Multiple Registration Protocol
Multiple MAC Registration Protocol

Author: **Hesham ElBakoury**
Version: 1.0
HUAWEI TECHNOLOGIES CO., LTD.

HUAWEI

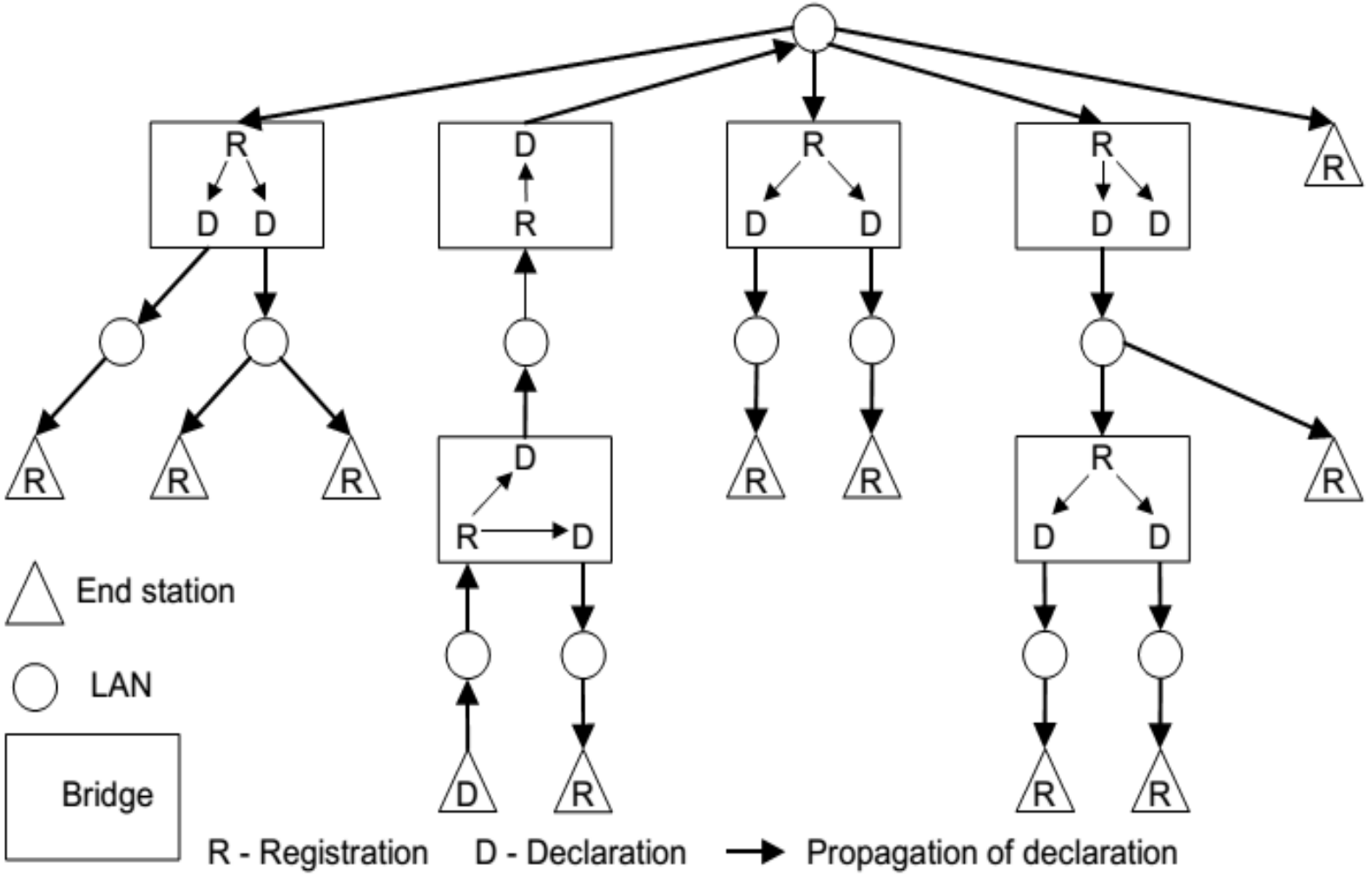
What is Multiple Registration Protocol

- **IEEE Std. 802.1ak-2007 Multiple Registration Protocol (MRP) is a robust, efficient protocol for declaring attributes to be registered in a database in each port of each bridge (optionally, station) in a bridged network. MRP replaces GARP (Generic Attribute Registration Protocol (GARP).**
- **Four applications (so far) are based on MRP: MVRP, MMRP, MSRP and MIRP.**
- **MVRP (Clause 11): Attribute is a VLAN ID. MVRP replaces GVRP**
  - Stations or configured Bridge Ports make (withdraw) declarations if they do (not) need to receive frames for a given VLAN ID.
  - If a VLAN ID is registered on a Bridge Port by MVRP, the Bridge knows that that frames for that VLAN ID should be transmitted on that Bridge Port.
- **MMRP (Clause 10.9): Attribute is a MAC address, often a multicast address. Replaces GMRP.**
  - Stations or configured Bridge Ports make (withdraw) declarations if they do (not) need to receive frames for a given address. If an address is registered on a Bridge Port by MMRP, the Bridge knows that that frames for that address should be transmitted on that Bridge Port

