

vBRAS — CP Solution

Case Study: CUSP State Machine Verification

Basic UP Testing

The purpose of this case study is to define different vBRAS test scenarios, where the DUT is configured as vBRAS-UP and ports are connected as vBRAS-CP, broadband subscribers and core network gateway. vBRAS CP has different interconnected modules such as VxLAN-GPE, PPPoX, CUSP-UP or DHCPv4 / v6 Server, and NETCONF. CP module takes care of the CUSP protocol, through which it communicates with the DUT's CUSP-UP module. The subscriber login / logoff information reaches the CP through the VxLAN GPE tunnel between CP and UP. NETCONF is used as management plane protocol to configure the UP. CP can configure different parameters on the UP and also fetch different statistics from the UP time to time. This section describes scenarios involving all the different modules noted above and focuses on the basic functionalities.

Functionality Testing: CUSP

Purpose

The purpose of this section is to validate basic functionality of the UP. Both functionality and scalability test scenarios have been covered. Test cases have been distributed in different scenarios like CUSP session establishment, different access scenarios (for example, PPPoE and IPoE), scalability testing from both control plane and data plane perspective.

Scenario: CUSP State Machine Verification

Test 1.1: CUSP session establishment between CP and UP

Discussion

This test verifies successful CUSP session establishment between the DUT (UP) and the CP. Once the CUSP session is up, the UP should report its configuration details like chassis id, slot id, port id, and so on to the CP. Also, it verifies the dead interval timer behavior.

Topology

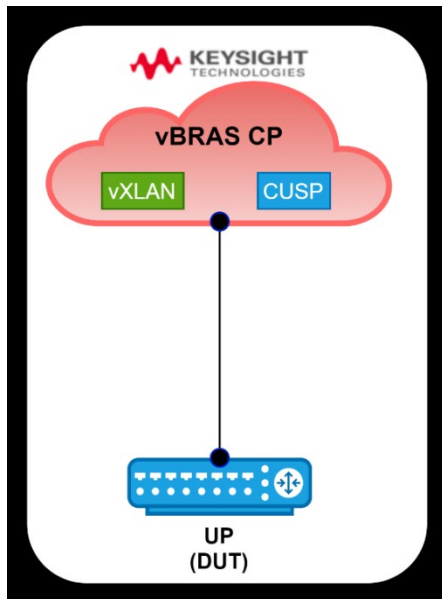


Figure 1. Single CUSP session

Test configuration

1. CP configuration:
 - a. Add single CP device. From the Topology Wizard, select 'CUSPv4 CP', 'VXLANGPE' is auto selected.

The screenshot shows the 'Quick Select Protocols' tab in the Topology Wizard. The interface is divided into sections for selecting protocols. Under the 'Data Center Ethernet' section, the 'VXLANGPE' checkbox is selected and highlighted with a red box. In the 'Access' section, the 'CUSPv4 CP' checkbox is also selected and highlighted with a red box. Other sections like 'Interfaces', 'L2 Security', 'Carrier Ethernet', and 'Data Center Ethernet' are visible with various other protocol options.

Figure 2. Selection from topology wizard

b. Configure CP.

