Moving Forward with Broadcast Technology
- Leaving the Legacy Behind?

Andy Rayner, Chief Technologist, Nevion

arayner@nevion.com

+44 7711 196609

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

The VSF YouTube video channel
- lots of exciting diversified content!

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Broadcast technology

The Good Old Days

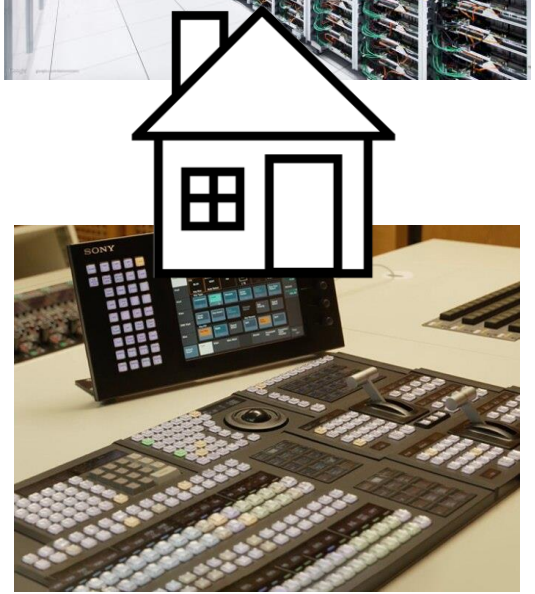
nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

