Reasons for Proposed change to PAR:

- Include Provider Bridges
- Remove reference to S-TAG
- Update 5C to reflect additional use cases for Port Extension

As long as we are doing this:
- Update terminology
- Format scope to fit the introduction to the amendment

CURRENT SCOPE:

5.2 Scope: This amendment specifies protocols, procedures, and managed objects to support Port Extension. A Port Extender attaches to a MAC port of an 802.1Q bridge and provides additional MAC ports that are logically ports of the 802.1Q bridge to which it is attached (i.e. the "Controlling Bridge"). The protocols, procedures, and managed objects specified in this amendment are expected to specify new behavior in bridges that support port extension as well as the behavior of Port Extenders themselves. In addition, the protocols, procedures, and managed objects specified in this amendment support the cascading of Port Extenders. To the extent technically reasonable, all frame filtering and relay functions remain in the Controlling Bridge. Use of a Service Virtual LAN Tag (S-TAG) for Multichannel capability as being defined in Edge Virtual Bridging is envisaged to achieve this objective. A new on-the-wire indication (e.g. a new tag) is envisioned to support remote replication for purposes including frame flooding and group address support.

PROPOSED SCOPE:

5.2 Scope: This amendment enables Bridge Port Extension of a controlling bridge's Ports to Ports provided by a Port Extender. To this end it:

a) Differentiates Customer VLANs (C-VLANs) and Service VLANs (S-VLANs) from Extension Channels (E-channels) that are used to segregate traffic within an Extended Bridge.
b) Specifies an Extension Tag format for E-channels allowing these tags to be distinguished and separately applied by Port Extenders and their Controlling Bridges.
c) Specifies the functionality and the specific requirements of an E-component derived from a generic VLAN-aware bridge component.
d) Specifies a Controlling Bridge as comprising a VLAN Bridge, a Provider Bridge, or a Provider Edge Bridge and the ability to support one or more E-components.
e) Specifies a Port Extender comprising a single E-component.
f) Defines an Extended Bridge comprising a Controlling Bridge and a set of attached Port Extenders. Attached Port Extenders may be cascaded forming a simple tree structure.
g) Positions the support of E-channels within the architectural description of the MAC Sublayer and specifies their relationship to media access method dependent functions and to the media independent functions used to administer networks, including the support of C-VLANs and S-VLANs.
h) Defines the principles of network operation in terms of the support and preservation of the MAC Service, and the maintenance of Quality of Service for each service instance, including the segregation of traffic belonging to different E-channels.
i) Establishes the requirements for Bridge Management to support Port Extension, identifying the managed objects and defining the management operations

Existing Purpose (No change proposed)

5.4 Purpose: The purposes of this project include:

- To reduce the management cost of networks comprising large number of bridges (such as those commonly found in a data center environments) through significant reduction in both the number of devices to be managed and the management traffic required.
- To decrease total cost of ownership by reducing initial capital expenditure along with management and operational costs.

5.5 Need for the Project: Management of large networks today is highly complex. This complexity may be reduced by aggregating the more complex bridging functions onto fewer bridges and by collapsing bridge layers from a management perspective.

The EVB project is defining reflective relay and multichannel capabilities. The Port Extension project extends these capabilities by providing a remote replication capability. In addition, a Port Extender device will be specified that utilizes the ECP protocol from EVB and the remote replication capability. This is intended to reduce management complexity by aggregating the more complex bridging functions onto fewer bridges.

The Port Extender device may be used to collapse layers in the network resulting in reduced capital expenditure, points of management, and management traffic and thus reducing total cost of ownership.

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FIVE CRITERIA:

1. **Broad Market Potential**
   a. **Broad sets of applicability**
   Data centers containing hundreds or thousands of deployed bridges are common. These include data centers that have deployed high density server solutions including "1U" servers, server blade racks, etc. Deployments such as these are expected to significantly benefit from the technologies proposed. Additionally, data centers that have deployed server virtualization technology are expected to enjoy even greater benefits. The proposed technology is also expected to benefit Provider Bridge deployments.
   b. **Multiple vendors and numerous users**
   There has been interest expressed by multiple vendors in this technology. In addition, many vendors have announced products supporting similar technology in a proprietary fashion. This technology is applicable to bridge, NIC, server, and software vendors. Given the wide deployment of networks that would benefit from this technology, numerous users may clearly be expected.
   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.

2. **Compatibility**
   The combination of Port Extenders and their Controlling Bridge result in an Extended bridge, thus compatibility with external devices is assured. In particular, such a combination will fully interoperate with neighbor bridges (whether embedded in stations or external), as well as existing NIC cards. Finally, this technology will assume full benefit of other Data Center Bridging technologies under development including Priority-based flow control, Enhanced Transmission Selection, and Congestion Notification.

   Deleted: 802.1Q

3. **Distinct Identity**
   a. **Substantially different from other IEEE 802 standards**
   IEEE Std 802.1Q is the authoritative specification for Bridges. No other IEEE 802 standard addresses remote replication and port extension by bridges.
   b. **One unique solution per problem (not two solutions to a problem)**
   The need to provide remote replication and port extension has not been anticipated by any other standard. Consequently, this is the only solution to this problem. Importantly, this proposal address the needs produced by both external and embedded bridge devices along with server virtualization with a common solution thereby eliminating the need for an additional solution in the future.
   c. **Easy for the document reader to select the relevant specification**
   IEEE Std 802.1Q is the natural reference for port extension of 802.1Q bridges.

4. **Technical Feasibility**
    a. **Demonstrated system feasibility**
    Similar techniques have been deployed as proprietary enhancements to 802.1Q bridging and are supported by multiple vendors. In additions, roughly analogous techniques have been deployed in Fibre Channel that have been widely adopted. These deployments have shown that the technology proposed is feasible.
    b. **Proven technology, reasonable testing**
    This technology has been proven on an operational basis in data centers using proprietary implementations. The resulting behavior remains that of an 802.1Q bridge thus existing testing methodologies remain applicable. The on-the-wire indication of ingress / egress port numbers is intuitively reasonable to test and has been shown to be such in the existing proprietary implementations.
    c. **Confidence in reliability**
    The overall behavior is that of an 802.1Q bridge; the reliability of such has been firmly established. Furthermore, the simplicity of the Port Extenders compared to that of the bridges they replace, along with the associated reductions in management complexity, is expected to yield an increase in reliability over that achievable today.
    d. **Coexistence of 802 wireless standards specifying devices for unlicensed operation**
    Not applicable.

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.

    b. **Reasonable cost for performance**
    The proposed technology reduces overall system cost while maintaining existing performance (both in raw bandwidth and feature / functionality) for a wide variety of deployments thus cost for performance is benefited.
    c. **Consideration of installation costs**
    Due to the simplicity of the Port Extender device, initial capital expenditure and initial configuration costs are expected to be reduced.