Timing planes in IP production linear and non-linear

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IP SHOWCASE™

Come and catch up on the Sony stand in Hall 13

Audio Engineering Society · AIMS Alliance for IP Media Solutions · AMWA Networked Media. Working. · EBU · SMPTE · VSF Video Services Forum

Queen Elizabeth II 1926-2022

The Queen and I

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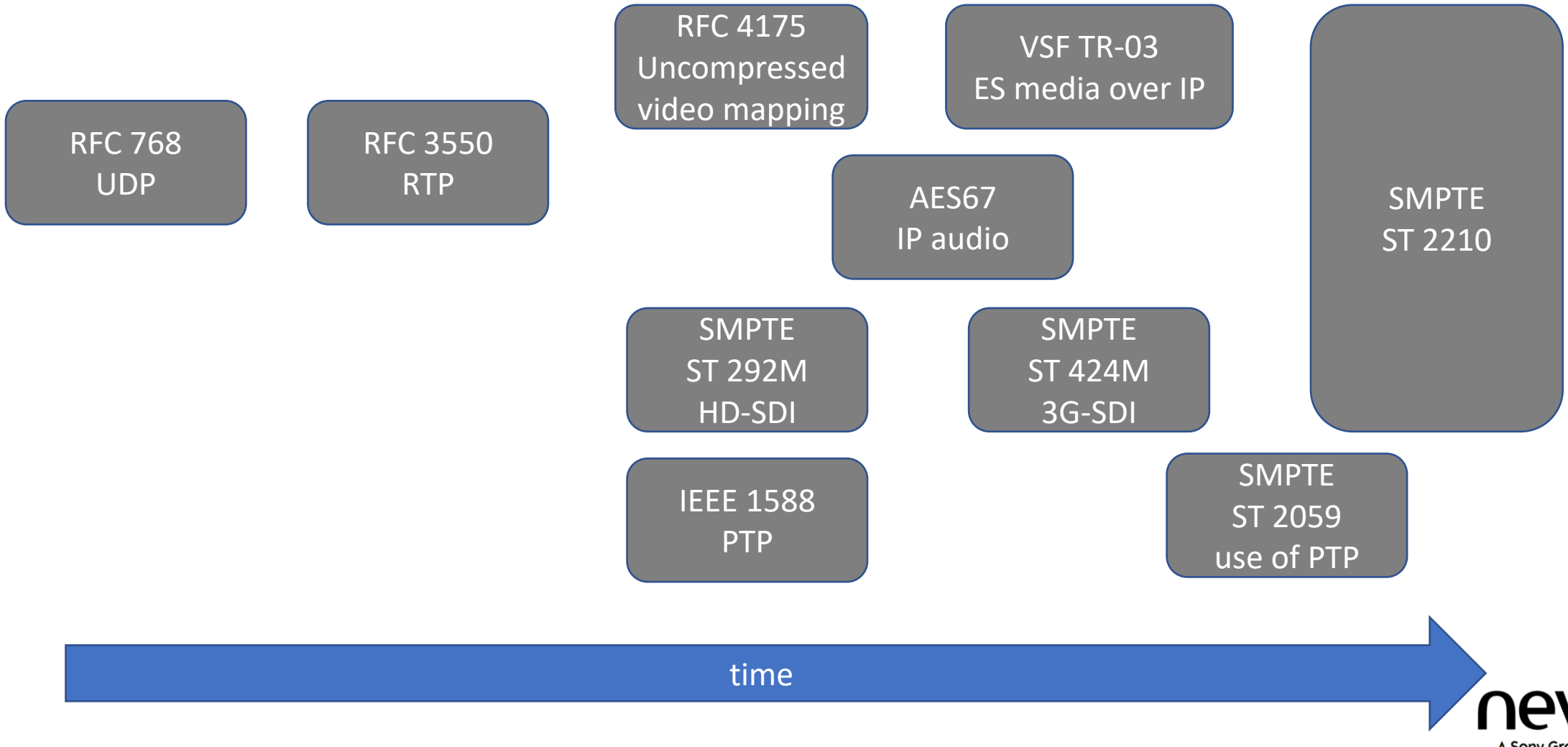
The fundamental challenges

Linear connection-based signal flow

Non-linear compute-based data flow

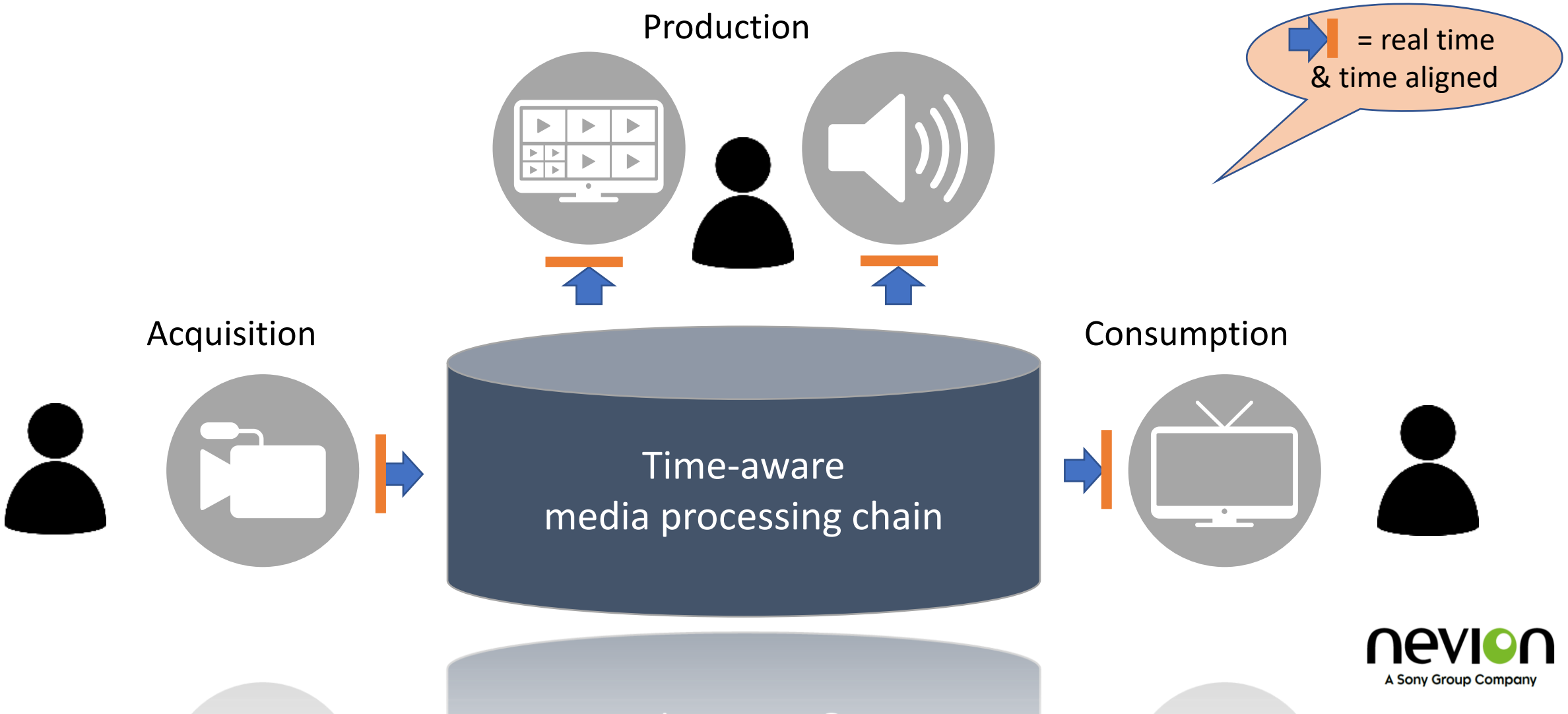
- Capturing time
- Tracking time
- Optimising time

The relevant linear standards journeys



The linear ST2110 suite (& NMOS ctl)

The broadcast end game



Why is ST2110-21 currently so critical?

