1 Table of Contents

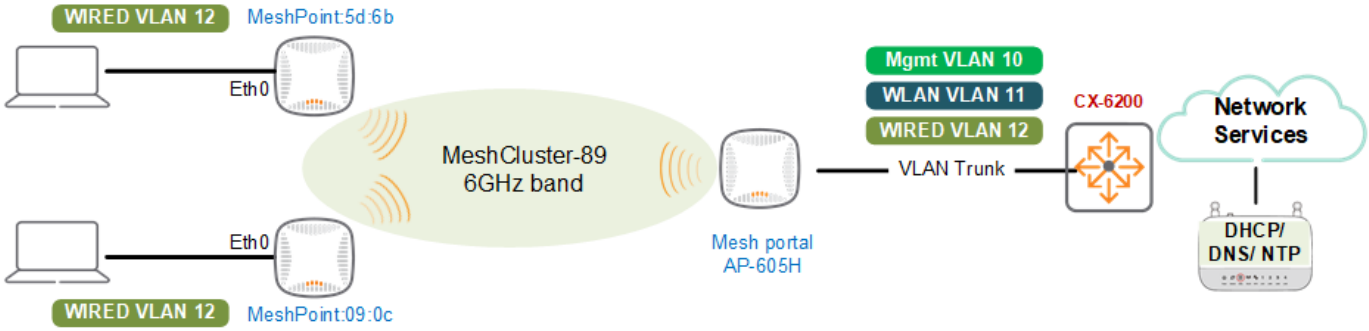
1.1 Revision History

DATE	VERSION	EDITOR	CHANGES
29 Sep 2024	0.1	Ariya Parsamanesh	Initial creation

2 Point to Multi Point Wi-Fi Mesh with AOS10 APs

This is the continuation of Wi-Fi Mesh with AOS10 APs technote in which we'll build on the previous mesh solution and demonstrate the following

- Wi-Fi-Mesh solution for Point to Multi Point (PMP) networks
- Ethernet Bridging across the PMP mesh network
- Testing the Ethernet bridging across PMP
- Use Central Automation Studio for Wi-Fi Mesh visualisation and statistics



2.1 Things you need

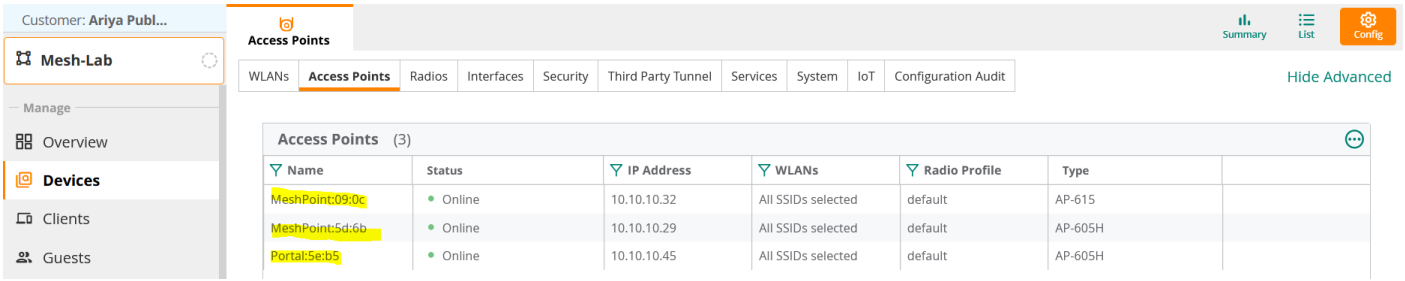
- Aruba AOS10 10.7.x.x or later
- 3x APs (I am using AP-605H and AP-615)
- A Layer three switch and some Wi-Fi and wired clients

2.2 Assumptions

The "Wi-Fi Mesh with AOS10 APs" was read and the setup was configured accordingly. This means that all the APs shown above are configured and Mesh-Cluster 89 is operational.

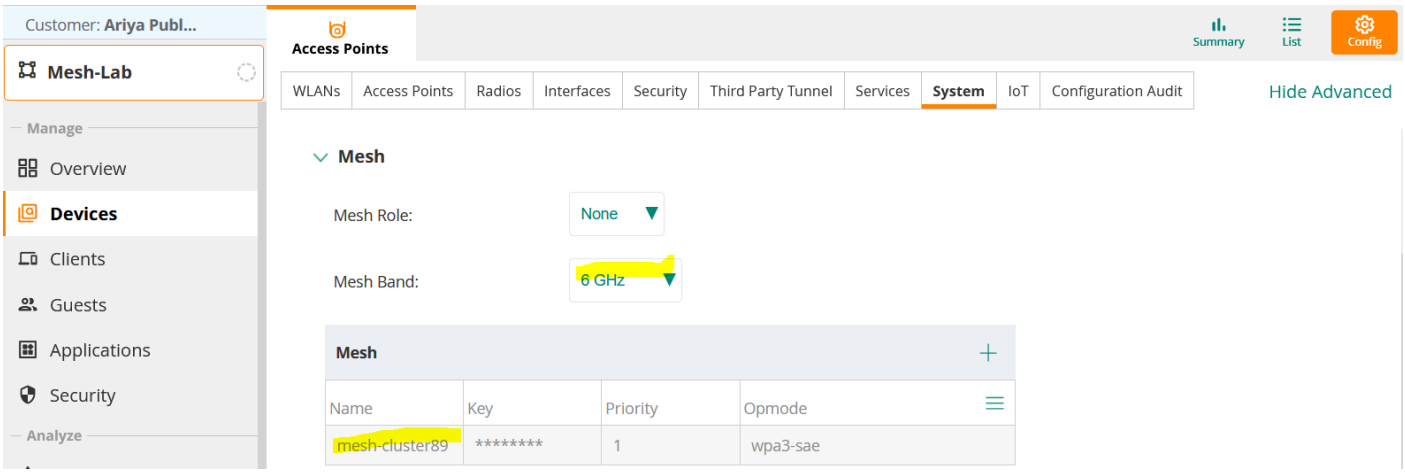
3 Mesh Configuration

This is just a re-cap of the configuration steps needed. The main points is that we'll assign specific Mesh Point and Mesh Portal roles to our APs and don't leave it as Auto. Also we'll configure appropriate names so we can easily identify the APs.

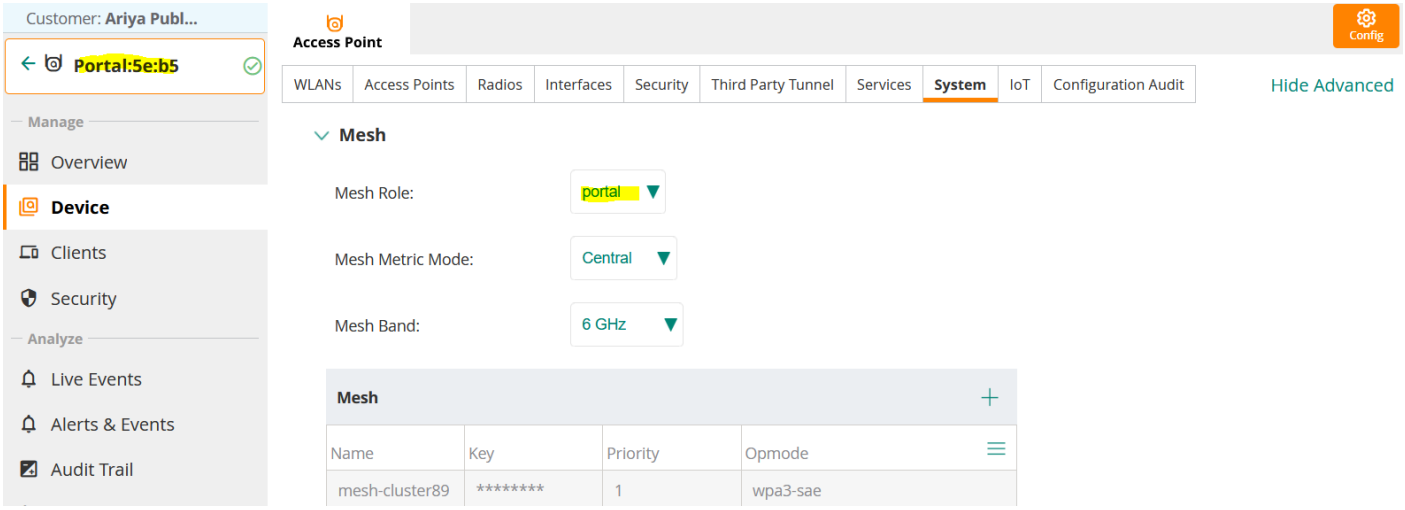


3.1 Mesh Cluster Configuration

Since we'll be using one mesh cluster we'll configure the mesh cluster at the group level.

