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1.1 Revision History

DATE	VERSION	EDITOR	CHANGES
03 Jun 2023	0.1	Ariya Parsamanesh	Initial creation
06 Jul 2023	0.2	Ariya Parsamanesh	Added the failover timing test section
07 Mar 2024	0.3	Ariya Parsamanesh	Changed the LAN switches to CX switches. Updated the failover timing test section after upgrade to 10.5.1.0 Added LAN switch spanning tree states.

2 Branch Gateway Redundancy

The aim for this technote is to provide branch gateways (BGW) redundancy and to be able to share the uplinks on each of the branch gateways.

The gateways in a High Availability (HA) group establishes a virtual link (GRE Tunnel) between redundant Aruba Gateways to share the WAN interfaces. This happens only if WAN ports are configured with different uplink VLANs. You should note that the uplinks on both BGWs can be active.

The second part of this is by configuring VRRP between all the VLANs on the LAN side. It is recommended to configure the same SD-WAN Gateway as the Conductor for all the VLANs.

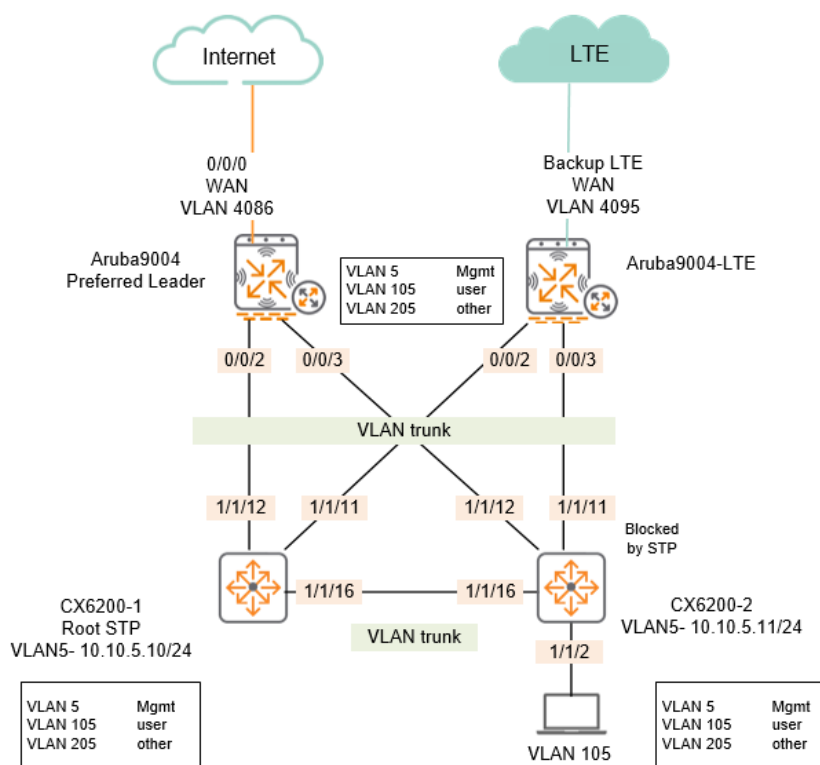
2.1 Assumptions

- The two BGWs are already added to the Aruba Central account
- The BGWs are running AOS 10.5.1.0 firmware
- BGWs are licenses with Foundation gateway foundation
- One of the BGWs is 9004 and the other is 9004-LTE

2.2 Topology

In this topology we are not using any VPNCs, we have 2x BGWs in a HA sharing their uplinks between them. One of them has wired Internet link while the other has LTE link.

The topology diagram shows a typical deployment for it where we have 2 LAN switches that are dual connected to BGWs. In this topology the LAN switches are not stackable switches, this is to highlight the importance of Spanning tree root.

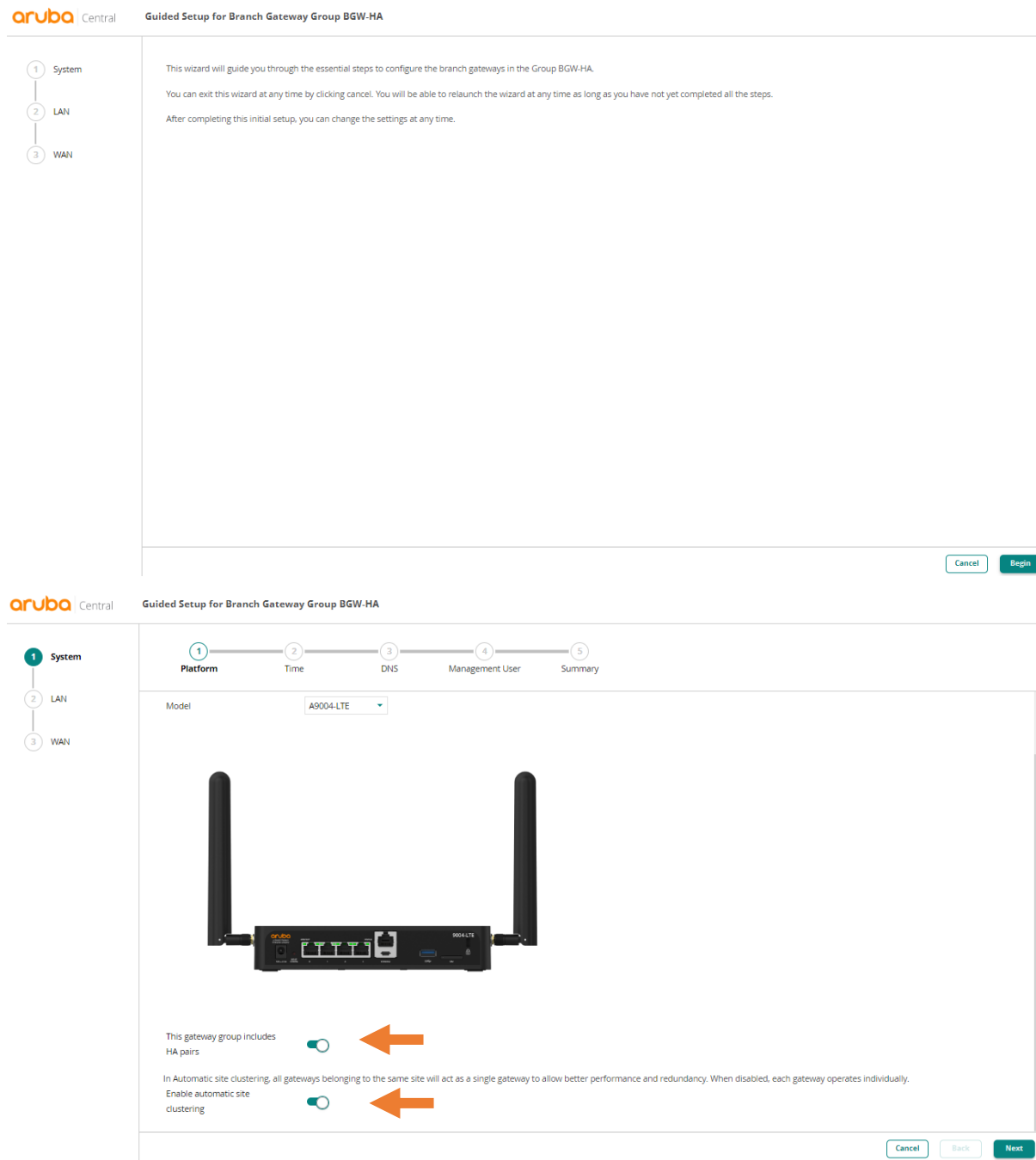


Once you configure the Clustering and its associated VRRP along with WAN uplink sharing, you'll have the following tunnels.

- Clustering - Establishes 1x IPSec Tunnel with peer system-IP address
- Uplink Sharing - Establishes 1x GRE Tunnel with peer, for each uplink VLAN not present on the gateway itself
- Overlay - Establishes 1x IPSec over each configured uplink (Virtual/Shared or Physical) to all configured VPNCs

2.3 HA Group Configuration

The easiest way to configure HA is at the group creation. So start with basic guided workflow.



The image shows two screenshots of the Aruba Central web interface for configuring a Branch Gateway Group (BGW-HA).

