Fast Chain Recovery with Traffic Engineering (FCR-TE)

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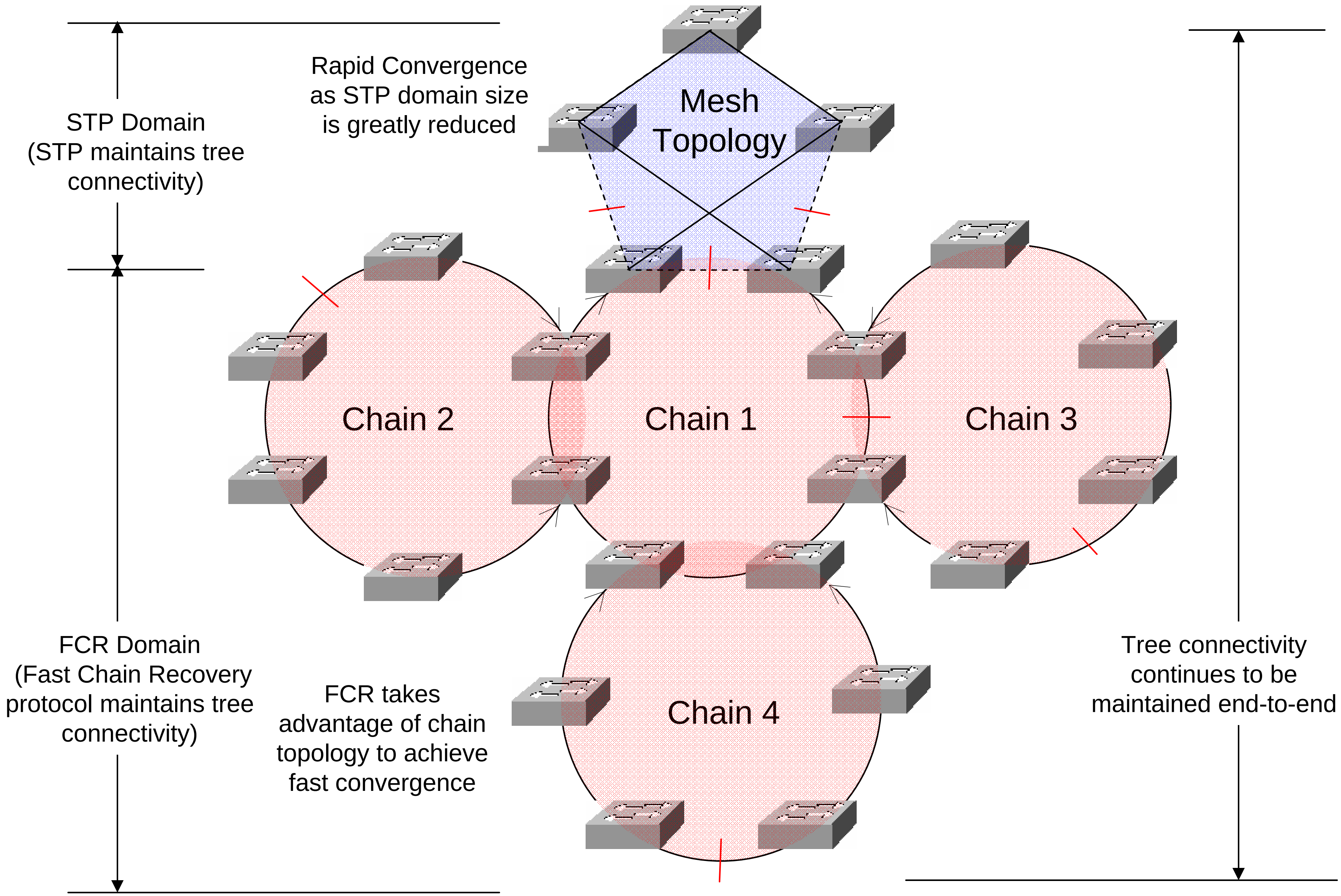
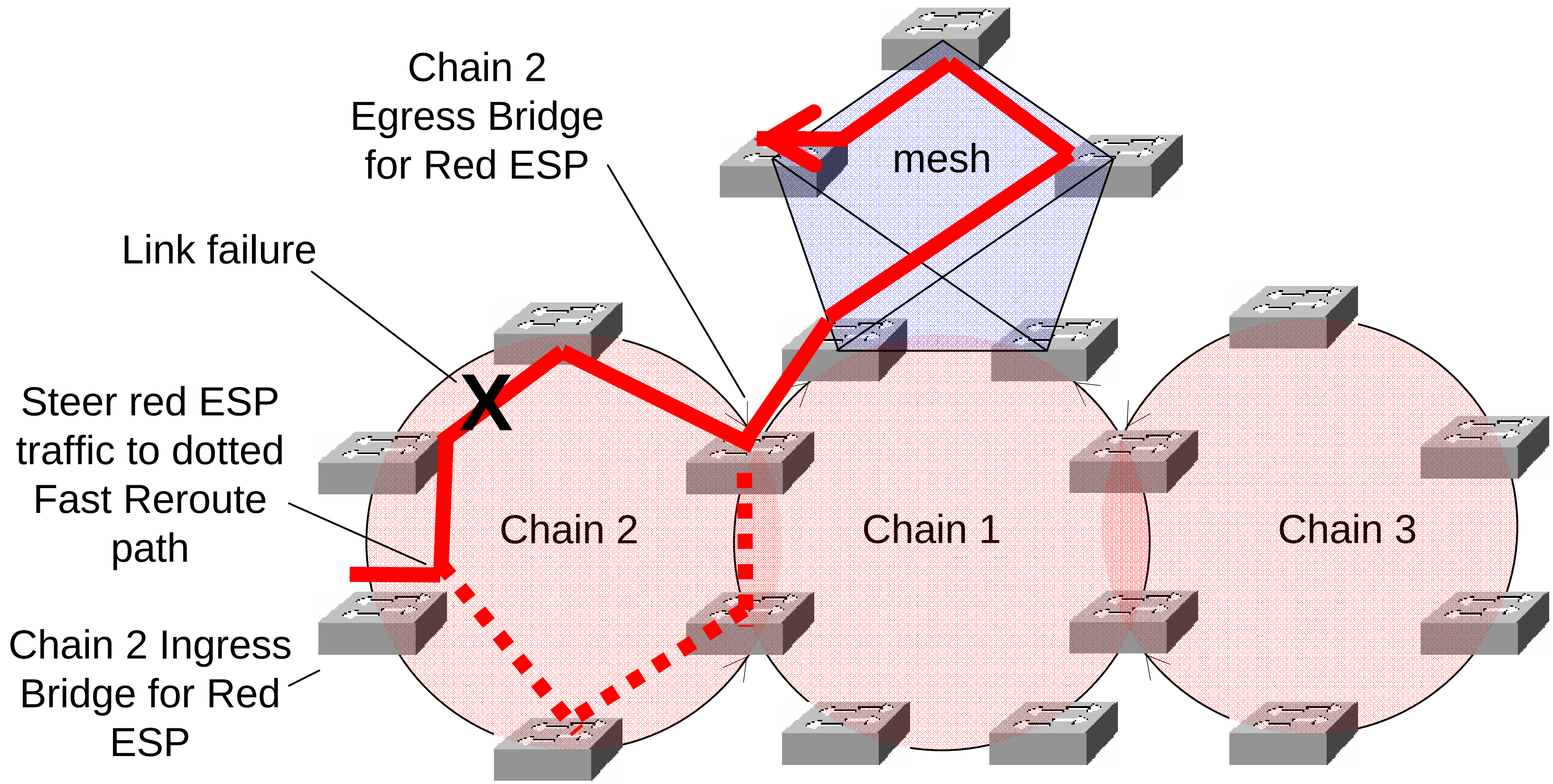
Fast Chain Recovery (FCR) for VLANs



