

# Bridging on 802.17 LAN with 802.1D/Q Compliance

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May 2002



# Objective

- Satisfy the compatibility requirements as specified in the 5 Criteria for 802.17  
*“The Resilient Packet Ring standard will be compatible with the relevant portions of 802.1D, 802.1Q and 802.1f”*

# Terminology

- **Unknown/Remote Address**
  - An address that is not found on the Ring
  - A remote address of the Ring
  - An address that is not found in the Topology Image of any station
- **Known/Local Address**
  - An address that can be found on the Ring
  - A local address of the Ring
  - An address that is found in the Topology Image of any station
- **Lowest Cost Path**
  - Typically a Ringlet with the shortest hop count to a particular destination
  - May be extended to include BW metrics in cost calculations
- **Flood**
  - A transmission mechanism that ensures all stations see a transmitted packet once, without duplication

# Key Points

1. Bridges operate in a Promiscuous mode
2. 802.17 MAC performs Symmetric transmission of the frames (e.g., reception on CW and transmission on CCW) for a given source and destination RPR station pair
3. A flooding indicator in the frame is required to ensure that *flooded* frames are indeed seen by every station on the Ring

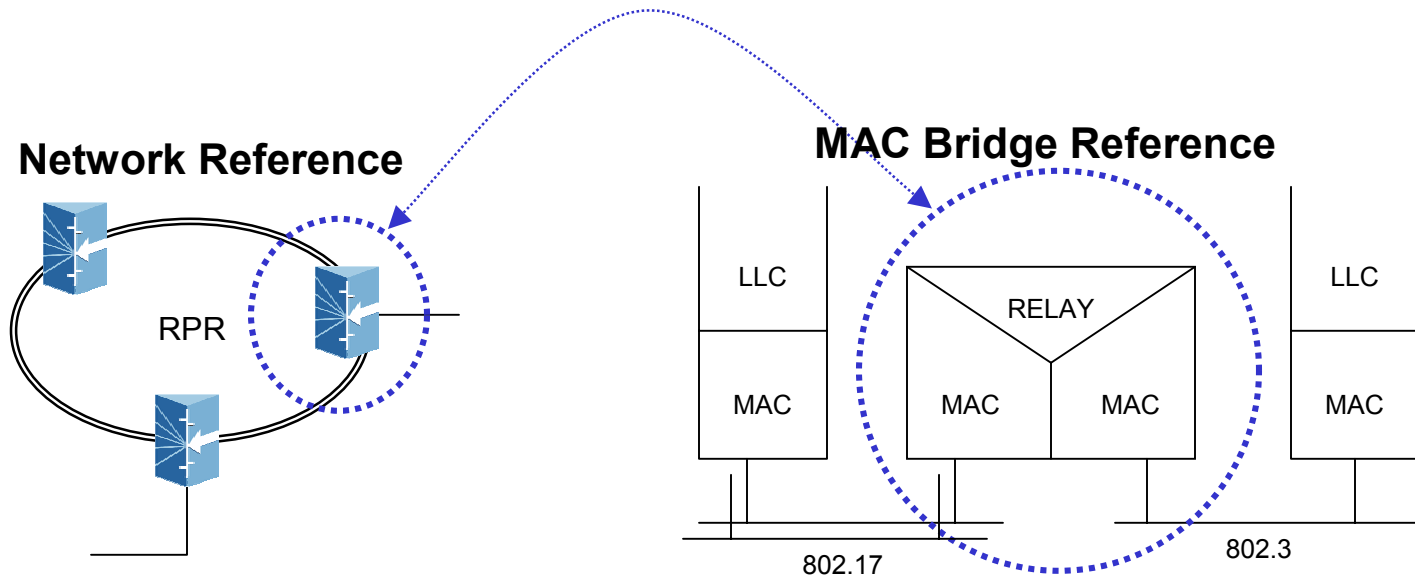
# Key Outcomes

1. Spatial Re-Use only applies to communications between end stations (e.g., Routers, Hosts, Servers, etc.) on the Ring
2. Any communication to/from a 802.1D/Q Bridge will not have any Spatial Re-Use feature
  - 802.1D/Q devices (e.g., Bridges) treat the Ring as a broadcast media
  - As long as a MAC can be operated as a broadcast medium, STP, GVRP will function properly

The spatial reuse features to support 802.1D/Q Bridging will be covered by the “Bridging & Spatial Re-Use” sub-team presentations. This solution does not preclude evolution to the “Bridging & Spatial Re-use” proposal. It should be forward compatible.

