Assignment one **Awais Hussain**
TA Finance Network Design **19031526**

In this assignment, I will be writing about the TA Finance company's expansion. I will use Cisco packet tracer software to build and establish this company's network, as well as assign all IP addresses and ensure full connectivity. For task one, I will set up the physical topology and use subnetting to ensure that the network has the correct IPv4 address. I will also provide ping results based on the criteria. I will explore and show how DHCP can improve the functionality of task one's implementation in task two. In addition, I will use DHCP configuration on the router to automatically assign IP addressing to the devices in the admin, accounting, management, sales, and wireless areas.

Task one

Network Configuration and Ping Results

The table below shows all the IP addressing (and range of IP addressing) allocated.

Name Of Device	Interface	IP address (Range)	Subnet Mask	Default Gateway
PC (Admin) x20 Printer0	NIC/Fa0	10.26.0.3/24 - 10.26.0.23/24	255.255.255.0	10.26.0.1
PC (Accounting) x35	NIC/Fa0	10.26.0.24/24 - 10.26.0.59/24	255.255.255.0	10.26.0.1
PC (Sales) x60	NIC/Fa0	10.26.0.60/24 - 10.26.0.120/24	255.255.255.0	10.26.0.1
Router (Awais router)	GigabitEthernet0/0	10.26.0.1/24	255.255.255.0	N/A
	GigabitEthernet0/1	10.26.1.1/27	255.255.255.224	N/A
	GigabitEthernet0/2	10.26.2.1/24	255.255.255.0	N/A
	Serial0/3/0	10.26.3.1/30	255.255.255.252	N/A
Switch (Hussain switch)	GigabitEtherner0/1 VLAN1	10.26.0.2/24	255.255.255.0	10.26.0.1
Switch (switch 1)	GigabitEthernet0/1 VLAN2	10.26.2.2/24	255.255.255.0	10.26.2.1
Laptop0	Wireless connection	10.26.2.3/24	255.255.255.0	10.26.2.1
SmartPhone	Wireless connection	10.26.2.4/24	255.255.255.0	10.26.2.1
DNS Server	NIC/Fa0	10.26.1.2/27	255.255.255.224	10.26.1.1
Cloud storage	NIC/Fa0	88.44.22.2/30	255.255.255.252	88.44.22.1
ISP Router	Serial0/3/0	10.26.3.2/30	255.255.255.252	10.26.3.1
	GigabitEthernet0/0	88.44.22.1/30	255.255.255.252	88.44.22.1

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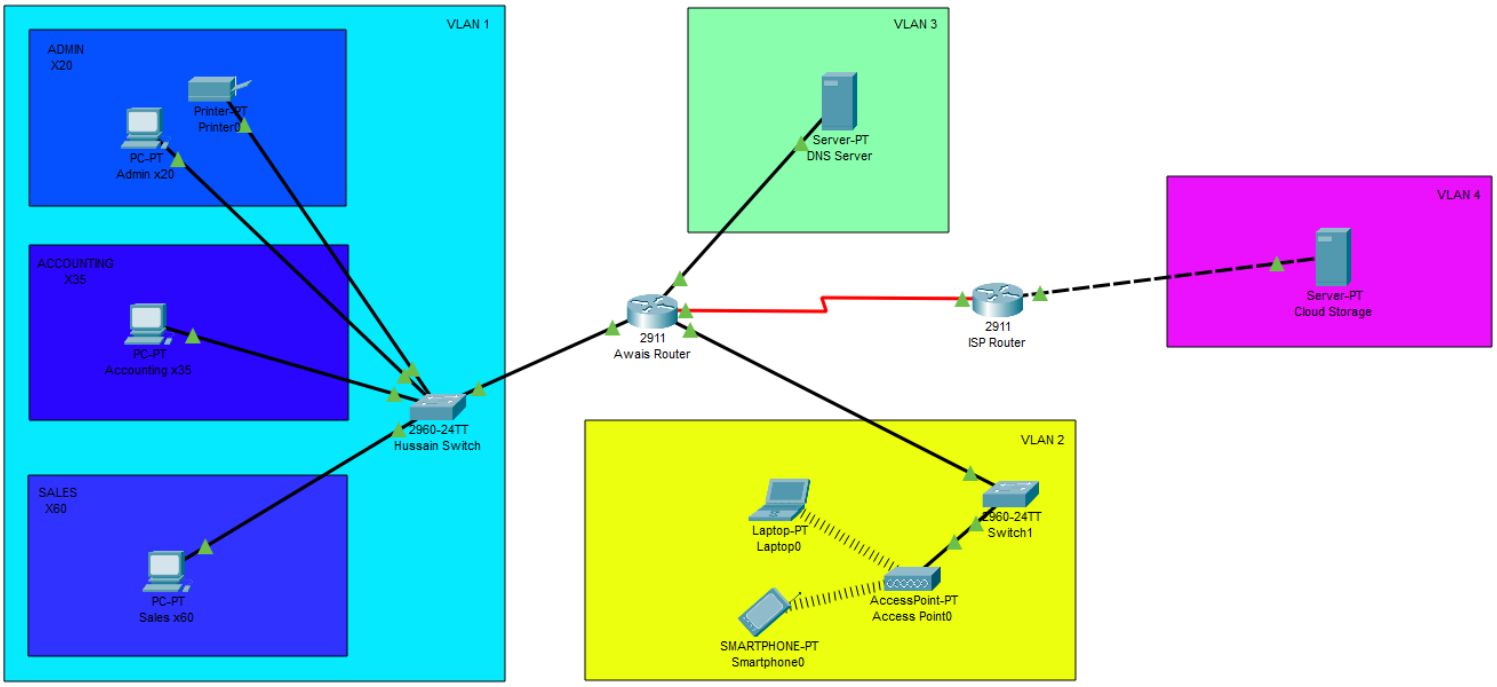
Topology:



Show Runs and Ping Results

Awais Router Show Run:

Awais Router

Physical Config CLI Attributes

IOS Command Line Interface

```
User Access Verification

Password:

Awais>en
Password:
Awais#sh run
Building configuration...

Current configuration : 1021 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname Awais
!
!
!
enable secret 5 $1$mERr$UoSyTJlbm/P2Fq3rnQCA.0
enable password 7 0822404F1A0A
!
!
!
!
!
!
no ip cef
no ipv6 cef
!
!
!
!
license udi pid CISCO2911/K9 sn FTX1524WHRW-
!
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
 --More--
```

Ctrl+F6 to exit CLI focus

Copy Paste

Awais Router

Physical Config CLI Attributes

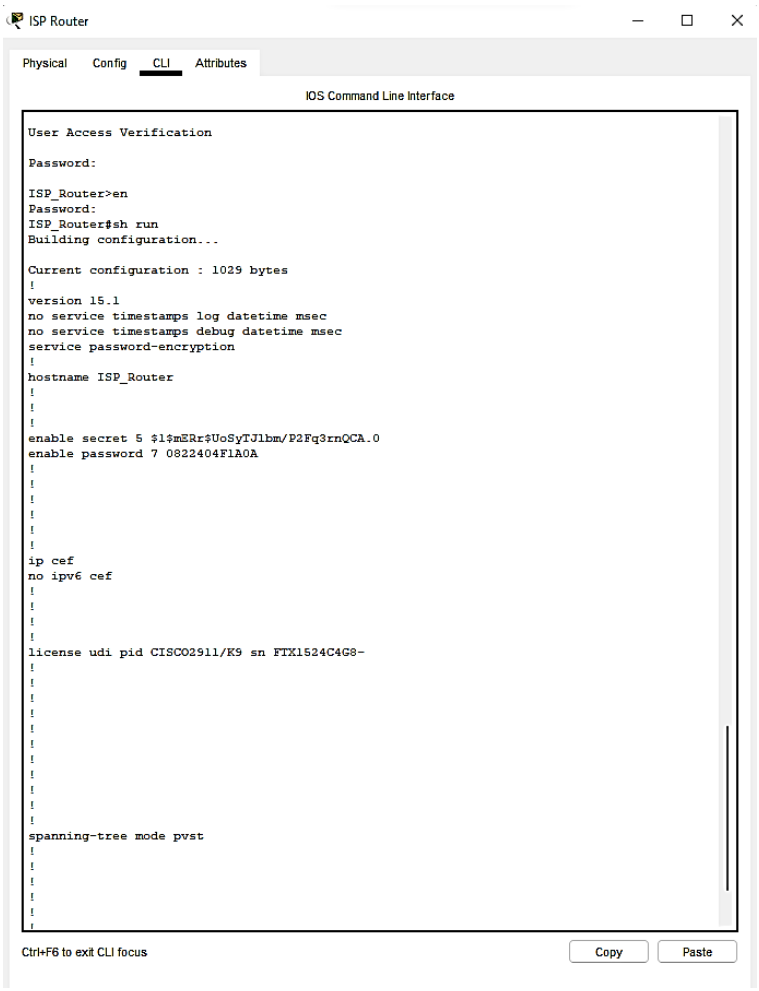
IOS Command Line Interface

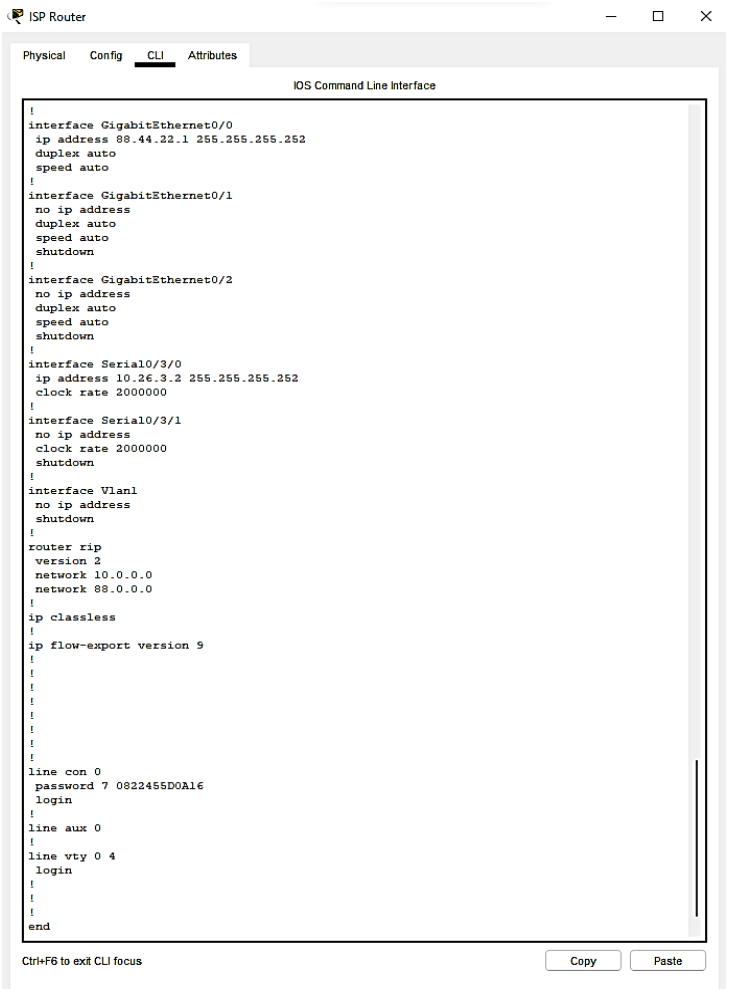
```
!
interface GigabitEthernet0/0
 ip address 10.26.0.1 255.255.255.0
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 10.26.1.1 255.255.255.224
 duplex auto
 speed auto
!
interface GigabitEthernet0/2
 ip address 10.26.2.1 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/3/0
 ip address 10.26.3.1 255.255.255.0
!
interface Serial0/3/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 10.0.0.0
!
ip classless
!
ip flow-export version 9
!
!
!
no cdp run
!
!
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line aux 0
!
line vty 0 4
 login
!
!
!
end

Awais#
```

