Reserved group address method of SAS interworking

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Agenda

- Objectives
- Problem overview
- Solution overview
- SAS interworking packet walk-thrus

Terminology and terms

- Directed transmissions – Refers to a RPR source station transmitting to a designated (unicast) destination address on the ring
- Undirected transmission – Refers to a RPR source station flooding a frame over the ring
- Remote address – A MAC address of a client that is not resident on the ring

Objectives

- Demonstrate SAS operations to support interworking with 802.17-2004 RPR MACs

Problem overview

- RPR needs to adhere to IEEE 802.1D/Q compliance on a ring containing basic RPR MACs (i.e., those without spatially aware sublayer) and enhanced RPR MACs (i.e., those with spatially aware sublayer)

Spatially aware sublayer (1)

- SAS is below MAC service interface (and within data link layer)
- An optional sublayer of RPR MAC

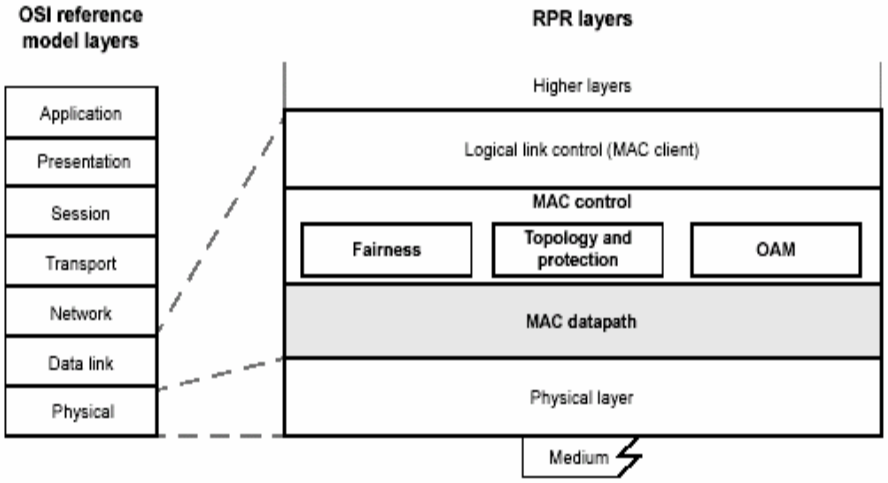
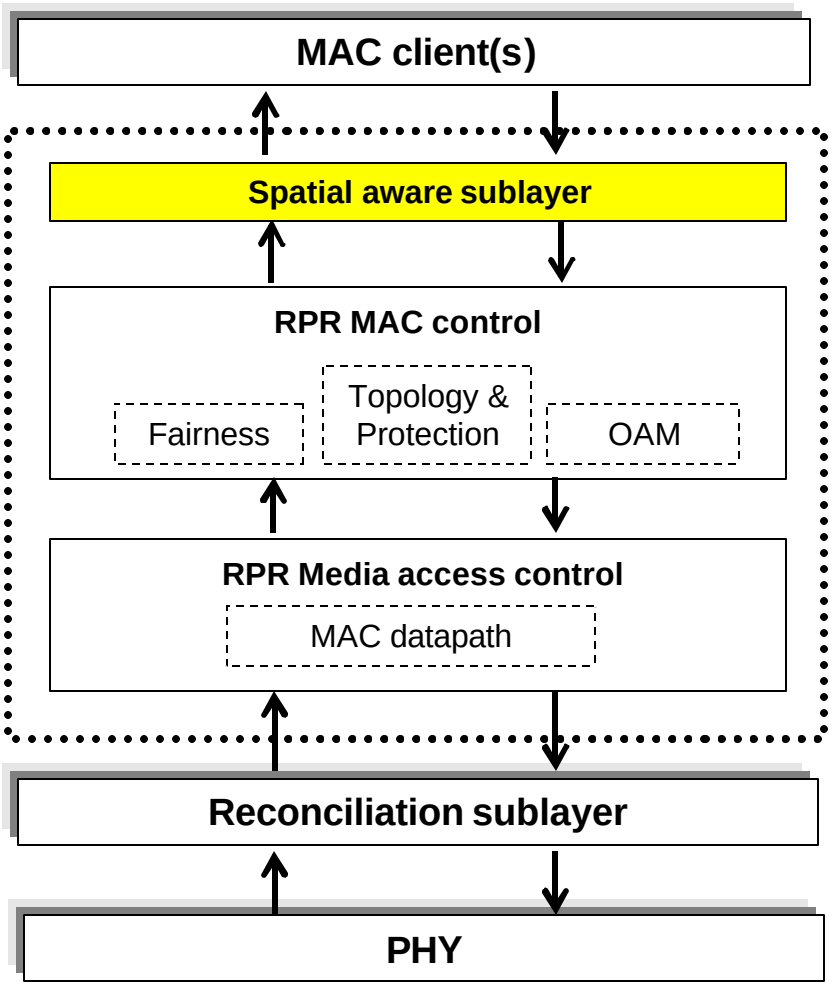


