Application Requirements for Support of Duplicate Addresses in VLANS

Contribution to IEEE 802.1Q

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Issues with FDB Models

- Current Assumptions:
  - 1 Spanning Tree
  - Port based VLANs
- Do forwarding rules and FDB structure support instances of an address per VLAN?
  - Why is this important?
 - When is it not-desireable?

Application Requirements

- Migration from Multi-channel hubs to VLANs
- Litmus Test Application Examples
  1. Workstation with two adapters, single MAC
  2. Bridge/Router between VLANs
  3. DECnet P4 router
  4. Tagged end stations
- There are STP issues in example 2.

Migration from Multi-Channel Hub

Consider the following migration (a common requirement in many user sites):
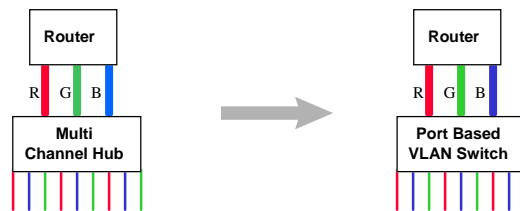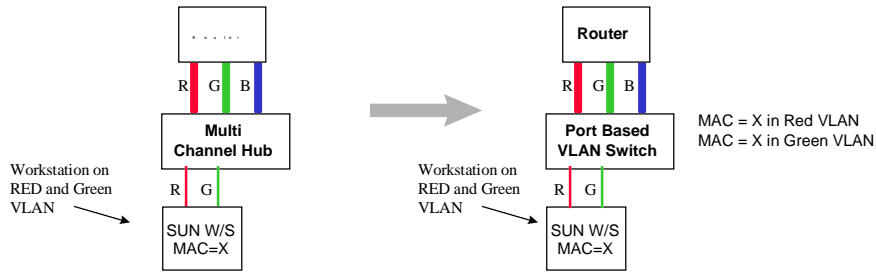

Support for duplicate addressing (by VLAN) in the FDB is required in at least 4 cases.

Multi-adapter - Single MAC

Multi-adapter, single MAC (Sun Workstation):

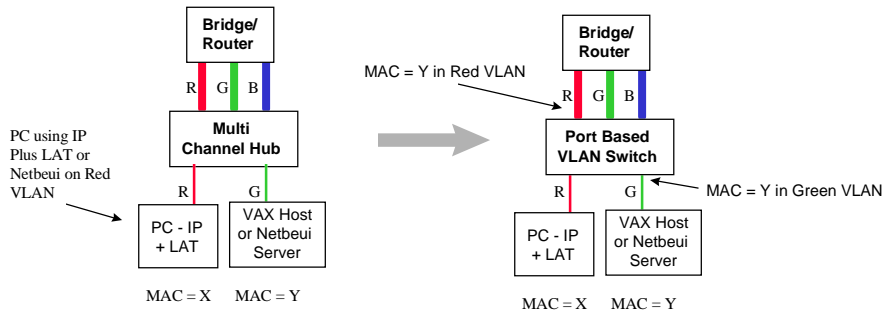Workstation on
RED and Green
VLAN

MAC = X in Red VLAN
MAC = X in Green VLAN

Potential Workaround if FDB does not support
instance of MAC per VLAN = Create MAC unique
addresses for W/S using ifconfig in Unix

Bridge/Router Between VLANs

Bridge/Router Between VLANS (TCP/IP + LAT or NETBEUI)

PC using IP
Plus LAT or
Netbeui on Red
VLAN

MAC = Y in Red VLAN

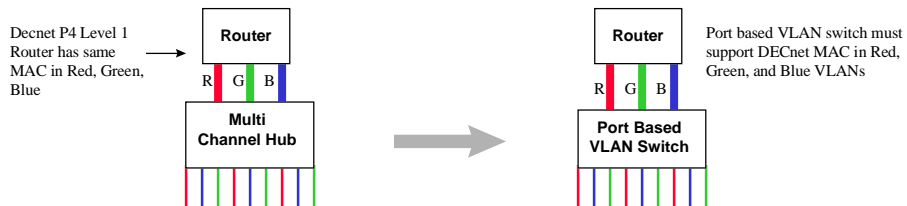MAC = Y in Green VLAN

MAC = X   MAC = Y

Issue: Unless FDB supports instance of MAC per VLAN there is
no workaround for non-routable protocols in the case where a
bridge/router exists between VLANs (ignoring STP issues)

DECnet Router between VLANs

DECnet Phase IV Level 1 Router between VLANS

Decnet P4 Level 1 Router has same MAC in Red, Green, Blue

Router

R G B

Multi Channel Hub

Router

R G B

Port Based VLAN Switch

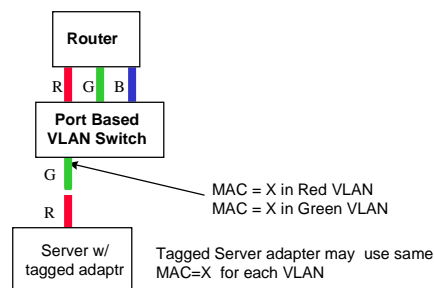Port based VLAN switch must support DECnet MAC in Red, Green, and Blue VLANs

Issue: Unless FDB supports instance of MAC per VLAN there is no workaround for DECnet P4 Level 1router between VLANs for port based VLAN

Tagged End Station

Tagged End Station:

Router

R G B

Port Based VLAN Switch

G

R

MAC = X in Red VLAN
MAC = X in Green VLAN

Server w/ tagged adaptr

Tagged Server adapter may use same MAC=X for each VLAN

1. If tagged endstation uses one MAC, FDB must support multiple VLAN identities for the MAC (at least on one port)

2. Future multiple STP instances might forward RED VLAN on one trunk and GREEN VLAN on another….thus MAC=X would need multiple port identities as well.

Addressing by MAC/VLAN

- Needed: An FDB structure which works to solve these "litmus" tests:

    1. Need logically segmented address filtering data bases

    2. Potential implementations:
        - FDB per VLAN (48 bit lookup within VLAN)
        - Address entries (static and dynamic) include VLAN-ID

    3. Addresses learned and aged separately by VLAN

"Leaky" VLANs

- Should we allow direct forwarding between VLANs? Why?

    1. Separate "broadcast/flood domain" (=VLAN) from directly addressed reachability

    2. Allow schemes bypassing routing between VLANs

    3. Allow (multicast) groups spanning VLANs

- Problem: Previously described scheme doesn't appear to allow this

Conclusion

- There are real application problems which need solution (litmus test cases) which should be applied to our FDB and forwarding processes
- MAC address per VLAN is solvable without complexity
- leaky VLAN solution is a separate issue