

Link Signaling Sublayer (LSS) Proposal

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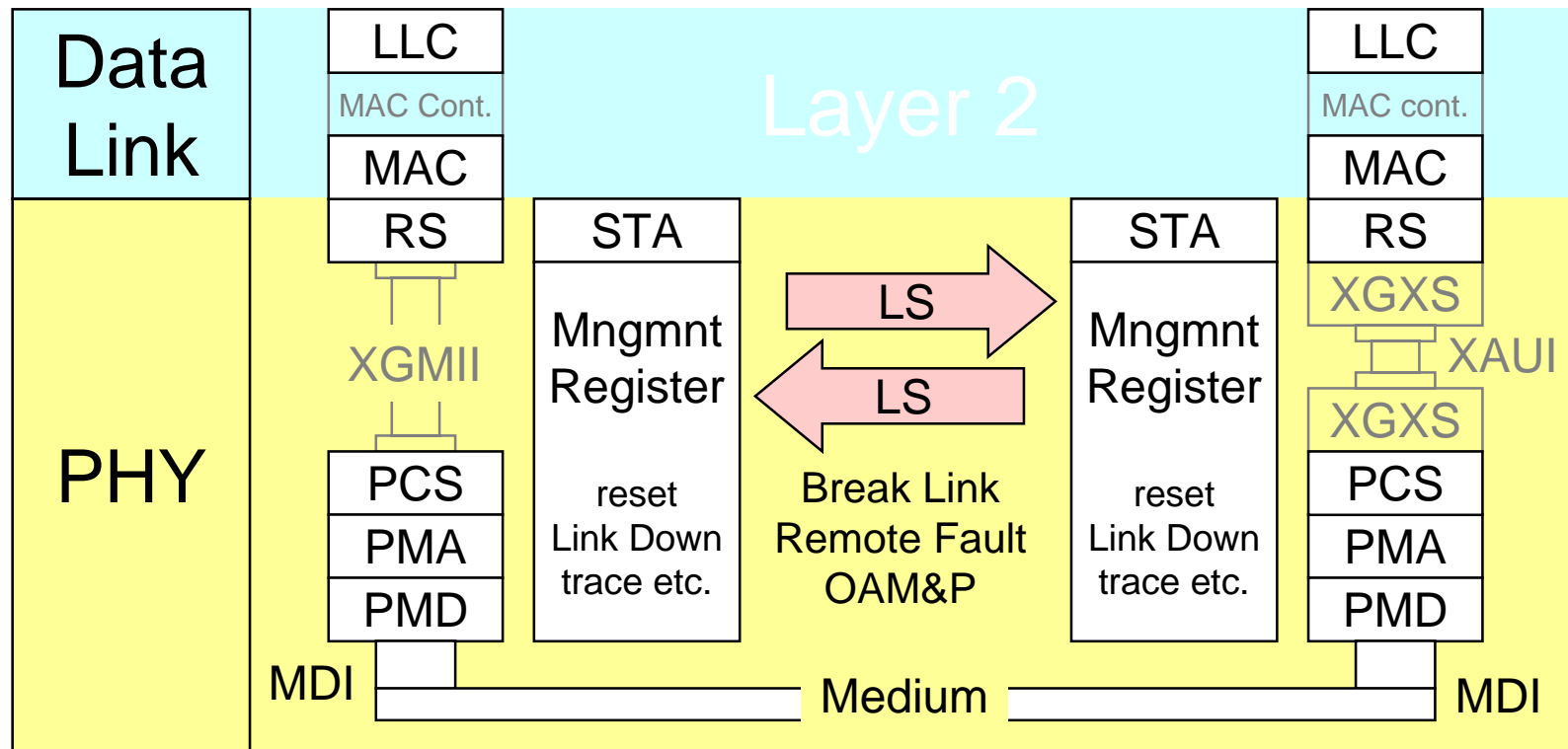
Presentation Purpose

- Update of May '00 proposal
 - http://grouper.ieee.org/groups/802/3/ae/public/may00/ishida_1_0500.pdf
- Clarification of Link Signaling Sublayer (LSS) function
 - Advertising Management Register Status to Link Partner
 - Break Link, Remote Fault, and OAM&P (optional)
- Link Signaling (LS) code mapping
 - Code set with 4-bit minimum Hamming distance
 - Link Status Code defined for Break Link and Remote Fault

Why do Link Signaling?

