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Revision History

<table>
<thead>
<tr>
<th>DATE</th>
<th>VERSION</th>
<th>EDITOR</th>
<th>CHANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>09 Sep 2021</td>
<td>0.1</td>
<td>Ariya Parsamanesh</td>
<td>Initial creation</td>
</tr>
<tr>
<td>24 Sep 2021</td>
<td>0.2</td>
<td>Ariya Parsamanesh</td>
<td>Added mesh section</td>
</tr>
</tbody>
</table>
2 Dual Ethernet Uplink

In this technote we’ll cover a useful solution for small retail stores/remote sites that need 1-2 APs and require active-passive Ethernet uplink. Note that you can run IAP-VPN on top of this solution which is not covered here. This solution uses the new feature in Instant 8.8.x that basically supports use of multiple Ethernet uplinks. This solution will also cover the second IAP as a mesh point using the dual uplinks of the Mesh portal IAP.

The main points for this solution are

- One Ethernet port will be the active uplink port while the other Ethernet port will be backup uplink port.
- Only DHCP based IP address on the uplinks are supported
- Failover and pre-emption features are enabled by default when multiple Ethernet uplink is configured.
- This is only configurable using CLI
- This is only supported for standalone mode or 1 Conductor mesh portal + mesh points in the swarm and NOT supported on a cluster of more than 1x AP.

Note that you can run IAP-VPN on top of this solution which is not covered here.

Here is the lab set-up to demonstrate this feature with/without mesh point AP.

Things you need

- Two APs with two or more Ethernet ports (AP-303H /AP-505H)
- Aruba Instant version 8.8.0.0 or later
- A Layer three switch and some WiFi/wired clients
- Optionally two Internet links.
3 Dual Ethernet Uplinks

Here we have an existing Instant Cluster which consists of one AP-505H.

Some AP models with more than one Ethernet ports have uplink enabled for both E0 and E1 ports and some don’t. In either way, it is best to check it. And set it correctly.

3.1 Uplink Configuration

By default, Eth0 will be the uplink for the AP. Here we’ll first need to change the mode of Eth1 from platform-default to downlink.

The main points here are that if Eth1 mode

1. is changed to “uplink”, then E0 and E1 are bonded together, and the LAN switch ports should be configured in LACP.

2. is changed to “downlink” then E1 is not bonded to E0 and you can use it as a backup to E0
Once you have saved it, you need to reboot the AP for changes to take effect.

Now we’ll check a few things from the CLI. This first command will show the AP environment parameters and here we’ll see that the E1 link is set to downlink.

AP505H-Lab1# sh ap-env

Antenna Type: Internal
IoT Antenna Type: Internal
Need USB field: Yes
name: AP505H-Lab1
ap1xuser: InstantAP
ap1xpasswd: 274d5d134a80c4ded537657e000f6cbb4801341fe0639d54
uap_controller_less: 1
enet1_mode: downlink
AP505H-Lab1#

Next, we’ll make sure that the port bonding is active-backup.

AP505H-Lab1# sh port-bonding
Bonding Mode: fault-tolerance (active-backup)
Primary Interface: eth0 (primary_reselect always)
Currently Active Interface: eth0
MII Status: up
MII Polling Interval (ms): 400
Up Delay (ms): 0
Down Delay (ms): 0

Interface: eth0
MII Status: up
Speed: 1000 Mbps
Duplex: full
Link Failure Count: 1
Permanent HW addr: 20:4c:03:b2:75:97
Queue ID: 0
AP505H-Lab1#

Next, we need to configure the VLAN for the 2nd uplink. And it is done only through the CLI.

uplink-enforce-wired-port-vlan-setting
!
interface vlan 192
  ip address dhcp-client
!

I have also configured VLAN 192 which will be the VLAN 192 used for my backup uplink on E1. And finally assigning the priority for it under the uplink configuration.

!
uplink
uplink-wired vlan 192 priority 5
!
Remember priority for the E0 as an uplink is 0 which is the highest.

I’ll also need to fine tune the uplink configuration by enabling pre-emption and change a few counters to shorten the time it takes for the backup link (eth1) to be activated.
3.2 Port Profile Configuration

