

# | Networking in a Business

| By Rachel Arnold

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## | Introduction

Ever wonder how networking between a business works, whether it's a small coffee shop or a corporate office the basics stay the same. To explain it simply (in the terms of a coffee shop), we need to separate a network to mini networks so any customer on the public Wi-Fi of a coffee shop cannot see the transactions of the cash register. Through Cisco Packet Tracer (a free virtual networking environment - see link below to download), I will show you the basics of subnet mask and why the network is formatted the way it is.

## | Vocab

**Network** - A collection of interconnected computers, servers, and other devices. This term broadly describes the infrastructure that enables communication, data sharing, and resource access across multiple devices.

**IP address** - A unique number that is assigned to an device to ensure they are on the internet and allows other computers to talk to it. There are two major types of IP addresses, IPv4 and IPv6. This is internet protocol version 4 and 6. For this example, we will only be using IPv4.

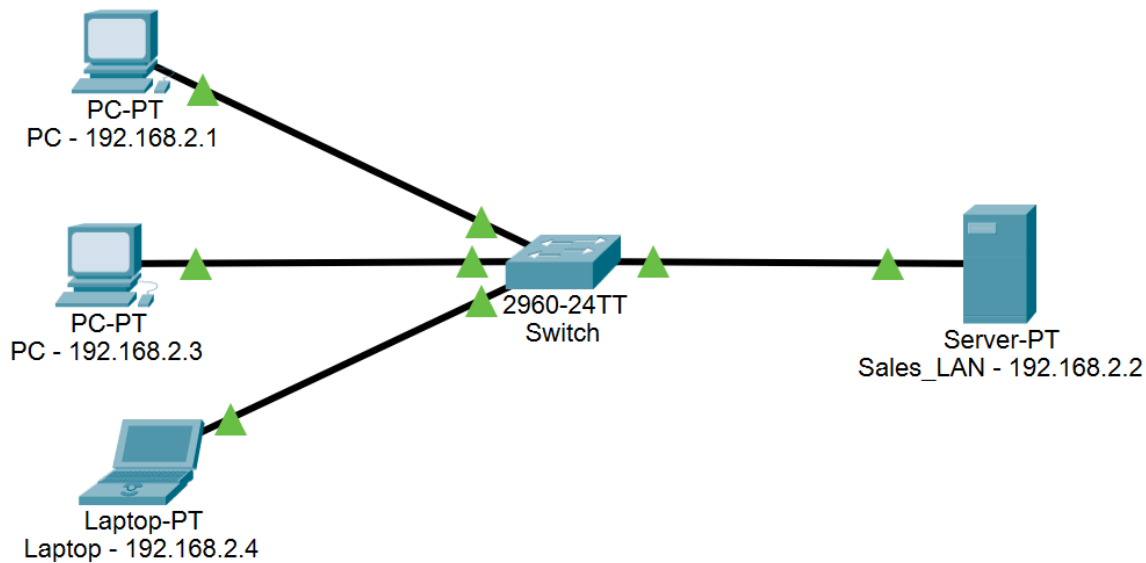
**Topology** - The physical and logical building of your network. This describes the physical layout of your devices and routes of cables, but can also describe the path your data takes through the network no matter how it's laid out.

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## | Creating you own DHCP and DNS

### | DHCP

The DHCP - dynamic host configuration protocol - is a server that assigns any computer to an IP address. In Cisco Packet Tracer, they're open and shut on how to make. All you need is a server, a switch, and a few PCs. Here is the topology I made below.

