Thoughts on PBB TE based Port Extension

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Thoughts

- Paul Bottorff, et. al, have proposed a new direction for Port Extension utilizing PBB TE technology
  - Hoping to increase the likelihood of success of the project
  - It is a good thing to reuse technology when possible

- However:
  - How much is really reused?
  - How much is new and needs to be defined?

- Other important considerations:
  - Keep it simple
  - Avoid features creep
The Port Extension Environment

- Port Extension targeted at the “near edge”
The Port Extension Environment

- Intended for use at or near the edge of the network
- The goal is to reduce the number of bridges in the network by collapsing layers into a single Extended Bridge
- The requirements in this neighborhood are extremely modest
  - It seems counter-intuitive to “simplify” the network by replacing the existing bridges with an even more sophisticated bridge
  - It is also clear that the modest requirements at the edge are insufficient for the core
- One size does not fit all
  - Lacking a finite scope results in an infinite project
From the P802.1Qbh Approved Five Criteria

1. Broad Market Potential
   c. Balanced costs (LAN versus attached stations)

   This technology has been expressly designed for balanced costs. It is deployable with no change to existing attached stations (that is, the technology interoperates with existing NIC cards). The design of the Port Extender function has been carefully considered to keep costs constrained. This has been a high priority since it is expected that Port Extenders may well outnumber bridges in typical deployments and are likely to be integrated in with attached stations.

5. Economic Feasibility
   a. Known cost factors, reliable data

   Port Extenders are expected to cost less than existing bridges due to their relative simplicity (e.g. by simplifying the address table structure and eliminating many of the advanced functions typically found in the bridges that Port Extenders would replace). This is supported by experience in existing deployments of this technology. In addition, the resultant reduction in management complexity brings significant cost advantages. The Port Extender creates many lower cost Ports for every controlling bridge Port further benefiting the overall system cost. Existing experience also indicates no significant increase in the cost of the bridges that attach to the Port Extenders.

This text is also in the proposed P802.1BR PAR
Support for Provider Bridges

- During review of draft 0.2 (March, 2010), it was observed that the current approach precluded support of Provider Bridges (i.e. S-TAGs)
  - At that time, providing support seemed trivial
  - Four options considered
    - Do nothing
    - Stack S-TAGs
    - Create something like an S-TAG with a new Ethertype
    - Expand the use of the M-TAG

- During review of draft 0.4 (Aug, 2010), consensus was reached to expand use of M-TAG. Added to draft 0.5 (Oct 2010)

- In retrospect, what seemed like a trivial bonus that was almost free has generated tremendous scope confusion

- On July 18, 2011, consensus was reached in DCB to remove support for S-components to re-focus scope to the near edge
  - Including agreement by the original commenter
What is a PBB TE based Port Extender?

As proposed in bh-bottorff-pbbte-pe-draft-0711-v1:

It is a fully compliant TESI BEB that supports PE CSP

As currently defined in P802.1BR, a Port Extender is one of the simplest devices defined by 802.1

The PBB TE approach makes it one of the most sophisticated devices defined in 802.1

- Scope appears unbounded

  Therefore, every possible capability can be argued as desirable since we may need it
What is Required for a PBB TE based Port Extender?

- The proposal has many contradictions
  - e.g., TESI requires that every managed object be controllable
    - However, the entire basis of Port Extension is that the Port Extender is controlled by the controlling bridge only
  - PE CSP does not provide complete control of every manageable object
    - Paul’s latest proposal suggests that PE CSP be expanded to fully control a BEB
    - It is highly undesirable to do so – it results in much greater and unnecessary complexity, likely reducing interoperability

- Of course, we could define a reduced functionality BEB for Port Extension
  - In fact, this is required to make Port Extension practical
    - However:
      - once the unneeded functionality is removed, the remaining functionality is modified to support Port Extension, the required new functionality is added,
      - we end up with a BEB in name only
Below are the conformance pages for a B-component within a BEB:

- Red indicates functionality that must be removed or is unnecessary
- Yellow indicates functionality that must be changed
- Hashed area indicates conformance requirements not related to the B-component in a BEB

For reference, the conformance clause in P802.1BR for a Port Extender occupies approximately half a page
PBB TE based Port Extender Conformance (2)

- Note that the previous slide covers only the B-component portion of a PBB TE based Port Extender
  And it does not address the extension necessary to a B-component that would be utilized only in a Port Extender

- A similar situation occurs with the T-component and the 2-port VLAN component
Some details about the B-component (1)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except:

  It does not use VLANs

- Relay and filter frames as described in 8.1 and specified in 8.5, 8.6, 8.7, and 8.8

  Except that very little functionality defined in these sections is actually used

  VLANs are not required, so this is set to default values and the VLAN information is essentially ignored
Some details about the B-component (2)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except:
  - Management configuration of PVID and static VLAN entries, insertion and removal of tag headers, MVRP, dynamic VLAN entries, and VID to FID allocations are not needed.
  - The interoperability note does not apply.
  - Optional capabilities would cause improper operation or are not needed, including: MST, port and protocol VLAN classification, extended filtering services, MMRP, multiple VLAN filtering entries, setting of acceptable frame types, ingress filtering, multiple VIDs in untagged set, management, multiple VIDs, assignment of multiple VIDs to FIDs, VLAN learning constraints, fixed VID to FID assignments, Restricted_MAC_Address_Registration, Restricted_VLAN_Registration, time sensitive streams, SNMPv2 MIB modules, and MSRP.

