

Hierarchical LAN Services

Providing Scalability in
L2 Virtual Private Networks by using
a MAC-n-MAC Frame Encapsulation
and a Larger Service-tag

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Authors

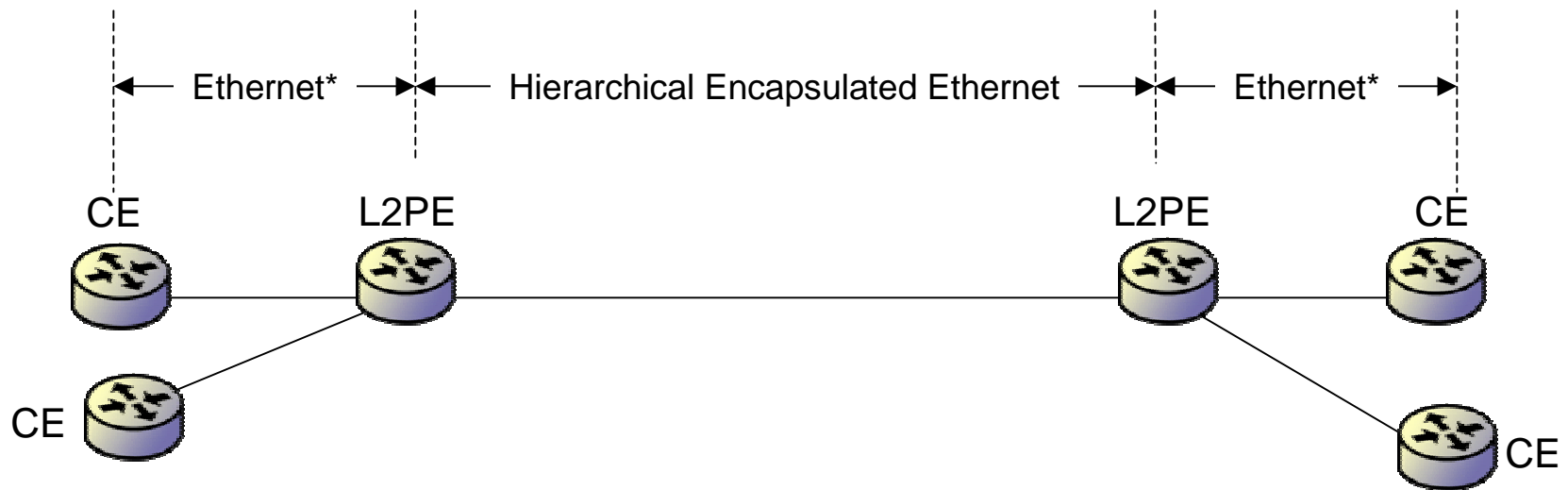
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Topics

