RPR MAC Model

IEEE 802.17

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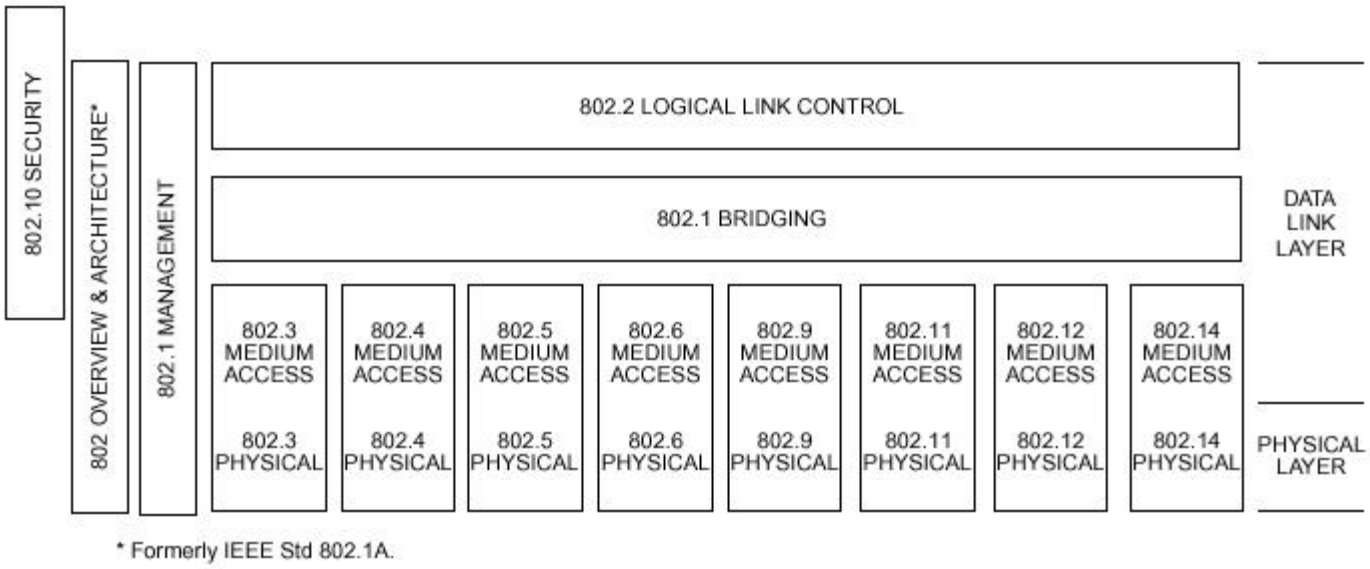
Agenda

- Bridging Model
- BW Management Model

802.1 Architecture Model

- 802.1 Architecture Model
  - 802.1 Bridging is a sublayer within the Data Link layer
  - MAC is also a sub-layer within the Data Link Layer



