Ethernet Video Fabric

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Why Ethernet Video Fabric?

An explosion in the volume of data caused by video resolutions evolving from HD to UHD, 4K, and in the near future 8K. Past proprietary solutions of Serial Digital Interfaces (SDI) are expensive, can't keep pace with transitions and introduce many difficult challenges in the business processes of rapid set up and tear down required when switching projects and changing to file-based workflows.

All this has left media and production companies searching for solutions to simplify operations and reduce costs while keeping pace with higher resolutions. Also, the time-sensitive nature of video can be particularly sensitive to network jitter, requiring higher performance and lower latency interconnects. This has opened an opportunity to use IP as a video transport.

Ethernet means choice – lot of vendors to choose from but which one?

What are the challenges for Live Broadcast Workflows?

Unpredictable Network
- Video / audio requires deterministic latency & low jitter
- Multi-switch silicon = multi-latency/jitter deltas
- Signals synchronization (timing) becomes a challenge with varying jitter

More speed
- High Frame Rate (HFR) = higher data rates
- High Dynamic Range (HDR) = higher data rates
- 4k uncompressed is > 10G, 8k uncompressed is > 100G

Broadcast engineers face complexity
- SDI → IP is non trivial – ST2022, ST2110 etc.
- New technologies: IP, RTP, BGP, OSPF, Multicast, PTP etc.
- Telemetry – Need visibility: packet switch is more complex than circuit switched SDI

Media needs

Consistency

And

Control
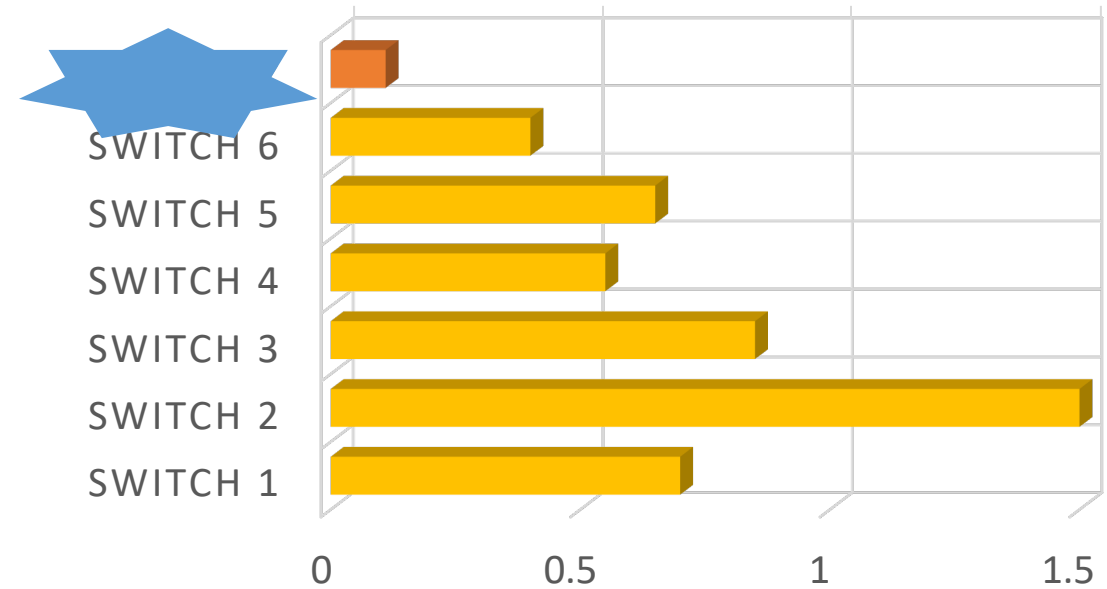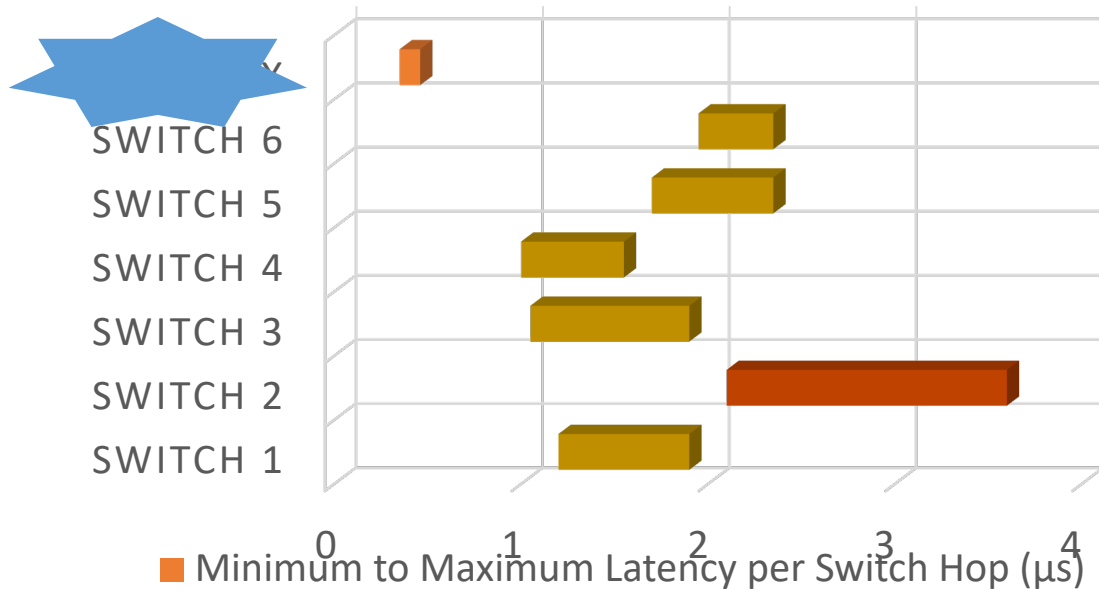
Unpredictable Network

