

Project #4 Case Study and Requirements

Albion University is a large university which has two campuses situated 20 miles apart. The university's students and staff are distributed in 4 faculties; these include the faculties of Health and Sciences; Business; Engineering / Computing and Art/Design. Each member of staff has a PC and students have access to PCs in the labs. Create a network topology with the main components to support the following:

- University location.

Main

Campus

- Building A: Administrative staff in the departments of management, HR and finance. The admin staff PCs are distributed in the building offices and it is expected that they will share some networking equipment (Hint: use of VLANs is expected here). The Faculty of Business is also situated in this building
- Building B: Faculty of Engineering and Computing and Faculty of Art and Design.
- Building C: Students' labs and IT department. The IT department hosts the University Web server and other servers - There is also an email server hosted externally on the cloud.

Smaller campus:

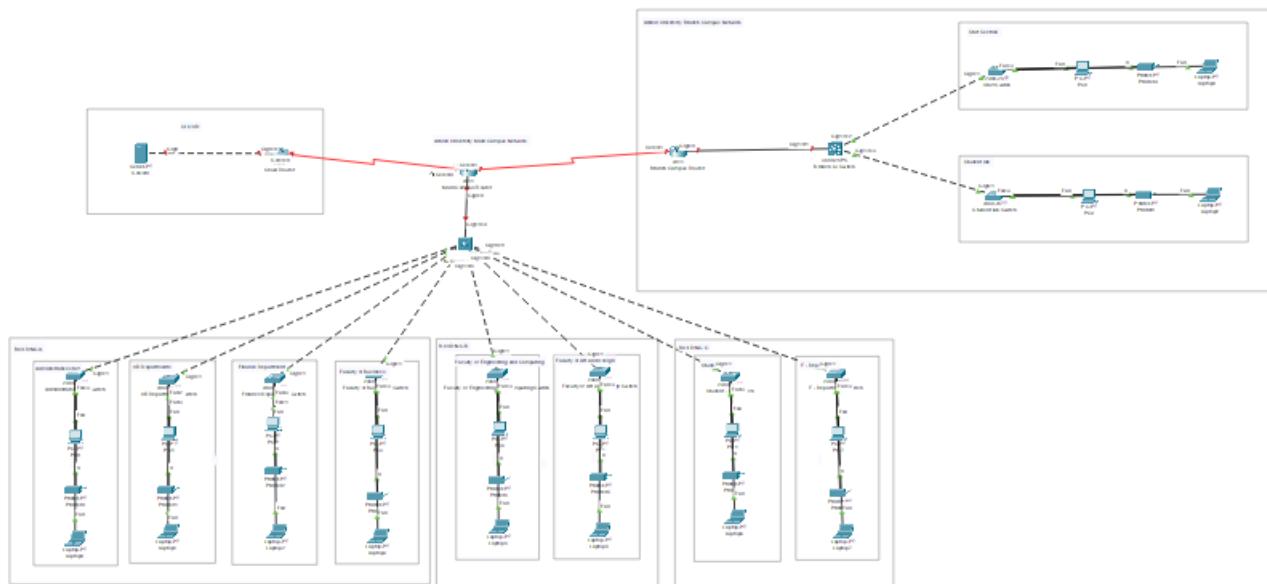
Faculty of Health and Sciences (staff and students' labs are situated on separate floors)

- Each department/faculty is expected to be on its own separate IP network.
- The switches should be configured with appropriate VLANs and security settings.
- RIPv2 will be used to provide routing for the routers in the internal network and static routing for the external server.
- The devices in building A will be expected to acquire dynamic IP addresses from a router-based DHCP server.

Configure in Packet Tracer the network with appropriate settings to achieve the connectivity and functionalities specified in the requirements.

Technologies Implemented

1. Creating a network topology using Cisco Packet Tracer.



2. Hierarchical Network Devices.

1. Router Model 2911
2. L3 Switch 3650-24ps
3. Switch Model 2960-24T
4. Server-PT
5. PC
6. Laptop
7. Printer

3. Connecting Networking devices with Correct cabling.

1. Copper Straight Through
2. Copper Cross – Over

3. Serial DCE

4. Creating VLANs and assigning ports VLAN numbers.

Main Campus Network

Building A

Administrative staff	VLAN 10	IP:192.168.1.0/24
HR Departments	VLAN 20	IP:192.168.2.0/24
Finance Departments	VLAN 30	IP:192.168.3.0/24
Faculty of Business	VLAN 40	IP:192.168.4.0/24

