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**COMP 20173 Data Communications and Networking  
Teleperformance Topology**

**Submitted by:**

Arboladura,Mary Grace

Haber,Jhon Mark

Mana-ay,Shawn Michael F.

Reynoso,Francheska

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**Submitted to:**

Professor Mariel Leo Violeta

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# Introduction



Teleperformance is a company based in France that provides various means of services in the support department: customer care, technical support, financial management, trust and other safety services. It is currently revenue at €8.154 billion, making it a huge company. In total it has access to 300 dialects for the purpose and to serve as an extension of various industries.

Created by Daniel Julien, it is a company formed in 1978 whose origin is entirely from Europe. Its expansion was first established in the USA, gaining a footing on open contracts. Strong relations with USA eventually helped the company to expand on Southeast Asia particularly in Philippines and Singapore. A

## The Project Overview

A large company such as Teleperformance, that means billions of euros in revenue, also needs a diverse topology among its connection systems. This led to the creation of the project that will eventually showcase the following cases: A compound that will diagnose the connection between the company’s service in the regions of France and Philippines. This will eventually be composed of various buildings that have its own connection design, purpose, and color schemes.

## Purpose:

The purpose of creating a bird’s eye viewpoint of the Teleperformance topology is to see how they can manage a fast and reliable system. Big companies such as this rely heavily on various metrics and considerations to reach their intended goal limit. A significant portion of most Business Process Outsourcing companies rely on speed, movement, and quantity of return of investments due to them functioning as a middleman among all networks particularly in calls and agreements. An unsteady network will yield poor results into the company’s revenue; thus, the significance of properly tuned networks is what makes the company successful.

## Main Objectives

The following will be the main objective of the creative of this report:

* To provide the network topology of Teleperformance and its intricate values, devices, significance of design and its considerations.
* To highlight the various services, optimization performances, scalability, reliability, and security measures present within the Teleperformance topology.
* Investigate various considerations of device placements.
* To explore various designs of topology and to provide a comprehensive viewpoint in detail on how it was installed or connected.
* To apply best practices and proper network design and to provide a quality reporting structure.

# Network Design

## Topology:

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Figure 1: The Teleperformance Compound for PH-FR services

The network topology of this Teleperformance will showcase of the various intricate system of France and Philippine services. It is composed primarily of the following:

### Buildings:

There will be 8 buildings present within the topology. The buildings are Finance and Accountancy, Human Resource, Philippine Server for Operations and Training, France Server for Operations and Training, Administrator Building, Managerial Building, IT building, and two server rooms.

### Router Placement:

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Figure 2: Router Placements

All routers are placed at the center of the buildings. In total there are 5 routers: IT Router, HR and Finance Router, PH-FR Router, and Admin Router. Each router has its own configuration, and the small number of routers helps us to pinpoint problems to fix it fast.

## IP Addressing for Devices (excluding Routers and Switches)

Designing the address was in the form of IPv4 and is not entirely connected to the internet. Each IP Address. The network itself is considerably large, and it was decided to name IP Address on a set of rules. For subnets, to make it simple and not to overly complicate all devices are on 255.255.255.0

For devices the following is true for the configurations rule:

* The first octet will always be 192.
* The second octet will always be 168.
* The third octet will always be the number of VLAN that a particular subnet.
* The fourth octet will have a few sets of rules on some devices:

1. If the subnet is static, then it will always have its Server-PT at 2.
2. If the subnet is dynamic, then it will always have its Server-PT at 5.
3. If the building is
4. Any number between 3 and 5 regardless of subnet type will have its distribution accordingly. Thus, all starting fourth octet for regular devices will be 3.

As such, this is the device addresses of the following:

Table 1: Network VLAN Configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LAN | VLAN Name | Subnet | Subnet Mask | Distribution Range |
| 10 | Finance and Accounting | 192.168.10.0 | 255.255.255.0 | 192.168.10.3 - 192.168.10.5 |
| 20 | Human Resource | 192.168.20.0 | 255.255.255.0 | 192.168.20.3 - 192.168.20.5 |
| 30 | Ph-Training | 192.168.30.0 | 255.255.255.0 | 192.168.30.6 - 192.168.30.254 |
| 40 | Ph-Operations | 192.168.40.0 | 255.255.255.0 | 192.168.40.6 - 192.168.40.254 |
| 50 | Fr-Training | 192.168.50.0 | 255.255.255.0 | 192.168.50.6 - 192.168.50.254 |
| 60 | Fr-Operations | 192.168.60.0 | 255.255.255.0 | 192.168.60.6 - 192.168.60.254 |
| 70 | Managers | 192.168.70.0 | 255.255.255.0 | 192.168.70.3 - 192.168.70.5 |
| 80 | Admin | 192.168.80.0 | 255.255.255.0 | 192.168.80.6 - 192.168.80.254 |
| 90 | IT | 192.168.90.0 | 255.255.255.0 | 192.168.90.6 - 192.168.90.254 |

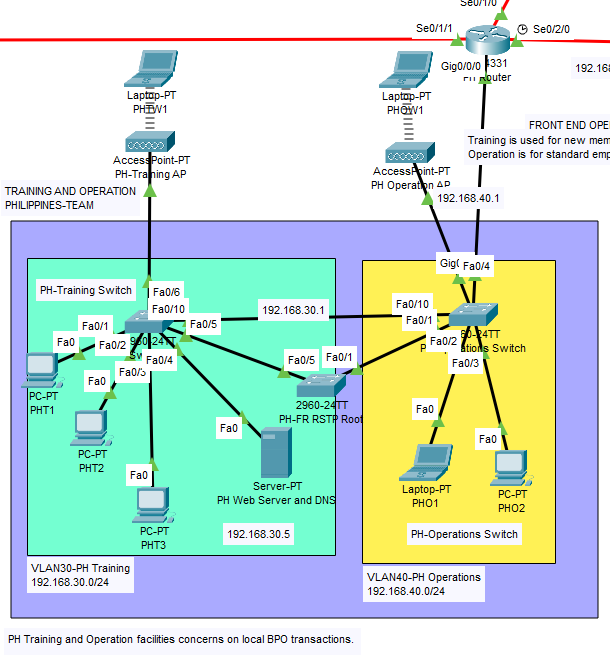
A diagram of a computer network

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Figure 3: Finance and Accounting and Human Resource Building

