

RPR 802.1D/Q Bridging Compliance

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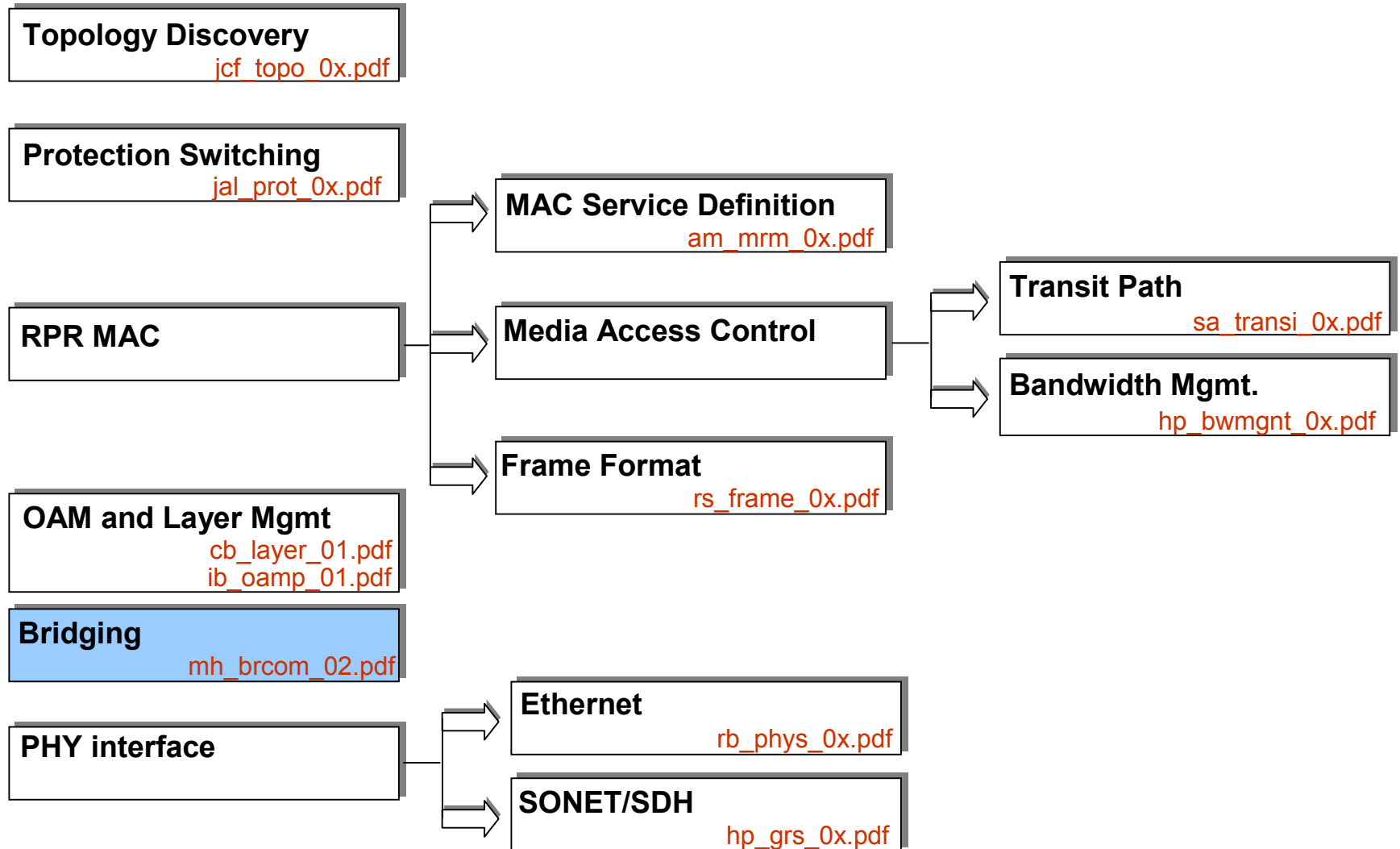
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Henry Hsiaw, NEC

Components of a Complete RPR Proposal



Objective

- Demonstrating that 802.17 MAC is compatible with the relevant portions of 802.1D/Q.

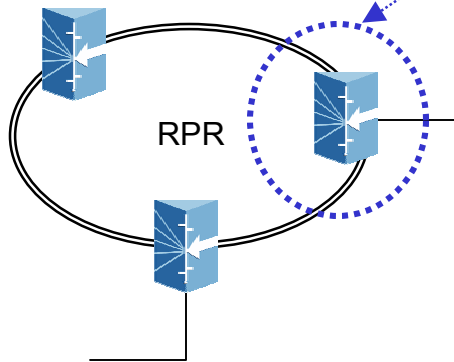
Outline

- 802.17 Bridge Reference Models
- Bridge (802.1D/Q) Reference Model
- 802.1D/Q Compliance Requirements
- 802.17 MAC Conformance to 802.1D/Q
- Conclusions

