Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| ISP | G0/0/0 | 88.165.100.225 | 255.255.255.252 | N/A |
|  | G0/0/1 | 209.165.100.1 | 255.255.255.0 | N/A |
|  | G0/0/2 | 209.165.200.1 | 255.255.255.0 | N/A |
| HQ | G0/0/0 | 192.168.2.1 | 255.255.255.252 | N/A |
| *R1* | G0/0/1 | 192.168.3.1 | 255.255.255.252 | N/A |
|  | G0/0/2 | DHCP | DHCP | DHCP |
|  | G0/1/0 | LAN port 1 | N/A | N/A |
|  | VLAN 1 | 192.168.1.1 | 255.255.255.0 | N/A |
| Branch 1 | G0/0/0 | 192.168.2.2 | 255.255.255.252 | *N/*N/A |
|  | G0/0/1.10 | 172.16.10.1 | 255.255.255.0 | N/A |
| *R1* | G0/0/1.20 | 172.16.20.1 | 255.255.255.0 | N/A |
| Branch2 | G0/0/0 | 192.168.3.2 | 255.255.255.252 | N/A |
| *R1* | G0/0/1 | 10.10.10.1 | 255.255.255.0 | N/A |
| Wireless Router | Internet | DHCP | DHCP | DHCP |
| *R1* | LAN | 192.168.0.1 | 255.255.255.0 | N/A |
| Student PC | NIC – FA0/10 | DHCP | DHCP | DHCP |
| Teacher PC | NIC – FA0/20 | DHCP | DHCP | DHCP |
| DHCP Server | NIC | 192.168.1.254 | 255.255.255.0 | 192.168.1.1 |
| HTTP Server | NIC | 209.165.100.254 | 255.255.255.0 | 209.165.100.1 |
| DNS Server | NIC | 209.165.200.254 | 255.255.255.0 | 209.165.200.1 |
| Laptop0 | Wireless | DHCP | DHCP | DHCP |
| S0 | G0/1 Trunk |  |  |  |
|  | Fa0/10 VLAN 10 |  |  |  |
|  | Fa0/20 VLAN 20 |  |  |  |

**Step 1 Configure IP addresses**

Follow the Addressing table and assign IP addresses and masks as shown **for all interfaces and devices that are not using DHCP.**

**If you're unsure about the interface name, you can use the show ip interface brief command to list all available interfaces and their statuses. This will help you identify the correct interface to configure.**

**Always use command for saving your configuration, copy running-config startup-config, for everything you do. I didn’t write it everywhere but its important. And save your progress in Packet Tracer every 15-20 minutes in case it decides to die on you.**

**I think that DNS - DHCP – HTTP (WEB) SERVERS have graphical interface for assigning these addresses, so check that first when doing this on those devices.**