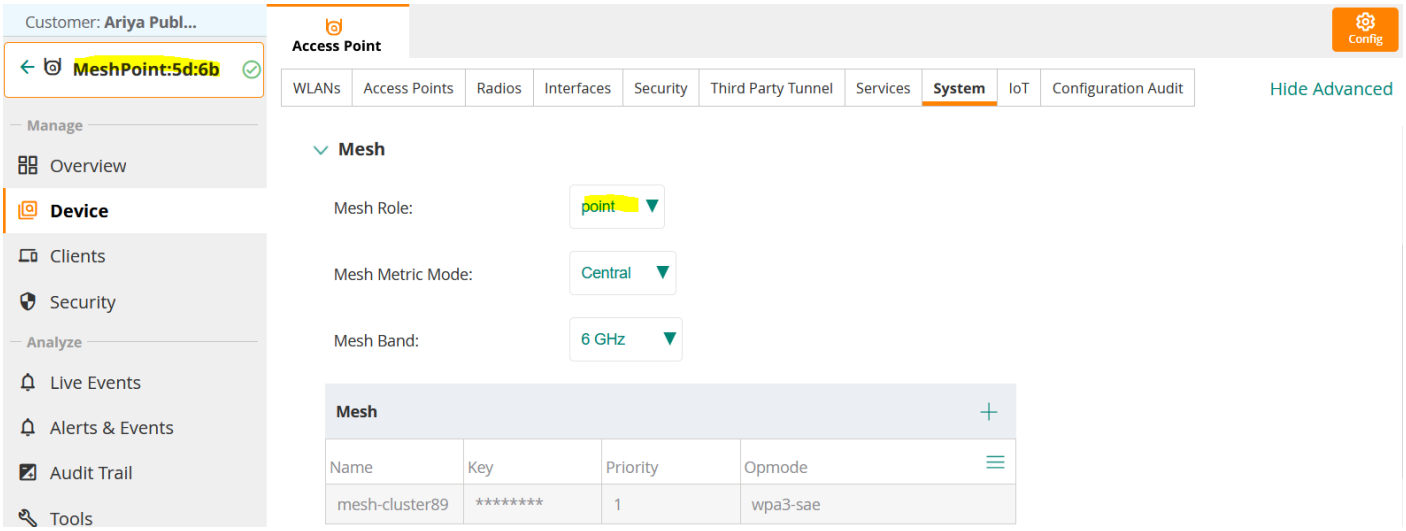


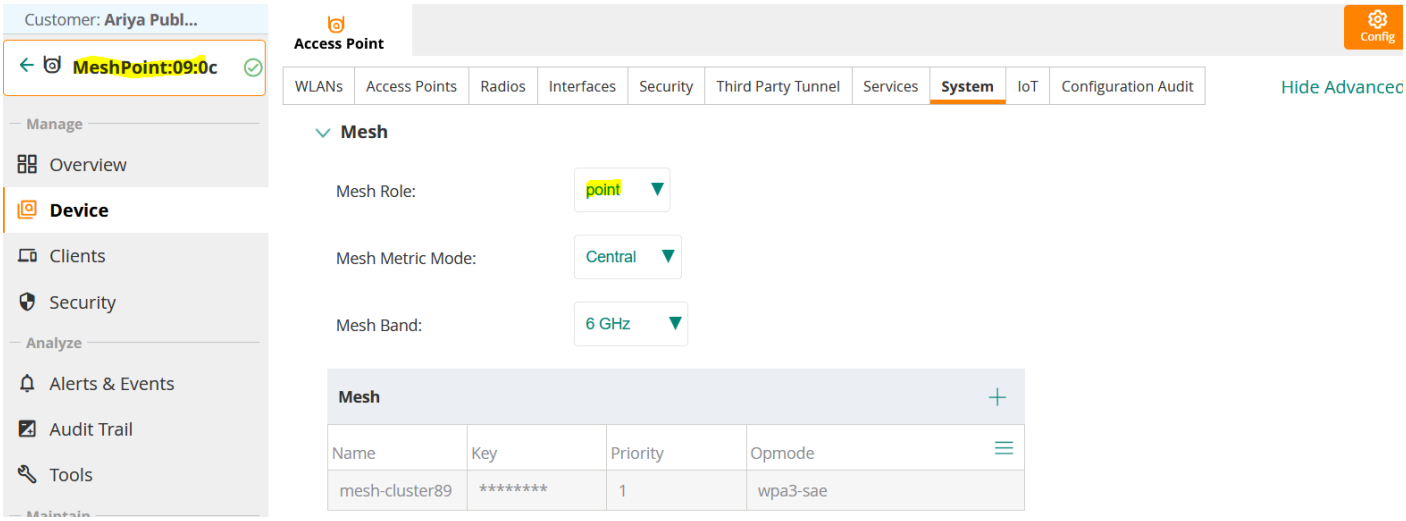
Then at individual device level we'll assign the respective Mesh roles.



3.2 Mesh Role Configuration

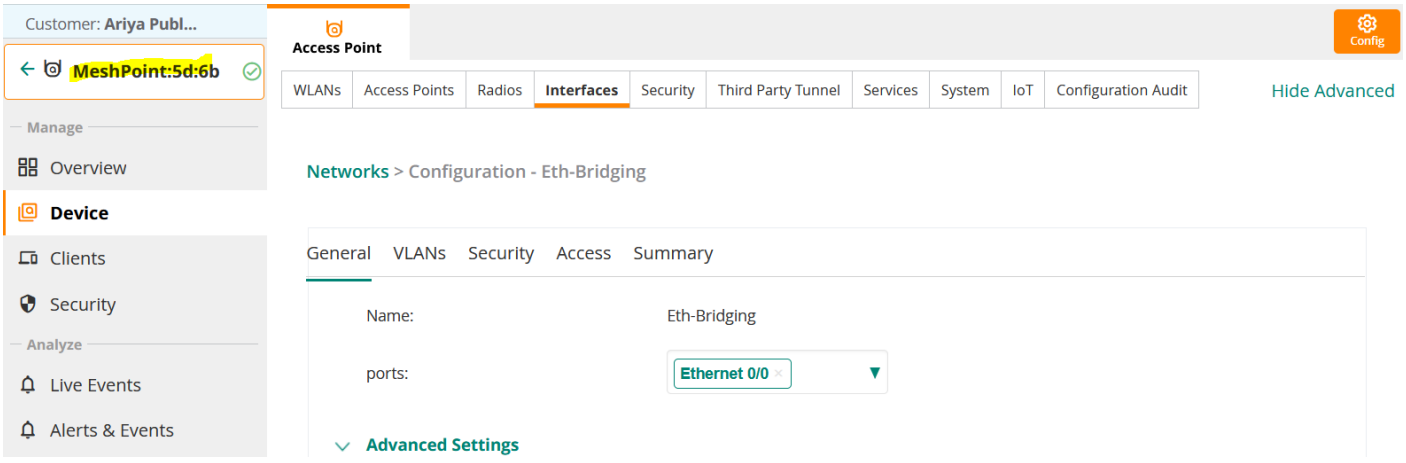
Here is the mesh role configuration for the two APs. The Mesh Portal was already configured in the previous technote.