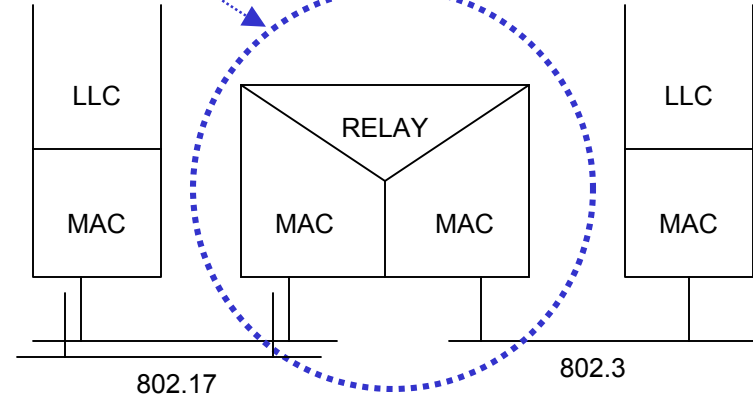
802.17 Bridge

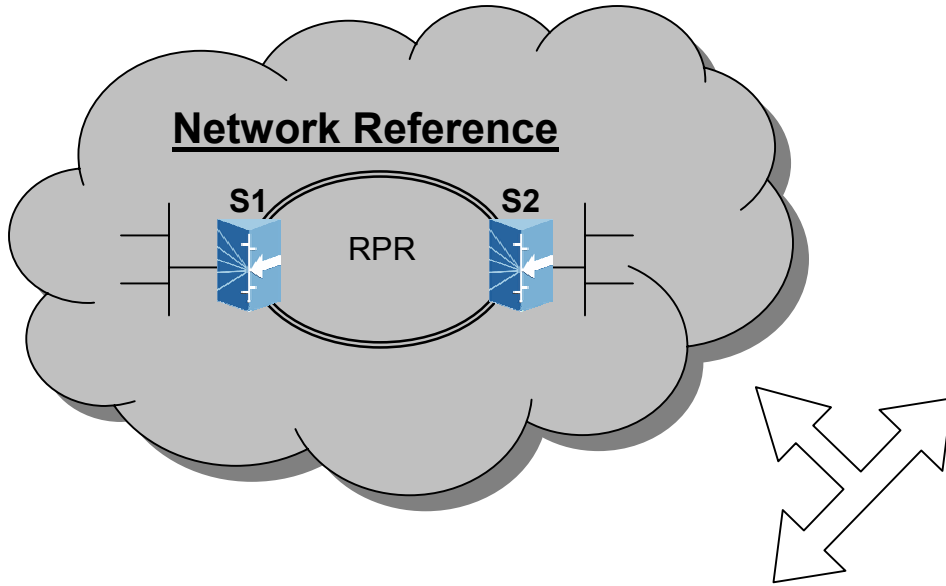
Station on Ring is (Transparent) Bridge and the Ring is the shared LAN media.