# 802.17 MAC in a Bridge

- The station on the RPR is a transparent bridge and the ring is the shared medium



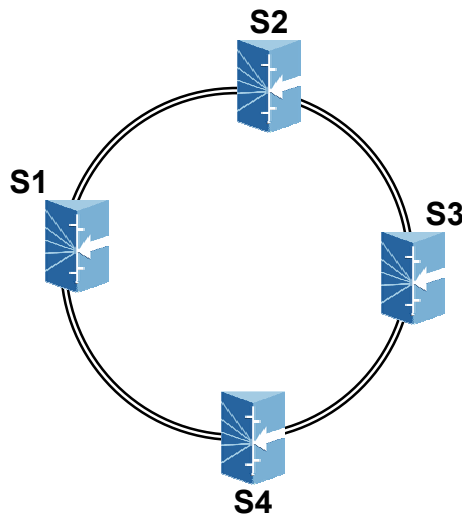
# MAC Requirements for Compatibility With 802.1D/Q



1. MAC must support a promiscuous mode so that it allows the Relay Entity to process packets not destined to it
2. Must handle frames with all types of addresses
  - Remote* unicast, *local* unicast, multicast, broadcast
3. Must be able to communicate with the Bridge Protocol Entity via the LLC sublayer
4. Must be able to support the Internal Sublayer Service (ISS) and the Extended ISS (E-ISS) defined in 802.1D and 802.1Q respectively

# 802.17 MAC Ringlet Selection

- Under normal operations, MAC takes lowest cost path (e.g., chooses Ringlet with lowest hop count) to destination Station
  - Topology Discovery protocol provides the MAC with hop count and direction (I.e., Ringlet) information associated with all Stations on the Ring



**S1 Station Topology Image**

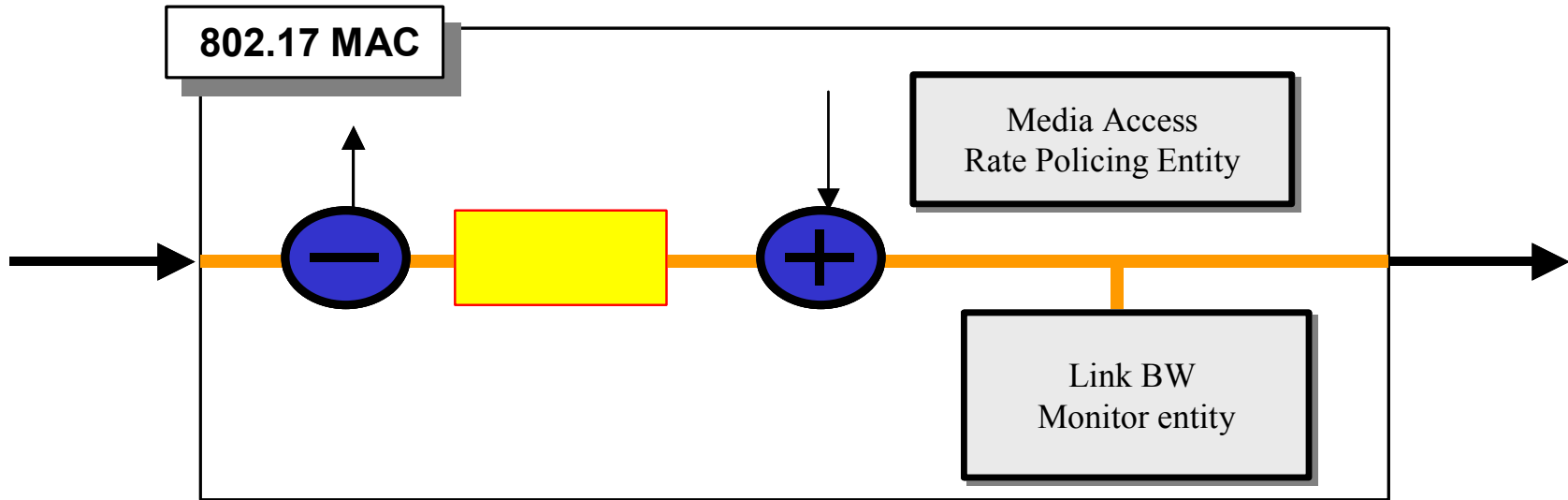
		CCW	CW
Dest Station	Primary	TTL	TTL
S2	CW	3	1
S3	CW or CCW	2	2
S4	CCW	1	3

