

## AlliedWare Plus™ OS

# How To | Configure Nested VLANs

## Introduction

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Nested VLANs are used to overlay a private Layer 2 network over a public Layer 2 network. The feature is also known as *VLAN double tagging*, *VLAN stacking* and *Q-in-Q*. It provides simple access to an infrastructure of network service providers in Metropolitan Area Networks (MANs).

Network service providers often have customers whose VLAN range requirements overlap, and the traffic from different customers is mixed in with the service providers' infrastructure. With a nested VLAN configuration, each customer is given a customer-ID (CID), which is a unique identifier within the service provider infrastructure. Traffic from individual customers is tagged with the CID and segregated from other customer's traffic. The VLANs identification of the customer's network can be preserved while the traffic is tunneled through the network service provider's infrastructure.

You may need a special feature licence to use nested VLANs. See your Allied Telesis distributor or reseller for more information.

## Which products and software version does the Note apply to?

This configuration applies to the following Allied Telesis switches, running AlliedWare Plus version 5.2.1 or later:

- SwitchBlade x908
- x900-12XT/S
- x900-24 series
- x600 Series
- x610 Series

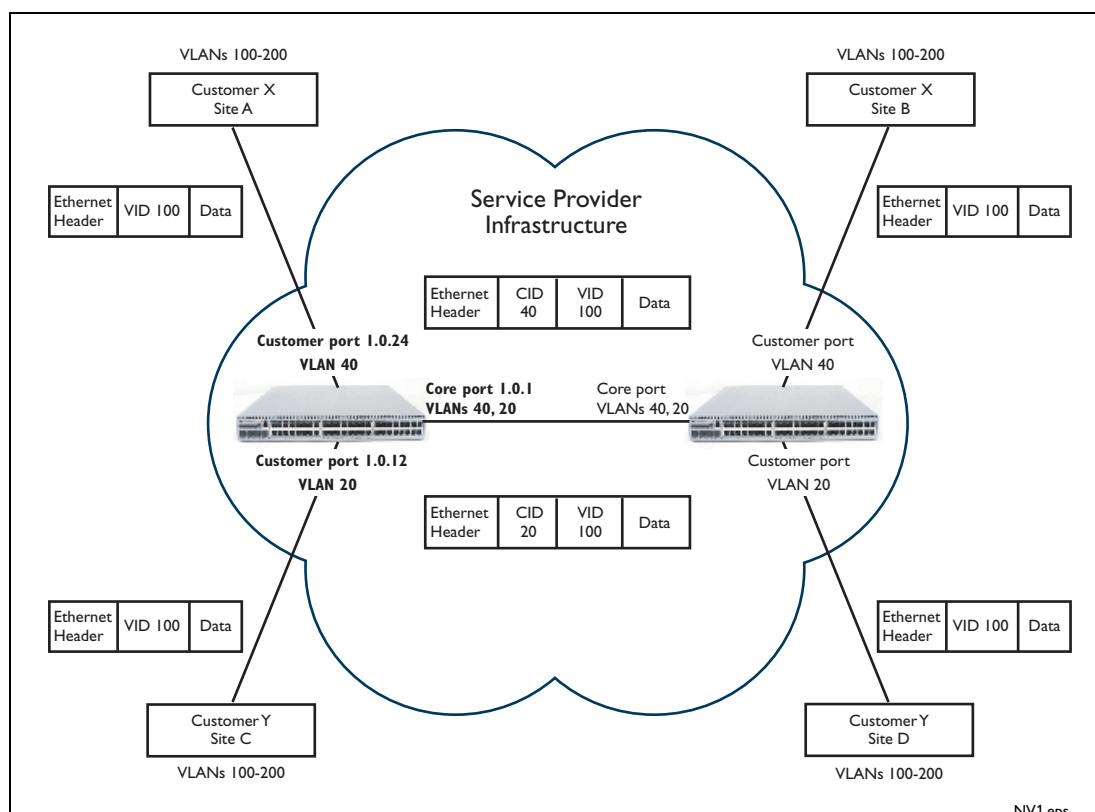
## How nested VLANs work

A nested VLAN implementation consists of:

- Core ports connected to a service provider network (public Layer 2 network).
- Customer ports connected to a customer network (private Layer 2 network).
- Customer IDs (CIDs), which are a second VLAN Identifier (VID) assigned to each customer.