Network Reference

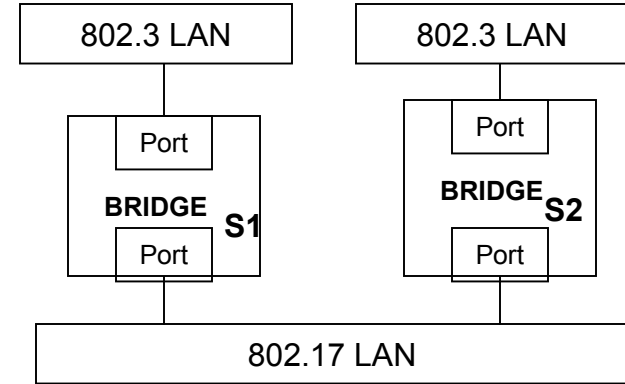


MAC Bridge Reference

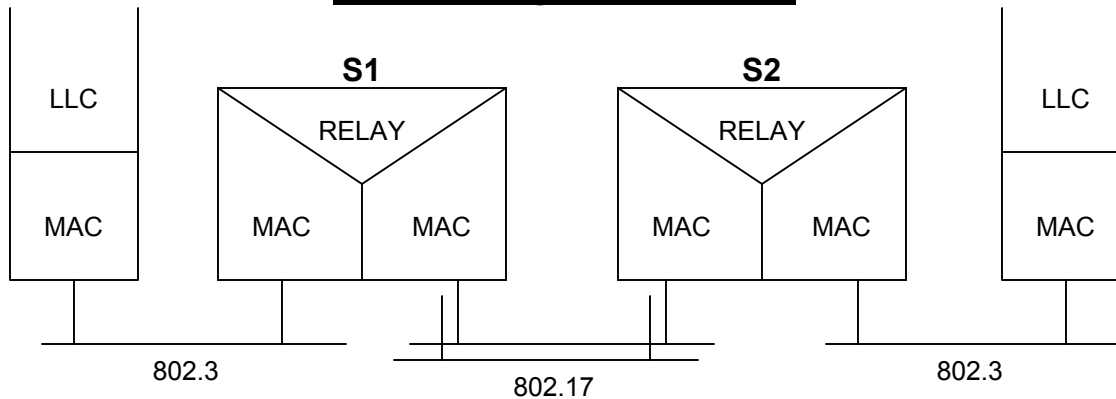




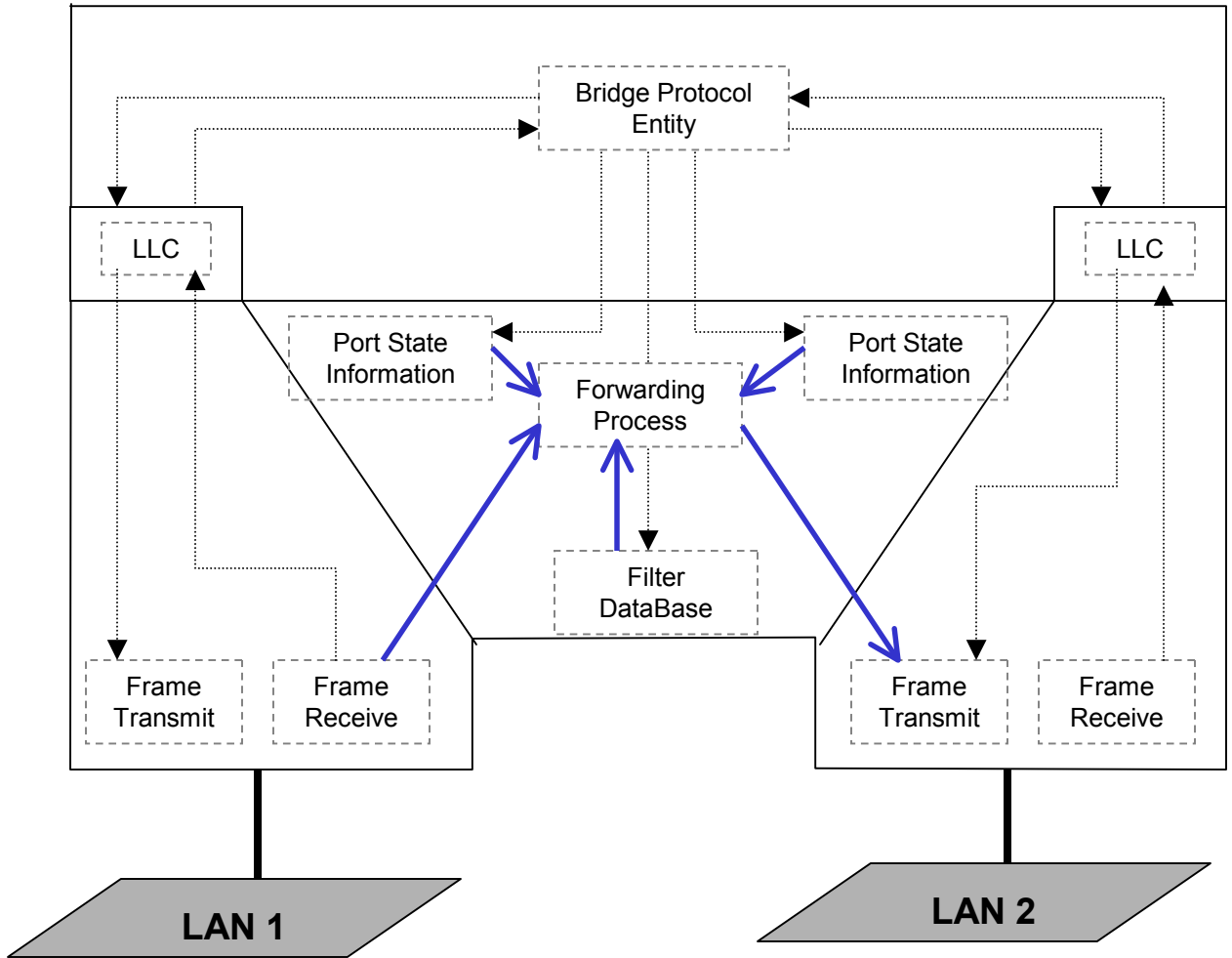
Bridged Local Area Network



MAC Bridge Reference