Ctrl+F6 to exit CLI focus

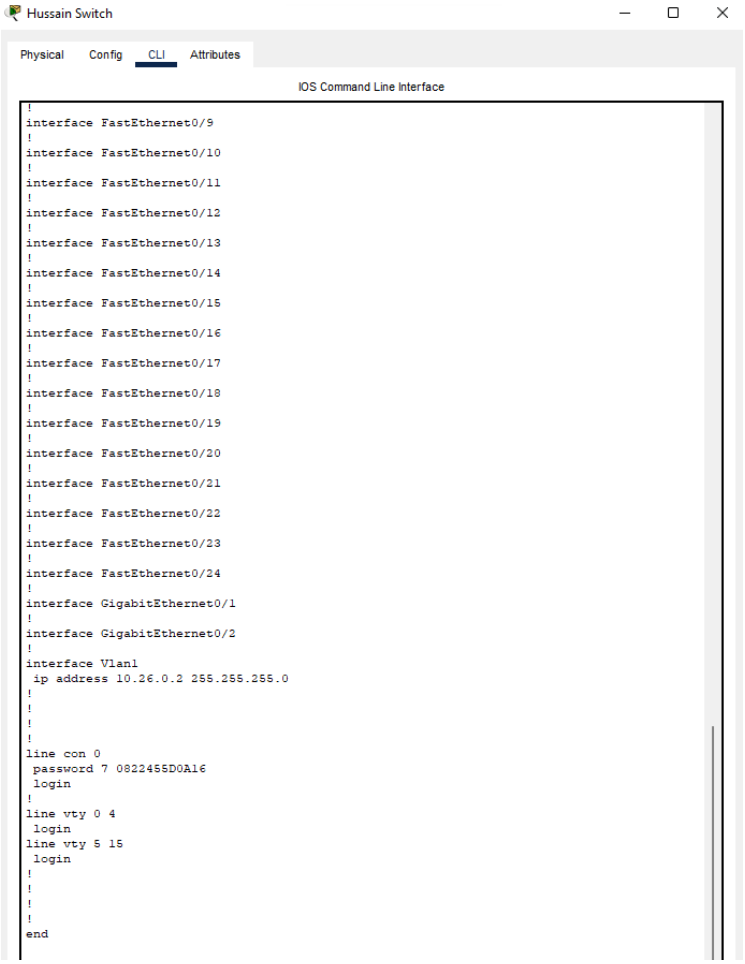
Copy Paste

ISP Router Show Run:





Hussain Switch Show Run:



Switch 1 Show Run:

Switch1

Physical Config CLI Attributes

IOS Command Line Interface

```
User Access Verification

Password:
Password:

Switch1>en
Password:
Switch1#sh run
Building configuration...

Current configuration : 1244 bytes
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname Switch1
!
enable secret 5 $1$mERr$UoSyTJ1bm/P2Fq3rnQCA.0
enable password 7 0822404F1A0A
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
 --More--
```

Ctrl+F6 to exit CLI focus Copy Paste

Switch1

Physical Config CLI Attributes

IOS Command Line Interface

```
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
 no ip address
 shutdown
!
interface Vlan2
 ip address 10.26.2.2 255.255.255.0
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line vty 0 4
 login
line vty 5 15
 login
!
!
!
!
end


Switch1#S
```