- IEEE P802.3ae includes new Ethernet objectives
 - Support at least 40 km fiber links
- Provide LAN compatible SONET OAM&P signaling
 - Assess OK/NotOK link status (mandatory)
 - without using Auto-Negotiation function
 - Manage the LAN cable plant (optional)
 - Exchange trace identifiers to ascertain link connections
 - Reporting link performance (BER etc.) for maintenance

What is Link Signaling?



LLC = Logical Link Control

MAC = Media Access Control

RS = Reconciliation Sublayer

STA = Station Management entity

XGMII = 10 Gigabit Media Independent Interface

PCS = Physical Coding Sublayer

PMA = Physical Medium Attachment

PMD = Physical Medium Dependent

MDI = Media Dependent Interface

XGXS = XGMII Extender Sublayer

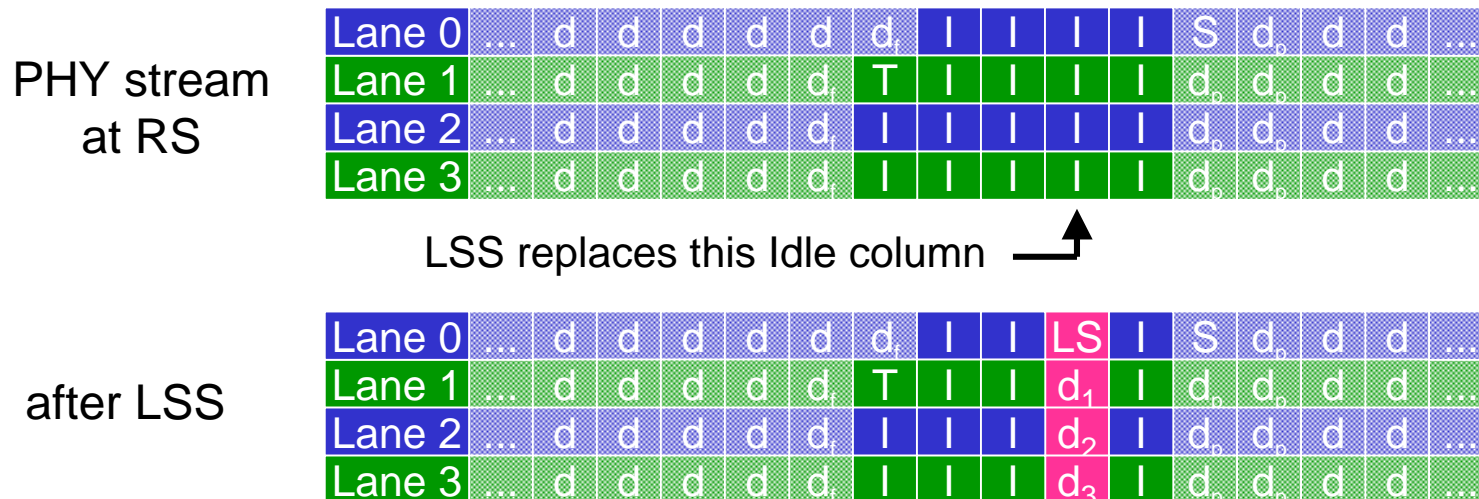
XAUI = 10 Gigabit Attachment Unit Interface

