Ethernet AVB Overview and Status

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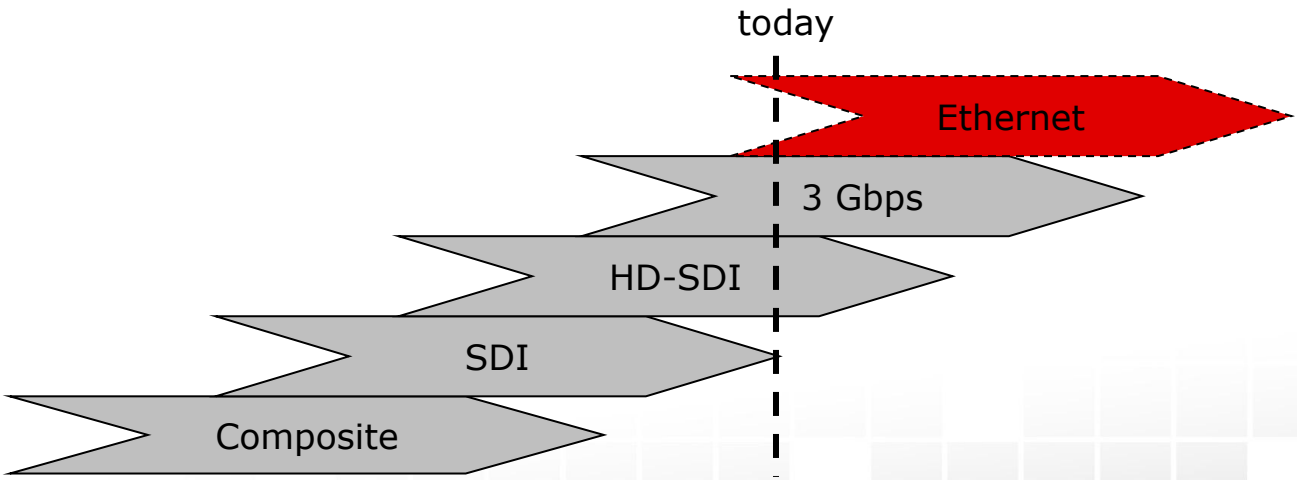
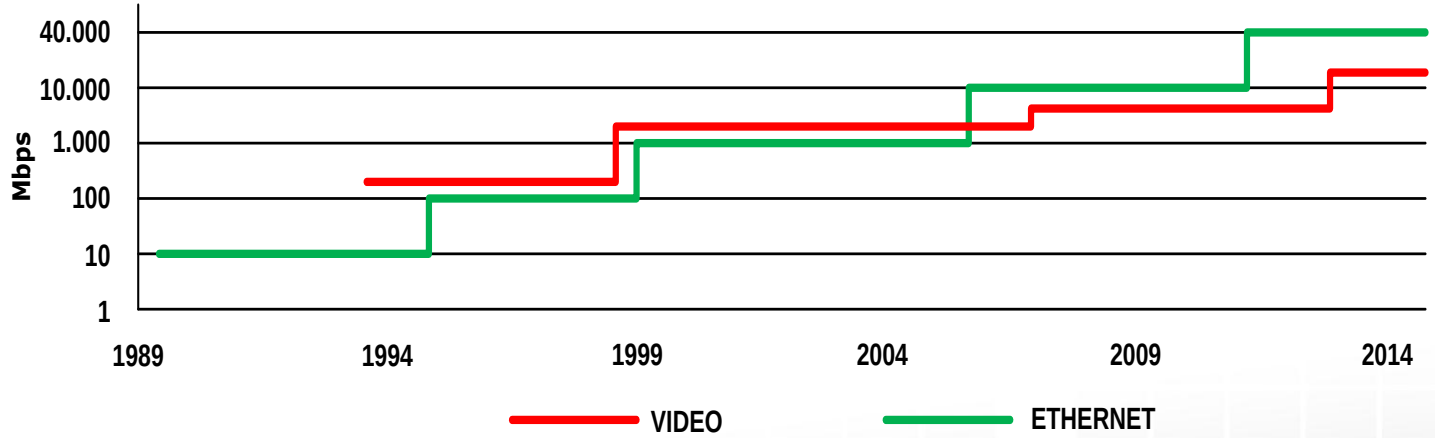
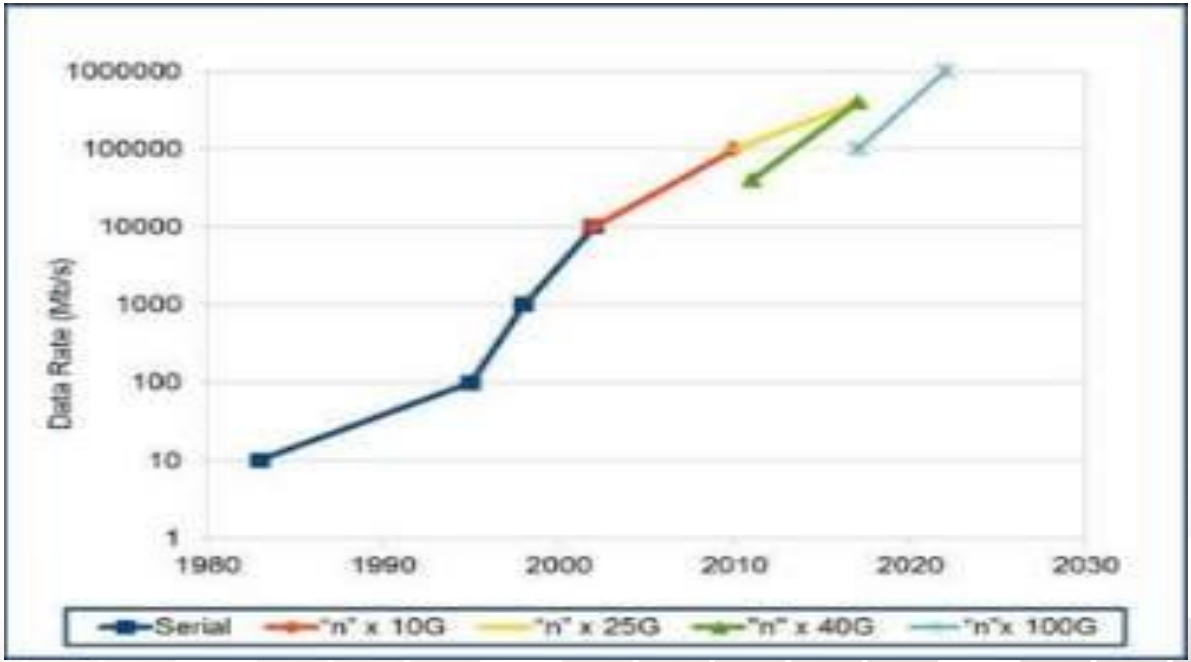
Bye Bye SDI, welcome Ethernet !