Ctrl+F6 to exit CLI focus Copy Paste

VLAN 1 (Admin) to VLAN 2 (Laptop0) CONNECTIVITY: ping result

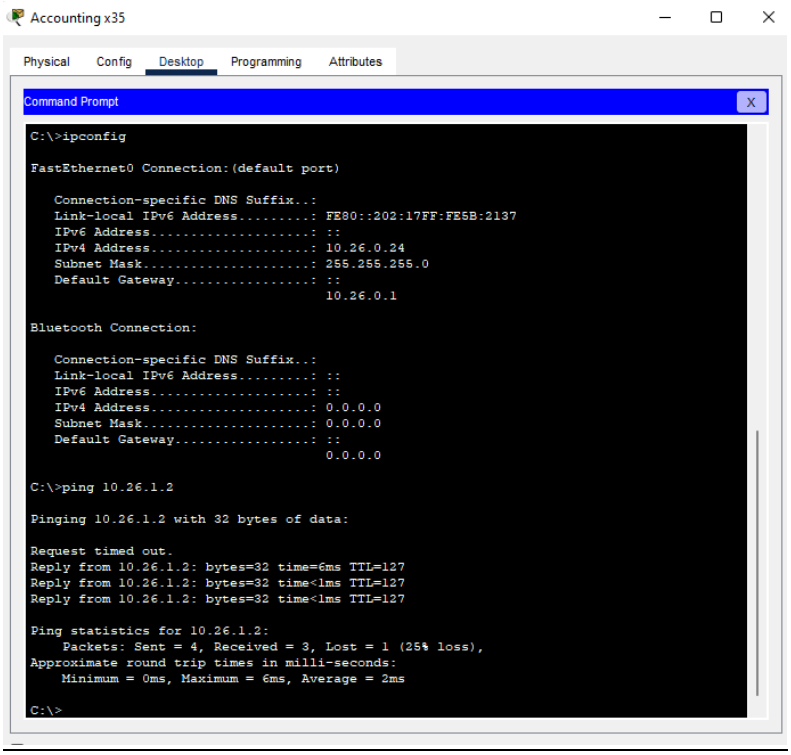
Admin x20

Physical Config Desktop Programming Attributes

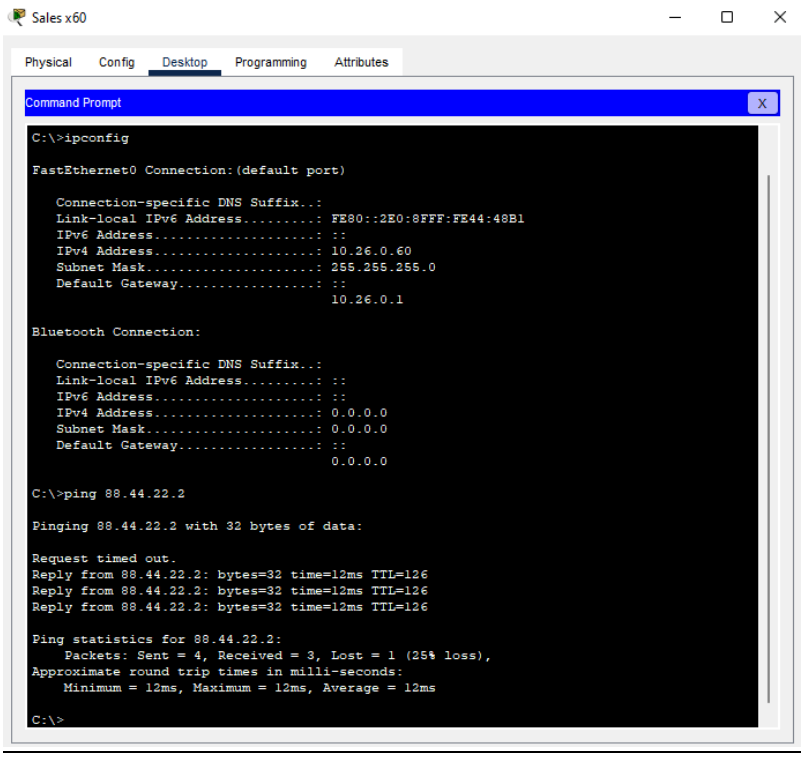
Command Prompt X

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.....: FE80::2E0:B0FF:FEC2:E71A
   IPv6 Address.....: ::
   IPv4 Address.....: 10.26.0.3
   Subnet Mask.....: 255.255.255.0
   Default Gateway.....: ::
                                 10.26.0.1

Bluetooth Connection:

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.....: ::
   IPv6 Address.....: ::
   IPv4 Address.....: 0.0.0.0
   Subnet Mask.....: 0.0.0.0
   Default Gateway.....: ::
                                 0.0.0.0

C:\>ping 10.26.2.3

Pinging 10.26.2.3 with 32 bytes of data:

Reply from 10.26.2.3: bytes=32 time=22ms TTL=127
Reply from 10.26.2.3: bytes=32 time=13ms TTL=127
Reply from 10.26.2.3: bytes=32 time=18ms TTL=127
Reply from 10.26.2.3: bytes=32 time=14ms TTL=127

Ping statistics for 10.26.2.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 13ms, Maximum = 22ms, Average = 16ms