Unpredictable Network	• Video / audio requires deterministic latency & low jitter • Multi-switch silicon = multi-latency/jitter deltas • Signals synchronization (timing) becomes a challenge with varying jitter

- A single ASIC based switch will or should give you a well defined latency and jitter regardless of how the switch ports are utilised – lets look at some results from 7 different switches

Unpredictable Network

Lowest Port-to-Port Latency

Lowest Packet Delay Variance (Jitter)

SWITCH 6
SWITCH 5
SWITCH 4
SWITCH 3
SWITCH 2
SWITCH 1

0   1   2   3   4

■ Minimum to Maximum Latency per Switch Hop (μs)

SWITCH 6
SWITCH 5
SWITCH 4
SWITCH 3
SWITCH 2
SWITCH 1

0   0.5   1   1.5

Independent IEEE1588 (PTP) Snake test*   Tested by   FOX ENTERTAINMENT   and   sam Snell Advanced Media

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The need for speed

More speed	• High Frame Rate (HFR) = higher data rates • High Dynamic Range (HDR) = higher data rates • 4k uncompressed is > 10G, 8k uncompressed is > 100G

Speed is needed from end to end. This means not only the network (port speed and low latency and low jitter) but the servers too.

It all needs to be optimized for a complete EVF

Let's look at an example of software that can optimize the server side for media

Unleash your Video Flows

- Video Streaming library for the Broadcasting industry
  - SMPTE 2110-21 compliance with packet pacing even at 100GbE
  - Offloads packet handling – keeps application at frame/line(s) level
  - Kernel bypass technology – no bottlenecks, low latency, deterministic performance
  - Cloud ready (VM / VF / SRIOV etc.)

- Supports Linux and Windows OS

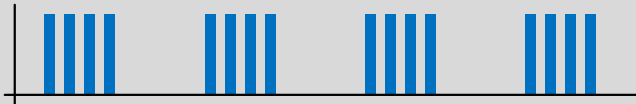**64** HD Streams **= 1** CPU CORE   **8K** UHD   **= 1** CPU CORE

Key pieces to optimizing Video flow

Packet Pacing

- Leverages hardware based Packet Pacing
- SMPTE ST 2110-21 compliance at any bit rate
- No dependency on CPU Strength, OS interrupt level or Application

