802.17 Bridging

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Outline

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- Simple Bridging
- Bridging with Destination Stripping
- Reference Models
- Common Frame Format / TX/RX Procedures
- Interoperability Examples
- Flooding Issues
- Why DSID/SSID is important to 802.17
- Recommendations
- References

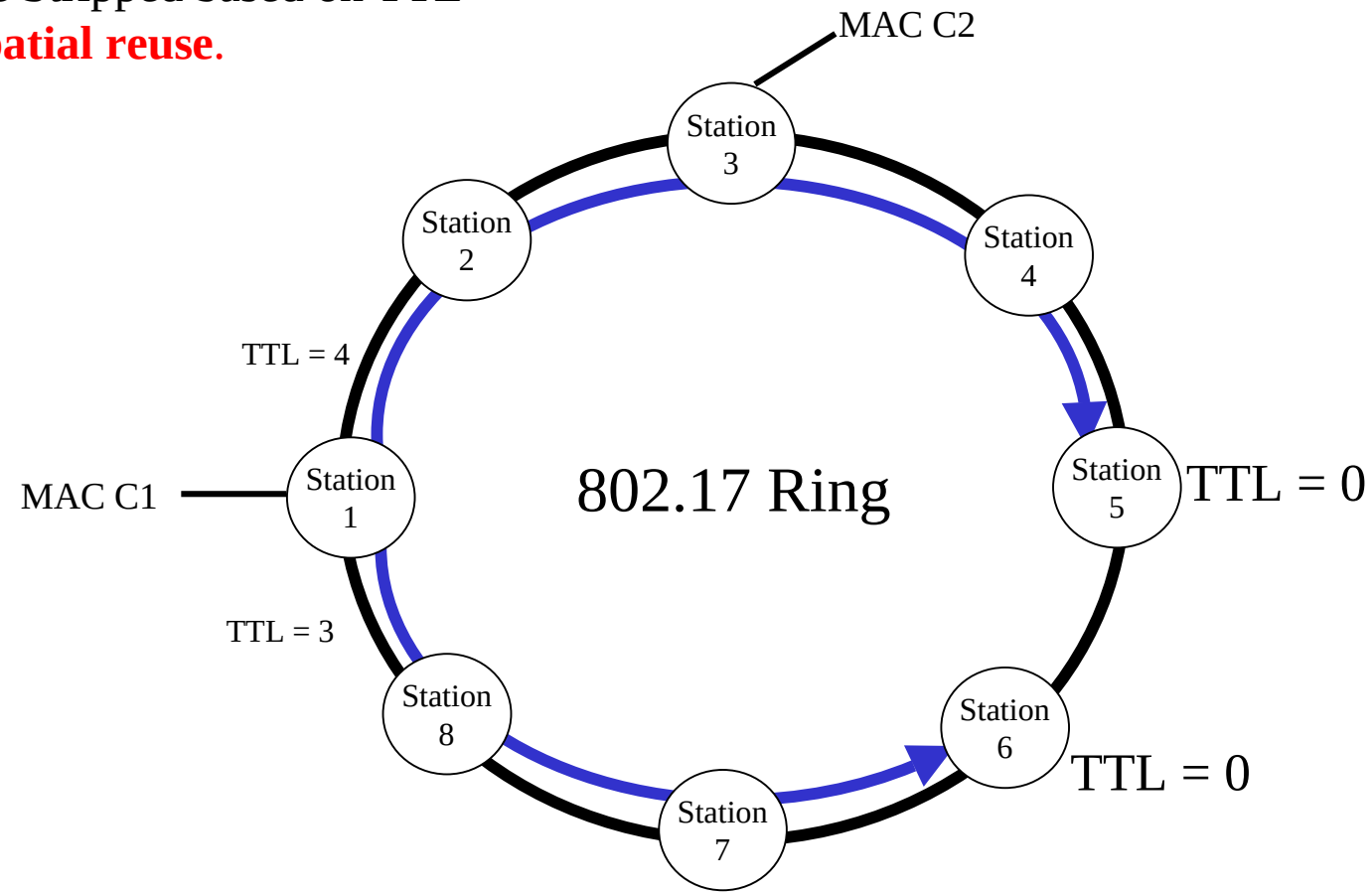
Bridging Requirements

- 5 Criteria
  - 802 Overview and Architecture
  - Compatible with relevant portions of 802.1d, 802.1q, and 802.1f
  - Allow for simple mapping between 802.3 frames and RPR frames and vice versa.

- Spatial Reuse of Unicast Traffic
  - Motion 7 Pass 89/1/4 - Requirement: The MAC shall support destination removal for uni-cast packets during normal operation.