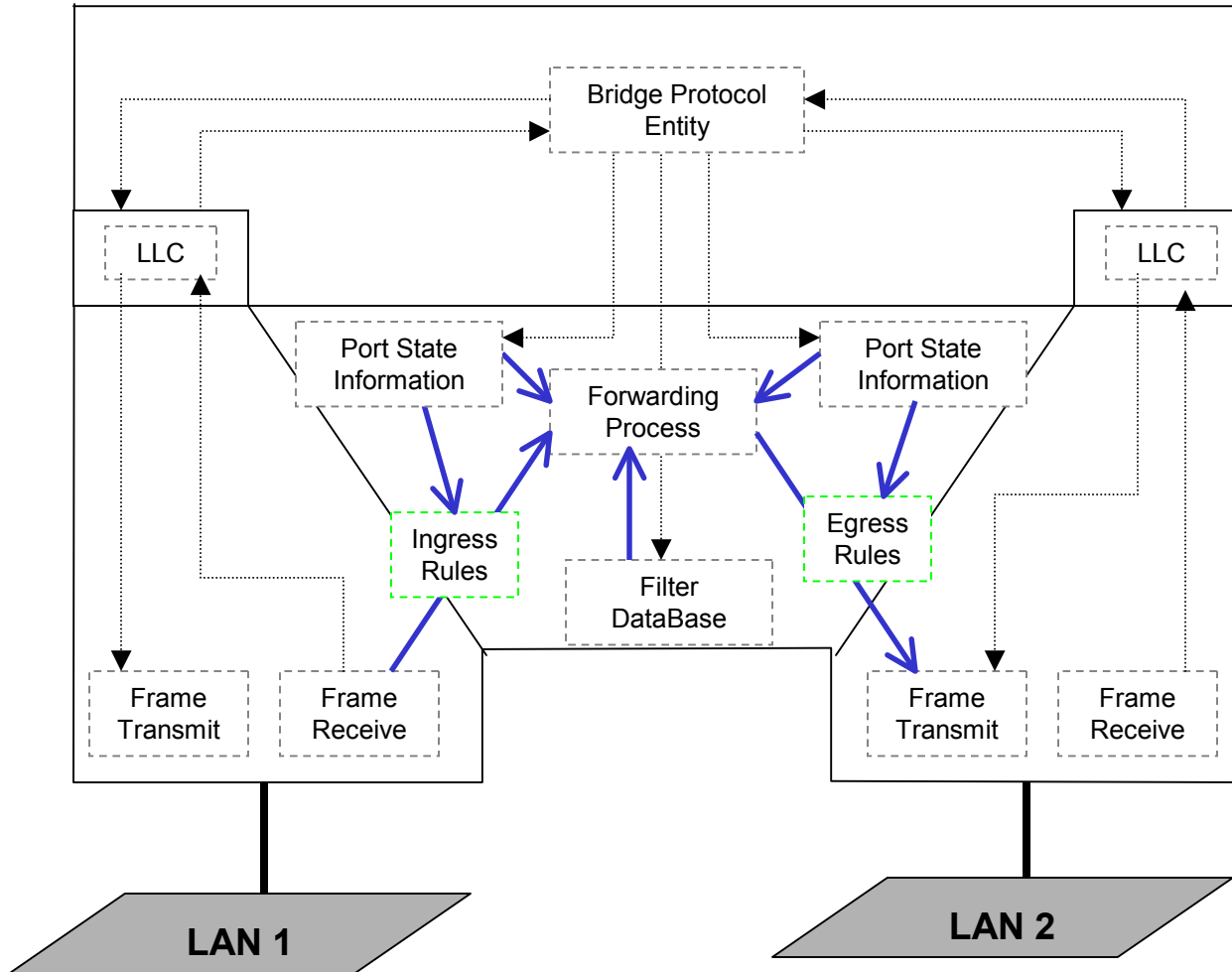


Transparent Bridging (802.1D) Reference



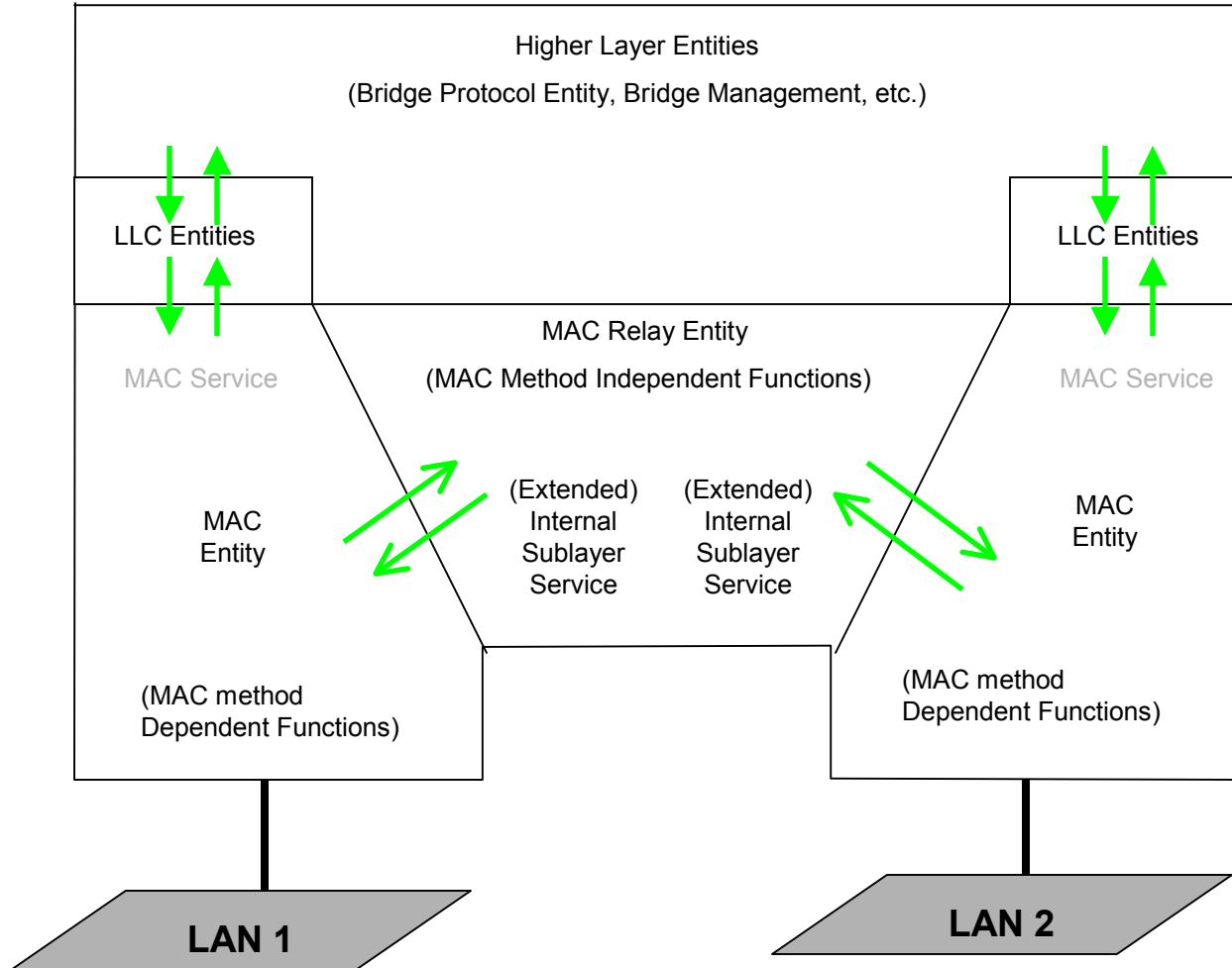
- • Denotes Relaying MAC frames
- ⋯→ • Denotes reception and transmission of BPDUs

