

Government Network Optimization

I SITUATIONAL PROBLEM

Government agencies have independent databases that makes the registration process lengthy and redundant.

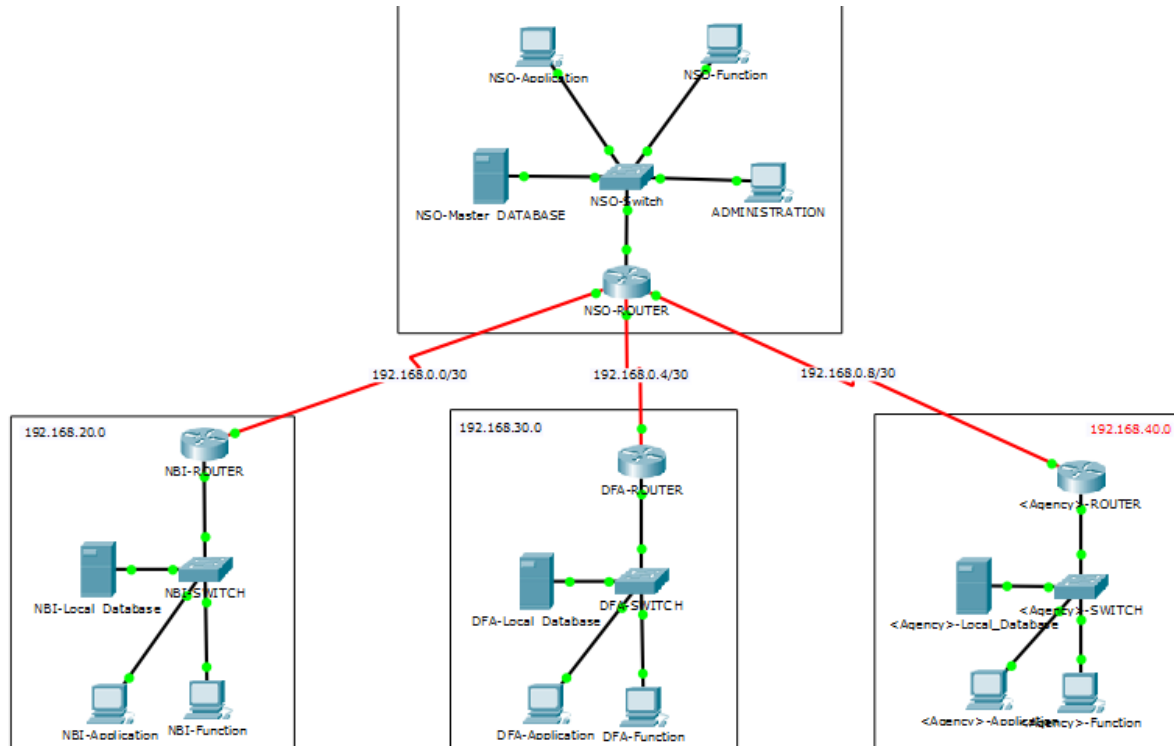
II OBJECTIVES

The intention of this simulation is to implement the concepts, commands, and methods that were learned in the course Routing and Switching Essentials to build and simulate a proposed network design for our design through packet tracer and using Cisco Network Academy Laboratory Equipment.

The specific objectives are as follows:

- To apply concepts in switching such as port security.
- To apply concepts in routing both static and dynamic.
- To provide remote access using SSH.
- To apply dynamic host control protocol (DHCP).
- To restrict certain networks using access lists (ACL).

III PROPOSED NETWORK TOPOLOGY



There are four main networks in this topology namely network NSO, DFA, BIR, and <Agency> and all are connected to a master database and as well as each of them has their own servers. The network of NSO is configured by a switch and a router. In the NSO-Switch, SSH and Port security are set. It has a maximum of 1 changes for f0/1 to 4 and the MAC address sticky are also configured. This setup would be similar to the switches in the other networks (DFA, NBI & <Agency>), they would only change in interfaces where these settings are applied.

Moving on to the NSO router, this is configured to run dynamic routing to R2 and a static routing connection to R3. This static configuration is only necessary to demonstrate the effects of ACL which would be applied at R2.

