HVLAN

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HVLAN

A proposed Ethernet standard that enables extending the use of Ethernet VLAN in enterprise and carrier networks

- VLAN methodology heritage
- HVLAN features an extended ~2^{24-32} address space
- HVLAN includes support for hierarchical addressing schemes
- Provisions for both carrier and enterprise applications

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Scaling Ethernet

Ethernet Scaling Highlighted

- Ethernet address space is 2^48
- More than enough for carrier transport needs
- The problem:
  - 2^48 possible MACs = potentially very big MAC tables at every device in the network

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Ethernet Scaling – Quick Fix

MAC Encapsulation

- Advantages:
  - Limits the MAC space to provider space
  - Demarcation between carrier and customer data-planes
- Limitations:
  - *Non efficient support for Multi-point services using unicast MACS*
  - *Number of services when using Multicast MACs*

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Multi point services
Problem definition

- Carriers need to support MP services (IPTV, L2VPN)
- P2MP and MP2MP require special connectivity scheme, not efficiently supported by p2p data-planes
- Overlaying MP trees over P2P data-plane results in inefficient BW resources allocation

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Why Not Full Mesh?

- Inefficient due to multiplication of frames at source instead of optimal duplication point
- Enormous forwarding table entries at the edges due to full mesh per service

MP over bridged Ethernet options

- Use MAC+VID for unicast
- Use VLAN for MP services
  - Problem: Only 4K VLANs
    - Quick Fix- Use Multicast MACs for P2MP services
      - Problem: *MAC Per P2MP service*
      - *Problem 2: No good solution for MP2MP*,
    - Its back to the MAC scalability issue

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Scalability –RECAP

- 2^48 is not a scalable address space due to potential huge number of entries
- There is a practical limit on FDB size

Mick's rule of thumb: "*If you have more than 50K entries in the core switches- You have a problem*"

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VLAN in Enterprises

- VLAN Enterprise Limitations:
  - VLAN allocation is flat
  - Enterprise organizational structure is hierarchical
  - Thus enterprise networks are segregated accordingly (several VLANs)
  - Routers are needed to communicate between VLANs (router on a stick)

Applying HVLAN to Enterprise

- Allocate hierarchical HVIDs conforming to enterprise hierarchical organizational structure
- Use best match to transverse between HVLANs

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HVLAN Goal function

- Provide native VLAN MP solution
  - Reuse VLAN methodology
  - 2^24-32 tag space
  - Use hierarchy for FDB entries pruning, based on the structure of the HVID
  - Also use best match for flexibility
- Use OAM per HVID
- Use disjoint trees for protection

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HVLAN Components

- New ETPID
- 24-32 bits HVid tag
- Optional 6 Bit QoS tag- DiffServ compatible
- Encapsulation
  - Explicit indication to trigger/disable learning per flow
  - Not required for p2p services
  - Straight forward- less overhead
- Filtering Database (FDB) includes an added subnet-mask and best match methodology