Now we need to create a Wired network port profile and assign it to E1 port, which we can do through the WebUI.
You’ll note that we are assigning VLAN192 that we configured as a DHCP client to E1 port. Now we can connect the second Internet connection to E1 port and then check the uplink status.

```
AP505H-Lab1# sh uplink status

Uplink preemption : enable
Uplink preemption interval : 60
Uplink enforce : none
Uplink wired-1 : DHCP
Uplink wired-192 : DHCP
Internet failover : enable
Max allowed test packet loss : 3
Secs between test packets : 5
VPN failover timeout (secs) : 180
Internet check timeout (secs) : 5
APX type: PEAP
Certification type: NONE
Validate server: Disable

Uplink Table
------------------
<table>
<thead>
<tr>
<th>Type</th>
<th>VLAN</th>
<th>State</th>
<th>Reach State</th>
<th>Prio</th>
<th>In Use</th>
<th>Interface</th>
<th>IP</th>
<th>Mask</th>
<th>GW</th>
<th>Sent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet 1</td>
<td>UP</td>
<td>UP</td>
<td></td>
<td>0</td>
<td>Yes</td>
<td>br0</td>
<td>10.10.10.20</td>
<td>255.255.255.0</td>
<td>10.10.10.1</td>
<td>590</td>
</tr>
<tr>
<td>Ethernet 192</td>
<td>UP</td>
<td>UP</td>
<td></td>
<td>5</td>
<td>No</td>
<td>br0.192</td>
<td>192.168.2.49</td>
<td>255.255.255.0</td>
<td>192.168.2.1</td>
<td>541</td>
</tr>
<tr>
<td>Cellular 0</td>
<td>INIT</td>
<td>INIT</td>
<td></td>
<td>22</td>
<td>No</td>
<td>ppp0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0</td>
</tr>
<tr>
<td>Wifi-sta 0</td>
<td>INIT</td>
<td>INIT</td>
<td></td>
<td>20</td>
<td>No</td>
<td>wuuplink0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0</td>
</tr>
</tbody>
</table>

Wired Port Table
------------------
<table>
<thead>
<tr>
<th>Port</th>
<th>State</th>
<th>Type</th>
<th>Bonding(Admin/Oper/Active)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eth0</td>
<td>UP</td>
<td>WAN</td>
<td>Yes/Yes/Yes</td>
</tr>
<tr>
<td>eth1</td>
<td>UP</td>
<td>WAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth2</td>
<td>UP</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth3</td>
<td>DOWN</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth4</td>
<td>DOWN</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
</tbody>
</table>
```
We also need to check the IP addresses of the interfaces and the routing.

```
AP505H-Lab1# sh ip int brief
Interface                         IP Address / IP Netmask       Admin  Protocol
br0                              10.10.10.20 / 255.255.255.0    up     up
br0.192                         192.168.2.49 / 255.255.255.0    up     up
br0.3333                         172.31.98.1 / 255.255.254.0    up     up
```

```
AP505H-Lab1#
AP505H-Lab1# sh ip route
default via 10.10.10.1 dev br0
  8.8.8.8 via 192.168.2.1 dev br0.192
  8.8.8.8 via 10.10.10.1 dev br0
  10.10.10.0/24 dev br0 src 10.10.10.20
  172.31.98.0/23 dev br0.3333 src 172.31.98.1
  192.168.2.0/24 dev br0.192 src 192.168.2.49
AP505H-Lab1#
```

### 3.3 Local DHCP Configuration

Even though we can use the IAP assigned magic VLAN which is 172.31.98.0/23, here we’ll configure a local DHCP pool which will be used for a wired client that will be connected to E2 port of the AP and for the wireless users.

![DHCP Configuration](image)

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>VLAN</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch-1</td>
<td>Local</td>
<td>99</td>
<td>10.0.99.0/24</td>
</tr>
</tbody>
</table>
```

```
Name     Type  VLAN  Network
----------|-------|------|----------------|
Branch-1  Local | 99   | 10.0.99.0/24 |
```

Once you have finished configuration save it. We’ll be using this VLAN ID (99) in the next section.

### 3.4 Client Wired Network Configuration

Here we have just added a wired network called E2-Net that is for our wired connected client on E2 port.
4 Dual Uplink Testing

We'll start testing the solution we have put together.

4.1 Initial Observation

Let's check the IP address of various interfaces on the IAP. Note VLAN 99 for our local DHCP pool.

```
AP505H-Lab1# sh ip int brief
Interface              IP Address / IP Netmask       Admin  Protocol
br0                   10.10.10.20 / 255.255.255.0    up     up
br0.99                10.99.99.1 / 255.255.255.0    up     up
br0.192               192.168.2.49 / 255.255.255.0    up     up
br0.3333              172.31.98.1 / 255.254.0    up     up

AP505H-Lab1#
```

```
AP505H-Lab1# sh ip route
default via 10.10.10.1 dev br0
8.8.8.8 via 192.168.2.1 dev br0.192
8.8.8.8 via 10.10.10.1 dev br0
10.10.10.0/24 dev br0  src 10.10.10.20
10.99.99.0/24 dev br0.99  src 10.99.99.1
172.31.98.0/23 dev br0.3333  src 172.31.98.1
192.168.2.0/24 dev br0.192  src 192.168.2.49

AP505H-Lab1#
```

Next we'll connect a laptop to the E2 port of the AP-505H.

We now also have a wired clients connected to E2 port

```
Wired Client List
-----------------
Name      IP Address   MAC Address        OS      Network  Access Point  Role       IPv6 Address  Speed
-----------
          0.0.0.0      b0:b9:8a:a6:ca:3a  NOFP    eth1     AP505H-Lab1   E1-Uplink  --  --
Info timestamp :5152

AP505H-Lab1#
AP505H-Lab1#
```

4.2 Disconnect Cable Test

In this test we'll

- do a non-stop ping test to 8.8.8.8 from the Win10 Client
- disconnect the Ethernet cable from E0 port
- see how long till E1 backup uplink will get activated
- and then reconnect the E0 and see if the pre-emption works

After disconnecting the E0 cable, we’ll observe the following that E0 link is down but the default route is still pointing to 10.10.10.1 which is on E0.

