1 Table of Contents

Table of Contents

1.1 Revision History

DATE	VERSION	EDITOR	CHANGES
24 Jun 2019	0.1	Ariya Parsamanesh	Initial creation
02 Jul 2019	0.2	Ariya Parsamanesh	IAP WAN Loop

2 Instant Wired Protection Features

Aruba Instant APs (IAP) provide an effective way to connect to multiple LAN segments for branch offices/sites with Aps that have multiple Ethernet ports like AP303H, AP205H, AP303

Instant 8.4.x introduced the loop protection feature that detects and avoids the formation of loops on the Ethernet ports of an Instant AP. The loop protect feature can be enabled on all Instant APs, particularly those that have multiple Ethernet ports.

The loop protection feature prevents the formation of loops when:

- An unmanaged switch is connected to one port of an Instant AP and a loop forms in the unmanaged switch.
- The WAN port (E0) and either of ports 1, 2 or 3, if it exists, in an AP are connected to the same switch.
- Multiple ports in an Instant AP are connected to an unmanaged switch

Along with Loop protect, we also have storm-control feature in which it will restrict broadcast packets per sec.

In this short guide we'll use loop protection in three common scenarios.

1. IAP Down Link Loop Scenario
2. IAP Switch Port Loop Scenario.
3. IAP WAN Loop Scenario

2.1 Things you need

- Aruba Instant version 8.4.0.0 or later
- 1x IAP with more than one Ethernet port like AP303H.
- A Layer three switch

3 Instant AP Configuration

When you enable loop protection feature, it transmits a proprietary loop detection packet on one Ethernet port of an IAP and check to see of it detects it on other ports. You can configure the interval at which this is sent.

Note that loop protect feature transmits this packet without a VLAN tag irrespective of mode configured on the port to be access or trunk. So if you have configured the port to be a VLAN trunk then the packet will be transmitted on the native VLAN only.

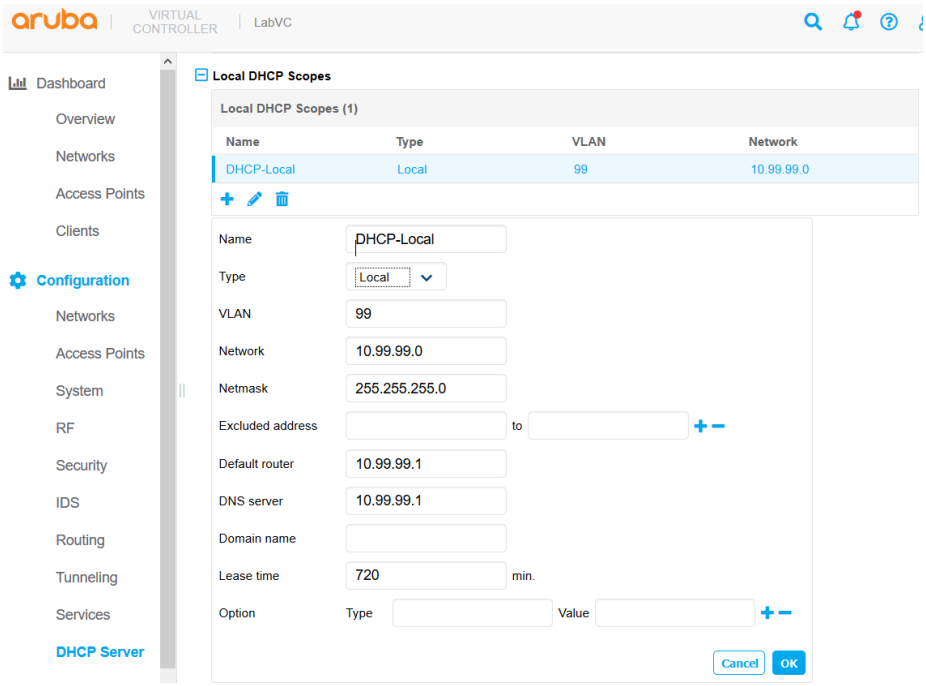
The configuration is through the CLI.

3.1 Local DHCP Scope

We'll start by configuring a Local DHCP scope on the IAP and call it VLAN 99, we then assign this to the E1 port of the AP-303H. This way when a client connects to E1 port it will get an IP address from this scope.

```
ip dhcp DHCP-Local
 server-type Local
 server-vlan 99
 subnet 10.99.99.0
 subnet-mask 255.255.255.0
 default-router 10.99.99.1
 dns-server 10.99.99.1
```

This is the WebUI view of it.