VLAN Bridging (802.1Q) Reference



- • Denotes Relaying MAC frames
- ⋯→ • Denotes reception and transmission of BPDUs

802.17 Bridging Architecture



Service Primitives (Bridge Relay)

Service Primitive	Transparent Bridge (802.1D)	VLAN Bridge (802.1Q)	Source Route Bridge	SRT (Source Route Transparent)	Remote Bridge
Indication	<ul style="list-style-type: none"> • Frame_Type • Mac_Action • DA • SA • RI • MSDU • User_Priority • FCS 	<ul style="list-style-type: none"> • CFI • VLAN_Id • RIF_Info 			<ul style="list-style-type: none"> • Cluster_Id
Request	<ul style="list-style-type: none"> • Frame_Type • Mac_Action • DA • SA • RI • MSDU • User-Priority • Access_Priority • FCS 	<ul style="list-style-type: none"> • CFI • VLAN_Class • RIF_Info • Include_Tag 			<ul style="list-style-type: none"> • Cluster_Id

802.17 Bridge Requirements



802.1D/Q Compliance achieved by:

1. Conform to the requirements of ISO/IEC 15802-3, Section 5.1.

Requirements include:

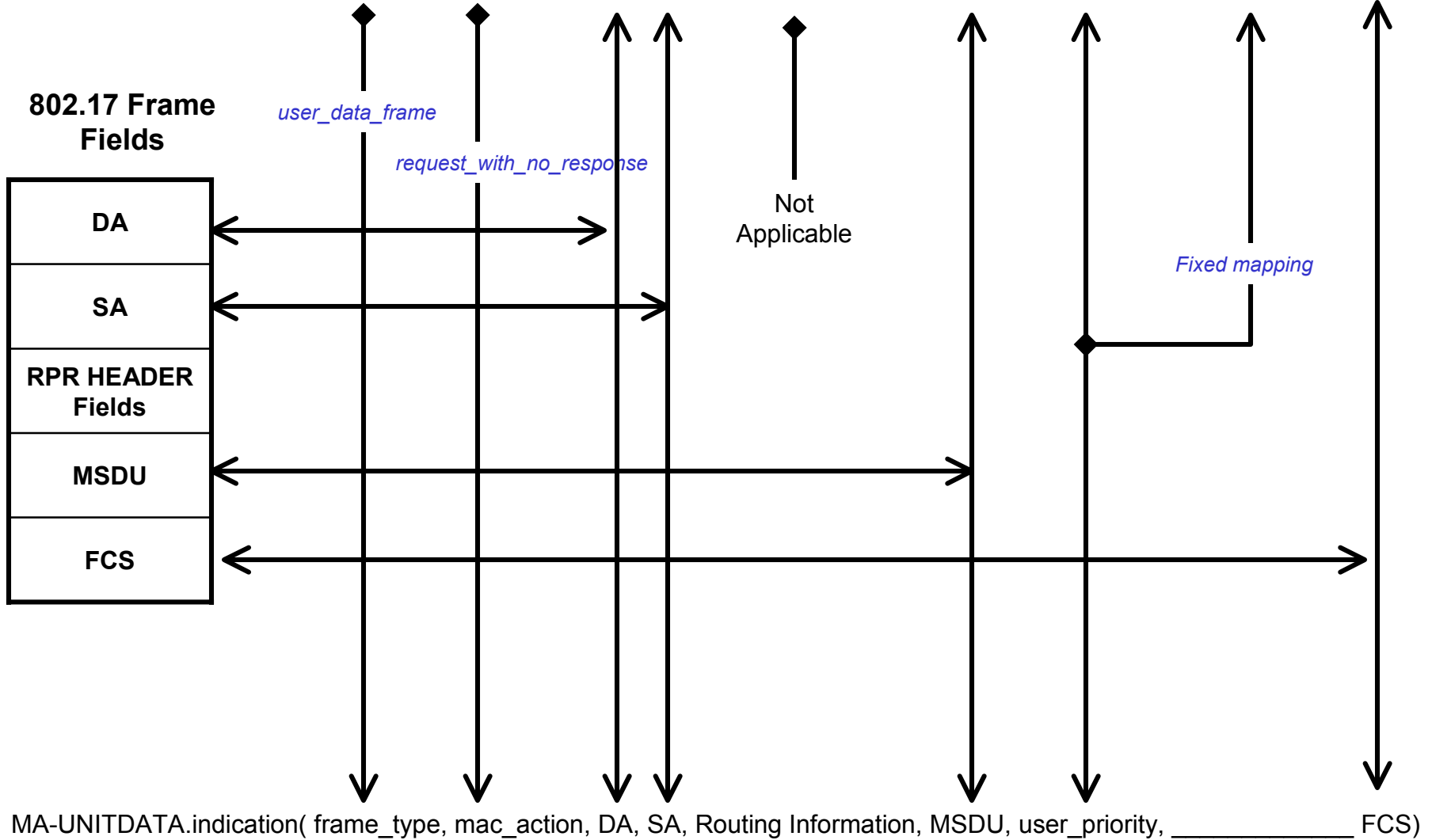
- Conformance to mapping 802.17 MAC protocol to MAC Service primitives to comply with Bridging Relay and Basic Filtering Services.
- Implement the Spanning Tree Algorithm and Protocol.
- Conform to ISO/IEC 8802-2 for the implementation of a class of LLC supporting Type 1 operations.