Building B

Faculty of Engineering and Computing	VLAN 50	IP:192.168.5.0/24
Faculty of Art and Design	VLAN 60	IP:192.168.6.0/24

Building C

Student – Lab	VLAN 70	IP:192.168.7.0/24
IT – Department	VLAN 80	IP:192.168.8.0/24

Branch Campus Network

Staff – Departments	VLAN 90	IP:192.168.9.0/24
Students – Lab	VLAN 100	IP:192.168.10.0/24

5. Subnetting and IP Addressing.

Main Campus Router to Branch Campus Router	IP:10.10.10.0/30
Main Campus Router to Cloud Router	IP: 10.10.10.4/30
EMAIL SERVER to Cloud Router	IP: 20.0.0.0/30

6. Configuring Inter-VLAN Routing (Router on a stick).

Main_Campus_Router

```
Main_Campus_Router(config)#interface gigabitEthernet 0/0.10
Main_Campus_Router(config-subif)#encapsulation dot1Q 10
Main_Campus_Router(config-subif)#ip address 192.168.1.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.20
Main_Campus_Router(config-subif)#encapsulation dot1Q 20
Main_Campus_Router(config-subif)#ip address 192.168.2.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.30
Main_Campus_Router(config-subif)#encapsulation dot1Q 30
Main_Campus_Router(config-subif)#ip address 192.168.3.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.40
Main_Campus_Router(config-subif)#encapsulation dot1Q 40
Main_Campus_Router(config-subif)#ip address 192.168.4.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.50
Main_Campus_Router(config-subif)#encapsulation dot1Q 50
Main_Campus_Router(config-subif)#ip address 192.168.5.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.60
```

```

Main_Campus_Router(config-subif)#encapsulation dot1Q 60
Main_Campus_Router(config-subif)#ip address 192.168.6.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.70
Main_Campus_Router(config-subif)#encapsulation dot1Q 70
Main_Campus_Router(config-subif)#ip address 192.168.7.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

Main_Campus_Router(config)#interface gigabitEthernet 0/0.80
Main_Campus_Router(config-subif)#encapsulation dot1Q 80
Main_Campus_Router(config-subif)#ip address 192.168.8.1 255.255.255.0
Main_Campus_Router(config-subif)#exit
Main_Campus_Router(config)#

```

Branch_Campus_Router

```

Branch_Campus_Router(config)#interface gigabitEthernet 0/0.90
Branch_Campus_Router(config-subif)#encapsulation dot1Q 90
Branch_Campus_Router(config-subif)#ip address 192.168.9.1 255.255.255.0
Branch_Campus_Router(config-subif)#exit
Branch_Campus_Router(config)#

Branch_Campus_Router(config)#interface gigabitEthernet 0/0.100
Branch_Campus_Router(config-subif)#encapsulation dot1Q 100
Branch_Campus_Router(config-subif)#ip address 192.168.10.1 255.255.255.0
Branch_Campus_Router(config-subif)#exit

```

7. Configuring DHCP Server (Router as the DHCP Server).

Main_Campus_Router

```

Main_Campus_Router(config)#service dhcp
Main_Campus_Router(config)#ip dhcp pool Administrative_staff_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.1.1
Main_Campus_Router(dhcp-config)#dns-server 192.168.1.1
Main_Campus_Router(dhcp-config)#exit

\Main_Campus_Router(config)#ip dhcp pool HR_Departments_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.2.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.2.1
Main_Campus_Router(dhcp-config)#dns-server 192.168.2.1
Main_Campus_Router(dhcp-config)#exit

Main_Campus_Router(config)#ip dhcp pool Finance_Departments_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.3.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.3.1
Main_Campus_Router(dhcp-config)#dns-server 192.168.3.1
Main_Campus_Router(dhcp-config)#exit

Main_Campus_Router(config)#ip dhcp pool Faculty_of_Business_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.4.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.4.1
Main_Campus_Router(dhcp-config)#dns-server 192.168.4.1
Main_Campus_Router(dhcp-config)#exit

Main_Campus_Router(config)#ip dhcp pool Faculty_of_Engineering_and_Computing_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.5.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.5.1

