

Лабораторная работа №16

Администрирование локальных сетей

Мишина А. А.

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- Мишина Анастасия Алексеевна
- НПИбд-02-22
- <https://github.com/nasmi32>

- Получить навыки настройки VPN-туннеля через незащищённое Интернет-соединение.

1. Разместить в рабочей области проекта в соответствии с модельными предположениями оборудование для сети Университета г. Пиза.
2. В физической рабочей области проекта создать город Пиза, здание Университета г. Пиза. Переместить туда соответствующее оборудование.
3. Сделать первоначальную настройку и настройку интерфейсов оборудования сети Университета г. Пиза.
4. Настроить VPN на основе протокола GRE.
5. Проверить доступность узлов сети Университета г. Пиза с ноутбука администратора сети «Донская».

Выполнение лабораторной работы

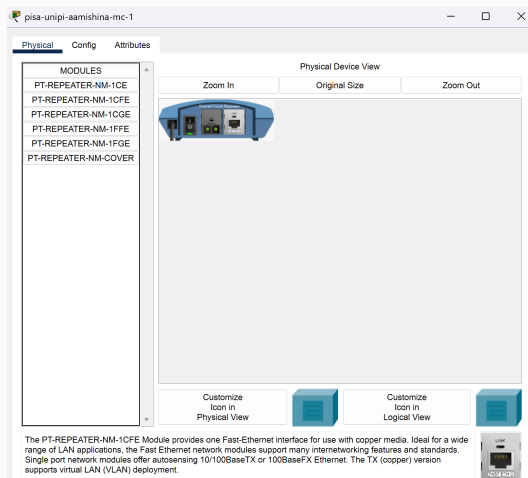


Рис. 1: Медиаконвертер с модулями PT-REPEATER-NM-1FFE и PT-REPEATER-NM-1CFE

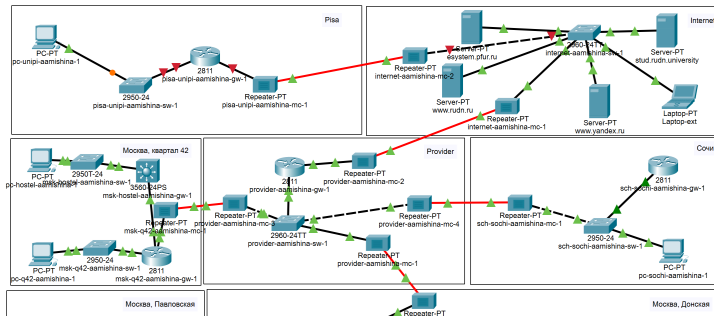


Рис. 2: Схема сети с дополнительными площадками

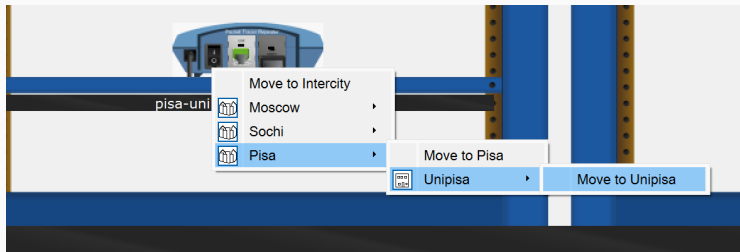


Рис. 3: Перемещение оборудования в г. Пиза

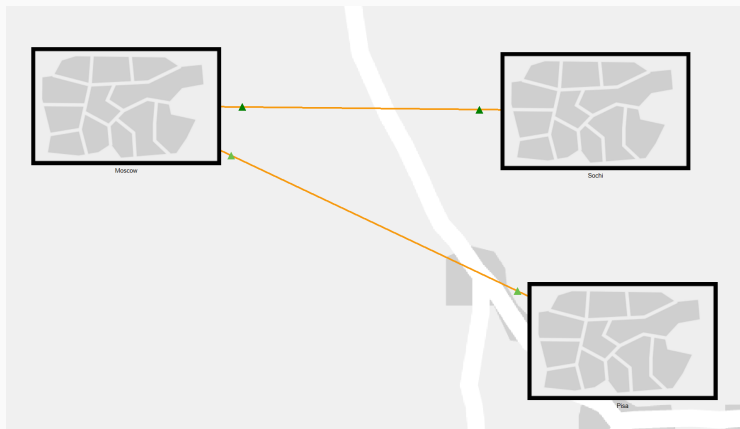


Рис. 4: Добавление г. Пиза

```
pisa-unipi-aamishina-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
pisa-unipi-aamishina-gw-1(config)#line vty 0 4
pisa-unipi-aamishina-gw-1(config-line)#password cisco
pisa-unipi-aamishina-gw-1(config-line)#login
pisa-unipi-aamishina-gw-1(config-line)#exit
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#line console 0
pisa-unipi-aamishina-gw-1(config-line)#password cisco
pisa-unipi-aamishina-gw-1(config-line)#login
pisa-unipi-aamishina-gw-1(config-line)#exit
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#enable secret cisco
pisa-unipi-aamishina-gw-1(config)#service password-encryption
pisa-unipi-aamishina-gw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#ip domain-name unipi.edu
pisa-unipi-aamishina-gw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-aamishina-gw-1.unipi.edu
Choose the size of the key modulus in the range of 360 to 4096 for your
  General Purpose Keys. Choosing a key modulus greater than 512 may take
  a few minutes.

How many bits in the modulus [512]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]

pisa-unipi-aamishina-gw-1(config)#line vty 0 4
*Mar 1 0:21:18.662: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-aamishina-gw-1(config-line)#transport input ssh
pisa-unipi-aamishina-gw-1(config-line)#
```