**S4 Station Topology Image**

		CCW	CW
Dest Station	Primary	TTL	TTL
S1	CW	3	1
S2	CW or CCW	2	2
S3	CCW	1	3



# Operation of an 802.17 MAC in a 802.1D/Q Bridge



- The MAC must operate in promiscuous mode
- All frames are “Replicated/Copied”
  - The frame is “Dropped” (I.e., passed to appropriate MAC Client)
  - The frame is forwarded downstream if MAC stripping rules don’t strip (e.g., TTL permits, not destination address, etc.)

# Reception of Frames by a 802.17 MAC

- Packet gets stripped off of Ring as per RPR Draft MAC reception rule (e.g., TTL, destination address match, etc.) with the following exception
  - If flooding indicator set, then DA stripping is not enforced

If RPR Frame structure support Station Identifiers, then flooded packets would be dispatched using a DSID of broadcast

- No MAC reception rules changes would be required

# Transmission of Frames by a 802.17 MAC (non-Bridge)

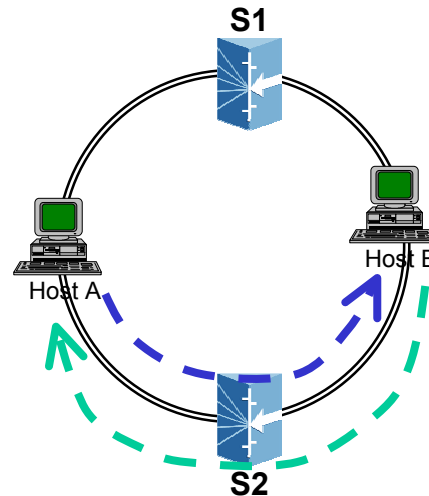
**Assumption:** 802.17 MAC is doing Ringlet Selection

- Packets with remote addresses are *flooded* on the ring
- Packet with multicast or broadcast addresses are broadcast over the ring
- Packets with local unicast address are sent directly to destination station

# Transmission of Frames by a 802.17 MAC (non-Bridge)

**Assumption:** 802.17 MAC is doing Ringlet Selection

- Local address terminations between {source, destination} station pair where there is equal cost associated with both Ringlets should follow symmetric paths
  - Example: Station with higher MAC address will take Ringlet\_0, and Station with the lower MAC address will take Ringlet\_1



