## Tips to Keep the ARP Table Available for DHCP IP Addressing

### Objective

This article explains how to set the Address Resolution Protocol (ARP) table of a switch to frequently clear the expired Media Access Control (MAC) addresses from the ARP table. In addition, this article illustrates how to clear the ARP table manually. These options are solutions to bug <u>CSCvn36700</u>.

### Introduction

ARP performs a required function in IP routing. ARP finds the MAC address, also known as the hardware address, of a host from its known IP address. ARP maintains a cache (table) in which MAC addresses are mapped to IP addresses. ARP is part of all Cisco devices that run IP.

Some Cisco Small Business switches can run at layer 3 and are able to implement Dynamic Host Configuration Protocol (DHCP) server support. DHCP is commonly used to automatically assign IP addresses to devices. When a switch is configured as a DHCP server with appropriate DHCP pools, no intervention is typically needed to allocate IP addresses to clients.

When an IP address is assigned, it is also given a DHCP lease time. If the lease is renewed before expiration, the same IP address is usually kept on the device, and it is given a new lease time. This typically happens when a device is consistently connected to a network.

If a device is shut down, moved between networks, or there has been a restart of the network, that IP address reservation can expire. These expired addresses are typically retained for a while, matched with the MAC address it was assigned. This is kept within the DHCP server database as a holding place so that if a client joins the network again, it can be assigned the same IP address it had before. This can be convenient, but if there are a lot of devices joining and leaving a network, the expired list can get long very quickly.

Every time a new device connects, it needs to be assigned an IP address. If you run a network where there are a lot of expired IP addresses that haven't been cleared quickly enough, the DHCP pool can run out of IP addresses and not have any to give out to new clients. There are a few options for avoiding this potential issue.

Option 1: Configure the Switch to Clear the ARP Table More Often

Option 2: Manually Clear the ARP List

Read on to first verify your settings within the Graphical User Interface (GUI) of the switch.

## **Applicable Devices**

SF200

SG200

SF300

SG300

SG350X

SG500X

SG500XG

SG550

SG550X

SG550XG

#### **Software Version**

Applicable to all versions

#### Verify Settings on the GUI

Step 1. Log in to the Cisco switch by entering the **Username** and **Password**. Click **Log In**. By default the username and password are *cisco*, but since you are working on an existing network, you should have your own username and password. Enter those credentials instead.



Step 2. Navigate to **IP Configuration > DHCP Server > Properties** and verify the *DHCP Server Status* is **Enabled**.



Step 3. Navigate to **IP Configuration > DHCP Server > Network Pools**. Under *Network Pool Table*, verify the details including the *Number of Leased Addresses*.

cisco SG300-28 2	28-Po	ort Gigab	it Manage	d Switch			cisco Language:
Spanning Tree     MAC Address Tables	Netv	work Pools					
Multicast	Netw	vork Pool Table	)	Address Deel Otert	Address Deal Fed	Long Duration	
IDv/ Management and Inter		Pool Name	Network Mask	Address Pool Start	Address Pool End	Lease Duration	Number of Leased Addresses
<ul> <li>IPv4 Management and Intel</li> <li>IPv4 Interface</li> </ul>		MyDHCPpool	255.255.255.0	192.168.1.10	192.168.1.253	1d 0h 0m	0
IPv4 Routes		Add Edit Delete Details					
ARP							
ARP Proxy		DHCP Server Options					
2 UDP Relay/IP Helper							
DHCP Snooping/Relay							
Proportion							
Network Pools 3							
Excluded Addresses							
Static Hosts							
DHCP Options							
Address Binding							
IPv6 Management and Inter							
<ul> <li>Domain Name System</li> </ul>							

**Note:** In this example, *Number of Leased Addresses* displays *zero,* as there are no clients connected.

Step 4. Navigate to **IP Configuration > DHCP Server > Address Binding** to see the expired client details. By default, DHCP leased time is configured for one day. Once the leased time has expired for a DHCP client and the client is disconnected from the network, the switch will still hold that entry as *Expired* status for a period of time.

