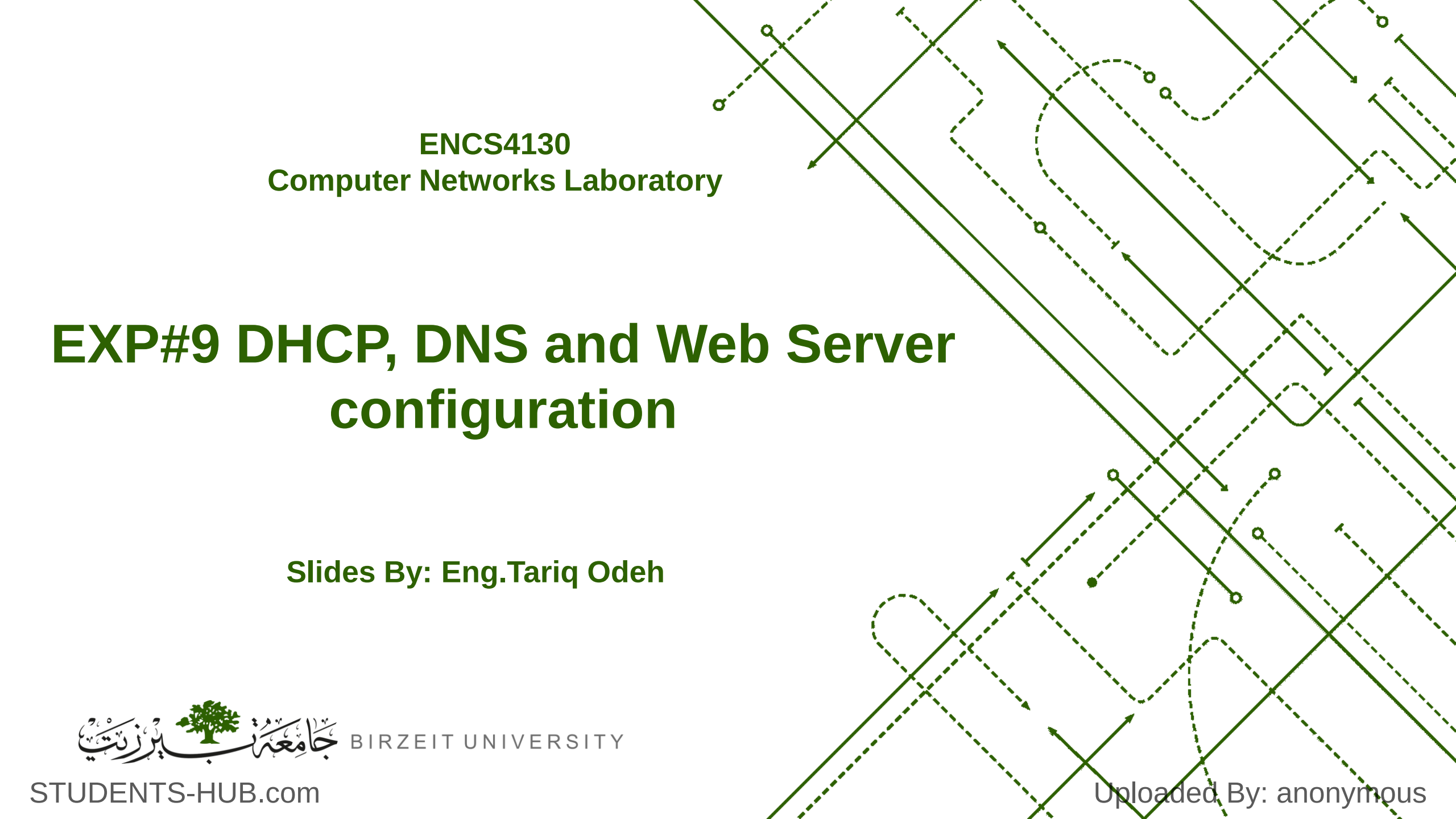
ENCS4130
Computer Networks Laboratory

EXP#9 DHCP, DNS and Web Server configuration

Slides By: Eng.Tariq Odeh



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Objectives

- Learn how to configure DHCP server using Cisco IOS command-line Interface (CLI).
- Learn how to configure DNS server.
- Learn how to configure Web server.

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Introduction

- **DHCP (Dynamic Host Configuration Protocol):**
  - Automates IP address assignment, enabling devices to connect to network services like DNS and NTP.
- **DNS (Domain Name System):**
  - Translates domain names (e.g., example.com) into IP addresses for easy access to online resources.
- **Web Server:**
  - Delivers web content via HTTP/HTTPS, responding to browser requests.
- **Objective:**
  - Configure DHCP, DNS, and a Web Server using Cisco Packet Tracer to understand their setup and functionality.

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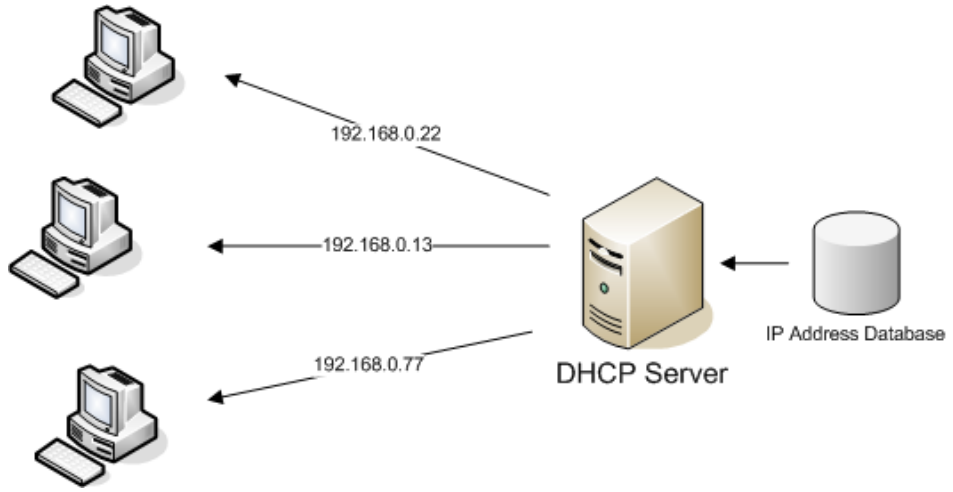
What is DHCP?

Dynamic Host Configuration Protocol (DHCP):

- Automates IP address assignment to network devices (hosts) such as computers, tablets, and mobile phones.
- Eliminates manual IP configuration, simplifying network setup.
- Assigns essential network parameters like:
  - IP Address
  - DNS Server
  - Subnet Mask
  - Default Gateway



- Automatically updates IP addresses when devices change locations on the network.

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How Does DHCP Work?

4-Step DHCP Process (DORA):

1. **DHCP Discover:**
   - Client broadcasts a request (DHCP Discover) to find a DHCP server using IP 255.255.255.255.
2. **DHCP Offer:**
   - Server responds with an IP address offer (DHCP Offer), including lease time and network info.
3. **DHCP Request:**
   - Client accepts the offer and requests to lease the IP address (DHCP Request).
4. **DHCP Acknowledgment (ACK):**
   - Server confirms (DHCP ACK), finalizing the IP address assignment.

