

# Configure VLAN on Industrial Wireless Access Points in CURWB Mode

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## Introduction

This document describes the VLAN configuration on Industrial Wireless (IW) Access Points so they can pass tagged traffic over Wireless.

## Background Information

Cisco Ultra-Reliable Wireless Backhaul (CURWB) lets you connect remote buildings both fixed or moving assets to your network.

It provides a high data rate, ultra-low latency and packet loss, and seamless handoffs.

## Prerequisites

If you want to send VLAN traffic over wireless, the VLAN feature needs to be activated on all the Access Points in the cluster.

The VLAN feature is used to receive and transmit packets with VLAN tags on the radios.

This is not a default feature and requires the designated radios to have an FM-VLAN license installed and activated.

Once the VLAN feature is enabled, the user can edit two different settings on the radio:

- Management VLAN
- Native VLAN

## VLAN Settings

- Management VLAN: The Management VLAN ID is the VLAN identity tag at which the radio can be accessed to make control plane changes. The management VLAN facilitates administrative access to the radio through the GUI & CLI. The default value of Management VLAN ID is '1', and can be

changed.

- Native VLAN: Incoming untagged packets are tagged with this VLAN number.
  - Default: 1
  - If configured as “0”, the incoming untagged packets are dropped.
  - If the radio is configured to be in “mesh end” mode, the incoming packets tagged with the configured native VLAN tag are forwarded untagged.

## Configuration Steps

1. Activate VLAN feature on the IW radios. Note: With IW licensing model all features (except bandwidth) are available out of the box.
2. Navigate to VLAN tab of the GUI to configure the Management VLAN and Native VLAN.
3. Set the Management VLAN ID.
4. Set the Native VLAN ID. The radio uses it to tag untagged packet. If it is set to 0, the radio just drops all untagged packets.

The VLAN configuration is the same on all radios in the cluster and, by default, Management and Native VLANs are set to 1. You can also configure smart VLAN from the CLI and the process is as follows:

CLI configuration

```
#configure vlan management X (where X is an integer from 1 to 1024 and represents the Management Vlan ID)
#configure vlan native Y (where Y is an integer from 1 to 1024 and represents the Native Vlan ID)
#write (to save the configuration)
#reload (to reboot the radio and apply the changes)
```

Note: Both management and native VLANs can be configured to be the same.

## VLAN SETTINGS

When the Native VLAN is enabled (VID != 0), untagged packets received on the trunk port will be assigned to the specified VLAN ID. When disabled (VID = 0), VLAN trunking will operate according to the IEEE 802.1Q standard, i.e. only tagged packets will be allowed on the port (including those of the management VLAN).

### VLAN Settings

Enable VLANs:

Management VLAN ID:

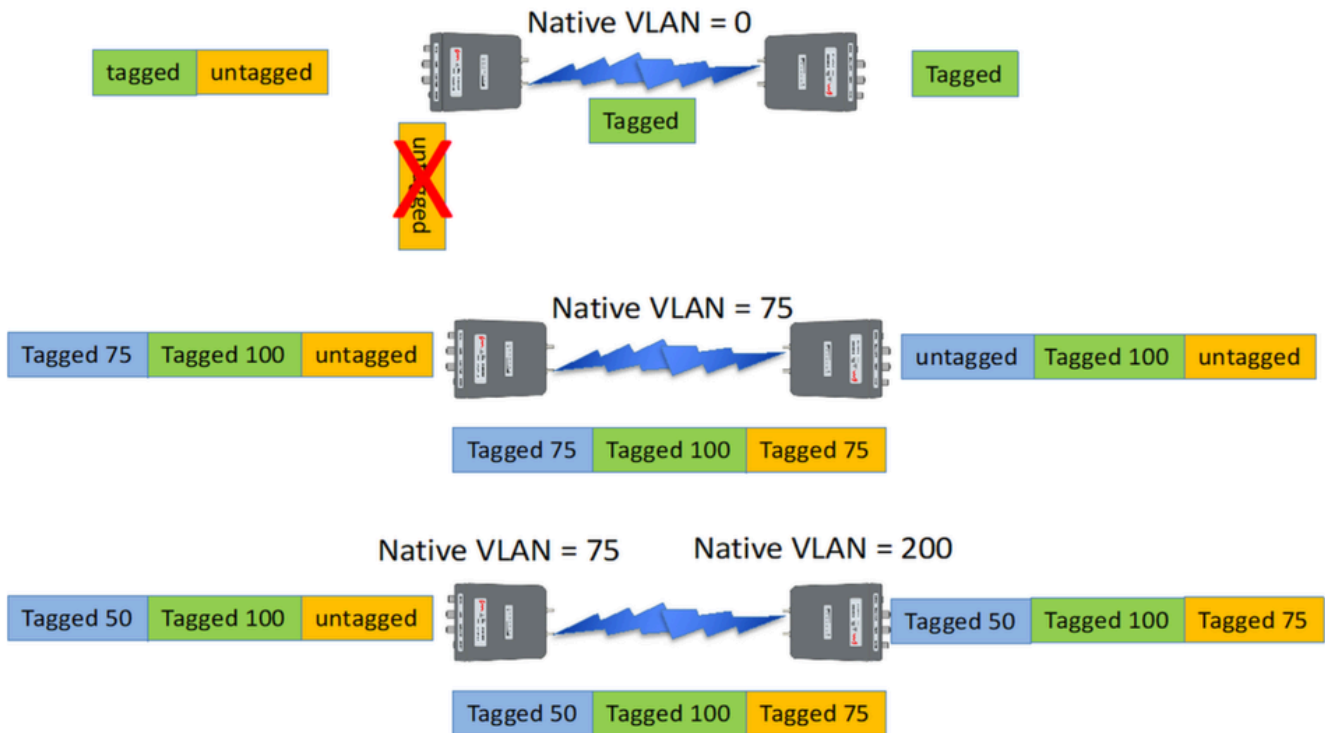
Native VLAN ID:

Reset

Save

## Native & Management VLAN Scenarios

This image depicts three scenarios where the radios forward VLAN tags and how the native VLAN works.



Scenario 1: If the native VLAN on the radio is set to 0, any untagged traffic is dropped by the radio as the radio receives the packet.

Scenario 2: If the native VLAN on both the CURWB radios is set to VLAN 75 and the incoming traffic has VLAN 100 and untagged traffic, the untagged traffic goes over the CURWB radio after it gets tagged by CURWB radio's own native VLAN. However, after leaving the CURWB radios and entering the corporate network, VLAN tags of all VLAN 75 traffic is stripped off. After which, there is only the tagged VLAN 100 and untagged traffic.

Scenario 3: If the native VLAN of CURWB radio needs to be tagged permanently so even after it leaves the radio and enters the corporate network with VLAN 200, then remote CURWB radio needs to have a VLAN other than VLAN 200. In this example, the Mesh End has a Native VLAN of 75, and the Mesh Point with a native VLAN of 200. For Untagged traffic originating from the mesh point side, it is tagged as VLAN 200, arriving at the Mesh End the native VLANs do not match causing it to be tagged permanently as VLAN 200 into the corporate network.

