

# Лабораторная работа №12

Настройка NAT.

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НПИБД-01-22

# Новый проект

Имя файла: lab\_PT-12.pkt

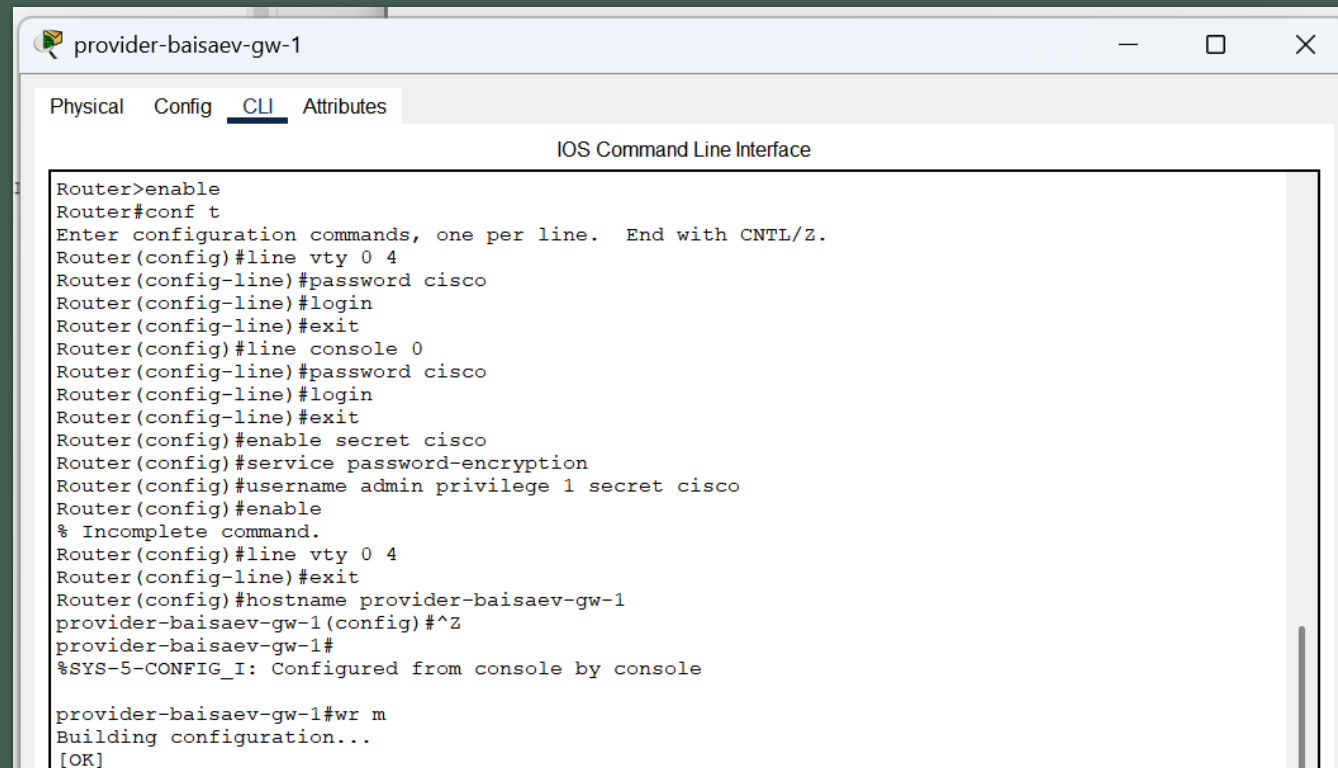
Тип файла: Cisco Packet Tracer Activity File (\*.pkt)

^ Скрыть папки

Сохранить Отмена

Рис. 1.1. Открытие проекта lab\_PT-12.pkt.

# Первоначальная настройка

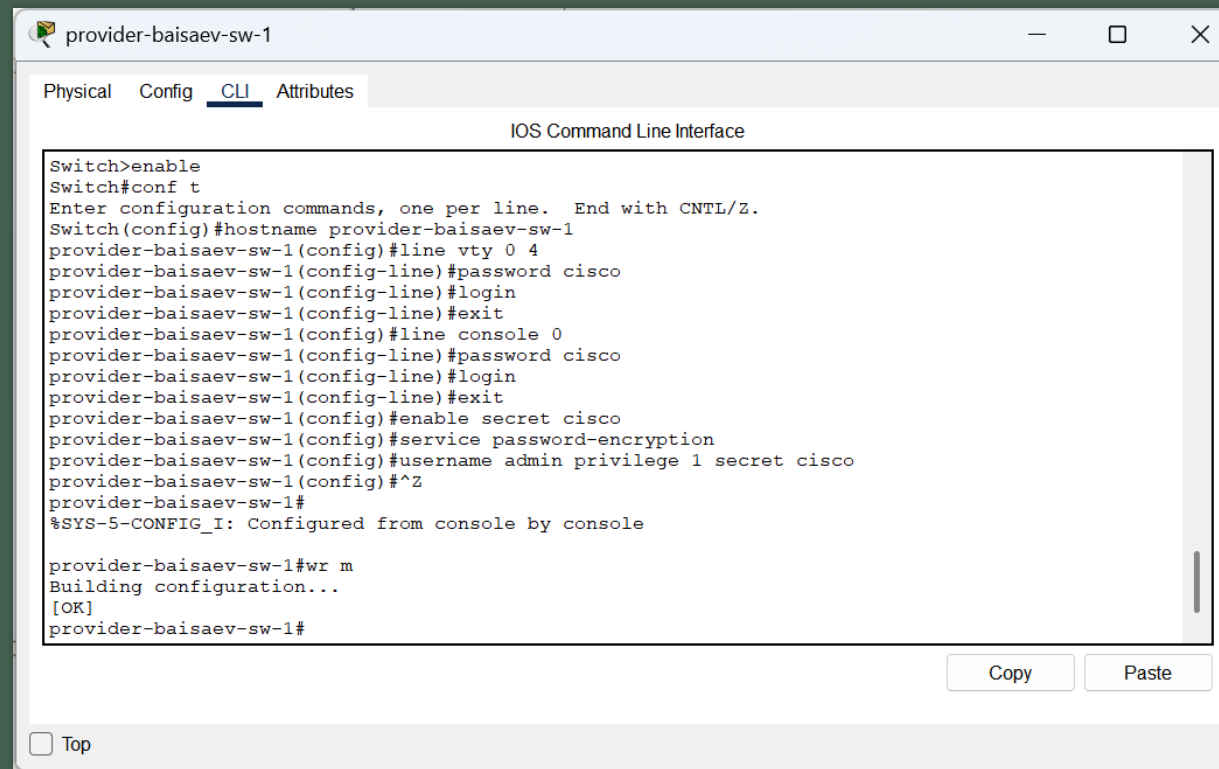


```
provider-baisaev-gw-1
Physical Config CLI Attributes
IOS Command Line Interface
Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#line vty 0 4
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#exit
Router(config)#line 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]
```

**Рис. 1.2.** Первоначальная настройка маршрутизатора provider-baisaev-gw-1 (присвоение имени, настройка доступа по паролю и др.).