End Station Reference Model

- Overview and Architecture document

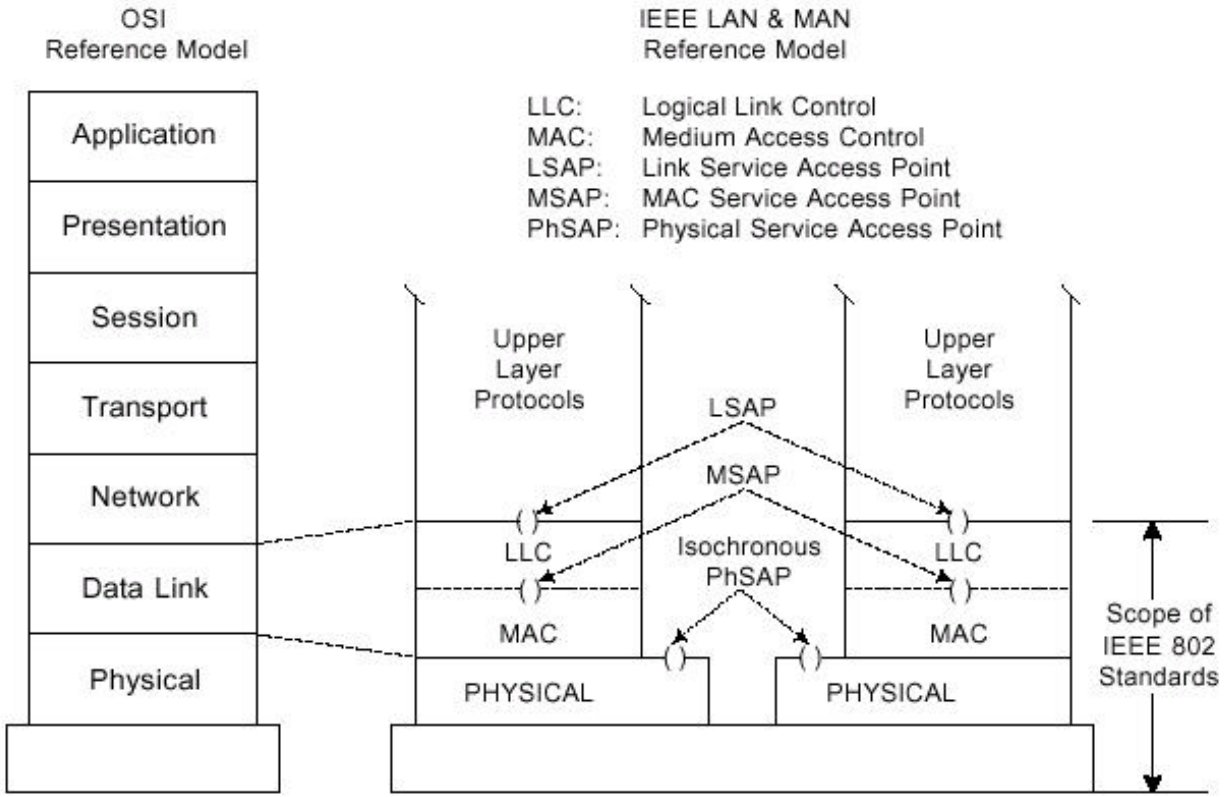
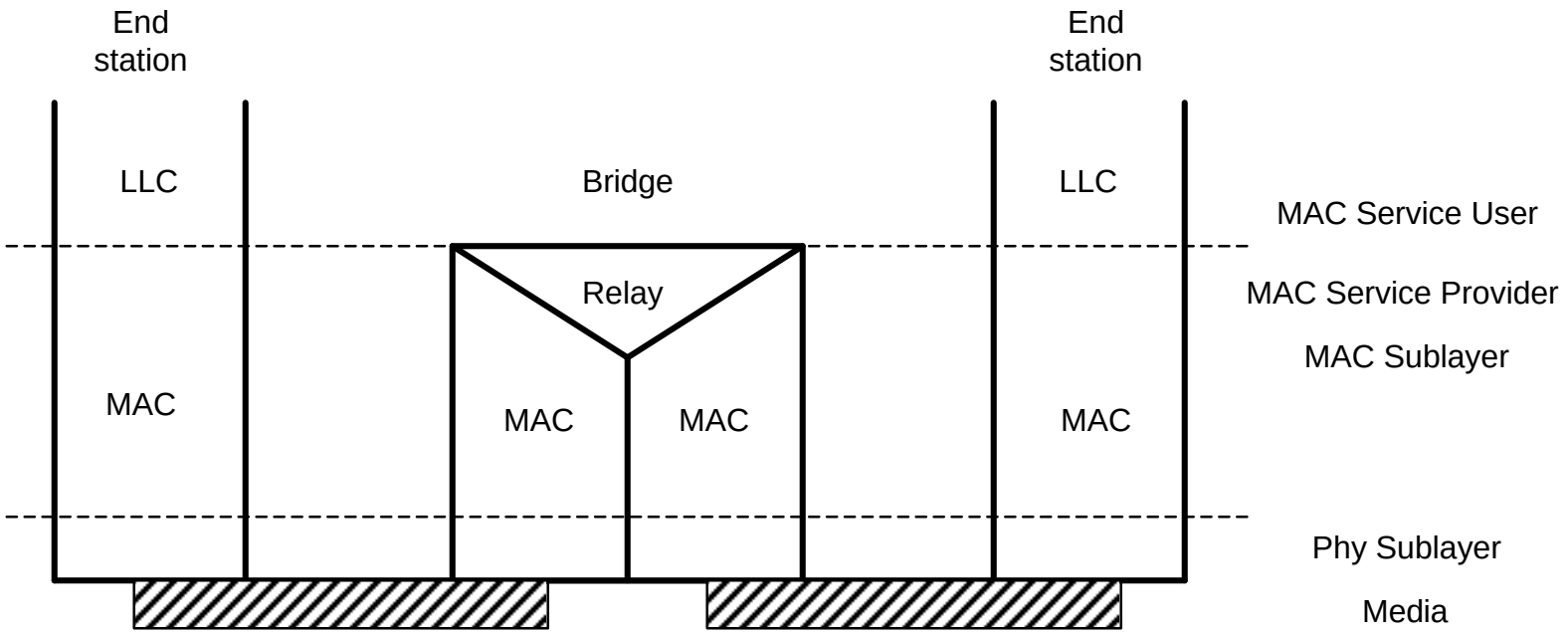


