Manuals+ — User Manuals Simplified.

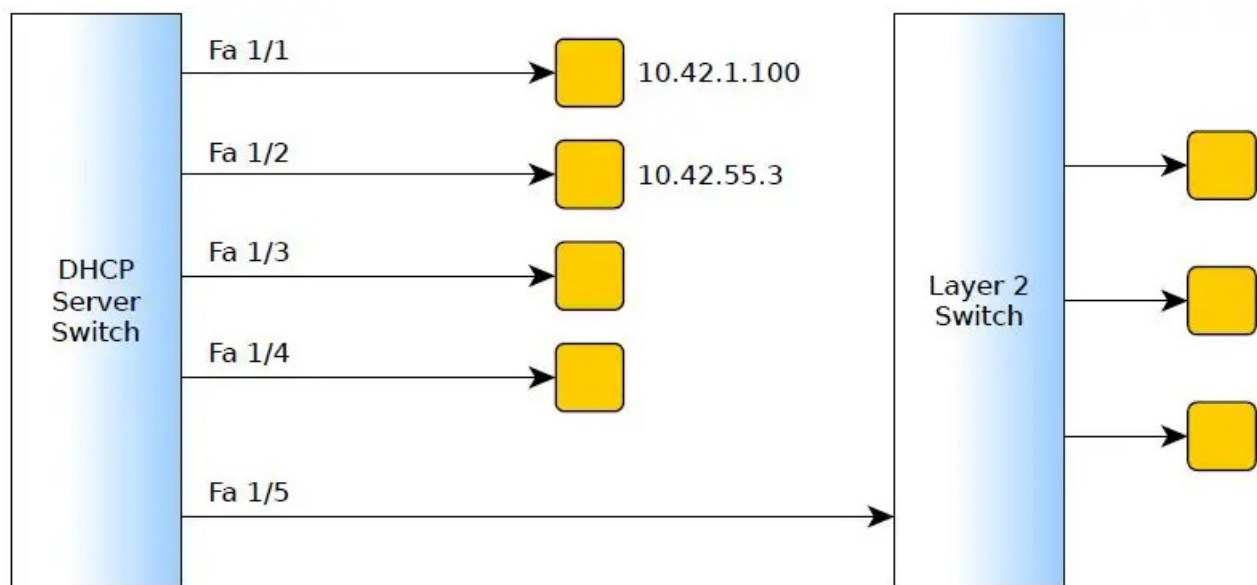# Microsemi AN1196 DHCP Pool Per Interface Addresses Configuration Software User Guide

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Microsemi AN1196 DHCP Pool Per Interface Addresses Configuration Software

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Introduction

This document briefly describes CLI-based usage of DHCP pool per-interface addresses, also known as reserved addresses.

Feature Description

This feature aims to provide an ability to configure a DHCP pool such that there is a 1:1 mapping between an

Ethernet port interface and the IP address offered on exactly that port interface.

A primary use-case is when a switch device has only one directly attach client per port, for some subset of ports. In that case it can be convenient to lock the IP address of the device attached to each port, as this simplifies client device replacement in a production environment: Assume, say, a sensor of some kind is attached to interface Fa 1/4 , and the sensor malfunctions. The service technician will simply disconnect the failing device, replace it and connect the new device—which will then via DHCP receive exactly the same IP configuration as the failed device. It is then, of course, up to a network management system to perform additional configuration of the new device if it needs it, but at least the network management system doesn't have to somehow search the network for the replacement device IP.

info

Except where explicitly noted, all mentions of an interface are in relation to a specific pool. It is valid for the same physical interface to be included in multiple pools that service different VLAN interfaces. Configuration consistency in that case is the responsibility of the system administrator.

Example

- Assume VLAN interface 42 with IP 10.42.0.1/16

- Assume ports Fa 1/1-4 are members of VLAN 42

- Assume we create a DHCP pool for that network, 10.42.0.0/16

- Then we want to be able to say:
    - A DHCP DISCOVER/REQUEST arriving on ` Fa 1/1` shall receive IP 10.42.1.100/16
    - And on Fa 1/2 it shall receive 10.42.55.3/16

But then what about Fa 1/3 and Fa 1/4 ? It depends on whether the pool is configured to only hand out reserved addresses or not. If it is, only the two addresses for Fa 1/1 and Fa 1/2 are available—and Fa 1/3 and Fa 1/4 won't service DHCP clients.