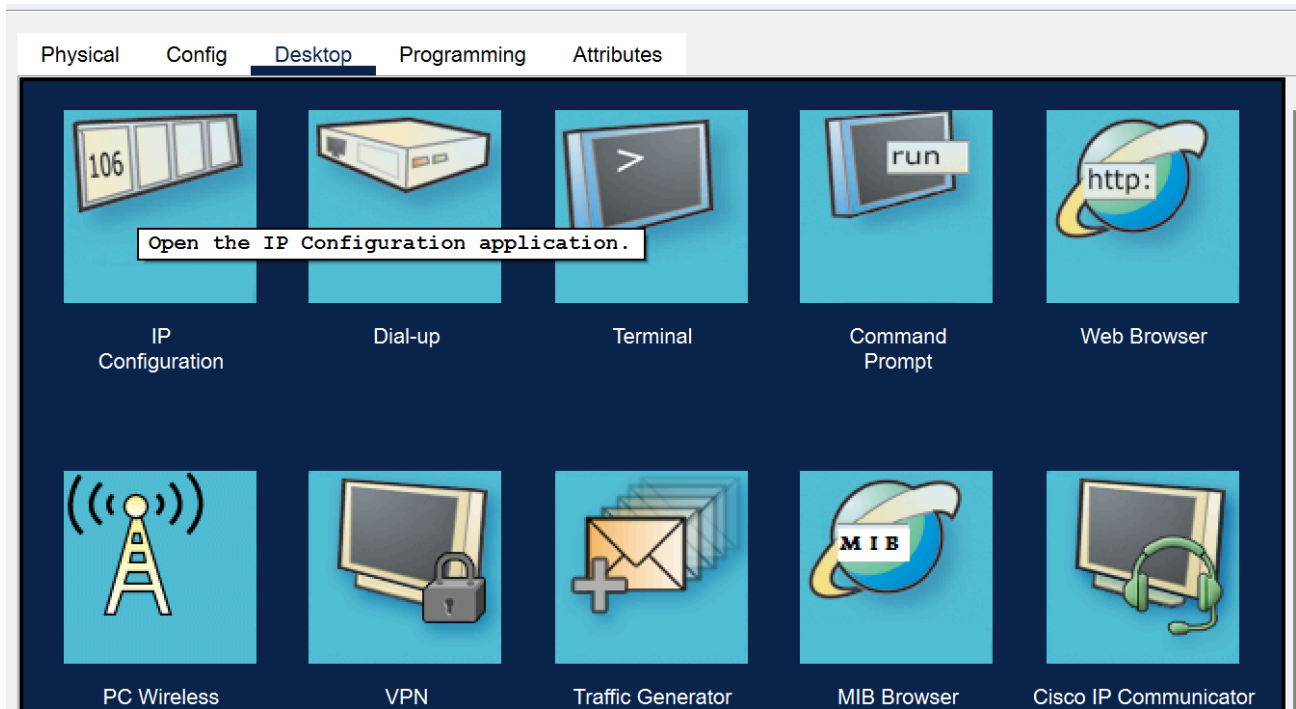


As you can see, the server goes through the switch and to the computers. Before creating your own DHCP server, here is some important knowledge you need to know:

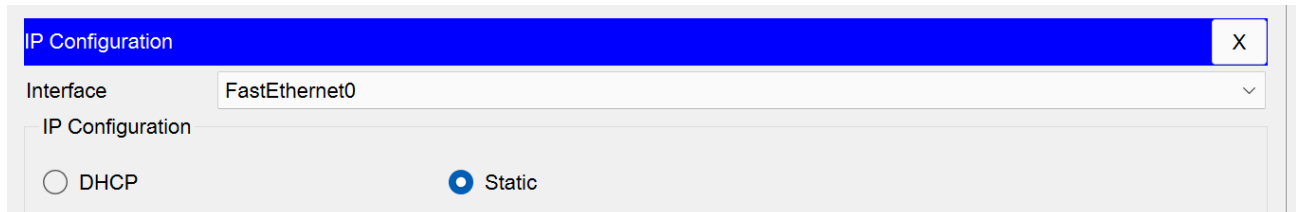
1. The default gateway is the first IP address of a network. In the case above, the Default Gateway is 192.168.2.1
2. Subnet Masks allow you to choose how many devices you would like on the network. There are 3 classes of subnet masks:
  1. Class A - /8  
255.0.0.0
  2. Class B - /16  
255.255.0.0
  3. Class C - /24  
255.255.255.0Most LANs will have a Class C subnet mask, and for this, we will use Class C as well!  
This is the most common, as it allows 256 different devices.
3. Statically assigned IP addresses, this means you manually set IP address, default gateway, and DNS server (if you have one). The great part of DHCP is you won't have to statically assign IP addresses to all devices!

