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IEEE 802.1aq

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



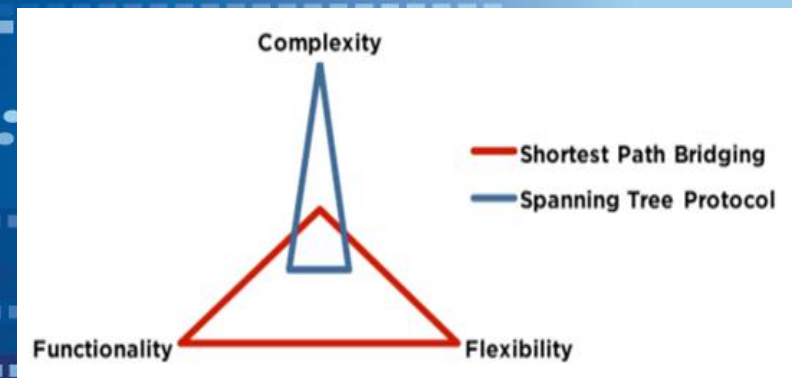
802.1aq today

- 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.



Sponsored by



Main Competitor

- IETF TRILL
 - Internet Engineering Task Force
 - Transparent Interconnection of Lots of Links
 - Combines techniques from bridging and routing



TRILL



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



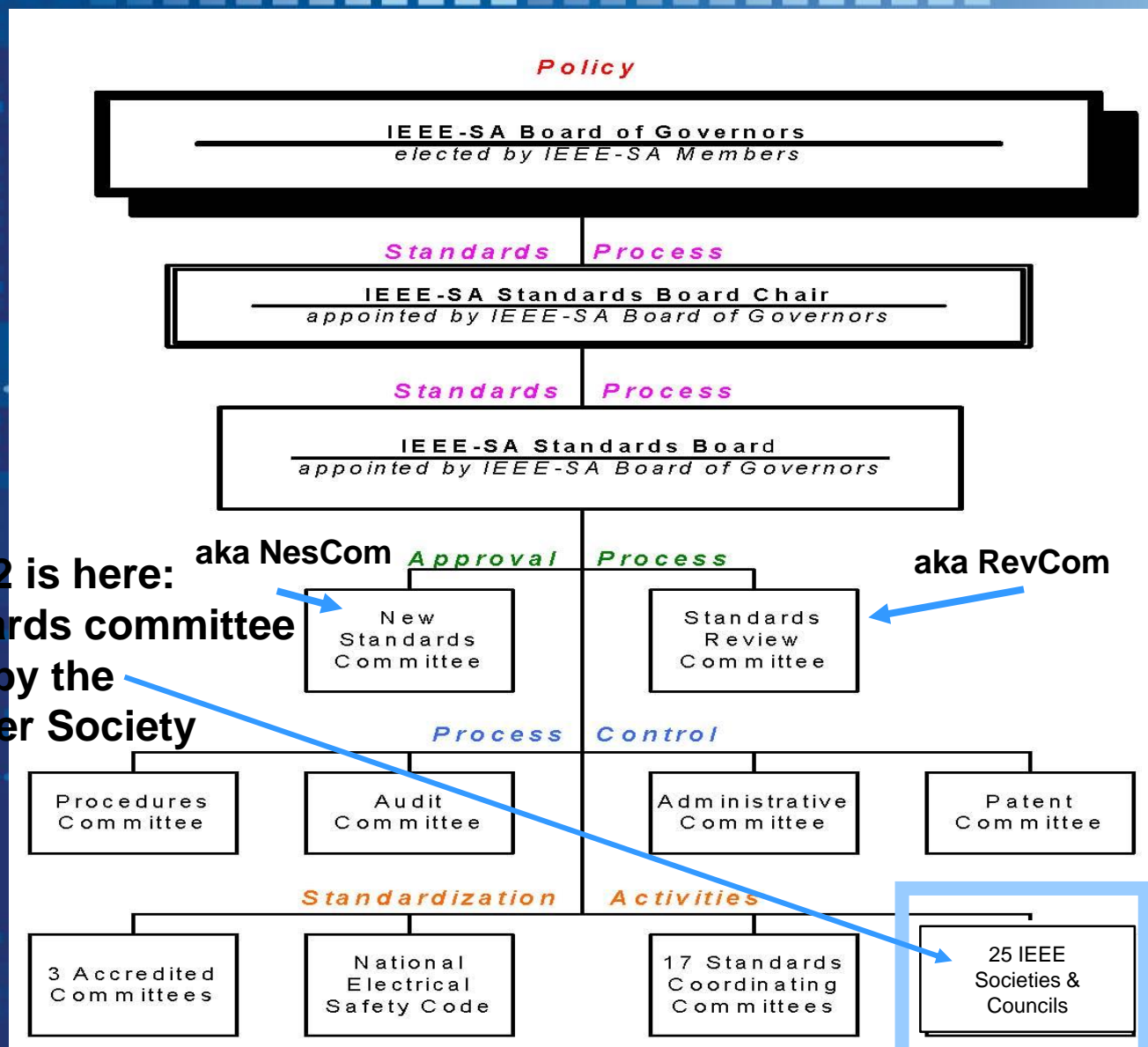
use all available physical connectivity

fast restoration of connectivity after failure

rapid restoration of broadcast and multicast connectivity

complex because compatibility with existing technology is maintained

IEEE Standards Organization



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

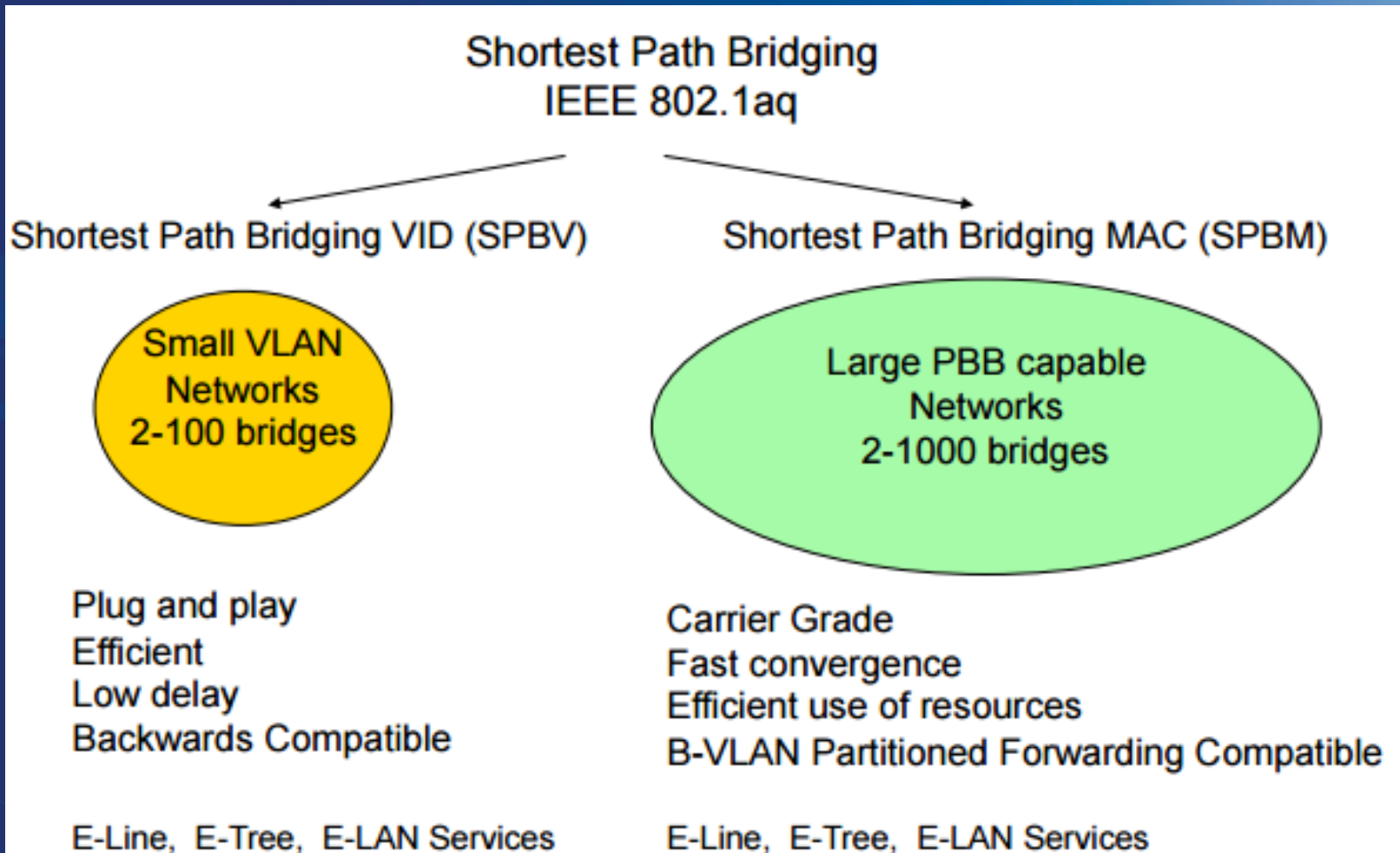
Shortest-
Path
Bridging-
VID