###### ISP

ISP> en

ISP# conf t

ISP(config)# int G0/0/0

ISP(config-if)# ip address 88.165.100.225 255.255.255.252

ISP(config-if)# no shut

ISP(config-if)# exit

ISP(config)# int G0/0/1

ISP(config-if)# ip address 209.165.100.1 255.255.255.0

ISP(config-if)# no shut

ISP(config-if)# exit

ISP(config)# int G0/0/2

ISP(config-if)# ip address 209.165.200.1 255.255.255.0

ISP(config-if)# no shut

ISP(config-if)# exit

**HQ**

HQ> en

HQ# conf t

HQ(config)# int G0/0/0

HQ(config-if)# ip address 192.168.2.1 255.255.255.252

HQ(config-if)# no shut

HQ(config-if)# exit

HQ(config)# int G0/0/1

HQ(config-if)# ip address 192.168.3.1 255.255.255.252

HQ(config-if)# no shut

HQ(config-if)# exit

HQ(config)# int VLAN 1

HQ(config-if)# ip address 192.168.1.1 255.255.255.0

HQ(config-if)# no shut

HQ(config-if)# exit

**Branch 1**

Branch1> en

Branch1# conf t

Branch1(config)# int G0/0/0

Branch1(config-if)# ip address 192.168.2.2 255.255.255.252

Branch1(config-if)# no shut

Branch1(config-if)# exit

Branch1(config)# int G0/0/1.10

Branch1(config-subif)# encapsulation dot1Q 10

Branch1(config-subif)# ip address 172.16.10.1 255.255.255.0

Branch1(config-subif)# exit

Branch1(config)# int G0/0/1.20

Branch1(config-subif)# encapsulation dot1Q 20

Branch1(config-subif)# ip address 172.16.20.1 255.255.255.0

Branch1(config-subif)# exit

Branch1(config)# exit

**Branch 2**

Branch2> en

Branch2# conf t

Branch2(config)# int G0/0/0

Branch2(config-if)# ip address 192.168.3.2 255.255.255.252

Branch2(config-if)# no shut

Branch2(config-if)# exit

Branch2(config)# int G0/0/1

Branch2(config-if)# ip address 10.10.10.1 255.255.255.0

Branch2(config-if)# no shut

Branch2(config-if)# exit

Branch2(config)# exit

**Wireless Router**

WirelessRouter> en

WirelessRouter# conf t

WirelessRouter(config)# int LAN **(Replace LAN with actual interface name, F0/0 or G0/0…)**

WirelessRouter(config-if)# ip address 192.168.0.1 255.255.255.0

WirelessRouter(config-if)# no shut

WirelessRouter(config-if)# exit

WirelessRouter(config)# end

WirelessRouter#

**I think that devices bellow, DNS - DHCP – HTTP (WEB) SERVERS, have graphical interface for assigning these addresses, so check that first when doing this on those devices.**

**DHCP Server**

DHCPServer> en

DHCPServer# conf t

DHCPServer(config)# int NIC **(Replace NIC with actual interface name, F0/0 or G0/0…)**

DHCPServer(config-if)# ip address 192.168.1.254 255.255.255.0

DHCPServer(config-if)# no shut

DHCPServer(config-if)# exit

DHCPServer(config)# exit

HTTP Server

HTTPServer> en

HTTPServer# conf t

HTTPServer(config)# int NIC **(Replace NIC with actual interface name, F0/0 or G0/0…)**

HTTPServer(config-if)# ip address 209.165.100.254 255.255.255.0

HTTPServer(config-if)# no shut

HTTPServer(config-if)# exit

HTTPServer(config)# exit

##### DNS Server

DNSServer> en

DNSServer# conf t

DNSServer(config)# int NIC **(Replace NIC with actual interface name, F0/0 or G0/0…)**

DNSServer(config-if)# ip address 209.165.200.254 255.255.255.0

DNSServer(config-if)# no shut

DNSServer(config-if)# exit

DNSServer(config)# exit

#### Step 2 Enable RIP version 2 on Branch1, Branch2 and HQ

##### Branch1 Router

Branch1> en

Branch1# conf t

Branch1(config)# router rip

Branch1(config-router)# version 2

Branch1(config-router)# no auto-summary

Branch1(config-router)# network 192.168.2.0

Branch1(config-router)# network 172.16.10.0

Branch1(config-router)# network 172.16.20.0

Branch1(config-router)# passive-interface g0/0/1 **(no routers this way)**

Branch1(config-router)# exit

Branch1(config)# do write

Branch1(config)# exit

**Branch2 Router**

Branch2> en

Branch2# conf t

Branch2(config)# router rip

Branch2(config-router)# version 2

Branch2(config-router)# no auto-summary

Branch2(config-router)# network 192.168.3.0

Branch2(config-router)# network 10.10.10.0

Branch2(config-router)# **no passive-interface here because it connects to wireless router**

(Maybe wireless router will need to be configured wit command for passive interface? I don’t know – not sure – wasn’t asked)

Branch2(config-router)# exit

Branch2(config)# do write

Branch2(config)# exit

HQ Router

HQ> en

HQ# conf t

HQ(config)# **ip route 0.0.0.0 0.0.0.0 g0/0/2 (to the internet – I didn’t see John do this line but just because he didn’t doesn’t mean that it isn’t actually needed. Maybe…)**

HQ(config)# router rip

HQ(config-router)# version 2

HQ(config-router)# no auto-summary

HQ(config-router)# network 192.168.1.0

HQ(config-router)# network 192.168.2.0

HQ(config-router)# network 192.168.3.0

HQ(config-router)#  passive-interface g0/1/0 **(no routers this way)**

HQ(config-router)# **default-information originate**

HQ(config-router)# exit

HQ(config)# do write

HQ(config)# exit

Step 3 Configuring G0/0/1 on Branch1 as a Router-on-a-stick to Switch S0, interface G0/1