········	2 28	-Port Gia	abit DoE+	Managed Switch			
<b>CISCO</b> 36300-20FF	20	-Fort Gig		Manayeu Switch			
Getting Started		192.168.95.12	Client Identifier	01.94.bf.2d.f1.81.65	2018-Oct-19 00:00:-29324	Dynamic	Expired
<ul> <li>Status and Statistics</li> </ul>		192.168.95.13	Client Identifier	01.14.20.5e.8f.42.0e	2018-Oct-20 00:00:-34234	Dynamic	Expired
<ul> <li>Administration</li> </ul>		192.168.95.14	Client Identifier	01.4c.57.ca.5e.15.b6	2018-Oct-21 00:00:-27963	Dynamic	Expired
<ul> <li>Port Management</li> </ul>		192.168.95.15	Client Identifier	01.a0.56.f3.e3.b0.06	2018-Oct-20 00:00:-34099	Dynamic	Expired
<ul> <li>Smartport</li> </ul>		192.168.95.16	Client Identifier	01.f0.db.e2.65.d4.60	2018-Oct-20 10:41:30	Dynamic	Expired
<ul> <li>VLAN Management</li> </ul>		192.168.95.17	Client Identifier	01.b4.f7.a1.c0.c2.20	2018-Oct-21 00:00:-45672	Dynamic	Expired
<ul> <li>Spanning Tree</li> </ul>		192.168.95.18	Client Identifier	01.fc.d8.48.d9.2a.7e	2018-Oct-21 00:00:-36500	Dynamic	Expired
<ul> <li>MAC Address Tables</li> </ul>		192.168.95.19	Client Identifier	01.54.33.cb.67.1f.69	2018-Oct-20 00:00:-45676	Dynamic	Expired
▶ Multicast		192.168.95.20	Client Identifier	01.64.5a.04.b0.83.a6	2018-Oct-20 10:04:11	Dynamic	Expired
IP Configuration		192.168.95.21	Client Identifier	01.80.ed.2c.9f.95.0b	2018-Oct-19 09:38:24	Dynamic	Expired
		192.168.95.22	Client Identifier	01.4c.57.ca.46.76.1a	2018-Oct-20 00:00:-29323	Dynamic	Expired
IPv4 Management and Interface		192.168.95.23	Client Identifier	01.c4.b3.01.d4.aa.dd	2018-Oct-19 09:42:03	Dynamic	Expired
IPv4 Routes		192.168.95.24	Client Identifier	01.3c.2e.f9.24.ef.7d	2018-Oct-21 00:00:-30419	Dynamic	Expired
ARP		192.168.95.25	Client Identifier	01.a0.56.f3.cd.7f.4e	2018-Oct-19 10:15:07	Dynamic	Expired
ARP Proxy		192.168.95.26	Client Identifier	01.a0.4e.a7.0c.f6.06	2018-Oct-20 00:00:-47162	Dynamic	Expired
DHCP Spooping/Relay		192.168.95.27	Client Identifier	01.30.35.ad.bf.37.76	2018-Oct-20 00:00:-46586	Dynamic	Expired
THCP Server		192.168.95.28	Client Identifier	01.0c.d7.46.26.bb.0b	2018-Oct-21 00:00:-26690	Dynamic	Expired
Properties		192.168.95.29	Client Identifier	01.14.56.8e.6b.00.85	2018-Oct-21 00:00:-31124	Dynamic	Expired
Network Pools		192.168.95.30	Client Identifier	01.24.18.1d.31.a5.6e	2018-Oct-20 00:00:-31676	Dynamic	Expired
Excluded Addresses		192.168.95.31	Client Identifier	01.a0.99.9b.45.33.61	2018-Oct-21 00:00:-25319	Dynamic	Expired
DHCP Options		192.168.95.32	Client Identifier	01.f0.d7.aa.7f.af.a0	2018-Oct-21 00:00:-44698	Dynamic	Expired
Address Binding		192.168.95.33	Client Identifier	01.7c.04.d0.2b.1f.0a	2018-Oct-21 00:00:-24125	Dynamic	Expired
		192.168.95.34	Client Identifier	01.3c.f8.62.d9.0a.62	2018-Oct-21 00:00:-25297	Dynamic	Expired
IPv6 Management and Interface		Delete					
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Step 5. Navigate to **Status and Statistics > TCAM Utilization** and verify the *Maximum TCAM Entries for IPv4 and Non-IP*. Ternary Content-Addressable Memory (TCAM) is the memory in a switch that builds and looks up MAC address tables. By default, the Maximum ARP table size is 128 entries. When the switch is in Layer 3 mode, ARP timeout is set to 60000 seconds by default as well. When the ARP table reaches its maximum capacity, the switch will stop learning new MAC addresses until inactive (expired) MAC addresses are cleared.

SG300-28 28-Port Gigabit Managed Switch						
Getting Started	TCAM Utilization					
System Summary	TCAM Resources Table					
Interface	Maximum TCAM Entries for	IPv4 Ro	uting	Non-IP I	Rules	
Etherlike	IPv4 and Non-IP	In Use	Maximum	In Use	Maximum	
802.1x EAP	128	7	128	0	338	
ACL TCAM Utilization 2 RMON View Log	Routing Resource Manageme	ent				

# Option 1: Configure the Switch to Clear the ARP Table More Often

Clearing ARP table will allow new DHCP clients to get an IP address from the DHCP pool. To do this you can reduce the ARP timeout settings to 300 seconds from the default of 60,000 seconds. This will clear expired MAC addresses from the ARP table more frequently on a regular basis.