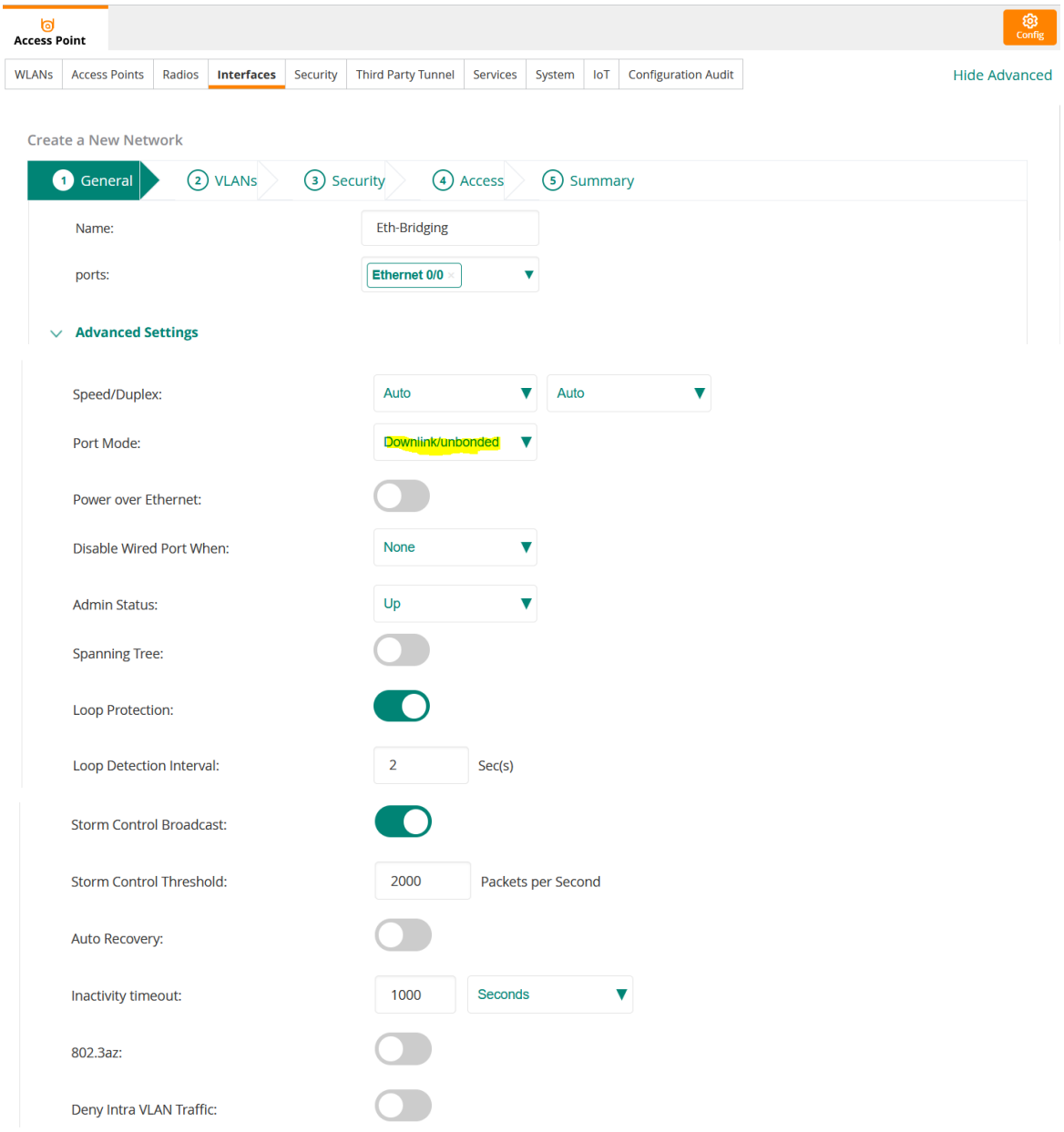




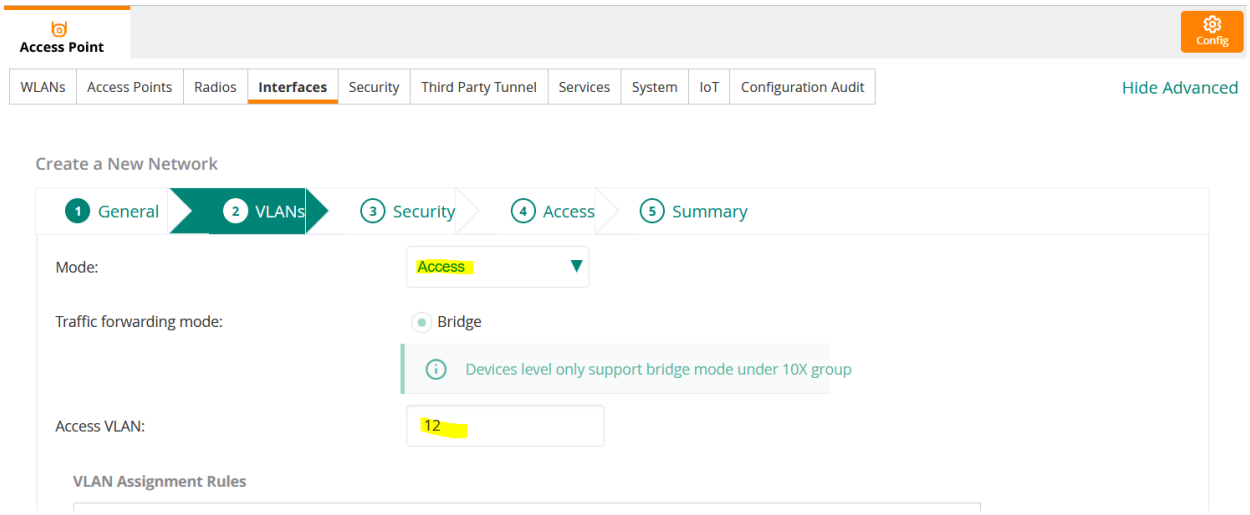
3.3 Ethernet Bridging

Now we'll start the Ethernet bridging configuration that we covered in the previous technote. This configuration will be done at device level for both the Mesh Point APs. Here we are showing the configuration for one of the Mesh Point APs.

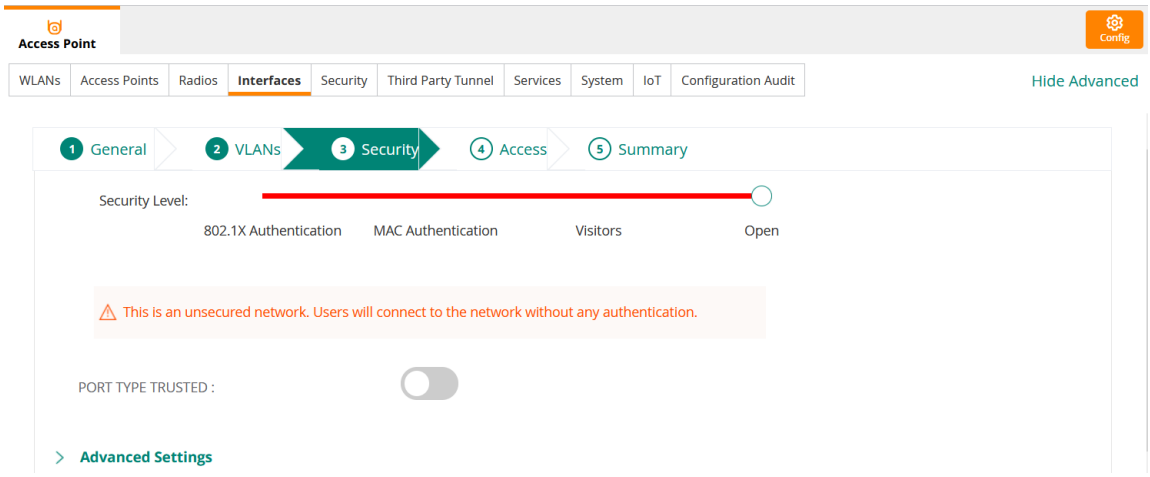


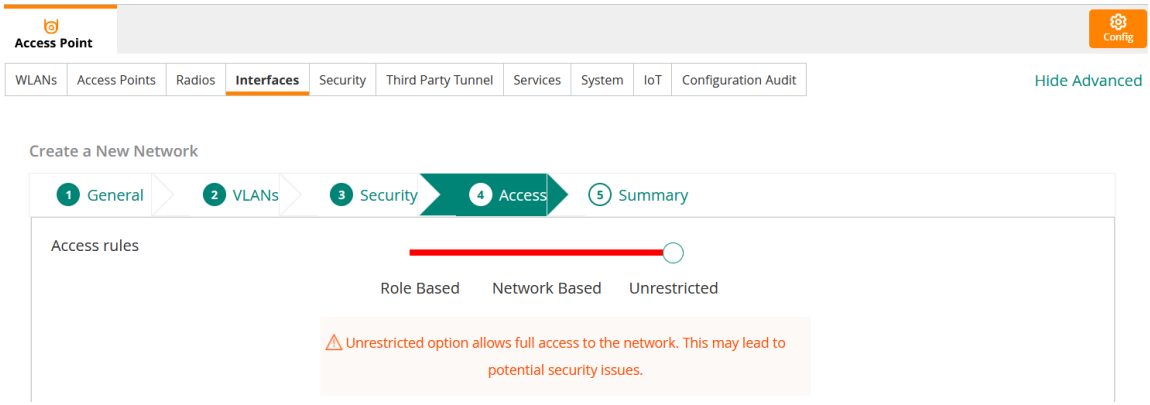


We'll assign the VLAN 12 for the Access mode



Note that if you want to add LAN switches instead and need VLAN trunking, then you can change the "mode" from Access to Trunk.