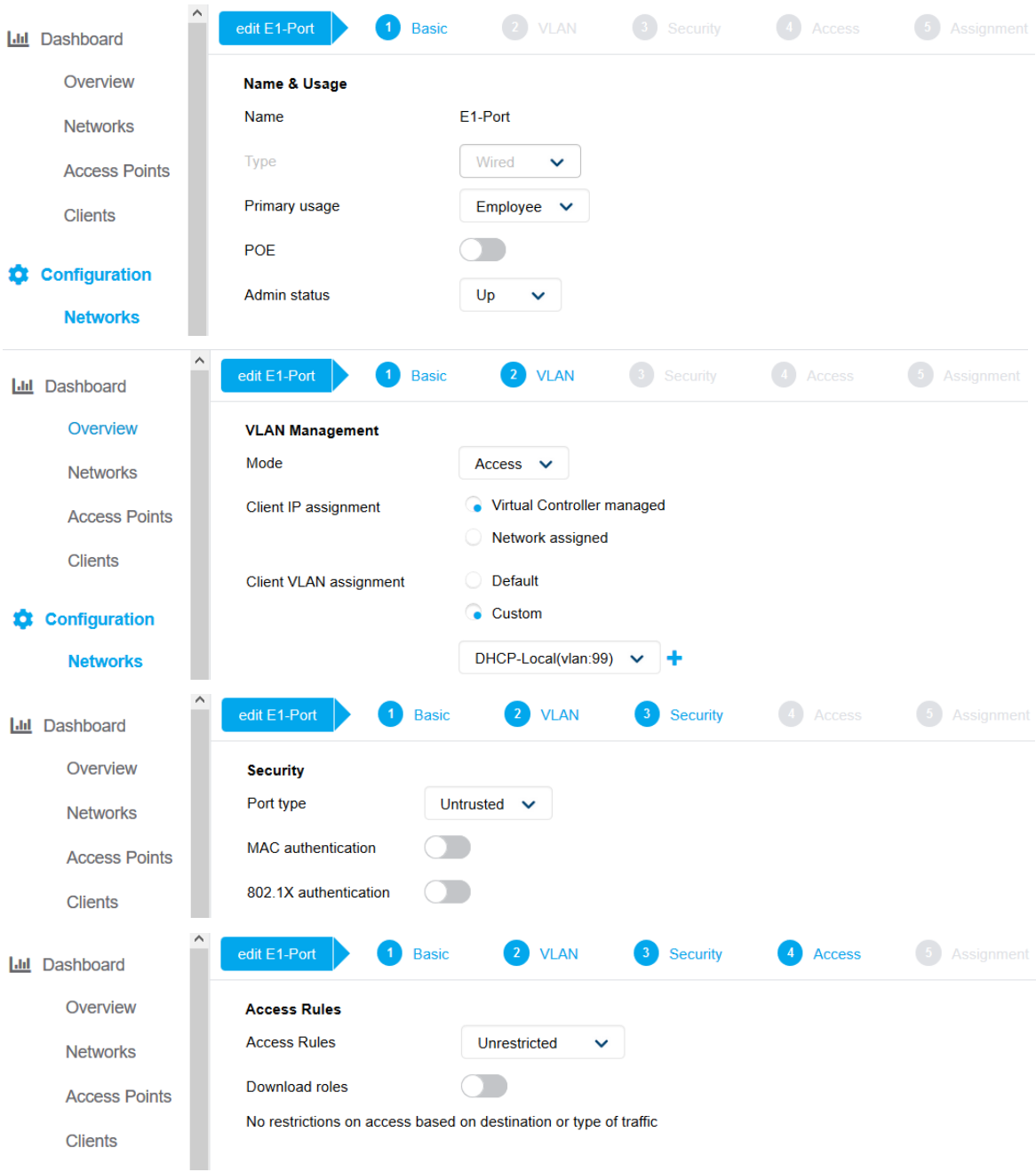
3.2 Wired Port Profile

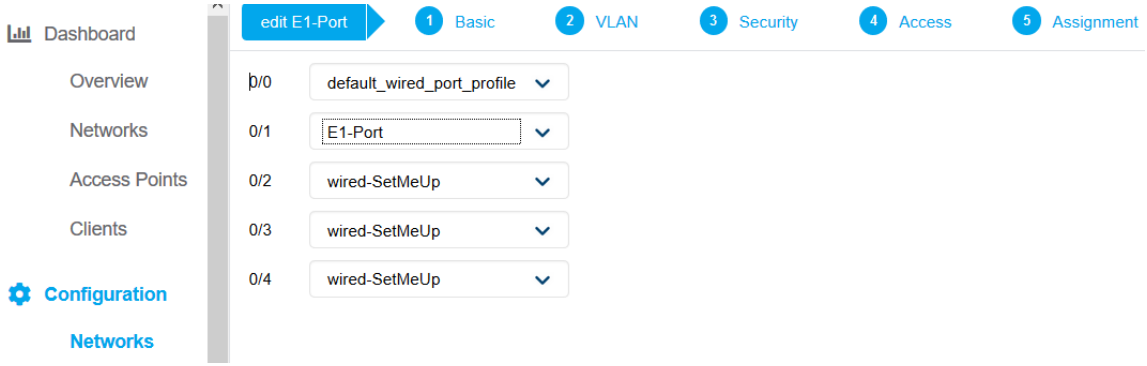
Now we need to create a Wired Port Profile and then assign it to each of the physical Ethernet ports. Here we have configured one and called it E1-Port

```
wired-port-profile E1-Port
 switchport-mode access
 allowed-vlan all
 native-vlan 99
 no shutdown
```

```
 access-rule-name E1-Port
 speed auto
 duplex auto
 no poe
 type employee
 auth-server InternalServer
 captive-portal disable
 no dot1x
!
enet1-port-profile E1-Port
```

You need to assign it to the enet1 port profile. You can do all this through the WebUI as well. You start by creating a new network and choosing wired type as shown below.





