

In This Chapter

This section provides information about Bridged CO model of Triple Play Service Delivery Architecture (TPSDA).

Topics in this section include:

- [Applicability on page 1990](#)
- [Summary on page 1991](#)
- [Overview on page 1992](#)
- [Configuration on page 1998](#)
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Applicability

This section is applicable to the 7750 SR and 7450 ESS series and was tested on SR-OS 7.0 R4. Chassis mode B or higher must be used. The 7750 SR-c4 is supported from 8.0R4 and higher. This note is related only to the use of IPv4 DHCP hosts.

Summary

This section provides information about basic technology, network topology and configuration examples which are used in Bridged CO model of Triple Play Service Delivery Architecture (TPSDA). Regardless of aggregation technologies which are used by customers Alcatel-Lucent offers flexible and easy to use methodology to manage DHCP subscribers in Layer 2 domain and distribute subscriber management intelligence across multiple nodes.

Knowledge of the Alcatel-Lucent Triple Play Service Delivery Architecture (TPSDA) concepts is assumed throughout this section.

Overview

Bridged CO is a basic TPSDA model and implies that access nodes are united in one Layer 2 aggregation network and VPLS is used as a primary technology for these purposes. This fact allows the use of subscriber management functionality on BSA nodes. Bridged CO network topology is shown in [Figure 311](#).

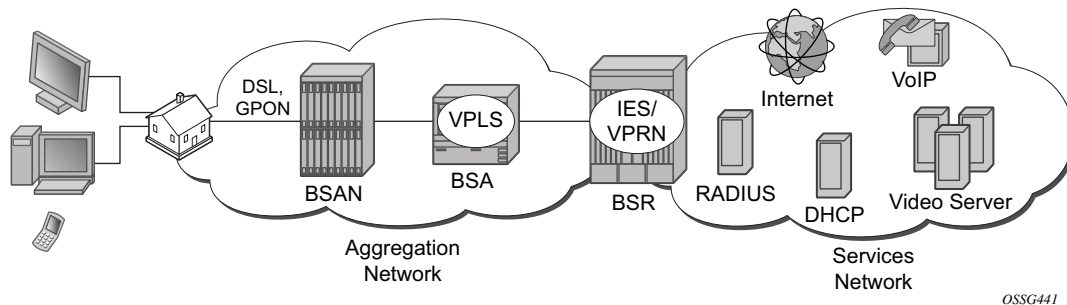


Figure 311: Bridged CO Network Topology

Following types of nodes are defined in Bridged CO model:

- Broadband Service Access Node (BSAN) — Access node connected to Layer 2 domain to aggregate all traffic from subscribers (IP DSLAM, ethernet switch).
- Broadband Services Aggregator (BSA) — Layer 2 node, which is capable for subscriber management in VPLS service (7450 ESS).
- Broadband Service Router (BSR) — Layer 3 node, which is capable for routing and service allocation (7750 SR).

As any model, Bridged CO introduces several key concepts that must be determined in advance. Major ones are presented in [Figure 312](#) and include:

- Subscriber— A set of hosts belonging to a single connection line (switch port, DSL line)
- Subscriber host — Unique customer device (could be PC, IP phone, STB, routed CPE).
- Subscriber-profile — Configured entity which defines the aggregate QoS for all hosts within a subscriber context.
- SLA-profile — Configured entity which defines QoS policies and filters for a subset of hosts within a subscriber context.

- Subscriber identification policy — Configured entity which defines the python script for dynamic subscriber host identification
- Authentication policy — Configured entity which defines the RADIUS servers to use for dynamic subscriber host identification
- Subscriber identification string — 32 characters identification string which uniquely identifies a subscriber on a node.

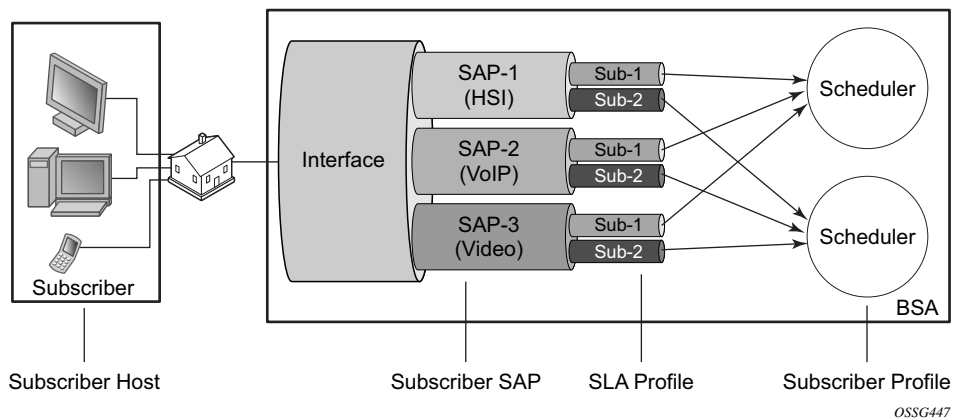


Figure 312: Key Concepts of Bridged CO Model

For normal operation each subscriber has to get several parameters / attributes:

- Subscriber-ID — Attribute, which uniquely identifies subscriber on the node and used as index key in subscriber database
- IP parameters — Attributes, which allows host to get access to services
- Subscriber profile and SLA — Profile for subscriber host □ a set of filters and QoS policies.
- Lease time — Period when subscriber parameters are kept in subscriber database on the node.

There are several methods how to get each of these parameters:

- Static
- Python scripts
- RADIUS
- DHCP

Each of the subscriber parameters could be defined in several ways simultaneously. In this case use the following algorithm for selecting:

Step 1. For subscriber profile

Step 1.1 A lookup in the **subscriber-explicit-map** is performed with the *sub-ident* string returned by the Python script, RADIUS or statically configured. If a matching entry is found, the sub-profile-name (if defined) is taken. If no entry was found go to [Step 1.2](#).

```
A:BSA>config>subscr-mgmt# info
explicit-subscriber-map
  entry key "Sub-1" sub-profile "sub-profile-1" sla-profile "sla-profile-1"
```

Step 1.2 If a sub-ident-policy is defined on the SAP, a lookup is done on its sub-profile-map with the sub-profile string from the script. The sub-profile-name is taken from the entry. If no entry was found go to [Step 1.3](#).

```
A:BSA>config>service>vpls>sap# info
sub-sla-mgmt
  sub-ident-policy "sub-ident-policy-1"

A:BSA>config>subscr-mgmt# info
sub-ident-policy "sub-ident-policy-1" create
sub-profile-map
  entry key "sub-1" sub-profile "sub-profile-1"
```

Step 1.3 If provisioned, the sub-profile-name is taken from the def-sub-profile attribute on the SAP. If no entry was found go to [Step 1.4](#).

```
A:BSA>config>service>vpls>sap# info
sub-sla-mgmt
  def-sub-profile "sub-profile-1"
```

Step 1.4 If a sub-profile with the name **default** is provisioned. If no entry was found DHCP Ack is dropped.

```
A:BSA>config>subscr-mgmt# info
sub-profile "default" create
```

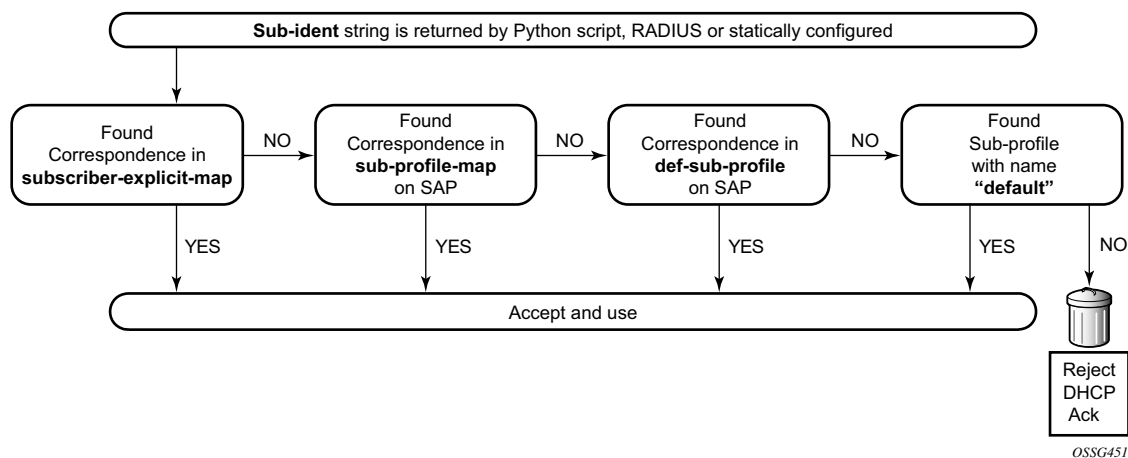


Figure 313: Flow Chart for Subscriber-Profile Identification Algorithm

Step 2. For SLA profile

Step 2.1 The sla-profile-name is taken from the sub-ident string (returned by the Python script, RADIUS or statically configured) in the subscriber-explicit-map. If no entry was found go to [Step 2.2](#).

```
A:BSA>config>subscr-mgmt# info
explicit-subscriber-map
entry key "Sub-1" sub-profile "sub-profile-1" sla-profile "sla-profile-1"
```