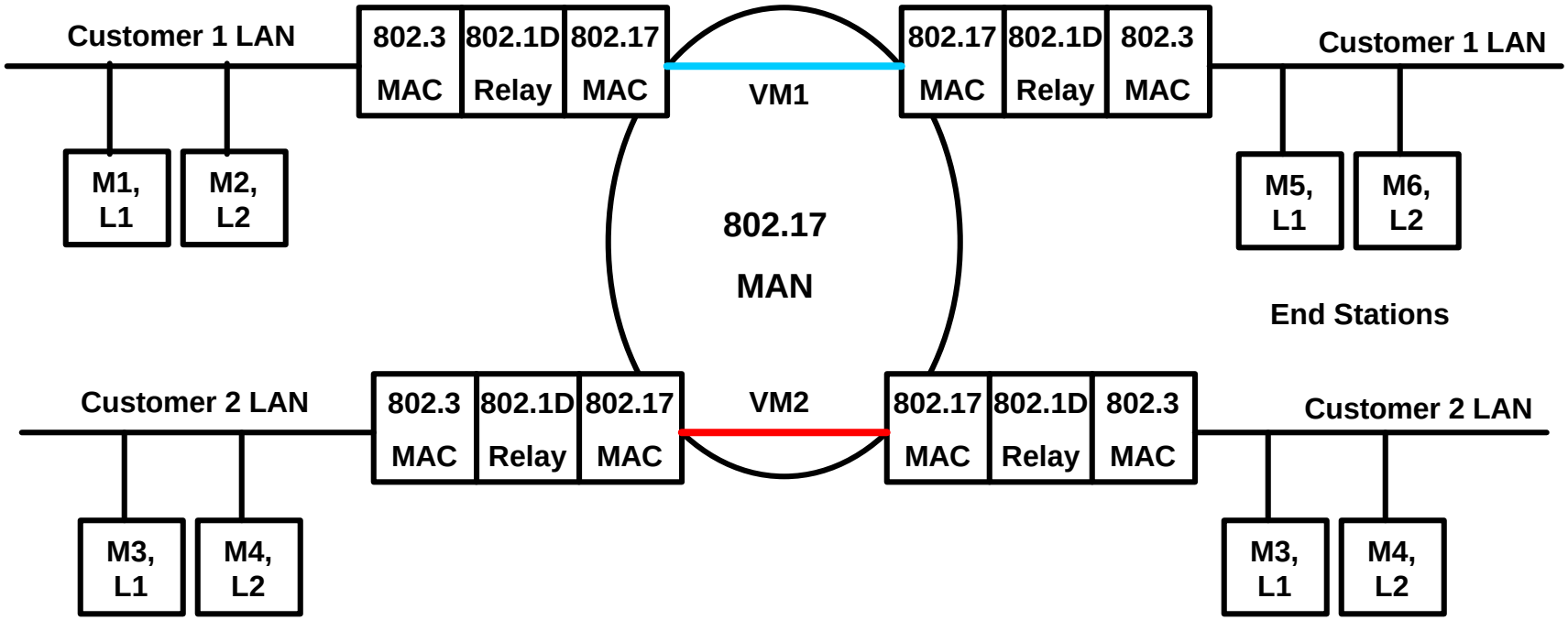
Figure 1—IEEE 802 reference model for end stations (LAN&MAN/RM)

