

Лабораторная Работа №12. Настройка NAT.

Администрирование локальных сетей

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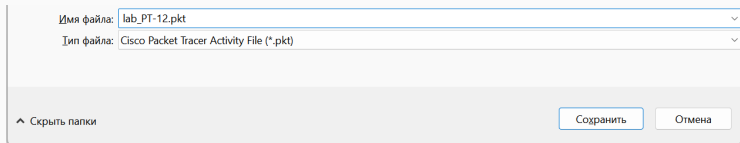
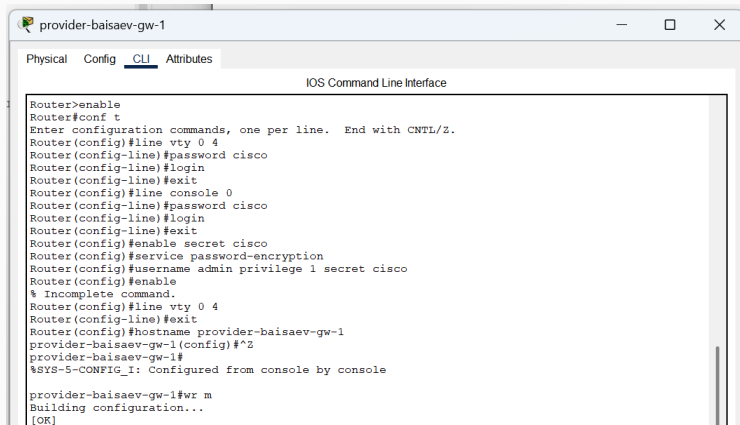


Figure 1: Открытие проекта lab_PT-12.pkt.