C:\>
```

VLAN 1 (ACCOUNTING) to VLAN 3 CONNECTIVITY:



VLAN 1 (SALES) to VLAN 4 (Cloud Storage Via ISP Router):



Password for switches and routers:
console password: cisco
enable password: class
secret password: class1
Both passwords have been encrypted.

Task two

How DHCP can improve the functionality.

Prior to getting into the technical aspects of DHCP, let us start by defining what IP addressing is and why it holds such immense importance in the accessing of the internet. A device connected to the internet, or a local network is identified by its IP address, which is a unique address. The Internet Protocol (IP) is a collection of rules that regulate the format of data transferred over the internet or a local network. IP addresses, essentially, are the identifiers that allow data to be transmitted between devices on a network. They contain location information and make devices reachable for communication. The internet requires a method of distinguishing between various computers, routers and more. IP addresses are a useful way to accomplish this, and because of this reason the need for IP addressing is highlighted as it holds such importance. [1]

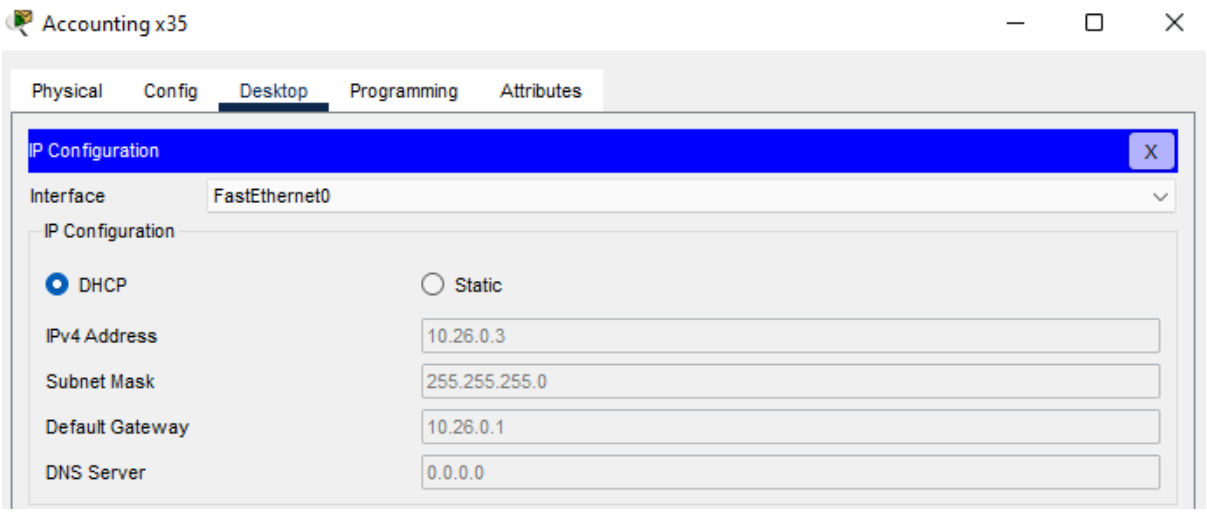
So, as we are informed on what an IP address is, we can now question about what DHCP can do to enhance the functionality of the TA Finance company's expansion implementation? First and foremost, what is DHCP and what does it achieve? The Dynamic Host Configuration Protocol (DHCP) is a mechanism that automates the distribution of IP addresses to fixed and mobile hosts that are both wired and wirelessly connected. When a device wants to connect to a DHCP server network, it sends a request for an IP address, and the DHCP server then responds. The server responds to the request by assigning an IP address to the device, then monitoring its usage and returning the address after a certain period of time or when the device shuts down. The