Partial Fault Notification and Shared Protection within PBB-TE

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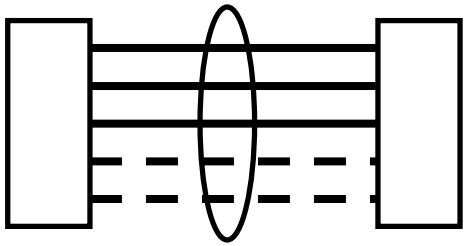
Overview

- Shared Protection: TDM vs. Ethernet
- Partial Faults
- Managing Partial Faults
- Goals for PBB-TE

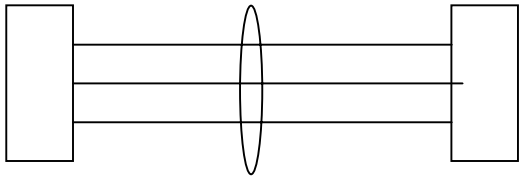
Shared Protection: TDM vs. Ethernet

- Protection in TDM Networks:
  - Protect against a single failure (either an intermediate node or a link), but not protect against a double failures
  - Link protection and end-to-end path protection
  - Link is either up or down. (No notion of 90% up)
- Protection in Ethernet Networks:
  - Not limited to single failure protection.
    Link aggregation can easily protect against multiple link failures.
  - Protection path width can be less than the primary path bandwidth.
    Subset of service instances can be switched over to protection path.



802.3ad

Partial Faults



802.3ad Link Aggregation

- Physical link bundles are common in packet network
  - Several GE links form a large logical link based on 802.3ad. For example, five 1GE form a 5G link
  - High speed Ethernet links (>10G) will generally use link aggregation.
- Partial fault exists in packet transport network
  - When one of physical links fails in a link bundle, the logical link still exist and is able to transport some packets but not at its maximum throughput
  - Carriers want to continue using a partial failed link for packet transportation and minimize the service impact
  - Particularly important for high-speed (high-cost) links
  - For example, partial failure in 3ad link is notified to OSPF-TE, which in turn will advertise reduction in available bandwidth.

Managing Partial Faults

- Managing partial faults consists of **detecting** partial faults and **responding** to partial faults
  - Detection points need to be able to signal capacity reduction to aggregation points
  - Aggregation points need to be able to adjust load to new link capacity

Goals for PBB-TE

- Define a **mechanism for notification** of partial faults to be propagated to PBB-TE end nodes (Source or Destination).

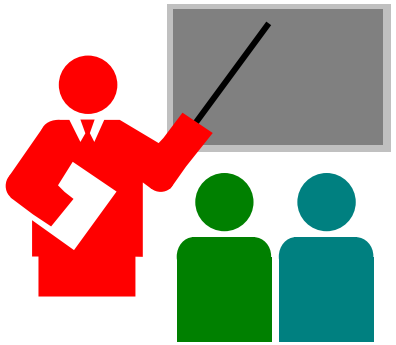
  Based on service provider's policies, this will:

  1. Allow end nodes to switch a portion of service instances bundled within the affected PBB-TE path to protection path if protection path is available
  2. Allow end nodes to shutdown a portion of service instances to guarantee:
     a. That the remaining services are transported without interference and
     b. Proper notification regarding services for which there is now insufficient bandwidth, via OAM

Goals for PBB-TE (Cont)

- The shutdown option is useful when the selected service instances are segments to other services. By disabling these service instances, CC message for the service instances can't get through, which will trigger protection at outer layer.
- Disabling selected service instances instead of letting intermediate nodes silently drop packets with lower priority has following advantages:
  - Dropping lower priority packets is not predicable. Some CC can still go through even though some data packets might be dropped when partial fault occurs.
  - For TE traffic, it is important to have predicable behavior. Sometimes, it is better for outer service layer to be aware of shutdown than having unpredictable behavior.
  - Dropping packets may work for voice and video. For data traffic, all dropped packets have to be retransmitted.

Summary



- PBB-TE should provide **mechanisms for indicating** reduced capacity to originating end-points, which allows them to redistribute or selectively shutdown the service instances.