Step 2.2 A lookup with the sla-profile string from the script is done in the sla-profile-map of the sub-profile found earlier. The corresponding sla-profile-name is used. If no entry was found go to [Step 2.3](#):

```
A:BSA>config>subscr-mgmt# info
sub-profile "sub-profile-1" create
sla-profile-map
entry key "sla-1" sla-profile "sla-profile-1"
```

Step 2.3 The sla-profile-name is taken from sla-profile-map of the sub-ident-policy configured on the SAP. The corresponding sla-profile-name is used. If no entry was found go to [Step 2.4](#).

```
A:BSA>config>service>vpls>sap# info
sub-sla-mgmt
sub-ident-policy "sub-ident-policy-1"
```

```
A:BSA>config>subscr-mgmt# info
sub-ident-policy "sub-ident-policy-1" create
sla-profile-map
entry key "sla-1" sla-profile "sla-profile-1"
```

Step 2.4 The *sla-profile-name* is taken from the *def-sla-profile* attribute on the SAP. If no entry was found DHCP Ack is dropped.

```
A:BSA>config>service>vpls>sap# info
sub-sla-mgmt
def-sla-profile "sla-profile-1"
```

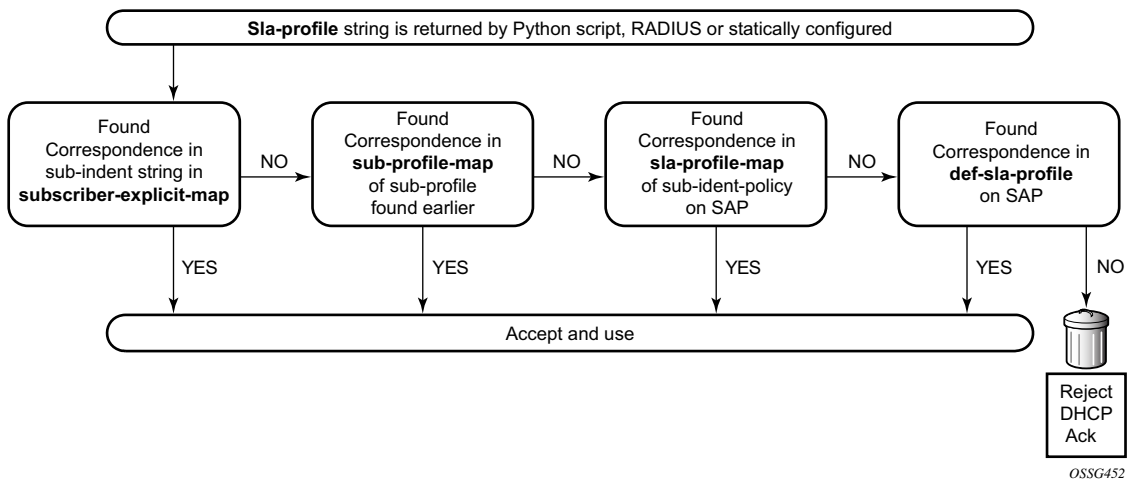


Figure 314: Flowchart for SLA-Profile Identification Algorithm

Note: static configuration has priority over RADIUS configuration and RADIUS has priority over DHCP/Python scripts.

Note: each host can have different SLA-profile, while sub-profile applies to whole subscriber. The last definition of sub-profile will force all previously defined hosts to change their sub-profile.

Bridged CO supports typical access node connection models, such as:

- One VLAN per service (ESM for subscriber differentiation and SAP for service)
- One VLAN per subscriber (SAP for subscriber differentiation and QoS flag for service)
- One VLAN per access node (ESM for subscriber differentiation and QoS flag for service)

Each of these modes has its pros and cons, but this is out of scope of this document.

This configuration guide focuses on configuration of one subscriber with three different hosts. VLAN per service is used as mode of subscriber aggregation and mixed RADIUS and DHCP as subscriber identification method. IP termination is done in IES service of BSR.

Correlation of BSA/BSR services and subscriber hosts is presented in [Table 20](#).

Table 20: Correlation of Hosts and BSA/BSR Services

	BSA (Service/Features)	BSR (Service/Features)
Host-1 ca:00:0c:54:00:08	VPLS-100 <ul style="list-style-type: none"> • DHCP proxy server • SAP/SDP DHCP snoop • Sub-Ident origin via RADIUS • Sla/Sub-profiles via RADIUS • IP options via RADIUS 	IES-100
Host-2 ca:01:08:10:00:08	VPLS-200 <ul style="list-style-type: none"> • SAP/SDP DHCP snoop • Sub-Ident origin through RADIUS • Sla/Sub-profiles through RADIUS • IP options through DHCP 	IES-200 <ul style="list-style-type: none"> • DHCP relay
Host-3 ca:02:02:d0:00:08	VPLS-300 <ul style="list-style-type: none"> • SAP/SDP DHCP snoop • Sub-Ident origin through DHCP • Sla/Sub-profiles through DHCP • IP options through DHCP 	IES-300 <ul style="list-style-type: none"> • DHCP relay

Different methods of authentication and address allocation were chosen for demonstration purposes. The customer is not limited to one method and can use a combination of methods as presented in this guide.

The following entities should be configured in advanced. Refer to the appropriate platform user guide for specific information. See [Preface on page 37](#) for a list of documents.

- Basic router configuration (interfaces, routing protocols, MPLS)
- External RADIUS server
- External/Local DHCP server

Configuration

A sample topology is presented in [Figure 315](#)

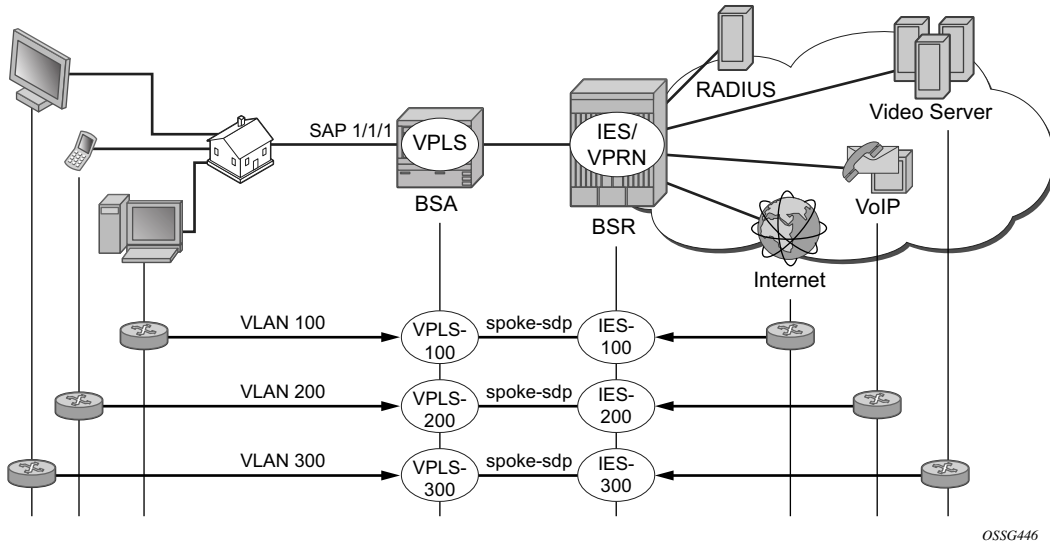


Figure 315: Sample Topology

Bridged CO model requires certain techniques and features to be used on different nodes. Major methods are presented in [Figure 316](#).

