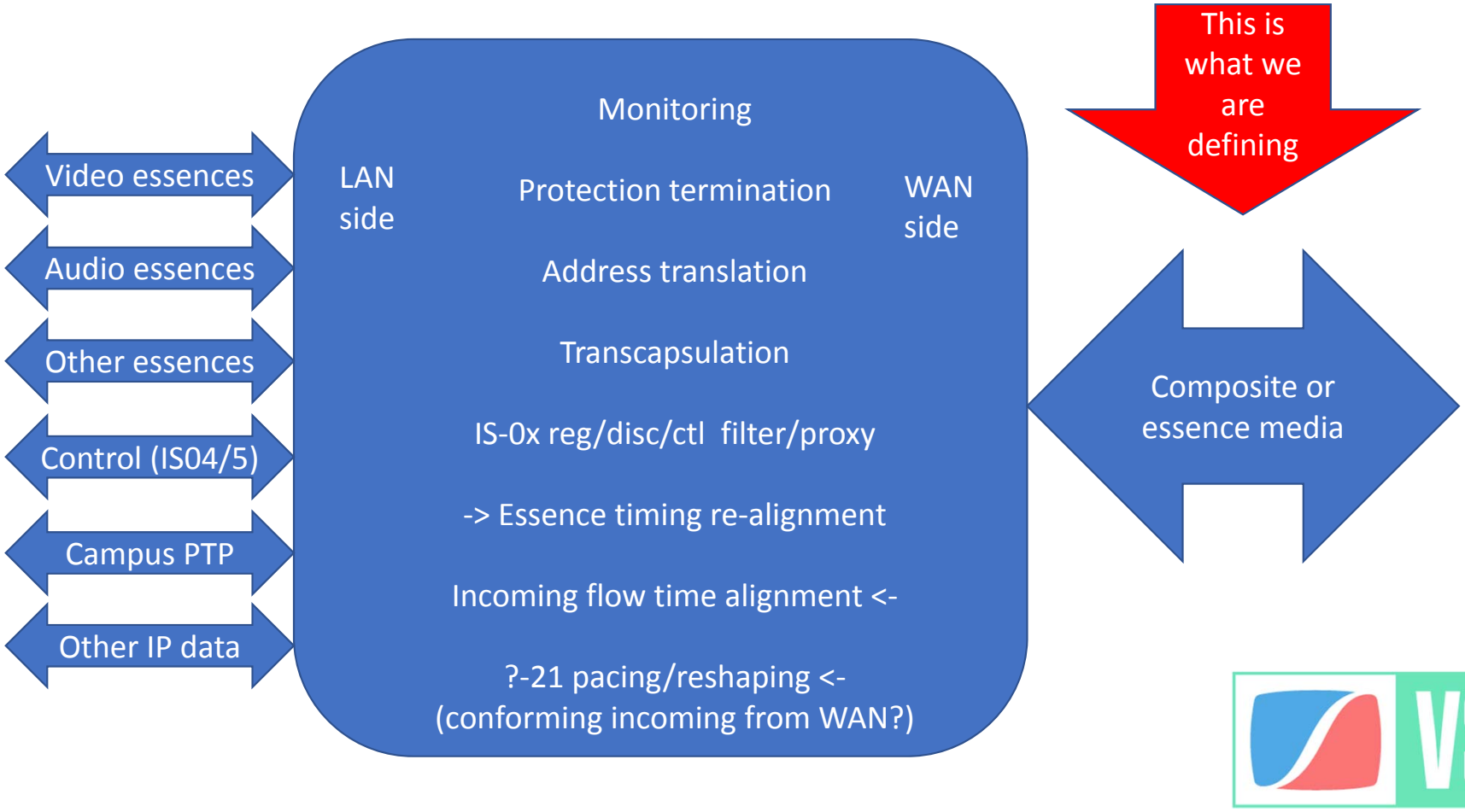
Phase 1: NAB 2019

Phase 2: IBC 2019

Activity Group Team represents:

- Vendors: Nevion, Imagine, GV, Evertz, Netinsight, Matrox, Medialinks, Mellanox, Packetstorm, Intopix, Sony, Artel
- Users: BT, BBC, ESPN, AT&T, Century Link, Zayo
- Others: IRT