## Creating your own DHCP

1. After copying the topology above, go into your server's desktop.

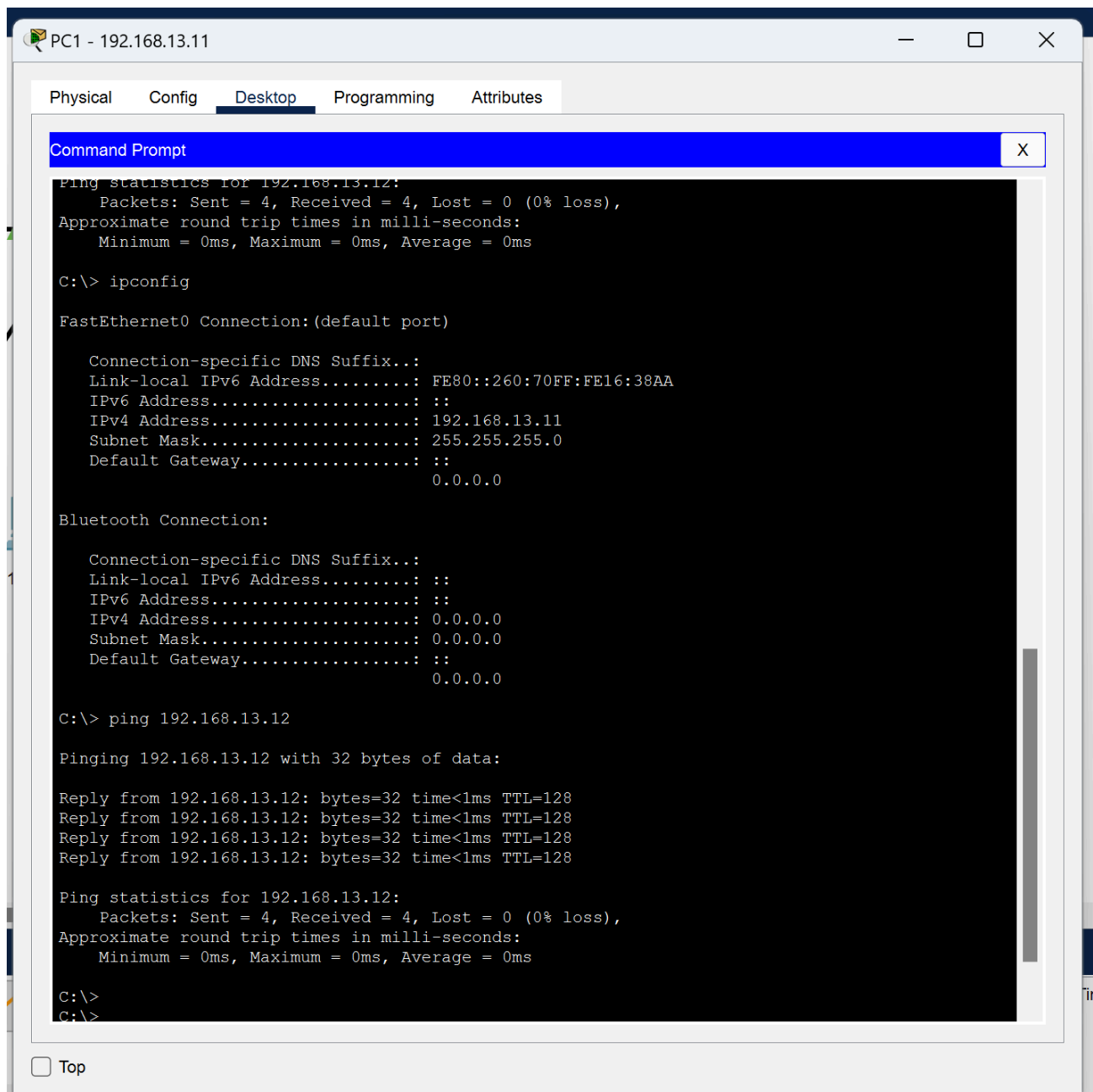


2. Click on the IP configuration and set the following:  
Pool Name : MY\_LAN  
Default Gateway : 192.168.2.1  
Start IP Address : 192.168.2.3  
Subnet Mask : 255.255.255.0
3. Press "Add" and then "Save"
4. Open up any computer > Desktop > IP Configuration
5. Change IP configuration from static to DHCP



As long as your IP address is 192.168.2.1-255, you've know you successfully created a DHCP server!