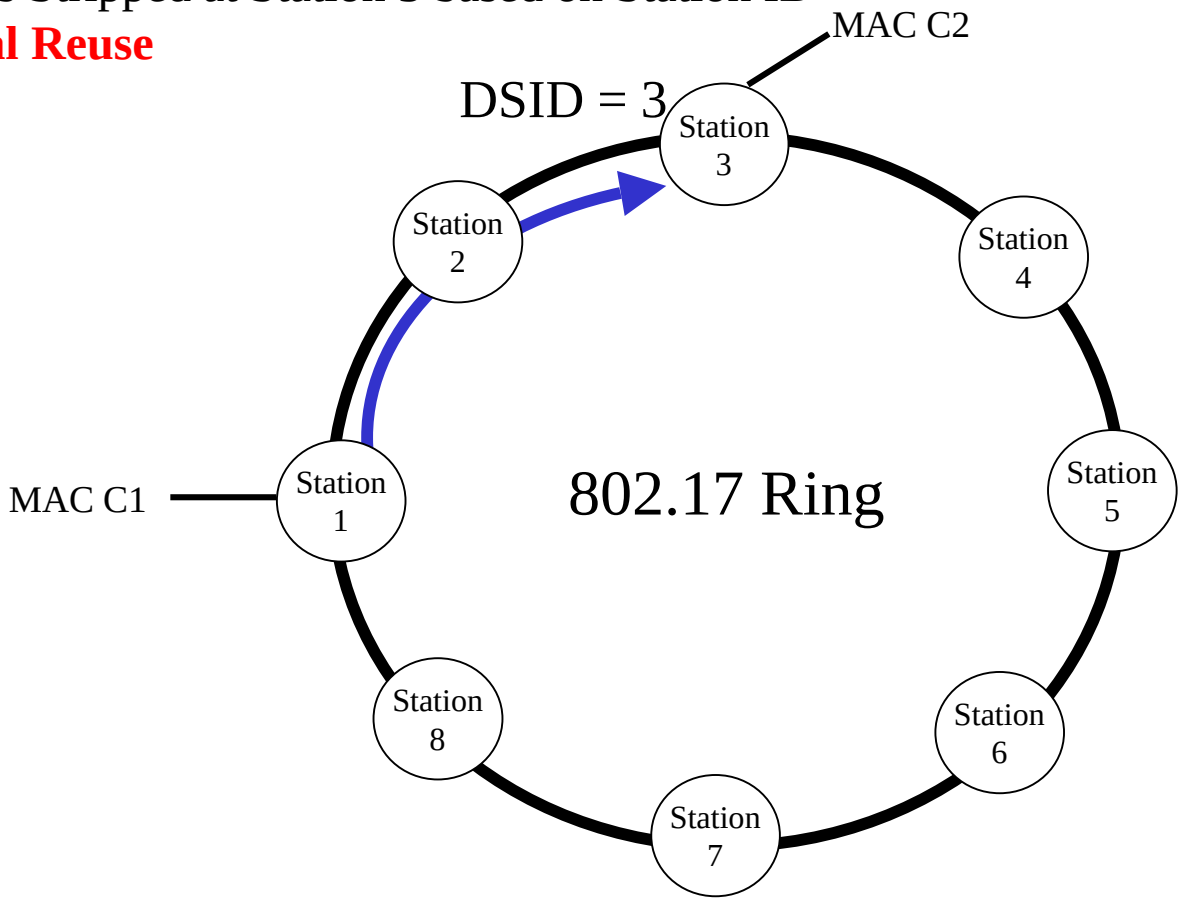
Simple Bridging

Unicast Frame Transmitted from C1 to C2
All frames flooded to every station on the ring.
Frame Stripped based on TTL
No spatial reuse.



Bridging w/Destination Stripping

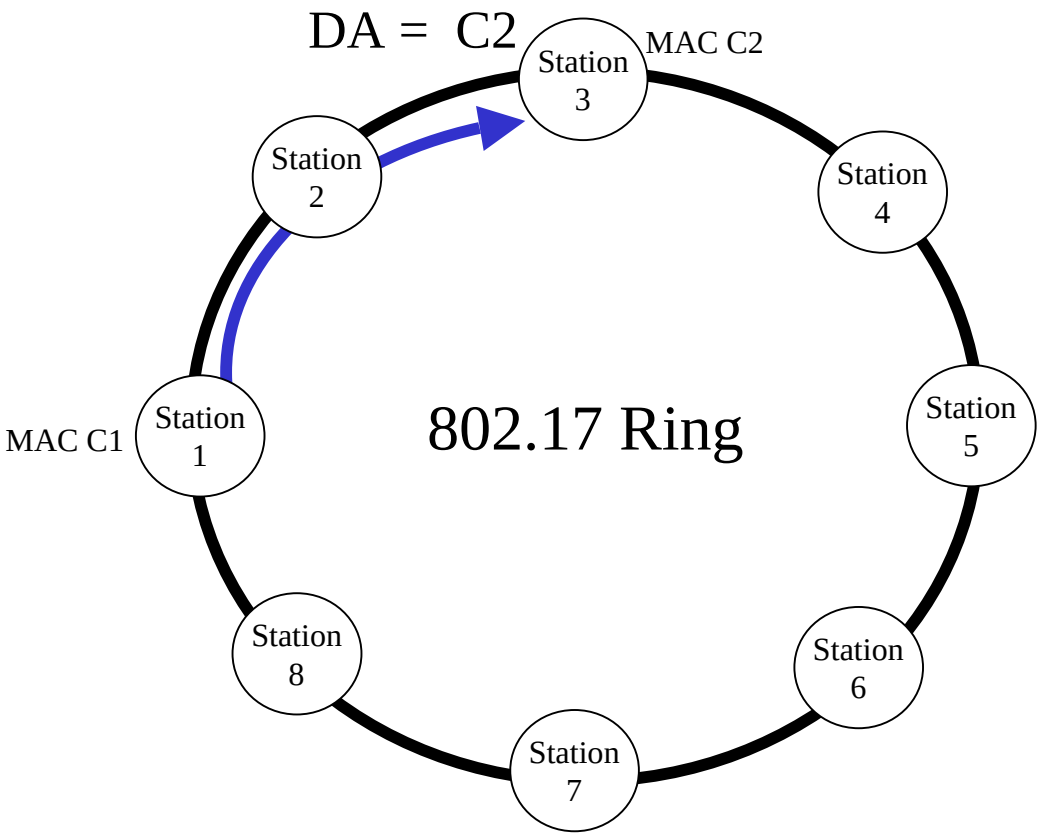
Unicast Frame Transmitted from C1 to C2
Frame directed to intended destination
Frames Stripped at Station 3 based on Station ID
Spatial Reuse