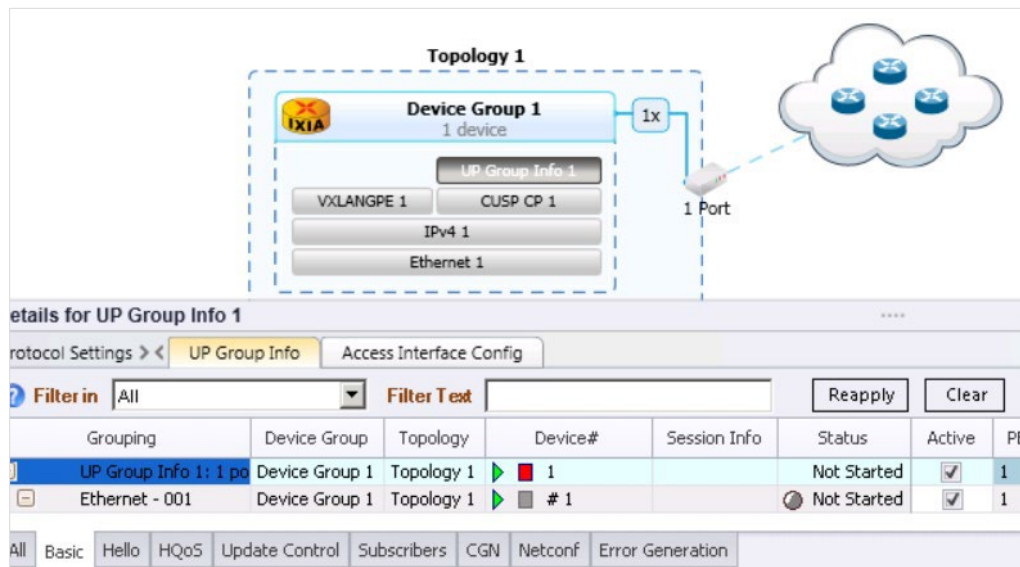


Figure 3. Configuration of CUSP CP.

c. Configure IPv4 address for the UP.

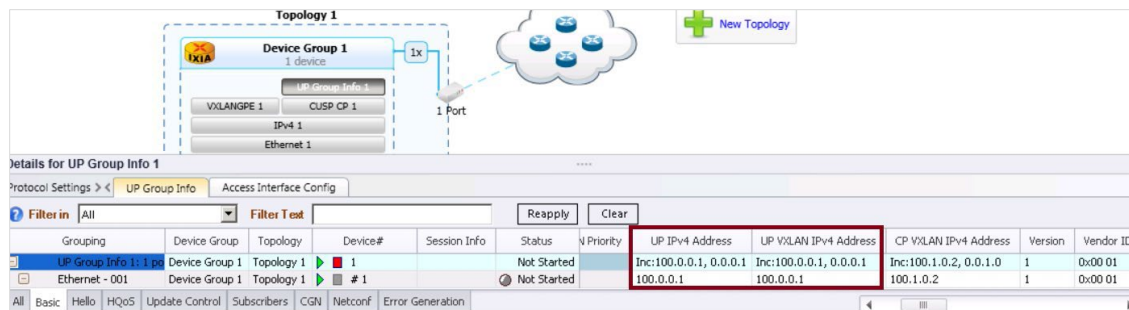


Figure 4. UP configuration

2. DUT configuration:

- Configure CP IPv4 address.
- Configure IP addresses on the access interfaces.
- Configure dead timer interval as 120 sec.

Test steps

1. Start capture on the CP port.
2. Start protocols on the Keysight CP port.
3. After the CUSP session is up, fetch learned info. Right Click UP Group Info row and select Get UP Resource Info.

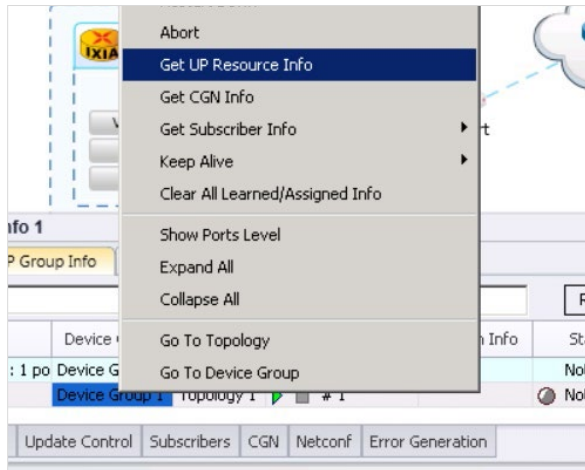


Figure 5. UP Resource Learned info fetch

4. Simulate link down at CP port.

Observable result

1. CUSP session is up.
2. Verify packet captures:
 - a. Hello message exchange between the CP and UP. UP must send one Hello without ACK and another Hello with ACK in response to the CP's Hello.
 - b. Check for resource message from the UP with BOARD_INFO and INTERFACE_INFO TLVs.
 - c. Verify learned info and check that the resource information received from the UP matches with UP board and interface configuration.

