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**GNS3 (Claude)**

Documentation

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# GNS3 Enterprise Network Configuration Guide

## Network Overview

This lab implements a complex enterprise network with:

* 6 Routers (R1-R6 + ISP)
* 6 Switches (SW1-SW6) with Layer 3 capability on SW1/SW2
* Multiple VLANs with HSRP redundancy
* OSPF WAN routing
* Multiple services (DHCP, DNS, Web, PBX)

## Phase 1: Basic Router WAN Configuration

### ISP Router Configuration

hostname ISP

!

interface GigabitEthernet0/0

description "Connection to R3"

ip address 192.10.0.1 255.255.255.252

no shutdown

!

interface GigabitEthernet0/1

description "Connection to R4"

ip address 192.10.1.1 255.255.255.252

no shutdown

!

interface GigabitEthernet0/2

description "Connection to R5"

ip address 145.0.10.1 255.255.255.240

no shutdown

!

interface GigabitEthernet0/3

description "Connection to R6"

ip address 66.2.10.1 255.255.255.240

no shutdown

!

interface Loopback0

ip address 8.8.8.8 255.255.255.255

!

interface Loopback1

ip address 8.8.4.4 255.255.255.255

!

router ospf 1

router-id 1.1.1.1

network 192.10.0.0 0.0.0.3 area 0

network 192.10.1.0 0.0.0.3 area 0

network 145.0.10.0 0.0.0.15 area 0

network 66.2.10.0 0.0.0.15 area 0

network 8.8.8.8 0.0.0.0 area 0

network 8.8.4.4 0.0.0.0 area 0

### R1 Configuration

hostname R1

!

interface GigabitEthernet0/0

description "Connection to R2"

ip address 192.10.5.1 255.255.255.252

no shutdown

!

interface GigabitEthernet0/1

description "Connection to R3"

ip address 192.10.4.2 255.255.255.252

no shutdown

!

router ospf 1

router-id 2.2.2.2

network 192.10.5.0 0.0.0.3 area 0

network 192.10.4.0 0.0.0.3 area 0

default-information originate

!

ip route 0.0.0.0 0.0.0.0 192.10.4.1

ip route 10.0.10.0 255.255.255.0 145.0.10.2

ip route 192.168.10.0 255.255.255.0 145.0.10.2

ip route 172.16.10.0 255.255.255.0 145.0.10.2

ip route 10.1.10.0 255.255.255.0 145.0.10.2

ip route 172.1.10.0 255.255.255.0 145.0.10.2

### R2 Configuration

hostname R2

!

interface GigabitEthernet0/0

description "Connection to R1"

ip address 192.10.5.2 255.255.255.252

no shutdown

!

interface GigabitEthernet0/1

description "Connection to R3"

ip address 192.10.3.1 255.255.255.252

no shutdown

!

interface GigabitEthernet0/2

description "Connection to R4"

ip address 192.10.2.2 255.255.255.252

no shutdown

!

interface GigabitEthernet0/3

description "Connection to ARHuawei"

ip address 192.168.10.1 255.255.255.252

no shutdown

!

router ospf 1

router-id 3.3.3.3

network 192.10.5.0 0.0.0.3 area 0

network 192.10.3.0 0.0.0.3 area 0

network 192.10.2.0 0.0.0.3 area 0

network 192.168.10.0 0.0.0.3 area 0

default-information originate

!

ip route 0.0.0.0 0.0.0.0 192.10.2.1

ip route 10.0.10.0 255.255.255.0 66.2.10.2

ip route 192.168.10.0 255.255.255.0 66.2.10.2

ip route 172.16.10.0 255.255.255.0 66.2.10.2

ip route 10.1.10.0 255.255.255.0 66.2.10.2

ip route 172.1.10.0 255.255.255.0 66.2.10.2

### R3 Configuration

hostname R3

!

interface GigabitEthernet0/0

description "Connection to ISP"

ip address 192.10.0.2 255.255.255.252

no shutdown

!

interface GigabitEthernet0/1

description "Connection to R1"

ip address 192.10.4.1 255.255.255.252

no shutdown

!

interface GigabitEthernet0/2

description "Connection to R2"

ip address 192.10.3.2 255.255.255.252

no shutdown

!

router ospf 1

router-id 4.4.4.4

network 192.10.0.0 0.0.0.3 area 0

network 192.10.4.0 0.0.0.3 area 0

network 192.10.3.0 0.0.0.3 area 0

### R4 Configuration

hostname R4

!