Figure 7.1—MAC datapath sublayer relationship to the ISO/IEC OSI reference model



Spatially aware sublayer (2)

- Spatially aware sublayer (SAS) is not specific to bridge clients
  - Any RPR MAC client can be serviced by the SAS
  - For example, router or host clients of an RPR MAC (that interact with other RPR MACs serving a bridge client) may support a SAS in order to achieve spatial reuse over the ring

Solution overview

- Spatial reuse over RPR shall be achieved when the source RPR MAC is served by a SAS and the destination RPR MAC is served by a SAS
- Otherwise, the ring is treated as a broadcast media, when frame transmissions over RPR involve a bridge client

Source RPR MAC	Destination RPR MAC	Spatial reuse
SAS	SAS	√
SAS	No SAS	✖
No SAS	SAS	✖
No SAS	No SAS	✖

Tx operations overview (1)

- SAS will not interfere with source myMACAddress to local RPR destination transmissions
- Otherwise, transmit an extended frame where:

NOTE: Extended frame format uniformly used for non local transmissions over RPR.

  - RPR header *da* = targetRPRAddress, if destination_address [& vid] found in SAS DB,
  - Else RPR header *da* = RRPGroupAddress

NOTE: One of the available IEEE 802.1D reserved group addresses (01-80-C2-00-00-0*) will be used to represent the RPRGroupAddress. Consequently, there is no chance that frames with this *da* will be forward off the ring by a 802.1D/Q compliance bridging client.

Tx operations overview (2)

Client provides source_address (srcAddr) and destination_address (destAddr) parameters

- If (srcAddr == myMacAddress) && local(destAddr), then pass to RPR MAC for Tx
- Otherwise, transmit an extended frame where:
  - *sa* = myMACAddress
  - *saExtended* = scrAddr
  - *daExtended* = destAddr
  - If (SDB(destAddr, vid) → targetAddress) != NULL then
    da = targetRPRAddress
    else
    da = RRPGroupAddress
  - Pass to RPR MAC for Tx

Rx operations overview

- The SAS DB is updated with {*saExtended*, [*vid*] } and associated with *sa* if

NOTE: SAS extracts information from the RPR frame in a consistent manner. Always from *saExtended*, *sa*, (and [*vid*]) frame fields.

(*da* == RPRGroupAddress) OR

(*ef* == 1 && *fi* == fi_none)

MAC client rules (1)

- RPR MAC clients conforming to 802.1D/Q bridging, 802 bridged network filtering integrity (see 802.17-2004, section F.1.4), and SAS functionality should adhere to the following Tx rules:
  1. MAC clients requesting Tx of frames which should be flooded, having mac_protection equals to FALSE, should guarantee delivery to all reachable stations on the ring.
  2. MAC clients requesting Tx of frames using the extended frame should follow this rule:
     - If the client provides source_address_extended or destination_address_extended, then the frame should be flooded (i.e., *fi* != fi_none)

NOTE: Purpose of source_address_extended and destination_address_extended fields were intended for bridging use. Basic bridges flood frames over RPR.