Top Screenshot: The 'Guided Setup for Branch Gateway Group BGW-HA' wizard is shown at the 'System' step. A sidebar on the left lists the steps: 1 System, 2 LAN, and 3 WAN. The main content area contains the following text:

- This wizard will guide you through the essential steps to configure the branch gateways in the Group BGW-HA.
- You can exit this wizard at any time by clicking cancel. You will be able to relaunch the wizard at any time as long as you have not yet completed all the steps.
- After completing this initial setup, you can change the settings at any time.

Buttons for 'Cancel' and 'Begin' are located at the bottom right.

Bottom Screenshot: The wizard is shown at the 'Platform' step. The sidebar on the left lists the steps: 1 System, 2 LAN, and 3 WAN. The main content area shows a progress bar with five steps: 1 Platform, 2 Time, 3 DNS, 4 Management User, and 5 Summary. Below the progress bar, the 'Model' is set to 'A9004-LTE'. An image of the Aruba A9004-LTE gateway is displayed. Below the image, there are two toggle switches, both of which are turned on. The first toggle is labeled 'This gateway group includes HA pairs' and the second is labeled 'Enable automatic site clustering'. Both toggles have orange arrows pointing to them. Below the second toggle, there is a note: 'In Automatic site clustering, all gateways belonging to the same site will act as a single gateway to allow better performance and redundancy. When disabled, each gateway operates individually.' Buttons for 'Cancel', 'Back', and 'Next' are located at the bottom right.

Here we are not showing the rest of the workflow but once it is completed you should get the following when you move the gateways to this group.

2.4 System IP Configuration

Once the gateways are in the group you need to assign them their system-IP.

Its mandatory to have LAN mgmt subnet as the system IP of the gateways for HA branch GW Clustering to work as expected. So the gateways should not use the pool mgmt. as their system IP. This is done at the device level

Customer: Ariya Publ...

← Aruba9004

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GeneralAdminCertificatesSNMPLoggingSwitchingExternal Monitoring

> Basic Info

> Clock

> Domain Name System

> Dynamic Domain Name System

> Dynamic Domain Name System (HTTPS)

> System IP Address

MAC address: 20:4c:03:82:0f:0a

IPv4 address: VLAN 5 10.10.5.1

> Loopback Interface

> Capacity Threshold

> Location

Customer: Ariya Publ...

← Aruba9004-LTE

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GeneralAdminCertificatesSNMPLoggingSwitchingExternal Monitoring

> Basic Info

> Clock

> Domain Name System

> Dynamic Domain Name System

> Dynamic Domain Name System (HTTPS)

> System IP Address

MAC address: 20:4c:03:bc:2f:ba

IPv4 address: VLAN 5 10.10.5.2

> Loopback Interface

> Capacity Threshold

> Location

Note that changing the system-IP of gateways will cause them to reboot.

2.5 WAN Uplink Configuration

Now at the group level we'll configure the WAN uplinks.

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BGW-HA

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Uplink
Dynamic Path Steering
SAAS Express
WAN Scheduler
Health Check

Compression:

Loadbalancing mode:
Uplink utilization

Uplink VLANs

LINK	ID	OPERATION STATE	BACKUP LINK	BANDWIDTH PERCENTAGE	SOURCE NAT VLAN
inet_inet	4086	✓		100	--
cellular_lte	4095	✓	✓	--	--

Note that the LTE interface is configured as backup only and it will always use internal VLAN 4095

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BGW-HA

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Uplink
Dynamic Path Steering
SAAS Express
WAN Scheduler
Health Check

Compression:

Loadbalancing mode:
Uplink utilization

Uplink VLANs

LINK	ID	OPERATION STATE	BACKUP LINK	BANDWIDTH PERCENTAGE	SOURCE NAT VLAN	
inet_inet	4086	✓		100	--	
cellular_lte	4095	✓	✓	--	--	

Uplink > cellular_lte

Active SIM slot:
SIM 1
SIM 2

Access point name (APN):
TELSTRA.INTERNET

Public land mobile network (PLMN):
Auto
Manual

Mode:
Auto
4G LTE
3G
Custom

Data usage tracking:

Interface VLAN ID:
4095
This VLAN is reserved for LTE USB or Internal

NAT outside:

Use only as backup link:

Weight:
10

Speed:
Mbps

Remember we will not make any changes to the WAN uplinks in the device level configuration.

Once this is done add the BGWs to a site, that refers to a physical location where a set of devices are installed. Aruba Central allows you to use sites as a primary navigation element.

Organization -> Network Structure -> Sites

arubaCentral

Search or ask Aruba

Customer: Ariya Publ...

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Network Structure

Platform Integration

Site Name	Address	Device Count
All Devices		21
Unassigned		7
AOS10	22 Smith Street	5
AriyaStore	16 Smith Street	2
Campus-1	19 Smith Street	3
MicroBranch1	19 Smith Street	1
MicroBranch2	18 Smith street	1
Store2	20 Smith street	2
visualrt_default		0

New Site

7 Sites

Name	Group	Type
Aruba9004	BGW-HA	Gateway
Aruba9004-LTE	BGW-HA	Gateway

2.6 High Availability Clustering Group Configuration

With AOS10 firmware we'll be using the clustering function that comes with it.

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BGW-HA

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SELECTED GROUP TYPE
Branch Gateway

Summary

Clusters

Redundancy

Cluster mode

Automatic: ☒

☐ Auto Group ☒ Auto Site

Default gateway mode: ☒ ☐

CLUSTER NAME	GATEWAYS	SITE NAME	MANUAL CONFIGURATION PRESENT
auto_gwcluster_site_9_260_0	2	AriyaStore	No

Note that the auto-clustering will happen only when you have assigned the gateways to a site. Then you can select the cluster name and choose one of the gateways to be preferred leader.

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BGW-HA

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SELECTED GROUP TYPE
Branch Gateway

Summary

List

Config

Basic Mode

Clusters

Redundancy

Cluster mode

Automatic: ☒

☐ Auto Group ☒ Auto Site

Default gateway mode: ☒ ☐

CLUSTER NAME	GATEWAYS	SITE NAME	MANUAL CONFIGURATION PRESENT
auto_gwcluster_site_9_260_0	2	AriyaStore	No

Gateways in auto_gwcluster_site_9_260_0 Cluster

GATEWAY	PREFERRED LEADER
Aruba9004	<input checked="" type="checkbox"/>
Aruba9004-LTE	<input type="checkbox"/>

Management VLAN:

-None- ☐

Note that mgmt. VLAN is important when you want to do CoA from the VRRPs. All the VRRP configuration for different LAN side VLANs are done at the device level not at the group level.

Customer: Ariya Publ...

BGW-HA

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Virtual Router Table

When Clustering is enabled in default-gateway mode, Virtual Router IP configurations must be done from the device-level Cluster configuration pages.

Virtual routers

ROUTER ID	IPV4 ADDRESS	VLAN	ADMINISTRATION STATE
-----------	--------------	------	----------------------

2.7 Link Aggregation

I won't be covering this specific setup here but If you need to enable link aggregation for the LAN interfaces of each BGW, then ensure that that you have enabled Jumbo frames.

BGW1

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B

PC-0

Port channel id: PC-0

Protocol: LACP

LACP mode: active

Port members: GE-0/0/2,GE-0/0/3

Admin state: ☒

Trust: ☐

Policy: Not-defined

Mode: Trunk

Native VLAN: 5

Allowed VLANs: 5,105,205

Description:

Jumbo MTU: ☒

2.8 Device Level Interface Configuration

Before proceeding with VRRP for the LAN side interfaces, you need to configure the IP address for the relevant VLANs.

Customer: Ariya Publ...

