

Лабораторная Работа №16. Настройка VPN.

Администрирование локальных сетей

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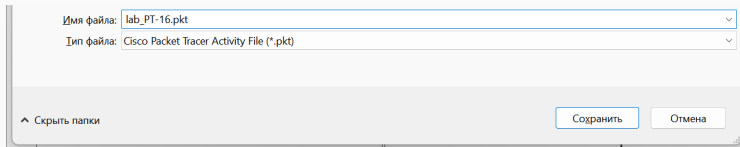


Figure 1: Открытие проекта lab_PT-16.pkt.

Размещение оборудования

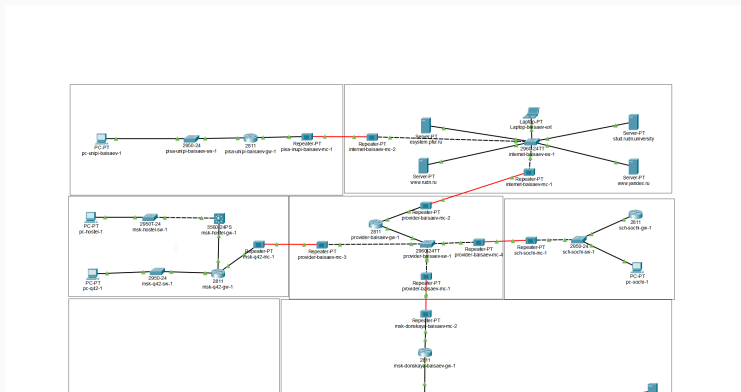
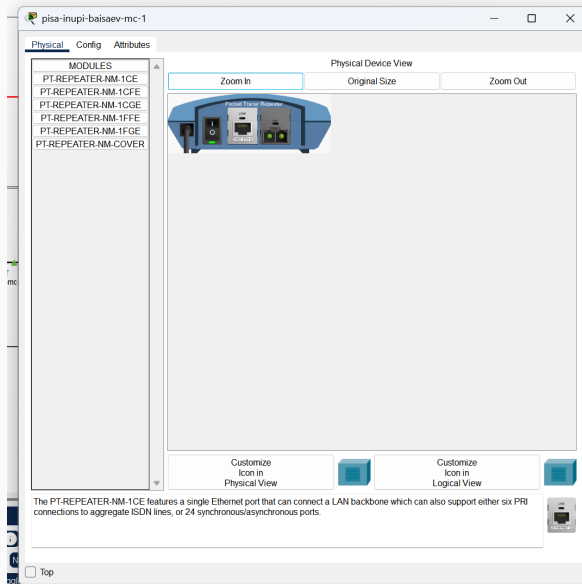


Figure 2: Размещение оборудования в рабочей области проекта.

Замена модулей



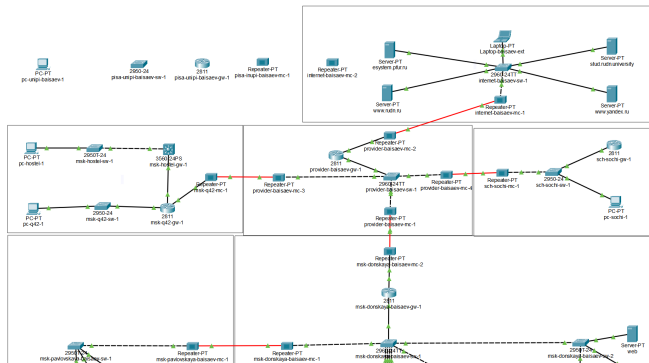


Figure 4: Подключение оборудования.



Figure 5: Создание города Пиза в физической рабочей области.