Remember that since this is the Mesh-Point and enabling Eth0 bridging is done by setting it to downlink. We can check that with this CLI command.

```
MeshPoint:5d:6b# sh wired-port-settings

Wired Port Profiles
-------------------
Name                          VLAN Mode  Allowed VLANs  Native VLAN    Admin Status  Role
Speed  Duplex  POE  In Use   Authentication Method  STP  Trusted
----                          ---------  -------------  -----------    ------------  ----
wired-SetMeUp                 Access     all            guest          Up            wired-SetMeUp
auto   auto    No   Yes      None                   No   No
default_wired_port_profile    Trunk      all            ap-ip-vlan(1)  Up
default_wired_port_profile    auto   full    No   No       None                  No   No
Eth-Bridging                  Access     all            12             Up            Eth-Bridging
auto   auto    Yes  Yes      None                   No   No
Port Profile Assignments
------------------------
Port  Profile Name
----  ------------
0     Eth-Bridging
1     wired-SetMeUp
2     wired-SetMeUp
3     wired-SetMeUp
4     wired-SetMeUp
USB   wired-SetMeUp

MeshPoint:5d:6b#
```

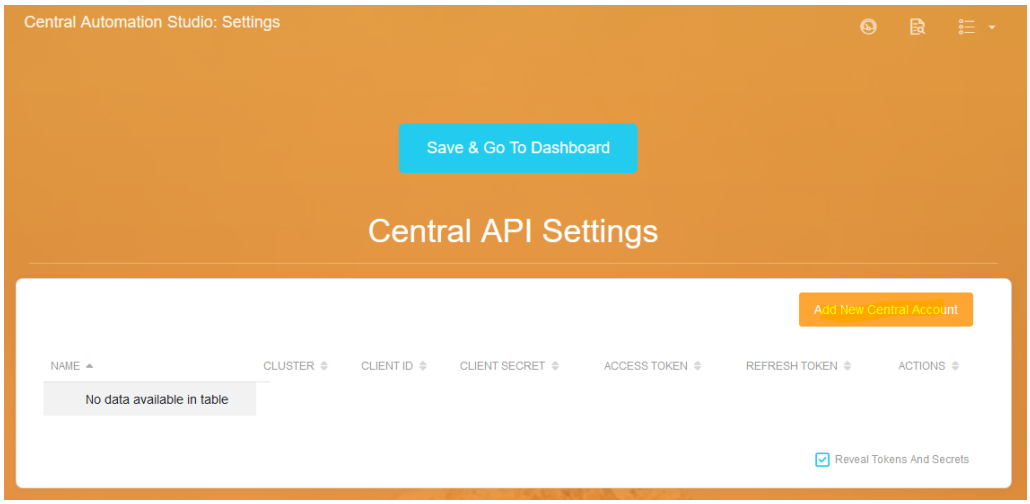
You should then reboot the APs for this change to take effect. Note that if an AP is set to Ethernet 0 bridging, it always acts as a mesh point.

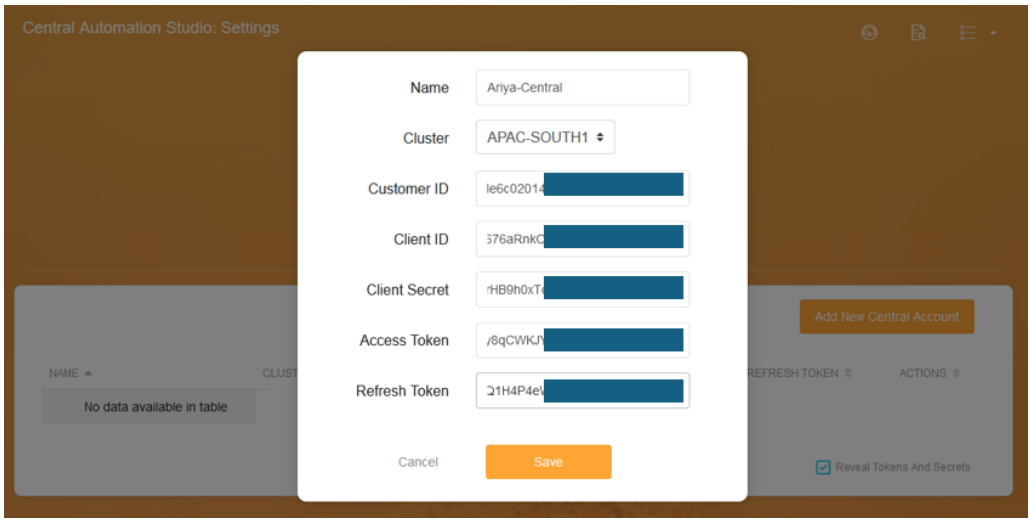
3.4 Central Automation Studio for Mesh cluster

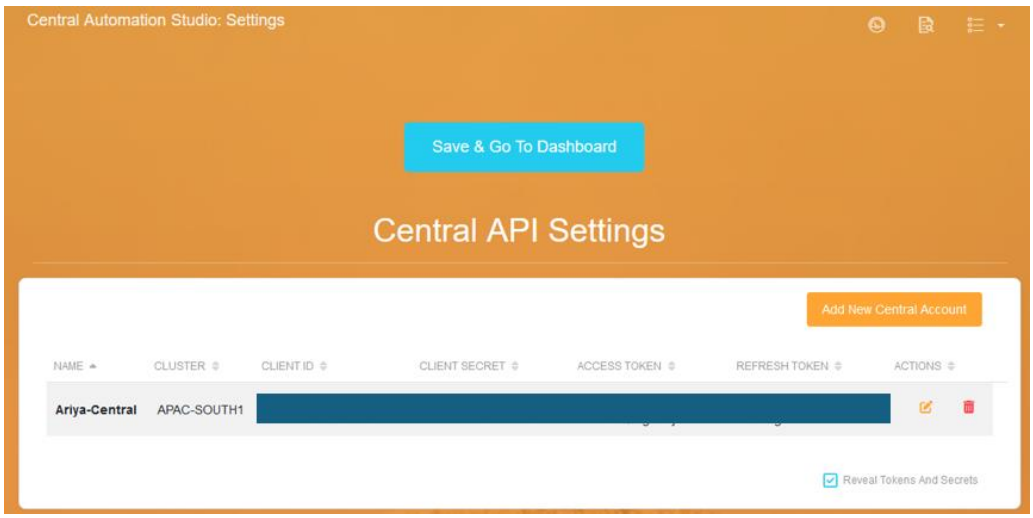
As covered in the first part, we'll configure API gateway and then use Central Automation Studio (CAS) to visualise the mesh links. You can refer to the "Wi-Fi Mesh with AOS10 APs" .

