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802.1aj Two port MAC Relay status

ADVA™
Optical Networking

Two port MAC Relay

- Industry recognises that full 802.1 bridges are sometimes unnecessarily complex
- TPMR (802.1aj) attempts to provide a simpler relay function than a VLAN bridge
- PAR granted December 2004
- Drafts:
  - Initial draft 0.0 May 2005
  - Draft 1.0 July 2005
  - Draft 1.1 August 2005
  - Draft 1.2 November 2005
- This presentation represents the results of the Jan 2006 interim meeting, and a new draft is expected before March 2006

TPMR topics

- Zero configuration option
  - Should work out-of-the-box
- Topologies
- Differences from a bridge
- Link maintenance
- Discovery
- Management
- Forwarding
- MAC types
- Loopback
- Link status propagation

Topologies

- A TPMR can be deployed singly, or in a chain
- A typical application might be as a demarcation device
- A TPMR has exactly two ports
  - Each port can be Ethernet or any MAC or emulated MAC which supports the 802.1 Internal Sublayer Service
    - (implies that the device is not VLAN-aware)
- Protection is not supported in the standard
- Management is from a more intelligent device which proxies the TPMR's managed objects into its own MIB

Differences from a Bridge

- Only two ports
- No MAC address learning
- No VLAN tagging
- No Spanning Tree
  - BPDUs require special treatment (see later slide)
- Mandatory extra features

Link maintenance

- For Ethernet links, 802.3ah EFM OAM may be employed
  - This provides an indication of link up/down
    - Ethernet MAC link down indication is notoriously unreliable
- 802.3ah also provides
  - Link status change information
  - Link statistics including errored seconds etc.
  - Managed object access, which is NOT used in TPMR
- E-LMI (MEF UNI Phase 2) was considered, but is not suited as a link maintenance protocol
  - Intended for CE to retrieve status and service attributes from the network
  - Includes UNI and per-EVC configuration and status information
- Other MACs and emulated MACs can use their own protocol
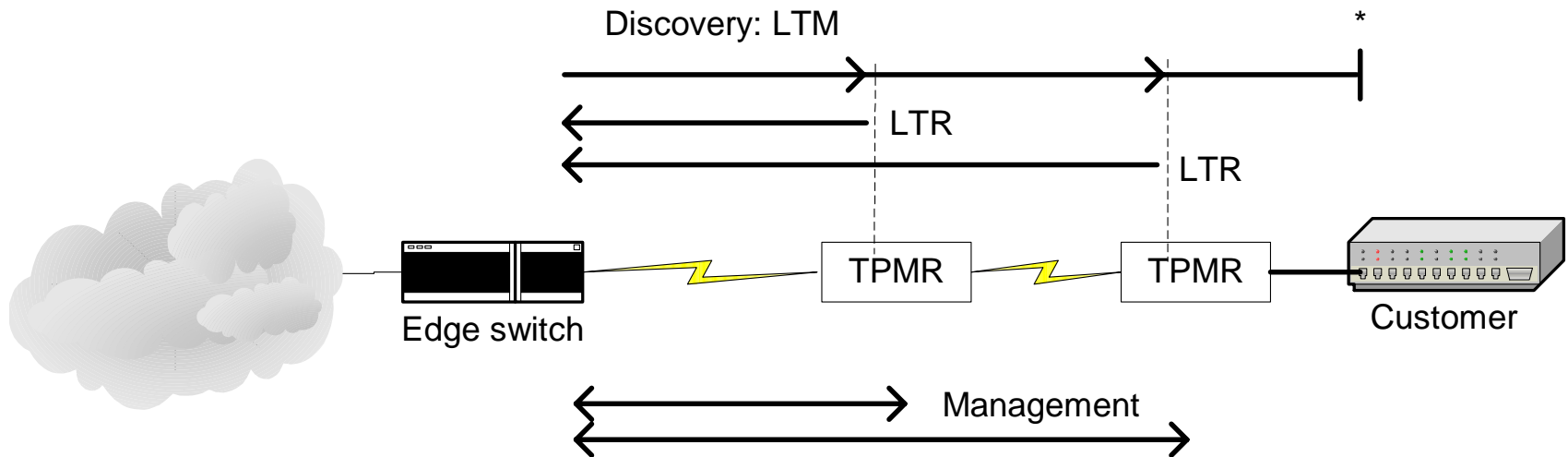
Discovery

- A mechanism is required to allow discovery of TPMRs, so that the managing device knows what to manage
- Mandatory CFM (802.1ag) is the primary discovery method
  - At least a level 0 MIP is required in TPMR
  - Attached bridge or station can use Linktrace to discover connectivity of attached TPMR chain
  - All TPMRs in a chain can be found, but a method is needed to know when the end of the chain has been reached
  - CFM tells you what kind of device it is (but requires a data point for TPMR)
  - CFM tells you which port number you are connected to

Discovery

- 802.1ag CFM Linktrace is used to find TPMRs to manage

- ❖ Discovery may terminate at UNI or might discover customer equipment
  - ❖ Consider placement of MEP in demarc TPMR?