MAC Sublayer with Bridging



Transparent Bridging

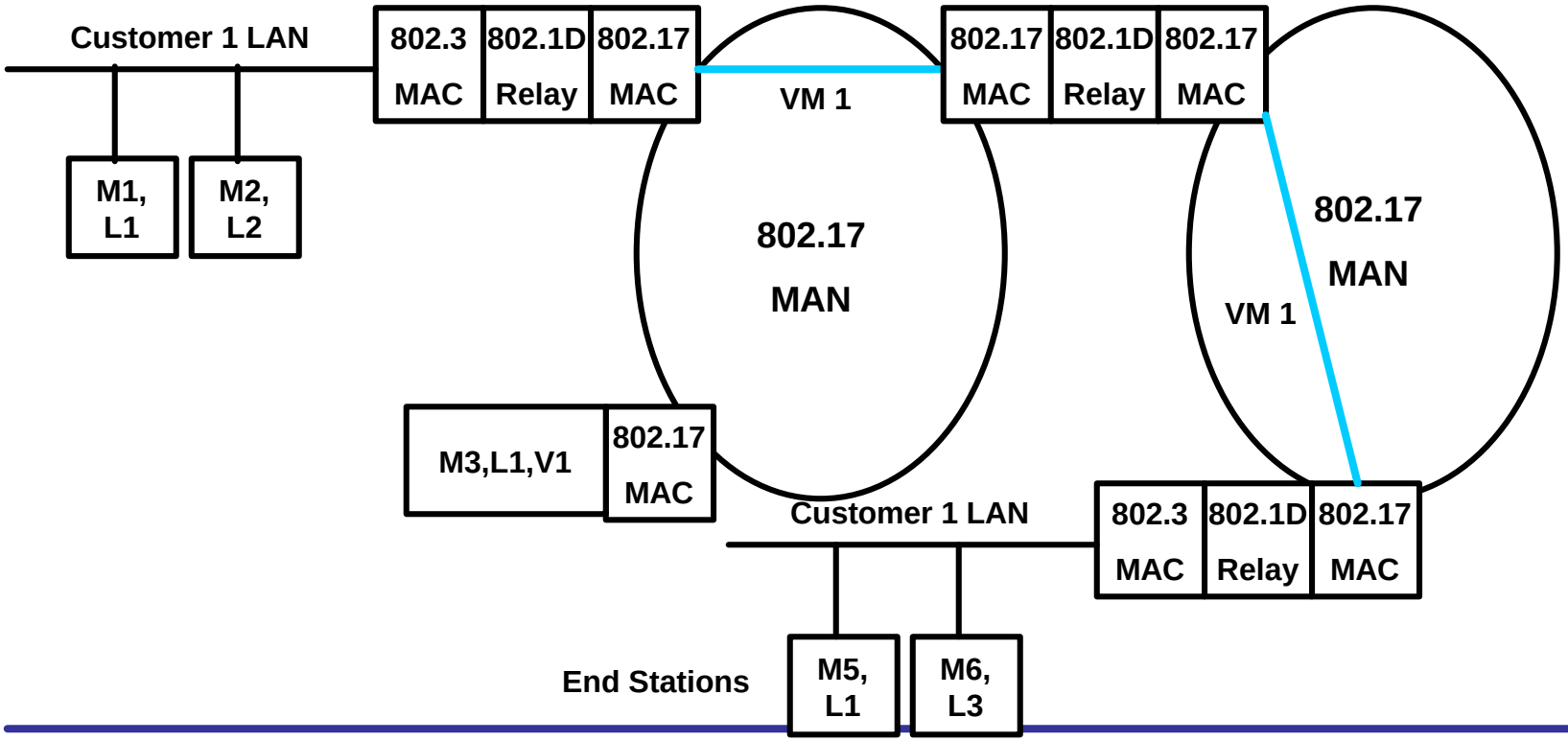
- Need a Customer Traffic Separation ID/Virtual Media (VM) field in the RPR header, in addition to 802.1p&Q tags
  - Maintain Customer VLAN and Priority tags (802.1p&Q)



A host is identified as M (MAC address), L (VLAN ID), V (VMID)

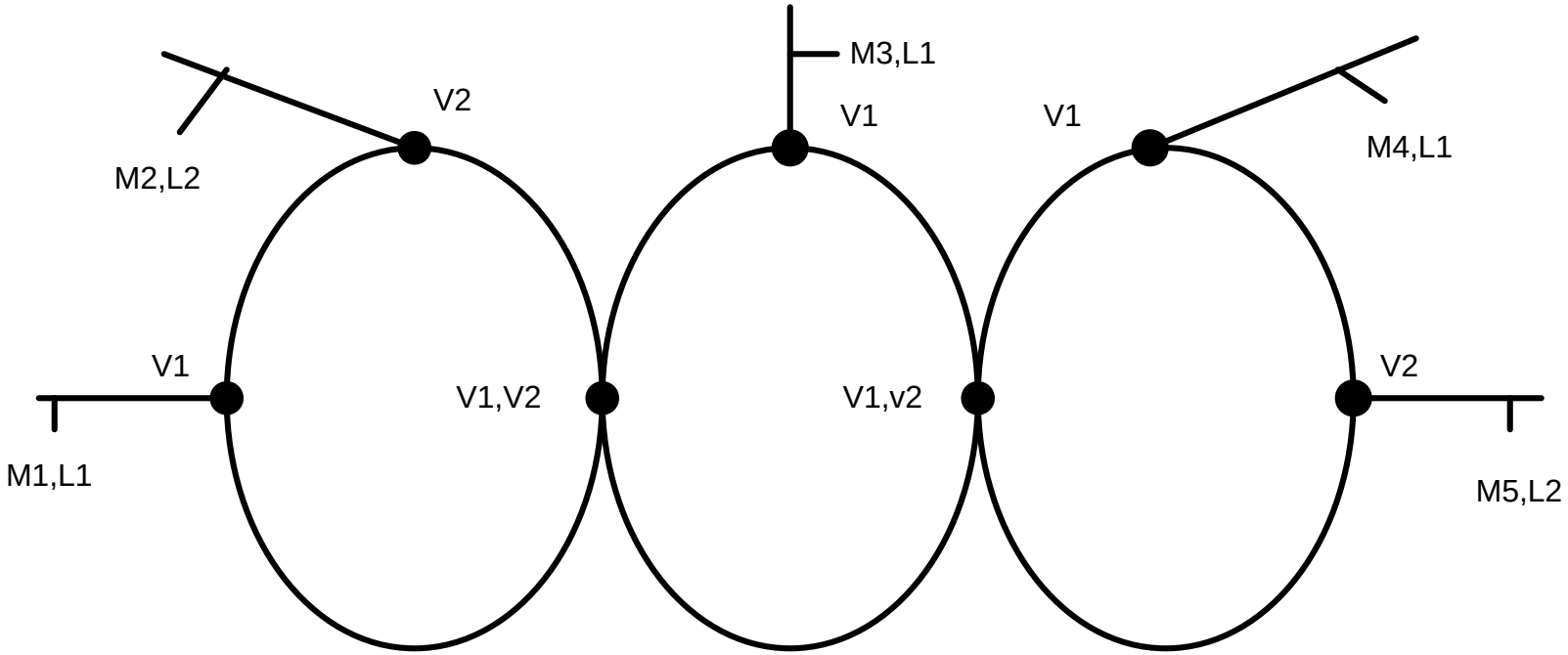
Virtual Media (VM)

