Small Office Home Office/SOHO Network

Problem Statement

There is a small XYZ company that is in New York. Who is new planning to open their new branch on a new location. They are looking for new graduate to plan network of their new branch and to implement and look after. This is a great change for new graduates to start their career. The requirements of networks are given below:

1. You can only use only one switch and one router.
2. 3 departments (Admin, HR and Customer)
3. Create a vlan for each department.
4. Each department user also can use wifi.
5. Use DHCP service to provide IPv4 address to the users of each Department.
6. Each device must communicate with every other device.

The IP address that is given by the company is 192.168.100.0. Now you are a young engineer who must design and implement the network under these conditions.

Solution

First, perform the subnetting of the provided IP address to divide it so every department can have equal number to address. The cider of this network is 24, so the remaining bits that a host can use are 8. We add 2 more bits in network bits, by doing this we have 4 network that we can in our task. Each network now has 64 IP addresses and from these 64 IP address 62 IP addresses will be used by host devices. Below is the table which contains details of each network.

Network	Network Address	Usable IP Address	Broadcast Address	Subnet Mask
192.168.100.0-63	192.168.100.0	192.168.100.1-62	192.168.100.63	255.255.255.192
192.168.100.64-127	192.168.100.64	192.168.100.65-126	192.168.100.127	255.255.255.192
192.168.100.128-191	192.168.100.128	192.168.100.129-190	192.168.100.191	255.255.255.192

192.168.100.192-255	192.168.100.192	192.168.100.193-254	192.168.100.255	255.255.255.192

After doing all this next task is to connect and perform all configuration on router, switch, AP, and host devices. Take a 2960 series switch, 2911 series router, 3 pieces, 3 printers and 3 AP and connect them.

Configuration

Access the switch and create vlans for each department and name them according to their departments.

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/6, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/7, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/8, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/9, changed state to up


Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name admin
Switch(config-vlan)#vlan 20
Switch(config-vlan)#hr
                    ^
% Invalid input detected at '^' marker.

Switch(config-vlan)#name hr
Switch(config-vlan)#vlan 30
Switch(config-vlan)#name customer
Switch(config-vlan)#
```

Select interfaces, change their mode to access and add them to appropriate vlans.

```
Switch(config)#
Switch(config)#
Switch(config)#
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Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#int range fa0/1-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#int range fa0/4-6
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#int range fa0/7-9
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
Switch(config-if-range)#exit
Switch(config)#int fa0/10
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#
```

Select the interface that connected to the router and change its mode to trunk.

```
Switch(config)#
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Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#int fa0/10
Switch(config-if)#switchport mode trunk
Switch(config-if)#
```
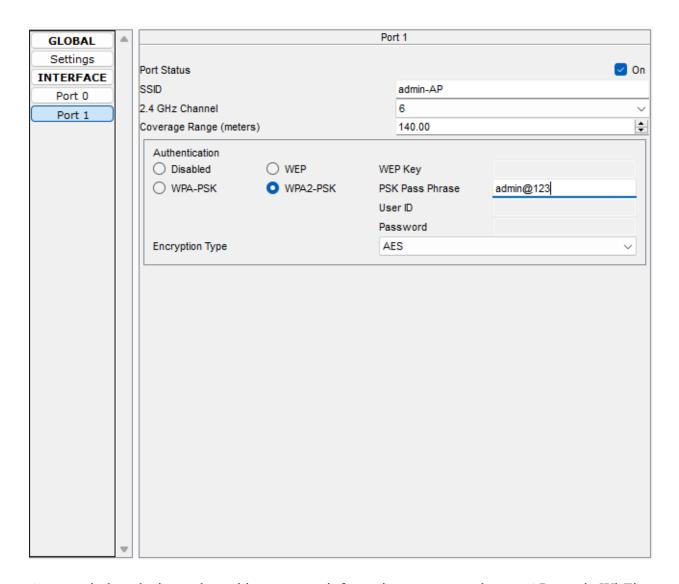
Now select the router and create sub-interfaces for each vlan and give them appropriate IP addresses to each sub-interface.

```
If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)


          --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no


Press RETURN to get started!



Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig0/0.10
Router(config-subif)#encapsulation dotlq 10
Router(config-subif)#ip add 192.168.100.1 255.255.255.192
Router(config-subif)#no shu
Router(config-subif)#int gig0/0.20
Router(config-subif)#encapsulation dotlq 20
Router(config-subif)#ip add 192.168.100.65 255.255.255.192
Router(config-subif)#no shu
Router(config-subif)#int gig0/0.30
Router(config-subif)#encapsulation dotlq 30
Router(config-subif)#ip add 192.168.100.129 255.255.255.192
Router(config-subif)#no shu
Router(config-subif)#exit
Router(config)#
```

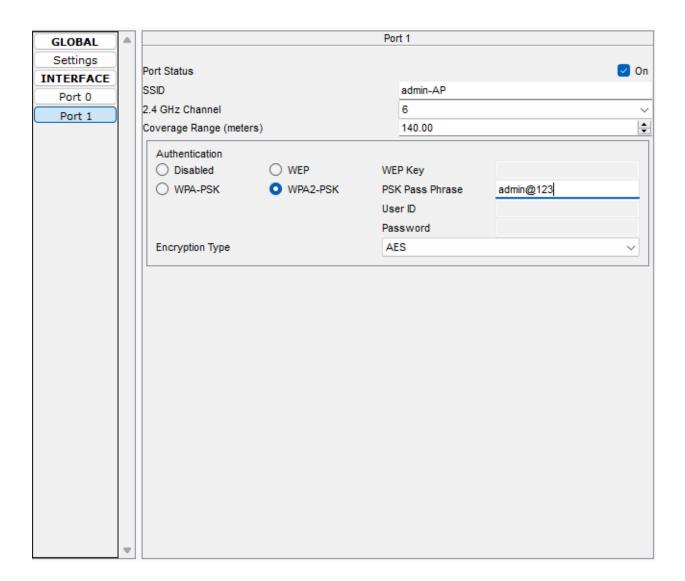Create a dhcp pool for each department.

```
Router(config)#
Router(config)#
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Router(config)#
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Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#ip dhcp po
Router(config)#ip dhcp pool admin
Router(dhcp-config)#ne
Router(dhcp-config)#network 192.168.100.0 255.255.255.192
Router(dhcp-config)#default-gateway 192.168.100.1
                               ^
% Invalid input detected at '^' marker.

Router(dhcp-config)#def
Router(dhcp-config)#default-router 192.168.100.1
Router(dhcp-config)#ip dhcp pool hr
Router(dhcp-config)#network 192.168.100.64 255.255.255.192
Router(dhcp-config)#default-router 192.168.100.65
Router(dhcp-config)#ip dhcp pool customer
Router(dhcp-config)#network 192.168.100.128 255.255.255.192
Router(dhcp-config)#default-router 192.168.100.129
Router(dhcp-config)#
Router(dhcp-config)#
```

Access the AP of each department and perform necessary configuration to provide Wi-Fi service.

	Port 1
GLOBAL	
Settings	Port Status ☑ On
INTERFACE	SSID admin-AP
Port 0	2.4 GHz Channel 6
Port 1	Coverage Range (meters) 140.00

Port 1

Port Status ☑ On

SSID   admin-AP

2.4 GHz Channel   6 ⌄

Coverage Range (meters)   140.00 ⬍

Authentication

○ Disabled   ○ WEP   WEP Key

○ WPA-PSK   ⦿ WPA2-PSK   PSK Pass Phrase   admin@123

User ID

Password

Encryption Type   AES ⌄

Access wireless device and provide necessary information to connect them to AP to gain Wi-Fi access.

	Port 1		
Port Status			☑ On
SSID		admin-AP	
2.4 GHz Channel		6	⌄
Coverage Range (meters)		140.00	⬍

Authentication

○ Disabled	○ WEP	WEP Key	
○ WPA-PSK	⦿ WPA2-PSK	PSK Pass Phrase	admin@123
		User ID	
		Password	
Encryption Type		AES	⌄

GLOBAL
Settings
INTERFACE
Port 0
Port 1

Show the DHCP service is running successfully.

| Physical | Config | Desktop | Programming | Attributes |

IP Configuration X

Interface   FastEthernet0   ⌄

IP Configuration

● DHCP   ○ Static   DHCP request successful.

IPv4 Address   192.168.100.2

Subnet Mask   255.255.255.192

Default Gateway   192.168.100.1

DNS Server   0.0.0.0

IPv6 Configuration

○ Automatic   ● Static

IPv6 Address   [   ] / [   ]

Link Local Address FE80::2D0:BAFF:FE00:86EE

Default Gateway   [   ]

DNS Server   [   ]

802.1X

☐ Use 802.1X Security

Authentication   MD5   ⌄

Username   [   ]

Password   [   ]

Shows devices can communicate with each other.

Command Prompt   X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.100.66

Pinging 192.168.100.66 with 32 bytes of data:

Request timed out.
Reply from 192.168.100.66: bytes=32 time<1ms TTL=127
Reply from 192.168.100.66: bytes=32 time<1ms TTL=127
Reply from 192.168.100.66: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.100.66:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Final network design.