**Networking 1A – Final Project – 250 Points**

Project Details: There are several parts to this project.

**Part I. Building the IP Addressing Scheme**

1. You will be given a unique, Class A network that you must use on this project. Mr. Dixon will assign to you the first octet value of your network. (X Value) Write this value at the top of this document.
2. Your topology must have a minimum of 14 LANs, 12 WAN links and eight routers.
3. You get to pick the sizes of your LANs. However, you must use at least eight different subnet masks in your topology. 4 of the LANs will actually be VLANs, so pick a theme for these subnets.
4. You must first fill out an IP Addressing table and submit it to Mr. Dixon for approval before you move onto Part II.

**Part II. Building the Packet Tracer Topology**

1. Requirements
   1. 8 Routers – Use 2811 Routers – Add appropriate ports for your topology.
   2. 8 regular LANs (Switch, PC, Laptop)
   3. 2 DHCP LANs(Switch, 2 PC, 2 Laptops, 1 DHCP Server)
   4. 1 LAN with 4 VLANs (3 Switches, 3 PCs in each VLAN, DNS server which will be in VLAN 1.
   5. 12 WAN Links
   6. ISP Router and connected servers (not a part of your IP Addressing scheme)
2. Theme
   1. Be sure to give names to all devices. Pick a theme and stick with it. (Teams, Colors, etc…)
3. Notes and Labeling
   1. Use the note tool to document the size, network address and subnet mask of each LAN.
   2. Use the note tool to label your WAN link numbers (WAN1 to WAN12), their network address and the clock rate you assigned to it.
   3. Label the VLAN names and numbers that you will use on that part of the topology.
4. Regular LANs (8) - These LANs will consist of:
   1. (1) 2960 Switch
   2. (1) PC
   3. (1) Laptop
   4. These devices should connect to the router on its FastEthernet port. Since there are 8 routers and 10 LANs to connect, some of your routers will use multiple FastEthernet ports. (F0/0 and F1/0).
   5. IP Addressing rules
      1. First usable on the router
      2. Second usable on PC
      3. Third usable on laptop.
      4. The switch should get the last usable.
      5. Make sure you also enter in the DNS server information or none of these devices will be able to travel to the websites you will build.
5. DHCP LANs (2) – These LANs will consist of:
   1. (1) 2960 Switch
   2. (1) DHCP Server
   3. (3) PC
   4. Connect these devices like the regular LANs above.
   5. IP addressing
      1. Manually assign first usable to router.
      2. Manually assign the last usable to switch
      3. Manually assign the second to last usable to server (DHCP)
      4. Configure DHCP on Server to provide the following to each PC:
         1. IP Address
         2. Subnet Mask
         3. Default Gateway
         4. DNS Server
      5. The PC should only have to click on “DHCP” to get this information.
6. VLAN LAN (1) – This LAN should consist of:
   1. (3) 2960 Switches
   2. (9) PC – 3 PCs for each of the four VLANs you will create and configure
   3. (1) DNS Server – Assign this server
   4. (1) Web Server
   5. IP addressing
      1. The switches will be on VLAN 1 and will get the 2nd, 3rd, and 4th usable IP addresses from VLAN 1.
      2. The web server will also be placed on VLAN 1 and will receive the last usable IP address from VLAN 1.
      3. The DNS server will also be placed on VLAN 1 and will receive the second to last usable IP address from VLAN 1.
7. ISP – This part of the topology will be composed of:
   1. (1) 2811 router (This router doesn’t count toward your 8 router minimum)
   2. (1) HTTP (web) server connected to ISP router on port F0/0
   3. (1) WAN link that connects to one of your routers (will function as border router)
   4. IP Addressing
      1. The ISP router will not use any IP addresses from the class A network you were assigned.
      2. The ISP router will connect to your border router on S0/0/0 with a clock rate of 4000000.
      3. Use 201.100.11.128 /30 for the WAN link from the router to your border router.
      4. The F0/0 interface of the ISP router will connect directly to the web server.
         1. ISP F0/0 should be given the following IP: 201.100.11.1 /25
         2. The web server will be given: 201.100.11.126 /25

**Part III. Router Configuration**

1. Each router requires the following to be done (except ISP):
   1. Hostname – This should match exactly the name provided in the topology.
   2. IP addressing – IP addresses matching the IP scheme that you did in Phase 1 should be applied to all router interfaces.
      1. Serial Interfaces
         1. Be sure you turn on all interfaces.
         2. You must use at least 8 different clock rates for your WAN links.
         3. Make sure your WAN link notes match the values you assign here.
         4. Provided accurate clock rates and bandwidth statements.
      2. FastEthernet Interfaces
         1. Make sure you put the proper IP address (first usable) on this interface.
         2. Double check that you are using the correct subnet mask.
         3. Remember that some routers will use more than one FastEthernet interface.
   3. Configure OSPF
      1. Use a process ID that matches the first octet of your IP scheme.
      2. Add network statements for all subnets this router is connected to.
   4. Save the configuration – This should be done on every router.
2. Border router (The one router that connects to ISP)
   1. In addition to what you did on other routers, you will so perform these tasks:
      1. Protect privilege mode with a password of "class".
      2. Set up telnet and protect user mode with a password of "cisco"
      3. Encrypt the above passwords.
      4. Set up interface descriptions on all serial interfaces on this router. Tell which router is on other end. Ex: “Connects to Red”
      5. Create a banner message of the day on this router. ("Authorized personnel only")
   2. Create a default route that points to the ISP router.
   3. Distribute the default route to all other routers through your routing protocol. (DIO)
   4. In addition to OSPF, you will also configure RIP so this router can communicate with ISP.
   5. Yes! You will configure and use both RIPv2 and OSPF on this router.
3. VLAN router (The router that connects to the VLAN part of your topology
   1. In addition to #1, you will also have to configure this router for inter-VLAN communications:
      1. Assign the IP address for VLAN 1 directly to your FastEthernet interface.
      2. Create subinterfaces for each of your other 3 LANs. Use DOT1Q encapsulation to associate them with the appropriate VLAN.
   2. When configure OSPF, make sure you put a network statement in for each of the VLAN subnets that are connected to it.
4. ISP Router details
   1. The WAN link between the border router (explained in #2) and the ISP router will have the clock rate set on the ISP side (4000000). This WAN link will use 201.100.11.128 /30.
   2. Configure RIPv2 on the ISP router. This will share the information about the web server’s LAN to your border router.