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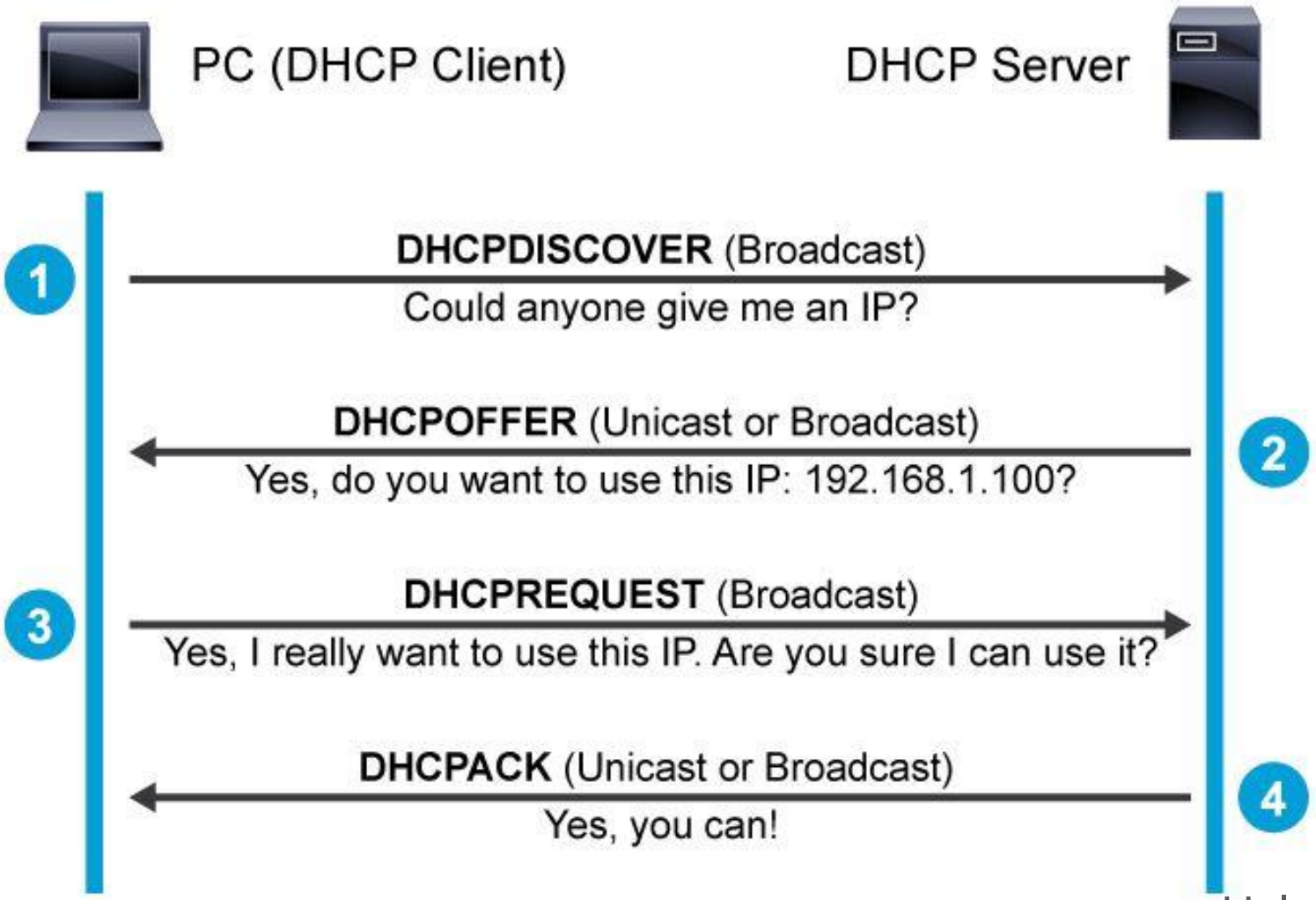
How Does DHCP Work?



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Benefits of Using DHCP

- **Simplifies Network Management:**
  - Reduces manual configuration, lowering admin workload.
- **Efficient IP Utilization:**
  - Reuses IP addresses dynamically, minimizing total IP address requirements.
- **Flexible Changes:**
  - Easily update IP address schemes without disrupting user access.
- **Error Minimization:**
  - Centralized IP management prevents address conflicts and incorrect assignments.

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What is DNS?

- **Domain Name System (DNS):**
  - Translates domain names (e.g., example.com) into IP addresses.
  - Enables browsers to load websites using user-friendly names instead of numeric IP addresses.
  - Acts like the Internet's phonebook, connecting domain names with their respective IP addresses.
- **DNS Server:**
  - A computer with a database of domain names and their corresponding IP addresses.
  - Finds the correct IP address when users enter a domain name in their browser.

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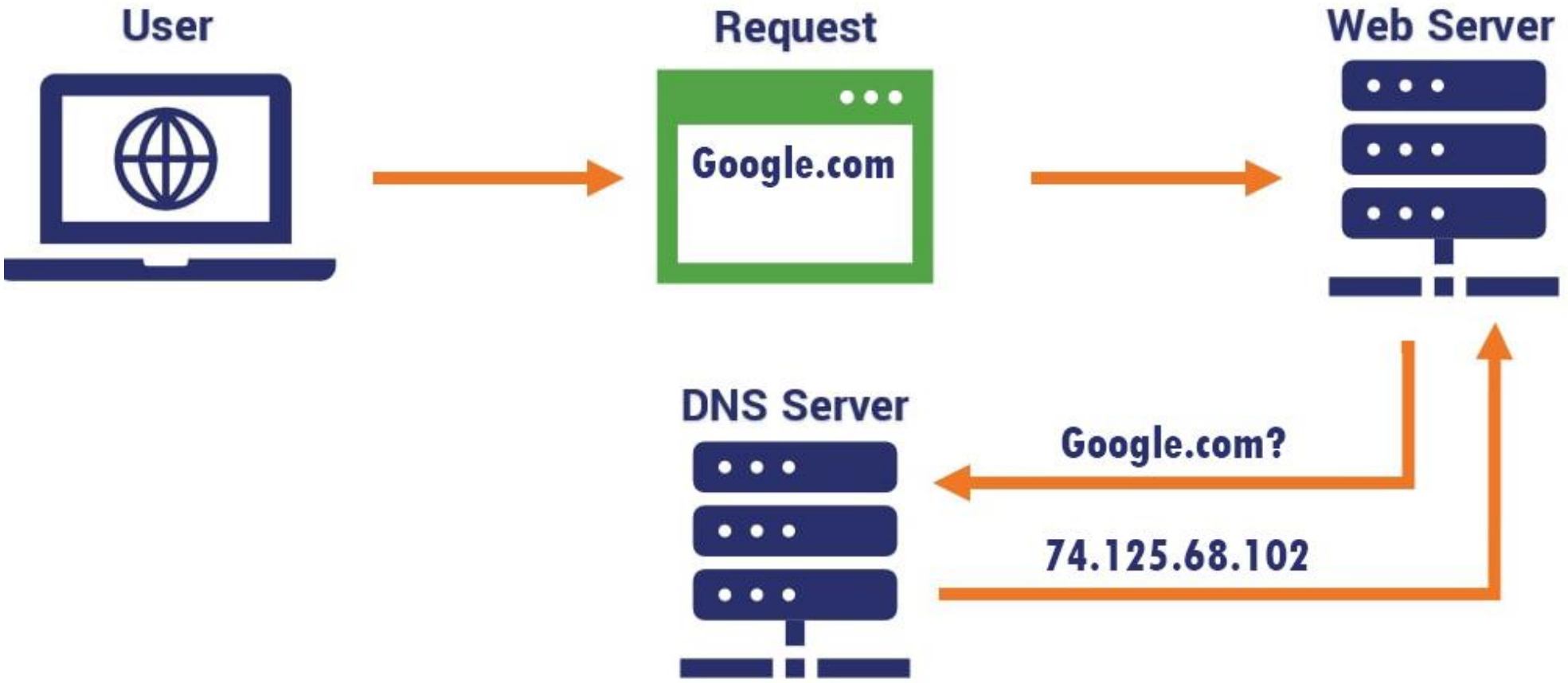
What is DNS?


User
Request
Google.com
Web Server
DNS Server
Google.com?
74.125.68.102

Distributed, Hierarchical DNS Structure

- **DNS is organized in a hierarchical and distributed system with three main server types:**

1. Root DNS Servers:
   - The top of the hierarchy; directs queries to TLD servers.
2. Top-Level Domain (TLD) Servers:
   - Manages domains like .com, .org, .edu, and country codes like .uk, .jp.
   - Directs queries to Authoritative DNS servers.
3. Authoritative DNS Servers:
   - Provides the final IP address for a given domain name.
   - Maintained by organizations for their public web services.