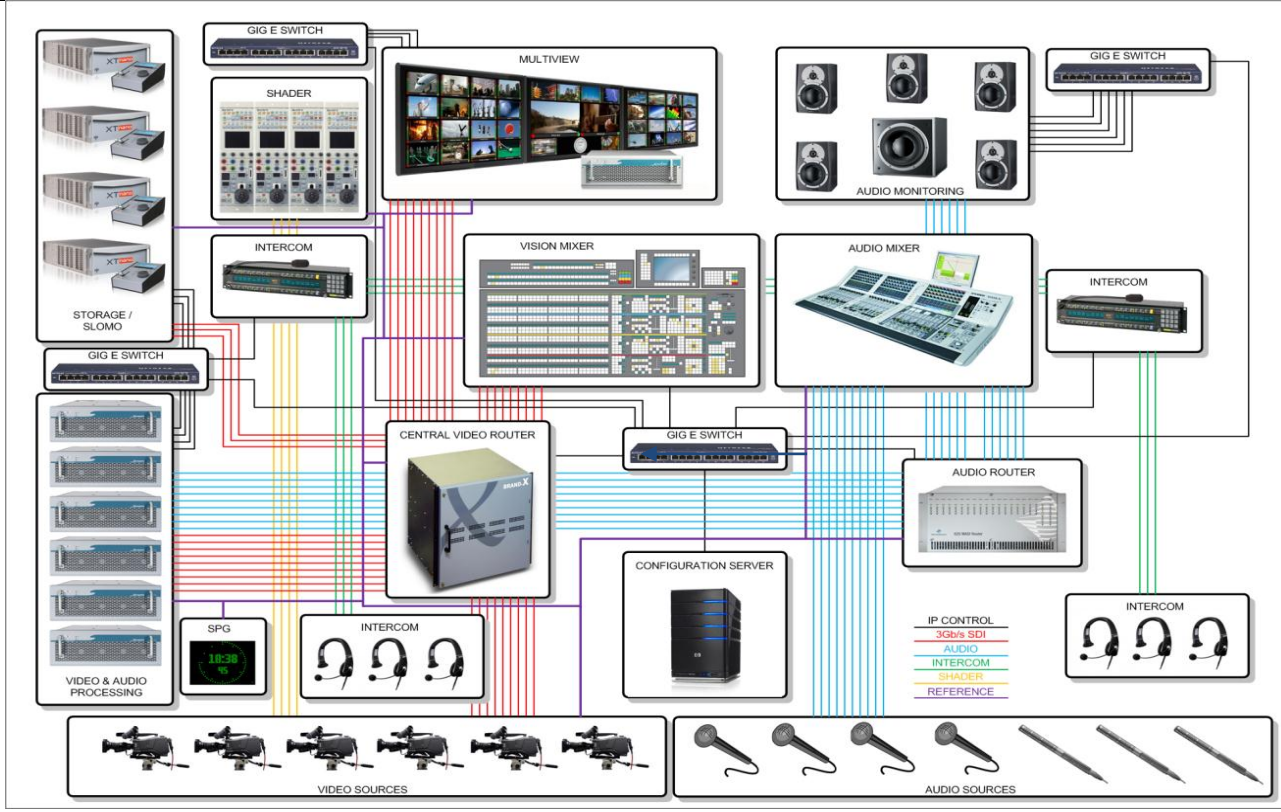


Ethernet bandwidth is evolving very fast



And strong Ethernet roadmap going forward !




