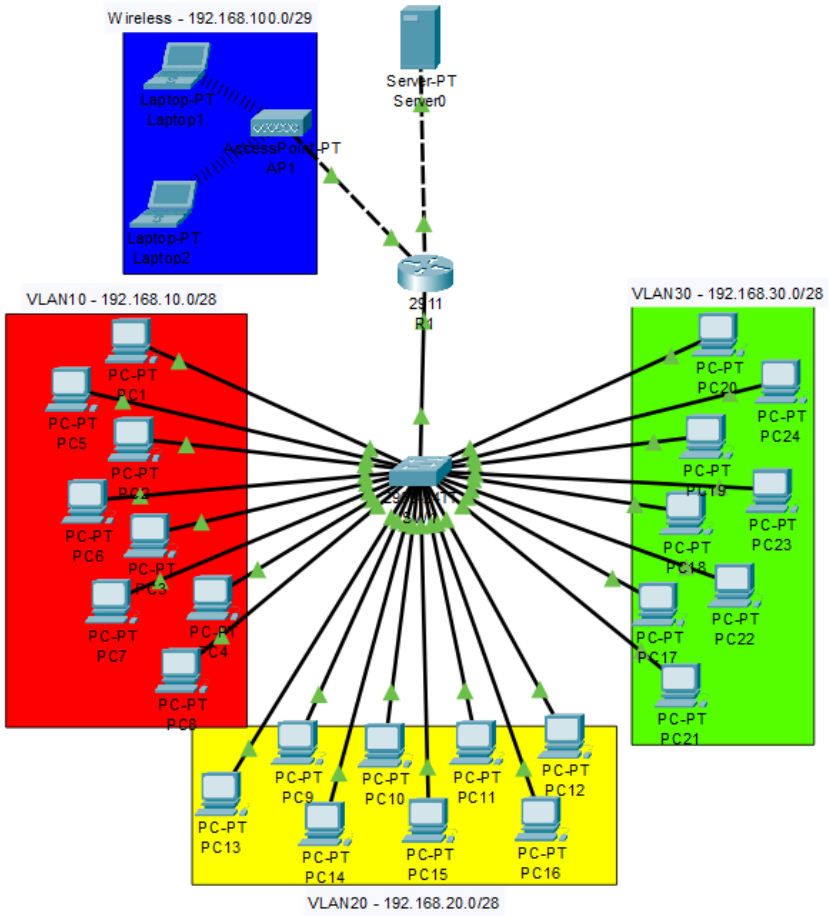
Simple Office Network Topology

This documentation describes the scenario of a small office network and how it has been implemented in Cisco Packet Tracer.

Topology Structure:

The network is segregated into 4 sections, those being 3 VLANs and a wireless LAN. Based on the Cisco Hierarchical Network Design Model the end hosts, the Layer 2 switch and the WAP are found at the Access Layer of the topology while the Distribution Layer consists of one single router due to this being a small size network.



Acess Layer Configurations:

- End devices

  For IP assignment I've used DHCP and configured subnets to save addressing space.

  1. Wireless segment:
     Uses a /29 subnet, allowing for 4 usable host IPs:
     192.168.100.0/29 – network address,
     192.168.100.1/29 – default gateway,
     192.168.100.7/29 – broadcast address,
     192.168.100.2-6/29 – available host addresses
  2. VLANs:
     1st VLAN uses a /28 subnet, allowing for a total of 14 usable IPs:
     192.168.10.0/28 – network address,
     192.168.10.1/28 – default gateway,
     192.168.10.17/28 – broadcast address,
     192.168.10.2-16/28 – available host addresses

     2nd VLAN uses a /28 subnet, allowing for a total of 14 usable IPs:
     192.168.20.0/28 – network address,
     192.168.20.1/28 – default gateway,
     192.168.20.17/28 – broadcast address,
     192.168.20.2-16/28 – available host addresses

     3rd VLAN uses a /28 subnet, allowing for a total of 14 usable IPs:
     192.168.20.0/28 – network address,
     192.168.20.1/28 – default gateway,
     192.168.20.17/28 – broadcast address,
     192.168.20.2-16/28 – available host addresses
  3. Server:
     Configured with a /30 subnet mask to connect directly to the router.
     192.168.101.0/30 – network address,
     192.168.101.1/30 – router's interface towards the server,
     192.168.101.2/30 – server's IP address,
     192.168.101.3/30 – broadcast address

  In order to configure end devices to start the IP addressing process via DHCP I used the following command: **ipconfig /release**; to

ensure pre-existing IP configurations were wiped clean and finally: **ipconfig /renew** to start dynamically assigning IP addresses.

- Layer 2 Switch Configurations:
  Activate and start configuring the device:
  enable
  configure terminal

  Rename the switch to SW1:
  hostname SW1

  Configure Fast Ethernet ports as access ports:
  interface range f0/1-24
  switchport mode access

  For each VLAN the configurations are as followed:
  VLAN10:
  vlan 10
  name IT
  interface range f0/1-8
  switchport access vlan 10

  VLAN20:
  vlan 20
  name HR
  interface range f0/9-16
  switchport access vlan 20

  VLAN30:
  vlan 30
  name SALES
  interface range f0/17-24
  switchport access vlan 30

  Trunk link:
  interface g0/1
  switchport mode trunk
  switchport trunk allowed vlan 10,20,30
- <!--STUB FOR ACCESS POINT-→

Distribution Layer Configurations:

- Router:

  Activate and start configuring the device:
  enable
  configure terminal

  Rename device:
  hostname R1

  Turn all interfaces on:
  interface range g0/0-2
  no shutdown

  In order for devices within separate VLANs to communicate with each other I decided to use ROAS (Router-On-The-Stick) and configure router sub-interfaces for each VLAN:
  VLAN 10:
  interface g0/0.10
  encapsulation type dot1Q 10
  ip address 192.168.10.1 255.255.255.240