```

```

Main_Campus_Router(dhcp-config)#dns-server 192.168.5.1
Main_Campus_Router(dhcp-config)#exit

Main_Campus_Router(config)#ip dhcp pool Faculty_of_Art_and_Design_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.6.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.6.1
Main_Campus_Router(dhcp-config)#dns-server 192.168.6.1
Main_Campus_Router(dhcp-config)#exit

Main_Campus_Router(config)#ip dhcp pool Building_C_Student_Lab_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.7.0 255.255.255.0
Main_Campus_Router(dhcp-config)#dns-server 192.168.7.1
Main_Campus_Router(dhcp-config)#default-router 192.168.7.1
Main_Campus_Router(dhcp-config)#exit

Main_Campus_Router(config)#ip dhcp pool IT-Department_Switch-pool
Main_Campus_Router(dhcp-config)#network 192.168.8.0 255.255.255.0
Main_Campus_Router(dhcp-config)#default-router 192.168.8.1
Main_Campus_Router(dhcp-config)#dns-server 192.168.8.1
Main_Campus_Router(dhcp-config)#exit

```

Branch_Campus_Router

```

Branch_Campus_Router(config)#service dhcp
Branch_Campus_Router(config)#ip dhcp pool saff-pool
Branch_Campus_Router(dhcp-config)#network 192.168.9.0 255.255.255.0
Branch_Campus_Router(dhcp-config)#default-router 192.168.9.1
Branch_Campus_Router(dhcp-config)#dns-server 192.168.9.1
Branch_Campus_Router(dhcp-config)#exit
Branch_Campus_Router(config)#

Branch_Campus_Router(config)#ip dhcp pool studentlab-pool
Branch_Campus_Router(dhcp-config)#network 192.168.10.0 255.255.255.0
Branch_Campus_Router(dhcp-config)#default-router 192.168.10.1
Branch_Campus_Router(dhcp-config)#dns-server 192.168.10.1
Branch_Campus_Router(dhcp-config)#exit

```

8. Configuring SSH for secure Remote access.

Main Campus

Administrative staff Switch

```

Administrative_staff_Switch(config)#int vlan 10
Administrative_staff_Switch(config-if)#ip address 192.168.1.254 255.255.255.0
Administrative_staff_Switch(config-if)#exit
Administrative_staff_Switch(config)#ip default-gateway 192.168.1.1

Administrative_staff_Switch(config)#ip domain name Administrative_staff_Switch.com
Administrative_staff_Switch(config)#enable password cisco
Administrative_staff_Switch(config)#username cisco password cisco
Administrative_staff_Switch(config)#service password-encryption

```

```

Administrative_staff_Switch(config)#crypto key generate rsa
Administrative_staff_Switch(config)#ip ssh version 2

```

```

Administrative_staff_Switch(config)#line vty 0 15
Administrative_staff_Switch(config-line)#login local
Administrative_staff_Switch(config-line)#transport input ssh
Administrative_staff_Switch(config-line)#exit

```

HR Department Switch

```

HR_Departments_Switch(config)#int vlan 20

```

```
HR_Departments_Switch(config-if)#ip address 192.168.2.254 255.255.255.0
HR_Departments_Switch(config-if)#exit
HR_Departments_Switch(config)#ip default-gateway 192.168.2.1

HR_Departments_Switch(config)#
HR_Departments_Switch(config)#ip domain name HR_Departments_Switch.com
HR_Departments_Switch(config)#enable password cisco
HR_Departments_Switch(config)#username cisco password cisco
HR_Departments_Switch(config)#service password-encryption

HR_Departments_Switch(config)#crypto key generate rsa
HR_Departments_Switch(config)#ip ssh version 2

HR_Departments_Switch(config)#line vty 0 15
HR_Departments_Switch(config-line)#login local
HR_Departments_Switch(config-line)#transport input ssh
HR_Departments_Switch(config-line)#exit
```

Finance Departments Switch

```
Finance_Departments_Switch(config)#int vlan 30
Finance_Departments_Switch(config-if)#ip address 192.168.3.254 255.255.255.0
Finance_Departments_Switch(config-if)#exit
Finance_Departments_Switch(config)#ip default-gateway 192.168.3.1

Finance_Departments_Switch(config)#ip domain name Finance_Departments_Switch.com
Finance_Departments_Switch(config)#enable password cisco
Finance_Departments_Switch(config)#username cisco password cisco
Finance_Departments_Switch(config)#service password-encryption

Finance_Departments_Switch(config)#crypto key generate rsa
Finance_Departments_Switch(config)#ip ssh version 2

Finance_Departments_Switch(config)#line vty 0 15
Finance_Departments_Switch(config-line)#login local
Finance_Departments_Switch(config-line)#transport input ssh
```

