



Timing Tails & Buffers

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Editor, at The Broadcast Bridge

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SMPTE 2110

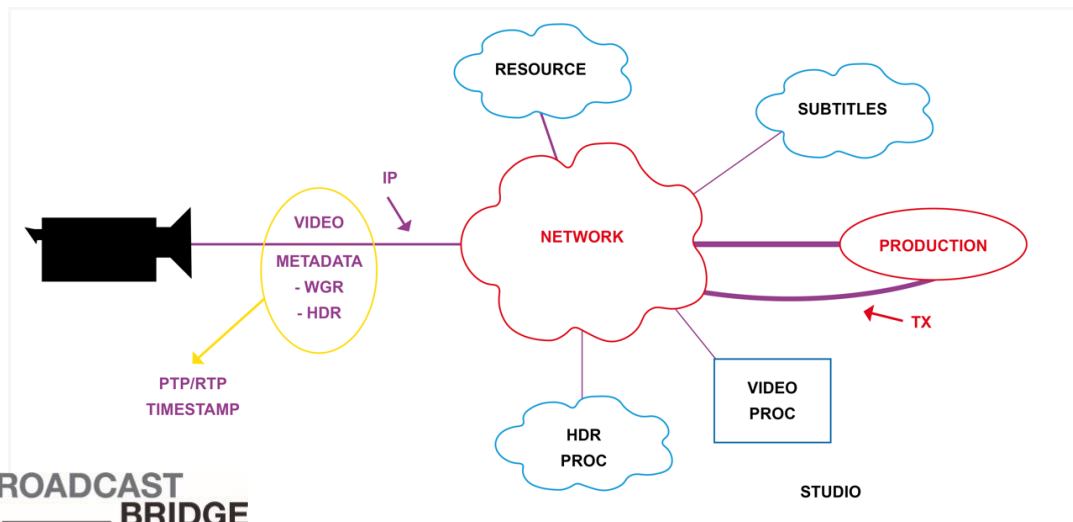
- SMPTE have abstracted away the video, audio, and metadata essence from the underlying hardware
- No longer will we be dependent on point to point dedicated connections
- No longer will we be constrained by fixed non-scalable hardware systems

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REMI (REMOte Integration) – OB's



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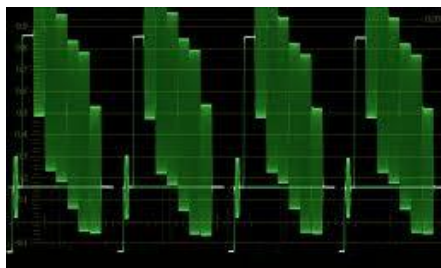
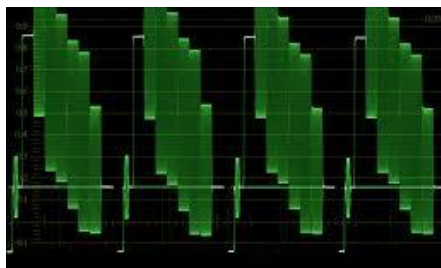
Television Demands Continuity

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Input and Output must be synchronous

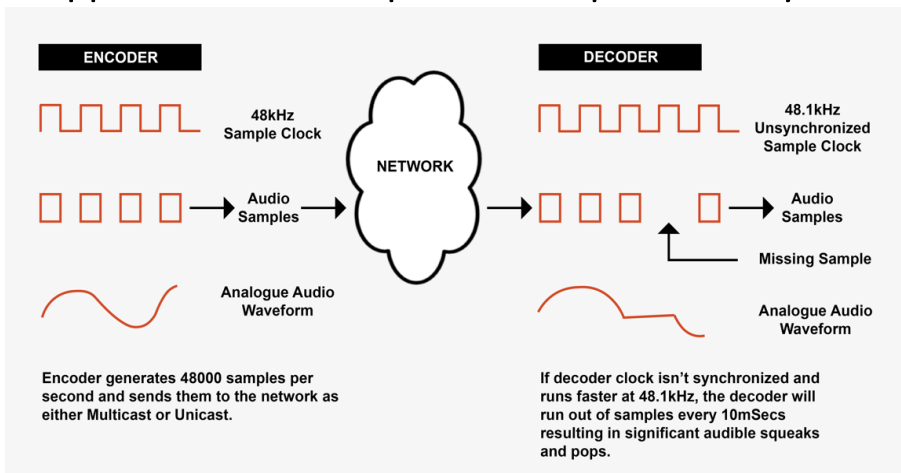


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What Happens When the Input and Output is Not Synchronous?



