OAM in Frames

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Recap of prior presentations

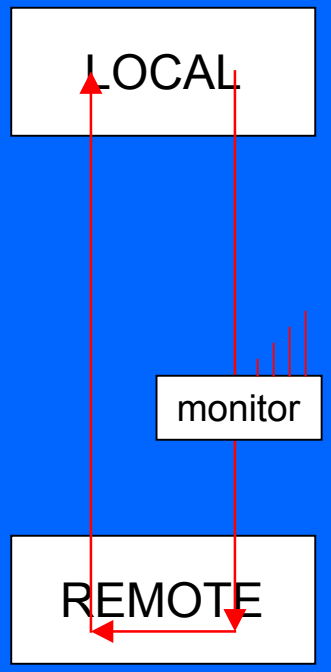
- Functionality in MAC Control layer
- OAM in Frames
  - Link Monitor sends statistics from clause 30
  - Failure events also send stats
- Remote Loopback using TEST frames
  - Send request, get response
  - Connectivity test, not performance
  - Non modal (mix TEST frames with regular traffic)
- Slow Protocol (Annex 43B)
  - 5 frames/sec
  - Passes up to MAC Client (eases implementation)
  - 802.1D compliant bridges will not propagate

Overview of this presentation

1. Sending stats on the wire
2. Effect on Clause 30
3. Relationship to SNMP
4. PHY issues

Part 1: Remote Stats

- Several reasons to send stats
  - Link Monitoring
  - Failure Indication
- Sent at regular intervals
  - Once per second, for monitoring
- Sent for exceptional events
  - Last Gasp



Part 1: Format on the Wire

- Must define encoding
  - Identify stat
  - Current value
  - Width

<statName, statValue, statWidth>

- Identify which stat
  - aFramesTransmittedOK, aOctetsReceivedOK
- Current value
  - Variable width integer
- Width
  - 802.3 does not define register widths
  - Need to know where it wraps

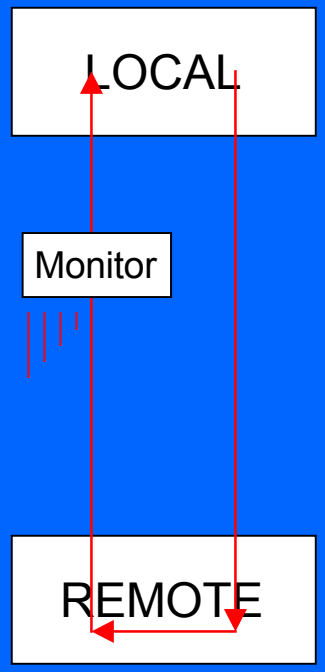
Part 1: Identify the statistic

- OIDs defined in Annex 30
  - iso(1) member-body(2) us(840) 802dot3(10006) csmacdmgmt(30)
  - OID can reference any object in 802.3
- Vendor/Externally Specified stats
  - Make sure they don't conflict
    - Within csmacdmgmt, distinguished by OUI?
    - Private Enterprise MIB space?
- Example: Carrier MIB
  - Facilities alarm
  - Temperature alert

Part 2: Remote Stats and Clause 30

Part 2: Remote entity object

- Attributes grouped into objects
  - oMacEntity, oPhyEntity, etc
- Remote stats appear in a new object class
  - oRemoteEntity
- Contains a SEQUENCE attribute
  - Snapshot of most recently received stats
  - Prepend the source MAC address
    - For P2P, there will be only one entry



MACaddr1: <stat1><stat2><stat3>
MACaddr2: <stat1><stat2>
MACaddr3: <stat1><stat2><stat3>

Part 2: Master/Slave relationship

- Attribute in oRemoteEntity defines stats to be sent
  - SEQUENCE attribute of OIDs to send to other end
  - Define a default with useful stats (CRC errors, etc)
  - If empty, do not send Link Monitor

1.2.840.10006.30.7.6
1.2.840.10006.30.7.35

- No inherent Master/Slave relationship
  - Carriers do not want to send stats to CPE
    - Fine. Configure it not to (set to NULL)
  - Do not embed that relationship into 802.3 spec
    - 802.3 covers more than one market space

