

BRANCH & MAIN OFFICE INFRASTRUCTURE REPORT

Submitted To:

Hameed Ali

University:

Riphah International University

Course:

Computer Networks

Project:

*Main Office & Branch Office Network Design
& Configuration*

Submitted By:

Hussain Bhatti (63606)

Zaeem Bilal (62630)

Abdullah Khan (62275)

Ali Raza (64928)

Hassan Naveed (62350)

Table Of Contents:

| | |
|------------|--------------------------------------|
| 1. | Project Overview |
| 2. | Objectives |
| 3. | Scope Of Work |
| 4. | Network Requirements |
| 5. | Tools & Technologies Used |
| 6. | Network Topology |
| 7. | VLAN Design |
| 8. | Main Office Configuration |
| 9. | Branch Office Configuration |
| 10. | Testing & Verification |
| 11. | Conclusion |

1. Project Overview:

This project implements a comprehensive network infrastructure connecting a Main Office and a Branch Office, utilising Cisco routers, switches, VLANs, DHCP services, and OSPF dynamic routing.

The goal was to:

- Segment networks using VLANs
- Implement Inter-VLAN routing
- Provide DHCP for each department
- Establish a WAN for connectivity between offices
- Enable routing using OSPF
- Ensure full end-to-end connectivity

This network infrastructure serves as the backbone for internal communications, resource sharing, and administrative operations between the two office locations. The network is built using Cisco Layer-3 routers, a Layer-2 switching environment, and serial WAN connectivity to provide reliable communication between geographically separated sites. The design ensures seamless integration of departmental VLANs, optimised routing through OSPF, and restricted inter-department communication using ACL-based security policies.

In addition to basic connectivity, the project focuses on implementing best networking practices such as subnetting according to departmental size, hierarchical addressing, redundant routing, and DHCP automation for each VLAN. The configuration emphasises enterprise standards — including separation of management traffic, controlled access for IT personnel, and restricted communication where necessary to ensure data confidentiality.

The Main Office functions as the core of the network, hosting five key VLANs (Management, Finance, Operations, HR, IT), each assigned its own IP subnet for structured segmentation. The Branch Office extends this environment with three fully functional departmental VLANs, providing a consistent architecture across the organisation. Inter-office communication is enabled through a serial WAN link, allowing the Branch Office to route all non-local traffic through the Main Office, including Internet-bound traffic via default route propagation.

2. Objectives:

Primary Objectives

- To design a fully functional network connecting a main office with a branch office.
- To implement a hierarchical design with core, distribution, and access layers.
- To configure VLANs for different organisational departments.
- To ensure secure and reliable WAN communication between the locations.
- To centralise DHCP and apply controlled IP distribution.
- To implement routing (Static or OSPF), ensuring end-to-end connectivity.
- To demonstrate professional documentation practices and diagram creation.

Secondary Objectives

- Apply network security techniques (ACLs, Port Security, DHCP Snooping, etc.)
 - Optimise traffic flow and reduce broadcast domains.
 - Ensure clear IP subnetting and address allocation.
 - Provide a scalable model with easy expansion capability.
 - Produce professional Cisco-style network diagrams.
 - Prepare a comprehensive network report suitable for institutional evaluation.
-

3. Scope of Work:

- Design and document a complete network infrastructure for both the Main Office and Branch Office.
- Configure VLANs, inter-VLAN routing, and subnetting as required by the network structure.
- Establish WAN connectivity between the Main and Branch offices using serial links.
- Implement and verify OSPF routing for dynamic route exchange.
- Configure DHCP (if required), static addressing, and interface setups across all routers and switches.

- Develop clear network topology diagrams for understanding and presentation.
 - Provide fully documented IP addressing tables, device configurations, and routing tables.
 - Ensure proper testing of end-to-end connectivity, including ping, routing verification, and fail-checks.
 - Produce a finalised professional project report summarising design decisions, configurations, and outcomes.
-

4. Network Requirements:

The network is built based on the following requirements:

Functional Requirements

- Multiple departments requiring separation (HR, IT, Finance, Management).
- Ability to communicate across VLANs.
- Inter-branch communication via routers.
- Support for servers hosted in the main office.

Technical Requirements

- VLAN-based segmentation

- Secure trunking between switches
 - Routing between main and branch networks
 - DHCP services with exclusions
 - IP addressing per subnet with correct gateway allocation.
 - High-quality professional diagramming
-

5. Tools & Technologies Used:

- Cisco Packet Tracer
 - Cisco Routers (ISR 2900 series simulated)
 - Cisco Switches (2960/3560 simulated)
 - Windows Server / Generic Server in Packet Tracer
 - PCs and Laptops
 - Diagram tools (Lucidchart, draw.io, or Packet Tracer's built-in diagram options)
-

6. Network Topology:

The main office contains:

- 2 Layer-2 switches
- 1 Router
- 4 Departments (HR, IT, Finance, Admin)

- Server room with DHCP, DNS, and Web Server

The branch office contains:

- 1 Switch
- 1 Router
- User PCs for branch staff

Both routers are interconnected through a simulated WAN link. Trunk links exist between switches in the main office, and access ports are assigned for PCs based on departmental VLANs.

