

Company Acquisition and Integration: A Network Simulation

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A Proposal Submitted to
The Faculty of the Department of Information Technology
In Partial Fulfillment of the Requirements for
The Degree of Bachelor of Science
In Information Technology

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March 2016

Table of Contents

Abstract.....	1
Introduction.....	2
Solution.....	4
Budget.....	14
Conclusion.....	14
References.....	15

Figures

Network Diagram.....	3
Main Site Configuration.....	5
Main Site Routing Table.....	6
Site 1 Configuration.....	7
Site 1 Routing Table.....	8
Site 2 Configuration.....	9
Site 2 Routing Table.....	10
Inter-VLAN Routing Configuration.....	11
User Profile.....	12
Gantt Chart.....	13

Tables

Budget Chart.....	14
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Abstract

Our project simulates a merger of three companies all using different routing protocols. It shows an effective and non-disruptive way of mediating the differing networks and their protocols with each other. The scenario involves a main company headquarters site, as well as two external sites that are being acquired by the parent company. The idea is to be able to get all three sites to communicate to each other without major disruptions to the network. This project gave us useful insight and a model for adding new companies to an existing network. The finalized solution uses Dynamic Multipoint VPN and routing protocol redistribution for the overlying network connections. We utilized inter-VLAN routing in order to allow the various departments to connect to each other while remaining secure, regardless of physical location.

Introduction:

Our project simulates a merger of three fictional companies with different technologies used. The newly acquired companies are being added to the main company network. The idea is to be able to get all three sites to communicate to each other without major disruptions to the network, and with as minimal expenses as possible. This project gives useful insight and a model for adding new companies to an existing network, and the challenges that may be involved with doing so. This was solved with Dynamic Multipoint VPN and routing protocol redistribution.

The focus of this project includes VLANs, and router/switch configurations for basic routing. The VLANs are used as a security measure and organizational measure for the hosts of our network. This project covers a means of setting up a VLAN solution as a model that could easily be used on a variety of different networks. Our fictional company contains all of the standard and typical departments that most companies have, and as such should be a good example for most companies with a standard organizational structure.

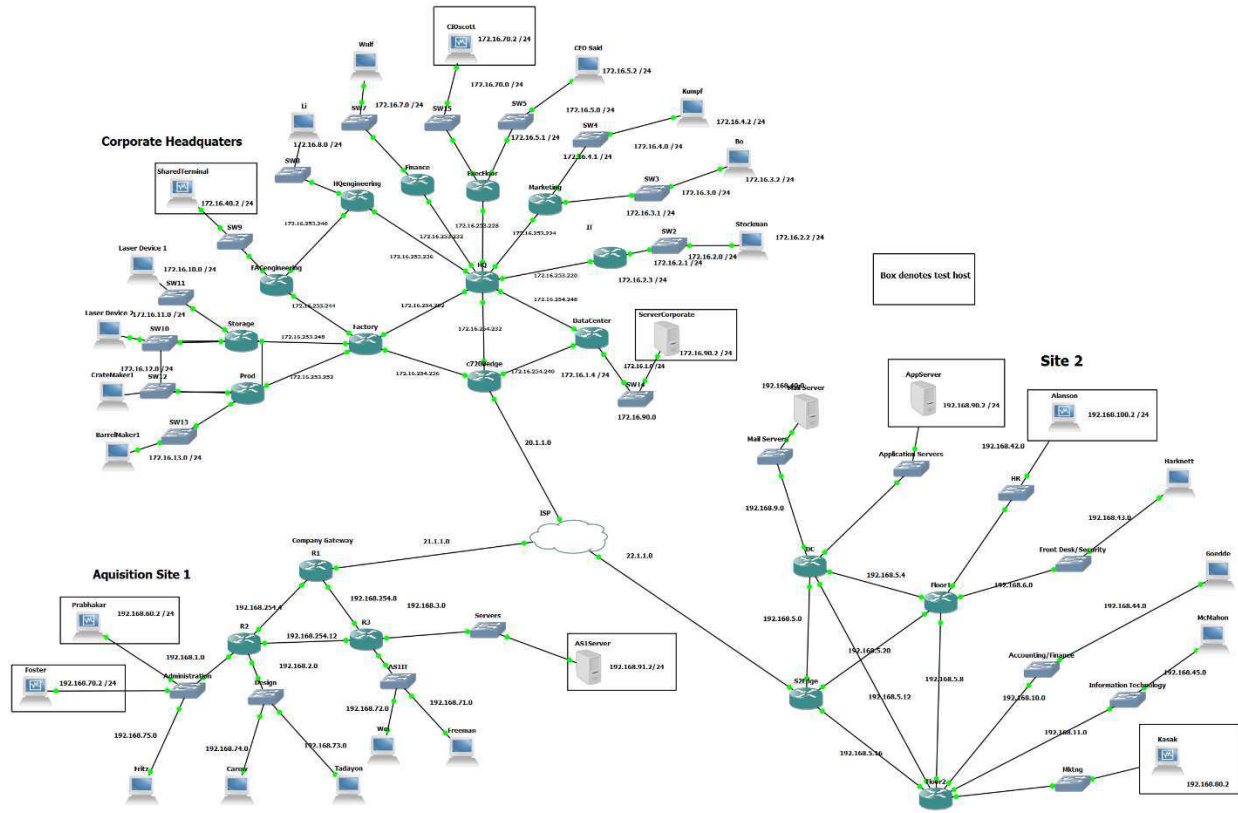


Figure 1, Network Diagram

Above is the network diagram for our scenario. Corporate headquarters is the main company and site 1 and 2 are the companies being acquired.

Solution

Our solution involved three primary parts: a Dynamic Multipoint VPN solution, a routing redistribution solution, and a VLAN routing solution.

The first of these, DMVPN, would be required to be set up regardless of other technologies such as routing protocols used in a merger. DMVPN uses GRE tunneling to provide a secure and scalable IPsec tunnel between sites. DMVPN allows for sites to access one another directly, without going through a hub site, thus relieving overhead for said central site.