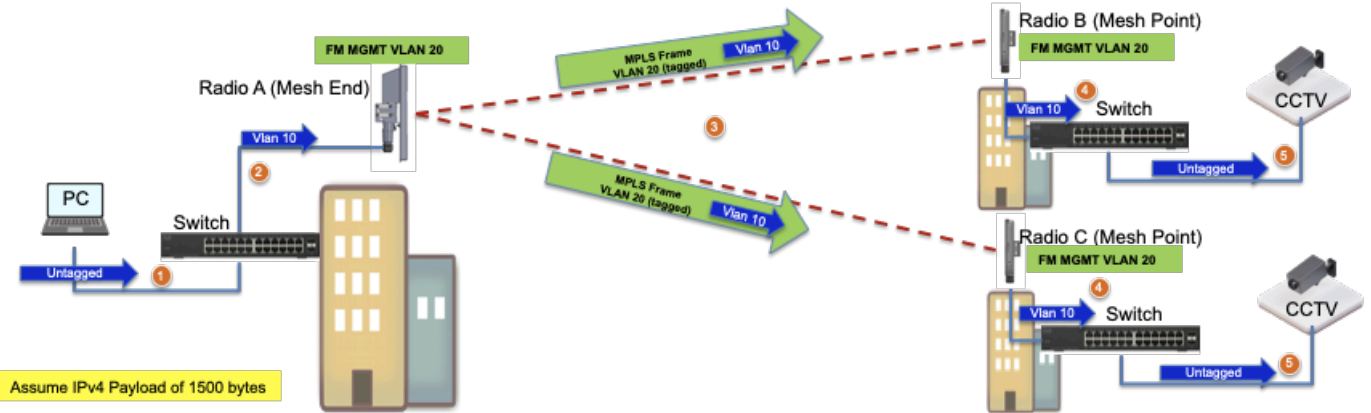
## CURWB Management VLAN & MPLS encapsulation

This image is a common Point to Multipoint architecture. On the left, we have a Mesh-End radio connected to a VLAN-tagged Layer 2 network. CURWB preserves Layer 2 within our Prodigy protocol (shown as note 3) and adds the additional MPLS headers and VLAN tags to the datagram, then sends the data over the air to the Mesh-Point radios on the right. At the receiving Mesh Point side, the MPLS and Management headers are stripped, and the data is presented as the usual tagged Ethernet traffic on the other side.

| Frame from device                              | Frame Size | MTU  | ENCAPSULATION |              |                      |             |              |     |
|------------------------------------------------|------------|------|---------------|--------------|----------------------|-------------|--------------|-----|
| Frame from client switch (no 802.1q - no MPLS) | 1518       | 1500 | Eth(dev-dst)  | Eth(dev-src) | Eth Type (ipv4:0800) | Ipv4 Header | Ipv4 Payload | CRC |
|                                                |            |      | 14            |              | 20                   | 1480        | 4            |     |

| Frame from device                           | Frame Size | MTU  | ENCAPSULATION |              |                     |                 |                    |                      |             |              |     |
|---------------------------------------------|------------|------|---------------|--------------|---------------------|-----------------|--------------------|----------------------|-------------|--------------|-----|
| Frame from client switch (802.1q - no MPLS) | 1522       | 1500 | Eth(dev-dst)  | Eth(dev-src) | Eth Type (d1q:8100) | 802.1q priority | Vlan id (Original) | Eth Type (ipv4:0800) | Ipv4 Header | Ipv4 Payload | CRC |
|                                             |            |      | 18            |              |                     |                 |                    | 20                   | 1480        | 4            |     |

| Frame from device                        | Frame Size | MTU  | ENCAPSULATION |              |                     |                 |                  |                      |                 |              |              |                     |                 |                    |                      |             |              |     |
|------------------------------------------|------------|------|---------------|--------------|---------------------|-----------------|------------------|----------------------|-----------------|--------------|--------------|---------------------|-----------------|--------------------|----------------------|-------------|--------------|-----|
| Frame from client switch (802.1q - MPLS) | 1544       | 1522 | Eth(dev-dst)  | Eth(dev-src) | Eth Type (d1q:8100) | 802.1q priority | Vlan ID (tagged) | Eth Type (MPLS:8847) | MPLS Header (1) | Eth(dev-dst) | Eth(dev-src) | Eth Type (d1q:8100) | 802.1q priority | Vlan id (Original) | Eth Type (ipv4:0800) | Ipv4 Header | Ipv4 Payload | CRC |
|                                          |            |      | 18            |              |                     |                 | 4                |                      |                 |              |              | 18                  |                 |                    | 20                   | 1480        | 4            |     |



## VLAN configuration in a lab setup



Here is a sample lab configuration for reference.