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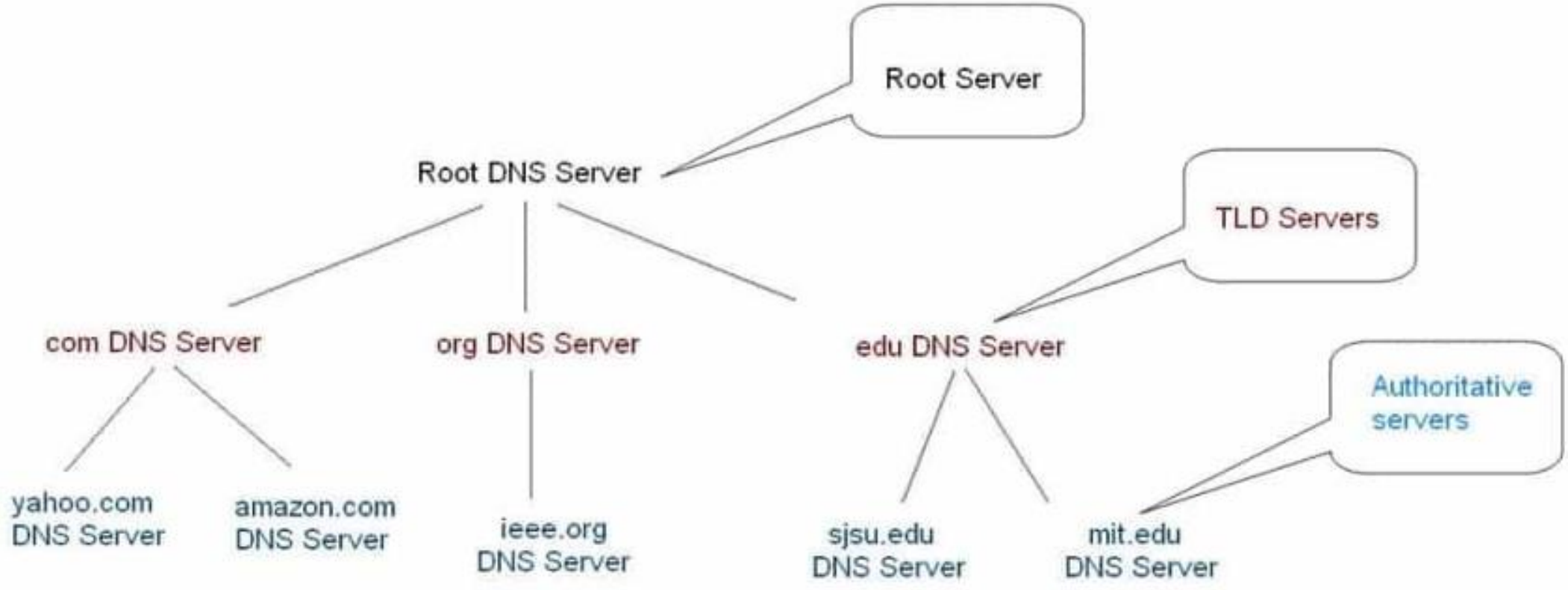
Distributed, Hierarchical DNS Structure (Cont.)



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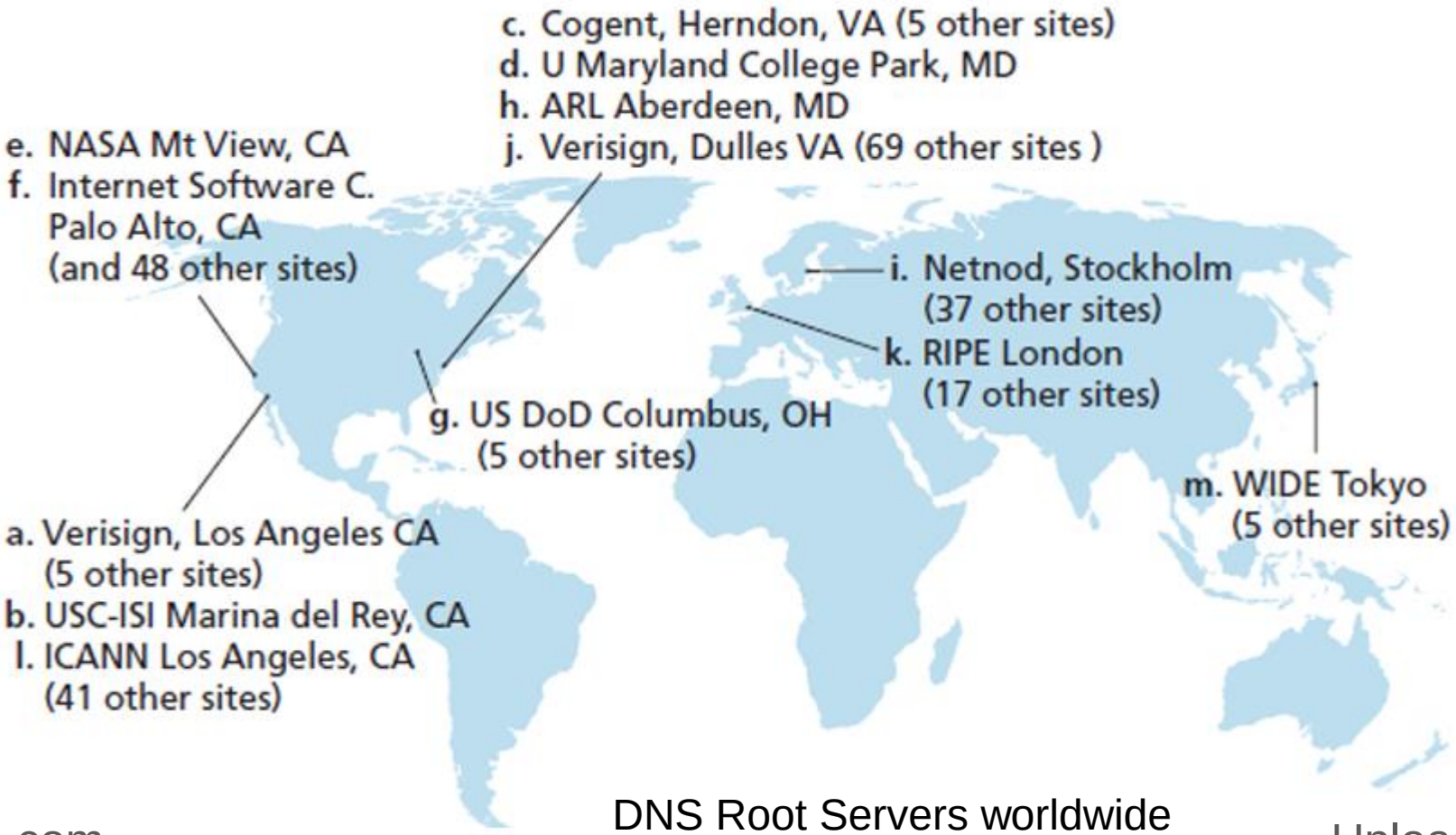
Distributed, Hierarchical DNS Structure (Cont.)



DNS Root Servers worldwide

How DNS Works?

- **Step-by-Step DNS Resolution Process:**
  1. **User Request:** User's browser sends a DNS query to the local DNS server (e.g., ISP's DNS).
  2. **Local Cache Check:** If found, the local DNS replies; otherwise, it queries the Root DNS server.
  3. **Root DNS Response:** Provides the address of the relevant TLD server (e.g., .com).
  4. **TLD Query:** Local DNS queries the TLD server for the domain's IP address.
  5. **TLD Response:** TLD server provides the Authoritative DNS server's address.
  6. **Authoritative DNS Query:** Local DNS queries the Authoritative DNS server.
  7. **Final IP Address:** The Authoritative DNS server replies with the IP address of the domain.
  8. **Resolution Complete:** The local DNS sends the IP address to the user's computer, enabling the browser to access the website.

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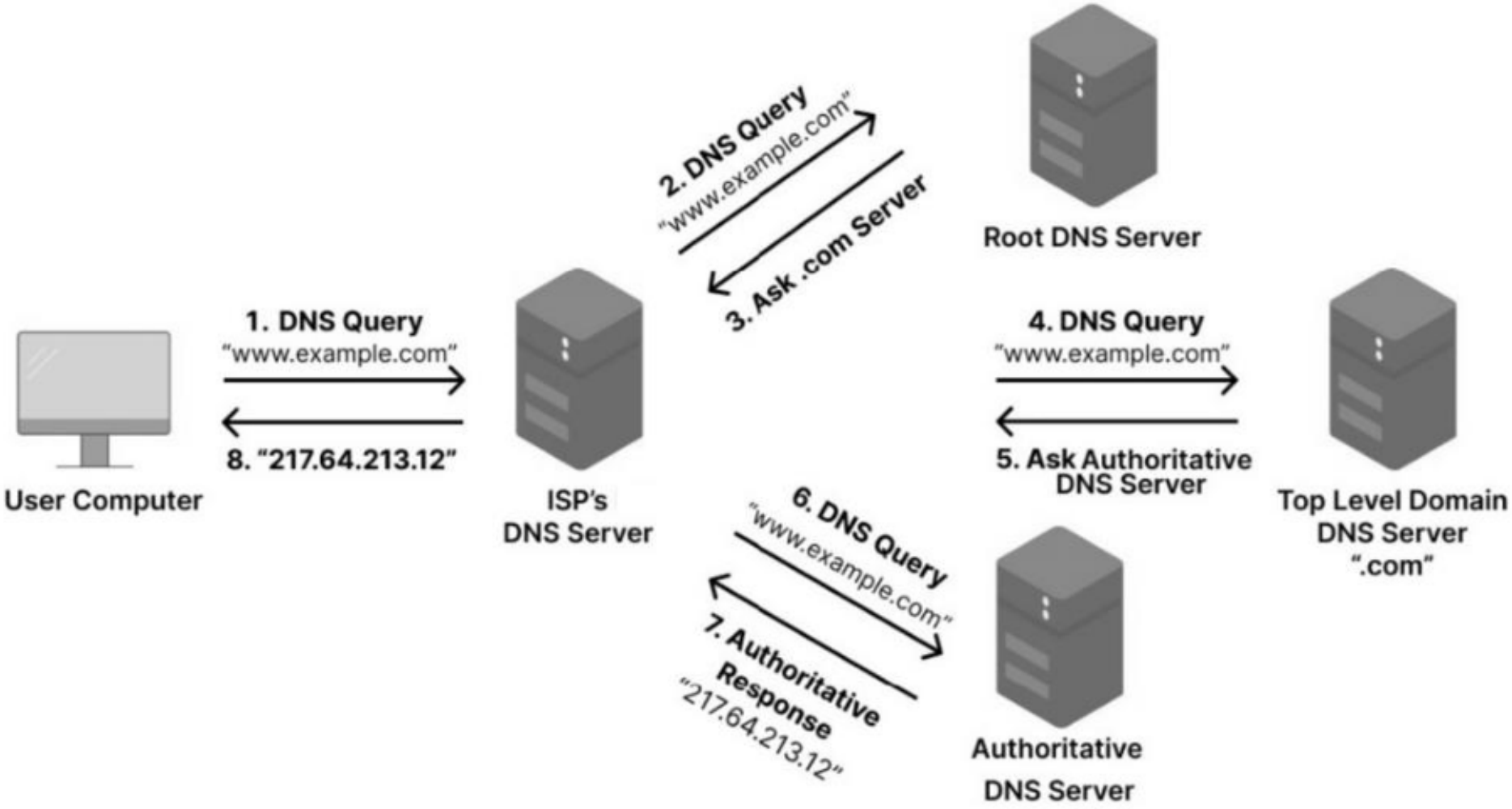
How DNS Works?