The LAN-WAN Gateway

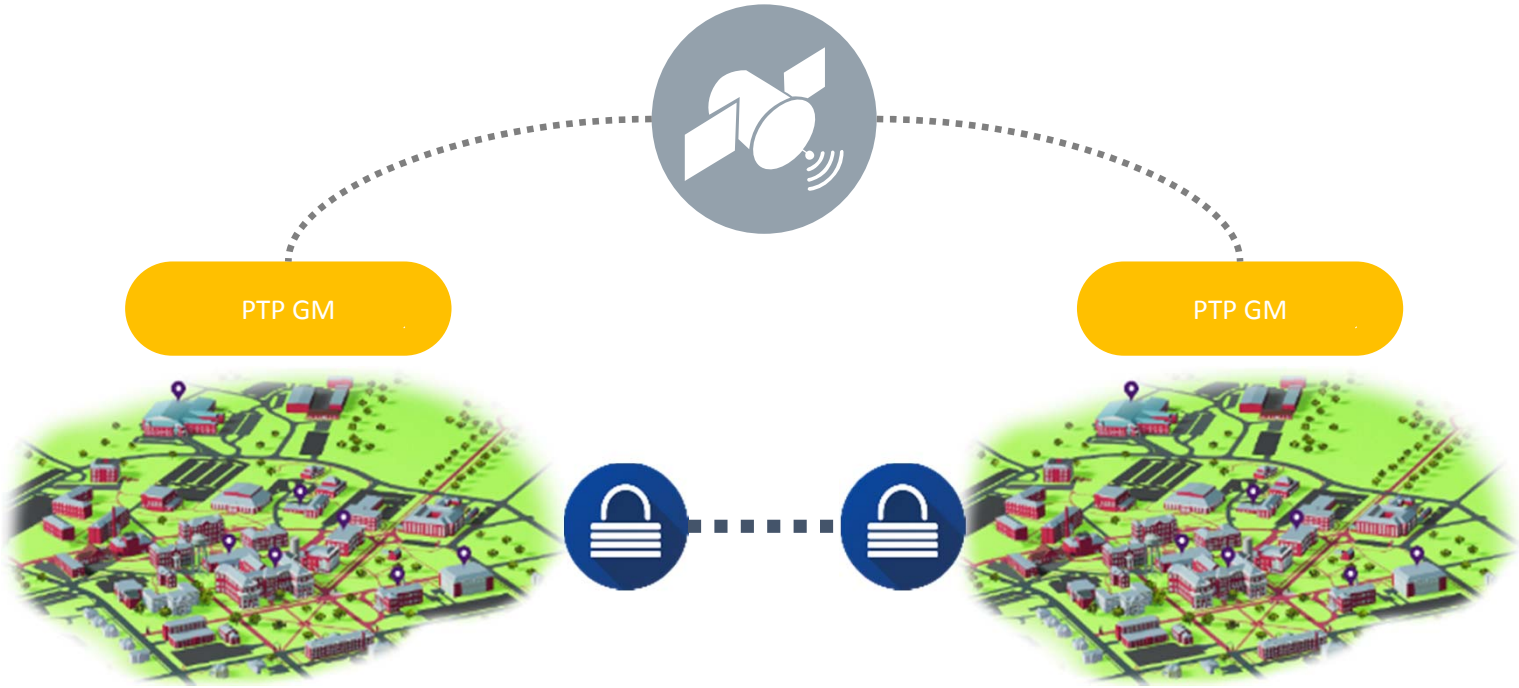


Key user scenarios:

Inter-company facilities connectivity

Intra-company facilities connectivity

Event remote production connectivity



ST2110 over WAN for inter-facility & OBs

WORK IN PROGRESS

- 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

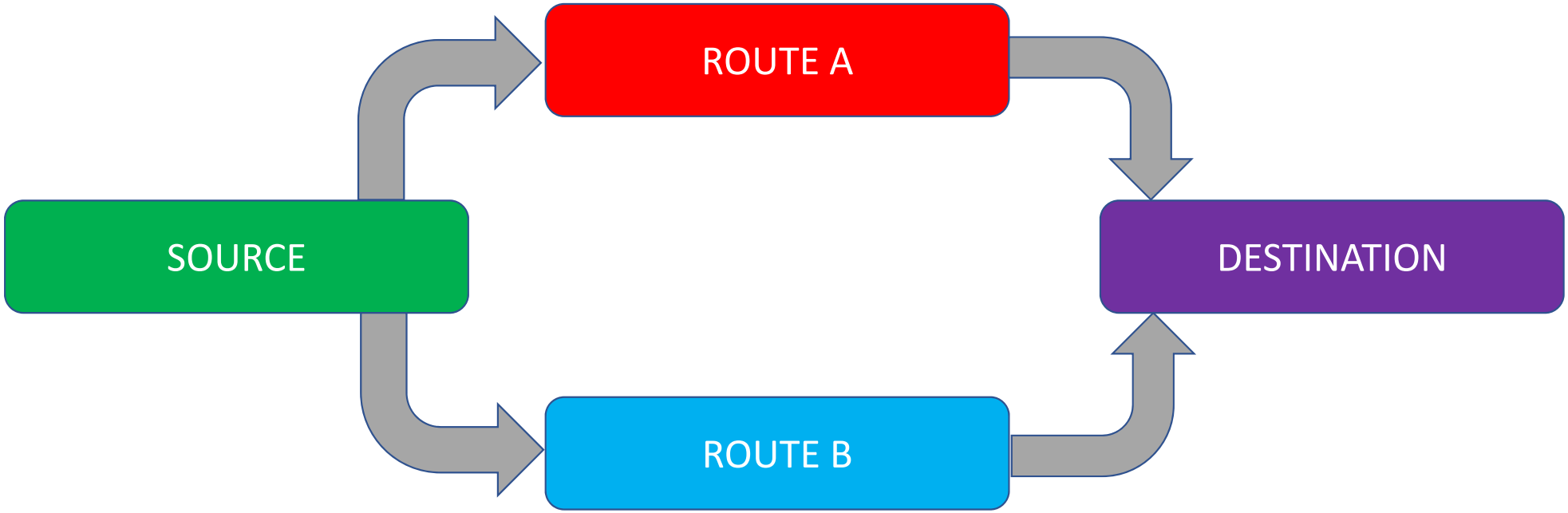
Next topic

VSF

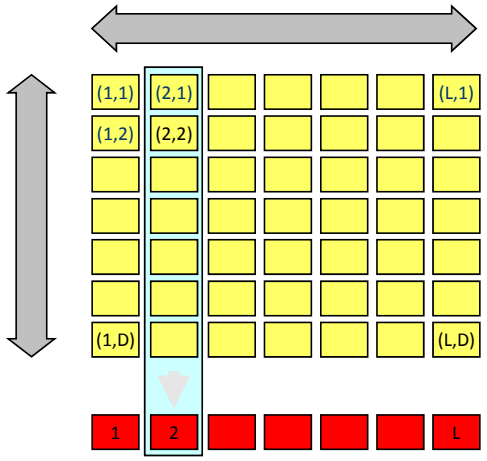
ST2110-WAN: Protection

- Dual path protection will use ST2022-7
- FEC on individual essence flows (all media types) will use bounded ST2022-5
  - Receivers shall support a matrix product of at least 100
  - Transmitters shall be configurable to use a matrix whose product is 100 or less
- Single FEC - 2D column-only (as opposed to 1D which is inherently row based)
- FEC on trunk (the GRE over RTP option) will use the same restrictions as above
- Aim to keep latency as low as possible (important for low bit rate flows)
- RIST for OTT transport could be explored later

Flow protection #1 - SMPTE2022-7 based



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



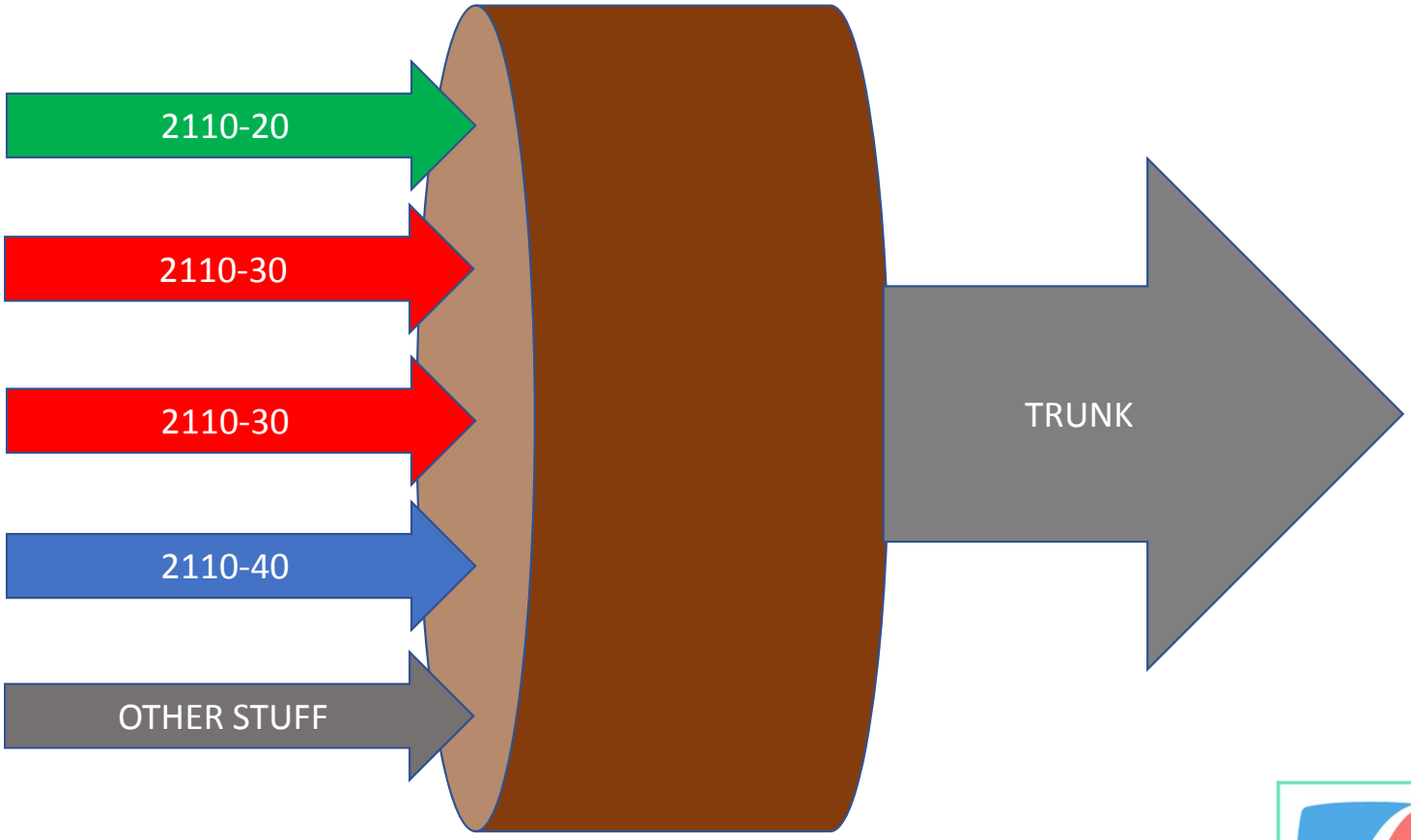
n	n+1	n+2	n+3
n+4	n+5	n+6	n+7
n+8	n+9	n+10	n+11
n+12	n+13	n+14	n+15
n+16	n+17	n+18	n+19
n+20	n+21	n+22	n+23
n+24	n+25	n+26	n+27
n+28	n+29	n+30	n+31
n+32	n+33	n+34	n+35
n+36	n+37	n+38	n+39
n+40	n+41	n+42	n+43