MAC client rules (2)

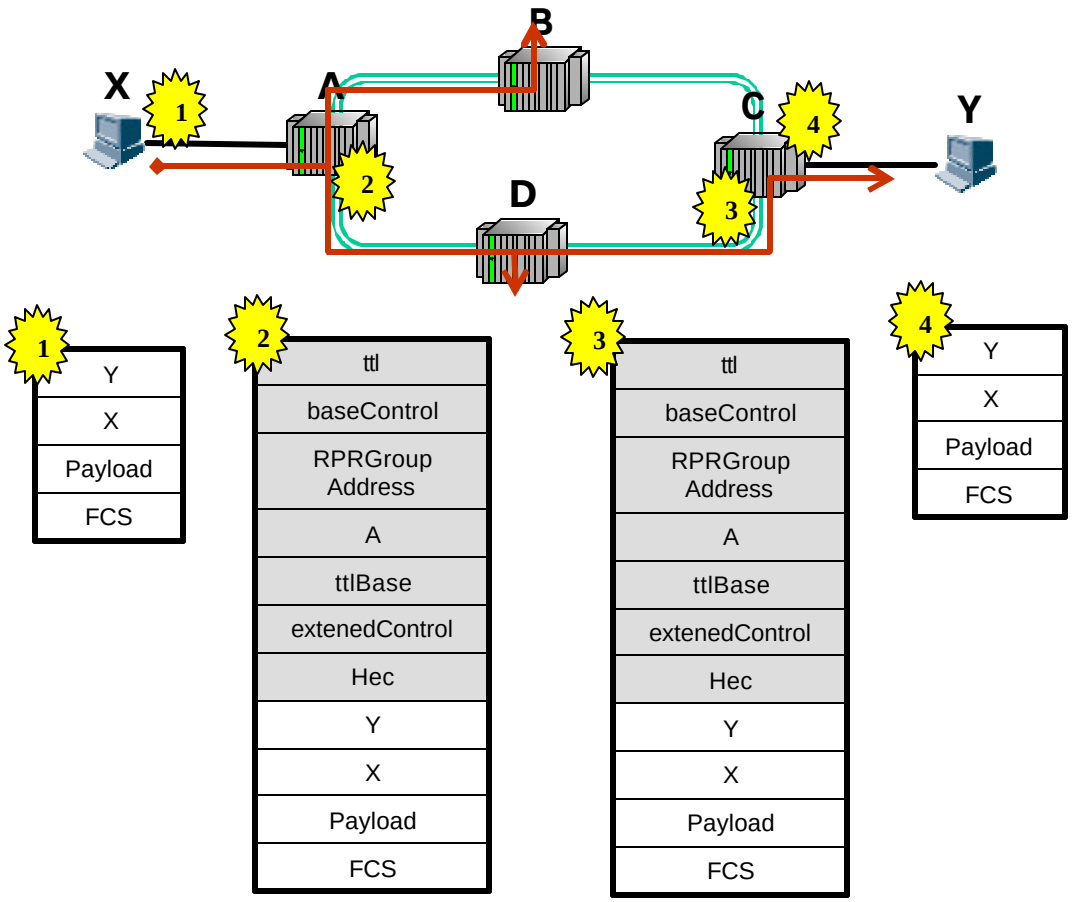
- If RPR MAC clients is being served by a RPR MAC with SAS, then extended address parameters should not be provided

RPR MAC transition to/from SAS capable

- If an RPR MAC moves from SAS capable to SAS non-capable or SAS non-capable to SAS capable, then
  - A topology change event shall occur which result in the RPR SAS DBs entries being removed

SAS interworking #1 (a)

NOTE: RPR MAC A and C have SAS. RPR MAC B and D do not have a SAS.



