Al-Najah National University
Network Design Lab

DISTRIBUTED NETWORK

Instructor:Dr. Amjad Hawash

Mohammed Adnan
Dima Bshara
Amall ALdeek

1 Abstract

This lab aims to know how to design a distributed network based on a real scenario, Design the logical topology as per the requirements, also choose the appropriate WAN connection option for each link to give the best performance with the least possible cost.

2 Introduction

A distributed network is a type of computer network that is spread over different networks. This provides a single data communication network, which can be managed jointly or separately by each network. Besides shared communication within the network, a distributed network often also distributes processing. In this lab, after designing a network, we choose the connection option based on the city and the service that will have to offer across the network. Also, it depends on the city if it provides that connection option or not. Then we Connect the topology proposed and Configure all devices with the required configurations. In the end, we Enable routing between all possible destinations on all sites using the EIGRP protocol.

3 Scenario

You are a network architect working for a company that just took a project for redesigning a network for a company called NIS that works in consulting and business strategy planning. NIS has three locations, an HQ in Ramallah Al Ersal street, one main branch in Nablus located in Rafedia St. west of the city, and a small office to the east. The company also rented a building in Al Baloo' to be used for its data center. Multimedia processing occur in HQ with all video and images stored in the data center which contains the file, email, and web servers. Nablus east branch stores all multimedia content on a local storage unit located in the west branch. The applications used in Nablus west branch are transaction based software that only send text based transactions to Ramallah HQ. NIS HQ has 200 employees, the data center has 13 servers, Nablus west branch has 70 employees, and Nablus east branch has 30 employees. PALTEL offers frame relay and leased line services everywhere. Metro Ethernet (simply Ethernet) available only in Ramallah.