6. In order to ensure everything is working correctly, go into Command Prompt, ping the IP address of a fellow computer. It is working for sure if it looks like the following below. Just make sure you see a Reply from 192.168.2.X:



```
PC1 - 192.168.13.11
Physical Config Desktop Programming Attributes
Command Prompt
Ping statistics for 192.168.13.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\> ipconfig

FastEthernet0 Connection: (default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::260:70FF:FE16:38AA
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 192.168.13.11
    Subnet Mask . . . . .: 255.255.255.0
    Default Gateway . . . . .: ::
                                   0.0.0.0

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 192.168.13.12

Pinging 192.168.13.12 with 32 bytes of data:

Reply from 192.168.13.12: bytes=32 time<1ms TTL=128
Reply from 192.168.13.12: bytes=32 time<1ms TTL=128
Reply from 192.168.13.12: bytes=32 time<1ms TTL=128
Reply from 192.168.13.12: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.13.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
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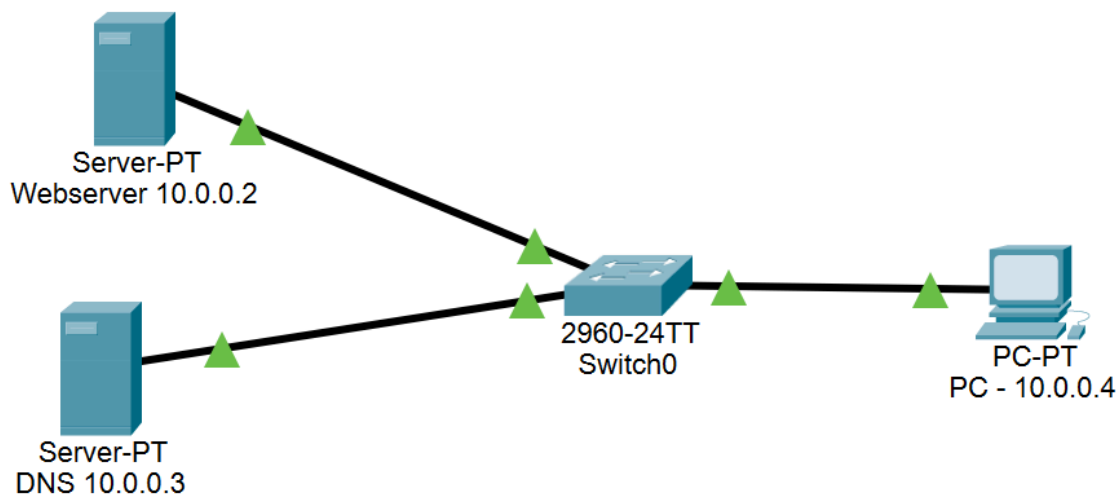
C:\>
C:\>
```

Congratulations! You just successfully created your first DHCP server!

## I DNS

The DNS Server - Domain Name System - is what makes googling possible. Basically, the DNS server is a phone book for the internet. All websites (for example Google) have an address of a number like Google.com which is actually 8.8.8.8. Without a DNS server, you would have to memorize IP addresses in order to get to websites. When you type in google.com, DNS converts it into 8.8.8.8 (or any other IP address) and sends it to the computer. This then takes your system to google.com. Private DNS servers are great, as you're able to block many ads and malware, increase security, and optimize traffic routing. To create a successful DNS server

in Cisco, you need 2 servers and a computer.



## Creating your own DNS

1. Copy the topology exactly as you see above
2. Statically assign the IP address of your DNS Server. Next, statically assign the PC and the Webserver. In the DNS server for all servers and PC, put the IP of the DNS - 10.0.0.3. Except for the DNS server itself, add the following IP - 127.0.0.1. This is a loopback

address. This means every time it calls the DNS, it calls upon itself.

The screenshot shows a window titled "Server0" with a tabbed interface. The "Desktop" tab is selected, displaying the "IP Configuration" settings. The window has a title bar with standard minimize, maximize, and close buttons. The tabs are "Physical", "Config", "Services", "Desktop", "Programming", and "Attributes". The "IP Configuration" section is highlighted with a blue header and a close button. It contains two main sections: "IP Configuration" and "IPv6 Configuration". The "IP Configuration" section has radio buttons for "DHCP" and "Static" (selected). Below are input fields for "IPv4 Address" (10.0.0.3), "Subnet Mask" (255.255.255.0), "Default Gateway" (10.0.0.1), and "DNS Server" (127.0.0.1). The "IPv6 Configuration" section has radio buttons for "Automatic" and "Static" (selected). Below are input fields for "IPv6 Address" (empty), "Link Local Address" (FE80::2E0:F7FF:FE29:7B6C), "Default Gateway" (empty), and "DNS Server" (empty). The "802.1X" section has a checkbox for "Use 802.1X Security" (unchecked), a dropdown for "Authentication" (MD5), and input fields for "Username" and "Password". A "Top" button is at the bottom left. A "Time(se" label is visible on the right edge of the window.

