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 requirements

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.
Focus On Traffic Engineering for E-LINE
MEF Ethernet Virtual Connections (EVCs)

E-LINE
Router Mesh

E-TREE
Hub & Spoke

E-LAN
Multi-Site

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

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

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 and 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?