Filtering Services in Bridged Networks

- **Basic Filtering Services**. These services are supported by the Forwarding Process (8.6) and by Static Filtering Entries (8.8.1), Static VLAN Registration Entries (8.8.2), Dynamic Filtering Entries (8.8.3), and Dynamic VLAN Registration Entries (8.8.5) in the Filtering Database. The information contained in the Dynamic Filtering Entries is maintained through the operation of the Learning Process (8.7), while the information contained in the Dynamic VLAN Registration Entries is maintained through the operation of MVRP (11.2) and MIRP (Clause 39).
- **Extended Filtering Services**. These services are supported by the Forwarding Process (8.6),and the Static Filtering Entries (8.8.1) and MAC Address Registration Entries (8.8.4) in the Filtering Database. The information contained in the MAC Address Registration Entries is maintained through the operation of MMRP (10.9)

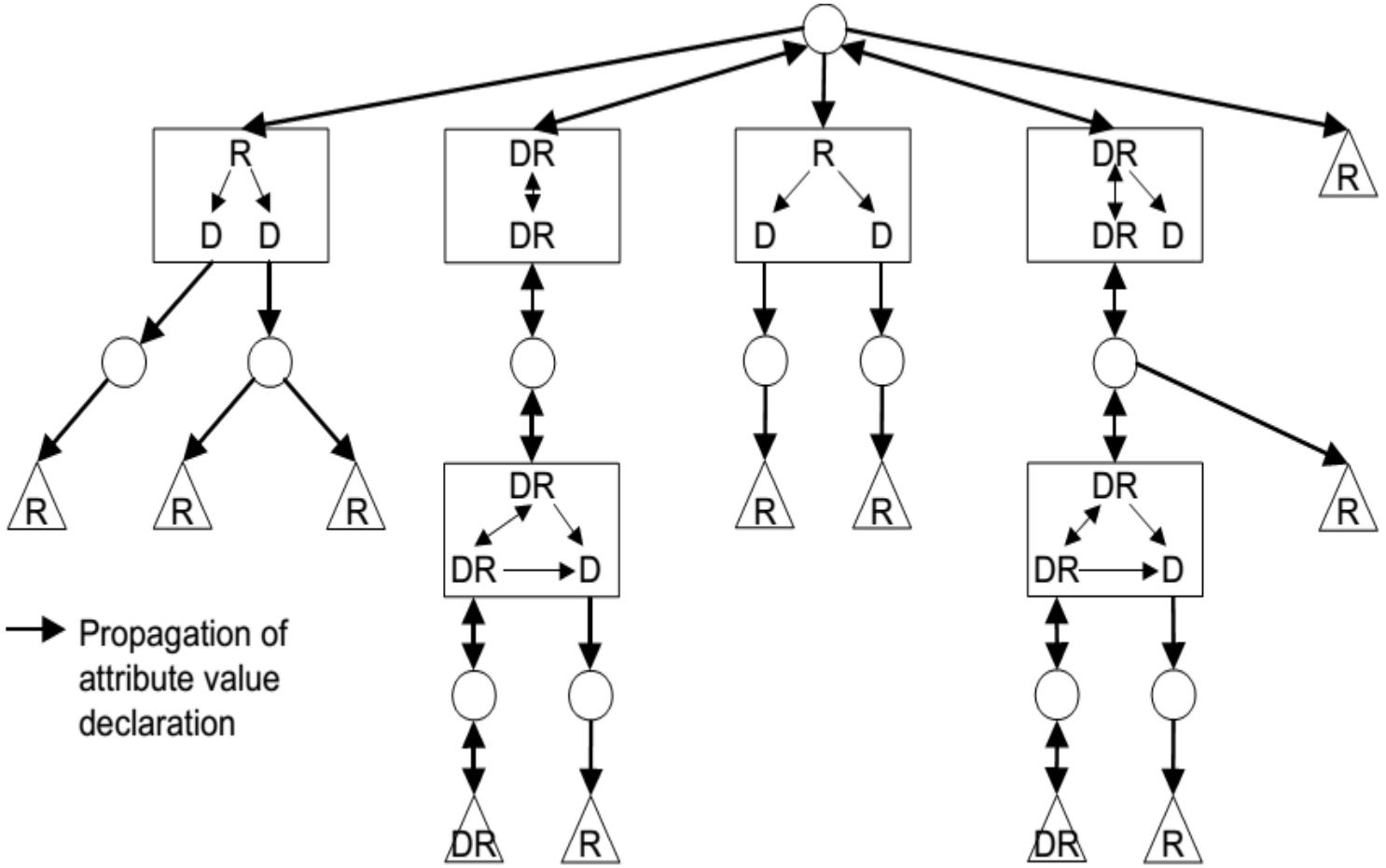
Example—Attribute value propagation from one station



✓Devices declare their desire for a given attribute by making a *declaration*
✓Done by issuing a *Join* event
✓Declarations can be withdrawn by issuing a *Leave* event
✓Devices enter a registration for an attribute on a given port when they hear a declaration for the attribute on that port

