ST2110
Why Is It So Important?

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SMPTE’s ST2110 is the most important advance in television since John Logie Baird went head to head with EMI-Marconi in the BBC’s 1936 trials at Alexandra Palace, London.
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What Problem Are We Trying to Solve?

Distributed, reliable, real-time, point to point system for broadcasting media to viewers.
What is Real-Time?

The execution of data in the shortest time possible, providing near instantaneous output.

What Does This Mean in Reality?

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- MPEG distribution increased to at least a second
- IPTV and Radio increased delays to many seconds, usually less than a minute

What Are We Familiar With?

- Traditional distribution assumes the underlying network is error free (almost)
- Latencies are easily defined and usually very low
- Systems are predictable and static (relatively)
What is Different About IP?

• Distribution of IP packets is unreliable
• Latencies are difficult to define and do vary
• Systems self-heal and are dynamic
• Networks have their history in the banking industry

Solutions?

• Broadcasting requires placing a synchronous network on to an asynchronous network
• Make delivery task based instead of time based
• Make all recorders and players timestamp synchronous
SMPTE 2022

- Converts entire video and audio signal to IP packets
- Respects line, field and frame syncs
- Wasteful of bandwidth
- Assumes network to be almost error free

SMPTE ST2110

- Line, field and frame sync data removed
- Each sample (frame, field or audio group) has a unique timestamp
- Timestamp is used as a reference to playout audio and video
SMPTE ST2110

• SMPTE have abstracted away the video, audio and metadata essence from the underlying hardware

• No longer will we be dependent on point to point dedicated networks

• No longer will we be constrained by fixed non-scalable hardware systems

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• Success of ST2110 has nothing to do with Commercial-Off-The-Shelf (COTS) products

• Routers/switches are enterprise grade and beyond

• Support contracts and spare parts are expensive
SMPTE ST2110

- Success of ST2110 is all about the fact that SMPTE have abstracted away the underlying hardware from the video, audio and meta-data essence

- Traditional broadcast has relied on SDI, MADI and AES to provide end to end synchronisation – ST2110 has done away with this

SMPTE ST2110 Bandwidth

- Uses less bandwidth for uncompressed media as only the active image is sent, no blanking

- Supports image sizes to 32K by 32K

- Supports different colour spaces such as YCrCb, RGB, XYZ
### SMPTE ST2110

#### Bandwidth Saved

<table>
<thead>
<tr>
<th>Format</th>
<th>ST2022-6 (Gbps)</th>
<th>ST2110-20 (Gbps)</th>
<th>Difference</th>
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</thead>
<tbody>
<tr>
<td>1080p59.94</td>
<td>3,070</td>
<td>2,570</td>
<td>16%</td>
</tr>
<tr>
<td>1080i29.97</td>
<td>1,535</td>
<td>1,285</td>
<td>16%</td>
</tr>
<tr>
<td>720p59.94</td>
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<td>25%</td>
</tr>
<tr>
<td>1080p50</td>
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</tr>
<tr>
<td>1080i25</td>
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<td>1,071</td>
<td>30%</td>
</tr>
<tr>
<td>720p50</td>
<td>1,537</td>
<td>953</td>
<td>40%</td>
</tr>
</tbody>
</table>

### SMPTE ST2110

#### Advantages

- Each essence can be distributed on diverse networks
- Distribution is no longer piecemeal
SMPTE ST2110 Advantages

- Format agnostic – UHD-4K and 8K can be distributed over fibre channels, no need for 6G and 12G SDI
- Different formats can be simultaneously distributed over the same network and fibre
- Future proof for new formats yet to emerge

SMPTE ST2110 Advantages

- Product development will mainly be software (understand Agile development and continuous deployment)
- Cost of development and time to market for new products and services will be considerably reduced
- New pricing models will emerge
**SMPTE ST2110**

**Advantages**

- Pay-as-you-go and pay-on-demand services
- Virtualisation and cloud services
- Systems will be more dynamic

**Disadvantages**

- Currently only specified for managed networks
- Requires a deep understanding of Precision Time Protocol (PTP)
- Limited diagnosis and testing tools available
SMPTE ST2110
Disadvantages

• Requires broadcast engineers to think differently, especially ITIL processes
• IT and broadcast engineers must become one
• We can’t do it all!

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Specifications

ST2110-10 - System timing
ST2110-20 - Uncompressed Video
ST2110-21 - Traffic shaping Uncompressed Video
ST2110-30 – PCM Audio
ST2110-40 – Ancillary data
ST2110-50 – Integration with ST2022-6
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Data Packing

Data is 32bit packed, difficult to process in software but more efficient for distribution

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Beyond Audio & Video

- Metadata in live systems such as HDR10+
scene data
- Datacentre and cloud integration
- Simple connectivity to telco’s
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PTP Timing

- Maintains correct time relationship between capture and playback devices
- All assets can be synchronised to nano-second accuracy
- Protocol takes network latency into consideration, but assumes symmetrical routes

Session Description Protocol - RFC4566

- Each stream has a set of metadata to direct the receiver
- SDP provides data for the receiver to decode the streams
- Senders create an SDP for every stream provided
Network Media Open Specifications (NMOS)

- Network Media Open Specifications
  www.nmos.tv
- Discovery and registration
- Connection management API
- Network controller
- Automated testing framework
- https://github.com/AMWA-TV/nmos

Alliance for IP Media Solutions - AIMS

AIMS, the Alliance for IP Media Solutions (AIMS), is a non-profit trade alliance that promotes the open standards that broadcast and media companies use to move from legacy SDI systems to a virtualized, IP-based future—quickly and profitably

Whitepaper preparing broadcast facilities for IP-Based live production
NewTek Network Device Interface

NDI is a royalty free standard enabling compatible products to share video, audio, and data across a local area network. Using refined encoding and communication, NDI allows systems, devices and applications to identify and communicate bi-directionally with one another over IP, and to encode, transmit, and receive multiple streams of high quality, low latency, frame-accurate video and audio in real time.

NDI SDK

Open Broadcast Systems

Open Broadcast Systems provides broadcast software for video and audio transport running on off-the-shelf IT equipment. This allows IT hardware to perform multiple broadcast functions, each running as apps, aiding convergence between the broadcast and IT industries, and reducing costs drastically.

Download broadcast encoder software
IP Systems Challenges

- COTs products do not exist in enterprise grade datacentres
- Documentation becomes interesting – be careful where you store your IP lists
- Firewalls will need to be huge
- Don’t be tempted to replace the acronym “SDI” with “IP”
- Security is every bodies problem

IP Systems Opportunities

- Barriers to entry for innovators have been slashed
- Full cloud production systems now possible
- Speed with which new products and services will accelerate
- New pricing models available
- Look to telco’s and IT for solutions
Remote Outside Broadcast
Remote Outside Broadcast

Processing Metadata
Information

- Understanding the terminology behind IP
- Enabling Interop Between AIMS, ASPEN, NewTek NDI and Sony NMI
- What is Networked Media Incubator Project?

Conclusion

- ST2110 has abstracted away the underlying hardware from the video, audio and metadata essence
- IP is bi-directional and opens up a world of new possibilities
- Virtualisation and generic networks have removed the antiquated, restrictive, hardware models of operation