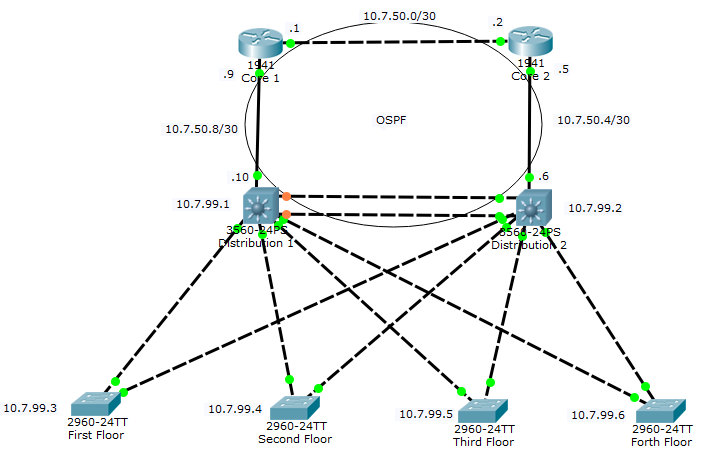
LAN Assignment – Phase 1

# Overview

This document outlines the topology and configuration for the Head Office branch of our WAN. It defines the configuration for each gateway router, level 3 distribution switches, and an example configuration for an access switch.

# Topology Diagram



Distribution 2 SVI’s:  
10.7.10.2 (VLAN 10)  
10.7.20.2 (VLAN 20)  
10.7.30.2 (VLAN 30)  
10.7.40.2 (VLAN 40)  
10.7.99.2 (VLAN 99)

Distribution 1 SVI’s:  
10.7.10.1 (VLAN 10)  
10.7.20.1 (VLAN 20)  
10.7.30.1 (VLAN 30)  
10.7.40.1 (VLAN 40)  
10.7.99.1 (VLAN 99)

HSRP Standby IP:  
10.7.10.3 (VLAN 10)  
10.7.20.3 (VLAN 20)  
10.7.30.3 (VLAN 30)  
10.7.40.3 (VLAN 40)  
10.7.99.254 (VLAN 99)

# Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | VLAN | Network | Subnet | Usable Address Range |
| Sales & Marketing | 10 | 10.7.10.0 | 255.255.255.0 | .1 - .254 |
| Human Resources | 20 | 10.7.20.0 | 255.255.255.0 | .1 - .254 |
| Finance | 30 | 10.7.30.0 | 255.255.255.0 | .1 - .254 |
| Administration | 40 | 10.7.40.0 | 255.255.255.0 | .1 - .254 |
| Management | 99 | 10.7.99.0 | 255.255.255.0 | .1 - .254 |
| Point to Point 1 | - | 10.7.50.0 | 255.255.255.252 | .1 - .2 |
| Point to Point 2 | - | 10.7.50.4 | 255.255.255.252 | .5 - .6 |
| Point to Point 3 | - | 10.7.50.8 | 255.255.255.252 | .9 - .10 |

Variable Length subnetting was calculated and considered. However due to the large numbers of address spaces available to us, we decided that this network would be easier to manage and maintain using fixed length subnetting.

# Gateway Routers (Core)

We are implementing two cisco routers as a redundant gateway into our LAN. After doing some research we have selected two Cisco ASR 1001-X Routers to purchase as our gateway routers. These are 1 rack unit devices with upgradable throughput (2.5, 5, 10, 20Gbps) (Cisco ASR 1006-X Router, 2017). This will allow us to scale in the future as our head office grows.

The routers are joined via a gigabit ethernet link. Each router is connected to a layer 3 switch via a gigabit Ethernet link.

OSPF is used to advertise the network links between the routers and layer 3 switches.

**Why OSPF?**

OSPF offers faster convergence and scales to larger network implementations than the older protocol RIP. It is a link state routing protocol that was developed as a replacement for the distance vector routing protocol offered by RIP. RIP uses hop-count as the only metric, which can quickly become problematic, whereas OSPF looks at a number of factor when deciding the best route to take. These factors can be customised by the network administration for greater control over network paths.