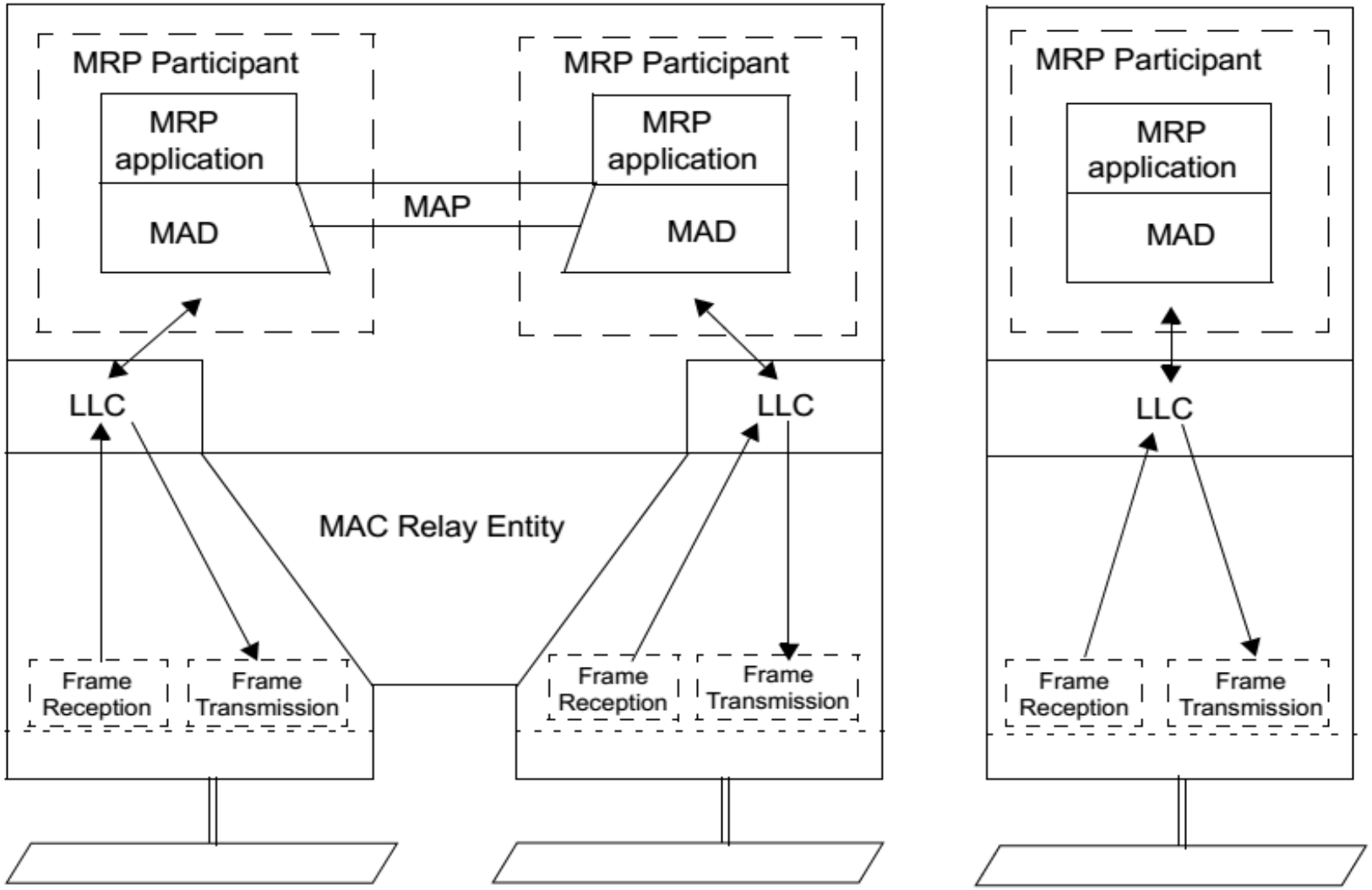
✓Registration can occur on any bridge port regardless of the Port state.
✓Propagation of declaration follows Spanning tree active topology.

Example—Attribute value propagation from two stations



if the attribute in this Figure is a Group MAC Address that is used as a destination address for a video data stream, and it is deemed desirable fort hat video data to be sent only to the subset of the active topology that contains end stations that have declared that attribute, then an end station that is the source of that video stream could use the presence or absence of a registration as an indication of whether or not to send the data on the LAN to which it is attached. Any Bridge receiving the data could determine on which Ports the data should be forwarded

MRP Architecture



MRP Architecture Components

- **MRP Application.**
  - MVRP, MMRP
- **MRP Participant**
  - One exists per application for each point of attachment (end station or Bridge Port).
  - Declares or registers Application Attributes.
  - Attributes encoding and decoding is application specific.
  - It includes **MRP Attributes Declaration component (MAD)** which generates MRP messages for transmission and processes MRP messages received from other Participants.
- **MRP Attribute Propagation (MAP)**
  - Propagates attribute information between per-port Participants.
  - Enables propagation of attributes registered on Bridge Ports across the Network to other Participants.
  - MAP Context defines the active topology (ex: VLAN Context, RSTP Context).
    - **When MRP application is used in multiple VLAN contexts, an instance of the Participant exists for each VLAN**

MRP Operation

- **MRP Participant Maintains Four state machines**
  - Registrar State Machine for each Attribute
  - Applicant State Machine for each Attribute
  - LeaveAll State Machine
  - Periodic Transmission State Machine
- **The following four distinct messages communicate the transmitting participant's state for an Attribute:**
  - Empty – Not Declared and not registered
  - In – Not Declared, but Registered
  - JoinEmpty – Declared, but not registered.; JoinIn -- Declared and registered
  - Leave—Previously registered, but now withdrawn; LeaveAll—All registrations will shortly be deregistered; Participants need to reregister
  - New—Newly declared, and possibly not previously register
- **Applicant-Only Participants (e.g. end stations)**
  - Only support Applicant and Periodic Transmission State machines.
- **The Registrar for each attribute implements 3 states for the attribute :**

  IN – Registered; LV – Previously registered, but now being timed out; MT – Not registered.