RPR station with bridge client

Step #2

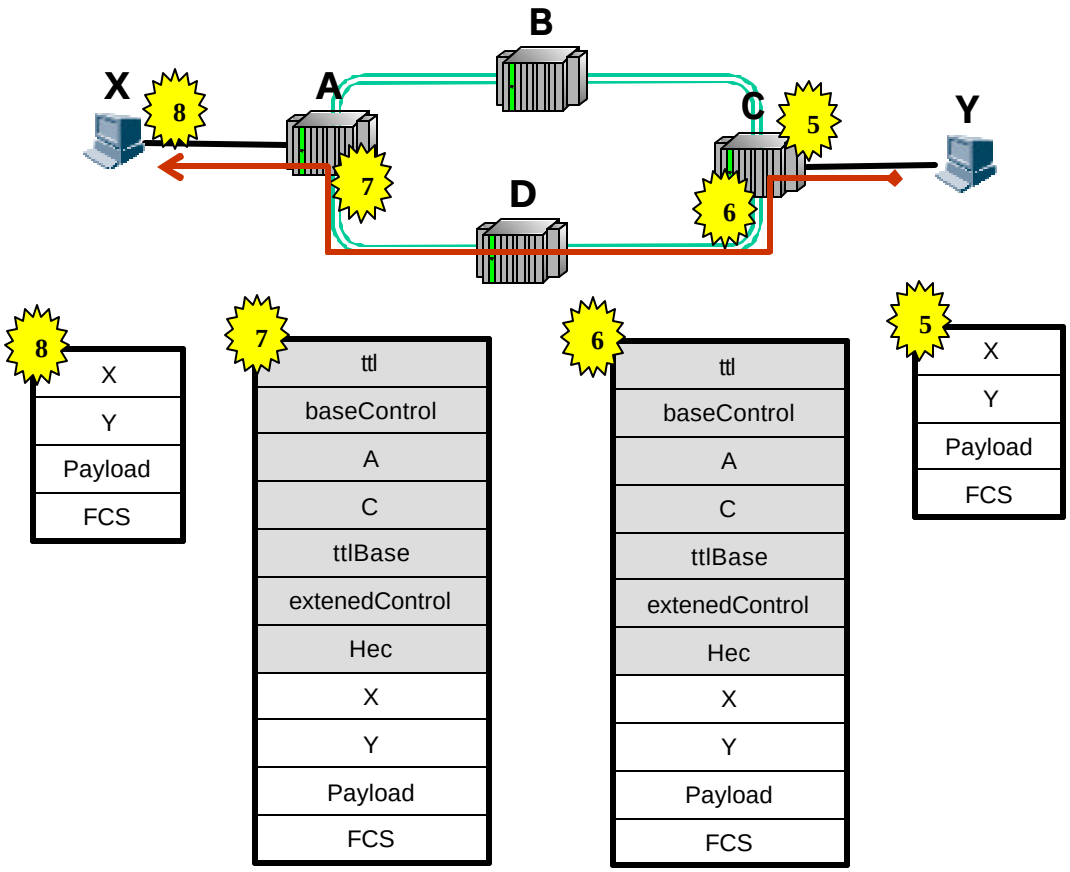
- SAS DB is indexed by the client destination address Y
- No entry found, thus RPR*GroupAddress* placed in RPR header *da*
- Undirected transmission occurs

Step #3

- SAS DB associates client MAC source address X with source RPR MAC address A, since RPR header *da* is *RPRGroupAddress*

SAS interworking #1 (b)

NOTE: RPR MAC A and C have SAS. RPR MAC B and D do not have a SAS.



