

# Лабораторная работа № 16

## Настройка VPN

---

Демидова Е. А.

30 мая 2024

Российский университет дружбы народов, Москва, Россия

## Вводная часть

---

### Цели

Получение навыков настройки VPN-туннеля через незащищённое Интернет-соединение.

### Задачи

Настроить VPN-туннель между сетью Университета г. Пиза (Италия) и сетью «Донская» в г. Москва

## Выполнение лабораторной работы

---

# Размещение оборудования

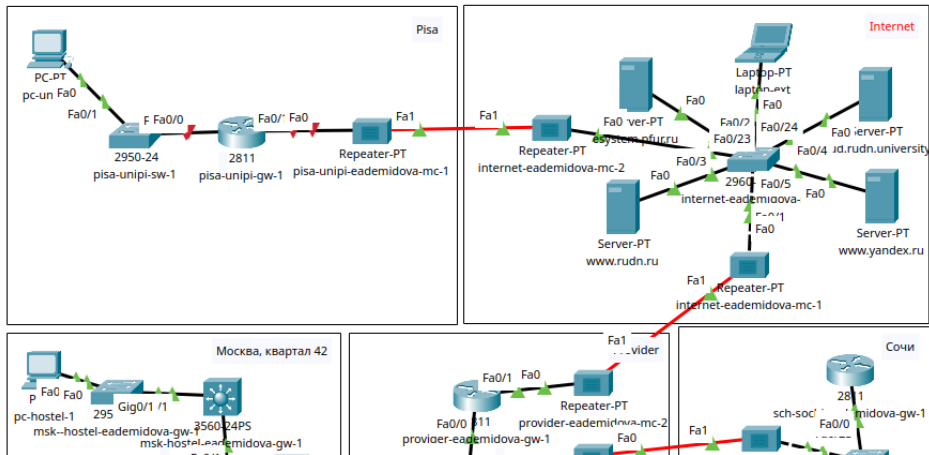


Рис. 1: Схема сети



Рис. 2: Города сети

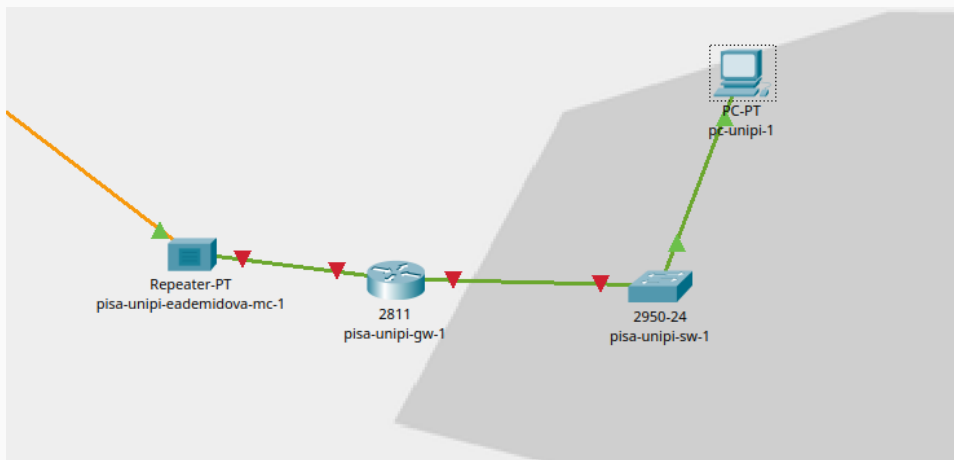


Рис. 3: Физическая область города Пиза

# Первоначальная настройка оборудования

```
pisa-unipi-gw-1>
pisa-unipi-gw-1>en
pisa-unipi-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-gw-1(config)#line vty 0 4
pisa-unipi-gw-1(config-line)#password cisco
pisa-unipi-gw-1(config-line)#login
pisa-unipi-gw-1(config-line)#exit
pisa-unipi-gw-1(config)#line console 0
pisa-unipi-gw-1(config-line)#password cisco
pisa-unipi-gw-1(config-line)#login
pisa-unipi-gw-1(config-line)#exit
pisa-unipi-gw-1(config)#en secr
pisa-unipi-gw-1(config)#enable secret cisco
pisa-unipi-gw-1(config)#service pass
pisa-unipi-gw-1(config)#service password-encryption
pisa-unipi-gw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-gw-1(config)#ip domain-name unipi.edu
pisa-unipi-gw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-gw-1.unipi.edu
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]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]

pisa-unipi-gw-1(config)#line vty 0 4
*Mar 1 0:18:4.959: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-gw-1(config-line)#transport input ssh
pisa-unipi-gw-1(config-line)#^Z
pisa-unipi-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr me
Building configuration...
[OK]
pisa-unipi-gw-1#
```