Branch1> en

Branch1# conf t

Branch1(config)# int G0/0/1

Branch1(config-if)# no shut

Branch1(config-if)# exit

Branch1(config)# int G0/0/1.10

Branch1(config-subif)# encapsulation dot1Q 10

Branch1(config-subif)# ip address 172.16.10.1 255.255.255.0

Branch1(config-subif)# exit

Branch1(config)# int G0/0/1.20

Branch1(config-subif)# encapsulation dot1Q 20 native

Branch1(config-subif)# ip address 172.16.20.1 255.255.255.0

Branch1(config-subif)# exit

Branch1(config)# int G0/0/1

Branch1(config)# no shut

#### Step 4 Configuring S0 ports for VLAN 10, VLAN 20

S0> en

S0# conf t

S0(config)# vlan 10

S0(config-vlan)# name Students

S0(config-vlan)# exit

S0(config)# vlan 20

S0(config-vlan)# name Teachers

S0(config-vlan)# exit

S0(config)# int fa0/10

S0(config-if)# switchport mode access

S0(config-if)# switchport access vlan 10

S0(config-if)# exit

S0(config)# int fa0/20

S0(config-if)# switchport mode access

S0(config-if)# switchport access vlan 20

S0(config-if)# exit

S0(config)# int G0/1

S0(config-if)# switchport mode trunk

S0(config-if)# switchport trunk native vlan 20

S0(config-if)# exit

S0(config)# end

**Step 5 Configuring the DHCP server for 3 DHCP pools and enable DHCP relay in Branch1, Branch2**

**In this step, you will create 3 DHCP pools in the DHCP server.**

You will create Students VLAN which is VLAN 10 and will belong to the network 172.16.10.0/24 with default gateway 172.16.10.1

You will create Teachers VLAN which is VLAN 20 and will belong to the network 172.16.20.0/24 with default gateway 172.16.20.1.

**You will create Wireless WAN to give IP address to the Wireless Router WAN/Internet interface.**

**You will also configure DHCP relay in the appropriate interfaces.**

##### DHCP Server Configuration

**Configuring DHCP on a Server in Packet Tracer**

* **Open the Server Configuration**:
  + Click on the server to open its configuration window.
* **Assign an IP Address**:
  + Go to the Config tab and select FastEthernet0 **(for example)**
  + Assign an IP address and subnet mask
* **Enable DHCP Service**:
  + Go to the Services tab and select DHCP.
  + Turn on the DHCP service.
* **Create a DHCP Pool**:
  + In the DHCP configuration section, create a new DHCP pool.
  + Enter the network address, subnet mask, default gateway, and DNS server information.
  + Optionally, exclude specific IP addresses from the DHCP pool.
* **Configure Client Devices**:
  + Click on each PC to open its configuration window.
  + Go to the Config tab and select the network interface (e.g., FastEthernet0).
  + Set the IP configuration to DHCP to allow the PC to obtain an IP address automatically from the DHCP server.

**This bellow is from John’s pdf file, and its about the same subject:**

* Open the server.
* Select the Services tab.
* Select DHCP tab. Turn on DHCP services.
* In the Pool Name create a new DHCP pool giving it a name.
* This pool gives out IP addresses to PCs in a LAN.
* Specify the Default Gateway for this LAN.
* Enter the first IP address to be given out in the range – Start IP address.
* Enter the maximum number of users – the number of IP addresses to be given out.
* Enter the DNS server IP address.
* Don’t forget to Add this new pool by clicking on the Add button
* Turn on DNS and add the URL you want to define in the NAME tab.
* Associate an IP address with this name. Click ADD to add to the configuration.

##### Branch1 Router DHCP Relay Configuration

Branch1> en

Branch1# conf t

Branch1(config)# int g0/0/1.10

Branch1(config-subif)# ip helper-address 192.168.1.254

Branch1(config-subif)# exit

Branch1(config)# int G0/0/1.20

Branch1(config-subif)# ip helper-address 192.168.1.254

Branch1(config-subif)# exit

Branch1(config)# exit

##### Branch2 Router DHCP Relay Configuration

Branch2> en

Branch2# conf t

Branch2(config)# int g0/0/1

Branch2(config-if)# ip helper-address 192.168.1.254

Branch2(config-if)# exit

Branch2(config)# exit

#### Step 6 Configure the Wireless LAN

**Access the Wireless Router:**

Connect to the wireless router's web interface using a web browser. The default IP address is usually something like 192.168.0.1 or 192.168.1.1.