GIG E SWITCH
MULTIVIEW
SHADER
AUDIO MONITORING
GIG E SWITCH
INTERCOM
VISION MIXER
AUDIO MIXER
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STORAGE / SLOMO
GIG E SWITCH
CENTRAL VIDEO ROUTER
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AUDIO ROUTER
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SPG
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3Gb/s SDI
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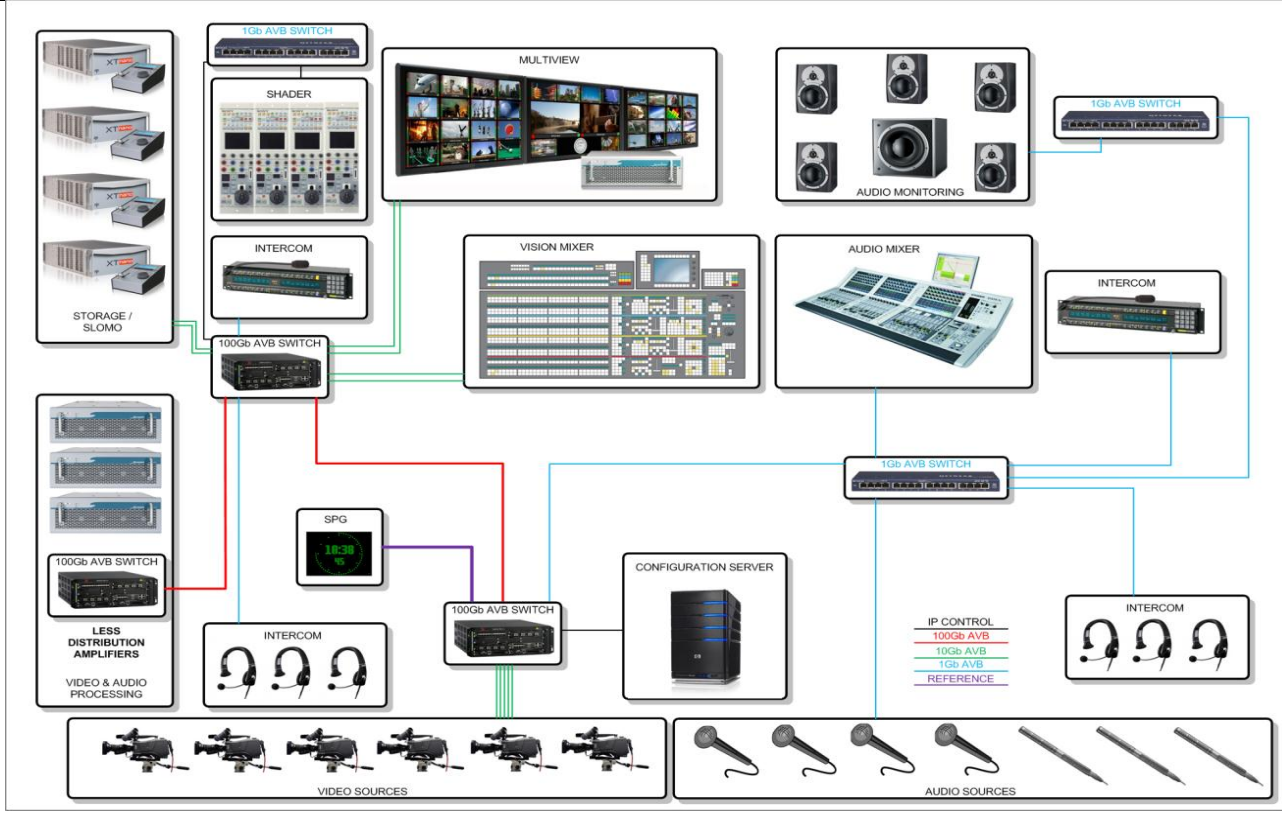
VIDEO & AUDIO PROCESSING
VIDEO SOURCES
AUDIO SOURCES