Перемещение оборудования

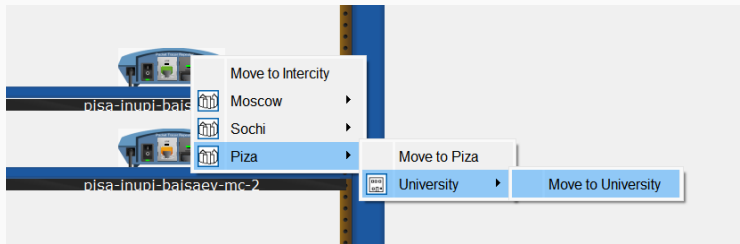
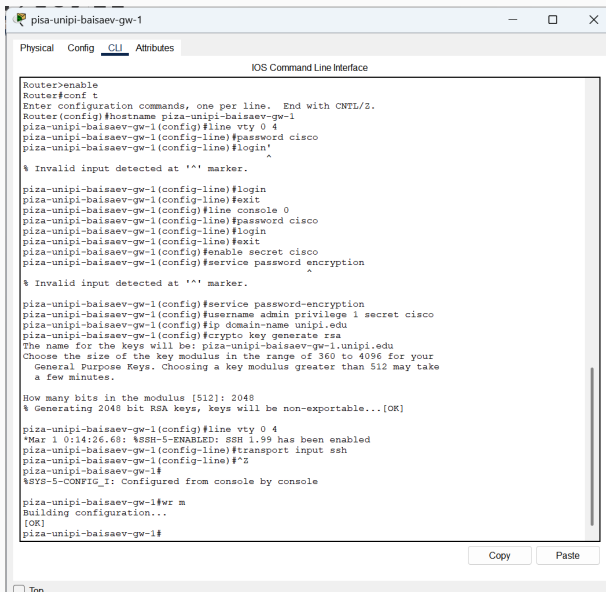


Figure 6: Перемещение оборудования.

Первоначальная настройка



```
pisa-unipi-baisaev-gw-1
Physical Config CLI Attributes
IOS Command Line Interface

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname pisa-unipi-baisaev-gw-1
pisa-unipi-baisaev-gw-1(config)#line vty 0 4
pisa-unipi-baisaev-gw-1(config-line)#password cisco
pisa-unipi-baisaev-gw-1(config-line)#login
^
% Invalid input detected at '^' marker.

pisa-unipi-baisaev-gw-1(config-line)#login
pisa-unipi-baisaev-gw-1(config-line)#exit
pisa-unipi-baisaev-gw-1(config)#line console 0
pisa-unipi-baisaev-gw-1(config-line)#password cisco
pisa-unipi-baisaev-gw-1(config-line)#login
pisa-unipi-baisaev-gw-1(config-line)#exit
pisa-unipi-baisaev-gw-1(config)#enable secret cisco
pisa-unipi-baisaev-gw-1(config)#service password encryption
^
% Invalid input detected at '^' marker.

pisa-unipi-baisaev-gw-1(config)#service password-encryption
pisa-unipi-baisaev-gw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-baisaev-gw-1(config)#ip domain-name unipi.edu
pisa-unipi-baisaev-gw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-baisaev-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]

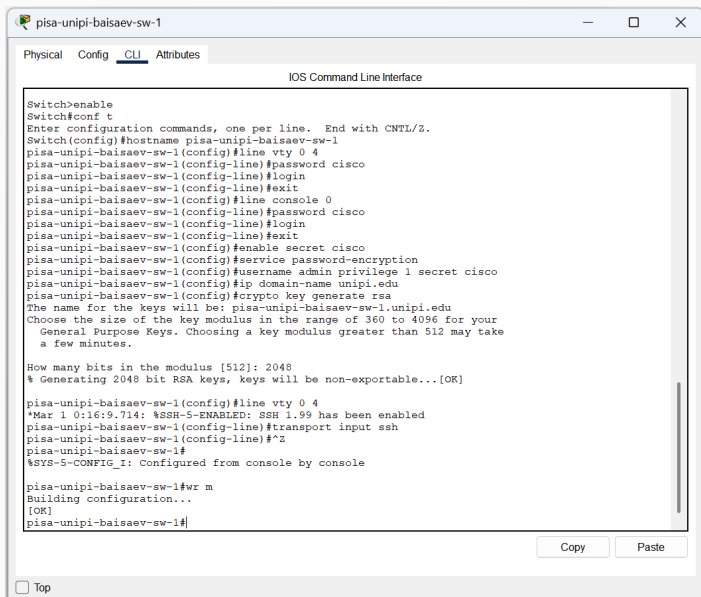
pisa-unipi-baisaev-gw-1(config)#line vty 0 4
^Mar 1 0:14:26.68: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-baisaev-gw-1(config-line)#transport input ssh
pisa-unipi-baisaev-gw-1(config-line)#^Z
pisa-unipi-baisaev-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

Copy Paste

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Первоначальная настройка



The screenshot shows a window titled "pisa-unipi-baisaev-sw-1" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal output shows the following commands and responses:

```
Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname pisa-unipi-baisaev-sw-1
pisa-unipi-baisaev-sw-1(config)#line vty 0 4
pisa-unipi-baisaev-sw-1(config-line)#password cisco
pisa-unipi-baisaev-sw-1(config-line)#login
pisa-unipi-baisaev-sw-1(config-line)#exit
pisa-unipi-baisaev-sw-1(config)#line console 0
pisa-unipi-baisaev-sw-1(config-line)#password cisco
pisa-unipi-baisaev-sw-1(config-line)#login
pisa-unipi-baisaev-sw-1(config-line)#exit
pisa-unipi-baisaev-sw-1(config)#enable secret cisco
pisa-unipi-baisaev-sw-1(config)#service password-encryption
pisa-unipi-baisaev-sw-1(config)#username admin privilege 1 secret cisco
pisa-unipi-baisaev-sw-1(config)#ip domain-name unipi.edu
pisa-unipi-baisaev-sw-1(config)#crypto key generate rsa
The name for the keys will be: pisa-unipi-baisaev-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.

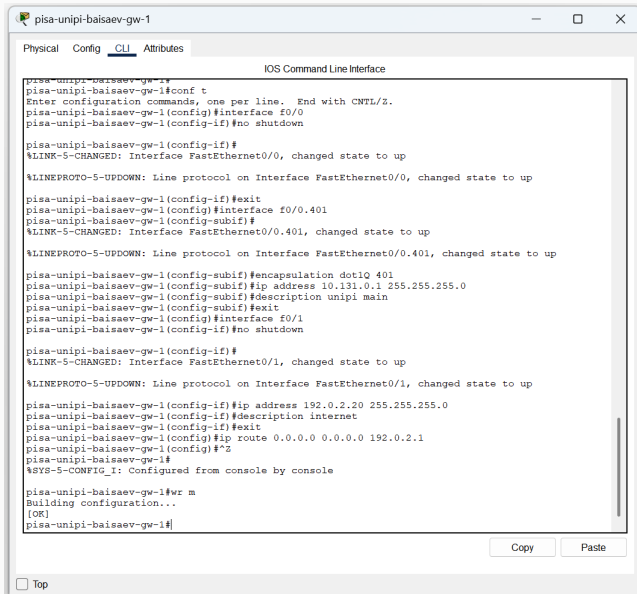
How many bits in the modulus [512]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]

pisa-unipi-baisaev-sw-1(config)#line vty 0 4
*Mar 1 0:16:9.714: %SSH-5-ENABLED: SSH 1.99 has been enabled
pisa-unipi-baisaev-sw-1(config-line)#transport input ssh
pisa-unipi-baisaev-sw-1(config-line)#^Z
pisa-unipi-baisaev-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

At the bottom of the window, there are "Copy" and "Paste" buttons, and a "Top" button with a checkbox.

