

Mesh Bridging with VLAN Tagging and MAP-side L2 switches

Updated: 3.21.12 20:56

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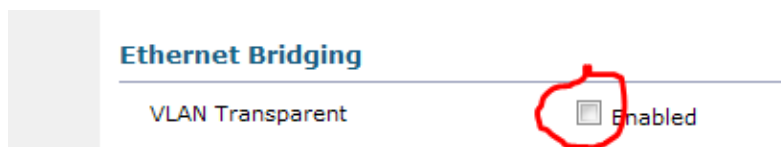
Overview:

V7.0.220.0 of WLC code. Assume we want to use mesh ethernet bridging to bridge VLANs 10, 20 and 30 across the mesh. At remote buildings we have switches installed and the switch uplinks are connected to the ethernet interfaces of the MAPs.

General Notes:

.. VLAN Transparent turned OFF on WLC-->Wireless-->Mesh

VLAN Transparent is disabled globally on WLC:



- .. For switches attached to MAPs, VTP domain should be different than VTP domain of switch(es) connected to RAP(s), also recommend VTP mode *transparent* on MAP-attached switches; Cisco goes so far as to say turn VTP off entirely
- .. Turn off Rogue Detection on all RAP and MAP radios (doesn't do much good outdoors anyway)
- .. When making changes to AP bridging settings, clear ARP on switches before testing
- .. Do not test cross-bridge connectivity from wireless clients connected to a WLAN hosted on RAP(s) or MAP(s); hairpinning traffic on the WLC interface seems to have intermittent results (need to investigate this further)
- .. Per the above note, it's really just best to be wired in when configuring bridging

.. RAP configuration

!--- Any RAPs used for bridging must have their corresponding switchports in trunking mode and the native VLAN must be the VLAN that the RAP (and MAPs) will get its management IP address in:

Switchport configuration for the RAP in this example. VLAN 11 is where the mesh APs live (e.g., this RAP management IP = 10.0.11.102):

NOTE: BPDUFILTER may help on this interface (as with the MAP, below), but so far haven't needed it

```
Current configuration : 217 bytes
!
interface GigabitEthernet0/1
  description to MESH-RAP1
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 11
  switchport trunk allowed vlan 10,11,20,30
  switchport mode trunk
end
```

!--- The management VLAN for the mesh APs (the one used to assign IP addresses to RAPs and MAPs) cannot

be a bridged data vlan across the mesh, therefore, a dedicated VLAN for mesh AP address assignment is recommended

!--- On the switchport, prune to only the needed VLANs to suppress non-essential broadcasts, and make sure to include the native vlan in the list (switchport trunk allowed vlan n-x,y,z)

!--- On the WLC RAP configuration, Ethernet Bridging must be enabled (checkbox on Mesh tab in AP configuration)

!--- The backhaul wired ethernet link of a RAP is not configured with vlan native and tag IDs like MAPs. Just leave it at mode NORMAL and tags will still pass. DO NOT put this interface in TRUNK mode, even though it is very tempting and seems like the logical thing to do. NORMAL mode on the RAP downlink port (typically g0-poe-in) is the Cisco-confirmed correct way to set up this interface. Cisco documentation on this specific configuration task is confusing and conflicting.

RAP configuration Mesh tab. Ethernet bridging is enabled. Notice Gig0 is in Mode NORMAL:

All APs > Details for MESHLAB-1522

The screenshot shows the configuration page for AP MESHLAB-1522, with the 'Mesh' tab selected. The configuration includes:

- AP Role: RootAP
- Bridge Type: Outdoor
- Bridge Group Name: meshlab
- Ethernet Bridging:
- Backhaul Interface: 802.11a
- Bridge Data Rate (Mbps): auto
- Ethernet Link Status: UpDnNANA
- Heater Status: OFF
- Internal Temperature: 31 °C

Below the configuration is a table titled 'Ethernet Bridging' with the following data:

Interface Name	Oper Status	Mode	Vlan ID
GigabitEthernet0	Up	Normal	0
GigabitEthernet1	Down	Normal	0
GigabitEthernet2	Down	Normal	0
GigabitEthernet3	Down	Normal	0

Interface-specific setting on connected wired ethernet interface on RAP:

All APs > MESHLAB-1522 > VLAN Mappings

Interface Name	GigabitEthernet0
Mode	<input type="text" value="Normal"/>

.. MAP configuration:

!--- The connected switchport must be configured as a trunk (just like with RAPs)

Switchport configuration for the MAP in this example. Use a null/junk VLAN (e.g., VLAN 2) as the native VLAN.