2. Conformance to the requirements of IEEE Std 802.1Q, Section 5.1.



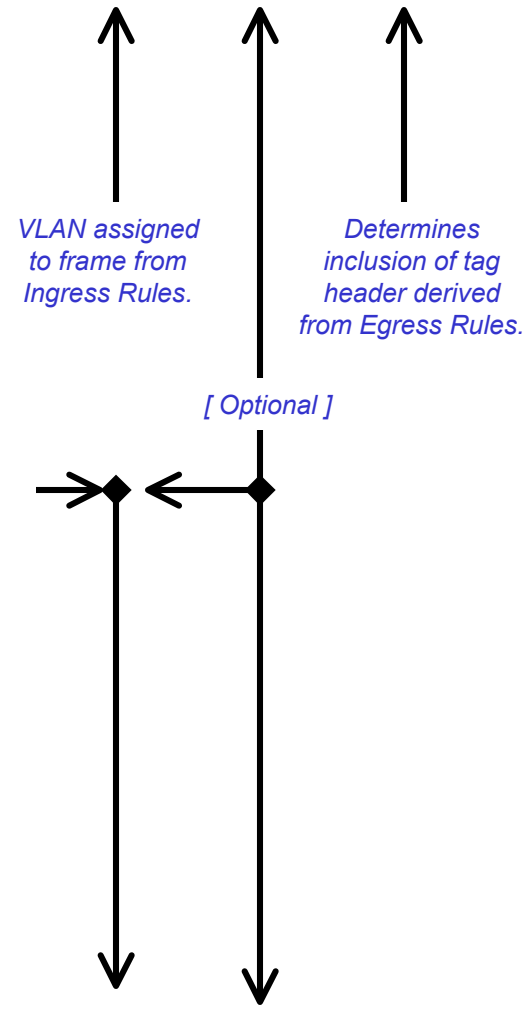
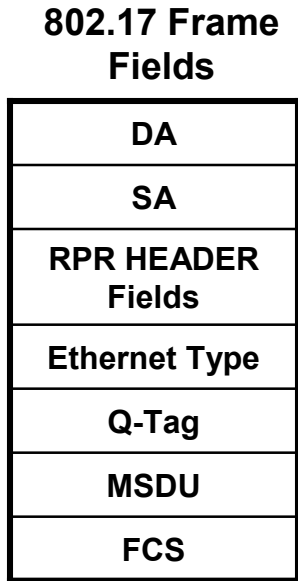
802.1D Mapping MAC Service to/from 802.17 MAC

MA-UNITDATA.request(frame_type, mac_action, DA, SA, Routing Information, MSDU, user_priority, access_priority, FCS)



802.1Q Mapping MAC Service to/from 802.17 MAC

EM-UNITDATA.request(MA-UNITDATA.request.parameters, cfi, vlan_class, rif_info, include_tag)



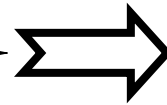
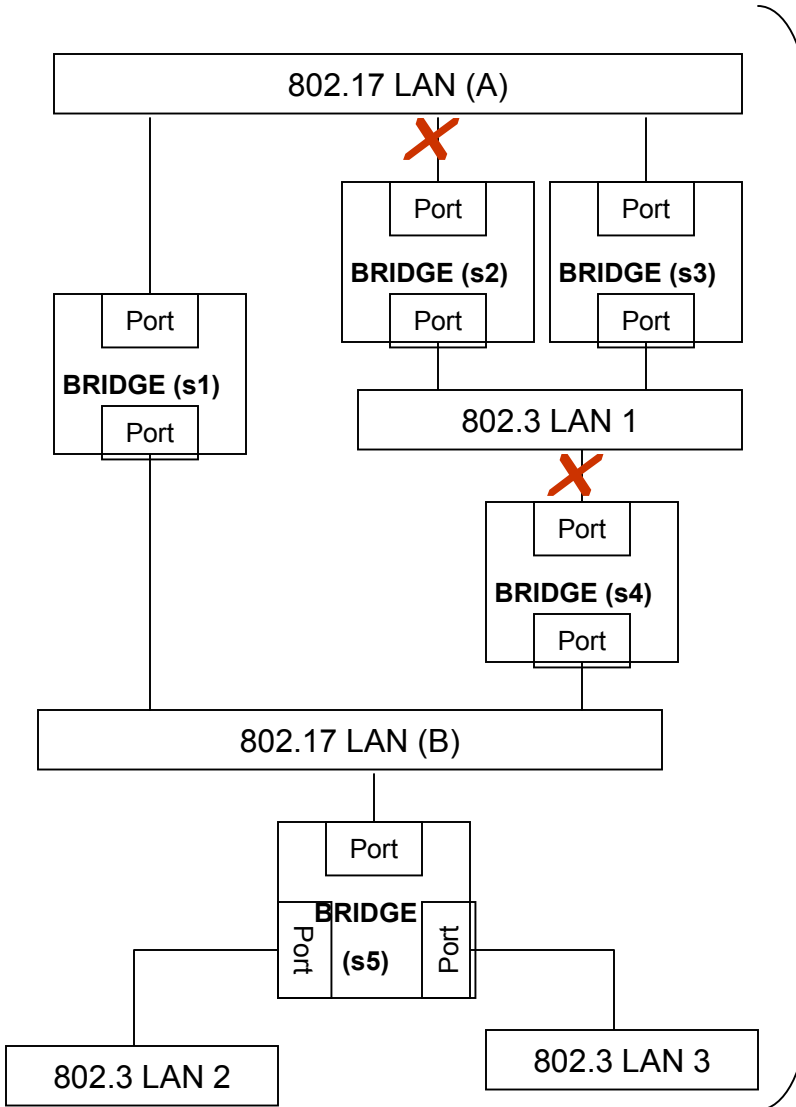
VLAN Id