interface GigabitEthernet0/0

description "Connection to ISP"

ip address 192.10.1.2 255.255.255.252

no shutdown

!

interface GigabitEthernet0/1

description "Connection to R2"

ip address 192.10.2.1 255.255.255.252

no shutdown

!

router ospf 1

router-id 5.5.5.5

network 192.10.1.0 0.0.0.3 area 0

network 192.10.2.0 0.0.0.3 area 0

### R5 Configuration

hostname R5

!

interface GigabitEthernet0/0

description "Connection to ISP"

ip address 145.0.10.2 255.255.255.240

no shutdown

!

interface GigabitEthernet0/1

description "Connection to SW1"

ip address 145.0.10.3 255.255.255.240

standby 1 ip 145.0.10.4

standby 1 priority 110

standby 1 preempt

no shutdown

!

router ospf 1

router-id 6.6.6.6

network 145.0.10.0 0.0.0.15 area 0

### R6 Configuration

hostname R6

!

interface GigabitEthernet0/0

description "Connection to ISP"

ip address 66.2.10.2 255.255.255.240

no shutdown

!

interface GigabitEthernet0/1

description "Connection to SW2"

ip address 66.2.10.3 255.255.255.240

standby 1 ip 66.2.10.4

standby 1 priority 90

standby 1 preempt

no shutdown

!

router ospf 1

router-id 7.7.7.7

network 66.2.10.0 0.0.0.15 area 0

## Phase 2: Layer 3 Switch Configuration (SW1 & SW2)

### SW1 Configuration (Root for VLANs 10,11,12)

hostname SW1

!

enable secret cisco

!

username admin password cisco

ip domain-name cisco.com

crypto key generate rsa modulus 1024

!

vtp domain cisco.com

vtp mode server

vtp password cisco

vtp version 2

!

vlan 10

name gerencia

vlan 11

name administracion

vlan 12

name VoIP

vlan 13

name IT

vlan 15

name Admin\_Equipos

vlan 18

!

spanning-tree mode pvst

spanning-tree vlan 10 root primary

spanning-tree vlan 11 root primary

spanning-tree vlan 12 root primary

spanning-tree vlan 13 root secondary

spanning-tree vlan 15 root secondary

!

interface range GigabitEthernet0/1-6

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan all

no shutdown

!

interface GigabitEthernet0/7

description "Connection to R5"

no switchport

ip address 145.0.10.5 255.255.255.240

standby 1 ip 145.0.10.4

standby 1 priority 90

standby 1 preempt

no shutdown

!

interface Vlan10

description "VLAN 10 - Gerencia"

ip address 10.0.10.2 255.255.255.0

standby 10 ip 10.0.10.1

standby 10 priority 110

standby 10 preempt

ip helper-address 10.1.10.11

no shutdown

!

interface Vlan11

description "VLAN 11 - Administracion"

ip address 192.168.10.2 255.255.255.0

standby 11 ip 192.168.10.1

standby 11 priority 110

standby 11 preempt

ip helper-address 10.1.10.11

no shutdown

!

interface Vlan12

description "VLAN 12 - VoIP"

ip address 172.16.10.2 255.255.255.0

standby 12 ip 172.16.10.1

standby 12 priority 110

standby 12 preempt

ip helper-address 10.1.10.11

no shutdown

!

interface Vlan13

description "VLAN 13 - IT"

ip address 10.1.10.2 255.255.255.0

standby 13 ip 10.1.10.1

standby 13 priority 90

standby 13 preempt

no shutdown

!

interface Vlan15

description "VLAN 15 - Admin\_Equipos"

ip address 172.1.10.2 255.255.255.0

standby 15 ip 172.1.10.1

standby 15 priority 90

standby 15 preempt

no shutdown

!

ip routing

ip route 0.0.0.0 0.0.0.0 145.0.10.4

!

access-list 100 permit ip 10.1.10.0 0.0.0.255 172.1.10.0 0.0.0.255

access-list 100 deny ip any 172.1.10.0 0.0.0.255

access-list 100 permit ip any any

!

interface vlan 15

ip access-group 100 in

!

line vty 0 4

login local

transport input ssh

!

ip ssh version 2

### SW2 Configuration (Root for VLANs 13,15)

hostname SW2

!

enable secret cisco

!

username admin password cisco

ip domain-name cisco.com

crypto key generate rsa modulus 1024

!

