

TECHNICAL WHITEPAPER

CONFIGURING DHCP SERVER AND DHCP RELAY IN ARUBAOS-SWITCH

ARUBAOS-SWITCH CONFIGURATION GUIDE

INTRODUCTION

There are two parts to this document. In the first part, we will discuss and configure Dynamic Host Configuration Protocol (DHCP) Server in ArubaOS-Switch, and in the second part, we will discuss and configure DHCP Relay in ArubaOS-Switch.

DHCP SERVER OVERVIEW

The DHCP is a network protocol that enables a server to automate assignment of IP addresses to hosts. A DHCP Server can be configured to provide other network information like IP addresses of TFTP servers, DNS server, boot file name and vendor specific options. Commonly, there are two types of address assignments, dynamic and manual. The lease of dynamic addresses is renewed periodically; manual leases are permanently assigned to hosts. With this feature, you can configure multiple pools of IP addresses for IP address assignment and tracking. The DHCP server also functions as BootP server. A manual binding configured in a static IP Pool may either service a BootP client request or a DHCP client request.

DHCP SERVER IP POOLS

A DHCP server is configured with IP pools in ArubaOS-Switch. The Server is then instructed to use IP addresses falling into the specified range of IP while offering leases. Multiple IP pools are configured to not have duplicate or overlapping IP subnets. You can also configure a DHCP Server with multiple IP ranges within an IP subnet; this confines the allocable IP addresses within the configured IP pool. An IP pool will be claimed valid only if it is either:

- Dynamic pool – Has a network address, subnet mask and IP range(s).
- Static pool – Should have a static IP-to-MAC binding.

The DHCP server will discard the invalid and incomplete pools and will only operate on the valid IP pools. The DHCP server will require at least one valid pool to start. The table 1 snippet shows the typical DHCP pool configuration in ArubaOS-Switch.

```
dhcp-server pool "Test-1"  
  default-router "10.15.0.2"  
  network 10.15.0.0 255.255.252.0  
  range 10.15.0.1 10.15.0.254  
  range 10.15.1.1 10.15.1.254  
  range 10.15.2.1 10.15.2.254  
  range 10.15.3.1 10.15.3.254  
  exit
```

Table 1. DHCP pool configuration in ArubaOS-Switch

The following are the limits to DHCP Server configuration in ArubaOS-Switch.

- Maximum supported VLAN interfaces are as many as maximum IP VLANs that are allowed on a given platform/hardware.
- Maximum 8,192 IP leases are allowed. This is a system wide limit.
- Maximum 128 IP pools can be configured inclusive of pools with static bindings. This is a system wide limit.
- Maximum 64 ranges are allowed to be configured per pool.

DHCP OPTIONS

On a DHCP server, an IP pool is configured with various options. These options signify additional information about the network. Options are supported with explicit commands such as boot-file. Option codes that correspond to explicit commands cannot be configured with a generic option command; the generic option command requires an option code and TLV.

NOTE: RFC 2132 defines various network information that a client may request when trying to get the lease. Following DHCP options are not supported in ArubaOS-Switch at the moment: 1,3,6,12,15,44,46,50,52,54,55,57,58,59,61,66,67,82.

You can use the following available CLIs for respective DHCP option codes, as shown in table 2 below.

DHCP Option Code	CLI Syntax
1	[no] network <ip-addr/mask-length>
3	[no] default-router <IP-ADDR-STR> [IP-ADDR2 ... IP-ADDR8]
6	[no] dns-server <IP-ADDR> [IP-ADDR2 ... IP-ADDR8]
15	[no] domain-name <name>
44	[no] netbios-name-server <IP-ADDR-STR> [IP-ADDR2 ... IP-ADDR8]
43	[no] option 43 {ascii <ascii-string> hex <hex-string> ip <IPADDR-STR>[IP-ADDR2 ... IP-ADDR8]}
46	[no] netbios-node-type <broadcast hybrid mixed peer-to-peer>
60	[no] option 60 {ascii <ascii-string> hex <hex-string> ip <IPADDR-STR>[IP-ADDR2 ... IP-ADDR8]}
66	[no] tftp-server server-name <ASCII-STR>
67	[no] bootfile-name<filename>
138	[no] option 138 {ascii <ascii-string> hex <hex-string> ip <IPADDR-STR>[IP-ADDR2 ... IP-ADDR8]}
150	[no] tftp-server server-ip <ip-address> or [no] option 150 <IPADDR-STR> [IP-ADDR2 ... IP-ADDR8]