Protocol Timers

- **The Join Period Timer, jointimer, controls the interval between transmit opportunities that are applied to the Applicant state machine.**
  - An instance of this timer is required on a per-Port, per-MRP Participant basis.
  - Default value is 200 msec.
- **The Leave Period Timer, leavetimer, controls the period of time that the Registrar state machine will wait in the LV state before transiting to the MT state.**
  - An instance of the timer is required for each state machine that is in the LV state
  - Default value is 600 msec to 1 sec.
- **The Leave All Period Timer, leavealltimer, controls the frequency with which the LeaveAll state machine generates LeaveAll PDUs.**
  - The timer is required on a per-Port, per-MRP Participant basis.
  - Default value is 10 sec.
- **The Periodic Transmission timer, periodictimer, controls the frequency with which the PeriodicTransmission state machine generates periodic events**
  - The timer is required on a per-Port basis. It is set to one second when it is starte

MRP Frame Format

Table 10-2—MRP EtherType values

Assignment	Value
MMRP EtherType	88-F6
MVRP EtherType	88-F5
MSRP EtherType	22-EA
MIRP EtherType	89-29

Table 10-1—MRP application addresses

Assignment[a]	Value
Customer and Provider Bridge MMRP address	01-80-C2-00-00-20
Customer Bridge MVRP address	01-80-C2-00-00-21
All Provider Bridge Intermediate Systems	01-80-C2-00-00-2E
All Customer Bridge Intermediate Systems	01-80-C2-00-00-2F

[a]MIRP is an MRP application, but is not assigned an address from this table (39.2.1.5, 39.2.1.6).

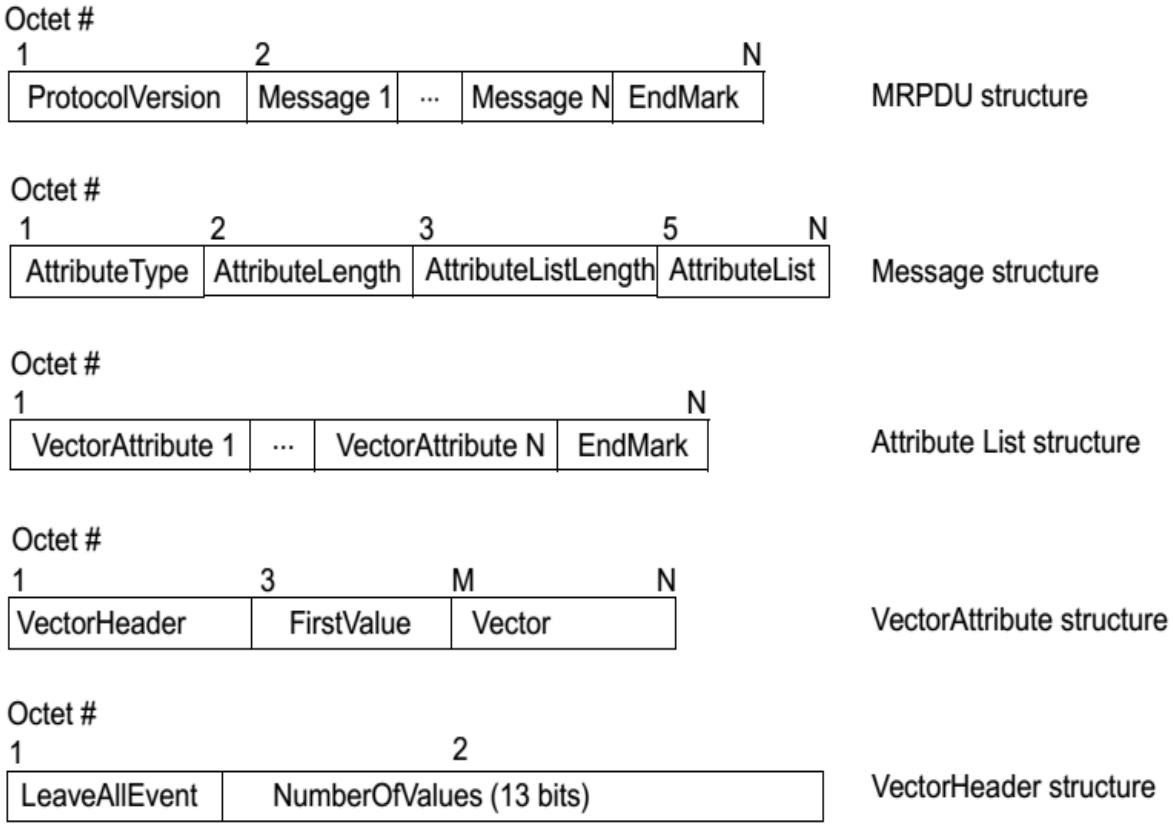


Figure 10-5—Format of the major components of an MRPDU

a) In Bridges and end stations that support the operation of the MRP application concerned, all MRP PDUs shall be submitted to the MRP Participant associated with the reception Port for further processing.
b) In Bridges that do not support the operation of the MRP application concerned, all MRP PDUs shall be submitted to the Forwarding Process