What is a Web Server?

- A web server is both software and hardware that delivers web content to users via HTTP (Hypertext Transfer Protocol).
- Its primary role is to store, process, and serve web pages to client browsers.
- **Supports additional protocols like:**
  - SMTP (Simple Mail Transfer Protocol) for email.
  - FTP (File Transfer Protocol) for file transfers.
- **Usage:**
  - Hosts data for websites and web applications, making them accessible over the internet.

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Web Client-Server Interaction

1. **Browser Request:** User enters a web address (e.g., http://www.example.com).
2. **DNS Resolution:** The DNS server translates the domain name to an IP address.
3. **HTTP Request:** Browser sends an HTTP request to the server at the resolved IP address.
4. **ISP Routing:** The request is sent through the Internet Service Provider (ISP) to reach the server.
5. **Server Response:**
   - The server processes the request and generates an HTTP response.
   - The response is sent back through the ISP to the user's browser.
6. **Page Display:** The browser receives the HTTP response and displays the web page content.

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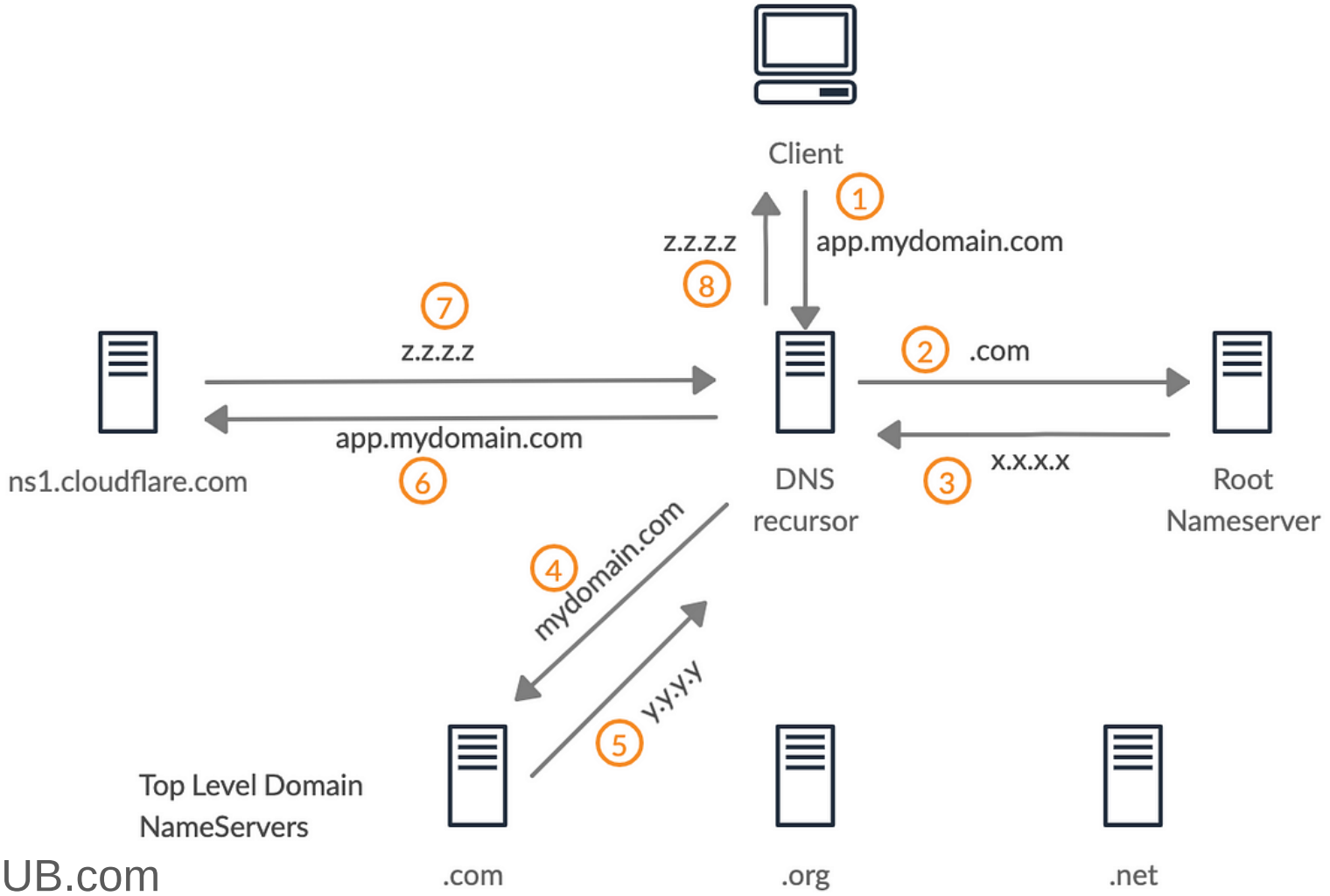
Web Client-Server Interaction (Cont.)



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Key Functions of a Web Server

- **Main Functions:**
  - **Content Storage:** Hosts website files (HTML, CSS, JavaScript, images).
  - **Request Handling:** Interprets and processes client HTTP requests.
  - **Response Delivery:** Sends back the requested webpage or resource to the client.
  - **Support for Multiple Protocols:**
    - HTTP/HTTPS for web content.
    - SMTP for emails.
    - FTP for file storage and transfers.
- **Benefits of Web Servers:**
  - Efficiently delivers web content to users.
  - Provides a platform for hosting web applications and services.