Aruba9004

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SELECTED DEVICE TYPE
Branch Gateway

Basic Mode

PORT	TYPE	ADMIN STATE	POLICY	MODE	NATIVE VLAN	ACCESS VLAN	TRUNK VLANS	TRUSTED VLANS	SPANNING TREE	DESCRIPTION
GE-0/0/0	WAN	Enabled	Per-Session	access	--	4086	--	4086	✓	INET_inet
GE-0/0/1	--	Enabled	Not-defined	access	--	1	--	1-4094	✓	GE0/0/1
GE-0/0/2	LAN	Enabled	Not-defined	trunk	5	--	5,105,205	5,105,205	✓	GE0/0/2
GE-0/0/3	--	Enabled	Not-defined	access	--	1	--	1-4094	✓	GE0/0/3

This table shows the IP address

	VLAN5	VLAN105	VLAN205
Aruba9004	10.10.5.1/24	10.10.105.1/24	10.10.205.1/24
Aruba9004-LTE	10.10.5.2/24	10.10.105.2/24	10.10.205.2/24

The general recommendation is to set LAN interfaces to be “untrusted” so that all devices in the branch get tracked by the role-based firewall. Make sure the peer gateway is placed in a role where VRRP and GRE communication is allowed.

2.9 Device Level VRRP and WAN Redundancy Configuration

We’ll start with the first gateway.

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Aruba9004

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ClustersRedundancy

Cluster mode

Automatic: ☒

☐ Auto Group ☒ Auto Site

Default gateway mode: ☒

Gateways in auto_gwcluster_site_9_260_0 Cluster

GATEWAY	PREFERRED LEADER
Aruba9004	<input checked="" type="checkbox"/>
Aruba9004-LTE	<input type="checkbox"/>

Management VLAN:

-None-

WAN Redundancy

Peer gateway IP address:

10.10.5.2

VLAN ID connecting to peer gateway:

5

Cluster Virtual Router IPs

VRRPID	VLANID	VIRTUAL IPADDRESS	CLUSTER MANAGEMENT
220	5	10.10.5.3	<input checked="" type="checkbox"/>
105	105	10.10.105.3	<input type="checkbox"/>
205	205	10.10.205.3	<input type="checkbox"/>

And here is the other LTE gateway.

Customer: Ariya Publ...

Aruba9004-LTE

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Clusters

Redundancy

Cluster mode

Automatic

Auto Group

Auto Site

Default gateway mode:

Gateways in auto_gwcluster_site_9_260_0 Cluster

GATEWAY	PREFERRED LEADER
Aruba9004	
Aruba9004-LTE	

Management VLAN:

5

Virtual IP address:

10.10.5.3

WAN Redundancy

Peer gateway IP address:

10.10.5.1

VLAN ID connecting to peer gateway:

5

Cluster Virtual Router IPs

VRRPID	VLANID	VIRTUAL IPADDRESS	CLUSTER MANAGEMENT
220	5	10.10.5.3	
105	105	10.10.105.3	
205	205	10.10.205.3	

2.10 Checking VRRP Configuration

For all the CLI commands in this guide, we are using the console access that is available from Aruba Central.

aruba Central

Search or ask Aruba

Customer: Ariya Publ...

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Device Type

Create New Session

REMOTE CONSOLE

Console session for the device: Aruba9004(CNJFKLB01M)

admin@Aruba9004(CNJFKLB01M) [11:22:20 AM] x +

(Aruba9004) #

Now checking the configuration for the Aruba9004

```
(Aruba9004) #show vrrp
```

```
Virtual Router 105:
```

```
Description  
Admin State UP, VR State MASTER  
IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105  
Priority 100, Advertisement 1 sec, Preemption Disable Delay 0  
Auth type NONE *****  
tracking is not enabled  
cluster-preempt enabled
```

```
Virtual Router 205:
```

```
Description  
Admin State UP, VR State MASTER  
IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205  
Priority 100, Advertisement 1 sec, Preemption Disable Delay 0  
Auth type NONE *****  
tracking is not enabled  
cluster-preempt enabled
```

```
Virtual Router 220:
```

```
Description  
Admin State UP, VR State MASTER  
IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5  
Priority 255, Advertisement 1 sec, Preemption Enable Delay 0  
Auth type NONE *****  
tracking is not enabled
```

```
(Aruba9004) #
```

Here is the configuration for the Aruba9004-LTE

```
(Aruba9004-LTE) #show vrrp
```

```
Virtual Router 105:
```

```
Description  
Admin State UP, VR State BACKUP  
IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105  
Priority 100, Advertisement 1 sec, Preemption Disable Delay 0  
Auth type NONE *****  
tracking is not enabled  
cluster-preempt enabled
```

```
Virtual Router 205:
```

```
Description  
Admin State UP, VR State BACKUP  
IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205  
Priority 100, Advertisement 1 sec, Preemption Disable Delay 0  
Auth type NONE *****  
tracking is not enabled  
cluster-preempt enabled
```

```
Virtual Router 220:
```

```
Description  
Admin State UP, VR State BACKUP  
IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5  
Priority 235, Advertisement 1 sec, Preemption Enable Delay 0  
Auth type NONE *****  
tracking is not enabled
```

At this point the clustering should also be formed as indicated in the WebUI

Customer: Ariya Publ...

← auto_gwcluster_s...
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CLUSTER INFO

CLUSTER NAME auto_gwcluster_site_9_260_0	CLUSTER CLIENT CAPACITY 8192	VLAN MISMATCH Yes	CURRENT LEADER VERSION 10.4.0.1_86647
MAX GATEWAY FAILURE WITHSTAND COUNT 2	SITE AriyaStore		

CLIENT CAPACITY

Customer: Ariya Publ...

← auto_gwcluster_s...
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Gateways (2)

Name	IP Address	Status	Client Capacity (Active Standby)	Model	Role	Version
Aruba9004	10.10.5.1	Up	0 (0 0)	A9004	Leader	10.4.0.1_86647
Aruba9004-LTE	10.10.5.2	Up	0 (0 0)	A9004-LTE	Member	10.4.0.1_86647

GATEWAYS | ARUBA9004

Gateway Peer Detail (2)

Type	IP Address	Status	Role	VLAN Mismatch
SELF	10.10.5.1	-	Leader	-
PEER	10.10.5.2	Connected	Member	1

And here is the CLI command for checking it.

```
(Aruba9004) #show lc-cluster group-membership

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"
One-to-one-redundancy Enabled
Heartbeat Threshold = 900 msec
Cluster Info Table
-----
Type IPv4 Address      Priority Connection-Type STATUS
-----
self      10.10.5.1      255          N/A CONNECTED (Leader)
peer      10.10.5.2      128      L2-Connected CONNECTED (Member)
(Aruba9004) #
```

```
(Aruba9004-LTE) #show lc-cluster group-membership

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"
One-to-one-redundancy Enabled
Heartbeat Threshold = 900 msec
Cluster Info Table
-----
Type IPv4 Address      Priority Connection-Type STATUS
-----
peer      10.10.5.1      255      L2-Connected CONNECTED (Leader)
self      10.10.5.2      128          N/A CONNECTED (Member)
(Aruba9004-LTE) #
```

2.11 DHCP Configuration

As most of the BGWs will also provide DHCP services for the branches, we need to configure the scope for the HA pair at group level. First, we need to configure NTP.

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BGW-HA

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Basic Info

Clock

Time:

Get time from NTP server

NTP servers

IP ADDRESS/FQDN	BURST MODE	AUTHENTICATION KEY
216.239.35.4	Yes	--
<div></div>		

Source interface:

-None-

NTP server VLAN:

-Choose an option-

Use NTP authentication:

Time zone:

Australia: Australia/Melbourne (UTC+...

The next step is to create DHCP scopes for VLAN 5, 105 and 205, here we'll show VLAN 105.

