**Text

Description automatically generated**

**Week 6**

**Module 7 & 8**

**A Flipped Classroom Approach**

|  |  |
| --- | --- |
| **NAME** | **MOHAMAD SAIFUL NIZAM BIN ABD AZIZ** |
| **NO. MATRIC** | **A179830** |
| **INSTRUCTOR** | **TS. DR. WAN FARIZA BINTI FAUZI** |

**Week 6: Module 7 and 8 – A Flipped Classroom Approach**

All devices/hosts need an **IP address** to communicate in the network.

Typically, the person in charge of the network (i.e., network administrator) will **manually assign** an IP address to each device. This is called **static assignment**.

As the number of devices in a network grows, this method is tedious.

Hence, **DHCP** is introduced to **automatically assigned IP addresses** to devices. DHCPv4 to automatically assign IPv4 addresses (Module 7) and SLAAC and DHCPv6 to automatically assign IPv6 addresses (Module 8).

**Module 7 – DHCPv4:**

DHCP stands for **Dynamic Host Configuration Protocol** where a host automatically gets an IP address and other network configurations such as gateway, DNS servers, etc.

It operates in **client-server** mode.

The **Server** **DYNAMICALLY ASSIGNS** IP addresses and other network configuration information to client for limited period of time (set at the server or until client return/release the address).

The **Client LEASES** the information for the set period of time (usually range from 1 day to a week), if expires, and client still need IP address, it will ask the server for another address (RENEW lease). The Server will then re-assign an IP address (usually the same IP address).

**Instructions:**

Refer to your Module 7 slides and Netacad resources, please answer the questions below.

1. Describe at least TWO advantages of using DHCP.

- DHCP is simple to set up and assigns IP addresses to requesting customers automatically, reducing the amount of time spent manually configuring IP numbers.

- There are no disputes in IP addresses since duplicate or faulty IP addresses are not assigned.

1. Describe TWO methods of implementing DHCPv4 in a network.

* Configure a Cisco IOS DHCP4 Server
* Configure a DHCP4 Client

1. DHCPv4 Operations:
   1. 2 pcap files are provided and can be opened using Wireshark.
   2. For each pcap file:
      1. Identify and examine the DHCP packets

* How many types of DHCP packets are there?

-DHCP1 – 6 packets

-DHCP2 – 3 packets

* How are they differentiated?

-See under the protocol column

* What important information each type of packet carry?

-Source and destination IP address

* + 1. Describe the DHCP operations and illustrate the communication between the server and client.

|  |  |  |
| --- | --- | --- |
| Steps | Illustrate | Description |
| 1. DHCP Discover |  | To find available DHCPv4 servers, the client sends out a broadcast DHCPDISCOVER message with its own MAC address. Because the client does not have proper IPv4 information at bootup, it communicates with the server using Layer 2 and Layer 3 broadcast addresses. The DHCPDISCOVER message is used to locate DHCPv4 servers on a network. |
| 1. DHCP Offer |  | When a DHCPDISCOVER message is received, the DHCPv4 server reserves an available IPv4 address to lease to the client. The server additionally creates an ARP entry with the requesting client's MAC address and the client's leased IPv4 address. The DHCPv4 server delivers the requesting client the binding DHCPOFFER message. |
| 1. DHCP Request |  | The client responds with a DHCPREQUEST message after receiving the DHCPOFFER from the server. This mail is sent out for both new leases and lease renewals. When used for lease origination, the DHCPREQUEST acts as a binding acceptance notification to the selected server for the parameters it has provided, as well as an implicit decline to any other servers who may have made a binding offer to the client.  DHCPv4 servers are used in many enterprise networks. The DHCPREQUEST message is broadcast to this DHCPv4 server and any other DHCPv4 servers to advise them of the accepted offer. |
| 1. DHCP Acknowledgment |  | The server will check the lease information with an ICMP ping to that address to confirm it is not already in use, generate a new ARP entry for the client lease, and react with a DHCPACK message after receiving the DHCPREQUEST message. Except for a change in the message type field, the DHCPACK message is identical to the DHCPOFFER. The client logs the configuration information and may do an ARP lookup for the allocated address when it receives the DHCPACK message. If the client receives no response to the ARP, it assumes the IPv4 address is genuine and begins using it as its own. |

* 1. Compare the DHCP packets and operations found in the 2 pcap files.