1Gb AVB SWITCH
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LESS DISTRIBUTION AMPLIFIERS
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INTERCOM
VIDEO SOURCES
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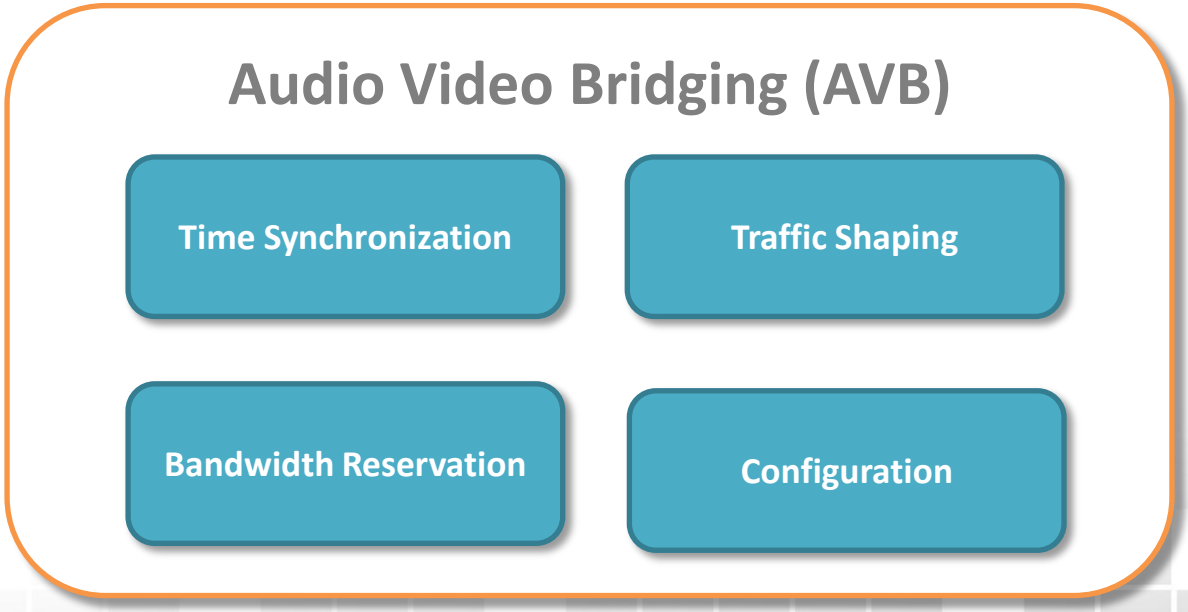
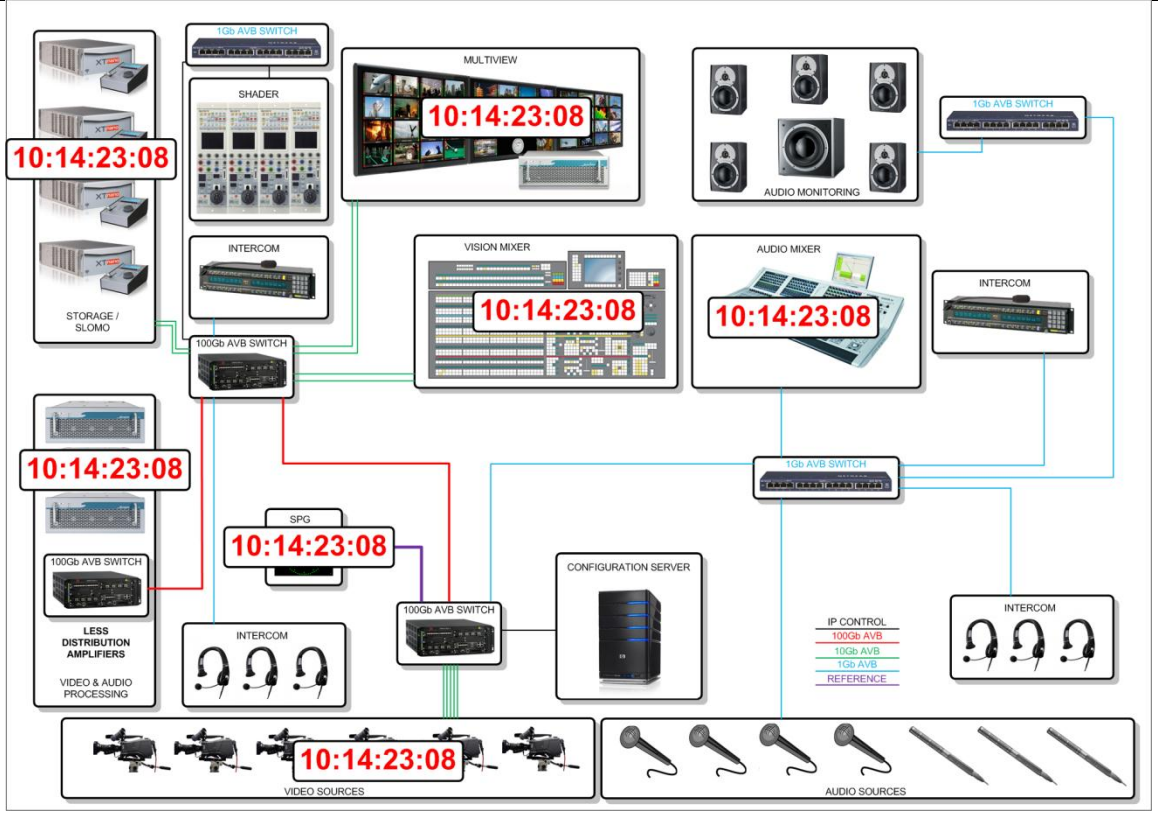
The Ethernet AVB key elements

