Here Comes Ethernet®!

802.1BA (AVB)

Finally…an Ethernet Standard for Audio, Video and Broadcast Applications

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A *Very* Short History of Ethernet®

- Bob Metcalfe and Dave Boggs
- May 22, 1973
- Xerox Research Center
  - Packetized data
  - Collision detection/retransmission
- Xerox abandoned computer development
  - Gave Ethernet to IEEE
  - An "open standard".

Ethernet and Audio-Video

- Collision detection/retransmission
  - Data not "real time"
  - Audio or video not "real time"
- Monitoring off-air
  - Maximum delay ?
  - Easily exceeded in Ethernet bit stream
  - "Latency"
- Multiple source, multiple bit streams
  - Aligning them increases latency

Proprietary Layer 2/Layer 3

Product Name	Company	Type	Channels	Top Specs
A-Net Pro 64	Aviom	100baseT	64	?
ASI 2416	Audio Science	100baseT	16	48kHz 24-bit
AudiaFLEX	Biamp	100baseT	?	?
Audinate Dante	Yamaha	100baseT	16	96kHz 24-bit
Axia	Telos	100baseT	?	48kHz 24 bit
CobraNet	Cirrus Logic	100baseT	128	96 kHz 24-bit
E-Snake	Whirlwind	100baseT	64	800-733-9473
Ethernet Audio	360 Systems	100baseT	2	48 kHz 16-bit
EtherSound	Digigram	100baseT	64	48 kHz 24-bit
Hydra	Calrec	1GbaseT	512	?
iLive	Allen & Heath	100baseT	64	?
IQ Net	Crown	100baseT	128	96 kHz 24-bit
MaGIC	Gibson	1GbaseT	320	48 kHz 24-bit
Mongoose	Rane	100baseT	32	?
REAC	Roland	100baseT	40	96 kHz 24-bit
WheatNET-IP	Wheatstone	100baseT	64	48 kHz 24-bit

The Decision is Made

- Reed Hundt, headed FCC 1993-97

  [We] "decided in 1994 that the Internet should be the common medium in the United States and broadcast should not be."

  - Speech at the Columbia Business School, 2010

A New IEEE Draft Standard

- Not just for audio and video
- For all data applications
- Addition to the Ethernet standard
  - Backward compatible with legacy Ethernet
  - Audio-Video Task Group of IEEE 802.1
    - "Time-sensitive audio and/or video data streams"
- What about existing audio-video Ethernet?
  - Proprietary versions of Ethernet
  - Often not cross-compatible

New Bells and Whistles

- Precise Synchronization
  - Bit stream alignment
    - PTP – Precision time protocol
  - Two levels of low latency
    - 2 ms through 7 hops (Media)
      - 6 switches, 2 end devices
    - 50 ms (Control)
  - Common Time Base
    - "Grand Master Clock"

New Bells and Whistles

- Traffic Shaping
  - Evenly distribute packets
- Admission Controls
  - Bandwidth Reservation
    - Talker to Listener and all Switches
- ID Non AVB compliant devices

A New IEEE Draft Standard

- Redundancy
  - HSR
    - High availability Seamless Redundancy
  - Normal recovery 100ms – 50 ms
  - Hirschmann recovery – 0 ms
    - No bits lost

Advantages of Ethernet

- Very versatile
- Very reliable
  - International Space Station
  - Nuclear Power Plants
  - Aircraft Carriers
- Easily designed and installed
- Made to be reconfigurable
- Redundancy
- Huge number of IT professional

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