OSPFv4 is being used in our network as we are using IPv4 as our IP protocol. A further advantage of OSPF is that MD5 can be implemented, to improve network security. This means that routers will only accept OSPF updates from peers with the same pre-shared password.

The configuration is as follows:

**Core1:**

**Interface Config**

(config-if)# int g0/0

(config-if)# ip address 10.7.50.0 255.255.255.252

(config-if)# no shut

(config-if)# int g0/1

(config-if)# ip address 10.7.50.1 255.255.255.252

(config-if)# no shut

**OSPF Config:**

(config)# router ospf 1

(config-router)# router-id 1.1.1.1

(config-router)# log-adjacency-changes

(config-router)# network 10.7.50.9 0.0.0.0 area 0

(config-router)# network 10.7.50.1 0.0.0.0 area 0

(config-router)# area 0 authentication message-digest

(config-router)# exit

(config)# int g0/0

(config-if)# ip ospf message-digest-key 1 md5 P@ssw0rd

(config)# int g0/1

(config-if)# ip ospf message-digest-key 1 md5 P@ssw0rd

**Core2:**

**Interface Config**

(config-if)# int g0/0

(config-if)# ip address 10.7.50.5 255.255.255.252

(config-if)# no shut

(config-if)# int g0/1

(config-if)# ip address 10.7.50.2 255.255.255.252

(config-if)# no shut

**OSPF Config:**

(config)# router ospf 1

(config-router)# router-id 2.2.2.2

(config-router)# log-adjacency-changes

(config-router)# network 10.7.50.2 0.0.0.0 area 0

(config-router)# network 10.7.50.5 0.0.0.0 area 0

(config-router)# area 0 authentication message-digest

(config-router)# exit

(config)# int g0/0

(config-if)# ip ospf message-digest-key 1 md5 P@ssw0rd

(config)# int g0/1

(config-if)# ip ospf message-digest-key 1 md5 P@ssw0rd  
  
**Distriution 1**

ip routing

no switchport

ip address 10.7.50.10 255.255.255.252  
router ospf 1

router-id 3.3.3.3

log-adjacency-changes

network 10.7.50.10 0.0.0.0 area 0

network 10.7.10.0 0.0.0.255 area 0

network 10.7.20.0 0.0.0.255 area 0

network 10.7.30.0 0.0.0.255 area 0

network 10.7.40.0 0.0.0.255 area 0

passive-interface f0/1

passive-interface f0/2

passive-interface f0/3

passive-interface f0/4

**Distriution 2**

ip routing

no switchport

ip address 10.7.50.6 255.255.255.252  
router ospf 1

router-id 4.4.4.4

log-adjacency-changes

network 10.7.50.10 0.0.0.0 area 0

network 10.7.10.0 0.0.0.255 area 0

network 10.7.20.0 0.0.0.255 area 0

network 10.7.30.0 0.0.0.255 area 0

network 10.7.40.0 0.0.0.255 area 0

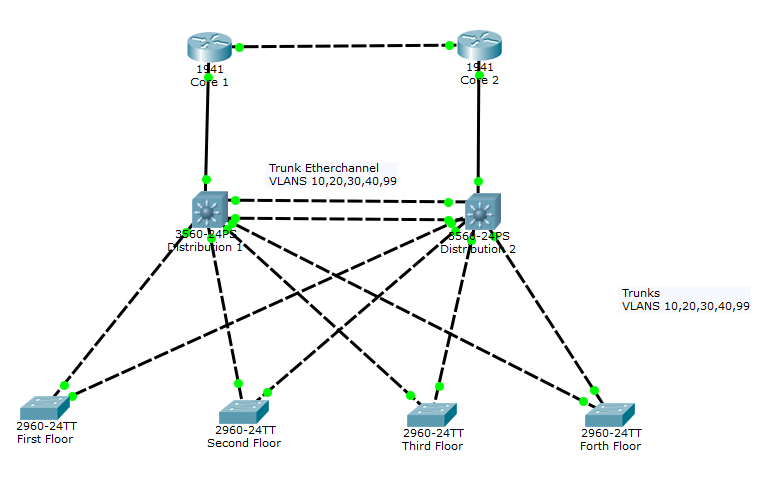
passive-interface f0/1

passive-interface f0/2

passive-interface f0/3

passive-interface f0/4

# VLANS and Spanning Tree



Priority for VLANs 30,40

Priority for VLANs 10,20,99

This network will be configured with rapid PVST. This will allow for spanning tree configuration on a per VLAN basis. It will also allow for less downtime if a link fails. Distribution 1 switch is configured as the priority switch for VLANS 10, 20, and 99. Distribution 2 is configured as the priority switch for VLANs 30, and 40. This will ensure each VLAN has a loop-free path through the network (Software Configuration Guide, 2016) .

## VLAN Configuration

**Each Switch:**

vlan 10

name Sales&Marketing

vlan 20

name HR

vlan 30

name Finance