Table 2: Devices for Finance and Accounting and Human Resources

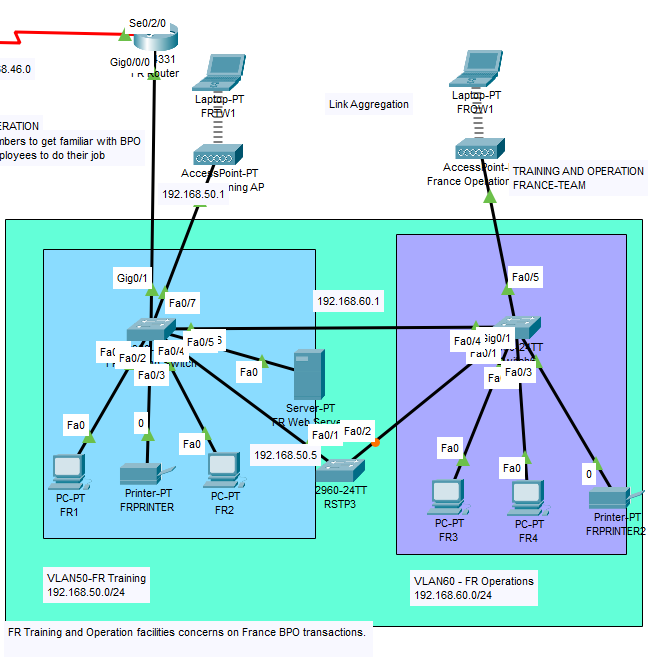
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| LAN | Device Name | Device Type | IP Address and Gateways | | Subnet Mask | DNS Server |
| *Connecting Router and Devices* | | | | | | |
| 10,20 | Finance and HR Router | Router |  | |  |  |
| 10,20 | FA-HR Switch | Switch | 192.168.10.1  192.168.20.1 | |  |  |
| *Finance and Accounting Sector* | | | | | | |
| 10 | FA Switch | Switch | 192.168.10.1 | |  |  |
| 10 | Finance-AP | AP Switch |  |  | |  |
| 10 | FA Web Server and DNS | Server | 192.168.10.2 | | 255.255.255.0 | 192.168.10.2 |
| 10 | FA1 | PC | 192.168.10.3 | | 255.255.255.0 | 192.168.10.2 |
| 10 | FA2 | PC | 192.168.10.4 | | 255.255.255.0 | 192.168.10.2 |
| 10 | FA3 | PC | 192.168.10.5 | | 255.255.255.0 | 192.168.10.2 |
| 10 | FAW1 | Wireless PC | 192.168.10.9 | | 255.255.255.0 | 192.168.10.2 |
| *Human and Resources Sector* | | | | | | |
| 20 | HR Switch | Switch | 192.168.20.1 | |  |  |
| 20 | HR-AP | AP Switch |  | |  |  |
| 20 | HR Web Server and DNS | Server | 192.168.20.2 | | 255.255.255.0 | 192.168.20.2 |
| 20 | HR1 | PC | 192.168.20.3 | | 255.255.255.0 | 192.168.20.2 |
| 20 | HR2 | PC | 192.168.20.4 | | 255.255.255.0 | 192.168.20.2 |
| 20 | HRW1 | Wireless PC | 192.168.20.9 | | 255.255.255.0 | 192.168.20.2 |

****

*Figure 4. PH Training and Operations Building*

*Table 3: Devices for PH Training and Operations Building*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| LAN | Device Name | Device Type | | IP Address and DHCP Gateways | Subnet Mask | DNS Server |
| *Connecting Router and Devices* | | | | | | |
| 30,40 | PH Router | Router |  | |  |  |
| 30,40 | PH-FR RSTP Root | Switch |  | |  |  |
| *PH Training Sector* | | | | | | |
| 30 | PH Training Switch | Switch | 192.168.30.1 | |  |  |
| 30 | PH-Training AP | AP Switch |  | |  |  |
| 30 | PH Webserver and DNS | Server | 192.168.30.1 | | 255.255.255.0 | 192.168.30.5 |
| 30 | PHT1 | PC | 192.168. 30.1 | | 255.255.255.0 | 192.168.30.5 |
| 30 | PHT2 | PC | 192.168. 30.1 | | 255.255.255.0 | 192.168.30.5 |
| 30 | PH3 | PC | 192.168. 30.1 | | 255.255.255.0 | 192.168.30.5 |
| 30 | PH3 | PC | 192.168. 30.1 | | 255.255.255.0 | 192.168.30.5 |
| 30 | PHTW1 | Wireless PC | 192.168. 30.1 | | 255.255.255.0 | 192.168.30.5 |
| *PH Operations Sector* | | | | | | |
| 40 | PH Operations Switch | Switch | 192.168.40.1 | |  |  |
| 40 | PH-Operations AP | AP Switch |  | |  |  |
| 40 | PHO1 | PC | 192.168.40.1 | | 255.255.255.0 | 192.168.30.5 |
| 40 | PHO2 | PC | 192.168.40.1 | | 255.255.255.0 | 192.168.30.5 |
| 40 | PHOW1 | Wireless PC | 192.168.40.1 | | 255.255.255.0 | 192.168.30.5 |

**

*Figure 5. FR Training and Operations Building*

Table 3: Devices in FR Training and Operations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| LAN | Device Name | Device Type | IP Address and DHCP Gateways | Subnet Mask | DNS Server |
| *Connecting Router and Devices* | | | | | |
| 50,60 | PH Router | Router |  |  |  |
| 50,60 | PH-FR RSTP Root | Switch |  |  |  |
| *PH Training Sector* | | | | | |
| 50 | FR Training Switch | Switch | 192.168.50.1 |  |  |
| 50 | France Training AP | Access Point-PT |  |  |  |
| 50 | FR Webserver and DNS | Server | 192.168.50.1 | 255.255.255.0 | 192.168.50.5 |
| 50 | FRT1 | PC | 192.168. 50.1 | 255.255.255.0 | 192.168.50.5 |
| 50 | FRT2 | PC | 192.168. 50.1 | 255.255.255.0 | 192.168.50.5 |
| 50 | FRPRINTER | PRINTER | 192.168. 50.1 | 255.255.255.0 | 192.168.50.5 |
| 50 | FRTW1 | Wireless Laptop | 192.168.50.1 | 255.255.255.0 | 192.168.50.5 |
| *PH Operations Sector* | | | | | |
| 50,60 | FR Operations Switch | Switch | 192.168. 60.1 |  |  |
| 60 | France Operations AP | Access Point-PT |  |  |  |
| 60 | FR3 | PC | 192.168.60.1 | 255.255.255.0 | 192.168.50.5 |
| 60 | FR4 | PC | 192.168.60.1 | 255.255.255.0 | 192.168.50.5 |
| 60 | FR4 | PC | 192.168.60.1 | 255.255.255.0 | 192.168.50.5 |
| 60 | FROW1 | Wireless PC | 192.168.60.1 | 255.255.255.0 | 192.168.50.5 |
| 60 | FRPRINTER2 | PRINTER | 192.168.60.1 | 255.255.255.0 | 192.168.50.5 |

A computer network diagram with many computers connected to each other

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Figure 4: Manager and Administrator Building