RPR station with bridge client

Step #6

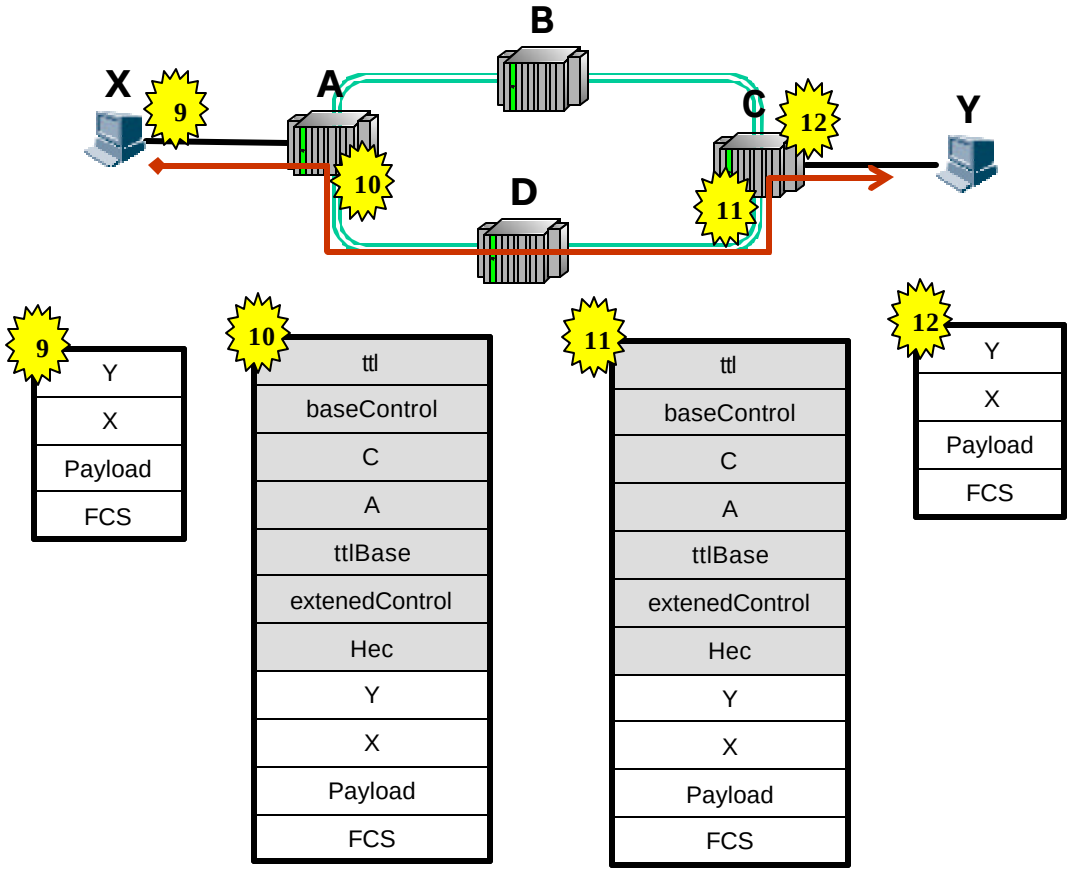
- SAS DB is indexed by the client destination address X
- *rprMACAddress* A is found and inserted in RPR header *da*
- Directed transmission occurs

Step #7

- SAS DB associates client MAC source address Y with source RPR MAC address C, since directed transmission (i.e., RPR header *da* is unicast, and extended frame)

SAS interworking #1 (c)

NOTE: RPR MAC A and C have SAS. RPR MAC B and D do not have a SAS.



