SPB Path Control and Reservation (SPB-PCR) draft PAR and 5C

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Title

- PAR for an amendment to an existing Standard 802.1Q-2011

- P802.1Q??

- IEEE Standard for Local and Metropolitan Area Networks -- Media Access Control (MAC) Bridges and Virtual Bridge Local Area Networks
  Amendment:
  Path Control and Reservation (PCR)

Scope

- This standard enhances Shortest Path Bridging, its protocols, procedures and managed objects, to provide explicit path control, bandwidth reservation, redundancy (protection or restoration) for data flows and distribution of control parameters for time synchronization and scheduling.

- This standard preserves the IS-IS model applied for the control of IEEE 802.1Q bridges and will be backwards compatible with SPB (802.1aq) and interwork or be backwards compatible with SRP (802.1Qat).

Purpose

- Enhanced SPB specified by this standard will provide the capabilities necessary to be able to determine the forwarding paths explicitly thus being able to deviate from the default path. It will also provide a tool to reserve bandwidth along the forwarding path. Protection switching mechanisms will be provided for the data traffic.
- The extensions will also be able to carry control information for time synchronization and scheduling for applications requiring this.

Need

- SPB and ECMP only allows the use of a shortest path for data frame forwarding. Certain traffic requires an explicitly determined forwarding path which may often deviate from the shortest path. Certain traffic requires quarantined bandwidth, which has to be reserved. Protection against data loss is also often required.
- Time sensitive traffic may also require time synchronization and enhanced scheduling. It is desired to use a single protocol for the control of many network features, or at least to provide support for other control mechanisms. Thus, a standard link state solution is needed to provide these enhanced control features.

Stakeholders

- Users, Vendors, IC developers, administrators, designers, customers, and owners of Provider Backbone Bridged Networks, Carrier Ethernet Networks, Data Center networks, Automotive networks, Industrial networks, Audio/Video and Residential systems requiring optimized bandwidth usage and/or redundancy.

Other Standards with a Similar Scope

- There is no standard providing the necessary Path Control and Reservation features for IEEE 802.1Q bridges.
- Partial solutions to the needed features are provided by IEEE 802.1Q-2011 and IETF RFC 5305.
  - 802.1Qay PBB-TE provides explicit path control by external agents for point-to-point and point-to-multipoint connections, and also end-to-end 1:1 bidirectional linear protection switching for point-to-point connections
    - It does not provide any protocol for the path control, thus not applicable “as is” for link state control by SPB. Furthermore, there are other protection schemes that need to be supported (notably fully diverse routed 1+1) in collaboration with link state control.
  - 802.1Qat SRP provides bandwidth reservation, however, it is constrained by the tree span by RSTP or MSTP, i.e. SRP cannot freely control the forwarding path
  - IETF RFC 5305 provides IS-IS TLVs to support traffic engineering
    - Bandwidth reservation is not confined into a single link state protocol, e.g. IS-IS,
    - but adequate intrinsic support for explicit path control is not provided (only a single TE metric is supported for a link)
- IEEE 802.1 intends that the semantics of the protocol commands and the data formats encoded in potentially new IS-IS sub-TLVs be standardised using the IETF process. IEEE 802.1 further intends to use the existing technology base as much as possible, e.g. existing 802.1 protection switching and IS-IS TLVs.

5 Criteria

Broad Market Potential

- Broad sets of applicability
  - The application of Ethernet services and technology across data centers, metropolitan, automotive (vehicle) and industrial networks is large and growing business. Enhanced SPB could provide a unified control base for these networks and enable even wider spread by means of providing missing control features.
- Multiple vendors and numerous users
  - Large body of vendors and users having a requirement for IEEE 802.1Q in data center, metro, automotive and industrial networks.
- Balanced costs (LAN versus attached stations)
  - This project does not materially alter the existing cost structure of bridged networks. Attached stations would not be aware of the operations by transit bridges.

Compatibility

- IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management and Inter-working documents as follows: 802- Overview and Architecture, 802.1D and 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.
  - This PAR is for an enhancement to Shortest Path Bridging and it is intended to be fully compatible with the currently specified 802.1aq and 802.1Q functionality.
- Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.
  - Such a definition will be included.

Distinct Identity

- Substantially different from other IEEE 802 standards.
  - This is an amendment to 802.1Q the only standard for VLAN aware bridges.
- One unique solution per problem (not two solutions to a problem).
  - There is no standard providing link state control allowing coexistence on the same network of shortest path bridging and explicit path selection, with support of bandwidth reservation, data traffic protection, time synchronization and scheduling for bridge networks.
- Easy for the document reader to select the relevant specification.
  - This project will amend only the IEEE 802 standard defining VLAN aware bridges.

Technical Feasibility

- Demonstrated system feasibility.
  - The function is similar in complexity to existing functions in 802.1Q and 802.1aq, which have been successfully implemented.
- Proven technology, reasonable testing.
  - The main concepts are proven and SPB is a proven technology. Compliance with the project can be tested using straightforward extensions of existing test tools for bridged networks.
- Confidence in reliability.
  - The reliability of the enhancements will be not be measurably worse than that of existing SPB.
- Coexistence of 802 wireless standards specifying devices for unlicensed operation.
  - Not applicable

Economic Feasibility

- Known cost factors, reliable data.
  - This project introduces no hardware costs beyond the minimal and well-known resources consumed by an additional software protocol whose requirements are firmly bounded.
- Reasonable cost for performance.
  - The cost of upgrading software and configuring the protocol is reasonable, given the improvement in the applicability of bridge networks, e.g. for time aware or mission critical applications.
- Consideration of installation costs.
  - The cost of installing enhanced software, in exchange for improved network performance, is familiar to vendors and users of bridged networks.