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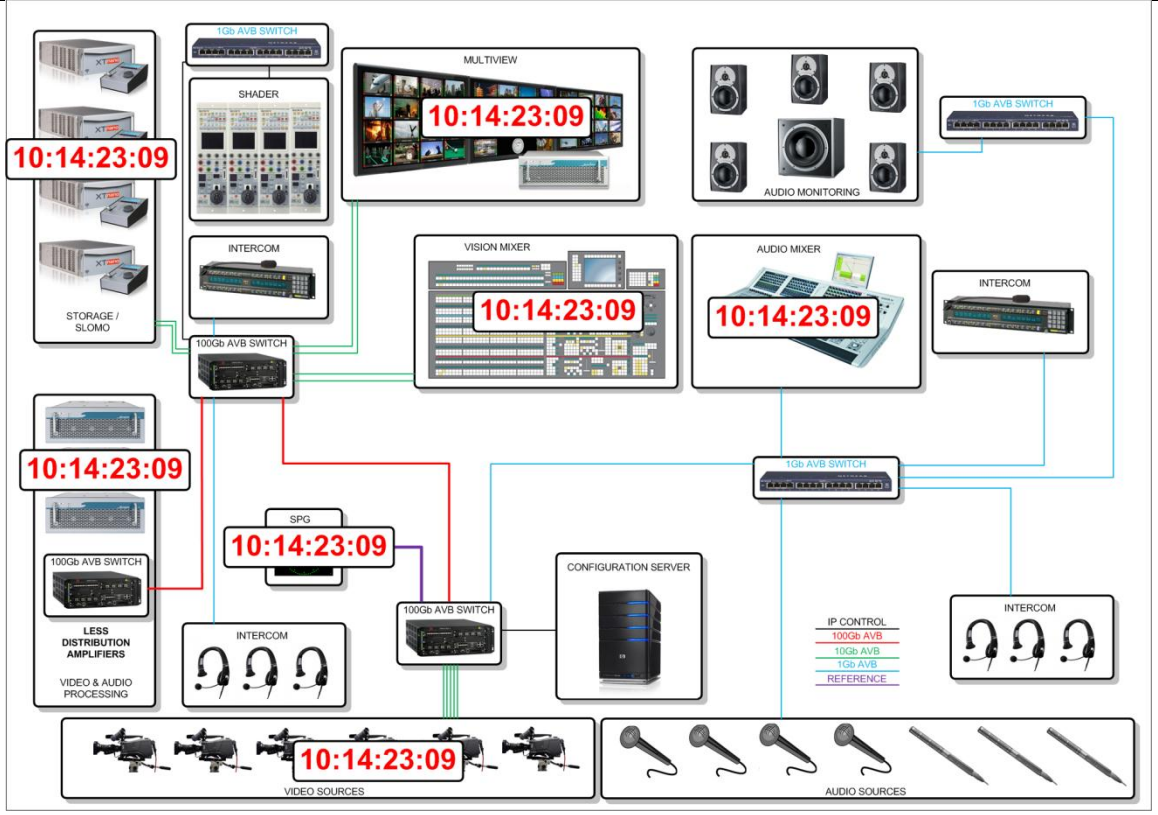
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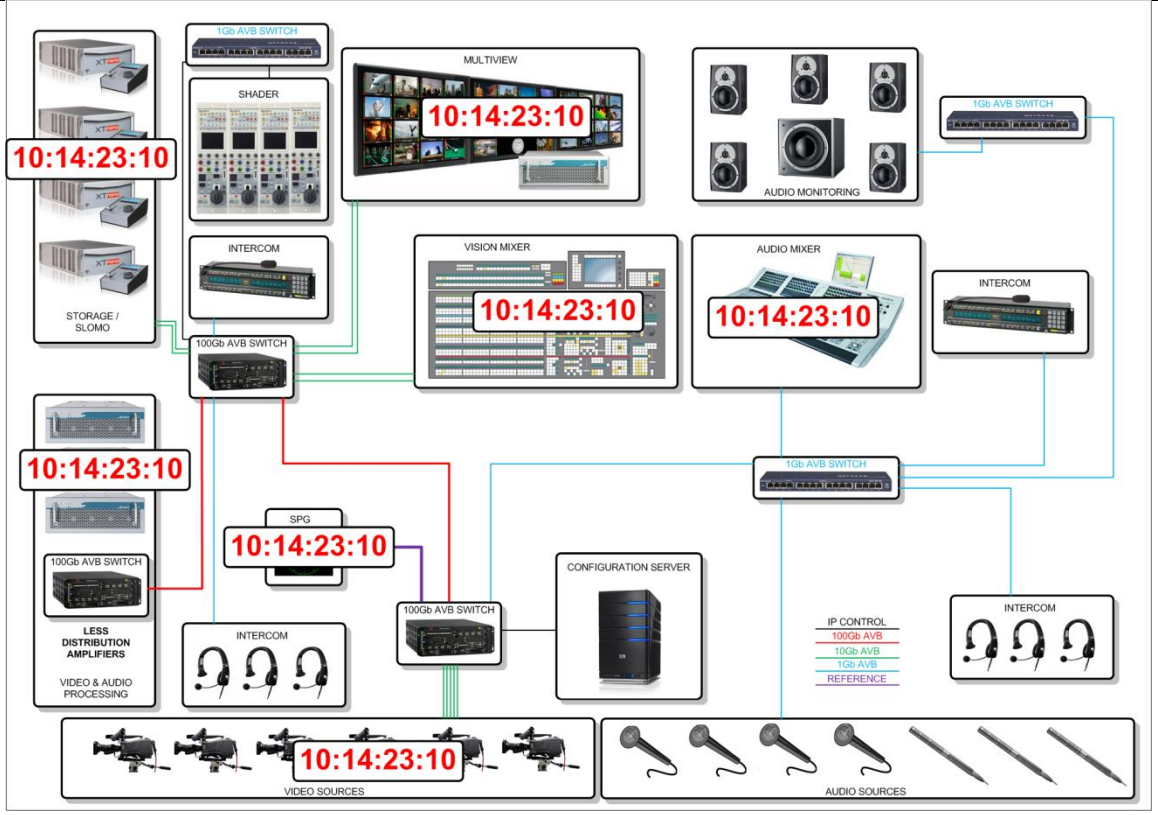
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Admission Control / bandwidth management

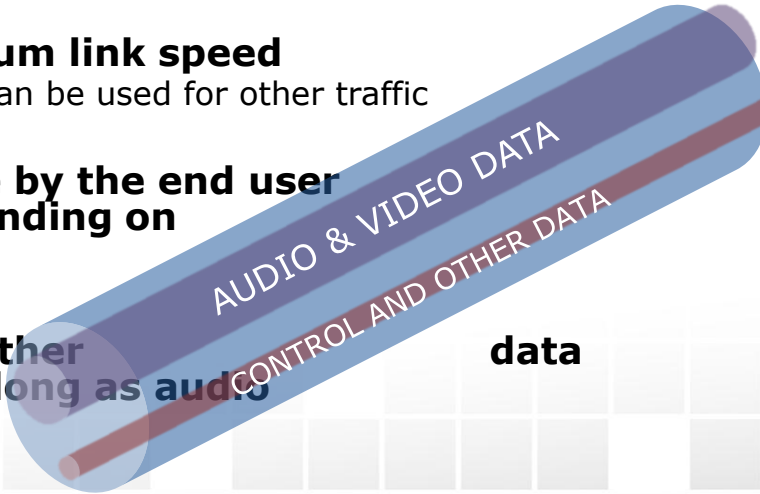
This technology makes sure that the payload (audio and video) can use a predefined amount of the bandwidth.