UP Resource Info										
Grouping	Index#	Topology	Device Group	Device#	CP IPv4 Address	CP IPv6 Address	UP IPv4 Address	UP IPv6 Address	Interface Details	Board Status
Ethernet - 001	# 1	Topology 1	CP	1	100.1.0.20		100.1.0.1		0/1/2/3	Normal
CGN Business Card										

Figure 6. UP Resource Learned info

3. The CUSP session at UP must go down after 120 sec from the last Keepalive message from the CP.

Test 1.2: Verify CP-UP Sync process without any pre-existing subscriber

Discussion

After the CUSP session establishment is complete, CP and UP does a database sync up. UP reports its hardware information like chassis id, port id, slot id, and so on. After the CP receives information about the interface, it may configure the access properties on the ports. This test verifies whether the UP configuration is properly done as per the information received from the CP over CUSP session.

Topology

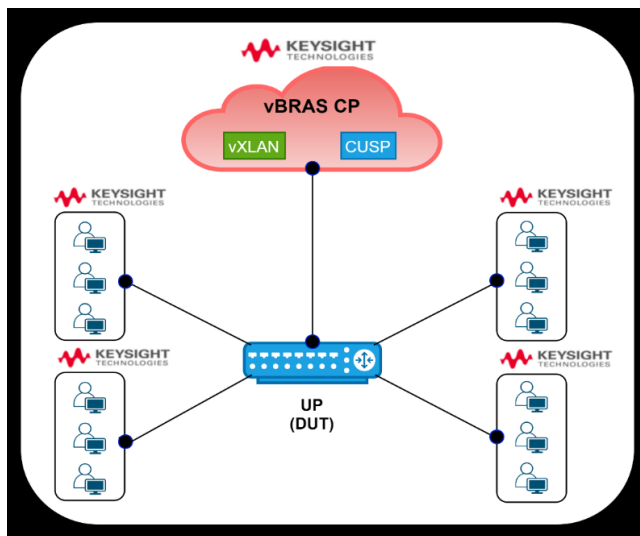


Figure 7. Multiple access interfaces

Test configuration

1. CP configuration:
 - a. Add a single CP device.
 - b. Configure the IPv4 address for the UP.
 - c. Turn on the **Enable Sync Request** option.

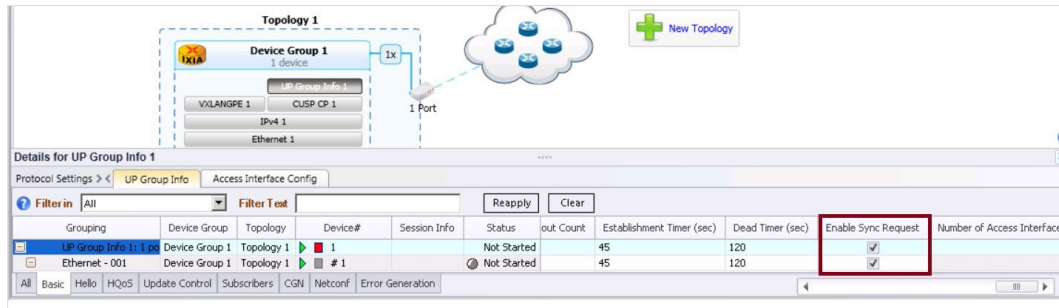


Figure 8. Sync request configuration

2. DUT configuration:

- a. Configure a CP IPv4 address.
- b. Configure an IP addresses on the access interfaces.
- c. Enable sync request.

