**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.

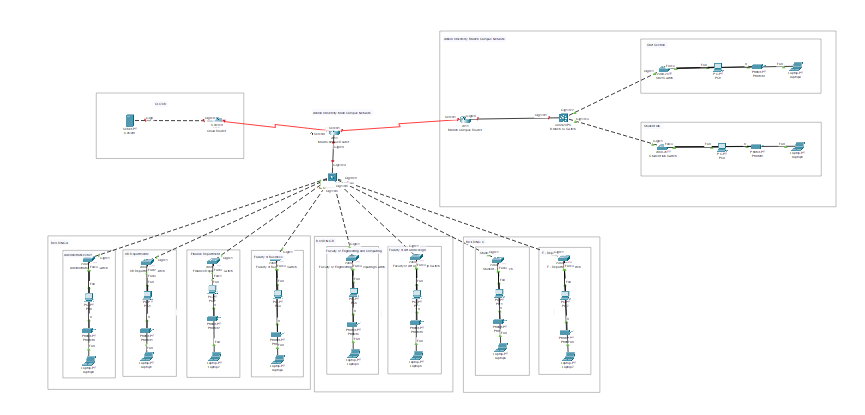
**Smaller campus:**

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.**



1. **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
2. **Connecting Networking devices with Correct cabling.**
   1. Copper Straight Through
   2. Copper Cross – Over
   3. Serial DCE
3. **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

1. **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

1. **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

1. **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 Bulding\_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

1. **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\_Computi(config-line)#transport input ssh

Faculty\_of\_Engineering\_and\_Computi(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

1. **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

1. **Host Device Configurations.**
2. **Test and Verifying Network Communication.**