The router on network 10 (R2) is the router for the main branch, here configurations such as dynamic routing going to R1 and static routing going to R3 are also used. As mentioned before,

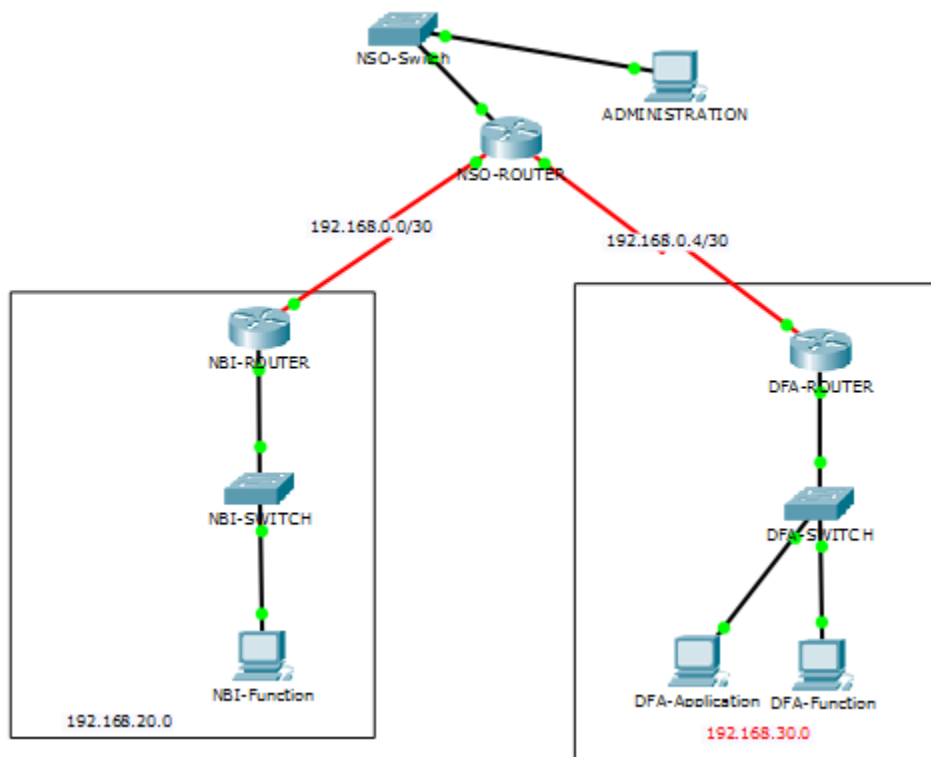
R2 would apply the necessary named ACL restriction for network 20. The ACL would be applied to interface Serial 0/0/1 outbound. This will block any type of connection from network 20 going to network 30.

Lastly, R3 is configured to provide DHCP addressing to its hosts. It is also responsible to have static routing for networks 10 and 20. All of the networking devices have proper housekeeping commands such as banners and encrypted passwords for priv-exec and line con.

IV NETWORK ADDRESSES USED

| Allocation size | Network Address | Subnet Mask |
|-----------------------|-----------------------|-----------------|
| 14 | 192.168.10.0/28 | 255.255.255.240 |
| 6 | 192.168.20.0/29 | 255.255.255.248 |
| 6 | 192.168.30.0/29 | 255.255.255.248 |
| 6 | 192.168.40.0/29 | 255.255.255.248 |
| | | |
| 2 | 192.168.0.0/30 | 255.255.255.252 |
| 2 | 192.168.0.4/30 | 255.255.255.252 |
| 2 | 192.168.0.8/30 | 255.255.255.252 |
| | | |
| 1st Usable Address | 2nd Usable Address | |
| NSO Router | NSO Database | |
| NBI Router | NBI Local Database | |
| DFA Router | DFA Local Database | |
| Agency Router | Agency Local Database | |
| | | |
| Master Router(S0/0/0) | NBI Router(S0/0/0) | |
| Master Router(S0/0/1) | DFA Router(S0/0/1) | |
| Master Router(S0/1/0) | Agency(S0/1/0) | |

V LABORATORY DEMONSTRATION TOPOLOGY



VI RUNNING CONFIGURATIONS

NSO-ROUTER:

```
hostname NSO-ROUTER
!
!
!
enable password 7 0822455D0A16
!
!
ip dhcp excluded-address 192.168.10.1 192.168.10.3
!
ip dhcp pool NSO-POOL
network 192.168.10.0 255.255.255.240
default-router 192.168.10.1
dns-server 192.168.10.1
!
!
!
no ip cef
no ipv6 cef
!
!
!
username admin password 7 0822455D0A16
!
!
license udi pid CISCO2901/K9 sn FTX1524RP3R
!
!
!
!
!
!
!
!
no ip domain-lookup
ip domain-name DFA.ph
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0
ip address 192.168.10.1 255.255.255.240
ip access-group NSO in
duplex auto
speed auto
!
interface GigabitEthernet0/1
no ip address
```

```
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 192.168.0.1 255.255.255.252
ip access-group NoAgency out
!
interface Serial0/0/1
ip address 192.168.0.5 255.255.255.252
ip access-group NoAgency out
!
interface Serial0/1/0
ip address 192.168.0.9 255.255.255.252
ip access-group NoDFA out
clock rate 2000000
!
interface Serial0/1/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router rip
version 2
network 192.168.0.0
network 192.168.10.0
no auto-summary
!
ip classless
!
ip flow-export version 9
!
!
ip access-list standard NSO
permit host 192.168.10.3
permit host 192.168.10.2
deny any
ip access-list standard NoAgency
deny 192.168.40.0 0.0.0.255
permit any
ip access-list standard NoDFA
deny 192.168.20.0 0.0.0.255
permit any
!
banner motd ^CUnauthorized access to this device is
prohibited!^C
!
!
!
!
line con 0
```

logging synchronous

!