Discovery

- LLDP (802.1ab) may be used for further probing
  - LLDP support is optional
  - CFM already gives chassis type
  - What additional benefits would this offer?
  - Potential conflict between scope of LLDP and scope of TPMR discovery?
    - Part of the management approach is to hide TPMRs from network management as individual network elements
- Ethernet EFM OAM (802.3ah) could have been chosen for Ethernet links, but is harder to use for chain discovery
  - Hop-by-hop approach

Management

- SNMP over Ethernet, without IP, has been chosen
  - SNMP over IP was rejected because of the desire to avoid IP address management and NMS interaction with individual TPMRs
  - 802.3ah EFM/OAM was rejected because of concerns over scalability to a chain and lack of "Set" capability
  - CORBA was considered too much of a stretch given that nothing else in 802.1 uses it
- There is an Ethertype for SNMP
  - Untagged frames are used
  - Management VLAN option not yet discussed much
- Initial managed object set needs expanding
  - Should include EFM MIB, Interface MIB, extra stuff

Management continued

- Discovery is used first to find what to manage
- Retrieved objects are incorporated into the managing device's MIB
  - Details undecided, but Interface MIB objects are a candidate
- Which ports can be used to manage the device?
  - A management block will be provided to prevent access from the customer port
  - Is this locally provisioned?
  - Is access provided by authentication, to allow a device which is installed the wrong way round to be "recovered" remotely?
  - In a device with different port types, which port then?
  - Suggest that selection of which ports are active for management be left as an exercise for the reader

Forwarding

- General idea is to be transparent to protocols the TPMR does not implement
  - But some protocols are filtered out by the MAC, e.g. Pause
  - Transparent to BPDUs
  - Transparent to LACP (despite the layering violation)
  - Treatment of other reserved addresses needs defining
- No modification of user data frames (e.g., tagging)
- Multiple queues are optional
  - Extract priority from Q-tag and 802.1ae LinkSec tag
    - Only for integrity-protected frames – unencrypted
  - Recognise L2 control protocols and place in fastest queue
    - Typically BPDUs
- Otherwise like 802.1d/Q
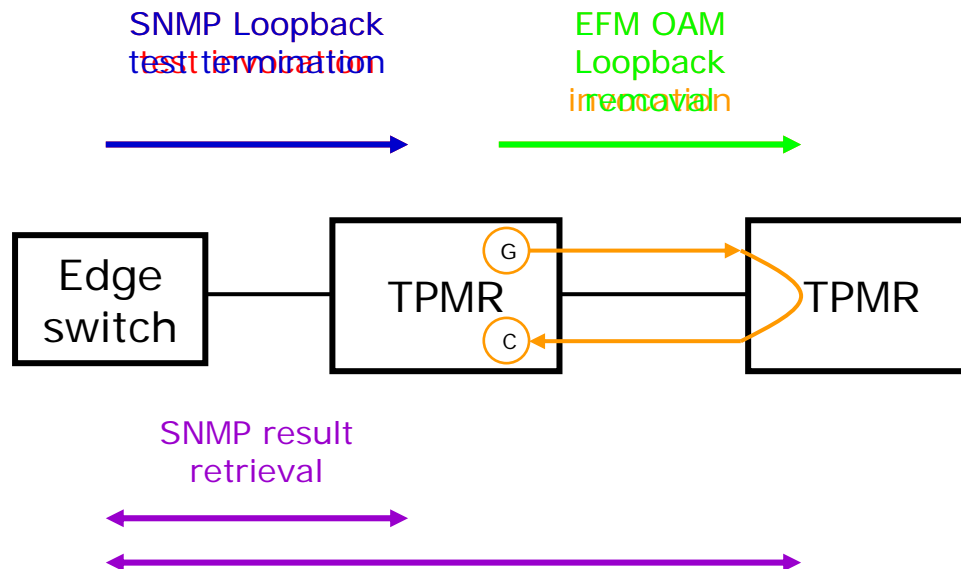 - Note that MRP (802.1ak) needs special handling in a Q-bridge

Loopback

- Optional per-link loopback on Ethernet with 802.3ah EFM/OAM
  - Invoked by SNMP to previous hop
- Multi-hop CFM-based (802.1ag) loopback
  - Uses a special loopback frame
  - Can contain arbitrary data inside a TLV
  - Non-intrusive, in that user data continues
  - Stateless (no invocation or termination command required)
  - Limitation: TPMR is not VLAN-aware, so uses untagged CFM only
- Stateful per-VLAN loopback is not supported
  - CFM group rejected this idea as not sufficiently useful at resolving data-driven errors – still controversial
  - Could be provided using an EFM/OAM extension invoked from the previous hop using SNMP

Optional per-link loopback

- Per-link loopback on Ethernet with 802.3ah EFM/OAM
  - Invoked by SNMP to previous hop
  - Beware that EFM OAM loopback discards returned frames
    - Frame generator (G) and checker (C) needed to support this

SNMP Loopback
test termination

EFM OAM
Loopback
removal

Edge switch — TPMR — TPMR

G
C

SNMP result retrieval

Link status propagation

- The draft proposes classic link-loss forwarding where one port is disabled when failure is detected on the other port

- This has problems regarding management reachability in the case of failure of the customer-side port

- A proposal is needed for the standard
  - It needs a signalling-based method
  - Could Y.1731 AIS be used as part of this?

Open issues

- Interworking of Discovery with LLDP
- Managed object set
- Management VLAN option
- Details of forwarding behaviour for reserved layer-2 control protocol addresses
- Link status propagation

Turning
metro visions
into value

Thank you

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