The traditional broadcast chain

VSF
VIDEO SERVICES FORUM

The emerging broadcast chain



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

TV delivery & consumption evolution

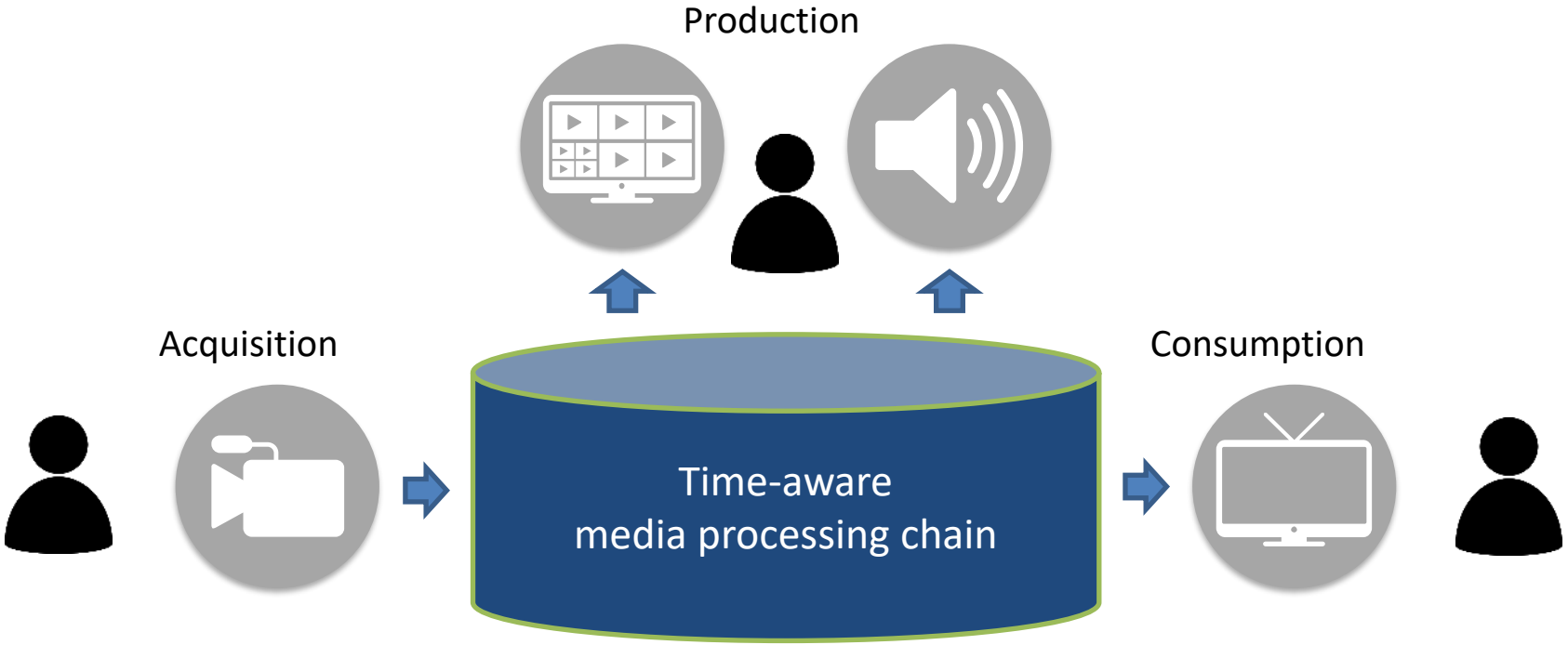
Linear

On-demand

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

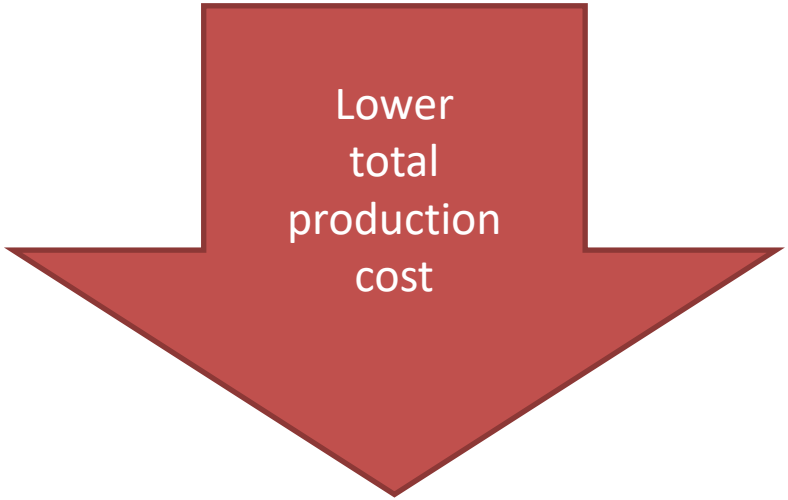
The broadcast end game

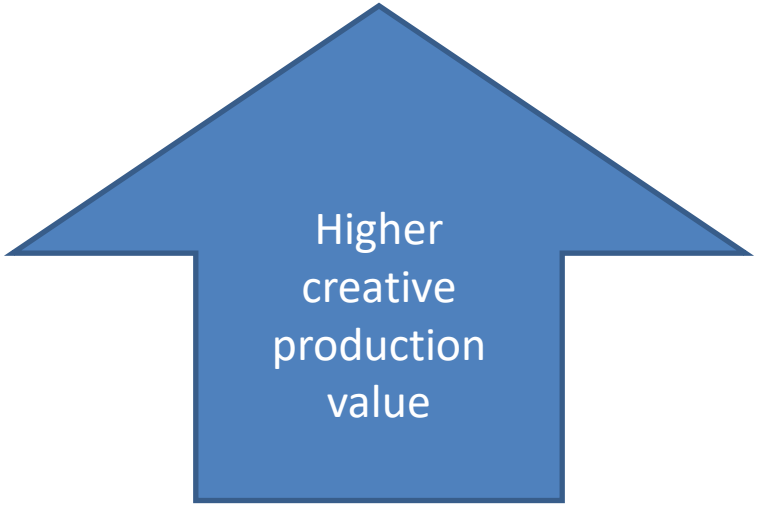


nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

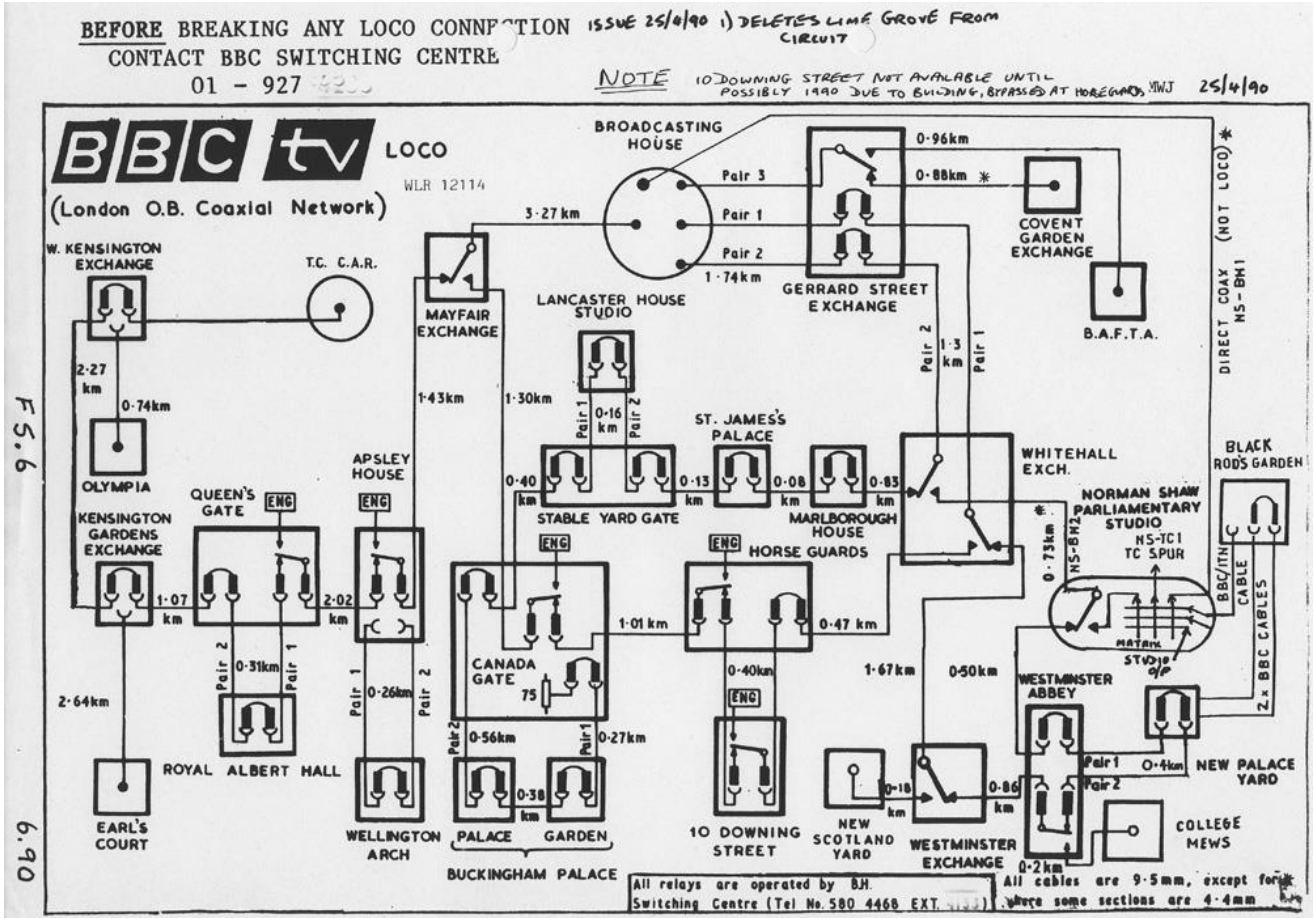
Key content producer requirements

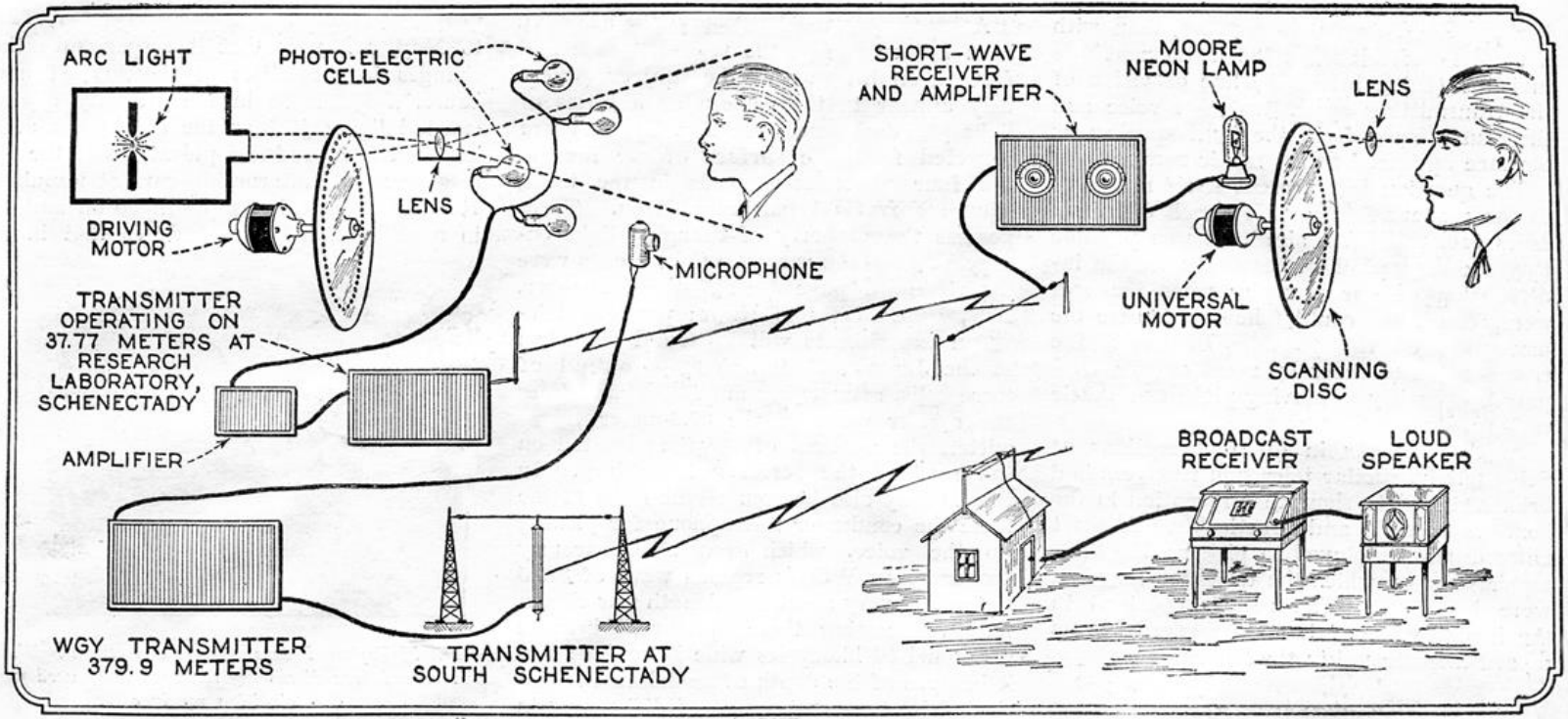




nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM





A diagram of the Alexanderson method of operation in the transmission and reception of television. At the upper left are the transmitter for the image and the microphone for the voice, which is broadcast on a different wavelength. ***At the right are the receivers for television and speech.***