RPR station with bridge client

Step #10

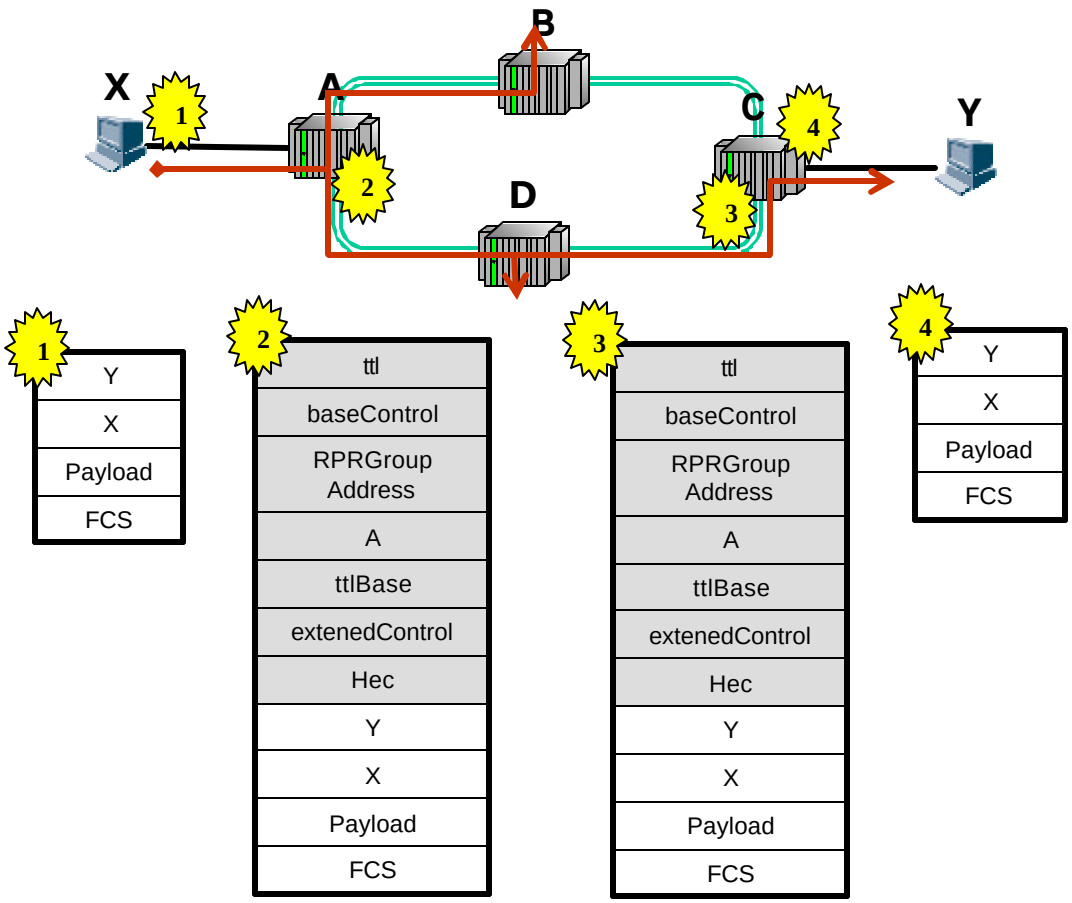
- SAS DB is indexed by the client destination address Y
- *rprMACAddress* C is found and inserted in RPR header *da*
- Directed transmission occurs

Step #11

- SAS DB associates client MAC source address X with source RPR MAC address A, since directed transmission (i.e., RPR header *da* is unicast, and extended frame)

SAS interworking #2 (a)

NOTE: RPR MAC A has SAS. RPR MAC B, C, and D do not have a SAS.



