Timing Tails & Buffers

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SMPTE 2110

• 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 connections

• No longer will we be constrained by fixed non-scalable hardware systems
REMI (REMote Integration) – OB’s

Television Demands Continuity
Input and Output must be synchronous

What Happens When the Input and Output is Not Synchronous?

Encoder generates 48000 samples per second and sends them to the network as either Multicast or Unicast.

If decoder clock isn’t synchronized and runs faster at 48.1kHz, the decoder will run out of samples every 10mSecs resulting in significant audible squeaks and pops.
IP Protocols vs Broadcast

- Broadcasting uses dedicated, synchronous point-to-point connections
- UDP – fire and forget with no error control
- TCP – windowed error correction delivery
Understanding IP

Imagine sitting on the back of an IP datagram as it traverses through a network and consider what happens next as you move from device to device and network to network.
IP Packet Journey

- Congestion
- Jitter
- Re-ordering
- Bursting
Is this realistic?
What Problem Do Buffers Solve?

Synchronize Asynchronous Events
Software Processing

Buffers by Design
In the short term, input rate and output rate differ.

In the long term, input and output rates must be the same otherwise overflow or underflow will occur.

Determining what is meant by short and long term is a skill broadcast engineers will learn as we continue our IP journey.

Unintended Consequences

Beware of TCP/IP
TCP/IP

Large errors can result in many resends, this gives the impression of a high bit rate, but the data throughput is greatly reduced, leading to high latency.
Conclusion

• Buffers are a necessary part of IP life
• IP networks are “bursty” by design
• Understanding the interaction between latency and buffers is essential
• We can work with buffers
• Zero latency does not exist
Further Reading at The Broadcast Bridge

- Essential Guide – Software COTS for Real Time Broadcast
  - case study from TAG Video Solutions
- Essential Guide – Hybrid IP and SDI Test and Measurement
  - case study from Leader
- Essential Guide – Secure IP Infrastructures
  - case study from HPE OEM
- Essential Guide – IP Explored ST2110 and ST2022
  - case study from TSL Professional Products

Thank you

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