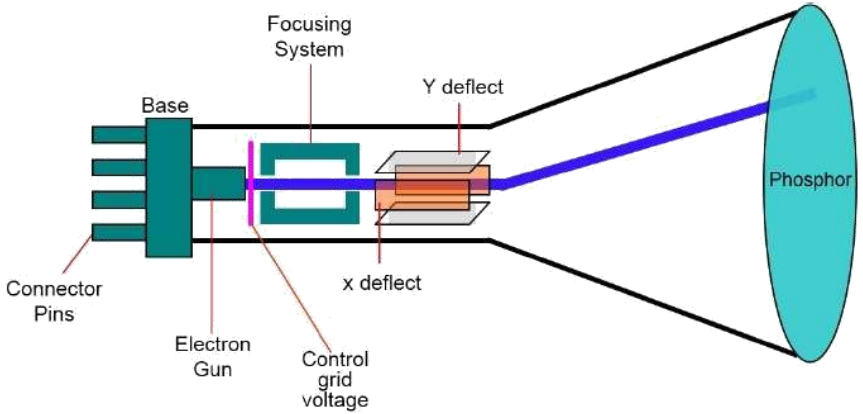
In the beginning……

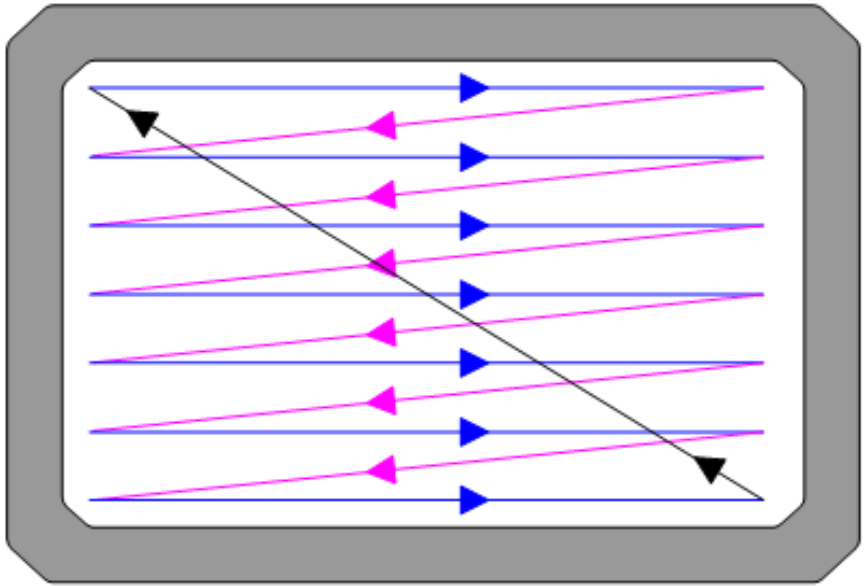
Betty Bolton

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

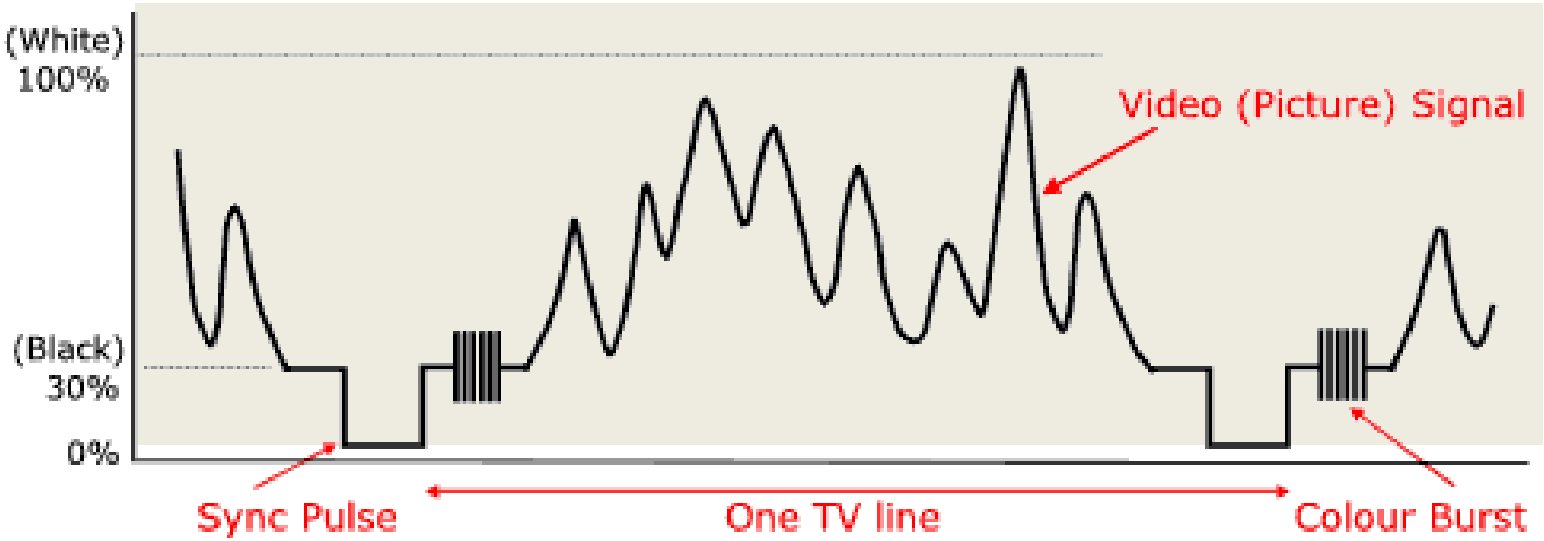
The raster scan





nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Interlaced video

Leon Theremin

Fritz Schröter

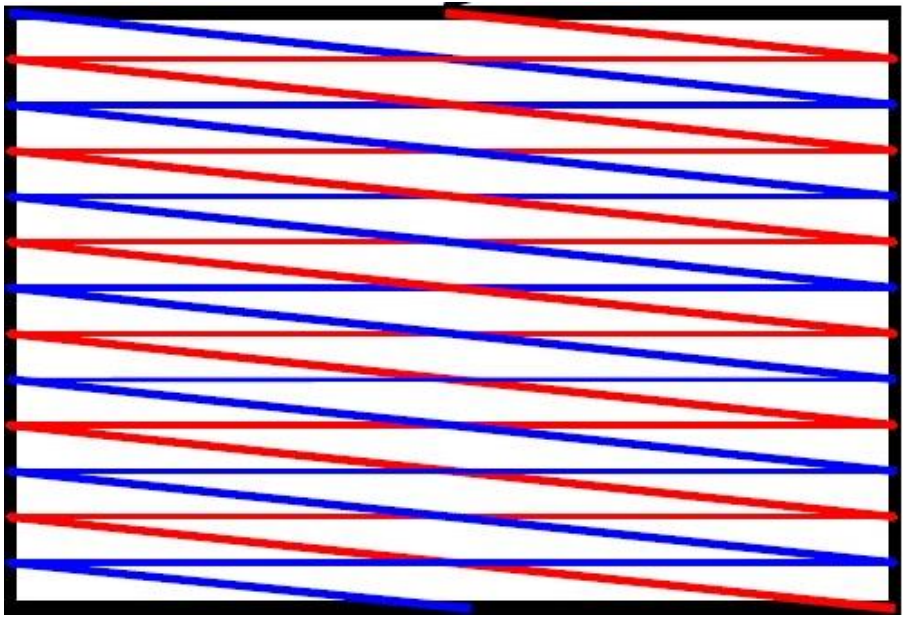
Randall C. Ballard

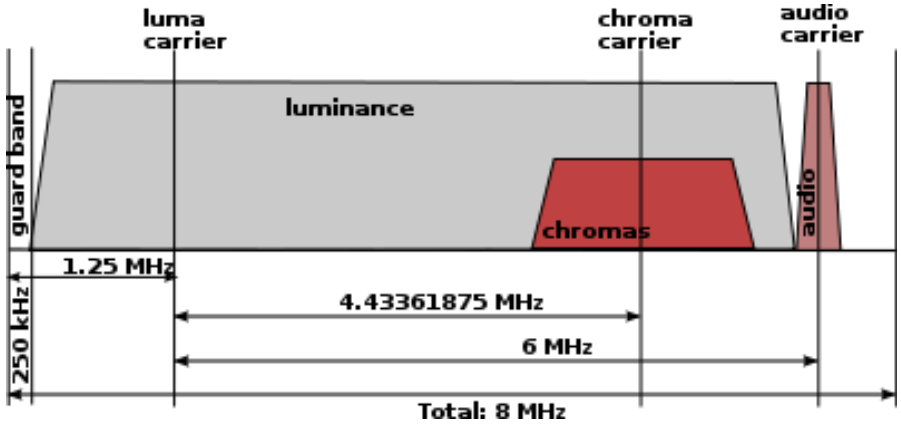
1930s
200 lines @ 50Hz

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Raster scan plus other clever inventions that continue to give us legacy
- interlace (1932), Colour subcarrier (& FFR) (1953)