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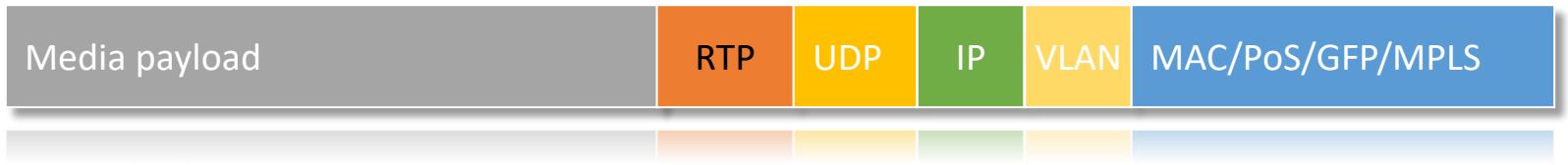
IP Packet integrity

UDP | TCP | SRD | RoCE



IETF RFC3550

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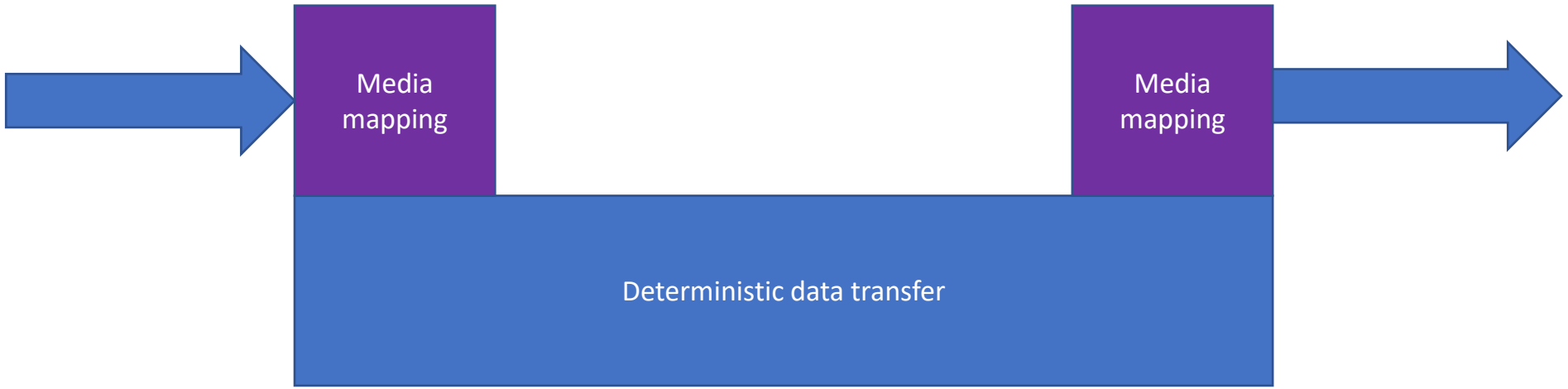
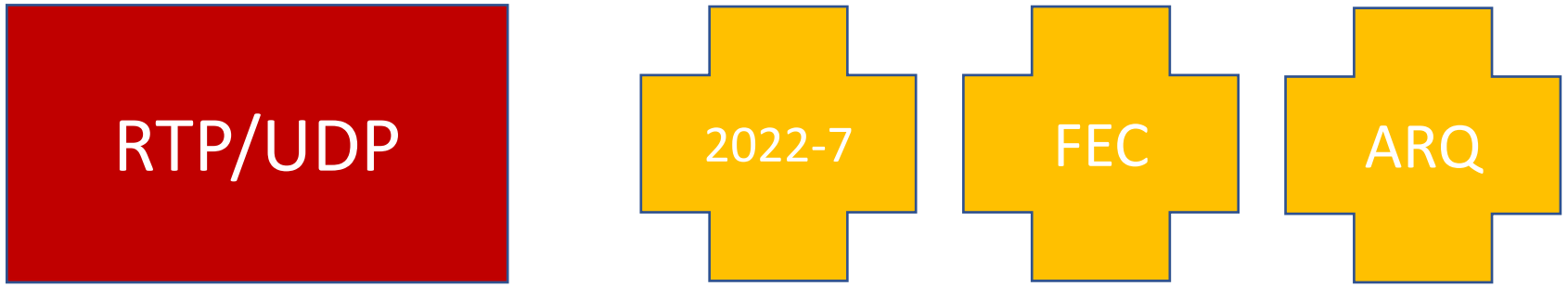
Data transfer between Virtual Processing Functions

Compute does not do linear data transfer easily!



