

OAM in Frames

Denton Gentry

Dominet Systems

denny@dominetsystems.com

Jonathan Thatcher

World Wide Packets

jonathan.thatcher@wwp.com

Craig Easley

Extreme Networks

ceasley@extremenetworks.com

K. Seto

Information System Group, Hitachi Cable Ltd.

seto@rop2.hitachi-cable.co.jp

Andrew Smith

ah_smith@acm.org

Glen Kramer

AllOptic

glen.kramer@alloptic.com

Why OAM in Frames?

- PHY independent
 - Use with existing PHYs
 - Use with future PHYs
 - Nothing special from the PHY
- OAM done ethernet style
 - Ethernet is a packet network
- EFM is not restricted to new PHYs
 - Lots of interest in existing PHYs (1000BASE-LX, 100BASE-FX, etc)
 - Don't revisit an existing PHY to add OAM

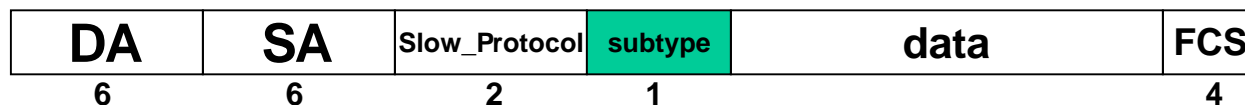
Slow Protocols

- Defined in IEEE Std 802.3ad Annex 43B
 - Ethertype: Slow_Protocols_Type (88-09)
- One of 16 reserved multicast addresses
 - Does not propagate through IEEE Std 802.1D bridges
- Restrictions
 - no more than 5 pkts/sec
 - Recommended small (<128 byte) frames
- Suitable for firmware impl (ex: LACP)



OAM Frame Proposal

- Claim a Slow Protocol Subtype for EFM_OAM
 - 8 are still available out of 10 defined
 - First unused is 3
- Utilize for certain OAM features:
 - Remote Loopback (TEST)
 - Remote Failure Indication
 - Link Monitoring

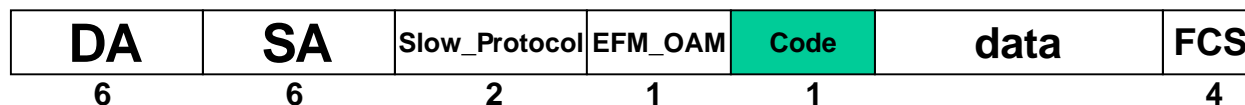


OAM Frame Proposal

- Code byte

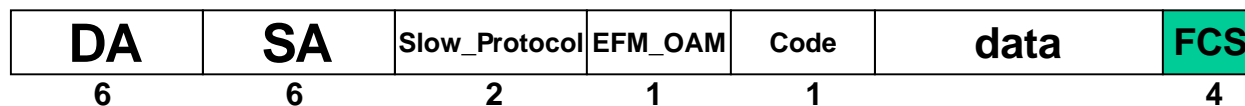
00	NO-OP
01	TEST Request
02	TEST Response
03	Link Monitor
04	Remote Statistics
05	Dying Gasp

- Format of rest of frame is Code dependant

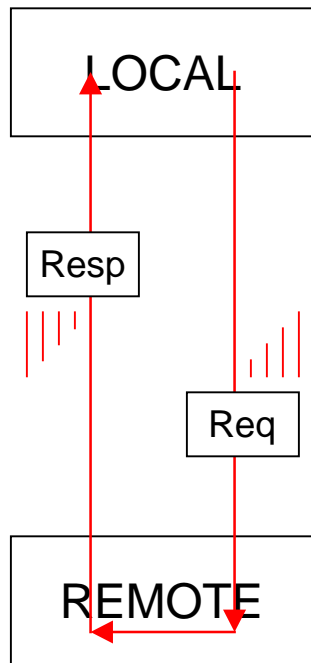


OAM Frame Proposal

- Ethernet frame like any other
 - Ethernet CRC for protection
 - Ethernet MAC for addressing, etc
- B/W use can be fixed, SLAs possible

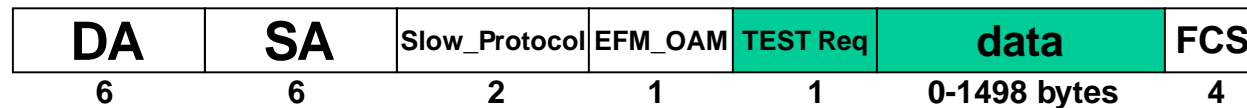


TEST



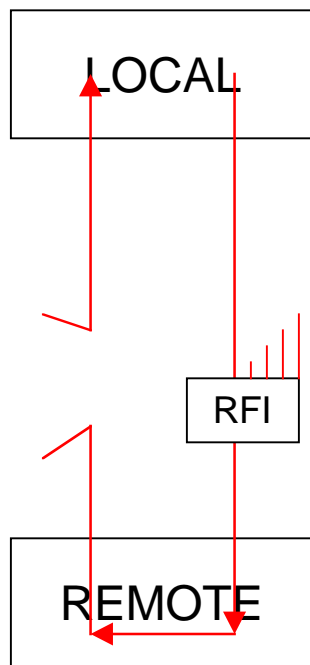
- Send a TEST Request frame...wait for TEST Response
 - Don't respond to responses
- Include any data pattern in Info
 - Response will return it back
- Connectivity test, not performance

