SAS Backplane Channel References

Anthony Calbone, Seagate

Tom Skaar, Seagate

T10 SAS Related Info

- There were many S-Parameters of SAS backplanes that were contributed to the SAS effort in T10

- These S-Parameters, along with detailed analysis, are publicly available

- Document search link: http://www.t10.org/t10docs.htm
  - Paste T10 document number into the search field to find files

- Reminder that SAS rates are expressed in line rate up until SAS-4
  - SAS-1: 3G SAS (2005) = 3 Gbps
  - SAS-2: 6G SAS (2009) = 6 Gbps
  - SAS-3: 12G SAS (2013) = 12 Gbps
  - SAS-4: 24G SAS (TBD) = 22.5 Gbps
- 8b/10b with scrambling used up to and including SAS-3
- 128b/150b with scrambling will be used for SAS-4

- Reminder that 802.3 Annex 69B describes backplane Ethernet characteristics and the high confidence regions associated with each parameter

S-Parameter Analysis Contributions to T10

- The documents listed below are very helpful for understanding the performance of SAS channels
- Some of the presentations utilize methods from backplane Ethernet, which helps understand the performance of these channels as it relates to backplane Ethernet
- Takeaways from the presentations:
  - The presentations are showing that many 6G SAS 6G backplanes are outside of the high confidence regions shown in 802.3 Clause 69B for 10GBASE-KR
  - There is a combination of cross-talk and insertion loss limited channels
  - This implies that a combination of improved connectors\layout and backplane material would be needed to overcome these limitations

- ICR Analysis of Channels for SAS-3
  - T10 Document: 09-395R1
  - Uses ICR technique from Backplane Ethernet
  - References 10GBASE-KR on page 11 in ICR results table
- SAS-3 Channel Analysis
  - T10 Document: 10-041R5
  - Analysis of many SAS channels
  - The channels used are listed beginning on page 10
- Backplane Ethernet Overview presented to T10
  - T10 Document: 05-214R0

S-Parameter Contributions to T10

- The 6G SAS channels shown below are a subset of the available channels

- These channels could be used for 64b/66b vs. 8b/10b discussions, as well as understanding how 10GBASE-KR will perform over these channels

- The analysis of these channels would provide a wealth of information for the group

- HP Channel Set 1
  - T10 Document: 05-384R2
  - Consists of channels with 3 connectors ranging from 12 to 20 inches of FR4

- HP Channel Set 2
  - T10 Document: 05-389R0
  - Consists of channels with 4 connectors ranging from 18 to 20 inches of FR4

- HP Channel Set 3
  - T10 Document: 05-390R1
  - Consists of channels with 3 connectors and a combination traces and cables

- HP Channel Set 4
  - T10 Document: 06-017R0
  - Consists of channels with 4 connectors ranging from 18 to 20 inches of FR4