```
AP505H-Lab1# [ 5343.959577] eth0 (Int switch port: 1) (Logical Port: 1) (phyId: 1e) Link DOWN.
AP505H-Lab1#
AP505H-Lab1# sh ip route
default via 10.10.10.1 dev br0
8.8.8.8 via 192.168.2.1 dev br0.192
8.8.8.8 via 10.10.10.1 dev br0
10.10.0.24 dev br0 src 10.10.10.20
10.99.99.0/24 dev br0.99 src 10.99.99.1
172.31.98.0/23 dev br0.3333 src 172.31.98.1
192.168.2.0/24 dev br0.192 src 192.168.2.49
AP505H-Lab1#
```

Here is the output of the ping test and roughly we’ll lose 4-5 pings.

```
C:\Users\Parsa>ping 8.8.8.8 -t
Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=38ms TTL=57
Reply from 8.8.8.8: bytes=32 time=13ms TTL=57
Reply from 8.8.8.8: bytes=32 time=17ms TTL=57
Reply from 8.8.8.8: bytes=32 time=11ms TTL=57
Reply from 8.8.8.8: bytes=32 time=19ms TTL=57
Reply from 8.8.8.8: bytes=32 time=12ms TTL=57
Reply from 8.8.8.8: bytes=32 time=15ms TTL=57
Reply from 8.8.8.8: bytes=32 time=14ms TTL=57
Reply from 8.8.8.8: bytes=32 time=11ms TTL=57
Reply from 8.8.8.8: bytes=32 time=78ms TTL=57
Reply from 8.8.8.8: bytes=32 time=20ms TTL=57
Reply from 8.8.8.8: bytes=32 time=13ms TTL=57
Reply from 8.8.8.8: bytes=32 time=13ms TTL=57
Reply from 8.8.8.8: bytes=32 time=14ms TTL=57
Reply from 8.8.8.8: bytes=32 time=15ms TTL=57
Reply from 8.8.8.8: bytes=32 time=22ms TTL=57
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Reply from 8.8.8.8: bytes=32 time=52ms TTL=54
Reply from 8.8.8.8: bytes=32 time=67ms TTL=54
Reply from 8.8.8.8: bytes=32 time=82ms TTL=54
Reply from 8.8.8.8: bytes=32 time=44ms TTL=54
Reply from 8.8.8.8: bytes=32 time=69ms TTL=54
Reply from 8.8.8.8: bytes=32 time=67ms TTL=54
Reply from 8.8.8.8: bytes=32 time=38ms TTL=54
Reply from 8.8.8.8: bytes=32 time=63ms TTL=54
Reply from 8.8.8.8: bytes=32 time=82ms TTL=54
Reply from 8.8.8.8: bytes=32 time=56ms TTL=54
Reply from 8.8.8.8: bytes=32 time=47ms TTL=54
Reply from 8.8.8.8: bytes=32 time=82ms TTL=54
Reply from 8.8.8.8: bytes=32 time=76ms TTL=54
Reply from 8.8.8.8: bytes=32 time=64ms TTL=54
Reply from 8.8.8.8: bytes=32 time=65ms TTL=54
Reply from 8.8.8.8: bytes=32 time=40ms TTL=54
Reply from 8.8.8.8: bytes=32 time=43ms TTL=54
Reply from 8.8.8.8: bytes=32 time=68ms TTL=54
```
So once the pings are again successful, we’ll notice that the default route has changed and now it is pointing to 192.168.2.1 which is on E1 port.

Checking the uplink status

<table>
<thead>
<tr>
<th>Type</th>
<th>VLAN</th>
<th>State</th>
<th>Reach State</th>
<th>Prio</th>
<th>In Use</th>
<th>Interface</th>
<th>IP</th>
<th>Mask</th>
<th>GW</th>
<th>Sent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet 1</td>
<td>1</td>
<td>UP</td>
<td>DOWN</td>
<td>0</td>
<td>No</td>
<td>br0</td>
<td>10.10.10.20</td>
<td>255.255.255.0</td>
<td>10.10.10.1</td>
<td>2</td>
</tr>
<tr>
<td>Ethernet 192</td>
<td>192</td>
<td>UP</td>
<td>UP</td>
<td>5</td>
<td>Yes</td>
<td>br0.192</td>
<td>192.168.2.49</td>
<td>255.255.255.0</td>
<td>192.168.2.1</td>
<td>1004</td>
</tr>
<tr>
<td>Cellular 0</td>
<td>0</td>
<td>INIT</td>
<td>INIT</td>
<td>22</td>
<td>No</td>
<td>ppp0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0</td>
</tr>
<tr>
<td>Wifi-sta 0</td>
<td>0</td>
<td>INIT</td>
<td>INIT</td>
<td>20</td>
<td>No</td>
<td>wuplink0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0</td>
</tr>
</tbody>
</table>

Wired Port Table

<table>
<thead>
<tr>
<th>Port</th>
<th>State</th>
<th>Type</th>
<th>Bonding(Admin/Oper/Active)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eth0</td>
<td>DOWN</td>
<td>WAN</td>
<td>Yes/Yes/Yes</td>
</tr>
<tr>
<td>eth1</td>
<td>UP</td>
<td>WAN</td>
<td>No/Yes/Yes</td>
</tr>
<tr>
<td>eth2</td>
<td>UP</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth3</td>
<td>DOWN</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth4</td>
<td>DOWN</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
</tbody>
</table>

AP505H-Lab1#
Now we’ll reconnect E0, and there will be no ping loses.

AP505H-Lab1# [ 5444.310591] eth0 (Int switch port: 1) (Logical Port: 1) (phyId: 1e) Link Up at 1000 mbps full duplex
[ 5449.832734] eth0 (Int switch port: 1) (Logical Port: 1) (phyId: 1e) Link DOWN.
[ 5453.024233] eth0 (Int switch port: 1) (Logical Port: 1) (phyId: 1e) Link Up at 1000 mbps full duplex

AP505H-Lab1# sh ip route
default via 10.10.10.1 dev br0
8.8.8.8 via 192.168.2.1 dev br0.192
8.8.8.8 via 10.10.10.1 dev br0
10.10.0.0/24 dev br0 src 10.10.10.20
10.99.99.0/24 dev br0.99 src 10.99.99.1
192.168.2.0/24 dev br0.192 src 192.168.2.49

AP505H-Lab1#

