SMF for Short Reach Interconnects

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SMF for Short Reach Interconnects

- Both MMF and SMF solutions likely for switch to server interconnects
  - Most such links are greenfield and will be optimized for the generation/application
- For cost optimization one must consider both sides of the link:
  - In Switch to Switch interconnects these may both be the same (ie, 400G-DR4 to 400G-DR4)
  - In Server to Switch interconnects these are going to be different (ie, 100G-DR to 400G-DR4)
- Options for decreasing the cost of the high density (switch) side may differ from those for decreasing the low density (server) side
  - Silicon Photonics (SMF) solutions generally benefit from sharing one laser across multiple lanes (switch side)

SMF for Short Reach Interconnects

- Loss/m is quite low for SMF, so there is little incentive to reduce reach
  - IE, 400G-DR4 allocates about 0.3 dB of loss for 500m of fiber
- Connector losses dominate the loss budget
  - Approximately 2.7 dB for double-link model (4xMPO) *(kolesar_3bs_01_0514.pdf)*
- Reductions in the number of connectors can reduce the loss budget
  - Approximately 1.6 dB of connector loss for a single-link model (2xMPO)
  - For a server to switch application this is likely sufficient

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- Reductions in loss budget may allow for incremental improvement of switch side optics cost
  - Lower OMA spec can allow for more lanes per laser (assuming an externally modulated architecture such as SiP)
  - 1 dB decrease in OMA ~ 25% increase in throughput per laser (more lanes)
  - For a 51.2T switch this could mean a reduction from 128 lasers (4x100G per laser) to 103 lasers (~ 5x100G per laser)

- Likely minimal cost savings on the server side (vs. 100G-DR)
  - Since the number of lanes per laser is pretty low (ie, 1-2), and likely serviced with a single laser already

SMF for Short Reach Interconnects

- SMF has other (potential) advantages for cost sensitive short reach interconnects:
  - The ability to use remote light sources likely to allow for higher density integration into high temperature environments (ie, switch)
  - Getting more throughput per laser also likely to improve system reliability
  - SMF is also quite low cost (generally lower than MMF)

- However the benefits (of a new PMD) would favor the switch side
  - Ie, 100GBASE-DR already pretty optimal as an SMF server side I/O.

Additional Considerations

- Currently 100GbE and 400GbE have 100G per lane in SMF standards
  - EX: 100GBASE-DR, 400GBASE-DR4
- 200GbE only has 50G per lane in SMF standards
  - EX: 200GBASE-DR4
- If new 200GbE is being considered (for MMF), companion objectives for 100 per lane over SMF may be worthwhile
  - EX: 200GBASE-DR2

Thank You