

# Лабораторная работа №16

## Настройка VPN

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## Информация

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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».

Виртуальная частная сеть (Virtual Private Network, VPN) — технология, обеспечивающая одно или несколько сетевых соединений поверх другой сети (например, Интернет).

Сеть Университета г. Пиза (Италия) содержит маршрутизатор Cisco 2811 pisa-inip1-gw-1, коммутатор Cisco 2950 pisa-unip1-sw-1 и оконечное устройство PC pc-unip1-1.

Разместим эти устройства в рабочей области, заменим у медиаконвертеров имеющиеся модули на PT-REPEATER-NM-1FFE и PT-REPEATER-NM-1CFE для подключения витой пары по технологии Fast Ethernet и оптоволокна соответственно (рис. ??).

# Выполнение лабораторной работы

pisa-unipi-cahanqirov-mc-1

Physical Config Attributes

Physical Device View

Zoom In Original Size Zoom Out

Packet Tracer Repeater

MODULES

- PT-REPEATER-NM-1CE
- PT-REPEATER-NM-1CFE
- PT-REPEATER-NM-1CGE
- PT-REPEATER-NM-1FFE
- PT-REPEATER-NM-1FGE
- PT-REPEATER-NM-COVER

Customize Icon in Physical View

Customize Icon in Logical View

The PT-REPEATER-NM-1FFE Module provides one Fast-Ethernet interface for use with fiber media. Ideal for a wide range of LAN applications, the Fast Ethernet network modules support many internetworking features and standards. Single port network

# Выполнение лабораторной работы

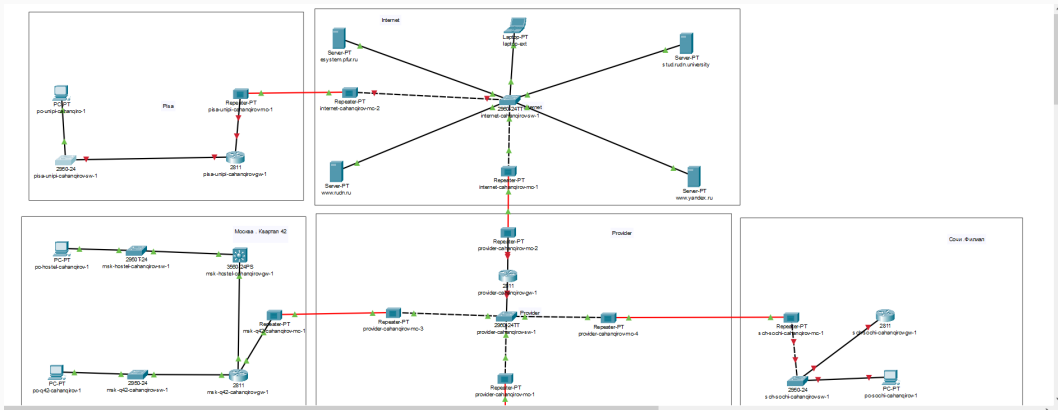


Figure 2: Схема сети с дополнительными площадками

В физической рабочей области проекта создадим город Пиза, здание Университета г. Пиза и 7/18