# Первоначальная настройка



The screenshot shows a web-based configuration interface for a network switch. The window title is "provider-baisaev-sw-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 in a terminal window, including enabling the switch, entering configuration mode, setting the hostname to "provider-baisaev-sw-1", configuring VTY and console lines with passwords, enabling secret storage, and setting up a local user "admin" with privilege level 1. The configuration is saved to the startup configuration file.

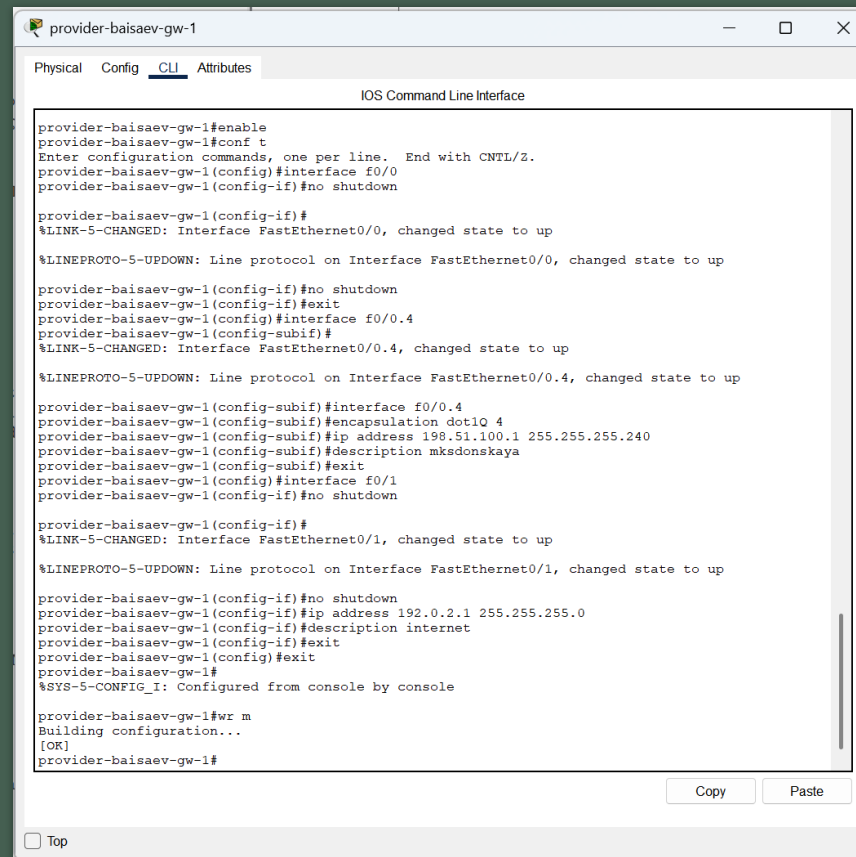
```
Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname provider-baisaev-sw-1
provider-baisaev-sw-1(config)#line vty 0 4
provider-baisaev-sw-1(config-line)#password cisco
provider-baisaev-sw-1(config-line)#login
provider-baisaev-sw-1(config-line)#exit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

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

At the bottom of the CLI window, there are "Copy" and "Paste" buttons. Below the CLI window, there is a "Top" button.

Рис. 1.3. 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

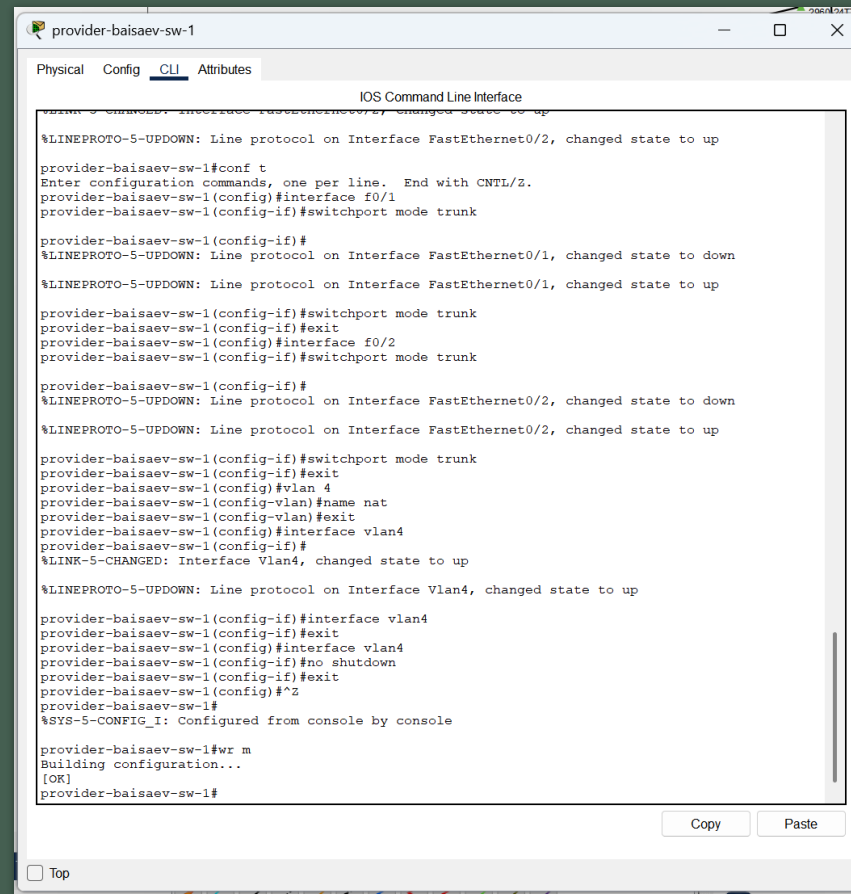
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

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#
```

Рис. 1.4. Настройка интерфейсов маршрутизатора provider-baisaev-gw-1.

# Настройка интерфейсов



```
provider-baisaev-sw-1#
%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#
```

Рис. 1.5. Настройка интерфейсов коммутатора provider-baisaev-sw-1.

