IEEE P802.3dj Package Next Steps

Kent Lusted, Intel Liav Ben-Artsi, Marvell Matt Brown, Alphawave Semi Ali Ghiasi, Ghiasi Quantum / Marvell Adam Healey, Broadcom Mike Li, Intel Rich Mellitz, Samtec Adee Ran, Cisco



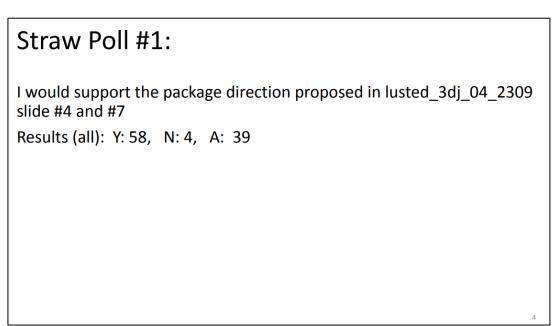
Supporters and Contributions

Supporters

- Jim Weaver, Arista
- Rick Rabinovich, Keysight
- Jason Chan, Arista
- Howard Heck, Intel
- Tobey P.-R. Li, MediaTek
- Mike Dudek, Marvell

Problem Statement - Recap

- Device packages are projected to consume a considerably larger portion of the die-to-die loss budget at 200 Gbps/lane
- Two different (opposing) approaches:
 - Loss optimized:
 - E.g. <u>https://www.ieee802.org/3/dj/public/23_0720/lim_3</u> <u>dj_02a_2307.pdf</u>
 - Radix optimized:
 - E.g. <u>https://www.ieee802.org/3/dj/public/23_07/benartsi_3dj_02_2307.pdf</u>
- There was strong consensus in September 2023 to support the following proposal (slide 4 & 7)
 - No motion was taken; Straw Poll only



https://www.ieee802.org/3/dj/public/23_09/motions_3cwdfdj_2309.pdf

Proposed Path - Recap

- Define two classes of packages
 - Both the Class A "loss optimized" and Class B "radix optimized" approaches are supported
- Create two sets of transmitter and receiver specifications, one for each package class
 - TX Class A (common die model + Class A package)
 - TX Class B (common die model + Class B package)
 - RX Class A (common die model + Class A package)
 - RX Class B (common die model + Class B package)
 - Choose the reference package model that is applicable
- Package-to-Package (TP0-TP5) channel compliance using COM with a specific reference package on each end
- Apply to backplane PHYs, AUI C2C interfaces
 - Look at CR and C2M later

Transmitter and Receiver Compliance Direction - Recap

• Define multiple reference package models differentiated <u>at first order</u> by a maximum insertion loss allocation e.g., ...

Transmitter or receiver	Maximum package IL allocation [1], dB	
Class A (e.g. "loss optimized")	TBD = 6	
Class B (e.g. "radix optimized")	TBD = 9	

[1] From TP0d to TP0 for transmitters and from TP5 to TP5d for receivers.

- All transmitters and receivers must meet Class B requirements. Some may meet Class A requirements.
- TX/RX compliance to Class A and/or Class B is demonstrated using existing compliance test methods with the reference package model that reflects the corresponding limit on insertion loss

Some Future Work Items - Recap

- Test cases of different trace lengths for each package needs consideration
- A separate minimum package loss test case may also be included
- Package-to-package channel classification, if needed
- Parameters and values for Class A and Class B packages
- Consider package choices for CR and C2M interfaces

Example KR Channel Matrix (IL <= 40 dB die-die) - Recap

Example compliance test requirements

Reference package models for COM		KR Channel IL	
Transmitter	Receiver	(ball-ball)	
Class A <mark>(6 dB)</mark>	Class A <mark>(6 dB)</mark>	<mark>28 dB</mark>	
Class A <mark>(6 dB)</mark>	Class B <mark>(9 dB)</mark>	- <mark>25 dB</mark>	
Class B <mark>(9 dB)</mark>	Class A <mark>(6 dB)</mark>		
Class B <mark>(9 dB)</mark>	Class B <mark>(9 dB)</mark>	<mark>22 dB</mark>	

Co-design of channel with targeted package and vice versa

*C2C channel class loss will be adjusted after agreement on max bump-bump loss.

Example compatibility matrix

KR Channel IL (ball-ball)		Receiver class	
		Class A	Class B
Transmitter class	Class A	<mark>28, 25, 22 dB</mark>	<mark>25, 22 dB</mark>
	Class B	<mark>25, 22 dB</mark>	<mark>22 dB</mark>

Note: values in magenta are placeholders, not a baseline proposal

Summary

- We should set the direction in November 2023:
 - Specifying two package classes
 - Each package class is optimized for a different approach
 - Creating two sets of transmitter and receiver specifications for backplane and AUI C2C, one for each package class
 - Choose the reference package model that is applicable
 - Channel compliance using COM with a specific reference package on each end
 - Apply to backplane PHYs, AUI C2C interfaces
- A straw poll and motion was requested

BACKUP