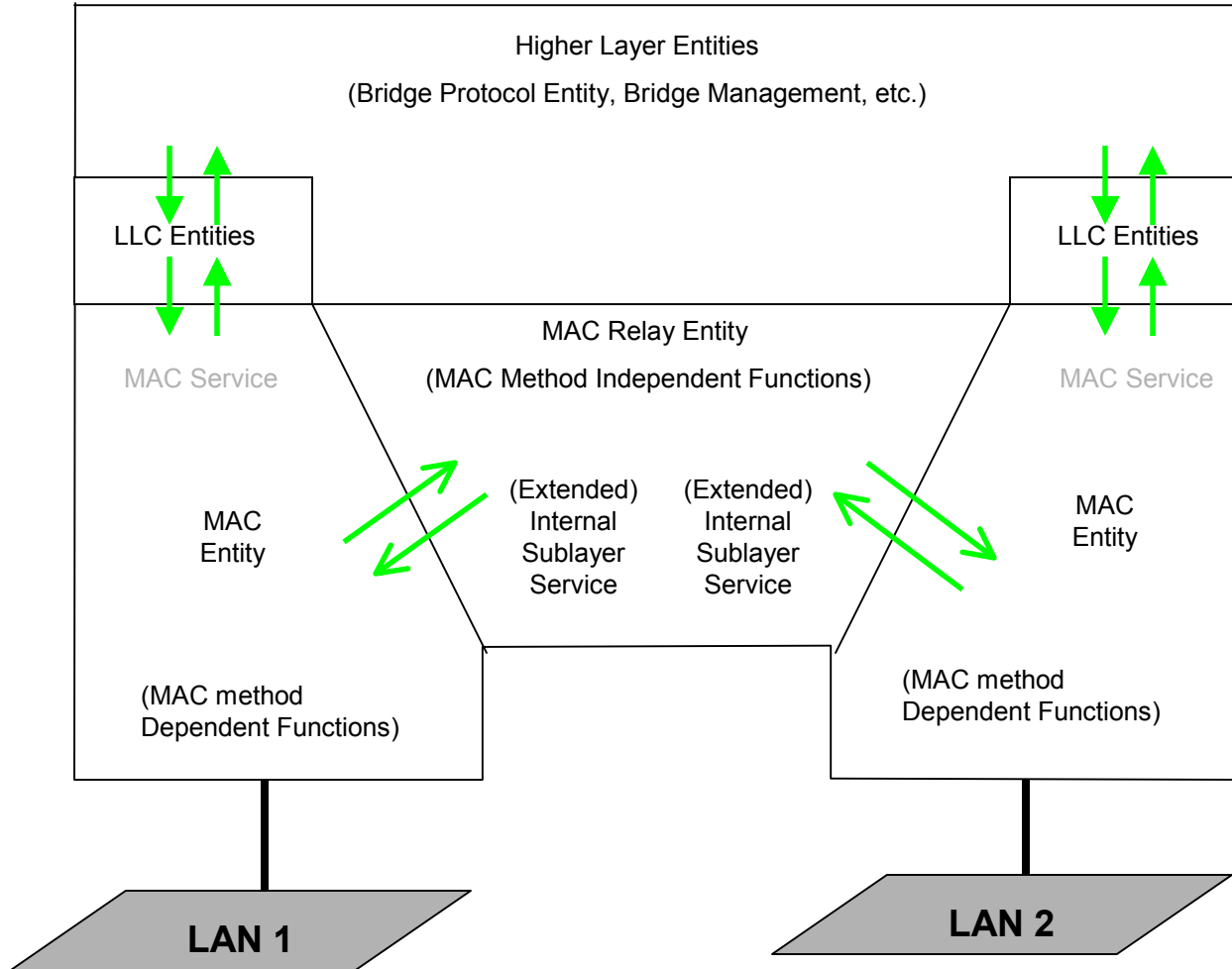
# Transmission of Frames by a 802.17 MAC supporting a Bridge

**Assumption:** 802.17 MAC is doing Ringlet Selection

- All packets are *flooded* on the ring independent of
  - Unicast (remote and local), multicast, or broadcast addresses are *flooded*
  - Flooding indicator in RPR Frame is set

If RPR Frame structure support Station Identifiers, then flooded packets would be dispatched using a DSID of broadcast

