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**CS 3800 – Final Project**

**IT Network Design**

1. **Description**

The implementation we designed for a network of four bank branches consists of ten components in total: three routers, three servers, and four switches. Considering the network requirements outlined in the project guidelines, our network is built around the LA branch router along with connections to the other two routers labeled Riverside and Pomona. Each branch has its own designated switch but since the scenario limits the network to only three routers, the Anaheim and Pomona switches share the same router. Lastly, all connections made to the three servers are relayed through the main branch and its controllers. After determining the general layout of the network, we proceeded to configure each device and make appropriate connections.

The routers in our network are configured such that the main branch has two RIPv2 connections with the other internal branch routers and provides access to internet servers as well as its local servers. Which means the Riverside, Pomona, Anaheim, and Los Angeles branch all have the ability to ping each other. The RIPv2 protocol is configured through the 10.10.10.0 network. DHCP connections are configured for all routers to produce IP addresses and the main router is responsible for NAT translations for access. The Riverside router will have the address of 192.168.2.0 network. The Pomona router will have the 192.168.3.0 network for the Pomona network as well as the 192.168.4.0 for the Anaheim branch. The Pomona branch and the Anaheim branch will have to share routers because of the limited resources. However, since the other internal branches are only allowed access to the Gmail server and the main router lacked available ports to provide this restricted connection, an additional local server was allocated for this purpose. Our story here is that the banks partnered with Gmail to have their own Gmail server in their bank network. That Gmail server that is in the bank network is at the main branch so it can communicate with the internet. The application server and the bank database server also have static public IP addresses, which are 13.100.96.35 and 13.100.96.36 respectively. At the main router there is also NAT translation occurring for anything coming out of the 192.168.1.0 network to the internet. The inside network is configured for the 192.168.1.10 network and outside is 13.100.96.37 network. The IP addresses will be translated to IP address ranging from 13.100.96.38-42. This possible by creating an access-list of NAT pool permitting the 192.168.1.0 access to the NAT pool. The main branch router will also have a static host route for the application server. Anything coming from the router from the internet will first go to the application server for faster connection.

The internet configuration for the network is in the main branch router. The main router is directed connected to the internet, giving access to the 192.168.1.0 network. From the internet, google.com and customers will be able to connect to the main branch network. The Riverside, Pomona, and Anaheim networks are not given access to the internet because they only learn of the 192.168.1.0 network through RIPv2 routing. They are not given any information about the internet for it to learn about that route, therefore they cannot connect to the internet.

The overview of this entire bank network is that every branch has the ability to communicate with each other. The main branch is the only branch that has access to the internet. The internet and the bank customers can connect to only the main branch network. The only way the other three branches could connect to the internet is by the Gmail server. The other three branches have indirect connection to the internet through the Gmail server by the Gmail server having access to the internet.

1. **Challenges**

The challenges that we came across during the course of this project were fairly mild, mainly due to lacking familiarity with certain protocols. In particular, we had trouble with the necessary commands when configuring the redundant RIPv2 connections between the internal routers and the main. We had issues with those commands as well as determining the correct IP addresses for each corresponding connection. We were also confused as to what the project description meant by redundant connections, but we were just overthinking. It was just a double connection from router to router. Another challenge we came across was understanding NAT translations. Especially for the translations performed in the main router, this became a considerable obstacle when configuring the private-public IP addresses required for internet access. We had to figure out how NAT translations work and what commands are needed to create it in the router. The trickiest parts of configuring the routers was figuring out the correct commands to use. Another challenge we came across was how to have four different bank networks with only three routers. We thought we needed four routers to have four different networks. But to solve this problem we just had two branches share one router, but that router had DHCP configured for two different networks. Speaking of DHCP protocol, that was also another one of our struggles. We thought about having a DHCP server for each branch, but we felt like that was a step in the wrong direction. We felt that would be too many resources for the bank to allocate. We eventually solved this problem by discovering that DHCP protocol can be configured without a DHCP server but can be configured in the router. One of the trickiest parts of this project was finding out how to connect the main branch router to the internet. I thought the main branch router would just have access to the internet since it is directly connected. But I realized that a connection between two routers are default not broadcasted. To resolve this, we created a static route between the two routers using 0.0.0.0 network. A very helpful resource to answer our questions about this project was a YouTube channel named danscourses.

1. **Conclusion**

From this project, we were able to demonstrate our general understanding of network devices and the configuration of these devices given a set of requirements and limitations. This project was a beneficial one to help us learn more about the IT side of networks. Most of what we have learned in our classes was coding, but we never really had much experience with IT networks. Although we had some difficulty in applying certain concepts for this scenario, we were able to figure out the issues and set up the network described. We feel like this project will also help us expand knowledge in Cisco Packet Tracer as well as IT networks.