- VMID limits the broadcast domain for unknown DAs and provides traffic separation/security



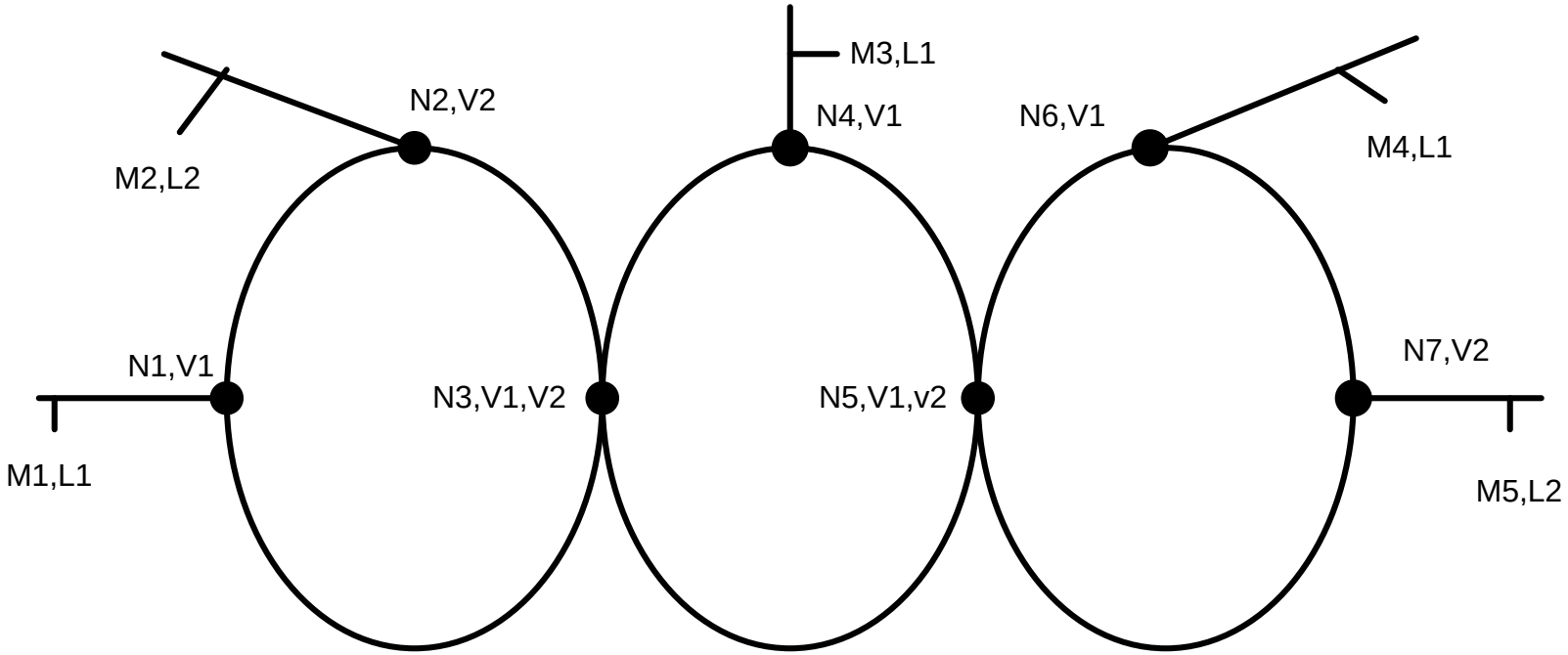
Addressing: No Re-encapsulation

- Each destination is reached via MAC, VLAN and VM Ids
  - Abbreviation: M (MAC address), L (VLAN ID), V (VMID)