Default is 75% of the maximum link speed

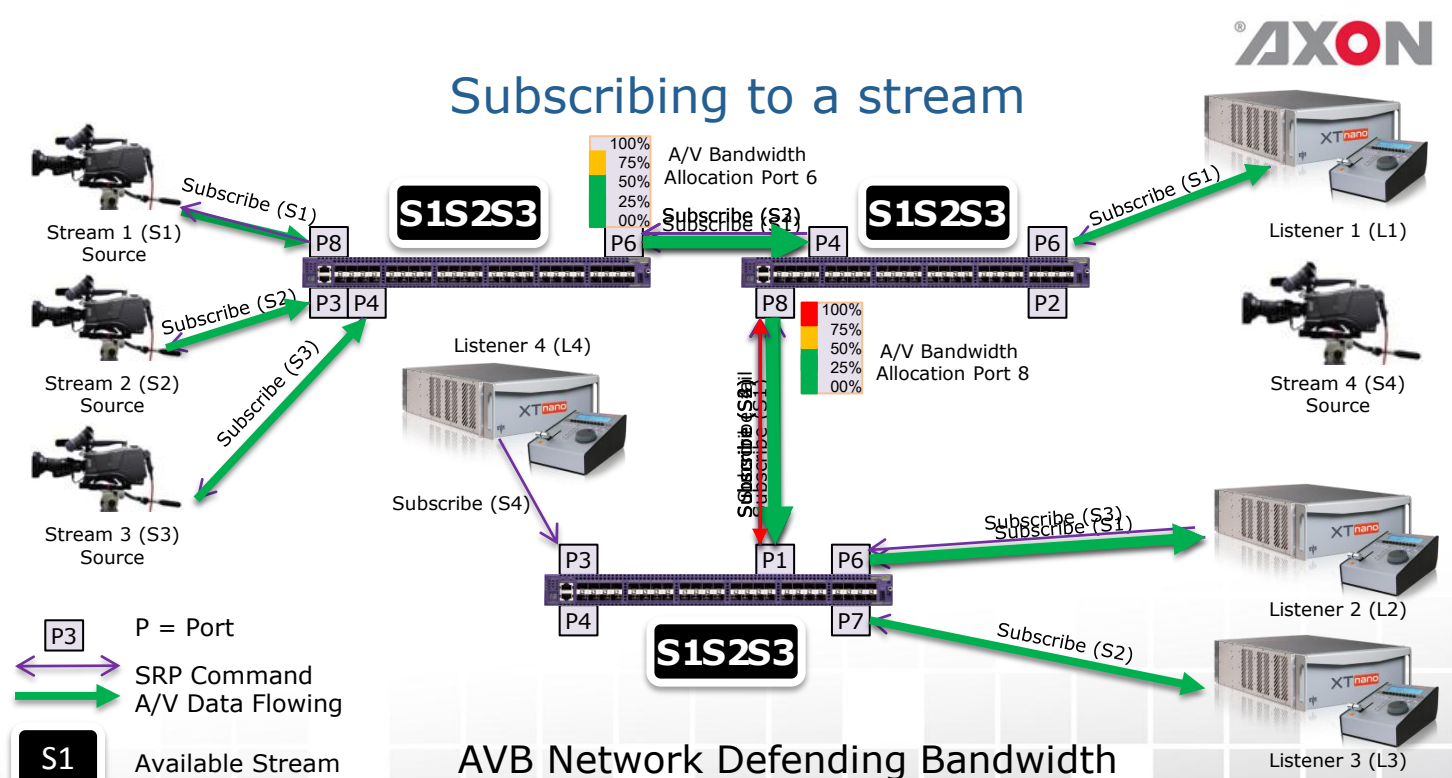
- The other 25% of bandwidth can be used for other traffic

This percentage is adjustable by the end user on a port by port basis (depending on switch functionality)

When available control and other data may use more bandwidth as long as audio and video data need less



Subscribing to a stream



AVB Network Defending Bandwidth

Forwarding, Queuing & Traffic Shaping (FQTSS)