  VLAN 20:
  interface g0/0.20
  encapsulation type dot1Q 20
  ip address 192.168.20.1 255.255.255.240

  VLAN 30:
  interface g0/0.30
  encapsulation type dot1Q 30
  ip address 192.168.30.1 255.255.255.240

  Configure router interface towards the wireless segment:
  interface g0/1
  ip address 192.168.100.1 255.255.255.248

  Configure router interface towards the server:
  interface g0/2
  ip address 192.168.101.1 255.255.255.252

  Configure DHCP pools for each network segment:
  ip dhcp pool IT
  network 192.168.10.0 255.255.255.240

default-router 192.168.10.1
dns-server 8.8.8.8

ip dhcp pool HR
network 192.168.20.0 255.255.255.240
default-router 192.168.20.1
dns-server 8.8.8.8

ip dhcp pool SALES
network 192.168.30. 255.255.255.240
default-router 192.168.30.1
dns-server 8.8.8.8

Minimal Security features:

In order to offer some security features I decided to add ACL configurations on the router so that devices from the wireless segment can only access the server.

Allow traffic towards the server:
access-list 100 permit ip 192.168.100.0 0.0.0.7 host 192.168.101.2

Block traffic towards the VLANs:
access-list 100 deny ip 192.168.100.0 0.0.0.7 192.168.10.0 0.0.0.15
access-list 100 deny ip 192.168.100.0 0.0.0.7 192.168.20.0 0.0.0.15
access-list 100 deny ip 192.168.100.0 0.0.0.7 192.168.30.0 0.0.0.15

Allow ICMP connectivity test between devices in the wireless segment, their default gateway and the interface facing the server.
access-list 100 permit icmp 192.168.100.0 0.0.0.7 host 192.168.100.1
access-list 100 permit icmp 192.168.100.0 0.0.0.7 host 192.168.101.1

Connectivity tests:

```
C:\>ping 192.168.100.2

Pinging 192.168.100.2 with 32 bytes of data:

Reply from 192.168.100.2: bytes=32 time=70ms TTL=128

Ping statistics for 192.168.100.2:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 70ms, Maximum = 70ms, Average = 70ms

Control-C
^C
C:\>ping 192.168.101.1

Pinging 192.168.101.1 with 32 bytes of data:

Reply from 192.168.101.1: bytes=32 time=51ms TTL=255

Ping statistics for 192.168.101.1:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 51ms, Maximum = 51ms, Average = 51ms

Control-C
^C
C:\>ping 192.168.101.2

Pinging 192.168.101.2 with 32 bytes of data:

Reply from 192.168.101.2: bytes=32 time=38ms TTL=127

Ping statistics for 192.168.101.2:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 38ms, Maximum = 38ms, Average = 38ms

Control-C
^C
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.100.1: Destination host unreachable.

Ping statistics for 192.168.10.1:
    Packets: Sent = 1, Received = 0, Lost = 1 (100% loss),

Control-C
^C
```

Figure 1: Checking connectivity between devices

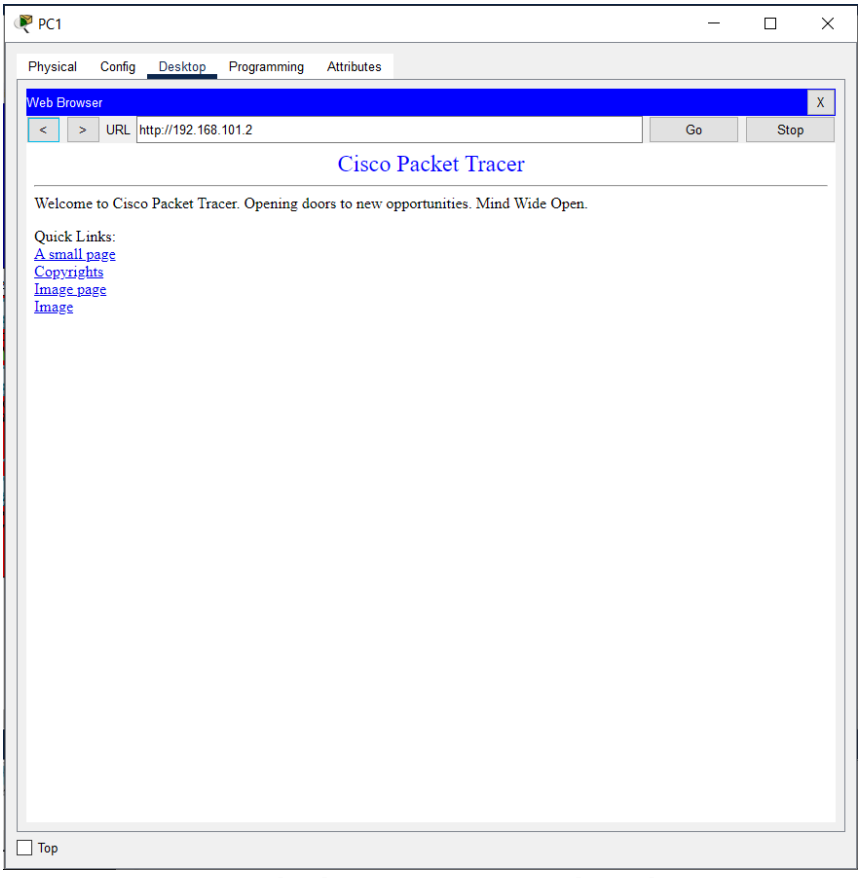


Figure 2: Checking connection to the web page