# Supporting ISS and E-ISS

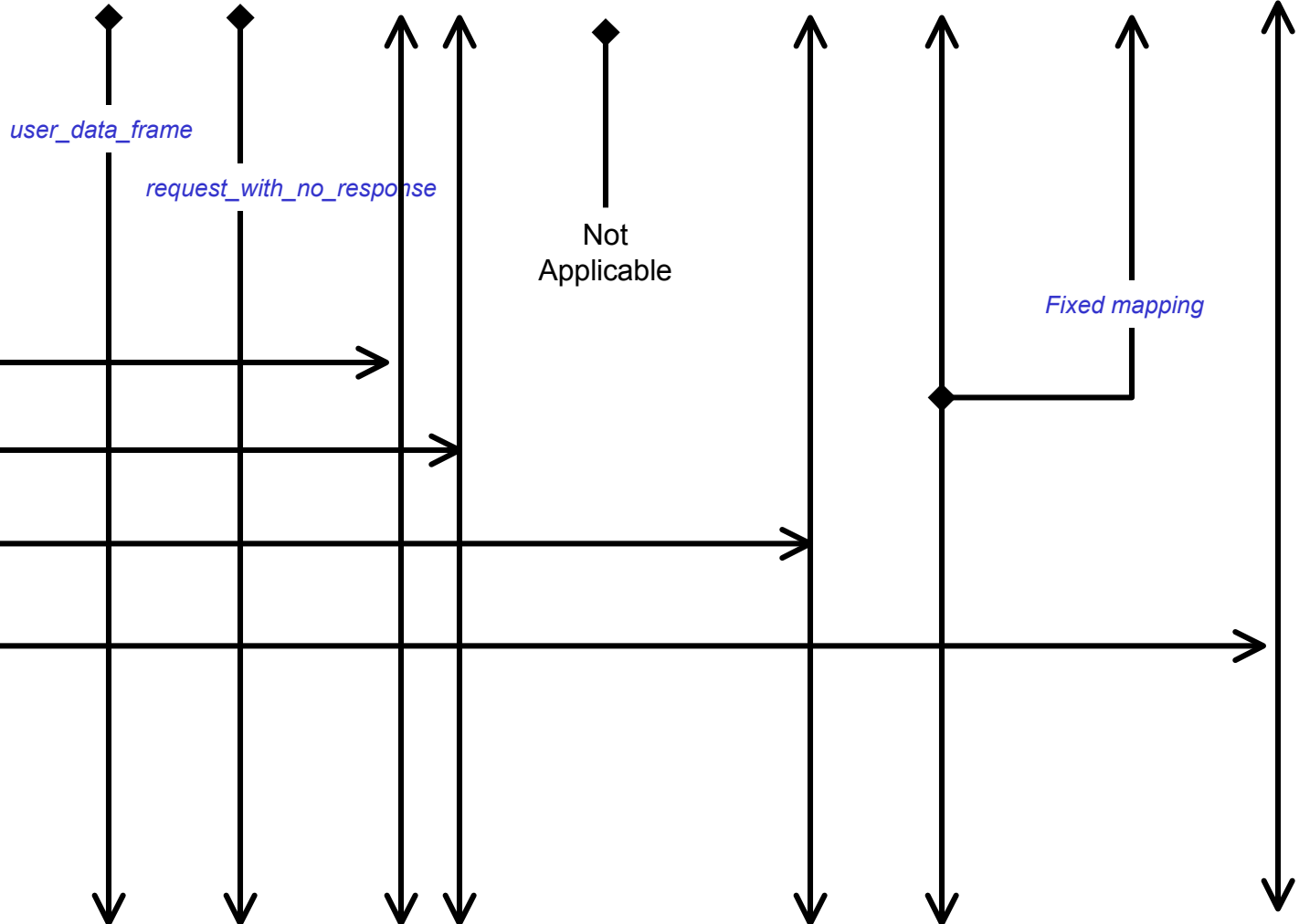


# ISS Service Mappings for 802.17 MAC

MA-UNITDATA.request( frame\_type, mac\_action, DA, SA, Routing Information, MSDU, user\_priority, access\_priority, FCS)