Table 4:Devices for Manager and Administrator Building

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| LAN | Device Name | Device Type | IP Address and DHCP Gateways | Subnet Mask | DNS Server |
| *Connecting Router and Devices* | | | | | |
| 70,80 | Admin Router | Router |  |  |  |
| *Managers Sector* | | | | | |
| 70 | Managers’ Switch | Switch | 192.168.70.1 |  |  |
| 70 | Finance Head | PC | 192.168.70.1 | 255.255.255.0 | 192.168.70.5 |
| 70 | HR Head | PC | 192.168.70.1 | 255.255.255.0 | 192.168.70.5 |
| 70 | PH Head | PC | 192.168.70.1 | 255.255.255.0 | 192.168.70.5 |
| 70 | France Head | PC | 192.168.70.1 | 255.255.255.0 | 192.168.70.5 |
| 70 | Administrator Web Server | Server | 192.168.70.5 | 255.255.255.0 | 192.168.70.5 |
| *Administrator Sector* | | | | | |
| 80 | Admin Switch | Switch | 192.168.80.1 |  |  |
| 80 | CEO | PC | 192.168.80.1 | 255.255.255.0 | 192.168.70.5 |
| 80 | Head Manager | PC | 192.168.80.1 | 255.255.255.0 | 192.168.70.5 |
| 80 | Teams Manager | PC | 192.168.80.1 | 255.255.255.0 | 192.168.70.5 |
| 80 | Printer | Printer |  |  | 192.168.70.5 |

A computer network diagram with a tape measure

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Figure 5: IT Building

Table 5: Devices for IT Building

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| LAN | Device Name | Device Type | IP Address and Gateways | Subnet Mask | DNS Server |
| *Connecting Router and Devices* | | | | | |
| 90 | IT Router | Router |  |  |  |
| 90 | IT Switch | Switch | 192.168.90.1 |  |  |
| 90 | IT-AP | AP Switch | 192.168.90.1 |  |  |
| 90 | IT Web Server and DNS | Server | 192.168.90.3 | 255.255.255.0 | 192.168.90.2 |
| 90 | IT Email Server | Server | 192.168.90.6 | 255.255.255.0 | 192.168.90.2 |
| 90 | IT1 | PC | 192.168.90.7 | 255.255.255.0 | 192.168.90.2 |
| 90 | IT2 | PC | 192.168.90.2 | 255.255.255.0 | 192.168.90.2 |
| 90 | Laptop6 | Wireless  Laptop | 192.168.90.2 | 255.255.255.0 | 192.168.90.2 |

## Routing and Switching

Routers and their IP interfaces have the following set of rules:

* The first octet will always be 192.
* The second octet will always be 168.
* The third octet will base on a set of rules base on its interface:

1. Finance and Human Resources are addressed in the same router.
2. Administrator and Managerial are addressed in the same router.
3. PH and FR are addressed together, but PH is the only router within the main line, thus FR router is an extension of the PH.
4. 45 will be the address between Finance-HR and PH-FR.
5. 46 will be the address between PH and FR.
6. 47 will be the address between Finance-HR and IT
7. 48 will be the address of PH-FR and Admin.
8. 49 will be the address of Admin and IT.

* The fourth octet will be based on the router interface of the direction depending on its neighbor. An example of this is that Finance and HR Router will have its fourth octet on 1 towards IT and 2 towards PH router.

Table 6: Routing Configurations

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| LAN Operating | **Device Name** | **Gateway Provided** | Neighbor and IP Port Interface | | | |
| **Serial** | **Neighbor** | **IP Address** | Interface |
| 10,20 | Finance and HR Router | 192.168.10.1  192.168.20.1 | Serial0/0/0 | PH Router | 192.168.47.1 | 192.168.47.0 |
| Serial0/1/0 | IT Router | 192.168.45.1 | 192.168.45.0 |
| Gigabyte0/0/0 | FA-HR Switch | Gateway for VLAN 10,20 |  |
| 30,40 | PH Router | 192.168.30.1  192.168.40.1 | Serial0/1/1 | IT Router | 192.168.45.2 | 192.168.45.0 |
| Serial0/1/0 | Admin Router | 192.168.48.2 | 192.168.48.0 |
| Serial0/2/0 | FR Router | 192.168.46.1 | 192.168.46.0 |
| Gigabyte0/0/0 | PH Operations  Switch | Gateway for VLAN 30,40 |  |
| 50,60 | FR Router | 192.168.50.1  192.168.60.1 | Serial0/2/0 | PH Router | 192.168.46.2 | 192.168.46.0 |
| Gigabyte0/0/0 | FR Training Switch | Gateway for VLAN 50,60 |  |
| 70,80 | Admin Router | 192.168.70.1  192.168.80.1 | Serial0/1/1 | IT Router | 192.168.49.2 | 192.168.49.0 |
| Serial0/2/0 | PH Router | 192.168.48.1 | 192.168.48.0 |
| Gigabyte0/0/0 | Manager Switch | Gateway for VLAN 70,80 |  |
| 90 | IT Router | 192.168.90.1 | Serial0/1/1 | Admin Router | 192.168.49.1 | 192.168.49.0 |
| Serial0/1/0 | Finance and HR Router | 192.168.47.2 | 192.168.47.0 |
| Gigabyte0/0/0 | IT Switch | Gateway for VLAN 90 |  |

### Routing and Switching Protocols

The following are the routing protocols that are used for the switches. For switches, we used RSTP and for routers OSPF and RIP are configured.

#### OSPF

The following is the OSPF Summary that was used within the network.

Table 7: OSPF Table

|  |  |  |  |
| --- | --- | --- | --- |
| Device Name | IP Address | Neighbors (Router ID) | Interface |
| Finance and HR Router | 192.168.10.1 | PH Router (192.168.47.1) | Serial0/0/0 |
| Finance and HR Router | 192.168.10.1 | IT Router (192.168.45.1) | Serial0/1/0 |
| PH Router | 192.168.47.1 | Finance and HR Router (192.168.10.1) | Serial0/0/0 |
| PH Router | 192.168.47.1 | IT Router (192.168.45.1) | Serial0/1/0 |
| PH Router | 192.168.47.1 | FR Router (192.168.46.1) | Serial0/2/0 |
| IT Router | 192.168.45.1 | Finance and HR Router (192.168.10.1) | Serial0/1/0 |
| IT Router | 192.168.45.1 | PH Router (192.168.47.1) | Serial0/0/0 |
| IT Router | 192.168.45.1 | Admin Router (192.168.48.2) | Serial0/1/1 |
| Admin Router | 192.168.48.2 | IT Router (192.168.45.1) | Serial0/1/1 |
| Admin Router | 192.168.48.2 | PH Router (192.168.48.1) | Serial0/2/0 |
| PH Router | 192.168.48.1 | Admin Router (192.168.48.2) | Serial0/2/0 |
| PH Router | 192.168.48.1 | FR Router (192.168.46.1) | Serial0/2/0 |
| FR Router | 192.168.46.1 | PH Router (192.168.48.1) | Serial0/2/0 |
| FR Training Switch | 192.168.46.2 | FR Router (192.168.46.1) | Gigabyte0/0/0 |
| IT Router | 192.168.49.2 | Admin Router (192.168.48.2) | Serial0/1/1 |
| Admin Router | 192.168.49.1 | IT Router (192.168.49.2) | Serial0/1/1 |
| Finance and HR Router | 192.168.47.2 | PH Router (192.168.47.1) | Serial0/0/0 |
| IT Router | 192.168.45.2 | PH Router (192.168.45.1) | Serial0/1/0 |

#### RIP

The following is also the RIP Table used just in assistance of OSPF.