But to recap you need the following info to add to CAS

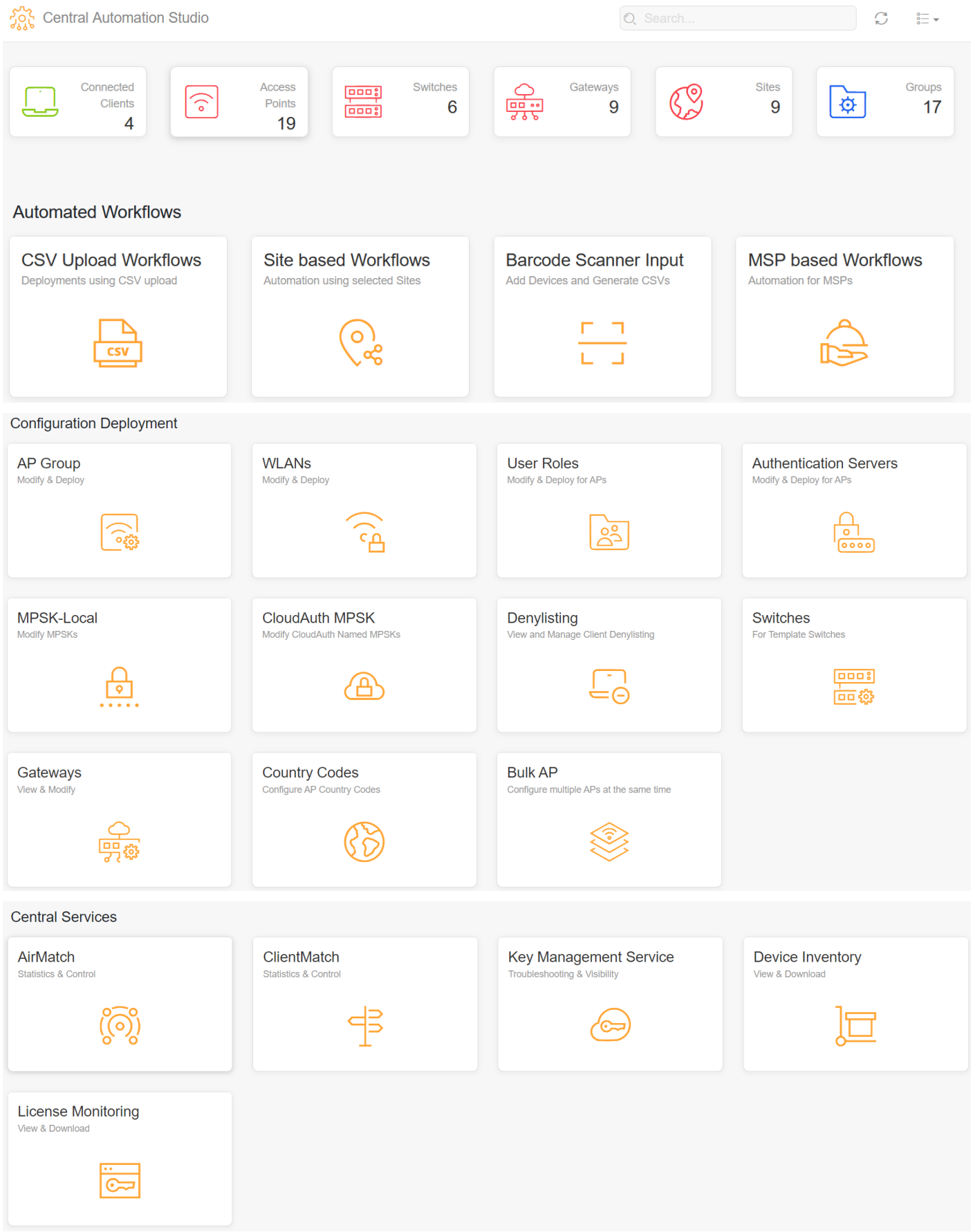
- Customer ID
- Client Id
- Client secret
- Access_token
- Refresh_token







Then once you click on Save and go to dashboard, you should see this dashboard for the account that you just added.



There are also Monitoring, Statistics and Troubleshooting sections in the dashboard that is not shown.

Now we are ready to test our environment.

4 Solution Testing

4.1 Point to Multi Point Mesh Testing

Here we'll check to see if our mesh cluster is formed and established between the three APs.

We'll start with Mesh Portal AP.

```
Portal:5e:b5# sh ap mesh link

Neighbor list
-------------
Radio  MAC                AP Name          Portal             Channel  Band  Age  Hops  Cost  Relation
Flags  RSSI  Rate Tx/Rx  A-Req  A-Resp  A-Fail  HT-Details        Cluster ID
-----  ---               -------          ------             -------  ----  ---  ----  ----  ---------------
--        -----  ----  ----------  -----  ------  ------  ----------        ----------
1      48:b4:c3:90:90:c0  MeshPoint:09:0c  50:e4:e0:14:17:81  5-       6GHz  0    1     8.00  C 4h:51m:19s
ELK    16    1152/1361   1      1       0       HE-40MHzsgi-2ss   e1baf29f4ca4ed35645e0a937d9c9c7
1      50:e4:e0:14:0e:40  MeshPoint:5d:6b  50:e4:e0:14:17:81  5-       6GHz  0    1     8.00  C 17m:11s
VLK    38    2041/2268   5      5       0       VHT-40MHzsgi-2ss  e1baf29f4ca4ed35645e0a937d9c9c7

Total count: 2, Children: 2
Relation: P = Parent; C = Child; N = Neighbor; B = Denylisted-neighbor
Flags: R = Recovery-mode; S = Sub-threshold link; D = Reselection backoff; F = Auth-failure; H = High
Throughput; V = Very High Throughput, E= High efficient, L = Legacy allowed
        K = Connected; U = Upgrading; G = Descendant-upgrading; Z = Config pending; Y = Assoc-resp/Auth
pending
        a = SAE Accepted; b = SAE Denylisted-neighbour; e = SAE Enabled; u = portal-unreachable; o =
opensystem; m = Mobility Enabled

Portal:5e:b5#
```

And here are the Mesh Point APs

```
MeshPoint:09:0c# sh ap mesh link

Neighbor list
-------------
Radio  MAC                AP Name       Portal  Channel  Band  Age  Hops  Cost  Relation
Flags  RSSI  Rate Tx/Rx  A-Req  A-Resp  A-Fail  HT-Details     Cluster ID
-----  ---               -------       ------  -------  ----  ---  ----  ----  -----------------        ----
-  ----  ----------  -----  ------  ------  ----------     ----------
1      50:e4:e0:14:17:81  Portal:5e:b5  Yes     5S       6GHz  0    0     2.00  P 2h:16m:0s              ELK
30    136/544     3      2       1       HE-160MHz-2ss  e1baf29f4ca4ed35645e0a937d9c9c7

Total count: 1, Children: 0
Relation: P = Parent; C = Child; N = Neighbor; B = Denylisted-neighbor
Flags: R = Recovery-mode; S = Sub-threshold link; D = Reselection backoff; F = Auth-failure; H = High
Throughput; V = Very High Throughput, E= High efficient, L = Legacy allowed
        K = Connected; U = Upgrading; G = Descendant-upgrading; Z = Config pending; Y = Assoc-resp/Auth
pending
        a = SAE Accepted; b = SAE Denylisted-neighbour; e = SAE Enabled; u = portal-unreachable; o =
opensystem; m = Mobility Enabled

MeshPoint:09:0c#
```

```
MeshPoint:5d:6b# sh ap mesh link

Neighbor list
-------------
Radio  MAC                AP Name       Portal  Channel  Band  Age  Hops  Cost  Relation
Flags  RSSI  Rate Tx/Rx  A-Req  A-Resp  A-Fail  HT-Details     Cluster ID
-----  ---               -------       ------  -------  ----  ---  ----  ----  -----------------        ----
-  ----  ----------  -----  ------  ------  ----------     ----------
1      50:e4:e0:14:17:81  Portal:5e:b5  Yes     5S       6GHz  0    0     2.00  P 20m:49s                ELK
36    2268/1921   4      2       2       HE-160MHz-2ss  e1baf29f4ca4ed35645e0a937d9c9c7

Total count: 1, Children: 0
Relation: P = Parent; C = Child; N = Neighbor; B = Denylisted-neighbor
Flags: R = Recovery-mode; S = Sub-threshold link; D = Reselection backoff; F = Auth-failure; H = High
Throughput; V = Very High Throughput, E= High efficient, L = Legacy allowed
        K = Connected; U = Upgrading; G = Descendant-upgrading; Z = Config pending; Y = Assoc-resp/Auth
pending
```

```
        a = SAE Accepted; b = SAE Denylisted-neighbour; e = SAE Enabled; u = portal-unreachable; o =
opensystem; m = Mobility Enabled

MeshPoint:5d:6b#
```

