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**GNS3 (Claude) [v1.0.1]**

Documentation

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use of vlan 18 instead of the networks: 145.0.10.2 – 66.2.10.2

# GNS3 Enterprise Network Configuration Guide - CORRECTED VERSION

## Network Overview

This lab implements a complex enterprise network with:

* 6 Routers (R1-R6 + ISP) with OSPF WAN routing
* 6 Switches (SW1-SW6) with Layer 3 capability on SW1/SW2
* Multiple VLANs with HSRP redundancy
* NAT on edge routers (R5/R6)
* Multiple services (DHCP, DNS, Web, PBX)

## WAN Network Usage

* **145.0.10.0/28**: ISP ↔ R5 (Primary internet gateway)
* **66.2.10.0/28**: ISP ↔ R6 (Secondary internet gateway)
* **192.10.x.x/30**: Internal WAN router-to-router links
* **10.12.10.0/28 (VLAN 18)**: Router-to-switch interconnection (LAN side)

## Phase 1: WAN Router 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 10.12.10.1

ip route 192.168.10.0 255.255.255.0 10.12.10.1

ip route 172.16.10.0 255.255.255.0 10.12.10.1

ip route 10.1.10.0 255.255.255.0 10.12.10.1

ip route 172.1.10.0 255.255.255.0 10.12.10.1

ip route 10.12.10.0 255.255.255.240 10.12.10.1

### 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 10.12.10.1

ip route 192.168.10.0 255.255.255.0 10.12.10.1

ip route 172.16.10.0 255.255.255.0 10.12.10.1

ip route 10.1.10.0 255.255.255.0 10.12.10.1

ip route 172.1.10.0 255.255.255.0 10.12.10.1

ip route 10.12.10.0 255.255.255.240 10.12.10.1

### 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 (Internet Gateway + NAT)

hostname R5

!

interface GigabitEthernet0/0

description "Connection to ISP - WAN"

ip address 145.0.10.2 255.255.255.240

ip nat outside

no shutdown

!

interface GigabitEthernet0/1

description "Connection to SW1 - VLAN 18"

ip address 10.12.10.2 255.255.255.240

ip nat inside

standby 18 ip 10.12.10.1

standby 18 priority 110

standby 18 preempt

no shutdown

!

! NAT Configuration

ip nat inside source static tcp 10.1.10.10 80 145.0.10.2 80

ip nat inside source static udp 10.1.10.10 53 145.0.10.2 53

ip nat inside source list 1 interface GigabitEthernet0/0 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

access-list 1 permit 10.12.10.0 0.0.0.15

!

router ospf 1

router-id 6.6.6.6

network 145.0.10.0 0.0.0.15 area 0

network 10.12.10.0 0.0.0.15 area 0

### R6 Configuration (Backup Internet Gateway + NAT)

hostname R6

!

interface GigabitEthernet0/0

description "Connection to ISP - WAN"

ip address 66.2.10.2 255.255.255.240

ip nat outside

no shutdown

!

interface GigabitEthernet0/1

description "Connection to SW2 - VLAN 18"

ip address 10.12.10.3 255.255.255.240

ip nat inside

standby 18 ip 10.12.10.1

standby 18 priority 90

standby 18 preempt

no shutdown

!

! NAT Configuration (Redundant)

ip nat inside source static tcp 10.1.10.10 80 66.2.10.2 80

ip nat inside source static udp 10.1.10.10 53 66.2.10.2 53

ip nat inside source list 1 interface GigabitEthernet0/0 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

access-list 1 permit 10.12.10.0 0.0.0.15

!

router ospf 1

router-id 7.7.7.7

network 66.2.10.0 0.0.0.15 area 0

network 10.12.10.0 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

spanning-tree vlan 18 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 R5 - VLAN 18"

no switchport

ip address 10.12.10.4 255.255.255.240

standby 18 ip 10.12.10.1

standby 18 priority 90

standby 18 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

!

interface Vlan18

description "VLAN 18 - Router Interconnect"

ip address 10.12.10.5 255.255.255.240

no shutdown

!

ip routing

ip route 0.0.0.0 0.0.0.0 10.12.10.1

!

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

spanning-tree vlan 18 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 R6 - VLAN 18"

no switchport

ip address 10.12.10.6 255.255.255.240

standby 18 ip 10.12.10.1

standby 18 priority 110

standby 18 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

!

interface Vlan18

description "VLAN 18 - Router Interconnect"

ip address 10.12.10.7 255.255.255.240

no shutdown

!

ip routing

ip route 0.0.0.0 0.0.0.0 10.12.10.1

!