IP address is then returned to the pool of addresses on the DHCP server, where it will be assigned to another device requesting network access. While the protocol's primary purpose is to provide IP addresses, it also assigns subnet masks, default gateway addresses, and domain name server addresses (DNS). The earlier BOOTP (bootstrap protocol) has become outdated and due to this it only works on IPv4 networks, therefore DHCP is an IEEE standard developed on top of it. [3]

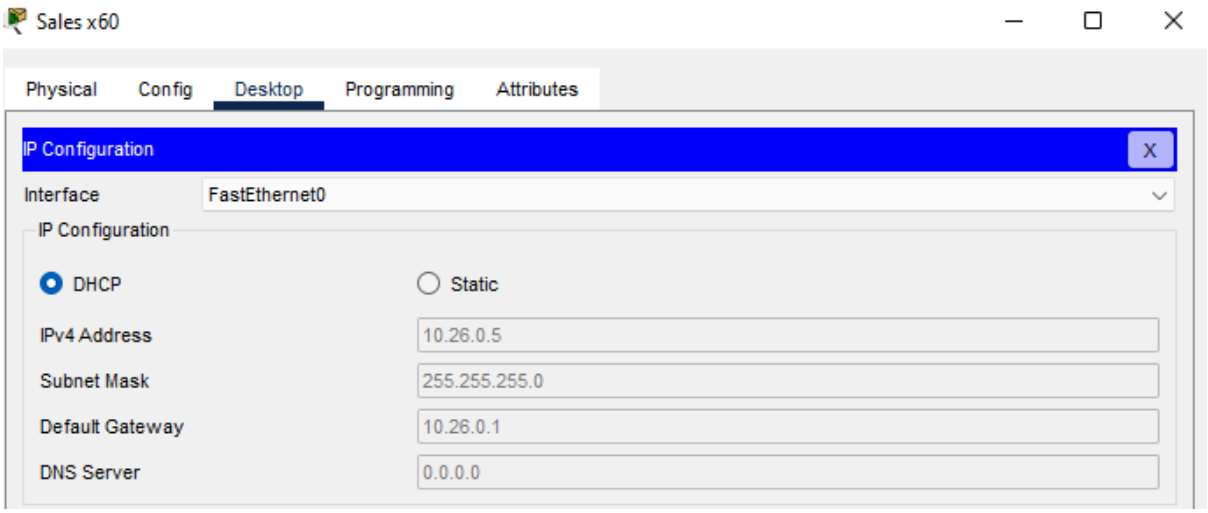
How can DHCP improve the functionality of the implementation of the TA Finance company's expansion now that we know what it is and what it does? Well, increasing reliability is one of the ways it can increase functionality. Some devices can wind up with the same IP address due to human error, and the fact is that two people cannot utilize the same IP address [4]. This is caused by a conflict between both devices, which implies that in this circumstance, one or both users will be unable to connect to the network if this problem were to occur. The DHCP eliminates the potential of human error and keeps the server running smoothly, thus enhancing the network functionality. Not only that, but because DHCP does more than just assign addresses, the IP addresses are optimized as well. Additionally, it also automatically takes the addresses back and returns them to the pool when the user is no longer using them. Furthermore, another significant benefit of utilizing the DHCP to acknowledge is the ability to control the lease time of the IP addresses. As the DHCP does not assign addresses indefinitely, it is static rather than dynamic. Static addresses are useful for some devices, such as network printers. The DHCP protocol, on the other hand, assigns a lease time to each address assigned by the DHCP server. Once the lease has ended, the client can no longer use

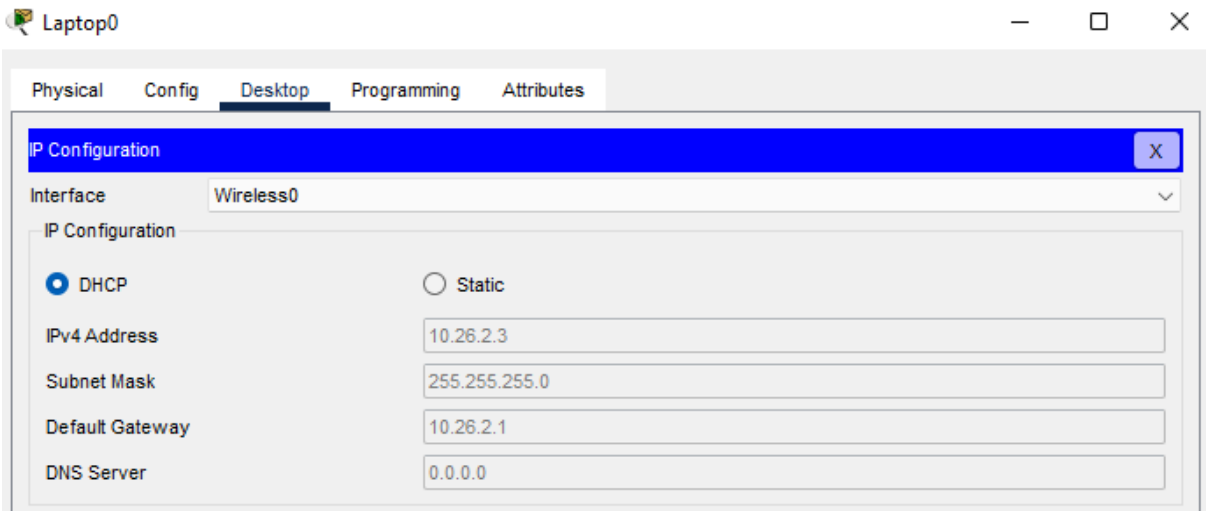