Первоначальная настройка



The screenshot shows a web-based configuration interface for a network device. The window title is "provider-baisaev-gw-1". There are four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, showing the "IOS Command Line Interface". The interface displays a series of commands entered into the router's command line, along with the system's responses. The commands configure the router's hostname, enable VTY and console access with passwords, and set up a local user with administrative privileges. The configuration is saved to the running configuration file.

```
Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#line vty 0 4
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#exit
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#exit
Router(config)#enable secret cisco
Router(config)#service password-encryption
Router(config)#username admin privilege 1 secret cisco
Router(config)#enable
% Incomplete command.
Router(config)#line vty 0 4
Router(config-line)#exit
Router(config)#hostname provider-baisaev-gw-1
provider-baisaev-gw-1(config)#^Z
provider-baisaev-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

Figure 2: Первоначальная настройка маршрутизатора provider-baisaev-gw-1 (присвоение имени, настройка доступа по паролю и др.).

Первоначальная настройка

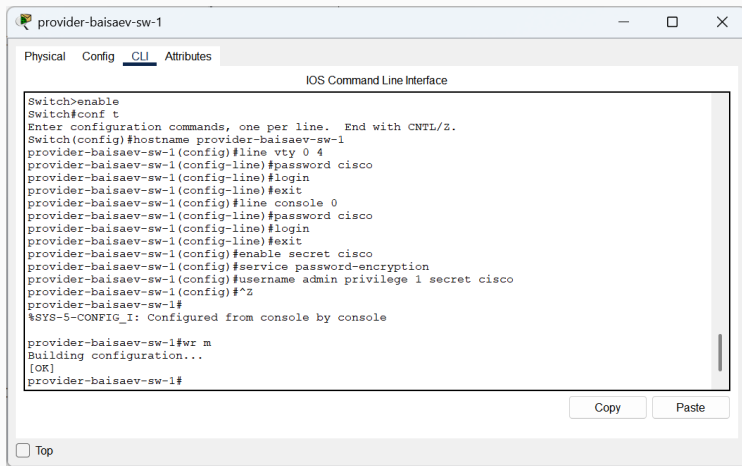
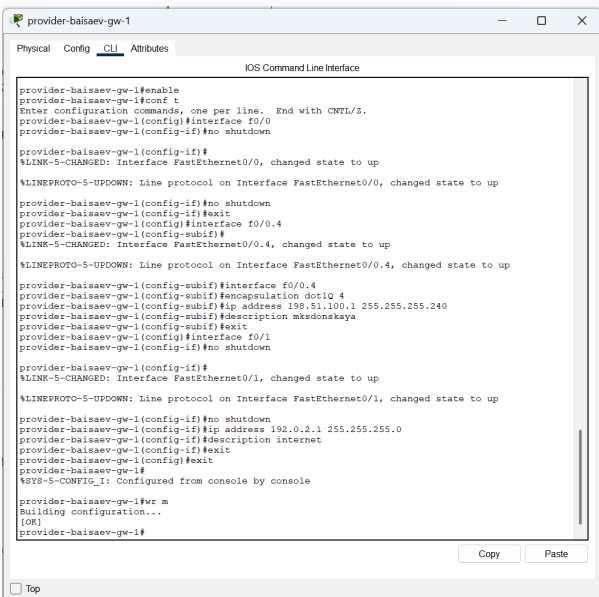


Figure 3: Первоначальная настройка коммутатора provider-baisaev-sw-1 (присвоение имени, настройка доступа по паролю и др.).

Настройка интерфейсов



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

provider-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

provider-baisaev-gw-1(config-if)#no shutdown
provider-baisaev-gw-1(config-if)#exit
provider-baisaev-gw-1(config)#interface f0/0.4
provider-baisaev-gw-1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.4, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.4, changed state to up

provider-baisaev-gw-1(config-subif)#interface f0/0.4
provider-baisaev-gw-1(config-subif)#encapsulation dot1q 4
provider-baisaev-gw-1(config-subif)#ip address 198.51.100.1 255.255.255.240
provider-baisaev-gw-1(config-subif)#description mksdonskaya
provider-baisaev-gw-1(config-subif)#exit
provider-baisaev-gw-1(config)#interface f0/1
provider-baisaev-gw-1(config-if)#no shutdown

provider-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

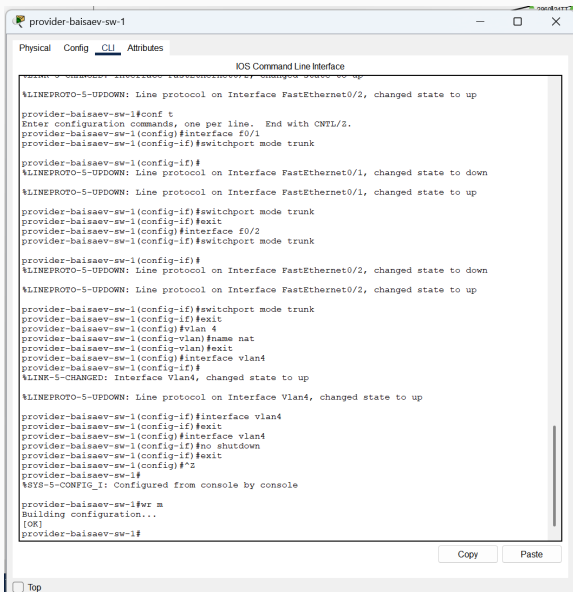
provider-baisaev-gw-1(config-if)#no shutdown
provider-baisaev-gw-1(config-if)#ip address 192.0.2.1 255.255.255.0
provider-baisaev-gw-1(config-if)#description internet
provider-baisaev-gw-1(config-if)#exit
provider-baisaev-gw-1(config)#exit
provider-baisaev-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

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Настройка интерфейсов