3.3 Loop-protect Configuration

Before we configure the loop-protect and storm-control features, let's check the status pf the ports.

```
20:4c:03:23:a7:98#sh port status

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

20:4c:03:23:a7:98#
```

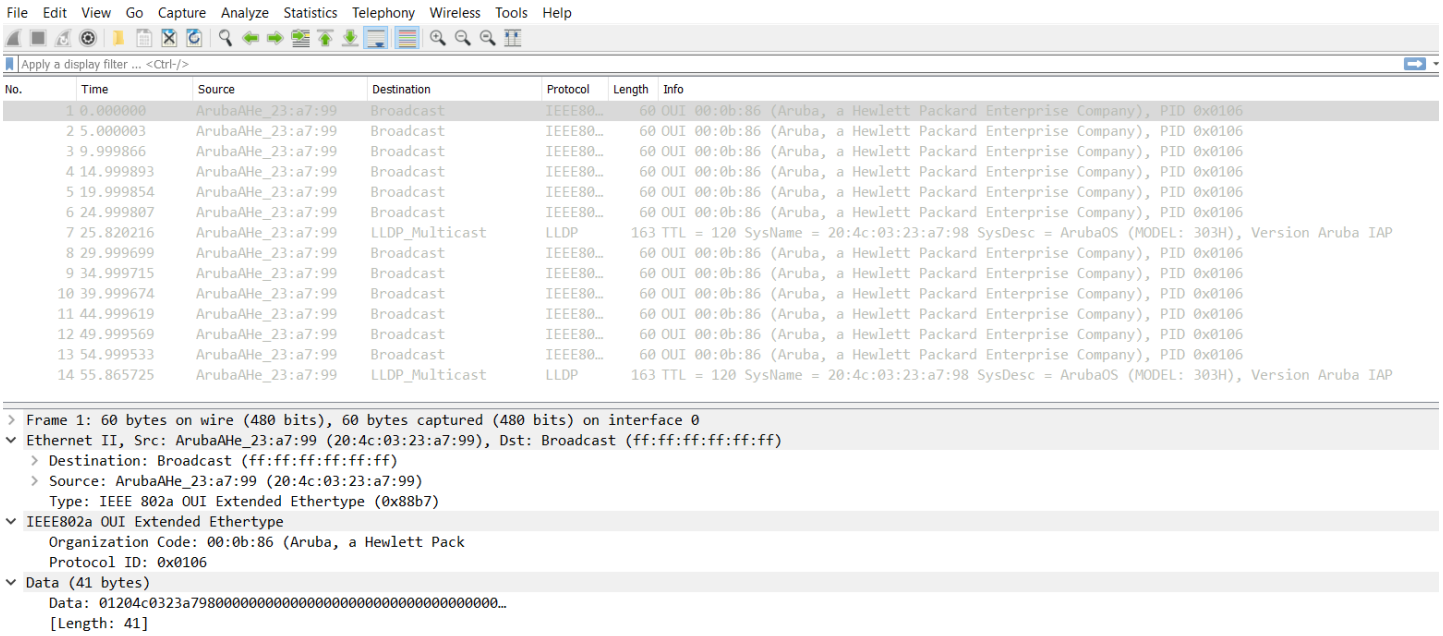
Here are the CLI commands to enable loop-protect. You can also enable it from the WebUI.

```
20:4c:03:23:a7:98# conf t
We now support CLI commit model, please type "commit apply" for configuration to take
effect.
20:4c:03:23:a7:98 (config) # wired-port-profile E1-Port
20:4c:03:23:a7:98 (wired ap profile E1-Port) # loop-protect
20:4c:03:23:a7:98 (wired ap profile E1-Port) # loop-detection-interval 5
20:4c:03:23:a7:98 (wired ap profile E1-Port) #

20:4c:03:23:a7:98# comm app
committing configuration...
configuration committed.
20:4c:03:23:a7:98#
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-
Detection-TX  Loop-Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -------------
----  -----------------
eth0  GE    up           up          Off        Disable  OFF           OFF            0
0
eth1  GE    up           up          Off        Disable  ON            OFF            311
0
```

```
eth2  GE    up            down        Off        Disable  OFF           OFF           0
0
eth3  GE    up            down        Off        Disable  OFF           OFF           0
0
eth4  USB   up            down        Off        Disable  OFF           OFF           0
0
20:4c:03:23:a7:98#
```

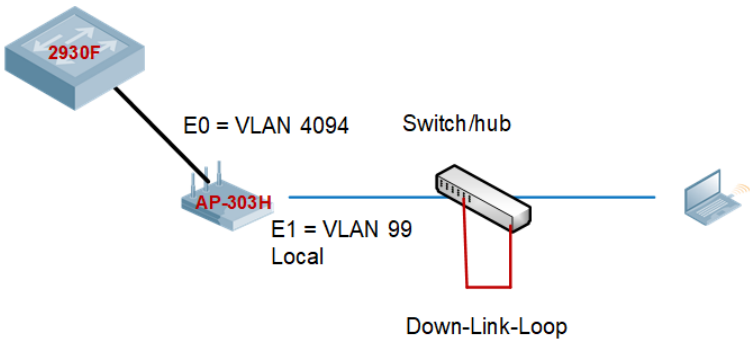
So once we enable it, the IAP will start sending the proprietary loop detection packet that I mentioned earlier for the port that the wired port profile is applied. In our case it's E1.