Table 8:RIP Table

|  |  |  |  |
| --- | --- | --- | --- |
| Device Name | IP Address | Next Hop | Interface |
| Finance and HR Router | 192.168.10.1 | - | - |
| Finance and HR Router | 192.168.20.1 | - | - |
| PH Router | 192.168.47.1 | 192.168.47.1 | Serial0/0/0 |
| PH Router | 192.168.46.1 | 192.168.46.1 | Serial0/2/0 |
| IT Router | 192.168.45.1 | 192.168.45.1 | Serial0/1/0 |
| Admin Router | 192.168.48.2 | 192.168.48.2 | Serial0/1/0 |
| FR Router | 192.168.46.1 | 192.168.46.1 | Serial0/2/0 |
| PH Router | 192.168.30.1 | 192.168.47.1 | Serial0/0/0 |
| PH Router | 192.168.40.1 | 192.168.46.1 | Serial0/2/0 |
| FR Router | 192.168.50.1 | 192.168.46.1 | Serial0/2/0 |
| FR Router | 192.168.60.1 | 192.168.46.1 | Serial0/2/0 |
| Admin Router | 192.168.70.1 | 192.168.48.2 | Serial0/1/0 |
| Admin Router | 192.168.80.1 | 192.168.48.2 | Serial0/1/0 |
| IT Router | 192.168.49.2 | 192.168.45.1 | Serial0/1/0 |
| IT Router | 192.168.90.1 | 192.168.45.1 | Serial0/1/0 |
| IT Router | 192.168.45.2 | 192.168.45.1 | Serial0/1/0 |
| Admin Router | 192.168.48.1 | 192.168.48.1 | Serial0/2/0 |
| IT Router | 192.168.49.1 | 192.168.45.1 | Serial0/1/0 |
| Finance and HR Router | 192.168.47.2 | 192.168.47.1 | Serial0/0/0 |

#### RSTP for Finance and Human Resources:

RSTP protocol is effectively managing the network's spanning tree to prevent loops and ensure smooth data transmission. Most ports in each VLAN are in the Forwarding state, actively forwarding data, while one port in each VLAN remains in the Blocking state as a loop prevention mechanism.

Table 9: RSTP Table for Finance and Human Resources

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| VLAN | Blocking | Listening | Learning | Forwarding | STP Active |
| 1 | 1 | 0 | 0 | 3 | 4 |
| 10 | 1 | 0 | 0 | 3 | 4 |
| 20 | 1 | 0 | 0 | 3 | 4 |
| Total | 3 | 0 | 0 | 9 | 12 |

#### RSTP for PH Operations and Training:

The table provides information about the Rapid Spanning Tree Protocol (RSTP) states for different VLANs in two specific instances. In the first instance, which is referred to as "RSTP for PH Operations and Training," VLANs 1, 40, 50, and 60 have some of their ports in the Blocking state, signifying that these ports are not actively participating in data forwarding. Instead, they are effectively disabled. In contrast, VLAN 30 (PH Training) has all its ports in the Forwarding state, indicating that they are actively forwarding data packets.

Table 10: RSTP Table for PH Operations and Training

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| VLAN | Blocking | Listening | Learning | Forwarding | STP Active |
| 1 | 5 | 0 | 0 | 1 | 6 |
| 30 | 0 | 0 | 0 | 6 | 6 |
| 40 | 5 | 0 | 0 | 1 | 6 |
| 50 | 5 | 0 | 0 | 1 | 6 |
| 60 | 5 | 0 | 0 | 1 | 6 |
| Total | 20 | 0 | 0 | 10 | 30 |

#### RSTP for French RSTP for Operations and Training:

The second instance, labeled "French RSTP for Operations and Training," shows that all VLANs (VLANs 1, 30, 40, 50, and 60) have all their ports in the Forwarding state. This means that in this configuration, all ports across these VLANs are actively participating in data forwarding, facilitating the flow of network traffic.

Table 11: RSTP Table for FR Operations and Training

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| VLAN | Blocking | Listening | Learning | Forwarding | STP Active |
| 1 | 0 | 0 | 0 | 3 | 3 |
| 30 | 0 | 0 | 0 | 3 | 3 |
| 40 | 0 | 0 | 0 | 3 | 3 |
| 50 | 0 | 0 | 0 | 7 | 7 |
| 60 | 0 | 0 | 0 | 3 | 3 |
| Total | 0 | 0 | 0 | 19 | 19 |

# Device Configurations

All devices are expected to be configured on their configuration terminal in CLI. The following are how each functionality within the network is achieved.

## Routers and its Configurations

### Interfaces Configurations

Table 12: Interface Configurations

|  |  |  |
| --- | --- | --- |
| Router Name | Interface | Network Configuration |
| Finance and HR Router | Serial0/0/0 | Router(config)#interface Serial0/0/0  Router(config-if)# ip address 192.168.45.1 255.255.255.0 |
|  | Serial0/1/0 | Router(config)# interface Serial0/1/0  Router(config-if)# ip address 192.168.47.1 255.255.255.0 |
| PH Router | Serial0/1/0 | Router(config)# interface Serial0/1/0  Router(config-if)# ip address 192.168.45.1 255.255.255.0 |
|  | Serial0/2/0 | Router(config)# interface Serial0/2/0  Router(config-if)# ip address 192.168.46.1 255.255.255.0 |
|  | Serial0/1/1 | Router(config)# interface Serial0/1/1  Router(config-if)# ip address 192.168.45.2 255.255.255.0 |
| IT Router | Serial0/2/0 | Router(config)# interface Serial0/2/0  Router(config-if)# ip address 192.168.48.1255.255.255.0 |
|  | Serial0/1/0 | Router(config)# interface Serial0/1/0  Router(config-if)# ip address 192.168.45.1 255.255.255.0 |
|  | Serial0/1/1 | Router(config)# interface Serial0/1/1  Router(config-if)# ip address 192.168.49.1 255.255.255.0 |
| Admin Router | Serial0/1/1 | Router(config)# interface Serial0/1/1  Router(config-if)# ip address 192.168.49.2255.255.255.0 |
|  | Serial0/2/0 | Router(config)# interface Serial0/2/0  Router(config-if)# ip address 192.168.48.1255.255.255.0 |
| FR Router | Serial0/2/0 | Router(config)# interface Serial0/2/0  Router(config-if)# ip address 192.168.46.2.1255.255.255.0 |