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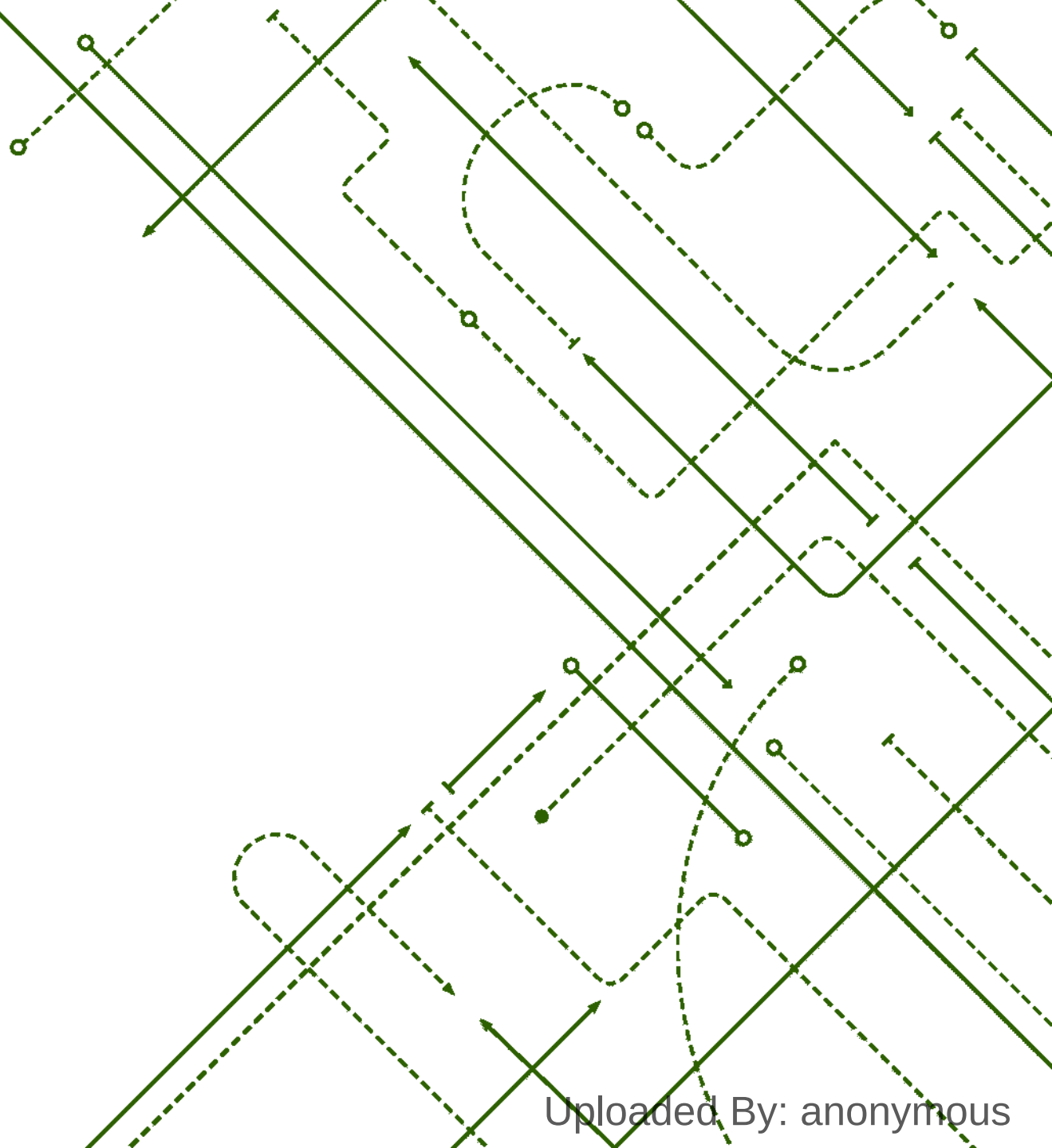
Procedure



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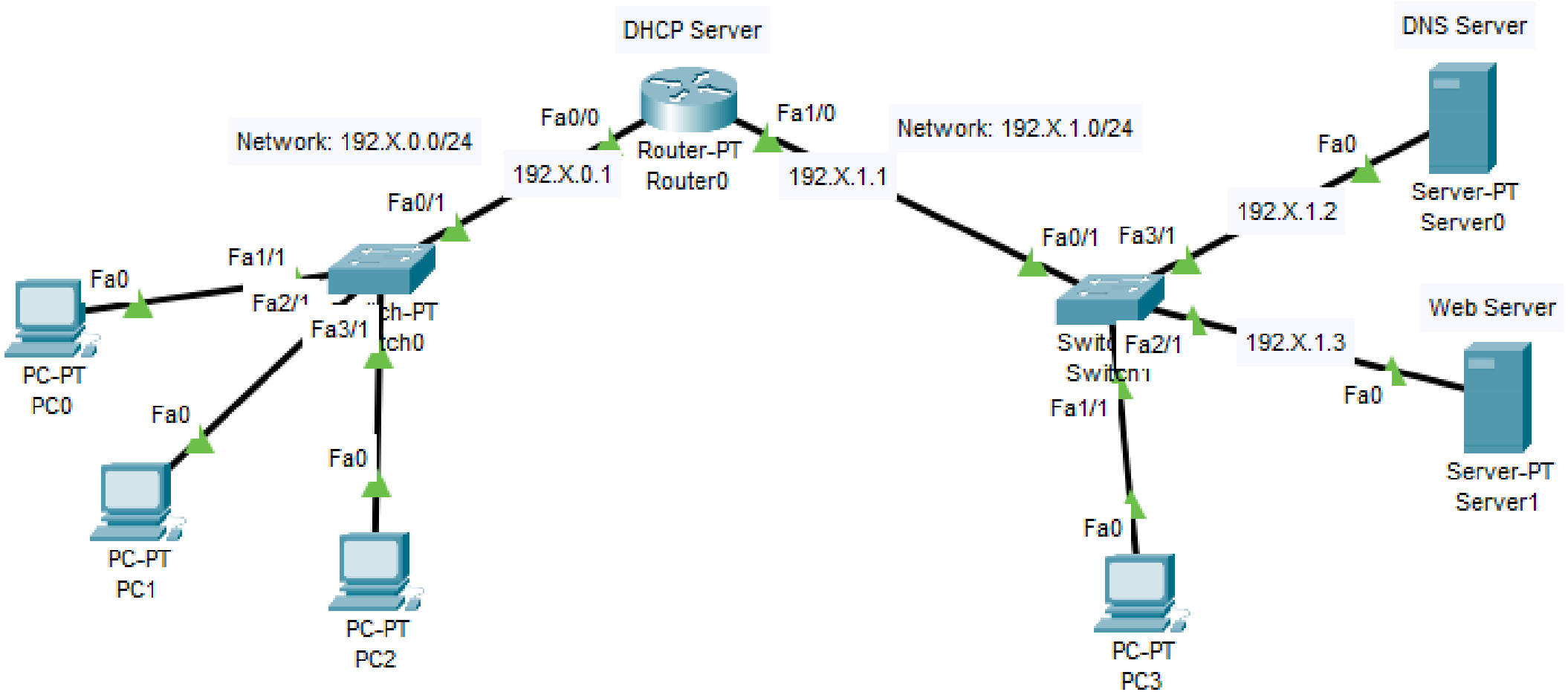
Topology



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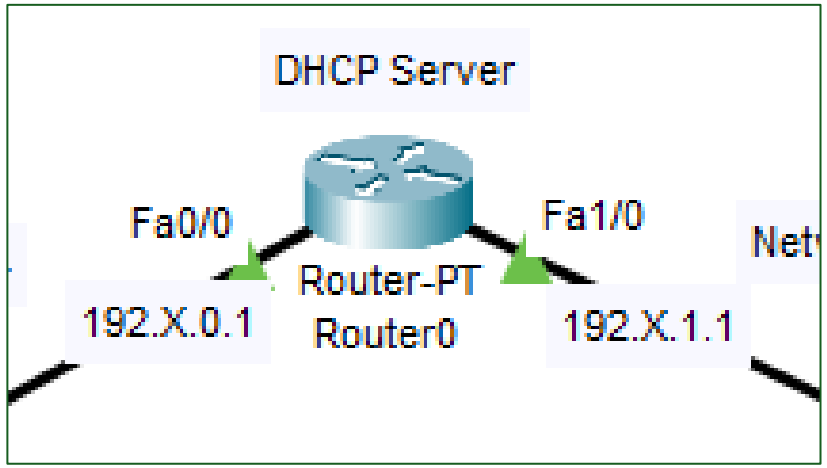
Step 1: Configuring Static IPs

A. DHCP Server (Router0) Fa0/0

- Router(config)# interface fa0/0
- Router(config-if)# ip address 192.X.0.1 255.255.255.0
- Router(config-if)# no shutdown
-



B. DHCP Server (Router0) Fa1/0

- Router(config)# interface fa1/0
- Router(config-if)# ip address 192.X.1.1 255.255.255.0
- Router(config-if)# no shutdown