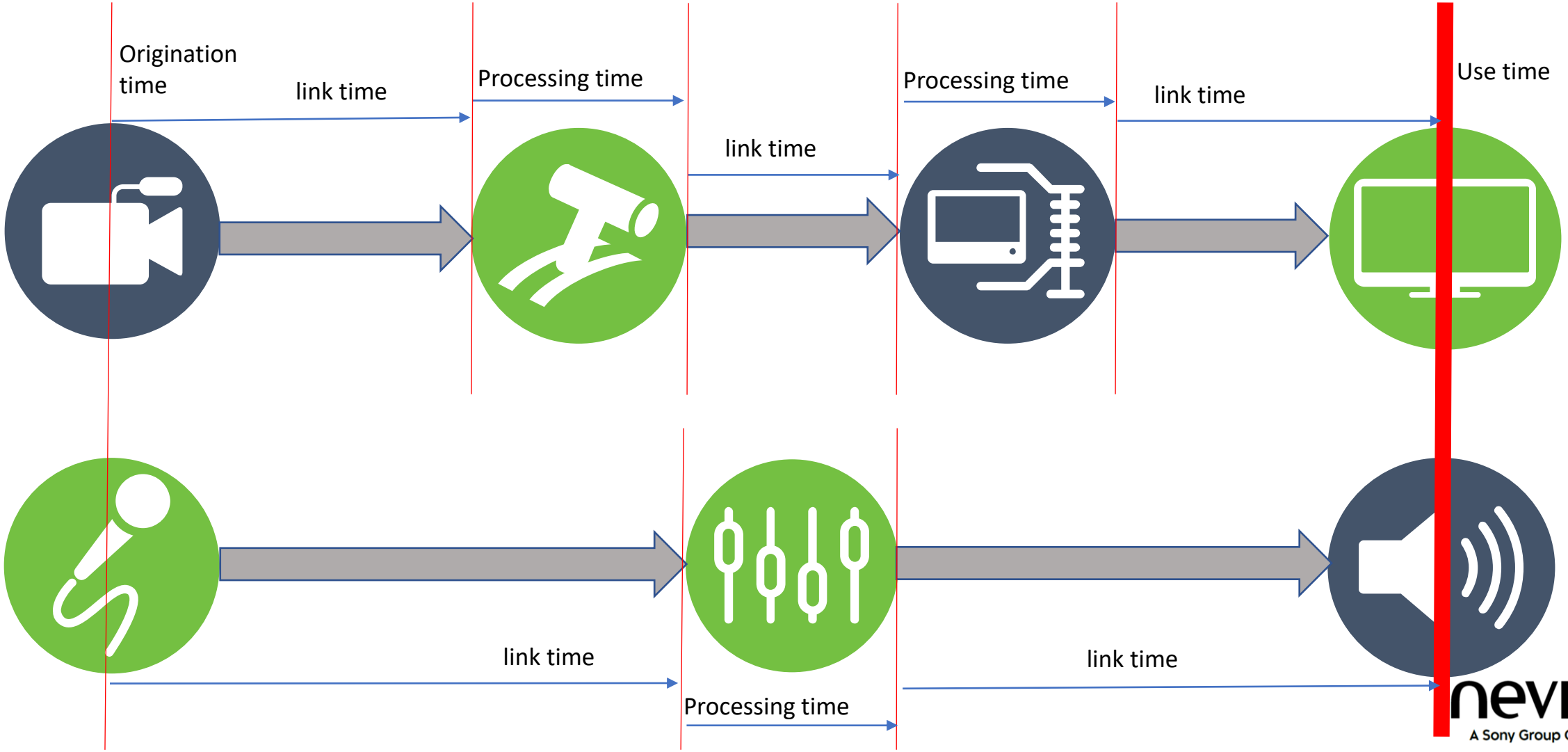
Deterministic data transfer



AWS CDI

SRD

Reconciling media essence timings



The ST2110 suite & NMOS - revisions

SYSTEM -10

VIDEO -20

AUDIO -30

AES3-32 bit AUDIO -31

ANCILLARY DATA -40

TIMING -21

COMPRESSED VIDEO -22

MULTI-PART VIDEO -23

SD VIDEO -24

FAST METADATA -41

FMX -42

2022-8 COMPOSITE

BCP-003-0x Security suite

IS-04 Discovery and Registration

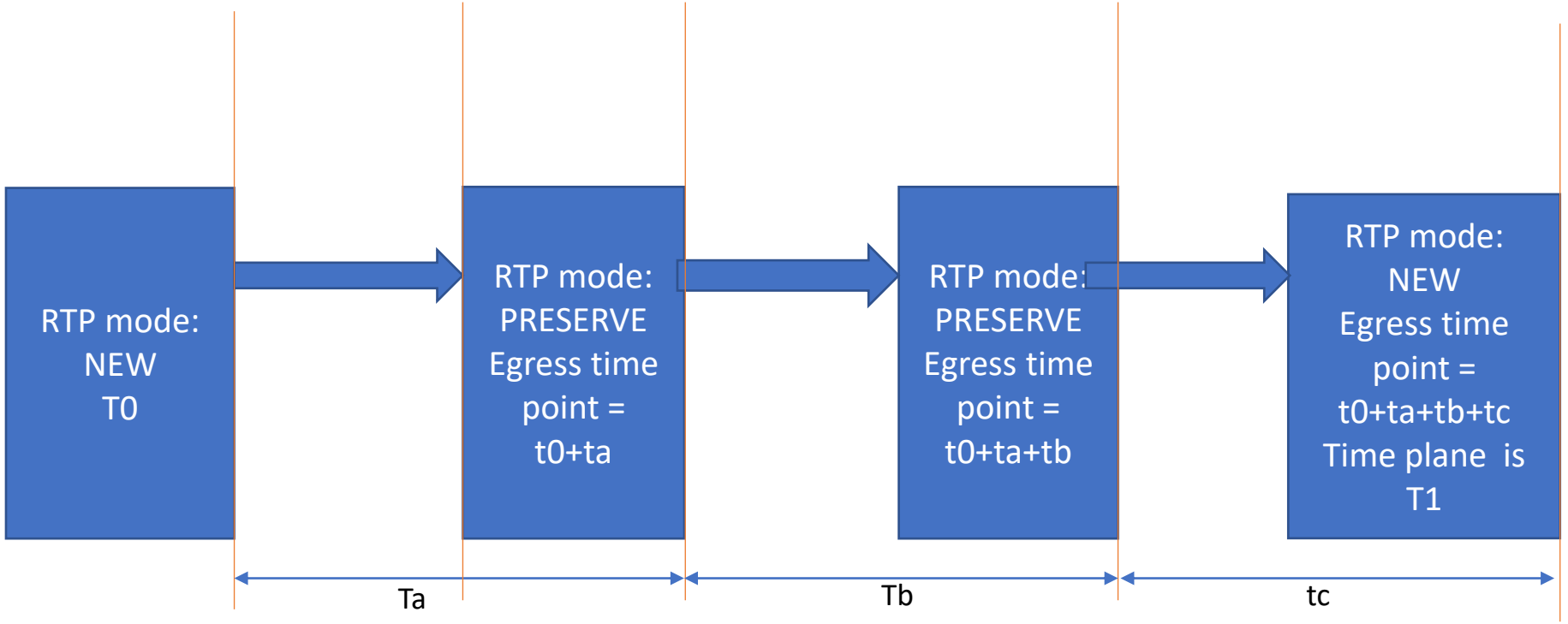
IS-05 Connection Management

IS-07 Event and Tally

IS-08 Audio Channel Mapping

IS-09 System

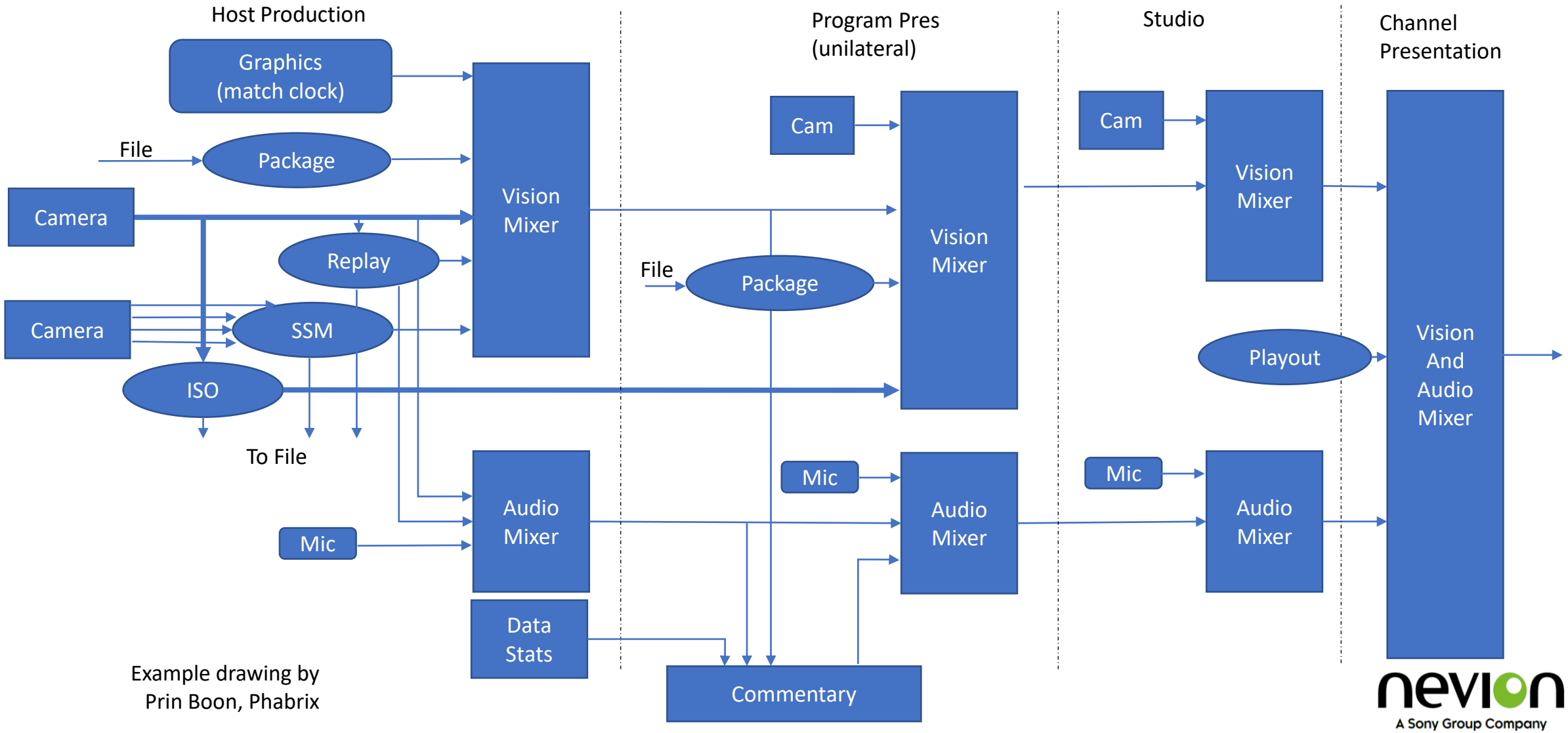
Timing propagation through system – ST 2110 revisions