```
provider-baisaev-sw-1
Physical Config CLI Attributes
IOS Command Line Interface
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
provider-baisaev-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
provider-baisaev-sw-1(config)#interface f0/1
provider-baisaev-sw-1(config-if)#switchport mode trunk
provider-baisaev-sw-1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
provider-baisaev-sw-1(config-if)#switchport mode trunk
provider-baisaev-sw-1(config-if)#exit
provider-baisaev-sw-1(config)#interface f0/2
provider-baisaev-sw-1(config-if)#switchport mode trunk
provider-baisaev-sw-1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
provider-baisaev-sw-1(config-if)#switchport mode trunk
provider-baisaev-sw-1(config-if)#exit
provider-baisaev-sw-1(config)#vlan 4
provider-baisaev-sw-1(config-vlan)#name nat
provider-baisaev-sw-1(config-vlan)#exit
provider-baisaev-sw-1(config)#interface vlan4
provider-baisaev-sw-1(config-if)#
%LINK-5-CHANGED: Interface Vlan4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan4, changed state to up
provider-baisaev-sw-1(config-if)#interface vlan4
provider-baisaev-sw-1(config-if)#exit
provider-baisaev-sw-1(config)#interface vlan4
provider-baisaev-sw-1(config-if)#no shutdown
provider-baisaev-sw-1(config-if)#exit
provider-baisaev-sw-1(config)#^Z
provider-baisaev-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
provider-baisaev-sw-1#wr m
Building configuration...
[OK]
provider-baisaev-sw-1#
```

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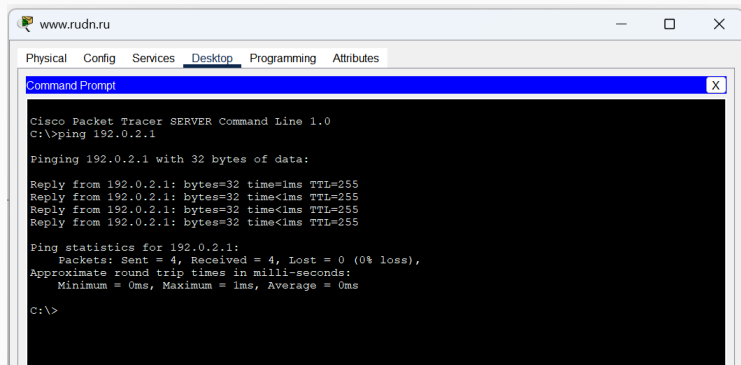
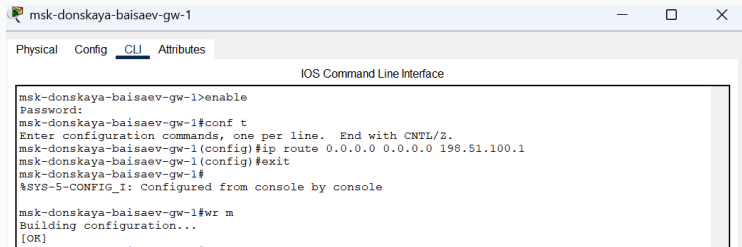


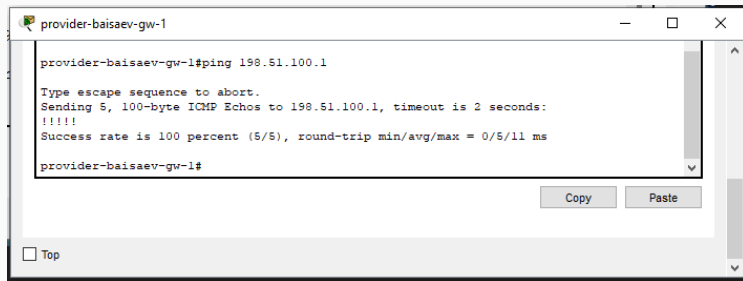
Figure 6: Проверка командой ping с сервера www.rudn.ru на роутер провайдера.

Настройка интерфейсов



```
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#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip route 0.0.0.0 0.0.0.0 198.51.100.1
msk-donskaya-baisaev-gw-1(config)#exit
msk-donskaya-baisaev-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
msk-donskaya-baisaev-gw-1#wr m
Building configuration...
[OK]
```

Figure 7: Настройка интерфейсов маршрутизатора msk-donskaya-baisaev-gw-1 для доступа к сети провайдера.



A terminal window titled "provider-baisaev-gw-1" with standard window controls (minimize, maximize, close). The terminal shows the execution of a ping command to 198.51.100.1. The output indicates a 100% success rate with a round-trip time of 0/5/11 ms. Below the terminal output are "Copy" and "Paste" buttons. At the bottom left of the window is a "Top" button with an unchecked checkbox.

