Time Accuracy Requirements in Audio Networks

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Issues

- AVB should be as good as, if not an improvement upon current technologies
- AVB should be easy to configure and not require network engineering in standard configurations

Current Standards

- The current standard for high quality digital transport is AES 3/AES 11
  - AES3-2003: AES standard for digital audio engineering - Serial transmission format for two-channel linearly represented digital audio data
  - AES11-2003: AES recommended practice for digital audio engineering - Synchronization of digital audio equipment in studio operations

Current Standards

- Consumer version of AES is S/PDIF
- IEC 60958
- Major difference between S/PDIF and AES is the use of less expensive unbalanced cables.
- However the same basic requirements for accuracy exist

AES 3 / AES 11

- In AES 3/11 systems word clock is required to be accurate to within 5% of the sample clock
  - 44.1k = 1.134 uSecs
  - 48k = 1.042 uSecs
  - 96k = 520 nSecs
  - 192k = 260 nSecs

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Critical AES 3/11 Applications

- Professional
  - Recording
  - Broadcast
  - Cinema Post Production
  - Live Performance
  - Theatres
- Consumer
  - CD/DVD Players
  - AV Receivers
  - Home Studio

Line Array Applications

- Time delay is used to control the dispersion of high fidelity line arrays
- Small phase mismatches are also engineered in to control the dispersion of the array
- The phase changes specified can range from 10-60° of phase at 16-20 kHz
- The engineer needs the accuracy of the audio transport to be better than the nominal phase shift being specified
- This points to 10° phase shift at 20kHz being required, which matches the AES standard of 1 uSec

Signaling Frequency Range

- 16kHz to 20kHz is the practical limit for loudspeakers
- However to be fully transparent with a 48kHz sample rate the signal quality needs to be maintained to 24kHz
- 10 degrees @ 24kHz = 1.15 uSecs

Conclusions

- For AVB to be a viable solution in many applications it will need to be at least as good as current practice. Therefore 1uSec accuracy will required.
- In order to maintain ease of use AVB should attempt to achieve 1 uSec accuracy in standard configurations.
- If 1 uSec cannot be achieved in standard configurations, then we need to specify under what conditions it can be achieved.