IEEE 802.1aq
What is 802.1aq?

- Shortest Path Bridging (SPB)
  - networking technology intended to simplify the creation and configuration of networks
  - enables multipath routing
Adopting 802.1aq

Development
• March 4, 2006
• This day marked the first draft of 802.1aq

Building process
• March 2012 IEEE approved the 802.1aq standard

802.1aq today
• 2014 Winter Olympics was the first fabric-enabled event using SPB IEEE 802.1aq technology
Before the Standard

• IEEE 802.1d which was Spanning Tree Protocol (STP).

• Standardized in 1998, STP purpose was to prevent bridge loops and ensure loop proof topology.
Main Competitor

- IETF TRILL
  - Internet Engineering Task Force
  - Transparent Interconnection of Lots of Links
  - Combines techniques from bridging and routing
You can join Ethernet segments using Bridges deliberately introduce loops for resiliency allowed campus and datacenter networks to scale with resilient links.

potentially long data interruption no way to load balance traffic
SPB

use all available physical connectivity

fast restoration of connectivity after failure

rapid restoration of broadcast and multicast connectivity

complex because compatibility with existing technology is maintained
IEEE 802 is here: a standards committee formed by the Computer Society

May 8, 2012
Additions to SPB

A new control plane for Q-in-Q and M-in-M
Leverage existing inexpensive ASICs
Q-in-Q mode called SPBV
M-in-M mode called SPBM

Backward compatible to 802.1 – 802.1ag, Y.1731, Data Center Bridging suite

Multiple loop free shortest paths routing
Tremendous use of mesh connectivity – Currently 16, path to 1000’s including hashed per hop.
Optimum multicast – head end or tandem replication
Additions to SPB

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<th>Shortest-Path Bridging-VID</th>
<th>SPBV is very flexible and can be used in networks implementing IEEE 802.1Q VLANs</th>
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<td>IEEE 802.1ad provider bridges</td>
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<td>IEEE 802.1ah provider backbone bridges</td>
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Two modes of operation

Shortest Path Bridging
IEEE 802.1aq

Shortest Path Bridging VID (SPBV)
- Small VLAN Networks
  - 2-100 bridges
- Plug and play
- Efficient
- Low delay
- Backwards Compatible
- E-Line, E-Tree, E-LAN Services

Shortest Path Bridging MAC (SPBM)
- Large PBB capable Networks
  - 2-1000 bridges
- Carrier Grade
- Fast convergence
- Efficient use of resources
- B-VLAN Partitioned Forwarding Compatible
- E-Line, E-Tree, E-LAN Services
Topology Layers

- Physical Network Topology
  - SPB, MSTP, RSTP
  - Management controls (enable/disable port)
    - SPB, MSTP, RSTP

- Station Location (MAC address topology)
  - SPB, MMRP, SRP
  - Source address learning

- VLAN Topology
  - SPB, MVRP, SRP

- Active Topology (shortest path, spanning tree, TE path)
  - Management controls (enable/disable port)
    - SPB, MSTP, RSTP

- Physical Network Topology
Shortest Path Bridging (SPB) has been standardized by the IEEE as the next step in the evolution of the various spanning tree and registration protocols. 802.1aq allows for the best shortest path forwarding in a mesh Ethernet network context utilizing multiple equal cost paths. This permits it to support much larger Layer 2 topologies, with faster convergence, and vastly improved use of the mesh topology. Combined with this is single point provisioning for logical connectivity membership, which includes point-to-point, point-to-multipoint, and multipoint-to-multipoint variations.” - Fedyk
References

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