```
provider-baisaev-gw-1#ping 198.51.100.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 198.51.100.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/5/11 ms

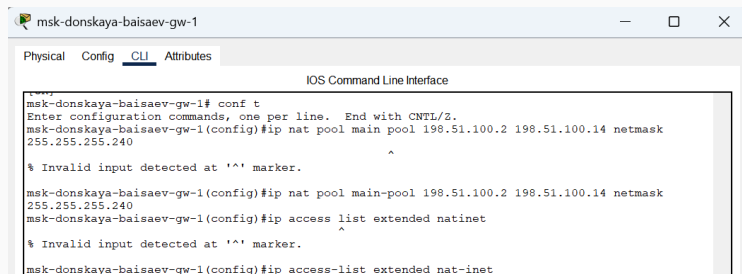
provider-baisaev-gw-1#
```

Copy Paste

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Figure 8: Проверка

Настройка пула адресов



The screenshot shows a web-based configuration interface for a device named 'msk-donskaya-baisaev-gw-1'. The 'CLI' tab is selected, displaying the 'IOS Command Line Interface'. The terminal text shows the user entering 'conf t' to enter configuration mode, then 'ip nat pool main pool 198.51.100.2 198.51.100.14 netmask 255.255.255.240'. An error message '% Invalid input detected at '^' marker.' appears because of an extra space before 'pool'. The user then corrects the command to 'ip nat pool main-pool 198.51.100.2 198.51.100.14 netmask 255.255.255.240'. Another error message appears for the same reason. Finally, the user enters 'ip access list extended natinet' and another error message appears. The last line of the terminal shows the corrected command 'ip access-list extended nat-inet'.

```
msk-donskaya-baisaev-gw-1# conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip nat pool main pool 198.51.100.2 198.51.100.14 netmask
255.255.255.240
                                     ^
% Invalid input detected at '^' marker.

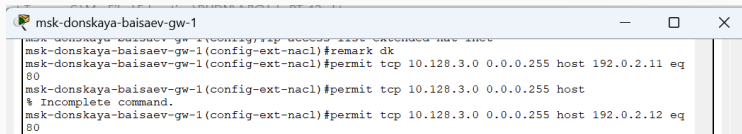
msk-donskaya-baisaev-gw-1(config)#ip nat pool main-pool 198.51.100.2 198.51.100.14 netmask
255.255.255.240
msk-donskaya-baisaev-gw-1(config)#ip access list extended natinet
                                     ^
% Invalid input detected at '^' marker.

msk-donskaya-baisaev-gw-1(config)#ip access-list extended nat-inet
```

Figure 9: Настройка пула адресов для NAT.

```
msk-donskaya-baisaev-gw-1(config)#ip access list extended natinet
                                     ^
% Invalid input detected at '^' marker.
msk-donskaya-baisaev-gw-1(config)#ip access-list extended nat-inet
```

Figure 10: Настройка списка доступа для NAT



