

НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО

Факультет Программной Инженерии и Компьютерной Техники

Компьютерные сети

Лабораторная работа № 5

“Разработка схемы административной виртуальной сети для бизнес-центра”

Выполнил

студент

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Группа № Р33701

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2022

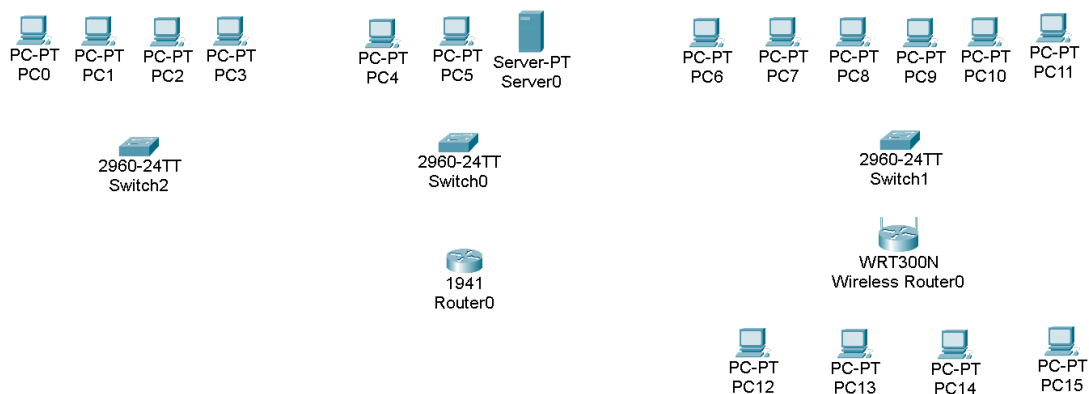
**Цель работы:** изучить принципы разработки виртуальных сетей в Cisco Packet Tracer.

**Программа работы:**

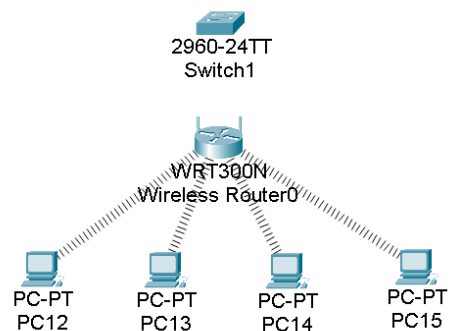
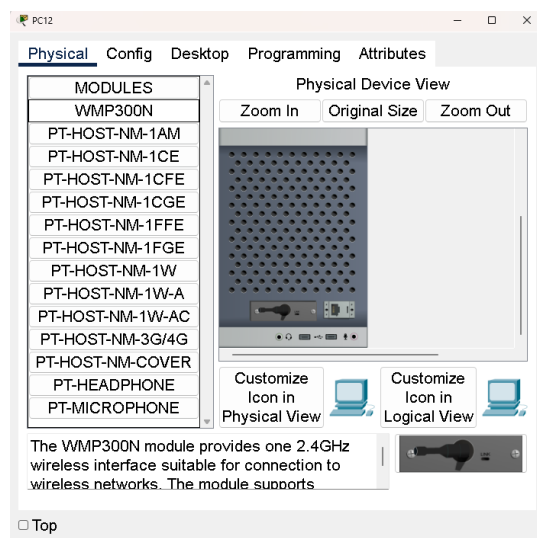
1. Добавление оборудования в сеть
2. Установка wi-fi модуля в ПК
3. Настройка ПК 1-го и 2-го отдела
4. Настройка 3-го отдела
5. Настройка роутера
6. Подключение кабелей и соединение отделов
7. Настройка сервера
8. Настройка SSH
9. Настройка защиты портов на каждом коммутаторе