IEEE 802.3ae

Task Force

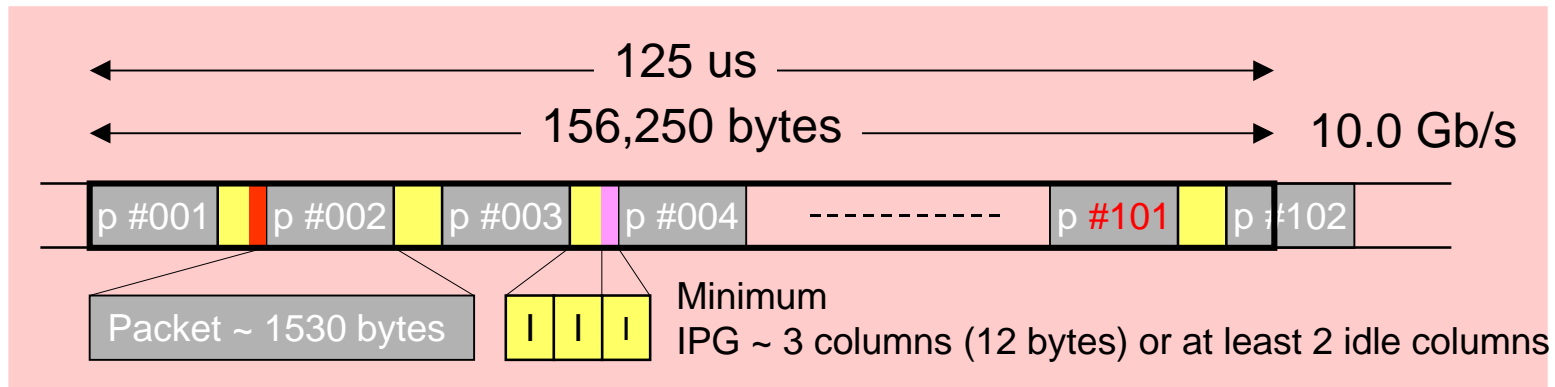
How does LSS work?

- Link signaling by using interpacket gap (IPG) period.
 - Idle column is replaced by Link Signaling column [LS]
 - [LS] = / LS / d1 / d2 / d3 / d1-d3: valid data bytes

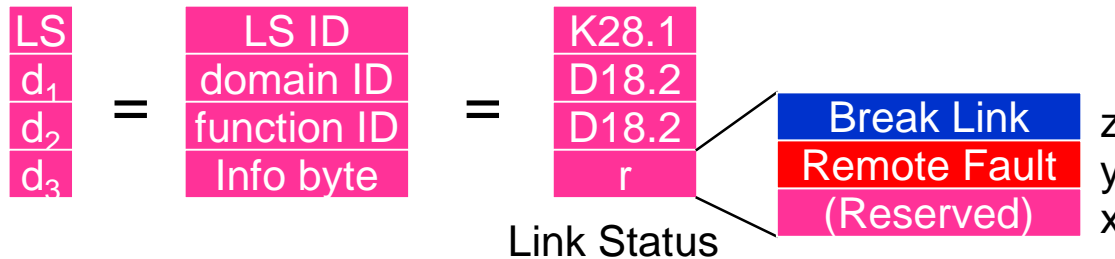
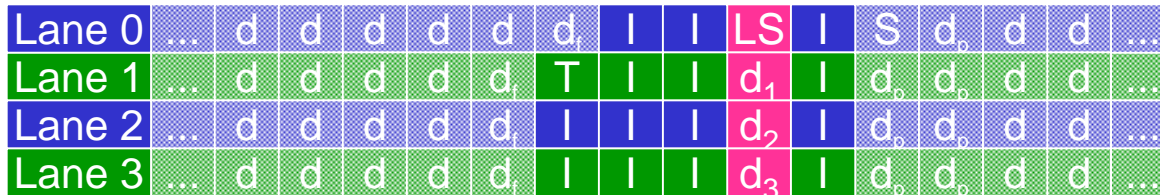


IPG Bandwidth for Link Signaling

- ~ 50 columns per 125 us at the worst case
 - maximum 1530-byte Ethernet packet
 - minimum 12-byte IPG on the average
 - 3 of every 4 Idle columns would be reserved for clock adjustment
 - 125 us period is assumed for compatibility to SONET OAM&P