Here is the pcap of this packet.



3.4 IAP Down Link Loop Scenario

So now we are going to create a down link loop as shown below.



And we'll check the port status.

```
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  -----------------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  0
eth1  GE    up           up          Off        Disable  ON            OFF            391                0
eth2  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
```

```
20:4c:03:23:a7:98# [ 2179.453592] asap_loop_protect_detection_rcv: SJ: loop detected in downlink switch, port: 1


20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  -----------------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  0
eth1  GE    up           down        Off        Disable  ON DL-LOOP    OFF            392                1
eth2  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
20:4c:03:23:a7:98#
```

Here we'll look at the logs as well.

```
20:4c:03:23:a7:98# sh log loop-protect
cparser_cmd_wired_port_profile_loop_protect 2840: start with[2019-04-27 01:00:33.879] <CONFIG>loop protect enable 1
cparser_cmd_wired_port_profile_loop_detection_interval_interval 2873: start with[2019-04-27 01:00:33.892] <CONFIG>loop protect
interval 5
configure_enet_profile 3743: start with[2019-04-27 01:00:41.528] <CONFIG>loop protect enable 1 interval 5 ifname 1 eth1
configure_enet_profile 3778: start with[2019-04-27 01:00:41.540] <CONFIG>Disable storm control check and recovery timer
configure_enet_profile 3807: start with[2019-04-27 01:00:41.552] <CONFIG>Disable recovery timer of loop protect
configure_enet_profile 3820: start with[2019-04-27 01:00:41.564] <CONFIG>Disable recovery timer of storm control
configure_enet_profile 3743: start with[2019-04-27 01:00:57.715] <CONFIG>loop protect enable 0 interval 2 ifname 2 eth2
configure_enet_profile 3778: start with[2019-04-27 01:00:57.730] <CONFIG>Disable storm control check and recovery timer
configure_enet_profile 3807: start with[2019-04-27 01:00:57.744] <CONFIG>Disable recovery timer of loop protect
configure_enet_profile 3820: start with[2019-04-27 01:00:57.756] <CONFIG>Disable recovery timer of storm control
configure_enet_profile 3743: start with[2019-04-27 01:01:20.862] <CONFIG>loop protect enable 0 interval 2 ifname 3 eth3
configure_enet_profile 3778: start with[2019-04-27 01:01:20.874] <CONFIG>Disable storm control check and recovery timer
configure_enet_profile 3807: start with[2019-04-27 01:01:20.886] <CONFIG>Disable recovery timer of loop protect
configure_enet_profile 3820: start with[2019-04-27 01:01:20.898] <CONFIG>Disable recovery timer of storm control

cli_get_storm_control_state 256: start with[2019-06-26 22:37:55.741] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-26 22:37:55.752] <LOOP-STATUS> no wired profile bind enet4
cli_get_storm_control_state 256: start with[2019-06-26 22:38:45.598] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-26 22:38:45.608] <LOOP-STATUS> no wired profile bind enet4
cli_get_storm_control_state 256: start with[2019-06-26 22:39:04.221] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-26 22:39:04.231] <LOOP-STATUS> no wired profile bind enet4
cli_get_storm_control_state 256: start with[2019-06-26 22:40:19.436] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-26 22:40:19.446] <LOOP-STATUS> no wired profile bind enet4
cli_get_storm_control_state 256: start with[2019-06-26 22:41:38.612] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-26 22:41:38.622] <LOOP-STATUS> no wired profile bind enet4

cli_loop_detect_event_handler 549: start with[2019-06-27 09:40:59.320] <LOOP-PROTECT> port err event on enet 1, shutdown the
port eth1
cli_get_storm_control_state 256: start with[2019-06-27 09:41:05.027] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-27 09:41:05.036] <LOOP-STATUS> no wired profile bind enet4
cli_get_storm_control_state 256: start with[2019-06-27 09:41:13.363] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-27 09:41:13.372] <LOOP-STATUS> no wired profile bind enet4
cli_get_storm_control_state 256: start with[2019-06-27 09:45:42.568] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-27 09:45:42.578] <LOOP-STATUS> no wired profile bind enet4

20:4c:03:23:a7:98#
```

You'll note that the port is in DN-Loop status and the port is down. This is because we have not enable auto-recovery which we'll now enable.

