IEEE 802.3 25G Ethernet SG – Arch Ad Hoc PCS Thoughts and Considerations

Eric Baden (ericb at broadcom com)

Yong Kim (ybkim at broadcom com), presenting.

25G Objectives (post-Sept ‘14 Interim)

- Recap (not to revisit, but stating the assumptions).
  - Both 3m and 5m reach adopted as objectives (implicit ToR and InterR)
  - FEC/no FEC (implicit sub-set objectives of latency, cost, compatibilities)

- Desires
  - Serve the market need as soon as possible. Systems are being deployed or very soon to be.
  - Re-use/leverage/adopt/etc work of 802.3bj (tech feasibility, arch, etc)

Recap: Prior Arch Ad Hoc Work in RS/PCS/FEC

- From Sept 2014 Interim @ Ottawa
  - **"25GE Arch Ad Hoc Report" Slides 10-13 on RS/PCS/FEC**
    http://www.ieee802.org/3/25GSG/public/Sept14/brown_25GE_02_0914c.pdf, which refers parts of
  - "25GE Arch"
    http://www.ieee802.org/3/25GSG/public/adhoc/architecture/gustlin_081214_25GE_adhoc.pdf,
  - "Cable Reach" – a good summary of reach discussions"
    http://www.ieee802.org/3/25GSG/public/Sept14/ran_25GE_01_0914.pdf
- Option 1
  - 64/66b. 64 bit encoding, 40/100GBASE-R @ 25.78125G, but no AM, 256/257B TC, RS-FEC or no-FEC option.
- Option 2
  - 64/66b. 32 bit encoding, 10GBASE-R @ 25.78125G, no AM, 256/257B TC, RS-FEC or no-FEC option.
- Option 3
  - 64/66b. 64 bit encoding, 40GBASe-R @ 25.78125G, Single Lane-AM?, 256/257B TC (no AM remapping), RS-FEC or no-FEC option.
- And we could keep going…and more discussions happening and continued…

RS/PCS/FEC Considerations

- Technology leverage and choices well understood and discussed already.
  - P802.3bj work.
  - Installed base of 10G.
    - e.g. OIF CEI-28G-MR, extending to ~> 25G speed up.
  - Options 1, 2, and 3,.. we could keep on going., so
- Time for a firm proposal that may meet all objectives and desires.
  - Caveat: Not a unique set of solutions presented here, but a set of directions that attempt to meet all simultaneously.

General and Common Ideas

- 64/66B.
- Lane rate of 25.78125G
- Alignment Marker eases the use of FEC (not FEC capability).
- Optional Auto-negotiation determines use of FEC and training, among other things.

Direction A. 25G PCS with no FEC

- "10GBASE-R" at 2.5X speed.
  - 25.78125 GHz Lane Rate.
  - 64/66b
  - No Alignment Markers, No FEC.
- Rationale
  - 10G SerDes has been deployed, mature, and well understood. 'Simple' scaling, e.g. I/F going from existing 10G to 25G speed upgrade.
  - Some 25G Ethernet implementation has little to do with "100G break-out", server-centric and switch centric.
  - Deployed technology – proprietary speed-up extensions of 10G Ethernet, OIF-CEI28, and others.
  - Optimized to serve the greater portion (# of connections) of the of the ToR Ethernet market, e.g. 3 meter ToR reach, lower latency, lower cost.
  - Viewed as the minimum common denominator for 25G ToR links.

Direction B. 25G PCS with FEC

- "10GBASE-R" at 2.5X speed-up, plus other augmentations, OR P802.3bj, break out to ¼, plus other augmentations.
- Logistically, 2nd path (.3bj) is a better baseline to modify.
  - Alignment Marker (AM) as per Clause 82, but adopted to PCS as per CL49.
    - RS-FEC as per Clause 91.
- Rationale
  - Combining use of both AM and FEC provides system benefits.
    - Alignment on the receive similar to CL91, etc.
    - Eases EEE implementation (deterministic link alignment sync-up)
  - Select the most robust system to achieve 5 meter reach objective (RS-FEC), and also support the implementations that support 100G and break out to 4 x 25G.
  - Viewed as the sensible superset for 25G ToR links
- Other Market Friendly considerations, if the group wants take on,
  - Optional (as in allow in AN) use of Clause 74 BASE-R FEC for implementations that already support 10G and 40G, extended to 25G.

A summary of Directions A & B

RS/PCS/FEC	10G	25G with no FEC	25G with FEC	40G	100G
Block Coding			64/66B		
Lanes	1	1	1	4	4
PCS	CL49	CL49	CL49	CL82	CL82
Align M	-	-	Y	Y	Y
Trans Code	-	-	256/257B	N/A	256/257B
Reach		3+ m	5 m		5 m
Latency	Low	Low	High		High
Optional CL74 FEC Use (TBD)	Y	Y	Y	Y	Y

Summary & Conclusions

- Sufficient socialization on technical feasibility, stds-leverage, and adoption timeline, has occurred in 25G SG and ad hoc meetings thus far.
- The Direction B (25G, AM, CL91 FEC) is the reasonable super set.
  - A view from 100G down.
  - Includes up to 5 meter reach.
  - Turn off AM and FEC to interoperable Direction A, or
  - Turn off individually, to interoperate with sub-set options.
- The Direction A (25G, no AM, no FEC) is reasonable minimum set.
  - A view from 10G speed up.
  - For many use case, this is minimum and complete capability (long term.)
  - WRT to option of AM with no FEC operation, AM does no harm, but would cost the implementation-spin with little to no (perceived) benefit.
- Both the Direction A and the B should be considered as TF objectives, and to be standardized in the Task Force of this project.

THANK YOU!