Let's have a look at the system logs

AP505H-Lab1# sh log system 40

Sep  9 14:08:21   cli[6041]: <341227> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| uplink detection:
total_icmp_sent 980, total_icmp_lost 4, continuous_icmp_lost 3.
Sep  9 14:08:21   cli[6041]: <341264> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| disable uplink wired-1.
Sep  9 14:08:21   cli[6041]: <341006> <CRIT> |AP AP505H-Lab1@10.10.10.20 cli| route delete default
Sep  9 14:08:21   cli[6041]: <341185> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| Retrieving ip address from br0, ip 10.10.10.20, mask 255.255.255.0.
Sep  9 14:08:21   cli[6041]: <341274> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| Update election ip from br0, election ip 10.10.10.20/255.255.255.0.
Sep  9 14:08:21   cli[6041]: <341004> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| build_my_ip_address: old ip and new ip same; skipping
Sep  9 14:08:21   cli[6041]: <341177> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| Try next uplink because current uplink is down: wired-1 --> wired-192.
Sep  9 14:08:21   cli[6041]: <341004> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| build_my_ip_address:setting this as new IP address for swarm/receive handler.
Sep  9 14:08:21   cli[6041]: <341227> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| ethernet eth0 link up;
Sep  9 14:08:21   cli[6041]: <341339> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| Uplink wired-1, reach-state DOWN-->UP.
Sep  9 14:08:21   cli[6041]: <341185> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| Retrieving ip address from br0.192, ip 192.168.2.49, mask 255.255.255.0.
Sep  9 14:08:21   cli[6041]: <341274> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| Update election ip from br0.192, election ip 192.168.2.49/255.255.255.0.
Sep  9 14:08:21   cli[6041]: <341004> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| build_my_ip_address:setting this as new IP address for swarm
Sep  9 14:08:21   cli[6041]: <341004> <WARN> |AP AP505H-Lab1@10.10.10.20 cli| build_my_ip_address_stage2:setting this as new IP address for swarm/clients
Sep  9 14:08:43   cli[6041]: <341227> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| uplink detection:
total_icmp_sent 4, total_icmp_lost 3, continuous_icmp_lost 3.
Sep  9 14:09:18   cli[6041]: <341005> <ERRS> |AP AP505H-Lab1@192.168.2.49 cli| uplink axpx: entering axpx receive handler.
Sep  9 14:09:24   cli[6041]: <341227> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| ethernet eth0 link up;
Sep  9 14:09:51   cli[6041]: <341339> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| Uplink wired-1, reach-state DOWN-->UP.
Sep  9 14:09:51   cli[6041]: <341185> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| Retrieving ip address from br0.192, ip 192.168.2.49, mask 255.255.255.0.
Sep  9 14:09:51   cli[6041]: <341274> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| Update election ip from br0.192, election ip 192.168.2.49/255.255.255.0.
Sep  9 14:09:51   cli[6041]: <341004> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| build_my_ip_address:old ip and new ip same; skipping
Sep  9 14:09:51   cli[6041]: <341005> <ERRS> |AP AP505H-Lab1@192.168.2.49 cli| DDNS: ddns update for IAP is not enabled
Sep  9 14:10:23   cli[6041]: <341266> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| uplink preempt to wired-192
Sep  9 14:10:23   cli[6041]: <341004> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| Preemption: trying a higher uplink
Sep  9 14:10:23   cli[6041]: <341264> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| disable uplink wired-192
Sep  9 14:10:23   cli[6041]: <341006> <CRIT> |AP AP505H-Lab1@192.168.2.49 cli| route del default gw 192.168.2.1
Sep  9 14:10:23   cli[6041]: <341185> <WARN> |AP AP505H-Lab1@192.168.2.49 cli| Retrieving ip address from br0.192, ip 192.168.2.49, mask 255.255.255.0.
### 4.3 Block the Traffic on the primary uplink

In this test we’ll:

- do a non-stop ping test to 8.8.8.8 from the Win10 Client
- block the traffic in the upstream router, which is connected to E0 port, simulating a logical failure
- see how long till E1 backup uplink will get activated
- and then permit traffic in the upstream router on E0 and see if the pre-emption works

After blocking the traffic on the upstream router of E0, we’ll notice that the E0 port is up, but after about 4-5 ping misses the default route is pointing to E1