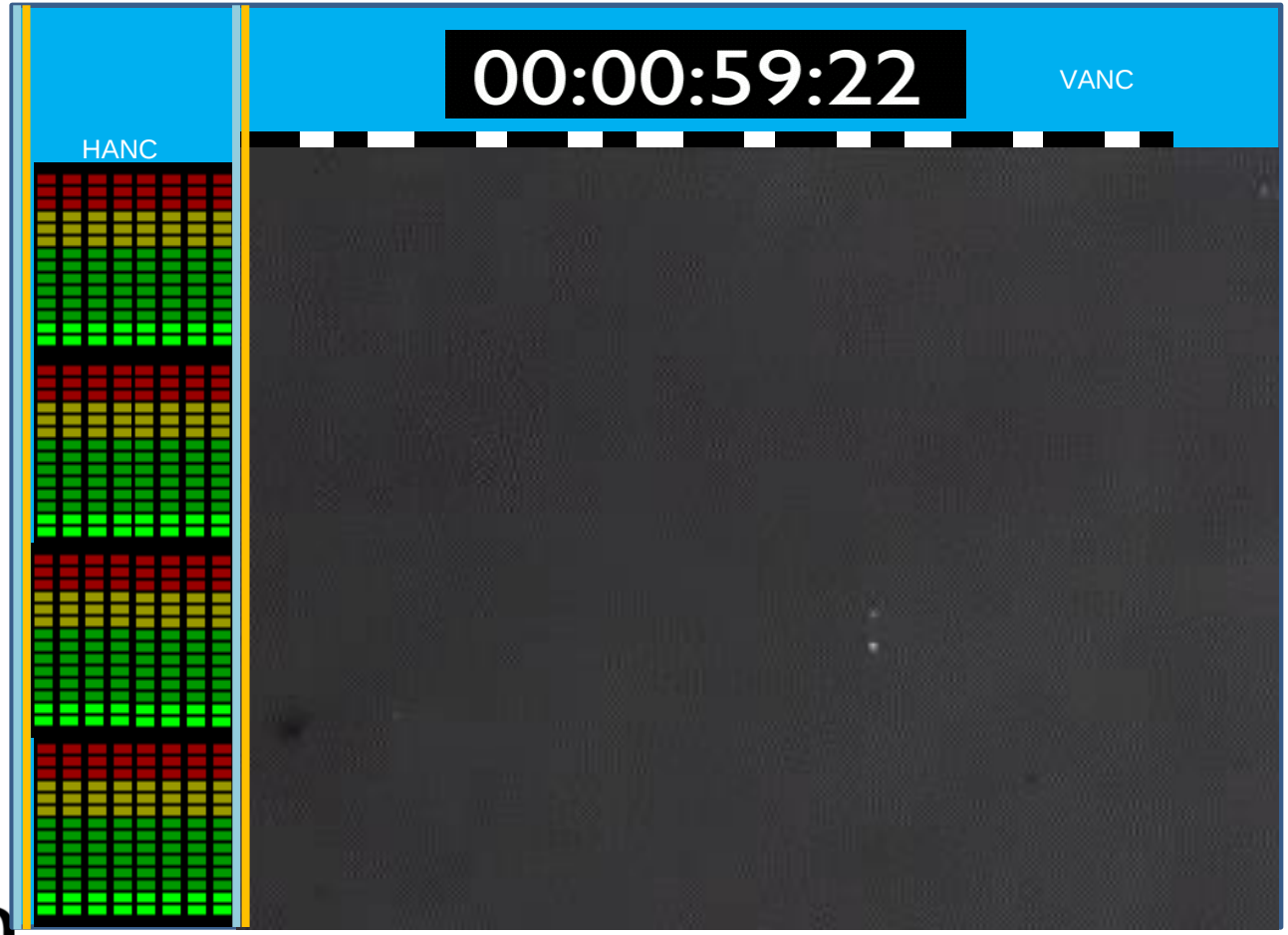




nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

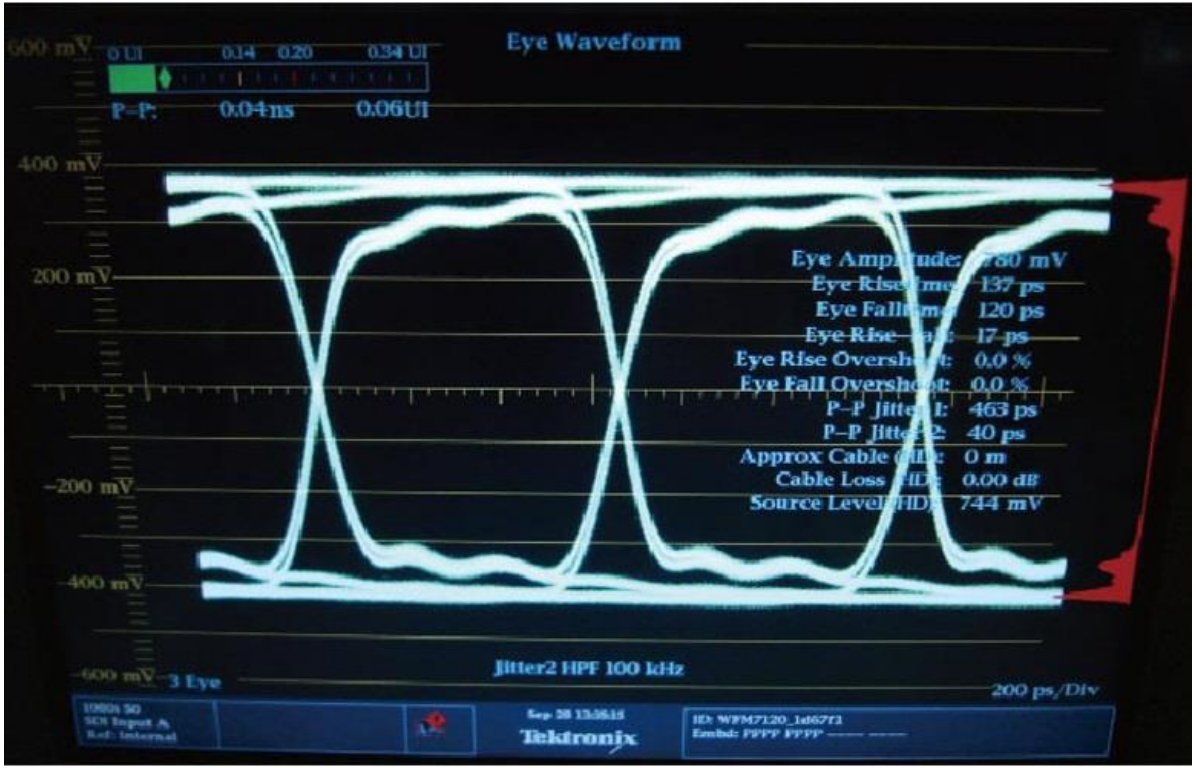
Then came **SDI**



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

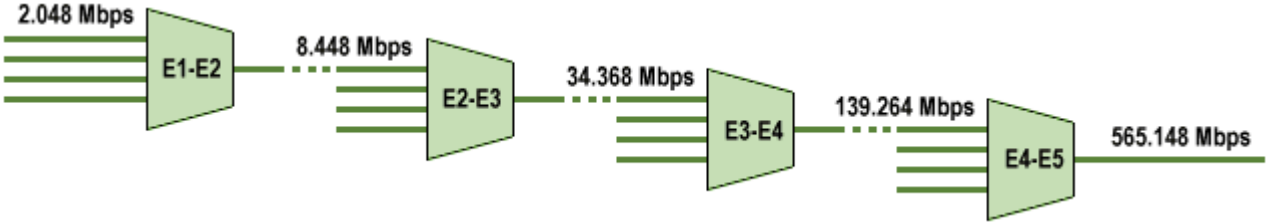
Responsibility for physical transport layer

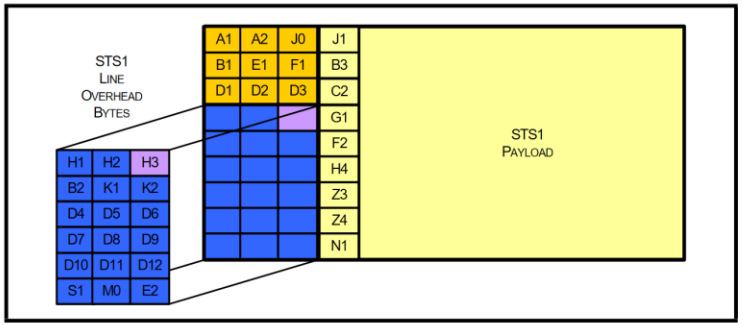


nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Coping with timing in transmission evolution



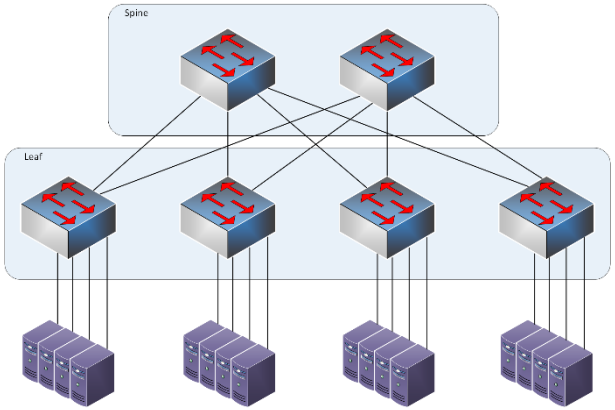


ITU-T Y.1540 PDV

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Broadcast transport now uses IT IP technology



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Distance independent transport

- Finally - a physical transport layer the broadcasters don’t need to worry about
- We need
  - Integrity (~ zero packet loss)
  - Consistency of delivery (low PDV)
  - Lowest possible latency
  - Ability to carry timing information

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Monochrome Analogue video

Composite PAL/NTSC Analogue video

SDI

SDI

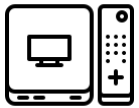
IP

IP

Analogue mast

Analogue mast

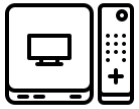
Analogue Satellite



Analogue Cable

Analogue mast

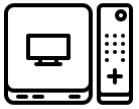
Analogue Satellite



Analogue Cable

Digital mast

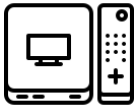
Digital Satellite



Digital Cable

Digital mast

Digital Satellite



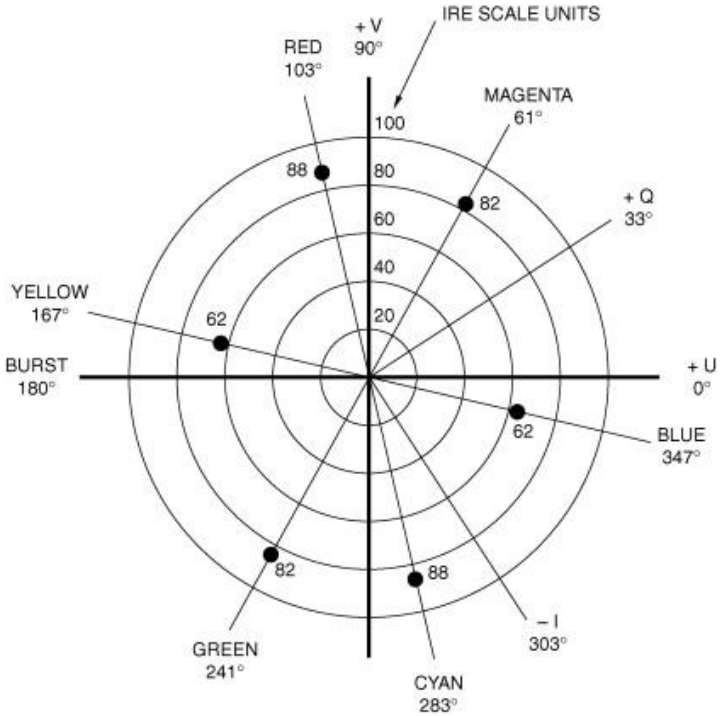
Digital Cable

Internet delivered

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

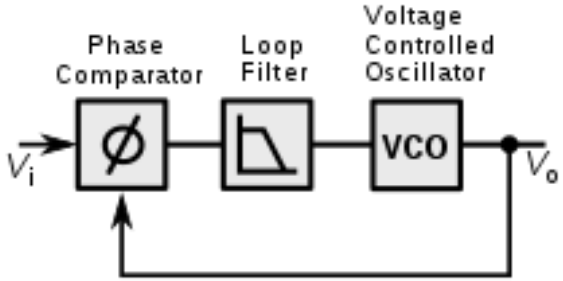
Legacy subcarrier accuracy demands



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Engineering limitations potentially still in the chain