Multiple MAC Registration Protocol (MMRP)

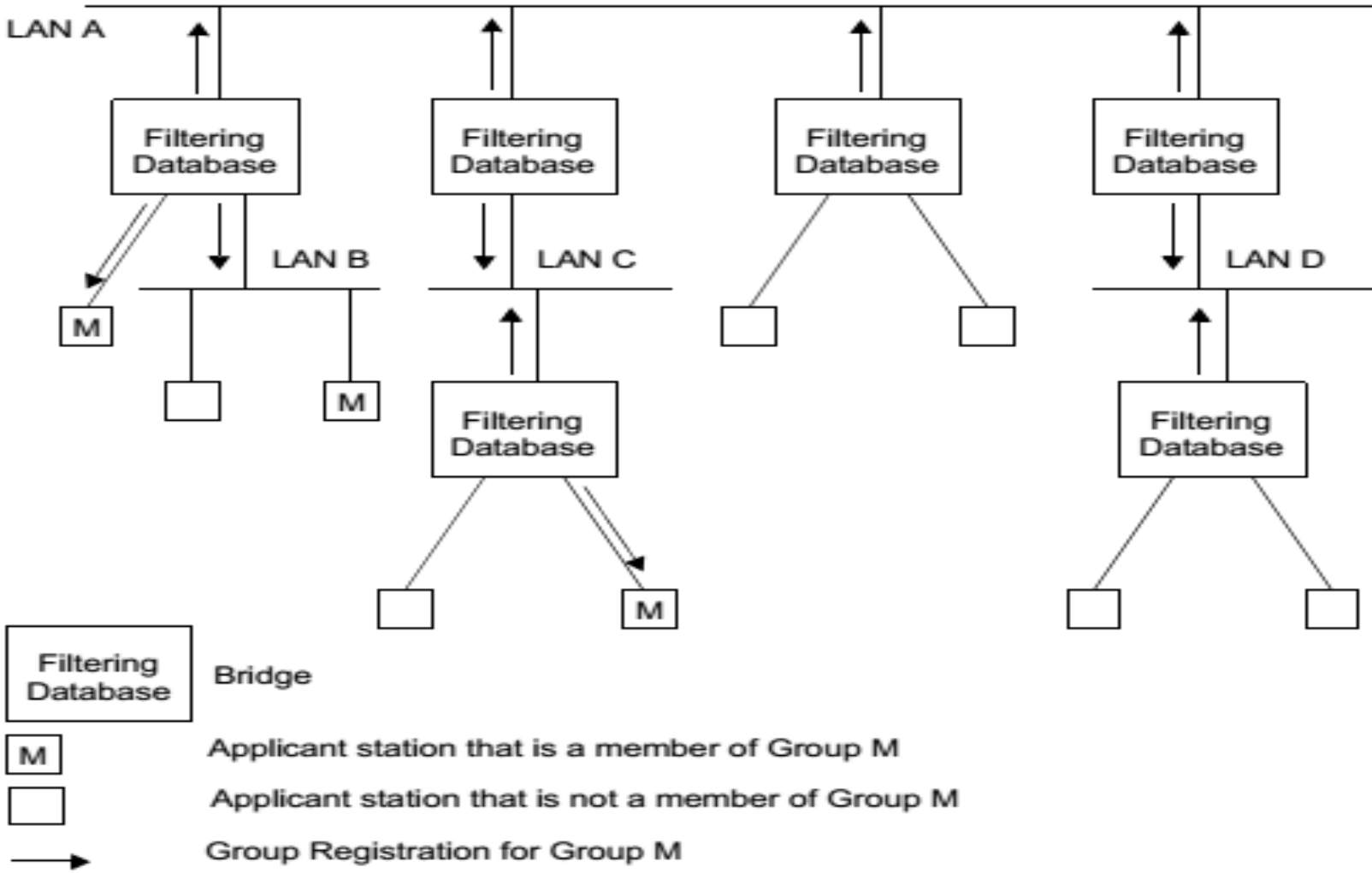
Purpose

- MMRP provides a mechanism that allows end stations and MAC Bridges to dynamically register (and subsequently, deregister) Group membership or individual MAC address information with the Bridges attached to the same LAN, and disseminates that information across all the Bridges that support Extended Filtering Services in the Bridged Network. The operation of MMRP relies upon the services provided by MRP
- The information registered, deregistered and disseminated via MMRP can be group MAC address or individual MAC addresses.
- The exchange of specific Group membership information can result in the creation or updating of MAC Address Registration Entries in the Filtering Database to indicate the Port(s) and VID(s) of the VLAN(s) on which members of the Group(s) have been registered.

MMRP Attribute Types

- **MMRP Defines two attribute types:**
  - Service Requirement Vector Attribute Type (1)
  - The MAC Vector Attribute Type (2)
- **Two types of service requirements are supported:**
  - All Groups shall be encoded as the value 0.
    - **Forward all Multicast is used to support legacy devices that do not support MMRP/GMRP.**
  - All Unregistered Groups shall be encoded as the value 1.
    - **Flood unregistered multicast traffic and other traffic is pruned by MMRP.**
  - The remaining possible values (2 through 255) are reserved.
- **Bridge group filtering behavior for Forward All Groups and Forward Unregistered groups is specified in Clause 8.8.6 of IEEE 802.1Q-Rev.**

Using MMRP To Propagate Group Membership Info.