- Brief Description
- Market Potential and Advantages
- Compatibility Goals

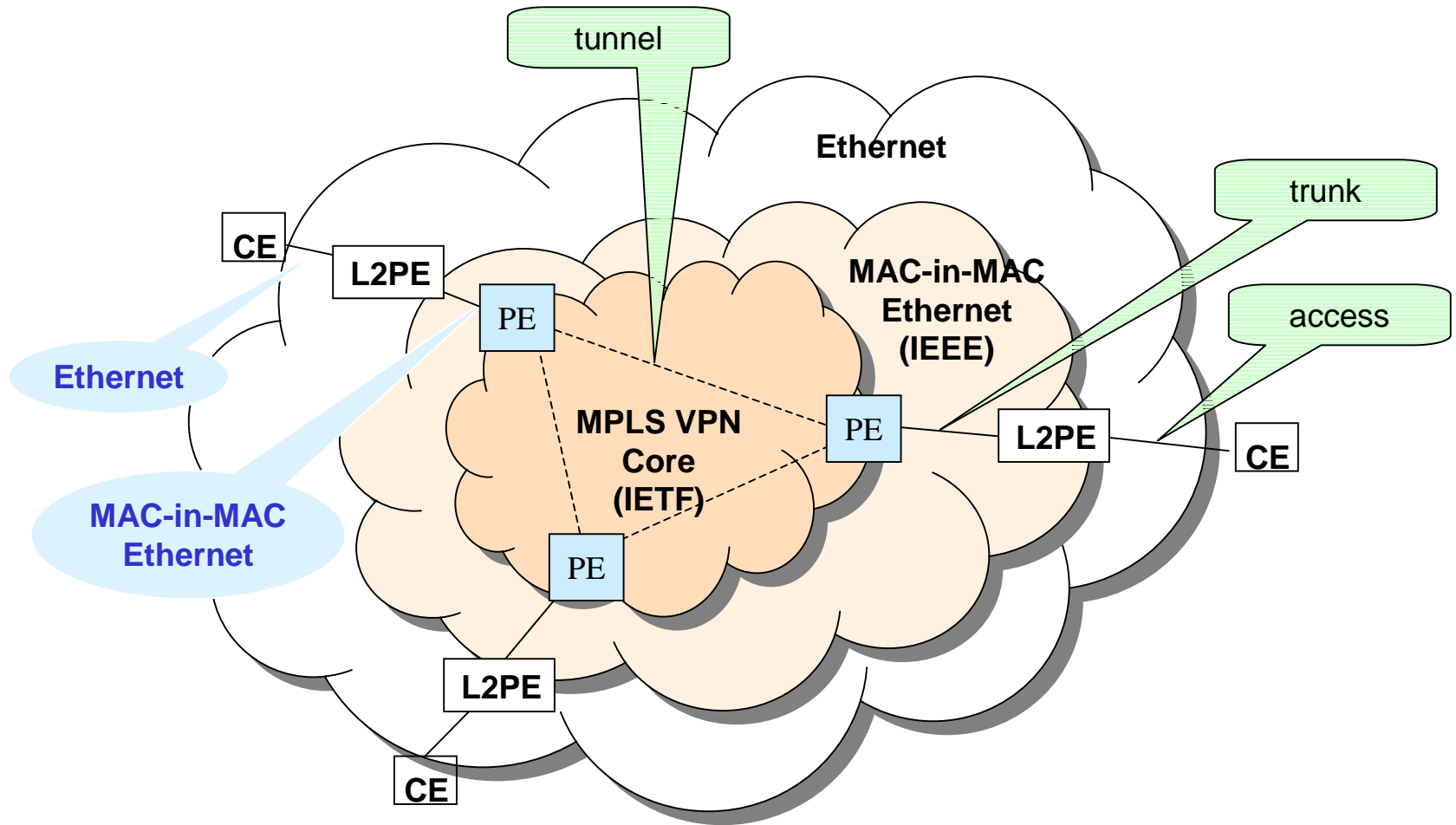
Hierarchical LAN Services



- CE – Customer Edge Device (standard device)