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BGW-HA

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DHCP Server

IP DHCP server

Pool configuration

IP VERSION	NAME	NETWORK	DEFAULT ROUTER	
IPv4	vlan_105	10.10.105.0	10.10.105.3	
IPv4	vlan_205	10.10.205.0	10.10.205.3	
IPv4	vlan_5	10.10.5.0	10.10.5.3	
<div></div>				

Pool Configuration

vlan_105

IP version:

IPv4

Pool name:

vlan_105

Network IP address type:

Static

Network IP address:

10.10.105.0

Network IP mask:

255.255.255.0

Default routers:

10.10.105.3

Multiple Default Routers should be separated by spaces

2.12 DHCP Sync Monitor

This is how we can check if DHCP is in sync between the BGWs

```
(Aruba9004) #show ip dhcp binding failover-peer
```

```
failover peer "hpe-aruba-failover-partner" state {  
  my state normal at epoch 1686634193; # Tue Jun 13 15:29:53 2023  
  partner state normal at epoch 1686634229; # Tue Jun 13 15:30:29 2023  
}
```

WARNING: Normal functioning of a DHCP server is dependent on NTP clock synchronization and network reachability between branch-gateway peers in a HA setup. Please ensure that both the peers are running and have connectivity.

```
(Aruba9004) #
```

And here is the current DHCP database

```
(Aruba9004) #show ip dhcp database
```

DHCP enabled

```
# Failover peer profile
```

```
failover peer "hpe-aruba-failover-partner" {  
  primary;  
  address 10.10.5.1;  
  port 647;  
  peer address 10.10.5.2;  
  peer port 647;  
  max-response-delay 60;  
  max-unacked-updates 10;  
  mclt 3600;  
  split 128;  
  load balance max seconds 3;  
}  
# vlan_5  
subnet 10.10.5.0 netmask 255.255.255.0 {  
  option domain-name-servers 8.8.8.8;  
  option routers 10.10.5.3;  
  pool {  
    failover peer "hpe-aruba-failover-partner";  
    range 10.10.5.4 10.10.5.254;  
  }  
  authoritative;  
}  
# vlan_205  
subnet 10.10.205.0 netmask 255.255.255.0 {  
  option domain-name-servers 8.8.8.8;  
  option routers 10.10.205.3;  
  pool {  
    failover peer "hpe-aruba-failover-partner";  
    range 10.10.205.2 10.10.205.2;  
    range 10.10.205.4 10.10.205.254;  
  }  
  authoritative;  
}  
# vlan_105  
subnet 10.10.105.0 netmask 255.255.255.0 {  
  option domain-name-servers 8.8.8.8;  
  option routers 10.10.105.3;  
  pool {  
    failover peer "hpe-aruba-failover-partner";  
    range 10.10.105.2 10.10.105.2;  
    range 10.10.105.4 10.10.105.254;  
  }  
}
```

```

    authoritative;
}
(Aruba9004) #

```

The DHCP syncing happens between the system IPs (VLAN5) on port 647

```

(Aruba9004) #show datapath session | include 647
10.10.5.2      10.10.5.1      6      54171 647      0/0      0      0      0      tunnel 11      f68      391
22993          C              1
10.10.5.1      10.10.5.2      6      647      54171 0/0      0      0      1      tunnel 11      f68      426
25192          1
(Aruba9004) #

```

2.13 WAN Uplink Sharing

In the previous configuration we enabled WAN redundancy. So, there is no configuration to be done for it here, but it is important to understand the tunnels that gets established for it.

- Aruba9004 will build 1x IPSec to Aruba9004-LTE for clustering over VLAN 5
- Aruba9004 will build 1x GRE to BGW-LTE-2 for VLAN 4095 as virtual uplink
- Aruba9004-LTE will build 1x GRE to Aruba9004 for VLAN 4086 as virtual uplink
- Each GW will build 1x IPSec tunnel over each configured Uplink (Physical or Virtual/Shared) to each configured VPNC. (but in this topology we don't have VPNCs)

Just for reference this was configured on Aruba9004

WAN Redundancy

Peer gateway IP address:

VLAN ID connecting to peer gateway: ⓘ

Cluster Virtual Router IPs

VRRPID	VLANID	VIRTUAL IPADDRESS	CLUSTER MANAGEMENT
220	5	10.10.5.3	<input checked="" type="checkbox"/>
105	105	10.10.105.3	<input type="checkbox"/>
205	205	10.10.205.3	<input type="checkbox"/>

From the CLI we can check the communication between gateways

```
(Aruba9004) #show branch-gateway-peer
```

```

IP Address of Transit VLAN in Peer: 10.10.5.2
Transit VLAN Interface: 5
Transit VLAN ip: 10.10.5.1
Peer Mac Address: 20:4c:03:bc:2f:ba
Peer Serial: CNK7KSP05H
(Aruba9004) #

```

```
(Aruba9004-LTE) #show branch-gateway-peer
```

```

IP Address of Transit VLAN in Peer: 10.10.5.1
Transit VLAN Interface: 5
Transit VLAN ip: 10.10.5.2
Peer Mac Address: 20:4c:03:82:0f:0a
Peer Serial: CNJFKLB01M
(Aruba9004-LTE) #

```

Once the peer gateways is configured, there will be a GRE tunnel created between the BGWs which then will look at the type of uplinks being WAN that will then be shared with the peer gateways.

```
(Aruba9004) #show datapath session | include 10.10.5.2 | include 10.10.5.1
10.10.5.1 10.10.5.2 17 8212 8211 0/0 0 0 0 tunnel 11 15 4 2464 FI
10.10.5.2 10.10.5.1 6 9190 9199 0/0 0 0 0 tunnel 11 131f 326 17081 C
10.10.5.2 10.10.5.1 6 54171 647 0/0 0 0 0 tunnel 11 12fd 482 28344 C
10.10.5.2 10.10.5.1 17 8211 8211 0/0 0 46 0 0/0/2 1336 102657 11745334 FCI
10.10.5.1 10.10.5.2 6 9199 9190 0/0 0 0 0 tunnel 11 131f 324 19275
10.10.5.2 10.10.5.1 17 8211 8498 0/0 0 0 0 0/0/2 1336 0 0 CIB
10.10.5.1 10.10.5.2 17 8498 8211 0/0 0 0 0 0/0/2 1336 160 43309 IB
10.10.5.2 10.10.5.1 50 0 0 0/0 0 48 0 0/0/2 1325 26328 4469088 FC
10.10.5.1 10.10.5.2 47 0 0 0/0 0 48 0 local 132a 62719 66625620 FC
10.10.5.2 10.10.5.1 17 8211 9212 0/0 0 0 1 tunnel 11 15 0 0 FYCI
10.10.5.1 10.10.5.2 17 9212 8211 0/0 0 0 1 tunnel 11 15 0 0 FYI
10.10.5.1 10.10.5.2 50 0 0 0/0 0 0 43 0/0/2 1325 0 0 FY
10.10.5.1 10.10.5.2 6 647 54171 0/0 0 0 0 tunnel 11 1300 517 30484
10.10.5.2 10.10.5.1 47 0 0 0/0 0 48 0 local 132d 24510 2338937 F
10.10.5.1 10.10.5.2 17 8211 8211 0/0 0 0 45 0/0/2 1339 0 0 FYI
10.10.5.2 10.10.5.1 17 8211 8212 0/0 0 0 2 tunnel 11 18 0 0 FYCI
10.10.5.1 10.10.5.2 6 9190 9199 0/0 0 0 1 local 1327 323 16925 C
10.10.5.2 10.10.5.1 6 9199 9190 0/0 0 0 1 local 1327 321 16821
(Aruba9004) #
```

In the above session table, we can see the

- GRE tunnels, protocol 47 (highlighted yellow)
- IPSEC ESP, tunnel protocol 50 (highlighted blue)
- Port 647 for DHCP synching (highlighted green)

For WAN uplink sharing to work, the uplink and its associated VLAN should not be present in the other gateway or if configured, the actual port should be disconnected. Here we have both the WAN VLANs present, and this configuration is inherited from the group level.

Customer: Ariya Publ...

Aruba9004

Manage

Overview
WAN
LAN

Device

Clients
Applications
Security

Gateway

System
WAN
Interface
Security
VPN
Routing
High Availability
Config Audit

Uplink
Dynamic Path Steering
SAAS Express
WAN Scheduler
Health Check

Compression: ☐
Loadbalancing mode: Uplink utilization

Uplink VLANs

LINK	ID	OPERATION STATE	BACKUP LINK	BANDWIDTH PERCENTAGE	SOURCE NAT VLAN
inet_inet	4086	✓		100	--
cellular_lte	4095	✓	✓	--	--

Customer: Ariya Publ...