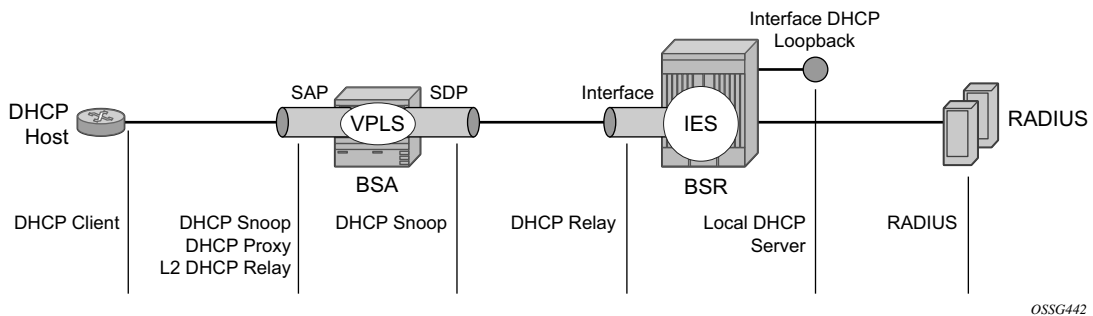


Figure 316: Functionality of Each Node

The following configuration steps are required:

Step 1. On BSA

Step 1.1 Configure subscriber management profiles

Step 1.1.1 Configure sla profiles

Step 1.1.2 Configure subscriber profiles

Step 1.1.3 Configure subscriber identification policies

Step 1.1.4 Configure authentication and accounting policies if required

Step 1.2 Configure VPLS service

Step 1.2.1 Configure split horizon group

Step 1.2.2 Configure SAP

Step 1.2.2.1 Configure anti-spoofing filters

Step 1.2.2.2 Configure DHCP snooping

Step 1.2.2.3 Configure optional parameters (lease split, L2 DHCP relay agent, etc.)

Step 1.2.2.4 In case of RADIUS authentication apply authentication policy

Step 1.2.2.5 Configure ESM

Step 1.2.3 Configure SDP

Step 1.2.3.1 Configure DHCP snooping

Step 2. On BSR

Step 2.1 Configure IES service

Step 2.1.1 Configure IP interface

Step 2.1.1.1 Configure DHCP relay agent if required

Basic ESM Configuration on BSA

Subscriber management is enabled on BSA in Bridged CO model. A relevant configuration is presented below. SLA and subscriber profiles show the default configurations. The authentication policy appeals to RADIUS server 192.0.2.5. The subscriber identification policy is configured to use DHCP Option 254 to transfer custom attributes (subscriber-id, sla-profile, sub-profile, etc.)

```
A:BSA>config>subscr-mgmt# info
  authentication-policy "auth-policy-1" create
    password password-1
    radius-authentication-server
      router "management"
      server 1 address 192.0.2.5 secret ALU
    exit
  include-radius-attribute
    circuit-id
    remote-id
    nas-port-id
    nas-identifier
  exit
exit
sla-profile "sla-profile-1" create
exit
sla-profile "sla-profile-2" create
exit
sla-profile "sla-profile-3" create
exit
sla-profile "sla-profile-default" create
exit
sub-profile "sub-profile-1" create
exit
sub-profile "sub-profile-default" create
exit
sub-ident-policy "sub-ident-policy-1" create
  sub-profile-map
    use-direct-map-as-default
  exit
  sla-profile-map
    use-direct-map-as-default
  exit
  strings-from-option 254
exit
```

The **string-from-option 254** command is shared in-built dhcp-server of BSR. Using this option, the DHCP server could transmit subscriber identification options such the subscriber-id, sla-profile-string, and sub-profile-string.

BSA/BSR Configuration for Host-1 Operation

The test subscriber has three hosts. Host-1 gets all necessary information from RADIUS server.

Table 21: BSA/BSR Configuration for Host-1 Operation

	BSA (Service/Features)	BSR (Service/Features)
Host-1 ca:00:0c:54:00:08	VPLS-100 <ul style="list-style-type: none"> • DHCP proxy server • SAP/SDP DHCP snoop • Sub-Ident origin through RADIUS • Sla/Sub-profiles through RADIUS • IP options through RADIUS 	IES-100

In this case BSA takes role of DHCP proxy with DHCP server emulation. DHCP snooping on the SAP must be enabled. Anti-spoofing filters on the SAP must be enabled. An authentication policy must be applied on the SAP.

```

vpls 100 customer 1 create
  split-horizon-group "RSHG-1" residential-group create
  exit
--snip--
sap 1/1/4:100 split-horizon-group "RSHG-1" create
  dhcp
    snoop
    lease-populate 400
    proxy-server
      emulated-server 10.0.1.253
      no shutdown
    exit
    no shutdown
  exit
  authentication-policy "auth-policy-1"
  anti-spoof ip-mac
  sub-sla-mgmt
    def-sub-id string "default-subscriber"
    def-sub-profile "sub-profile-default"
    def-sla-profile "sla-profile-default"
    sub-ident-policy "sub-ident-policy-1"
    no shutdown
  exit
  exit
  spoke-sdp 12:100 create
  exit
  no shutdown
exit

```

Basic ESM Configuration on BSA

On BSR IES-100, the service is configured with a pure IP interface, which plays role of DG for host-1.

```
ies 100 customer 1 create
  interface "int-host-1" create
    address 10.0.1.254/24
    spoke-sdp 21:100 create
  exit
exit
no shutdown
exit
```

BSA/BSR Configuration for Host-2 Operation

The test subscriber has three hosts. Host-2 gets subscriber-id and sla/sub-profiles information from RADIUS server and IP options from DHCP server.

Table 22: BSA/BSR Configuration for Host-2 Operation

	BSA (Service/Features)	BSR (Service/Features)
Host-2 ca:01:08:10:00:08	VPLS-200 <ul style="list-style-type: none">• SAP/SDP DHCP snoop• Sub-Ident origin through RADIUS• Sla/Sub-profiles through RADIUS• IP options through DHCP	IES-200 <ul style="list-style-type: none">• DHCP relay

DHCP snooping on the SAP and SDP must be enabled. Anti-spoofing filters on the SAP must be enabled.

```
vpls 200 customer 1 create
  split-horizon-group "RSHG-1" residential-group create
  exit
--snip--
sap 1/1/4:200 split-horizon-group "RSHG-1" create
  dhcp
    snoop
    lease-populate 400
    no shutdown
  exit
  authentication-policy "auth-policy-1"
  anti-spoof ip-mac
  sub-sla-mgmt
    def-sub-id string "default-subscriber"
    def-sub-profile "sub-profile-default"
```

```
        def-sla-profile "sla-profile-default"
        sub-ident-policy "sub-ident-policy-1"
        no shutdown
    exit
exit
spoke-sdp 12:200 create
    dhcp
        snoop
    exit
exit
no shutdown
exit
```

On BSR IES-200, the service is configured with an IP interface which as the DG for Host-2. DHCP relay must be configured to transform broadcast DHCP discover message into unicast and send it to DHCP server for processing.

```
ies 200 customer 1 create
    interface "int-host-2" create
        address 10.0.2.254/24
        dhcp
            server 192.0.2.4
            trusted
            no shutdown
        exit
    spoke-sdp 21:200 create
    exit
exit
no shutdown
exit
```

BSA/BSR Configuration for Host-3 Operation

The test subscriber has three hosts. Host-3 receives all necessary information from the DHCP server.

