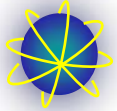




# Comments on Multi-Lane PMD Reliability

Hidenori Takahashi and Itsuro Morita  
KDDI R&D Laboratories Inc.

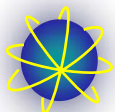
# Discussion Objectives



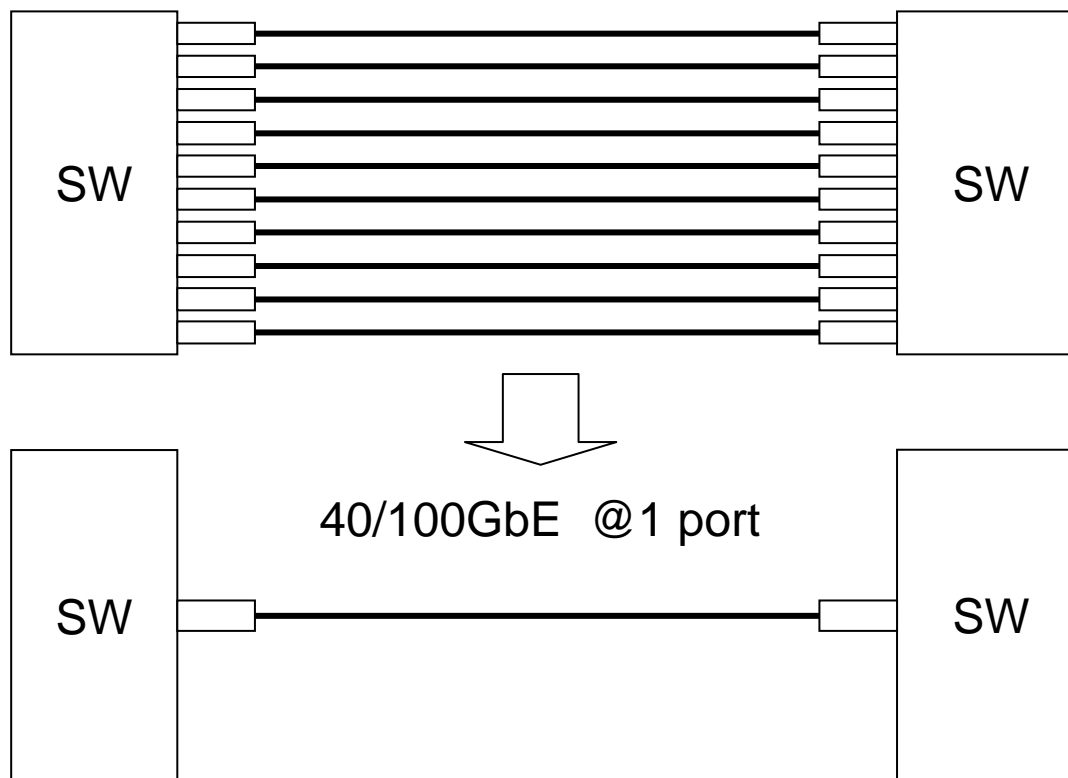
- 40/100G Ethernet are not just “local area network” technologies anymore
- It will be used for link aggregation and large-scale network
- The link fault of 40/100GbE should give large impact for network

