

Two cable types for 25GBASE-CR and 25GBASE-CR-S

**Addressing Draft 1.0 comments:
86, 87, and many others**

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P802.3by Chief Editor

Introduction

- Draft 1.0 comments 86 and 87 propose that ...
 - 3 m cable may be supported with a 25GBASE-CR or 25GBASE-CR-S PHY with no FEC enabled
 - 4 m cable may be supported with a 25GBASE-CR or 25GBASE-CR-S PHY with BASE-R FEC enabled
- This presentation proposes that...
 - IF the task force approves a 3 m cable specification for no FEC operation
 - THEN only a 3 m (no FEC) cable and a 5 m (RS-FEC) cable should be specified.
- Details to follow.

Comment #86

<i>CI</i> 110	<i>SC</i> 110.10.2	<i>P</i> 150	<i>L</i> 24	# <input type="text" value="86"/>
Mellitz, Richard		Intel Corporation		
<i>Comment Type</i>	TR	<i>Comment Status</i>	X	
A base-R FEC cable assembly can support a cable up to at least 4 meters and a no-FEC cable assembly up to a least 3 meters See mellitz_3by_01_0515.pdf				
<i>SuggestedRemedy</i>				
Change				
The measured insertion loss at 12.8906 GHz of the CA-S cable assembly shall be less than or equal to 16.48 dB. The measured insertion loss at 12.8906 GHz of the CA-N cable assembly shall be less than or equal to 12.98 dB				
To				
The measured insertion loss at 12.8906 GHz of the CA-S cable assembly shall be less than or equal to 19.48 dB. The measured insertion loss at 12.8906 GHz of the CA-N cable assembly shall be less than or equal to 15.98 dB				
<i>Proposed Response</i>		<i>Response Status</i>	O	

Comment #87

CI 110A	SC 110A.5	P 220	L 37	# 87
Mellitz, Richard		Intel Corporation		
<i>Comment Type</i>	TR	<i>Comment Status</i>	X	
A base-R FEC cable assembly can support a cable up to at least 4 meters and a no-FEC cable assembly up to a least 3 meters See mellitz_3by_01_0515.pdf				
<i>SuggestedRemedy</i>				
In Table 110A-1 Change IL_Chmax for CA-S From 29 to 31 IL_Camax for CA-S From 16.48 to 19.48				
IL_Chmax for CA-N From 25.5 to 28 IL_Camax for CA-N From 12.48 to 15.48				
And on page 227 line 40ff table 110C-a Change CA-S references for RS-FEC, BASE-R FEC from 3m to 4m and Change CA-N references for RS-FEC, BASE-R FEC, no FEC from 2m to 4m				
<i>Proposed Response</i>	<i>Response Status</i> O			

Draft 1.0 cable types

- Draft 1.0 defines 3 cable types
 - CA-N
 - up to 2 m
 - compatible with PHY using no FEC, BASE-R FEC, or RS-FEC
 - CA-S
 - up to at least 3 m
 - compatible with PHY using BASE-R FEC or RS-FEC
 - CA-L
 - up to at least 5 m
 - compatible with PHY using RS-FEC