EM-UNITDATA.indication(MA-UNITDATA.indication.parameters, cfi, vlan_id, rif_info)

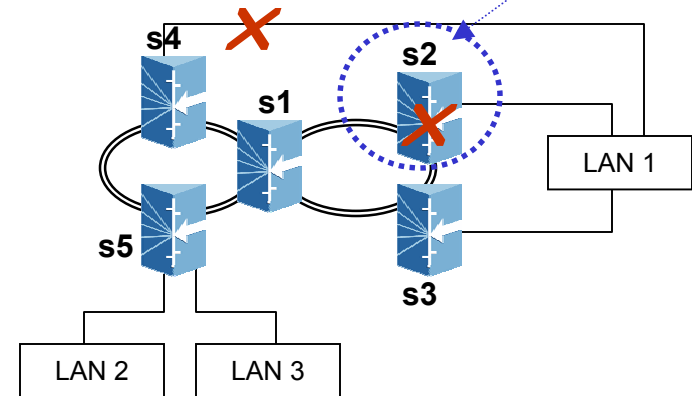
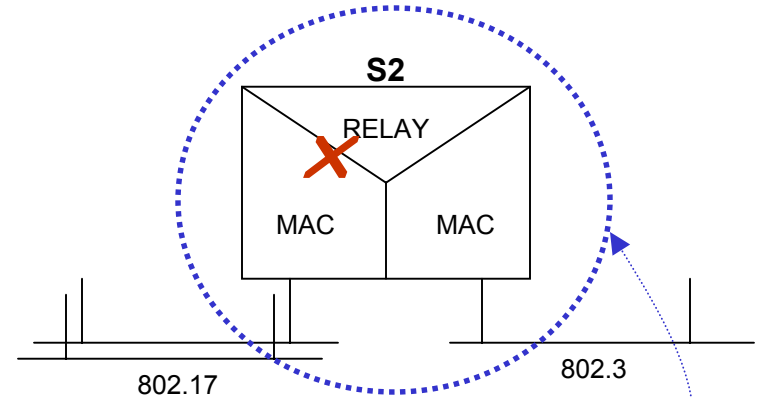
802.17 STP Interactions with 802.17 Reference



Bridged Local Area Network



Network Reference



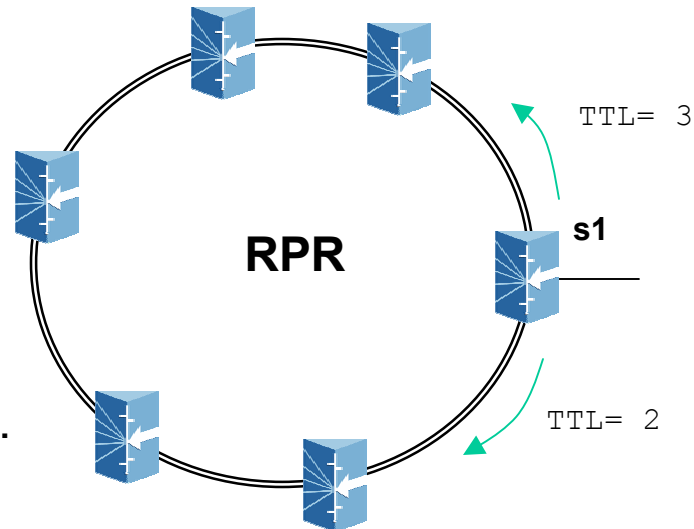
Denotes blocking port state due to STP.

802.17 MAC Bridge

- Each RPR MAC will always **flood** Bridged packets over the Ring.

Flooding Packets over 802.17

- Packet is replicated and dispatched over both directions of the RPR (at the station).
- The TTL found in the RPR Header of each packet is set such that each station on the Ring only sees the packet once.



Conclusions

- 802.17 MAC compliance to 802.1D/Q has been demonstrated.
 - As required by Criterion 2 of the RPRSG 5 Criteria document.
- Spanning Tree Protocol conformance is achieved due to 802.17 MAC compliance to 802.1D.
 - Careful engineering of the RPR within the network would be required if STP is enabled.
- RPR Header will not be relayed by an 802.1D/Q compliant Bridging station.
 - The contents of the RPR Header is of local significance.

Back Up Charts

Proposal #1: 802.17 Transparent Bridging Concerns/Observations

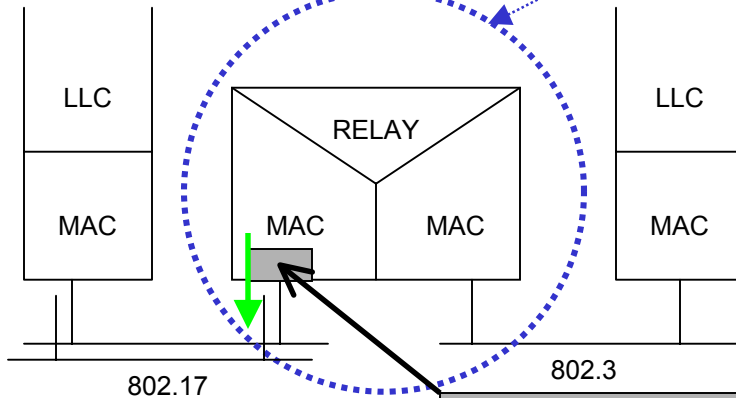
- ❑ Filter Data Bases in MAC Bridge Relay Entity in the Bridging RPR station needs to be large to maintain host MAC addresses serviced by the RPR.
- ❑ All Bridged packets onto the Ring will be *flooded* over the Ring, resulting in increased bandwidth utilization. Consequently diminishes spatial reuse property of Ring (during Bridging).
- ❑ Networks containing RPRs, where the RPR Bridging stations are running STP need to be carefully engineered.

