Provider Backbone Transport

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Agenda

> Motivation

> Problem statement

> What is Provider Backbone Transport

> Basic Provider Backbone Transport concepts

> Summary

What is this presentation about?

- This presentation is to inform the IEEE 802.1 committee about Ethernet related work proposals being made in other standard bodies by Nortel and British Telecom.
- The technology presented here has been proposed in ITU-T SG15/Q12 under the name ***Provider Backbone Transport*** (PBT).
- Additional proposals on PBT will be introduced in IETF CCAMP in November 2005.
- We are looking for the IEEE to informally endorse PBT and to support it with a few modifications to 802.1ah and 802.1ag.

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Carriers Need To

- Build packet based infrastructure allowing efficient support of packet data, voice, and video applications
- Minimize capital costs to allow major build outs
- Maximize facility utilization while providing high quality service
- Minimize operational costs
- Verify service level agreements
- Minimize backward compatibility issues

Ethernet and MPLS are the alternatives

> Today only two technologies are in a position to provide both the scaling and features needed for future carrier networks. These are MPLS/PW and Ethernet.

> Both of these technologies can support multi-protocol packet transport

> Both of these technologies can scale to global sizes

> The Ethernet technologies cost less, have native multicast support, and are evolving to have superior management

> The MPLS technologies have more developed traffic engineering and protection mechanisms

Filling Ethernet Gaps

- Traffic engineering requires the ability to route traffic in diverse ways to allow full utilization of carrier facilities
- Traffic engineering requires the ability to perform constraint based route management and admission control for service guarantees
- Protection requires the ability to recover some services very quickly. Some networks will have requirements of less than 20 msec from the time of the failure to complete restoration.
- Protection must support traffic engineering and must be able to protect the full QoS guarantees.

Pt-Pt and MPt have different requirement

- Most current demand for traffic engineering is for engineered Pt-Pt services used for various types of leased line and trunk replacement.
- The advanced work in progress at MEF on metrics for multipoint traffic engineering will probably result in different network requirements than classic Pt-Pt traffic engineering.
- The current 802.1ah/ad models allows for engineering enough multipoint circuits using management of B-VLANs for metro video distribution.

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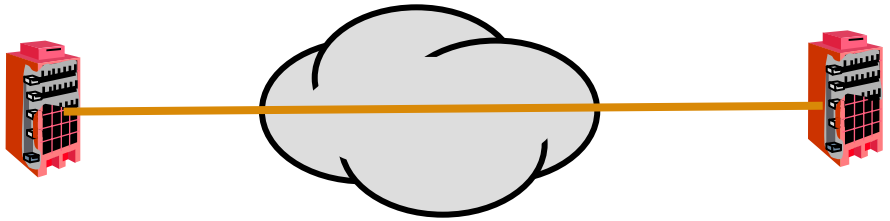
Focus On Traffic Engineerging for E-LINE

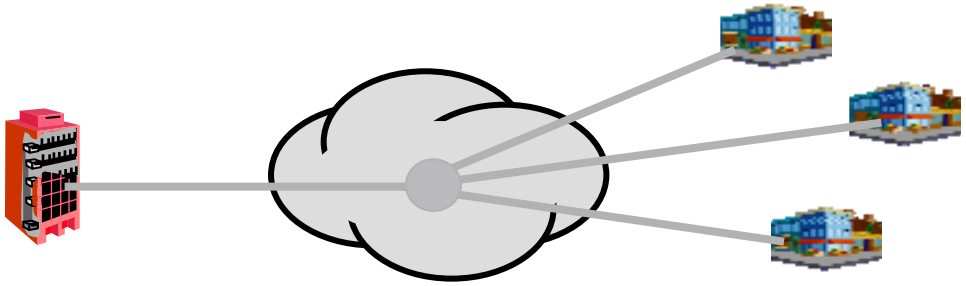
MEF Ethernet Virtual Connections (EVCs)

