
IEEE 802.1 Architecture

Design paradigms in 802.1 standards

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References

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Architecture Goals

Design rules for *interoperable* and *optional* protocols providing one or more MAC Service¹ instances in LAN attached stations:

- using individual instances provided by 802 LAN technologies²
- increasing geographical extent and number of attached stations
- maintaining/enhancing Quality of Service³

and supporting:

- administrative/organizational partitioning⁴
- management with IETF MIB & YANG⁵
- access control, data integrity, confidentiality, authenticity⁶

1. See IEEE Std 802.1AC.

2. Each LAN providing a single (in some cases more) instance of the media-independent MAC Service.

3. Throughput, availability, transit delay, loss &c. See 6.5 of IEEE Std 802.1Q for a fuller description.

4. To support, e.g., provider networks with cooperating providers supporting a single service instance. See Clauses 15, 16, 18–22, 26 of 802.1Q.

5. In particular alignment with the concept of interface stacks.

6. See IEEE Stds 802.1X, 802.1AE, 802.1AR.

Basic architecture

Protocol entities transmit frames to their *peers*:

- ‘Higher layer’ entities (e.g. IP) use *the MAC Service* provided by *interface stacks*.
- MAC Relay Entities, in *Bridges*, connect *MAC Internal Sublayer Service*¹ (ISS) *instances*
- Interface stack sublayers (shims) use *and* provide the ISS.

with the source *MAC address* of their *interface* and their *protocol identifier* in the initial data octets, and process frames with their protocol identifier,² and a destination MAC address that is:

- The individual MAC address of their interface, or
- a Group MAC address that identifies one or more types of protocol entity, and their interface stack layer/sublayer, or
- any address (promiscuous) not filtered by lower stack components.

1. Clause 7 (Basic architectural concepts and terms) and Clause 11 of IEEE Std 802.1AC: “The Internal Sublayer Service (ISS) forms the basis of the MAC Service, providing elements necessary both to the performance of data transfer between MSAPs and the provision of MAC relay ...”.

2. Shims that do not tag (add their own protocol identifier) to transmitted frames, generally pass untagged received frames to their client.

Network architecture

Basic architecture concepts applied to Bridges and Bridged Networks:

VLAN tagging/detagging functions¹ multiplex/demultiplex MAC
Service instances and support priority signalling for the ISS.

Bridges selectively forward frames to:

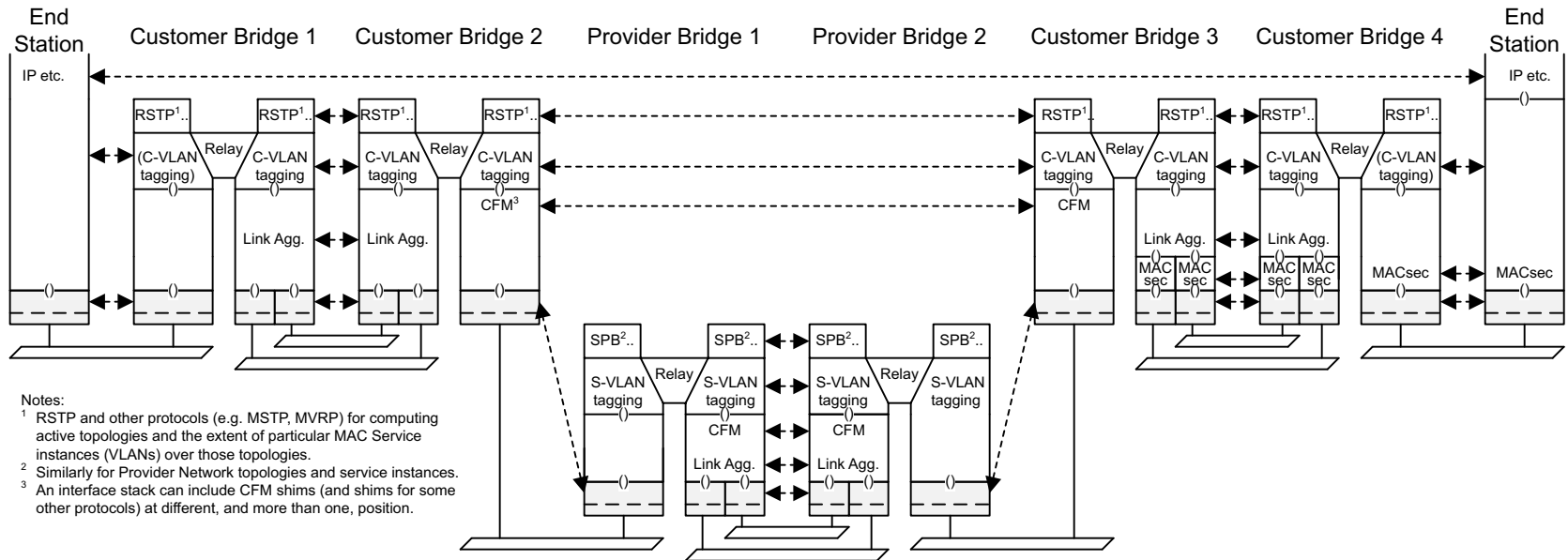
- Determine scope/span of communication for 'Reserved' Group destination MAC addresses for nearest peer (of given type) discovery/communication.
- Support one or more active topologies (loop free forwarding).
- Manage individual VLAN extent and group addressed frame propagation.
- Restrict frames to paths leading to their destinations.
- Support multipath transmission with frame replication and elimination when automatic topology recalculation² is not sufficient to meet reliability goals.