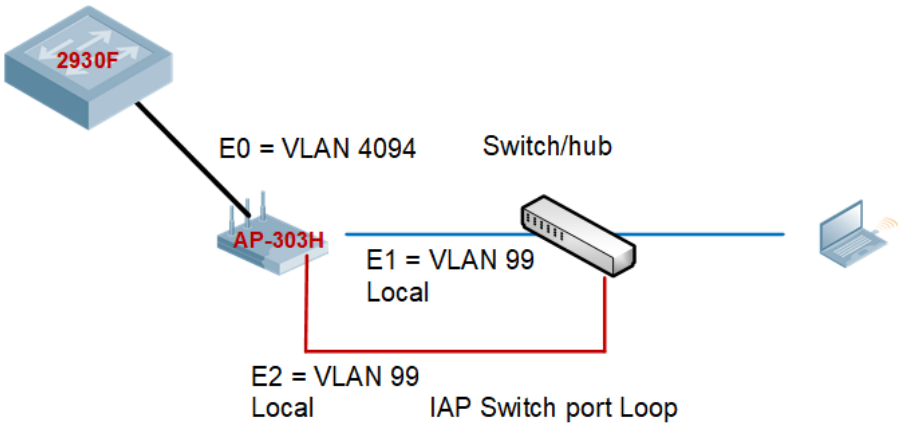
```
20:4c:03:23:a7:98 (config) # wired-port-profile E1-Port
20:4c:03:23:a7:98 (wired ap profile E1-Port) # auto-recovery
20:4c:03:23:a7:98 (wired ap profile E1-Port) # auto-recovery-interval ?
<interval>     Time to recover port in seconds (range is 30-43200 and default is 300)

20:4c:03:23:a7:98 (wired ap profile E1-Port) # auto-recovery-interval 120
20:4c:03:23:a7:98 (wired ap profile E1-Port) #
20:4c:03:23:a7:98# com app
committing configuration...
configuration committed.
20:4c:03:23:a7:98#
```

So now that auto-recovery is set to 2 min, the port should be enabled again.

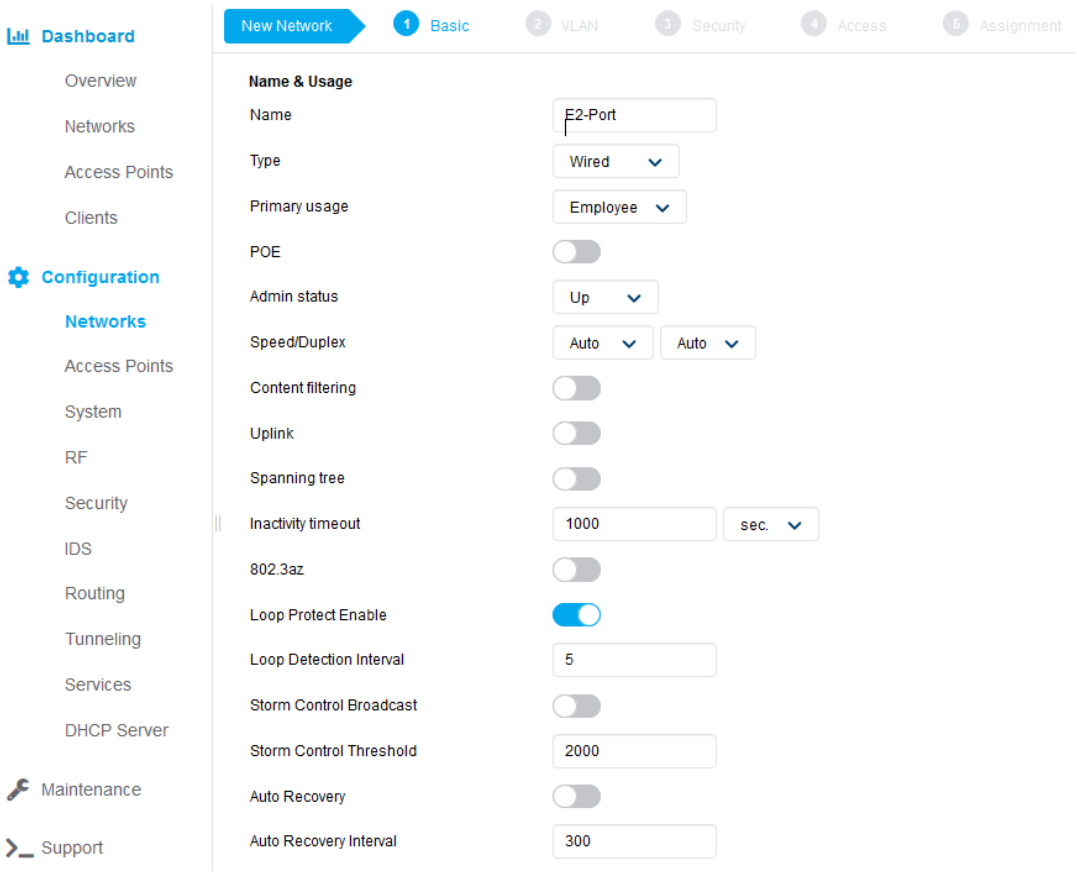
```
20:4c:03:23:a7:98# sh log loop-protect
cli_get_storm_control_state 256: start with[2019-06-27 10:00:19.826] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-27 10:00:19.836] <LOOP-STATUS> no wired profile bind enet4
cparser_cmd_wired_port_profile_auto_recovery 2962: start with[2019-06-27 10:01:33.529] <CONFIG>auto recovery
enable
cparser_cmd_wired_port_profile_auto_recovery_interval_interval 2995: start with[2019-06-27 10:01:33.762]
<CONFIG>auto recovery interval 120

cli_clear_port_err 282: start with[2019-06-27 10:01:34.220] <LOOP-PROTECT> reset port error of enet1
configure_enet_profile 3743: start with[2019-06-27 10:01:34.233] <CONFIG>loop protect enable 1 interval 5 ifname
1 eth1
configure_enet_profile 3778: start with[2019-06-27 10:01:34.245] <CONFIG>Disable storm control check and
recovery timer
configure_enet_profile 3800: start with[2019-06-27 10:01:34.257] <CONFIG>Enable interval 120 recovery timer of
loop protect
configure_enet_profile 3813: start with[2019-06-27 10:01:34.269] <CONFIG>Enable interval 120 recovery timer of
storm control
cli_get_storm_control_state 256: start with[2019-06-27 10:02:33.856] <LOOP-STATUS> no wired profile bind enet0
cli_get_storm_control_state 256: start with[2019-06-27 10:02:33.866] <LOOP-STATUS> no wired profile bind enet4
cli_loop_protect_recovery 407: start with[2019-06-27 10:03:36.405] <TIMER> loop protect revovery timer expires
enet1 port eth1, port_err 0
cli_storm_control_recovery 379: start with[2019-06-27 10:03:36.417] <TIMER> storm control revovery timer expires
enet1 port eth1, port_err 0

20:4c:03:23:a7:98#
20:4c:03:23:a7:98#
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-
Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  -------
----------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  0
eth1  GE    up           up          Off        Disable  ON            OFF            486                1
eth2  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
20:4c:03:23:a7:98#
```