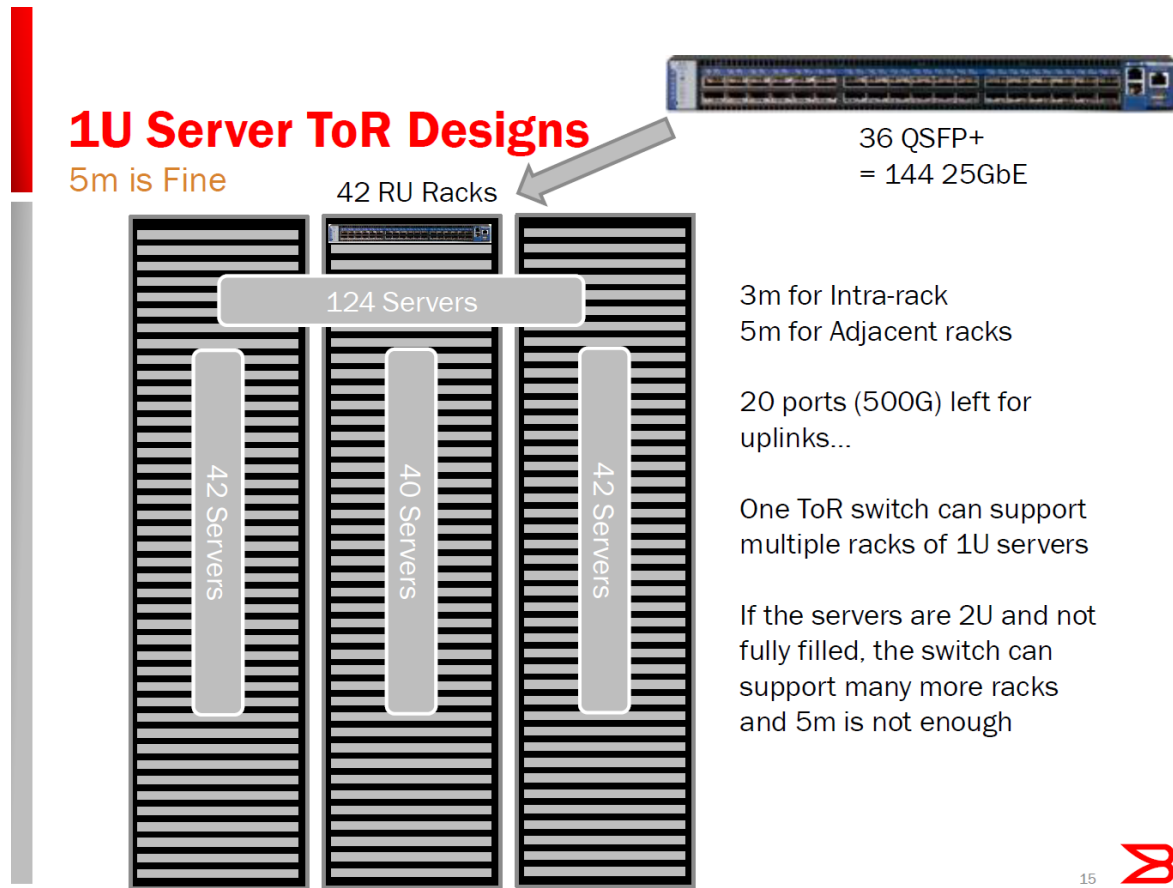
P802.3by objectives

- Define a single-lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m.
- Define a single-lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 5m.

Use cases

- Need 5 m for connection from top of rack switch to server on adjacent rack (inter-rack).
- Need 3 m for connection from top of rack switch to server on same rack (intra-rack).
- Need 2 m for connection from middle of rack switch to server on same rack (intra-rack).
- Desire for minimum latency by using no FEC, if possible.