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 - Same Servers for Redundancy)

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 - Secondary NIC"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/4

description "DHCP Server - Secondary NIC"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/5

description "Windows Server - Secondary NIC"

switchport mode access

switchport access vlan 13

spanning-tree portfast

no shutdown

!

interface GigabitEthernet0/6

description "PBX Server - Secondary NIC"

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: Server Configuration Guidelines

### Server Redundant Link Configuration

For the servers connected to both SW5 and SW6, configure NIC teaming/bonding for link redundancy:

#### Windows Server NIC Teaming

# On Windows Server - Configure NIC Teaming

New-NetLbfoTeam -Name "ServerTeam" -TeamMembers "Ethernet","Ethernet 2" -TeamingMode SwitchIndependent -LoadBalancingAlgorithm Dynamic

#### Linux Server NIC Bonding (for DNS/Web/DHCP servers)

# /etc/network/interfaces (Debian/Ubuntu)

auto bond0

iface bond0 inet static

address 10.1.10.10/24

gateway 10.1.10.1

bond-slaves eth0 eth1

bond-mode active-backup

bond-miimon 100

bond-primary eth0

# Load bonding module

echo "bonding" >> /etc/modules

Note: Both SW5 and SW6 are connected to the same physical servers via redundant network interfaces, providing link-level redundancy but using the same logical servers.