ST2110-WAN: Flow trunking

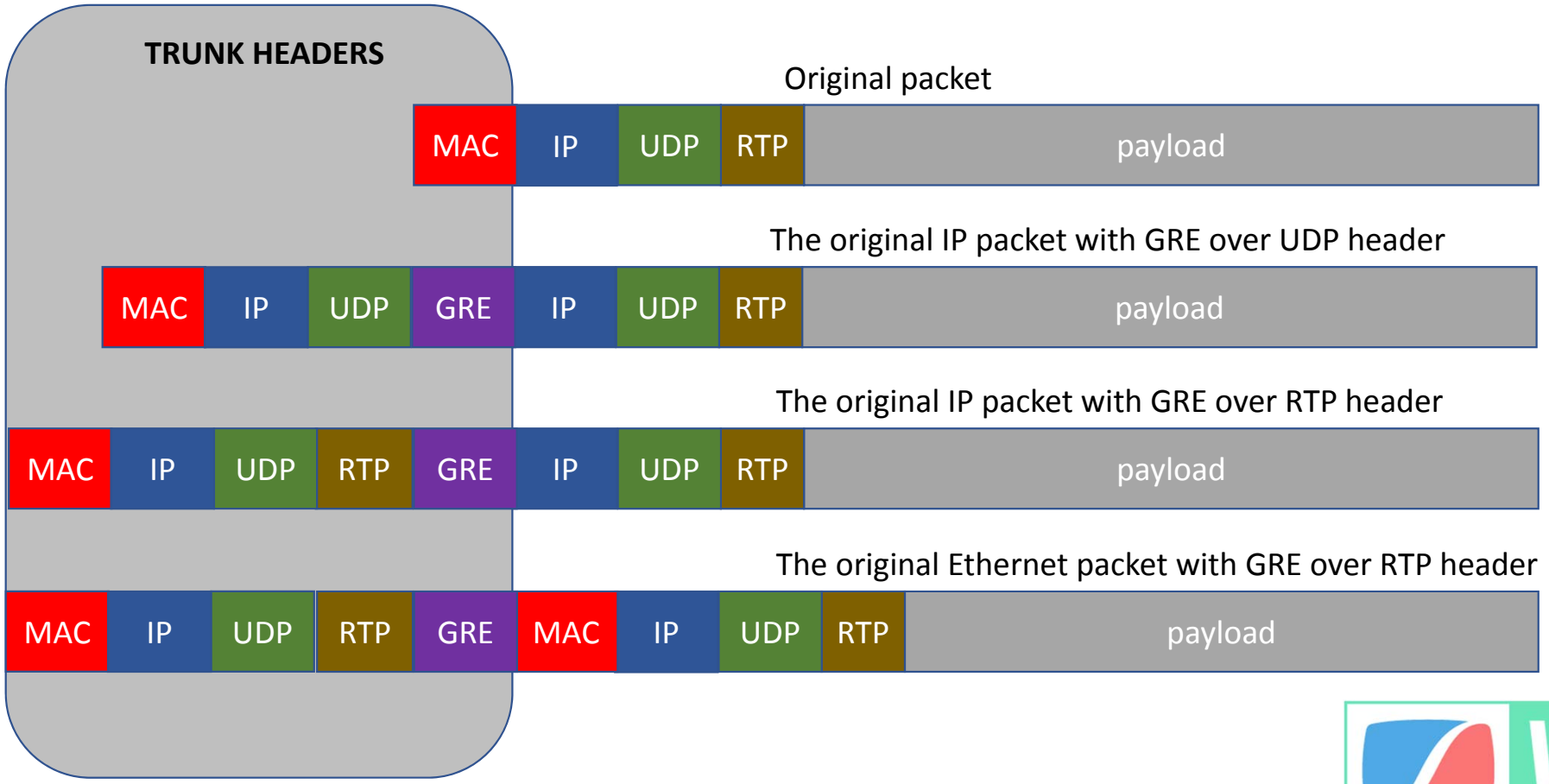
- Common routing of all essences
- High aggregate bit rate gives low latency when using FEC
- Easier for Service provider handling

- Trunking using GRE (RFC2784) over RTP (RFC3550) with 2110-style SN extension
  - Use for cases where protection is needed at the trunk layer
  - This needs to be defined (see proposal in subsequent slide)
  - Use 2022-7 for RTP merge and (constrained) 2022-5 for FEC (as per previous slide)
  - Consideration for RFC submission (not necessary – precedent exists)