### Static Routing Configuration

Table 13: Static Routing Configurations

|  |  |
| --- | --- |
| Router Name | Configuration |
| Finance and HR Router | Router(config)# interface GigabitEthernet0/0  Router(config-if)# ip address 192.168.10.1 255.255.255.0  Router(config-if)# no shutdown  Router(config)# interface GigabitEthernet0/1  Router(config-if)# ip address 192.168.20.1 255.255.255.0  Router(config-if)# no shutdown |

### DHCP , DNS, and Network Configuration in Routers

Table 14: DHCP, DNS, and Network Configurations

|  |  |  |
| --- | --- | --- |
| VLAN/Subnet | Router Name | Configuration |
| 30 (phOperations) | PH Router | Router(config)# ip dhcp pool phOperations  Router(dhcp-config)#network 192.168.30.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.30.1  Router(dhcp-config)# dns-server 192.168.30.5  Router(dhcp-config)# exit |
| 40 (phTraining) | PH Router | Router(config)# ip dhcp pool phTraining  Router(dhcp-config)# network 192.168.40.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.40.1  Router(dhcp-config)# dns-server 192.168.30.5  Router(dhcp-config)# exit |
| 50 (frOperations) | FR Router | Router(config)# ip dhcp pool frOperations  Router(dhcp-config)# network 192.168.50.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.50.1  Router(dhcp-config)# dns-server 192.168.50.3  Router(dhcp-config)# exit |
| 60 (frTraining) | FR Router | Router(config)# ip dhcp pool frTraining  Router(dhcp-config)# network 192.168.60.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.60.1  Router(dhcp-config)# dns-server 192.168.50.5  Router(dhcp-config)# exit |
| 70 (manager) | Admin Router | Router(config)# ip dhcp pool manager  Router(dhcp-config)# network 192.168.70.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.70.1  Router(dhcp-config)# dns-server 192.168.70.5  Router(dhcp-config)# exit |
| 80 (admin) | Admin Router | Router(config)# ip dhcp pool admin  Router(dhcp-config)# network 192.168.80.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.80.1  Router(dhcp-config)# dns-server 192.168.70.5  Router(dhcp-config)# exit |
| 90 (it) | IT Router | Router(config)# ip dhcp pool it  Router(dhcp-config)# network 192.168.90.0 255.255.255.0  Router(dhcp-config)# default-router 192.168.90.1  Router(dhcp-config)# dns-server 192.168.90.5  Router(dhcp-config)# exit |

### VLAN Configuration

Table 15: VLAN Configurations in Routers

|  |  |  |
| --- | --- | --- |
| Router Name | Interface | VLAN Configuration |
| Finance and HR Router | VLAN 10,20 | Router(config)# interface Gigabit0/0/0  Router(config-if)# no shutdown  Router(config)# interface Gigabit0/0/0.10  Router(config-subif)# encapsulation dot1Q 10  Router(config-subif)# ip address 192.168.10.1 255.255.255.0  Router(config)# interface Gigabit0/0/0.20  Router(config-subif)# encapsulation dot1Q 20  Router(config-subif)# ip address 192.168.20.1 255.255.255.0 |
| PH Router | VLAN 30,40,50,60 | Router(config)# interface Gigabit0/0/0  Router(config-if)# no shutdown  Router(config)# interface Gigabit0/0/0.30  Router(config-subif)# encapsulation dot1Q 30  Router(config-subif)# ip address 192.168.30.1 255.255.255.0  Router(config)# interface Gigabit0/0/0.40  Router(config-subif)# encapsulation dot1Q 40  Router(config-subif)# ip address 192.168.40.1 255.255.255.0  Router(config)# interface Gigabit0/0/0  Router(config-if)# no shutdown  Router(config)# interface Gigabit0/0/0.50  Router(config-subif)# encapsulation dot1Q 50  Router(config-subif)# ip address 192.168.50.1 255.255.255.0  Router(config)# interface Gigabit0/0/0.60  Router(config-subif)# encapsulation dot1Q 60  Router(config-subif)# ip address 192.168.60.1 255.255.255.0 |
| FR Router | VLAN 50,60 | Router(config)# interface Gigabit0/0/0  Router(config-if)# no shutdown  Router(config)# interface Gigabit0/0/0.50  Router(config-subif)# encapsulation dot1Q 50  Router(config-subif)# ip address 192.168.50.1 255.255.255.0  Router(config)# interface Gigabit0/0/0.60  Router(config-subif)# encapsulation dot1Q 60  Router(config-subif)# ip address 192.168.60.1 255.255.255.0 |
| Admin Router | VLAN 70,80 | Router(config)# interface Gigabit0/0/0  Router(config-if)# no shutdown  Router(config)# interface Gigabit0/0/0.70  Router(config-subif)# encapsulation dot1Q 70  Router(config-subif)# ip address 192.168.70.1 255.255.255.0  Router(config)# interface Gigabit0/0/0.80  Router(config-subif)# encapsulation dot1Q 80  Router(config-subif)# ip address 192.168.80.1 255.255.255.0 |
| IT Router | VLAN 90 | Router(config)# interface Gigabit0/0/0  Router(config-if)# no shutdown  Router(config)# interface Gigabit0/0/0.90  Router(config-subif)# encapsulation dot1Q 90  Router(config-subif)# ip address 192.168.90.1 255.255.255.0 |

### OSPF in Routers

Table 16: OSPF Configurations

|  |  |
| --- | --- |
| Device Name | OSPF Configuration |
| Finance and HR Router | router ospf 1; network 192.168.10.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.10.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.47.0 0.0.0.255 area 0 |
| PH Router | router ospf 1; network 192.168.47.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.47.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.47.0 0.0.0.255 area 0 |
| IT Router | router ospf 1; network 192.168.45.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.45.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.45.0 0.0.0.255 area 0 |
| Admin Router | router ospf 1; network 192.168.48.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.49.0 0.0.0.255 area 0 |
| PH Router | router ospf 1; network 192.168.48.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.46.0 0.0.0.255 area 0 |
| FR Router | router ospf 1; network 192.168.46.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.46.0 0.0.0.255 area 0 |
| IT Router | router ospf 1; network 192.168.49.0 0.0.0.255 area 0 |
|  | router ospf 1; network 192.168.45.0 0.0.0.255 area 0 |

### RIP in Routers

Table 17: RIP Routing Configurations

|  |  |
| --- | --- |
| Device Name | RIP Configuration |
| Finance and HR Router | router rip;network 192.168.10.0;network 192.168.20.0 |
| PH Router | router rip;network 192.168.47.0 |
| IT Router | router rip;network 192.168.45.0 |
| Admin Router | router rip;network 192.168.48.0;network 192.168.49.0 |
| FR Router | router rip; network 192.168.46.0 |