Ta
= time from egress of previous device to time of egressing this device

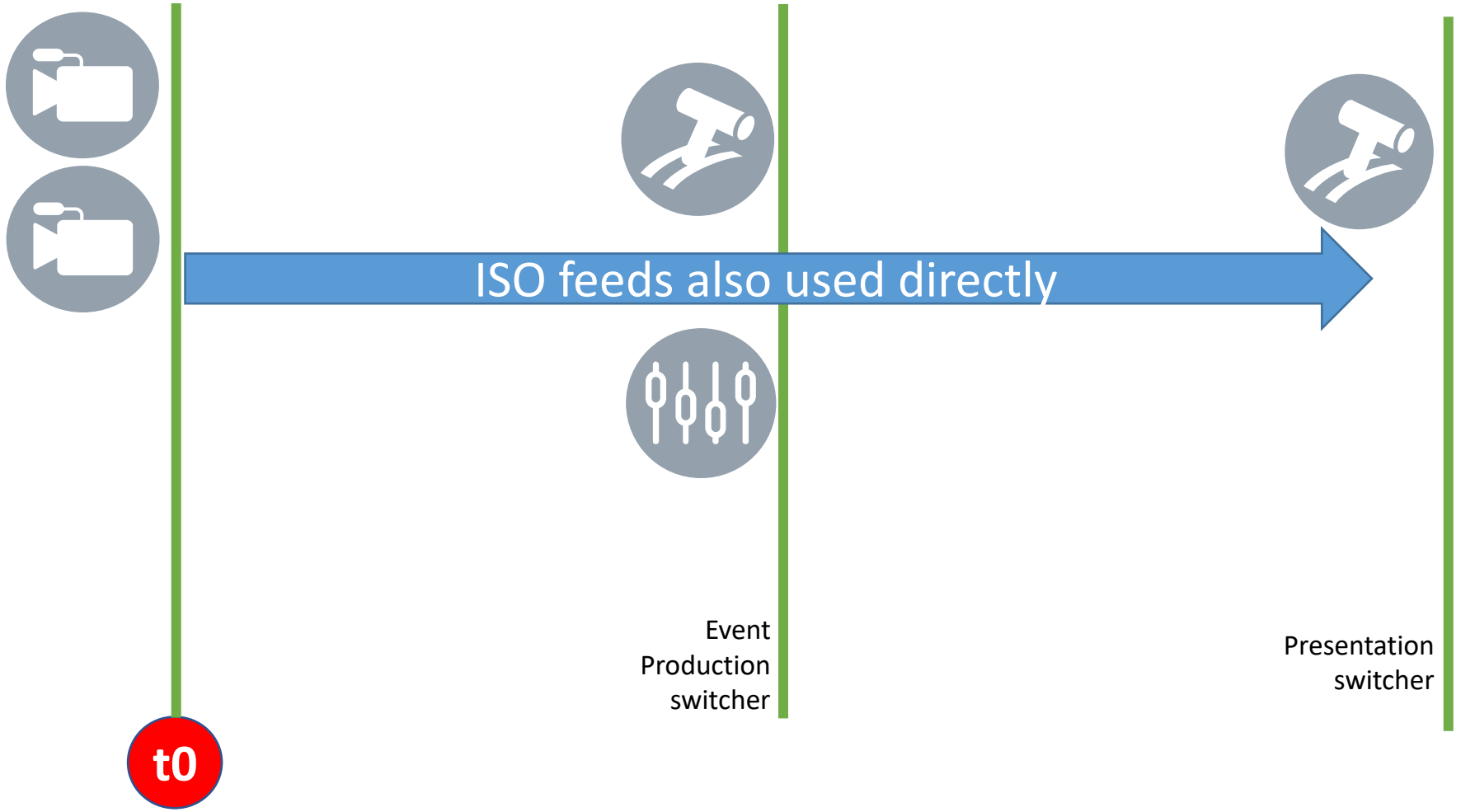
$T1-T0 = T_{NEWRTP} - T_{RTP}$

Example of production timing planes

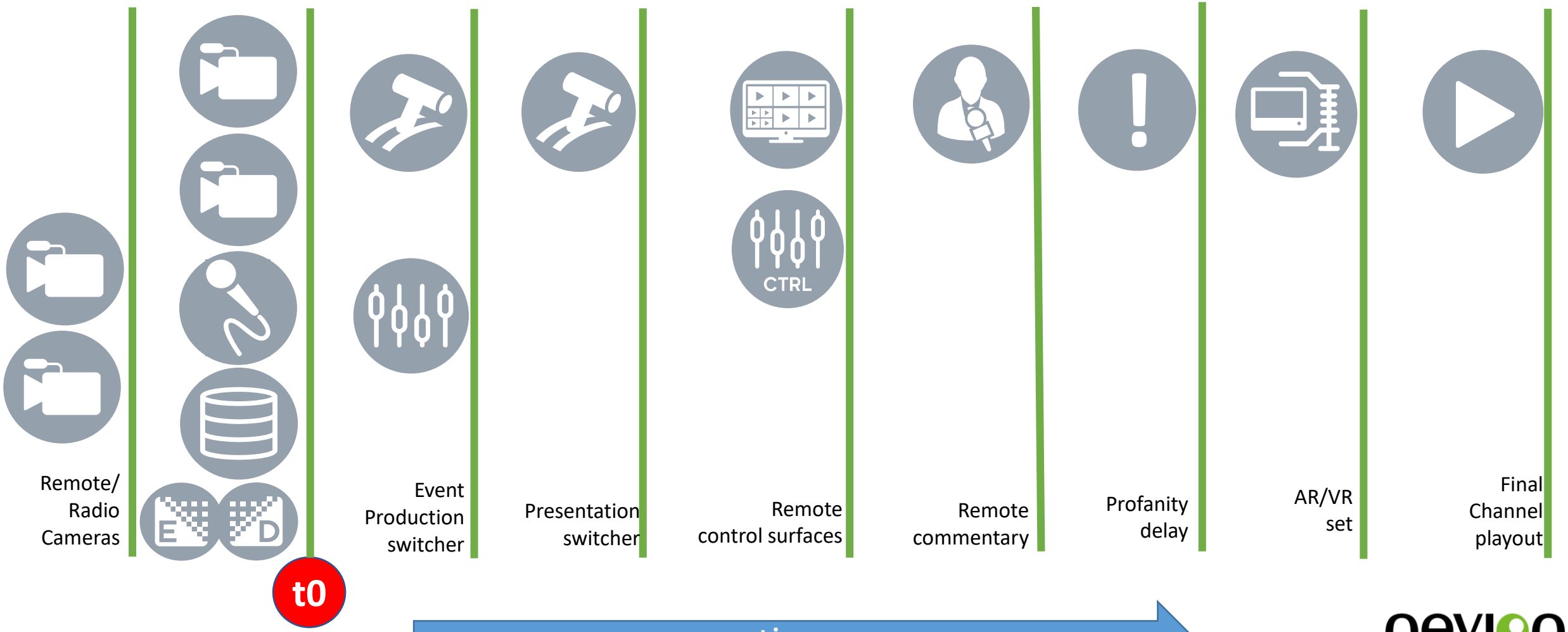


Example drawing by
Prin Boon, Phabrix

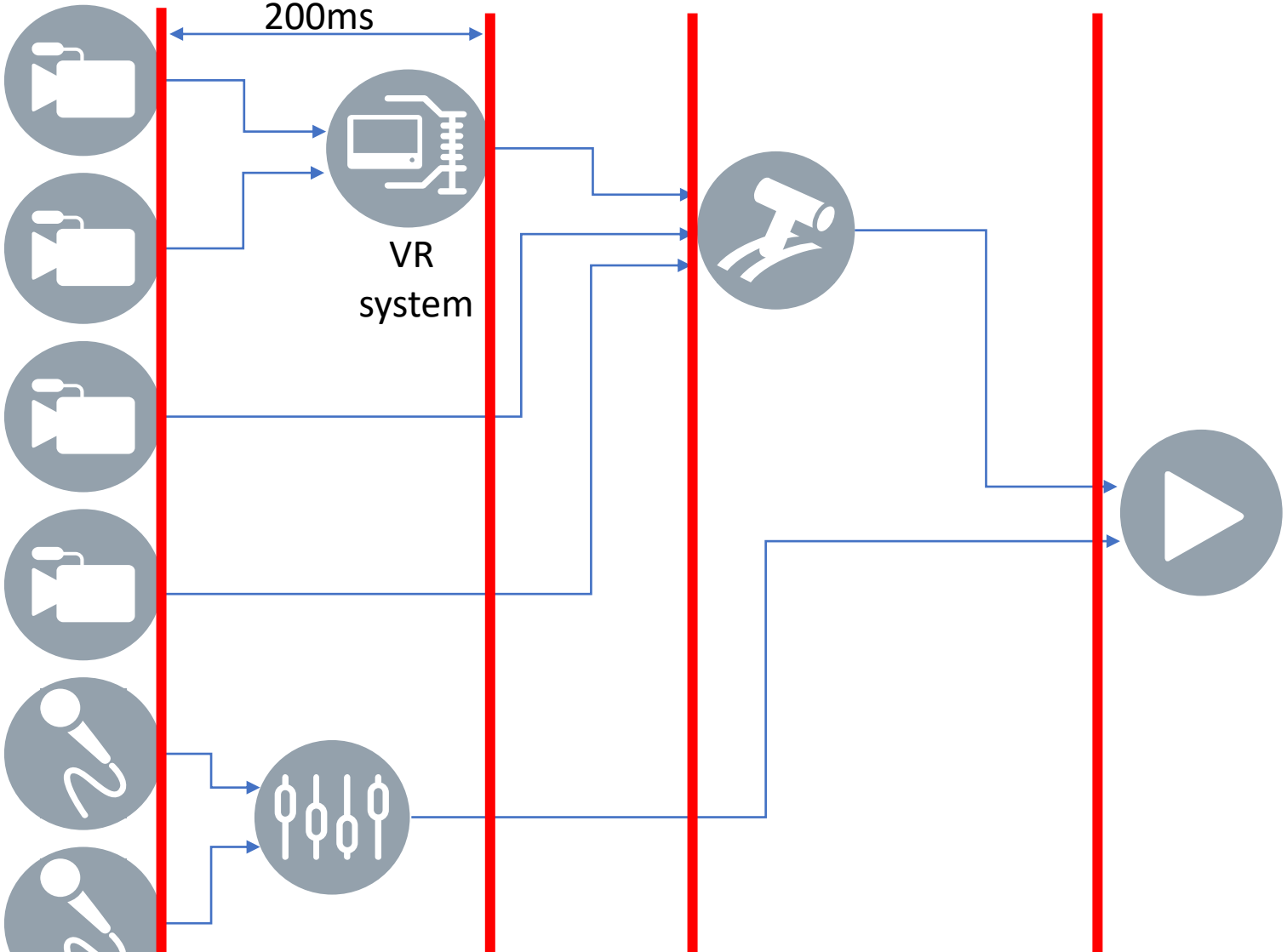