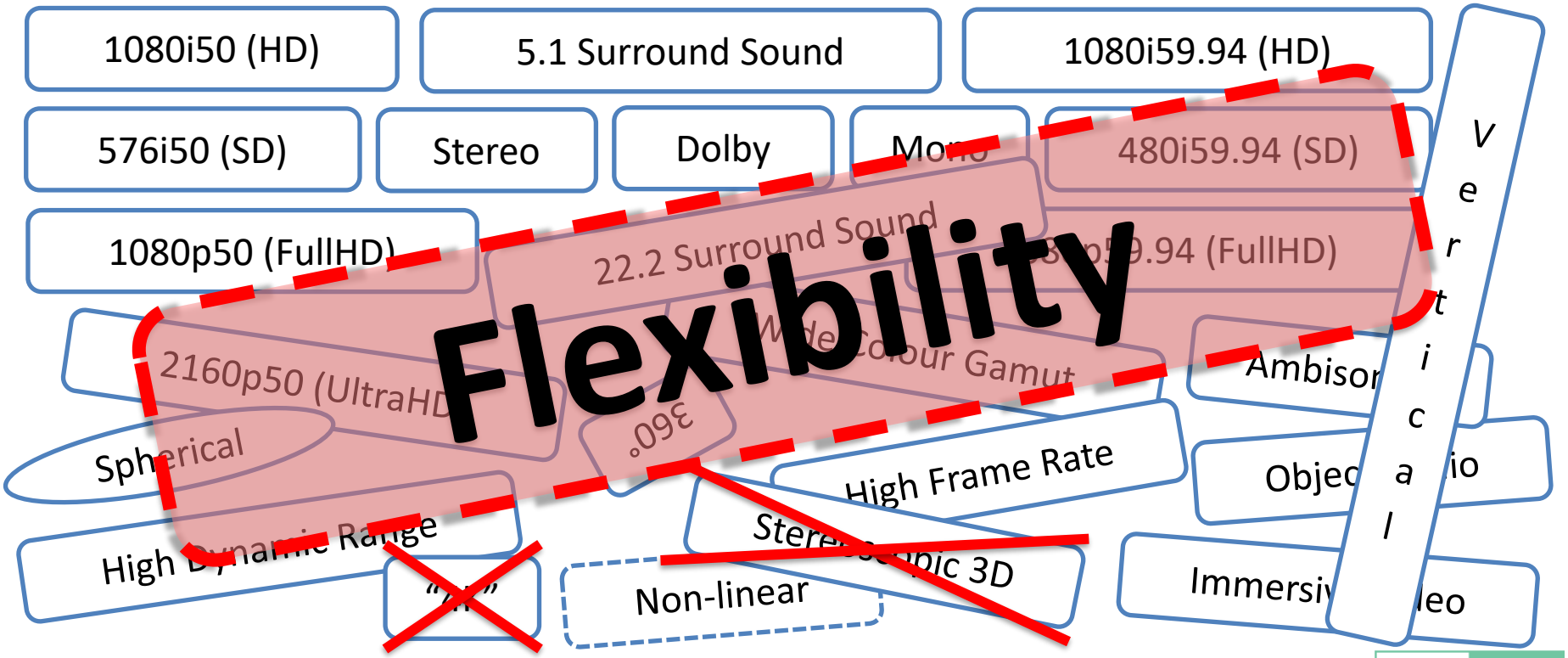


± 20ppm

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Why move to IP?



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

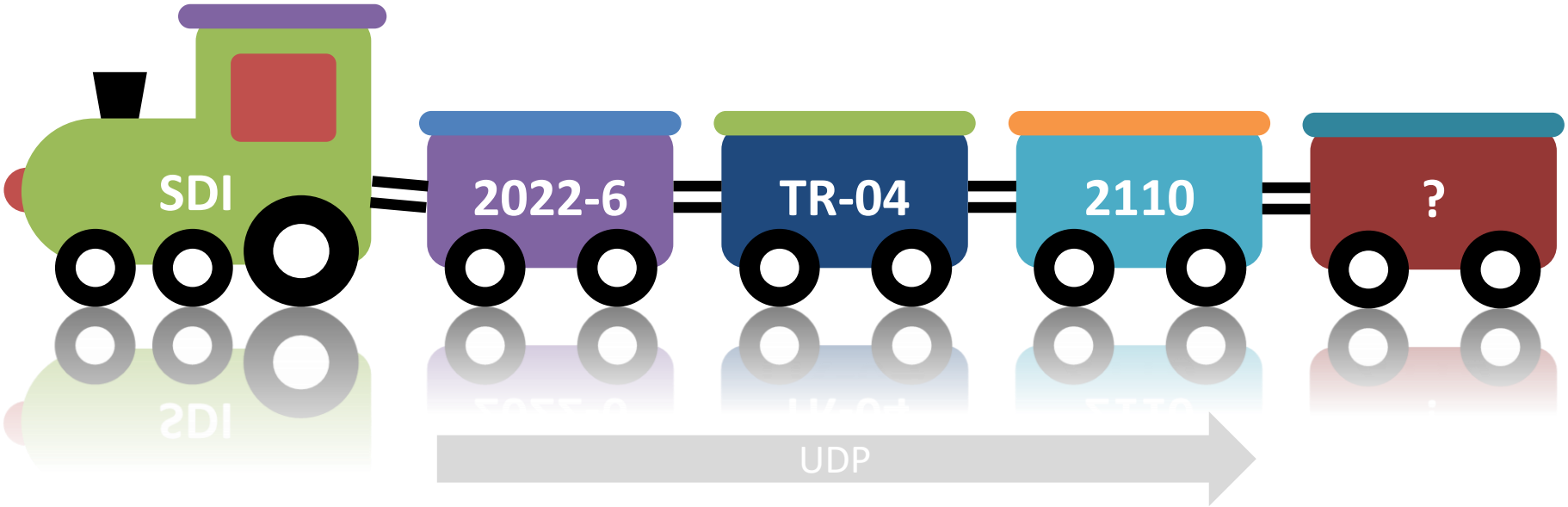
Some of the aims of ST 2110

- Use IP for transport of all media flows
- Transport individual media ‘essence’ flows
- Scalable for formats
- Video spatial & temporal resolution agnostic
- Carry only active media data (no raster blanking)
- Sufficient timing to allow ‘composite’ reconstitution
- Sufficient metadata to for downstream processing