```
msk-donskaya-baisaev-gw-1
msk-donskaya-baisaev-gw-1(config-ext-nacl)#remark dk
msk-donskaya-baisaev-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.11 eq
80
msk-donskaya-baisaev-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host
% Incomplete command.
msk-donskaya-baisaev-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.12 eq
80
```

Figure 11: Сеть дисплейных классов (имеют доступ только к сайтам, необходимым для учёбы (www.yandex.ru (192.0.2.11), stud.rudn.university (192.0.2.12))).

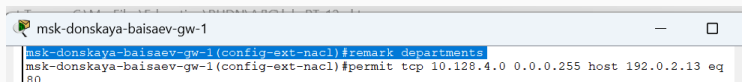


Figure 12: Сеть кафедр (работает только с образовательными сайтами (esystem.pfur.ru (192.0.2.13)))..

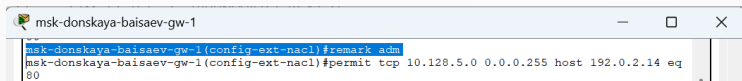
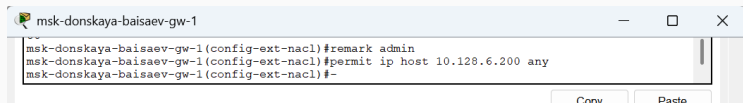


Figure 13: Сеть администрации (имеет возможность работать только с сайтом университета (www.rudn.ru (192.0.2.14))).



```
msk-donskaya-baisaev-gw-1
msk-donskaya-baisaev-gw-1(config-ext-nacl)#remark admin
msk-donskaya-baisaev-gw-1(config-ext-nacl)#permit ip host 10.128.6.200 any
msk-donskaya-baisaev-gw-1(config-ext-nacl)#-
```

Figure 14: Доступ для компьютера администратора (в сети для других пользователей компьютер администратора имеет полный доступ в Интернет. Другие не имеют доступа.).

msk-donskaya-baisaev-gw-1

Physical Config CLI Attributes

IOS Command Line Interface

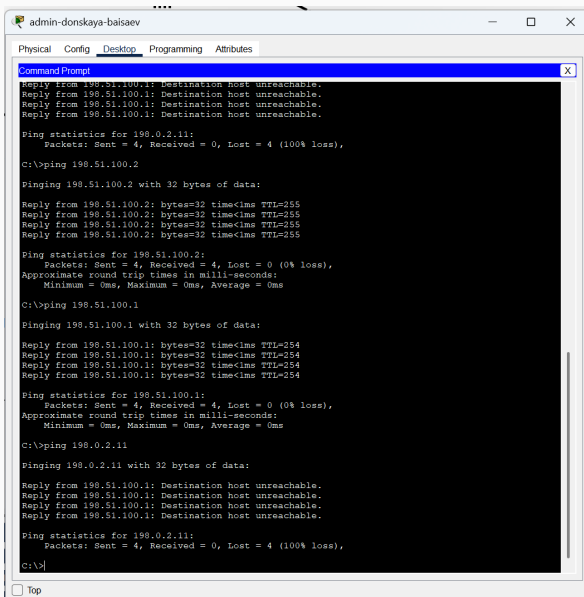
```
[OK]
msk-donskaya-baisaev-gw-1#enable
msk-donskaya-baisaev-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip nat inside source list natinet pool main pool overload
                                     ^
% Invalid input detected at '^' marker.

msk-donskaya-baisaev-gw-1(config)#ip nat inside source list natinet pool main-pool overload
msk-donskaya-baisaev-gw-1(config)#int f0/0.3
msk-donskaya-baisaev-gw-1(config-subif)#ip nat inside
msk-donskaya-baisaev-gw-1(config-subif)#interface f0/0.101
msk-donskaya-baisaev-gw-1(config-subif)#ip nat inside
msk-donskaya-baisaev-gw-1(config-subif)#exit
msk-donskaya-baisaev-gw-1(config)#interface f0/0.102
msk-donskaya-baisaev-gw-1(config-subif)#ip nat inside
msk-donskaya-baisaev-gw-1(config-subif)#exit
msk-donskaya-baisaev-gw-1(config)#interface f0/0.103
msk-donskaya-baisaev-gw-1(config-subif)#ip nat inside
msk-donskaya-baisaev-gw-1(config-subif)#exit
msk-donskaya-baisaev-gw-1(config)#interface f0/0.104
msk-donskaya-baisaev-gw-1(config-subif)#ip nat inside
msk-donskaya-baisaev-gw-1(config-subif)#exit
msk-donskaya-baisaev-gw-1(config)#interface f0/1.4
msk-donskaya-baisaev-gw-1(config-subif)#ip nat outside
msk-donskaya-baisaev-gw-1(config-subif)#exit
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#
```

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The screenshot shows a Windows Command Prompt window with the title bar 'admin-donskaya-baisaev'. The window has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes', with 'Desktop' currently selected. The Command Prompt displays the following text:

```
Reply from 198.51.100.1: Destination host unreachable.
Reply from 198.51.100.1: Destination host unreachable.
Reply from 198.51.100.1: Destination host unreachable.
Reply from 198.51.100.1: Destination host unreachable.