Table 23: BSA/BSR Configuration for Host-3 Operation

	BSA (Service/Features)	BSR (Service/Features)
Host-3 ca:02:02:d0:00:08	VPLS-300 * SAP/SDP DHCP snoop * Sub-Ident origin through DHCP * Sla/Sub-profiles through DHCP * IP options through DHCP	IES-300 * DHCP relay

DHCP snooping on the SAP and SDP must be enabled. Anti-spoofing filters on the SAP must be enabled.

```

vpls 300 customer 1 create
  split-horizon-group "RSHG-1" residential-group create
  exit
---- snip ----
sap 1/1/4:300 split-horizon-group "RSHG-1" create
  dhcp
    snoop
    lease-populate 400
    no shutdown
  exit
  anti-spoof ip-mac
  sub-sla-mgmt
    def-sub-id string "default-subscriber"
    def-sub-profile "sub-profile-default"
    def-sla-profile "sla-profile-default"
    sub-ident-policy "sub-ident-policy-1"
    no shutdown
  exit
exit
spoke-sdp 12:300 create
  dhcp
    snoop
  exit
exit
no shutdown
exit

```


On BSR IES-300, the service is configured with IP interface, which plays role of DG for host-3. DHCP relay must be configured to transform broadcast DHCP discover message into unicast and send it to DHCP server for processing.

```
ies 300 customer 1 create
  interface "int-host-3" create
    address 10.0.3.254/24
    dhcp
      server 192.0.2.4
      trusted
      no shutdown
    exit
    spoke-sdp 21:300 create
    exit
  exit
  no shutdown
exit
```

RADIUS Configuration Bridged CO

The username in the RADIUS access request is configurable and could be one of the following formats:

- mac — MAC Source Address of the DHCP DISCOVER message
- circuit-id — Taken from option 82 in the received DHCP message. If no circuit-id can be found, the DHCP-msg is rejected.
- tuple — Concatenation of MAC source address and circuit-ID
- ascii-converted-circuit-id — Identical to circuit-id, but the user name will be sent to the RADIUS server as a string of hex digits
- ascii-converted-tuple — Identical to tuple, but the circuit-id part of the user name will be sent to the RADIUS server as a string of hex digits

Note: Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information about how to use different options.

```
A:BSA>config>subscr-mgmt>auth-plcy# user-name-format
- user-name-format <format> [append domain-name]
- no user-name-format

<format>          : mac|circuit-id|tuple|ascii-converted-circuit-id|
                  ascii-converted-tuple
```

For simplicity, MAC format is used in this guide.

There are two hosts configured in the users file on RADIUS server:

- a:00:0c:54:00:08 — The mac address of host-1 host [VPLS/IES 100]. For host-1 all necessary parameters are returned: subscriber-id, sla/sub-profiles, IP parameters and lease time.
- a:01:08:10:00:08 — The mac address of host-2 host [VPLS/IES 200]. For host-2 only subscriber-id, sla/sub-profiles are returned, while ip parameters and lease time are returned from DHCP server.

```
ca:00:0c:54:00:08 Auth-Type := Local, User-Password == "password-1"
                  Alc-Subsc-ID-Str = "sub-id-1",
                  Alc-Subsc-Prof-Str == "sub-profile-1",
                  Alc-SLA-Prof-Str == "sla-profile-1",
                  Framed-IP-Address = 10.0.1.1,
                  Framed-IP-Netmask = 255.255.255.0,
                  Alc-Default-Router = 10.0.1.254,
                  Session-Timeout = 6000

ca:01:08:10:00:08 Auth-Type := Local, User-Password == "password-1"
                  Alc-Subsc-ID-Str = "sub-id-1",
                  Alc-Subsc-Prof-Str == "sub-profile-1",
                  Alc-SLA-Prof-Str == "sla-profile-2"
```

Local DHCP Server Configuration Bridged CO

In the setup local DHCP server is used with reference to local user database.

```
A:BSR>config>router>dhcp# info
    local-dhcp-server "dhcp-server-1" create
        user-db "user-db-1"
        pool "pool-1" create
            subnet 10.0.2.0/24 create
            exit
            subnet 10.0.3.0/24 create
            exit
        exit
    no shutdown
exit
```

Note: Subnets must be configured, even if all IP parameters are returned from local user DB. Without this option, DHCP server do not return IP parameters.

The local user database is configured on BSR. Identification is done via MAC address of a host, which is taken from DHCP-Discover message. There are several possibilities to identify DHCP host. **match-list** command is used for this purpose.

```
*A:BSR>config>subscr-mgmt>loc-user-db>dhcp# match-list
- no match-list
- match-list <dhcp-match-type-1> [<dhcpmatch-type-2>...(up to 4 max)]

<dhcp-match-type> : circuit-id|mac|option60|remote-id|sap-id|service-id|
string|system-id
```

There are two hosts configured:

- a:01:08:10:00:08 — mac address of host-2 [VPLS/IES 200]. DHCP returns ip address, subnet mask and default route.
- a:02:02:d0:00:08 — mac address of host-3 [VPLS/IES 300]. DHCP returns all necessary parameters: subscriber-id, sla/sub-profiles and all ip options.

```
A:BSR>config>subscr-mgmt# info
    local-user-db "user-db-1" create
        dhcp
            match-list mac
            host "host-2" create
                host-identification
                    mac ca:01:08:10:00:08
                exit
                address 10.0.2.1
                options
                    subnet-mask 255.255.255.0
                    default-router 10.0.2.254
                exit
```

Basic ESM Configuration on BSA

```
        no shutdown
    exit
    host "host-3" create
        host-identification
            mac ca:02:02:d0:00:08
        exit
        address 10.0.3.1
        identification-strings 254 create
            subscriber-id "sub-id-1"
            sla-profile-string "sla-profile-3"
            sub-profile-string "sub-profile-1"
        exit
        options
            subnet-mask 255.255.255.0
            default-router 10.0.3.254
        exit
        no shutdown
    exit
exit
no shutdown
exit
```

Setup Procedures and Debugging

Subscriber/Host Verification

The initialization of all active subscribers and hosts can be shown using the **how service active-subscribers** command. Different options can be used to filter the output of the command.

```
A:BSA# show service active-subscribers
=====
Active Subscribers
=====
-----
Subscriber sub-id-1 (sub-profile-1)
-----
-----
(1) SLA Profile Instance sap:1/1/4:100 - sla:sla-profile-1
-----
IP Address      MAC Address      PPPoE-SID Origin
-----
10.0.1.1        ca:00:0c:54:00:08 N/A      DHCP
-----
(2) SLA Profile Instance sap:1/1/4:200 - sla:sla-profile-2
-----
IP Address      MAC Address      PPPoE-SID Origin
-----
10.0.2.1        ca:01:08:10:00:08 N/A      DHCP
-----
(3) SLA Profile Instance sap:1/1/4:300 - sla:sla-profile-3
-----
IP Address      MAC Address      PPPoE-SID Origin
-----
10.0.3.1        ca:02:02:d0:00:08 N/A      DHCP
-----
Number of active subscribers : 1
=====
A:BSA#
```

Hierarchy of subscriber hosts is represented in a convenient form using following command.

```
A:BSA# show service active-subscribers hierarchy
=====
Active Subscriber hierarchy
=====
-- sub-id-1 (sub-profile-1)
|
|-- sap:1/1/4:100 - sla:sla-profile-1
| |
| |-- 10.0.1.1 - ca:00:0c:54:00:08 - N/A (DHCP)
| |
|
|-- sap:1/1/4:200 - sla:sla-profile-2
| |
| |-- 10.0.2.1 - ca:01:08:10:00:08 - N/A (DHCP)
| |
|
```

Basic ESM Configuration on BSA

```

|
|-- sap:1/1/4:300 - sla:sla-profile-3
|
|   |-- 10.0.3.1 - ca:02:02:d0:00:08 - N/A (DHCP)
|
|

```

Host-1 Setup Debug

The Host-1 setup process is shown in [Figure 317](#).