Настройка интерфейсов



The screenshot shows a Cisco IOS Command Line Interface window for a device named 'pisa-unipi-baisaev-gw-1'. The window has tabs for 'Physical', 'Config', 'CLI' (selected), and 'Attributes'. The CLI shows the following configuration steps:

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

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

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

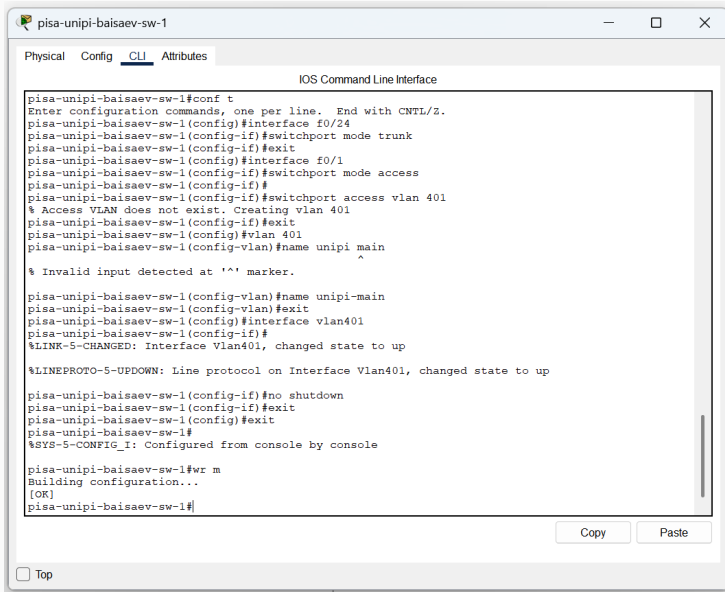
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

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

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

At the bottom of the window, there are 'Copy' and 'Paste' buttons, and a 'Top' button with a checkbox.

Настройка интерфейсов



The screenshot shows a Cisco IOS Command Line Interface window for a switch named 'pisa-unipi-baisaev-sw-1'. The window has tabs for 'Physical', 'Config', 'CLI' (selected), and 'Attributes'. The CLI tab displays the following configuration commands and system messages:

```
pisa-unipi-baisaev-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-baisaev-sw-1(config)#interface f0/24
pisa-unipi-baisaev-sw-1(config-if)#switchport mode trunk
pisa-unipi-baisaev-sw-1(config-if)#exit
pisa-unipi-baisaev-sw-1(config)#interface f0/1
pisa-unipi-baisaev-sw-1(config-if)#switchport mode access
pisa-unipi-baisaev-sw-1(config-if)#
pisa-unipi-baisaev-sw-1(config-if)#switchport access vlan 401
% Access VLAN does not exist. Creating vlan 401
pisa-unipi-baisaev-sw-1(config-if)#exit
pisa-unipi-baisaev-sw-1(config)#vlan 401
pisa-unipi-baisaev-sw-1(config-vlan)#name unipi main
^
% Invalid input detected at '^' marker.

pisa-unipi-baisaev-sw-1(config-vlan)#name unipi-main
pisa-unipi-baisaev-sw-1(config-vlan)#exit
pisa-unipi-baisaev-sw-1(config)#interface vlan401
pisa-unipi-baisaev-sw-1(config-if)#
%LINK-5-CHANGED: Interface Vlan401, changed state to up

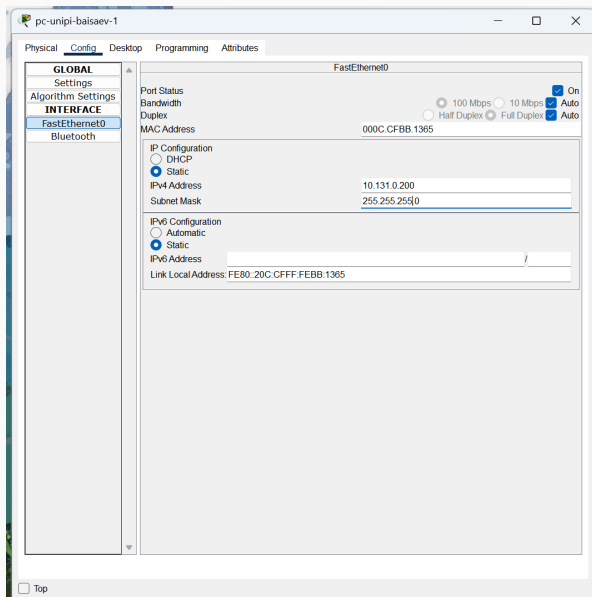
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan401, changed state to up

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

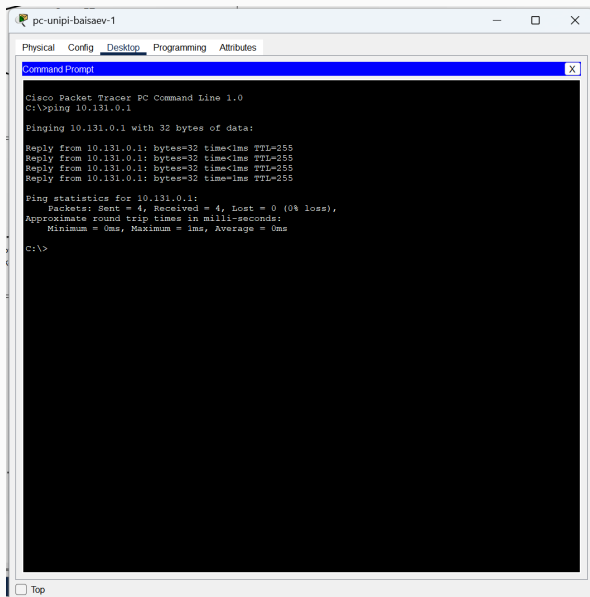
pisa-unipi-baisaev-sw-1#wr m
Building configuration...
[OK]
pisa-unipi-baisaev-sw-1#
```