**Отчёт:**

**Оборудование в сети:**

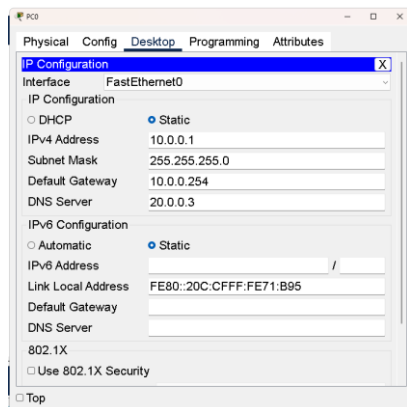


**Установим wi-fi модуль:**

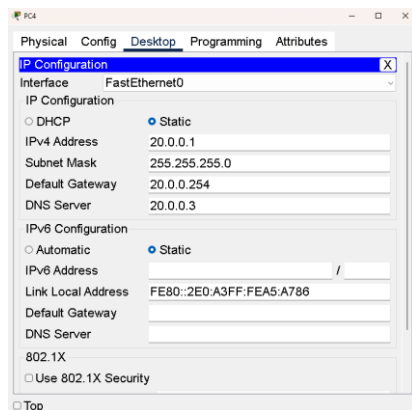


Настроим ПК 1-2 отдела и сервера

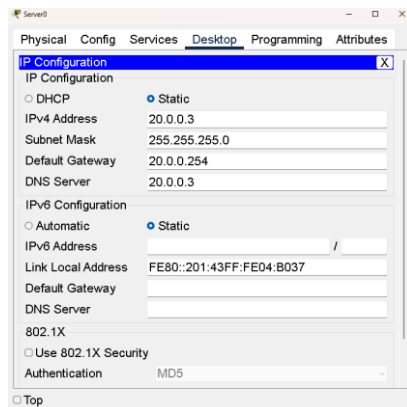
- ПК 1-го отдела



- ПК 2-го отдела



- Сервер



Настроим 3-ий отдел

PC6

Physical Config **Desktop** Programming Attributes

**IP Configuration** X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 30.0.0.101

Subnet Mask 255.255.255.0

Default Gateway 30.0.0.254

DNS Server 20.0.0.3

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::260:70FF:FEED:98E3

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

☐ Top

## Настраиваем роутер:

Wireless Router0

Physical Config **GUI** Attributes

**Internet Setup**

Internet Connection type Automatic Configuration - DHCP

Optional Settings (required by some internet service providers)

Host Name:

Domain Name:

MTU: Size: 1500

**Network Setup**

Router IP

IP Address: 30 . 0 . 0 . 253

Subnet Mask: 255.255.255.0

DHCP Server Settings

DHCP Server: ☒ Enabled ☐ Disabled

Start IP Address: 30.0.0.1

Maximum number of Users: 20

IP Address Range: 30.0.0.1 - 20

Client Lease Time: 0 minutes (0 means one day)