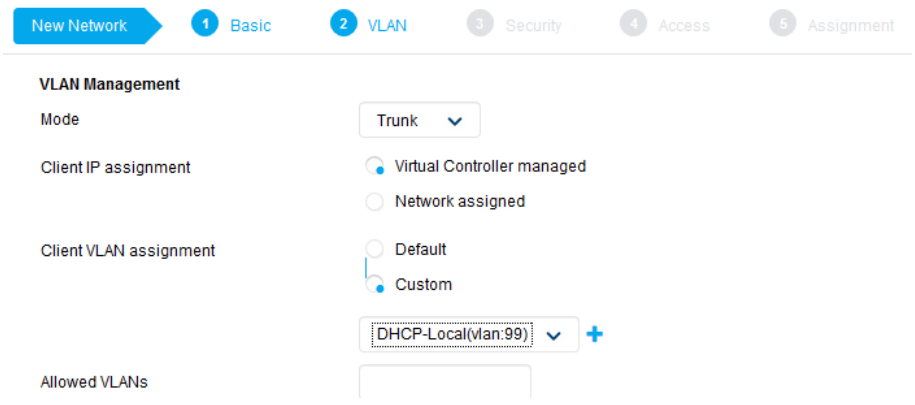
3.5 IAP Switch Port Loop Scenario

Here we have the scenario that the switch port of the IAP are physically looped.

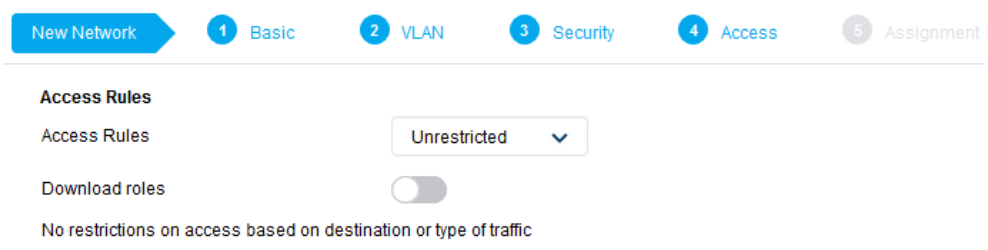


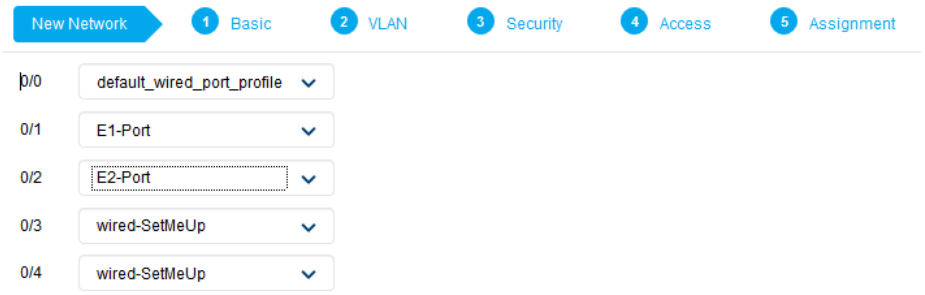
First we should enable loop protect on E2 port