On the other hand, if the pool isn't locked to reserved addresses, then Fa 1/3 and Fa 1/4 will hand out non-reserved addresses from the remaining free addresses of the configured pool network, 10.42.0.0/16. The set of remaining address is:

- The IP network (10.42.0.0/16), minus:
    - The VLAN interface address, e.g. 10.42.0.1
    - The set of per-interface addresses, 10.42.1.100 and 10.42.55.3

      Any excluded address ranges
    - (And any already active DHCP client addresses)

The relevant parts of the configuration would look similar to this:

```
# show running-config
! Globally enable the DHCP server function
ip dhcp server
! Create the VLAN and VLAN interface that will be serving DHCP
vlan 42
interface vlan 42
ip address 10.42.0.1 255.255.0.0
ip dhcp server
! (Port VLAN membership setup omitted)
! Create the pool
ip dhcp pool my_pool
network 10.42.0.0 255.255.0.0
broadcast 10.42.255.255
```

lease 1 0 0
! Specify per-interface addresses for Fa 1/1 and Fa 1/2:
address 10.42.1.100 interface FastEthernet 1/1
address 10.42.55.3 interface FastEthernet 1/2
! Only hand out per-interface addresses:
! reserved-only
! Or hand out both per-interface addresses and normal dynamic addresses
! no reserved-only

Reserved-Only vs. Not Reserved-Only

The above configuration can be illustrated as follows. The DHCP Server Switch has numerous interfaces with clients attached. One of those clients is a simple layer 2 ethernet switch with three attached clients. The two first interfaces on the DHCP Server Switch hand out the per-interface addresses, and the remaining interfaces hand out available addresses from the pool.

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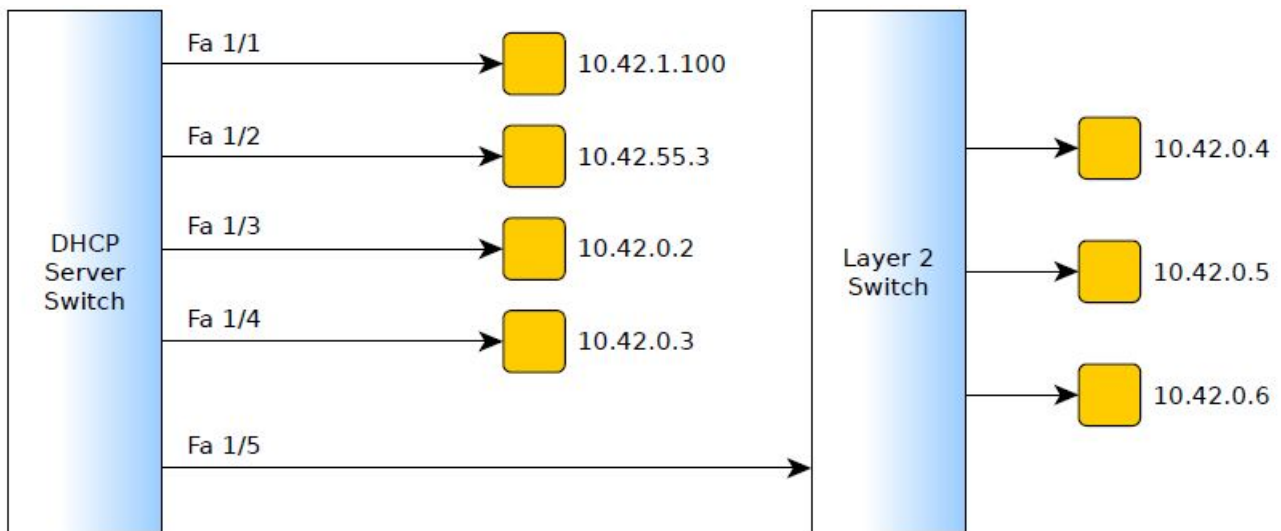The Layer 2 Switch is assumed to have a static IP.