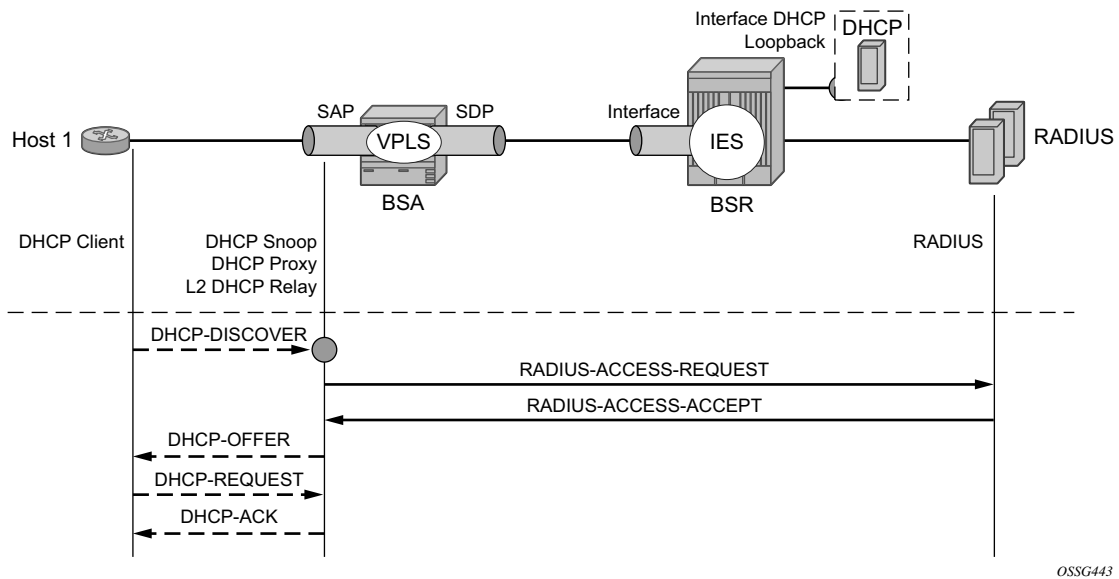


Figure 317: Host-1 Setup Process

Host-1 sends DHCP discover message in VLAN 100 to BSA. BSA plays role of DHCP proxy server and transforms DHCP discover into RADIUS access-request message. After receiving RADIUS access-accept BSA transforms it to DHCP Ack message. Session setup process could be represented using debug commands:

```

A:BSA# debug service id 100 dhcp mode egr-ingr-and-dropped
A:BSA# debug service id 100 dhcp detail-level medium
A:BSA# debug radius detail
18 2009/12/15 06:31:56.63 UTC MINOR: DEBUG #2001 Base SVCMMGR
"SVCMMGR: RX DHCP Packet
  VPLS 100, SAP 1/1/4:100

  BootRequest to UDP port 67
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 0.0.0.0
  chaddr: ca:00:0c:54:00:08  xid: 0xd42

```

```

    DHCP options:
    [53] Message type: Discover
--snip--
"
19 2009/12/15 06:31:56.63 UTC MINOR: DEBUG #2001 management RADIUS
"RADIUS: Access-Request
  user ca:00:0c:54:00:08  policy auth-policy-1"
20 2009/12/15 06:31:56.63 UTC MINOR: DEBUG #2001 management RADIUS
"RADIUS: Transmit
  Access-Request(1) 192.0.2.5:1812 id 69  len 85
    USER NAME [1] 17 ca:00:0c:54:00:08
    PASSWORD [2] 16 lkhSVrFePQ0A0Xc4ZyMwMk
    NAS IP ADDRESS [4] 4 192.0.2.1
    NAS PORT TYPE [61] 4 Ethernet(15)
    NAS PORT ID [87] 9 1/1/4:100
    NAS IDENTIFIER [32] 3 BSA
"
21 2009/12/15 06:31:56.73 UTC MINOR: DEBUG #2001 management RADIUS
"RADIUS: Receive
  Access-Accept(2) id 69  len 108 from 138.203.18.79:1812
    VSA [26] 10 Alcatel(6527)
      SUBSC ID STR [11] 8 sub-id-1
    VSA [26] 15 Alcatel(6527)
      SUBSC PROF STR [12] 13 sub-profile-1
    VSA [26] 15 Alcatel(6527)
      SLA PROF STR [13] 13 sla-profile-1
    FRAMED IP ADDRESS [8] 4 10.0.1.1
    FRAMED IP NETMASK [9] 4 255.255.255.0
    VSA [26] 6 Alcatel(6527)
      DEFAULT ROUTER [18] 4 10.0.1.254
    SESSION TIMEOUT [27] 4 6000
"
22 2009/12/15 06:31:56.73 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: TX DHCP Packet
  VPLS 100, SAP 1/1/4:100

  BootReply to UDP port 68
  ciaddr: 0.0.0.0          yiaddr: 10.0.1.1
  siaddr: 10.0.1.253      giaddr: 0.0.0.0
  chaddr: ca:00:0c:54:00:08  xid: 0xd42

  DHCP options:
  [53] Message type: Offer
--snip--
"
23 2009/12/15 06:31:57.57 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: RX DHCP Packet
  VPLS 100, SAP 1/1/4:100

  BootRequest to UDP port 67
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 0.0.0.0
  chaddr: ca:00:0c:54:00:08  xid: 0xd42

  DHCP options:
  [53] Message type: Request
--snip--
"

```

Basic ESM Configuration on BSA

```
24 2009/12/15 06:31:57.57 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: TX DHCP Packet
  VPLS 100, SAP 1/1/4:100

  BootReply to UDP port 68
  ciaddr: 0.0.0.0          yiaddr: 10.0.1.1
  siaddr: 10.0.1.253      giaddr: 0.0.0.0
  chaddr: ca:00:0c:54:00:08  xid: 0xd42

  DHCP options:
  [53] Message type: Ack
--snip
```

The number of snooped/forwarded/dropped/proxied DHCP packets can be checked using the **show service id 100 dhcp statistics** command.

```
A:BSA# show service id 100 dhcp statistics
=====
DHCP Statistics, service 100
=====
Client Packets Snooped           : 2
Client Packets Forwarded         : 0
Client Packets Dropped           : 0
Client Packets Proxied (RADIUS)  : 2
Client Packets Proxied (Lease-Split) : 0
Server Packets Snooped           : 0
Server Packets Forwarded         : 0
Server Packets Dropped           : 0
DHCP RELEASEs Spoofed           : 0
DHCP FORCERENEWs Spoofed        : 0
=====
A:BSA#
```

Connectivity of Host-1 could be checked with the **show service id 100 subscriber-hosts** command. Different options can be used to filter output of the command.

```
A:BSA# show service id 100 subscriber-hosts detail
=====
Subscriber Host table
=====
Sap          IP Address   MAC Address   PPPoE-SID Origin
Subscriber
-----
1/1/4:100    10.0.1.1    ca:00:0c:54:00:08 N/A    DHCP
sub-id-1

Sub Profile   : sub-profile-1
SLA Profile   : sla-profile-1
App Profile   : N/A
-----
Number of subscriber hosts : 1
```

The DHCP lease state can be checked with the **show service id 100 dhcp lease-state** command. Different options can be used to filter output of a command.


```
A:BSA# show service id 100 dhcp lease-state detail
=====
DHCP lease states for service 100
=====
Service ID           : 100
IP Address           : 10.0.1.1
Client HW Address    : ca:00:0c:54:00:08
SAP                  : 1/1/4:100
Remaining Lifetime   : 01h33m41s
Persistence Key      : N/A
Sub-Ident            : "sub-id-1"
Sub-Profile-String   : "sub-profile-1"
SLA-Profile-String   : "sla-profile-1"
--snip--
Sub-Ident origin     : Radius
Strings origin       : Radius
Lease Info origin    : Radius
--snip--
Radius User-Name     : "ca:00:0c:54:00:08"
-----
Number of lease states : 1
=====
A:BSA#
```

Host-2 Setup Debug

Host-1 setup process is displayed in [Figure 318](#).