Second, routing redistribution was used to allow for three different routing protocols: RIP, EIGRP, and OSPF to interact with one another. Redistribution allows one to translate one routing protocol into another format. Without redistribution, different routing protocols would fail to communicate. One could alternatively replace the routing protocols on the acquisition site with that of the main site, however this would require significant downtime on those sites.

Finally, VLANs were implemented appropriately in order to logically segment our network. Inter-VLAN routing was also configured on appropriate routers. In a real-world situation these VLANs would be a useful security measure.

Below are the show run commands for each of the edge routers for the networks. Show run commands show the history of the commands that were input in a router. Someone using our project as a model could therefore copy and edit our commands as they see fit. Following the configurations, the routing tables can be viewed.

```
c7200edge
interface Tunnel0
 ip address 10.1.1.10 255.255.255.0
 no ip redirects
 no ip split-horizon eigrp 100
 ip nhrp map multicast dynamic
 ip nhrp network-id 1
 tunnel source 20.1.1.2
 tunnel mode gre multipoint
!
interface Ethernet0/0
 no ip address
 shutdown
 duplex auto
!
interface GigabitEthernet0/0
 ip address 172.16.254.234 255.255.255.252
 duplex full
 speed 1000
 media-type gbic
 negotiation auto
!
interface GigabitEthernet1/0
 ip address 172.16.254.237 255.255.255.252
 negotiation auto
!
interface GigabitEthernet2/0
 no ip address
 shutdown
 negotiation auto
!
interface GigabitEthernet3/0
 ip address 172.16.254.241 255.255.255.252
 negotiation auto
!
interface GigabitEthernet4/0
 ip address 20.1.1.2 255.255.255.252
 negotiation auto
!
interface GigabitEthernet5/0
 no ip address
 shutdown
 negotiation auto
!
interface GigabitEthernet6/0
 no ip address
 shutdown
 negotiation auto
!
--More--

c7200edge
interface GigabitEthernet6/0
 no ip address
 shutdown
 negotiation auto
!
!
router eigrp 10
 network 172.16.254.232 0.0.0.3
 network 172.16.254.236 0.0.0.3
 network 172.16.254.240 0.0.0.3
 redistribute eigrp 100
!
!
router eigrp 100
 network 10.1.1.0 0.0.0.255
 redistribute eigrp 10
```

Figure 2, (Above) Main Site Configuration – This shows the configuration of the main site edge router, including the tunnel, interface, and EIGRP configurations.

```

C    20.1.1.0/30 is directly connected, GigabitEthernet4/0
L    20.1.1.2/32 is directly connected, GigabitEthernet4/0
172.16.0.0/16 is variably subnetted, 15 subnets, 3 masks
D    172.16.253.208/28
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D    172.16.253.220/30
     [90/30976] via 172.16.254.242, 00:34:55, GigabitEthernet3/0
     [90/30976] via 172.16.254.238, 00:34:55, GigabitEthernet1/0
D    172.16.253.224/30
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D    172.16.253.228/30
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D    172.16.253.232/30
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D    172.16.253.236/30
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D    172.16.253.240/30
     [90/284416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
C    172.16.254.232/30 is directly connected, GigabitEthernet0/0
L    172.16.254.234/32 is directly connected, GigabitEthernet0/0
C    172.16.254.236/30 is directly connected, GigabitEthernet1/0
L    172.16.254.237/32 is directly connected, GigabitEthernet1/0
C    172.16.254.240/30 is directly connected, GigabitEthernet3/0
L    172.16.254.241/32 is directly connected, GigabitEthernet3/0
D    172.16.254.248/30
     [90/28416] via 172.16.254.242, 00:34:55, GigabitEthernet3/0
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D    172.16.254.252/30
     [90/28416] via 172.16.254.238, 00:34:55, GigabitEthernet1/0
     [90/28416] via 172.16.254.233, 00:34:55, GigabitEthernet0/0
D EX 192.168.1.0/24 [170/26880256] via 10.1.1.11, 00:34:17, Tunnel0
D EX 192.168.2.0/24 [170/26880256] via 10.1.1.11, 00:34:17, Tunnel0
D EX 192.168.3.0/24 [170/26880256] via 10.1.1.11, 00:34:17, Tunnel0
192.168.5.0/30 is subnetted, 6 subnets
D EX 192.168.5.0 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.5.4 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.5.8 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.5.12 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.5.16 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.5.20 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.6.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.7.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.8.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.9.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.10.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.11.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
D EX 192.168.12.0/24 [170/26880256] via 10.1.1.12, 00:01:29, Tunnel0
192.168.254.0/30 is subnetted, 3 subnets
D EX 192.168.254.4 [170/26880256] via 10.1.1.11, 00:34:17, Tunnel0
D EX 192.168.254.8 [170/26880256] via 10.1.1.11, 00:34:17, Tunnel0
D EX 192.168.254.12 [170/26880256] via 10.1.1.11, 00:34:17, Tunnel0
CorporateEdge#

```

Figure 3, Main Site Routing Table (Above) – Here you can see the routing table of our corporate edge router. To confirm that redistribution has occurred, one should be sure to look for EX routes.

```

R1
interface Tunnel0
 ip address 10.1.1.11 255.255.255.0
 no ip redirects
 ip nhrp map 10.1.1.10 20.1.1.2
 ip nhrp map multicast 20.1.1.2
 ip nhrp network-id 1
 ip nhrp nhs 10.1.1.10
 tunnel source 21.1.1.2
 tunnel mode gre multipoint
!
interface Ethernet0/0
 no ip address
 shutdown
 duplex auto
!
interface GigabitEthernet0/0
 no ip address
 shutdown
 duplex full
 speed 1000
 media-type gbic
 negotiation auto
!
interface GigabitEthernet1/0
 ip address 192.168.254.5 255.255.255.252
 ip ospf priority 255
 negotiation auto
!
interface GigabitEthernet2/0
 ip address 192.168.254.9 255.255.255.252
 ip ospf priority 255
 negotiation auto
!
interface GigabitEthernet3/0
 no ip address
 shutdown
 negotiation auto
!
interface GigabitEthernet4/0
 ip address 21.1.1.2 255.255.255.252
 negotiation auto
!
interface GigabitEthernet5/0
 no ip address
 shutdown
 negotiation auto
!
router eigrp 100
router ospf 109

```

```

R1
router eigrp 100
 network 10.1.1.0 0.0.0.255
 redistribute ospf 109 metric 1000000 1 255 1 1500
!
router ospf 109
 redistribute eigrp 100 subnets
 network 192.168.254.4 0.0.0.3 area 0
 network 192.168.254.8 0.0.0.3 area 0
!