…but .1Q includes TE as well as VLAN

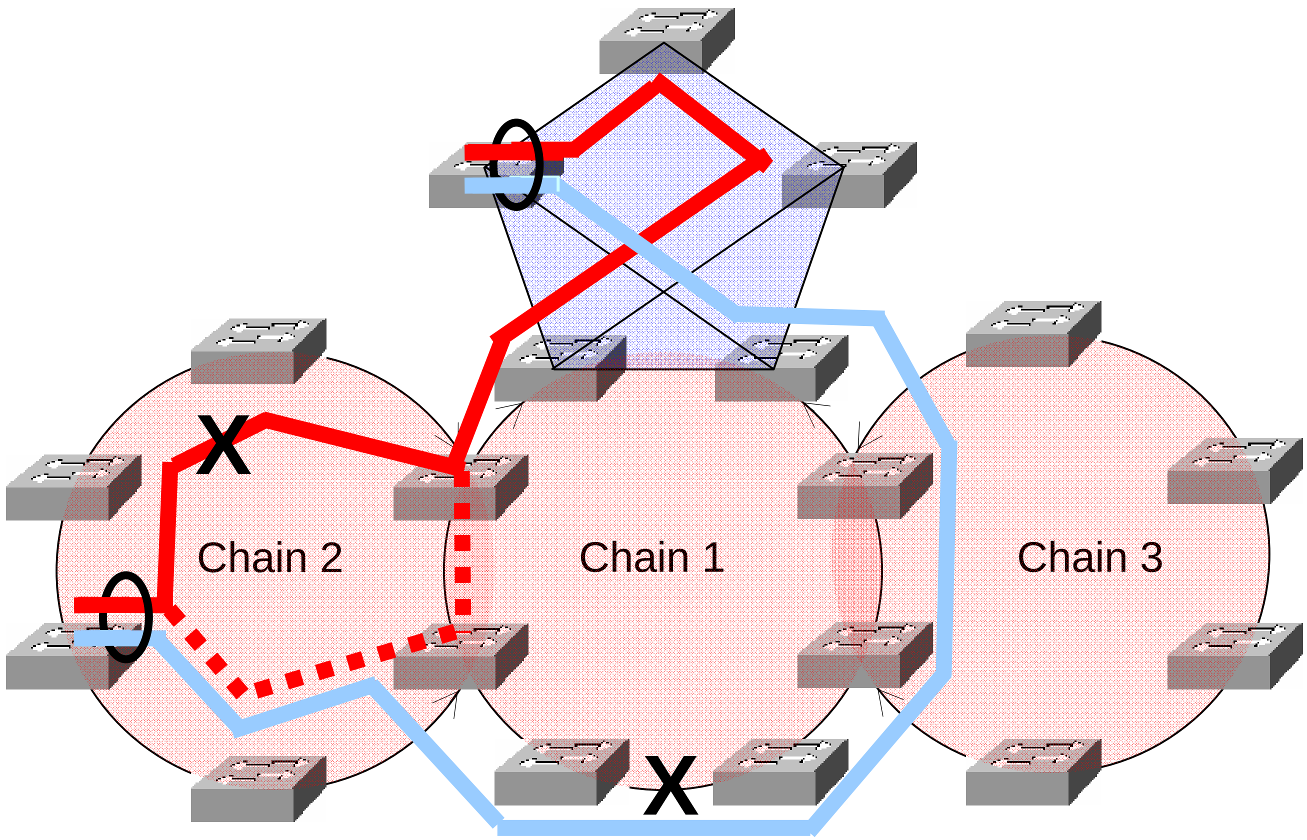
- .1Qay specifies VLAN and TE to operate on same network (partitioned by VID)
- Once FCR is deployed for VLANs, chains are defined and algorithms/protocols protocols are in place to provide almost all that is needed to support per-chain Fast Reroute of ESP around a fault.

FCP with Traffic Engineering (FCP-TE)



- Active chain topology known to Bridges on chain.
- Ingress Bridge provisioned with identity of Egress.
- Ingress computes whether fault lies on ESP.
- If so, ESP traffic steered away from fault on chain.

FCR-TE and TESI Protection Group



- FCR-TE survives one fault *per chain*.
- TESI PG survives one fault *end-to-end*.
- FCR-TE cannot be used on mesh.
- TESI PG and FCR-TE synergistic in chain domain

Proposed Extensions To Par and 5-Criteria

- Modifications (in red) to Norm Finn's proposal from March meeting on slides that follow
- See posted "FCR-TE Whitepaper" for detailed description of scheme.

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 in the case of VLAN traffic.

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. Further, in Traffic Engineered networks, Ethernet Switched Path (ESP) connectivity can be maintained in the presence of a single fault in each chain through which the ESP passes.

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.
- It is anticipated that Traffic Engineered bridged networks, like VLAN Bridged networks, may support topologies having chains or rings of bridges. Currently, an ESP cannot be recover from failures occurring in multiple chains or rings through which it passes. Such localized protection is supported by synchronous transport networks traditionally used to provide Traffic Engineered service and by Fast ReRoute in MPLS-based packet transport networks. The absence of this capability in Bridged networks is a competitive disadvantage.

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 or of Traffic Engineered services.

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 and Traffic Engineered 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~~ a VLAN or TE bridged network.
- Easy for the document reader to select the relevant specification.
  - This project will amend the only IEEE 802 standard defining VLAN and TE 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~~ VLAN or TE bridged networks.

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.