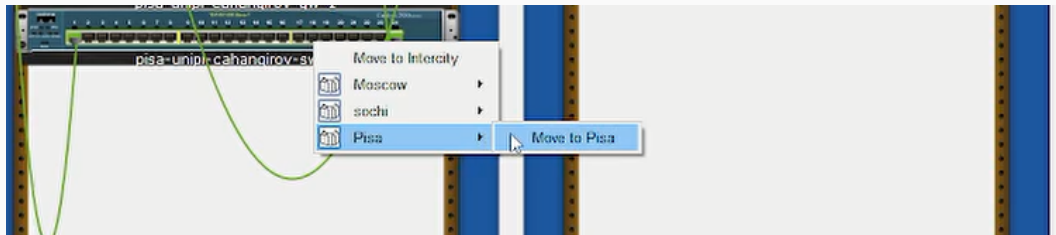


Figure 3: Перемещение оборудования в г. Пиза

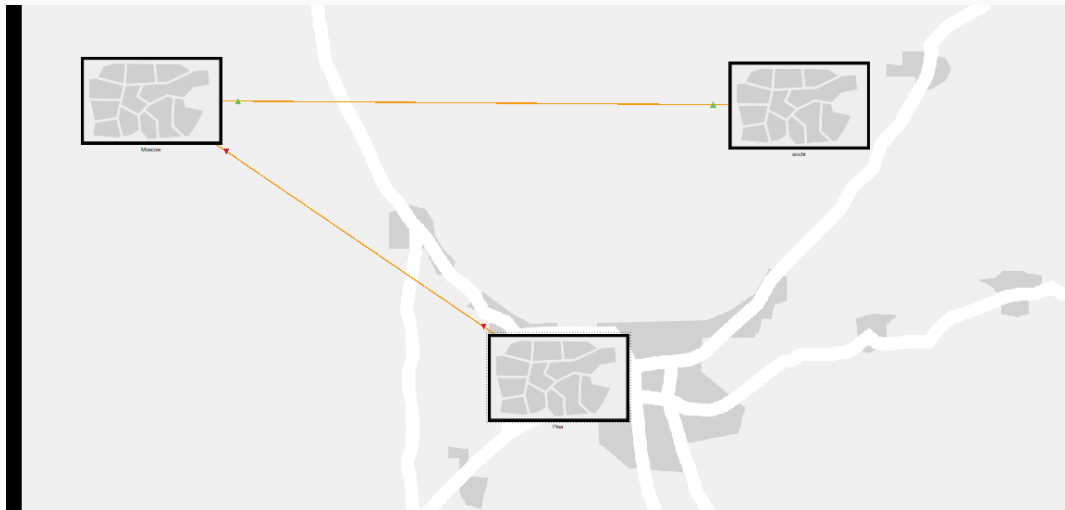


Figure 4: Добавление г. Пиза

## Выполнение лабораторной работы

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname pisa-unipi-cahanqrov-gw-1
pisa-unipi-cahanqrov-gw-1(config)#line vty 0 4
pisa-unipi-cahanqrov-gw-1(config-line)#password cisco
pisa-unipi-cahanqrov-gw-1(config-line)#login
pisa-unipi-cahanqrov-gw-1(config-line)#exit
pisa-unipi-cahanqrov-gw-1(config)#line console 0
pisa-unipi-cahanqrov-gw-1(config-line)#password cisco
pisa-unipi-cahanqrov-gw-1(config-line)#login
pisa-unipi-cahanqrov-gw-1(config-line)#exit
pisa-unipi-cahanqrov-gw-1(config)#enable secret cisco
pisa-unipi-cahanqrov-gw-1(config)#service password-encryption
pisa-unipi-cahanqrov-gw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-cahanqrov-gw-1(config)#ip domain-name unipi.edu
pisa-unipi-cahanqrov-gw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-cahanqrov-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-cahanqrov-gw-1(config)#line vty 0 4
*Mar 1 0:21:32.762: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-cahanqrov-gw-1(config-line)#transport input ssh
pisa-unipi-cahanqrov-gw-1(config-line)#^Z
pisa-unipi-cahanqrov-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname pisa-unipi-cahanqirov-sw-1
pisa-unipi-cahanqirov-sw-1(config)#line vty 0 4
pisa-unipi-cahanqirov-sw-1(config-line)#password cisco
pisa-unipi-cahanqirov-sw-1(config-line)#login
pisa-unipi-cahanqirov-sw-1(config-line)#exit
pisa-unipi-cahanqirov-sw-1(config)#line console 0
pisa-unipi-cahanqirov-sw-1(config-line)#password cisco
pisa-unipi-cahanqirov-sw-1(config-line)#login
pisa-unipi-cahanqirov-sw-1(config-line)#exit
pisa-unipi-cahanqirov-sw-1(config)#enable secret cisco
pisa-unipi-cahanqirov-sw-1(config)#service password-encryption
pisa-unipi-cahanqirov-sw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-cahanqirov-sw-1(config)#ip domain-name unipi.edu
pisa-unipi-cahanqirov-sw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-cahanqirov-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-cahanqirov-sw-1(config)#line vty 0 4
*Mar 1 0:23:56.83: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-cahanqirov-sw-1(config-line)#
```

## Выполнение лабораторной работы

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

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

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

pisa-unipi-cahanqrov-gw-1(config-if)#ip address 192.0.2.20 255.255.255.0
pisa-unipi-cahanqrov-gw-1(config-if)#description internet
pisa-unipi-cahanqrov-gw-1(config-if)#exit
pisa-unipi-cahanqrov-gw-1(config)#ip route 0.0.0.0 0.0.0.0 192.0.2.1
pisa-unipi-cahanqrov-gw-1(config)#^Z
pisa-unipi-cahanqrov-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