Addressing: Re-encapsulation

- Nodes have individual MAC addresses
- A node may belong to multiple VMs

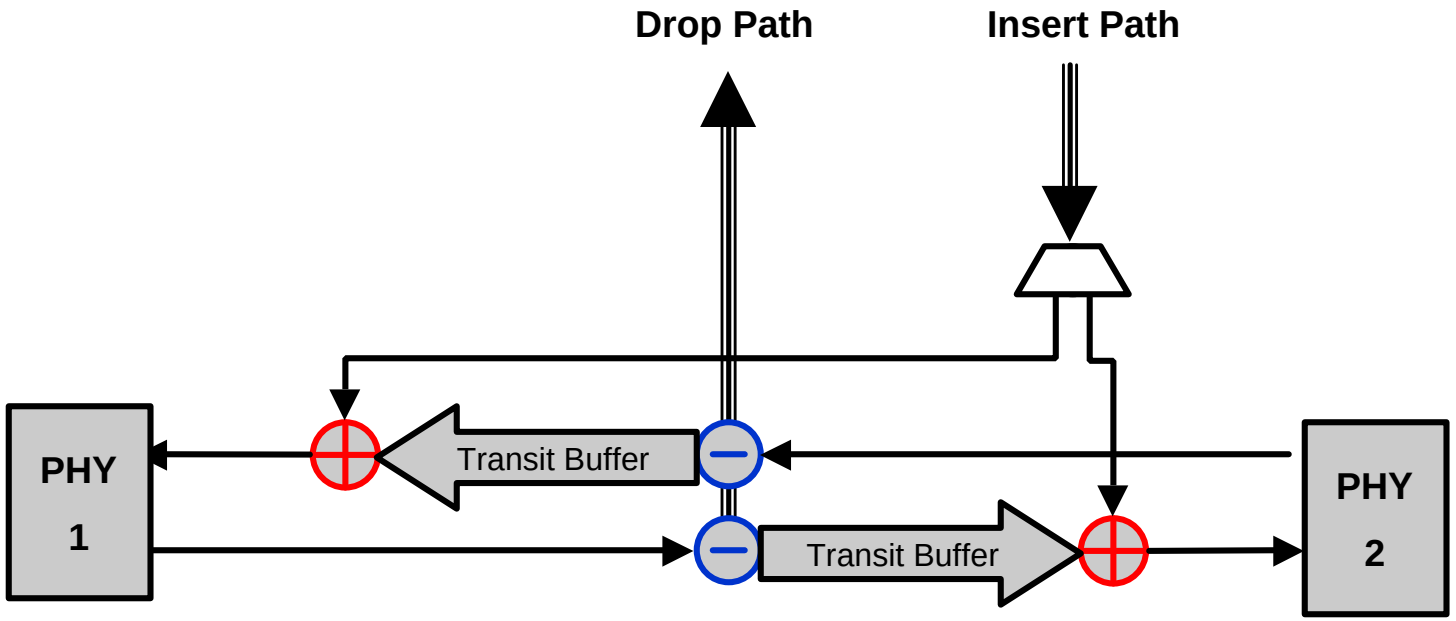


Addressing Options

- No re-encapsulation (Lower Overhead)
  - DA,SA,(VLAN),VM
  - RPR Header
  - Handles both bridged LANs and directly attached stations
- Re-encapsulate
  - DA, SA,(VLAN),DN,SN,VM
  - RPR Header
  - How to address directly attached stations?
- Requires Extensions to 802.1?
- Re-use Ethernet Frame format
- Additional fields to indicate unknown DA and MC?
- Re-encapsulation as an option?