- L2PE – Layer 2 Provider Edge Switch (supports HLS)

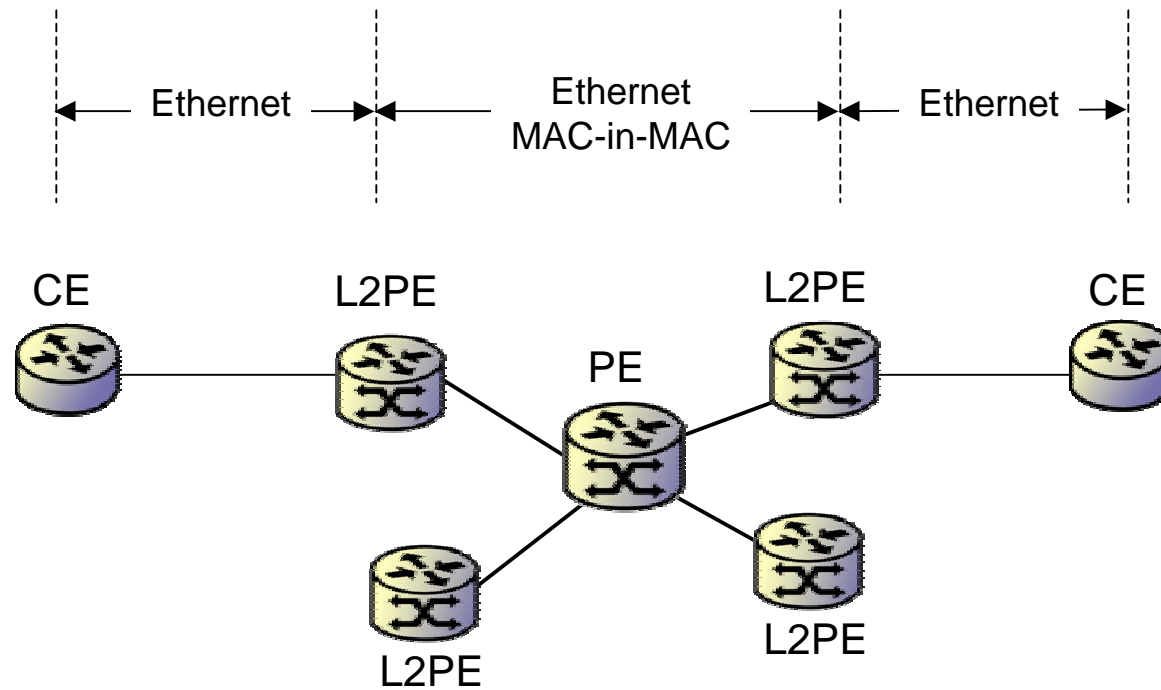
* May be either transparent or non-transparent with respect to CE defined VLAN's