## 802.17 Frame Fields

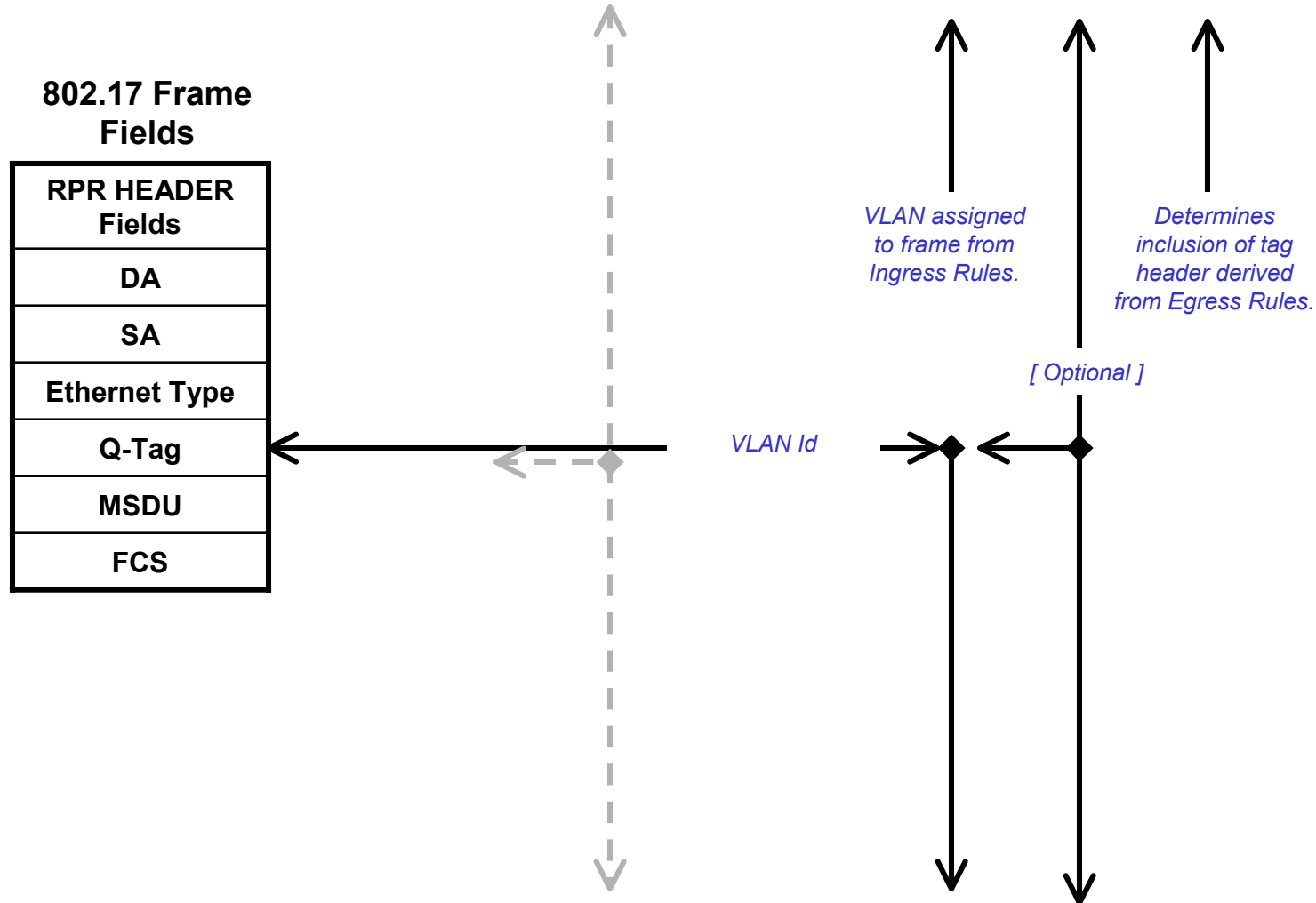
RPR HEADER Fields
DA
SA
MSDU
FCS



MA-UNITDATA.indication( frame\_type, mac\_action, DA, SA, Routing Information, MSDU, user\_priority, \_\_\_\_\_ FCS)

# E-ISS Service Mappings for 802.17 MAC

EM-UNITDATA.request( MA-UNITDATA.request.parameters, cfi, vlan\_class, rif\_info, include\_tag )