**Login:**

Enter the default username and password (often admin/admin or admin/password). If these have been changed, use the updated credentials.

**Basic Wireless Settings:**

SSID (Network Name): Set the SSID to a unique name for your wireless network.

Channel: Choose a channel that is less congested (usually channels 1, 6, or 11 for 2.4 GHz).

Mode: Set the wireless mode (e.g., 802.11n, 802.11ac).

**Security Settings:**

Encryption: Use WPA2 or WPA3 for better security.

Password: Set a strong password for your wireless network.

**DHCP Settings:**

Ensure the DHCP server is enabled if you want the router to assign IP addresses to devices on the network.

**Save and Reboot:**

Save the settings and reboot the router if necessary.

#### Step 7 Setting up DNS server

All devices now know that the DNS server is 209.165.200.254. Any time a URL such as www.cisco.com is typed, the DNS server will translate that to an IP address. In our case, we are going to associate the domain name www.cisco.com to the HTTP server 209.165.100.254 but we need to program this in the DNS server.

**DNS Server Configuration**

DNSServer> enable

DNSServer# conf t

DNSServer(config)# ip dns server

DNSServer(config)# ip host www.cisco.com 209.165.100.254

DNSServer(config)# exit

DNSServer# exit

#### Step 8 Securing the switch and the internal routers

**S0 Switch**

S0> en

S0# conf t

S0(config)# line console 0

S0(config-line)# password cisco

S0(config-line)# login

S0(config-line)# exit

S0(config)# enable secret ccna

S0(config)# line vty 0 4

S0(config-line)# password academy

S0(config-line)# login

S0(config-line)# exit

S0(config)# service password-encryption

S0(config)# exit

**Branch1 Router**

Branch1> en

Branch1# conf t

Branch1(config)# line console 0

Branch1(config-line)# password cisco

Branch1(config-line)# login

Branch1(config-line)# exit

Branch1(config)# enable secret ccna

Branch1(config)# line vty 0 4

Branch1(config-line)# password academy

Branch1(config-line)# login

Branch1(config-line)# exit

Branch1(config)# service password-encryption

Branch1(config)# exit

**Branch2 Router**

Branch2> en

Branch2# conf t

Branch2(config)# line console 0

Branch2(config-line)# password cisco

Branch2(config-line)# login

Branch2(config-line)# exit

Branch2(config)# enable secret ccna

Branch2(config)# line vty 0 4

Branch2(config-line)# password academy

Branch2(config-line)# login

Branch2(config-line)# exit

Branch2(config)# service password-encryption

Branch2(config)# exit

###### HQ Router

HQ RouterHQ> en

HQ# conf t

HQ(config)# line console 0

HQ(config-line)# password cisco

HQ(config-line)# login

HQ(config-line)# exit

HQ(config)# enable secret ccna

HQ(config)# line vty 0 4

HQ(config-line)# password academy

HQ(config-line)# login

HQ(config-line)# exit

HQ(config)# service password-encryption

HQ(config)# exit

EXTRA INFO BECAUSE WHY NOT

Remote Access through Telnet

**(Note for Telnet and SSH, you must have the Enable password setif you want Telnet or SSH users to have Privileged/Enable access)**

Note the **Telnet password does not have to be the same as the Console** password.

Router> en

Router# conf t

Router(config)# line vty 0 15

Router(config-line)# password cisco

Router(config-line)# login

**Telnet for a Switch**

**One extra step is required for a Switch if you want Telnet access. You need to give it an IP address.**

Switch> enable

Switch# conf t

Switch(config)# int vlan 1

Switch(config-if)# ip address 192.168.1.10 255.255.255.0 **(example address)**

Switch(config-if)# no shut

Switch(config-if)# exit

Switch(config)# ip default-gateway 192.168.1.1 **(example address)**

**Secure Shell SSH**

**Steps to set up SSH**

1. Change the name of the IOS device to something other than the default.

2. Configure the IP domain name.

3. Generate RSA key pairs.

4. Configure user authentication.

5. Configure the vty lines.

6. Enable SSH version 2.

Router(config)# hostname R1

R1(config)# ip domain-name cisco.com

R1config)# crypto key generate rsa

The name for the keys will be: **R1.cisco.com (an example name…)**

(Choose the size of the key modulus in the range of 360 to 2048 for your

General Purpose Keys. Choosing a key modulus greater than 512 may take

a few minutes.)