line aux 0

!

line vty 0 4

login local

transport input ssh

NSO-SWITCH

hostname NSO-SWITCH

!

enable password 7 0822455D0A16

!

!

!

no ip domain-lookup

!

!

spanning-tree mode pvst

!

interface FastEthernet0/1

switchport mode access

switchport port-security

switchport port-security mac-address sticky

switchport port-security mac-address sticky

00E0.8F2E.D325

!

interface FastEthernet0/2

switchport mode access

switchport port-security

switchport port-security mac-address sticky

switchport port-security mac-address sticky

00E0.8F07.93D5

!

interface FastEthernet0/3

switchport mode access

switchport port-security

switchport port-security mac-address sticky

switchport port-security mac-address sticky

00D0.D38A.0BCC

!

interface FastEthernet0/4

switchport mode access

switchport port-security

switchport port-security mac-address sticky

switchport port-security mac-address sticky

0009.7C72.9635

!

interface FastEthernet0/5

switchport mode access

switchport port-security

switchport port-security mac-address sticky

switchport port-security mac-address sticky

0030.A325.D7A0

!

interface FastEthernet0/6

shutdown

!

interface FastEthernet0/7

shutdown

!

interface FastEthernet0/8

shutdown

!

interface FastEthernet0/9

shutdown

!

interface FastEthernet0/10

shutdown

!

interface FastEthernet0/11

shutdown

!

interface FastEthernet0/12

shutdown

!

interface FastEthernet0/13

shutdown

!

interface FastEthernet0/14

shutdown

!

interface FastEthernet0/15

shutdown

!

interface FastEthernet0/16

shutdown

!

interface FastEthernet0/17

shutdown

!

interface FastEthernet0/18

shutdown

!

interface FastEthernet0/19

shutdown

!

interface FastEthernet0/20

shutdown

!

interface FastEthernet0/21

shutdown

!

interface FastEthernet0/22

shutdown

!

interface FastEthernet0/23

shutdown

!

interface FastEthernet0/24

shutdown

!


```

interface GigabitEthernet0/1
shutdown
!
interface GigabitEthernet0/2
shutdown
!
interface Vlan1
no ip address
shutdown
!
banner motd ^CUnauthorized access to this device is
prohibited!^C
!
!
line con 0
logging synchronous
!
line vty 0 4
login
line vty 5 15
login

```

NBI-ROUTER

```

hostname NBI-ROUTER
!
!
!
enable password 7 0822455D0A16
!
!
ip dhcp excluded-address 192.168.20.1 192.168.20.2
ip dhcp excluded-address 192.168.20.1 192.168.20.3
!
ip dhcp pool NBI-POOL
network 192.168.20.0 255.255.255.248
default-router 192.168.20.1
!
!
!
no ip cef
no ipv6 cef
!
!
!
username admin password 7 0822455D0A16
!
!
license udi pid CISCO2901/K9 sn FTX1524C9UF
!
!
!
!
!
!
!

```

```

!
!
no ip domain-lookup
ip domain-name DFA.ph
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0
ip address 192.168.20.1 255.255.255.248
duplex auto
speed auto
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 192.168.0.2 255.255.255.252
clock rate 2000000
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Serial0/1/0
no ip address
clock rate 2000000
shutdown
!
interface Serial0/1/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router rip
version 2
network 192.168.0.0
network 192.168.20.0
no auto-summary
!
ip classless
!
ip flow-export version 9

```

```

!
!
!
banner motd ^CUnauthorized access to this device is
prohibited!^C
!
!
!
!
line con 0
logging synchronous
!
line aux 0
!
line vty 0 4
login local
transport input ssh

```

NBI-SWITCH

```

hostname NBI-SWITCH
!
enable password 7 0822455D0A16
!
!
!
no ip domain-lookup
!
!
spanning-tree mode pvst
!
interface FastEthernet0/1
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
00D0.9765.87D4
!
interface FastEthernet0/2
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
0002.1725.9DA4
!
interface FastEthernet0/3
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
00D0.FFE9.A38A
!
interface FastEthernet0/4
switchport mode access
switchport port-security
switchport port-security mac-address sticky