Step #2

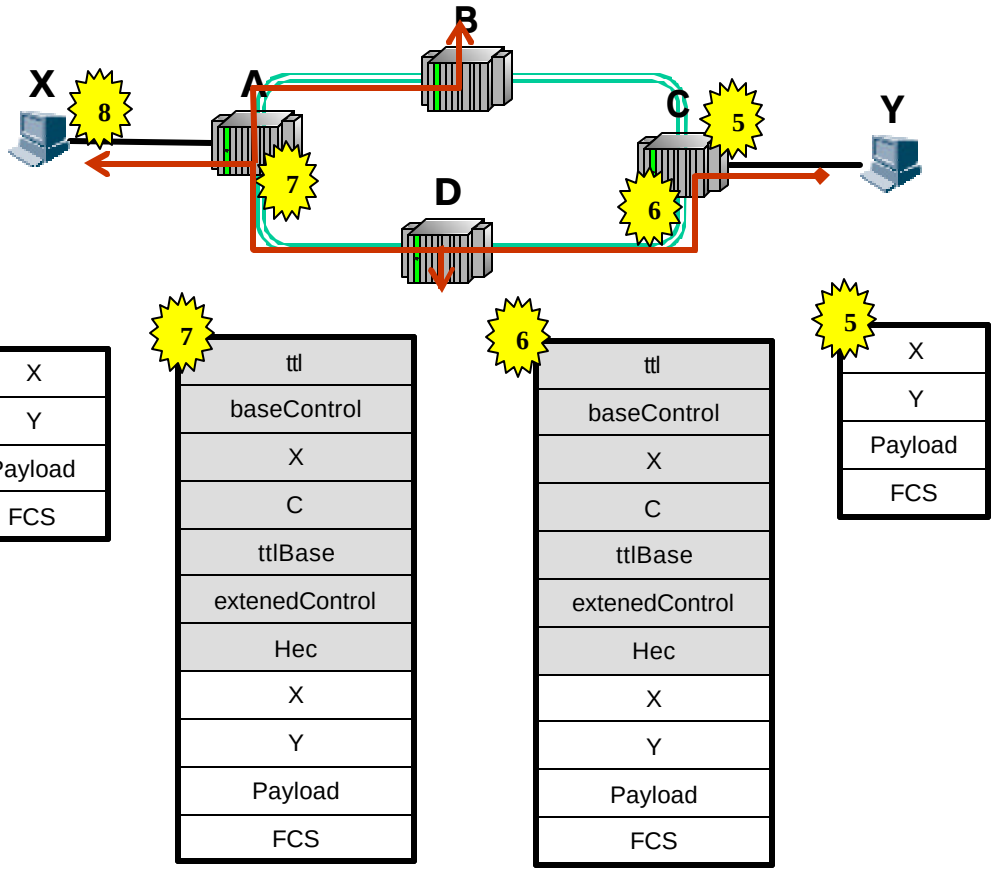
- SAS DB is indexed by the client destination address Y
- No entry found, thus *RPRGroupAddress* placed in RPR header *da*
- Undirected transmission occurs

Step #3

- SAS not present

SAS interworking #2 (b)

NOTE: RPR MAC A has SAS. RPR MAC B, C, and D do not have a SAS.



