Fast Recovery for Chains and Rings

Proposal for PAR and 5 Criteria

Version 1

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Background

Background

(See http://www.ieee802.org/1/files/public/docs2008/new-lemon-finn-rpr-0108-v1.pdf for more.)

- IEEE 802.17 defines a complex MAC that can be used to create a closed ring of bridges. An 802.17 ring offers:

  Recovery in 10s of milliseconds from a failure of a link.

  Fairness of access by data streams to best-effort bandwidth regardless of the streams' path lengths around the ring.

  Ring topology discovery.

  Customer address hiding (satisfied by 802.1ah).

  Bandwidth allocation (likely satisfied by 802.1Qav, 802.1Qaz).

- The addition of these three features to 802.1Q bridged LANs would enhance their viability in the metropolitan Ethernet space, due to the widespread deployment of ring topologies.
- This PAR addresses the first feature: the rapid recovery of connectivity.

Project Authorization Request

Title

- PAR for an amendment to an existing Standard 802.1Q-2005
- P802.1Qbb (or Qbc, etc., as appropriate)
- IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks - Amendment: Fast Recovery for Chains and Rings

Scope

- This standard specifies protocols, procedures, and managed objects to support the rapid restoration of connectivity across a physical bridged network topology that includes chains or rings of bridges in a manner that interoperates with the Multiple Spanning Tree Protocol.

Purpose

- Under certain failure scenarios in networks that include long chains or rings of bridges, the Multiple Spanning Tree Protocol (MSTP) defined in Clause 13 of IEEE Std. 802.1Q-2005 can interrupt the network's connectivity for several seconds while determining the new active topologies. By configuring a subset of bridges in such a network with knowledge of the network's intended physical connectivity, these interruptions can be minimized in a manner that interoperates with MSTP.

Need

- IEEE 802.1 bridged networks are being deployed by providers of wide-area commercial Ethernet services using pre-existing physical topologies that often include long chains or rings of bridges. Such topologies highlight a weakness of MSTP—certain failure scenarios can cause MSTP to interrupt network connectivity for several seconds. The existence of several proprietary solutions to this problem indicates that a standard solution is in order.

Stakeholders

- Vendors, users, administrators, designers, customers, and owners of bridged networks.

Other standards with a similar scope

- There are no standards solving this problem for IEEE 802.1Q bridges. ITU-T Draft Recommendation G.8032 addresses the problem of a single closed ring of ITU-T defined Ethernet switches, which are similar to IEEE 802.1Q bridges, but not in the context of MSTP.

Five Criteria

Broad Market Potential

A standards project authorized by IEEE 802 shall have a broad market potential. Specifically, it shall have the potential for:

- Broad sets of applicability.

  The commercial provision of Ethernet services across metropolitan or larger networks is a large and growing business. Metropolitan networks are not, of course, the only ones among the millions of bridged networks that can benefit from optimization for ring topologies.

- Multiple vendors and numerous users.

  Multiple bridge vendors offer similar, proprietary solutions to many customers.

- Balanced costs (LAN versus attached stations).

  This project does not materially alter the existing cost structure of bridged networks.

Compatibility

- IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management, and Interworking documents as follows: 802. Overview and Architecture, 802.1D, 802.1Q, and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.

  This PAR is for an amendment to 802.1Q, thus ensuring compatibility.

- 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

Each IEEE 802 standard shall have a distinct identity. To achieve this, each authorized project shall be:

- Substantially different from other IEEE 802 standards.

  This project will amend the only IEEE 802 standard defining VLAN bridged networks.

- One unique solution per problem (not two solutions to a problem).

  There are no other standard solutions to the ring recovery problem in an MSTP network.

- Easy for the document reader to select the relevant specification.

  This project will amend the only IEEE 802 standard defining VLAN bridged networks.

Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

- Demonstrated system feasibility.

  Several bridge vendors offer products that offer capabilities substantially the same as those defined by this project.

- Proven technology, reasonable testing.

  Several bridge vendors offer products that offer capabilities substantially the same as those defined by this project. Compliance with the project can be tested using straightforward extensions of existing test tools for bridged networks.

- Confidence in reliability.

  The reliability of the modified protocols will be not be measurably worse than that of the existing MSTP.

Economic Feasibility

For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated) for its intended applications. At a minimum, the proposed project shall show:

- Known cost factors, reliable data.

  This project introduces no hardware costs beyond the minimal and well-known resources consumed by extending an existing software protocol.

- Reasonable cost for performance.

  The cost of upgrading software and configuring a priori knowledge of the overall system topology is reasonable for the significant reduction in the time required to recover from a network failure.

- 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.