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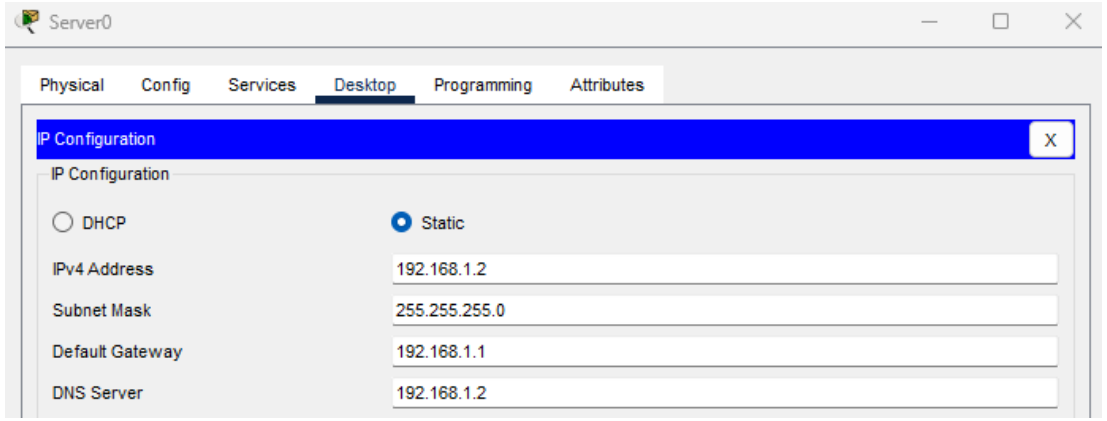
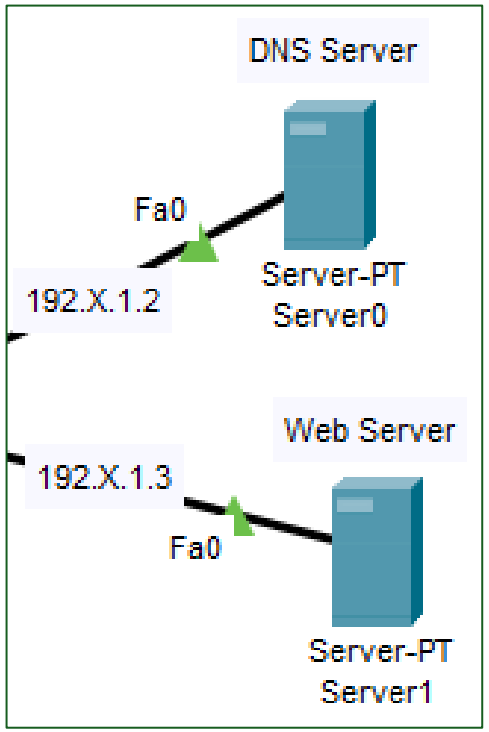
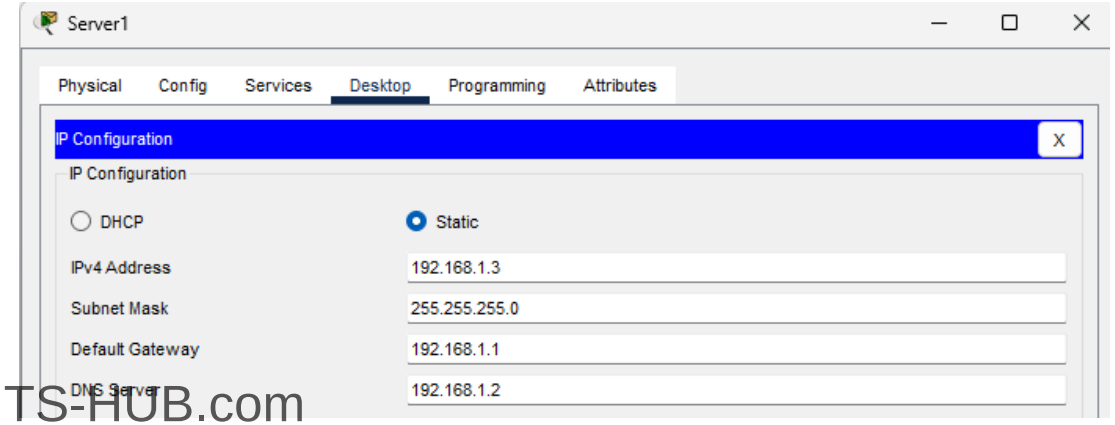
Step 1: Configuring Static IPs (Cont.)

C. DNS Server





D. Web Server



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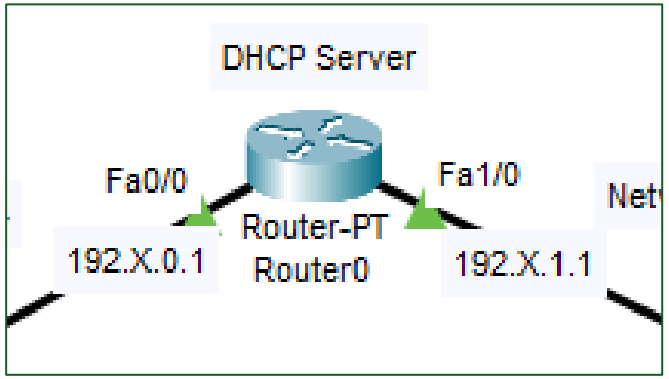
Step 2: Configuring DHCP on the Router0

A. Configure DHCP for Network 192.X.1.0/24

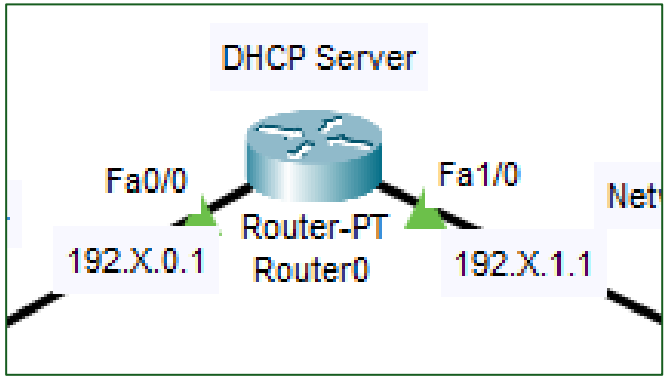
- **Exclude Reserved IP Addresses in Network**
  - Router(config)# ip dhcp excluded-address 192.X.1.1 192. X.1.10
- **DHCP Pool for Network**
  - Router(config)# ip dhcp pool LAN1
  - Router(dhcp-config)# network 192. X.1.0 255.255.255.0
  - Router(dhcp-config)# default-router 192. X.1.1
  - Router(dhcp-config)# dns-server 192. X.1.2
  - Router(dhcp-config)# exit



Step 2: Configuring DHCP on the Router0 (Cont.)

B. Configure DHCP for Network 192.X.0.0/24

- **Exclude Reserved IP Addresses in Network**
  - Router(config)# ip dhcp excluded-address 192.X.0.1 192. X.0.10
- **DHCP Pool for Network**
  - Router(config)# ip dhcp pool LAN0
  - Router(dhcp-config)# network 192. X.0.0 255.255.255.0
  - Router(dhcp-config)# default-router 192. X.0.1
  - Router(dhcp-config)# dns-server 192. X.1.2
  - Router(dhcp-config)# exit



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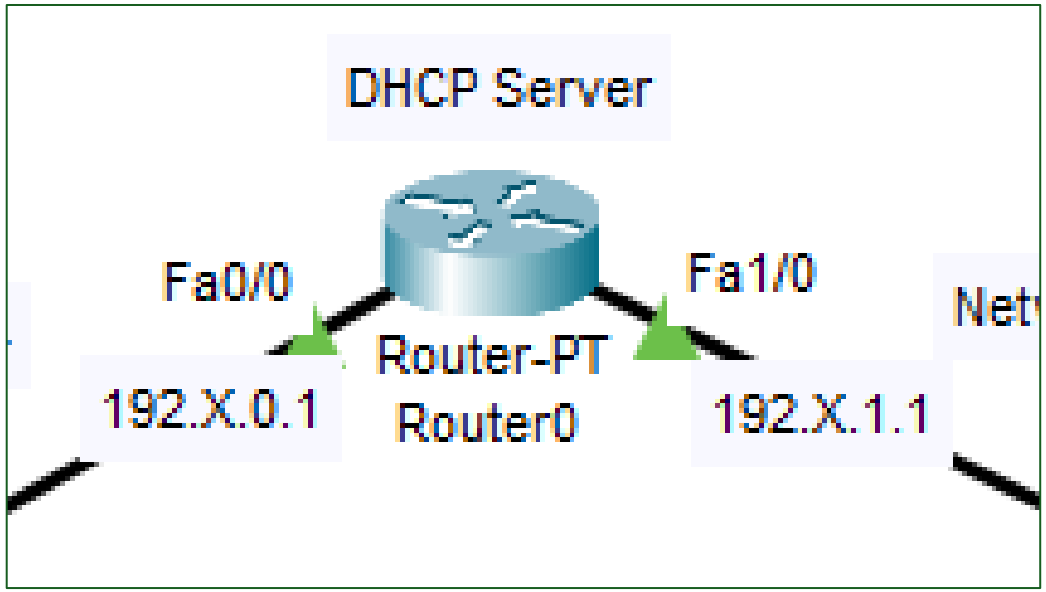
Step 2: Configuring DHCP on the Router0 (Cont.)