nevion
A Sony Group Company

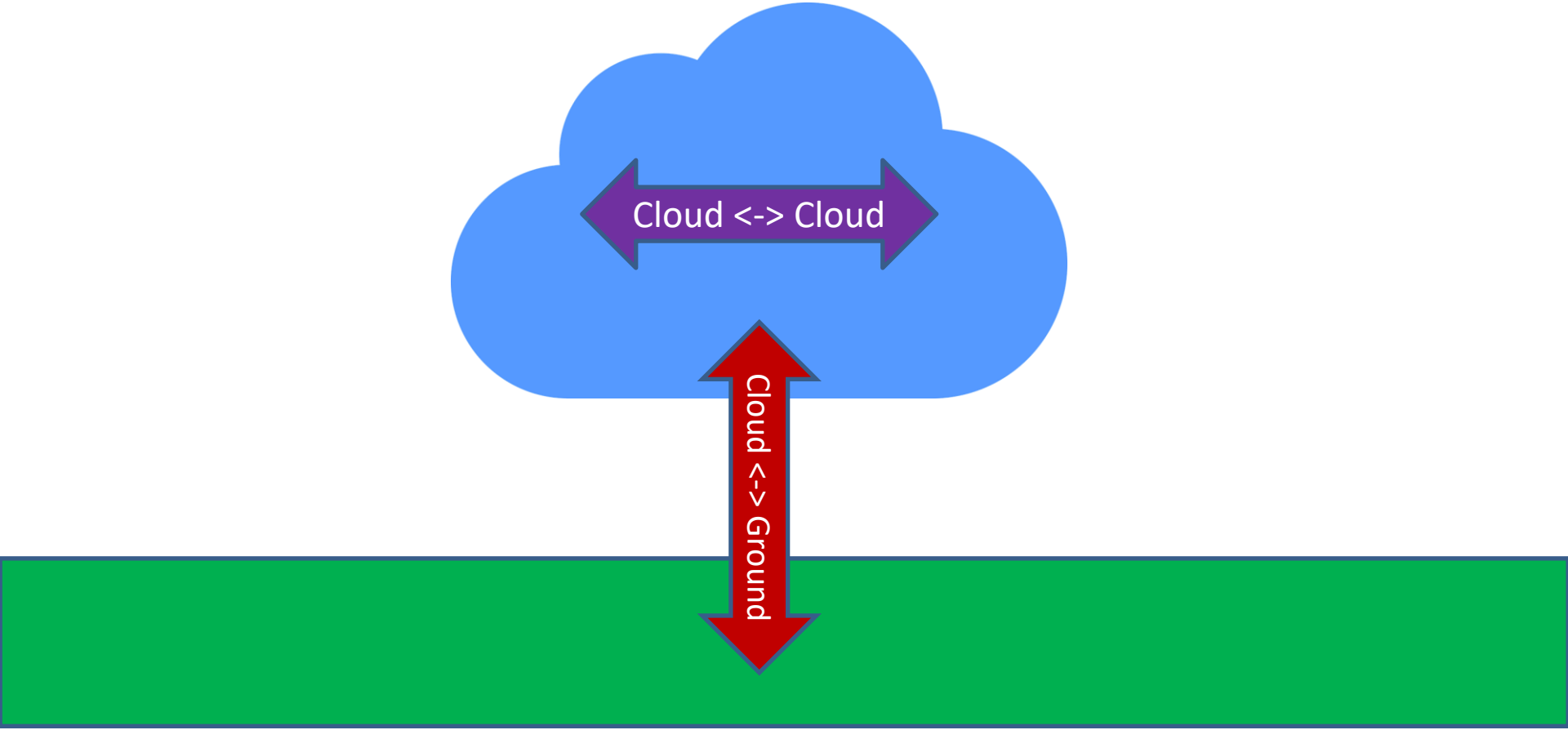
VSF
VIDEO SERVICES FORUM

The IP digital video **journey**

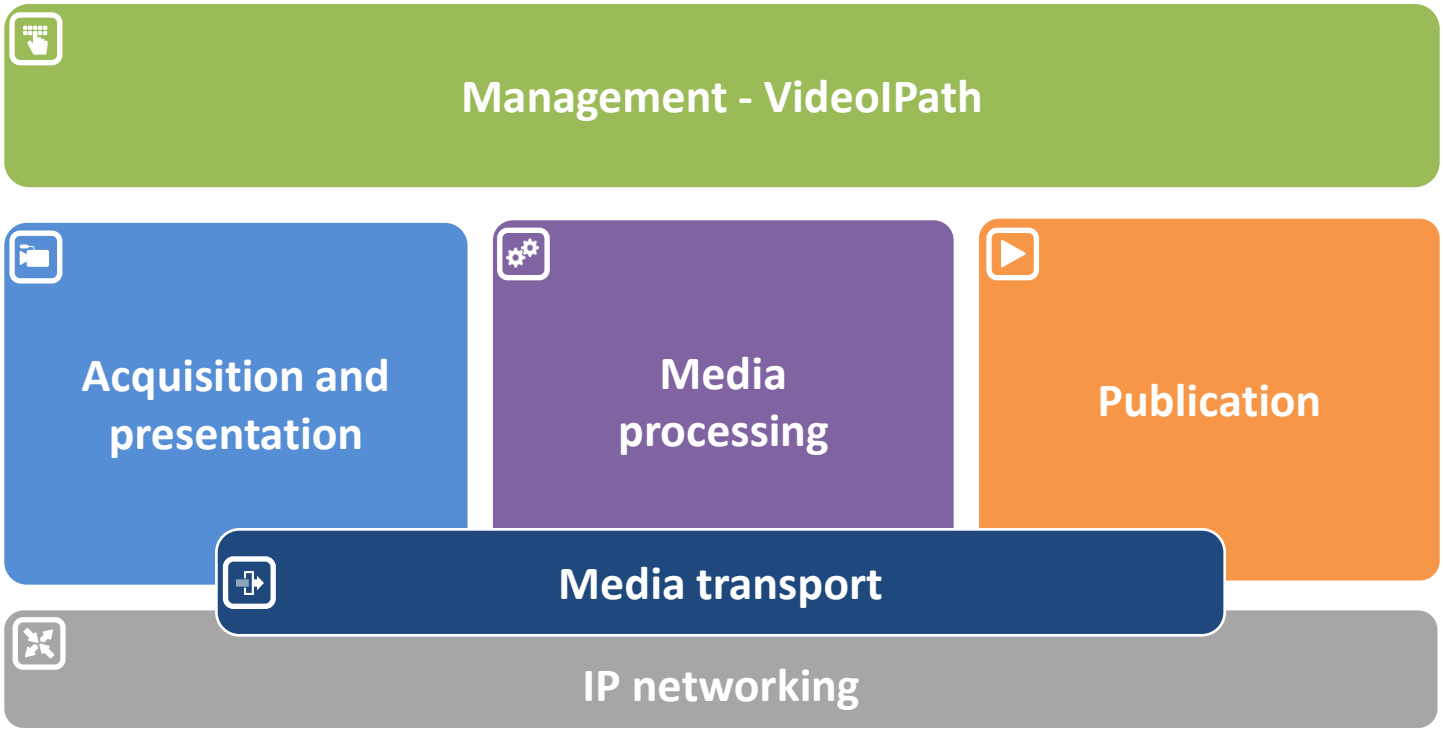


nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM


Cloud <-> Cloud
Cloud <-> Ground

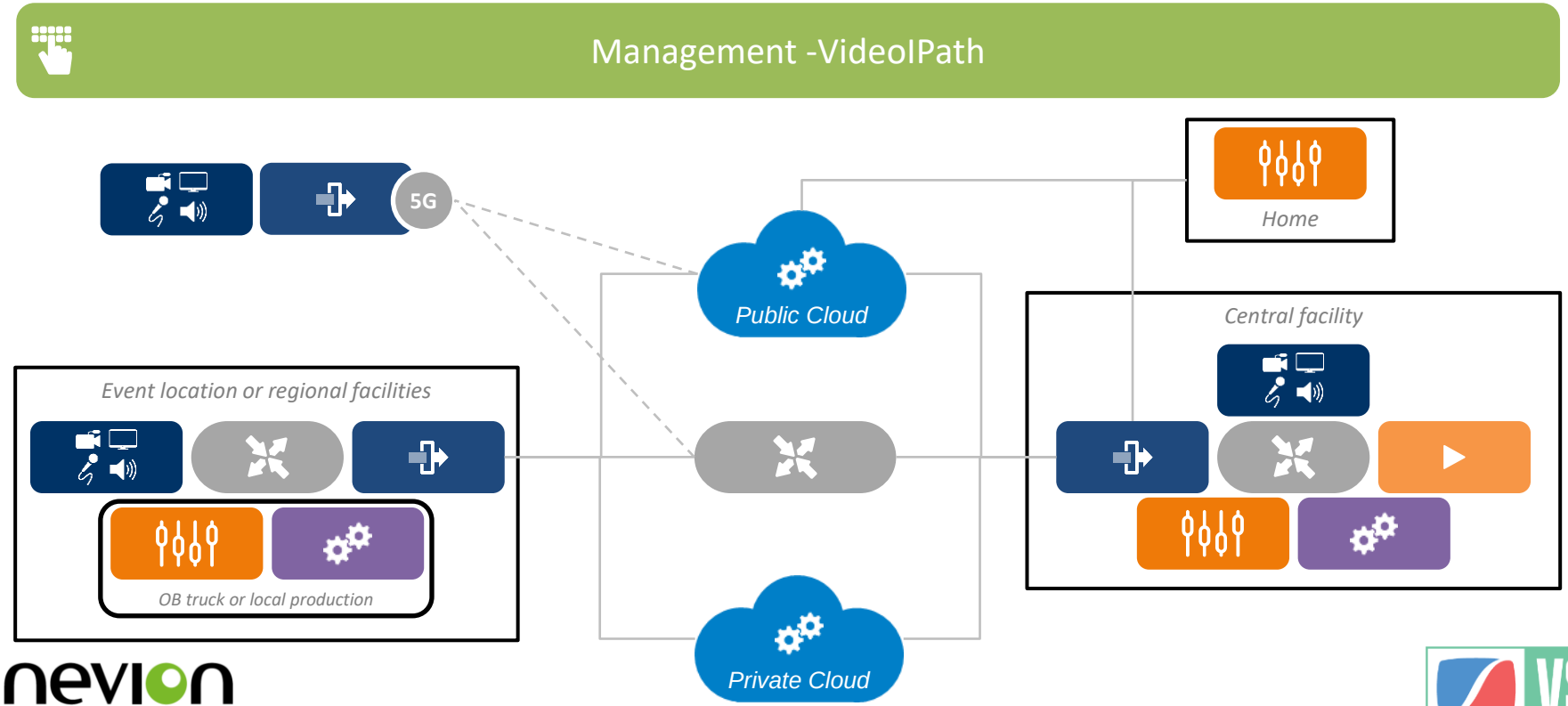
Live media production



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

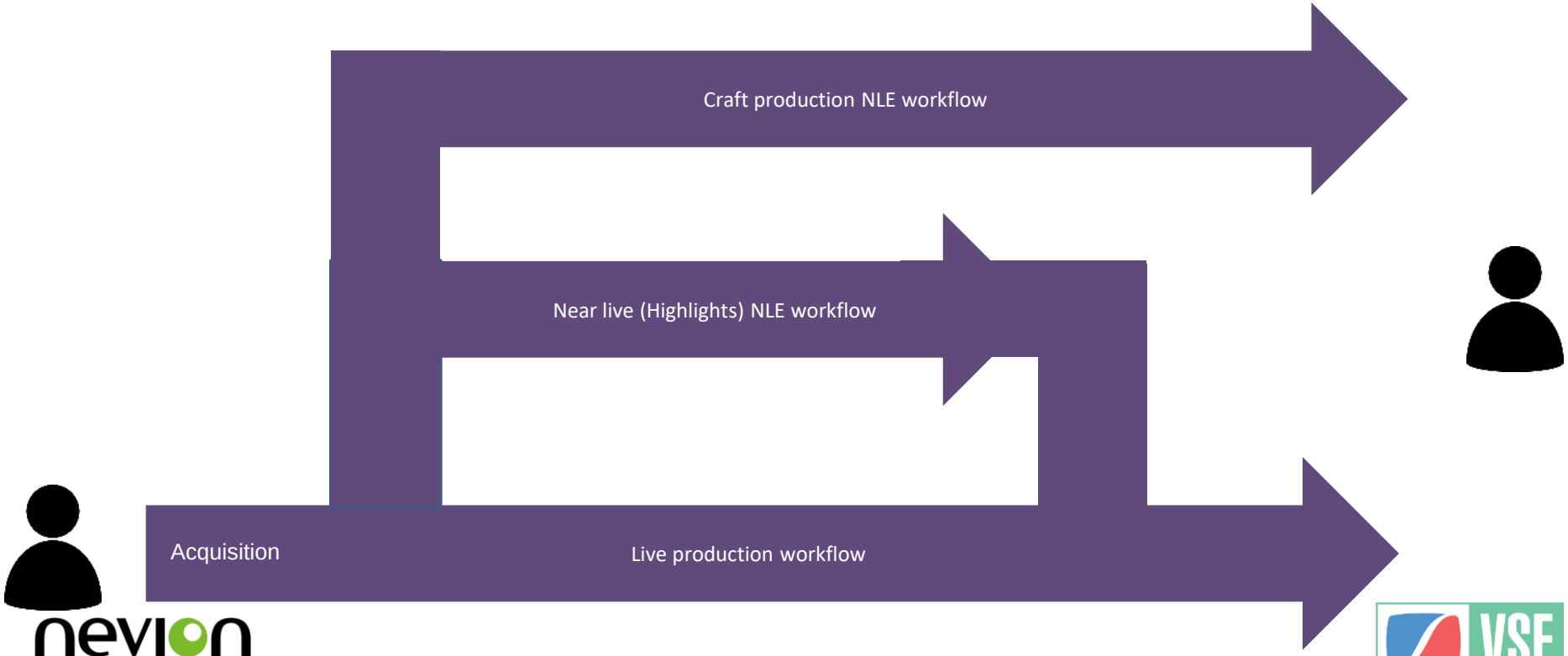
Towards **distributed production**



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

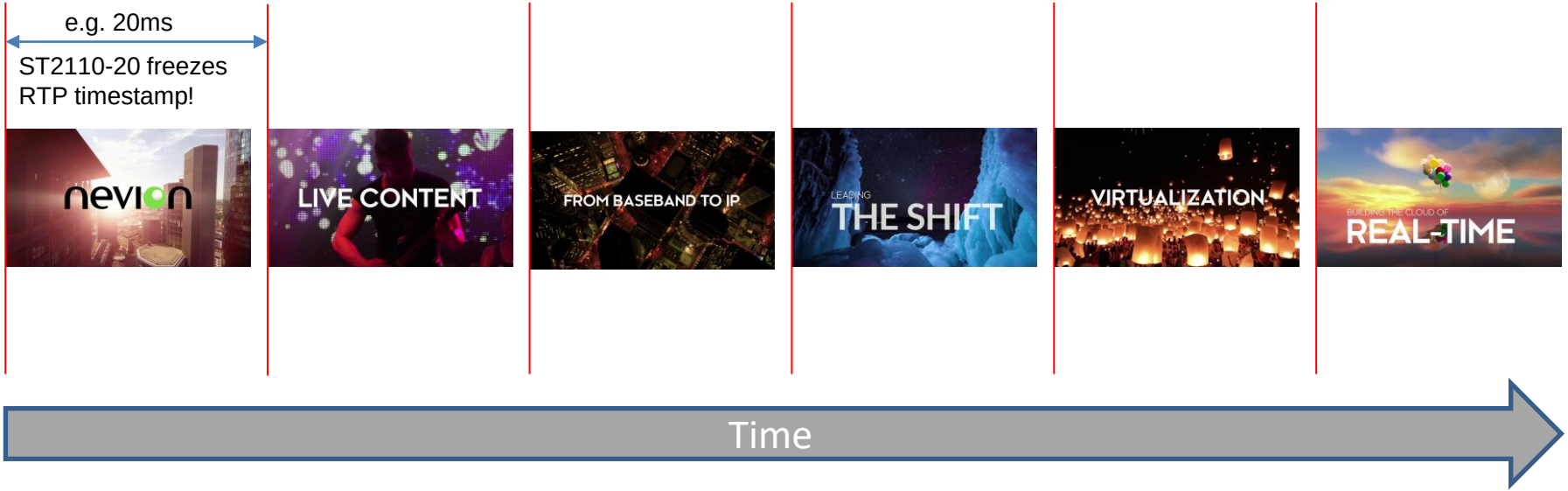
Media production convergence



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

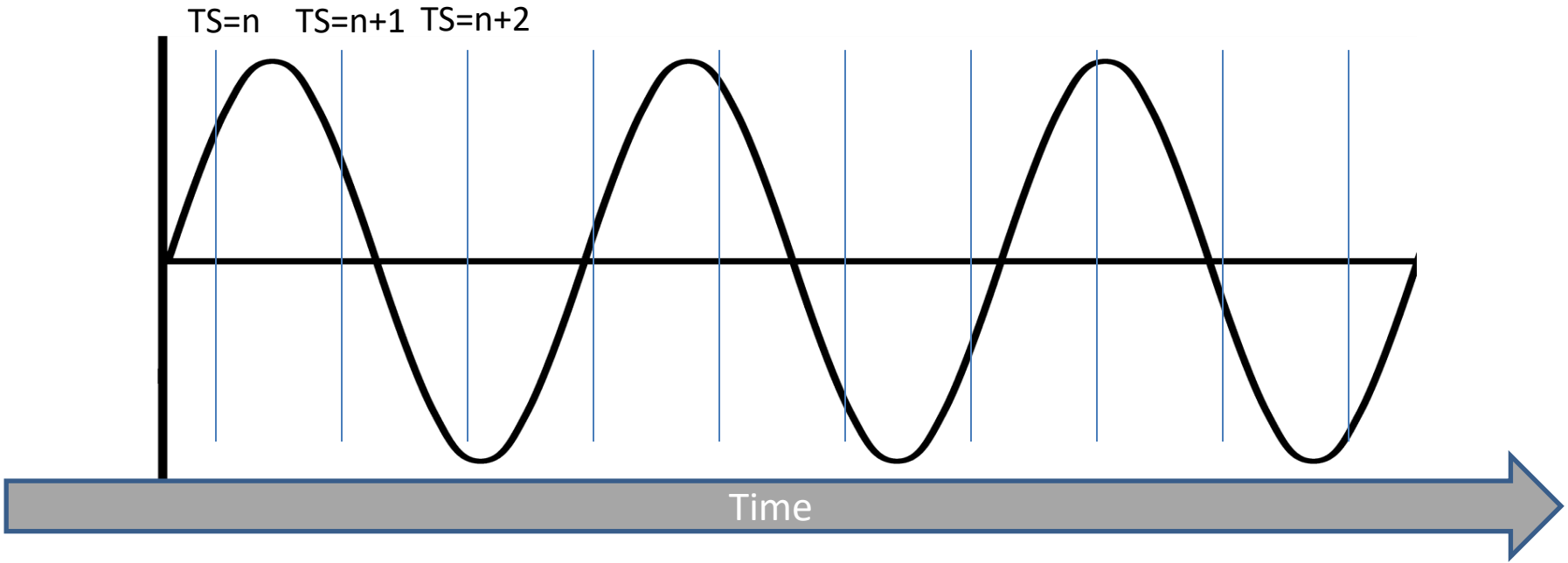
An image at a moment in time



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