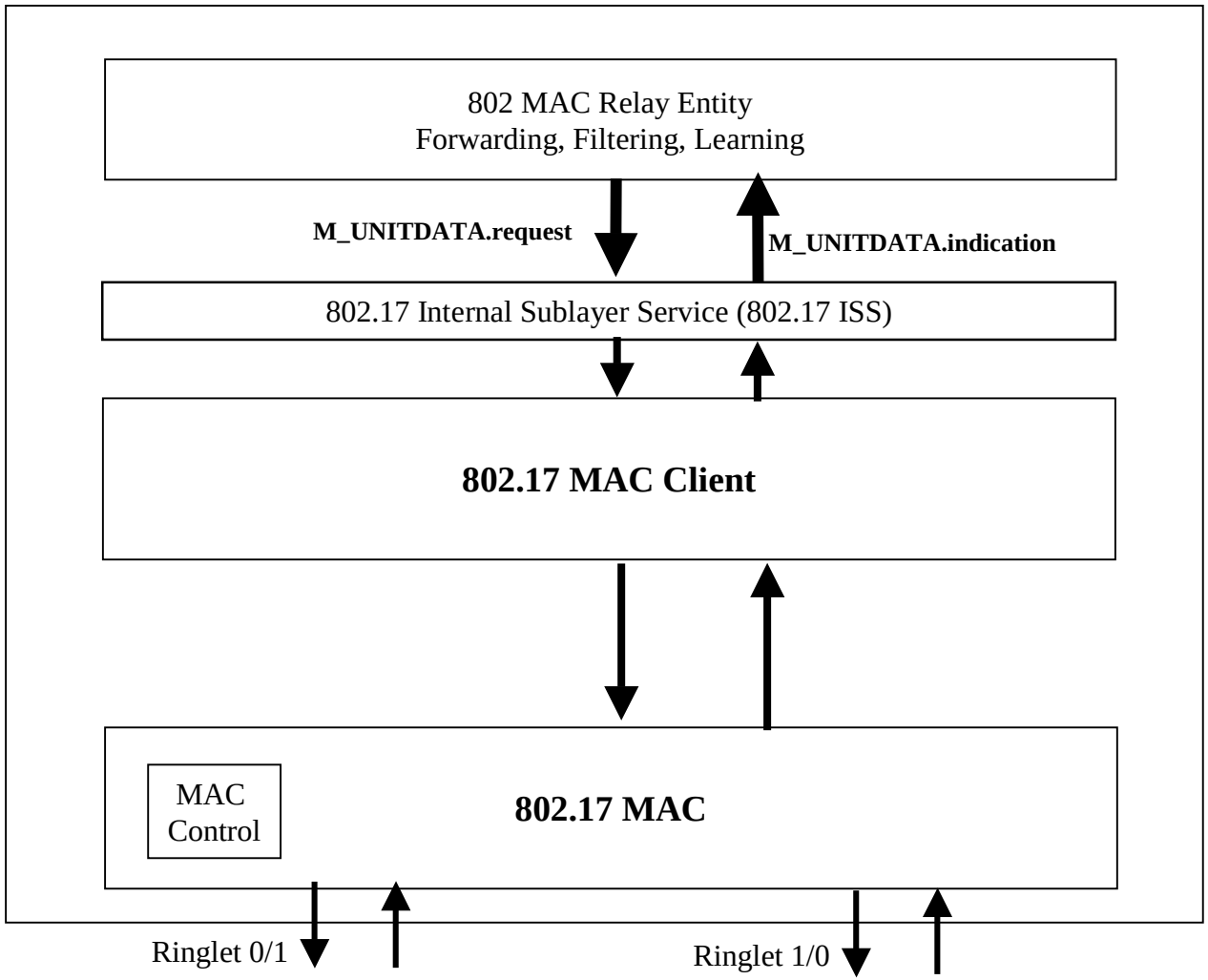
802.17 End Station

Unicast Frame Transmitted from C1 to C2
Frame Stripped at Station 3 based on destination MAC address