```

Figure 4, Site 1 Configuration (Above) – Tunnel, interface, OSPF, and EIGRP configuration commands used

```

R1
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
+ - replicated route, % - next hop override

Gateway of last resort is 21.1.1.1 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 21.1.1.1
C    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    10.1.1.0/24 is directly connected, Tunnel0
L    10.1.1.11/32 is directly connected, Tunnel0
L    21.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    21.1.1.0/30 is directly connected, GigabitEthernet4/0
L    21.1.1.2/32 is directly connected, GigabitEthernet4/0
L    172.16.0.0/16 is variably subnetted, 12 subnets, 2 masks
D EX 172.16.253.208/28 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.253.220/30 [170/26885376] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.253.224/30 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.253.228/30 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.253.232/30 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.253.236/30 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.253.240/30 [170/26908416] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.254.232/30 [170/26880256] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.254.236/30 [170/26880256] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.254.240/30 [170/26880256] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.254.248/30 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
D EX 172.16.254.252/30 [170/26882816] via 10.1.1.10, 01:00:13, Tunnel0
O IA 192.168.1.0/24 [110/11] via 192.168.254.6, 01:01:27, GigabitEthernet1/0
O IA 192.168.2.0/24 [110/11] via 192.168.254.6, 01:01:27, GigabitEthernet1/0
O IA 192.168.3.0/24 [110/11] via 192.168.254.10, 01:02:01, GigabitEthernet2/0
L    192.168.5.0/30 is subnetted, 6 subnets
D EX 192.168.5.0 [170/28160256] via 10.1.1.10, 00:02:32, Tunnel0
D EX 192.168.5.4 [170/28160256] via 10.1.1.10, 00:02:32, Tunnel0
D EX 192.168.5.8 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.5.12 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.5.16 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.5.20 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.6.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.7.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.8.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.9.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.10.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.11.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
D EX 192.168.12.0/24 [170/28160256] via 10.1.1.10, 00:02:31, Tunnel0
L    192.168.254.0/24 is variably subnetted, 5 subnets, 2 masks
C    192.168.254.4/30 is directly connected, GigabitEthernet1/0
L    192.168.254.5/32 is directly connected, GigabitEthernet1/0
C    192.168.254.8/30 is directly connected, GigabitEthernet2/0
L    192.168.254.9/32 is directly connected, GigabitEthernet2/0
O    192.168.254.12/30
      [110/2] via 192.168.254.10, 01:02:01, GigabitEthernet2/0
      [110/2] via 192.168.254.6, 01:01:27, GigabitEthernet1/0
CoreRouterS1#

```

Figure 5, Site 1 Routing Table (Above) – Shows routing table but for our Acquisition site 1 edge router.

```

S2Edge
interface Tunnel0
ip address 10.1.1.12 255.255.255.0
no ip redirects
ip nhrp map 10.1.1.10 20.1.1.2
ip nhrp map multicast 20.1.1.2
ip nhrp network-id 1
ip nhrp nhg 10.1.1.10
tunnel source 22.1.1.2
tunnel mode gre multipoint
!
interface Ethernet0/0
no ip address
shutdown
duplex auto
!
interface GigabitEthernet0/0
ip address 192.168.5.1 255.255.255.252
duplex full
speed 1000
media-type gbic
negotiation auto
!
interface GigabitEthernet1/0
ip address 192.168.5.21 255.255.255.252
negotiation auto
!
interface GigabitEthernet2/0
ip address 192.168.5.18 255.255.255.252
negotiation auto
!
interface GigabitEthernet3/0
no ip address
shutdown
negotiation auto
!
interface GigabitEthernet4/0
ip address 22.1.1.2 255.255.255.252
negotiation auto
!
interface GigabitEthernet5/0
no ip address
shutdown
negotiation auto
!
!
router eigrp 100
network 10.1.1.0 0.0.0.255
redistribute rip metric 1000000 1 255 1 1500
!
router rip
version 2
network 192.168.1.0
network 192.168.5.0
!
!

```

Figure 6, Site 2 Configuration – Shows tunnel, interface, RIP and EIGRP redistribution configuration commands

```

Gateway of last resort is 22.1.1.1 to network 0.0.0.0

S* 0.0.0.0/0 [1/0] via 22.1.1.1
   10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C   10.1.1.0/24 is directly connected, Tunnel0
L   10.1.1.12/32 is directly connected, Tunnel0
   22.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C   22.1.1.0/30 is directly connected, GigabitEthernet4/0
L   22.1.1.2/32 is directly connected, GigabitEthernet4/0
   172.16.0.0/16 is variably subnetted, 12 subnets, 2 masks
D EX 172.16.253.208/28 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.253.220/30 [170/26889376] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.253.224/30 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.253.228/30 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.253.232/30 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.253.236/30 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.253.240/30 [170/26908416] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.254.232/30 [170/26880256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.254.236/30 [170/26880256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.254.240/30 [170/26880256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.254.248/30 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 172.16.254.252/30 [170/26882816] via 10.1.1.10, 01:07:31, Tunnel0
D EX 192.168.1.0/24 [170/28160256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 192.168.2.0/24 [170/28160256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 192.168.3.0/24 [170/28160256] via 10.1.1.10, 01:07:31, Tunnel0
   192.168.5.0/24 is variably subnetted, 9 subnets, 2 masks
C   192.168.5.0/30 is directly connected, GigabitEthernet0/0
L   192.168.5.1/32 is directly connected, GigabitEthernet0/0
R   192.168.5.4/30 [120/1] via 192.168.5.22, 00:00:13, GigabitEthernet1/0
      [120/1] via 192.168.5.2, 00:00:21, GigabitEthernet0/0
R   192.168.5.8/30 [120/1] via 192.168.5.22, 00:00:13, GigabitEthernet1/0
      [120/1] via 192.168.5.17, 00:00:21, GigabitEthernet2/0
R   192.168.5.12/30
      [120/1] via 192.168.5.17, 00:00:21, GigabitEthernet2/0
      [120/1] via 192.168.5.2, 00:00:21, GigabitEthernet0/0
C   192.168.5.16/30 is directly connected, GigabitEthernet2/0
L   192.168.5.18/32 is directly connected, GigabitEthernet2/0
C   192.168.5.20/30 is directly connected, GigabitEthernet1/0
L   192.168.5.21/32 is directly connected, GigabitEthernet1/0
R   192.168.6.0/24 [120/1] via 192.168.5.22, 00:00:13, GigabitEthernet1/0
R   192.168.7.0/24 [120/1] via 192.168.5.22, 00:00:13, GigabitEthernet1/0
--More--