Figure 1. Pool With Per-Interface Addresses, Not Reserved-Only

If, however, the pool is placed in reserved-only mode, only the two clients attached to Fa 1/1 and Fa 1/2 will be offered addresses:
Switch# configure terminal
Switch(config)# ip dhcp pool my_pool
Switch(config-dhcp-pool)# reserved-only
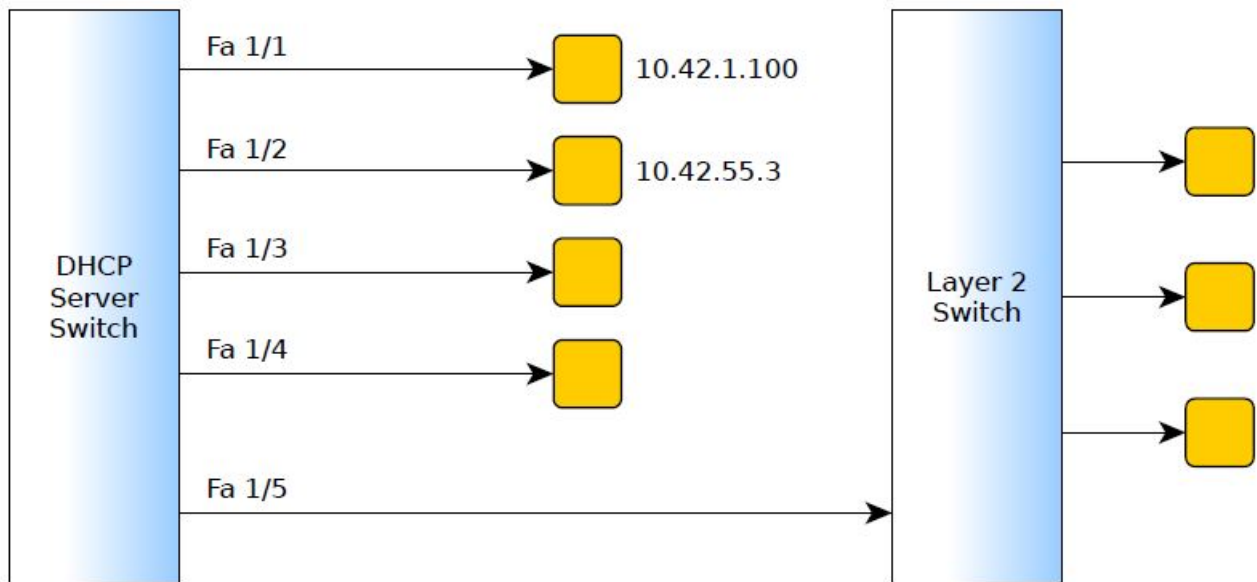Switch(config-dhcp-pool)# end