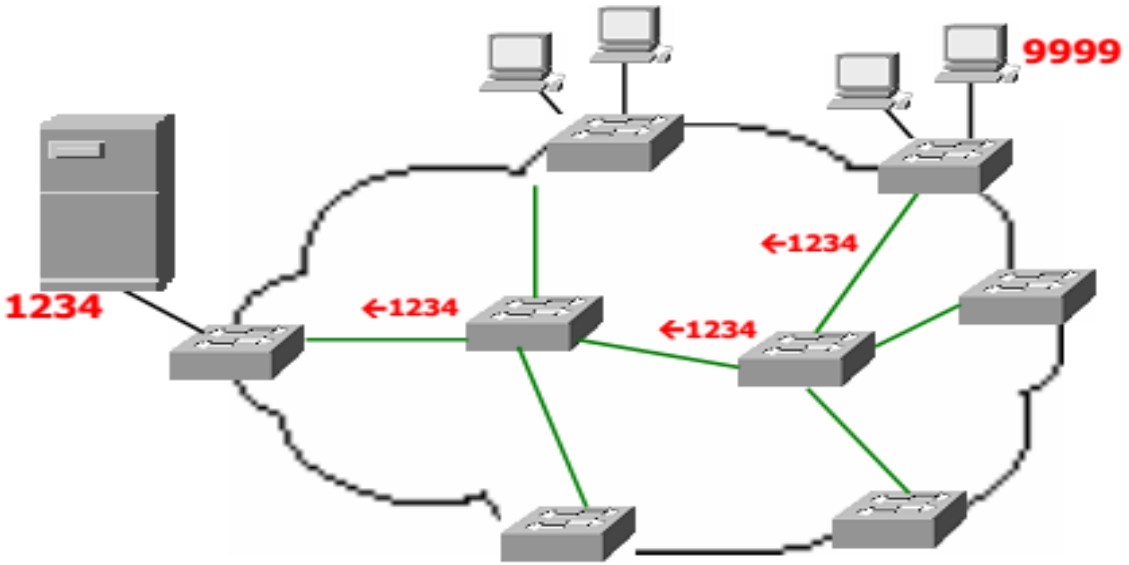


MMRP can be used to dynamically Register/deregister individual or group MAC Address information with bridges attached to the same LAN. This information supersedes learned MAC address location information. Refer to Tables 8-7 to 8-10 in 802.1Q-Rev

Source Pruning

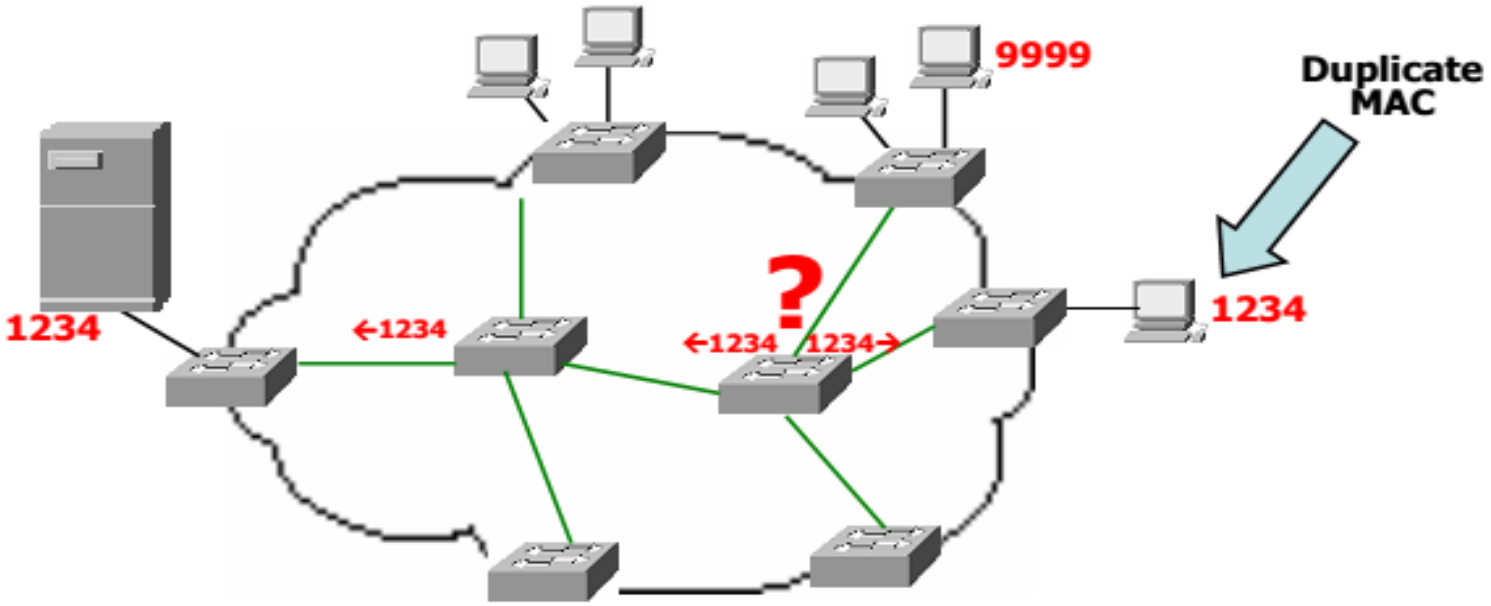
- The operation of MMRP defines a subtree of the Spanning Tree as a result of the creation of MAC Address Registration Entries in the Filtering Databases of the Bridges.
- End stations are also able to make use of the Group Membership information registered via MMRP to allow them to keep track of the set of Groups for which active members currently exist and the service requirements of upstream devices. This allows end stations that are sources of frames destined for a Group to suppress the transmission of such frames, if their registered Group membership and Group service requirement information indicates that there are no valid recipients of those frames reachable via the LANs to which they are attached.
- This end system behavior is known as source pruning which allows MAC Service users that are sources of MAC frames destined for a number of Groups, to avoid unnecessary flooding of traffic on their local LANs in circumstances where there are no current Group members in the network that wish to receive such traffic