the IP address and it is effectively evicted from the network. The protocol is set up so that active clients automatically contact the DHCP server halfway through their lease period to renew their lease. If the server does not answer fast enough, the client will keep requesting for a lease renewal from the DHCP server until one is granted. When a host goes down, the lease is usually promptly cancelled to provide room for another client on the network in order to utilize the IP address. I believe that by applying this IP leasing process, the network will undoubtedly run smoother as it will reduce the traffic consequently increasing the functionality. [2]

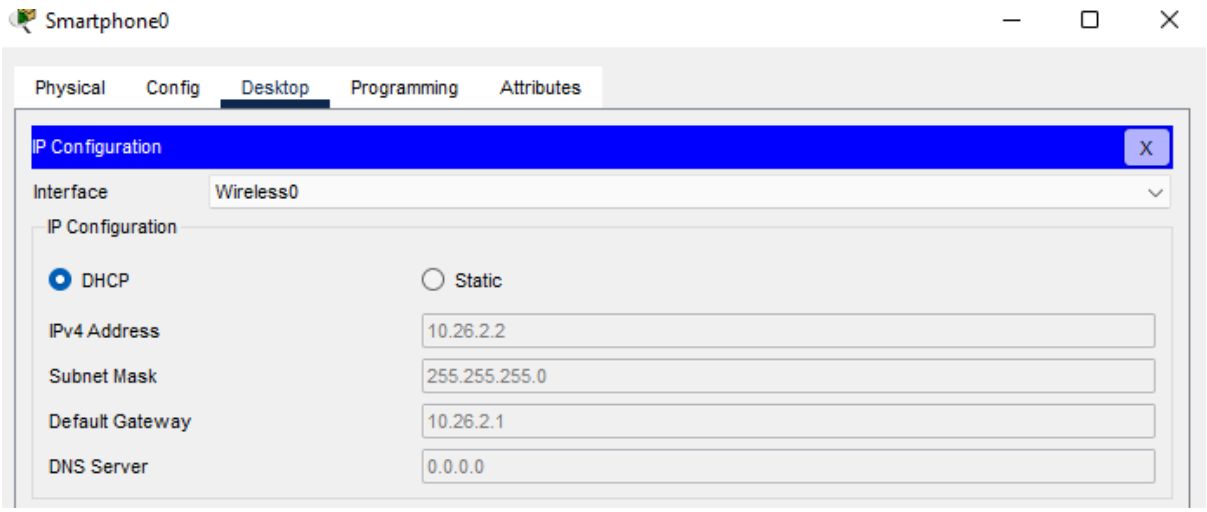
Ultimately, there are numerous pros to using DHCP. The factors mentioned above was just a handful of the substantial number of benefits, thus signifying the importance of implementing the DHCP in regard to letting the network reach its full potential of functionality and effectiveness for the network implementation. You might question 'Which protocol is better? DHCP or BOOTP?' The simple answer to this is DHCP. The DHCP is better choice to implemented due to the simple fact that there is mobile connection in this implementation whereas BOOTP does not support mobile connection. Therefore, this will limit the functionality more than improve the functionality in this case, making DHCP the superior protocol to be executed.

Ping test DHCP:






Laptop0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
Wireless0
IP Configuration
DHCP
Static
IPv4 Address
10.26.2.3
Subnet Mask
255.255.255.0
Default Gateway
10.26.2.1
DNS Server
0.0.0.0


Smartphone0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
Wireless0
IP Configuration
DHCP
Static
IPv4 Address
10.26.2.2
Subnet Mask
255.255.255.0
Default Gateway
10.26.2.1
DNS Server
0.0.0.0

DHCP connections screen shot

Router show run

Awais Router

Physical Config CLI Attributes

IOS Command Line Interface