Hierarchical LAN Services

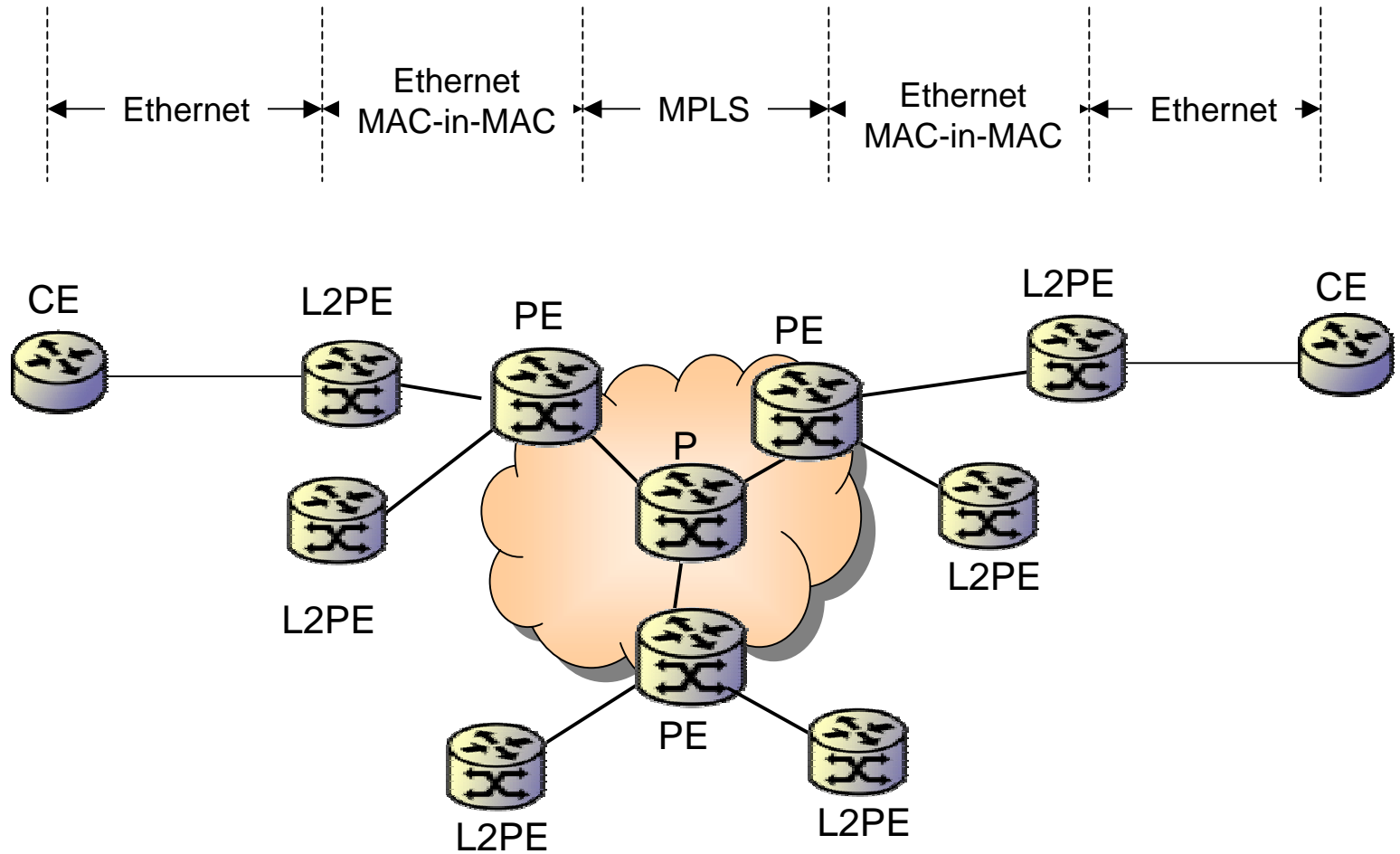


Alternative Architectures

- Initial deployments can be based on Ethernet
- Allows service providers to gradually evolve from a bridged architecture to a MPLS composite architecture

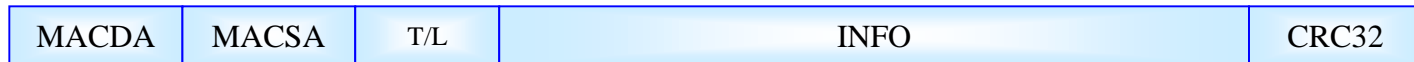


Alternatives (2)

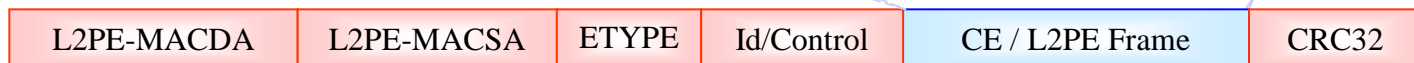


Encapsulation

- Ethernet



- MAC-in-MAC



Service Tag

Includes the following fields

- 24-bit Virtual Private Network (VPN) Identifier
- 3-bit Quality of Service
- Other control bits as needed for example:
 - 1-bit MAC-in-MAC indicator
 - 1-bit OAM indicator
 - 1-bit CRC indicator

Market Potential

- Service Providers are requesting scalable Layer 2 services for Connecting POPs (MANs and WANs)
- Simplicity of Ethernet Bridged Networks in Enterprise or University campus Backbones viewed positively
- With MAC-in-MAC, LANs can be connected by Service Provider without limiting service to router connections

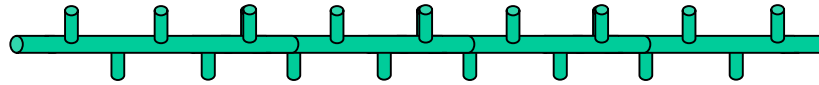
Advantages

- Large VPN Identifier number space
- Due to MAC-in-MAC size of MAC address table is lower on Intermediate network elements
- Customer Isolation: encapsulated customer traffic cannot gain in-band access to devices within the service provider's network
- Scales network size while preserving plug-and-play characteristics of bridging