E-LINE
Router Mesh



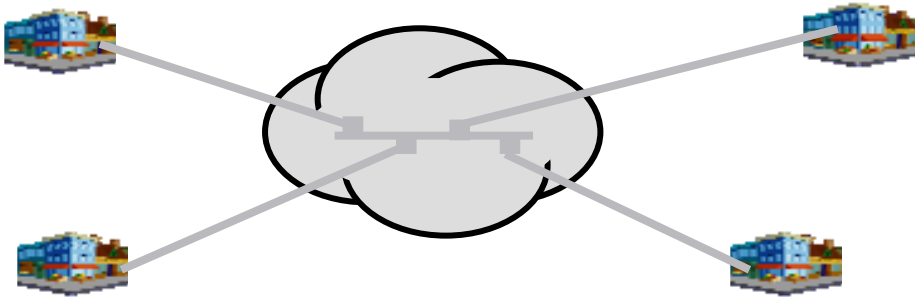
Pt-Pt, Like
Duplex Ethernet
Any-to-any

E-TREE
Hub & Spoke



Pt-MPt, Like
EPON Ethernet,
Root-to-Leaf and
Leaf-to-Root

E-LAN
Multi-Site



MPt, Like VLAN,
Any-to-any

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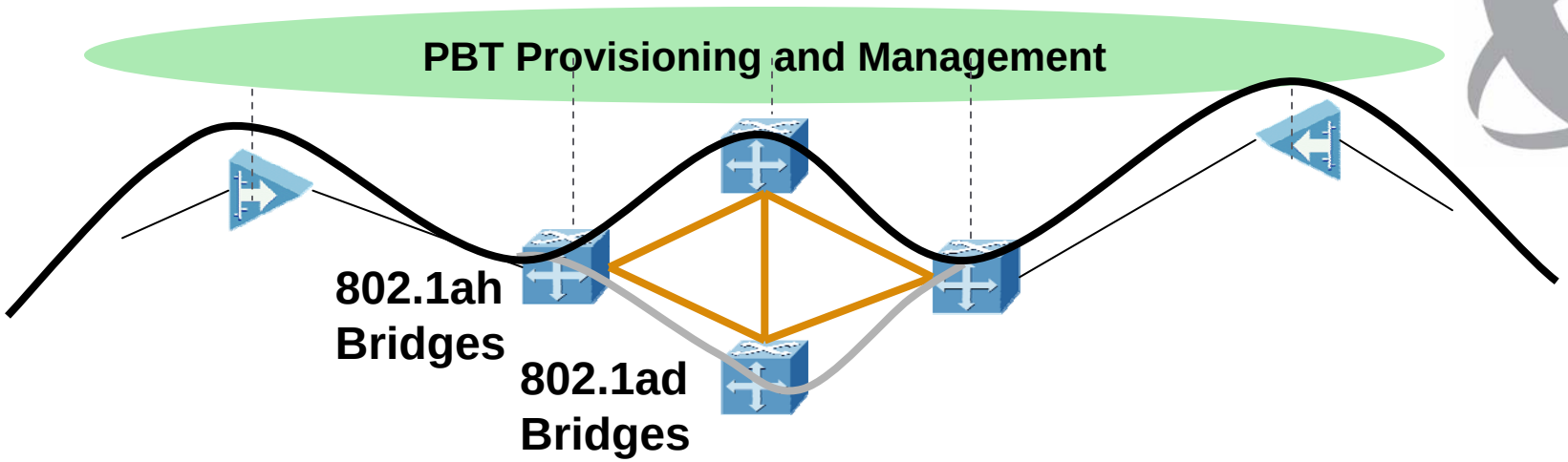
A Provisioned P2P Ethernet Transport



PBT is a variation on Provider Backbone Bridging which allows carriers to provision engineered and protected Pt-Pt service instance.

PBT operates by adding configured routes to a nearly standard Provider Backbone Bridged Network. The PBT provisioning and management system allows a carrier to provision point-to-point trunks and services within the Ethernet network. Each trunk is identified by a 16 bit VLAN ID and a 96 bit source/destination address pair.