```

```

C   192.168.5.16/30 is directly connected, GigabitEthernet2/0
L   192.168.5.18/32 is directly connected, GigabitEthernet2/0
C   192.168.5.20/30 is directly connected, GigabitEthernet1/0
L   192.168.5.21/32 is directly connected, GigabitEthernet1/0
R   192.168.6.0/24 [120/1] via 192.168.5.22, 00:00:13, GigabitEthernet1/0
R   192.168.7.0/24 [120/1] via 192.168.5.22, 00:00:13, GigabitEthernet1/0
R   192.168.8.0/24 [120/1] via 192.168.5.2, 00:00:21, GigabitEthernet0/0
R   192.168.9.0/24 [120/1] via 192.168.5.2, 00:00:21, GigabitEthernet0/0
R   192.168.10.0/24 [120/1] via 192.168.5.17, 00:00:21, GigabitEthernet2/0
R   192.168.11.0/24 [120/1] via 192.168.5.17, 00:00:21, GigabitEthernet2/0
R   192.168.12.0/24 [120/1] via 192.168.5.17, 00:00:21, GigabitEthernet2/0
   192.168.254.0/30 is subnetted, 3 subnets
D EX 192.168.254.4 [170/28160256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 192.168.254.8 [170/28160256] via 10.1.1.10, 01:07:31, Tunnel0
D EX 192.168.254.12 [170/28160256] via 10.1.1.10, 01:07:31, Tunnel0
S2Edge#
S2Edge#

```

Figure 7, Site 2 Routing Table - Shows routing table but for our Acquisition site 2 edge router.

```

DataCenter#show ip int br
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          172.16.254.242 YES NVRAM    up          up
FastEthernet0/1          unassigned      YES NVRAM    administratively down down
FastEthernet1/0          172.16.254.250 YES NVRAM    up          up
FastEthernet2/0          172.16.1.4     YES NVRAM    up          up
FastEthernet3/0          unassigned      YES NVRAM    administratively down down
FastEthernet4/0          unassigned      YES unset   up          down
FastEthernet4/1          unassigned      YES unset   up          down
FastEthernet4/2          unassigned      YES unset   up          down
FastEthernet4/3          unassigned      YES unset   up          down
FastEthernet4/4          unassigned      YES unset   up          down
FastEthernet4/5          unassigned      YES unset   up          down

DataCenter#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DataCenter(config)#int f2/0.90
DataCenter(config-subif)#enc
DataCenter(config-subif)#encapsulation dot1q ?
<1-4094> IEEE 802.1Q VLAN ID

DataCenter(config-subif)#encapsulation dot1q 90
DataCenter(config-subif)#ip address 172.16.90.1 255.255.255.0
DataCenter(config-subif)#no shut
DataCenter(config-subif)#

```

Figure 8, Inter-VLAN routing configuration - Shows configuration of encapsulation on a sub interface allowing for VLAN 90 to be routed appropriately

User Profile

Our project focuses on network engineers and network administrators that are looking into merging a new network seamlessly and quickly into their own.

User Profile Form
Application: Company Acquisition and Integration
Potential Users: Network Administrators, Network Engineers, or IT Management IT departments that must connect multiple site locations using different network technologies.
Software and Interface Experience: Users would need at least a basic to intermediate level of experience with configuring routers and switches.
Frequency of Use: The frequency of use would vary greatly from company to company. A company that does not expand and grow would not use this application while companies that regularly buy other companies to integrate them would could use this yearly.

Figure 8, User Profile.