Compatibility

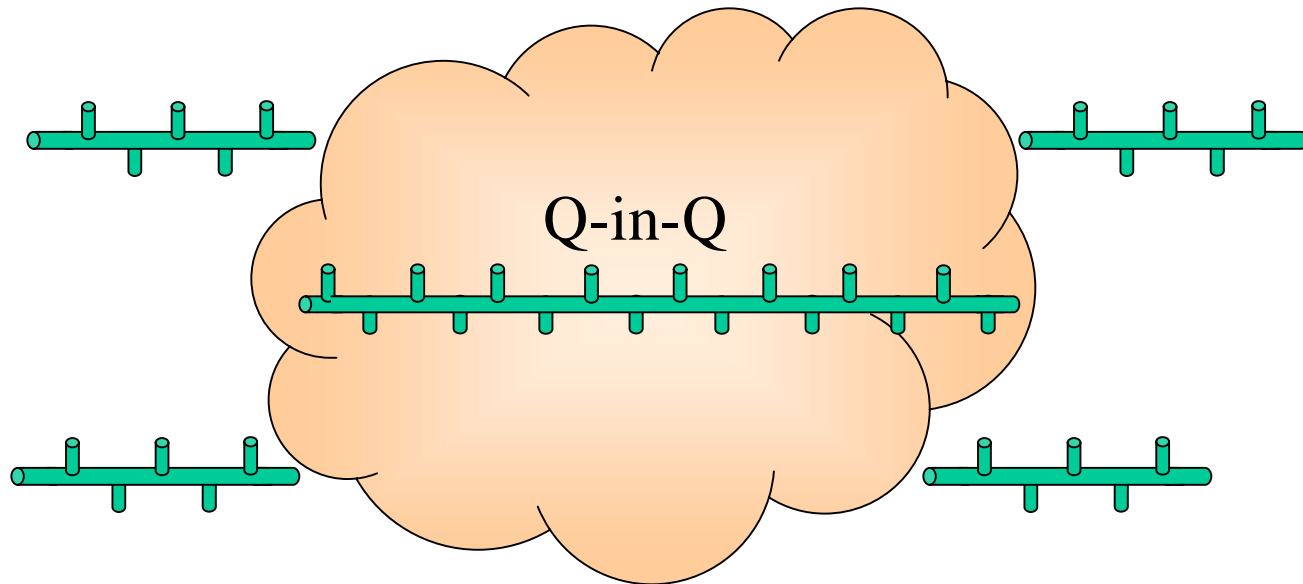
- Ethernet
- Q-in-Q
- MAC-in-MAC
- Virtual Private LAN Services (IETF)
- 802.3 Length Issue

Bridged Ethernet



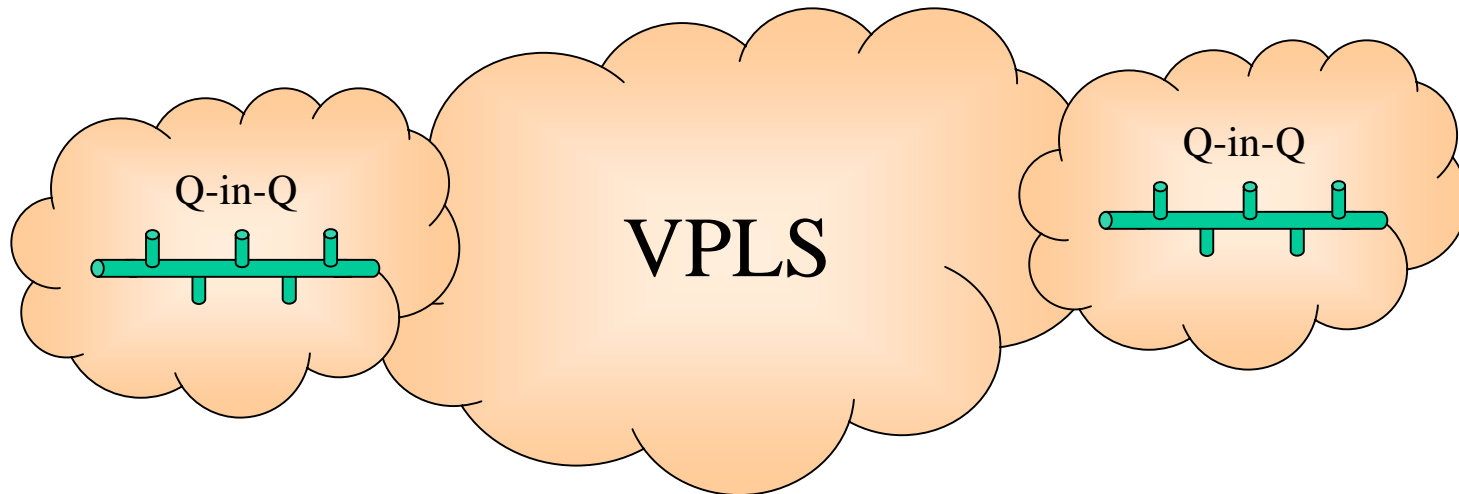
- Single .Q domain
- Single MAC Address Table
- No customer separation