C. Activate DHCP on the router

- **Router(config)# service dhcp**



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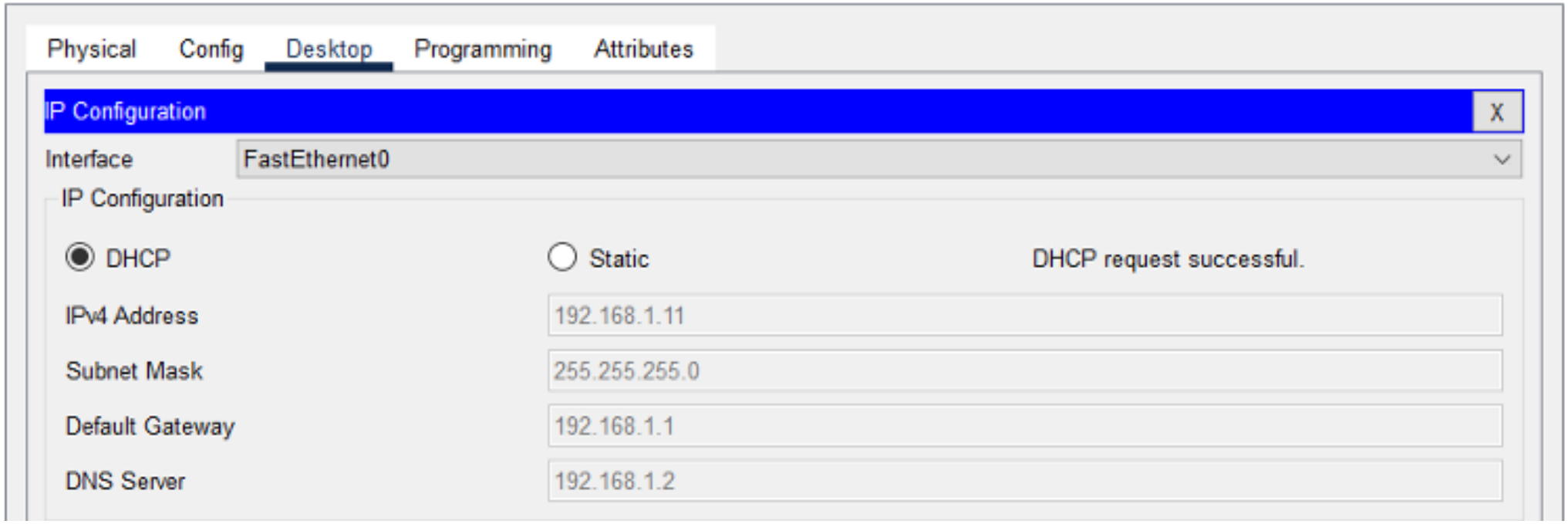
Step 3: Configuring DHCP on the PCs



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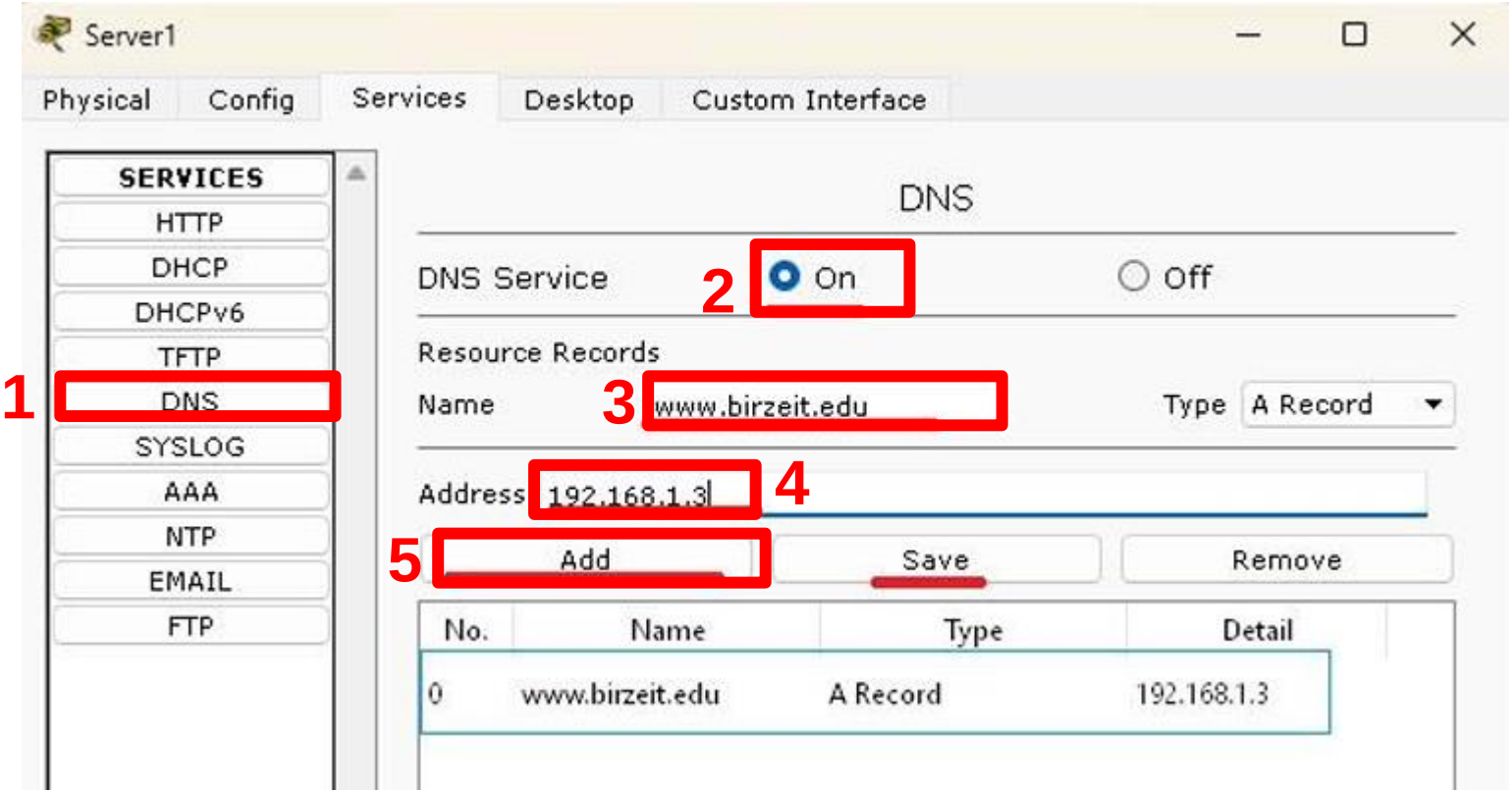
Step 4: Configuring DNS Server

A. Enable DNS on Server0 and adding entries to DNS Table



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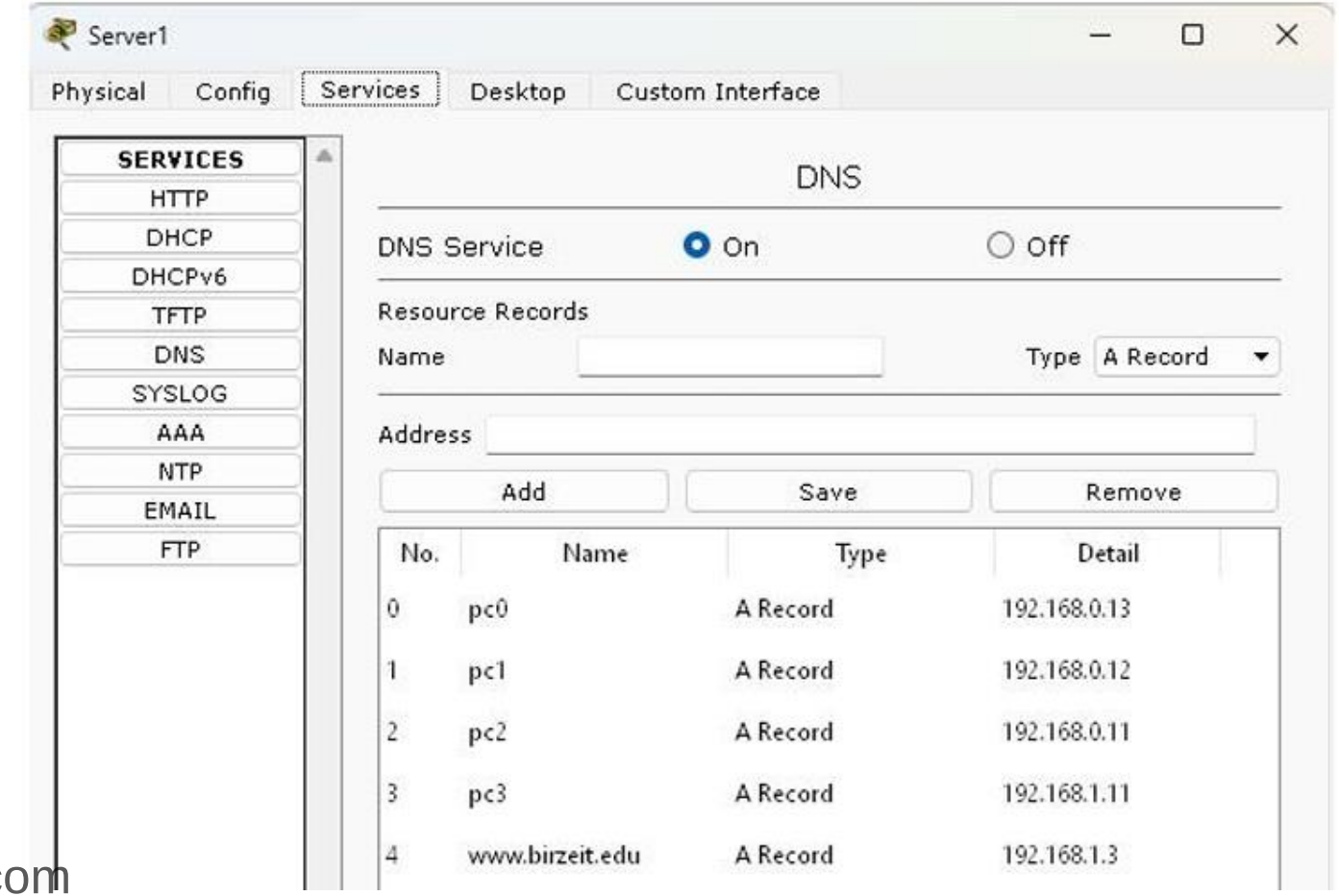
Step 4: Configuring DNS Server (Cont.)