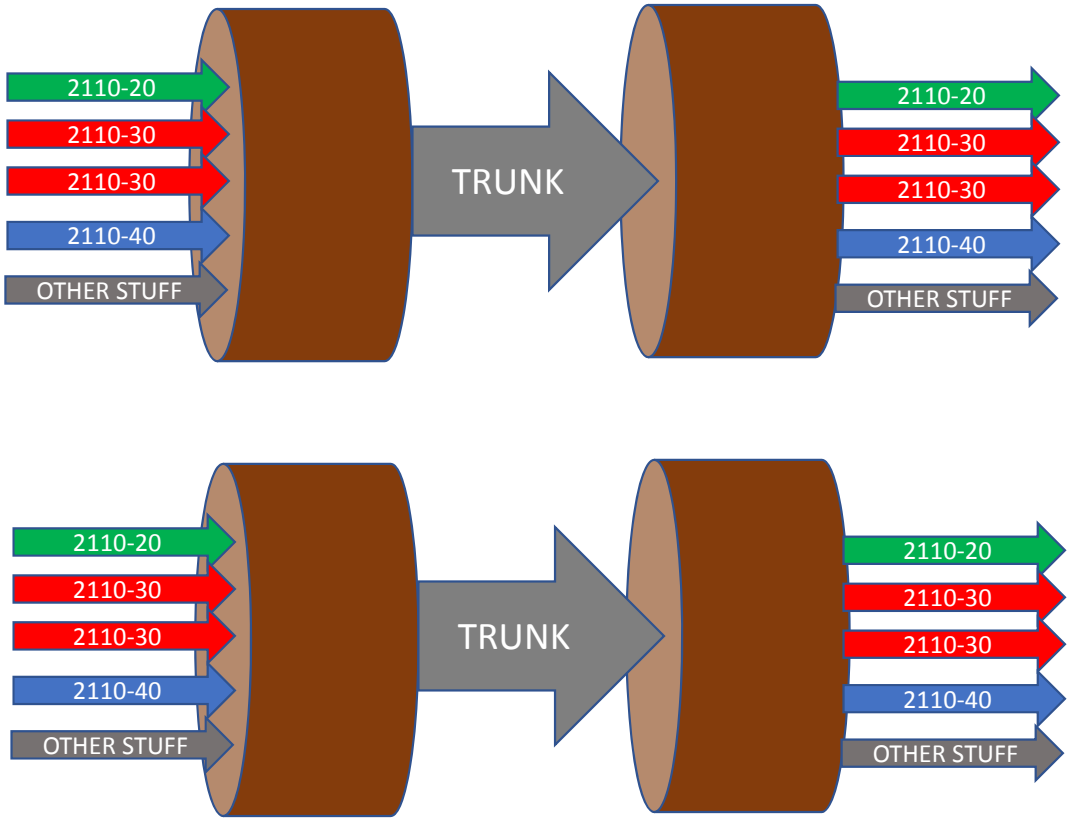
Trunking essences



Trunking encapsulation

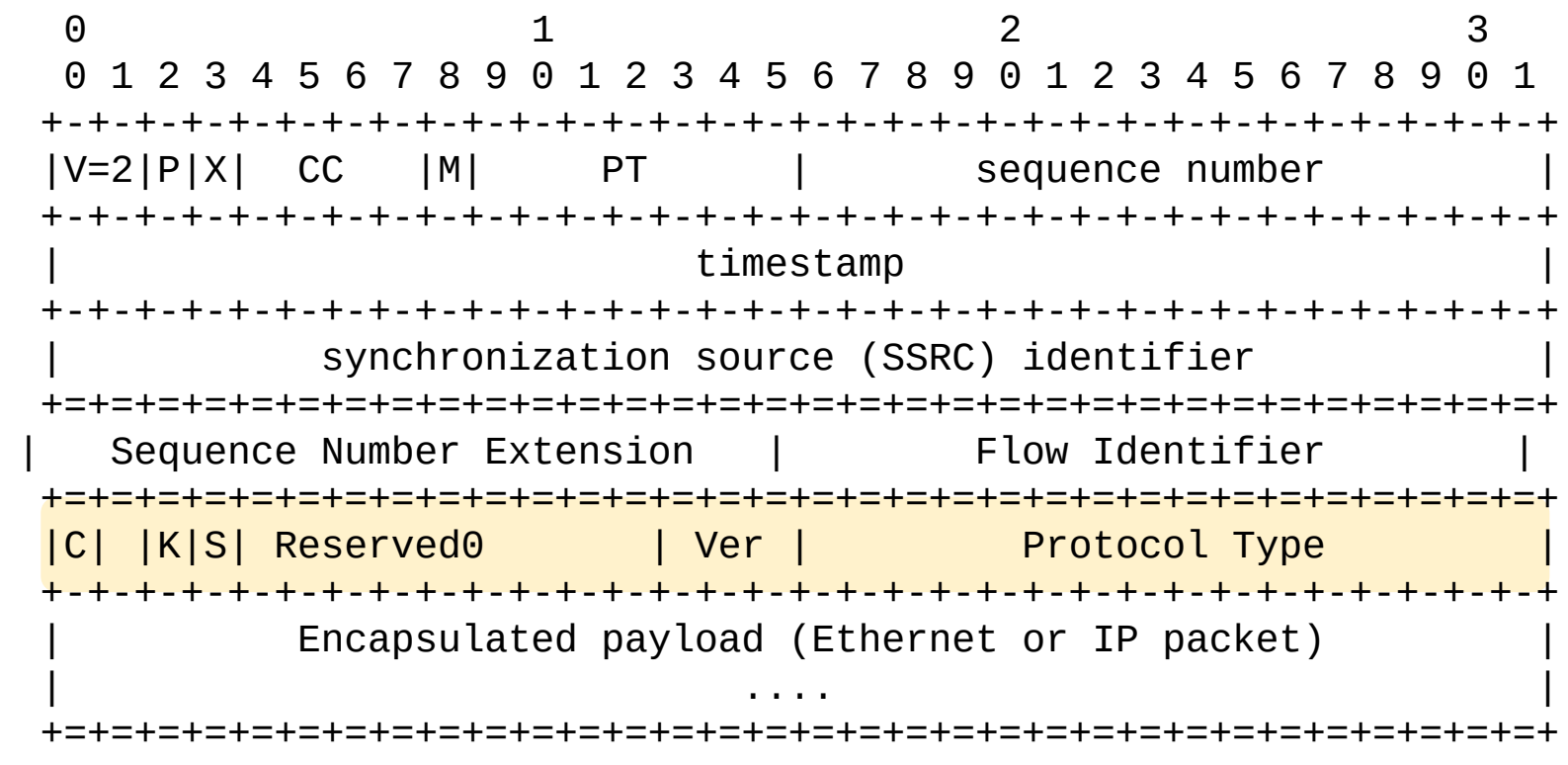


2022-7 protection at essence or trunk

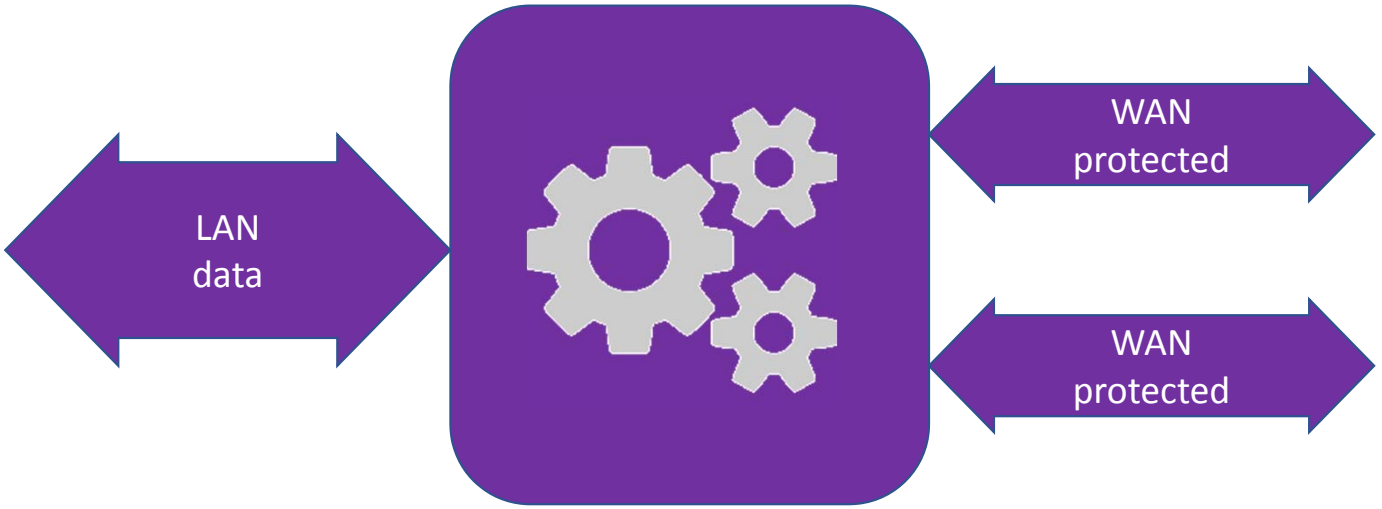


GRE over RTP


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) |
| .... |

Protection of other data



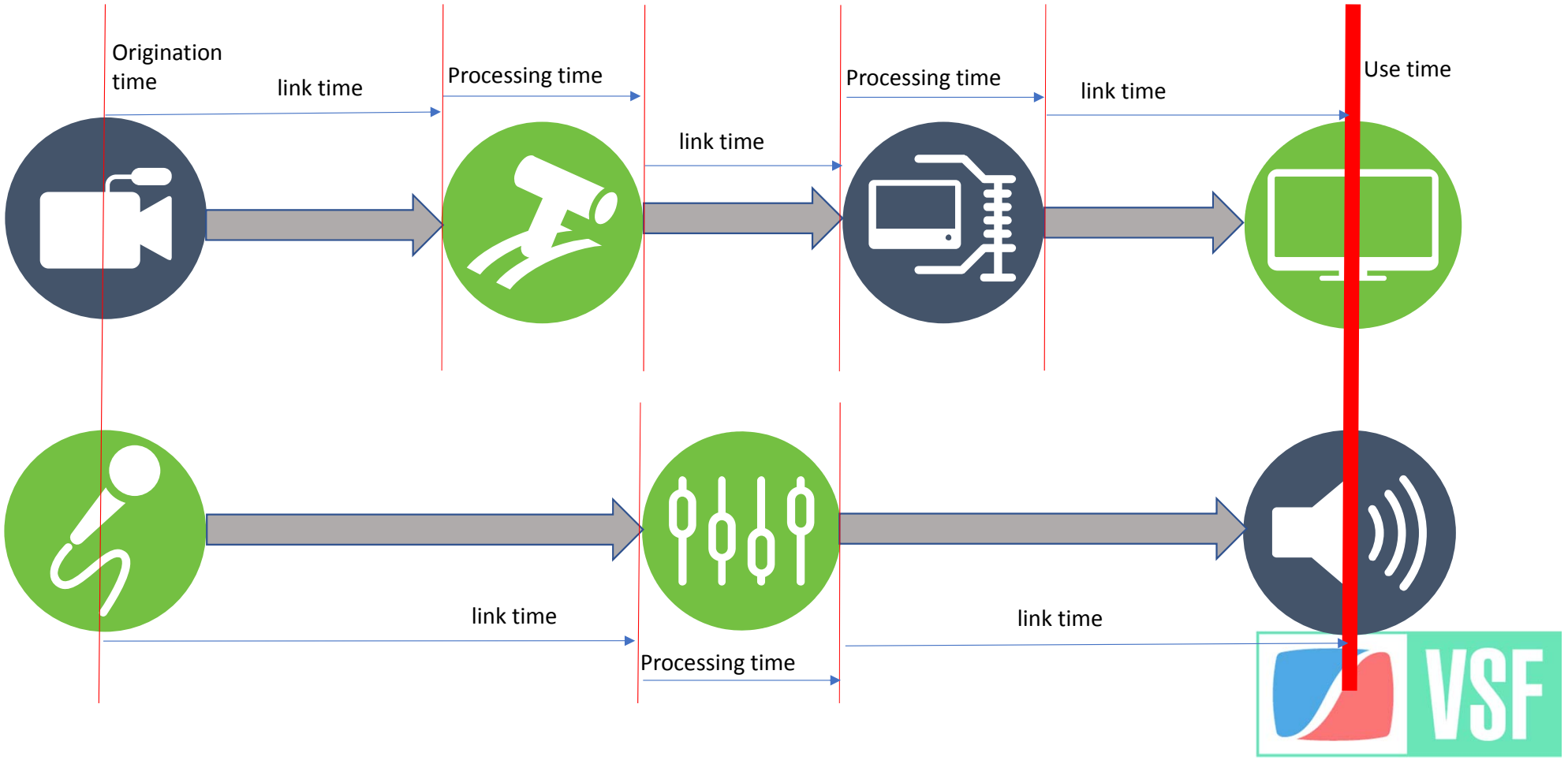
ST2110-WAN: Protection of other data

- Service providers and broadcasters have desire to trunk other IP data (TCP or UDP) with similar protection (specifically 2022-7 style)
- The GRE over RTP defined previously would allow both RTP merge and FEC to be applied if desired
- Differentiation of non-RTP traffic recommended so it protects optimally i.e. existing 2022-7 dual RTP flow best transported on two independent tunnels
- Broadcasters have other ‘stuff’ to carry in tunnel – not necessarily ST2110

ST2110-WAN: Essence realignment