Ping statistics for 198.0.2.11:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 198.51.100.2

Pinging 198.51.100.2 with 32 bytes of data:

Reply from 198.51.100.2: bytes=32 time<1ms TTL=255
Reply from 198.51.100.2: bytes=32 time<1ms TTL=255
Reply from 198.51.100.2: bytes=32 time<1ms TTL=255
Reply from 198.51.100.2: bytes=32 time<1ms TTL=255

Ping statistics for 198.51.100.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 198.51.100.1

Pinging 198.51.100.1 with 32 bytes of data:

Reply from 198.51.100.1: bytes=32 time<1ms TTL=254
Reply from 198.51.100.1: bytes=32 time<1ms TTL=254
Reply from 198.51.100.1: bytes=32 time<1ms TTL=254
Reply from 198.51.100.1: bytes=32 time<1ms TTL=254

Ping statistics for 198.51.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 198.0.2.11

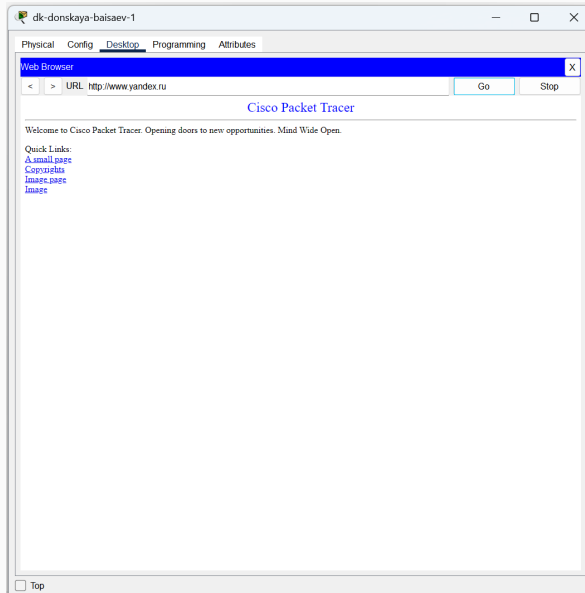
Pinging 198.0.2.11 with 32 bytes of data:

Reply from 198.51.100.1: Destination host unreachable.
Reply from 198.51.100.1: Destination host unreachable.
Reply from 198.51.100.1: Destination host unreachable.
Reply from 198.51.100.1: Destination host unreachable.

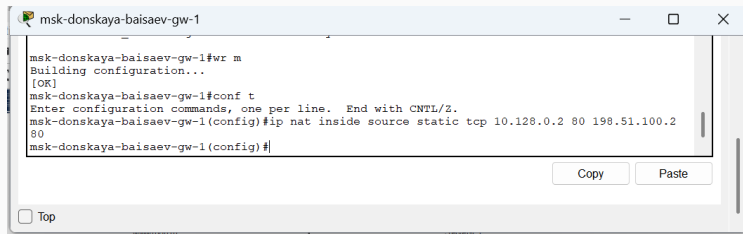
Ping statistics for 198.0.2.11:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

At the bottom left of the window, there is a checkbox labeled 'Top' which is currently unchecked.