Static DNS 1: 20 . 0 . 0 . 3

Static DNS 2: 0 . 0 . 0 . 0

Static DNS 3: 0 . 0 . 0 . 0

WINS: 0 . 0 . 0 . 0

Wireless Router0

Physical Config **GUI** Attributes

Wireless-N Broadband Router

**Wireless** Setup Wireless Security Access Restrictions Applications & Gaming Wireless-N Broadband Router Admin

**Basic Wireless Settings**

Network Mode: Mixed

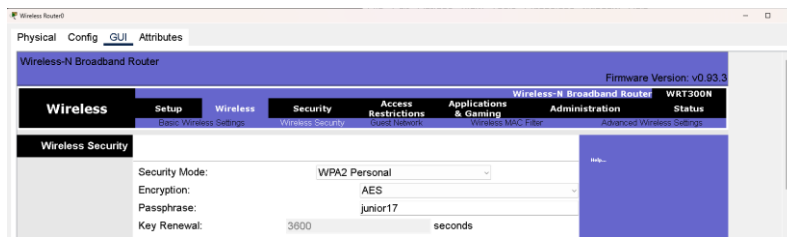
Network Name (SSID): Cisco2107

Radio Band: Auto

Wide Channel: Auto

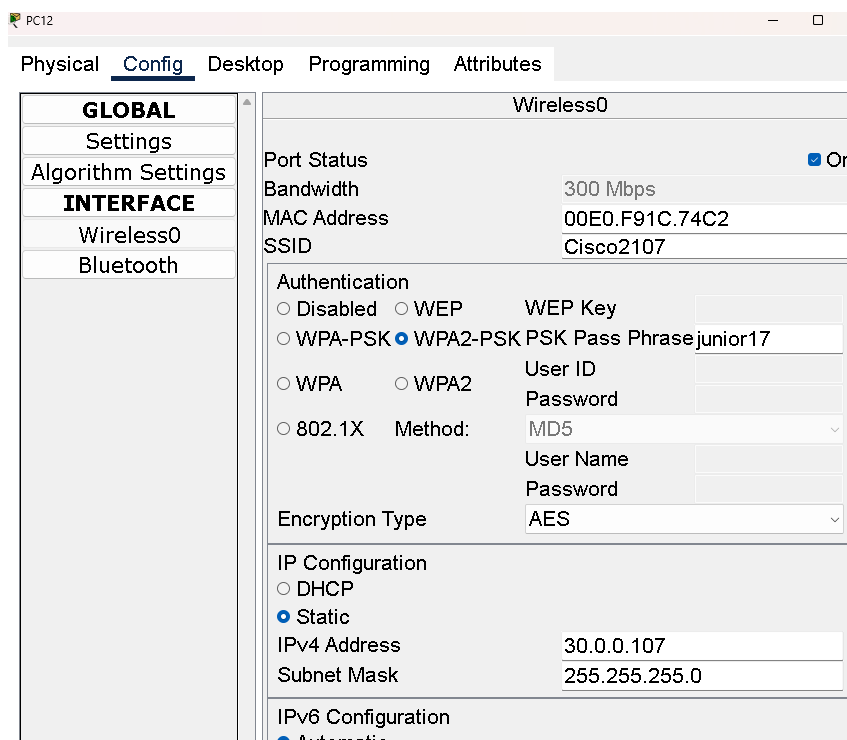
Standard Channel: 1 - 2.412GHz

SSID Broadcast: ☐ Enabled ☒ Disabled



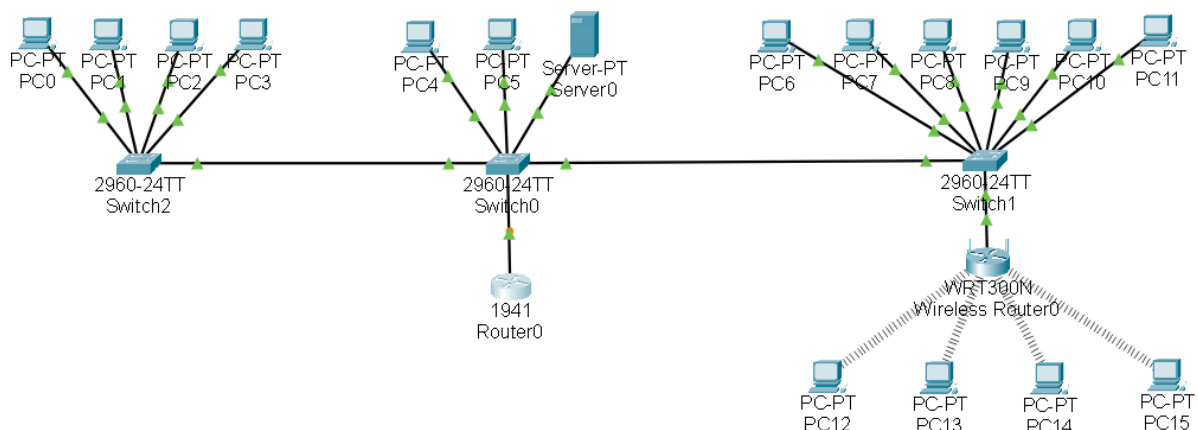
Далее нам нужно настроить ПК

Пример настройки одного из ПК (PC 12):



4. Подключаем кабели

Наша топология сети приобретает вид:



## Настройка VLAN на коммутаторах:

### - Первый отдел:

```
Switch#en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Office1
Switch(config-vlan)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

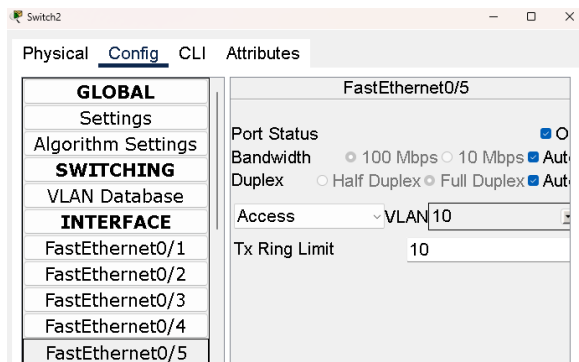
### - Второй отдел:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Office1
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Office2
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Office 3
Switch(config-vlan)#name Office3
Switch(config-vlan)#exit
Switch(config)#end
```