Sources that cross timing planes



Multiple production timing planes



Specific real-world use-case in 2021



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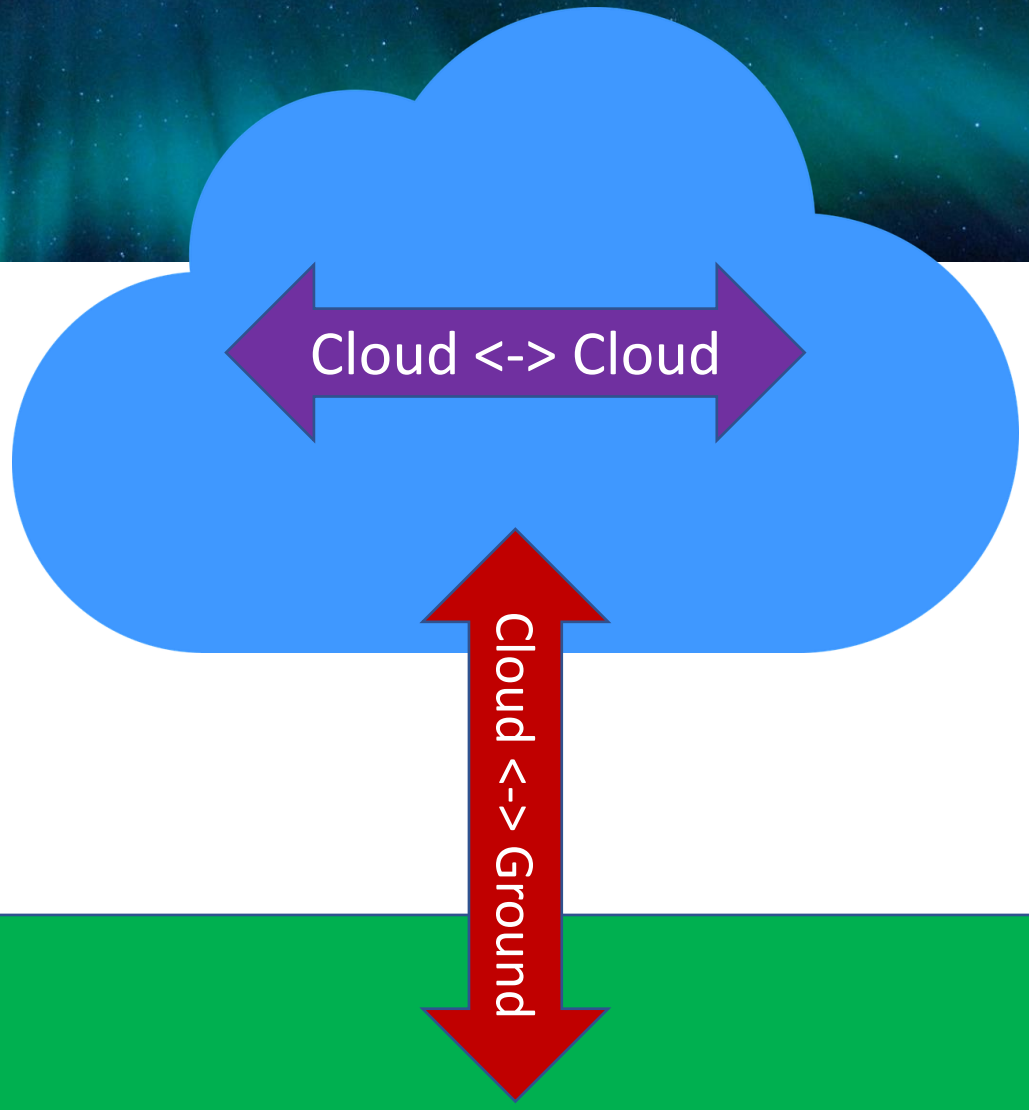
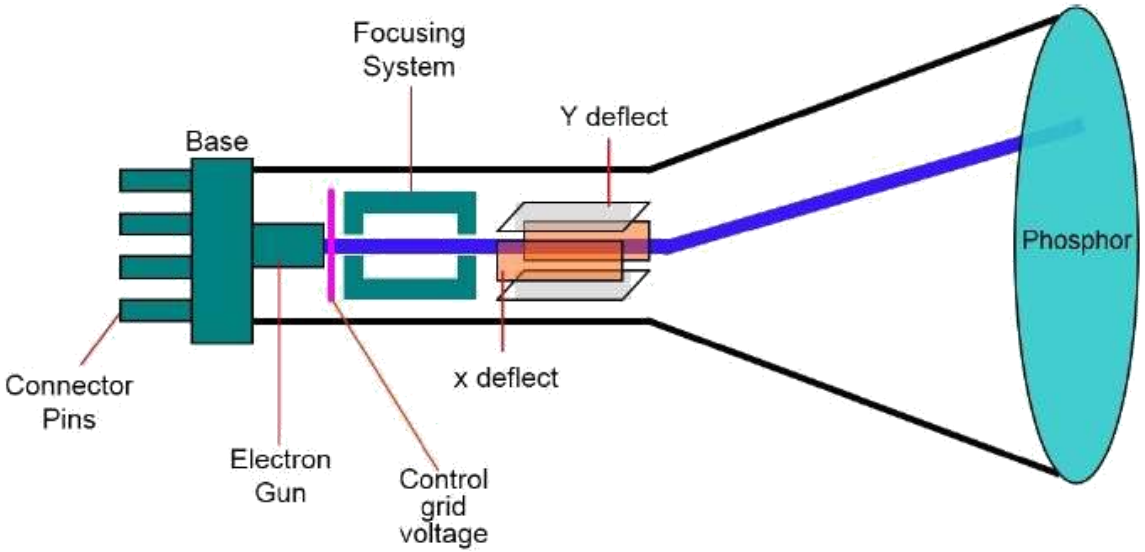
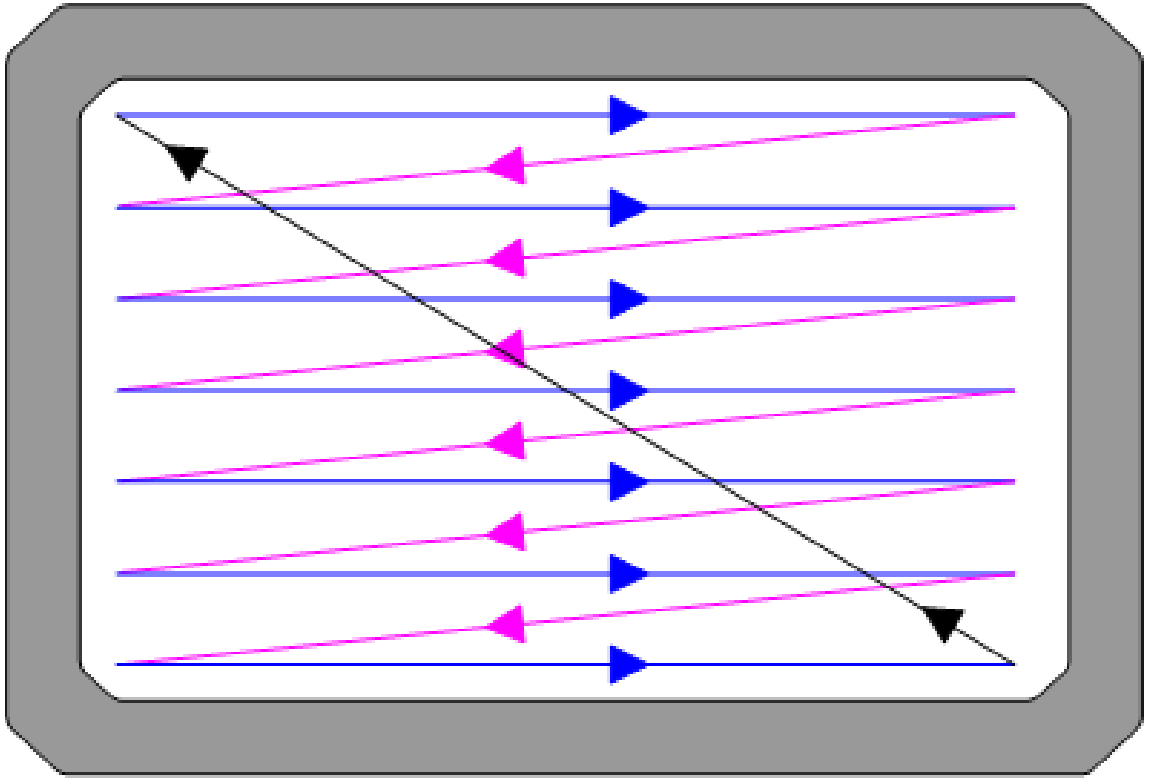
VSF GCCG