# Проверка

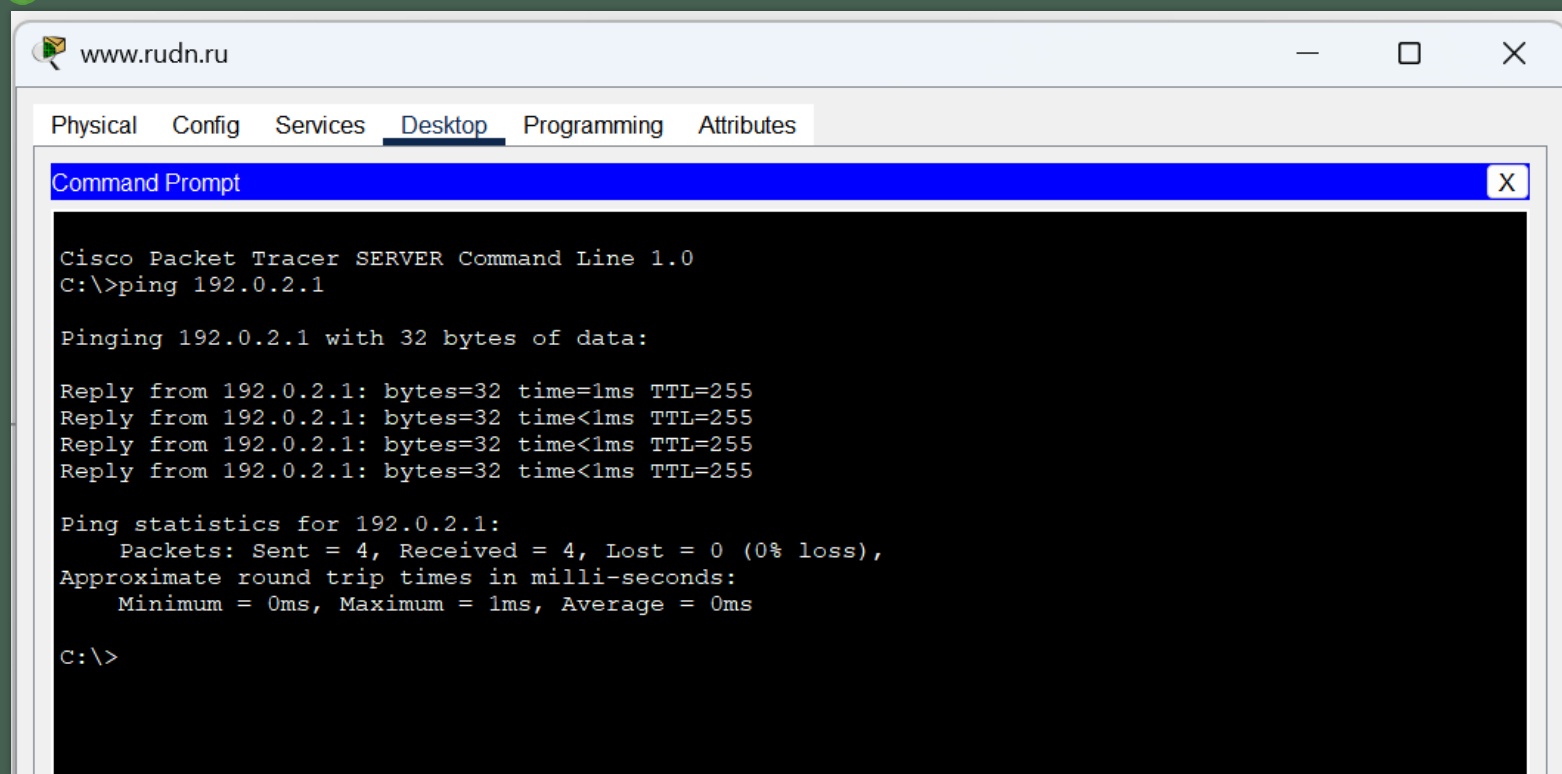
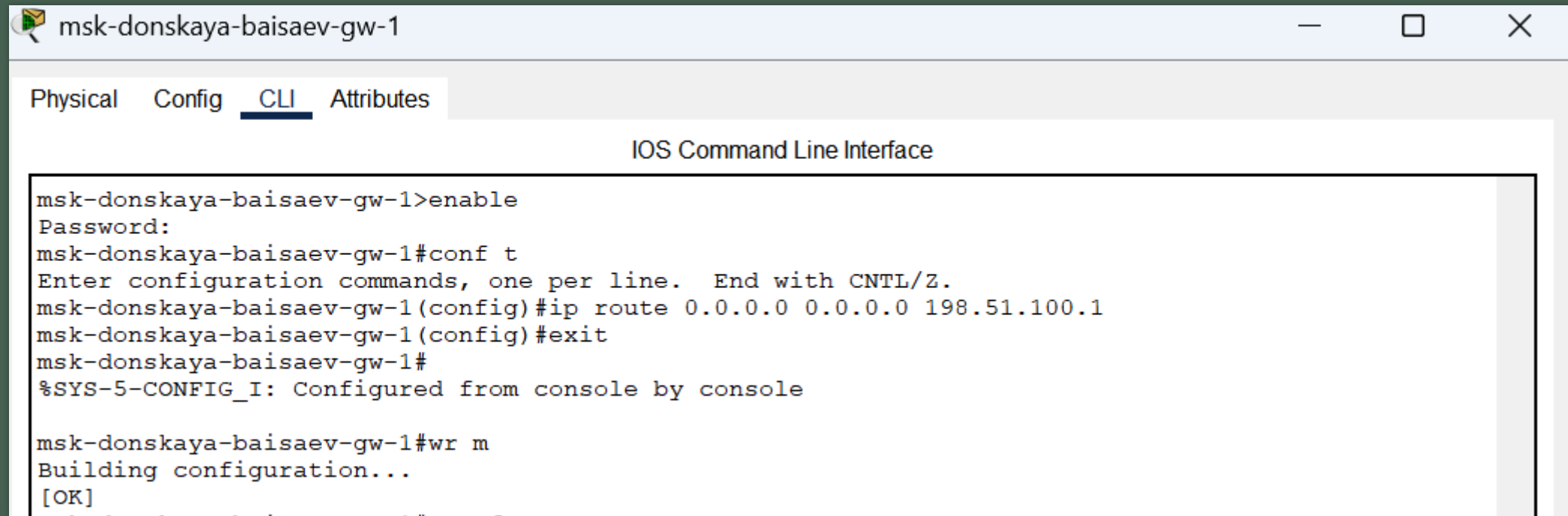


Рис. 1.6. Проверка командой ping с сервера www.rudn.ru на роутер провайдера.

# Настройка интерфейсов



The screenshot shows a window titled "msk-donskaya-baisaev-gw-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 sequence of commands and responses:

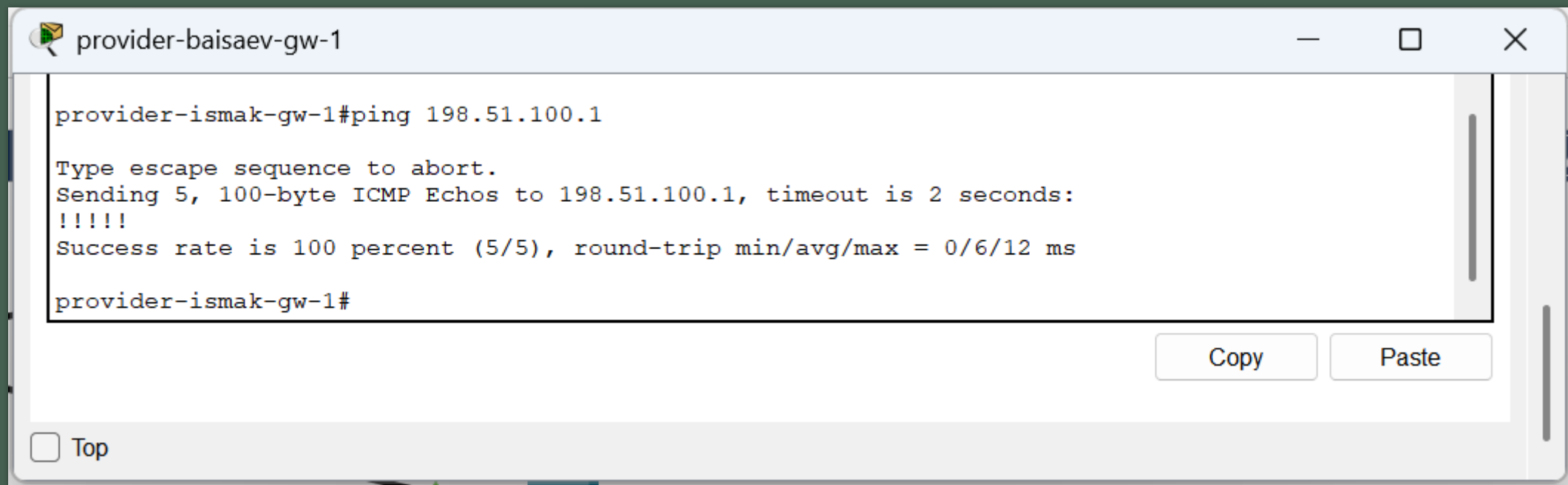
```
msk-donskaya-baisaev-gw-1>enable
Password:
msk-donskaya-baisaev-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-baisaev-gw-1(config)#ip route 0.0.0.0 0.0.0.0 198.51.100.1
msk-donskaya-baisaev-gw-1(config)#exit
msk-donskaya-baisaev-gw-1#
%SYS-5-CONFIG_I: Configured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

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

**Рис. 1.7.** Настройка интерфейсов маршрутизатора msk-donskaya-baisaev-gw-1 для доступа к сети провайдера.



# Проверка



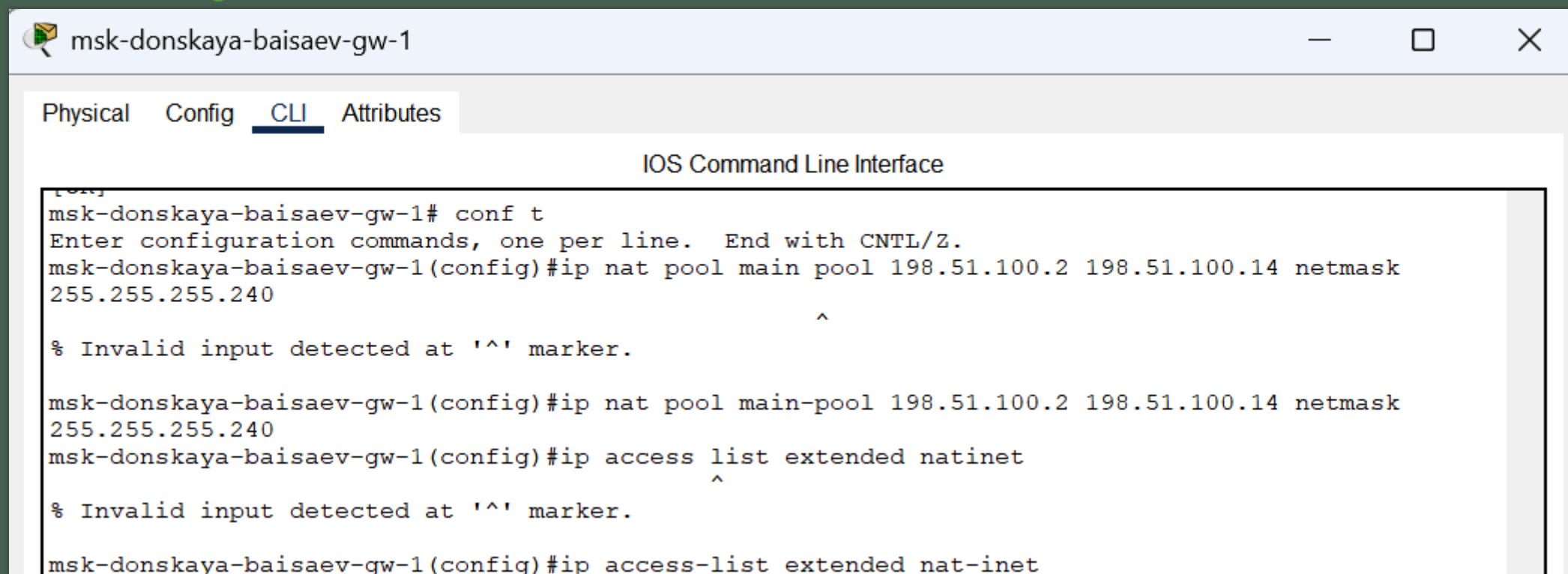
The screenshot shows a terminal window with the title bar 'provider-baisaev-gw-1'. The terminal content is as follows:

```
provider-ismak-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 = 0/6/12 ms  
provider-ismak-gw-1#
```

At the bottom of the terminal window, there are two buttons labeled 'Copy' and 'Paste', and a checkbox labeled 'Top'.

Рис. 1.8. 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 under the 'Config' section. The interface displays the 'IOS Command Line Interface' with a text area containing the following commands and responses:

```
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
```

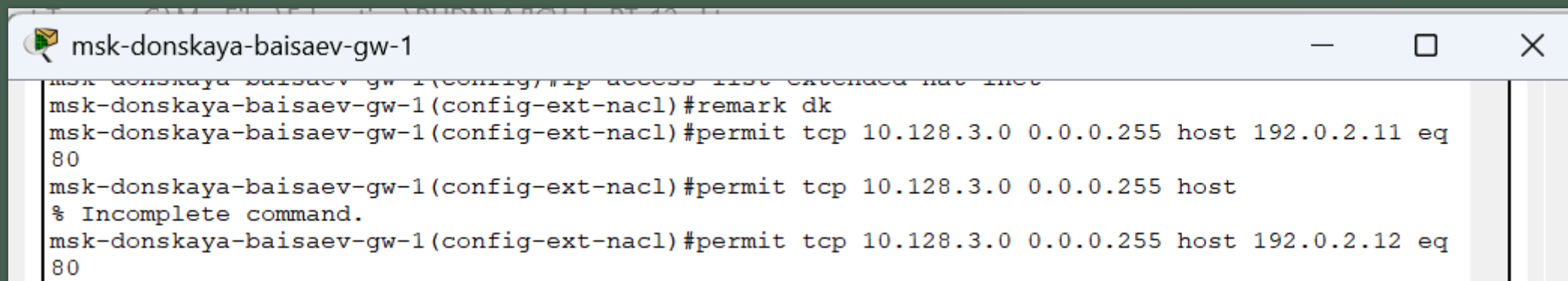
Рис. 1.9. Настройка пула адресов для NAT.

# Настройка списка доступа