Switched Ethernet + Q-in-Q



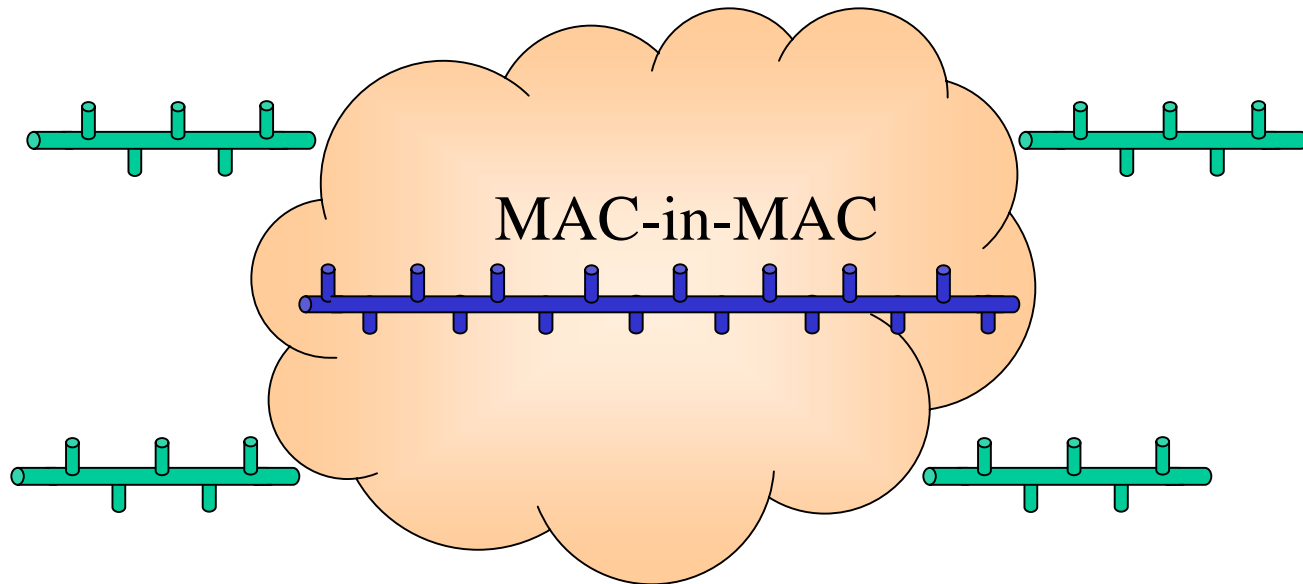
- Edge .Q domain and Service .Q domain separation
- Single MAC Address domain
- Service .Q provides customer separation