### 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 5: Testing and Verification

### Network 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 through both paths

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 access

curl http://dominio.com

curl http://www.dominio.com

### HSRP Verification Commands

# Check HSRP status on all Layer 3 devices

show standby brief

show standby 10

show standby 11

show standby 12

show standby 13

show standby 15

show standby 18

# Expected HSRP Active/Standby roles:

# VLAN 10: SW1 (Active), SW2 (Standby)

# VLAN 11: SW1 (Active), SW2 (Standby)

# VLAN 12: SW1 (Active), SW2 (Standby)

# VLAN 13: SW2 (Active), SW1 (Standby)

# VLAN 15: SW2 (Active), SW1 (Standby)

# VLAN 18: R5 (Active), R6 (Standby), SW1 (Listen), SW2 (Active for local)

### HSRP Failover Testing

# Test VLAN 10 failover (SW1 is primary)

# On SW1:

interface vlan 10

shutdown

# Verify HSRP transition

show standby brief

# SW2 should become active for VLAN 10

# Test continued connectivity from VLAN 10 devices

# From PC in VLAN 10:

ping 8.8.8.8 # Should still work through SW2

# Restore SW1 VLAN 10

interface vlan 10

no shutdown

### OSPF Verification

# Verify OSPF neighbors on all routers

show ip ospf neighbor

# Verify OSPF routing table

show ip route ospf

# Verify LSA database

show ip ospf database

# Expected OSPF neighbors:

# ISP: R3, R4, R5, R6

# R1: R2, R3

# R2: R1, R3, R4, ARHuawei

# R3: ISP, R1, R2

# R4: ISP, R2

# R5: ISP

# R6: ISP

### NAT Verification

# On R5 - Check NAT translations

show ip nat translations

show ip nat statistics

# On R6 - Check NAT translations

show ip nat translations

show ip nat statistics

# Test external access to web server

# From internet (ISP router):

telnet 145.0.10.2 80 # Should reach web server through R5

telnet 66.2.10.2 80 # Should reach web server through R6

# Test DNS resolution from internet

nslookup dominio.com 145.0.10.2 # Through R5

nslookup dominio.com 66.2.10.2 # Through R6

### VTP and VLAN Verification

# Check VTP status on all switches

show vtp status

show vtp counters

# Verify VLAN database consistency

show vlan brief

# Expected VTP configuration:

# SW1, SW2: VTP Server mode

# SW3, SW4, SW5, SW6: VTP Client mode

# Domain: cisco.com

# Password: cisco

### Spanning Tree Verification

# Check STP root bridge assignments

show spanning-tree summary

# Verify specific VLAN root bridges

show spanning-tree vlan 10 # SW1 should be root

show spanning-tree vlan 11 # SW1 should be root

show spanning-tree vlan 12 # SW1 should be root

show spanning-tree vlan 13 # SW2 should be root

show spanning-tree vlan 15 # SW2 should be root

show spanning-tree vlan 18 # SW1 should be root

### Access Control List Testing

# Test ACL blocking access to VLAN 15 (Admin\_Equipos)

# From VLAN 10 (should be blocked):

ping 172.1.10.10 # Should fail

telnet 172.1.10.10 22 # Should fail

# From VLAN 13 (IT - should be allowed):

ping 172.1.10.10 # Should work

ssh admin@172.1.10.10 # Should work

### Redundancy Testing

# Test router redundancy

# Shutdown R5 and verify R6 takes over

# On R5:

shutdown

# Verify HSRP failover on VLAN 18

show standby 18 # R6 should become active

# Test continued internet connectivity

ping 8.8.8.8 # Should work through R6

# Test switch redundancy

# Shutdown SW1 and verify SW2 handles all VLANs

# On SW1:

shutdown

# Verify STP reconvergence and HSRP failover

# All VLANs should remain accessible through SW2

## Phase 6: Advanced Service Configuration

### Windows Server Active Directory Setup

# Install Active Directory Domain Services

Install-WindowsFeature -Name AD-Domain-Services -IncludeManagementTools

# Promote to Domain Controller

Install-ADDSForest -DomainName "dominio.com" -SafeModeAdministratorPassword (ConvertTo-SecureString -AsPlainText "P@ssw0rd123" -Force)

# Add computers to domain (run on Windows 7 clients)

Add-Computer -DomainName "dominio.com" -Credential (Get-Credential)

### PBX IAX Trunk Configuration

# On GNS3 PBX - Configure outbound trunk to eSNP

# /etc/asterisk/iax.conf

[eSnP\_trunk]

type=friend

host=192.168.10.2

username=gns3\_pbx

secret=strongpassword

qualify=yes

disallow=all

allow=ulaw

# /etc/asterisk/extensions.conf

[from-internal]

; Route calls to eSNP (2XXX)

exten => \_2XXX,1,Dial(IAX2/eSnP\_trunk/${EXTEN})

exten => \_2XXX,2,Hangup()

## Implementation Checklist

### Phase 1: Core Infrastructure

* [ ] Configure all router WAN interfaces with correct IP addressing
* [ ] Enable OSPF on all routers and verify neighbor adjacencies
* [ ] Configure static default routes on edge routers (R1, R2)
* [ ] Verify WAN connectivity and routing tables

### Phase 2: LAN Infrastructure

* [ ] Configure VTP on all switches (SW1/SW2 servers, others clients)
* [ ] Create all VLANs and verify propagation
* [ ] Configure trunk ports on all switch interconnects
* [ ] Configure SVI interfaces on SW1/SW2 with HSRP

### Phase 3: Routing and NAT

* [ ] Configure VLAN 18 for router-switch interconnection
* [ ] Implement HSRP Group 18 for router redundancy
* [ ] Configure NAT on R5 and R6 for internet access
* [ ] Configure static routes for VLAN networks

### Phase 4: Security and Management

* [ ] Implement ACL to restrict access to VLAN 15
* [ ] Configure SSH access on all managed devices
* [ ] Set up management IP addresses in VLAN 15

### Phase 5: Services

* [ ] Deploy DHCP server and configure pools for user VLANs
* [ ] Set up DNS server with local and public zones
* [ ] Configure web server with company website
* [ ] Install and configure PBX system

### Phase 6: Testing and Validation

* [ ] Test inter-VLAN connectivity
* [ ] Verify internet access from all VLANs
* [ ] Test HSRP failover scenarios
* [ ] Validate DNS resolution and web server access
* [ ] Test PBX functionality and inter-PBX calling

## Troubleshooting Guide

### Common Issues and Solutions

#### VLAN Issues

# Problem: VLANs not propagating

# Solution: Check VTP configuration

show vtp status

show vtp counters

# Verify domain name, password, and mode

# Problem: No inter-VLAN routing

# Solution: Check SVI configuration and routing

show ip interface brief

show ip route

#### HSRP Issues

# Problem: HSRP not forming

# Solution: Check HSRP configuration

show standby brief

debug standby events

# Verify IP addressing, group numbers, and priorities

#### NAT Issues

# Problem: No internet access

# Solution: Check NAT configuration and translations

show ip nat translations

show ip nat statistics

debug ip nat

# Verify inside/outside interfaces and ACLs

#### OSPF Issues

# Problem: OSPF neighbors not forming

# Solution: Check OSPF configuration

show ip ospf neighbor

show ip ospf interface

debug ip ospf adj

# Verify network statements and area configuration

This comprehensive guide provides all configurations needed to implement the enterprise network topology with proper WAN usage, redundancy, and all required services.