```
pisa-unipi-cahanqirov-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-cahanqirov-sw-1(config)#interface f0/24
pisa-unipi-cahanqirov-sw-1(config-if)#switchport mode trunk
pisa-unipi-cahanqirov-sw-1(config-if)#exit
pisa-unipi-cahanqirov-sw-1(config)#interface f0/1
pisa-unipi-cahanqirov-sw-1(config-if)#switchport mode access
pisa-unipi-cahanqirov-sw-1(config-if)#switchport access vlan 401
% Access VLAN does not exist. Creating vlan 401
pisa-unipi-cahanqirov-sw-1(config-if)#exit
pisa-unipi-cahanqirov-sw-1(config)#vlan 401
pisa-unipi-cahanqirov-sw-1(config-vlan)#name unipi-main
pisa-unipi-cahanqirov-sw-1(config-vlan)#exit
pisa-unipi-cahanqirov-sw-1(config)#interface vlan401
pisa-unipi-cahanqirov-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-cahanqirov-sw-1(config-if)#no shutdown
pisa-unipi-cahanqirov-sw-1(config-if)#exit
pisa-unipi-cahanqirov-sw-1(config)#^Z
pisa-unipi-cahanqirov-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

# Выполнение лабораторной работы

Command Prompt

```
C:\>ipconfig

FastEthernet0 Connection: (default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::201:63FF:FE6E:360B
    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
```

## Выполнение лабораторной работы

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

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

msk-donskaya-cahanqirov-gw-1(config-if)#ip address 10.128.255.253 255.255.255.252
msk-donskaya-cahanqirov-gw-1(config-if)#tunnel source f0/1.4
msk-donskaya-cahanqirov-gw-1(config-if)#tunnel destination 192.0.2.20
msk-donskaya-cahanqirov-gw-1(config-if)#exit
msk-donskaya-cahanqirov-gw-1(config)#interface loopback0

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

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



## Выполнение лабораторной работы

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

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

pisa-unipi-cahangrov-gw-1(config-if)#ip address 10.128.255.254 255.255.255.252
pisa-unipi-cahangrov-gw-1(config-if)#tunnel source f0/1
pisa-unipi-cahangrov-gw-1(config-if)#tunnel destination 198.51.100.2
pisa-unipi-cahangrov-gw-1(config-if)#exit
pisa-unipi-cahangrov-gw-1(config)#interface loopback0

pisa-unipi-cahangrov-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-cahangrov-gw-1(config-if)#ip address 10.128.254.5 255.255.255.255
pisa-unipi-cahangrov-gw-1(config-if)#exit
pisa-unipi-cahangrov-gw-1(config)#ip route 10.128.254.1 255.255.255.255 10.128.255.253
pisa-unipi-cahangrov-gw-1(config)#router ospf 1
pisa-unipi-cahangrov-gw-1(config-router)#router id 10.128.254.5
^
% Invalid input detected at '^' marker.

pisa-unipi-cahangrov-gw-1(config-router)#router-id 10.128.254.5
pisa-unipi-cahangrov-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
pisa-unipi-cahangrov-gw-1(config-router)#exit
pisa-unipi-cahangrov-gw-1(config)#^Z
pisa-unipi-cahangrov-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

# Выполнение лабораторной работы

admin

Physical Config Desktop Programming Attributes

Command Prompt

```
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=2ms TTL=126
Reply from 10.131.0.200: bytes=32 time=10ms TTL=126
Reply from 10.131.0.200: bytes=32 time<1ms TTL=126
Reply from 10.131.0.200: bytes=32 time=3ms 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 = 10ms, Average = 3ms

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 = 0ms, Average = 0ms
```

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