-Pcap file 1 has more packets than pcap file 2. In pcap file 1, the client talks with a DHCPv4 server to obtain a lease, but in pcap file 2, the client communicates with a DHCPv4 server to renew a lease.

1. List the DHCP configuration steps on a Cisco router and the relevant commands.

Step 1: Exclude IPV4 addresses

ip dhcp exclude-addresses

Step 2: Define a DHCPv4 Pool Name  
 ip dhcp pool

Step 3: Configure the DHCPv4 Pool

The address pool – network

The default router or gateway – default-router

The DNS server – dns-server

The domain name – domain-name

The duration of the DHCP lease – lease

The NetBios WINS server – netbios-name-server

1. Briefly explain how to configure DHCP client.

* Use ip address dhcp command.

1. What is DHCP Relay? Describe one scenario that requires DHCP Relay.

* If the source address of an incoming message is 10.0.0.1/8, the DHCP server recognises that the client is part of a subnet with a 10.0.0.1/8 default gateway IP. After determining the default gateway IP, the DHCP server searches its pools for pools that utilise the same default gateway. It discovers the pool configured with the default gateway IP 10.0.0.1/8 in this scenario.

**Module 8 – SLAAC and DHCPv6:**

There are **3 methods** for an IPv6 device to obtain an IPv6 global unicast address (GUA) automatically:

1. SLAAC (Router Advertisement only), default mode/method
2. SLAAC with DHCPv6 (Router Advertisement and DHCPv6 server)
3. DHCPv6 server

Method 1 and 2 are considered as **stateless** as there are **NO** device (i.e., server) that keeps track of the assignments, whereas Method 3 is considered as **stateful** where there is a server that manages the IP assignments.

Two control messages of the ICMPv6 protocol are used to assign IPv6 address: **Router Advertisement (RA) and Router Solicitation (RS)**.

All stateless and stateful methods use **RA** messages to suggest to the host how to create or acquire its IPv6 configuration. OR, a host can also send a **RS** message requesting an RA from the router.

**Instructions:**

Refer to your Module 8 slides and Netacad resources, please answer the questions below.

1. Explain what is an IPv6 address and the different types of IPv6 addresses.

- IPv6 addresses are 128-bits long and are identifiers for individual interfaces and sets of interfaces.

-Unicast addresses identify a single interface.

- Multicast addresses are used to identify a group of interfaces so that a packet sent to one gets sent to all of the interfaces in the group.

1. List the three flags found in a RA message and the combinations for each method.

- The Address Autoconfiguration flag signifies to use Stateless Address Autoconfiguration (SLAAC) to create an IPv6 GUA

- The Other Configuration flag signifies that additional information is available from a stateless DHCPv6 server

- The Managed Address Configuration flag signifies to use a stateful DHCPv6 server to obtain an IPv6 GUA.

1. For each method, illustrate and describe the communication between router/server and host in obtaining an IPv6 address automatically.

- Stateless and Stateful techniques are the two options. A stateless approach is one in which no device keeps track of IPv6 address assignments. SLAAC Only and SLAAC with DHCP server are the two variants of stateless. When the router delivers Router Advertisement (RA) messages with entire IPv6 addressing information, it is known as SLAAC Only. The hosts also entirely use the RA information for all of their addressing, including constructing their own GUA. SLAAC with DHCP server is frequently referred to as Stateless DHCPv6.

The router RA messages offer IPv6 configuration information to hosts and inform them to contact a stateless DHCPv6 server for more configuration information in this type of stateless approach. The hosts additionally use the RA data to generate their own unique GUA and obtain further data from a DHCPv6 server.

The following approach is Stateful. A stateful technique is one in which an IPv6 address is assigned by a DHCPv6 server. A DHCPv6 server is used in the Stateful approach, which is also known as Stateful DHCPv6. The router RA messages in the DHCPv6 server instruct hosts to contact a stateful DHCPv6 server or a DHCPv6-enabled router for all IPv6 configuration information except the default gateway address. In order to obtain all of their IPv6 addressing information, the hosts also contact a DHCPv6 server. Router RA messages also provide default gateway information to the hosts.