1. 6.9 of 802.1Q.

2. 802.1CB.

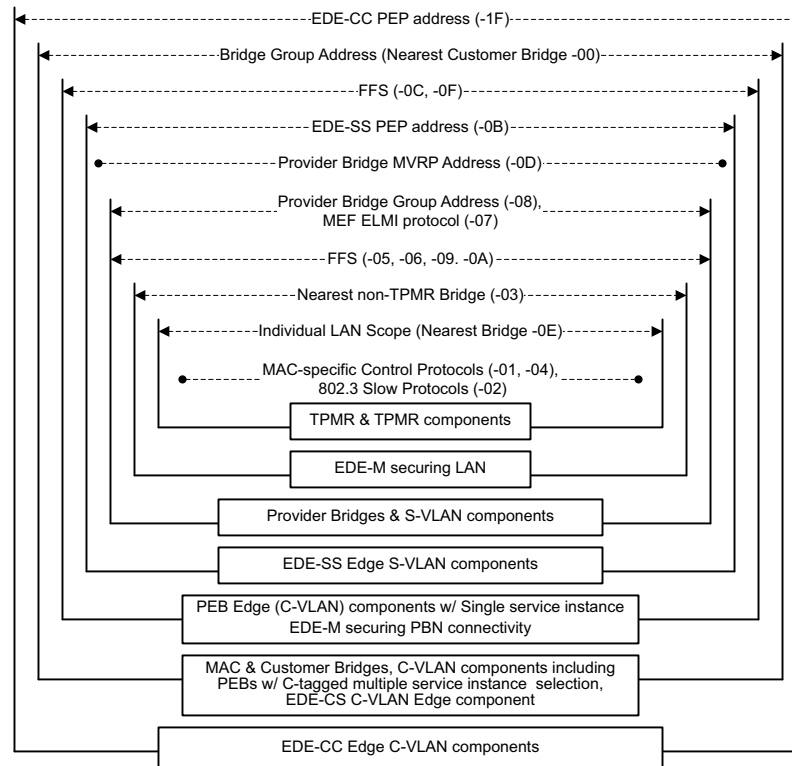
Peer protocol entities in a network

Bridges, interface stacks, and peer communication in an example network:



Reserved addresses

Nested address scopes for peer discovery and communication:



802.1Q Reserved addresses are the block of 16 beginning 01-80-C2-00-00-00

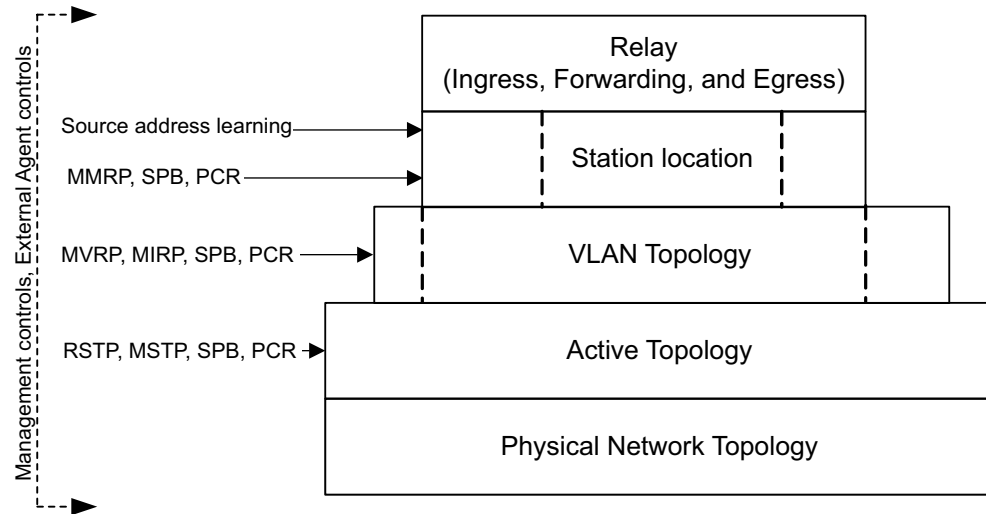
Addresses (inc. -07) are not assigned for the exclusive use of particular protocols, EtherTypes are required, as other protocols can use each address, with possible constraints (e.g. for -02).

The Provider Bridge MVRP Address (-0D) is filtered by S-VLAN components using MVRP as well as by C-VLAN components, so may not reach the latter.

EDE's also enforce frame scoping—discarding all frames that are not sent by CA participants, both when connectivity is secured and when not (unless unsecured connectivity is permitted).

Bridge protocols

Protocols supporting selective relay:



References

IEEE Standards:

- 802.1AC MAC Service Definition
- 802.1Q Bridges and Bridged Networks
- 802.1AX Link Aggregation
- 802.1X Port-Based Network Access Control
- 802.1AE MAC Security
- 802.1AB Station and Media Access Control
- 802.1AS Timing and Synchronization for Time-Sensitive Applications
in Bridged Local Area Networks
- 802.1BA Audio Video Bridging (AVB) Systems
- 802.1CB Frame Replication and Elimination for Reliability

Further architectural considerations:¹

- Priority, flow identification, and bandwidth assignment throughout the network
- Bridge queuing, transmission selection, flow policing for network transmission reliability and delay

1. Omitted from this presentation in the interests of time.