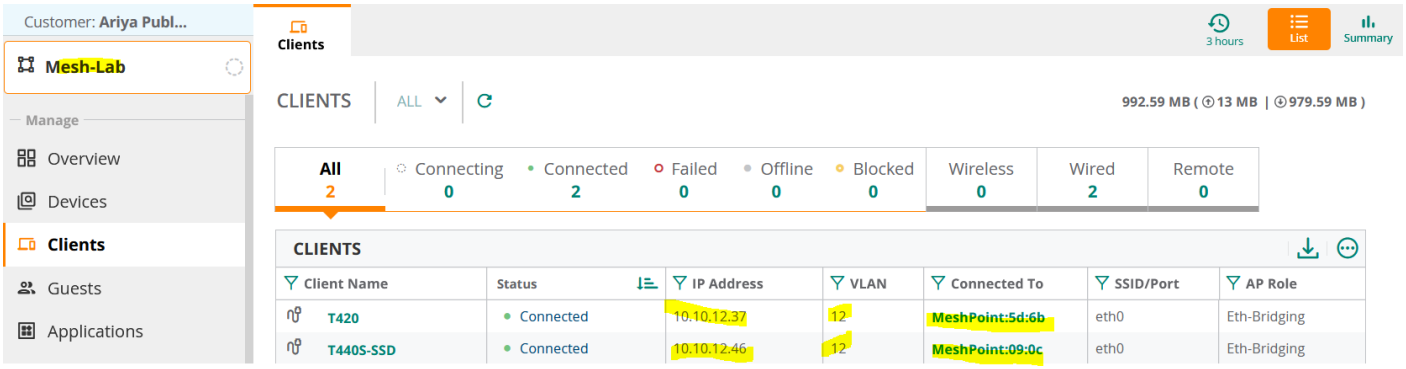
4.2 Wired Client Testing

Now that we have configured and rebooted the AP for Ethernet bridging, we'll connect a wired client to the Eth0 interface of each of the Mesh point AP. Here we'll check if the client is listed in the client table and has a correct IP address on VLAN 12. Since we have made the port untrusted, we can see the wired clients with this command.

```
MeshPoint:5d:6b# sh clients wired

Wired Client List
-----------------
Name   IP Address    MAC Address         OS       Network  Access Point      Role
IPv6 Address   Speed (mbps)
----   ----------    -----------         --       -------  ------------      ----          -
-----------   ------------
T420   10.10.12.37   f0:de:f1:64:0a:82   Win 10   eth0     MeshPoint:5d:6b   Eth-Bridging  -
-             -
Info timestamp       :9740

MeshPoint:5d:6b#
```

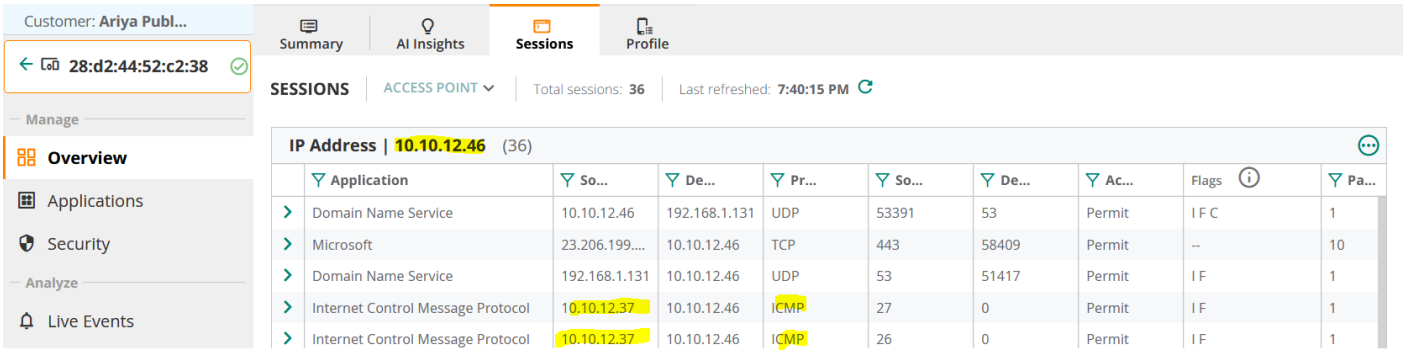
```
MeshPoint:09:0c# sh clients wired

Wired Client List
-----------------
Name   IP Address    MAC Address         OS     Network  Access Point      Role
IPv6 Address   Speed (mbps)
----   ----------    -----------         --     -------  ------------      ----          ---
---------   ------------
T440-SSD    10.10.12.46   28:d2:44:52:c2:38   NOFP   bond0    MeshPoint:09:0c   Eth-Bridging
--             -
Info timestamp       :8378
MeshPoint:09:0c#
MeshPoint:09:0c#
```

And here is the client view for the Mesh APs.

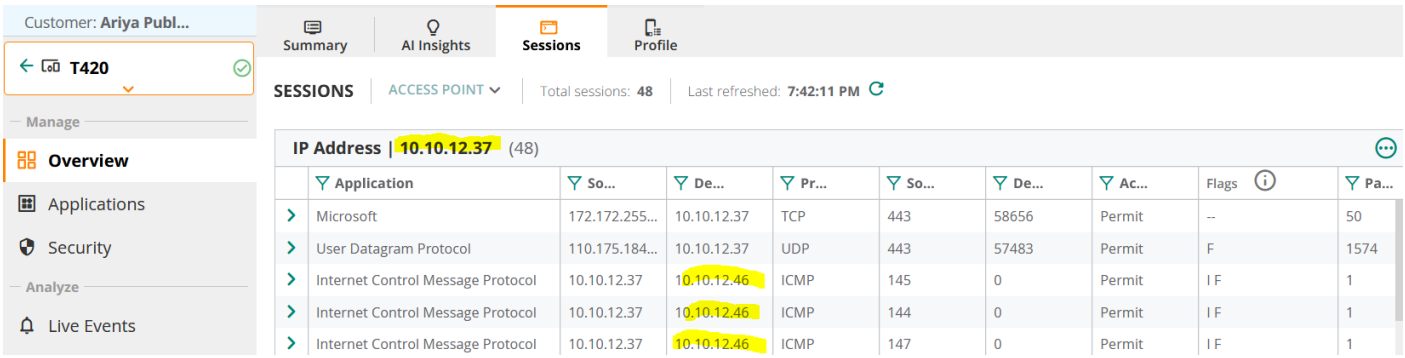


And as you can see, we have one wired client on each Mesh Point AP.

Now to ensure we have connectivity between the wired clients we'll ping one from the other. Here we are pinging 10.10.12.37 from 10.10.12.46



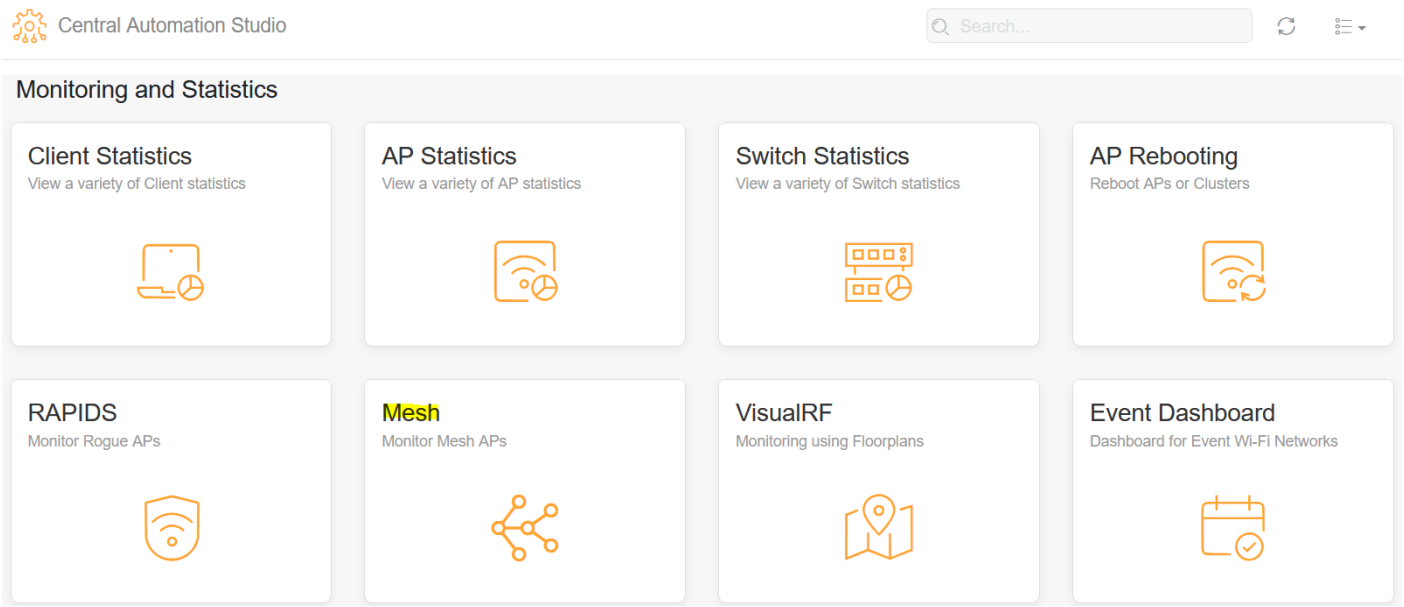
And this is the session table of the other wired client that shows the ICMP ping traffic between them.