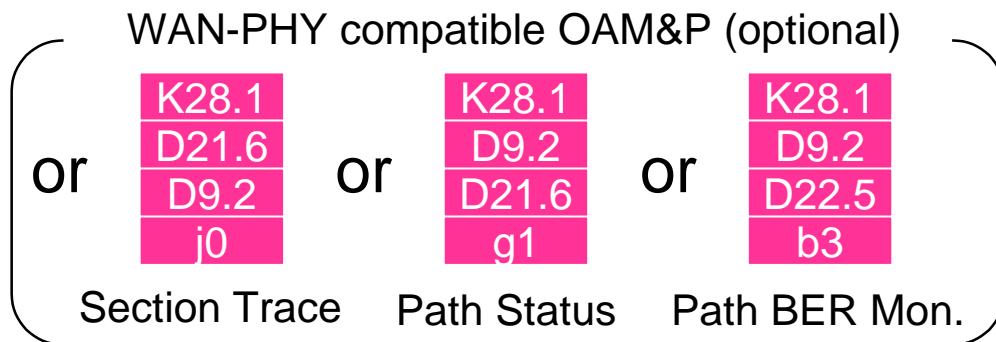


Link Signaling (LS) Codes

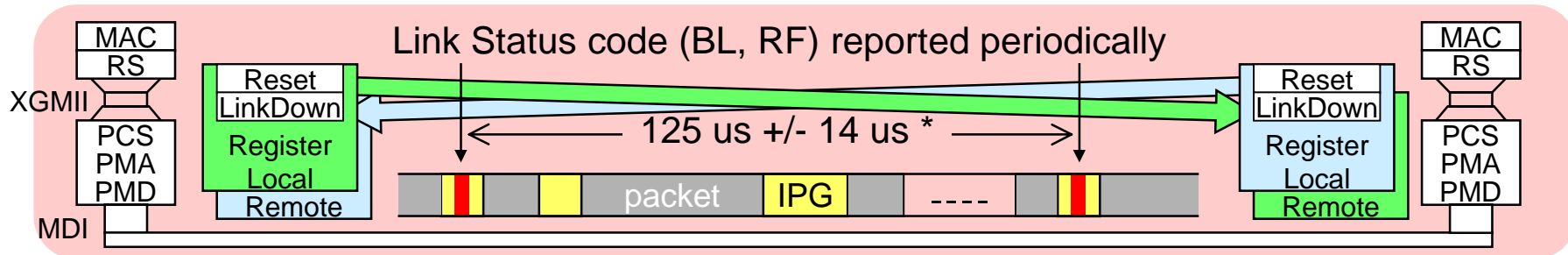


Hamming-protected code set
(min. 4 bit for both 8b & 10b)

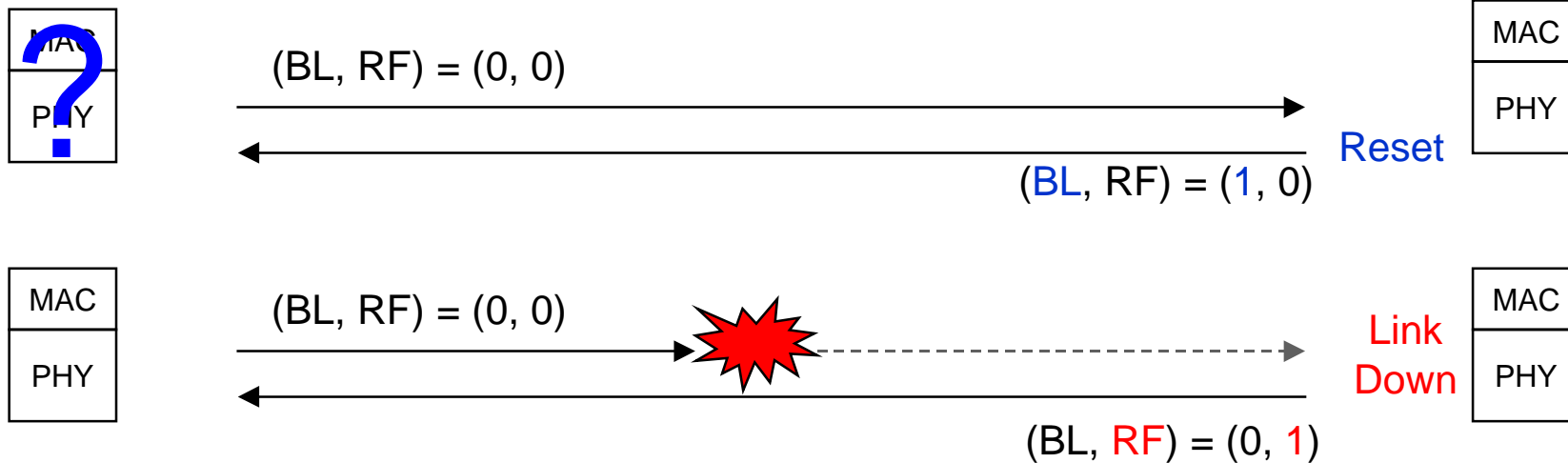
x	y	z	8b	10b	ID use
0	0	0	0x52	D18.2	LAN-PHY
0	0	1	0xd5	D21.6	Reserved
0	1	0	0xce	D14.6	
0	1	1	0x49	D9.2	
1	0	0	0xb6	D22.5	
1	0	1	0x31	D17.1	
1	1	0	0x2a	D10.1	
1	1	1	0xad	D13.5	
*	*	*	0x67	D7.3	IEEE voting Required
*	*	*	0x98	D24.4	
*	*	*	0xfb	D27.7	