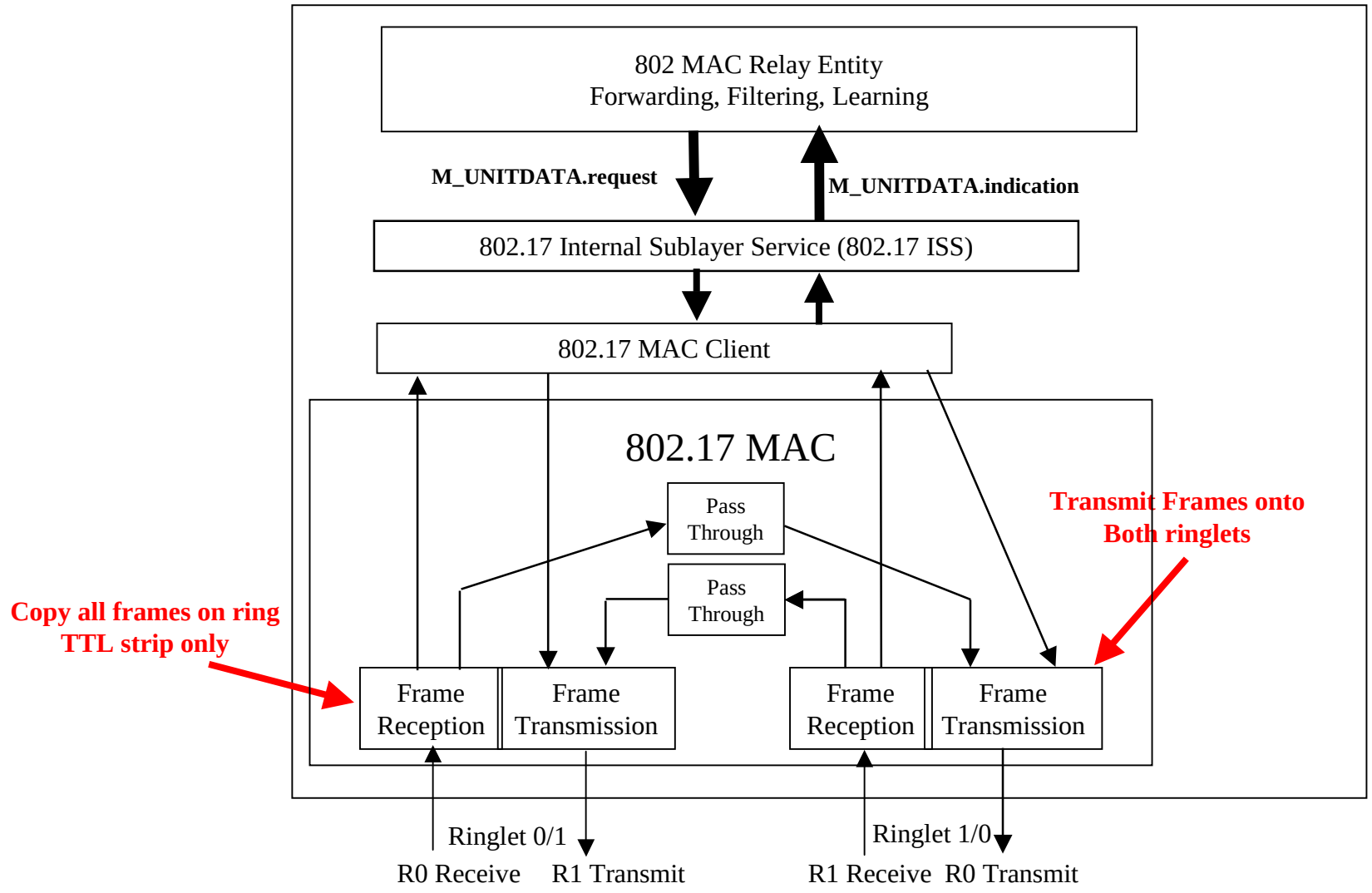
Spatial Reuse



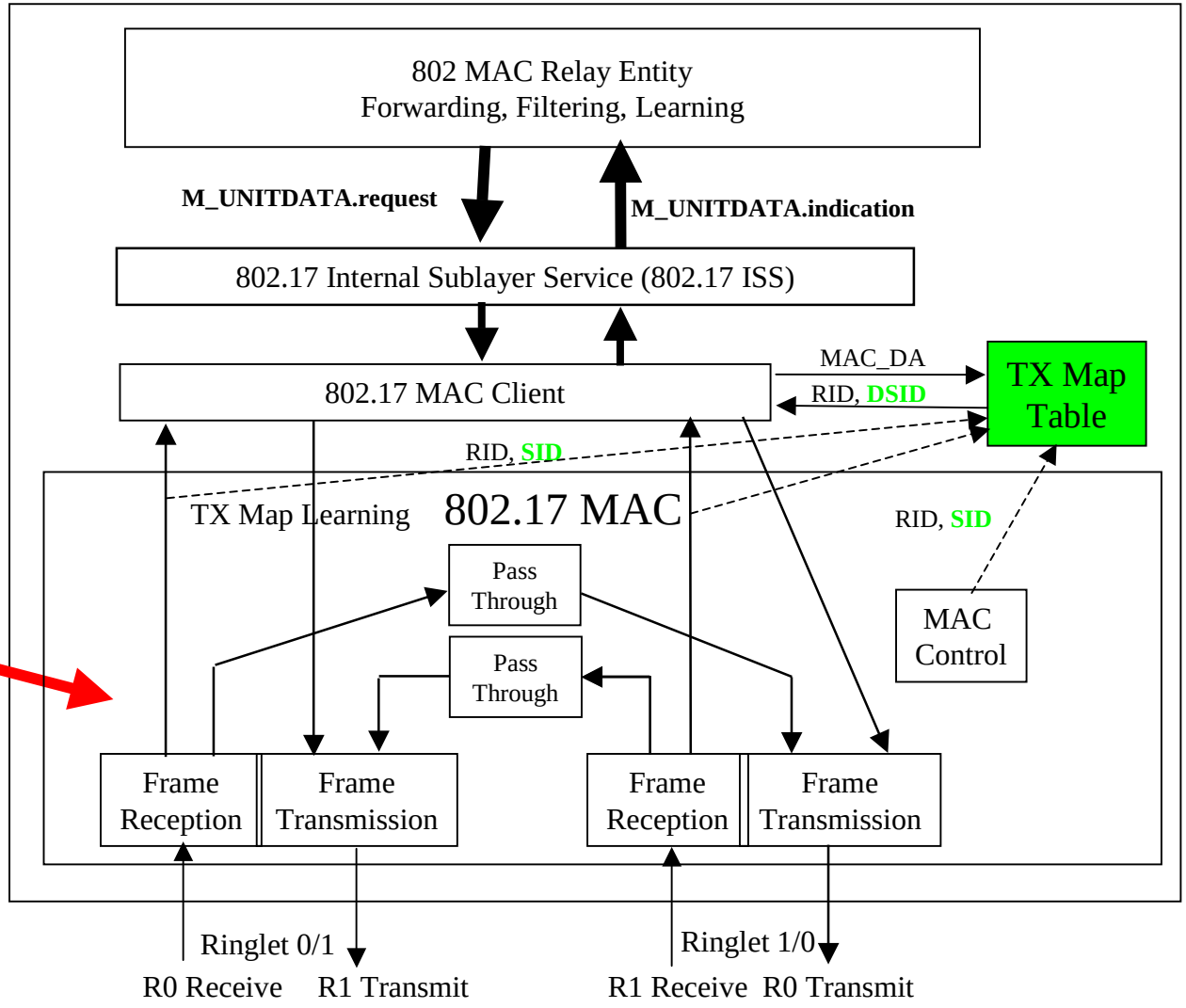
MAC Reference Model



Transparent Bridging w/ Simple Bridge



Transparent Bridging w/ DSID SSID Stripping



Copy/Strip frames when match on DSID, Copy all others)