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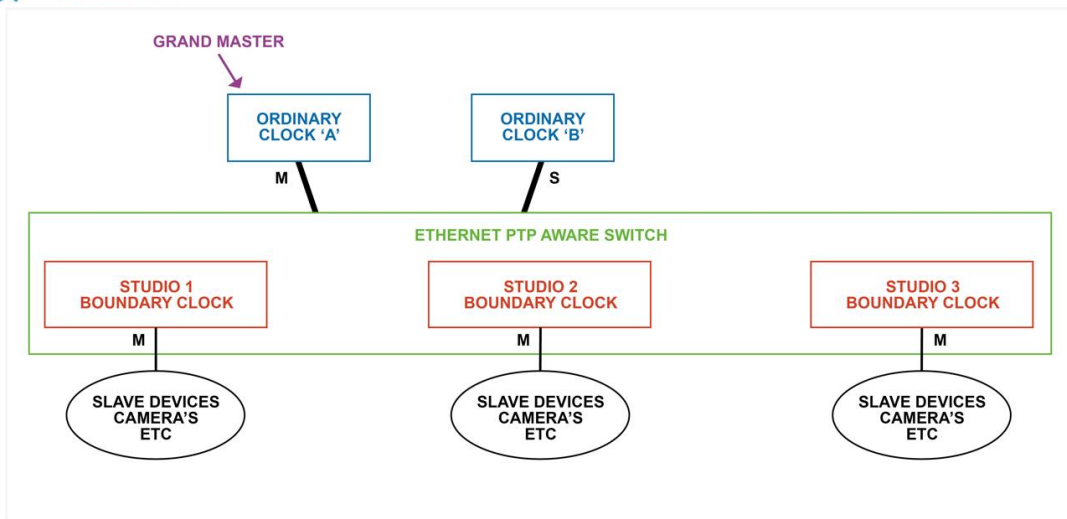


IP Protocols vs Broadcast

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

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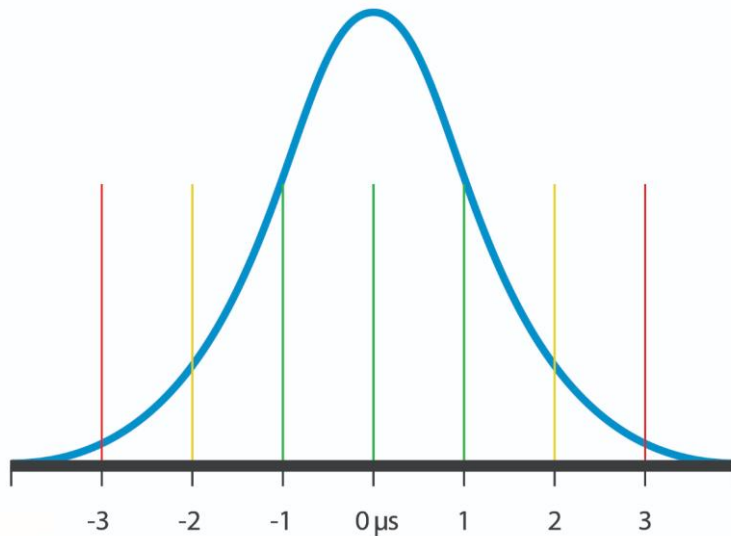


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Packet Delivery



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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