```
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
```

Рис. 1.10. Настройка списка доступа для NAT.

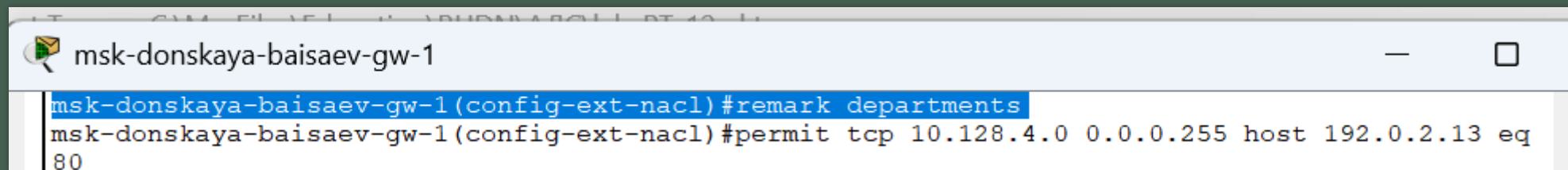
# Сеть



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

**Рис. 1.11.** Сеть дисплейных классов (имеют доступ только к сайтам, необходимым для учёбы ([www.yandex.ru](http://www.yandex.ru) (192.0.2.11), [stud.rudn.university](http://stud.rudn.university) (192.0.2.12))).

# Сеть

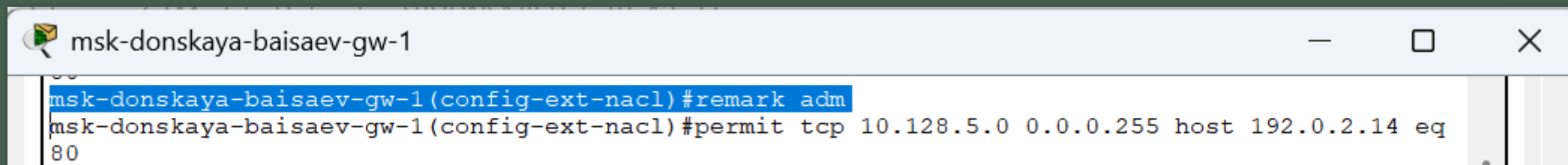


The image shows a terminal window titled "msk-donskaya-baisaev-gw-1". The terminal displays two lines of configuration commands in a blue monospaced font. The first line is "msk-donskaya-baisaev-gw-1(config-ext-nacl)#remark departments", where the entire line is highlighted with a blue background. The second line is "msk-donskaya-baisaev-gw-1(config-ext-nacl)#permit tcp 10.128.4.0 0.0.0.255 host 192.0.2.13 eq 80", where the text "msk-donskaya-baisaev-gw-1" is highlighted in blue and "80" is on a new line.

```
msk-donskaya-baisaev-gw-1
msk-donskaya-baisaev-gw-1(config-ext-nacl)#remark departments
msk-donskaya-baisaev-gw-1(config-ext-nacl)#permit tcp 10.128.4.0 0.0.0.255 host 192.0.2.13 eq
80
```

**Рис. 1.12.** Сеть кафедр (работает только с образовательными сайтами (esystem.pfur.ru (192.0.2.13))).

# Сеть

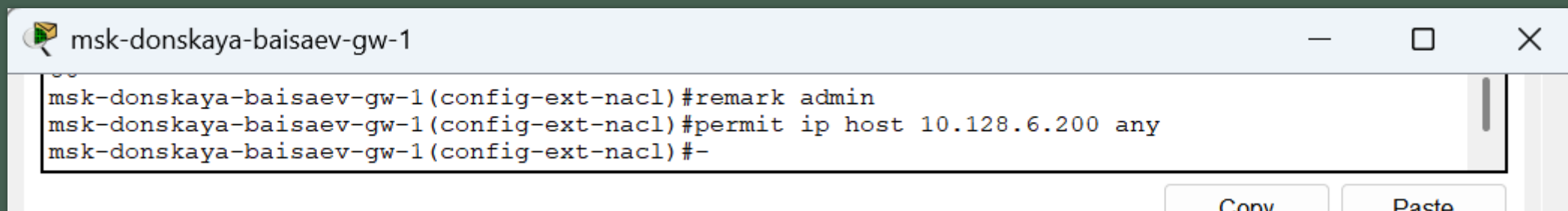


The image shows a terminal window titled "msk-donskaya-baisaev-gw-1". The terminal displays two commands being entered in a configuration mode. The first command is `remark adm`, and the second is `permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq 80`. The text is displayed in a monospaced font, typical of network device command-line interfaces.

```
msk-donskaya-baisaev-gw-1 (config-ext-nacl)#remark adm
msk-donskaya-baisaev-gw-1 (config-ext-nacl)#permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq
80
```

**Рис. 1.13.** Сеть администрации (имеет возможность работать только с сайтом университета (www.rudn.ru (192.0.2.14))).

# Сеть

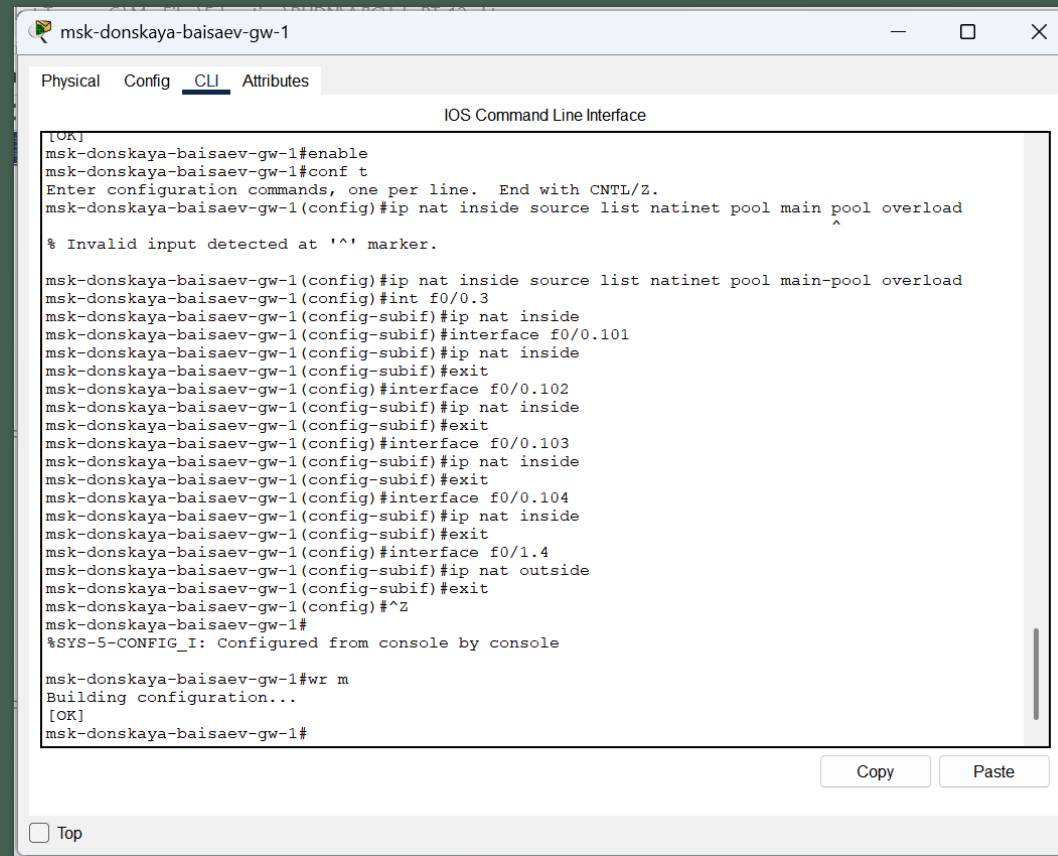


The image shows a terminal window titled "msk-donskaya-baisaev-gw-1". The terminal displays three lines of configuration commands in a Cisco IOS style. The first line is a remark, the second is a permit statement for a specific IP, and the third is the end-of-command character. Below the terminal window, there are "Copy" and "Paste" buttons.