```bash
c:\Users\Parsa>ping 8.8.8.8 -t

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=13ms TTL=57
Reply from 8.8.8.8: bytes=32 time=16ms TTL=57
Reply from 8.8.8.8: bytes=32 time=14ms TTL=57
Reply from 8.8.8.8: bytes=32 time=25ms TTL=57
Request timed out.
Request timed out.
Request timed out.
Reply from 192.168.1.130: Destination host unreachable.
Reply from 192.168.1.130: Destination host unreachable.
Reply from 8.8.8.8: bytes=32 time=41ms TTL=54
Reply from 8.8.8.8: bytes=32 time=65ms TTL=54
Reply from 8.8.8.8: bytes=32 time=28ms TTL=54
Reply from 8.8.8.8: bytes=32 time=54ms TTL=54
Reply from 8.8.8.8: bytes=32 time=40ms TTL=54
Reply from 8.8.8.8: bytes=32 time=39ms TTL=54
Reply from 8.8.8.8: bytes=32 time=68ms TTL=54
```

Checking the uplink status, we’ll notice that the reachability of E0 is down that’s why it has switches to the backup uplink on E1

```bash
AP505H-Lab1# sh port status

Port Status
-------------
Port          Type  Admin-State Oper-State STP-State Dot3az Loop-Protect Storm-Control Loop-Detection-TX
-------------- --------------- --------------- --------------- --------------- --------------- --------------- --------------- ---------------
eth0        2.5GE     up           up           Off         Disable OFF         OFF 0 0
eth1         GE        up           up           Off         Disable OFF         OFF 0 0
eth2         GE        up           up           Off         Disable OFF         OFF 0 0
eth3         GE        up           down        Off         Disable OFF         OFF 0 0
eth4         GE        up           down        Off         Disable OFF         OFF 0 0
eth5         USB       up           down        Off         Disable OFF         OFF 0 0

AP505H-Lab1# sh ip route

default via 192.168.2.1 dev br0.192
8.8.8.8 via 192.168.2.1 dev br0.192
8.8.8.8 via 10.10.10.1 dev br0
10.10.10.0/24 dev br0 src 10.10.10.20
10.99.99.0/24 dev br0.99 src 10.99.99.1
172.31.98.0/23 dev br0.3333 src 172.31.98.1
192.168.2.0/24 dev br0.192 src 192.168.2.49