Comparison of 802.17 Routed vs. Bridged PDUs for spatial reuse

Routed PDU with Spatial Reuse

CTRL	
MAC_DA	48 Bit
MAC_SA	48 Bit
SDU Type	16 Bit
MAC SDU	
FCS	32 Bit

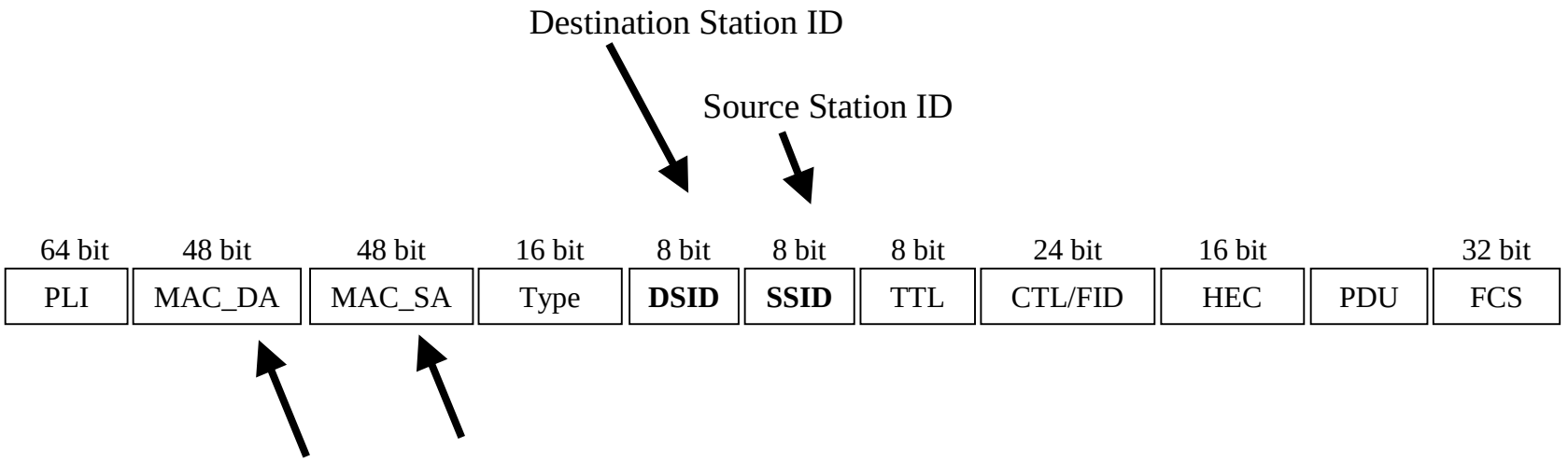
Bridge 802.17 Packet needs to add 14 bytes more overhead than the routed equivalent to achieve same level of spatial reuse as routed packet.

Additional 14 byte overhead is required To achieve the network scaleability benefits of encapsulation bridging (double encapsulation).

Encapsulated Bridged PDU with spatial reuse

CTRL	
Encap DA	48 Bit
Encap SA	48 Bit
Encap Type	16 Bit
MAC_DA	48 Bit
MAC_SA	48 Bit
SDU Type	16 Bit
MAC SDU	
FCS	32 Bit

Low overhead Common Frame Format



802.17 End Stations can still strip frames based on their MAC Address

DSID value of FF indicates a broadcast frame
SSID value of FF indicates Null DSID/SSID

Common frame format allows interoperability between simple & destination stripping type bridges and end stations residing on the ring and facilitates migration between the two.

Common Frame Procedures

- Destination Stripping type Bridges

  Transmission

  – Encapsulate a frame DSID based on the MAC_DA for all frames being transmitted onto the ring. Frame transmitted onto single ringlet.
  – DSID set to B_cast address for all broadcast/multicast/unknown traffic. Frame transmitted onto both ringlets.
  – SSID set to the transmitting station's station address
  – Perform DSID aging

  Reception

  – Copy/Strip frame if DSID matches station address
  – Copy frame of all other receive/transit frames to MAC relay for learning and forwarding
  – Learn all DSID in mapping table.

Common Frame Procedures

- Simple type Bridges

  Transmission

  – DSID set to B_cast address for all traffic.
  – SSID set to the transmitting station's station address
  – Frame transmitted onto both ringlets

  Reception

  – Copy/Strip frame if DSID matches station address
  – Copy all other receive/transit frames to MAC relay for learning and forwarding