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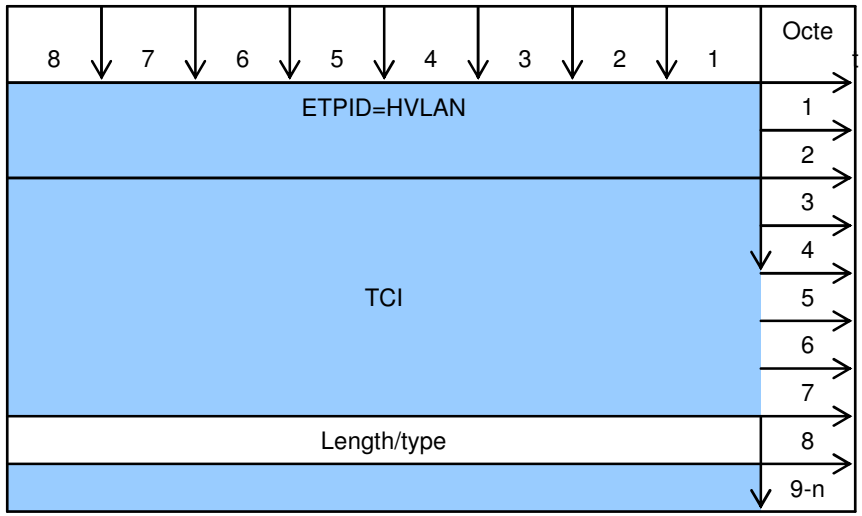
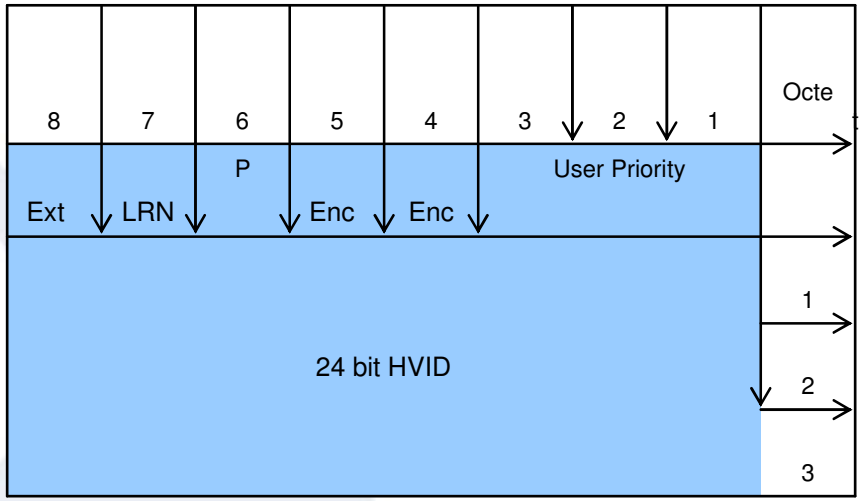
Suggested frame format





Keys		
Enc1	**Enc2**	Encapsulation type
0	0	No Encapsulation
0	1	MAC Encapsulation
1	0	VLAN Encapsulation
1	1	Both
EXT		Header is extended (for future use)
LRN		Enable/Disable learning of MAC
RES		Reserved
P		Enable disable Processing of inner tags

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PAR: Scope

This standard specifies the function of a HVLAN bridge, and the protocols and procedures to support its operation. An HVLAN bridge supports hierarchical virtual LANs based on VLAN methodology, but with a distinct ether-type. HVLAN bridge has subnet mask and best match methodologies added to its FDB. HVLAN can be implemented a closed island or a core closed island of a 802.1ad edge network

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PAR: Purpose

New carrier data networks require support for both provisioned point to point services and for multi-point services. VLAN is a service capable standard but lacks in address space and scalability. In enterprise market routers are used to communicate between VLANs. An HVLAN bridge will enable carriers to deploy scalable and multipoint efficient Ethernet transport while enterprises will be able to use it for a pure 802.1 infrastructure.

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Five Criteria: Broad Market Potential

Public networks represent a new and very broad application space for IEEE 802 technologies. Numerous Service Providers have expressed the need to integrate Ethernet link technologies with their existing infrastructure at a low cost, while providing large scale of new data services (E-Line, E-LAN, E-tree) traditionally offered by IP/MPLS technologies.

Five Criteria: Compatibility

The HVLAN bridge will be compatible with all 802.1 Bridge standards. A set of new managed objects, compatible with the extended functionality of the HVLAN bridge over VLAN bridge, will be defined.

Five Criteria: Distinct Identity

Existing 802 standards define VLAN bridges or other types of bridges which do not alter the VLAN behavior but adopt to it with its limitation. Instead of trying to add “hacks and flags” to 802.1q, a new approach is suggested to leverage the VLAN methodology to carrier and enterprise networks. By using increased address apace and adding hierarchies, HVLAN scales to millions of MP services while controlling FDBs number of entries

Five Criteria: Technical Feasibility

Numerous vendors supply silicon chips with flexible frame header. Existing L2/L3 chips can be easily modified to support hierarchies and best match.

Five Criteria: Economic Feasibility

The existence of high-volume L2/L3 silicon chips demonstrates that the HVLAN bridge should be economically viable. Existing 12 bit chips can be easily adopted to 24bits using fixed subnet mask.