

CYBERPATH SOLUTION WHITEPAPER

Q IN Q VLAN TAGGING FOR SERVICE PROVIDER NETWORKS

Introduction

Encapsulating IEEE 802.1Q VLAN tags within 802.1Q enables service providers to use a single VLAN to support customers who have multiple VLANs. Q-in-Q, also known as VLAN stacking, is a powerful, yet simple and cost-effective solution that allows Service Providers to offer IP-based Services, including Metro-Ethernet in scalable implementations. Q in Q VLANs can also be used to provide multiple virtual connections and access to multiple services available over the Metro (ISPs, ASPs, storage services, etc.).

Because of their simplicity, flexibility, cost/effectiveness, scalability, and resiliency, 802.1Q Ethernet Layer 2 backbones are currently the technology of choice for Service Providers offering Metro-Ethernet services. The predominant network architecture is evolving toward a hybrid model with 802.1Q at the service provider access and aggregation tiers and Ethernet/IP MPLS proving the technology for the core of large networks, especially those spanning multiple Metros. An eventual hybrid model makes sense because of the complementary nature of the two technologies: 802.1Q for simplicity and cost effectiveness at the edge of the network and Ethernet/IP MPLS for scalability and Layer 3 robustness at the core of the network. Therefore near term investments in 802.1Q Layer 2 Metros can be expected to have very long service lifetimes spanning both current and next generation architectures.

The advantages of Q in Q encapsulation include:

- Security via robust isolation of customer traffic
- Backward compatibility preserving existing customer VLAN structures
- Simplicity via unburdening the service provider from configuration management of CE devices
- VLAN scalability (with up to 4K private VLANs per subscriber for up to 4K subscribers)

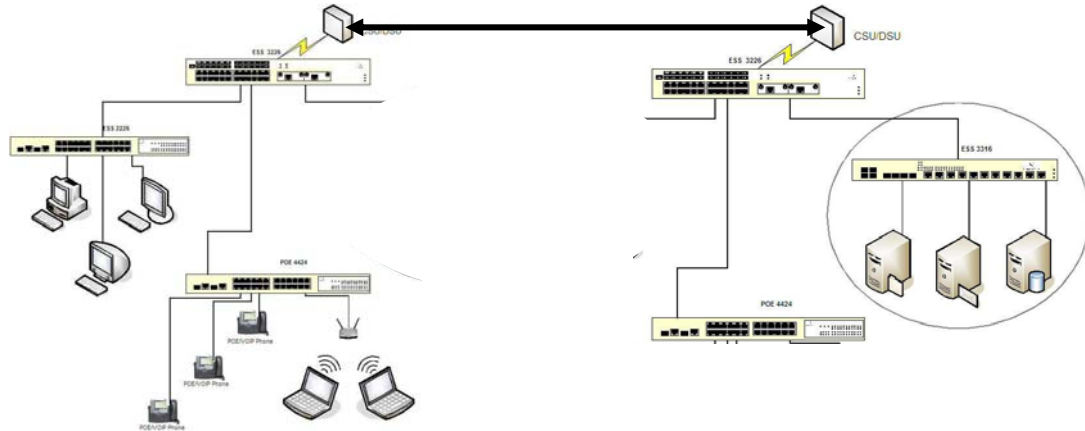
Technology Overview

The IEEE 802.1 Q-in-Q allows an additional VLAN tag, called a IEEE 802.1Q tagged Ethernet frame. This technology has been widely adapted in Metro Ethernet applications since it provides a very cost-effective solution to transport multiple customers' VLAN across the service provider's AN/WAN without interfering each other. In addition to IEEE 802.1p/Q, which includes the specification for both 802.1Q for tagged VLANs and 802.1p for Quality of Service (QoS) marking/signaling, a number of other enhancements to the Ethernet standards have made to improve the robustness of bridged Ethernet networks. For example, the Spanning Tree Protocol (STP) has been extended to allow for VLAN-specific spanning trees (Multiple-instance STP) and rapidly converging spanning trees (RSTP). MSTP allows the configuration of active-active redundant bridged topologies within the provider's .1Q backbone, while RSTP can reduce STP convergence times after link or node failure to less than one second.

Q in Q VLAN Tagging for Service Provider Networks (continued)

Network Application

CyberPath's EtherPath Layer 3 Ethernet Switches deployed in Service Provider networks offer Q in Q support which enables service providers to use a single VLAN to support customers who have multiple VLANs



Conclusion

CyberPath's EtherPath Layer 3 Routing Ethernet Switches are gigabit scale device, specifically designed to meet the challenges of providing full-featured L2 switching and L3 routing for network aggregation, in services provider networks offering Metro Ethernet.

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