Gantt Chart

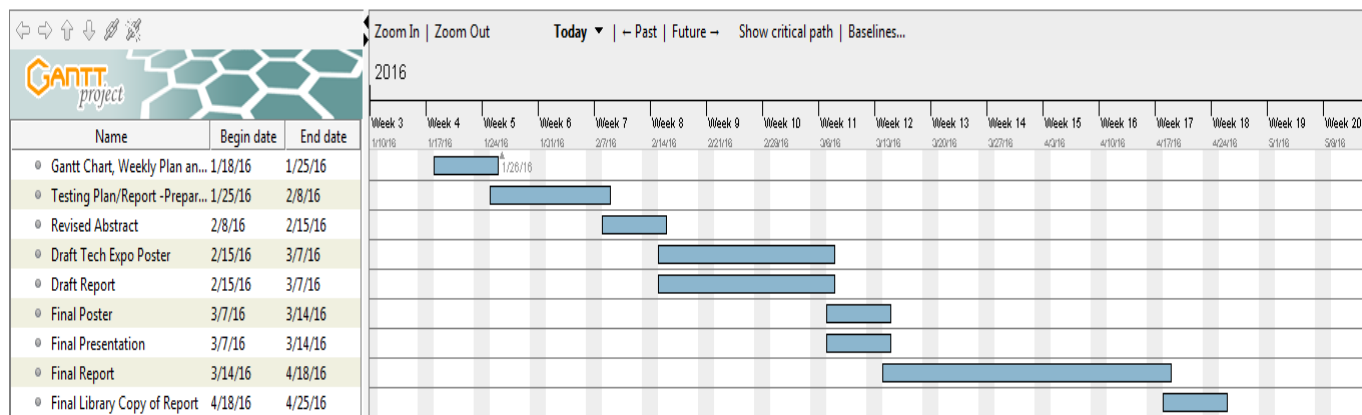
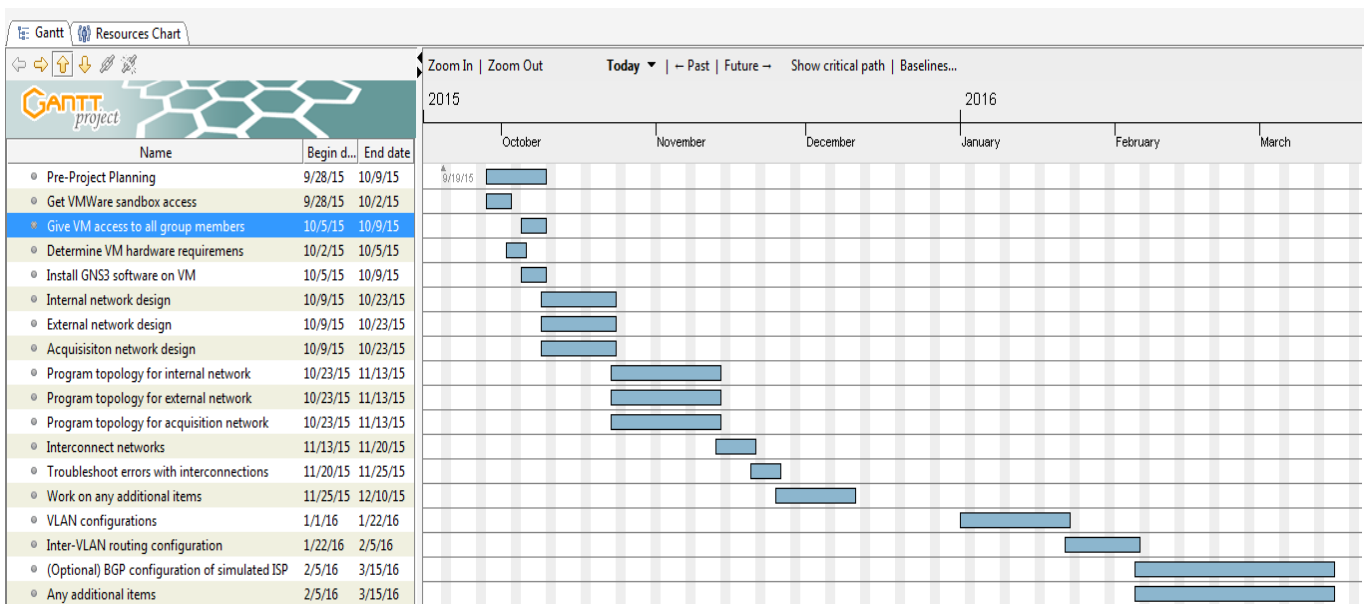


Figure 9, Gantt Chart

These charts show our work schedule over the last few months.

Budget

Our ideal expenses would only be the hours of the IT department for the process of the merging of the sites. We plan on integrating all of the networks together without purchasing any additional equipment. Potentially Layer 3 switches may need to be purchased for our future VLAN solution, however this may not be necessary if using a router on a stick method of inter-VLAN routing.

	Expense	Budget
IT Department hours	\$4000	\$8000
Potential equipment changes	\$0	\$10000

Table 1, Budget Chart

Conclusion

With the use of Dynamic Multipoint VPN on Cisco routers we successfully connected multiple company locations together. Each location had a different IP class which shows that an IT team could connect the companies together without first having to change an entire company IP layout. Our project also did not require any kind of rebooting of the routers or other devices on the network. This is a key factor in limiting the disruption to the acquired company.

References

Cisco IOS IP Configuration Guide, Release 12.2 - Configuring Routing Information Protocol [Cisco IOS Software Release 12.2] (Cisco)

http://www.cisco.com/c/en/us/td/docs/ios/12_2/ip/configuration/guide/fipr_c/1cfrip.html#wp1000952

Cisco ASA 5500 Series Configuration Guide using the CLI, 8.2 - Configuring OSPF [Cisco ASA 5500-X Series Next-Generation Firewalls] (Cisco)

http://www.cisco.com/c/en/us/td/docs/security/asa/asa82/configuration/guide/config/route_ospf.html

Cisco IOS IP Configuration Guide, Release 12.2 - Configuring EIGRP [Cisco IOS Software Release 12.2] (Cisco)

http://www.cisco.com/c/en/us/td/docs/ios/12_2/ip/configuration/guide/fipr_c/1cfeigrp.html

Redistributing Routing Protocols (Cisco)

<http://www.cisco.com/c/en/us/support/docs/ip/enhanced-interior-gateway-routing-protocol-eigrp/8606-redist.html>

Cisco Dynamic Multipoint VPN: Simple and Secure Branch-to-Branch Communications (Cisco)

http://www.cisco.com/c/en/us/products/collateral/security/dynamic-multipoint-vpn-dmvpn/data_sheet_c78-468520.html

Cisco CCNP Routing/Switching 300-101 ROUTE - Welcome: Course Overview and Cisco Certification (CBTNuggets.com)

<https://www.cbtnuggets.com/it-training/cisco-ccnp-routing-switching-300-101>

Index of /ciscoios (Index of /ciscoios)

<http://certs4u.info/ciscoios/>



Company Acquisition and Integration: A Network Simulation

Vince Keough | Josh Zahrte | Brian Merz



Agenda

- Background/Scenario
- Implementations
- Network Topology
- Demonstration
- Problems Encountered
- Questions