Test steps

1. Start capture on the CP port.
2. Start protocols on the Keysight CP port.
3. Once the CUSP session is up, fetch the learned info.

Observable result

1. The CUSP session is up.
2. Verify packet captures:
 - a. Hello message exchange between the CP and UP. The UP must send one Hello without ACK and another Hello with ACK in response to the CP's Hello.
 - b. Check for a resource message from the UP with BOARD_INFO and INTERFACE_INFO TLVs.
 - c. Verify Sync Messages (Request,Begin,Data,End) being exchanged.

Test 1.3: Verify UP access interface configuration by CP

Discussion

The UP's access interface properties can be configured either by CUSP or NETCONF. This test verifies whether the UP's access interfaces can be configured by CP using CUSP. Once the UP has reported its hardware information to CP, CP and UP must sync each other's data base.

Topology

Refer to the topology as depicted in Figure 1: Single CUSP Session.

Test configuration

1. CP configuration:
 - a. Add a single CP device.
 - b. Configure the IPv4 address for the UP.
 - c. Set the number of Access Interfaces and configure the required parameters.

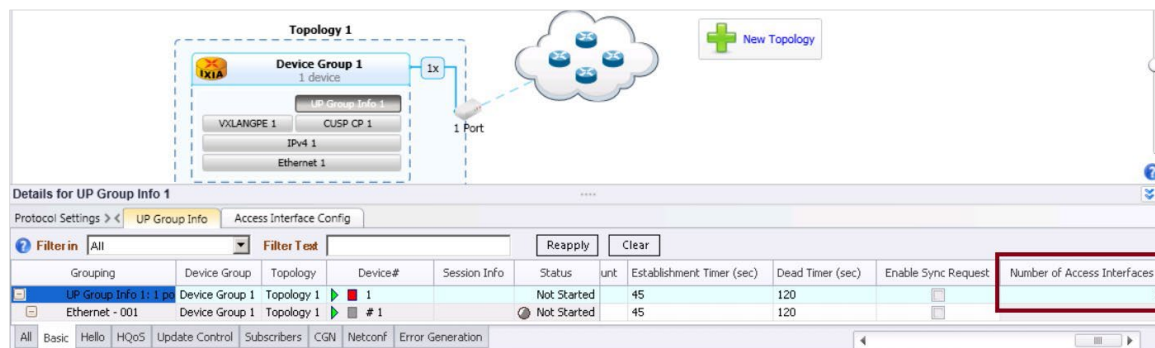


Figure 9. Set number of access interfaces

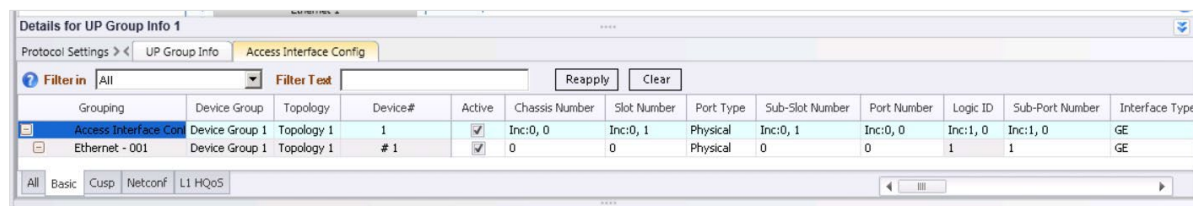


Figure 10. Access interface configuration parameters

3. DUT configuration:
 - a. Configure a CP IPv4 address.
 - b. Configure an IP addresses on the access interfaces.

Test steps

1. Start capture on the CP port.
2. Start protocols on the Keysight CP port.

Observable result

1. The CUSP session is up.

2. Verify packet captures:
 - a. Hello message exchange between the CP and UP. The UP must send one Hello without ACK and another Hello with ACK in response to the CP's Hello.
 - b. Check for a resource message from the UP with BOARD_INFO and INTERFACE_INFO TLVs.
 - c. Check that BRAS_ACCESS_IFSRV_INFO TLV is sent from CP.