vtp domain cisco.com

vtp mode server

vtp password cisco

vtp version 2

!

vlan 10

name gerencia

vlan 11

name administracion

vlan 12

name VoIP

vlan 13

name IT

vlan 15

name Admin\_Equipos

vlan 18

!

spanning-tree mode pvst

spanning-tree vlan 10 root secondary

spanning-tree vlan 11 root secondary

spanning-tree vlan 12 root secondary

spanning-tree vlan 13 root primary

spanning-tree vlan 15 root primary

!

interface range GigabitEthernet0/1-6

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan all

no shutdown

!

interface GigabitEthernet0/7

description "Connection to R6"

no switchport

ip address 66.2.10.5 255.255.255.240

standby 1 ip 66.2.10.4

standby 1 priority 110

standby 1 preempt

no shutdown

!

interface Vlan10

description "VLAN 10 - Gerencia"

ip address 10.0.10.3 255.255.255.0

standby 10 ip 10.0.10.1

standby 10 priority 90

standby 10 preempt

ip helper-address 10.1.10.11

no shutdown

!

interface Vlan11

description "VLAN 11 - Administracion"

ip address 192.168.10.3 255.255.255.0

standby 11 ip 192.168.10.1

standby 11 priority 90

standby 11 preempt

ip helper-address 10.1.10.11

no shutdown

!

interface Vlan12

description "VLAN 12 - VoIP"

ip address 172.16.10.3 255.255.255.0

standby 12 ip 172.16.10.1

standby 12 priority 90

standby 12 preempt

ip helper-address 10.1.10.11

no shutdown

!

interface Vlan13

description "VLAN 13 - IT"

ip address 10.1.10.3 255.255.255.0

standby 13 ip 10.1.10.1

standby 13 priority 110

standby 13 preempt

no shutdown

!

interface Vlan15

description "VLAN 15 - Admin\_Equipos"

ip address 172.1.10.3 255.255.255.0

standby 15 ip 172.1.10.1

standby 15 priority 110

standby 15 preempt

no shutdown

!

ip routing

ip route 0.0.0.0 0.0.0.0 66.2.10.4

!

access-list 100 permit ip 10.1.10.0 0.0.0.255 172.1.10.0 0.0.0.255

access-list 100 deny ip any 172.1.10.0 0.0.0.255

access-list 100 permit ip any any

!

interface vlan 15

ip access-group 100 in

!

line vty 0 4

login local

transport input ssh

!

ip ssh version 2

## Phase 3: Access Layer Switch Configuration

### SW3 Configuration (Client Mode)

hostname SW3

!

enable secret cisco

username admin password cisco

!

vtp domain cisco.com

vtp mode client

vtp password cisco

vtp version 2

!

spanning-tree mode pvst

!

interface range GigabitEthernet0/1-2

description "Trunk to SW1 and SW2"

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan all

no shutdown

!

interface GigabitEthernet0/3

description "Windows1 Cloud"

switchport mode access

switchport access vlan 10

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/4

description "PC1"

switchport mode access

switchport access vlan 11

spanning-tree portfast

no shutdown

!

interface Vlan15

ip address 172.1.10.10 255.255.255.0

no shutdown

!

ip default-gateway 172.1.10.1

!

line vty 0 4

login local

transport input ssh

### SW4 Configuration (Client Mode)

hostname SW4

!

enable secret cisco

username admin password cisco

!

vtp domain cisco.com

vtp mode client

vtp password cisco

vtp version 2

!

spanning-tree mode pvst

!

interface range GigabitEthernet0/1-2

description "Trunk to SW1 and SW2"

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan all

no shutdown

!

interface GigabitEthernet0/3

description "PC2"

switchport mode access

switchport access vlan 10

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/4

description "Windows2 Cloud"

switchport mode access

switchport access vlan 11

spanning-tree portfast

no shutdown

!

interface Vlan15

ip address 172.1.10.11 255.255.255.0

no shutdown

!

ip default-gateway 172.1.10.1

!

line vty 0 4

login local

transport input ssh

### SW5 Configuration (Client Mode - Servers)

hostname SW5

!

enable secret cisco

username admin password cisco

!

vtp domain cisco.com

vtp mode client

vtp password cisco

vtp version 2

!

spanning-tree mode pvst

!

interface range GigabitEthernet0/1-2

description "Trunk to SW1 and SW2"

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan all

no shutdown

!