Part 3: Relationship to SNMP

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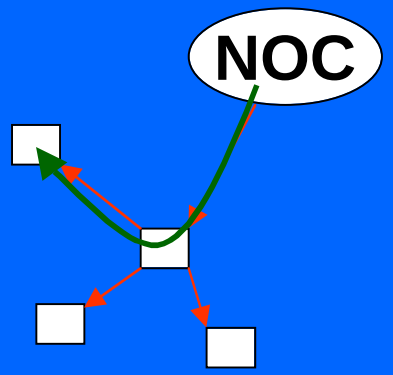
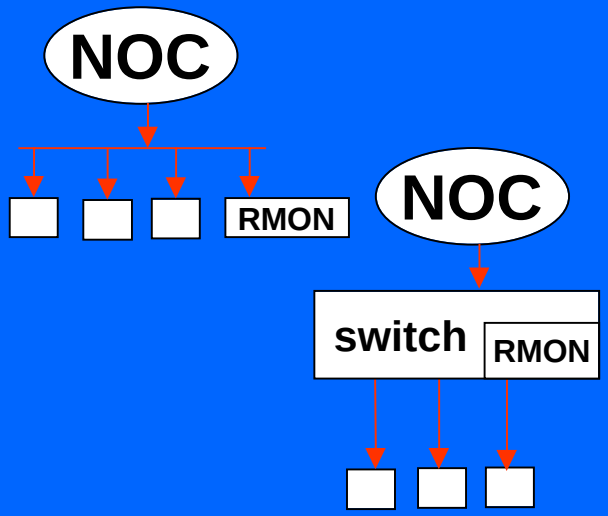
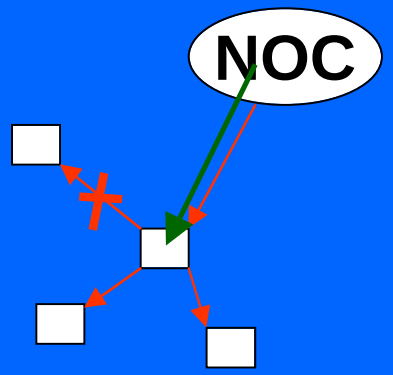
- SNMP has evolved as a centralized facility
  - Small number of management stations
  - Frequent polling of lots of links problematic
- SNMP strongly tied to IP
  - CPE device may not be IP addressable
  - SNMP over L2 defined in 1989
    - Little implementation in 12 years
- RMON supplements SNMP
  - Probe maintains stats for later query
  - Still not at the endpoints
- Ethernet OAM supplements SNMP
  - Maintain stats from endpoint for later query





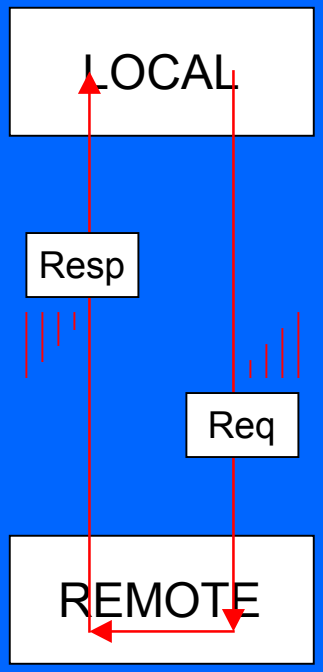
Part 3: Supplement SNMP

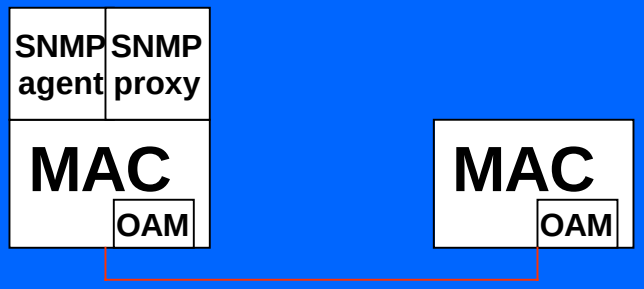
- Link Monitor supplements SNMP
  - Maintain stats from endpoint for later query
  - SNMP can query after problem occurs
- Ethernet OAM allows for “heartbeat”
  - Send stats at a regular interval
  - Does not require GET/RESPONSE
- Ethernet OAM stats appear in Clause 30
  - Intend them to appear in an SNMP MIB
  - NOC fetches them via SNMP



Part 3: Allow queries?

- Request contains statName
  - Allows query of other stats
  - Useful during active debugging
- Response fills in statValue and statWidth
- Overlap with SNMP?
  - Lowers the bar for manageable device
  - Mechanism could be used for SNMP proxy





Part 4: PHY Issues

Part 4: PHY-specific Stats

- Clause 30 lumps all PHYs together: oPHYEntity
- Some attributes are inherently PHY specific
  - aSQETestErrors
  - aSymbolErrorDuringCarrier
  - Personal belief: this isn't a good way to do it.
- 802.3ah likely to add a bunch more
  - FEC corrected errors (aFECCorrectedCount?)
  - Signal to Noise Ratio (aSNRatio?)
  - etc
- Time to make new entities for particular PHYs?
  - At a minimum, don't redefine existing stats

Part 4: One Way Links

- PHY prevents one way links
  - Disable TX on RX failure
- Every PHY provides different functions
  - 100BASE-X provides RFI bit
  - 1000BASE-X does nothing useful
  - 10GBASE-X provides RFI bit
- Implementations are sometimes broken
- RFI bit means “something, somewhere is broken”
  - Not very helpful
  - S/N Ratio, etc would be helpful