Bridge learning with dynamic FDB entries



- Host 9999 floods first time on unicast to server 1234
- Server sends non-flooded response to host
- Server 1234 learned along path to host 9999

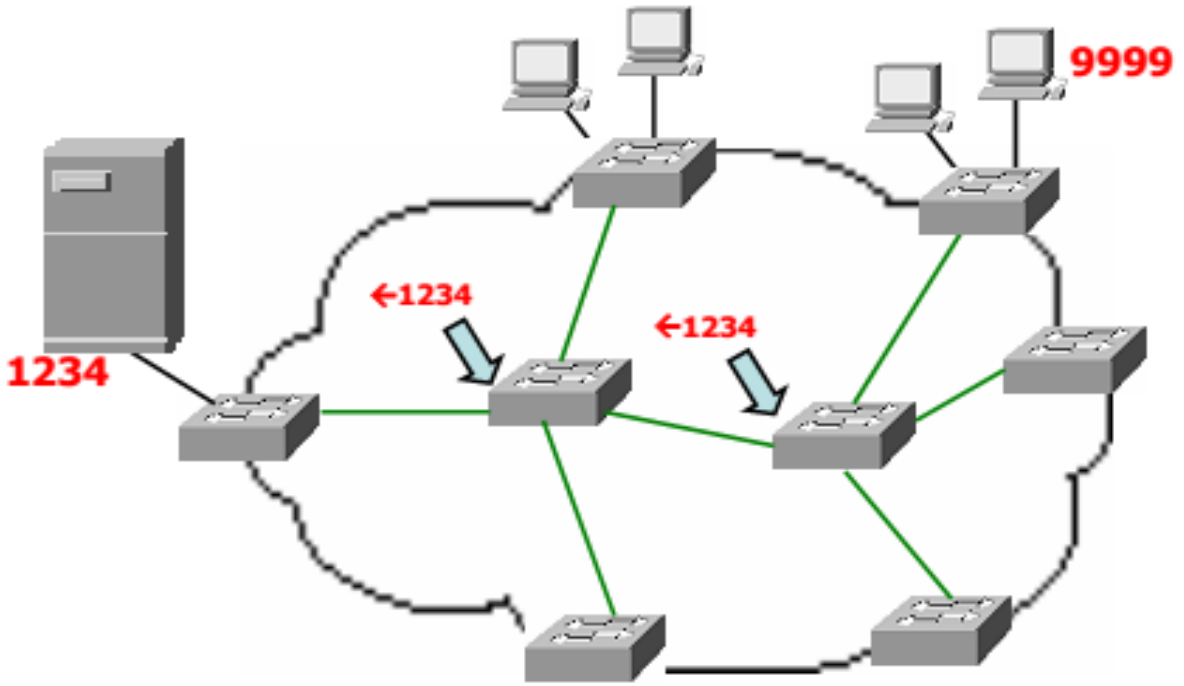
Host added with MAC same as server



- Perhaps error in coordinating locally assigned MAC
- Perhaps duplicate burned-in MAC
- Conflicting dynamic FDB entries overwrite each other