AP505H-Lab1# sh uplink status

Uplink preemption :enable
Uplink preemption interval :60
Uplink enforce :none
```
Uplink wired-1 :DHCP
Uplink wired-192 :DHCP
Internet failover :enable
Max allowed test packet loss :3
Secs between test packets :5
VPN failover timeout (secs) :180
Internet check timeout (secs) :5
APIX type:PEAP
Certification type:NONE
Validate server:Disable

Uplink Table
----------------
Type  VLAN  State  Reach State  Prio  In Use  Interface  IP            Mask           GW
Sent  Lost  Cont lost
----    ----    -----        ----    ------    ----------  -------          ------          ----
1      0      0         UP  0  No  br0        10.10.10.20   255.255.255.0
192.168.2.1  0      0     UP  5  Yes  br0.192    192.168.2.49  255.255.255.0
Cellular 0     INIT  INIT  22  No  ppp0       0.0.0.0       0.0.0.0        0.0.0.0
WiFi-sta 0     INIT  INIT  20  No  wuplink0   0.0.0.0       0.0.0.0        0.0.0.0

Wired Port Table
-----------------
Port  State  Type  Bonding(Admin/Oper/Active)
----    ----    ----          --------------
eth0  UP     WAN  Yes/Yes/Yes
eth1  UP     WAN  No/No/No
eth2  UP     LAN  No/No/No
eth3  DOWN   LAN  No/No/No
eth4  DOWN   LAN  No/No/No
AP505H-Lab1#

Now when we permit the traffic on the upstream router of E0, we should see the default route going back to
10.10.10.1 which is on E0. You’ll also notice that the reachability of E0 is up.

AP505H-Lab1# sh ip route
default via 10.10.10.1 dev br0
8.8.8.8 via 192.168.2.1 dev br0.192
8.8.8.8 via 10.10.10.1 dev br0
10.10.10.0/24 dev br0  src 10.10.10.20
10.99.99.0/24 dev br0.99  src 10.99.99.1
172.31.98.0/23 dev br0.3333  src 172.31.98.1
192.168.2.0/24 dev br0.192  src 192.168.2.49
AP505H-Lab1#
AP505H-Lab1#
AP505H-Lab1# sh uplink status

Uplink preemption :enable
Uplink preemption interval :60
Uplink enforce :none
Uplink wired-1 :DHCP
Uplink wired-192 :DHCP
Internet failover :enable
Max allowed test packet loss :3
Secs between test packets :5
VPN failover timeout (secs) :180
Internet check timeout (secs) :5
APIX type:PEAP
Certification type:NONE
Validate server:Disable
### Uplink Table

<table>
<thead>
<tr>
<th>Type</th>
<th>VLAN</th>
<th>State</th>
<th>Reach State</th>
<th>Prio</th>
<th>In Use</th>
<th>Interface</th>
<th>IP</th>
<th>Mask</th>
<th>GW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>1</td>
<td>UP</td>
<td>UP</td>
<td>0</td>
<td>Yes</td>
<td>br0</td>
<td>10.10.10.20</td>
<td>255.255.255.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.1</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>10.10.10.1</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>Ethernet</td>
<td>192</td>
<td>UP</td>
<td>UP</td>
<td>5</td>
<td>No</td>
<td>br0.192</td>
<td>192.168.2.49</td>
<td>255.255.255.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>192.168.2</td>
<td>2032</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>192.168.2.1</td>
<td>2032</td>
<td>0</td>
</tr>
<tr>
<td>Cellular</td>
<td>0</td>
<td>INIT</td>
<td>INIT</td>
<td>22</td>
<td>No</td>
<td>ppp0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
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<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>Wifi-sta</td>
<td>0</td>
<td>INIT</td>
<td>INIT</td>
<td>20</td>
<td>No</td>
<td>wuplink0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
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<tr>
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<td></td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
</tr>
</tbody>
</table>

### Wired Port Table

<table>
<thead>
<tr>
<th>Port</th>
<th>State</th>
<th>Type</th>
<th>Bonding(Admin/Oper/Active)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eth0</td>
<td>UP</td>
<td>WAN</td>
<td>Yes/Yes/Yes</td>
</tr>
<tr>
<td>eth1</td>
<td>UP</td>
<td>WAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth2</td>
<td>UP</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth3</td>
<td>DOWN</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
<tr>
<td>eth4</td>
<td>DOWN</td>
<td>LAN</td>
<td>No/No/No</td>
</tr>
</tbody>
</table>

AP505H-Lab1#
5 Instant Mesh Network

Instant Mesh network must have at least one valid uplink to provide mesh functionality. In this specific scenario, the IAP that has wired uplink is called Mesh Portal and IAP without an Ethernet link functions as a Mesh Point.

Instant mesh functionality is supported only on dual-radio Instant APs. The Mesh Point APs always use the 2.4 GHz radio for client traffic, while the 5 GHz radio is always used for both mesh-backhaul and client traffic.

The mesh network must be provisioned for the first time by plugging into the wired network.

5.1 Mesh Configuration

To configure mesh, we need to ensure we have

1. configured at least one WLAN for the Instant Cluster
2. disable extended SSID
3. Configure the mesh point's Eth0 interface to enable bridging

Here we already have a WLAN configured,

![Configuration](image)

Next, we’ll disable extended SSID which by default it is enabled.

![Configuration](image)
And finally enable ethernet bridging on E0 for the AP that is going to be the mesh point.
You can do that using CLI or WebUI. The command to use is “enet0-bridging”

```
20:4c:03:17:a0:4c# show ap-env
Antenna Type:Internal
IoT Antenna Type:Internal
Need USB field:Yes
uap_controller_less:1
enet1_mode:downlink
20:4c:03:17:a0:4c# ap-env ?
<env_name> string