### NAT in IT Router

Table 18: NAT Configuration

|  |  |
| --- | --- |
| Router | NAT Configuration |
| IT Router | Router(config)# interface GigabitEthernet0/0/0  Router(config-if)# ip address 192.168.10.1 255.255.255.0  Router(config-if)# ip nat inside  Router(config-if)# exit  Router(config)# interface GigabitEthernet0/1/0  Router(config-if)# ip address 192.168.50.1 255.255.255.0  Router(config-if)# ip nat inside  Router(config-if)# exit  Router(config)# interface GigabitEthernet0/1/1  Router(config-if)# ip address 192.168.20.1 255.255.255.0  Router(config-if)# ip nat inside  Router(config-if)# exit  Router(config)# interface GigabitEthernet0/1/2  Router(config-if)# ip address 192.168.30.1 255.255.255.0  Router(config-if)# ip nat inside  Router(config-if)# exit  Router(config)# interface GigabitEthernet0/1/3  Router(config-if)# ip address 192.168.40.1 255.255.255.0  Router(config-if)# ip nat inside  Router(config-if)# exit  Router(config)# interface Serial0/2/0  Router(config-if)# ip address 192.168.48.1 255.255.255.0  Router(config-if)# exit  Router(config)# interface Serial0/1/1  Router(config-if)# ip address 192.168.49.1 255.255.255.0  Router(config-if)# exit  Router(config)# access-list 1 permit 192.168.10.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.20.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.30.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.40.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.50.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.60.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.70.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.80.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.90.0 0.0.0.255  Router(config)# access-list 1 permit 192.168.100.0 0.0.0.255  Router(config)# ip nat pool PUBLIC\_POOL 203.0.113.1 203.0.113.254 netmask 255.255.255.0  Router(config)# ip nat inside source list 1 pool PUBLIC\_POOL overload  Router(config)# ip nat inside source static 192.168.48.1 203.0.113.10 |

## Switches and its Configurations

### VLAN, Trunk, Access, RSTP Configurations

Table 19: VLAN and its associated configurations

|  |  |  |  |
| --- | --- | --- | --- |
| **Switch Names** | **VLAN Assignment** | **Trunk/Access** | **RSTP/STP** |
| FA Switch | Switch(config)# vlan 10  Switch (config)# vlan 20 | Switch (config)# interface GigabitEthernet0/2  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20 |  |
| HR Switch | Switch(config)# vlan 10  Switch (config)# vlan 20 | Switch (config)# interface GigabitEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20  Switch (config)# interface GigabitEthernet0/2  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20 |  |
| FA-HR Middle Switch (Root) | Switch(config)# vlan 10  Switch (config)# vlan 20 | Switch (config)# interface FastEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20  Switch (config)# interface GigabitEthernet0/2  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20 | Switch (config)# spanning-tree mode rapid-pvst  Switch (config)# spanning-tree vlan 10 priority 4096  Switch (config)# spanning-tree vlan 20 priority 4096 |
| PH-Training Switch | Switch(config)# vlan 30 | Switch (config)# interface FastEthernet0/10  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport access vlan 30,40  Switch (config)# interface FastEthernet0/5  Switch (config-if)# switchport mode access  Switch (config-if)# switchport access vlan 30,40 |  |
| PH-Operations Switch | Switch(config)# vlan 40 | Switch (config)# interface FastEthernet0/10  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport access vlan 30,40,50,60  Switch (config)# interface FastEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport access vlan 30,40,50,60 |  |
| PH Middle Switch (Root) | Switch(config)# vlan 30  Switch(config)# vlan 40 | Switch (config)# interface FastEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport access vlan 30,40  Switch (config)# interface FastEthernet0/5  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport access vlan 30,40 | Switch (config)# spanning-tree mode rapid-pvst  Switch (config)# spanning-tree vlan 30 priority 4096  Switch (config)# spanning-tree vlan 40 priority 4096 |
| FR Training Switch | Switch(config)# vlan 50 | Switch (config)# interface FastEthernet0/4  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60  Switch (config)# interface FastEthernet0/5  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60  Switch (config)# interface FastEthernet0/6  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60 |  |
| FR -Operations Switch | Switch(config)# vlan 60 | Switch (config)# interface GigabitEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60  Switch (config)# interface FastEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60 |  |
| FR Middle Switch (Root) | Switch(config)# vlan 50  Switch(config)# vlan 60 | Switch (config)# interface FastEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60  Switch (config)# interface FastEthernet0/2  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 30,40,50,60 | Switch (config)# spanning-tree mode rapid-pvst  Switch (config)# spanning-tree vlan 50 priority 4096  Switch (config)# spanning-tree vlan 60 priority 4096 |
| Admin Switch | Switch(config)# vlan 70 | Switch (config)# interface GigabitEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 70,80 |  |
| Manager Switch | Switch(config)# vlan 10  Switch(config)# vlan 20  Switch(config)# vlan 30  Switch(config)# vlan 40  Switch(config)# vlan 50  Switch(config)# vlan 60  Switch(config)# vlan 70  Switch(config)# vlan 80  Switch(config)# vlan 90 | Switch (config)# interface GigabitEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20,30,40,50,60,70,80,90  Switch (config)# interface GigabitEthernet0/2  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20,30,40,50,60,70,80,90 |  |
| IT Switch | Switch(config)# vlan 10  Switch(config)# vlan 20  Switch(config)# vlan 30  Switch(config)# vlan 40  Switch(config)# vlan 50  Switch(config)# vlan 60  Switch(config)# vlan 70  Switch(config)# vlan 90 | Switch (config)# interface GigabitEthernet0/1  Switch (config-if)# switchport mode trunk  Switch (config-if)# switchport trunk allowed vlan 10,20,30,40,50,60,70, 90 |  |

## Servers and its Configurations

### Web Server/File Configuration

Table 20: Web Server and its associated Files

|  |  |
| --- | --- |
| Pool names | Configuration |
| finance | ip dns server  ip dns primary 192.168.10.2  ip dns record finance\_pool fromfinance 192.168.10.2  ip dns record finance\_pool finance 192.168.50.2  ip dns record finance\_pool tohumanresource 192.168.20.2 |
| hr | ip dns server  ip dns primary 192.168.20.2  ip dns record hr\_pool humanresource 192.168.20.2 |
| phOperations | ip dns server  ip dns primary 192.168.30.5  ip dns record phOperations\_pool operations.ph 192.168.30.5  ip dns record phOperations\_pool training.ph 192.168.30.5 |
| phTraining | ip dns server  ip dns primary 192.168.30.5  ip dns record phTraining\_pool operations.ph 192.168.30.5  ip dns record phTraining\_pool training.ph 192.168.30.5 |
| frOperations | ip dns server  ip dns primary 192.168.50.5  ip dns record frOperations\_pool operations.fr 192.168.50.5  ip dns record frOperations\_pool training.fr 192.168.50.5 |
| frTraining | config t  ip dns server  ip dns primary 192.168.50.5  ip dns record frTraining\_pool operations.fr 192.168.50.5  ip dns record frTraining\_pool training.fr 192.168.50.5 |
| manager | config t  ip dns server  ip dns primary 192.168.70.5  ip dns record manager\_pool managers 192.168.70.5 |
| it | config t  ip dns server  ip dns primary 192.168.90.5 |