At the bottom of the window, there are 'Copy' and 'Paste' buttons, and a 'Top' button with a checkbox.

Присвоение адресов



Ping



The screenshot shows a Cisco Packet Tracer PC Command Line window for a device named 'pc-unipi-balsaev-1'. The window has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes', with 'Desktop' selected. The Command Prompt shows the execution of the 'ping 10.131.0.1' command. The output indicates that the ping was successful, with 4 packets sent and received, 0% loss, and an average round trip time of 0ms.

```
pc-unipi-balsaev-1
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.131.0.1

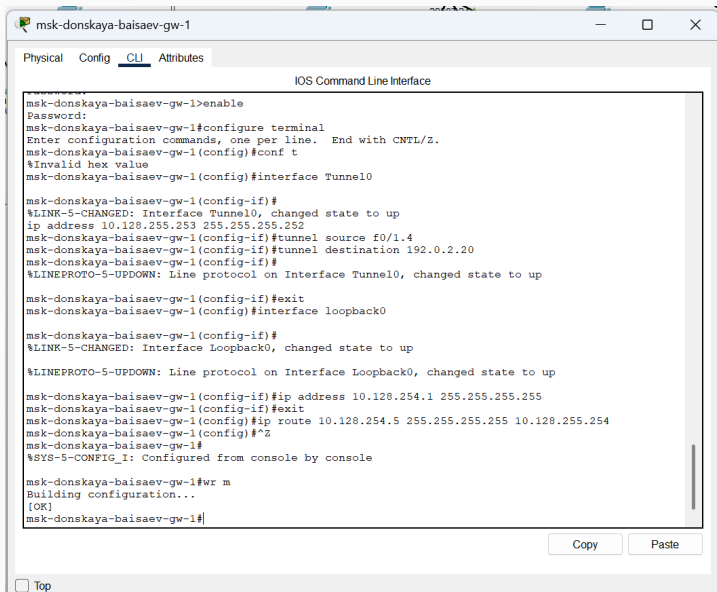
Pinging 10.131.0.1 with 32 bytes of data:

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:\>
```