=>The one of expectations for P802.3ba is **reliability** of link

# Most promising application

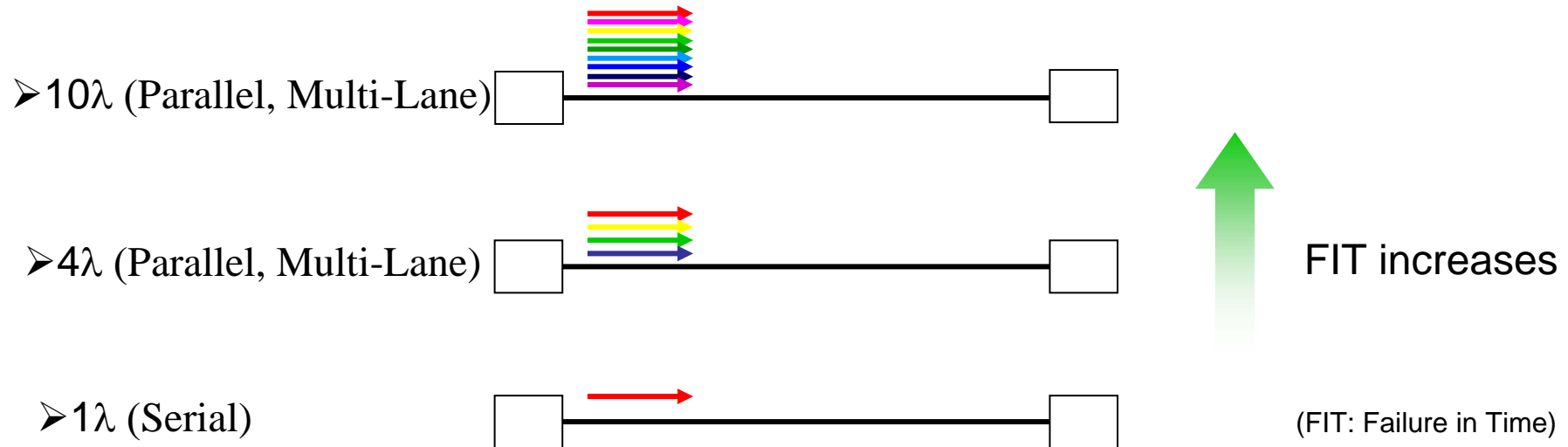


LAG (link aggregate group) 4 ~8(10)x10GbE



- Advantages: #1 Simple configuration #2 High bandwidth utilization
- How about reliability? Is it comparable to LAG?

# PMD candidates of 40/100GbE



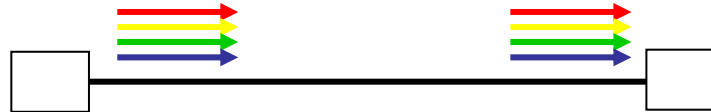
Even though just an optical lane of Multi-lane PMD fails, the link fails immediately.

Intrinsically, the larger number of lanes gives the higher possibility of failure.

To bring the FIT of Multi-Lane close to Serial one, some kinds of solution will be employed inside/outside of IEEE P802.3ba standardization.

# Solutions for the reliability of Multi-Lane

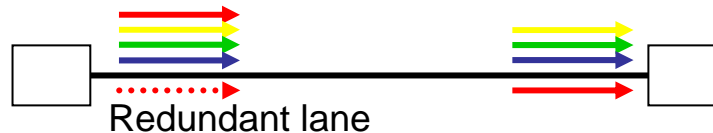
## Solution #1:



Prove the reliability of Multi-Lane PMD experimentally

(e.g. [www.ieee802.org/3/hssg/public/jan07/jaeger\\_01\\_0107](http://www.ieee802.org/3/hssg/public/jan07/jaeger_01_0107))

## Solution #2:



(detect a lane fault)

Keep the bandwidth with redundant lane (protection lane)

## (Partial) Solution #3:



(detect a lane fault)

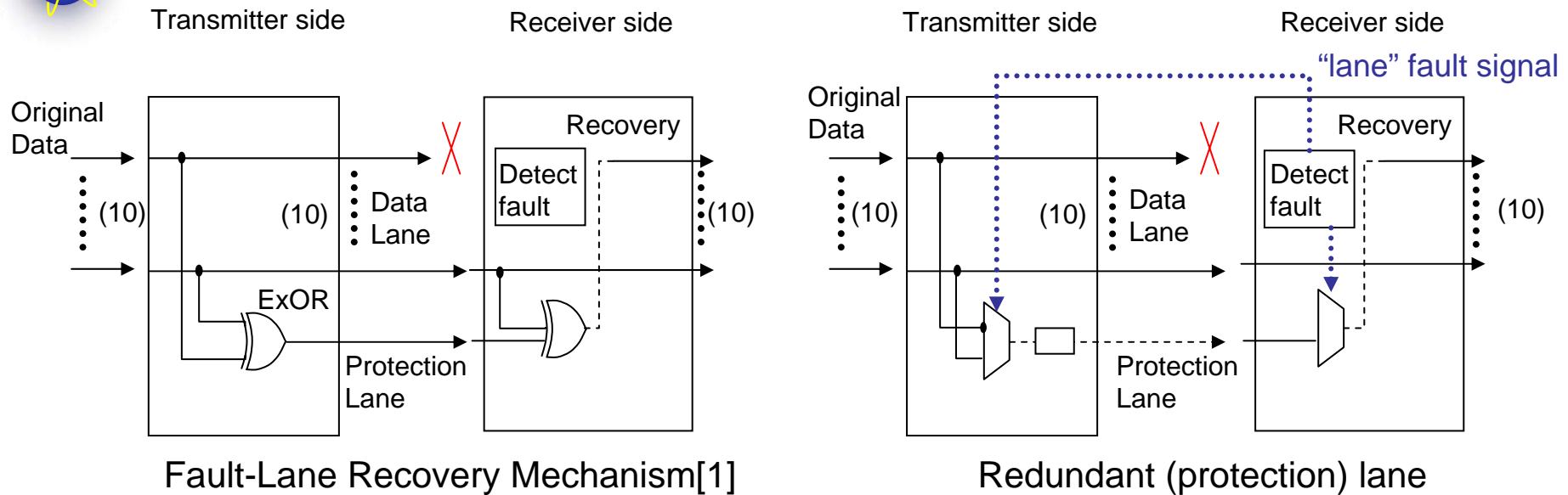
Keep connectivity with decreased bandwidth