Server0

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 10.0.0.3

Subnet Mask 255.255.255.0

Default Gateway 10.0.0.1

DNS Server 127.0.0.1

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::2E0:F7FF:FE29:7B6C

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

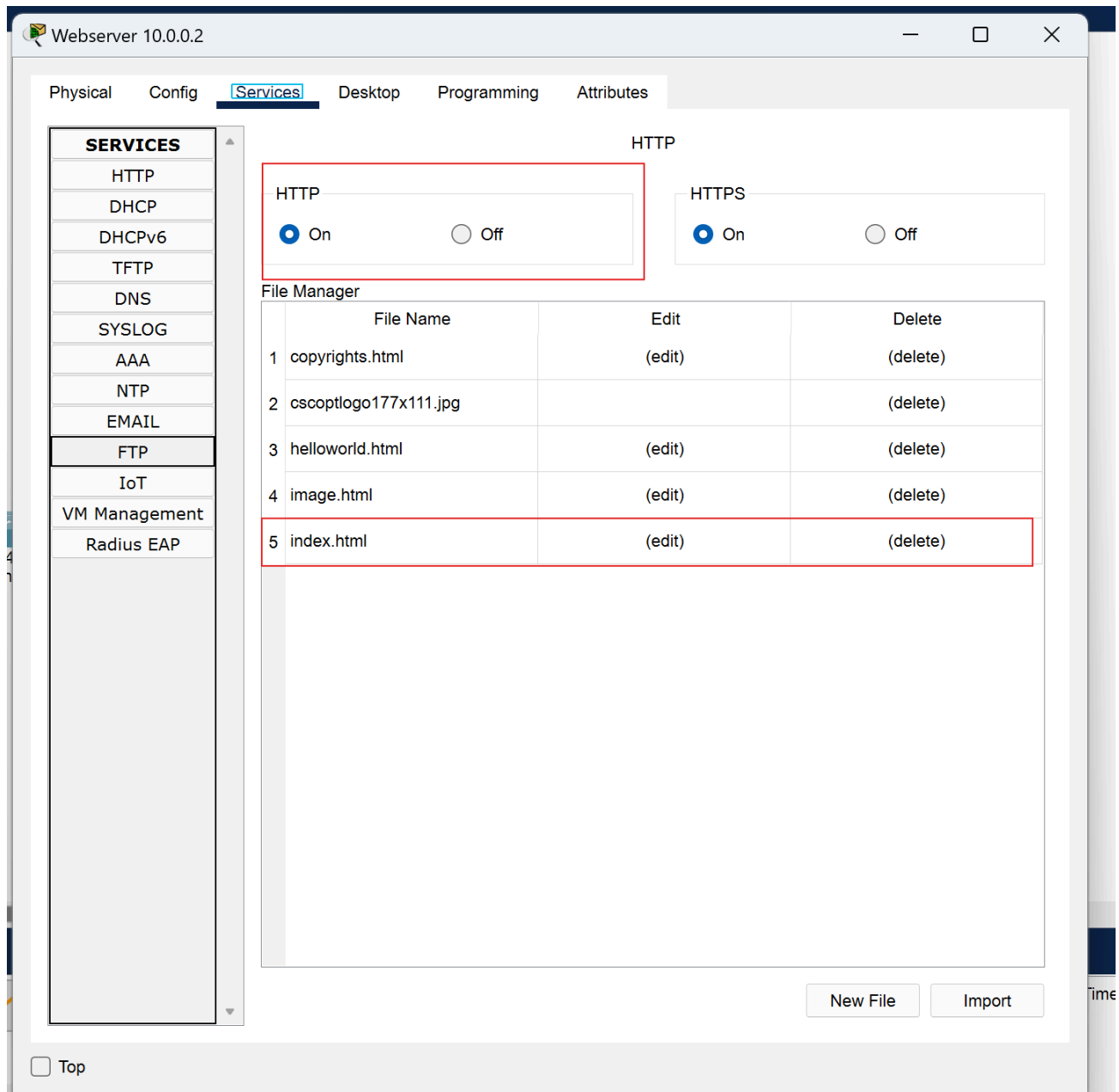
Username

Password

Top

Time(se

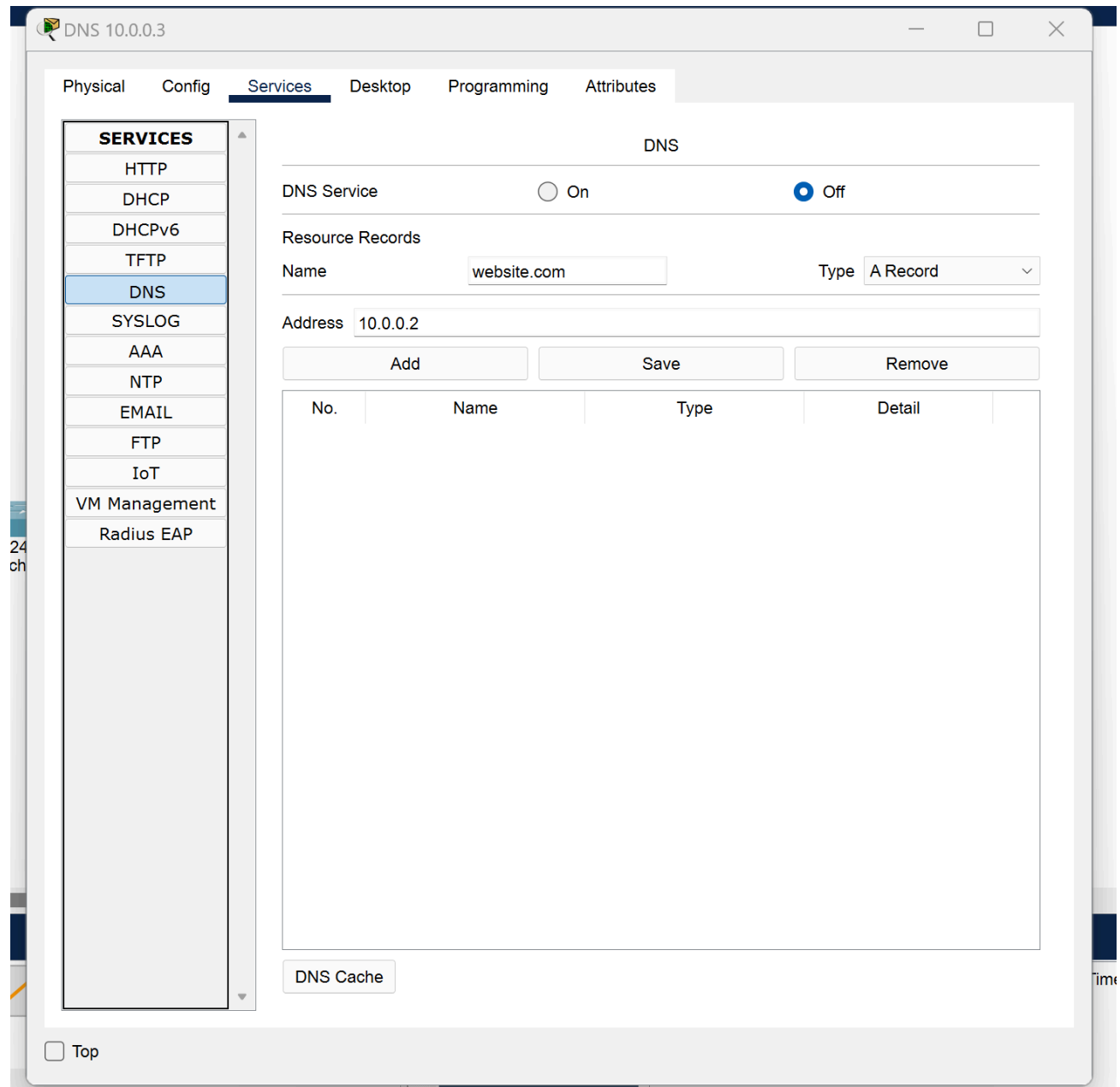
3. Open your webserver. This step is super simple, as we are not changing any of the code. In services, make sure it looks like the following



As long as your HTTP is on, which should be on by default, and you have a index.html file, you are great! In the case of wanting to edit the default website, you would press edit on the index.html file. From there, using HTML language, you could code a better website!