Рис. 5: Первоначальная настройка маршрутизатора pisa-unipi-gw-1

Первоначальная настройка

```
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#line vty 0 4
pisa-unipi-aamishina-sw-1(config-line)#password cisco
pisa-unipi-aamishina-sw-1(config-line)#login
pisa-unipi-aamishina-sw-1(config-line)#exit
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#line console 0
pisa-unipi-aamishina-sw-1(config-line)#password cisco
pisa-unipi-aamishina-sw-1(config-line)#login
pisa-unipi-aamishina-sw-1(config-line)#exit
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#enable secret cisco
pisa-unipi-aamishina-sw-1(config)#service password-encryption
pisa-unipi-aamishina-sw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#ip domain-name unipi.edu
pisa-unipi-aamishina-sw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-aamishina-sw-1.unipi.edu
Choose the size of the key modulus in the range of 360 to 4096 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]

pisa-unipi-aamishina-sw-1(config)#line vty 0 4
*Mar 1 0:22:44.755: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-aamishina-sw-1(config-line)#transport input ssh
pisa-unipi-aamishina-sw-1(config-line)#
```

Рис. 6: Первоначальная настройка коммутатора pisa-unipi-sw-1

```
-----
pisa-unipi-aamishina-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-aamishina-gw-1(config)#int f0/0
pisa-unipi-aamishina-gw-1(config-if)#no shutdown

pisa-unipi-aamishina-gw-1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

pisa-unipi-aamishina-gw-1(config-if)#exit
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#int f0/0.401
pisa-unipi-aamishina-gw-1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.401, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.401, changed state to up

pisa-unipi-aamishina-gw-1(config-subif)#encapsulation dot1Q 401
pisa-unipi-aamishina-gw-1(config-subif)#ip address 10.131.0.1 255.255.255.0
pisa-unipi-aamishina-gw-1(config-subif)#description unipi-main
pisa-unipi-aamishina-gw-1(config-subif)#exit
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#int f0/1
pisa-unipi-aamishina-gw-1(config-if)#no shutdown

pisa-unipi-aamishina-gw-1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

pisa-unipi-aamishina-gw-1(config-if)#ip address 192.0.2.20 255.255.255.0
pisa-unipi-aamishina-gw-1(config-if)#description internet
pisa-unipi-aamishina-gw-1(config-if)#exit
pisa-unipi-aamishina-gw-1(config)#ip route 0.0.0.0 0.0.0.0 192.0.2.1
pisa-unipi-aamishina-gw-1(config)#
```