Common Frame Procedures

- 802.17 End Stations

  Transmission

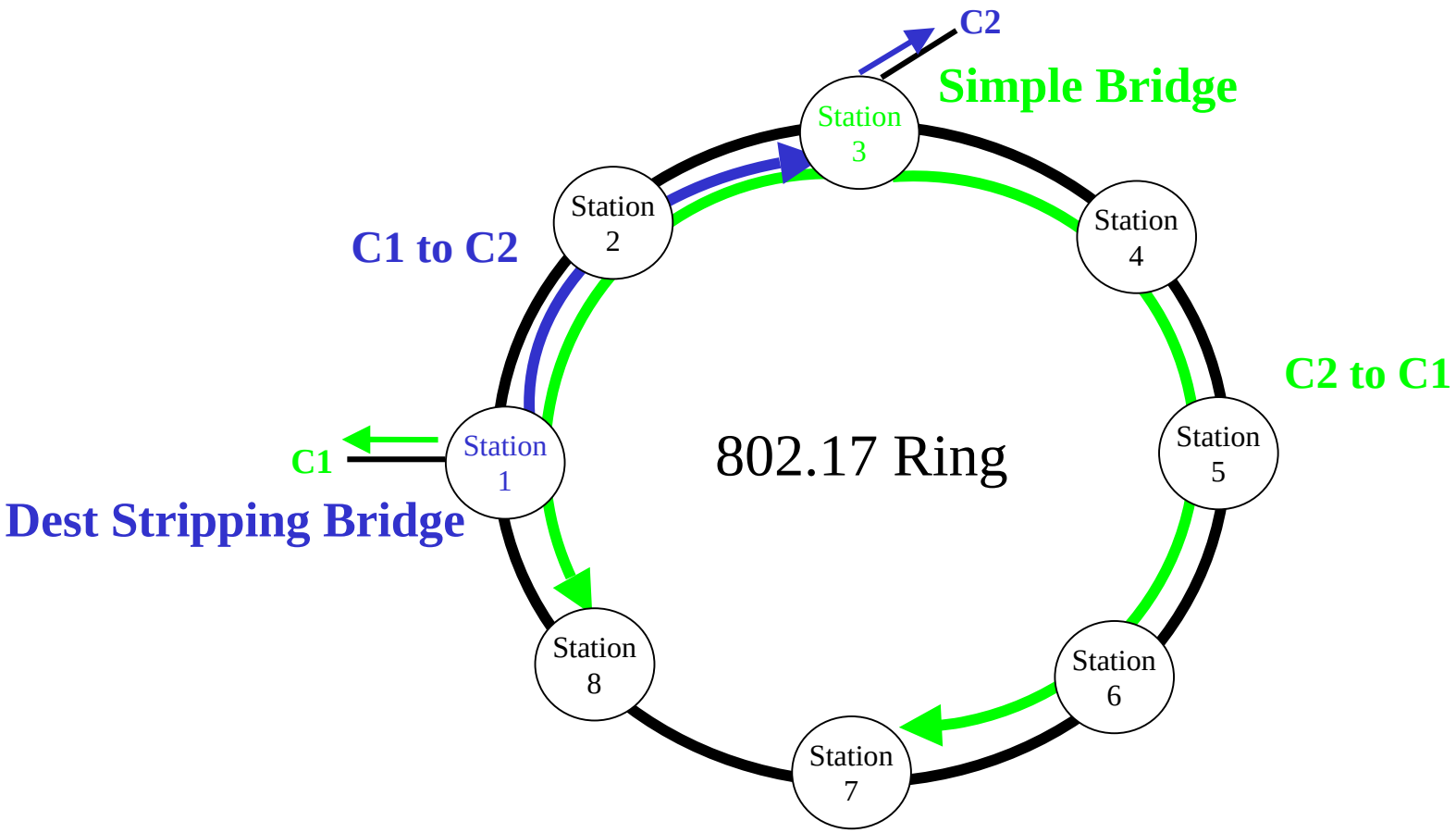
  – DSID set to B_cast address for all traffic.
  – SSID set to the transmitting station's station address
  – Frame transmitted onto both ringlets

  Reception

  – Copy/Strip frame if DSID or MAC destination address matches station address
  – Copy frame if broadcast/multicast

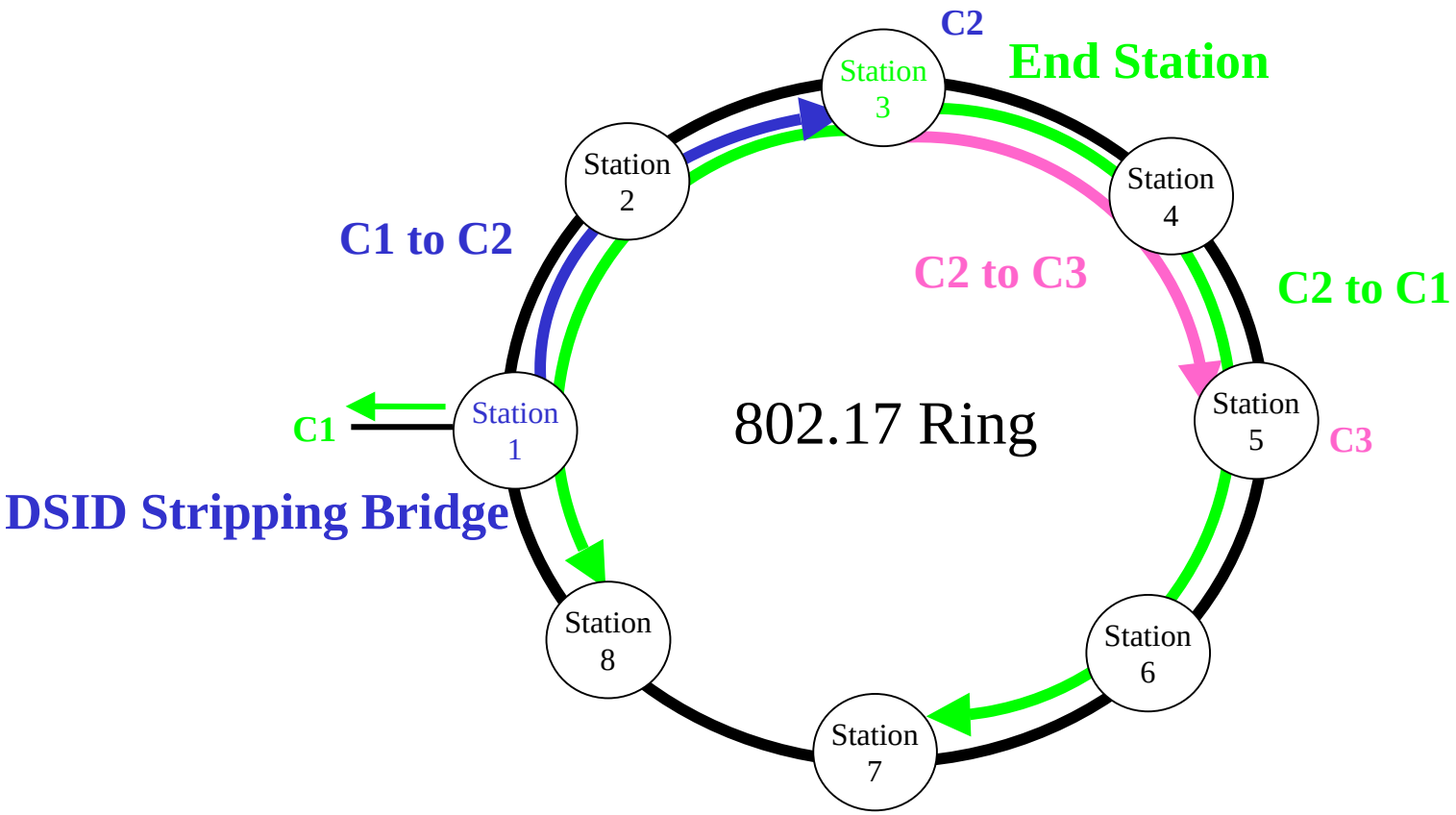
Interoperability
Simple Bridge / DSID Stripping Bridge