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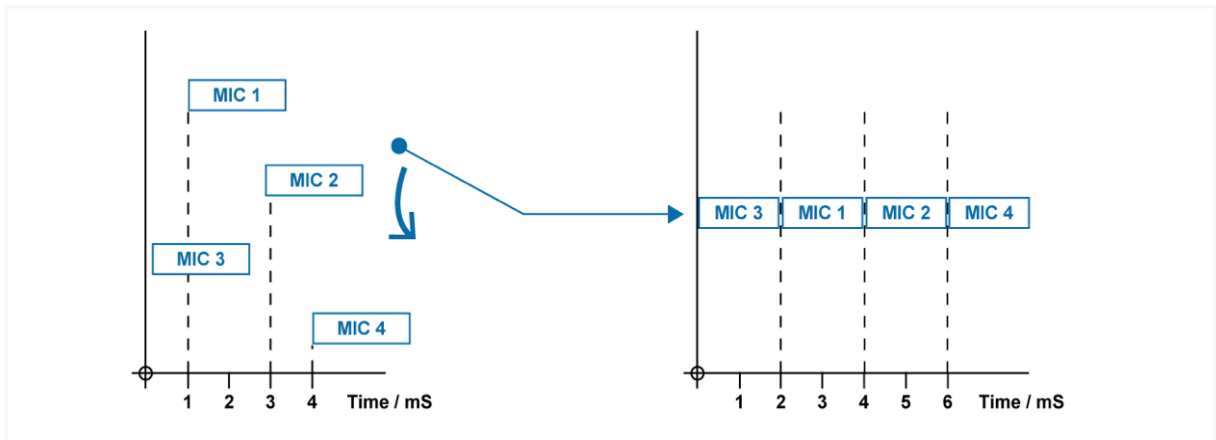


IP Packet Journey

- Congestion
- Jitter
- Re-ordering
- Bursting

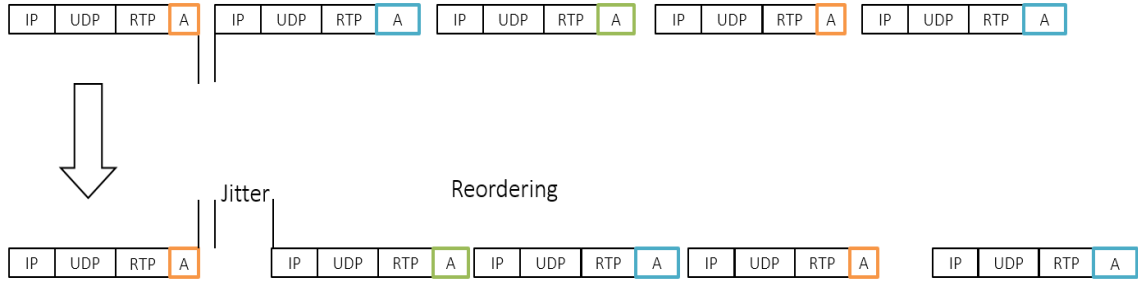
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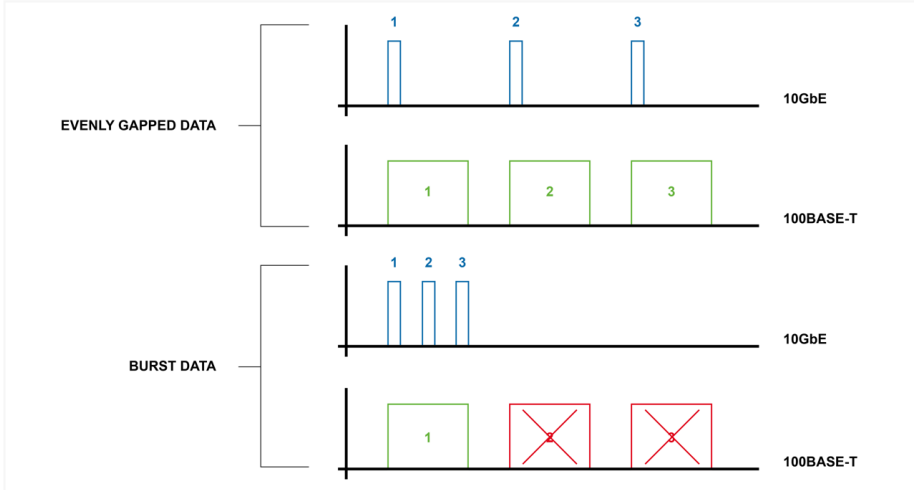
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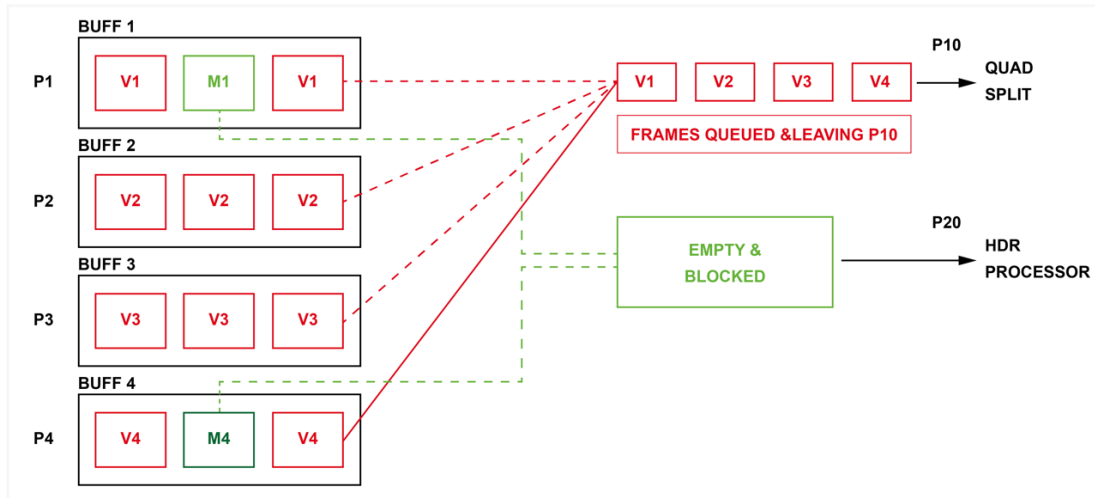
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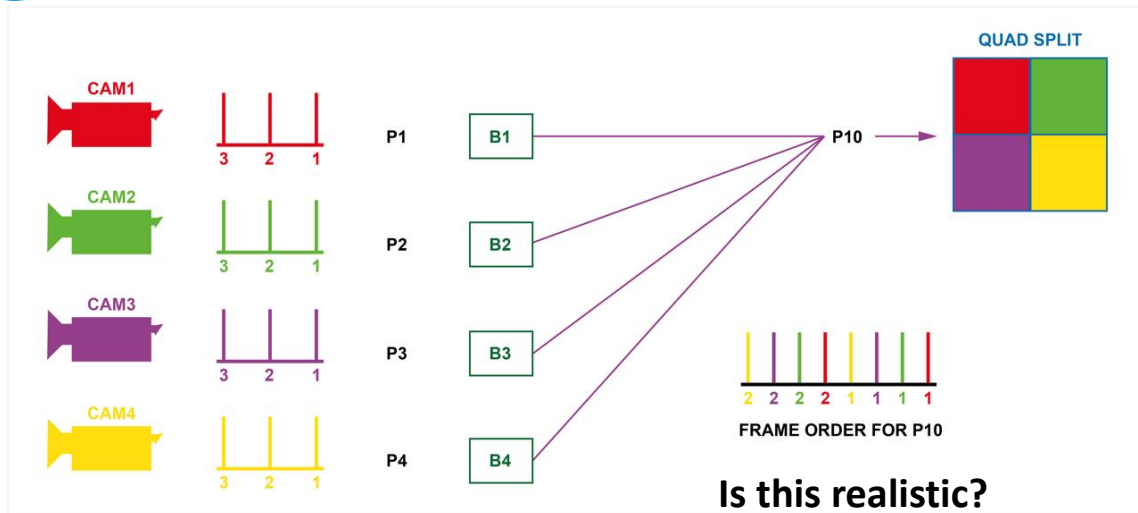
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What Problem Do Buffers Solve?