Рис. 7: Настройка интерфейсов маршрутизатора pisa-unipi-gw-1

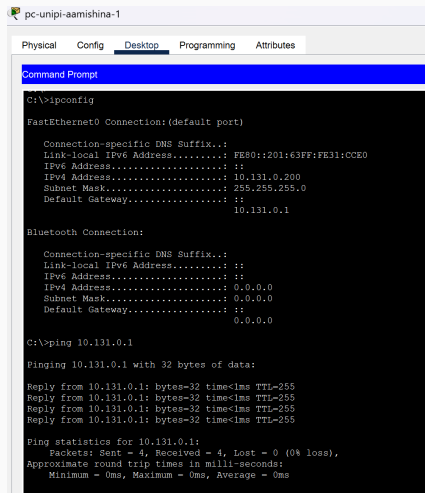
```
pisa-unipi-aamishina-sw-1#
pisa-unipi-aamishina-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-aamishina-sw-1(config)#int f0/24
pisa-unipi-aamishina-sw-1(config-if)#switchport mode trunk
pisa-unipi-aamishina-sw-1(config-if)#exit
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#int f0/1
pisa-unipi-aamishina-sw-1(config-if)#switchport mode access
pisa-unipi-aamishina-sw-1(config-if)#switchport access vlan 401
% Access VLAN does not exist. Creating vlan 401
pisa-unipi-aamishina-sw-1(config-if)#exit
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#vlan 401
pisa-unipi-aamishina-sw-1(config-vlan)#name unipi-main
pisa-unipi-aamishina-sw-1(config-vlan)#exit
pisa-unipi-aamishina-sw-1(config)#
pisa-unipi-aamishina-sw-1(config)#interface vlan401
pisa-unipi-aamishina-sw-1(config-if)#
%LINK-5-CHANGED: Interface Vlan401, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan401, changed state to up

pisa-unipi-aamishina-sw-1(config-if)#no shutdown
pisa-unipi-aamishina-sw-1(config-if)#exit
pisa-unipi-aamishina-sw-1(config)#^Z
pisa-unipi-aamishina-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

pisa-unipi-aamishina-sw-1#wr m
Building configuration...
[OK]
pisa-unipi-aamishina-sw-1#
```

Рис. 8: Настройка интерфейсов коммутатора pisa-unipi-sw-1



The screenshot shows a Windows Command Prompt window titled "pc-unipi-aamishina-1". The window has tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes", with "Desktop" currently selected. The command prompt displays the output of the following commands:

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address...: FE80::201:63FF:FE31:CCE0
    IPv6 Address...: ::
    IPv4 Address...: 10.131.0.200
    Subnet Mask...: 255.255.255.0
    Default Gateway...: ::
                        10.131.0.1

Bluetooth Connection:

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address...: ::
    IPv6 Address...: ::
    IPv4 Address...: 0.0.0.0
    Subnet Mask...: 0.0.0.0
    Default Gateway...: ::
                        0.0.0.0

C:\>ping 10.131.0.1

Pinging 10.131.0.1 with 32 bytes of data:

Reply from 10.131.0.1: bytes=32 time<1ms TTL=255
Reply from 10.131.0.1: bytes=32 time<1ms TTL=255
Reply from 10.131.0.1: bytes=32 time<1ms TTL=255
Reply from 10.131.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.131.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Рис. 9: Проверка работоспособности соединения

Настройка VPN на основе GRE

```
msk-donskaya-aamishina-gw-1>en
Password:
msk-donskaya-aamishina-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-aamishina-gw-1(config)#interface Tunnel0

msk-donskaya-aamishina-gw-1(config-if)#
%LINK-5-CHANGED: Interface Tunnel0, changed state to up

msk-donskaya-aamishina-gw-1(config-if)#ip address 10.128.255.253 255.255.255.252
msk-donskaya-aamishina-gw-1(config-if)#tunnel source f0/1.4
msk-donskaya-aamishina-gw-1(config-if)#tunnel destination 192.0.2.20
msk-donskaya-aamishina-gw-1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel0, changed state to up

msk-donskaya-aamishina-gw-1(config-if)#exit
msk-donskaya-aamishina-gw-1(config)#
msk-donskaya-aamishina-gw-1(config)#interface loopback0

msk-donskaya-aamishina-gw-1(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

msk-donskaya-aamishina-gw-1(config-if)#ip address 10.128.254.1 255.255.255.255
msk-donskaya-aamishina-gw-1(config-if)#exit
msk-donskaya-aamishina-gw-1(config)#
msk-donskaya-aamishina-gw-1(config)#ip route 10.128.254.5 255.255.255.255 10.128.255.254
msk-donskaya-aamishina-gw-1(config)#^Z
msk-donskaya-aamishina-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-aamishina-gw-1#wr m
Building configuration...
[OK]
msk-donskaya-aamishina-gw-1#
```