20:4c:03:17:a0:4c# enet0-bridging
20:4c:03:17:a0:4c# show ap-env
Antenna Type:Internal
IoT Antenna Type:Internal
Need USB field:Yes
enet0_bridging:1
uap_controller_less:1
enet1_mode:downlink
20:4c:03:17:a0:4c#
20:4c:03:17:a0:4c#
```

Or you can configure it using the WebUI, by changing the uplink mode for E0 to “Downlink”

![WebUI Configuration](image)

Once you have done all the configuration, you need to reboot the mesh point.

## 5.2 Mesh Link Monitoring

Here is the console logs of the Mesh Point AP that is rebooting.

Populate AP type info
Domain Name: SetMeUp.arubanetworks.com
Current OEM Name : Aruba Networks
Disabling ipv6 for devices by default
AP-type has_ble_support: ONBOARD.
IPv6 capability is supported for devices
No panic info available
Writing /dev/ttyMSM1 into /tmp/ble_port
Enabling ble_daemon and ble_relay via nanny
glenmorangie: Start hotplug
Backup ENV.
Installing glenmorangie ethernet driver
[ 46.917938] edma module_init
[ 47.791508] asap_switch: module license 'Proprietary' taints kernel.
[ 47.855126] Disabling lock debugging due to kernel taint
Enter non-FIPS mode
Cfg len is 4114
enet0 bridging detected
Mesh enabled
dual uplink platform just by config
Ethernet port 1 mode: active-standby
Ethl works as downlink when enet1_mode is downlink
Eth0 has been enslaved into bond0 working as downlink with Eth1
Starting watchdog process...
Aruba watchdog daemon started [4 thread(s)]
training packets starting...
training packets on interface:
eth0 eth1

wifi uplink not present...
Terminal access enabled...
Valid SSID detected...
touching file /tmp/ip_mode_0
do ethtool autoneg on for eth0
do ethtool autoneg on for eth1
do ethtool autoneg on for eth2
cp: /lib/nls_base.ko: No such file or directory
cp: /lib/usbcore.ko: No such file or directory
init usb modem ...
[ 59.579224] SCSI subsystem initialized
No USB Plugged in
Skip wired uplink detection
No uplink active. Becoming Mesh Point
Str Mesh Split5G Band Range:
Mesh Split5G Band Range: 0
disable auto topology rules
apdot1x authentication is not enabled

It boots up as Mesh Point.
Here is the CLI version for the above screenshot. This is the mesh topology from the Mesh Portal AP.

```
20:4c:03:5c:05:6e# show ap mesh cluster topology

Mesh Cluster name: 358bb6264af555543ef327cd338da93
Name               AP Type  Mesh Role  IP Address   Portal AP          Radio ID  Radio Mode
BSSID              Parent AP          Path Cost  Node Cost  Link Cost  Hop Count  Rate Tx/Rx RSSI  Last Update  Uplink Age  Children Num  Children List
----  -------  ----------  -----------  -----------  -----------  --------  ---------  ----------  -------------  -------------  ---------------
20:4c:03:17:a0:4c  AP            10.10.10.21  20:4c:03:5c:05:6e  0         MPC (AC)  c8:b5:ad:16:26:10  20:4c:03:5c:05:6e  4          0          3          1          650/866  39 1m:14s       4h:16m:59s  0
20:4c:03:5c:05:6e  Portal        10.10.10.20  20:4c:03:5c:05:6e  0         MPP (AC)  00:4e:35:7b:2c:d0  --  --  --  --  --  4s  4h:34m:6s  1

Total APs: 2
MPP: portal's radio. MPC: point's radio with active uplink. MPA: point's radio without active uplink.
```

Note that Split 5G lined below is referring to APs that have dual 5GHz radio like AP-555 and AP-345, in which you can split the 5G band into lower and upper to have one set aside for mesh backhaul and the other for client associations. Here it is automatically set to “full” because these APs don’t have dual 5GHz radios. This output is from he Mesh Point.

```
20:4c:03:5c:05:6e# sh ap mesh cluster status

Mesh cluster :Disabled
Mesh role :Mesh Portal
Mesh Split5G Band Range :full
Mesh mobility :Disabled
```

This is the CLI command to show the mesh config.
Here check the mesh link and the flags should be VLK

Lastly, we'll check the BSS-Table showing that the Mesh Point AP is also broadcasting WLANs on both radios.
Flags:  a = Airslice policy; A = Airslice app monitoring; c = MBO Cellular Data Capable BSS; d = Deferred Delete Pending; D = VLAN Discovered; E = Enhanced-open BSS without transition mode; I = Imminent VAP Down; K = 802.11K Enabled; m = Agile Multiband (MBO) BSS; M = WPA3-SAE mixed mode BSS; o = Enhanced-open transition mode open BSS; O = Enhanced-open BSS with transition mode; r = 802.11r Enabled; t = Broadcast TWT Enabled; T = Individual TWT Enabled; W = 802.11W Enabled; x = MBSSID Tx BSS; 3 = WPA3 BSS.

Here we see that the WiFi mesh automatically becomes highest priority uplink on the Mesh Point AP.