Proposal #2: 802.17 MAC Bridge

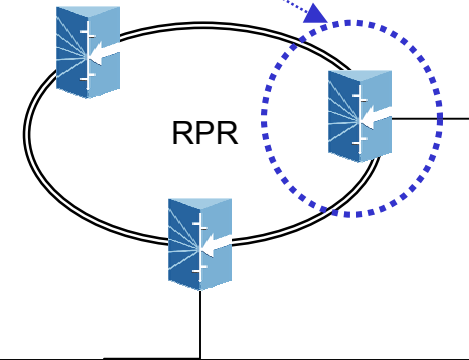
- ❑ Each MAC implements a Station DB that associates (host) MAC addresses to Station Identifiers. Each association forms a Cluster.
 - Ingress/Egress traffic to/from the Ring, causes the Station DB table to be updated. That is, source address of packet being transparently bridged is association with Station.
 - Ingress traffic to the Ring, indexes into the Station DB to determine if there is a Cluster containing a Station to packet DA association. If there is no DA membership, the packet is *flooded* over the Ring. Else, the station associated with the DA is used to index the Node Discovery DB to determine the path/direction to take over the Ring.
- ❑ Packet stripping at the RPR MAC includes:
 1. $TTL < 1$,
 2. Packet DA equal to Station MAC entity, and
 3. DA is a member of the set of (host) MAC addresses associated with the station. This association is maintained in the Station DB.
- ❑ Cluster ID, which denotes a collection of (host) MAC addresses that is local to a Station participating in Bridging, is carried in the RPR Header.

Proposal #2: 802.17 Bridge Unknown Unicast DA, Multicast, Broadcast Handling

MAC Bridge Reference



Physical Network Reference



802.17 MAC Entity is required to implement algorithm to determine dispatch mode over the Ring.

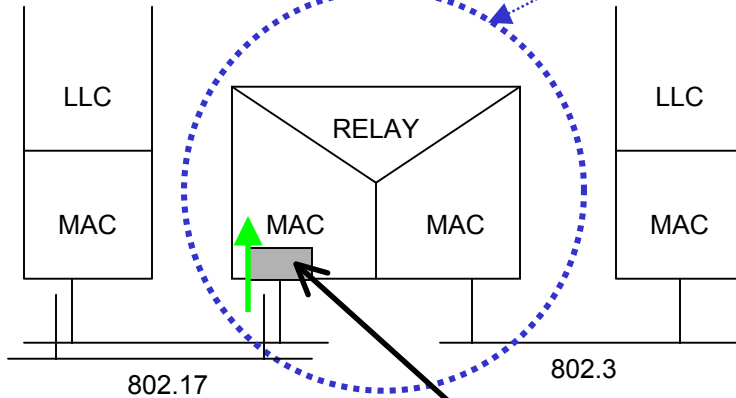
```

Update_Station_DB( Packet.SA, this_Station_ID )
Case DA
  { Multicast, Broadcast } :
    Flood_Packet()
  { Unicast } :
    If Packet.DA ∈ Station_DB
      /* Index into Node DB using Cluster ID. */
      Node_DB( DA_Station_ID ) -> direction
      Dispatch_Packet( direction )
    Else
      /* Unknown Unicast DA */
      Flood_Packet()
    End If
End Case

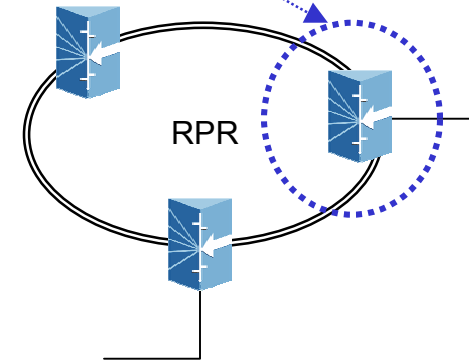
```

Proposal #2: 802.17 MAC Bridge Packet Stripping

MAC Bridge Reference



Physical Network Reference



802.17 MAC Entity is required to implement algorithm to determine dispatch mode over the Ring.

```

Update_Station_DB( Packet.SA, Packet.RPR_Header.CID )
/* Check to strip packet from Ring */
If Packet.RPR_Header.TTL < 1
    True -> RemovePacket
End If

If Packet.DA = Station_MAC
    True -> RemovePacket
End If

If Packet.DA ∈ Station_DB
    True -> RemovePacket
End If
    
```

Proposal #2: 802.17 Transparent Bridging Concerns/Observations

- ❑ Due to inherent destination stripping feature of RPR, source address learning over all Bridging stations on the Ring is inefficient. That is, not all Bridging MAC stations on the Ring are guaranteed to see unicast packets, and thus update the Station DB. This results in increased *flooding* of packets over the Ring.
- ❑ Filter Data Bases in MAC Bridge Relay Entity in the Bridging RPR station needs to be large to maintain host MAC addresses serviced by the RPR.
- ❑ 802.17 MAC Station Data Base needs to be large to maintain host MAC addresses serviced by the RPR.
- ❑ Networks containing RPRs, where the RPR Bridging stations are running STP need to be carefully engineered.