Dashboard
Overview
Networks
Access Points
Clients
Configuration
Networks
Access Points
System
RF
Security
IDS
Routing
Tunneling
Services
DHCP Server
Maintenance
Support
New Network
1 Basic
2 VLAN
3 Security
4 Access
5 Assignment
Name & Usage
Name
E2-Port
Type
Wired
Primary usage
Employee
POE
Admin status
Up
Speed/Duplex
Auto
Auto
Content filtering
Uplink
Spanning tree
Inactivity timeout
1000
sec.
802.3az
Loop Protect Enable
Loop Detection Interval
5
Storm Control Broadcast
Storm Control Threshold
2000
Auto Recovery
Auto Recovery Interval
300


New Network
1 Basic
2 VLAN
3 Security
4 Access
5 Assignment
VLAN Management
Mode
Trunk
Client IP assignment
Virtual Controller managed
Network assigned
Client VLAN assignment
Default
Custom
DHCP-Local(vlan:99)
Allowed VLANs


New Network
1 Basic
2 VLAN
3 Security
4 Access
5 Assignment
Security
Port type
Untrusted
MAC authentication
802.1X authentication


New Network
1 Basic
2 VLAN
3 Security
4 Access
5 Assignment
Access Rules
Access Rules
Unrestricted
Download roles
No restrictions on access based on destination or type of traffic



We should check the port status and see that loop-protect is on for E2.

```
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-
Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  -------
----------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  0
eth1  GE    up           up          Off        Disable  ON            OFF            979                2
eth2  GE    up           up          Off        Disable  ON            OFF            3                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
20:4c:03:23:a7:98#
```

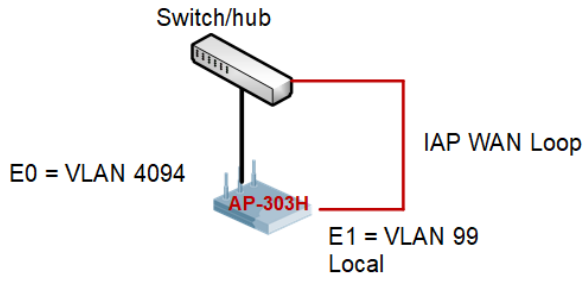
And now we will connect the loop as shown in the previous diagram to E2 port.

```
20:4c:03:23:a7:98# [ 6794.458090] asap_loop_protect_detection_rcv: SJ: loop detected with other interface, port:
2 looped with port: 1

20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect     Storm-Control  Loop-Detection-TX
Loop-Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------     -------------  -----------------  ----
-------------
eth0  GE    up           up          Off        Disable  OFF              OFF            0                  0
eth1  GE    up           up          Off        Disable  ON               OFF            1094               2
eth2  GE    up           down        Off        Disable  ON WITH_SJ_LOOP  OFF            3                  1
eth3  GE    up           down        Off        Disable  OFF              OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF              OFF            0                  0

20:4c:03:23:a7:98#
```

So here we see the status of WITH_SJ_LOOP, this shows a secure jack loop. If loop-protect packet is received on another Ethernet port of IAP, a loop between the Ethernet ports of the Instant AP is detected and the Ethernet port of the Instant AP port with lower priority is shut down. The Ethernet port with smaller port ID has high priority.

3.6 IAP WAN Loop Scenario

Here we have the scenario that the E0 and E1 ports of the IAP are physically looped through a head end switch.



We should check the port status and see that loop-protect is on for E1. And both E0 and E1 are up.

```
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-
Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  -------
----------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  1
eth1  GE    up           up          Off        Disable  ON            OFF            1                  0
eth2  GE    up           down        Off        Disable  ON            OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
20:4c:03:23:a7:98#
20:4c:03:23:a7:98#
```

And now we will connect the loop as shown in the previous diagram to E1 port.

```
20:4c:03:23:a7:98#
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect      Storm-Control  Loop-Detection-TX
Loop-Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------      -------------  -----------------  ---
--------------
eth0  GE    up           up          Off        Disable  OFF               OFF            0                  1
eth1  GE    up           down        Off        Disable  ON WITH-WAN-LOOP  OFF            1                  0
eth2  GE    up           down        Off        Disable  ON                OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF               OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF               OFF            0                  0
20:4c:03:23:a7:98#
```

So here we see the status of WITH_WAN_LOOP, this shows that a WAN loop is detected. As before if loop-protect packet is received on a different Ethernet port of IAP, the port with lower priority is shut down. The Ethernet port with smaller port ID has high priority, so in this case E1 is shutdown.