Aruba9004-LTE

Manage

Overview
WAN
LAN

Device

Clients
Applications
Security

Gateway

System
WAN
Interface
Security
VPN
Routing
High Availability
Config Audit

Uplink
Dynamic Path Steering
SAAS Express
WAN Scheduler
Health Check

Compression: ☐
Loadbalancing mode: Uplink utilization

Uplink VLANs

LINK	ID	OPERATION STATE	BACKUP LINK	BANDWIDTH PERCENTAGE	SOURCE NAT VLAN
inet_inet	4086	✓		100	--
cellular_lte	4095	✓	✓	--	--

But when you check the port status, we see that 0/0/0 is up in Aruba9004 and down in Aruba9004-LTE

```
(Aruba9004) #show port status
```

```
Port Status
```

```
-----
```

Slot-Port PortError	PortType	AdminState	OperState	PoE	Trusted	SpanningTree	PortMode	Speed	Duplex	
0/0/0	GE	Enabled	Up	N/A	Yes	Disabled	Access	1 Gbps	Full	-
0/0/1	GE	Enabled	Down	N/A	Yes	Disabled	Access	Auto	Auto	-
0/0/2	GE	Enabled	Up	N/A	Yes	Disabled	Trunk	1 Gbps	Full	-
0/0/3	GE	Enabled	Up	N/A	Yes	Disabled	Trunk	1 Gbps	Full	-

(Aruba9004) #

(Aruba9004-LTE) #show port status

Port Status

Slot-Port PortError	PortType	AdminState	OperState	PoE	Trusted	SpanningTree	PortMode	Speed	Duplex	
0/0/0	GE	Enabled	Down	N/A	Yes	Disabled	Access	Auto	Auto	-
0/0/1	GE	Enabled	Down	N/A	Yes	Disabled	Access	Auto	Auto	-
0/0/2	GE	Enabled	Up	N/A	Yes	Disabled	Trunk	1 Gbps	Full	-
0/0/3	GE	Enabled	Up	N/A	Yes	Disabled	Access	1 Gbps	Full	-

(Aruba9004-LTE) #

The key thing in the above screenshot is that each BGW should have 1x WAN uplinks that needs to be shared not 2. Make sure the uplink interfaces used by both gateways are tied to different VLANs, or the uplinks won't be shared as we have done here.

2.14 WAN Uplink Sharing Testing

Now let's check to see if the configuration has worked by checking first to see if the virtual tunnels between the BGWs is up and running. Checking the LTE gateway.

(Aruba9004-LTE) #show ip interface brief

Interface	IP Address / IP Netmask	Admin	Protocol	VRRP-IP
vlan 5	10.10.5.2 / 255.255.255.0	up	up	10.10.5.3
vlan 2	192.168.255.2 / 255.255.255.255	up	up	
vlan 90	unassigned / unassigned	up	down	
vlan 105	10.10.105.2 / 255.255.255.0	up	up	10.10.105.3
vlan 205	10.10.205.2 / 255.255.255.0	up	up	10.10.205.3
vlan 4086	unassigned / unassigned	up	down	
loopback	unassigned / unassigned	up	up	
tunnel 12 (INT)	172.16.50.9 / 255.255.255.255	up	up	

DHCP is enabled on VLAN(s) 90, 4086

(Aruba9004-LTE) #

Now let's check to ensure we have 2x uplinks on Aruba9004-LTE. Note that the LTE uplink is down because we have put it in backup mode. So, it'll be Up only when the uplink on the Aruba9004 gateways is not operational.

(Aruba9004-LTE) #show uplink

Uplink Manager: Enabled

Uplink Health-check: Enabled FQDN: pqm.arubanetworks.com(3.104.166.215)

Uplink Load-balancing:Enabled Mode: Uplink-utilization

Uplink Management Table

Uplink Type	Properties	Uplink-id	State	Gateway	Reachability
WAN Type	Speed Weight B/w utiln Max b/w				
Cellular	Internal-LTE (Backup)	cellular_lte	Disconnected from	ISP	Not Established
LTE	100 Mbps 10 0.00%	100%			
Virtual	tunnel 12	inet_inet	Connected	10.224.254.1	Reachable
Internet	50 Mbps 100 0.00%	100%			

(Aruba9004-LTE) #

Now on Aruba9004 we should see only 1x uplink which is local to it.

(Aruba9004) #show ip interface brief

Interface	IP Address / IP Netmask	Admin	Protocol	VRRP-IP
vlan 5	10.10.5.1 / 255.255.255.0	up	up	10.10.5.3
vlan 2	192.168.255.1 / 255.255.255.255	up	up	
vlan 105	10.10.105.1 / 255.255.255.0	up	up	10.10.105.3
vlan 205	10.10.205.1 / 255.255.255.0	up	up	10.10.205.3
vlan 4086	10.224.254.63 / 255.255.255.128	up	up	
vlan 4094	unassigned / unassigned	up	down	
loopback	unassigned / unassigned	up	up	

DHCP is enabled on VLAN(s) 4086, 4094

(Aruba9004) #show uplink

Uplink Manager: Enabled

Uplink Health-check: Enabled FQDN: pqm.arubanetworks.com(13.239.61.151)

Uplink Load-balancing:Enabled Mode: Uplink-utilization

Uplink Management Table

Uplink Type	Properties	Uplink-id	State	Gateway	Reachability	WAN Type	Speed	Weight
B/w utiln	Max b/w							
Wired	vlan 4086	inet_inet	Connected	10.224.254.1	Reachable	Internet	50 Mbps	100
0.00%	100%							

(Aruba9004) #

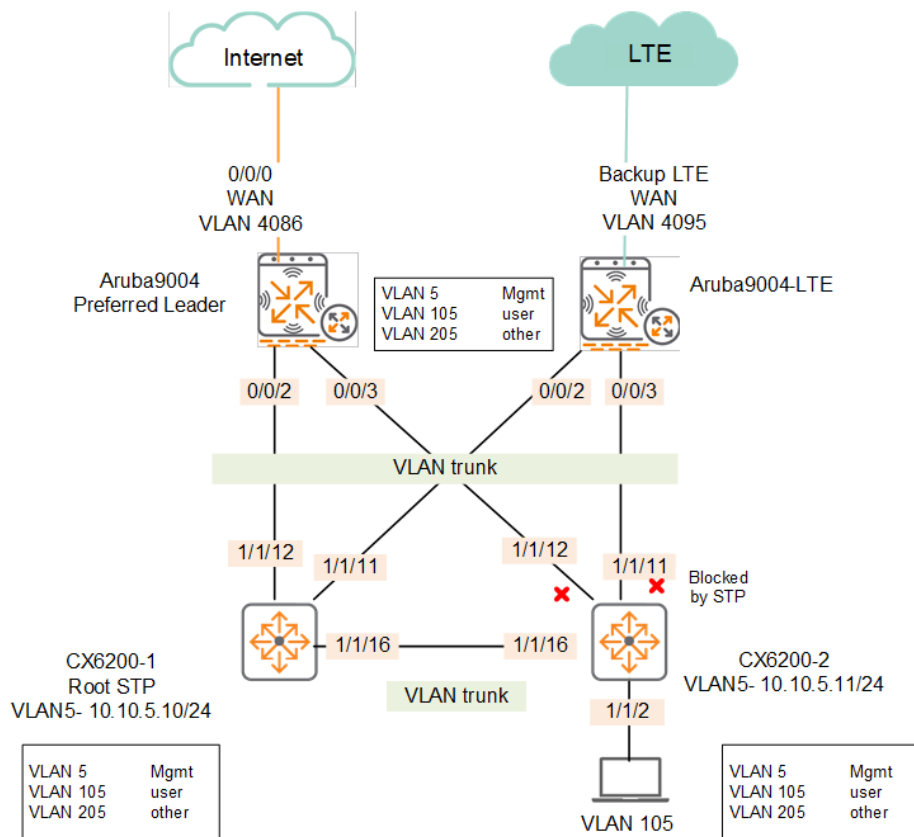
You will only see the INT tunnel on this gateway when the current uplink is down.

3 HA Failover Timing

In this section I'll explore the general time it takes for

1. 9004-LTE BGW to bring up its LTE interface when WAN uplink 0/0/0 is disconnected
2. Reconnected WAN uplink on 0/0/0 to become active for the user traffic
3. Backup LTE BGW to be the active gateway when the LAN interfaces on 9004 Gateway is disconnected.
4. The pre-emption of the preferred leader(9004 BGW) when it's LAN interfaces are reconnected

Here is the topology, the User (VLAN105) is connected to switch2 and does continuous ping to 1.1.1.1 with -w 1000



Customer: Ariya Publ...

