

# Clavister Service VLAN (Q-in-Q)

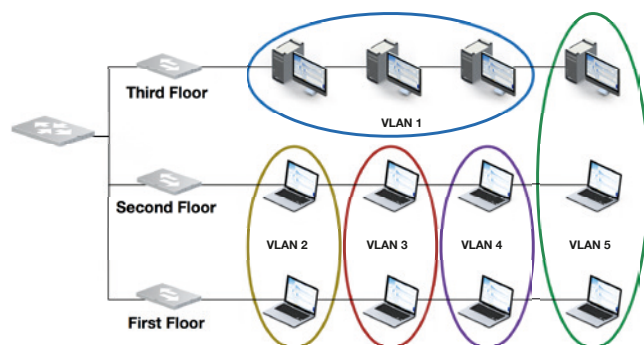
## Build smarter networks with Service VLANs (Q-in-Q)

### Top Features

- Increased flexibility in network design
- Improved security thanks to simplicity to design well isolated network segments
- Reduced costs by avoiding to buy and maintain additional equipment
- Reduced cost for administration by avoiding to manage additional equipment
- Improved customer satisfaction through more flexible service offering

### Introduction

VLAN, or Virtual Local Area Network, is a proven and trusted technology used in order to segment and isolate traffic. It helps administrators establish virtual logical groups of workstations, servers and network devices so that they will appear to be on the same LAN despite their geographical distribution or what physical switch they are connected to. Below is an example of VLANs (802.1Q) being used in an enterprise network.



Service VLANs, or Q-in-Q, is the technology that enables to stack multiple layers of VLANs on top of each other, or encapsulated inside each other. This technology gives even more flexibility and scalability to build efficient networks.

Typical use-cases for Service VLANs are found in scenarios where a service provider, such as a hosting provider or Internet provider, want to isolate traffic between multiple customers and still offer the customers the freedom to make use of, or extend their own VLAN topology also to the hosted data centers.

With Clavister Service VLANs (Q-in-Q) it becomes easier to design these networks where multiple layers of VLANs are needed in order to both isolate customers and offer greater freedom of configuration to each one of the customers without the need for additional equipment.

The technology is not new in any way but due to shortcomings in most firewall products the problem has often involved complementing the firewalls with a lot of additional equipment, which introduced both overhead in administration, and cost of equipment.

## Understanding the 802.1Q – (Q-in-Q) Protocol and Standards

IEEE 802.1ad is an Ethernet networking standard also known as Q-in-Q and is an amendment to the IEEE 802.1Q-1998 standard. The protocol is also known as Service VLANs (S-VLANs), Service Provider VLANs (SP-VLANs), Stacked VLANs, or simply Q-in-Q.

The original 802.1Q protocol allows a single Virtual Local Area Network (VLAN) header to be inserted into an Ethernet frame. Q-in-Q works in a similar way but allows multiple VLAN tags to be inserted into a single frame, an essential capability for implementing Metro Ethernet network topologies.

In the context of describing Q-in-Q the term “VLAN tag” is often used instead of “802.1Q VLAN header” and multiple VLAN tags in the same Ethernet frame is described as a “VLAN tag-stack”.

## Scenario: Data Center Migration

A customer has segmented his network by implementing 802.1q VLAN tags. This is a convenient way to segment the network using a single network infrastructure. The segmentation of the network can be for example the financial department has all their network-attached nodes connected to VLAN A while the development department has their nodes connected to VLAN B.

Now, the company has decided that some of the infrastructure should be out sourced to a hosting provider, but all database servers should still remain at their own data center.

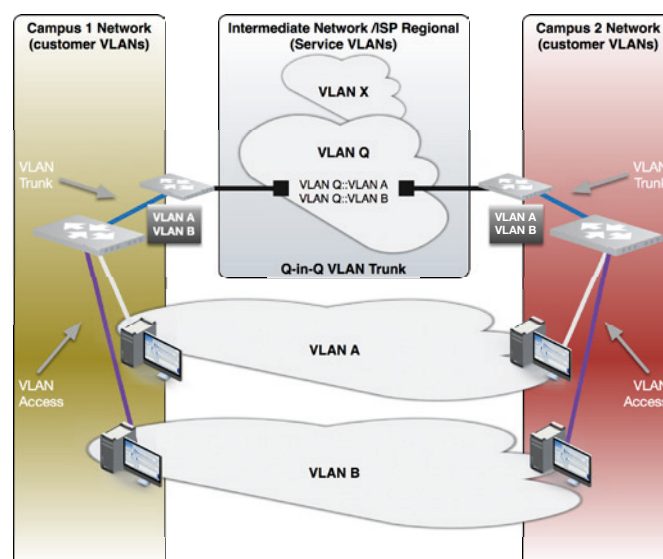
So VLAN A and B needs to be bridged in to the hosting providers network while the remaining of VLAN A and B should still be present at their own data center.