### SWITCH 1 CONFIG

```
Switch1#show cdp neighbors
```

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone

| Device ID       | Local Intrfce | Holdtme | Capability | Platform  | Port ID |
|-----------------|---------------|---------|------------|-----------|---------|
| MP_TRK_Backhaul | Gig 0/23      | 121     | R T        | IW9165DH- | Gig 0   |

```
Switch1#show ip interface brief
```

| Interface Protocol | IP-Address    | OK? | Method | Status                |
|--------------------|---------------|-----|--------|-----------------------|
| Vlan1              | unassigned    | YES | NVRAM  | administratively down |
| Vlan500            | 192.168.6.100 | YES | manual | up                    |
| Vlan581            | 10.122.136.1  | YES | NVRAM  | up                    |

```
GigabitEthernet0/23 unassigned YES unset up
up
```

```
Switch1#show interfaces trunk
```

| Port   | Mode | Encapsulation | Status   | Native vlan |
|--------|------|---------------|----------|-------------|
| Gi0/23 | on   | 802.1q        | trunking | 1           |

```
Port Vlans allowed on trunk
```

```
Gi0/23 500,581
```

```
Port Vlans allowed and active in management domain
```

```
Gi0/23 500,581
```

```
Port Vlans in spanning tree forwarding state and not pruned
```

```
Gi0/23 500,581
```

```
Switch1#show running-config interface g0/23
```

```
Building configuration...
```

```
Current configuration : 137 bytes
```

```
!
```

```
interface GigabitEthernet0/23
```

```
switchport trunk encapsulation dot1q
```

```
switchport trunk allowed vlan 500,581
```

```
switchport mode trunk
```

```
end
```

```
RADIO 1 CONFIG:
```

```
Radio1#show ip
```

```
IP: 10.122.136.9
```

```
Network: 255.255.255.192
```

```
Gateway: 10.122.136.1
```

```
Nameservers: 64.102.6.247
```

```
Radio1#show vlan
```

```
VLAN status: enabled
```

```
Management VID: 581
```

Native VID: 0

### RADIO 2 CONFIG:

Radio2#show ip

IP: 10.122.136.15

Network: 255.255.255.192

Gateway: 10.122.136.1

Nameservers: 64.102.6.247

Radio2#show vlan

VLAN status: enabled

Management VID: 581

Native VID: 0

### SWITCH 2 CONFIG

Switch2#show cdp neighbors

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,

D - Remote, C - CVTA, M - Two-port Mac Relay

| Device ID | Local Intrfce | Holdtme | Capability | Platform  | Port ID |
|-----------|---------------|---------|------------|-----------|---------|
| Radio2    | Gig 1/0/3     | 135     | R T        | IW9165DH- | Gig 0   |

Switch2#show ip interface brief

| Interface            | IP-Address    | OK? | Method | Status                | Protocol |
|----------------------|---------------|-----|--------|-----------------------|----------|
| Vlan1                | unassigned    | YES | NVRAM  | administratively down | down     |
| Vlan500              | 192.168.6.101 | YES | NVRAM  | up                    | up       |
| Vlan581              | 10.122.136.35 | YES | NVRAM  | up                    | up       |
| GigabitEthernet1/0/3 | unassigned    | YES | unset  | up                    | up       |

Switch2#show interface trunk

| Port    | Mode | Encapsulation | Status   | Native vlan |
|---------|------|---------------|----------|-------------|
| Gi1/0/3 | on   | 802.1q        | trunking | 1           |

Port Vlans allowed on trunk

Gi1/0/3 500,581

Port Vlans allowed and active in management domain

Gi1/0/3 500,581

Port Vlans in spanning tree forwarding state and not pruned

Gi1/0/3 500,581

Switch2#show running-config interface Gi1/0/3

Building configuration...

Current configuration : 100 bytes

!

interface GigabitEthernet1/0/3

switchport trunk allowed vlan 500,581

switchport mode trunk

end

With this configuration, VLAN 500 can communicate over wireless. Now it is important to note that while configuring VLAN on a Layer 2 network, Layer 3/multiple subnet fluidity cannot be configured.