NOTE: The native VLAN on the MAP side doesn't matter. The MAP gets its IP through the mesh and inherits its settings through the upstream RAP's native VLAN, e.g., VLAN 11 (MAP IP = 10.0.11.103)

NOTE: Enable BPDUfilter. This port will not transmit BPDUs and will drop received BPDUs. This has the added benefit of allowing mismatched PVIDs between AP and switch (the switch will complain, even though they are not really mismatched-bug?)

```
Current configuration : 238 bytes
!
interface GigabitEthernet0/1
  description to MESH-MAP1
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 2
  switchport trunk allowed vlan 10,20,30
  switchport mode trunk
  spanning-tree bpdufilter enable
end
```

!--- The native VLAN on the MAP switchport should be a null/junk VLAN like 2 or 999 (see below for configuring native vlan on the MAP in the WLC GUI)

!--- On the switchport, allow only the needed VLANs to suppress non-essential broadcasts

!--- BPDUFilter enable -- this is necessary because the connected switch complains the PVIDs don't match (even when they do)

!--- BPDUGuard disable -- make sure at this point you know what you are doing with your topology; this command is removing some STP loop protection!

!--- On the WLC: Ethernet Bridging must be enabled for the MAP (Mesh tab in AP configuration)

!--- On the WLC: The wired ethernet interface must be in TRUNK mode

!--- Native VLAN: match switchport setting (but it can't be 0 or 1--WLC won't let you), so...

!--- It is safest/recommended to use a native VLAN that is a null/junk vlan, like 2 or 999 or whatever-- this assumes that all MAP-side bridged traffic will be tagged (i.e., we're not going to put untagged traffic on the mesh bridge)

!--- add VLAN IDs for each carried/allowed VLAN -- these are the tagged vlans that are allowed to traverse the MAP and the mesh back to the root

!--- any tagged traffic that passes over the mesh will exit the RAP wired interface with tags intact; this traffic is not tunneled to the WLC

MAP configuration Mesh tab. Ethernet bridging is enabled. Notice Fa0 is in Mode TRUNK:

All APs > Details for MESHLAB-MAP1

The screenshot shows the configuration page for MESHLAB-MAP1, with the Mesh tab selected. The settings are as follows:

- AP Role: MeshAP
- Bridge Type: Indoor
- Bridge Group Name: meshlab
- Ethernet Bridging:
- Backhaul Interface: 802.11a
- Bridge Data Rate (Mbps): auto
- Ethernet Link Status: UP
- Heater Status: N/A
- Internal Temperature: N/A

Ethernet Bridging

Interface Name	Oper Status	Mode	Vlan ID
FastEthernet0	Up	Trunk	2

Interface-specific settings on connected wired ethernet interface on MAP:

All APs > MESHLAB-MAP1 > VLAN Mappings

Interface Name FastEthernet0

Mode

Native VLAN Id

Trunk VLAN Id

Configured VLANs

VLAN Id

10	<input type="checkbox"/>
20	<input type="checkbox"/>
30	<input type="checkbox"/>

..Final configuration checks: Log into each RAP and MAP. Run the command **show mesh forwarding vlans** and make sure that the VLANs match all the bridge groups and that the configuration is identical on every AP (e.g., VLAN 20 always maps to Bridge Group 4). If there are any mismatches, this will cause issues. Remove all the VLAN IDs from all the MAPs and rebuild it again, one VLAN at a time, moving from the first MAP to the last for each VLAN you want to bridge.

```

RAP#show mesh forwarding vlans

Mesh Forwarding Vlans
Vlan: 1      Supporting Bridge Group: 1
Vlan: 2      Supporting Bridge Group: 2
Vlan: 10     Supporting Bridge Group: 3
Vlan: 20     Supporting Bridge Group: 4
Vlan: 30     Supporting Bridge Group: 5

MAP-1#show mesh forwarding vlans

Mesh Forwarding Vlans
Vlan: 1      Supporting Bridge Group: 1
Vlan: 2      Supporting Bridge Group: 2
Vlan: 10     Supporting Bridge Group: 3
Vlan: 20     Supporting Bridge Group: 4
Vlan: 30     Supporting Bridge Group: 5

MAP-2#show mesh forwarding vlans

Mesh Forwarding Vlans
Vlan: 1      Supporting Bridge Group: 1
Vlan: 2      Supporting Bridge Group: 2
Vlan: 10     Supporting Bridge Group: 3
Vlan: 20     Supporting Bridge Group: 4
Vlan: 30     Supporting Bridge Group: 5

```

.. From the AP CLI, you can troubleshoot a lot of the VLAN tagging configuration. Particularly useful commands are in **bold**.

!--- mesh ap show commands:

- show mesh forwarding table
- show mesh forwarding vlan mode
- show mesh forwarding vlan statistics
- **show mesh forwarding vlans** (this command shows the current VLAN bridge table--i.e., the vlans that working and forwarding traffic)
- show mesh forwarding interfaces
- show mesh ethernet vlan statistics

!--- mesh ap debugs:

- debug mesh ethernet bridging
- debug mesh ethernet config
- **debug mesh ethernet registration** (this command will report when VLAN IDs are added/removed from MAPs or during periodic heartbeats from the RAP)
- debug mesh forwarding table
- debug mesh forwarding packet bridge-group