## Security Services

### ACL

Table 21: Admin Router configuration

|  |  |
| --- | --- |
| **Device** | **Configuration** |
| **Admin Router** | Router(config)# ip access-list extended 101  Router(config-ext-nacl)# permit icmp  Router(config-ext-nacl)# permit icmp host 192.168.10.3 host 192.168.70.5  Router(config-ext-nacl)# permit icmp host 192.168.10.4 host 192.168.70.5  Router(config-ext-nacl)# permit icmp host 192.168.20.3 host 192.168.70.6  Router(config-ext-nacl)# permit icmp host 192.168.20.4 host 192.168.70.6  Router(config-ext-nacl)# permit icmp host 192.168.40.2 host 192.168.70.4  Router(config-ext-nacl)# permit icmp host 192.168.40.3 host 192.168.70.4  Router(config-ext-nacl)# permit icmp host 192.168.40.4 host 192.168.70.4  Router(config-ext-nacl)# permit icmp host 192.168.40.5 host 192.168.70.4  Router(config-ext-nacl)# permit icmp host 192.168.40.6 host 192.168.70.4  Router(config-ext-nacl)# permit icmp host 192.168.50.3 host 192.168.70.2  Router(config-ext-nacl)# permit icmp host 192.168.50.4 host 192.168.70.2  Router(config-ext-nacl)# permit icmp host 192.168.60.2 host 192.168.70.2  Router(config-ext-nacl)# permit icmp host 192.168.60.3 host 192.168.70.2 |
| **Admin Router interface s0/1/1** | Router(config)# int s0/1/1  Router(config-if)# ip access-group 101 in |
| **Admin Router interface s0/2/0** | Router(config)# int s0/2/0  Router(config-if)# ip access-group 101 in |

### Firewall

# Services Implementation

## DHCP

The primary purpose of routers in the configuration is to assign DHCP to most of the Dynamic-based buildings such as PH Buildings, FR Building, IT, and Admin Building. As the rule states, all 4th octet 5th will be excluded. This is due to it being reserved for the Web Servers. Routers are the ones used to assign the DHCP of each VLAN together with the configuration of the switches. Static routings are used in HR and Finance at VLAN 10 and 20.

Table 21: DHCP Assignment

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| VLAN/Subnet | DHCP Pool Name | Network/Subnet | Default Router | DNS Server | DHCP Range Start | DHCP Range End |
| 10 | finance | 192.168.10.0/24 | 192.168.10.1 | 192.168.10.2 | Static | - |
| 20 | hr | 192.168.20.0/24 | 192.168.20.1 | 192.168.20.2 | Static | - |
| 30 | phOperations | 192.168.30.0/24 | 192.168.30.1 | 192.168.30.5 | 192.168.30.2 | 192.168.30.254 |
| 40 | phTraining | 192.168.40.0/24 | 192.168.40.1 | 192.168.30.5 | 192.168.40.2 | 192.168.40.254 |
| 50 | frOperations | 192.168.50.0/24 | 192.168.50.1 | 192.168.50.5 | 192.168.50.2 | 192.168.50.254 |
| 60 | frTraining | 192.168.60.0/24 | 192.168.60.1 | 192.168.50.5 | 192.168.60.2 | 192.168.60.254 |
| 70 | manager | 192.168.70.0/24 | 192.168.70.1 | 192.168.70.5 | 192.168.70.2 | 192.168.70.254 |
| 80 | admin | 192.168.80.0/24 | 192.168.80.1 | 192.168.70.5 | 192.168.80.2 | 192.168.80.254 |
| 90 | it | 192.168.90.0/24 | 192.168.90.1 | 192.168.90.5 | 192.168.90.2 | 192.168.90.254 |

## DNS and Web Service

All static networks such as VLAN 10 and 20 have its own DNS. Other DHCP from 30 to 90 are all dependent on its first network, such as in PH and FR where their operations room has the DNS server.

Table 22: DNS Table

|  |  |  |  |
| --- | --- | --- | --- |
| Pool Name | DNS Server | DNS Domain Name/Records | Address |
| finance\_pool | 192.168.10.2 | http://fromfinance  http://finance  http://tohumanresource | 192.168.10.2  192.168.50.2  192.168.20.2 |
| hr\_pool | 192.168.20.2 | http://humanresource | 192.168.20.2 |
| phOperations\_pool | 192.168.30.5 | http:// operations.ph  http:// training.ph | 192.168.30.5 |
| phTraining\_pool | 192.168.30.5 | http:// operations.ph  http:// training.ph | 192.168.30.5 |
| frOperations\_pool | 192.168.50.5 | http:// operations.fr  http:// training.fr | 192.168.50.5 |
| frTraining\_pool | 192.168.50.5 | http:// operations.fr  http:// training.fr | 192.168.50.5 |
| manager\_pool | 192.168.70.5 | http:// managers | 192.168.70.5 |
| admin\_pool | 192.168.70.5 | http:// admin | 192.168.70.5 |
| IT | 192.168.90.5 | http://itdept | 192.168.90.5 |

## Other Services

### Internet Connectivity

#### NAT

Nat usage was dynamic for all DHCPs. The connections all have blank Lease expirations. All types are automatic. All NAT values are configured on the IT-Router. Static buildings like HR and Finance and Accounting have not been connected to the internet.

Table 23: NAT Values in different Routers

|  |  |  |
| --- | --- | --- |
| Routers | Ip Address | Client-ID |
| IT Router | 192.168.90.3  192.168.90.2 | 0050.0FC8.AC27  0060.4746.B7DC |
| Admin Router | 192.168.70.3  192.168.70.2  192.168.70.6  192.168.70.4  192.168.70.4  192.168.70.2  192.168.70.3 | 0003.E460.713D  0010.1126.137E  000B.BE97.B6C5  000C.CF9C.C54B  00E0.A33B.96BC  0009.7C7C.409B  00D0.9729.DD2A |
| PH Router | 192.168.40.2  192.168.40.4  192.168.40.6  192.168.40.3  192.168.40.5 | 0006.2AE3.5B90  000C.8527.1B7D  0005.5E93.62C2  0000.0C12.13B5  00E0.F9C1.E6A3 |
| FR Router | 192.168.60.2  192.168.60.3  192.168.60.4  192.168.60.2  192.168.60.3  192.168.60.4 | 00D0.58D4.417A  0060.47B8.2130  0001.4332.0DB8  0009.7CB5.EA4C  0030.F25A.D734  0090.0CD9.531D |