Copy

Paste

Рис. 4: Настройка маршрутизатора pisa-unipi-eademidova-gw-1



# Первоначальная настройка оборудования

```
pisa-unipi-sw-1>en
pisa-unipi-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-sw-1(config)#line vty 0 4
pisa-unipi-sw-1(config-line)#password cisco
pisa-unipi-sw-1(config-line)#login
pisa-unipi-sw-1(config-line)#exit
pisa-unipi-sw-1(config)#line console 0
pisa-unipi-sw-1(config-line)#password cisco
pisa-unipi-sw-1(config-line)#login
pisa-unipi-sw-1(config-line)#exit
pisa-unipi-sw-1(config)#enable secret cisco
pisa-unipi-sw-1(config)#service pas
pisa-unipi-sw-1(config)#service password-encryption
pisa-unipi-sw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-sw-1(config)#ip domain-name unipi.edu
pisa-unipi-sw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-sw-1.unipi.edu
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]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]

pisa-unipi-sw-1(config)#line vty 0 4
'Mar 1 0:20:3.453: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-sw-1(config-line)#transport input ssh
A
% Invalid input detected at 'A' marker.

pisa-unipi-sw-1(config-line)#transport input ssh
pisa-unipi-sw-1(config-line)#^Z
pisa-unipi-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr me
Building configuration...
[OK]
pisa-unipi-sw-1#
```

Рис. 5: Настройка коммутатора pisa-unipi-eademidova-sw-1

# Первоначальная настройка оборудования

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

pisa-unipi-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
exit
pisa-unipi-gw-1(config)#int f0/0.401
pisa-unipi-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-gw-1(config-subif)#encapsulation dot1Q 401
pisa-unipi-gw-1(config-subif)#ip address 10.131.0.1 255.255.255.0
pisa-unipi-gw-1(config-subif)#descr
pisa-unipi-gw-1(config-subif)#description unipi-main
pisa-unipi-gw-1(config-subif)#exit
pisa-unipi-gw-1(config)#int f0/1
pisa-unipi-gw-1(config-if)#no shu
pisa-unipi-gw-1(config-if)#no shutdown

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

pisa-unipi-gw-1(config-if)#ip address 192.0.2.20 255.255.255.0
pisa-unipi-gw-1(config-if)#des
pisa-unipi-gw-1(config-if)#description internet
pisa-unipi-gw-1(config-if)#exit
pisa-unipi-gw-1(config)#ip route 0.0.0.0 0.0.0.0 192.0.2.1
pisa-unipi-gw-1(config)#^Z
pisa-unipi-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr me
Building configuration...
[OK]
pisa-unipi-gw-1#
```

Рис. 6: Настройка интерфейсов маршрутизатора pisa-unipi-eademidova-gw-1

# Первоначальная настройка оборудования

```
pisa-unipi-sw-1#en
pisa-unipi-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-sw-1(config)#int f0/24
pisa-unipi-sw-1(config-if)#switc
pisa-unipi-sw-1(config-if)#switchport mode trunk

pisa-unipi-sw-1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to up

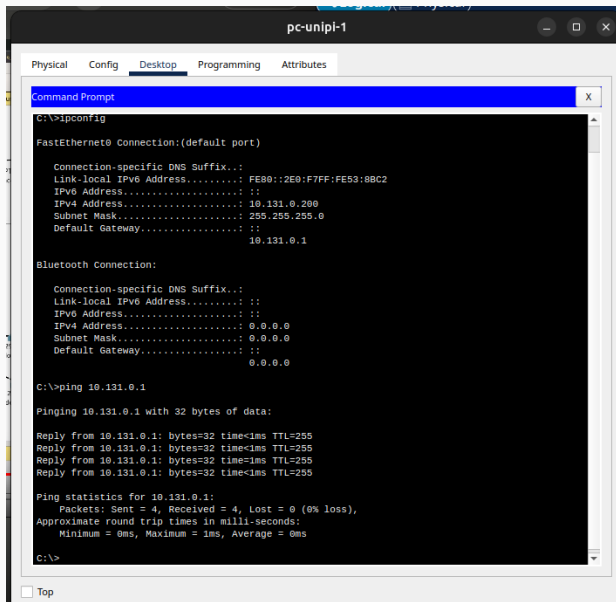
pisa-unipi-sw-1(config-if)#exit
pisa-unipi-sw-1(config)#int f0/1
pisa-unipi-sw-1(config-if)#switch
pisa-unipi-sw-1(config-if)#switchport mode acc
pisa-unipi-sw-1(config-if)#switchport mode access
pisa-unipi-sw-1(config-if)#switc
pisa-unipi-sw-1(config-if)#switchport acc
pisa-unipi-sw-1(config-if)#switchport access vlan 401
% Access VLAN does not exist. Creating vlan 401
pisa-unipi-sw-1(config-if)#exit
pisa-unipi-sw-1(config)#vlan 401
pisa-unipi-sw-1(config-vlan)#name unipi-main
pisa-unipi-sw-1(config-vlan)#exit
pisa-unipi-sw-1(config)#int vlan401
pisa-unipi-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-sw-1(config-if)#no shu
pisa-unipi-sw-1(config-if)#no shutdown
pisa-unipi-sw-1(config-if)#^Z
pisa-unipi-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr me
Building configuration...
[OK]
pisa-unipi-sw-1#
```

Рис. 7: Настройка интерфейсов коммутатора pisa-unipi-eademidova-sw-1

# Первоначальная настройка оборудования