**Part IV. VLAN Configuration**

1. On one LAN, you have set up three switches. In this part of the topology, you will create and use four VLANs.
   1. Each VLAN will have its own IP addressing subnet.
   2. You must set assign 1 subnet for VLAN 1, which will hold the switches, DNS server and a web server.
   3. The other 3 VLAN are your choice. You can pick the number and name for them.
2. Do not build the VLANs yet! You will be using VTP to distribute the VLAN information between the switches in this part of the topology.

**Part V. Switch Configuration**

1. Non-VLAN switches
   1. On each of the switches where VLANs are NOT configured, you will do the following:
      1. Assign the last usable IP address from that subnet to VLAN1
      2. Turn on VLAN 1
      3. Set the default gateway.
      4. These switches will need to be able to pass connectivity tests during final grading.
2. VLAN Switches
   1. On one of your LANS, you should have placed 3 switches.
   2. Each switch need to be connected to one other switch
   3. One switch needs to connect to the router.
   4. VTP
      1. One switch will be the server. Label it accordingly in your topology.
      2. Two switches will be clients. Label them as clients in your topology.
      3. Choose a VTP domain and password. Configure on all switches.
      4. Trunk between these switches and between the switch and the router.
   5. Build VLAN database
      1. This is done only on the switch that is acting as the VTP server.
      2. Do not build the VLAN database until VTP is set up.
      3. I will create a VLAN on your server and it should automatically distribute to the clients.
   6. Switch Ports
      1. Access ports - Set the switch ports that connect to PCs as access and associate them with the appropriate VLAN. The switch port that connects to the DNS server and the web server should remain in the default VLAN, VLAN 1.
      2. Trunk ports – Make sure those switch ports that connect to other switches are trunk.
   7. IP Addressing
      1. Like on the other LANs we need to assign IPs to our switches. Use the 2nd, 3rd and 4th available IPs from VLAN 1.
      2. Don’t forget to set up your default gateway.
   8. Housekeeping
      1. On these switches, configure the following:
         1. Protect privilege mode with a password of "class".
         2. Set up telnet and protect user mode with a password of "cisco"
         3. Save the configuration on the switch.

**Part VI. Server Configuration**

1. HTTP Servers
   1. There should be two web servers in your topology, one on your VLAN LAN and one connected to the ISP server. You will be creating two website domains.
   2. ISP web server – (yourlastname.com)
      1. Go to Services tab, then HTTP. Edit the index.html page. Change “Welcome to Packet Tracer” to “Welcome to <your last name>.com” This will be your first website domain
      2. Be sure to turn on the HTTP service.
   3. VLAN HTTP Server – yourchoice.com
      1. This time, you get to choose the domain name. Edit the index.html page to specify the domain name you choose.
      2. Make sure you turn on the HTTP service.
2. DHCP Servers
   1. On two of your LANs, you have a DHCP server, which has the job of assigning IP addressing automatically to the PCs on that LAN.
   2. Make sure you have manually assigned IP addresses to the server, router and switch.
   3. Using the DHCP option on the config tab, use DHCP to assign the following things to the PCs:
      1. IP Address – Start with second usable.
      2. Subnet mask
      3. Default gateway
      4. DNS server – This is found on your VLAN LAN.
   4. After it is configured, make sure you save it and that DHCP service is on.
   5. Choose DHCP on all of the PCs on those LANs.
3. DNS Server
   1. This server, found on the VLAN part of the topology, is responsible for translating your website domains into IP addresses.
   2. On the DNS server, you will be creating two records.
      1. record # 1 – yourlastname.com with IP address you assigned to the web server off ISP, which should be 201.100.11.126
      2. record # 2 – yourchoice.com with the IP address of the web server from the VLAN part of your topology.

**Part VII. Connectivity Tests**

1. You will need to test connectivity between all LANs and VLANs.
2. You will save the connectivity tests for each LAN to all other LANs in separate scenarios.
3. Each scenario will have 14 connectivity tests (To 9 other LANs, DNS and Web) and be named after the router it connects to. If the router has two LANs, use RouterA and RouterB when naming the Scenarios.
4. You will also test for web connectivity by using the PC browser to visit "yourlastname".com and “yourchoice.com”.