interface GigabitEthernet0/3

description "DNS\_Web Server"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/4

description "DHCP Server"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/5

description "Windows Server"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/6

description "PBX Server"

switchport mode access

switchport access vlan 12

spanning-tree portfast

no shutdown

!

interface Vlan15

ip address 172.1.10.12 255.255.255.0

no shutdown

!

ip default-gateway 172.1.10.1

!

line vty 0 4

login local

transport input ssh

### SW6 Configuration (Client Mode - Backup Servers)

hostname SW6

!

enable secret cisco

username admin password cisco

!

vtp domain cisco.com

vtp mode client

vtp password cisco

vtp version 2

!

spanning-tree mode pvst

!

interface range GigabitEthernet0/1-2

description "Trunk to SW1 and SW2"

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan all

no shutdown

!

interface GigabitEthernet0/3

description "DNS\_Web Server Backup"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/4

description "DHCP Server Backup"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/5

description "Windows Server Backup"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/6

description "PBX Server Backup"

switchport mode access

switchport access vlan 12

spanning-tree portfast

no shutdown

!

interface Vlan15

ip address 172.1.10.13 255.255.255.0

no shutdown

!

ip default-gateway 172.1.10.1

!

line vty 0 4

login local

transport input ssh

## Phase 4: NAT Configuration on Edge Routers

### R1 NAT Configuration

! NAT Configuration for R1

ip nat inside source static tcp 10.1.10.10 80 145.0.10.3 80

ip nat inside source static udp 10.1.10.10 53 145.0.10.3 53

ip nat inside source list 1 interface GigabitEthernet0/1 overload

!

access-list 1 permit 10.0.10.0 0.0.0.255

access-list 1 permit 192.168.10.0 0.0.0.255

access-list 1 permit 172.16.10.0 0.0.0.255

access-list 1 permit 10.1.10.0 0.0.0.255

access-list 1 permit 172.1.10.0 0.0.0.255

!

interface GigabitEthernet0/1

ip nat outside

!

interface GigabitEthernet0/0

ip nat inside

### R2 NAT Configuration

! NAT Configuration for R2

ip nat inside source static tcp 10.1.10.10 80 66.2.10.3 80

ip nat inside source static udp 10.1.10.10 53 66.2.10.3 53

ip nat inside source list 1 interface GigabitEthernet0/2 overload

!

access-list 1 permit 10.0.10.0 0.0.0.255

access-list 1 permit 192.168.10.0 0.0.0.255

access-list 1 permit 172.16.10.0 0.0.0.255

access-list 1 permit 10.1.10.0 0.0.0.255

access-list 1 permit 172.1.10.0 0.0.0.255

!

interface GigabitEthernet0/2

ip nat outside

!

interface GigabitEthernet0/0

ip nat inside

interface GigabitEthernet0/1

ip nat inside

## Phase 5: Server Configuration Guidelines

### DHCP Server Configuration (Mikrotik/RouterOS)

# Create DHCP pools for each VLAN (except server VLANs)

/ip pool

add name=pool\_vlan10 ranges=10.0.10.50-10.0.10.100

add name=pool\_vlan11 ranges=192.168.10.50-192.168.10.100

add name=pool\_vlan12 ranges=172.16.10.50-172.16.10.100

/ip dhcp-server network

add address=10.0.10.0/24 gateway=10.0.10.1 dns-server=10.1.10.10

add address=192.168.10.0/24 gateway=192.168.10.1 dns-server=10.1.10.10

add address=172.16.10.0/24 gateway=172.16.10.1 dns-server=10.1.10.10

/ip dhcp-server

add address-pool=pool\_vlan10 disabled=no interface=vlan10 name=dhcp\_vlan10

add address-pool=pool\_vlan11 disabled=no interface=vlan11 name=dhcp\_vlan11

add address-pool=pool\_vlan12 disabled=no interface=vlan12 name=dhcp\_vlan12

# Static DHCP leases

/ip dhcp-server lease

add address=10.0.10.10 mac-address=aa:bb:cc:dd:ee:01 server=dhcp\_vlan10

add address=10.0.10.11 mac-address=aa:bb:cc:dd:ee:02 server=dhcp\_vlan10

add address=192.168.10.10 mac-address=aa:bb:cc:dd:ee:03 server=dhcp\_vlan11

add address=192.168.10.11 mac-address=aa:bb:cc:dd:ee:04 server=dhcp\_vlan11

### DNS Server Configuration (Debian 12 with BIND9)

# Install BIND9

sudo apt update

sudo apt install bind9 bind9utils bind9-doc

# /etc/bind/named.conf.local

zone "dominio.com" {

type master;

file "/etc/bind/db.dominio.com";

allow-query { any; };