Faculty of Business Switch

```
Faculty_of_Business_Switch(config)#int vlan 40
Faculty_of_Business_Switch(config-if)#ip address 192.168.4.254 255.255.255.0
Faculty_of_Business_Switch(config-if)#exit
Faculty_of_Business_Switch(config)#ip default-gateway 192.168.4.1

Faculty_of_Business_Switch(config)#ip domain name Faculty_of_Business_Switch.com
Faculty_of_Business_Switch(config)#enable password cisco
Faculty_of_Business_Switch(config)#username cisco password cisco
Faculty_of_Business_Switch(config)#service password-encryption

Faculty_of_Business_Switch(config)#crypto key generate rsa
Faculty_of_Business_Switch(config)#ip ssh version 2

Faculty_of_Business_Switch(config)#line vty 0 15
Faculty_of_Business_Switch(config-line)#transport input ssh
Faculty_of_Business_Switch(config-line)#login local
Faculty_of_Business_Switch(config-line)#exit
```

Faculty of Engineering and Computing Switch

```
Faculty_of_Engineering_and_Computing_Sw(config)#int vlan 50
Faculty_of_Engineering_and_Computing(config-if)#ip address 192.168.5.254 255.255.255.0
Faculty_of_Engineering_and_Computing(config-if)#exit
Faculty_of_Engineering_and_Computing_Sw(config)#ip default-gateway 192.168.5.1
```

Faculty_of_Engineering_and_Computing_Sw(config)#ip domain	name
Faculty_of_Engineering_and_Computing_Switch.com	
Faculty_of_Engineering_and_Computing_Sw(config)#enable password cisco	
Faculty_of_Engineering_and_Computing_Sw(config)#username cisco password cisco	
Faculty_of_Engineering_and_Computing_Sw(config)#service password-encryption	

Faculty_of_Engineering_and_Computing_Sw(config)#crypto key generate rsa
Faculty_of_Engineering_and_Computing_Sw(config)#ip ssh version 2

Faculty_of_Engineering_and_Computing_Sw(config)#line vty 0 15
Faculty_of_Engineering_and_Computing_Sw(config-line)#transport input ssh
Faculty_of_Engineering_and_Computing_Sw(config-line)#login local

Faculty of Art and Design Switch

Faculty_of_Art_and_Design_Switch(config)#int vlan 60	
Faculty_of_Art_and_Design_Switch(config-if)#ip address 192.168.6.254 255.255.255.0	
Faculty_of_Art_and_Design_Switch(config-if)#exit	
Faculty_of_Art_and_Design_Switch(config)#ip default-gateway 192.168.6.1	

Faculty_of_Art_and_Design_Switch(config)#ip domain name Faculty_of_Art_and_Design_Switch.com
Faculty_of_Art_and_Design_Switch(config)#enable password cisco
Faculty_of_Art_and_Design_Switch(config)#username cisco password cisco
Faculty_of_Art_and_Design_Switch(config)#service password-encryption

Faculty_of_Art_and_Design_Switch(config)#crypto key generate rsa
Faculty_of_Art_and_Design_Switch(config)#ip ssh version 2

Faculty_of_Art_and_Design_Switch(config)#line vty 0 15
Faculty_of_Art_and_Design_Switch(config-line)#transport input ssh
Faculty_of_Art_and_Design_Switch(config-line)#login local

Student-Lab Switch

Bulding_C_Student_Lab_Switch(config)#int vlan 70	
Bulding_C_Student_Lab_Switch(config-if)#ip address 192.168.7.254 255.255.255.0	
Bulding_C_Student_Lab_Switch(config-if)#exit	
Bulding_C_Student_Lab_Switch(config)#ip default-gateway 192.168.7.1	

Bulding_C_Student_Lab_Switch(config)#ip domain name Bulding_C_Student_Lab_Switch.com
Bulding_C_Student_Lab_Switch(config)#enable password cisco
Bulding_C_Student_Lab_Switch(config)#username cisco password cisco
Bulding_C_Student_Lab_Switch(config)#service password-encryption

Bulding_C_Student_Lab_Switch(config)#crypto key generate rsa
Bulding_C_Student_Lab_Switch(config)#ip ssh version 2

Bulding_C_Student_Lab_Switch(config)#line vty 0 15
Bulding_C_Student_Lab_Switch(config-line)#transport input ssh
Bulding_C_Student_Lab_Switch(config-line)#login local