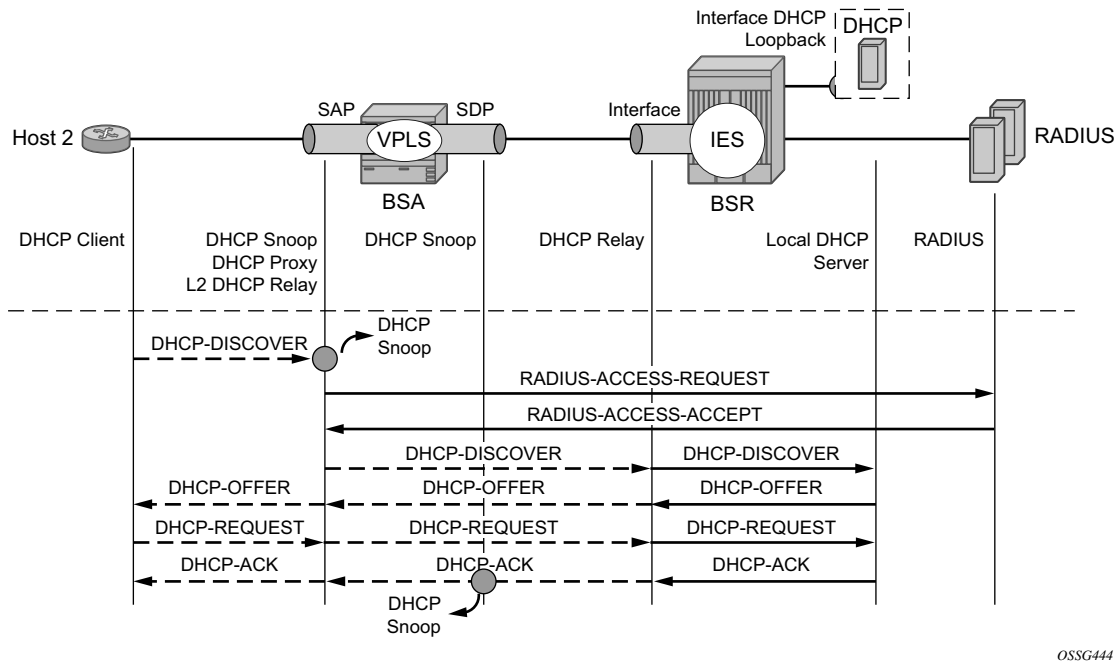


Figure 318: Host-2 Setup Process

Host-2 sends DHCP discover message in VLAN 200 to BSA. Host-2 is authenticated through RADIUS and gets subscriber-id, sla/sub-profiles. DHCP Discover message is flooded in VPLS service and reaches IP interface on BSA, where DHCP relay is configured. Session setup process could be represented using debug commands:

```
A:BSA# debug service id 200 dhcp mode egr-ingr-and-dropped
A:BSA# debug service id 200 dhcp detail-level medium
A:BSA#
*A:BSA#
18 2009/12/15 13:00:36.28 UTC MINOR: DEBUG #2001 Base SVCMMGR
"SVCMMGR: RX DHCP Packet
  VPLS 200, SAP 1/1/4:200

BootRequest to UDP port 67
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Discover
```

```

--snip--

19 2009/12/15 13:00:36.28 UTC MINOR: DEBUG #2001 management RADIUS
"RADIUS: Access-Request
  user ca:01:08:10:00:08  policy auth-policy-1"

20 2009/12/15 13:00:36.28 UTC MINOR: DEBUG #2001 management RADIUS
"RADIUS: Transmit
  Access-Request(1) 192.0.2.5:1812 id 80  len 85
    USER NAME [1] 17 ca:01:08:10:00:08
    PASSWORD [2] 16 .czdppt/0qAsqKqStbvnV.
    NAS IP ADDRESS [4] 4 192.0.2.1
    NAS PORT TYPE [61] 4 Ethernet(15)
    NAS PORT ID [87] 9 1/1/4:200
    NAS IDENTIFIER [32] 3 BSA
  "

21 2009/12/15 13:00:36.34 UTC MINOR: DEBUG #2001 management RADIUS
"RADIUS: Receive
  Access-Accept(2) id 80  len 78 from 138.203.18.79:1812
    VSA [26] 10 Alcatel(6527)
      SUBSC ID STR [11] 8 sub-id-1
    VSA [26] 15 Alcatel(6527)
      SUBSC PROF STR [12] 13 sub-profile-1
    VSA [26] 15 Alcatel(6527)
      SLA PROF STR [13] 13 sla-profile-2
  "

22 2009/12/15 13:00:36.34 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: TX DHCP Packet
  flooding in VPLS 200

  BootRequest to UDP port 67
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 0.0.0.0
  chaddr: ca:01:08:10:00:08  xid: 0xfc8

  DHCP options:
  [53] Message type: Discover
--snip--"

23 2009/12/15 13:00:36.35 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: RX DHCP Packet
  VPLS 200, spoke-sdp 12:200

  BootReply to UDP port 68
  ciaddr: 0.0.0.0          yiaddr: 10.0.2.1
  siaddr: 192.0.2.4        giaddr: 0.0.0.0
  chaddr: ca:01:08:10:00:08  xid: 0xfc8

  DHCP options:
  [53] Message type: Offer
--snip--"

24 2009/12/15 13:00:36.34 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: TX DHCP Packet
  VPLS 200, SAP 1/1/4:200

  BootReply to UDP port 68
  ciaddr: 0.0.0.0          yiaddr: 10.0.2.1

```

Basic ESM Configuration on BSA

```
siaddr: 192.0.2.4          giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Offer
--snip--"

25 2009/12/15 13:00:36.46 UTC MINOR: DEBUG #2001 Base SVCNMR
"SVCNMR: RX DHCP Packet
  VPLS 200, SAP 1/1/4:200

BootRequest to UDP port 67
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Request
--snip--"

26 2009/12/15 13:00:36.46 UTC MINOR: DEBUG #2001 Base SVCNMR
"SVCNMR: TX DHCP Packet
  flooding in VPLS 200

BootRequest to UDP port 67
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Request
--snip--"

27 2009/12/15 13:00:36.47 UTC MINOR: DEBUG #2001 Base SVCNMR
"SVCNMR: RX DHCP Packet
  VPLS 200, spoke-sdp 12:200

BootReply to UDP port 68
ciaddr: 0.0.0.0          yiaddr: 10.0.2.1
siaddr: 192.0.2.4        giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Ack
--snip--"

28 2009/12/15 13:00:36.46 UTC MINOR: DEBUG #2001 Base SVCNMR
"SVCNMR: TX DHCP Packet
  VPLS 200, SAP 1/1/4:200

BootReply to UDP port 68
ciaddr: 0.0.0.0          yiaddr: 10.0.2.1
siaddr: 192.0.2.4        giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Ack
--snip--"
```

```
DHCP relay is enabled in service IES-200 on BSR.

A:BSR# debug router ip dhcp mode egr-ingr-and-dropped
A:BSR#
*A:BSR#
17 2009/12/15 13:00:36.34 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 6 (int-host-2),
  received DHCP Boot Request on Interface int-host-2 (1/1/2) Port 67

  H/W Type: Ethernet(10Mb)  H/W Address Length: 6
  ciaddr: 0.0.0.0           yiaddr: 0.0.0.0
  siaddr: 0.0.0.0           giaddr: 0.0.0.0
  chaddr: ca:01:08:10:00:08  xid: 0xfc8

  DHCP options:
  [53] Message type: Discover
--snip--"

18 2009/12/15 13:00:36.34 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
  transmitted DHCP Boot Request to 192.0.2.4 Port 67

  H/W Type: Ethernet(10Mb)  H/W Address Length: 6
  ciaddr: 0.0.0.0           yiaddr: 0.0.0.0
  siaddr: 0.0.0.0           giaddr: 10.0.2.254
  chaddr: ca:01:08:10:00:08  xid: 0xfc8

  DHCP options:
  [53] Message type: Discover
--snip--"

19 2009/12/15 13:00:36.35 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
  received DHCP Boot Reply on 192.0.2.4 Port 67

  H/W Type: Ethernet(10Mb)  H/W Address Length: 6
  ciaddr: 0.0.0.0           yiaddr: 10.0.2.1
  siaddr: 192.0.2.4         giaddr: 10.0.2.254
  chaddr: ca:01:08:10:00:08  xid: 0xfc8

  DHCP options:
  [53] Message type: Offer
--snip--"

20 2009/12/15 13:00:36.35 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 6 (int-host-2),
  transmitted DHCP Boot Reply to Interface int-host-2 (spoke-21:200) Port 68

  H/W Type: Ethernet(10Mb)  H/W Address Length: 6
  ciaddr: 0.0.0.0           yiaddr: 10.0.2.1
  siaddr: 192.0.2.4         giaddr: 0.0.0.0
  chaddr: ca:01:08:10:00:08  xid: 0xfc8

  DHCP options:
  [53] Message type: Offer
```