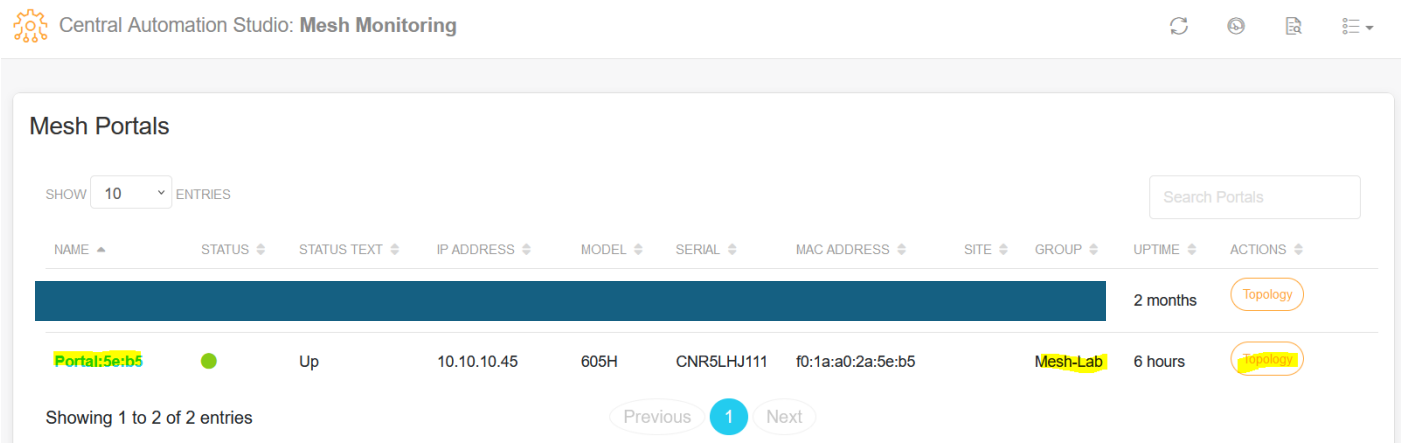
4.3 Central Automation Studio Visualisation

Since we have operational PMP mesh network, you can use the Central Automation Studio (CAS) to quickly check the basic statistics and other useful information. CAS is a frontend to the Aruba Central APIs and I covered how you can configure it for your Aruba Central Account.

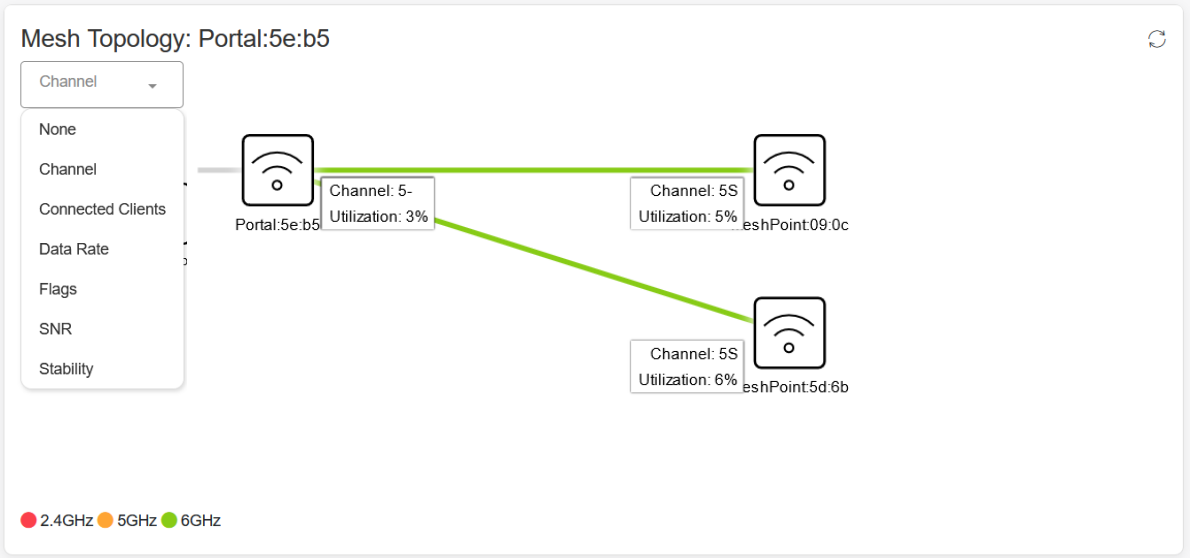
You can refer to Wi-Fi Mesh with AOS10 APs technote. Here is the monitoring and statistics CAS dashboard after it is successfully configured for my Central account. We'll select Mesh for Wi-Fi Mesh visualisation and stats.



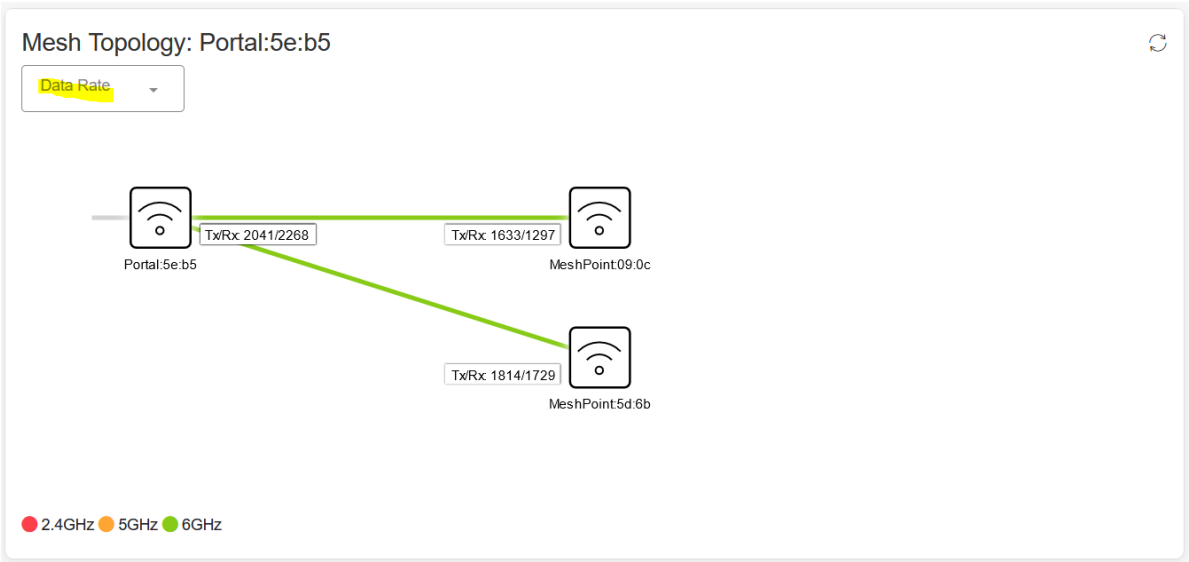
It will then display all the Mesh Portal APs in the Aruba Central account. Here we'll click on the "Topology" for our Lan mesh Portal AP.



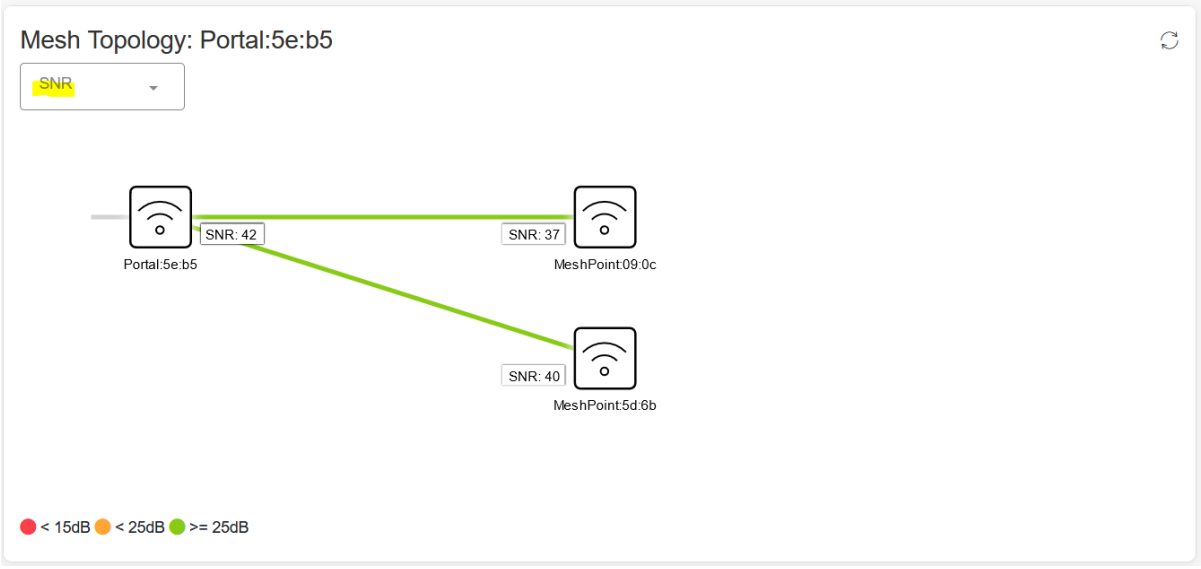
It then brings up the following showing the MPM mesh network initially indicating that it is using 6GHz band. Y ou can select the various options available in the drop-down menu. Here we are selecting the channel.