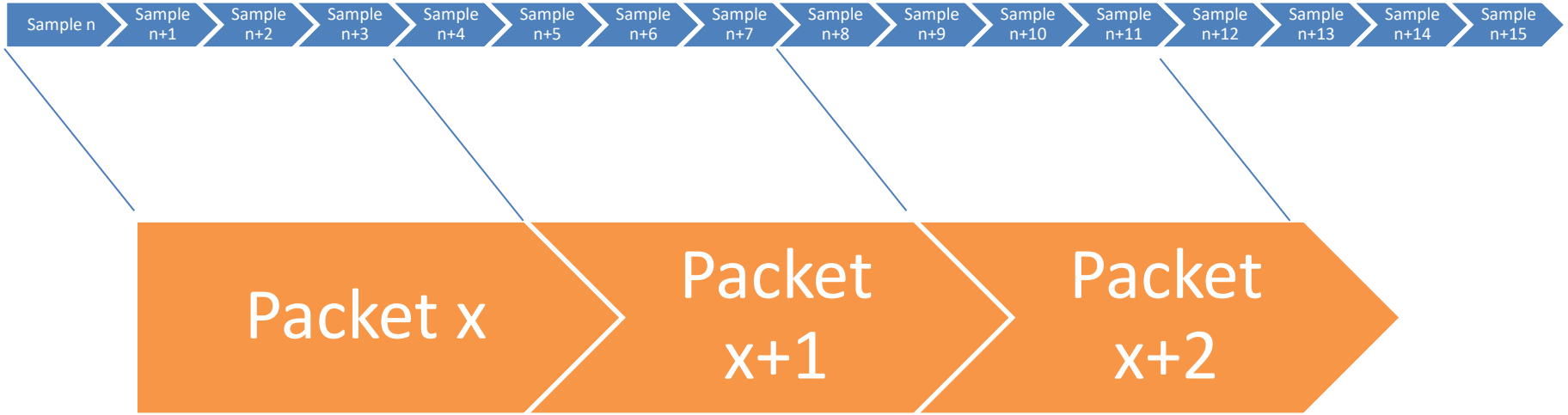
Audio per-sample timing



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Linear stream flows –
our raster & hardware heritage



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

ST2110 senders

N ✓

Narrow (gapped)
Typically hardware based
Linked to linear active-raster-based video
Small buffering requirement
Capable of low latency chaining

NL ✓

Narrow linear
Image based – not active raster
Small buffering requirement
Low latency when not raster interfaced
Containerised software can achieve this

W ✓

Wide
Typically software based using NIC
Not linear raster related
Larger buffering required
Low latency when not raster interfaced

nevion
A Sony Group Company

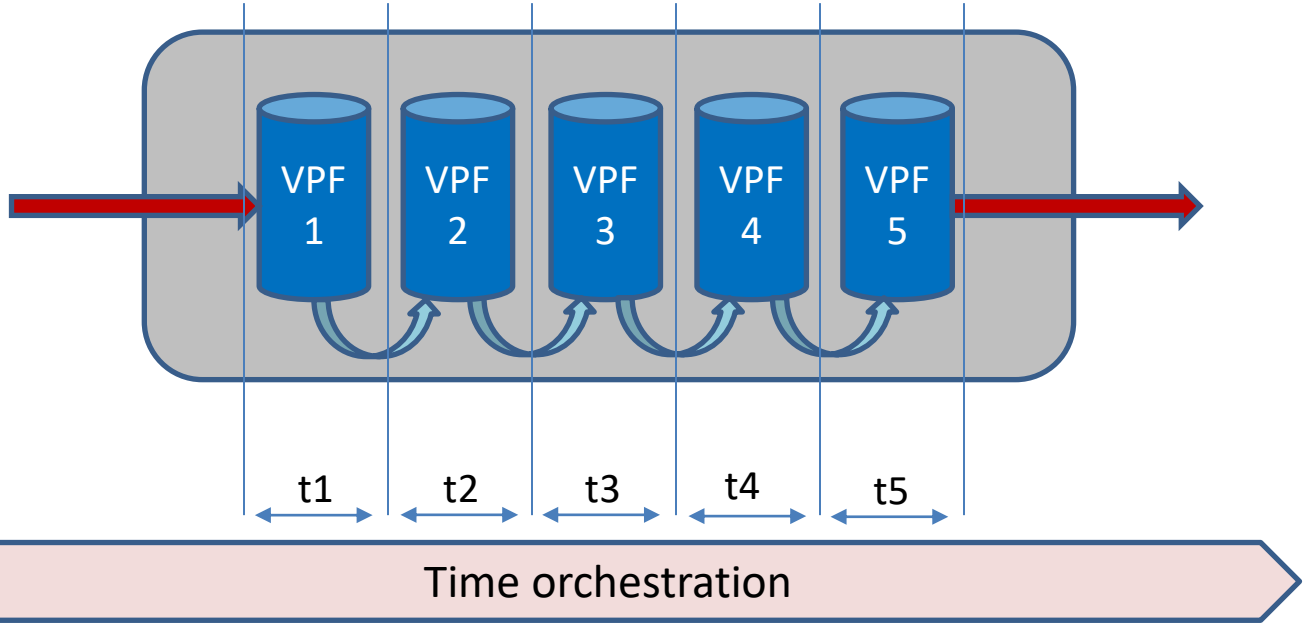
VSF
VIDEO SERVICES FORUM