```
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)#-
```

**Рис. 1.14.** Доступ для компьютера администратора (в сети для других пользователей компьютер администратора имеет полный доступ в Интернет. Другие не имеют доступа.).

# Настройка



The screenshot shows a network configuration window titled "msk-donskaya-baisaev-gw-1". It has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" selected. The main area is labeled "IOS Command Line Interface" and contains a text box with the following commands and output:

```
[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

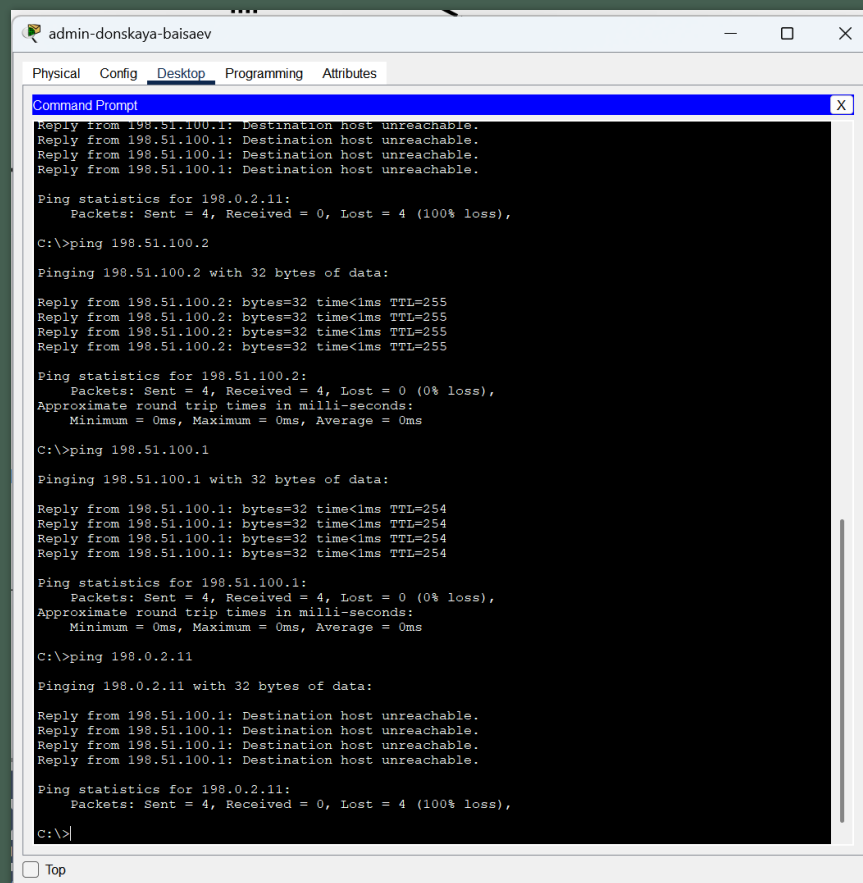
msk-donskaya-baisaev-gw-1#wr m
Building configuration...
[OK]
msk-donskaya-baisaev-gw-1#
```

At the bottom right of the window are "Copy" and "Paste" buttons. At the bottom left is a "Top" button with a checkbox.

Рис. 1.15. Настройка NAT (Port Address Translation и интерфейсов для NAT).



# Проверка



The screenshot shows a Windows Command Prompt window titled "admin-donskaya-baisaev". The window has tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes", with "Desktop" currently selected. The Command Prompt displays the results of several ping commands. The first command, "ping 198.51.100.1", shows four failed replies with the message "Destination host unreachable." and statistics indicating 100% loss. The second command, "ping 198.51.100.2", shows four successful replies with 0% loss. The third command, "ping 198.51.100.1", also shows four successful replies with 0% loss. The fourth command, "ping 198.0.2.11", shows four failed replies with the message "Destination host unreachable." and statistics indicating 100% loss. The prompt is currently at "C:\>".