Figure 2. Pool With Per-Interface Addresses, Reserved-Only

This would also apply if the layer 2 switch was attached to e.g. Fa 1/1: Only one of its clients would be offered the per-interface address:
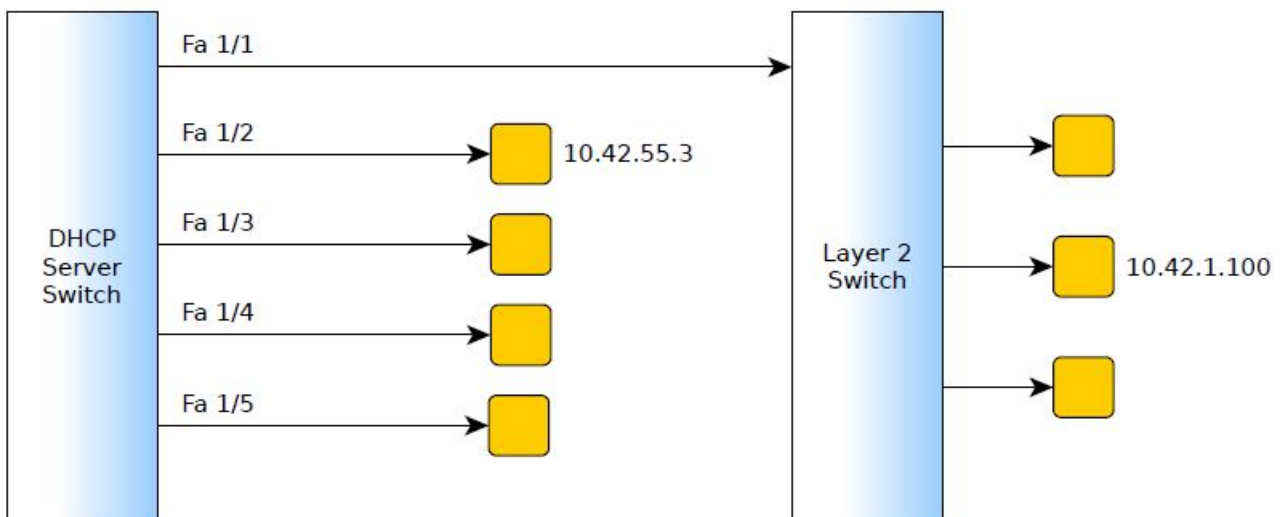

Figure 3. Pool With Per-Interface Addresses, Switch on Per-Interface Port

If the pool isn't reserved-only, the same situation applies to the L2 Switch clients: Only one of them will be offered an address, whereas the clients directly connected to the DHCP Server Switch on interfaces without a per-interface address will all be offered addresses from the pool.
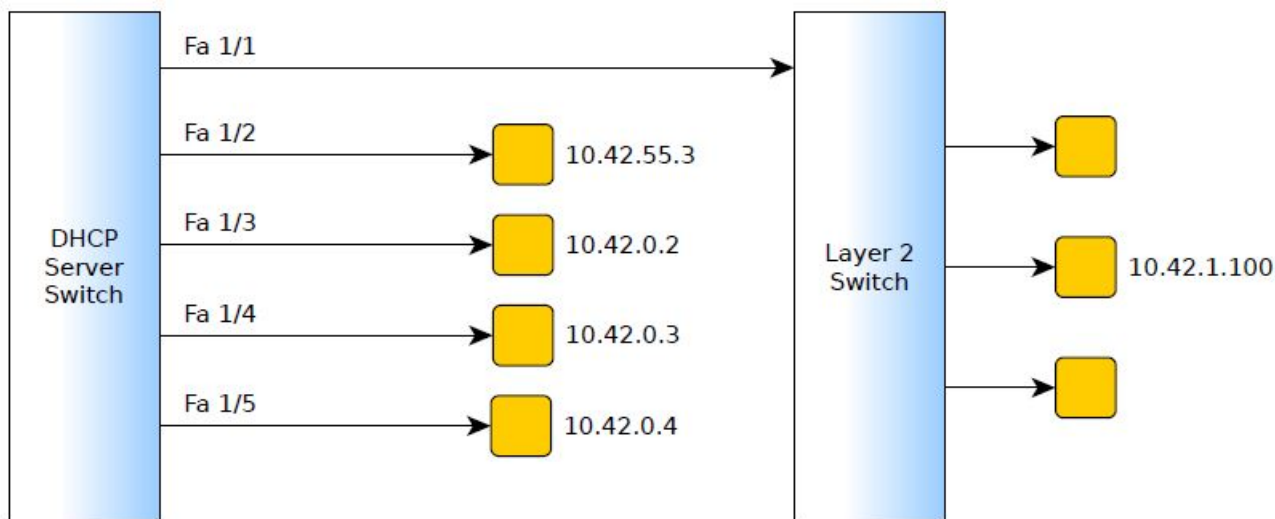
Figure 4. Pool With Per-Interface Addresses, Not Reserved-Only

In this case the three clients attached to the Layer 2 switch will compete for the sole available address offered by Fa 1/1 on the DHCP Server Switch. It is generally non-deterministic which device "wins", so this configuration should be avoided.