What maters to the content consumer…

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

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



So what legacy tech elements can we cast aside

Send in your ideas!

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

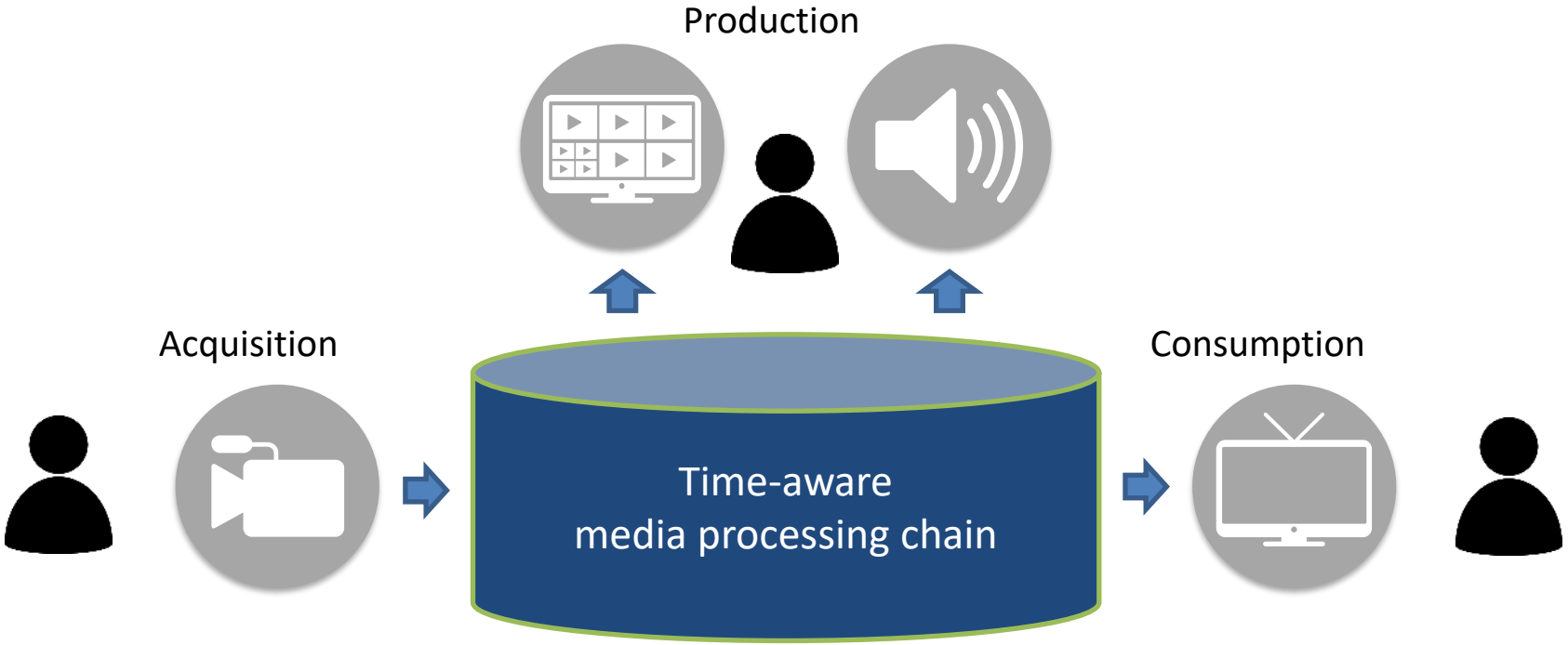
What we need moving forward is technologies that provide:

- Location independent acquisition, operation & delivery
- Sufficient media quality (resolution, frame rate, DR, PQ)
- Low enough latency for operation

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

The broadcast end game



nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM

Thank you!

Andy Rayner Chief Technologist

arayner@nevion.com +44 7711 196609

nevion
A Sony Group Company

VSF
VIDEO SERVICES FORUM