Step #6

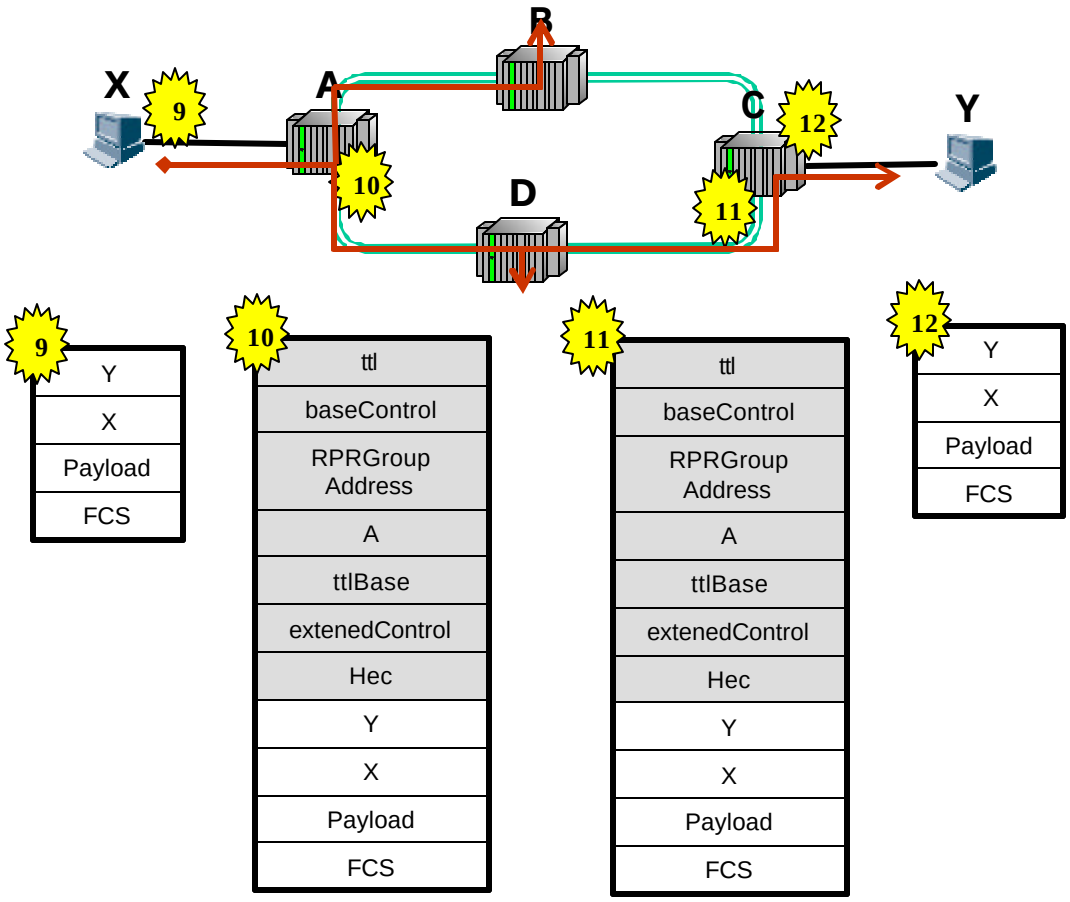
- SAS not present
- Undirected transmission occurs

Step #7

- SAS DB does not perform any learning/associates, since undirected transmission and RPR header *da* is not *RPRGroupAddress*

SAS interworking #2 (c)

NOTE: RPR MAC A has SAS. RPR MAC B, C, and D do not have a SAS.



Step #10

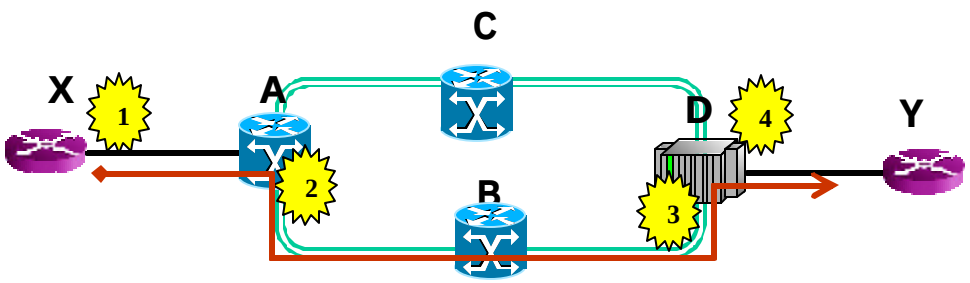
- SAS DB is indexed by the client destination address Y
- No entry found, thus *RPRGroupAddress* placed in RPR header *da*
- Undirected transmission occurs

Step #11

- SAS not present

Back Up

Bridging over RPR



RPR station with bridge client

RPR station with router client

1

A
X
Payload
FCS

2

ttl
baseControl
D
A
ttlBase
extenedControl
Hec
Y
A
Payload
FCS

3

ttl
baseControl
D
A
ttlBase
extenedControl
Hec
Y
A
Payload
FCS

4

Y
A
Payload
FCS

NOTE: SAS DB at station A has learnt that client MAC address Y is located behind RPR MAC address D. In RPR frame header: extended frame (ef) bit = 1, flooding indication bit = no flood, source address = source RPR MAC address, and destination address = destination RPR MAC address (D).