Basic ESM Configuration on BSA

```
--snip--"
21 2009/12/15 13:00:36.47 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 6 (int-host-2),
    received DHCP Boot Request on Interface int-host-2 (1/1/2) Port 67

H/W Type: Ethernet(10Mb) H/W Address Length: 6
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Request
--snip--"

22 2009/12/15 13:00:36.47 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
    transmitted DHCP Boot Request to 192.0.2.4 Port 67

H/W Type: Ethernet(10Mb) H/W Address Length: 6
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 10.0.2.254
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Request
--snip--"

23 2009/12/15 13:00:36.47 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
    received DHCP Boot Reply on 192.0.2.4 Port 67

H/W Type: Ethernet(10Mb) H/W Address Length: 6
ciaddr: 0.0.0.0          yiaddr: 10.0.2.1
siaddr: 192.0.2.4        giaddr: 10.0.2.254
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Ack
--snip--"

24 2009/12/15 13:00:36.47 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 6 (int-host-2),
    transmitted DHCP Boot Reply to Interface int-host-2 (spoke-21:200) Port 68

H/W Type: Ethernet(10Mb) H/W Address Length: 6
ciaddr: 0.0.0.0          yiaddr: 10.0.2.1
siaddr: 192.0.2.4        giaddr: 0.0.0.0
chaddr: ca:01:08:10:00:08  xid: 0xfc8

DHCP options:
[53] Message type: Ack
--snip--"
```

The number of snooped/forwarded/dropped/proxied DHCP packets could be checked using the **show service id 200 dhcp statistics** command.

```
A:BSA# show service id 200 dhcp statistics
=====
DHCP Statistics, service 200
=====
Client Packets Snooped           : 2
Client Packets Forwarded         : 2
Client Packets Dropped           : 0
Client Packets Proxied (RADIUS)  : 0
Client Packets Proxied (Lease-Split) : 0
Server Packets Snooped           : 2
Server Packets Forwarded         : 2
Server Packets Dropped           : 0
DHCP RELEASEs Spoofed           : 0
DHCP FORCERENEWs Spoofed        : 0
=====
A:BSA#
```

The connectivity of Host-2 can be verified with the **show service id 200 subscriber-hosts** command. Different options can be used to filter output of the command.

```
A:BSA# show service id 200 subscriber-hosts detail
=====
Subscriber Host table
=====
Sap      IP Address      MAC Address      PPPoE-SID Origin
Subscriber
-----
1/1/4:200      10.0.2.1        ca:01:08:10:00:08 N/A      DHCP
sub-id-1
-----
Sub Profile      : sub-profile-1
SLA Profile      : sla-profile-2
App Profile      : N/A
-----
Number of subscriber hosts : 1
=====
A:BSA#
```

Basic ESM Configuration on BSA

DHCP lease state can be verified with the **show service id 200 dhcp lease-state** command. Different options can be used to filter output of the command.

```
A:BSA# show service id 200 dhcp lease-state detail
=====
DHCP lease states for service 200
=====
Service ID           : 200
IP Address           : 10.0.2.1
Client HW Address    : ca:01:08:10:00:08
SAP                  : 1/1/4:200
Remaining Lifetime   : 09d23h44m
Persistence Key      : N/A
Sub-Ident            : "sub-id-1"
Sub-Profile-String   : "sub-profile-1"
SLA-Profile-String   : "sla-profile-2"
--snip--
Sub-Ident origin     : Radius
Strings origin       : Radius
Lease Info origin    : DHCP
--snip--
Radius User-Name     : "ca:01:08:10:00:08"
-----
Number of lease states : 1
=====
A:BSA#
```


Host-3 Setup Debug

The Host-3 setup process is presented in Figure 319.

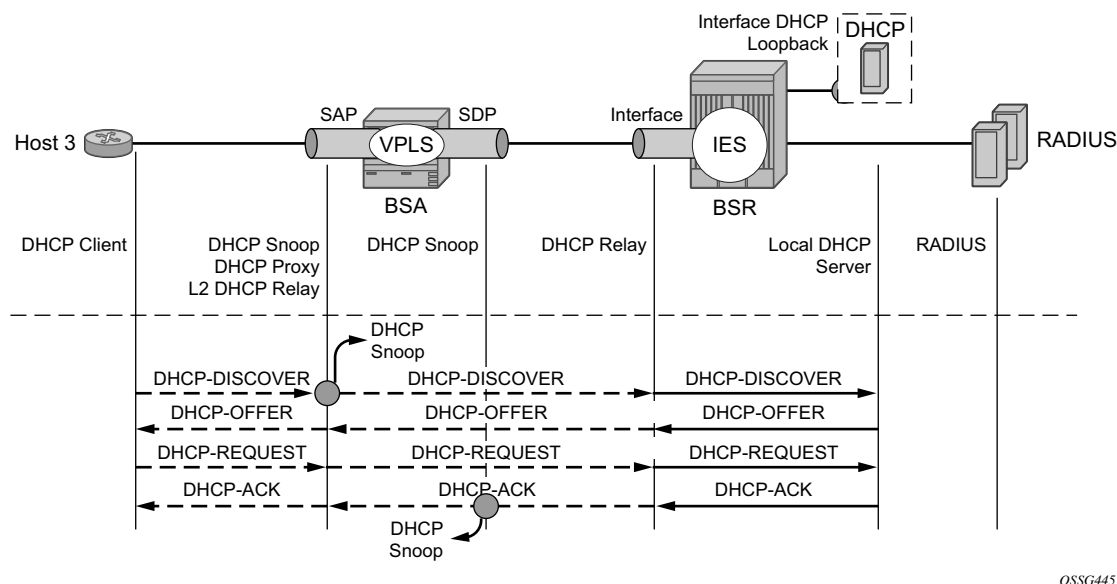


Figure 319: Host-3 Setup Process

Host-3 sends DHCP a discover message in VLAN 300 to BSA. Host-3 receives all parameters from the DHCP server using pre-configured Option 254. A DHCP discover message is flooded in VPLS service and reaches IP interface on BSA where DHCP relay is configured. The session setup process can be represented using debug commands.

```
A:BSA# debug service id 300 dhcp mode egr-ingr-and-dropped
A:BSA# debug service id 300 dhcp detail-level medium
*A:BSA#
33 2009/12/15 13:02:34.39 UTC MINOR: DEBUG #2001 Base SVCMMGR
"SVCMMGR: RX DHCP Packet
  VPLS 300, SAP 1/1/4:300

  BootRequest to UDP port 67
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 0.0.0.0
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Discover
--snip--
"
34 2009/12/15 13:02:34.38 UTC MINOR: DEBUG #2001 Base SVCMMGR
"SVCMMGR: TX DHCP Packet
  flooding in VPLS 300

  BootRequest to UDP port 67
```

Basic ESM Configuration on BSA

```
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Discover
--snip--
"
35 2009/12/15 13:02:34.40 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMMGR: RX DHCP Packet
  VPLS 300, spoke-sdp 12:300

BootReply to UDP port 68
ciaddr: 0.0.0.0          yiaddr: 10.0.3.1
siaddr: 192.0.2.4        giaddr: 0.0.0.0
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Offer
--snip--
"
36 2009/12/15 13:02:34.40 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMMGR: TX DHCP Packet
  VPLS 300, SAP 1/1/4:300

BootReply to UDP port 68
ciaddr: 0.0.0.0          yiaddr: 10.0.3.1
siaddr: 192.0.2.4        giaddr: 0.0.0.0
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Offer
--snip--
"
37 2009/12/15 13:02:34.52 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMMGR: RX DHCP Packet
  VPLS 300, SAP 1/1/4:300

BootRequest to UDP port 67
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Request
--snip--
"
38 2009/12/15 13:02:34.52 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMMGR: TX DHCP Packet
  flooding in VPLS 300

BootRequest to UDP port 67
ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
siaddr: 0.0.0.0          giaddr: 0.0.0.0
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Request
--snip--
```

```

"
39 2009/12/15 13:02:34.53 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: RX DHCP Packet
  VPLS 300, spoke-sdp 12:300

  BootReply to UDP port 68
  ciaddr: 0.0.0.0          yiaddr: 10.0.3.1
  siaddr: 192.0.2.4       giaddr: 0.0.0.0
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Ack
--snip--
"
40 2009/12/15 13:02:34.53 UTC MINOR: DEBUG #2001 Base SVCMGR
"SVCMGR: TX DHCP Packet
  VPLS 300, SAP 1/1/4:300

  BootReply to UDP port 68
  ciaddr: 0.0.0.0          yiaddr: 10.0.3.1
  siaddr: 192.0.2.4       giaddr: 0.0.0.0
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Ack
--snip--