```
User Access Verification

Password:

Awais>en
Password:
Awais$sh run
Building configuration...

Current configuration : 1426 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Awais
!
!
!
enable secret 5 $1$mERr$UoSyTJlbm/P2Fq3rnQCA.0
enable password class
!
!
!
ip dhcp pool dotONE
 network 10.26.0.0 255.255.255.0
 default-router 10.26.0.1
ip dhcp pool dotTWO
 network 10.26.2.0 255.255.255.0
 default-router 10.26.2.1
ip dhcp pool dotTHREE
 network 10.26.0.0 255.255.255.0
 default-router 10.26.0.1
ip dhcp pool dotFOUR
 network 10.26.0.0 255.255.255.0
 default-router 10.26.0.1
ip dhcp pool LAN1
 network 10.26.0.0 255.255.255.0
 default-router 10.26.0.1
 dns-server 10.26.1.2
!
!
!
no ip cef
no ipv6 cef
!
!
!
!
license udi pid CISCO2911/K9 sn FTX1524CS9B-
!
!
!
!
!
!
!
!
```

Awais Router

Physical Config CLI Attributes

IOS Command Line Interface

```
!
!
interface GigabitEthernet0/0
 ip address 10.26.0.1 255.255.255.0
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 10.26.1.1 255.255.255.224
 duplex auto
 speed auto
!
interface GigabitEthernet0/2
 ip address 10.26.2.1 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/3/0
 ip address 10.26.3.1 255.255.255.252
!
interface Serial0/3/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 10.0.0.0
!
ip classless
!
ip flow-export version 9
!
!
!
no cdp run
!
!
!
!
!
!
line con 0
 password cisco
 login
!
line aux 0
!
line vty 0 4
 login
!
!
!
end
```

References:

Kimanzi, S. (2018). *How to configure DHCP server in Packet Tracer.* [online] Computer Networking Highlights. Available at: https://computernetworking747640215.wordpress.com/2018/07/05/how-to-configure-dhcp-server-in-packet-tracer/.

[1] = Kaspersky (2021). *What is an IP Address – Definition and Explanation*. [online] www.kaspersky.com. Available at: https://www.kaspersky.com/resource-center/definitions/what-is-an-ip-address.

[2] = Zeus Kerravala (2018). *DHCP defined and how it works*. [online] Network World. Available at: https://www.networkworld.com/article/3299438/dhcp-defined-and-how-it-works.html.

[3] = GeeksforGeeks. (2019). *Difference between BOOTP and DHCP*. [online] Available at: https://www.geeksforgeeks.org/difference-between-bootp-and-dhcp/.

[4] = Microsoft (2019). *Dynamic Host Configuration Protocol (DHCP)*. [online] Microsoft.com. Available at: https://docs.microsoft.com/en-us/windows-server/networking/technologies/dhcp/dhcp-top.