Настройка VPN на основе GRE



msk-donskaya-baisaev-gw-1

Physical Config CLI Attributes

IOS Command Line Interface

```
msk-donskaya-baisaev-gw-1>enable
Password:
msk-donskaya-baisaev-gw-1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#conf t
%Invalid hex value
msk-donskaya-baisaev-gw-1(config)#interface Tunnel0

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

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

msk-donskaya-baisaev-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

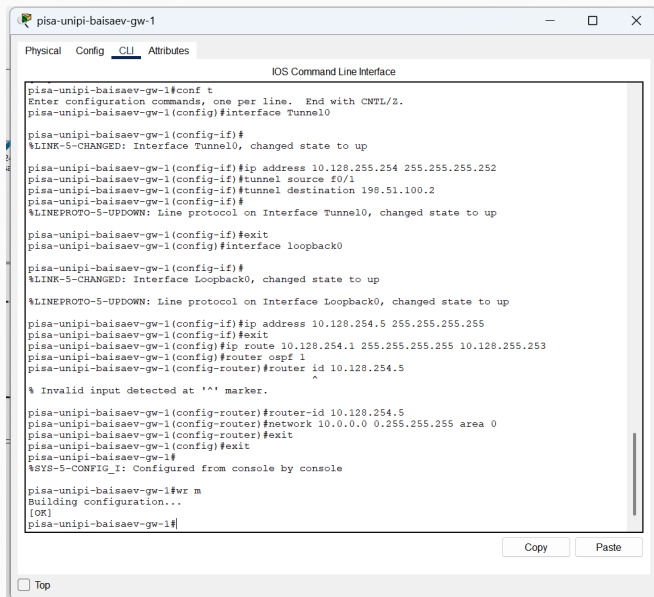
msk-donskaya-baisaev-gw-1(config-if)#ip address 10.128.254.1 255.255.255.255
msk-donskaya-baisaev-gw-1(config-if)#exit
msk-donskaya-baisaev-gw-1(config)#ip route 10.128.254.5 255.255.255.255 10.128.255.254
msk-donskaya-baisaev-gw-1(config)#^Z
msk-donskaya-baisaev-gw-1#
%SYS-5-CONFIG_I: Configured from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

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

Copy Paste

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Настройка VPN на основе GRE



```
pisa-unipi-baisaev-gw-1
Physical Config CLI Attributes
IOS Command Line Interface
pisa-unipi-baisaev-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
pisa-unipi-baisaev-gw-1(config)#interface Tunnel0

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

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

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

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

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

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

Copy Paste

☐ Top

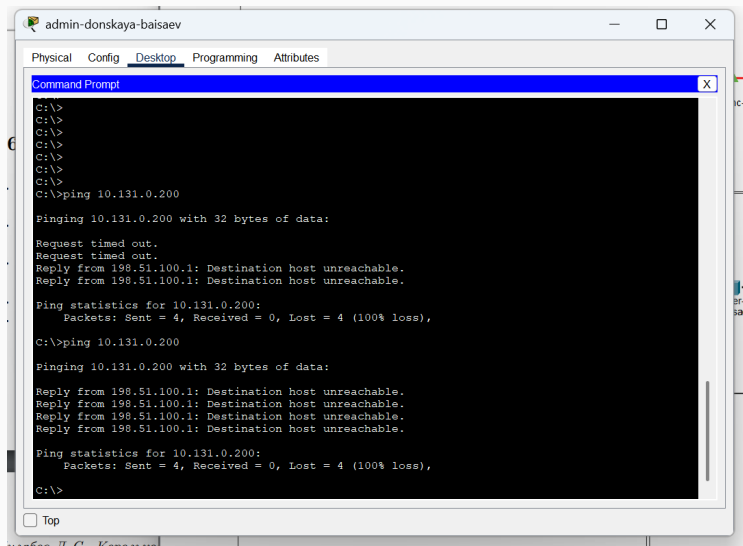


Figure 15: Проверка доступности узлов сети Университета г. Пиза с ноутбука

В ходе выполнения лабораторной работы мы получили навыки настройки VPN-туннеля через незащищённое Интернет-соединение.