802.1D – 1998

MAC Service (MS) Interface

Internal Sublayer Service (ISS) Interface

MAC Convergence Functions

MAC Specific Service (MSS) Interface

Bridge Control and Management Functions

MAC Relay Entity

MCF (e.g. 6.5.1)

MAC Entity (e.g. 802.3)

Network

MCF (e.g. 6.5.1)

MAC Entity (e.g. 802.3)

Network
802.1Q – 1998

Enhanced Internal Sublayer Service (E-ISS) Interface

MAC Relay Entity

MAC Entity (e.g. 802.3)

MCF (e.g. 802.1D 6.1.5)

ISS Interface

MSS Interface

MS Interface

Network

MAC Independent Functions (MIF -- e.g. 802.1Q 7.1.2)

* “the tagging and untagging functions”
If the ISS mac_service_data_unit received from the network contains a VLAN tag, then this tag is removed to form the E-ISS mac_service_data_unit and the fields of the tag are used to fill in the new parameters. Otherwise the parameters are assigned port-specific default values.
If the include_tag Boolean is “true”, then the VLAN tag is composed from the appropriate parameters and is inserted into the E-ISS mac_service_data_unit to create the ISS mac_service_data_unit.
The mapping between the ISS and the E-ISS is the same as in 802.1Q 7.1.2 except that the operations are performed on a different tag – the Provider Tag rather than the [Customer] VLAN Tag.

*“the tagging and untagging functions”*
Simple Provider Service

- Customer Network
  - CE (Customer Equipment)
    - Relay
      - MIF (Q-7.2.1)
      - MCF (D-6.5.1)
      - MAC
    - Network
  - Provider Equipment (VLAN Bridge)
  - Provider Network

- Provider Network
  - PE (Provider Equipment)
    - Relay
      - MIF (Q-7.2.1)
      - MCF (D-6.5.1)
      - MAC
    - Network
Simple Provider Service

- All the Provider Bridge does is slap a Provider Tag on all frames received from the Customer Equipment.
- No changes are required to convert 802.1Q to 802.1ad beyond assigning a new Provider Bridge Address block and a Provider Tag Ethertype.
- This is sufficient provided that:
  - All customer traffic maps to a single provider service instance.
  - All customer traffic has the same priority in the provider network.
  - Any given provider bridge only has one connection to any customer for a given service instance.
- But what if we want service multiplexing, multiple priorities, or multiple connections?
Option 1: New CPE Function

- Define new MAC Independent Functions block
  - Appears only on Customer Facing Ports of a Provider Bridge.
  - Aware of Customer VLAN tags as well as Provider Tags.
- Also need to specify handling of both Customer and Provider BPDUs and Configuration protocols.
- May ultimately be how we specify Provider Bridges, but not helpful in understanding required and desirable operation.
Option 2: “Dual Bridge” CPE Model

- Specify behavior of a CPE as two bridges in one box.
  - Customer facing side operates on Customer VLAN Tags and BPDUs
  - Provider facing side operates on Provider Tags and BPDUs
  - Interconnect with an “imaginary port” per service instance
Example 1: Service Multiplexing

- Customer accesses 3 different Provider Services over a single physical link to the Customer-Provider Edge Bridge.
  - VLAN Bridge portion of CPE connects to Provider Bridge portion via 3 imaginary ports – one per service instance.
  - VLAN Bridge portion of CPE selects service based on Customer VLAN IDs by forwarding packets for each service to the appropriate imaginary port.
  - Provider Bridge portion creates Provider Tag using PVID assigned to the imaginary port.
Example 2: Multiple Priorities

- Customer accesses single Provider Services that handles multiple priorities.
  - VLAN Bridge portion of CPE uses the user_priority field of the Customer VLAN tag to determine the access_priority for the imaginary MAC.
  - Imaginary MAC sets the PB_ISS_user_priority to equal to the VB_ISS_user_priority.
  - Provider Bridge portion creates Provider Tag with PB_EISS_user_priority “regenerated” from PB_ISS_user_priority.
    - “Regeneration” allows PB to map Customer specified priorities to different priority levels on the Provider network.
**Example 3: Multiple Customer Connections**

- Customer accesses 1 or more Provider Services over two links from different Customer Equipment.
  - Selection of multiple services discussed in Example 1.
  - VLAN Bridge portion of CPE participates in Customer Spanning Tree – receives, processes, and transmits Customer BPDUs on each customer facing port and each imaginary port.
  - Provider Bridge portion “tunnels” Customer BPDUs from imaginary ports across the Provider Network.
  - Provider Bridge portion participates in Provider Spanning Tree.
Summary

- A simple model of a Provider Bridge is adequate for the core of a Provider Network
  - Only modification from VLAN bridge is new Tag ethertype and new block of Bridge Addresses.
- The simple model is also adequate for Customer-Provider Edge, but only in a very limited scenario
  - No service multiplexing; single priority; single customer connection.
- A “dual-bridge” model of the Customer-Provider Edge resolves how to provide a richer set of functionality for the attachment of Customers to Services.