“…How many bits in the modulus [512]: **1024**

% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]…”

R1(config)# username admin secret ccna

R1(config)# line vty 0 15

R1(config-line)# transport input ssh

R1(config-line)# login local

R1(config-line)# exit

R1(config)# ip ssh version 2

R1(config)# exit

**Manually Select the Root Bridge**

**Here's an example of configuring a switch to be the root bridge for VLAN 1:**

Switch> en

Switch# conf t

Switch(config)# spanning-tree vlan 1 priority 4096 **(example VLAN)**

Switch(config)# exit

Switch# show spanning-tree vlan 1

By setting a **lower priority value,** you ensure that this switch is **selected as the root bridge for the specified VLAN.**

**In Spanning Tree Protocol (STP), the bridge priority values are used to determine the root bridge. The priority value must be a multiple of 4096. Here are the possible values:**

**0 (highest priority) 4096 8192 12288 16384 20480 24576 28672 32768 (default priority) 36864 40960 45056 49152 53248 57344 61440 (lowest priority)**

**By setting a lower priority value, you increase the likelihood of a switch becoming the root bridge.**

**Set the Root Bridge as Primary**

**Here's an example of configuring a switch to be the root bridge for VLAN 1:**

Switch> en

Switch# conf t

Switch(config)# spanning-tree vlan 1 root primary **(example VLAN)**

Switch(config)# exit

Switch# show spanning-tree vlan 1

**Set the Root Bridge as Secondary**

**Here's an example of configuring a switch to be the secondary root bridge for VLAN 1:**

Switch> en

Switch# conf t

Switch(config)# spanning-tree vlan 1 root secondary **(example VLAN)**

Switch(config)# exit

Switch# show spanning-tree vlan 1

**Steps to Analyse STP – Spanning Tree Protocol**

**Example Commands**

**Identify Root Bridge:**

Switch# show spanning-tree

**Check BPDU Exchange:**

Switch# show spanning-tree detail

**Verify Port Roles and States:**

Switch# show spanning-tree int **[interface-id]**

**Monitor Network Changes:**

Switch# show spanning-tree summary

**NOTES FROM JOHN’S PDF ABOUT SPANNING TREE**

**To set a Switch to be the Root Bridge for a particular VLAN, in this example VLAN 1**

Switch(config)# spanning-tree vlan 1 root primary

**To set another Switch as backup**

Switch(config)# spanning-tree vlan 1 root secondary

**To set STP to rapid STP**

Switch(config)# spanning-tree mode rapid-pvst

**To set all ports by default to Port Fast (not recommended)**

Switch(config)# spanning-tree portfast default

**To set an access port to *Port Fast and BPDU Guard* (recommended) for example ports 1 to 10 and ports 20 to 24.**

Switch(config)# int range fa0/1 – 10 , fa0/20 – 24

Switch(config-if-range)# spanning-tree portfast

Switch(config-if-range)# spanning-tree bpduguard enable

**Configuring Dynamic NAT**

**Step 1** **HQ(config)# access-list 1 permit any**

We create a list called an access list of all the private IP addresses we

want to translate to the single Public IP address on the Interface going

to the outside world.

If you want all internal Private IP addresses to be converted, a

simple method is to use the following command instead.

This creates a list that allows all IP addresses (any) to be converted

using NAT.

**Step 2 HQ(config)# ip nat inside source list 1 interface INT-ID overload**

Associate the list of Private IP addresses (list 1) with the interface

whose public IP address you want to use to translate the Private IP

addresses. The INT-ID will be the interface going to the outside world.

**Step 3 HQ(config)# int Interface-id**

**HQ(config-if)# ip nat inside**

**HQ(config-if)# exit**

Define the interfaces on which you want to use NAT to translate the

Private Source IP addresses to the Public IP address. These interfaces

are the internal Interfaces

Do this for all internal interfaces.

**Step 4 HQ(config)# int INT-ID**

**HQ(config-if)# ip nat outside**

**HQ(config-if)# exit**

Define the interface that will contain the NAT translated packets to the

outside world – INT-ID