Since the hosting provider already has VLAN A and B in his datacenter, used by other customers, this represent a challenge. The two customers VLAN will cause a collision, but with Q-in-Q this issue can be solved in an easy way.

A Clavister firewall is placed at the customer premises. One or multiple ports are configured for Q-in-Q so that VLAN A and B is encapsulated in a new Service VLAN decided by the hosting provider. At the hosting provider premises those VLAN is configured to exit at a port in the hosting providers Clavister firewall.

### Example diagram

In the following configuration two VLAN switches are linked together so that the VLAN A and VLAN B is distributed over multiple locations using Q-in-Q.

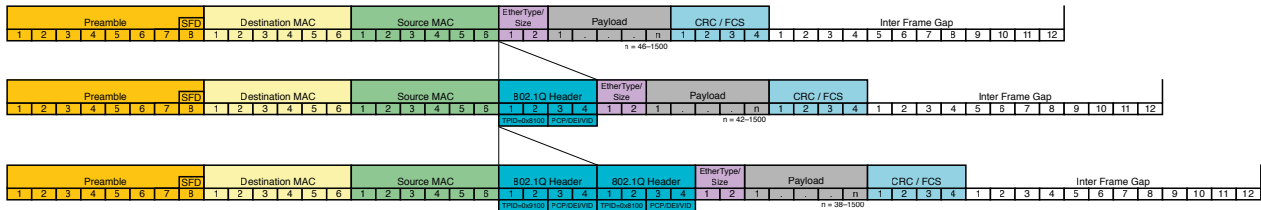


## Platform Support and MTU Considerations

In order to transport full frame payloads of 1500 bytes over Q-in-Q, the interface needs to support an MTU of 1508 bytes at the interface level to accommodate the extra VLAN header, compared to the 1504 bytes required for a single tagged VLAN frame. Currently not all interfaces on the hardware platforms from Clavister supports higher MTU than 1504 bytes at interface level, meaning that the maximum transferred payload size will be 1496 bytes for interfaces on these platforms over a 2-layer Q-in-Q VLAN. The actual MTU of the Q-in-Q VLAN interface is automatically calculated based on the underlying supported MTU at the physical interface level.

## Frame Format

With an additional 4 byte header for the Service VLAN, the frames will grow compared to a single tagged VLAN frame. The payload size can still be the Ethernet standard of 1500 byte if the interface supports an MTU of 1508 at the interface level.



Ethernet 802.1ad Double Tagged Frame by Luca Ghio

## Summary

The support for Service VLANs (Q-in-Q) in Clavister's products is a powerful feature that enables more efficient and granular network design.

For service providers this mean that they can offer a more attractive and flexible service to their customers at the same time as proper customer isolation can be achieved without having to rely on a mix-match of different products that introduce additional complexity and costs.

## Questions and Answers

- Q:** Can Service VLANs help me as a hosting provider to offer more flexibility to my customers?
- A:** Yes, absolutely. Service VLANs helps you segment and isolate your customers using VLANs at the same time as you can offer your customers full freedom to extend his own VLAN topology to your datacenter, without having to worry about collisions of VLAN domains between different customers or with your own VLANs.
- Q:** I am a hosting provider and are using VLANs in order to create multiple logical segments and to isolate customers. If I want to offer customers the freedom to extend their own VLAN topologies to my data centers this means more than 2 layers of VLAN tags. Does Clavister support that?
- A:** Yes, Clavister supports up to 16 layers of VLAN tags. This allows you to build and extend your network with enormous flexibility.
- Q:** I am a hosting provider and offer eight (8) pre-defined VLANs for each users and their hosted servers. I do not need to offer their own full flexibility but I worry about running out of VLANs as I can only host about 500 guests in my datacenter. Can Service VLANs help me scale beyond 500 guests in some way?
- A:** Yes, definitely. Since you can create 4095 VLANs on one layer and 4095 on a second layer your scalability grows exponentially ( $4095 \times 4095$ ). Since Clavister support up to 16 layers of VLANs you scale almost endlessly ( $4095 \times 4095 \times 4095 \times 4095 \times 4095 \dots$ ).

## Service VLAN (Q-in-Q) Key Benefits

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- Increased flexibility in network design
- Improved security due to the simplicity of designing well-isolated network segments
- Reduced costs by avoiding to buy and maintain additional equipment
- Reduced cost for administration by avoiding to manage additional equipment
- Improved customer satisfaction through more flexible service offering

## Where to Buy Clavister

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### About Clavister

Clavister (NASDAQ: CLAV) is a leading security provider for fixed, mobile and virtual network environments. Its award-winning solutions give enterprises, cloud service providers and telecoms operators the highest levels of protection against threats, with unmatched reliability. Clavister's performance in the security sector was recognized with the Product Quality Leadership Award from Frost & Sullivan. The company was founded in Sweden in 1997, with its solutions available globally through its network of channel partners. To learn more, visit [www.clavister.com](http://www.clavister.com).

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