802.1 AVB standards status

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AVB is …

- "Audio Video Bridging"
  - Individual network technologies have supported time-aware and streaming QoS for some time, but there was no way to bridge them …
  - so the capabilities were rarely used, or rarely successful in the market; and since …
  - the IEEE 802 architecture is the basis for all current successful LAN systems …

- the AVB task group was formed in 2006 …
  - to write the specifications for time-synchronized low latency streaming services through 802 networks.

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IEEE 802 AVB standards

- It's IEEE Std 802.1AS-2011 - time sync
  - "wall clock" reference time for 802 networks, accurate to better than 1μs even in very large networks
  - fully specified profile of IEEE 1588 for Ethernet, with compatible extensions to support much faster startup and reconfiguration, lower cost implementations (no complex filtering), and support for WiFi and other non-Ethernet LANs such as EPON and MoCA.

- It's IEEE Std 802.1Q-2011 - bridged virtual local area networks
  - full revision to bridge standard, includes AVB's traffic-shaping queuing and stream reservation protocol

- It's IEEE Std 802.11v-2011 and 802.11aa for wireless LANs
  - for 802.11v, the important part for AVB is delay measurement for 802.1AS ...
  - while 802.11aa provides more functions for streaming (such as better multicast services)

- It's IEEE Std 802.1BA-2011 - AVB systems
  - how to build interoperable systems

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Other IEEE AVB standards

- 1722 transport and control for AVB systems
  - IEEE Std 1722-2011: AVB transport streams
    - layer-2 real-time streams using IEC 61883 formats for audio and video (like Firewire)
    - used in professional audio systems with very tight jitter requirements, synchronization within 1μs, and thousands of simultaneous streams (e.g., Disney World - type attractions, major stadiums and auditoriums)
  - IEEE P1722.1 "Discovery, Enumeration, Configuration, and Control"
    - standardized higher levels for 1722-based systems
    - driven largely by professional audio

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IETF work for IP-based AVB

- New generation RTP to use well-known clock reference

  - older RTP used "NTP", but no way to tell which NTP nor any way to select a higher quality reference

    - new system to select 802.1AS, or 1588, or NTP based on application requirements

  - timestamps within RTP packets to be based on common clock selected for stream ... no ambiguity, vastly reduced buffering needed

- New generation SIP (session initiation protocol) to take advantage of 802.1Q stream reservations

  - actually using an updated SDP (session description protocol) format

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AVB "gen 2"

- Improved 802.1AS ("p802.1ASbt")
  - support advanced 802.1 services (link-aggregation, etc.), new media types (e.g., 1901, G.hn), redundant paths, one-step clocks and "concatenated follow-up", management tools to support longer cables, even faster reconfiguration, alternate time scales, tools to enable measurement of and compensate for link delay asymmetry.

- Improved Stream Reservation Protocol
  - redundant paths: stream can take more than one path from talker to listener
  - protocol computation and communication loads reduced for very large networks
  - may be an improved version of existing Stream Reservation Protocol or based on Shortest Path Bridging -- no PAR yet

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More "gen 2"

- Multiple talkers for a single stream
  - LAN-as-switch for uncompressed video -- no PAR yet
- Ultra-low-latency streams
  - industrial control needs long strings (32 devices in a chain, and 1-2 ms delay end to end at 100Mb/s
  - automotive control for some applications need < 100μs for 3 hops at 100Mb/s
  - "packet preemption" and "time aware shaping" are proposed solutions that scale to even larger and faster networks ... PARs in development for the 802 Executive Committee consideration in March, 2012.

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Industry support

- AVnu Alliance (see www.avnu.org) for AVB interop and compliance specifications
  - both layer-2-only and IP-based systems as well as interoperation/ bridging between the two
  - working with the IETF and IEEE (not doing their own standards)
  - member list includes (see http://www.avnu.org/about_us/our_members):
    - ICs: Analog Devices, Broadcom, Intel, Marvell, Micrel, Renesas, TI, Vitesse, Xilinx, XMOS, etc
    - Network infrastructure: Cisco, Extreme Networks
    - Pro A/V: Avid, Audinate, Barco, Bosch, Gibson, Harman, Meyer Sound, Presonus, Sennheiser, Shure, Yamaha, etc.
    - Automotive: Hyundai, Pelagicore, TC Group, etc.

- Apple
  - full AVB stack implemented in Mac OS X 10.7 and supported in all Macintosh computers released in the last year (not, unfortunately, the Mac Pro)

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Next steps

- Standards support coming for expanded industrial and real-time control systems
  - so now it's time for expanded participation by the manufacturing, transportation and power transmission industries

- It's important that we all work together!

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Thank you!

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