Link Status Signaling

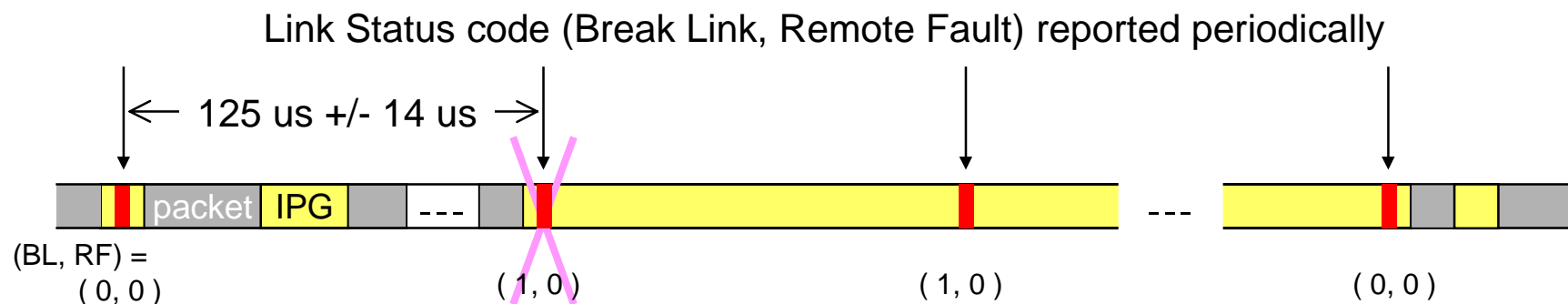


* This interval follows the FLP burst clock pulse spacing in Clause 28.