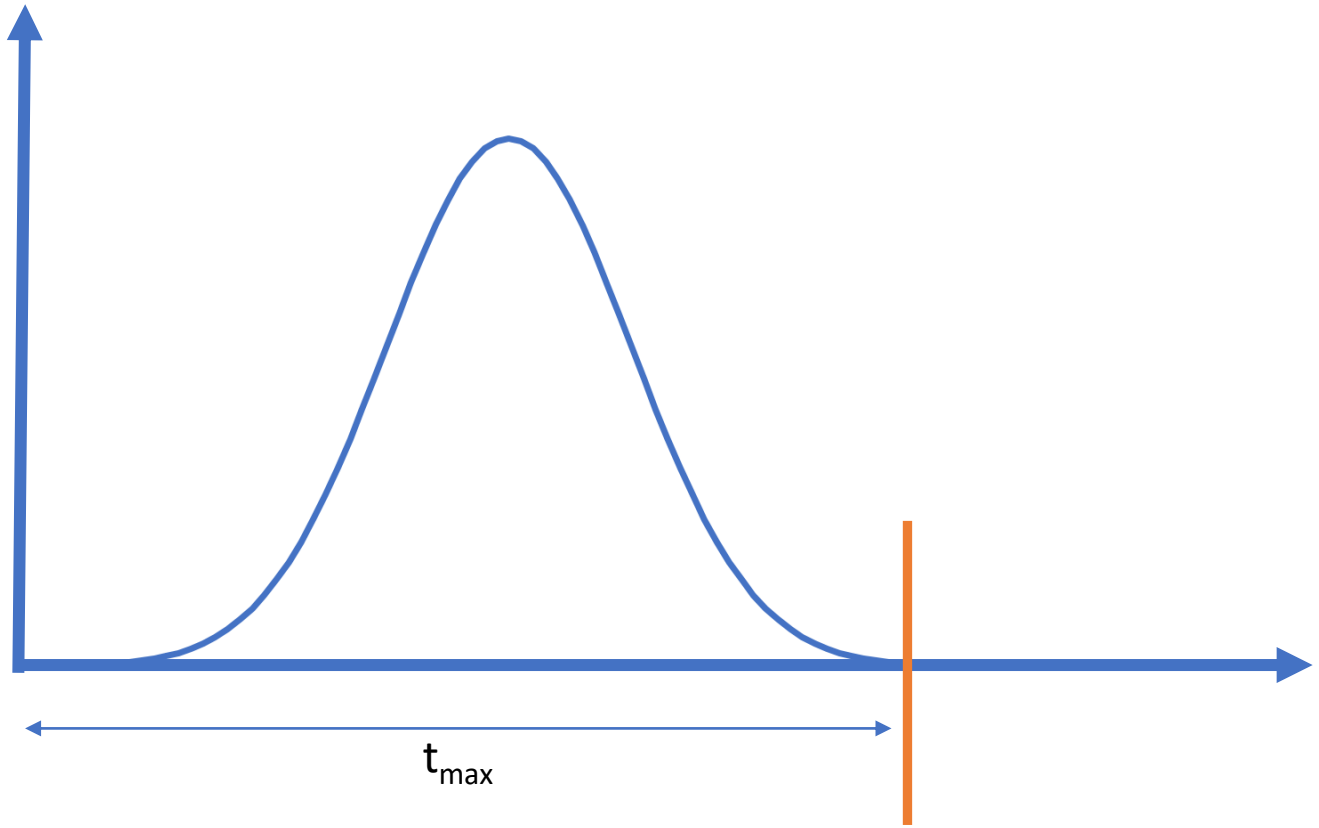
The raster scan





Linear broadcast technology

Software procession execution time



Compute doesn’t easily do linear data handoff

Compute latency and variability

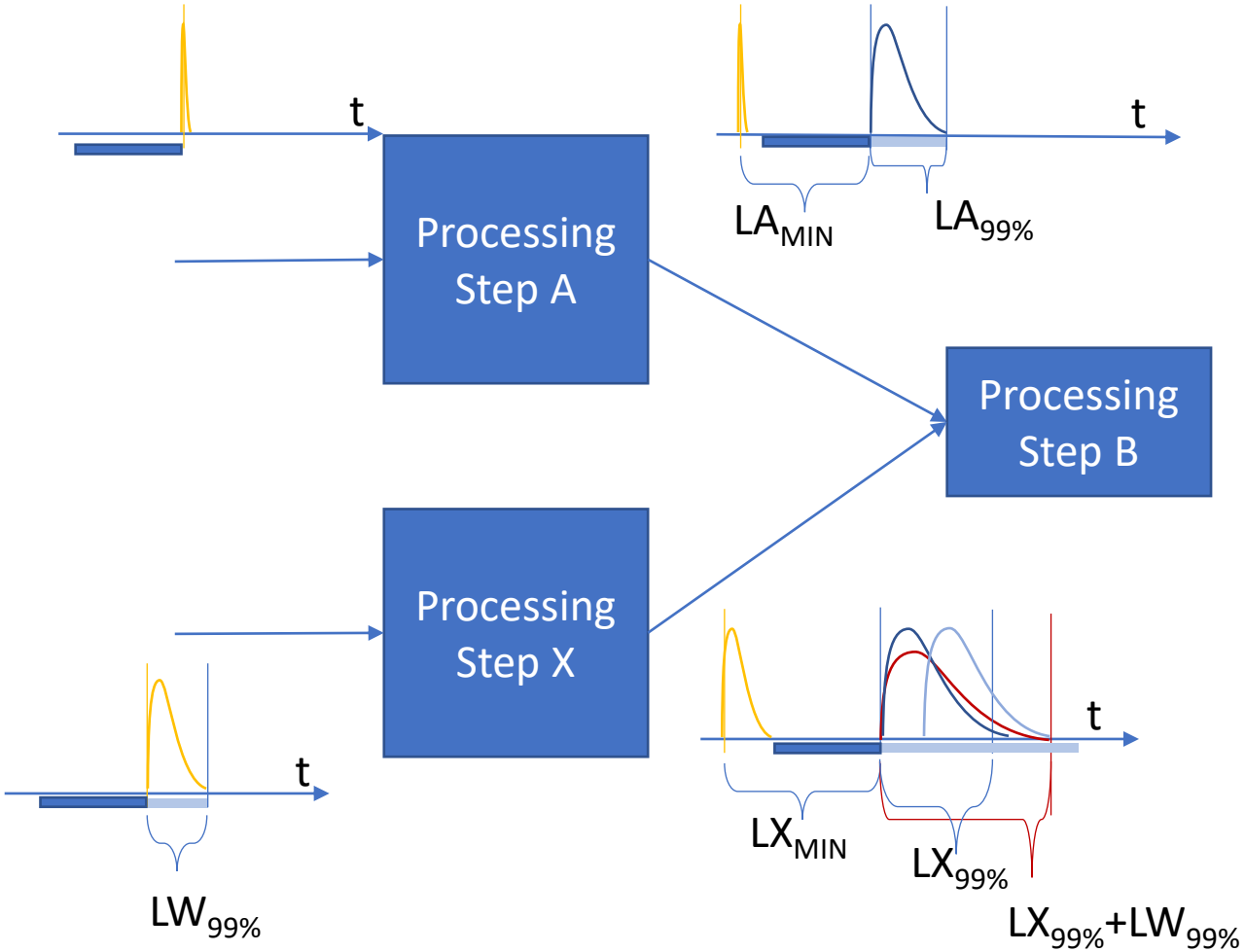
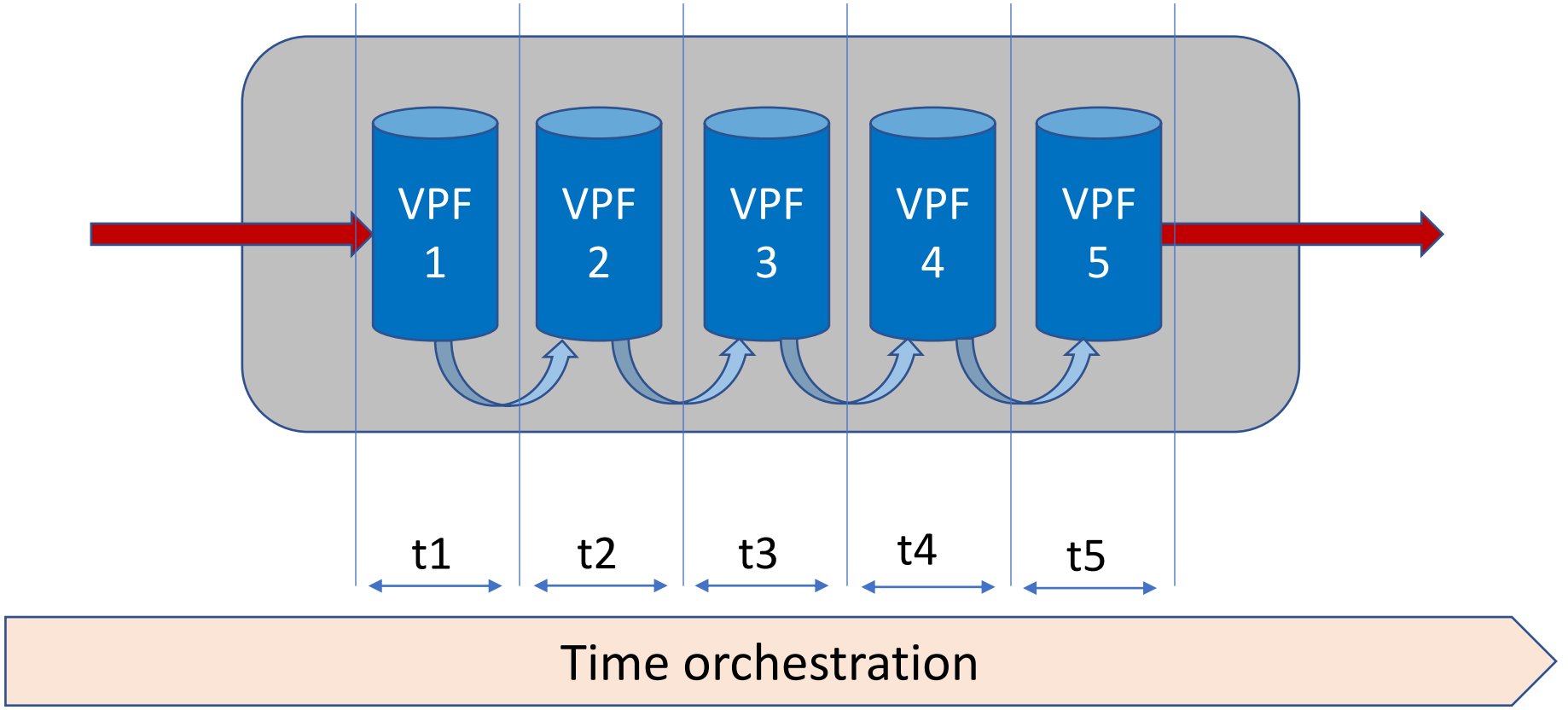
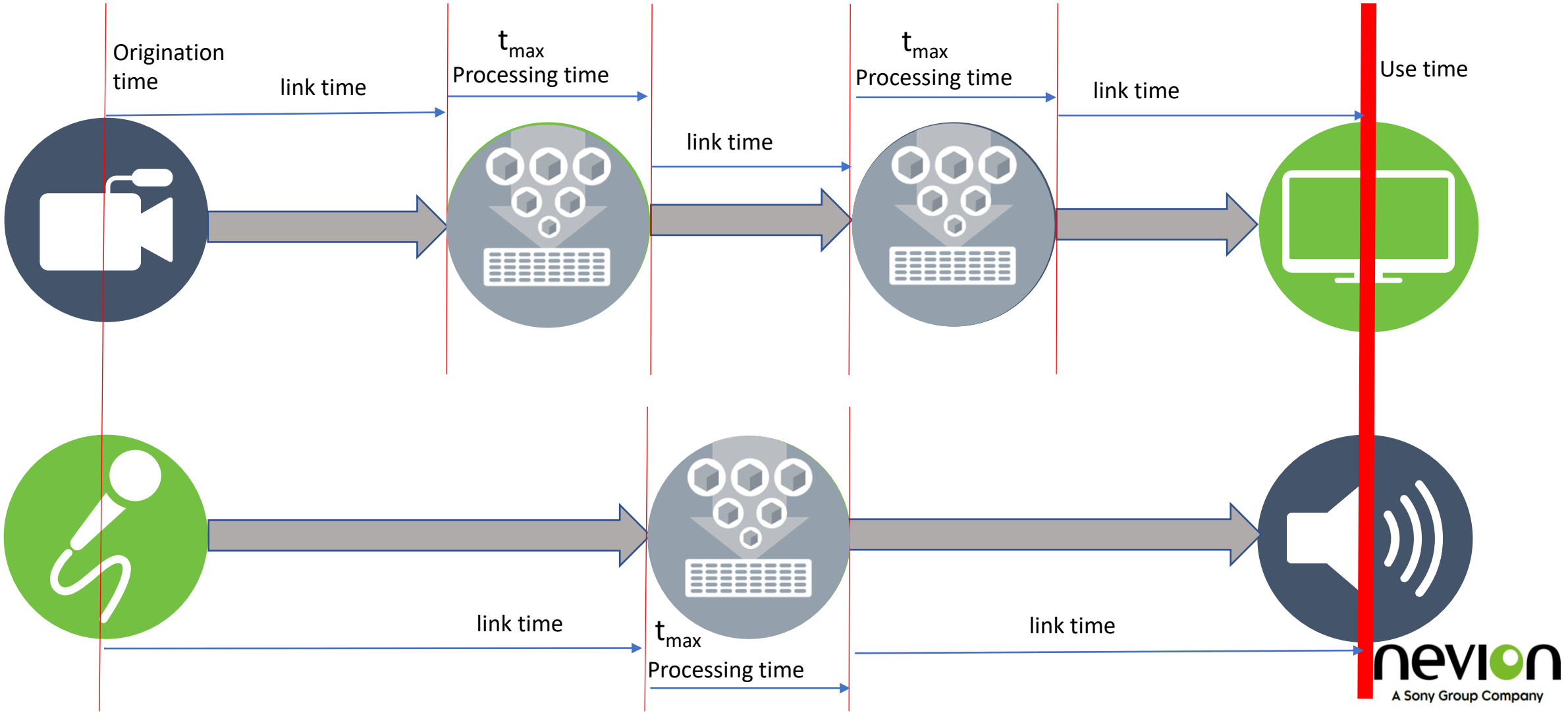