```

DHCP relay is enabled in service IES-300 on the BSR.

```

A:BSR# debug router ip dhcp mode egr-ingr-and-dropped
*A:BSR#
29 2009/12/15 13:02:34.39 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 7 (int-VoD),
  received DHCP Boot Request on Interface int-VoD (1/1/2) Port 67

  H/W Type: Ethernet(10Mb)  H/W Address Length: 6
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 0.0.0.0
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Discover
--snip--
30 2009/12/15 13:02:34.39 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
  transmitted DHCP Boot Request to 192.0.2.4 Port 67

  H/W Type: Ethernet(10Mb)  H/W Address Length: 6
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 10.0.3.254
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Discover
--snip--
"

```

Basic ESM Configuration on BSA

```
31 2009/12/15 13:02:34.39 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
  received DHCP Boot Reply on 192.0.2.4 Port 67

  H/W Type: Ethernet(10Mb) H/W Address Length: 6
  ciaddr: 0.0.0.0          yiaddr: 10.0.3.1
  siaddr: 192.0.2.4       giaddr: 10.0.3.254
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Offer
--snip--
"
32 2009/12/15 13:02:34.39 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 7 (int-VoD),
  transmitted DHCP Boot Reply to Interface int-VoD (spoke-21:300) Port 68

  H/W Type: Ethernet(10Mb) H/W Address Length: 6
  ciaddr: 0.0.0.0          yiaddr: 10.0.3.1
  siaddr: 192.0.2.4       giaddr: 0.0.0.0
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Offer
--snip--
"
33 2009/12/15 13:02:34.53 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 7 (int-VoD),
  received DHCP Boot Request on Interface int-VoD (1/1/2) Port 67

  H/W Type: Ethernet(10Mb) H/W Address Length: 6
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 0.0.0.0
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Request
--snip--
"
34 2009/12/15 13:02:34.53 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
  transmitted DHCP Boot Request to 192.0.2.4 Port 67

  H/W Type: Ethernet(10Mb) H/W Address Length: 6
  ciaddr: 0.0.0.0          yiaddr: 0.0.0.0
  siaddr: 0.0.0.0          giaddr: 10.0.3.254
  chaddr: ca:02:02:d0:00:08  xid: 0x2a6

  DHCP options:
  [53] Message type: Request
--snip--
"
35 2009/12/15 13:02:34.53 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base),
```

```

received DHCP Boot Reply on 192.0.2.4 Port 67

H/W Type: Ethernet(10Mb)  H/W Address Length: 6
ciaddr: 0.0.0.0           yiaddr: 10.0.3.1
siaddr: 192.0.2.4        giaddr: 10.0.3.254
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Ack
--snip--
36 2009/12/15 13:02:34.53 UTC MINOR: DEBUG #2001 Base PIP
"PIP: DHCP
instance 1 (Base), interface index 7 (int-VoD),
transmitted DHCP Boot Reply to Interface int-VoD (spoke-21:300) Port 68

H/W Type: Ethernet(10Mb)  H/W Address Length: 6
ciaddr: 0.0.0.0           yiaddr: 10.0.3.1
siaddr: 192.0.2.4        giaddr: 0.0.0.0
chaddr: ca:02:02:d0:00:08  xid: 0x2a6

DHCP options:
[53] Message type: Ack
--snip--"

```

The number of snooped/forwarded/dropped/proxied DHCP packets can be verified with the using **show service id 300 dhcp statistics** command.

```

A:BSA# show service id 300 dhcp statistics
=====
DHCP Statistics, service 300
=====
Client Packets Snooped           : 2
Client Packets Forwarded        : 2
Client Packets Dropped           : 0
Client Packets Proxied (RADIUS)  : 0
Client Packets Proxied (Lease-Split) : 0
Server Packets Snooped           : 2
Server Packets Forwarded        : 2
Server Packets Dropped           : 0
DHCP RELEASEs Spoofed           : 0
DHCP FORCERENEWs Spoofed        : 0
=====
A:BSA#

```

The connectivity of Host-3 can be verified with the **show service id 300 subscriber-hosts** command. Different options can be used to filter output of a command.

```

A:BSA# show service id 300 subscriber-hosts detail
=====
Subscriber Host table
=====
Sap          IP Address      MAC Address      PPPoE-SID Origin
Subscriber
-----

```

Basic ESM Configuration on BSA

```
1/1/4:300          10.0.3.1          ca:02:02:d0:00:08 N/A      DHCP
  sub-id-1
-----
Sub Profile       : sub-profile-1
SLA Profile       : sla-profile-3
App Profile       : N/A
-----
Number of subscriber hosts : 1
=====
A:BSA#
```

The DHCP lease state could be checked with the **show service id 300 dhcp lease-state** command. Different options can be used to filter output of a command.

```
A:BSA# show service id 300 dhcp lease-state detail
=====
DHCP lease states for service 300
=====
Service ID       : 300
IP Address       : 10.0.3.1
Client HW Address : ca:02:02:d0:00:08
SAP              : 1/1/4:300
Remaining Lifetime : 09d23h52m
Persistence Key  : N/A
Sub-Ident        : "sub-id-1"
Sub-Profile-String : "sub-profile-1"
SLA-Profile-String : "sla-profile-3"
--snip--
Sub-Ident origin : DHCP
Strings origin   : DHCP
Lease Info origin : DHCP
--snip--
Radius User-Name : ""
-----
Number of lease states : 1
=====
A:BSA#
```

Advanced Topics

Limiting Number of Subscribers

This topic is discussed in DHCP hosts. Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information.

```
vpls 100 customer 1 create
--snip--
sap 1/1/4:100 split-horizon-group "RSHG-1" create
--snip--
sub-sla-mgmt
--snip--
multi-sub-sap 2
```

Limiting Number of Lease States

This topic is discussed in DHCP hosts. Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information.

```
vpls 100 customer 1 create
--snip--
sap 1/1/4:100 split-horizon-group "RSHG-1" create
dhcp
lease-populate 400
```

Limiting Number of Host Per SLA-Profile

This topic is discussed in DHCP hosts. Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information.

```
subscriber-mgmt
sla-profile "sla-profile-1" create
host-limit 1 [remove-oldest]
```

Subscriber Host Connectivity Verification

This topic is discussed in DHCP hosts. Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information.

```
vpls 100 customer 1 create
  sap 1/1/4:100 split-horizon-group "RSHG-1" create
    host-connectivity-verify source-ip 10.1.0.253 source-mac 1e:54:ff:00:00:00
interval 1 action remove
```

```
A:BSA# show service id 100 host-connectivity-verify statistics
=====
Host connectivity check statistics
=====
Svc   SapId/      DestIp      Timestamp           Time since Oper
Id    SdpId      Address     last-reply/conn-lost Reply/Lost  State
-----
100   1/1/4:100  10.0.1.1    12/15/2009 09:04:06  0d 00:00:11 Up
-----
1 host-connectivity states : 1 Up / 0 Down / 0 Retry pending
=====
A:BSA#
```

Lease Split

This topic is discussed in DHCP hosts. Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information.

```
vpls 100 customer 1 create
  --snip--
  sap 1/1/4:100 split-horizon-group "RSHG-1" create
    dhcp
      proxy-server
        lease-time hrs 1
```

DHCP Option 82

This topic is discussed in DHCP hosts. Refer to [IPv4 DHCP Hosts on page 2031](#) for detailed information.

Conclusion

This note provides configuration and troubleshooting commands for Bridged CO model.

Conclusion