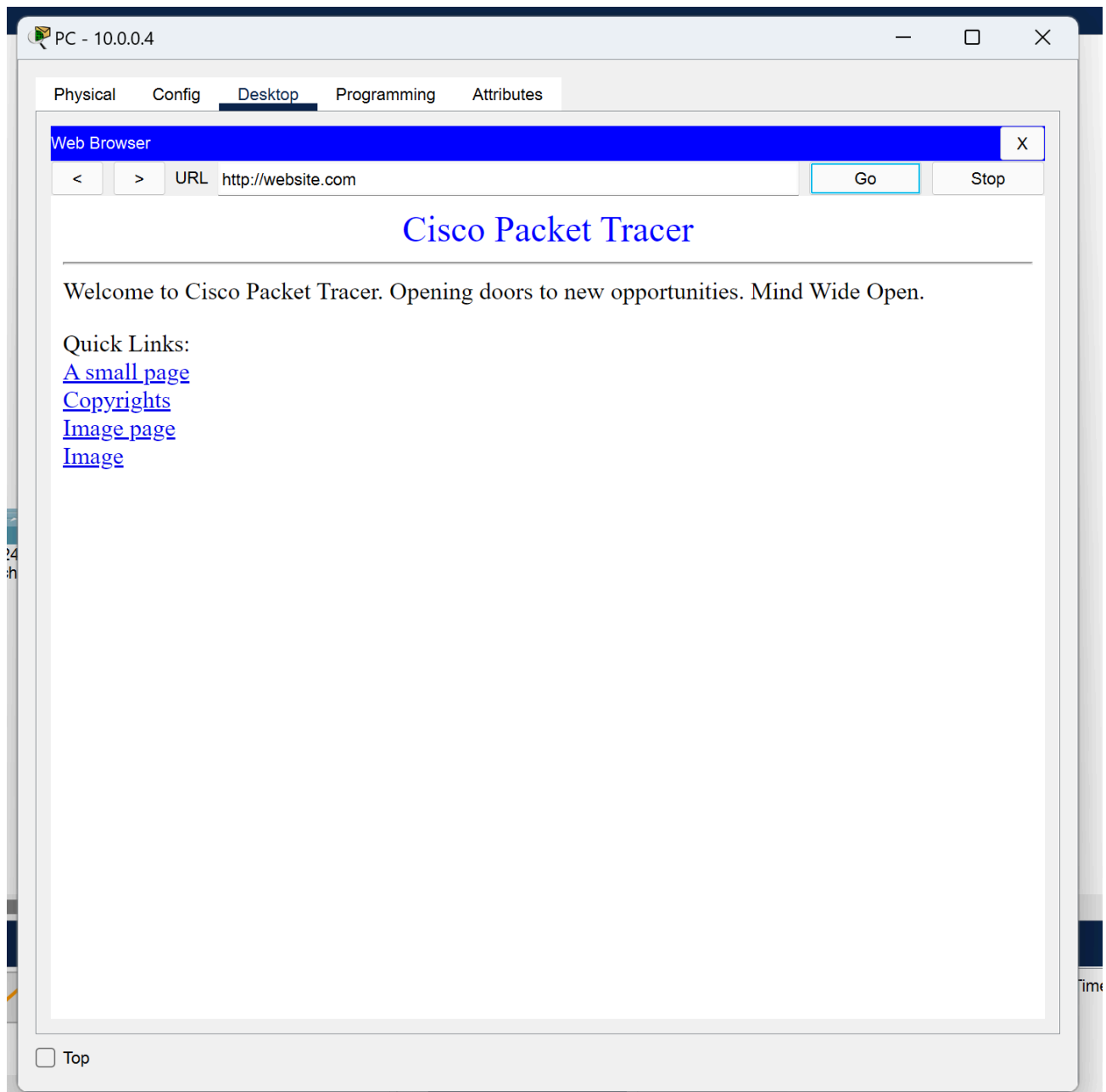
4. Create a DNS server. Open up your DNS and go into services. From there add a name. For this example, I used website.com. Then add the IP address of your webserver - 10.0.0.2. Finally press 'Add' and then press 'Save'. Make sure you press 'On' on your DNS

service.