Настройка доступа из Интернета



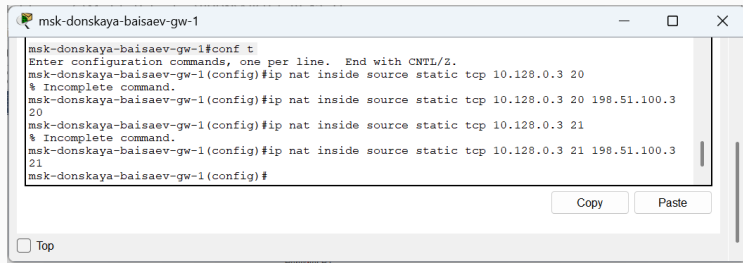
```
msk-donskaya-baisaev-gw-1
msk-donskaya-baisaev-gw-1#wr m
Building configuration...
[OK]
msk-donskaya-baisaev-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.2 80 198.51.100.2
80
msk-donskaya-baisaev-gw-1(config)#
```

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Figure 18: Настройка доступа из Интернета (WWW-сервер).

Настройка доступа из Интернета



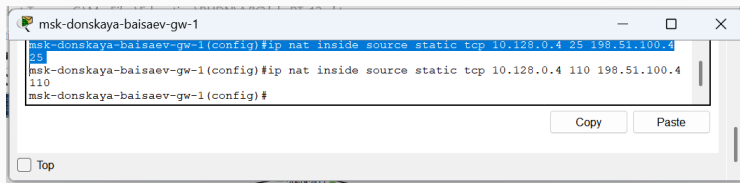
```
msk-donskaya-baisaev-gw-1
msk-donskaya-baisaev-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.3 20
% Incomplete command.
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.3 20 198.51.100.3
20
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.3 21
% Incomplete command.
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.3 21 198.51.100.3
21
msk-donskaya-baisaev-gw-1(config)#
```

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Figure 19: Настройка доступа из Интернета (файловый сервер).

Настройка доступа из Интернета



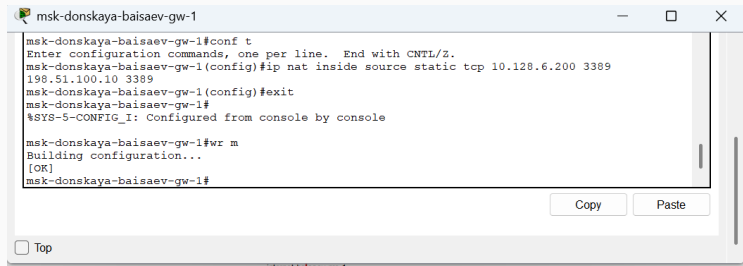
The screenshot shows a terminal window titled "msk-donskaya-baisaev-gw-1". The terminal displays the following commands and output:

```
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.4 25 198.51.100.4
25
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.0.4 110 198.51.100.4
110
msk-donskaya-baisaev-gw-1(config)#
```

Below the terminal output, there are two buttons: "Copy" and "Paste". At the bottom left of the window, there is a checkbox labeled "Top".

Figure 20: Настройка доступа из Интернета (почтовый сервер).

Настройка доступа из Интернета



```
msk-donskaya-baisaev-gw-1
msk-donskaya-baisaev-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip nat inside source static tcp 10.128.6.200 3389
198.51.100.10 3389
msk-donskaya-baisaev-gw-1(config)#exit
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#
```

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Figure 21: Настройка доступа из Интернета (доступ по RDP).

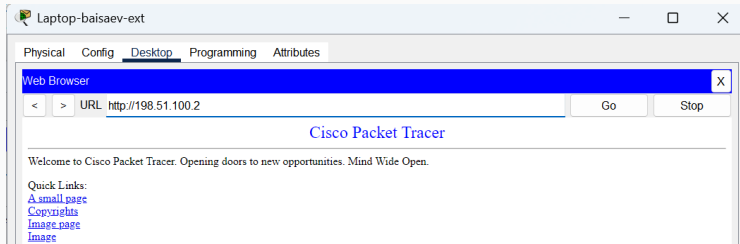


Figure 22: Проверка

В ходе выполнения лабораторной работы мы приобрели практические навыки по настройке доступа локальной сети к внешней сети посредством NAT.