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What Problem Do Buffers Solve?

Synchronize Asynchronous Events

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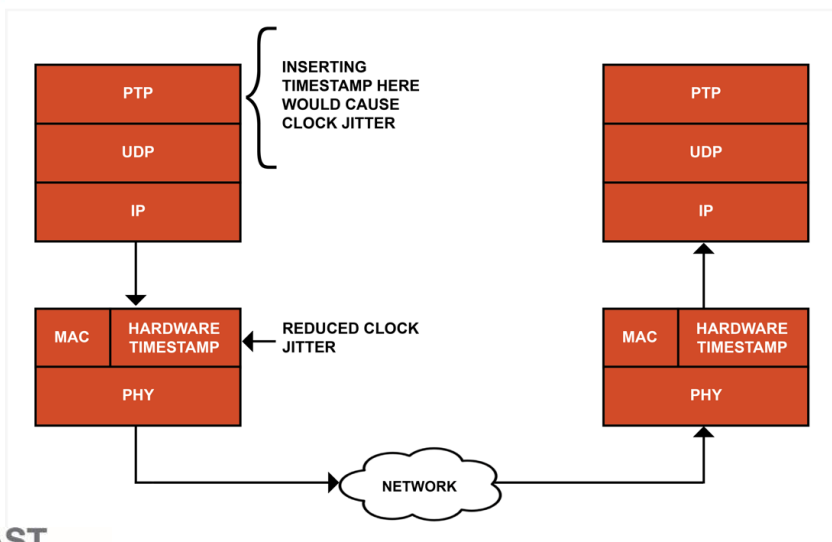