Diagram courtesy of VSF GCCG AG

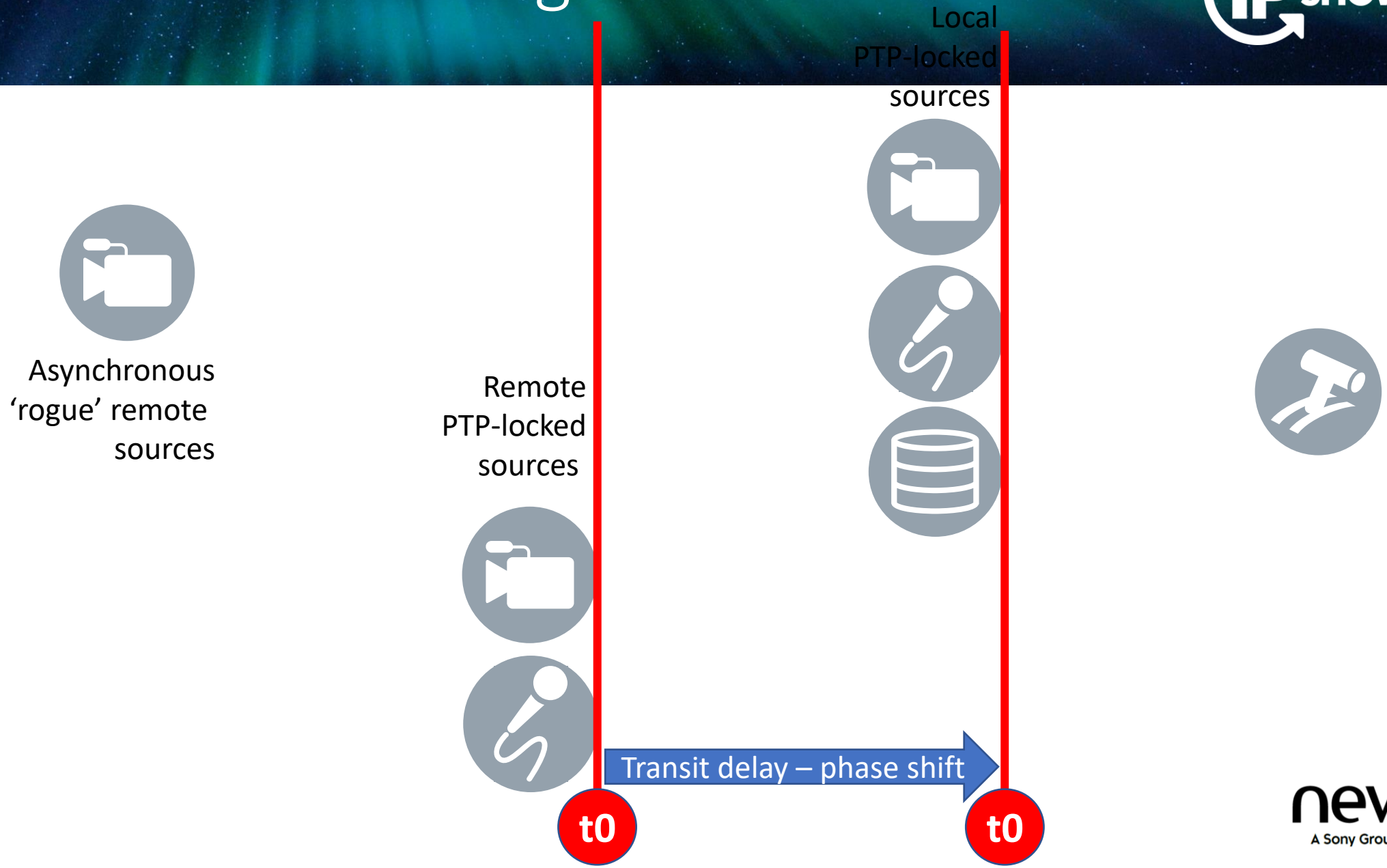
Concatenated virtual processing functions, each with defined (max) execution time