Test 1.4: Verify CUSP session establishment between CP and multiple UPs

Discussion

This test verifies successful CUSP session establishment between multiple DUTs (UP) and a single CP. All the UPs must establish a CUSP session with the single CP. Once the CUSP session is up, the UPs must report its configuration details like chassis id, slot id, port id, and so on to the CP. Also verify the dead interval timer behavior.

Topology

The UPs can be connected to the CP port either through an L2 switch or an L3 gateway device.

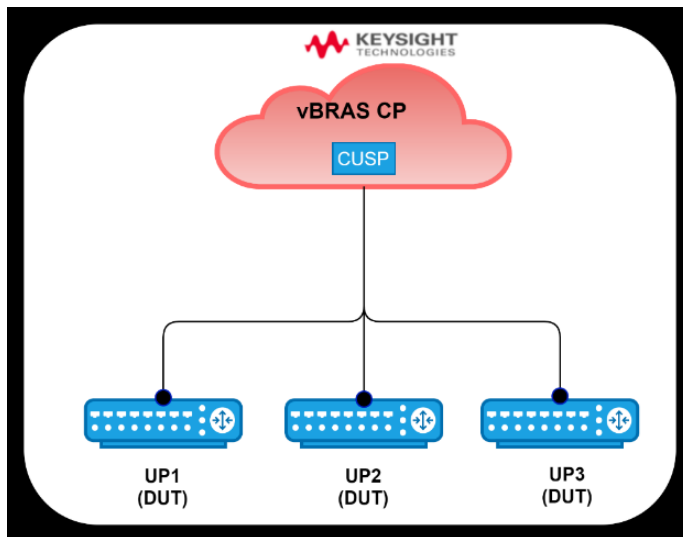


Figure 11. Multiple CUSP sessions

Test configuration

1. CP configuration:
 - a. Add a single CP device. Configure the UP-Multiplier value to 3, so that 3 CUSP session instances are created in the UP.

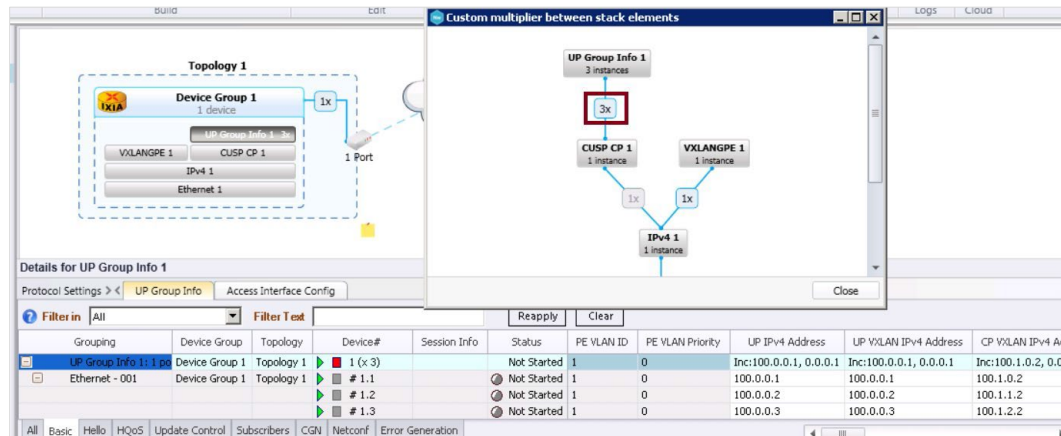


Figure 12. Session multiplier configuration

- b. Configure the IPv4 address for the UPs.
2. DUT configuration
 - a. Configure a CP IPv4 address.
 - b. Configure the IP addresses on the access interfaces.

Test steps

1. Start capture on the CP port.
2. Start protocols on the Keysight CP port.
3. Once the CUSP sessions are up, fetch the learned info one by one for each UP session.

