40G SMF Analysis –

XLAUI CDR vs 40G Mux / Demux

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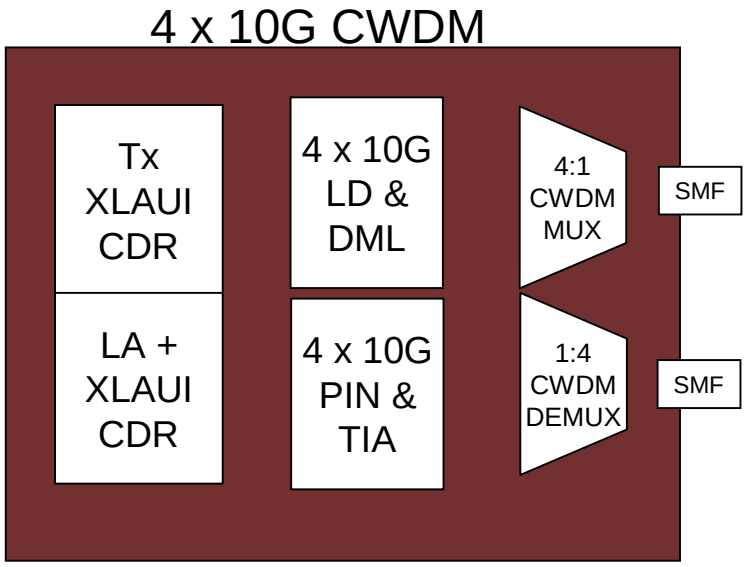
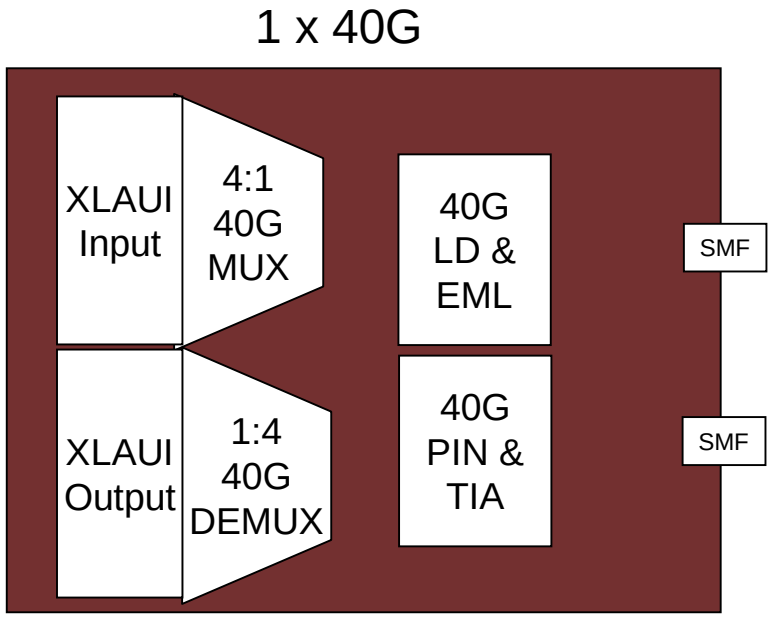
Agenda

1. Introduction
2. Comparing Cost 4 x 10G with 1 x 40G
3. Comparing Power
4. Comparing Technology Reuse
5. Proposal

Introduction

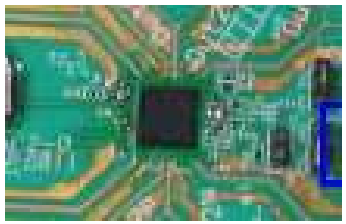
- There are two physical layer proposals on how to communicate 10km 40GbE
  - 4 x 10G leveraging CWDM multiplexing
  - 1 x 40G leveraging 40G Serializer / De-serializer
- 4 x 10G Characteristics:
  - Electrical I/O: 4 x 10G
  - Optical I/O: 4 x 10G (4 wavelengths)
  - 1UI = 97ps
- 1 x 40G Characteristics:
  - Electrical I/O: 4 x 10G
  - Optical I/O: 1 x 40G
  - 1UI = 24ps

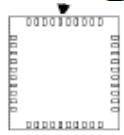




Assumptions

	CWDM XLAUI CDR Solution	40G Mux/Demux Solution
Number of Devices	2 (1 Tx, 1 Rx)	2 (1 Mux, 1 Demux)
Package Type and Size	7 x 7mm QFN for each device	7x7mm SMT for each device
Process (same die size)	Support 10G	Support 40G





Relative Cost

	CWDM XLAUI CDR Solution	40G Mux/Demux Solution
Package Cost	0.15	0.90
Die Cost	0.45	0.90
Test Cost	0.40	4.0
Application Considerations		Rogers (1.5 x FR4), 40G reference clock…
Total	1	>6

Even if 40G can use SMT, it is still much more expensive than QFN

Much higher FT process required for 40G

10G already leverages low cost ATE testing, and high yield is well established. 40G will require much more expensive testing (rack and stack)

Application cost of 40G SERDES much higher than 10G CDRs, even if GPPO is not used. Clocking architecture for 40G SERDES will be more expensive, mfg material will be more expensive

Relative Power – XLAUI CDR vs. Mux / Demux in 2008

	CWDM XLAUI CDR Solution	40G Mux/Demux Solution	
XLAUI	1.5W	0.75W	
40G Serialization, 40G Output	0	4W	Even if 40G can use SMT package, thermal constraints at this power level will present application challenges
40G Deserialization, 40G Input	0	3W	Even if 40G can use SMT package, thermal constraints at this power level will present application challenges
Total	1.5W	>7	

Technology Reuse

	CWDM XLAUI CDR Solution	40G Mux/Demux Solution
10GbE	Yes, Millions of Ports Shipped	No
Telecom	Maybe	Yes – OC768, low volume, high cost
Other Areas in 40GbE / 100GbE	Yes – lane extenders (XR / PMD repeaters / Lane Extenders, Active Copper…)	No
Summary	Significant Reuse	Very Little Reuse

Recommendation:

- 4 x 10G is the appropriate choice for 802.3ba
  - 10G technology is already well proven
  - Lower cost option for years to come since 10G technology can (has) been amortized across 10GbE
  - Lower power for years to come

4 x 10G CWDM