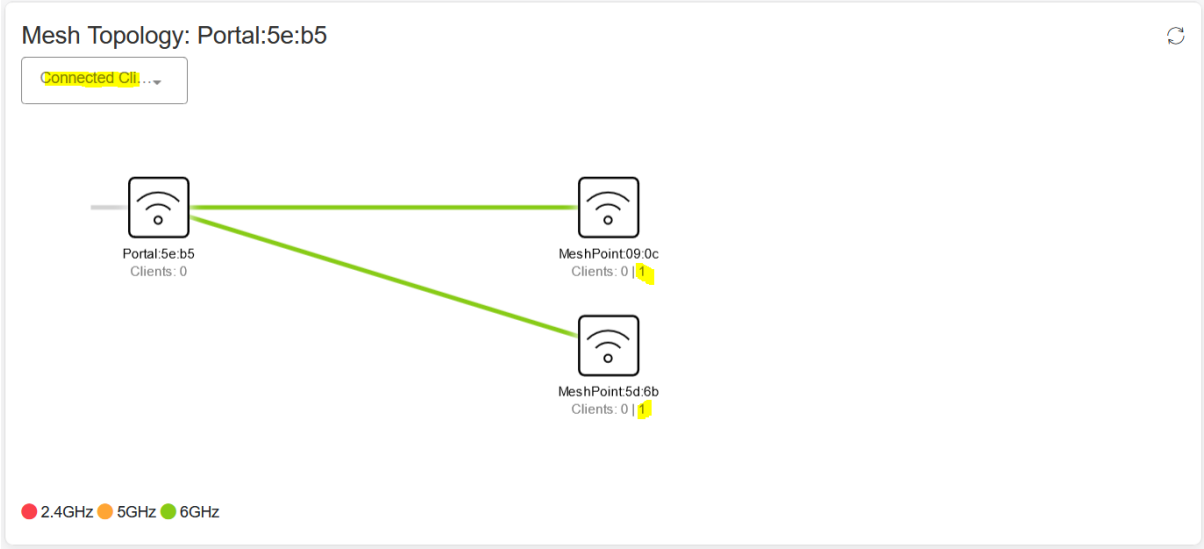
Next, we'll check the data rates. It shows Tx/Rx in Mbps.



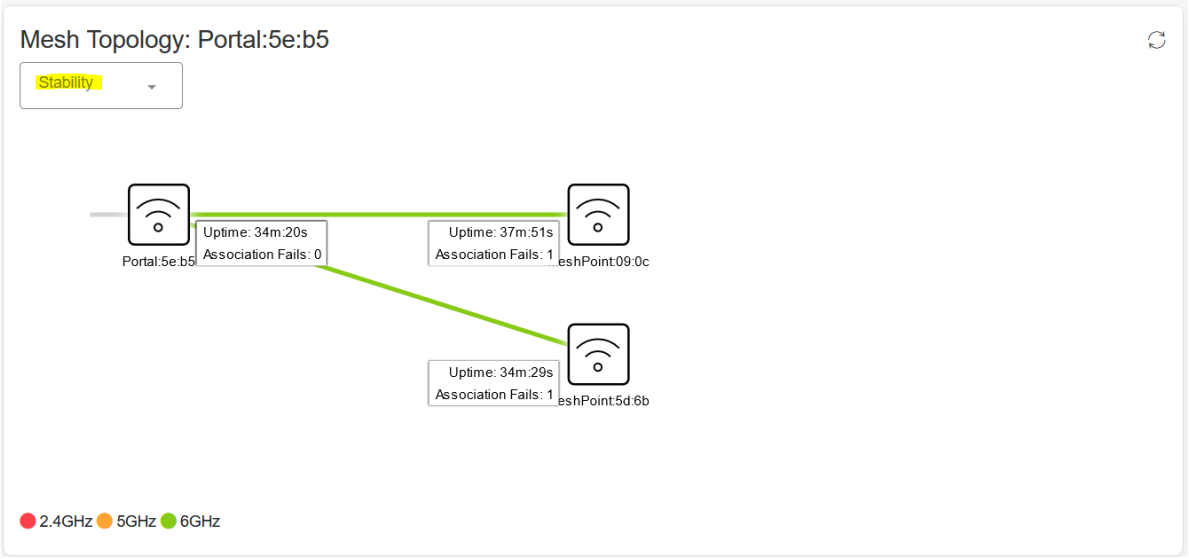
We can also check the SNR as shown below.



Here it shows the connected clients, and the format is 'Wireless Clients | Wired Clients. We see there is one wired client per Mesh Port AP.



And lastly the stability of the PMP mesh network.



4.4 Mesh Statistics

You can also get the Mesh statistics directly from the CLI of the Mesh Portal AP.

First you need the IP address of the Portal AP, you can get that with "Show ap mesh cluster active".

```
Portal:5e:b5# sh ap mesh cluster active

Mesh Cluster name: e1baf29f4ca4ed35645e0a937d9c9c7
-------------------------------------------------
Name          AP Type  Mesh Role  IP Address    Portal AP     Parent AP  RSSI  Last Update  Uplink
Age  Children Num  Children List
----          -------  ---------  ----------    ---------     ---------  ----  -----------  ------
----  ------------  -------------
Portal:5e:b5  AP-605H  Portal     10.10.10.45   Portal:5e:b5  -          0     12s
8h:55m:34s  2            MeshPoint:09:0c,MeshPoint:5d:6b

Total APs: 1
(N): 11N Enabled. (AC): 11AC Enabled. (AD): 11AD Enabled. (AX): 11AX Enabled. For Portals 'Uplink
Age' equals uptime.

Portal:5e:b5#
```

Then use the IP addresses of the Portal with this command “show ap mesh cluster stats” as shown below.

```
Portal:5e:b5# sh ap mesh cluster stats  10.10.10.45

Radio ID : 0
Mesh link on radio : No

Radio ID : 1
Mesh link on radio : Yes
Mesh link band : 6G
Children Num : 2
Children List : MeshPoint:09:0c,MeshPoint:5d:6b
Metrics stats:
--------------
Timestamp  RSSI  Channel Utilization (%)  Goodput [Tx] (bps)  Goodput [Rx] (bps)  Throughput [Tx] (bps)
Throughput [Rx] (bps)
---------  ----  -----------------------  ------------------  ------------------  ---------------------  ----
-----------------
19:49:43   0     4                        629564640           291026619           375573
13589
19:48:12   0     3                        605986130           309550945           379722
14772
19:46:42   0     5                        670417934           239321927           469114
16773
19:45:10   0     3                        1179181781          399710620           992246
20908
19:43:39   0     3                        1356917134          372098746           1128331
21554
19:42:09   0     3                        963927217           364064796           871803
20272
19:40:37   0     2                        1103603257          310902730           813968
20921
19:39:07   0     3                        779167242           311511025           446697
14296
19:37:36   0     4                        934770467           305289021           578143
14652
19:36:05   0     3                        684839021           266031883           434018
18908
19:34:34   0     4                        731038496           329658235           368088
11757
19:33:03   0     5                        779965349           260488687           471448
15198
19:31:33   0     4                        1124929763          310969558           731192
17980
19:30:01   0     4                        1284534637          531260885           1771191
31945
19:28:30   0     4                        556940644           467683864           1091853
64125

Radio ID : 2
Mesh link on radio : No

Portal:5e:b5#
```