AriyaStore

Manage

Overview

Devices

Clients

Applications

Security

Clients

CLIENTS

ALL

All1

Connecting0

Connected1

Failed0

Offline0

Blocked0

Wireless0

Wired1

Remote0

CLIENTS

Client Name	Status	IP Address	VLAN	Connected To	SSID/Port	AP Role	Gateway Role
T4405-SSD	Connected	10.10.105.128	105	Aruba9004	0/0/2		vlan105

3.1 Baseline

First we'll take a baseline before we start our tests.

Aruba9004 Gateway

```
(Aruba9004) #show uplink
```

Uplink Manager: Enabled
Uplink Health-check: Enabled FQDN: pgm.arubanetworks.com(13.239.61.151)
Uplink Load-balancing:Enabled Mode: Uplink-utilization

Uplink Management Table

Uplink Type	Properties	Uplink-id	State	Gateway	Reachability	WAN Type	Speed	Weight
B/w utiln	Max b/w							
Wired	vlan 4086	inet_inet	Connected	10.224.254.1	Reachable	Internet	50 Mbps	100
0.00%	100%							

(Aruba9004) #

(Aruba9004) #show ip interface b

Interface	IP Address / IP Netmask	Admin	Protocol	VRRP-IP
vlan 5	10.10.5.1 / 255.255.255.0	up	up	10.10.5.3
vlan 2	192.168.255.1 / 255.255.255.255	up	up	
vlan 105	10.10.105.1 / 255.255.255.0	up	up	10.10.105.3
vlan 205	10.10.205.1 / 255.255.255.0	up	up	10.10.205.3
vlan 4086	10.224.254.63 / 255.255.255.128	up	up	
vlan 4094	unassigned / unassigned	up	down	
loopback	unassigned / unassigned	up	up	

DHCP is enabled on VLAN(s) 4086, 4094

(Aruba9004) #

(Aruba9004) #show lc-cluster group-membership

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"
One-to-one-redundancy Enabled
Heartbeat Threshold = 900 msec
Cluster Info Table

Type	IPv4 Address	Priority	Connection-Type	STATUS
self	10.10.5.1	255	N/A	CONNECTED (Leader)
peer	10.10.5.2	128	L2-Connected	CONNECTED (Member)

(Aruba9004) #

(Aruba9004) #show vrrp

Virtual Router 105:

Description

Admin State UP, VR State MASTER

IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105

Priority 100, Advertisement 1 sec, Preemption Disable Delay 0

Auth type NONE *****

tracking is not enabled

cluster-preempt enabled

Virtual Router 205:

Description

Admin State UP, VR State MASTER

IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205

Priority 100, Advertisement 1 sec, Preemption Disable Delay 0

Auth type NONE *****

tracking is not enabled

cluster-preempt enabled

Virtual Router 220:

Description

Admin State UP, VR State MASTER

IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5

Priority 255, Advertisement 1 sec, Preemption Enable Delay 0

Auth type NONE *****

tracking is not enabled

(Aruba9004) #

Aruba9004-LTE Gateway

```
(Aruba9004-LTE) #show uplink
```

Uplink Manager: Enabled

Uplink Health-check: Enabled FQDN: pgm.arubanetworks.com(13.239.61.151)

Uplink Load-balancing:Enabled Mode: Uplink-utilization

Uplink Management Table

Uplink Type			Properties		Uplink-id		State	Gateway	Reachability
WAN Type	Speed	Weight	B/w utiln	Max b/w					
Virtual	tunnel 12	12			inet_inet		Connected	10.224.254.1	Reachable
Internet	50 Mbps	100	0.00%	100%					
Cellular	Internal-LTE (Backup)				cellular_lte		Disconnected from ISP	--	Not Established
LTE	100 Mbps	10	0.00%	100%					

```
(Aruba9004-LTE) #
```

```
(Aruba9004) #show ip interface brief
```

Interface	IP Address / IP Netmask	Admin	Protocol	VRRP-IP
vlan 5	10.10.5.2 / 255.255.255.0	up	up	10.10.5.3
vlan 2	192.168.255.2 / 255.255.255.255	up	up	
vlan 90	unassigned / unassigned	up	down	
vlan 105	10.10.105.2 / 255.255.255.0	up	up	10.10.105.3
vlan 205	10.10.205.2 / 255.255.255.0	up	up	10.10.205.3
vlan 4086	unassigned / unassigned	up	down	
loopback	unassigned / unassigned	up	up	
tunnel 12 (INT)	172.16.50.10 / 255.255.255.255	up	up	

DHCP is enabled on VLAN(s) 90, 4086

```
(Aruba9004-LTE) #show ip route
```

Codes: C - Connected, O - OSPF, IA - OSPF Inter Area, E1 - OSPF External Type 1, R - RIP
E2 - OSPF External Type 2, N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
B I - BGP Interior, B E - BGP Exterior, S - Static
U - BGW Peer Uplink, M - Management, Ru - Route Usable, * - Candidate Default
V - RAPNG VPN/Branch, I - Crypto-Cfgset, N - Not Redistributed, Bc - Cloud Overlay Protocol

```
S* 0.0.0.0/0 [50/10] via 10.224.254.1
C 10.10.205.0/24 is directly connected, VLAN205
C 192.168.255.2/32 is directly connected, VLAN2
C 10.10.105.0/24 is directly connected, VLAN105
C 172.16.50.10/32 is directly connected, Loopback
C 10.10.5.0/24 is directly connected, VLAN5
```

```
(Aruba9004-LTE) #
```

```
(Aruba9004-LTE) #show lc-cluster group-membership
```

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"

One-to-one-redundancy Enabled

Heartbeat Threshold = 900 msec

Cluster Info Table

Type	IPv4 Address	Priority	Connection-Type	STATUS
peer	10.10.5.1	255	L2-Connected	CONNECTED (Leader)
self	10.10.5.2	128	N/A	CONNECTED (Member)

```
(Aruba9004-LTE) #
```

```
(Aruba9004-LTE) #show vrrp
```

Virtual Router 105:

Description

Admin State UP, VR State BACKUP

```
IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105
Priority 100, Advertisement 1 sec, Preemption Disable Delay 0
Auth type NONE *****
tracking is not enabled
cluster-preempt enabled
```

Virtual Router 205:

Description

Admin State UP, VR State BACKUP

```
IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205
Priority 100, Advertisement 1 sec, Preemption Disable Delay 0
Auth type NONE *****
tracking is not enabled
cluster-preempt enabled
```

Virtual Router 220:

Description

Admin State UP, VR State BACKUP

```
IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5
Priority 235, Advertisement 1 sec, Preemption Enable Delay 0
Auth type NONE *****
tracking is not enabled
```

(Aruba9004-LTE) #

LAN Switch Spanning tree states

Here are the LAN switches Spanning tree states. Since 620012P-1 is the root for STP, all the interfaces will be in forwarding state.

```
6200-12P-1# sh spanning-tree
```

```
Spanning tree status      : Enabled Protocol: MSTP
```

MST0

```
Root ID    Priority    : 4096
MAC-Address: ec:67:94:d1:83:80
This bridge is the root
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15
```

```
Bridge ID  Priority    : 4096
MAC-Address: ec:67:94:d1:83:80
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15
```

Port TCN-Rx	Role	State	Cost	Priority	Type	BPDU-Tx	BPDU-Rx	TCN-Tx	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1/1/1	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/2	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/3	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/4	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/5	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/6	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/7	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/8	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/9	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/10	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/11	Designated	Forwarding	20000	128	P2P	4909	7	12	5
1/1/12	Designated	Forwarding	20000	128	P2P	4642	8	14	0
1/1/13	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/14	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/15	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/16	Designated	Forwarding	20000	128	P2P	4471	8	12	6

```
Number of topology changes      : 19
```

```
Last topology change occurred   : 76 seconds ago
```

```
6200-12P-1#
```

```
6200-12P-1# sh lldp nei
```

LLDP Neighbor Information

=====

```
Total Neighbor Entries          : 4
```

```
Total Neighbor Entries Deleted  : 3
```

```
Total Neighbor Entries Dropped  : 0
```

```
Total Neighbor Entries Aged-Out : 3
```