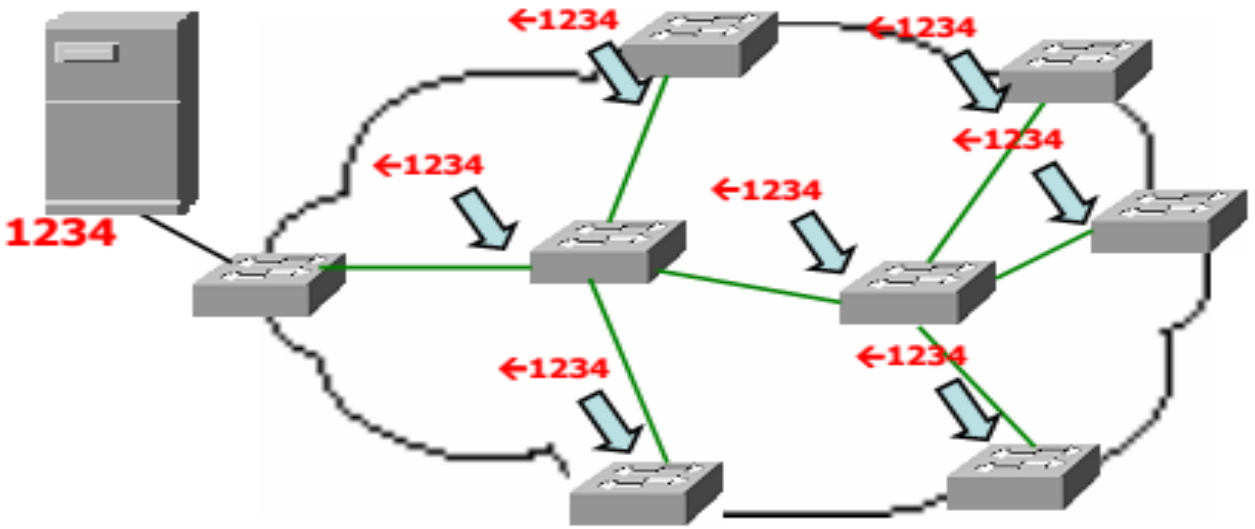
3

Can avoid problem with static FDB entries



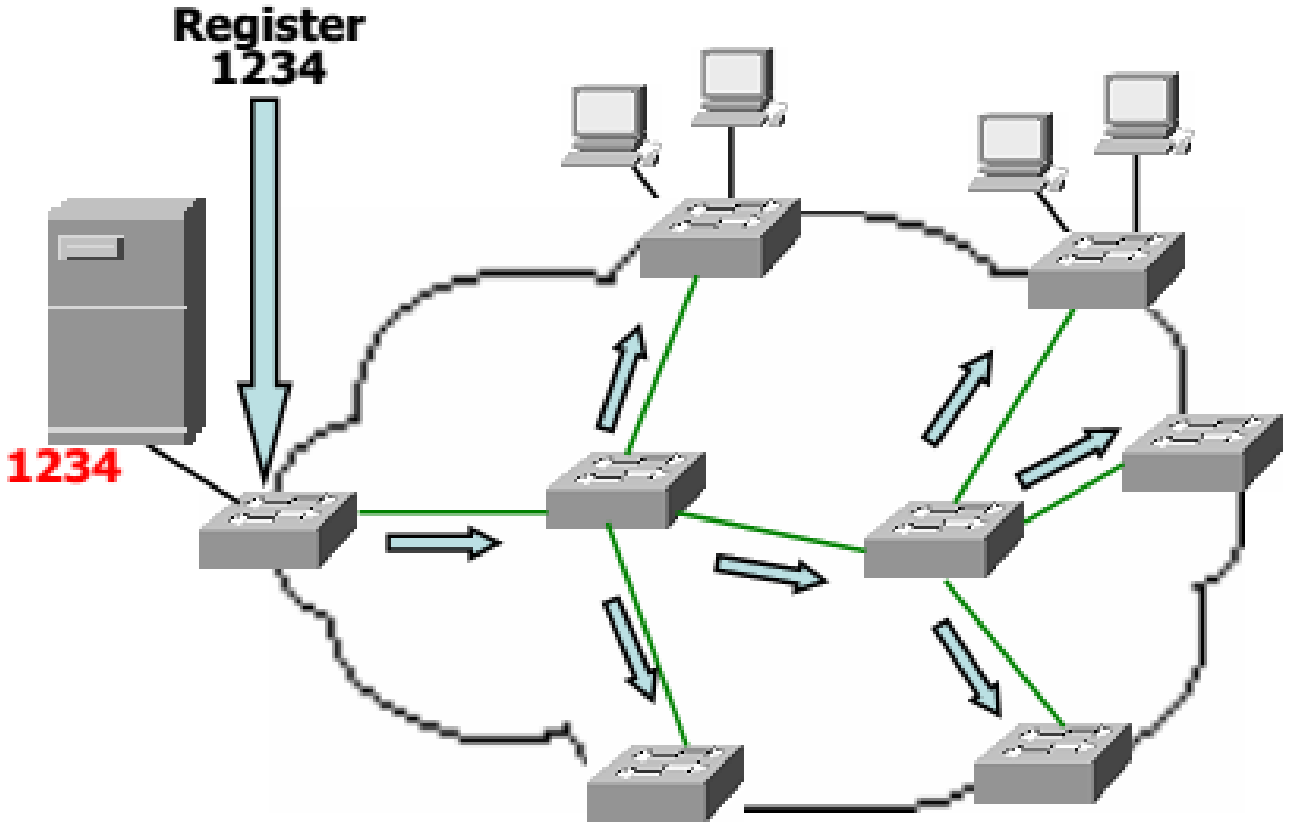
- Static entry locally installed by operator at each bridge
- Location of MAC 1234 no longer learned

local provisioning of a static MAC at every switch is a significant operational burden



- And entries must be changed to reflect any changes in topology

Support Individual MAC Address Registration



THANK YOU

Multiple MAC Registration Protocol (MMRP) - Terminology

- **Participant**: The Bridge port ot end-station that is participating in MMRP
- **Attribute**: The information MRP tracks. In MMRP, the attribute is MAC address (2) and Service Requirement (1) as defined in Clause 8.8.6.
- **Applicant**: The element that announces its interest, ensuring that the *declaration* of the participant is registered by the *registrars* of other participants. The applicant announces the group/individual MAC address and triggers Multiple Registration PDU (MRPDU) propagation.
- **Registrar**: The element that records the declaration from the applicant made by other participants on the LAN.
- **Declaration**: An announcement made by an applicant of its interest in a MAC address by triggering an MRPDU. The declaration of a local participant triggers MRPDU propagation and causes corresponding registrars of other participants to register the MAC address.
- **Propagation**: When an applicant in one participant declares interest in an attribute, it triggers the Bridge to flood MRPDU to all other participants. The propagation always follows the active STP topology