Table 2. DHCP option codes

The DHCP server raw Option 43 is supported and it is used for AirWave ZTP. DHCP server raw Option 60 is supported on ArubaOS-Switch starting version 16.06. DHCP server raw Option 138 is supported, and it is used for IPsec tunnel configuration in DHCP client. The following table 3 snippet shows the typical DHCP option configuration in ArubaOS-Switch.

```
dhcp-server pool "Test-2"
  default-router "10.10.1.1"
  network 10.10.1.0 255.255.255.0
  option 43 ascii "groups:switches,10.80.2.201,secret1"
  option 60 ascii "ArubaInstantAP"
  range 10.10.1.10 10.10.1.100
exit
```

Table 3. Typical DHCP option configuration

The table 3 configuration is executed on ArubaOS-Switch. The table 3 configurations executed when the DHCP Server is enabled on ArubaOS-Switch. Next, we will discuss DHCP Relay configuration in ArubaOS-Switch. The DHCP is used for configuring hosts with IP address and other configuration parameters without user intervention. The protocol is composed of three components:

- DHCP client
- DHCP server
- DHCP relay agent

The DHCP client sends broadcast request packets to the network; the DHCP servers respond with broadcast packets that offer IP parameters, such as an IP address for the client. After the client chooses the IP parameters, communication between the client and server is by unicast packets.

DHCP RELAY OVERVIEW

ArubaOS-Switches provide the DHCP relay agent to enable communication from a DHCP server to DHCP clients on subnets other than the one the server resides on. The DHCP relay agent transfers DHCP messages from DHCP clients located on a subnet without a DHCP server to other subnets. It also relays answers from DHCP servers to DHCP clients.

The DHCP relay agent is transparent to both the client and the server. Neither side is aware of the communications that pass through the DHCP relay agent. As DHCP clients broadcast requests, the DHCP relay agent receives the packets and forwards them to the DHCP server. During this process, the DHCP relay agent increases the hop count by one before forwarding the DHCP message to the server. A DHCP server includes the hop count from the DHCP request that it receives in the response that it returns to the client.

The DHCP relay agent on the routing switch forwards DHCP client packets to all DHCP servers that are configured in the table administrated for each VLAN.

Unicast forwarding

The packets are forwarded using unicast forwarding if the IP address of the DHCP server is a specific host address. The DHCP relay agent sets the destination IP address of the packet to the IP address of the DHCP server and forwards the message.

Broadcast forwarding

The packets are forwarded using broadcast forwarding if the IP address of the DHCP server is a subnet address or IP broadcast address (255.255.255.255.) The DHCP relay agent sets the DHCP server IP address to broadcast IP address and is forwarded to all VLANs with configured IP interfaces (except the source VLAN).

Prerequisites for DHCP relay operation

For the DHCP relay agent to work on the switch, you must complete the following steps:

1. Enable DHCP relay on the routing switch (the default setting.)
2. Ensure that a DHCP server is servicing the routing switch.
3. Enable IP routing on the routing switch.
4. Ensure that there is a route from the DHCP server to the routing switch and back.
5. Configure one or more IP helper addresses for specified VLANs to forward DHCP requests to DHCP servers on other subnets.

The following topology represents a typical DHCP Relay implementation in ArubaOS-Switch.