Kernel Bypass

- Reduced Kernel overhead with direct network adapter access
- Selective bypass – enables to select traffic bypasses and which flows to kernel
- Reduced latency
- Reduced CPU utilization
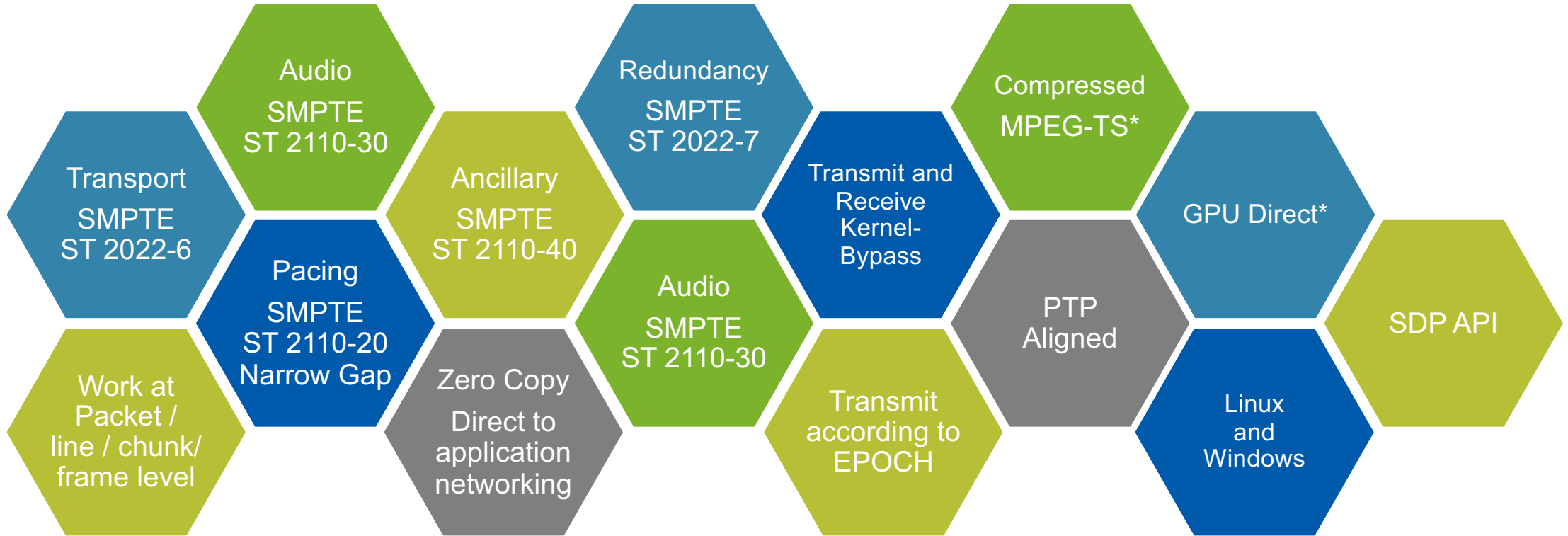- Increased throughput

Packet Aggregation

- Application at Frame/Line(s) level
- Receive: fully assembled frame/lines(s) in memory
- Transmit: synchronously transmit packet paced full frames/lines (/chunks)

Packets vs Frames

Broad feature set for Video

Broadcast engineers face complexity

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- How are the different protocol's licensed?

- How do the protocol's work?

- e.g. Take PTP, how has the vendor implemented it? What VLAN/s will it work in? Can you use it on a LAG? - Just saying PTP is supported is not enough

Summary

Leading broadcasting companies such as BBC, FOX and NBC are realizing that migrating to an IP-based infrastructure empowers broadcasters to innovate in all the areas of content creation and distribution, streamlining multi-platform environments and supports future video formats. **Ethernet Video Fabric** accelerates non-linear editing (NLE), distribution, live broadcasting, content distribution and post production alike.

An EVF provides connectivity for up to 200G Ethernet delivering full HD to 8K UHD (7680x4320 50fps 4:4:4 12bpp) flows equivalent to 82.2Gb/s bandwidth while only using a single CPU core at a low CPU usage, enriching the video experience, bringing about a revolution in the media and entertainment industry.

Thank You

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