LOCAL-PORT	CHASSIS-ID	PORT-ID	PORT-DESC	TTL	SYS-NAME
1/1/11	20:4c:03:bc:2f:ba	GE0/0/2	GE0/0/2	120	Aruba9004-LTE
1/1/12	20:4c:03:82:0f:0a	GE0/0/2	GE0/0/2	120	Aruba9004
1/1/16	ec:67:94:d4:79:c0	1/1/16	1/1/16	120	6200-12P-2
6200-12P-1#					

And for the other switch

6200-12P-2# sh spanning-tree									
Spanning tree status : Enabled Protocol: MSTP									
MST0									
Root ID Priority : 4096 MAC-Address: ec:67:94:d1:83:80 Hello time(in seconds):2 Max Age(in seconds):20 Forward Delay(in seconds):15									
Bridge ID Priority : 32768 MAC-Address: ec:67:94:d4:79:c0 Hello time(in seconds):2 Max Age(in seconds):20 Forward Delay(in seconds):15									
Port	Role	State	Cost	Priority	Type	BPDU-Tx	BPDU-Rx	TCN-Tx	
TCN-Rx									

1/1/1	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/2	Designated	Forwarding	20000	128	P2P	1019	0	0	0
1/1/3	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/4	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/5	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/6	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/7	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/8	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/9	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/10	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/11	Alternate	Blocking	20000	128	P2P Bound	10	4915	5	12
1/1/12	Alternate	Blocking	20000	128	P2P Bound	279	4597	0	14
1/1/13	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/14	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/15	Disabled	Down	20000	128	P2P	0	0	0	0
1/1/16	Root	Forwarding	2000	128	P2P Bound	9	4477	6	
12									
Number of topology changes : 8									
Last topology change occurred : 6849 seconds ago									
6200-12P-2#									
6200-12P-2# sh lldp neighbor-info									
LLDP Neighbor Information									
=====									
Total Neighbor Entries : 5									
Total Neighbor Entries Deleted : 3									
Total Neighbor Entries Dropped : 0									
Total Neighbor Entries Aged-Out : 3									
LOCAL-PORT	CHASSIS-ID	PORT-ID	PORT-DESC	TTL	SYS-NAME				

1/1/2	28:d2:44:52:c2:38	28:d2:44:52:c2:38		3601					
1/1/11	20:4c:03:bc:2f:ba	GE0/0/3	GE0/0/3	120	Aruba9004-LTE				
1/1/12	20:4c:03:82:0f:0a	GE0/0/3	GE0/0/3	120	Aruba9004				
1/1/16	ec:67:94:d1:83:80	1/1/16	1/1/16	120	6200-12P-1				
6200-12P-2#									

3.2 Failover Testing

This table captures the rough estimated time it takes for the backup link to be established when the main WAN links is disconnected. It also shows the time it takes for pre-emption to occur when the main WAN link is reconnected.

Also here is LTE signal strength for reference.

```
(Aruba9004-LTE) #show uplink cellular signal
```

Uplink Signal Stats

Uplink Type	Properties	State	Signal Type	Strength
Cellular	Internal-LTE (Backup)	Disconnected from ISP	FDD LTE	-67 dBm

(Aruba9004-LTE) #

	BGW-1	BGW-LTE-2	Ping timeout	LTE return to backup state
Uplink	0/0/0 Wired Active	LTE backup		
LAN 0/0/1 – 0/0/2	Connected	Connected		
lc-cluster group-membership				
Self	CONNECTED (Leader)	CONNECTED (Member)		
peer	CONNECTED (Member)	CONNECTED (Leader)		
VRRP VLAN5	Master	Backup		
VRRP VLAN105	Master	Backup		
VRRP VLAN105	Master	Backup		
WAN main uplink failure test				
	Disconnect 0/0/0		6 sec	
	Reconnect 0/0/0 after 30 sec		6 sec	18 sec
	Disconnect 0/0/0 after 30 sec		6 sec	
	Reconnect 0/0/0 after 30 sec		4 sec	22 sec
	Disconnect 0/0/0 after 30 sec		6 sec	
	Reconnect 0/0/0 after 30 sec		5 sec	17 sec
	Disconnect 0/0/0 after 30 sec		7 sec	
	Reconnect 0/0/0 after 30 sec		5 sec	17 sec
One LAN Link failure test	Disconnect either 0/0/2 or 0/0/3	LTE backup link will not be established as there is link redundancy	NA	NA
Dual LAN Links failure test				
Uplink	0/0/0 Wired Active	LTE Active		
lc-cluster group-membership				
Self	ISOLATED (Leader)	ISOLATED (Leader)		
peer	DISCONNECTED	DISCONNECTED		
VRRP VLAN5	Master	Master		
VRRP VLAN105	Init	Master		
VRRP VLAN105	Init	Master		
	Disconnect 0/0/2-3		6 sec	
	Reconnect 0/0/2-3 after 30 sec		5 sec	11 sec
	Disconnect 0/0/2-3 after 30 sec		6 sec	
	Reconnect 0/0/2-3 after 30 sec		7 sec	10 sec
	Disconnect 0/0/2-3 after 30 sec		6 sec	
	Reconnect 0/0/2-3 after 30 sec		5 sec	12 sec
Uplink	0/0/0 Wired Active	LTE backup		
lc-cluster group-membership				
Self	CONNECTED (Leader)	CONNECTED (Member)		
peer	CONNECTED (Member)	CONNECTED (Leader)		
VRRP VLAN5	Master	Backup		
VRRP VLAN105	Master	Backup		
VRRP VLAN105	Master	Backup		

Here are the outputs of the relevant show commands after WAN uplink 0/0/0 was disconnected on Aruba9004.

(Aruba9004) #show ip interface b

Interface	IP Address / IP Netmask	Admin	Protocol	VRRP-IP
vlan 5	10.10.5.1 / 255.255.255.0	up	up	10.10.5.3
vlan 2	192.168.255.1 / 255.255.255.255	up	up	
vlan 105	10.10.105.1 / 255.255.255.0	up	up	10.10.105.3

vlan 205	10.10.205.1 / 255.255.255.0	up	up	10.10.205.3
vlan 4086	unassigned / unassigned	up	down	
vlan 4094	unassigned / unassigned	up	down	
loopback	unassigned / unassigned	up	up	
tunnel 12 (INT)	172.16.50.4 / 255.255.255.255	up	up	

DHCP is enabled on VLAN(s) 4086, 4094

(Aruba9004) #show ip route

Codes: C - Connected, O - OSPF, IA - OSPF Inter Area, E1 - OSPF External Type 1, R - RIP
 E2 - OSPF External Type 2, N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
 B I - BGP Interior, B E - BGP Exterior, S - Static
 U - BGW Peer Uplink, M - Management, Ru - Route Usable, * - Candidate Default
 V - RAPNG VPN/Branch, I - Crypto-Cfgset, N - Not Redistributed, Bc - Cloud Overlay Protocol

```
S* 0.0.0.0/0 [50/10] via 10.97.49.120
C 10.10.205.0/24 is directly connected, VLAN205
C 192.168.255.1/32 is directly connected, VLAN2
C 172.16.50.4/32 is directly connected, Loopback
S 10.3.8.2/32 [50/10] via 10.97.49.120
S 10.3.56.162/32 [50/10] via 10.97.49.120
C 10.10.105.0/24 is directly connected, VLAN105
C 10.10.5.0/24 is directly connected, VLAN5
```

(Aruba9004) #

(Aruba9004) #show uplink

Uplink Manager: Enabled
 Uplink Health-check: Enabled FQDN: pgm.arubanetworks.com(8.8.8.8)
 Uplink Load-balancing:Enabled Mode: Uplink-utilization

Uplink Management Table

Uplink Type	Properties	Uplink-id	State	Gateway	Reachability	WAN Type
Speed	Weight B/w utiln	Max b/w				
Wired	vlan 4086	inet_inet	Waiting for link	--	Not Established	Internet 50
Mbps 100	0.00%	100%				
Virtual	tunnel 12	cellular_lte	Connected	10.97.49.120	Reachable	LTE 100
Mbps 10	0.00%	100%				