#### Wireless Access

|  |  |  |  |
| --- | --- | --- | --- |
| Department | Access Points | SSID | Passphrase |
| Finance | **Finance-AP** | Finance | finance123! |
| Human Resources | **HR-AP** | HR | human123! |
| Philippine Team-Training | **PH Training AP** | PHT | phtrain123! |
| Philippine Team-Operations | **PH Operations AP** | PHO | philop123! |
| France Team-Training | **France Training AP** | FranceT | francet123! |
| France Team-Operations | **France Operations AP** | FranceO | franceo123! |
| IT | **IT AP** | IT | info123! |

### Email Service

Table 24: Email Service Domains and users

|  |  |  |
| --- | --- | --- |
| **Domain Name** | **User** | **Password** |
| @gmail.com | finance1 | lab123 |
| @gmail.com | finance2 | lab123 |
| @gmail.com | hr1 | lab123 |
| @gmail.com | hr2 | lab123 |
| @gmail.com | hr3 | lab123 |
| @gmail.com | pht1 | ph123 |
| @gmail.com | pht2 | ph123 |
| @gmail.com | pht3 | ph123 |
| @gmail.com | pho1 | ph123 |
| @gmail.com | pho2 | ph123 |
| @gmail.com | financet1 | france123 |
| @gmail.com | financet2 | france123 |
| @gmail.com | financet3 | france123 |
| @gmail.com | financet4 | france123 |
| @gmail.com | financehead | manager123 |
| @gmail.com | hrhead | manager123 |
| @gmail.com | phhead | manager123 |
| @gmail.com | franchead | manager123 |
| @gmail.com | itemailserver | itemailserver |

Table 25: General E-Mail Server Protocols

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device name** | **Your Name** | **Email address** | **Incoming Mail Server** | **Outgoing Mail Server** |
| fa1 | finance1 | finance1@gmail.com | 192.168.90.4 | 192.168.90.4 |
| fa2 | finance2 | finance2@gmail.com | 192.168.90.4 | 192.168.90.4 |
| hr1 | hr1 | hr1@gmail.com | 192.168.90.4 | 192.168.90.4 |
| hr2 | hr2 | hr2@gmail.com | 192.168.90.4 | 192.168.90.4 |
| hr3 | hr3 | hr3@gmail.com | 192.168.90.4 | 192.168.90.4 |
| pht1 | pht1 | pht1@gmail.com | 192.168.90.4 | 192.168.90.4 |
| pht2 | pht2 | pht2@gmail.com | 192.168.90.4 | 192.168.90.4 |
| pht3 | pht3 | pht3@gmail.com | 192.168.90.4 | 192.168.90.4 |
| pho1 | pho1 | pho1@gmail.com | 192.168.90.4 | 192.168.90.4 |
| pho2 | pho2 | pho2@gmail.com | 192.168.90.4 | 192.168.90.4 |
| francet1 | francet1 | francet1@gmail.com | 192.168.90.4 | 192.168.90.4 |
| francet2 | francet2 | francet2@gmail.com | 192.168.90.4 | 192.168.90.4 |
| francet3 | francet3 | francet3@gmail.com | 192.168.90.4 | 192.168.90.4 |
| francet4 | francet4 | francet4@gmail.com | 192.168.90.4 | 192.168.90.4 |
| financehead | financehead | financehead@gmail.com | 192.168.90.4 | 192.168.90.4 |
| hrhead | hrhead | hrhead@gmail.com | 192.168.90.4 | 192.168.90.4 |
| phhead | phhead | phhead@gmail.com | 192.168.90.4 | 192.168.90.4 |
| francehead | francehead | francehead@gmail.com | 192.168.90.4 | 192.168.90.4 |
| itemailserver | itemailserver | itemailserver@gmail.com | 192.168.90.4 | 192.168.90.4 |

# Network Optimization

## Network Performance

### Load Balancing

### Qos

## Security

### ACL

Admin Router has an access-group ‘101’ that has only a set of permission rules considering that ‘deny any host to any host’ is a rule implicitly applied at the end of the rules. The defined access-group was implemented at interfaces Serial0/1/1 and Serial0/2/0 where the keyword ‘in’ means that ACL is applied to the data traffic coming into the device interface. The Admin router interface filters all incoming data transmitted to each department head.

### Firewall

## Redundancy and Reliability

### Link Aggregation

For the "Finance and HR" Switch, Port-channel 1 is up (SU) and consists of two ports: Gig0/1 (Port) and Gig0/2 (Interface). This means that Gig0/1 is actively participating in the link aggregation, while Gig0/2 is in a standby state.

Table 26: Link Aggregation Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Port-Channel** | **Protocol** | **Ports** |
| 1 | Po1(SU) | PAgP | Gig0/1(P) Gig0/2(I) |

# Conclusion

**Network Design Project**

The network design project was successfully completed through collaborative efforts of the ream, with adequate time allocated to each stage, including design, configuration, testing, and documentation. Teleperformance company’s network requirements were thoroughly reviewed, encompassing crucial aspects such as the number of users, devices, subnets, specific services like DNS, DHCP, web server, and performance criteria, including bandwidth, latency, and redundancy.

**Network Topology and Implementation**

The network topology was meticulously designed using Cisco Packet Tracer, incorporating essential components such as routers, switches, access points, and a mix of link types, including Ethernet and Wi-Fi. An efficient IPv4 addressing scheme was implemented, utilizing subnetting and VLANs to ensure smooth communication between different departments. The dynamic routing protocol OSPF was configured to facilitate seamless connectivity between subnets, and OSPF areas were introduced for improved scalability. Additionally, internet access was provided to all users through a single gateway, with Network Address Translation (NAT) used to translate internal IP addresses to public IP addresses. A Wi-Fi network was thoughtfully designed to cater to wireless connectivity needs in specific departments. Essential services like a DNS server for internal domain resolution and DHCP server for dynamic IP address assignment were set up, along with a web server hosting the company's intranet site.

**Security and IT Infrastructure**

Ensuring network security was a paramount consideration in the design. Access control lists (ACLs) were configured on routers, and a firewall was implemented at the network perimeter to filter incoming and outgoing traffic. Optional port security on switches was set up to limit device connections, further bolstering the network's defenses. To optimize performance and reliability, Gigabit Ethernet connections were utilized, along with link aggregation to enhance bandwidth and provide redundancy where required. Redundant connections were configured for critical devices to minimize single points of failure. The backend played a pivotal role, serving as a comprehensive data repository for the company's historical records and files. It catered to various departments, with the Finance and Accounting offices especially concerned about data accuracy and security. Additionally, the Human Resource department relied on the backend for monitoring workplace conditions and tracking employee-related information. On the front-end, training modules facilitated the onboarding of new members, while standard employees used operational features for their day-to-day tasks. Within the company's organizational structure, managers had supervisory capabilities, while admins held elevated permissions to manage and maintain the system. The IT building played a critical role in housing the necessary infrastructure and hardware, serving as the nerve center for seamless data storage, retrieval, and overall system performance.

# Recommendation