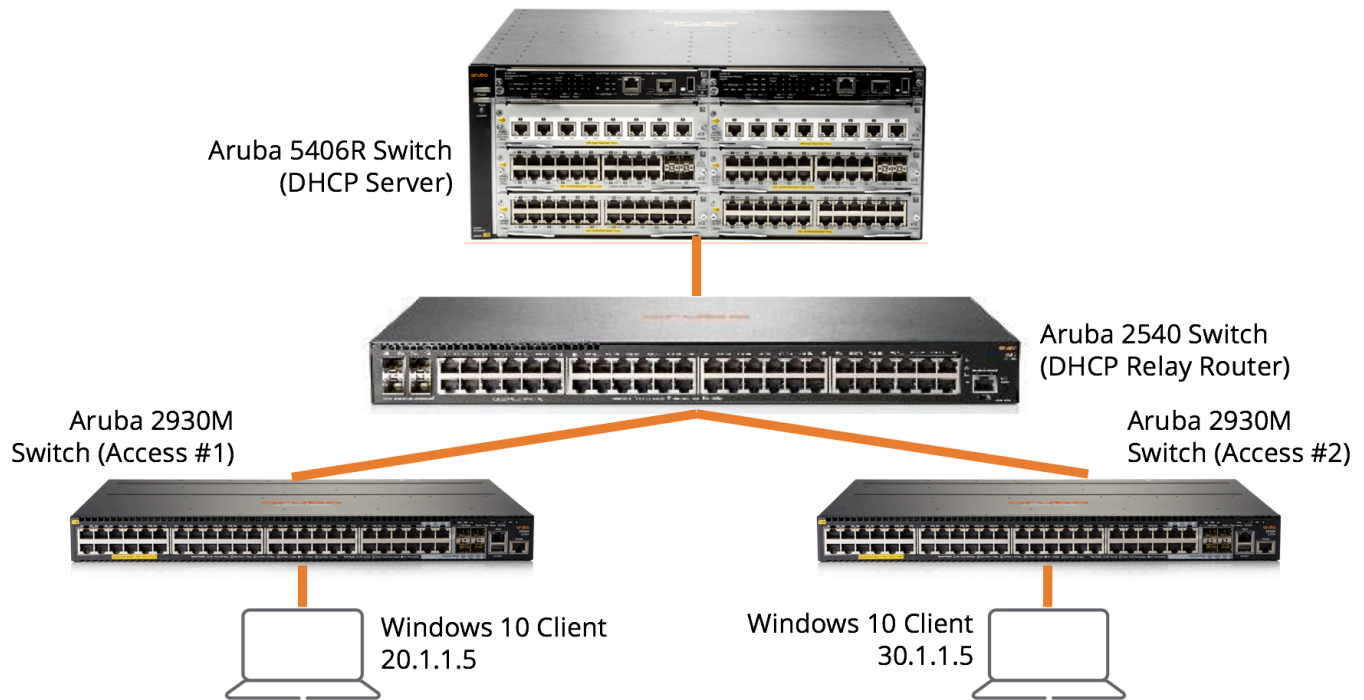


Figure 1. DHCP Relay topology

In the topology above, the Windows 10 laptops below obtain DHCP addresses from the Aruba 5406R Switch acting as DHCP Server and DHCP Relay Switch. With DHCP Relay implementation, the Windows 10 client on the 20.1.1.0/24 subnet can ping the Windows 10 Client on the 30.1.1.0/24 subnet. The following section provides details configuration of each switch in the topology above.

CONFIGURATION

The following configuration is for the DHCP Server Switch.

```
HP-Switch-5406Rz12(config)# show ru
```

Running configuration:

```
; J9850A Configuration Editor; Created on release #KB.16.06.0006
; Ver #13:4f.f8.1c.fb.7f.bf.bb.ff.7c.59.fc.7b.ff.ff.fc.ff.ff.3f.ef:49
hostname "HP-Switch-5406Rz12"
module A type j9987a
module B type j9993a
include-credentials
password manager user-name "admin" sha1 "d033e22ae348aeb5660fc2140aec35850c4da997"
timesync ntp
ntp unicast
```

```
ntp server 10.80.2.219 iburst
ntp enable
time daylight-time-rule continental-us-and-canada
time timezone -480
ip default-gateway 10.5.9.1
ip route 20.1.1.0 255.255.255.0 70.70.70.6
ip route 30.1.1.0 255.255.255.0 70.70.70.6
snmp-server community "public" unrestricted
snmpv3 engineid "00:00:00:0b:00:00:3c:a8:2a:36:e4:00"
oobm
    no ip address
    exit
vlan 1
    name "DEFAULT_VLAN"
    no untagged A24
    untagged A1-A23,B1-B8
    ip address 10.5.9.13 255.255.255.0
    exit
vlan 700
    name "VLAN700"
    untagged A24
    ip address 70.70.70.5 255.255.255.0
    dhcp-server
    exit
dhcp-server pool "Test-7"
    default-router "20.1.1.1"
    network 20.1.1.0 255.255.255.0
    range 20.1.1.5 20.1.1.254
    exit
dhcp-server pool "Test-8"
    default-router "30.1.1.1"
    network 30.1.1.0 255.255.255.0
    range 30.1.1.5 30.1.1.254
    exit
dhcp-server conflict-logging
dhcp-server enable
```

The following configuration is for the DHCP Relay Router Switch.