Рис. 10: Настройка маршрутизатора msk-donskaya-gw-1

Настройка VPN на основе GRE

```
pisa-unipi-aamishina-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-aamishina-gw-1(config)#interface Tunnel0

pisa-unipi-aamishina-gw-1(config-if)#
%LINK-5-CHANGED: Interface Tunnel0, changed state to up

pisa-unipi-aamishina-gw-1(config-if)#ip address 10.128.255.254 255.255.255.252
pisa-unipi-aamishina-gw-1(config-if)#tunnel source f0/1
pisa-unipi-aamishina-gw-1(config-if)#tunnel destination 198.51.100.2
pisa-unipi-aamishina-gw-1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel0, changed state to up

pisa-unipi-aamishina-gw-1(config-if)#exit
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#interface loopback0

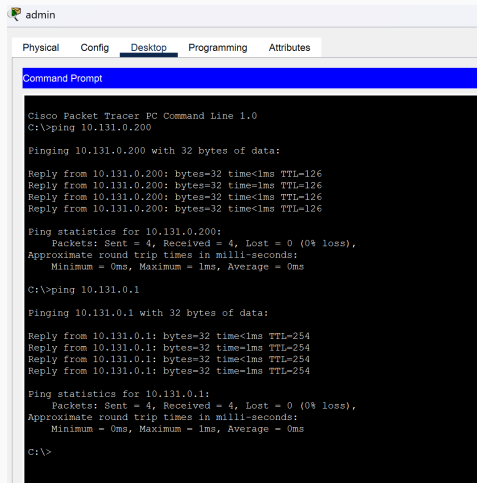
pisa-unipi-aamishina-gw-1(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

pisa-unipi-aamishina-gw-1(config-if)#ip address 10.128.254.5 255.255.255.255
pisa-unipi-aamishina-gw-1(config-if)#exit
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#ip route 10.128.254.1 255.255.255.255 10.128.255.253
pisa-unipi-aamishina-gw-1(config)#
pisa-unipi-aamishina-gw-1(config)#router ospf 1
pisa-unipi-aamishina-gw-1(config-router)#router-id 10.128.254.5
pisa-unipi-aamishina-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
pisa-unipi-aamishina-gw-1(config-router)#exit
pisa-unipi-aamishina-gw-1(config)#^Z
pisa-unipi-aamishina-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

pisa-unipi-aamishina-gw-1#wr m
Building configuration...
[OK]
pisa-unipi-aamishina-gw-1#
```

Рис. 11: Настройка маршрутизатора pisa-unipi-gw-1



The screenshot shows a Cisco Packet Tracer interface with a 'Command Prompt' window open. The window has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes', with 'Desktop' selected. The Command Prompt displays the output of two ping commands. The first command is 'ping 10.131.0.200', which shows four successful replies with 32 bytes of data, a time of less than 1ms, and a TTL of 126. The second command is 'ping 10.131.0.1', which also shows four successful replies with 32 bytes of data, a time of less than 1ms, and a TTL of 254. Both tests show 0% loss and an average round trip time of 0ms.

```
admin
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.131.0.200

Pinging 10.131.0.200 with 32 bytes of data:

Reply from 10.131.0.200: bytes=32 time<1ms TTL=126
Reply from 10.131.0.200: bytes=32 time<1ms TTL=126
Reply from 10.131.0.200: bytes=32 time<1ms TTL=126
Reply from 10.131.0.200: bytes=32 time<1ms TTL=126

Ping statistics for 10.131.0.200:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 10.131.0.1

Pinging 10.131.0.1 with 32 bytes of data:

Reply from 10.131.0.1: bytes=32 time<1ms TTL=254
Reply from 10.131.0.1: bytes=32 time<1ms TTL=254
Reply from 10.131.0.1: bytes=32 time<1ms TTL=254
Reply from 10.131.0.1: bytes=32 time<1ms TTL=254

Ping statistics for 10.131.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Рис. 12: Проверка доступности соединения

- В результате выполнения данной лабораторной работы я получила навыки настройки VPN-туннеля через незащищённое Интернет-соединение.