```
admin-donskaya-baisaev
Physical Config Desktop Programming Attributes
Command Prompt
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:\>
```

Рис. 1.16. Проверка.

# Проверка

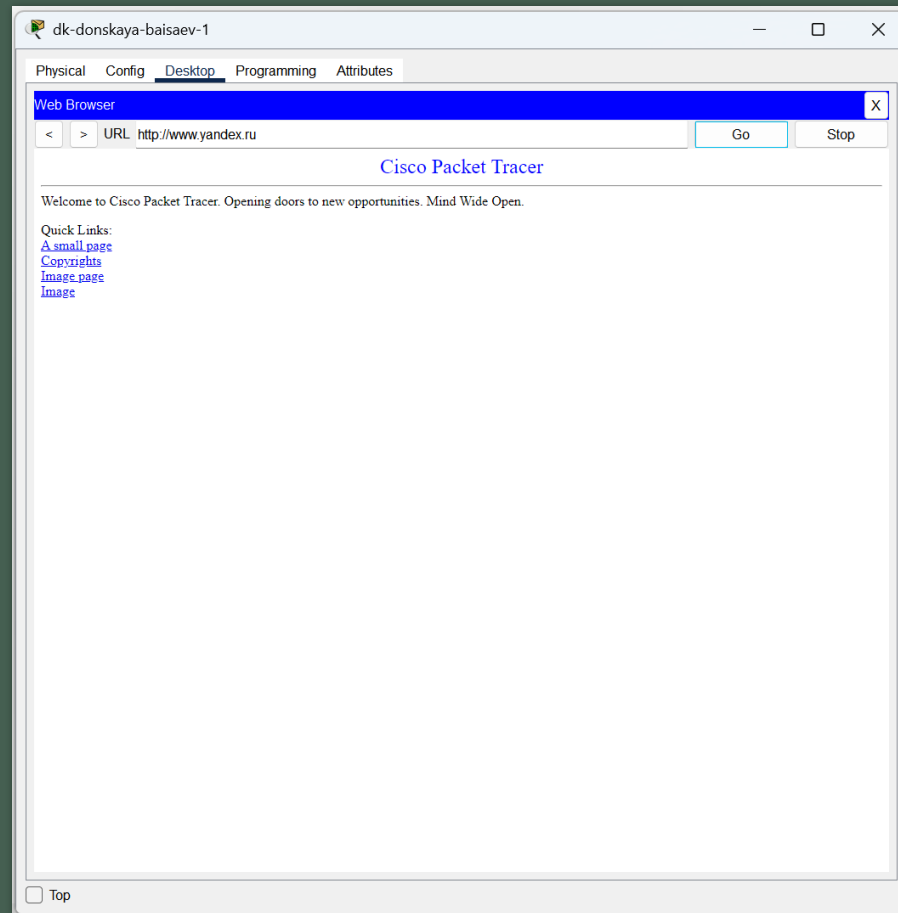


Рис. 1.17. Проверка.

# Настройка доступа из Интернета

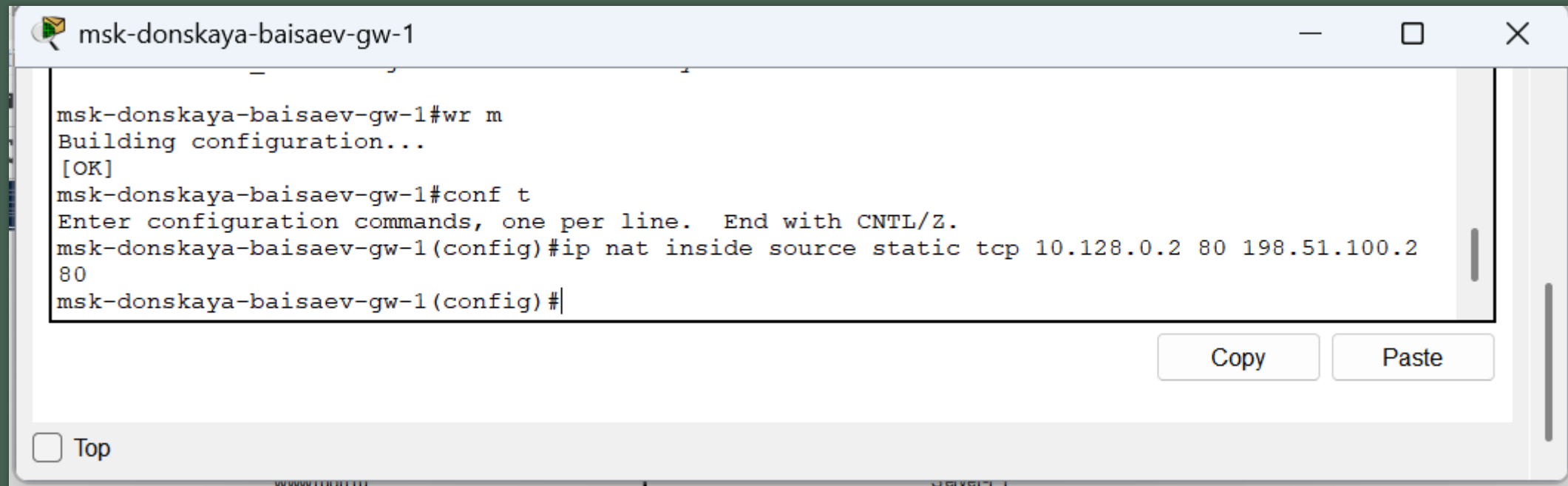
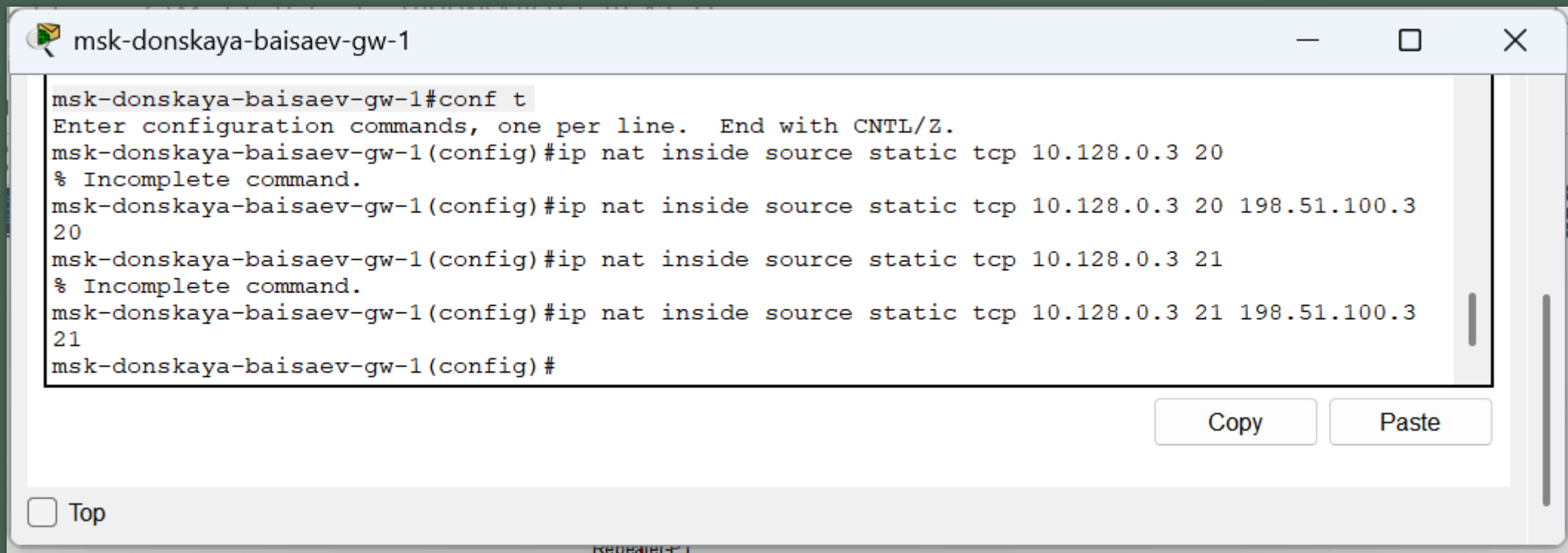


Рис. 1.18. Настройка доступа из Интернета (WWW-сервер).

# 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#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)#
```

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

Рис. 1.19. Настройка доступа из Интернета (файловый сервер).