};

zone "10.1.10.in-addr.arpa" {

type master;

file "/etc/bind/db.10.1.10";

allow-query { any; };

};

# /etc/bind/db.dominio.com

$TTL 604800

@ IN SOA ns1.dominio.com. admin.dominio.com. (

1 ; Serial

604800 ; Refresh

86400 ; Retry

2419200 ; Expire

604800 ) ; Negative Cache TTL

;

@ IN NS ns1.dominio.com.

ns1 IN A 10.1.10.10

www IN A 10.1.10.10

dominio.com. IN A 10.1.10.10

pbx IN A 172.16.10.10

### Web Server Configuration (Nginx on Debian 12)

# Install Nginx

sudo apt install nginx

# /etc/nginx/sites-available/dominio.com

server {

listen 80;

server\_name dominio.com www.dominio.com;

root /var/www/dominio.com;

index index.html;

location / {

try\_files $uri $uri/ =404;

}

}

# Enable site

sudo ln -s /etc/nginx/sites-available/dominio.com /etc/nginx/sites-enabled/

sudo mkdir -p /var/www/dominio.com

echo "<h1>Welcome to dominio.com</h1>" | sudo tee /var/www/dominio.com/index.html

sudo systemctl restart nginx

### PBX Server Configuration (Issabel)

# Install Issabel PBX (follow standard installation)

# After installation, configure through web interface:

# Create Extensions:

# Extension 1001-1010 for GNS3 users

# Extension 2001-2010 for eSNP users

# Configure IAX trunk between PBXs:

# Trunk Name: eSnP\_PBX

# Peer Details:

host=192.168.10.2

type=friend

username=gns3\_pbx

secret=strongpassword

qualify=yes

disallow=all

allow=ulaw

# Outbound Routes:

# Route Name: To\_eSNP

# Dial Patterns: 2XXX

# Trunk: eSnP\_PBX

## Phase 6: Testing and Verification

### Connectivity Tests

# Test inter-VLAN connectivity

ping 10.0.10.10 # From any VLAN to Gerencia

ping 192.168.10.10 # From any VLAN to Administracion

ping 172.16.10.10 # From any VLAN to VoIP

ping 10.1.10.10 # From any VLAN to IT servers

# Test internet connectivity

ping 8.8.8.8 # Google DNS

ping 8.8.4.4 # Google DNS alternate

# Test DNS resolution

nslookup www.dominio.com

nslookup dominio.com

nslookup pbx.dominio.com

# Test web server

curl http://dominio.com

curl http://www.dominio.com

### HSRP Failover Test

# Shutdown primary gateway and verify failover

# On SW1:

interface vlan 10

shutdown

# Verify HSRP status

show standby brief

show standby vlan 10

# Test continued connectivity from VLAN 10 devices

### OSPF Verification

# Verify OSPF neighbors

show ip ospf neighbor

# Verify routing table

show ip route ospf

# Verify LSA database

show ip ospf database

## Implementation Order

1. **Physical Topology Setup** - Connect all devices in GNS3
2. **Basic IP Configuration** - Configure all router interfaces
3. **OSPF Configuration** - Enable OSPF on all routers
4. **Switch VTP & VLAN** - Configure VTP domain and VLANs
5. **SVI & HSRP** - Configure Layer 3 interfaces with HSRP
6. **DHCP Server** - Setup Mikrotik DHCP server
7. **DNS & Web Servers** - Configure Debian servers
8. **NAT Configuration** - Configure static NAT and PAT
9. **ACL Implementation** - Apply access control lists
10. **PBX Setup** - Install and configure Issabel PBX
11. **Testing & Verification** - Comprehensive testing

## Troubleshooting Tips

### Common Issues:

* **VTP not propagating**: Verify VTP domain, password, and version
* **HSRP not working**: Check priority, preempt, and IP configuration
* **OSPF adjacency issues**: Verify network statements and area configuration
* **DHCP not working**: Check helper-address configuration on SVI interfaces
* **NAT not translating**: Verify inside/outside interface designation

### Debug Commands:

debug vtp events

debug standby events

debug ip ospf adj

debug ip dhcp server events

debug ip nat

This comprehensive configuration guide provides all the necessary commands and configurations to implement the complex enterprise network topology as specified in your lab requirements.