Q-in-Q + VPLS



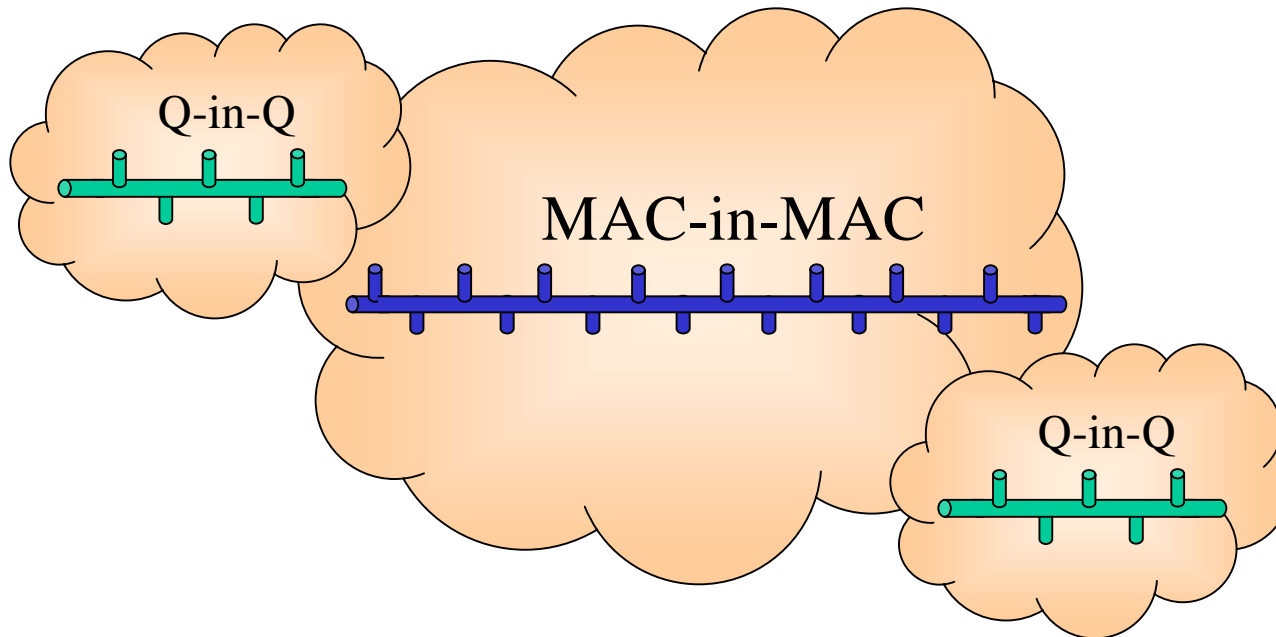
- VPLS connects Q-in-Q islands
- VPLS connections can be inter or intra service provider
- Single MAC address domain
- VPLS and Q-in-Q used to provide customer separation (Q-in-Q limited to 4K instances)

Switched Ethernet + MAC-in-MAC



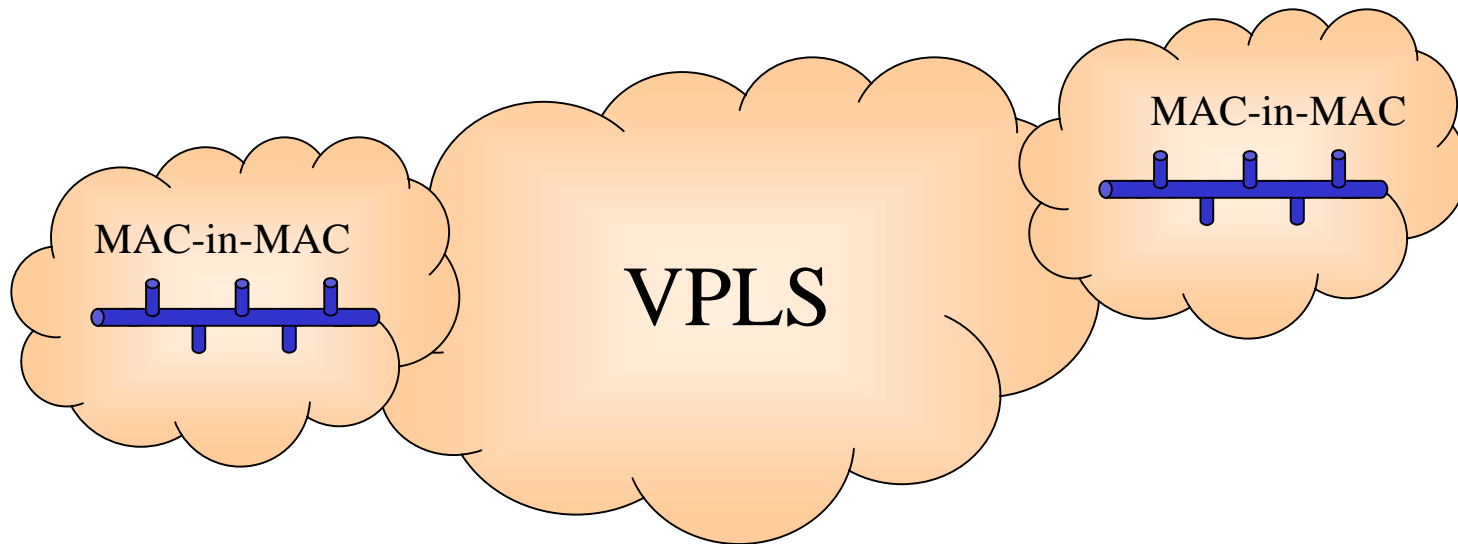
- Hierarchical MAC Address domains provide MAC address table scalability
- Service Tag provides customer separation (much greater than 4K VLAN Tag limitation)