5. Check to see if DNS is working by going into PC > Web browser > Search "website.com" the following should appear:





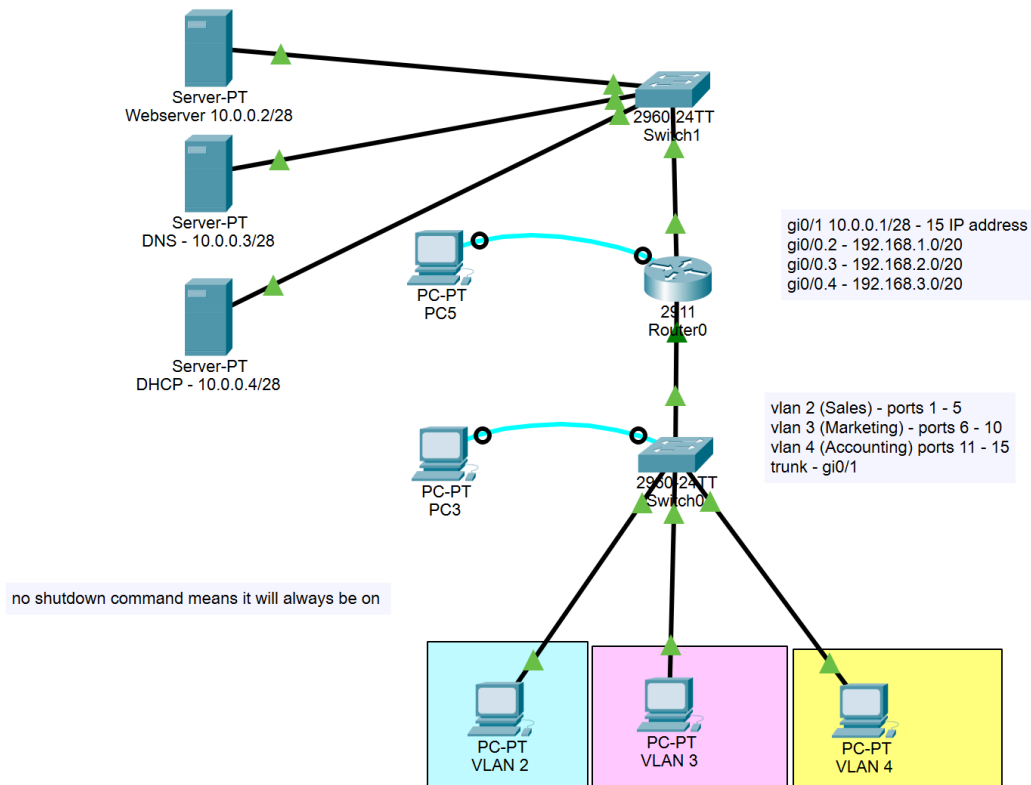
Congratulations! You just made a working DNS Server!

## **| Making your Network Suited For your Needs**

DHCP and DNS is the beginning of a great network! Different VLANs can separate one network into mini networks that provide better security as well, as reduce network traffic and make administration easier. DHCP assigns an IP address from the corresponding pool in order to put device in correct VLAN. This is more than useful, as in business companies, it will isolate each department. For example, have Sales in VLAN 2, Marketing in VLAN 3, and Accounting in VLAN 4. This adds an extra layer of security. In the event of Sales getting a virus, the virus cannot also infect Marketing and Accounting. This is even more important in businesses with customers connecting to WI-FI. Coffee shops have different VLANs for cash registers,

employees, and customers. This means that customers cannot monitor traffic in the cash register VLAN. Credit card information is more secure because of separate VLANs.

The topology below is a good example of a network of a business. It is important to understand that in each colored box (each VLAN) hundreds of computers and devices can reside.



The lab I did above perfectly shows a common network today. This lab shows two main network segment technologies. These components are all very important to be able to segment, organize, and manage network traffic. Without these components VLANs wouldn't work the same way they do today.

## dot1Q

dot1Q is the networking standard that supports VLANs on ethernet networks. This allows you to manage VLANs and create network segments. dot1Q also allows you create "trunked ports", a port that allows you to send data for multiple VLANs through one switch. This is quite important as it prevents your topology needing 3 DHCP servers, 3 DNS servers, 3 switch's, etc. dot1Q is the reason networking closets aren't triple the size! dot1Q also increases security of data being sent through as it encapsulates everything.

## Encapsulation

Encapsulation is the networking process of packaging data as it moves through the network. In the terms of a VLAN, it tags frames with the proper VLAN information so data being sent through Sales wouldn't be seen in Marketing. The tag that gets added allows switches and

routers to recognize the tag and keep traffic separated on proper VLANs. This encapsulation is super important, as without VLANs, it would be useless. Encapsulation is a main reason that VLANs remain separated.

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## **| Conclusion**

Hopefully, you learned a bit more about networks. It's very important that networks use VLANs, DHCP, and even DNS. Hopefully, you understand why network configuration is so important. I hope you enjoyed my guide of Networking from a business standpoint. For any questions, you may email at

`rachelarnold2007@gmail.com`

Thank you for reading!

## **| Download Link**

Need to download Cisco Packet Tracer, click the link below:

<https://www.netacad.com/courses/getting-started-cisco-packet-tracer?courseLang=en-US>