Aruba-2540-48G-PoEP-4SFPP(config)# show ru

Running configuration:

```
; JL357A Configuration Editor; Created on release #YC.16.06.0006
; Ver #13:44.38.04.99.03.b3.b8.ef.74.61.fc.68.f3.8c.fc.e3.ff.37.2f:13
```

```
hostname "Aruba-2540-48G-PoEP-4SFPP"
module 1 type jl357a
ip routing
snmp-server community "public" unrestricted
vlan 1
    name "DEFAULT_VLAN"
    no untagged 14-16
    untagged 1-13,17-52
    ip address 10.5.9.8 255.255.255.0
```

```
exit
vlan 200
  name "DHCP-RELAY-EDGE-1"
  untagged 15
  ip address 20.1.1.1 255.255.255.0
  ip helper-address 70.70.70.5
exit
vlan 300
  name "DHCP-RELAY-EDGE-2"
  untagged 16
  ip address 30.1.1.1 255.255.255.0
  ip helper-address 70.70.70.5
exit
vlan 700
  name "VLAN700"
  untagged 14
  ip address 70.70.70.6 255.255.255.0
exit
password manager
```

The following configuration is for the Access Switch #1.

```
Aruba-2930M-24G-PoEP(config)# show ru
```

Running configuration:

```
; JL320A Configuration Editor; Created on release #WC.16.06.0000x
; Ver #13:4f.f8.1c.9b.3f.bf.bb.ef.7c.59.fc.6b.fb.9f.fc.ff.ff.37.ef:05
```

```
hostname "Aruba-2930M-24G-PoEP"
module 1 type jl320a
flexible-module A type JL081A
telnet-server listen data
web-management listen data
ip ssh listen data
ip route 20.1.1.0 255.255.255.0 30.1.1.1
ip route 30.1.1.0 255.255.255.0 20.1.1.1
ip route 70.70.70.0 255.255.255.0 20.1.1.1
interface 11
  disable
  exit
snmp-server community "public" unrestricted
snmp-server listen data
oobm
  disable
  no ip address
  exit
vlan 1
  name "DEFAULT_VLAN"
  no untagged 15,17
  untagged 1-14,16,18-24,A1-A4
  ip address 10.5.9.5 255.255.255.0
  exit
vlan 200
  name "VLAN200"
```

```
untagged 15,17
ip address 20.1.1.2 255.255.255.0
ip helper-address 70.70.70.5
exit
tftp server listen data
```

The following configuration is for the Access Switch #2.

Aruba-2930M-40G-8SR-PoEP(config)# show ru

Running configuration:

```
; JL323A Configuration Editor; Created on release #WC.16.06.0000x
; Ver #13;4f.f8.1c.9b.3f.bf.bb.ef.7c.59.fc.6b.fb.9f.fc.ff.37.ef:05
```

```
hostname "Aruba-2930M-40G-8SR-PoEP"
module 1 type jl323a
telnet-server listen data
web-management listen data
ip ssh listen data
ip route 20.1.1.0 255.255.255.0 30.1.1.1
ip route 30.1.1.0 255.255.255.0 20.1.1.1
ip route 70.70.70.0 255.255.255.0 30.1.1.1
interface 12
  disable
  exit
snmp-server community "public" unrestricted
snmp-server listen data
oobm
  disable
  no ip address
  exit
vlan 1
  name "DEFAULT_VLAN"
  no untagged 16-17
  untagged 1-15,18-48
  ip address 10.5.9.6 255.255.255.0
  exit
vlan 300
  name "VLAN300"
  untagged 16-17
  ip address 30.1.1.2 255.255.255.0
  ip helper-address 70.70.70.5
  exit
tftp server listen data
```

FOR MORE INFORMATION

Please, refer to the following link for more information about DHCP Relay options.

http://h22208.www2.hp.com/eginfolib/networking/docs/switches/RA/15-18/5998-8165_ra_2620_mrg/content/ch03s09.html