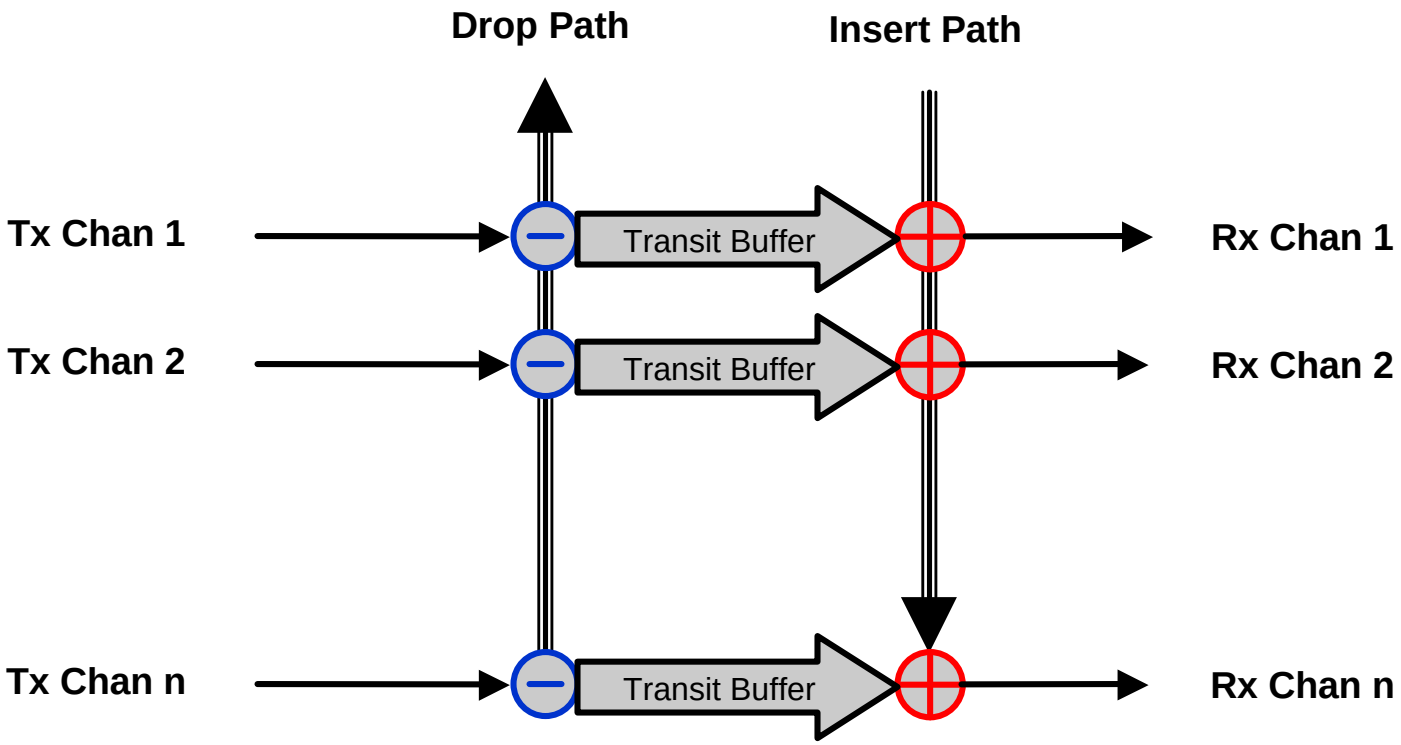
Dual Counter Rotating Rings

- Example of RPR MAC utilizing Ethernet Phy

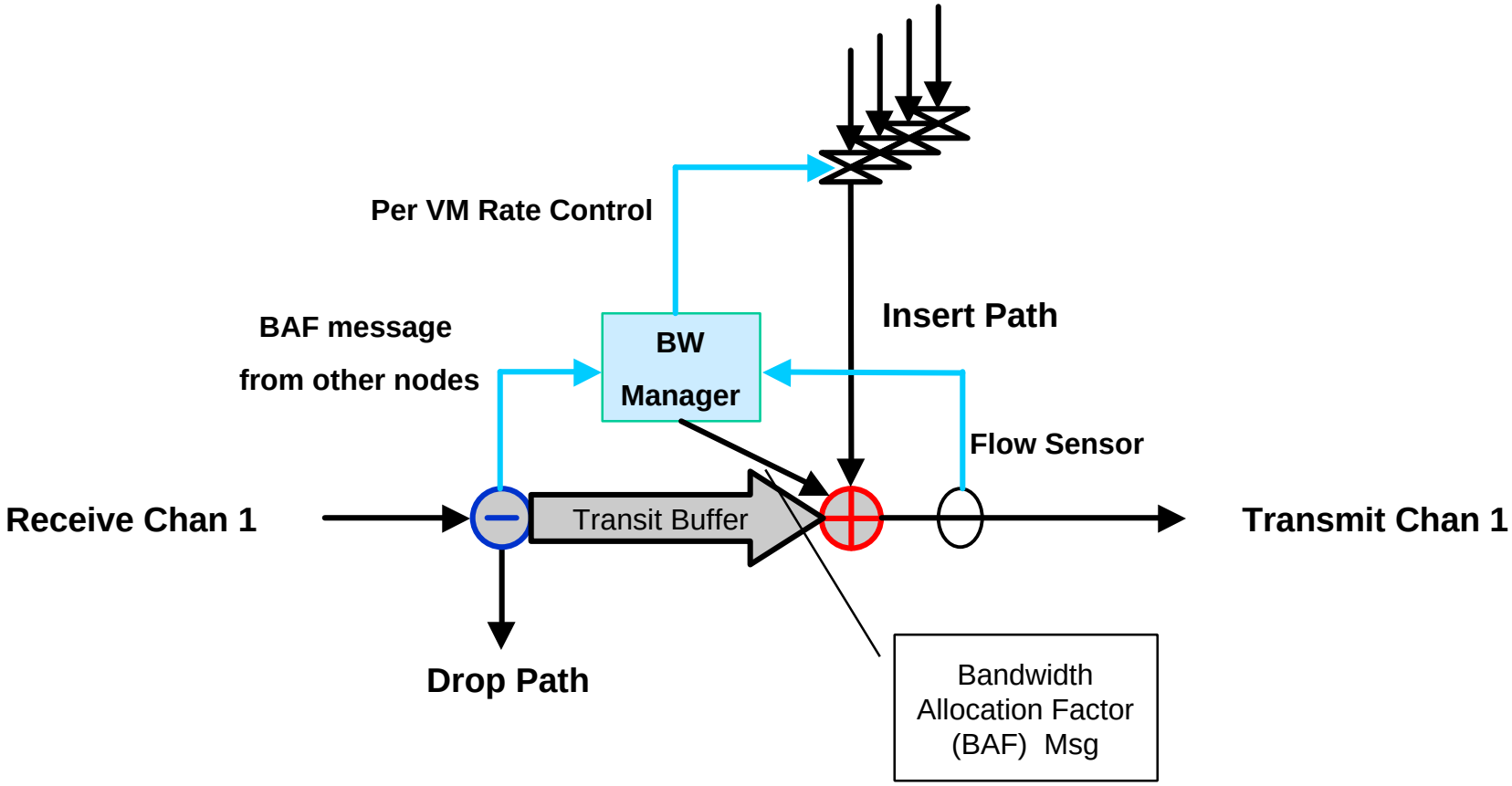


Multi Ring

- Multiple Logical/Physical rings Controlled by the same MAC
- Example use: multiple fibers, multiple Sonet channels, multiple lambdas



MAC Internal Data Paths



BW Management

- Per Virtual Media (Node, Class, etc) BW allocation scheme

$$R_i = r_i + w_i \frac{(C - \sum_{active} r_i)}{\sum_{active} w_i} \qquad BAF = \frac{(C - \sum_{active} r_i)}{\sum_{active} w_i}$$

- Where:
  - Ri = rate available for VM i
  - r = reserved rate, w = weight (WFQ parameters)
  - C = Link Capacity
  - BAF = Bandwidth Allocation Factor