### - Третий отдел:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 30
Switch(config-vlan)#name Office3
Switch(config-vlan)#end
Switch#
```

## Выставляем порты для каждого коммутатора по соответствию с VLAN:

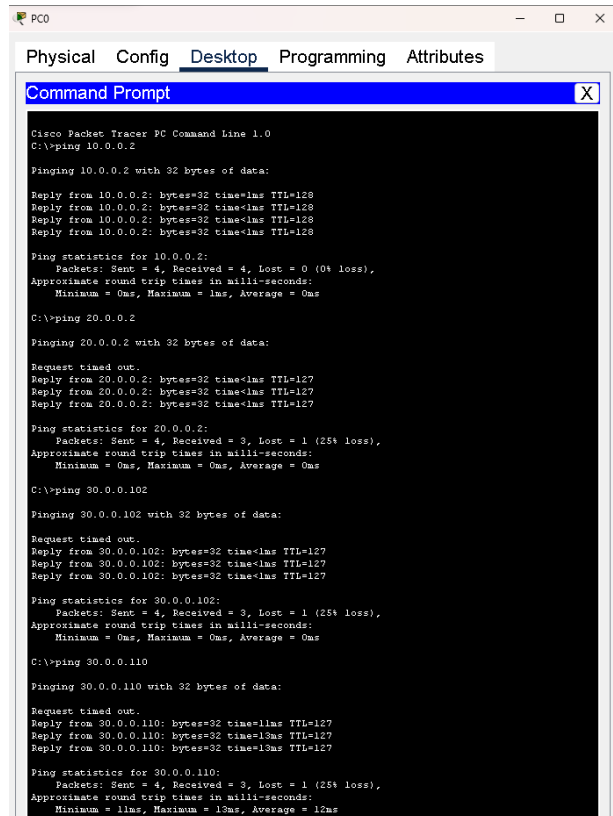


## Подключаем виртуальный интерфейс для работы с VLAN:

```
Router#en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int gig 0/0.10
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 10.0.0.254 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig 0/0.20
Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 20.0.0.254 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig 0/0.30
Router(config-subif)#encapsulation dot1Q 30
Router(config-subif)#ip address 30.0.0.254 255.255.255.0
Router(config-subif)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

## 6. Протестируем сеть командой ping:

### - Первый отдел:



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.2: bytes=32 time=1ms TTL=127
Reply from 20.0.0.2: bytes=32 time=1ms TTL=127
Reply from 20.0.0.2: bytes=32 time=1ms TTL=127

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 30.0.0.102

Pinging 30.0.0.102 with 32 bytes of data:

Request timed out.
Reply from 30.0.0.102: bytes=32 time=1ms TTL=127
Reply from 30.0.0.102: bytes=32 time=1ms TTL=127
Reply from 30.0.0.102: bytes=32 time=1ms TTL=127

Ping statistics for 30.0.0.102:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

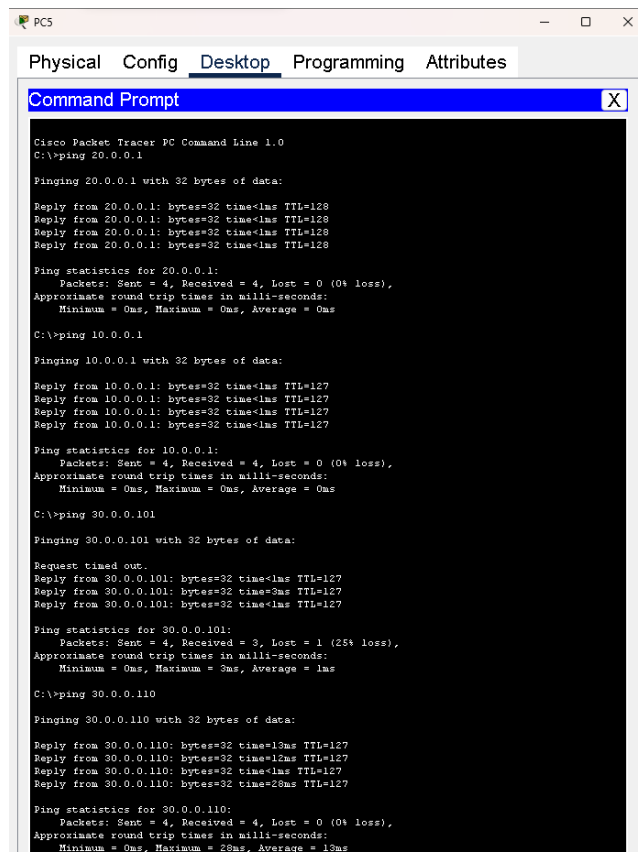
C:\>ping 30.0.0.110

Pinging 30.0.0.110 with 32 bytes of data:

Request timed out.
Reply from 30.0.0.110: bytes=32 time=1ms TTL=127
Reply from 30.0.0.110: bytes=32 time=13ms TTL=127
Reply from 30.0.0.110: bytes=32 time=13ms TTL=127

Ping statistics for 30.0.0.110:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 13ms, Average = 12ms
```

### - Второй отдел:



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Reply from 20.0.0.1: bytes=32 time=1ms TTL=128
Reply from 20.0.0.1: bytes=32 time=1ms TTL=128
Reply from 20.0.0.1: bytes=32 time=1ms TTL=128
Reply from 20.0.0.1: bytes=32 time=1ms TTL=128

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=1ms TTL=127
Reply from 10.0.0.1: bytes=32 time=1ms TTL=127
Reply from 10.0.0.1: bytes=32 time=1ms TTL=127
Reply from 10.0.0.1: bytes=32 time=1ms TTL=127

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 30.0.0.101

Pinging 30.0.0.101 with 32 bytes of data:

Request timed out.
Reply from 30.0.0.101: bytes=32 time=1ms TTL=127
Reply from 30.0.0.101: bytes=32 time=3ms TTL=127
Reply from 30.0.0.101: bytes=32 time=1ms TTL=127

Ping statistics for 30.0.0.101:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms

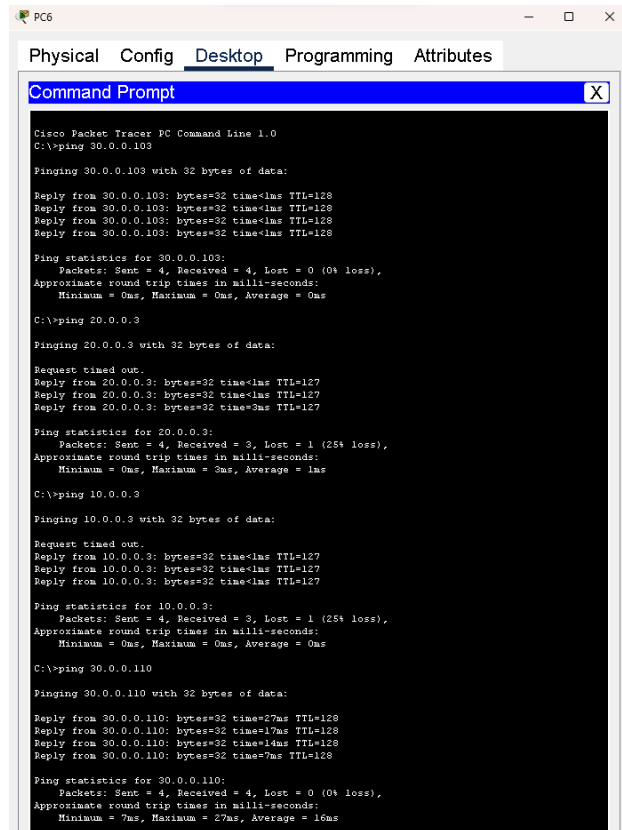
C:\>ping 30.0.0.110

Pinging 30.0.0.110 with 32 bytes of data:

Reply from 30.0.0.110: bytes=32 time=13ms TTL=127
Reply from 30.0.0.110: bytes=32 time=13ms TTL=127
Reply from 30.0.0.110: bytes=32 time=1ms TTL=127
Reply from 30.0.0.110: bytes=32 time=20ms TTL=127

Ping statistics for 30.0.0.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 20ms, Average = 13ms
```