IT - Department Switch

IT-Department_Switch(config)#int vlan 80	
IT-Department_Switch(config-if)#ip address 192.168.8.254 255.255.255.0	
IT-Department_Switch(config-if)#exit	
IT-Department_Switch(config)#ip default-gateway 192.168.8.1	

IT-Department_Switch(config)#ip domain name IT-Department_Switch.com
IT-Department_Switch(config)#enable password cisco
IT-Department_Switch(config)#username cisco password cisco
IT-Department_Switch(config)#service password-encryption

IT-Department_Switch(config)#crypto key generate rsa

```
IT-Department_Switch(config)#ip ssh version 2  
IT-Department_Switch(config)#line vty 0 15  
IT-Department_Switch(config-line)#transport input ssh  
IT-Department_Switch(config-line)#login local
```

Branch Campus

Branch Campus Staff Switch

```
Branch_Campus_Staff_Switch(config)#int vlan 90  
Branch_Campus_Staff_Switch(config-if)#ip address 192.168.9.254 255.255.255.0  
Branch_Campus_Staff_Switch(config-if)#exit  
Branch_Campus_Staff_Switch(config)#ip default-gateway 192.168.9.1  
  
Branch_Campus_Staff_Switch(config)#ip domain name Branch_Campus_Staff_Switch.com  
Branch_Campus_Staff_Switch(config)#enable password cisco  
Branch_Campus_Staff_Switch(config)#username cisco password cisco  
Branch_Campus_Staff_Switch(config)#service password-encryption  
  
Branch_Campus_Staff_Switch(config)#crypto key generate rsa  
Branch_Campus_Staff_Switch(config)#ip ssh version 2
```

```
Branch_Campus_Staff_Switch(config)#line vty 0 15  
Branch_Campus_Staff_Switch(config-line)#transport input ssh  
Branch_Campus_Staff_Switch(config-line)#login local
```

Branch Campus Student Lab Switch

```
Branch_Campus_Student_Lab_Switch(config)#int vlan 100  
Branch_Campus_Student_Lab_Switch(config-if)#ip address 192.168.10.254 255.255.255.0  
Branch_Campus_Student_Lab_Switch(config-if)#exit  
Branch_Campus_Student_Lab_Switch(config)#ip default-gateway 192.168.10.1  
  
Branch_Campus_Student_Lab_Switch(config)#ip domain name Branch_Campus_Student_Lab_Switch.com  
Branch_Campus_Student_Lab_Switch(config)#enable password cisco  
Branch_Campus_Student_Lab_Switch(config)#username cisco password cisco  
Branch_Campus_Student_Lab_Switch(config)#service password-encryption  
  
Branch_Campus_Student_Lab_Switch(config)#crypto key generate rsa  
Branch_Campus_Student_Lab_Switch(config)#ip ssh version 2  
  
Branch_Campus_Student_Lab_Switch(config)#line vty 0 15  
Branch_Campus_Student_Lab_Switch(config-line)#transport input ssh  
Branch_Campus_Student_Lab_Switch(config-line)#login local
```

9. Configuring RIPv2 as the routing protocol.

Main_Campus_Router

```
Main_Campus_Router(config)#  
Main_Campus_Router(config)#router rip  
Main_Campus_Router(config-router)#version 2  
Main_Campus_Router(config-router)#network 10.10.10.0  
Main_Campus_Router(config-router)#network 10.10.10.4  
Main_Campus_Router(config-router)#network 192.168.1.0  
Main_Campus_Router(config-router)#network 192.168.2.0  
Main_Campus_Router(config-router)#network 192.168.3.0  
Main_Campus_Router(config-router)#network 192.168.4.0  
Main_Campus_Router(config-router)#network 192.168.5.0  
Main_Campus_Router(config-router)#network 192.168.6.0  
Main_Campus_Router(config-router)#network 192.168.7.0  
Main_Campus_Router(config-router)#network 192.168.8.0
```

```
Main_Campus_Router(config-router)#exit
```

Branch_Campus_Router

```
Branch_Campus_Router(config)#router rip  
Branch_Campus_Router(config-router)#version 2  
Branch_Campus_Router(config-router)#network 192.168.9.0  
Branch_Campus_Router(config-router)#network 192.168.10.0  
Branch_Campus_Router(config-router)#network 10.10.10.0  
Branch_Campus_Router(config-router)#exit
```

10. Host Device Configurations.**11. Test and Verifying Network Communication.**