(Aruba9004) #

(Aruba9004) #show lc-cluster group-membership

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"
 One-to-one-redundancy Enabled
 Heartbeat Threshold = 900 msec
 Cluster Info Table

Type	IPv4 Address	Priority	Connection-Type	STATUS
self	10.10.5.1	255	N/A	CONNECTED (Leader)
peer	10.10.5.2	128	L2-Connected	CONNECTED (Member)

(Aruba9004) #

(Aruba9004) #show vrrp

Virtual Router 105:
 Description
 Admin State UP, VR State MASTER
 IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105
 Priority 100, Advertisement 1 sec, Preemption Disable Delay 0
 Auth type NONE *****
 tracking is not enabled
 cluster-preempt enabled


```
Virtual Router 205:
  Description
  Admin State UP, VR State MASTER
  IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205
  Priority 100, Advertisement 1 sec, Preemption Disable Delay 0
  Auth type NONE *****
  tracking is not enabled
  cluster-preempt enabled
```

```
Virtual Router 220:
  Description
  Admin State UP, VR State MASTER
  IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5
  Priority 255, Advertisement 1 sec, Preemption Enable Delay 0
  Auth type NONE *****
  tracking is not enabled
```

```
(Aruba9004) #
```

```
(Aruba9004) #show ip interface b
```

Interface	IP Address / IP Netmask	Admin	Protocol	VRRP-IP
vlan 5	10.10.5.2 / 255.255.255.0	up	up	10.10.5.3
CELL	10.97.49.119 / 255.255.255.240	up	up	
vlan 2	192.168.255.2 / 255.255.255.255	up	up	
vlan 90	unassigned / unassigned	up	down	
vlan 105	10.10.105.2 / 255.255.255.0	up	up	10.10.105.3
vlan 205	10.10.205.2 / 255.255.255.0	up	up	10.10.205.3
vlan 4086	unassigned / unassigned	up	down	
loopback	unassigned / unassigned	up	up	

```
DHCP is enabled on VLAN(s) 90, 4086
```

```
(Aruba9004-LTE) #show ip route
```

```
Codes: C - Connected, O - OSPF, IA - OSPF Inter Area, E1 - OSPF External Type 1, R - RIP
       E2 - OSPF External Type 2, N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       B I - BGP Interior, B E - BGP Exterior, S - Static
       U - BGW Peer Uplink, M - Management, Ru - Route Usable, * - Candidate Default
       V - RAPNG VPN/Branch, I - Crypto-Cfgset, N - Not Redistributed, Bc - Cloud Overlay Protocol
```

```
S* 0.0.0.0/0 [50/10] via 10.97.49.120
C 10.10.205.0/24 is directly connected, VLAN205
C 192.168.255.2/32 is directly connected, VLAN2
C 10.97.49.112/28 is directly connected, Loopback
S 10.3.8.2/32 [50/10] via 10.97.49.120
S 10.3.56.162/32 [50/10] via 10.97.49.120
C 10.10.105.0/24 is directly connected, VLAN105
C 10.10.5.0/24 is directly connected, VLAN5
```

```
(Aruba9004-LTE) #show uplink
```

```
Uplink Manager: Enabled
Uplink Health-check: Enabled FQDN: pqm.arubanetworks.com(13.239.61.151)
Uplink Load-balancing:Enabled Mode: Uplink-utilization
```

```
Uplink Management Table
```

Uplink Type	Properties	Uplink-id	State	Gateway	Reachability	WAN Type
Speed	Weight B/w utiln Max b/w					
Cellular	Internal-LTE (Backup)	cellular_lte	* Connected *	10.97.49.120	Reachable	LTE
100 Mbps	10 0.01% 100%					

```
(*) Backup Uplink is connected
```

```
(Aruba9004-LTE) #show lc-cluster group-membership
```

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"

One-to-one-redundancy Enabled

Heartbeat Threshold = 900 msec

Cluster Info Table

Type	IPv4 Address	Priority	Connection-Type	STATUS
peer	10.10.5.1	255	L2-Connected	CONNECTED (Leader)
self	10.10.5.2	128	N/A	CONNECTED (Member)

(Aruba9004-LTE) #show vrrp

Virtual Router 105:

Description

Admin State UP, VR State BACKUP

IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105

Priority 100, Advertisement 1 sec, Preemption Disable Delay 0

Auth type NONE *****

tracking is not enabled

cluster-preempt enabled

Virtual Router 205:

Description

Admin State UP, VR State BACKUP

IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205

Priority 100, Advertisement 1 sec, Preemption Disable Delay 0

Auth type NONE *****

tracking is not enabled

cluster-preempt enabled

Virtual Router 220:

Description

Admin State UP, VR State BACKUP

IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5

Priority 235, Advertisement 1 sec, Preemption Enable Delay 0

Auth type NONE *****

tracking is not enabled

(Aruba9004-LTE) #

Here are the outputs of the relevant show commands after LAN ports 0/0/2-3 were disconnected form Aruba9004

(Aruba9004) #show lc-cluster group-membership

Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"

One-to-one-redundancy Enabled

Heartbeat Threshold = 900 msec

Cluster Info Table

Type	IPv4 Address	Priority	Connection-Type	STATUS
self	10.10.5.1	255	N/A	ISOLATED (Leader)
peer	10.10.5.2	128	N/A	DISCONNECTED

(Aruba9004) #show vrrp

Virtual Router 105:

Description

Admin State UP, VR State INIT

IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105

Priority 100, Advertisement 1 sec, Preemption Disable Delay 0

Auth type NONE *****

tracking is not enabled

cluster-preempt enabled

Virtual Router 205:

Description

Admin State UP, VR State INIT

IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205

Priority 100, Advertisement 1 sec, Preemption Disable Delay 0

Auth type NONE *****

tracking is not enabled

cluster-preempt enabled

```
Virtual Router 220:
  Description
  Admin State UP, VR State MASTER
  IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5
  Priority 255, Advertisement 1 sec, Preemption Enable Delay 0
  Auth type NONE *****
  tracking is not enabled
(Aruba9004) #
```

```
Aruba9004-LTE) #show uplink
```

```
Uplink Manager: Enabled
Uplink Health-check: Enabled FQDN: pgm.arubanetworks.com(13.239.61.151)
Uplink Load-balancing:Enabled Mode: Uplink-utilization
```

```
Uplink Management Table
```

Uplink Type	Properties	Uplink-id	State	Gateway	Reachability	WAN Type
Speed	Weight B/w utiln Max b/w					
Cellular	Internal-LTE (Backup)	cellular_lte	* Connected *	10.97.49.120	Reachable	LTE
100 Mbps	10 0.00% 100%					

```
(*) Backup Uplink is connected
```

```
(Aruba9004-LTE) #show lc-cluster group-membership
```

```
Cluster Enabled, Profile Name = "auto_gwcluster_site_9_260_0"
One-to-one-redundancy Enabled
Heartbeat Threshold = 900 msec
Cluster Info Table
```

Type	IPv4 Address	Priority	Connection-Type	STATUS
peer	10.10.5.1	255	N/A	DISCONNECTED
self	10.10.5.2	128	N/A	ISOLATED (Leader)

```
(Aruba9004-LTE) #
```

```
(Aruba9004-LTE) #show vrrp
```

```
Virtual Router 105:
  Description
  Admin State UP, VR State MASTER
  IP Address 10.10.105.3, MAC Address 00:00:5e:00:01:69, vlan 105
  Priority 100, Advertisement 1 sec, Preemption Disable Delay 0
  Auth type NONE *****
  tracking is not enabled
  cluster-preempt enabled
```

```
Virtual Router 205:
  Description
  Admin State UP, VR State MASTER
  IP Address 10.10.205.3, MAC Address 00:00:5e:00:01:cd, vlan 205
  Priority 100, Advertisement 1 sec, Preemption Disable Delay 0
  Auth type NONE *****
  tracking is not enabled
  cluster-preempt enabled
```

```
Virtual Router 220:
  Description
  Admin State UP, VR State MASTER
  IP Address 10.10.5.3, MAC Address 00:00:5e:00:01:dc, vlan 5
  Priority 255, Advertisement 1 sec, Preemption Enable Delay 0
  Auth type NONE *****
  tracking is not enabled
```

```
(Aruba9004-LTE) #
```