## Третий отдел (кабель):



```
PC6
Physical Config Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 30.0.0.103

Pinging 30.0.0.103 with 32 bytes of data:

Reply from 30.0.0.103: bytes=32 time<1ms TTL=128
Reply from 30.0.0.103: bytes=32 time<1ms TTL=128
Reply from 30.0.0.103: bytes=32 time<1ms TTL=128
Reply from 30.0.0.103: bytes=32 time<1ms TTL=128

Ping statistics for 30.0.0.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 20.0.0.3

Pinging 20.0.0.3 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.3: bytes=32 time<1ms TTL=127
Reply from 20.0.0.3: bytes=32 time<1ms TTL=127
Reply from 20.0.0.3: bytes=32 time<3ms TTL=127

Ping statistics for 20.0.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms

C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.3: bytes=32 time<1ms TTL=127
Reply from 10.0.0.3: bytes=32 time<1ms TTL=127
Reply from 10.0.0.3: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

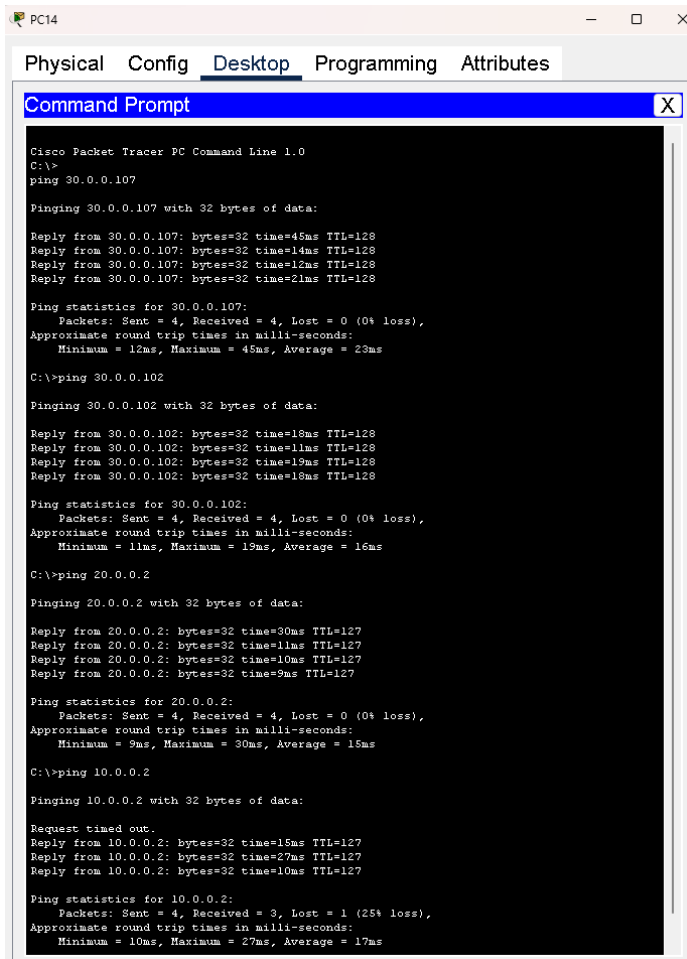
C:\>ping 30.0.0.110

Pinging 30.0.0.110 with 32 bytes of data:

Reply from 30.0.0.110: bytes=32 time=27ms TTL=128
Reply from 30.0.0.110: bytes=32 time=17ms TTL=128
Reply from 30.0.0.110: bytes=32 time=14ms TTL=128
Reply from 30.0.0.110: bytes=32 time=7ms TTL=128

Ping statistics for 30.0.0.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 27ms, Average = 16ms
```