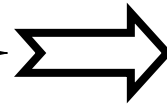
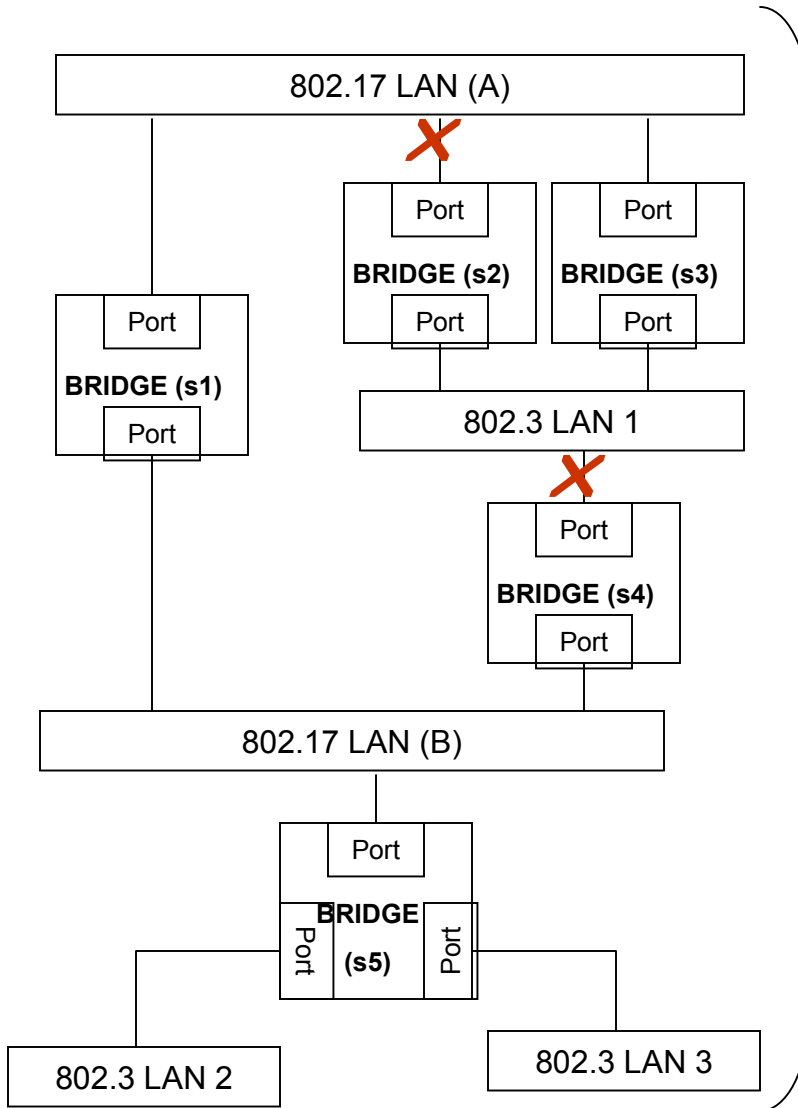
EM-UNITDATA.indication(MA-UNITDATA.indication.parameters, cfi, vlan\_id, rif\_info )



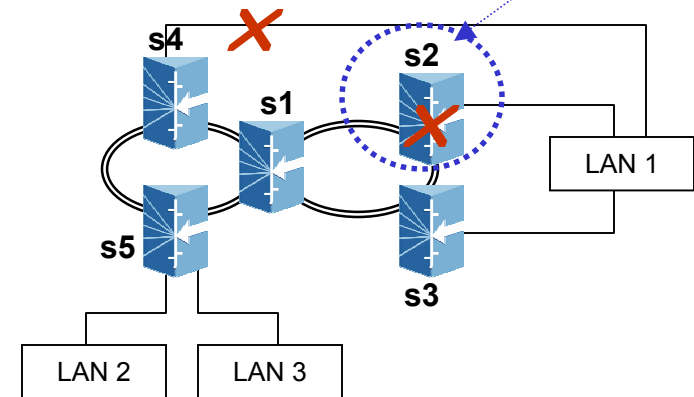
# STP Interactions With 802.17



## Bridged Local Area Network



## Network Reference



**X** Denotes blocking port state due to STP.

# Observations

- Transparent Bridge Stations
  - Persistently flood packets over the Ring.
  - No Spatial Re-use achieved for Transparent Bridges
- Non-Bridge Stations (e.g., Hosts, Servers, Routers, etc.)
  - Flood packets over the Ring when terminating to remote addresses
  - Transmits packets directly to Ring station when terminating to local addresses
  - Spatial Re-Use is achieved on the Ring for local terminations

# Other Observations

- Proposed solution can be
  - Supported by simple TTL scoping flooding technique
  - Supported with Frame Structure described in current RPR Draft (V2.0) with the addition of a flooding indicator bit
  - Supported by Frame Structures that support Station Identifiers
  - Supported by Flooding techniques offering increased robustness
  - Does not preclude graceful evolution to a Bridging & Spatial Re-use solution

# Conclusion

- 802.17 MAC demonstrates compliance to 802.1D and 802.1Q as required by the PAR and 5 Criteria
  - ISS and E-ISS conforms to 802.1D/Q specification
  - Integrity of Spanning Tree Algorithm/protocol is maintained

# BACK UP

# Example Flooding Techniques