SPBV is very flexible and can be used in networks implementing IEEE 802.1Q VLANs

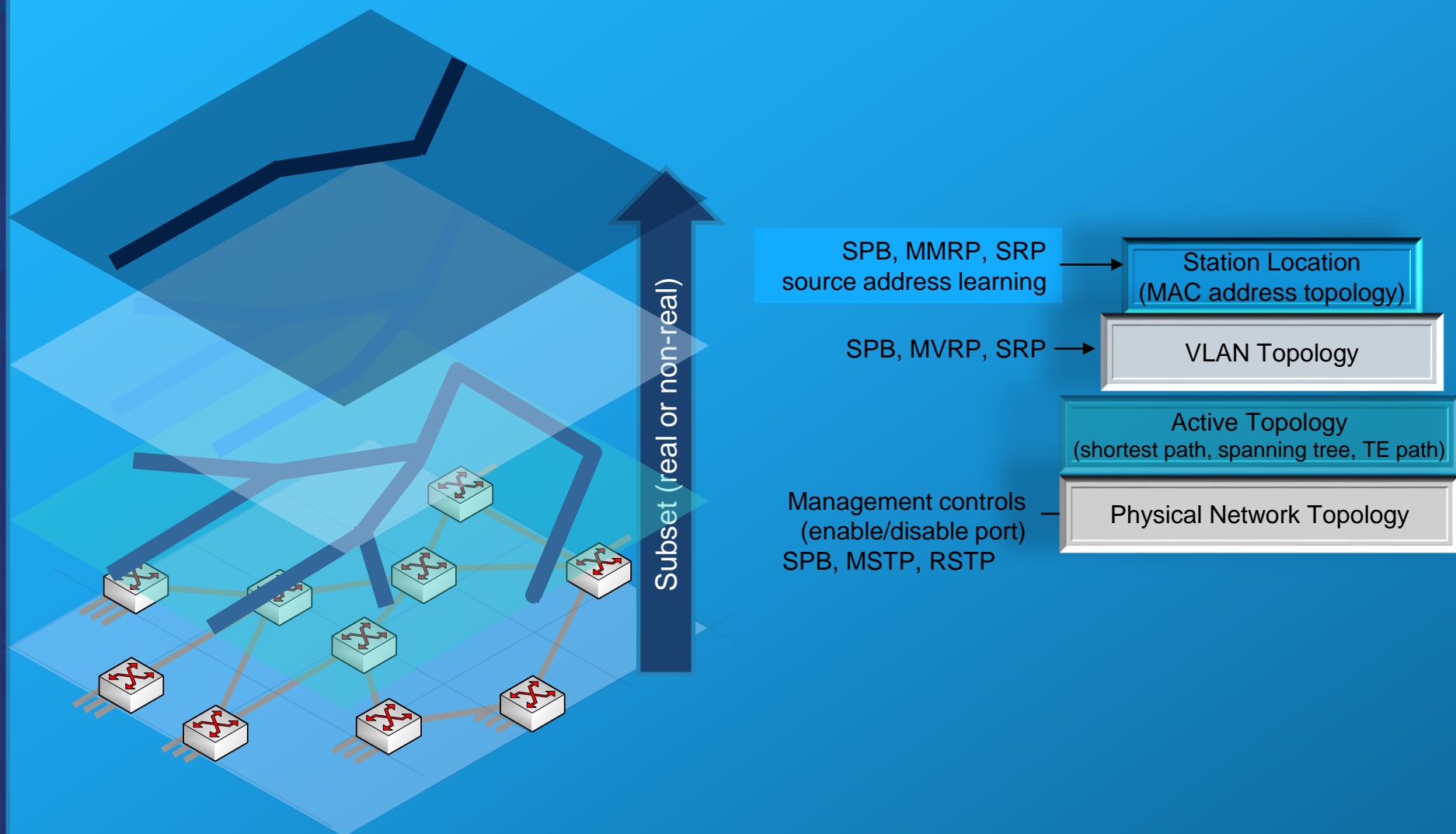
IEEE 802.1ad provider bridges

IEEE 802.1ah provider
backbone bridges

Two modes of operation



Topology Layers



Summary

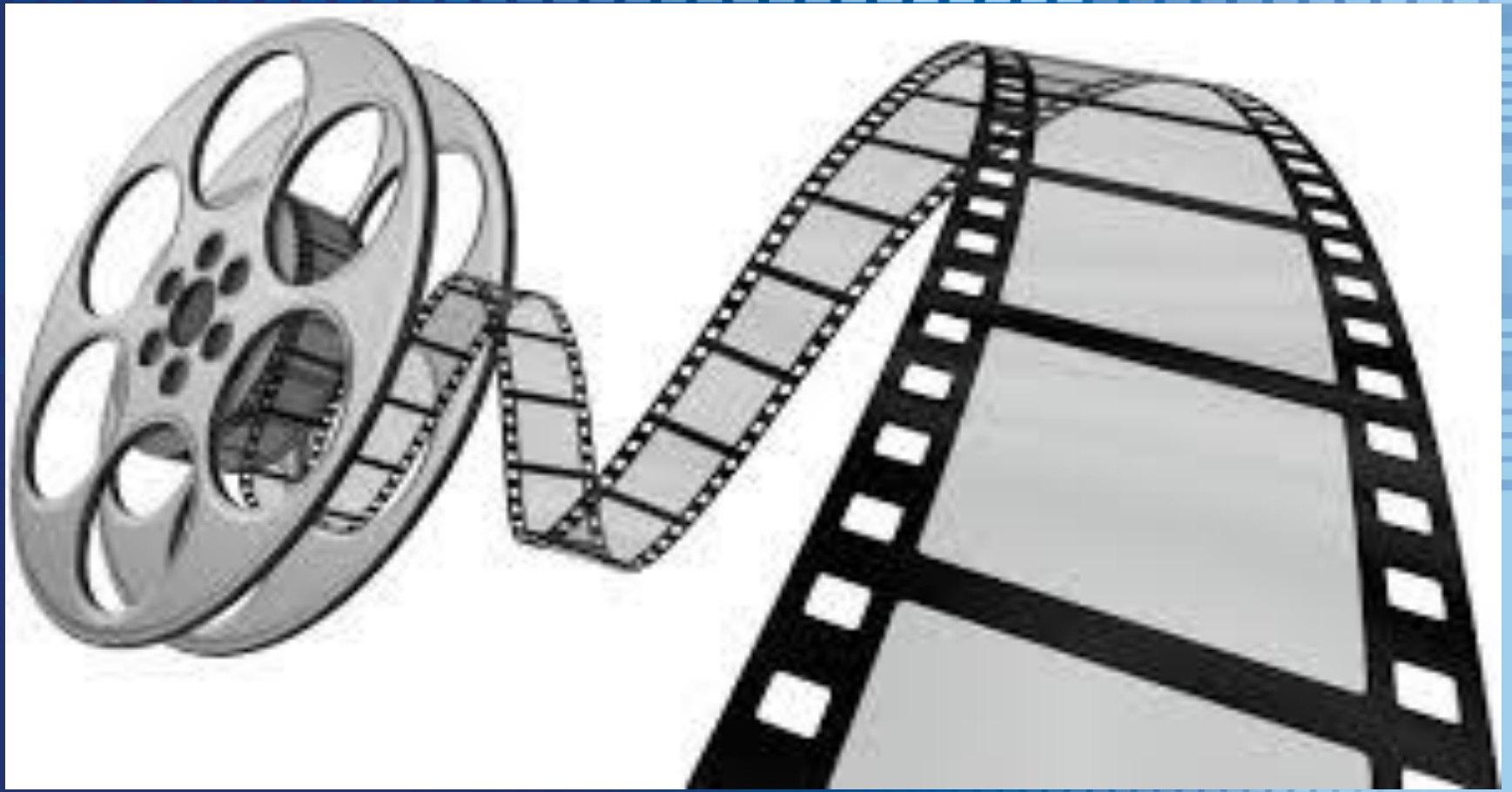
Shortest Path Bridging (SPB) has been standardized by the IEEE as the next step in the evolution of the various spanning tree and registration protocols.

802.1aq allows for the best shortest path forwarding in a mesh Ethernet network context utilizing multiple equal cost paths.

802.1aq

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



FIN



References

- https://www.nanog.org/meetings/nanog50/presentations/Sunday/IEEE_8021aqShortest_Path.pdf
- https://en.wikipedia.org/wiki/IEEE_802.1aq#Benefits
- <https://kirk.rvdp.org/publications/TRILL-SPB.pdf>
- <https://standards.ieee.org/develop/govern.html>