C1 to C2 – Spatial Reuse (DSID)
C2 to C1 – Frame Flooded



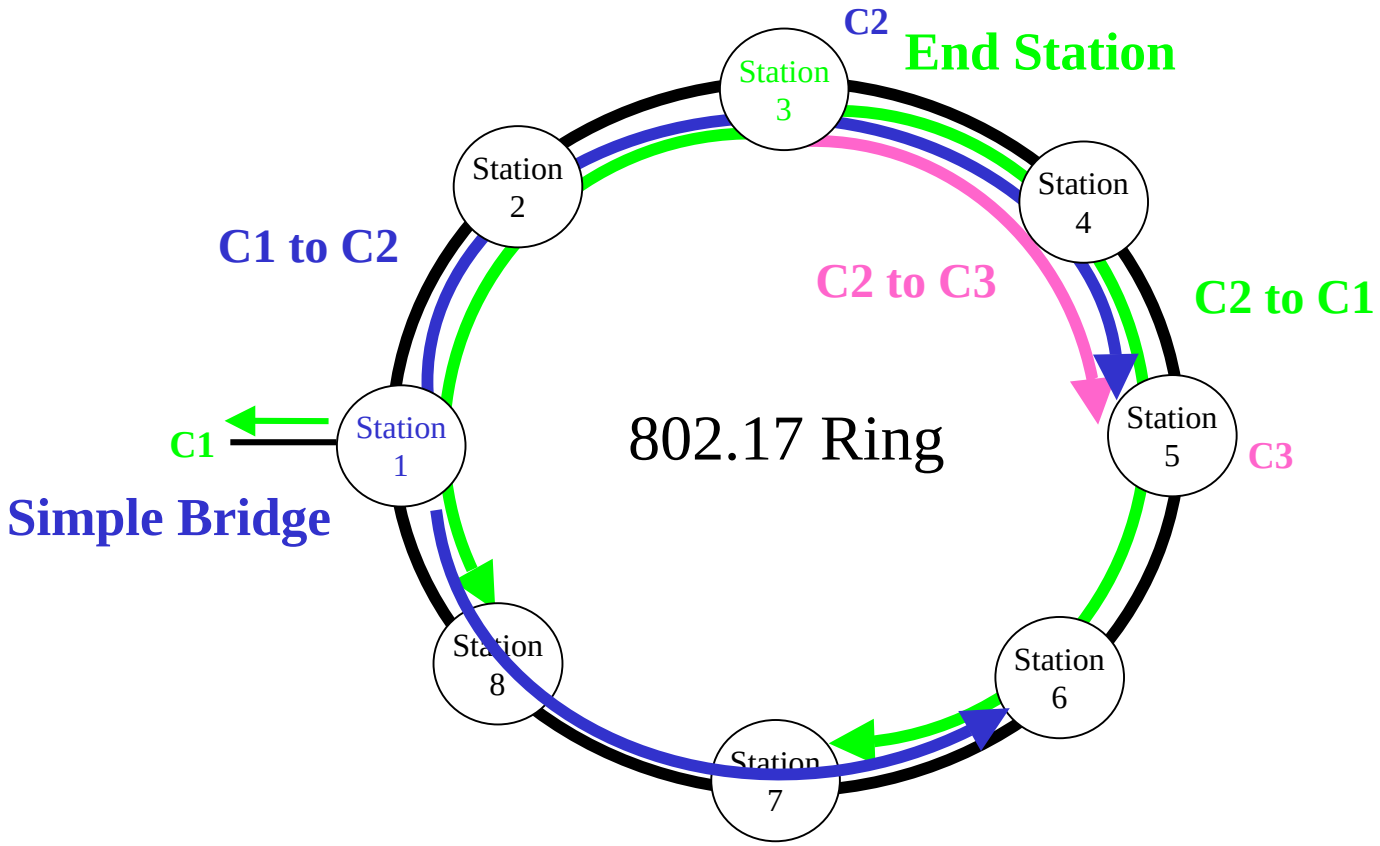
Interoperability
End Station / DSID Stripping Bridge

C1 to C2 – Spatial Reuse (DSID)
C2 to C1 – Frame Flooded
C1 to C3 – Spatial Reuse (MAC DA)