Solution #2 or #3 may be deployed by some vendors depending on their policy, and users may not notice whether the Solution #2 or #3 are activated.

However, the information of “One of lanes failed” is very useful for users.

⇒ Standardizing the format of the “lane” fault signal is recommended.

# Application 1: Fault-Lane Recovery Mechanism



[1]H. Toyoda et al, "A 100Gb-Ethernet subsystem for next-generation metro-area network," IEEE ICC 2005 in Seoul, GC10-3, May 2005.

With "lane" fault signal:

Users can notice the possibility of link fault in advance

⇒ It will be helpful for users to make maintenance plan

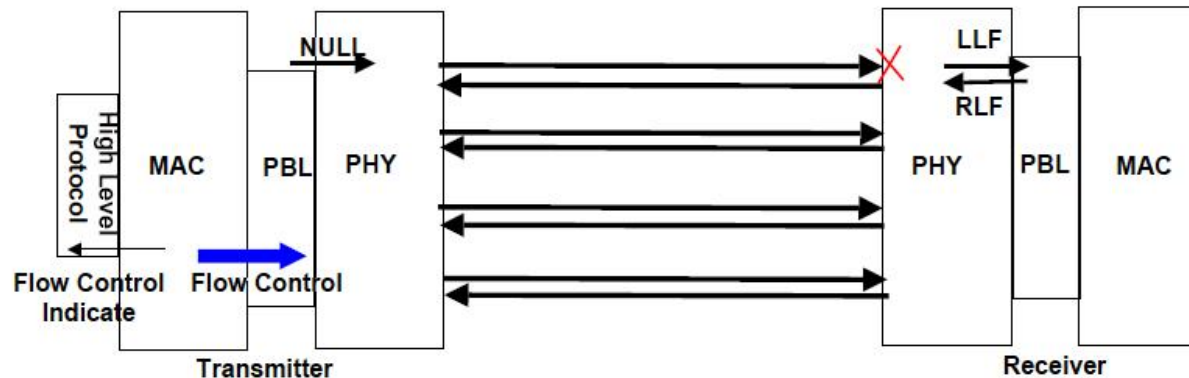
⇒ Users can decide anytime when the data path should be changed

⇒ Users can confirm availability of redundant path before changing data path <sup>6</sup>

# Application 2: Partial Fault Protection[2]



## PFP for Multi-Lane PMD



[2][http://www.ieee802.org/3/ba/public/jan08/jiang\\_01\\_0108.pdf](http://www.ieee802.org/3/ba/public/jan08/jiang_01_0108.pdf)

With “lane” fault signal:

⇒ Users can notice which link must be replaced immediately before changing the data path

⇒ Users can decide whether keep or down this link intentionally

# Summary



- The reliability of 40G/100GbE link is very important
- Some kinds of effort are required that the reliability of Multi-lane PMD should be comparable to serial PMD
- For the Multi-lane PMD, redundant lane or partial lane protection may be deployed inside/outside of P802.3ba, but the “lane” fault signal is useful for users, therefore standardizing the format of “lane fault signal” is recommended

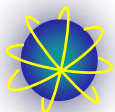
With “lane” fault signal:

⇒Users can notice the possibility of link fault in advance

⇒It will be helpful for users to make maintenance plan

⇒Users can notice which link must be replaced immediately before changing the data path





Thank you