```
Uplink preemption : enable
Uplink preemption interval : 45
Uplink enforce : none
Uplink wired-1 : DHCP
Uplink wired-192 : DHCP
Internet failover : enable
Max allowed test packet loss : 3
Secs between test packets : 5
VPN failover timeout (secs) : 180
Internet check timeout (secs) : 5
APIX type: NONE
Certification type: NONE
Validate server: NONE

Uplink Table
--------------
Type       VLAN  State  Reach State  Prio  In Use  Interface  IP           Mask           GW
Sent  Lost  Cont lost    ----  -----  -----  ------  -------  ------  ----  ----  ----
---- ---- ---- -------    ----  -----  -----  ------  -------  ------  ----  ----  ----
Ethernet  1     DOWN   DOWN         0     No      br0        0.0.0.0      0.0.0.0        0.0.0.0
0     0     0
Ethernet  192  DOWN   DOWN         5     No      br0.192    0.0.0.0      0.0.0.0        0.0.0.0
0     0     0
Cellular  0     INIT   INIT         7     No      ppp0       0.0.0.0      0.0.0.0        0.0.0.0
0     0     0
Wifi-sta  0     INIT   INIT         6     No      wuplink0   0.0.0.0      0.0.0.0        0.0.0.0
0     0     0
Wifi-mesh 0     UP     UP           0     Yes     br0        10.10.10.21  255.255.255.0
10.10.10.1 0     0     0

Wired Port Table
------------------
Port  State  Type  Bonding(Admin/Oper/Active)
---- ---- ---- ---------------
eth0  DOWN  LAN   No/Yes/Yes
eth1  DOWN  WAN   No/No/No
eth2  UP   LAN   No/No/No
eth3  DOWN  LAN   No/No/No
```

And lastly, the IP address for the Mesh Point AP that is from the native VLAN on E0 port of the Mesh Portal AP.

```
20:4c:03:17:a0:4c# sh ip int b
Interface IP Address / IP Netmask Admin Protocol
br0 10.10.10.21 / 255.255.255.0  up  up
br0.3333 172.31.98.1 / 255.255.254.0  up  up
```
5.3 Mesh Link Test with Wired Client

Now we are going to connect the second wired client to the E2 port of Mesh Point AP. As you recall, we had configured the E2 port of the cluster to use the local DHCP pool that is on 10.99.99.0/24

We have full connectivity between the two wired clients. And you get the same result when you have wired client connected to the Mesh AP and do continuous ping to say 1.1.1.1 and you then disconnect the primary uplink on E0 of the Mesh Portal.

Here is the output of the ping test from Client that is connected to Mesh Point roughly we’ll lose 4-5 pings.

C:\Users\Parsa>ping 10.99.99.2
Pinging 10.99.99.2 with 32 bytes of data:
Reply from 10.99.99.2: bytes=32 time=4ms TTL=128
Reply from 10.99.99.2: bytes=32 time=4ms TTL=128
Reply from 10.99.99.2: bytes=32 time=3ms TTL=128
Reply from 10.99.99.2: bytes=32 time=4ms TTL=128

C:\Users\Parsa>ping 1.1.1.1 -t
Pinging 1.1.1.1 with 32 bytes of data:
Reply from 1.1.1.1: bytes=32 time=18ms TTL=57
Reply from 1.1.1.1: bytes=32 time=13ms TTL=57
Reply from 1.1.1.1: bytes=32 time=17ms TTL=57
Reply from 1.1.1.1: bytes=32 time=11ms TTL=57
Reply from 1.1.1.1: bytes=32 time=19ms TTL=57
Reply from 1.1.1.1: bytes=32 time=12ms TTL=57
Reply from 1.1.1.1: bytes=32 time=15ms TTL=57
Reply from 1.1.1.1: bytes=32 time=14ms TTL=57
Reply from 1.1.1.1: bytes=32 time=11ms TTL=57
Reply from 1.1.1.1: bytes=32 time=14ms TTL=57
Reply from 1.1.1.1: bytes=32 time=13ms TTL=57
Reply from 1.1.1.1: bytes=32 time=13ms TTL=57
Reply from 1.1.1.1: bytes=32 time=14ms TTL=57
Reply from 1.1.1.1: bytes=32 time=17ms TTL=57
Reply from 1.1.1.1: bytes=32 time=23ms TTL=57

Request timed out.
Request timed out.
Request timed out.
Request timed out.
Reply from 1.1.1.1: bytes=32 time=45ms TTL=54
Reply from 1.1.1.1: bytes=32 time=49ms TTL=54
Reply from 1.1.1.1: bytes=32 time=63ms TTL=54