```

```

switchport port-security mac-address sticky
0001.42BA.8BBC
!
interface FastEthernet0/5
shutdown
!
interface FastEthernet0/6
shutdown
!
interface FastEthernet0/7
shutdown
!
interface FastEthernet0/8
shutdown
!
interface FastEthernet0/9
shutdown
!
interface FastEthernet0/10
shutdown
!
interface FastEthernet0/11
shutdown
!
interface FastEthernet0/12
shutdown
!
interface FastEthernet0/13
shutdown
!
interface FastEthernet0/14
shutdown
!
interface FastEthernet0/15
shutdown
!
interface FastEthernet0/16
shutdown
!
interface FastEthernet0/17
shutdown
!
interface FastEthernet0/18
shutdown
!
interface FastEthernet0/19
shutdown
!
interface FastEthernet0/20
shutdown
!
interface FastEthernet0/21
shutdown
!
interface FastEthernet0/22
shutdown

```

```

!
interface FastEthernet0/23
 shutdown
!
interface FastEthernet0/24
 shutdown
!
interface GigabitEthernet0/1
 shutdown
!
interface GigabitEthernet0/2
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
banner motd ^CUnauthorized access to this device is
prohibited!^C
!
!
!
line con 0
 logging synchronous
!
line vty 0 4
 login
line vty 5 15
 login

```

DFA-ROUTER

```

hostname DFA-ROUTER
!
!
!
enable password 7 0822455D0A16
!
!
ip dhcp excluded-address 192.168.30.1 192.168.30.2
ip dhcp excluded-address 192.168.30.1 192.168.30.3
!
ip dhcp pool DFA-POOL
 network 192.168.30.0 255.255.255.248
 default-router 192.168.30.1
!
!
!
no ip cef
no ipv6 cef
!
!
!
username admin password 7 0822455D0A16
!
!
license udi pid CISCO2901/K9 sn FTX15241BCV

```

```

!
!
!
!
!
!
!
no ip domain-lookup
ip domain-name DFA.ph
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0
 ip address 192.168.30.1 255.255.255.248
 ip access-group DFA in
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/0/0
 no ip address
 clock rate 2000000
 shutdown
!
interface Serial0/0/1
 ip address 192.168.0.6 255.255.255.252
 clock rate 2000000
!
interface Serial0/1/0
 no ip address
 clock rate 2000000
 shutdown
!
interface Serial0/1/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
router rip

```

```

version 2
network 192.168.0.0
network 192.168.30.0
no auto-summary
!
ip classless
!
ip flow-export version 9
!
!
ip access-list standard DFA
permit host 192.168.30.2
permit host 192.168.30.3
deny any
!
banner motd ^CUnauthorized access to this device is
prohibited!^C
!
!
!
!
line con 0
logging synchronous
!
line aux 0
!
line vty 0 4
login local
transport input ssh

```

DFA-SWITCH

```

hostname DFA-SWITCH
!
enable password 7 0822455D0A16
!
!
!
no ip domain-lookup
!
!
spanning-tree mode pvst
!
interface FastEthernet0/1
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
000A.F3DA.A403
!
interface FastEthernet0/2
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
0004.9A30.AC91
!

```

```

interface FastEthernet0/3
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
0002.1780.41A4
!
interface FastEthernet0/4
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address sticky
0001.437D.29D1
!
interface FastEthernet0/5
shutdown
!
interface FastEthernet0/6
shutdown
!
interface FastEthernet0/7
shutdown
!
interface FastEthernet0/8
shutdown
!
interface FastEthernet0/9
shutdown
!
interface FastEthernet0/10
shutdown
!
interface FastEthernet0/11
shutdown
!
interface FastEthernet0/12
shutdown
!
interface FastEthernet0/13
shutdown
!
interface FastEthernet0/14
shutdown
!
interface FastEthernet0/15
shutdown
!
interface FastEthernet0/16
shutdown
!
interface FastEthernet0/17
shutdown
!
interface FastEthernet0/18
shutdown
!

```

```
interface FastEthernet0/19
shutdown
!
interface FastEthernet0/20
shutdown
!
interface FastEthernet0/21
shutdown
!
interface FastEthernet0/22
shutdown
!
interface FastEthernet0/23
shutdown
!
interface FastEthernet0/24
shutdown
!
interface GigabitEthernet0/1
shutdown
!
interface GigabitEthernet0/2
shutdown
!
interface Vlan1
no ip address
shutdown
!
banner motd ^CUnauthorized access to this device is
prohibited!^C
!
!
!
line con 0
logging synchronous
!
line vty 0 4
login
line vty 5 15
login
```