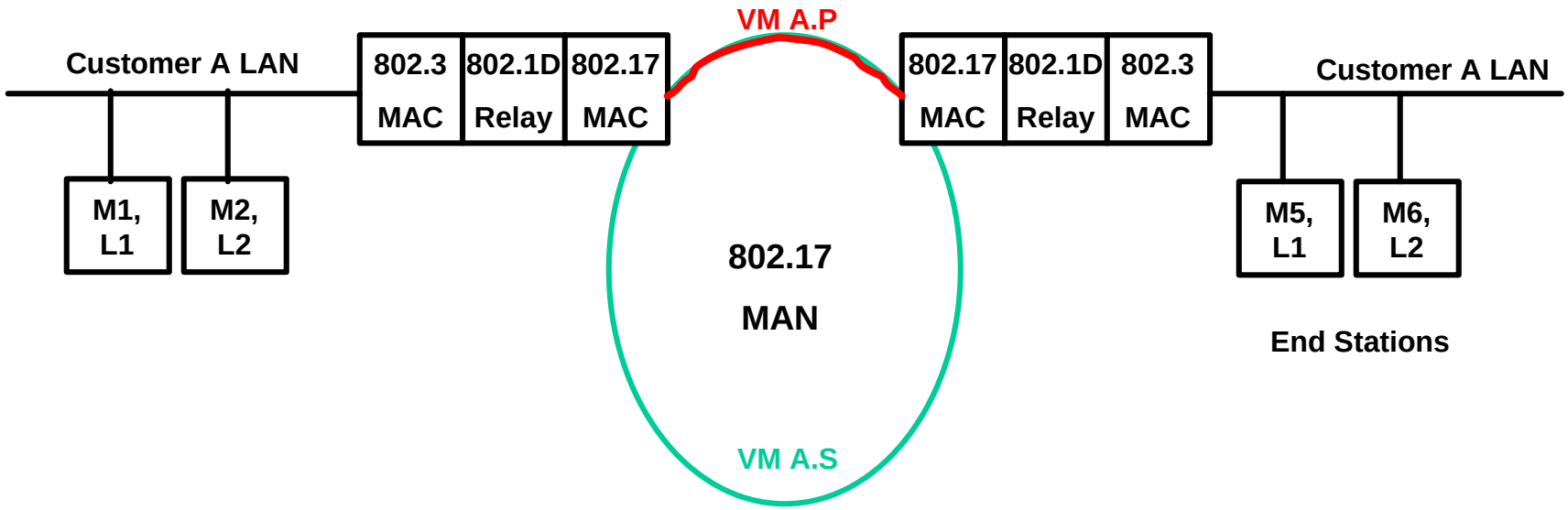
Dynamic Rate Control

- Insert rate per VM is calculated per most congested ring channel, in the path traversed by the packet
- Ri and Wi can be configured per VM

$$insert\_rate = r_i + w_i * \min_{src->dest}(BAF_j)$$

Protection Model

- Protection per Virtual Media
  - Each VM can have a backup (secondary VM)
  - Protection VM can have different Ri and Wi
- Primary VM 1.P
- Secondary VM 2.S



Summary

- MAC Model needs to address Transparent Bridging
- Virtual Media (VM)
  - Additional “tag” to provide traffic separation, security and limit “unknown destination” broadcast domain
- Dynamic Bandwidth Management Model
- Variable protection per VM