TEST Frame format



- On receipt of TEST Request:
 - Copy SA to DA
 - Overwrite SA w/ your unicast SA
 - Change Code to TEST Response
 - Send it back. Include the Data unmodified.
- Slow protocols recommend <128 bytes
 - Not a requirement
 - For TEST, allow maxUntaggedFrameSize

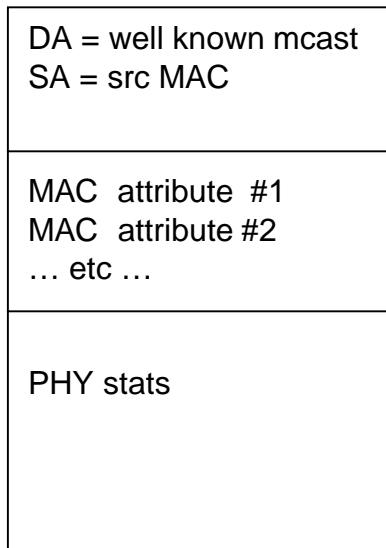
Link Monitoring / RFI



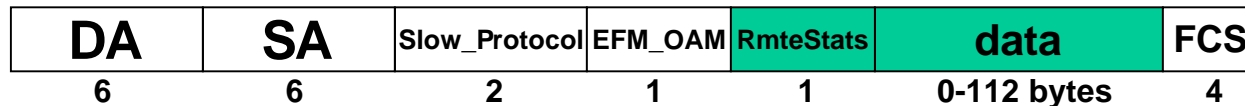
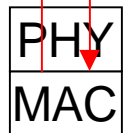
- Inform Remote end of link problems
 - Your packet might make it through
- Send 1 RFI packet per second
 - BER tracking
 - S/N tracking
 - FEC tracking
 - CRC tracking
 - Remote Failure Indication

DA	SA	Slow_Protocol	EFM_OAM	RFI	data	FCS
6	6	2	1	1	0-112 bytes	4

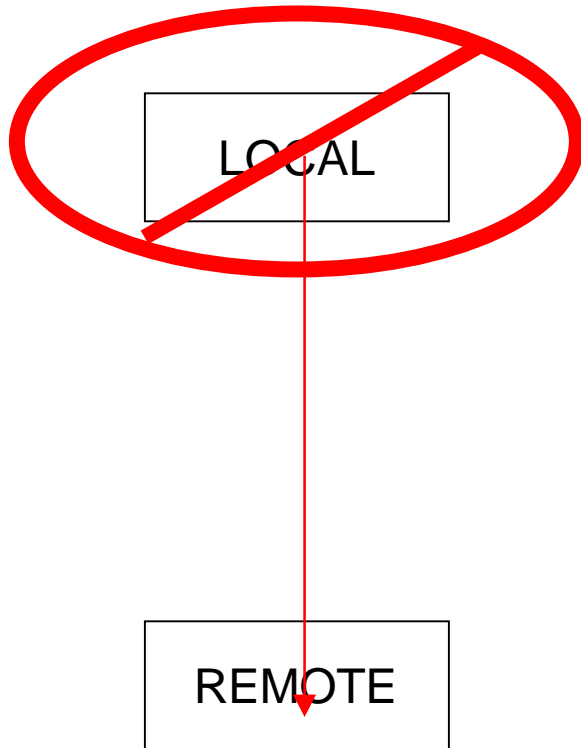
Remote Statistics



- Inform Remote end of local stats
- Allow access to EtherMIB stats
 - in addition to those in Link Monitor pkt
 - Does not require IP address assignment



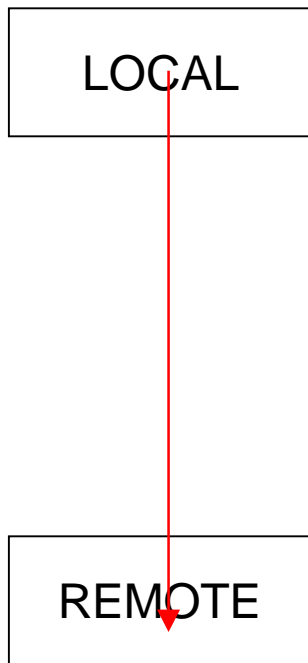
Dying Gasp



- Its dead, Jim
- One last gasp: send a packet

DA	SA	Slow_Protocol	EFM_OAM	Gasp!	padding	FCS
6	6	2	1	1		4

NO-OP



- May be sent to maintain a constant B/W for OAM
 - For example, always send 5 pkts/sec
- Not all deployments need this

DA	SA	Slow_Protocol	EFM_OAM	NOOP	padding	FCS
6	6	2	1	1		4

Items for Further Investigation

- Is 5 frames/second enough?
 - PROs: permits firmware implementation
 - CONs: may be too limiting
 - Increasing to 16 frames/sec provides OAM B/W equivalent to Sonet
- Additions to MIB attributes / objects
- Affect of OAM frames on existing MAC counters

Summary

- OAM done The Ethernet Way
 - Slow protocols are part of Ethernet today
- Fulfills EFM OAM objectives
 - Remote Fault Indication
 - Link Monitoring
 - Remote Loopback
- Extensible
 - Allows for firmware implementation
- PHY independent
 - Past, present, and future Ethernet PHYs