Observable result

1. The CUSP session is up.
2. Verify packet captures:
 - a. Hello message exchange between the CP and UP. The UP must send one Hello without ACK and another Hello with ACK in response to the CP's Hello.
 - b. Check for a resource message from the UP with BOARD_INFO and INTERFACE_INFO TLVs.
3. Verify learned info and check that the resource information received from the UP matches with UP board and interface configuration.

Test 1.5 CUSP session establishment between UP and multiple CPs

Discussion

This test verifies successful CUSP session establishment between the DUT (UP) and multiple CPs. The UP may need to establish sessions with multiple CPs for high availability in case of CP failure. The test verifies whether UP can setup and maintain CUSP sessions with multiple CPs. Once the CUSP session is up, the UP must report its configuration details like chassis id, slot id, port id, and so on to the CP.

Topology

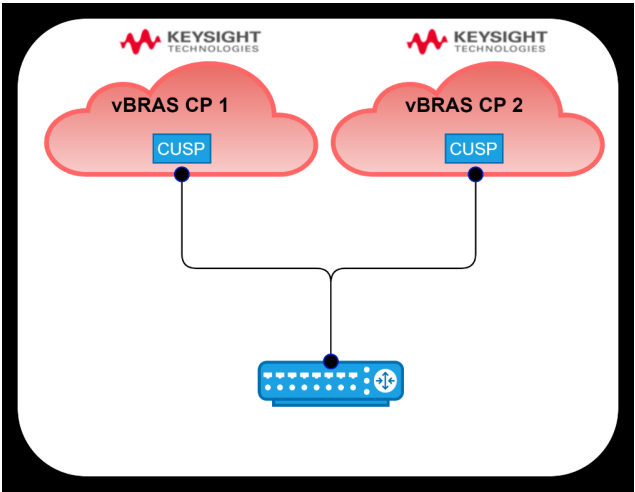


Figure 13. Single UP with multiple CPs

Test configuration

1. CP configuration:
 - a. Add two CP devices on the Keysight port using device multiplier.
 - b. Configure IPv4 address for the UP.

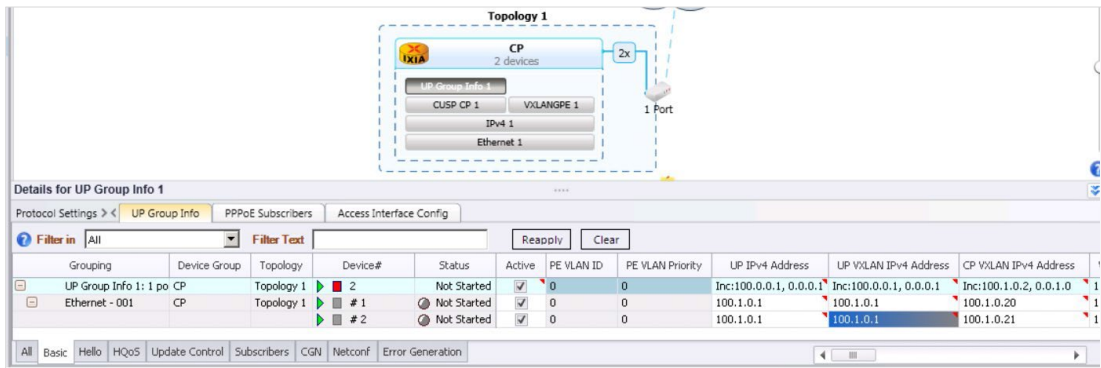


Figure 14. Multiple UP configuration

2. DUT configuration
 - a. Enable multiple ports on UP to configure CP IPv4 addresses.

Test steps

1. Start capture on the CP port.
2. Start protocols on both the tests.
3. Once the CUSP session is up, fetch the learned info.

Observable result

1. Verify packet captures and check for resource message from the UP.
2. Verify learned info and check that the resource information received from the UP matches with UP configuration.