- Essence realignment refers to the temporal realignment of the individual essence flows that constitute a wholistic media signal to ensure they are temporally in synchronization.
- Essence alignment consideration:
  - On transit off-campus
  - On transit on-campus
- Signals may be carried as native 2110 or in some other format on WAN
- Alignment is essential when converting to composite flow (e.g. ST2022-6)
- Alignment is optional when transiting WAN as ST2110 essence
- As a minimum, the RTP timestamps of related essences shall represent the actual difference of intended offset of the flows for presentation
- RTP should be preserved within WAN transport, to allow for far-end re-alignment
- Look to further work on carrying origination time that may be of use….

Reconciling essence timings for WAN



Compression

ST2110-WAN: WAN compression

- Recognize that long-haul WAN connectivity can be too costly to use uncompressed in some scenarios
- Define compression type, profile and bit-rate range to be used
  - TR-01 100-200Mbps for 1080i/720p, 150-300Mbps for 1080P
  - TR-01 already has maximum and minimum rates recommended – should they be narrowed?
  - AT&T (Nick) - expand up to 500Mbps for 1080P?
- Do we want to specify TR-01 2018 ULL for some use cases?
- Consideration that JPEG-XS may well be a good candidate for recommendation within the next 12 months

MTU/fragmentation

- GRE over UDP already addresses fragmentation - though could be improved
- The GRE over RTP should adopt the same text/recommendations as GRE over UDP
- Recommend that controllable media flow sources ensure packet lengths sufficiently small to avoid risk of reaching max MTU/fragmentation when wrapped
- For generic TCP data sources industry best practice (e.g. MSS clamping) should be used to minimize likelihood of fragmentation
- Other data sources (e.g. VPN data) may well default to max MTU and will be the likely area of unavoidable fragmentation