Part 4: OAM & One Way Links

- Alternate proposal for One Way Links: OAM
- On RX failure, PHY disables TX link
  - Happens “instantaneously”
- MAC stops accepting frames from client I/F
  - This will not be instantaneous
- Provide PHY bit to re-enable TX link
  - Mgmt sets after MAC Client disabled
- MAC can send OAM frames
  - It is in the MAC Control layer
- Only implemented in new PHYs

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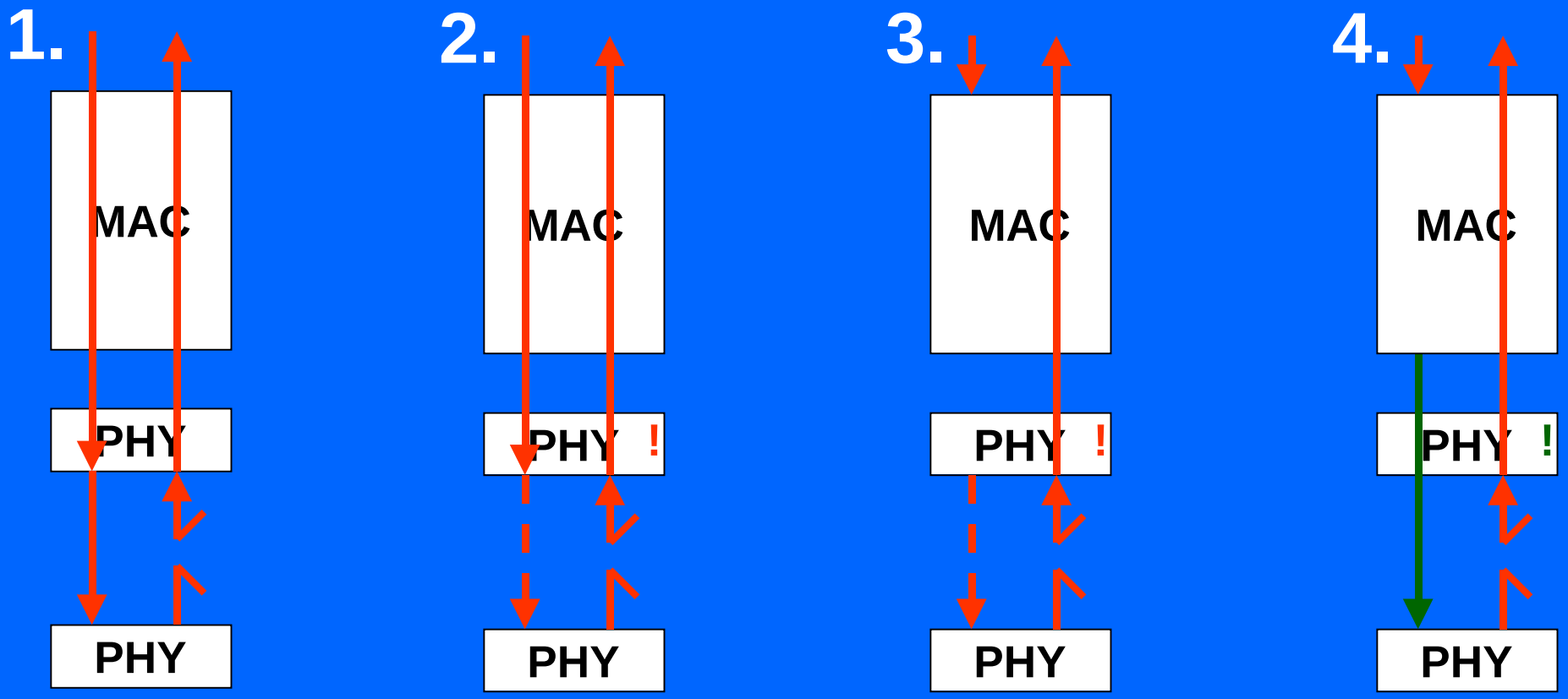

Problem detected

Disable TX PHY

Stop accepting frames

Re-enable TX PHY, send only OAM

Part 4: Compatibility

- Old PHY, Old Mac
  - Status Quo. We don't break anything.
- Old PHY, New MAC
  - PHY disables TX link.
  - MAC stops accepting frames from Mac client.
- New PHY, Old MAC
  - PHY disables TX link.
  - MAC does nothing more.
- New PHY, New MAC
  - We get to send OAM packets.

Summary

- Refining OAM in Frames
- How to send stats on wire
  - Encode name, value and width
- Received stats appear in oRemoteEntity
  - Also defines stats to send
  - No inherent Master/Slave relationship
- Ethernet OAM to supplement SNMP
  - Also provides standard protocol for proxy function
- New PHYs should allow OAM to enhance RFI