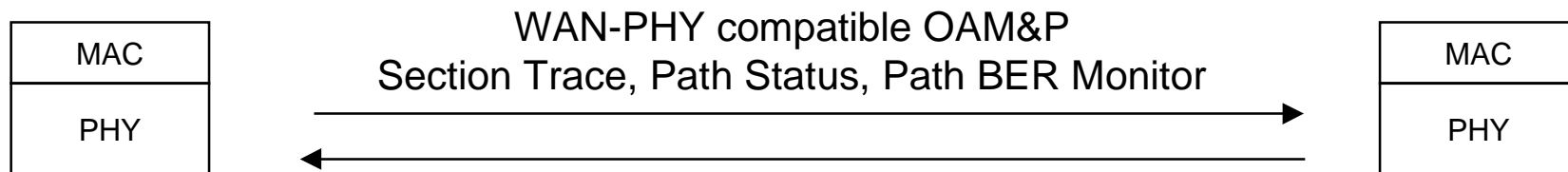
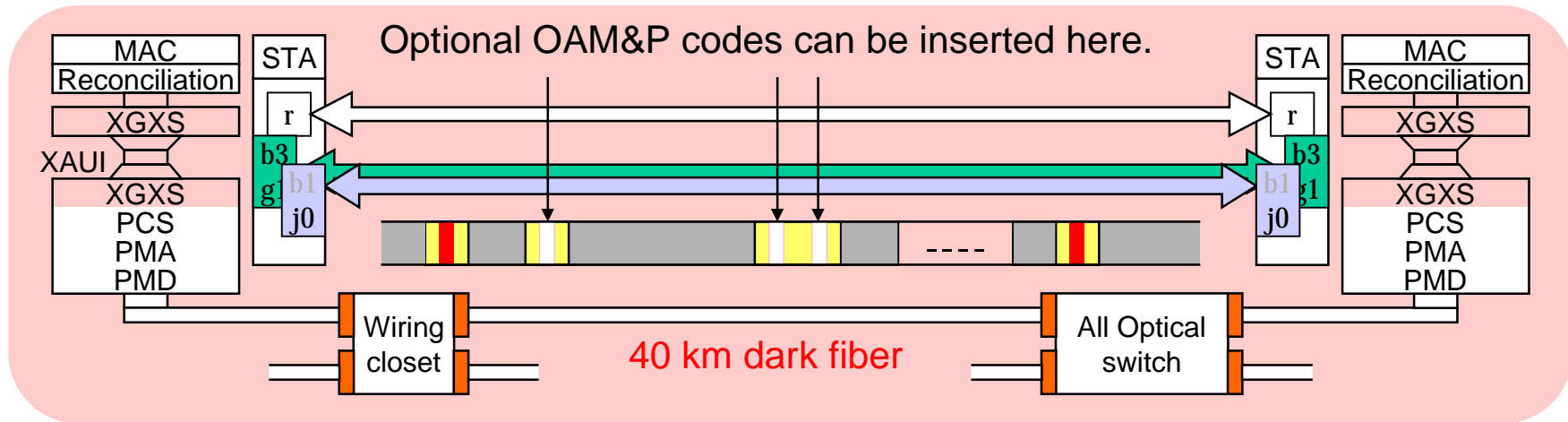
Link Status Code Detection

- Rewrite the register bit as it detects
 - No timer, no timeout, no state machine
 - 4-bit minimum Hamming distance reduces the misdetection rate at
 - once every 6,745 years at BER 10^{-4} (64b/66b)
 - once every 315,876 years at BER 10^{-4} (8b/10b)



If with a bit error, the LS code is discarded at detection.
The BL register bit will be rewritten by the next code detection.

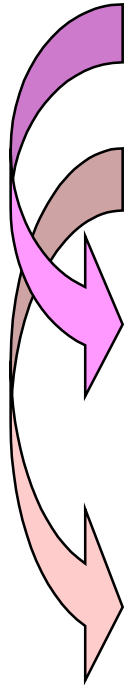
Optional OAM&P Signaling



One way information flow of management register bytes
no handshake, no negotiation, no synchronization

LS Code Summary

description			control code [LS] bytes			
name		function	Lane0	Lane1	Lane2	Lane3
Link Status	[r]	Break Link, Remote Fault	LS	0x52	0x52	r
Section Trace	[j0]	Identifier	LS	0xd5	0x49	j0
Path Status	[g1]	Remote bit error, etc.	LS	0x49	0xd5	g1
Path BER Mon	[b3]	End-End bit error monitor	LS	0x49	0xb6	b3



- Link Status signaling
 - Break Link (Reset)
 - Remote Fault (Fault detected by remote receiver)
 - Reserved 1 bit
- Optional OAM&P signaling* compatible to WAN-PHY
 - * http://grouper.ieee.org/groups/802/3/ae/public/may00/bottorff_1_0500.pdf
 - Section BER (b1) is monitored by PCS code violations

LSS Benefits

- Unified Link signaling mechanism for
 - Break Link and Remote Fault
 - OAM&P for fiber plant management
- No impact to cost of LAN PHY
- Compatibility with
 - WAN-PHY OAM&P
 - SONET OAM&P