B. Adding records to all PCs to the DNS table



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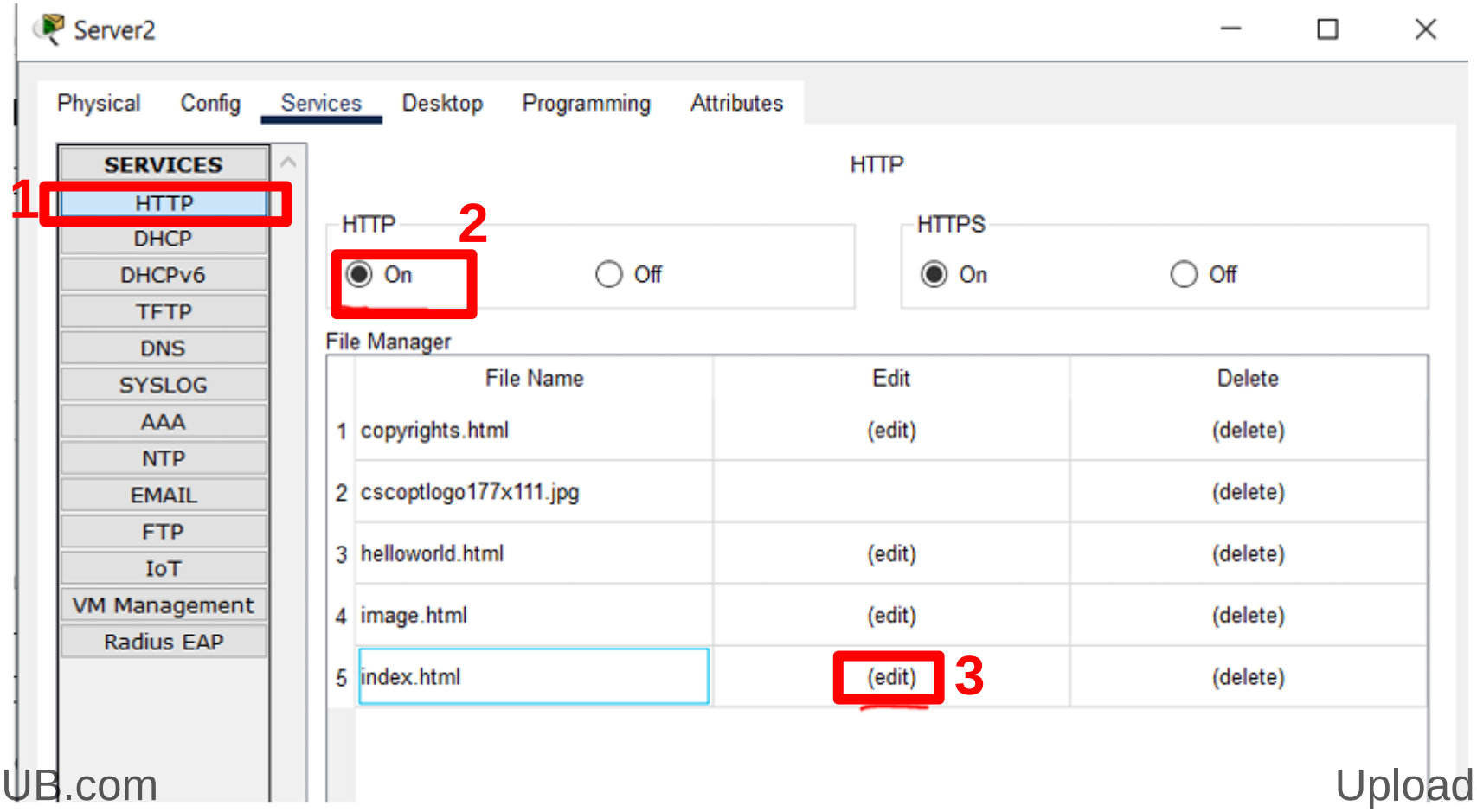
Step 4: Configuring Web Server

A. Enable HTTP Service and Upload a Webpage



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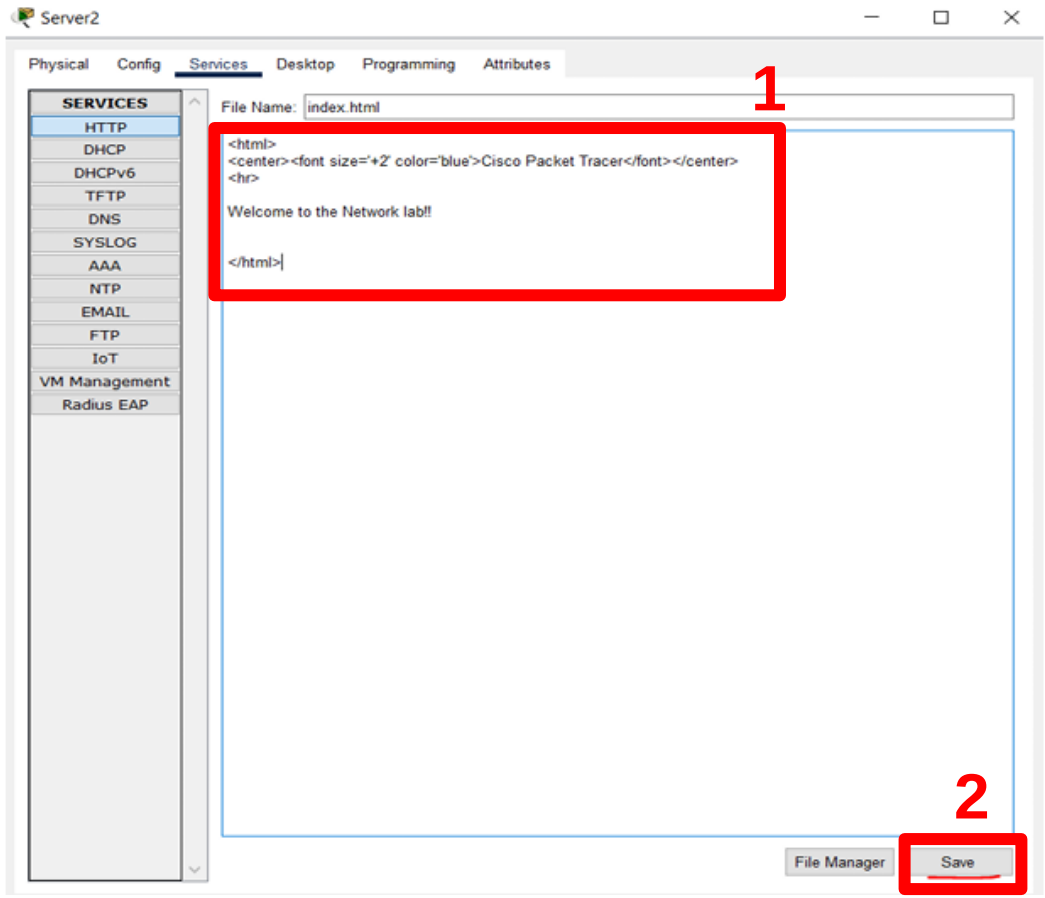
Step 4: Configuring Web Server (Cont.)

B. Update a Webpage



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Step 5: Testing

A. DHCP Testing:

- PC0, PC1, PC2, and PC3, verify that they receive dynamic IP addresses

B. DNS Testing:

- Pinging PCs by their IP's
- Pinging PCs by their domain names

C. Web Server Testing:

- Web Server Testing by IP (**http://192.X.1.3**)
- Web Server Testing by domain name (**http://www.birzeit.edu**)

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Saving Configurations

- **Don't forget to save the configurations on your router.**

  → **Router# write**

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Video explaining the experiment

--Soon--

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References

- **Manual for ENCS4130 Computer Networks Laboratory.**

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