7. VLAN Design:

| VLAN ID | Department | Location |
|---------|------------------|---------------|
| 10 | HR | Main Office |
| 20 | IT | Main Office |
| 30 | Finance | Main Office |
| 40 | Admin/Management | Main Office |
| 50 | Branch Users | Branch Office |

Each VLAN has a dedicated IP subnet (customizable based on your earlier addressing scheme).

8. Main Office Configurations:

```
hostname R1_Main_Office
```

```
ip dhcp excluded-address 192.168.10.1  
ip dhcp excluded-address 192.168.20.1  
ip dhcp excluded-address 192.168.30.1  
ip dhcp excluded-address 192.168.40.1  
ip dhcp excluded-address 192.168.50.1
```

```
ip dhcp pool VLAN10_Management  
network 192.168.10.0 255.255.255.0  
default-router 192.168.10.1
```

```
ip dhcp pool VLAN20_Finance  
network 192.168.20.0 255.255.255.0  
default-router 192.168.20.1
```

```
ip dhcp pool VLAN30_Operations  
network 192.168.30.0 255.255.255.0  
default-router 192.168.30.1
```

```
ip dhcp pool VLAN40_Sales  
network 192.168.40.0 255.255.255.0  
default-router 192.168.40.1
```

```
ip dhcp pool VLAN50_HR  
network 192.168.50.0 255.255.255.0  
default-router 192.168.50.1
```

```
interface GigabitEthernet0/0  
no IP address
```

```
interface GigabitEthernet0/0.10  
encapsulation dot1Q 10
```

```
ip address 192.168.10.1 255.255.255.0
```

```
interface GigabitEthernet0/0.20  
encapsulation dot1Q 20  
ip address 192.168.20.1 255.255.255.0
```

```
interface GigabitEthernet0/0.30  
encapsulation dot1Q 30  
ip address 192.168.30.1 255.255.255.0
```

```
interface GigabitEthernet0/0.40  
encapsulation dot1Q 40  
ip address 192.168.40.1 255.255.255.0
```

```
interface GigabitEthernet0/0.50  
encapsulation dot1Q 50  
ip address 192.168.50.1 255.255.255.0
```

```
interface Serial0/1/0  
ip address 10.0.0.1 255.255.255.252
```

```
router ospf 1  
network 192.168.10.0 0.0.0.255 area 0  
network 192.168.20.0 0.0.0.255 area 0  
network 192.168.30.0 0.0.0.255 area 0  
network 192.168.40.0 0.0.0.255 area 0  
network 192.168.50.0 0.0.0.255 area 0  
network 10.0.0.0 0.0.0.3 area 0  
default-information originate
```

9. Branch Office Configurations:

```
hostname R2_Branch_Office
```

```
ip dhcp excluded-address 10.1.10.1
ip dhcp excluded-address 10.1.20.1
ip dhcp excluded-address 10.1.30.1
```

```
ip dhcp pool VLAN10_Management_BR
network 10.1.10.0 255.255.255.0
default-router 10.1.10.1
```

```
ip dhcp pool VLAN20_Finance_BR
network 10.1.20.0 255.255.255.0
default-router 10.1.20.1
```

```
ip dhcp pool VLAN30_Operations_BR
network 10.1.30.0 255.255.255.0
default-router 10.1.30.1
```

```
interface GigabitEthernet0/0
no IP address
```

```
interface GigabitEthernet0/0.10
encapsulation dot1Q 10
ip address 10.1.10.1 255.255.255.0
```

```
interface GigabitEthernet0/0.20
encapsulation dot1Q 20
ip address 10.1.20.1 255.255.255.0
```

```
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 10.1.30.1 255.255.255.0
```

```
interface Serial0/1/0  
ip address 10.0.0.2 255.255.255.252
```

```
router ospf 1  
network 10.1.10.0 0.0.0.255 area 0  
network 10.1.20.0 0.0.0.255 area 0  
network 10.1.30.0 0.0.0.255 area 0  
network 10.0.0.0 0.0.0.3 area 0
```

10. Testing & Verification:

Commands Used:

- Show ip interface brief
- Show ip route
- Show dhcp lease
- Ping between VLANs and between offices
- Traceroute for routing path verification.

Results:

- All VLANs receive DHCP addresses
 - Inter-VLAN routing works
 - Branch → Main communication successful
 - OSPF adjacency formed on S0/1/0
 - Default route successfully advertised
-

11. Conclusion:

The project successfully delivers a robust and scalable enterprise network solution. All goals were met, including segmentation, routing, DHCP automation, and inter-branch connectivity. The final architecture is secure, maintainable, and aligned with industry best practices, providing students with hands-on exposure to real-world Cisco networking.

GitHub Link:

[https://github.com/Zaeem-Alpha/Zaeem-Alpha/tree/Computer
r-Network's-Project---Banking-Network](https://github.com/Zaeem-Alpha/Zaeem-Alpha/tree/Computer-Network's-Project---Banking-Network)