4 Procedure

1. At first, we Design the logical topology as per the requirements, as show in figure 1.

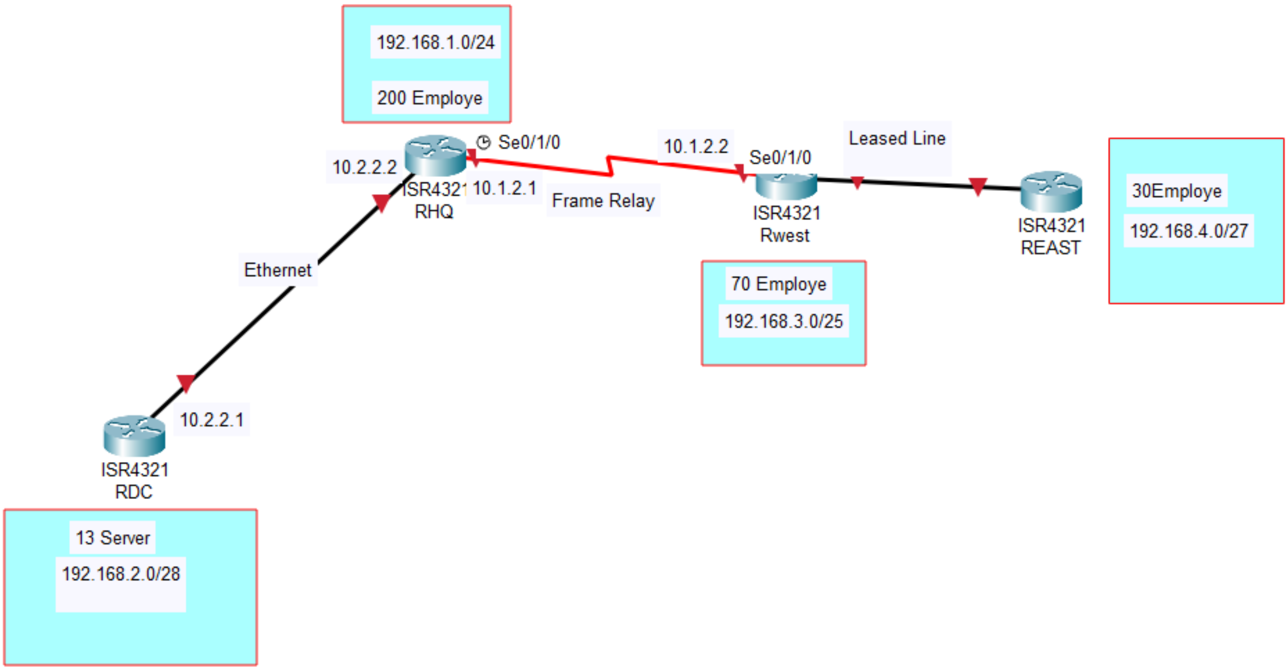

Figure 1: Logical Topology

2. Then, we choose the connection option for each link as shown in figure 1 based on requirements.
3. Between the RDC(Router Data Center) and RHQ **Ethernet connection** because we have Multi-media processing with all video and images stored in the data center, so that means there's, a very large date in the link, and the Ethernet connection is the best for that case. And this technology is available only in Ramallah..
4. Between RHQ and RWES, we choose the **frame relay connection** because The applications used in Nablus west branch are transaction-based software that only sends text-based transactions to Ramallah HQ, which is small data. Also, the frame relay is available in all cite.
5. Between RWEST and REST, we choose **Leased Line connection** because the Nablus east branch stores all multimedia content on a local storage unit located in the west branch which, is a large data to send. Also, because Nablus doesn't provide an ethernet connection, so the leased line will be the best choice for that case.
6. In the end, we configure the routing using the EIGRP protocol to make communication between all cite and routers, also we configure frame relay connection as shown in figure 2.

```
DLCI = 100, DLCI USAGE = UNUSED, PVC STATUS = ACTIVE, INTERFACE = Serial0/0/0

  input pkts 0              output pkts 0             in bytes 0
  out bytes 0               dropped pkts 0            in pkts dropped 0
  out pkts dropped 0                 out bytes dropped 0
  in FECN pkts 0            in BECN pkts 0            out FECN pkts 0
  out BECN pkts 0           in DE pkts 0              out DE pkts 0
  out bcast pkts 0          out bcast bytes 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  pvc create time 00:20:22, last time pvc status changed 00:16:43

DLCI = 101, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0/0

  input pkts 0              output pkts 1             in bytes 0
  out bytes 104             dropped pkts 0            in pkts dropped 0
  out pkts dropped 0                 out bytes dropped 0
  in FECN pkts 0            in BECN pkts 0            out FECN pkts 0
  out BECN pkts 0           in DE pkts 0              out DE pkts 0
  out bcast pkts 0          out bcast bytes 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  pvc create time 00:35:33, last time pvc status changed 00:16:43
```

Figure 2: frame relay

7. After that, we made sure that all cite can communicate with each other by verifying it using ping as shown in figures 3 and 4.

```
C:\Users\user>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:
Reply from 192.168.2.1: bytes=32 time=1ms TTL=255
Reply from 192.168.2.1: bytes=32 time=1ms TTL=255

Ping statistics for 192.168.2.1:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
Control-C
^C
C:\Users\user>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:
Reply from 192.168.1.1: bytes=32 time=1ms TTL=254
Reply from 192.168.1.1: bytes=32 time=1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
Control-C
^C
C:\Users\user>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

Figure 3: Ping result

```
Control-C
^C
C:\Users\user>ping 10.1.2.1

Pinging 10.1.2.1 with 32 bytes of data:
Reply from 10.1.2.1: bytes=32 time=1ms TTL=254
Reply from 10.1.2.1: bytes=32 time=1ms TTL=254
Reply from 10.1.2.1: bytes=32 time=1ms TTL=254
Reply from 10.1.2.1: bytes=32 time=1ms TTL=254

Ping statistics for 10.1.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\user>ping 10.1.2.2

Pinging 10.1.2.2 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 10.1.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Users\user>
C:\Users\user>ping 10.1.2.2

Pinging 10.1.2.2 with 32 bytes of data:
Reply from 10.1.2.2: bytes=32 time=1ms TTL=253
Reply from 10.1.2.2: bytes=32 time=2ms TTL=253
Reply from 10.1.2.2: bytes=32 time=2ms TTL=253
Reply from 10.1.2.2: bytes=32 time=2ms TTL=253

Ping statistics for 10.1.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Figure 4: Ping result