Software Processing

Buffers by Design

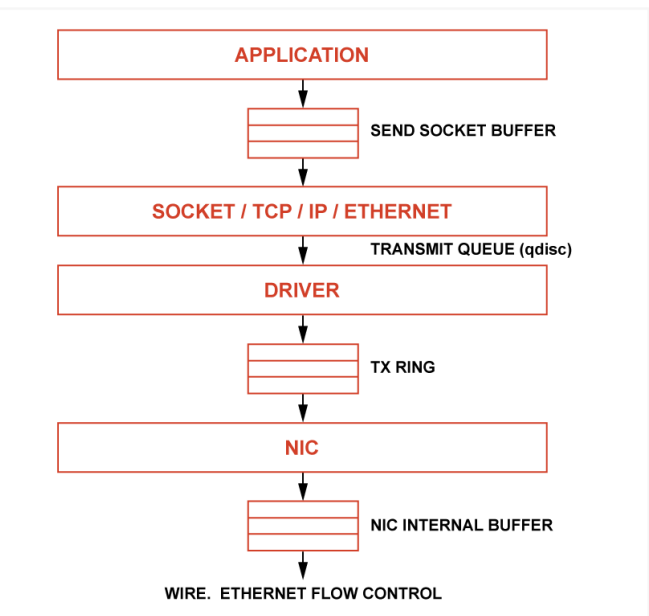
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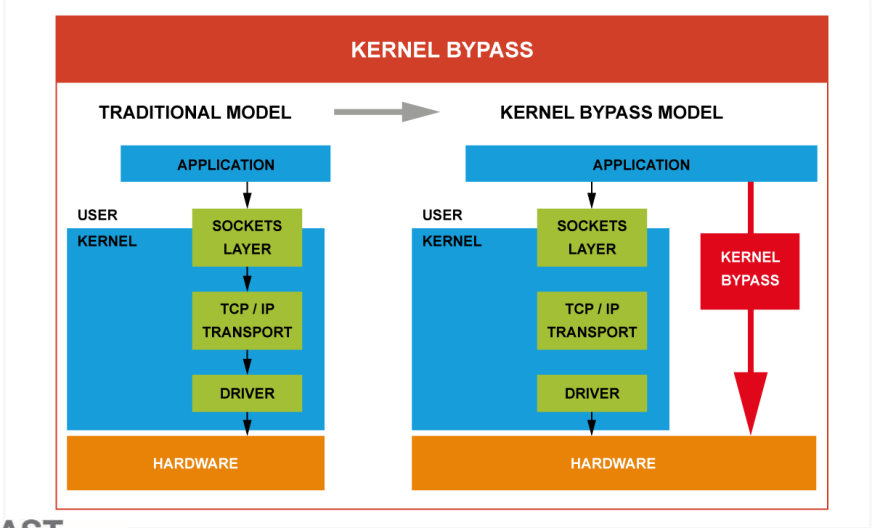


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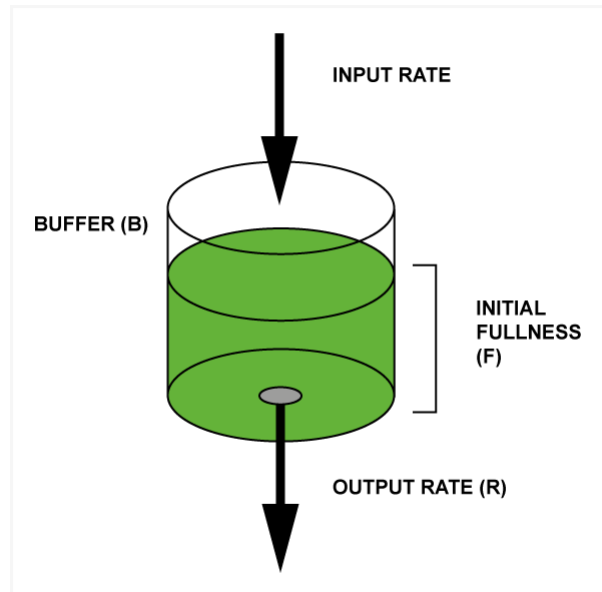
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- In the short term, input rate and output rate differ
- In the long term, input and output rates must be the same otherwise overflow or underflow will occur
- Determining what is meant by short and long term is a skill broadcast engineers will learn as we continue our IP journey