# Настройка доступа из Интернета

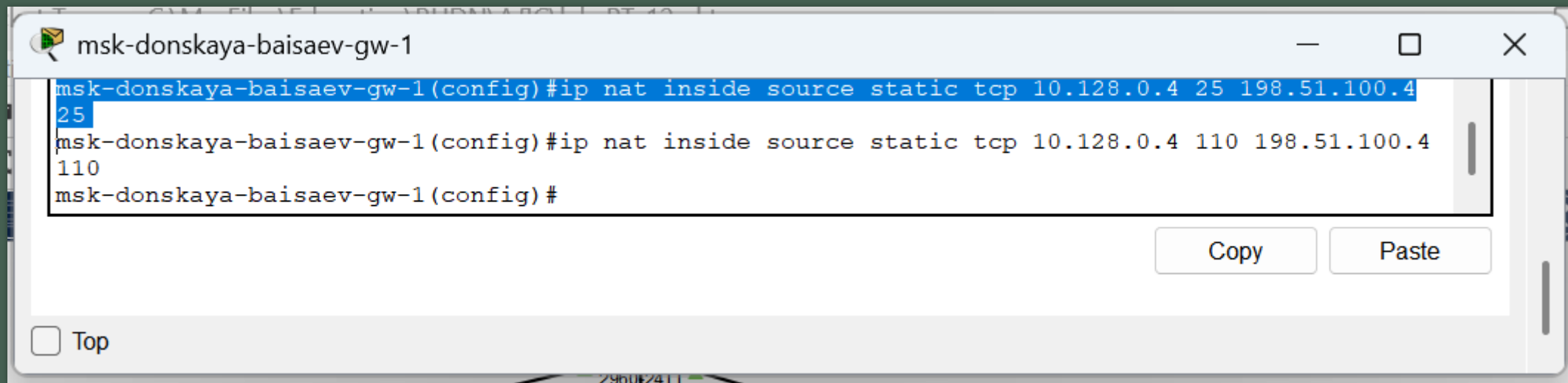
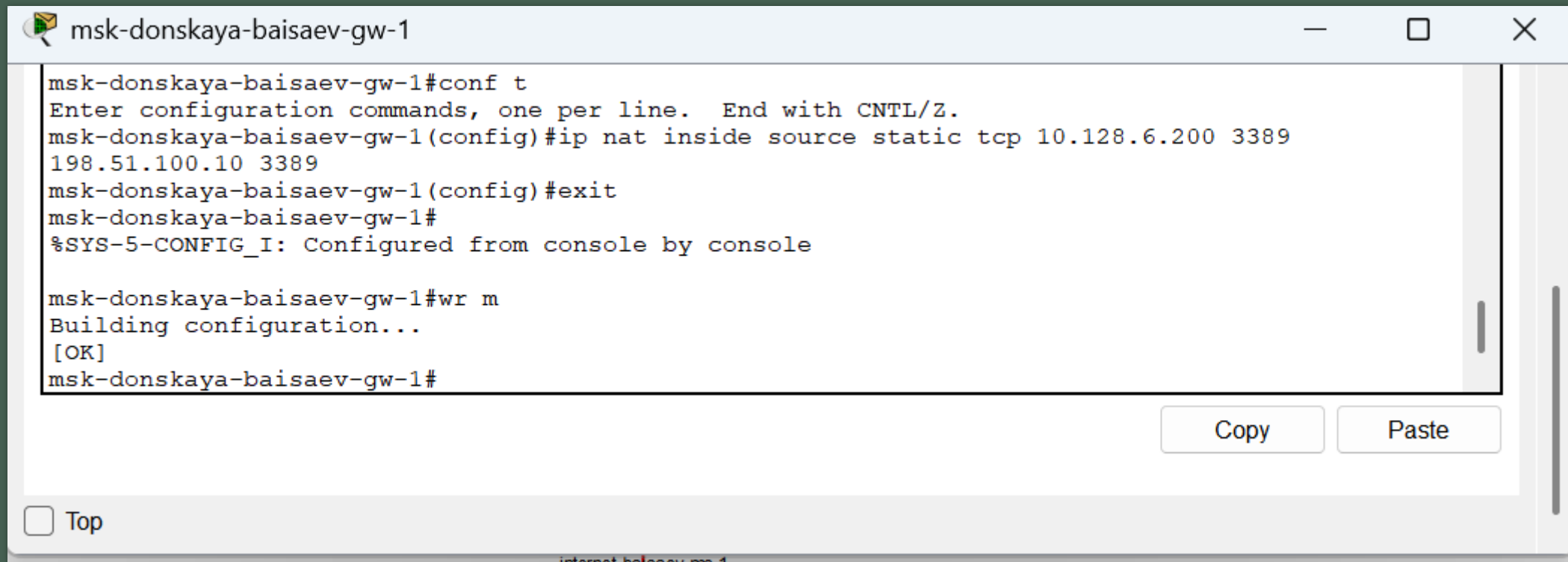


Рис. 1. 20. Настройка доступа из Интернета (почтовый сервер).

# 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#
```

Copy Paste

☐ Top

Рис. 1.21. Настройка доступа из Интернета (доступ по RDP).

# Проверка

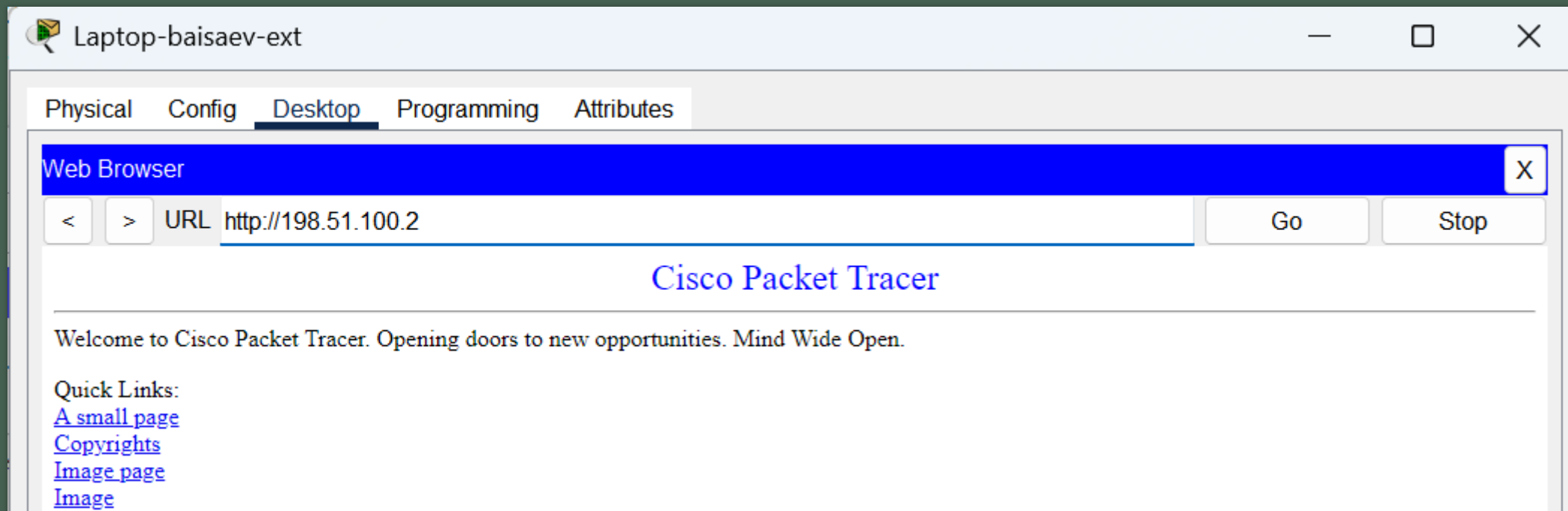


Рис. 1.22. Проверка.

# ВЫВОД

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



Спасибо за внимание!