Configuration

Per-interface addresses are available for DHCP pools of type 'network' only. They do not make sense for host pools, as those only have one address to offer anyway.
The following four configuration commands are available in the DHCP pool configuration sub-mode:

Table 1. Per-Interface Address Configuration Commands

Command	Description
address <ipv4_address> interface <interface_name>	Create/modify a per-interface address entry.
no address <ipv4_address>	Delete a per-interface address entry.
reserved-only	Only offer per-interface addresses.
no reserved-only	Offer both per-interface addresses and normal dynamic addresses from the pool.

The following rules apply:

- An interface can have only one per-interface address
- All per-interface addresses must be unique
- An interface with a per-interface address will only offer that one address to clients
- A per-interface address must belong to the pool network

The above rules are per pool. A particular physical port can be member of different VLANs and different pools, and offer different per-interface addresses in each pool.
Changing per-interface address configuration for an existing pool may invalidate existing bindings.

The rules governing binding expiry are:

- reserved-only ⇒ no reserved-only : Keep bindings, the pool of available addresses simply grows
- no reserved-only ⇒ reserved-only : Clear all bindings
- Add or Change per-interface address: Clear all bindings; it could be an already-inuse IP, or an interface with other, active, bindings
- Delete per-interface address: Clear binding for that address only
- Link-down on an interface with a per-interface address: Clear the binding. This ensures that the directly connected client device replacement scenario works: When the failed device is removed, link-down ensues. When the replacement device powers up and link-up ensues, this device will obtain the per-interface address.

Adding a reserved entry on an interface that has multiple existing clients implies that the existing clients won't be able to renew their bindings; they must compete for the single available address on the interface. This will ultimately leave all but one client without DHCPserved IP.

Monitoring

Per-interface addresses introduce no new monitoring commands, but merely extends the output from certain DHCP pool monitoring commands.

Table 2. Per-Interface Address Monitoring Commands

Command	Description
show ip dhcp pool [<pool_name>]	Display per-pool information. All pools are listed if the pool_name is omitted.
show ip dhcp server binding […]	Display binding information. Several filters are available, for filtering on state and/or type.

Examples:

Switch# show ip dhcp pool
Pool Name: my_pool
————————————————————-
Type is network
IP is 10.42.0.0
Subnet mask is 255.255.0.0
Subnet broadcast address is 10.42.255.255
Lease time is 1 days 0 hours 0 minutes
Default router is –
Domain name is –
DNS server is –
NTP server is –
Netbios name server is –
Netbios node type is –
Netbios scope identifier is –
NIS domain name is –
NIS server is –
Vendor class information is –
Client identifer is –
Hardware address is –

Client name is –
Is restricted to reserved addresses:
10.42.1.100 on interface FastEthernet 1/1
10.42.55.3 on interface FastEthernet 1/2

- As can be seen, the per-interface addresses are listed at the end of the output.

Switch# show ip dhcp server binding
IP: 10.42.1.100
————————————————————-
State is committed
Binding type is automatic
Pool name is my_pool
Server ID is 10.42.0.1
VLAN ID is 42
Subnet mask is 255.255.0.0
Client identifier is type of MAC address that is ..:..:..:..:..:..
Hardware address is ..:..:..:..:..:..
Lease time is 1 days 0 hours 0 minutes 0 seconds
Expiration is 12 hours 39 minutes 8 seconds

- The above output shows that the IP is currently committed to a client.

APPLICATION NOTE
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Documents / Resources

Microsemi **AN1196** Software Configuration Guide - DHCP Pool Per-Interface Addresses Application Note	**Microsemi AN1196 DHCP Pool Per Interface Addresses Configuration Software** [pdf] User Guide AN1196, AN1196 DHCP Pool Per Interface Addresses Configuration Software, DHCP Pool Per Interface Addresses Configuration Software, Pool Per Interface Addresses Configuration Software, Addresses Configuration Software, Configuration Software, Software

References

- **Microsemi | Semiconductor & System Solutions | Power Matters**