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Unintended Consequences

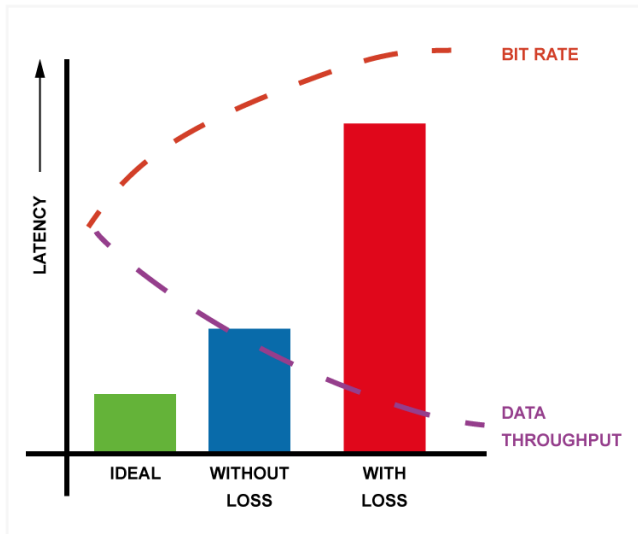
Beware of TCP/IP

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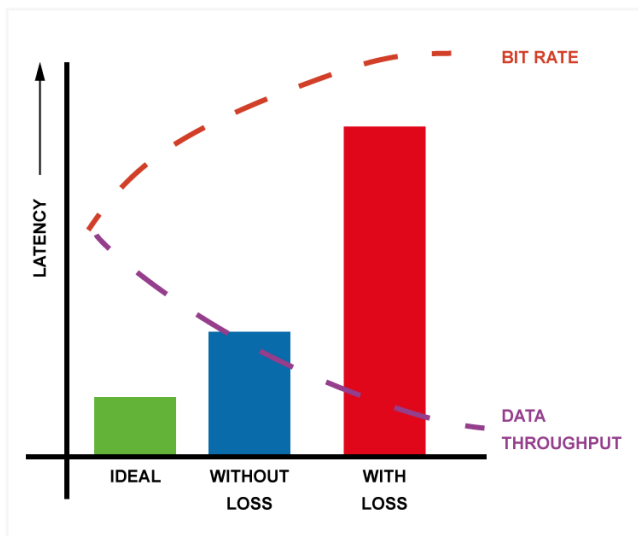
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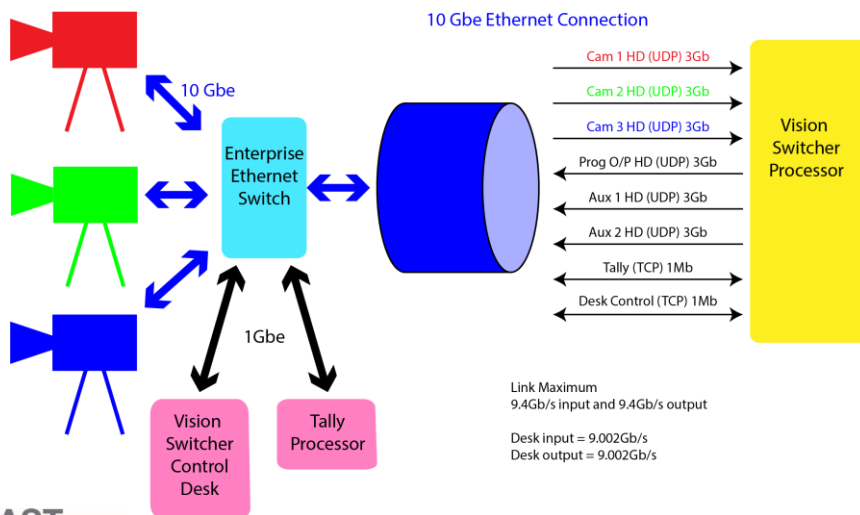
TCP/IP

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.

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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

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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

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Thank you

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