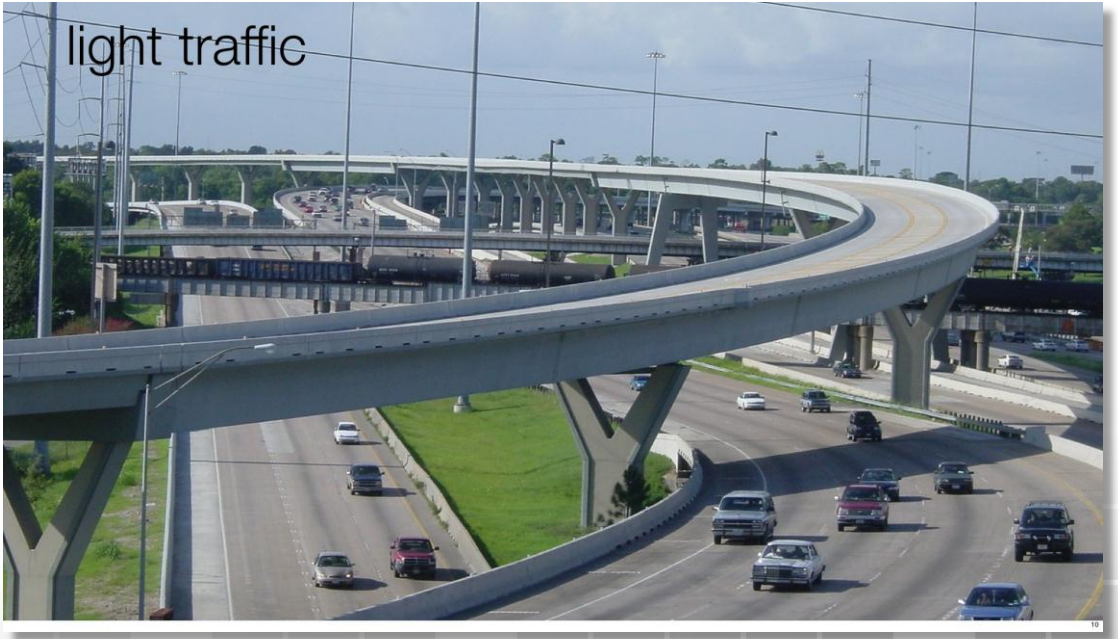
Priority scheduling of packets:

- Time sensitive streams have highest priority (Audio & Video)
- Other data has lower priority

Traffic shaping: AVB nodes must ‘behave’

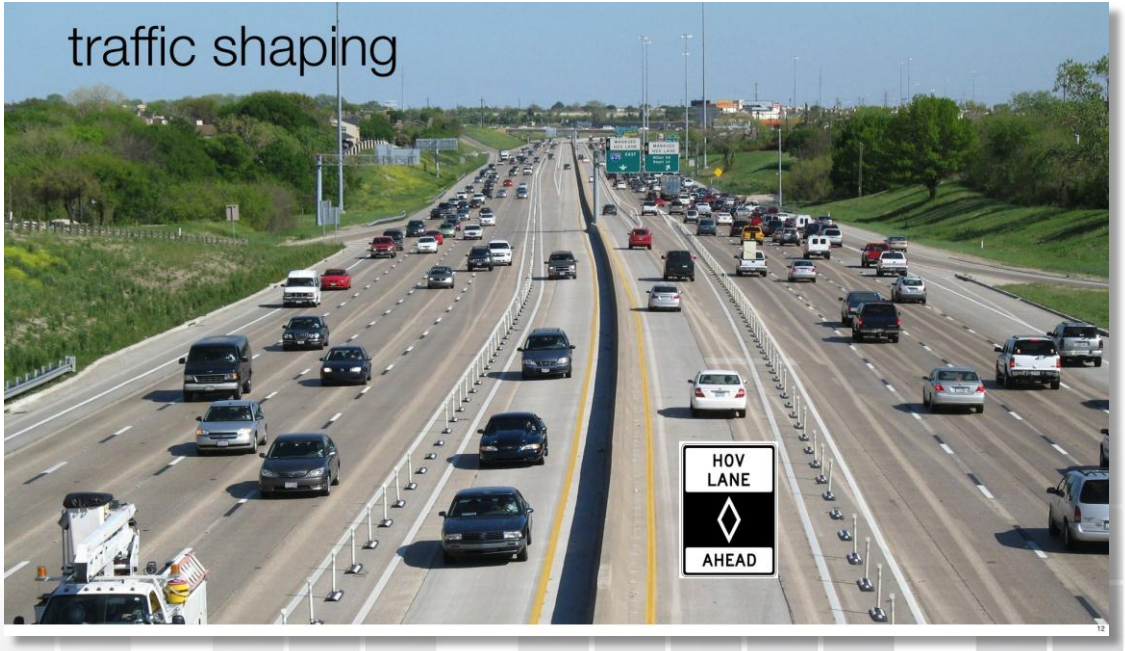
- Avoid bursts on links
- No jumbo-frames !

Example: Ethernet packets in light Traffic



Example: Ethernet packets in heavy Traffic

Example: Ethernet packets in an AVB system



AVB Configuration Protocol

Discovery

- Devices announce their presence to any listening controller

Configuration

- Controllers learn more about devices of interest and configure them

Connection Management

- Controllers make connections between Listeners and Talkers

Control

- Controllers interact with devices to control gain, phase, timing etc.

Typical characteristics of an AVB network

All nodes are *fully synchronised* to a (very stable) network clock

- Allows very accurate recovery of media clocks

***Low latency*: typically *2ms* overall network delay**

- Allows for complex/distributed networks (multiple hops)

The network *self-manages bandwidth reservation*

- links will never get overcommitted and/or packets are dropped

Uses *multi-cast*

- Only one copy of each active source on any given link or backbone

How real is Ethernet AVB ?

Standards are finished and published

Ethernet AVB switches are shipping

- 100Mbps, 1Gbps,10Gbps, 40Gbps and 100 Gbps

Several AVB Pro Audio products on the market from multiple vendors:

- Audio processors, audio consoles, speakers, etc
- Intercom systems

First broadcast quality AVB video products have started shipping

Compliance testing and certification process is up and running

On-going work on IEEE AVB – Revision of standards

IEEE 1722 (AVB transport layer)

New draft in progress, ballot to start soon,

- probably will be published as IEEE 1722-2015

Key new elements:

- Uncompressed audio payload
- Uncompressed video payload (more on that in subsequent slides)
- Clock Reference Streams (stream synchronisation)
- 'RTP' (compressed video) payload
- Security / Encryption (based on existing IEEE mechanisms/standards)
- Transport of IEEE 1722 using IP layer (UDP)
  - Port: 17220 (and 17221 for control protocol)

On-going work on IEEE AVB – AVB Gen 2 (TSN)

Next generation of AVB technology/standards

Mainly driven from automotive and industrial automation

Renamed to 'Time Sensitive Networking' (TSN)

- More focus on control, less on audio and video (hence the name change !)

