Preliminary Serial PMD Proposal for HSSG

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Evaluation Criteria

- Rate ability to meet broadest set of application & distance/fiber
- A working prototype of a PHY is available by completion of Sponsor Ballot (meets MDI specs)
- Relative cost comparison - short/long term
- Qualitative Reliability (e.g. MTBF, etc.)
- Undetected frame error rate at the MAC client IF
- Time to standardization, Time to market
- Multiple vendor supply available by completion of Sponsor Ballot
- Any new PHY proposals should address this criteria

Key Features of *Serial* Proposal

- Low Cost
  - Low-cost through the use of uncooled optics, and SiGe and/or GaAs
  - Low-cost through synergy with high volume applications (i.e. CO OC-192 VSR)
- Industry Support
  - Serial 10G transceivers being developed by multiple suppliers
    - Finisar, IBM, Infineon, Lucent, Mitsubishi, Picolight, Sumitomo, Tyco Electronics
  - Serial 10G electronics being developed by several suppliers
    - AMCC, IBM, Giga, Lucent ME, Maxim, Multilink, Vitesse, and others

Key Features of *Serial* Proposal

- Time to Market/Reliability
  - Product introduction planned for year 2000 from several sources
  - Leverage of proven OC-192 SR technology and innovative advanced packaging
- Broad Application
  - Meets all 10GE distance requirements
    - 65 m minimum using uncooled 1.3um F-P over installed MMF
    - 300 m using 0.85um VCSELs with enhanced MMF
      - ~65m on 500Mhz-km 50um fiber
    - 2 km using uncooled unisolated 1.3um F-P over STD SMF
    - 10 km using uncooled 1.3um DFB over STD SMF
    - 40km using cooled 1.3um DFB over STD SMF

Technical Choices for 10GE Transceiver

- Connectorized modules preferred
  - EMI issues may force pigtail implementation
- Compatible with current form factors
- Hot pluggable
- Support LVDS or CML I/O levels
- SerDes integrated
  - I/O will depend on form factor, but 1:4, 1:5, 1:8, 1:10, and 1:16 are considered viable implementations
  - pin count is an important consideration
- Data rate is 10.000 Gbps
  - Baud rate could be 10.0G, 9.95G, 11.25G, or 12.5G pending coding decision
  - Scrambling, 8b/10b, 16b/18b, MAS, and MB810 all being considered

Preliminary Power Budget Analysis for SMF

Description	2km	10km	40km	40km	Units
Source Type	F-P	DFB**	DFB*	DFB*	
Line Rate (up to)	12.5	12.5	12.5	12.5	Gb/s
Wavelength Range	1290 – 1330	1290 – 1325	1295 – 1315	1530 – 1560	nm
Response Time 20/80% max	25	25	25	20	ps
Spectral Width max	2^	.5	.3	.1	nm
Side Mode Suppression Ratio		30	30	30	dB
Launch Power max	+2	+2	+7	+2	dBm, avg
Launch Power min	-4	-4	+4	-2	dBm, avg
Extinction Ratio	6	6	6	6	dB
RIN max	-130	-140	-140	-140	dB/Hz

* Cooled ** DFB or LW VCSEL

^ RMS

Preliminary Power Budget Analysis for SMF Cont'd

Description	2km	10km	40km	40km	Units
Line Rate (up to)	12.5	12.5	12.5	12.5	Gb/s
Wavelength Range	1290 – 1330	1290 - 1325	1295 – 1315	1530 – 1560	nm
Receive Power max	+2	+2	TBD	+2	dBm, avg
Receive Power min	-14	-14	-22	-22	dBm, avg
Return Loss	26	26	26	26	dB

Preliminary Power Budget Analysis for MMF

Description	65m	300m*	Units
Source Type	F-P	VCSEL	
Line Rate (up to)	12.5	12.5	Gb/s
Wavelength Range	1290 - 1330	840 – 860	nm
Response Time 20/80% max	25	25	ps
Spectral Width max	2	.20**	nm, RMS
Launch Power max	+2	-3.7	dBm, avg
Launch Power min	-4	-8	dBm, avg
Extinction Ratio	6	7	dB
RIN max	-130	-120	dB/Hz

***~65m on 500MHz-km 50µm fiber**

**** alternate link models to accommodate wider spectral width will be investigated**

Preliminary Power Budget Analysis for MMF Cont'd

Description	100m	300m*	Units
Receiver			
Line Rate(up to)	12.5	12.5	Gb/s
Wavelength Range	1290 - 1330	840 – 860	nm
Receive Power max	+2	-3.7	dBm, avg
Receive Power min	-14	-16	dBm, avg
Return Loss	20	20	dB

***~65m on 500MHz-km 50µm fiber**

Conclusions

- A significant force of serial component suppliers are working to address the system level interface requirements as well as respond to the evaluation criteria
- Suppliers will leverage new developments in the SR(2km) and VSR(<500m) OC-192 applications to take advantage of economies of scale and reduce the cost to the customer