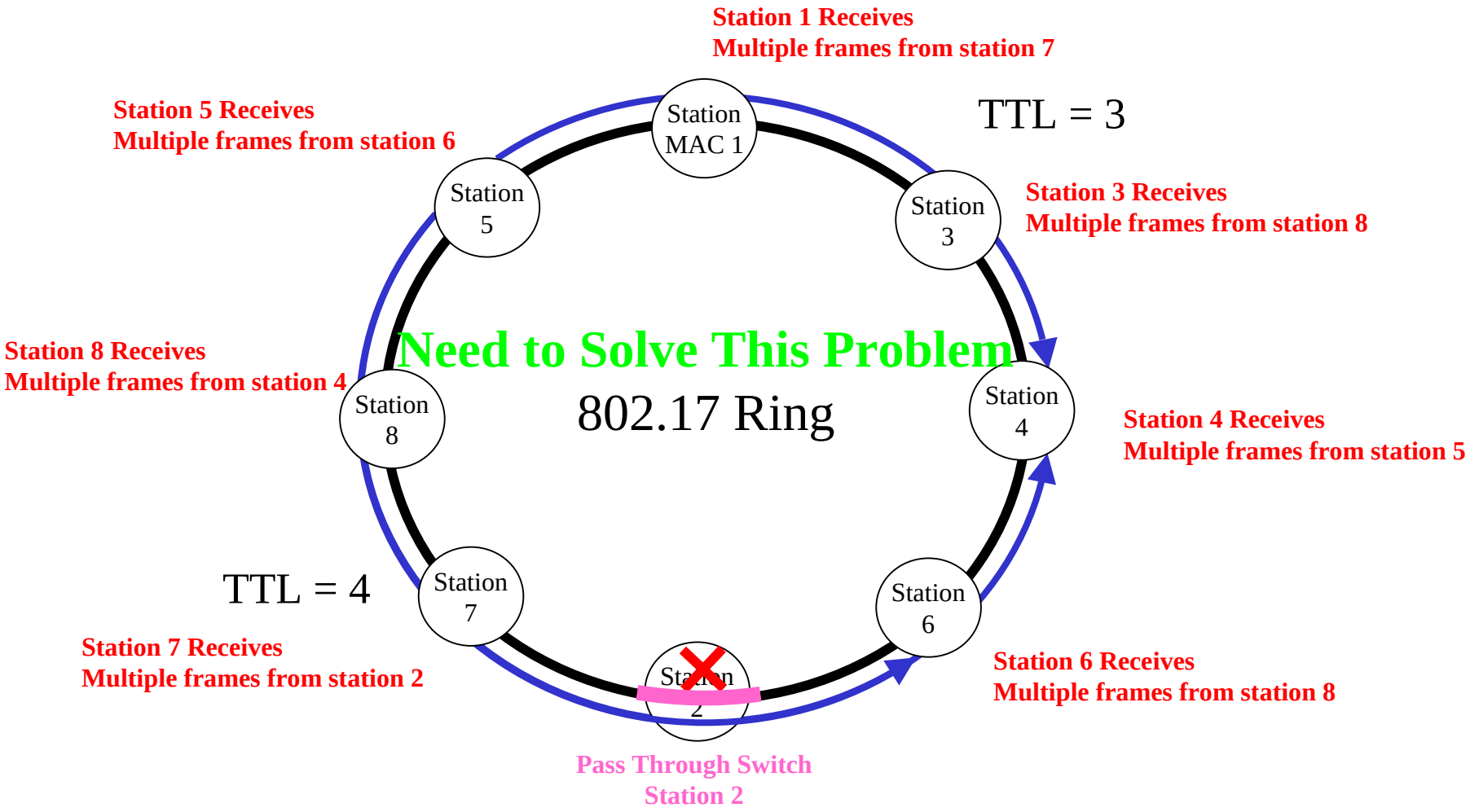


Interoperability - Darwin
End Station / Simple Bridge

C1 to C2 – Frame Flooded
C2 to C1 – Frame Flooded
C2 to C3 – Spatial Reuse



Flooding / Packet Stripping Issue
Shunted Rings



Why DSID/SSID Important to 802.17?

- Spatial Reuse for Bridged Networks
- Common low overhead (2 octet) frame format for Bridges/Routers
  - Routed networks have an unfair spatial reuse advantage over bridged networks.
  - Special frame format (Encapsulation PDU) required for 802.17 bridged networks to gain spatial reuse.
  - Bridged PDU pays 14 octets more overhead than the routed PDU to gain spatial reuse.
  - Encapsulation PDU poses interoperability problems between 802.17 routers and other 802 end stations connected through 802.17 bridges.
  - This is 802! Encapsulation Bridge PDUs should not be required to achieve transmission over a single LAN network.

DSID/SSID overcomes bridged network limitations!!

Conclusions

- Common Frame Format forward compatible with Destination Stripping
  - Supports Simple Bridging for compatibility with 802.1D/Q bridging
  - Meets the 5 Criteria / 802.17 Technical Motion Requirements for spatial reuse
  - Supports Interworking Simple / Destination Stripping Bridges / Routers / End Stations
  - Reduces transparent bridging overhead by 12 bytes vs. full 14byte encapsulation header
  - Supports adding encapsulation bridging for network scaleability
  - Minimal impact to routers/clients directly attached to ring

- Topology discovery algorithm performs unique station ID assignment
  - Station ID assignment can be done manually or via topology discovery

Recommendations to 802.17 WG

- Support simple bridging
- Support bridging with destination stripping
- Define a common frame format and procedures with SSID/DSID to support both simple and destination stripping type bridging
- Define Station ID Assignment Algorithm used by all 802.17 type stations
- Define a robust method addressing the flooding / stripping issues.

References

- 802.17 Bridging, R. Castellano et.al, rc_bridge, November 2001
- 802.17 MAC Compatibility with 802.1D/Q, M. Holness et. al., mh_brcom, November 2001
- Draft Proposal for Resilient packet ring access method & physical layer specifications, David James editor, dvj_RprDraft, November 2001
- Encapsulation Bridging and 802.17, R. Castellano, rc_ebridge, September 2001
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Thank You!