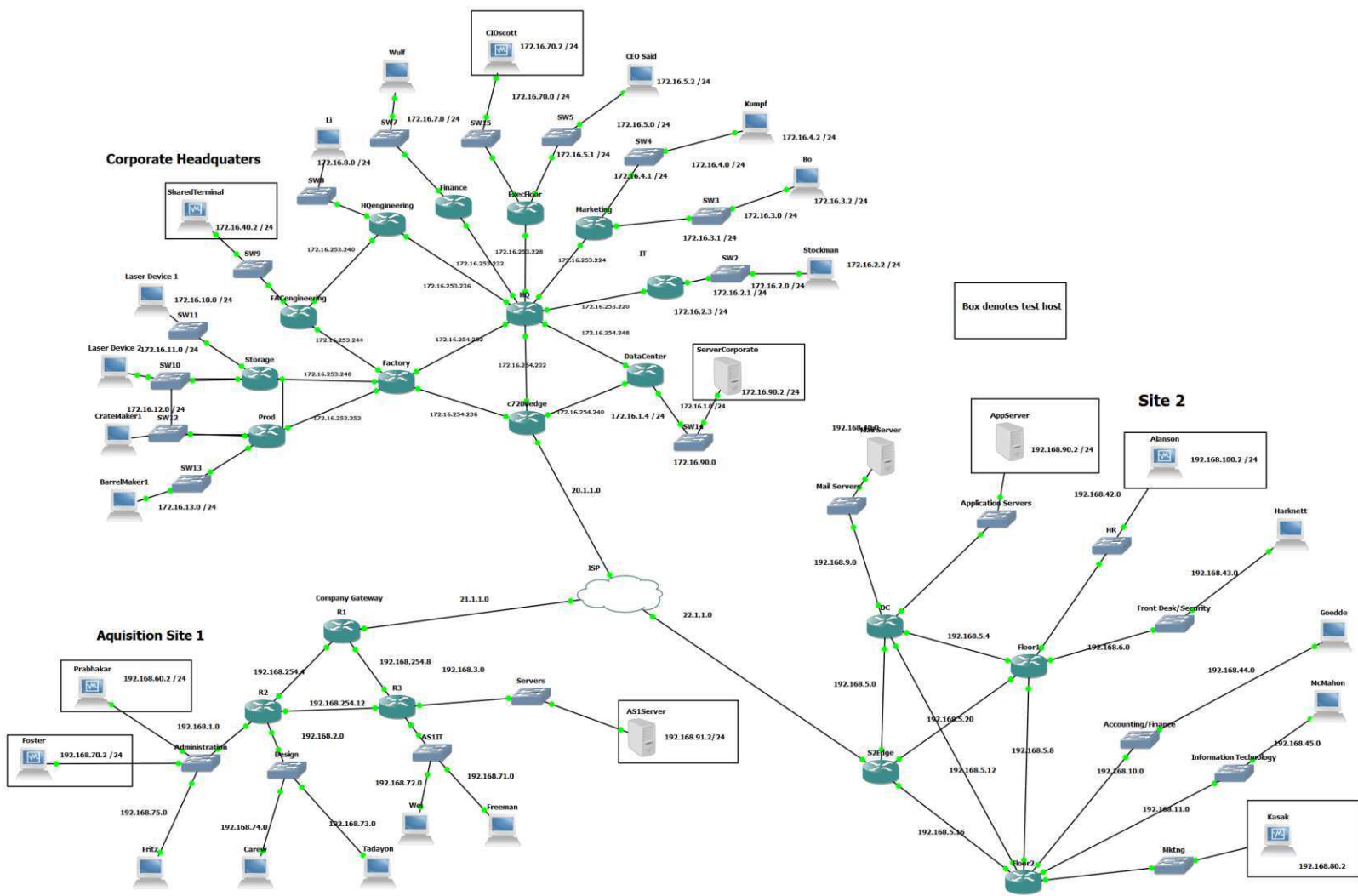
Background/Scenario

Main Focus:

Simulate a merger of three companies which all use different routing protocols (RIP, EIGRP, OSPF)

IT department must integrate the networks with minimal costs & disruption to everyday work

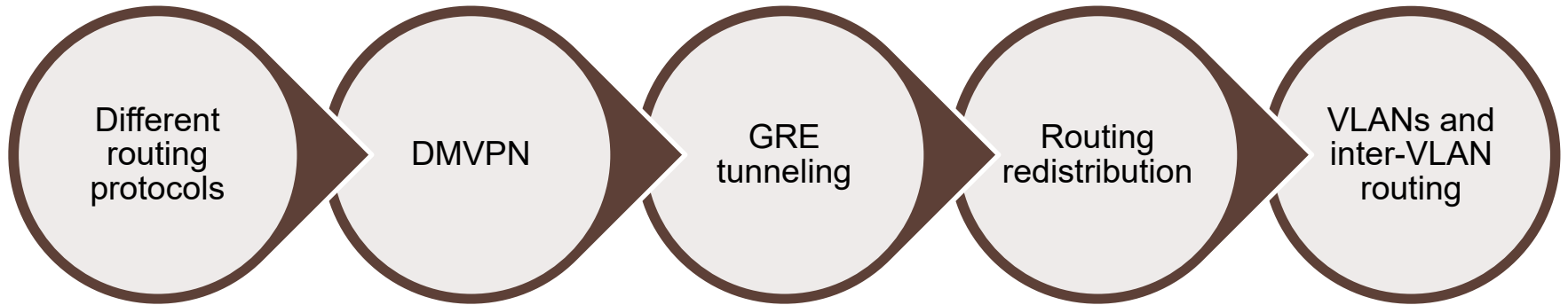
Use GNS3 and Cisco IOS files to simulate how a real-world network merger would occur



Problems Encountered

- VM was **very** slow, resulted in connections, pings, etc. timing out and failing over without any realistic issue
- VM would constantly shut down randomly – resulted in loss of progress
- Limited number of hosts and routers, we had to choose three hosts from each site instead of having all hosts operating
- General configuration mishaps which required troubleshooting

Implementations



Different Routing Protocols & Redistribution

- What are routing protocols?
 - Three different companies may call for three different protocols
- RIP – Hop count (routers passed through)
- OSPF – Uses link speed for next hop calculation
- EIGRP – Cisco proprietary, bandwidth/delay/reliability/MTU/etc. for route calculation
- **Redistribution** – allow different protocols to connect together

VLAN Assignment

Assigned as follows:

IT 10

Prod. 20

Storage 30

Factory Engineering 40

HQ Engineering 50

Finance 60

Exec. 70

Marketing 80

Datacenter 90

HR 100

Physical Security 110

- These VLANs (Virtual Local Area Networks) were assigned to the hosts and switches throughout our network
- They will allow us to segment the network by department instead of just by physical location
 - For example, security measures could be applied so that the Factory Engineering VLAN (40) is not allowed to access hosts in the Executive VLAN (70) even if the two hosts are on the same *physical* LAN.