- CFM and CN are applicable
  - However, CFM and CN are applicable to most everything, not just B-components.
Some details about the B-component (3)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except MST and Port and Protocol VLAN classification is not used.
Some details about the B-component (4)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except:
  - MMRP is not applicable
- CFM is applicable
  - However, CFM is applicable to most everything, not just B-components
Some details about the B-component (5)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except:
  - Forwarding of time sensitive streams is not applicable
  - MVRP is not applicable
Some details about the B-component (6)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except:
  - MSRP is not applicable

- Congestion notification is applicable
  - However, CN is applicable to most everything, not just B-components
Some details about the B-component (7)

- A B-component within a PBB TE based PE is comprised of a VLAN-aware bridge component except:
  - MSRP is not applicable

- A B-component within a PBB TE based PE is comprised of a S-VLAN component except:
  - S-VLANs are not used
  - The S-VLAN component operation is modified
  - Reserved MAC addresses are not filtered, does not use the provider bridge MVRP address (nor does it do MVRP at all), and does not support the enable ingress filtering parameter
Some details about the B-component (8)

- A B-component within a PBB TE based PE is comprised of a S-VLAN component except:
  - VLANs are not applicable
  - A specific TE-MSTID is not required
Some details about the B-component (9)

- The B-component within a PBB TE based PE is compliant except:
  - I-SIDs are not required and PBBN PDUs are not required therefore it is not necessary to explicitly prevent their transmission
  - I-SIDs, translation of I-SIDs, assignment of BVID based on I-SID, and the service instance table are all not applicable
  - A specific TE-MSTID is not required
  - Support of the service instance table, protection switching, and the management objects is not required
  - Control of B-VIDs and the protection hold-off timer is not applicable
Some details about the B-component (10)

- The B-component within a PBB TE based PE is compliant except:
  - Sharing TESIs among protection groups, support of mismatch defect identification, and support of the PBB TE MIB is not required.
But that’s not all folks...

- The entire Enhanced Internal Sublayer service is not required
- Active topology enforcement is not required
- Ingress filtering is not required
- Everything related to VIDs and FIDs in filtering is not required
- Reserved group addresses are not required
- The learning process is not required
- MST and FID to MST allocation is not required

...and this is just the B-component

- Repeat for the T-component and VLAN-aware Bridge component
So what’s left?

- Insert a MAC header
- Forward based on the MAC header

However…

- As proposed in bh-bottorff-pbbte-pe-draft-0711-v1, it is not really a MAC header (see 44.4)
  
  It is actually an E-Tag disguised as a MAC header
  
  The E-TAG parameters are encoded into the MAC header, along with two new bits that are not necessary in the E-TAG
  
  This is not MAC/FID forwarding as we know it today
Additional functionality required…

- New functionality within the BEB components is required to make Port Extension work:

  This functionality is Port Extension specific and has no applicability for use in PBB:
  
  - Ability to support two MAC addresses per PIP
  - Ability to do echo cancellation
  - Ability to pass a B-MAC in the connection_identifier
  - Deprecated MIB
Making a PBB TE based Port Extender

- Start with a BEB
- Delete almost everything that makes it a BEB
- Add everything currently specified in P802.1BR

What you get:

- Pretty much exactly what is specified in P802.1BR except:
  - It creates and processes an E-TAG disguised as a MAC header
Architectural Re-use

- Very little is reused when looking at the details
- By far much more needs to be deleted from the BEB model than what is currently defined in P802.1BR
  
  For reference, the specification of a PE in P802.1BR is 18 pages including approximately seven pages of descriptive material.

- Likewise, additional Port Extension specific functionality is needed in the PBB TE approach to Port Extension:
  
  - Generation of MAC addresses
  - Dual PIP MAC addresses
  - Echo cancellation
  - Mapping of PE CSP to the BEB managed objects

- The PBB TE approach encapsulates the E-TAG in a MAC header
  
  It is a bit of a stretch to claim it does not create a new encapsulation
  
  The MAC header enhancements to encapsulate the E-CID is new
Hardware reuse

- Hardware reuse

  No currently existing PBB TE ASIC is likely to be able to support Port Extension as is

    Need to add echo cancellation

    Likely to be a much more sophisticated part in comparison to a part compliant with the current BR

    This challenges the economic feasibility criteria

  MAC-in-MAC encapsulation is inconvenient for NIC implementations

    Increases internal buffering required for MAC headers

    Misaligns the rest of the headers and tags

    The C-DA starts at octet offset 22

    Had long discussions in the TG about 32-bit alignment
Considering the users of our technology…

- Users of networking services and equipment

  Frequently (almost universally) asked questions:
  - How soon will the standard be complete?
  - When can I buy compliant equipment?

  Rarely (if ever) asked questions:
  - Does this create a new tag?
  - Does this leverage PBB TE?
## Comparison of Approaches

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<td>Minimize PE impact to existing components</td>
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<td>More convenient NIC implementation</td>
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Thank You!