Key improvements:

- Improved overall network latencies (a few 100 μs max)
- Improved robustness (redundancy switching)
- Improved scalability (network architecture, # of nodes)

Most relevant for professional AV/Broadcast

- Better/seamless redundancy switching

IEEE 1722 transport layer overview

IEEE 1722 specifies a wealth of formats that can be transported:

MIDI

IEC-61883 (IEEE 1394 / Firewire)

Uncompressed audio (16/24/32 bit, sample rates upto 192 kHz, multi-channel)

Audio with meta-data (eg AES-3, allowing for Dolby-E transport)

SDI video (encapsulated)

RAW video ('active picture' only)

Clock Reference Streams (wordclock or H/V sync)

Time-Sensitive Control/Data Streams (eg transport of ANC data)

RFC ('RTP') compressed video streams

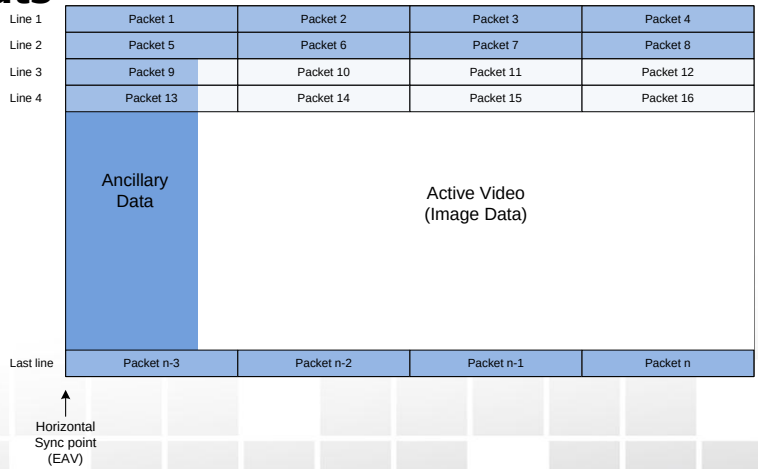
Vendor Specific (allows for custom/proprietary formats)

IEEE 1722 SDI Video transport format

Encapsulation of SDI in IEEE1722 packets

Support of all SDI formats

Every new line starts at start of a packet



IEEE 1722 RAW Video Format

Transmit (only) (active) video, audio, data as separate streams and save bandwidth

- Saving can be upto 40% (!) vs SDI format !

Picture resolution: 65535 pixels x 65535 pixels (16-bit field)

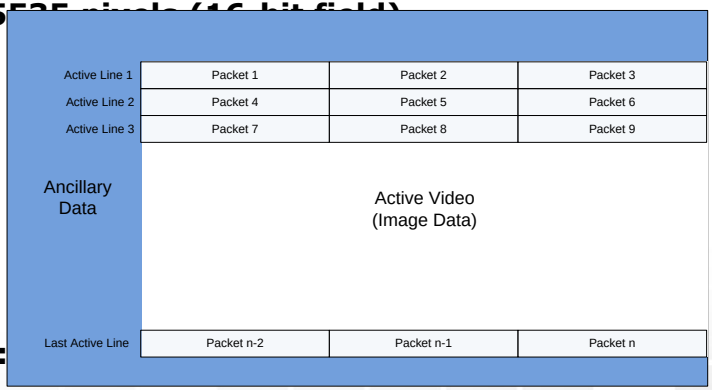
Frame-rate: 24, 25, 30, 35, 85 Hz

- Multiplier: 1, 2, 3, 4
- Including all 1000/1001 variants

Bit-depth: 8,10,12 or 16 bit

Pixel format: 4:1:1, 4:2:0, 4:2:2, 4:4:

Color space/coding: YCbCr, sRGB, XYZ, YCM, Bayer, BT601, BT709, ...



A standard does not guarantee *interoperability*

Ensuring that AVB nodes talk to AVB nodes

AVnu Alliance

AVnu Alliance update

Membership growing with 20+% year on year

- more than 80 members now

First test and certification test-site up and running

- Additional test-sites in preparation

First AVB Products have been certified

- Ethernet switches and Pro Audio devices

Certification of Pro Video devices planned to start in Q2 2015

- Minimum specification: only most common formats

Summarizing the benefits of Ethernet AVB

Based on ***existing***, ***open*** ***standards*** from a very reputable and succesful standards body (IEEE)

One framework for reliable, time-synchronised, real-time transport of ***video/audio/data***

Proven technology that is ***available now***: large professional AVB audio systems being deployed in the field

Interoperability is going to be taken care of: ***AVnu alliance***

Plug-and play : no conflicts or fiddling with IP addresses, etc

Fool-proof**:** the network is self-managing, it does not rely on the skills of network engineers or a (proprietery) software management layer.

Perfect co-existence (and reserved bandwidth for) with standard IP traffic (eg. control, monitoring, etc)

Thank you !