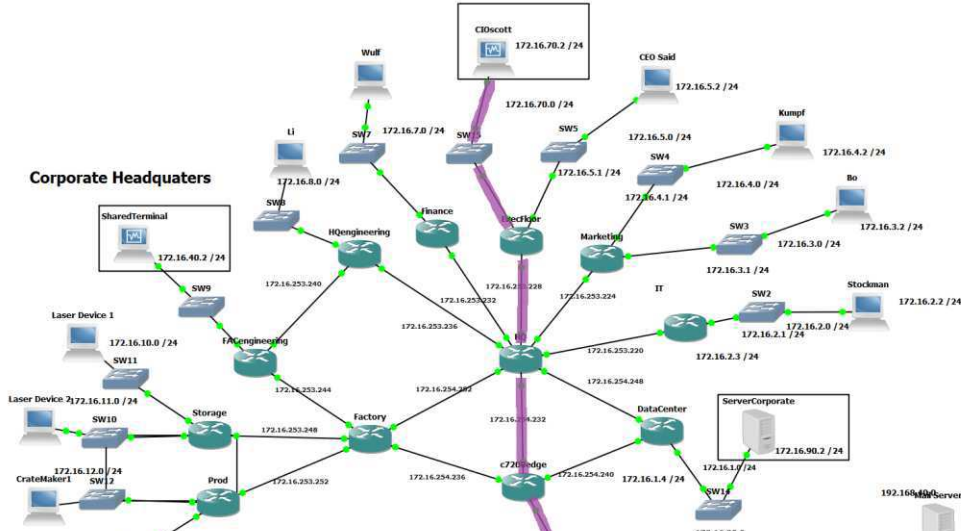
Inter-VLAN routing was also configured, which allows the VLANs to be routed, and therefore communicate.

DMVPN & GRE Tunneling

- DMVPN allows different network sites to connect to each other directly over the Internet in a secure manner.
- GRE Tunneling is an IP encapsulation protocol that is used to transport packets over a network. (Necessary for DMVPN)
- The main perk of DMVPN is it allows for sites in the DMVPN to access each other directly, without having to route through the main router
 - This saves bandwidth and overhead on our main site router
 - This also allows faster communication due to eliminating extra hops