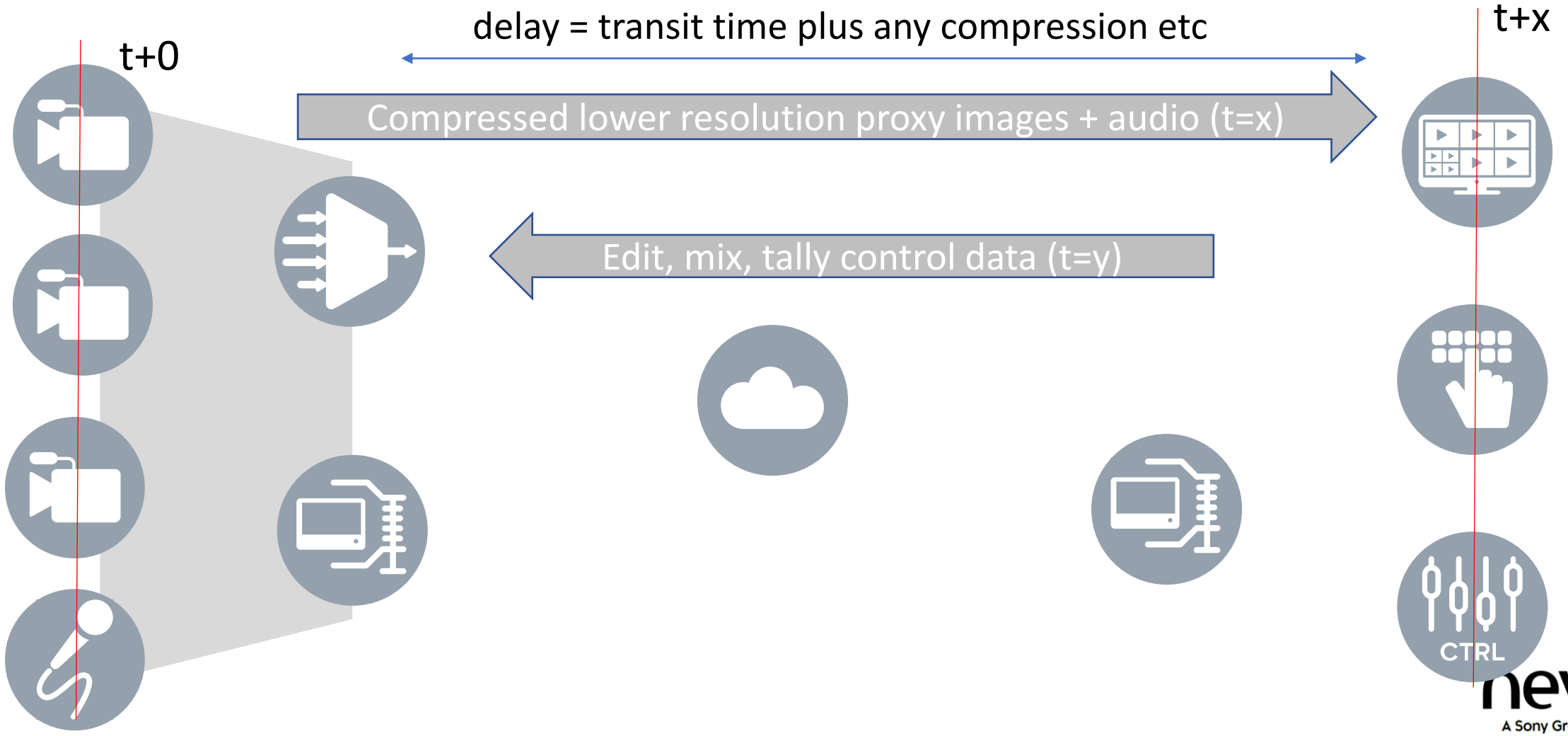
Same principles apply in virtualized world



Media Source timings



Proxy remote production timing reconciliation



Timing requirement examples

- Audio-video Iip sync ~5ms
- Coherent audio sync ~20us
- Absolute time delivery ~20ms

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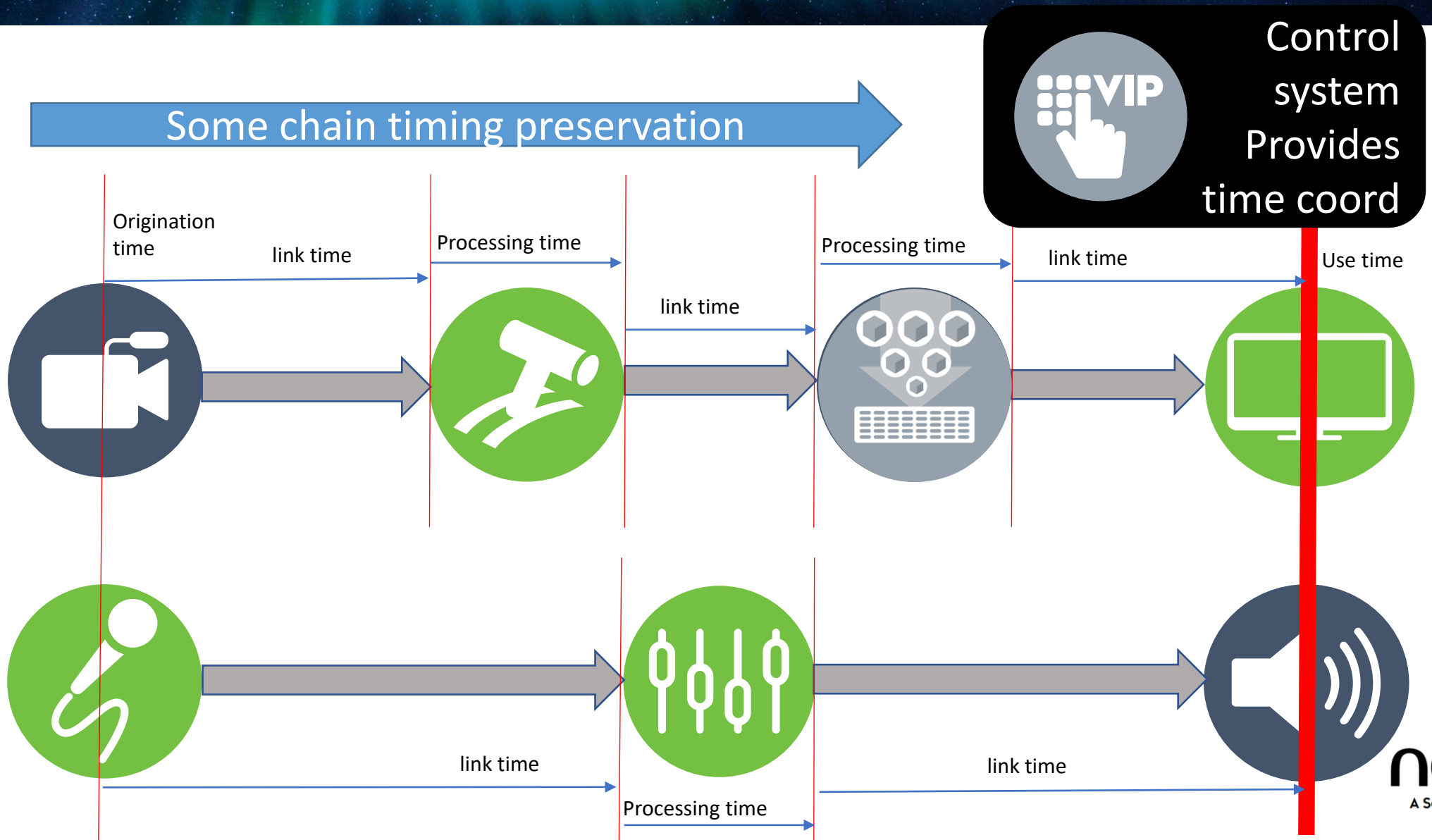
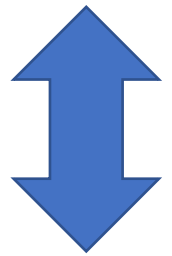
Hybrid timing reconciliation



What is needed to make this work

Control system **provides** time coordination



All media processing devices throughout chain **provide** necessary information and **accept** required configurations

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In-flight SMPTE RP/EG: ST2110-11

Draft an Recommended Practice document that defines a workable ecosystem to provide 'automatic' reconciliation of media essence timing at any point along a production chain.

Still time to get involved!

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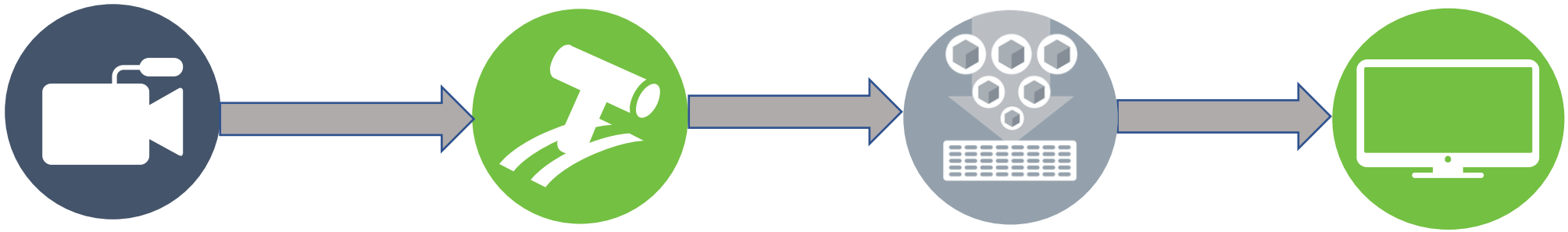
Optimising latency

Frame n	Frame n+1	Frame n+2	Frame n+3



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The fundamental challenges

Linear connection-based signal flow

Non-linear compute-based data flow

- Capturing time
- Tracking time
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Back 13:00 Sunday & 10:30 Monday

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IP networking tutorial
11:00 SUNDAY

Audio in live IP production
10:30 MONDAY

Thank you!

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Any Questions?

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