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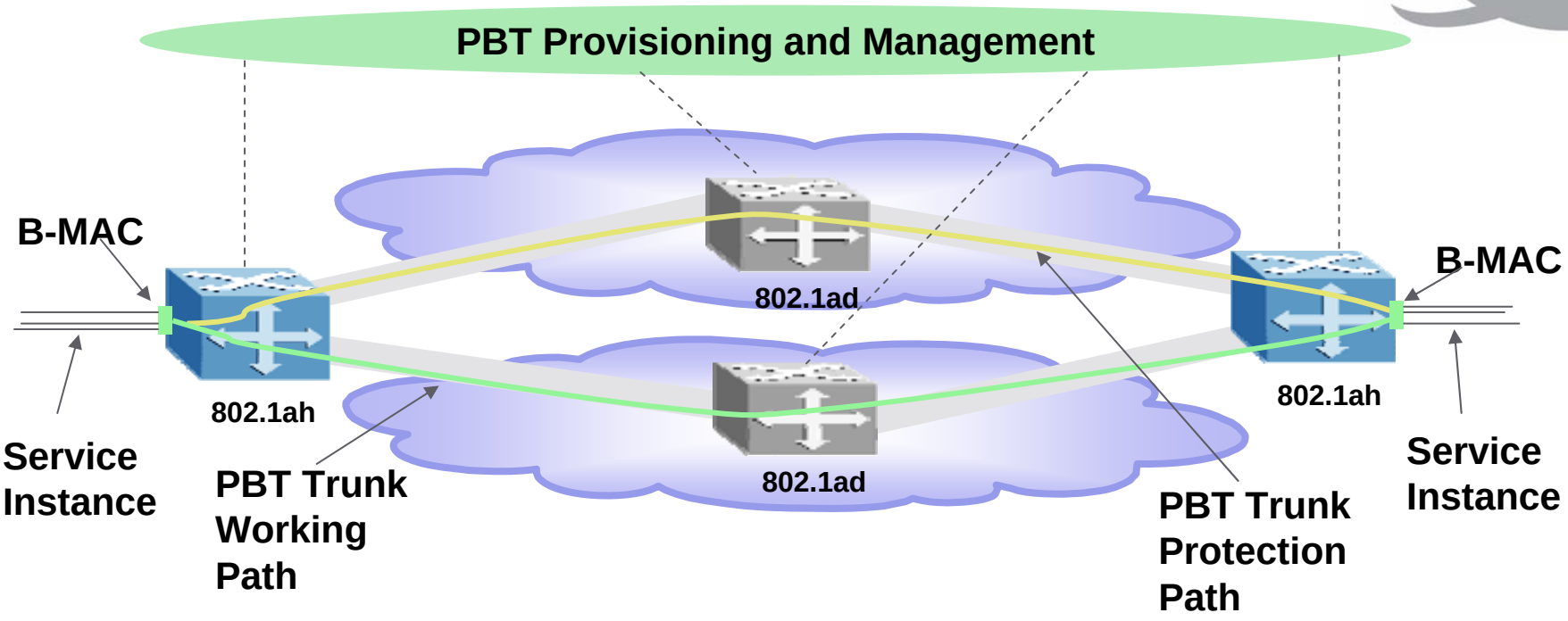
PBT Basic Concepts

- Divide the B-VID address space between conventional 802.1ah PBBN B-VLANs and PBT.
  - PBBN must operate in Independent VLAN Learning (IVL) mode
  - The number of B-VIDs used for PBT must be at least 2
  - B-VIDs not assigned to PBT operate as normal
- Turn off learning and broadcasting on all PBT B-VIDs
  - On PBT B-VIDs replace flooding of unknown frames with discarding for unknown frames
  - On PBT B-VIDs replace multicasting/broadcasting of frames with discarding of multicast/broadcast frames
- Use a provisioning/management system to configure the Bridge forwarding tables for PBT B-VIDs
  - These are accessed through the bridge MIB
- Each PBT circuit is composed of a working and a protection path
  - The working an protected paths use different B-VIDs to access the same backbone MAC address
- Manage co-routed bundles of PBT backbone circuits using 802.1ag
  - Requires unicast CC messages not currently implemented
  - Management must operate on both the working and protected paths

Complete Traffic Engineering for P2P



> Working and protected path use different B-VIDs

> Directed IEEE 802.1ag CC messages are sent over both the Working and Protection paths.

> CC messages are used to determine failure events and cause protection switching.

What do you get?

- Complete route selection freedom for PBT P2P trunks
  - Each P2P trunk may be along a different spanning tree
  - Provisioning systems may use shortest path, constraint based, manual placement, or any other route algorithm which assures loop free paths.
  - Each P2P trunk may use a different routing strategy.
- Load may be calculated for each P2P trunk and allocated to each physical link, port, and switch.
- Protection paths are pre-determined to allow rapid failover.
- Both working and protection trunks are constantly monitored.

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- BT and Nortel are proposing work on PBT in ITU-T and IETF CCAMP
- PBT fills the wholes in traffic management and protection switching for Ethernet E-LINE services and trunks
- PBT will require additional behaviors in 802.1ah/ad bridges to allow:
  - Turning off learning on a per VID basis
  - Discarding unknown frames on a per VID basis
  - Discarding broadcast frames on a per VID basis
  - Adding protection path switching to PBB bridges
- PBT will require adding directed CCs to 802.1ag

Questions?