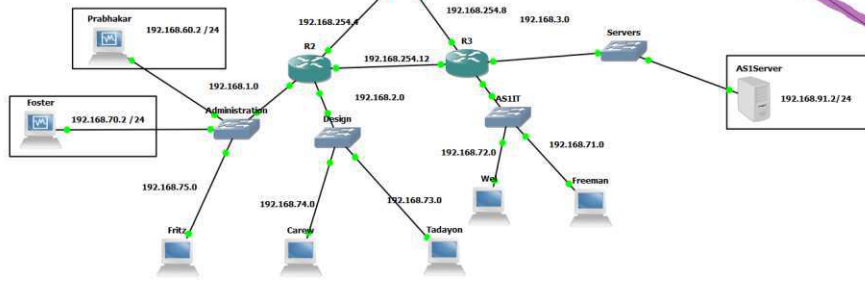
Demo

Corporate Headquarters

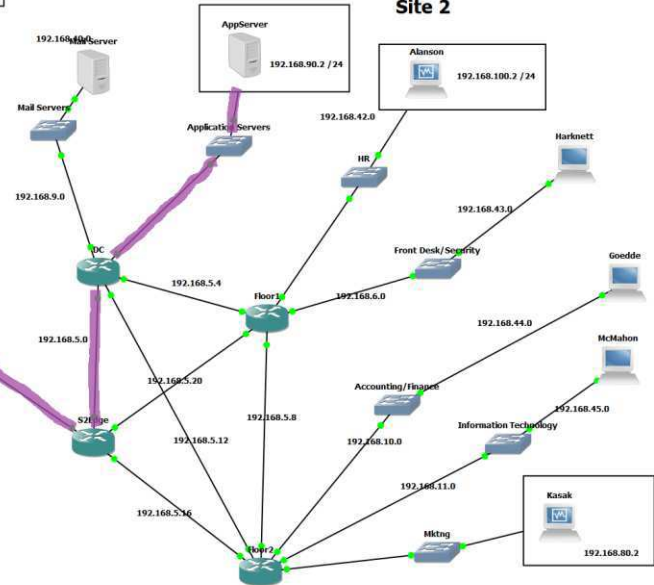


Box denotes test host

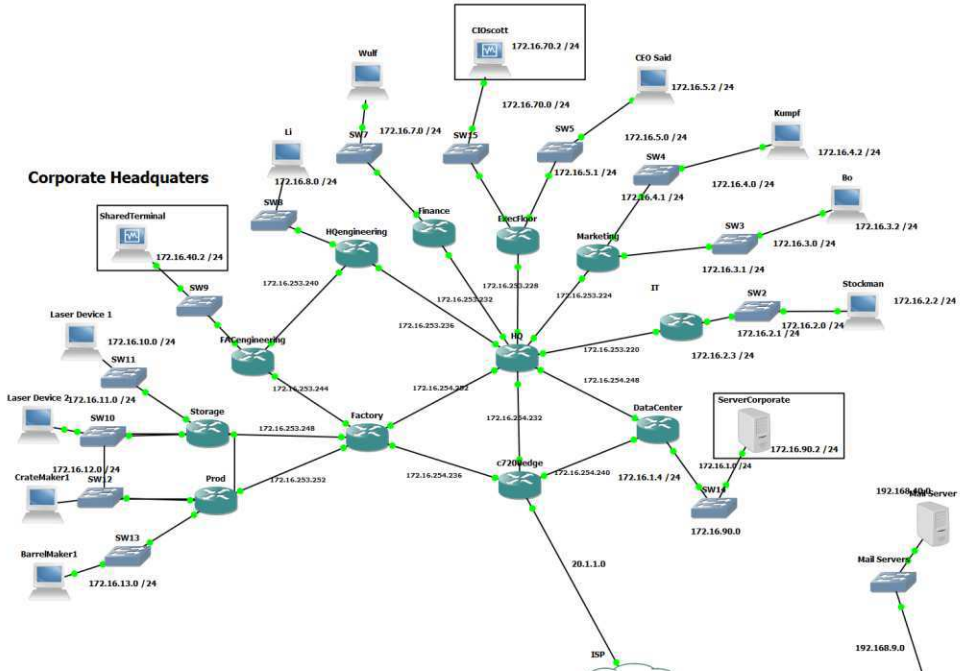
Aquisition Site 1



Site 2

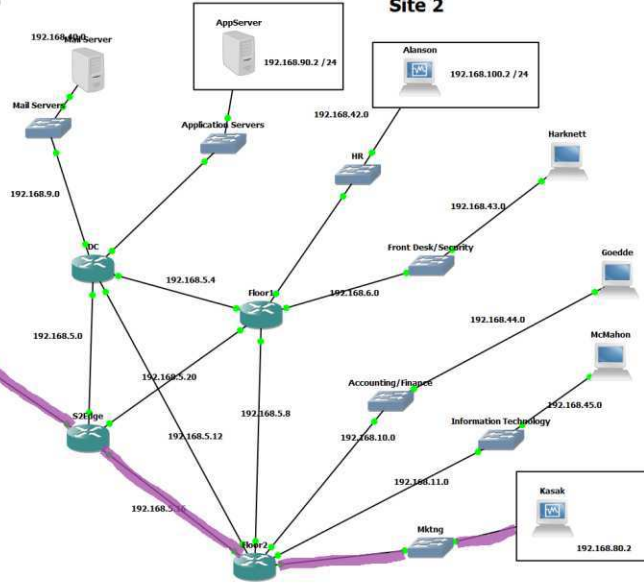


Corporate Headquarters

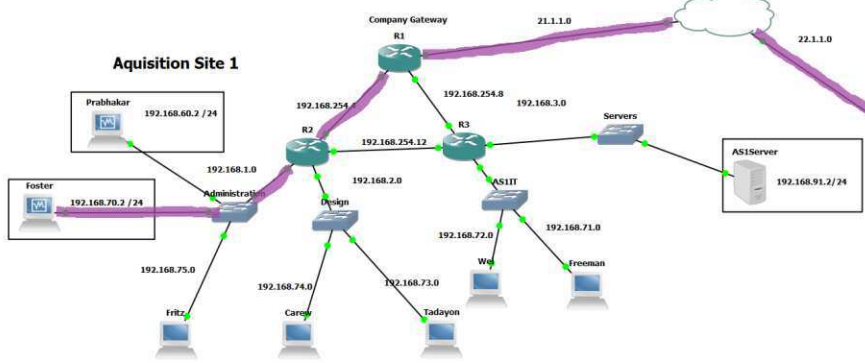


Box denotes test host

Site 2



Aquisition Site 1



Conclusion

- All three sites are operating and able to communicate with one another
 - Routing redistribution has populated the routing tables with all routes
 - DMVPN is properly configured and routing traffic between the sites
 - VLANs are configured and communicating as intended
- Minimal disruption would be caused during the merger to the individual sites

Questions?

Abstract

Our project simulates a merger of three companies all using different routing protocols. It shows an effective and non-disruptive way of mediating the differing networks and their protocols with each other. The scenario involves a main company headquarters site, as well as two external sites that are being merged into the main company. The idea is to be able to get all three sites to communicate to each other without major disruptions to the network. This project gave us useful insight and a model for adding new companies to an existing network. The finalized solution uses Dynamic Multipoint VPN and routing protocol redistribution for the overlying network connections. We utilized inter-VLAN routing in order to allow the various departments to connect to each other while remaining secure, regardless of physical location.

Problem / Solution

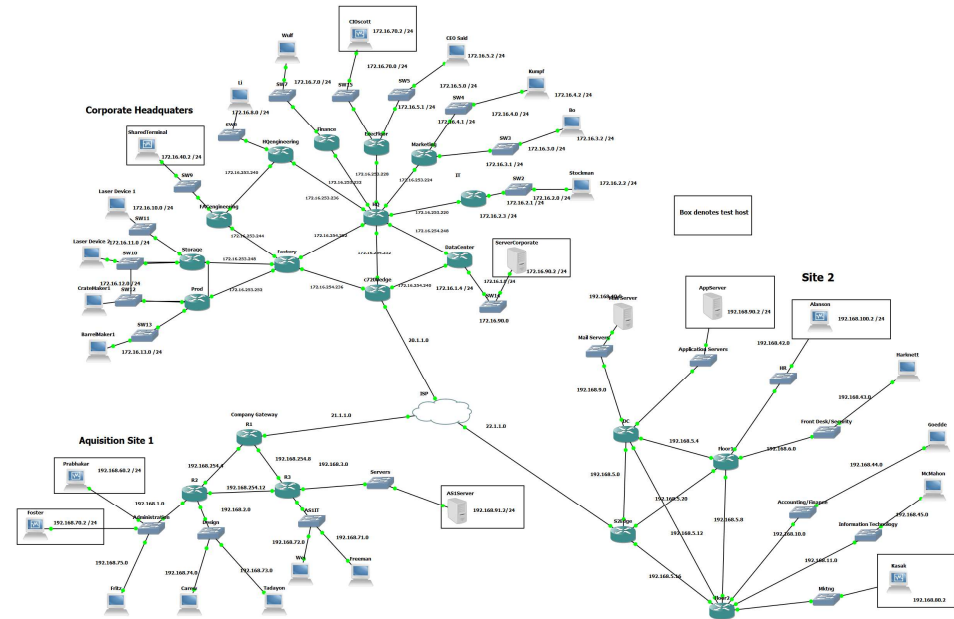
Problem: Integrate remote networks with each other.

- Three Networks
- Different IP schemes / Routing Protocols

Solution: Dynamic Multipoint VPN on Cisco Routers

- Connection of multiple locations was successful.
- Each site had a different IP class
- An IT team can connect the companies together without having to change an entire company IP layout.

Network Topology



Implementation

- GRE Tunneling
- OSPF, EIGRP, and RIP routing protocols
- Routing redistribution
- VLANs
- Dynamic Multipoint VPN