In a nested VLAN implementation, each customer is given a customer-ID (CID), which is a 12-bit identifier within the service provider network. Packets entering the customer port of the service provider switch are VLAN tagged packets with original VLAN identifiers (VIDs) from the customer network. When the packets enter the switch via a customer edge port, the switch adds a CID tag (outer tag) on top of the VLAN tag (inner tag). If the packet was originally untagged, then the CID tag becomes the packets one and only tag. Within the service provider infrastructure, the VID (inner tag) is ignored and bridging is based on the value of the CID. When the CID tagged packets exit the service provider network via a customer edge port of the destination switch, the CID tag (outer tag) is removed. Therefore, when the packets exit the customer port, the original VLAN tags are preserved. Nested VLAN operation is shown in Figure 1.

**Figure 1: Nested VLAN operation**



The Ethertype of the outer tag is configurable and can be set by changing the Tag Protocol Identifier (TPID). By default, the Ethertype is set to 0x8100.

In summary, the nested VLAN functionality makes use of the tag-in-tag technique. The inner tag comes from the customer; the outer tag comes from the core (provider) switch.

The frame formats at different stages of nested VLAN operation are shown in Figure 2, Figure 3, and Figure 4.

**Figure 2: Original standard Ethernet frame**

Destination address	Source address	Length/Type	Data	Frame checksum
(6 Bytes)	(6 Bytes)	(2 Bytes)	(0-1500 Bytes)	(4 Bytes)

**Figure 3: 802.1q VLAN tagged frame (frame entering the customer port)**

Destination address	Source address	Ethertype (TPID)	Tag Control Information (VID 12 bits)	Length/Type	Data	Frame checksum
(6 Bytes)	(6 Bytes)	(2 Bytes)	(2 Bytes)	(2 Bytes)	(0-1500 Bytes)	(4 Bytes)

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802.1q VLAN tag

**Figure 4: Nested VLAN frame with double tags (frame exiting the core port)**

Destination address	Source address	Ethertype (TPID)	Tag Control Information (CID 12 bits)	Ethertype (TPID)	Tag Control Information (VID 12 bits)	Length/Type	Data	Frame checksum
(6 Bytes)	(6 Bytes)	(2 Bytes)	(2 Bytes)	(2 Bytes)	(2 Bytes)	(2 Bytes)	(0-1500 Bytes)	(4 Bytes)

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Outer tag                      Inner tag

## How to configure nested VLANs

The following steps are required in order to configure a nested VLAN:

1. Create the nested VLANs.
2. Configure ports as members of the nested VLANs.
3. Set the Tag Protocol Identifier (TPID). This is an optional step.

A sample configuration of commands for each of these steps follows. Refer to Figure 1 for an illustration of the configuration.

### I. Create the nested VLANs

```
awplus(config)#vlan database
awplus(config-vlan)#vlan 40 name nested1
awplus(config-vlan)#vlan 20 name nested2
```

## 2. Configure the ports as members of the nested VLANs

### Customer ports:

```
awplus(config-vlan)#interface port1.0.12
awplus(config-if)#switchport access vlan 20
awplus(config-if)#switchport vlan-stacking customer-edge-port
```

```
awplus(config-if)#interface port1.0.24
awplus(config-if)#switchport access vlan 40
awplus(config-if)#switchport vlan-stacking customer-edge-port
```

### Core port:

```
awplus(config-if)#interface port1.0.1
awplus(config-if)#switchport mode trunk
awplus(config-if)#switchport trunk allowed vlan add 40,20
awplus(config-if)#switchport trunk native vlan none
awplus(config-if)#switchport vlan-stacking provider-port
```

## 3. Optionally, set the TPID

The Ethernet type of the tagged packet is set to 0x8100 by default when a nested VLAN is created, but can be changed.

To change it to 0x88a8, enter global configuration mode and use the command:

```
awplus(config)#platform vlan-stacking-tpid 88a8
```

Note that this command specifies the TPID value that applies to all VLANs used for nested VLANs. The TPID value cannot be set for only one particular VLAN if more than one nested VLAN is created.