Q-in-Q + MAC-in-MAC



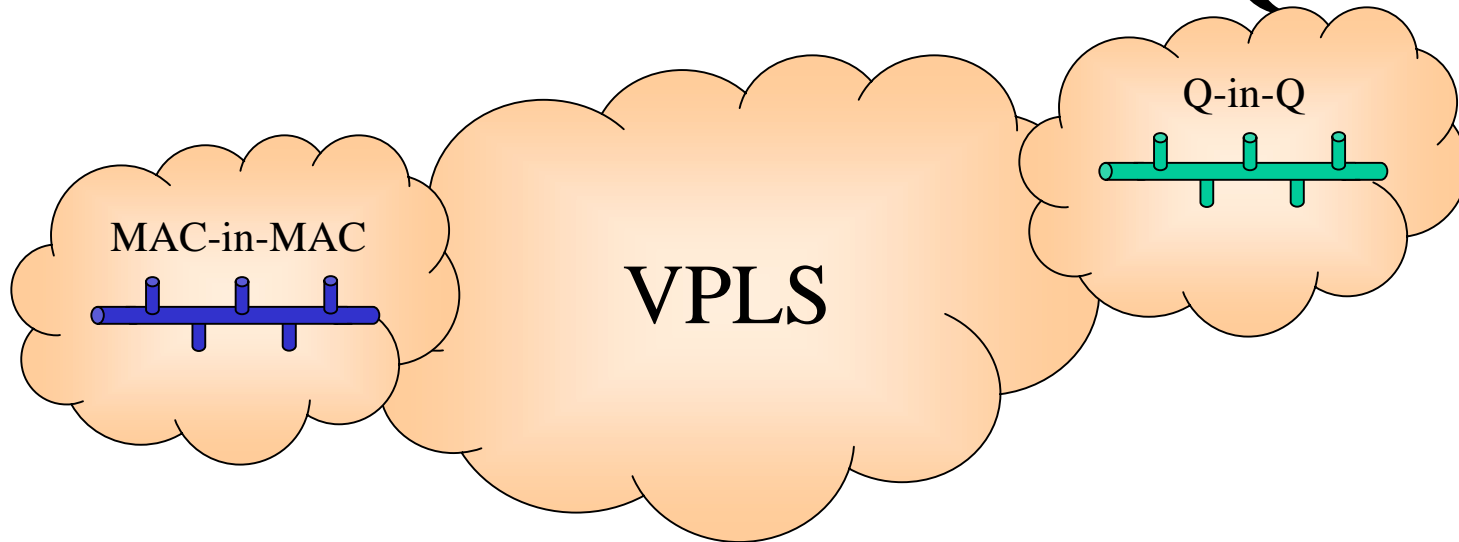
- Hierarchical MAC Address domains provide MAC address table scalability
- Service Tag provides customer separation (much greater than 4K VLAN Tag limitation)
- Q-in-Q must be translated to Service Tag at boundaries

MAC-in-MAC + VPLS



- VPLS connects MAC-in-MAC islands
- VPLS connections can be inter or intra service provider
- Hierarchical MAC Address domains provide MAC address table scalability
- Single MAC address domain for flows that traverse VPLS domain
- VPLS and Mac-in-Mac used to provide customer separation (Service Tag limit is much larger than 4K VLAN limit)

MAC-in-MAC + VPLS + Q-in-Q



- VPLS connects MAC-in-MAC or Q-in-Q islands
- VPLS connections can be inter or intra service provider
- Hierarchical MAC Address domains provide MAC address table scalability
- Single MAC address domain for flows that traverse VPLS domain
- MAC-in-MAC Service Tag provides customer separation, limit much larger than 4K VLAN Limit
- Q-in-Q provides customer separation, limit is 4K

802.3 Length

Proposal: Request that MAC-in-MAC be supported by full-duplex Ethernet only and the frame length be extended for this subset of interfaces.