## Третий отдел (Wi-Fi):



```
PC14
Physical Config Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 30.0.0.107

Pinging 30.0.0.107 with 32 bytes of data:

Reply from 30.0.0.107: bytes=32 time=45ms TTL=128
Reply from 30.0.0.107: bytes=32 time=14ms TTL=128
Reply from 30.0.0.107: bytes=32 time=12ms TTL=128
Reply from 30.0.0.107: bytes=32 time=21ms TTL=128

Ping statistics for 30.0.0.107:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 45ms, Average = 23ms

C:\>ping 30.0.0.102

Pinging 30.0.0.102 with 32 bytes of data:

Reply from 30.0.0.102: bytes=32 time=18ms TTL=128
Reply from 30.0.0.102: bytes=32 time=11ms TTL=128
Reply from 30.0.0.102: bytes=32 time=19ms TTL=128
Reply from 30.0.0.102: bytes=32 time=18ms TTL=128

Ping statistics for 30.0.0.102:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 19ms, Average = 16ms

C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32 time=30ms TTL=127
Reply from 20.0.0.2: bytes=32 time=11ms TTL=127
Reply from 20.0.0.2: bytes=32 time=10ms TTL=127
Reply from 20.0.0.2: bytes=32 time=9ms TTL=127

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 30ms, Average = 15ms

C:\>ping 10.0.0.2

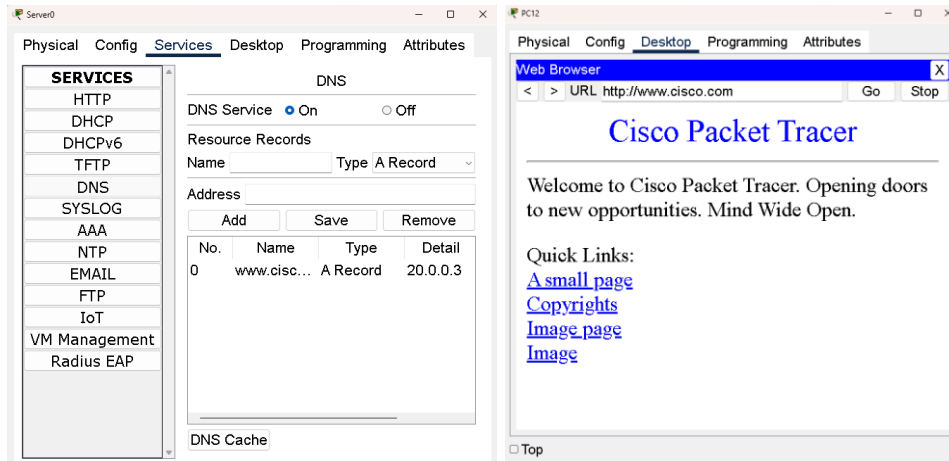
Pinging 10.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.2: bytes=32 time=18ms TTL=127
Reply from 10.0.0.2: bytes=32 time=27ms TTL=127
Reply from 10.0.0.2: bytes=32 time=10ms TTL=127

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 27ms, Average = 17ms
```



## 7. Настройка DNS сервера:



## 8. Настройка SSH на маршрутизаторе:

```
~#
R#en
R#clock set 23:10:00 9 Apr 2022
R#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R(config)#hostname R
R(config)#ip domain name ssh.dom
R(config)#crypto key generate rsa
% You already have RSA keys defined named R.ssh.dom .
% Do you really want to replace them? [yes/no]: yes
The name for the keys will be: R.ssh.dom
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable... [OK]

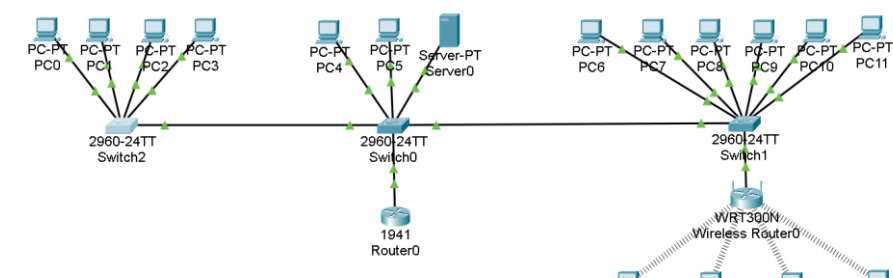
R(config)#service password-encryption
*Apr 9 23:10:42.192: %SSH-5-ENABLED: SSH 1.99 has been enabled
R(config)#username Valery privilege 15 password 8 junior17
R(config)#aaa new-model
R(config)#line vty 0 4
R(config-line)#transport input ssh
R(config-line)#logging synchronous
R(config-line)#exec-timeout 60 0
R(config-line)#exit
R(config)#exit
R#
%STS-5-CONFIG_I: Configured from console by console

R#copy running-config startup-config
Destination filename [startup-config]? startup-config
Building configuration...
[OK]
R#
```

## Настройка защиты портов на коммутаторах:



## Результат работы:



**Вывод:** в ходе лабораторной работы я научилась создавать администрируемую виртуальную сеть в программе Cisco Packet Tracer, настраивать в ней работу с Wi-Fi, роутер, SSH. Также я научилась работать с различными возможностями VLAN.