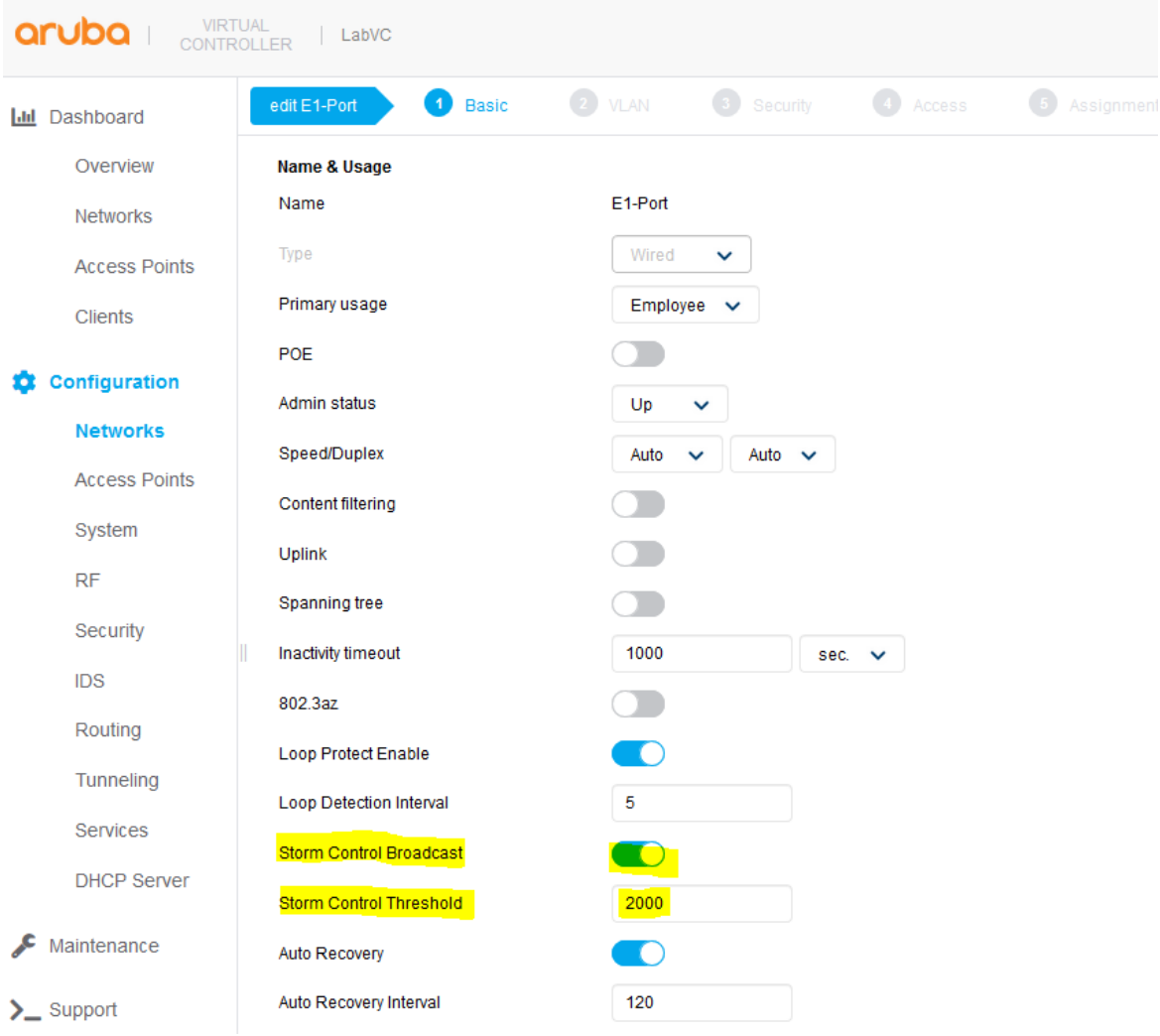
Now you can rely on auto-recovery or you can manually clear the loop-protect affected port by using this command.

```
20:4c:03:23:a7:98#
20:4c:03:23:a7:98# clear port enet1
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-
Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  -------
----------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  10
eth1  GE    up           up          Off        Disable  ON            OFF            10                 0
eth2  GE    up           down        Off        Disable  ON            OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
20:4c:03:23:a7:98#
```

3.7 Storm Control

Lastly it is always a good practise to also enable Storm control feature. During broadcast-storm control, an Instant AP counts the broadcast packets received on each of its Ethernet port and determines the packet rate in an interval. If the broadcast packet rate on one Ethernet port exceeds the configured threshold (default value is 2000 packets per second), the Ethernet port is shut down.

```
To configure broadcast storm control:
20:4c:03:23:a7:98(config)# wired-port-profile E1-Port
20:4c:03:23:a7:98 (wired ap profile E1-Port)# storm-control-broadcast
20:4c:03:23:a7:98 (wired ap profile E1-Port # storm-control-threshold 110
```



And finally here is the port status.

```
20:4c:03:23:a7:98# sh port status

Port Status
-----------
Port  Type  Admin-State  Oper-State  STP-State  Dot3az   Loop-Protect  Storm-Control  Loop-Detection-TX  Loop-
Detection-RX
----  ----  -----------  ----------  ---------  ------   ------------  -------------  -----------------  ------
eth0  GE    up           up          Off        Disable  OFF           OFF            0                  17
eth1  GE    up           down        Off        Disable  ON            ON             17                 0
eth2  GE    up           down        Off        Disable  ON            OFF            0                  0
eth3  GE    up           down        Off        Disable  OFF           OFF            0                  0
eth4  USB   up           down        Off        Disable  OFF           OFF            0                  0
20:4c:03:23:a7:98#
```