vlan 40

name Administration

vlan 99

name Management

exit

spanning-tree mode rapid-pvst

**Distribution Switch 1**

int range f0/23-24

channel-group 1 mode active

int port-channel 1

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

spanning-tree VLAN 10,20,99 root primary

spanning-tree VLAN 30,40 root secondary

int f0/1

switchport trunk native vlan 99  
switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/2

switchport trunk native vlan 99

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/3

switchport trunk native vlan 99

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/4

switchport trunk native vlan 99  
switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,9

int vlan 10

ip address 10.7.10.1 255.255.255.0

standby version 2

standby 1 ip 10.7.10.3

standby 1 priority 150

standby 1 preempt

int vlan 20

ip address 10.7.20.1 255.255.255.0

standby version 2

standby 1 ip 10.7.20.3

standby 1 priority 150

standby 1 preempt

int vlan 30

ip address 10.7.30.1 255.255.255.0

standby version 2

standby 1 ip 10.7.30.3

int vlan 40

ip address 10.7.40.1 255.255.255.0

standby version 2

standby 1 ip 10.7.40.3

int vlan 99

ip address 10.7.99.1 255.255.255.0

standby version 2

standby 1 ip 10.7.99.254

standby 1 priority 150

standby 1 preempt  
**Distribution Switch 2**(config)# int vlan 10

(config-if)#ip address 10.7.10.2

(config-if)# int vlan 20

(config-if)#ip address 10.7.20.2

(config-if)# int vlan 30

(config-if)#ip address 10.7.30.2

(config-if)# int vlan 40

(config-if)#ip address 10.7.40.2

spanning-tree VLAN 10,20,99 root secondary

spanning-tree VLAN 30,40 root primary

int range f0/23-24

channel-group 1 mode active

int port-channel 1

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/1

switchport trunk native vlan 99  
switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/2

switchport trunk native vlan 99

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/3

switchport trunk native vlan 99

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int f0/4

switchport trunk native vlan 99  
switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk allowed vlan 10,20,30,40,99

int vlan 10

ip address 10.7.10.2 255.255.255.0

standby version 2

standby 1 ip 10.7.10.3

int vlan 20

ip address 10.7.20.2 255.255.255.0

standby version 2

standby 1 ip 10.7.20.3

standby 1 priority 150

standby 1 preempt

int vlan 30

ip address 10.7.30.2 255.255.255.0

standby version 2

standby 1 ip 10.7.30.3

standby 1 priority 150

standby 1 preempt

int vlan 40

ip address 10.7.40.2 255.255.255.0

standby version 2

standby 1 ip 10.7.40.3

standby 1 priority 150

standby 1 preempt

int vlan 99

ip address 10.7.99.2 255.255.255.0

standby version 2

standby 1 ip 10.7.99.254

References

Cisco ASR 1006-X Router. (2017). Cisco. Retrieved from: https://www.cisco.com/c/en/us/products/routers/asr-1001-x-router/index.html

Catalyst 2960 and 2960-S Software Configuration Guide. (2016). Cisco. Retrieved from: http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst2960/software/release/12-2\_55\_se/configuration/guide/scg\_2960.html

Chapter 8. Single-Area OSPF. (2017). Cisco NetAcad.