Step 1. Navigate to **IP Configuration > ARP** to verify the default *ARP Entry Age Out* is configured as 60000 and *Normal Age Out* option is enabled.

cisco SG300-28 2	8-Port Gigabit Managed Switch				
Getting Started	ARP				
<ul> <li>Status and Statistics</li> </ul>					
<ul> <li>Administration</li> </ul>	ARP Entry Age Out: 60000 sec (Range: 1 - 40000000, Default: 60000)				
<ul> <li>Port Management</li> </ul>					
Smartport	Clear ARP Table Entries: All				
<ul> <li>VLAN Management</li> </ul>	Static				
<ul> <li>Spanning Tree</li> </ul>	Normal Age Out				
MAC Address Tables					
Multicast	Apply Cancel				
IP Configuration					
<ul> <li>IPv4 Management and Inter</li> </ul>	ARP Table				
IPv4 Interface	Filter: Interface equals to VLAN 1 V Go Clear Filter				
IPv4 Routes	Interface IP Address MAC Address Status				
ARP Proxy	ULAN 1 192.168.1.90 e8:6a:64:65:18:8a Dynamic				
UDP Relay/IP Helper	Add Edit Delete				
DHCP Snooping/Relay					

Step 2. Edit the **ARP Entry Age Out** value to **300** seconds, leave the **Normal Age Out** radio button selected by default. Click **Apply**.

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cisco SG300-28 2	28-Port Gigabit Managed Switch
Getting Started   Status and Statistics	ARP 1
Administration     Port Management	ARP Entry Age Out: 300 sec (Range: 1 - 40000000, Default: 60000)
Smartport     VLAN Management     Spanning Tree	Dynamic Static Normal Age Out
MAC Address Tables     Multicast	Apply Cancel
<ul> <li>IP Configuration</li> <li>IPv4 Management and Inter IPv4 Interface</li> </ul>	ARP Table       Filter:     Interface equals to VLAN 1 V       Go     Clear Filter
IPv4 Routes ARP ARP Proxy	Interface     IP Address     MAC Address     Status       VLAN 1     192.168.1.90     e8:6a:64:65:18:8a     Dynamic
UDP Relay/IP Helper DHCP Snooping/Relay DHCP Server	Add Edit Delete

Step 3. Select **Copy/Save Configuration** to save the running configuration to the startup configuration. This ensures that the configuration will remain after a restart or reboot of the switch.

sG300-28 2	8-Port Gigabit Managed Switch
Getting Started   Status and Statistics  Administration  Port Management  Smatter	ARP Success. To permanently save the configuration, go to the Copy/Save Configuration page or click the Save icon.
Sinarport     VLAN Management     Spanning Tree     MAC Address Tables     Multicast     IP Configuration	ARP Entry Age Out:     300 sec (Range: 1 - 40000000, Default: 60000)      Clear ARP Table Entries:     All     Dynamic     Static     Normal Age Out
<ul> <li>IPv4 Management and Inter IPv4 Interface IPv4 Routes</li> <li>ARP</li> <li>ARP Proxy</li> <li>UDP Relay/IP Helper</li> <li>DHCP Snooping/Relay</li> <li>DHCP Server</li> <li>Properties</li> <li>Network Pools</li> </ul>	Apply       Cancel         ARP Table       Filter:         Filter:       Interface equals to VLAN 1 V Go Clear Filter         Interface       IP Address         MAC Address       Status         VLAN 1       192.168.1.90         e8:6a:64:65:18:8a       Dynamic         Add       Edit

Step 4. *Under Source File Name*, verify **Running configuration** is selected. Under *Destination File Name*, verify **Startup configuration** is selected. Click **Apply**.



Step 5. This pop-up window will appear. Click **OK** to apply the new settings on the switch.



## **Option 2: Manually Clear the ARP List**

A second option is to manually clear the list to make room for other clients to get an IP address. This action will not set up future ARP clearing as it is a manual operation. This process can be repeated whenever necessary.

Step 1. Navigate to **IP Configuration > ARP**. Under *Clear ARP Table Entries*, select the type of ARP entries to be cleared from the system.

All — Deletes all of the static and dynamic addresses immediately.

**Dynamic** — Deletes all of the dynamic addresses immediately.

**Static** — Deletes all of the static addresses immediately.

**Normal Age Out** — Deletes dynamic addresses based on the configured ARP Entry Age Out time.

Note: In this example, All is selected.

Click **Apply**. The ARP global settings are temporarily written to the running configuration file.

Step 2. To permanently save the configuration, click on the **Copy/Save Configuration** or the blinking **Save** icon.

Step 3. You will be redirected to *Copy/Save Configuration* page. Verify the *Source File Name* is selected as **Running configuration** and *Destination File Name* is selected as **Startup configuration**, click **Apply**.

## SG300-28 28-Port Gigabit Managed Switch

<ul> <li>Status and Statistics</li> <li>Administration</li> </ul>	Copy/Save Configuration
System Settings Console Settings	All configurations that the switch is currently using are in the running To retain the configuration between reboots, make sure you copy to
User Accounts Idle Session Timeout	Source File Name:  Running configuration Startup configuration
<ul> <li>System Log</li> <li>File Management</li> </ul>	Destination File Name: Running configuration Startup configuration
Upgrade/Backup Firmwar Active Image Download/Backup Config	Sensitive Data: Exclude Encrypted Plaintext Available sensitive data options are det
Configuration Files Prope Copy/Save Configuration DHCP Auto Configuration Reboot Routing Resources	Save Icon Blinking: Enabled           Apply         Cancel         Disable Save Icon Blinking

Step 4. This pop-up window will appear. Click **OK** to apply the new settings on the switch.







### Conclusion

You have now completed either setting the ARP table to clear more frequently or manually clearing the ARP list.

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