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TECHNICAL FEASIBILITY OF 10G OVER 1 TP

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REVIEW OF 802.3 BQ AND BP

	40GBASE-T 802.3bq	1000BASE-T1 802.3bp
# of pairs	4	1
Total BW	40G	1G
Bandwidth per Pair	10G	1G
# of Signal levels	16	3
Baud Rate	3.2G	750M
Constellation	DSQ128	PAM3
Pre-conditioning	THP	
Error correction	LDPC	RS-FEC
Un-coded bit protection	Reed Solomon	
Cable Reach (meters)	30	15m UTP/40m STP
Cable Type	CAT 8	
Latency	25600 BT (640nsec)	7168 BT (7168nsec)
# of connectors	2 (RJ-45)	4 (single-pair)

SCALING OF .3BQ VS .3BP

- Achieving 10G over 1-pair from 40GBASE-T over 4-pairs preserves the baud rate
 - 1 TP cable requirement will be similar to CAT8 cabling
- Achieving 10G over 1-pair by scaling 1000BASE-T1 will require a very high rate @ 7.5GBaud
 - Higher baud rate will imply better than CAT8 type cabling > 4 GHz BW!
- 5G and 2.5G can be specified as frequency scaled version of 10G
 - Possibly leverage editorial framework from 802.3bq and bz

PHY TIMING PARAMETERS

- PHY LATENCY

- Phy Latency is specified as MAC to MAC
- 1 PHY TX + 1 PHY RX
- 40GBASE-T latency = 25 600 BT = 640 nsec
- 1 pair 10G version would, in the worst-case, have similar PHY latency
- Scales up by ~2x and ~4x for 5G and 2.5G respectively

- Start up time

- 40GBASE-T startup time = Autoneg + Training
- Clause 28 Autoneg is 2+ seconds - this PHY would use single-pair autoneg
- Training is 2+ seconds, reduced link IL allows faster convergence than 40GBASE-T
- For pre-configured links, autoneg will be bypassed and training can be a one-time event
- Feasible to achieve 100ms Startup time for fixed pre-configured links, similar to 1000BASE-T1

REACH, CONNECTORS AND POWER DELIVERY

- 40GBASE-T is specified up to 30 meters with 2 connectors
- Reducing cable reach down to 15 meters opens up room for 4 connectors with further room for power and cost reduction
- 10 meters with 2 connectors can lower the cost but the gains may diminish over time with semiconductor process improvements
- PoDL is applicable, as is, for either implementation

SUMMARY

- 10G over 1P derived from 40GBASE-T is feasible and practical
- 10G over 1P derived from 1000BASE-T1 will require substantially higher bandwidth cables and transformers
- 15 meter vs 10 meter reach is a power and cost tradeoff issue. Both are technically feasible
- Startup time optimization can leverage work done in 1000BASE-T1

THANK YOU