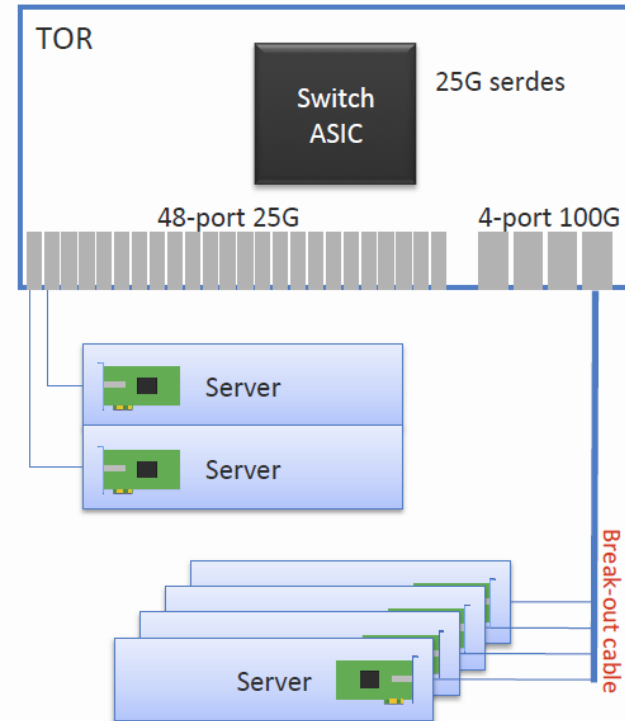
Use case example #1



Use case example #2

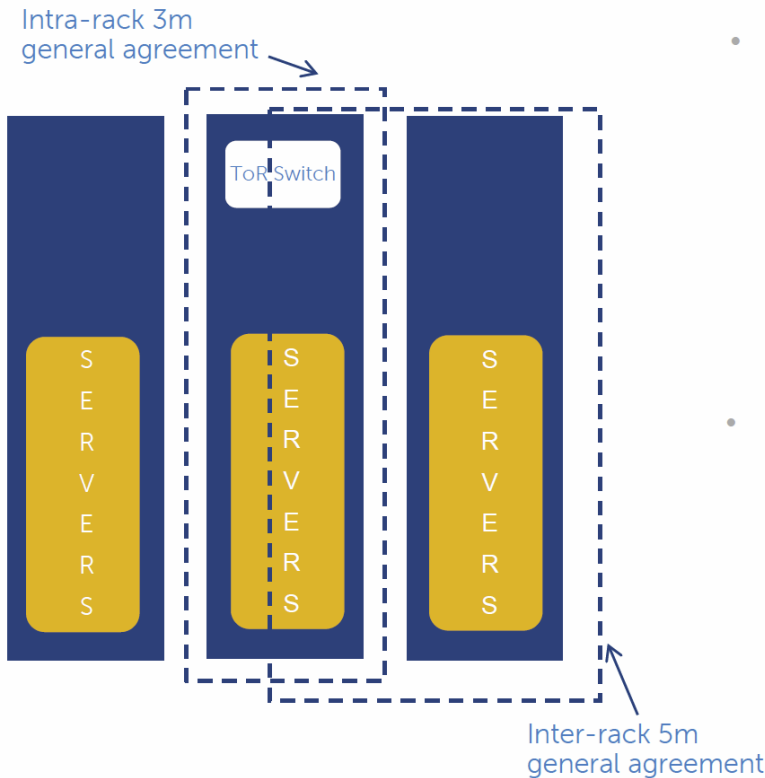
25Gb/s Ethernet Connectivity

- Enables similar topology as 40Gb/s & 10Gb/s
 - Single 25Gb/s SFP28 port implementation or Quad 25Gb/s QSFP28 breakout implementation possible
 - Maximizes ports and bandwidth in ToR switch faceplate
 - Dense rack server
 - Within rack, less than 3m typical length



Use case example #3

Cu Cable Distribution



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- Data obtained from
 - Two product groups within Dell (past 1 to 1.5 years)
 - 10GbE based products (servers & switches)
 - 40GbE based products (servers & switches)

Total (Cu Cable)	Division A	Division B
<=3m	79%	63%
5m	21%	28%
>5m	0%	8%

- Data obtained from
 - Two cabling companies (Molex, TE Connectivity)

Total (Cu Cable)	Company A MDI1/MDI2	Company B
<=3m	62% / 69%	80%
5m	30% / 24%	15%
>5m (Passive)	1%	5%
>7m (Active)	7% / 6%	-

IEEE 802.3 25GbE Study Group
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Use case example #4

Data Center Cable Length Scenarios

Examples from Microsoft Data Center usage.

Compute rack with “TOR” switch in middle of rack

- E.g. rack with 4 Open Compute Server (OCS) chassis (96 blades) per rack with single switch
- Cable lengths: 0.5m, 0.75m, 1.0m, 1.5m, 2.0m
- All server-TOR links are candidates for “no FEC”

3m and 5m requirements exist but much lower volume

- Cross-rack connections
- Chassis extension requirements, e.g. hot swap disk drawer
 - Majority of cables in rack are still $\leq 2\text{m}$

Bump-in-the-Wire topologies

- Single board implementations may use “KR” spec
- Multi-board implementations may use 0.5m cable



Observations

- Two cable types addressing, 3 m and 5 m reach, meets the project objectives.
- A 3 m cable specification requiring no FEC
 - addresses the desire for a low latency intra-rack connection
 - addresses the shorter 2 m reach for middle of rack switches.
- The BASE-R FEC is no longer required to meet the system requirements for 3 m but may still be useful for improving link performance or robustness when desired or necessary.
- A third cable type addressing 4 m reach and requiring a BASE-R FEC does not address a distinguishable system use case.

Proposal

- Retain CA-L cable type for 5 m reach.
- Change CA-S cable type for 3 m reach as follows:
 - FEC no longer required
 - revised cable specifications
- Drop CA-N cable type.
- Retain BASE-R FEC for use with CA-S cables at user discretion to:
 - improve MTTFPA
 - improve BER (e.g., $1E-15$)
 - extend reach beyond 3 m

Thank you!