IS-0X discovery transport proxy

Campus facility 1

Campus facility 2

Transcapsulation

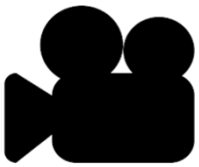
Security

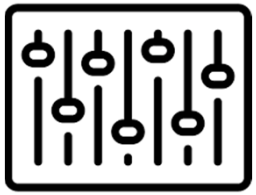
Connectivity Security

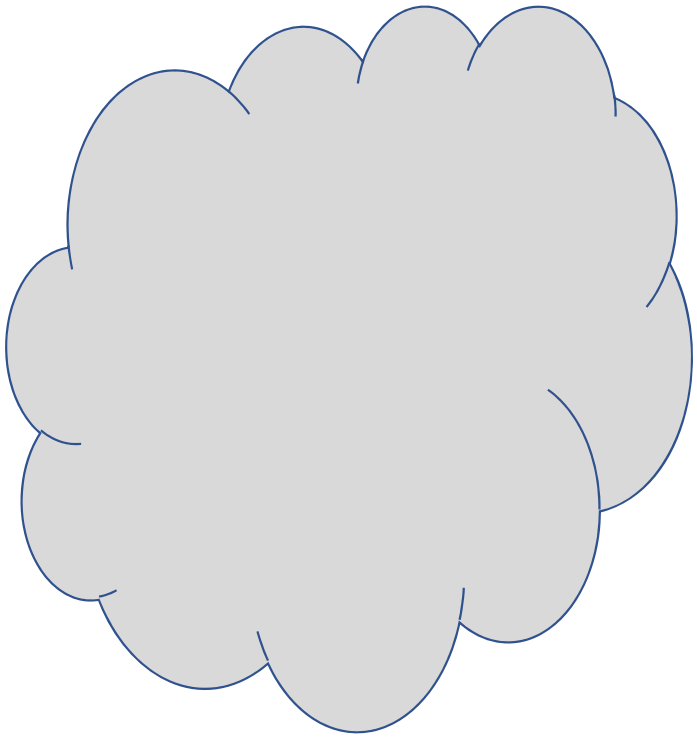
Content Security

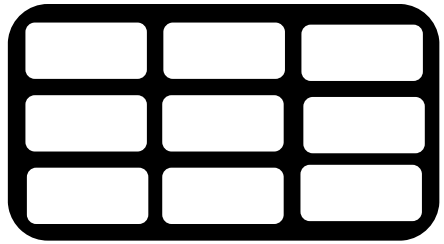
VSF

Discovery & control - filtering & proxy

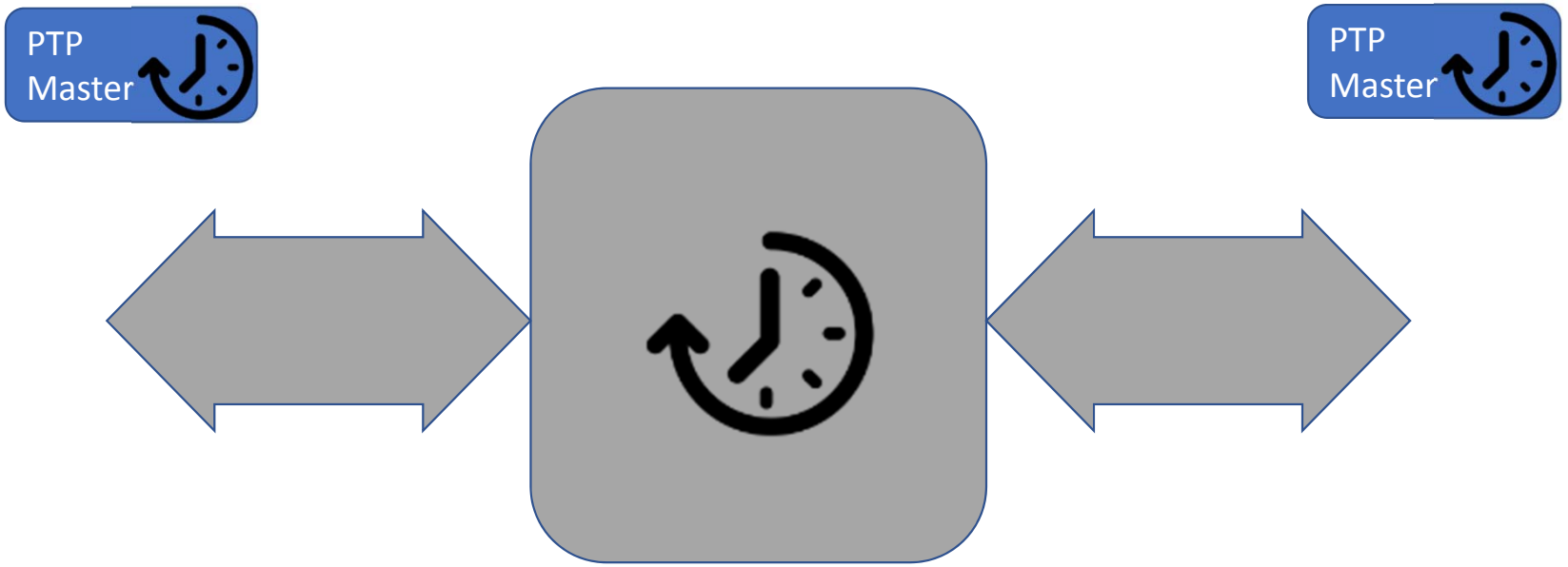








PTP trunking



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

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