```
pc-unipi-1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ipconfig

FastEthernet0 Connection:(default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::2E0:F7FF:FE53:8BC2
    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 = 1ms, Average = 0ms

C:\>
```

☐ Top

## Настройка VPN на основе GRE

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

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

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

msk-donskaya-eademidova-gw-1(config-if)#exit
msk-donskaya-eademidova-gw-1(config)#int loopback0

msk-donskaya-eademidova-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-eademidova-gw-1(config-if)#ip address 10.128.254.1 255.255.255.255
msk-donskaya-eademidova-gw-1(config-if)#exit
msk-donskaya-eademidova-gw-1(config)#ip route 10.128.254.5 255.255.255.255 10.128.255.254
msk-donskaya-eademidova-gw-1(config)#^Z
msk-donskaya-eademidova-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr me
Building configuration...
[OK]
msk-donskaya-eademidova-gw-1#
```

Copy

Paste

Рис. 9: Настройка VPN на маршрутизаторе msk-donskaya-eademidova-gw-1

## Настройка VPN на основе GRE

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

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

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

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

pisa-unipi-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-gw-1(config-if)#ip address 10.128.254.5 255.255.255.255
pisa-unipi-gw-1(config-if)#exit
pisa-unipi-gw-1(config)#ip route 10.128.254.1 255.255.255.255 10.128.255.253
pisa-unipi-gw-1(config)#router ospf 1
pisa-unipi-gw-1(config-router)#router-id 10.128.254.5
pisa-unipi-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
pisa-unipi-gw-1(config-router)#exit
pisa-unipi-gw-1(config)#
```

Copy

Paste

Рис. 10: Настройка VPN на маршрутизаторе pisa-unipi-eademidova-gw-1

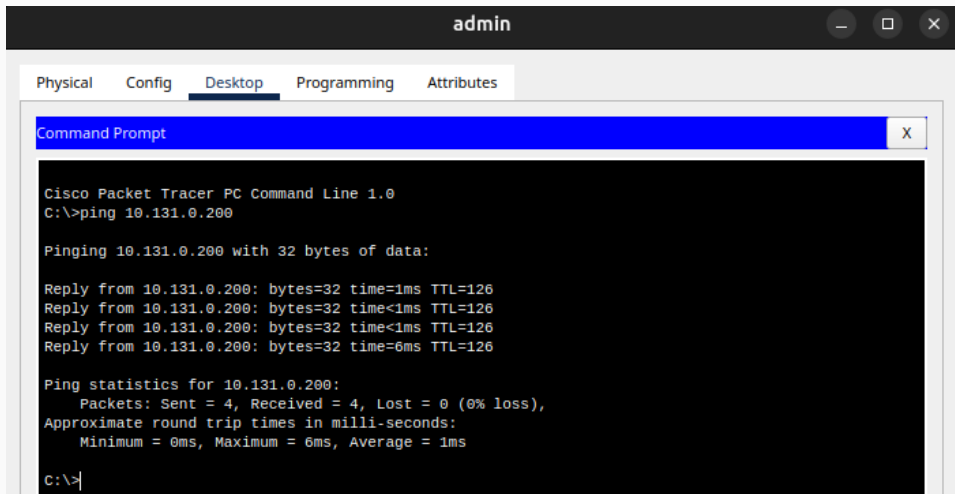


Рис. 11: Проверка доступности узлов сети Университета г. Пиза из сети Донская

## Выводы

---



В результате выполнения лабораторной были приобретены практические навыки по настройке VPN-туннеля через незащищённое Интернет-соединение.