

# Лабораторная работа №12

Настройка NAT.

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НПИБД-02-21

# Новый проект

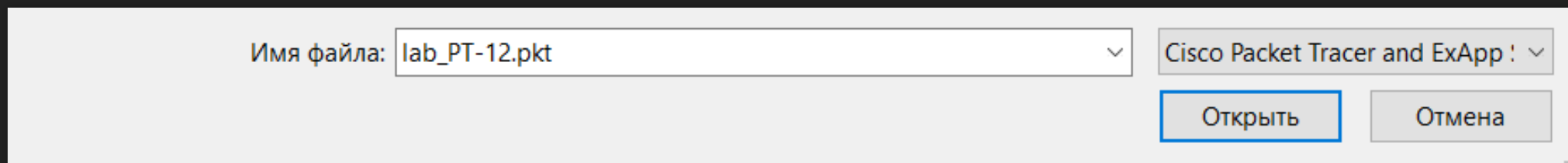
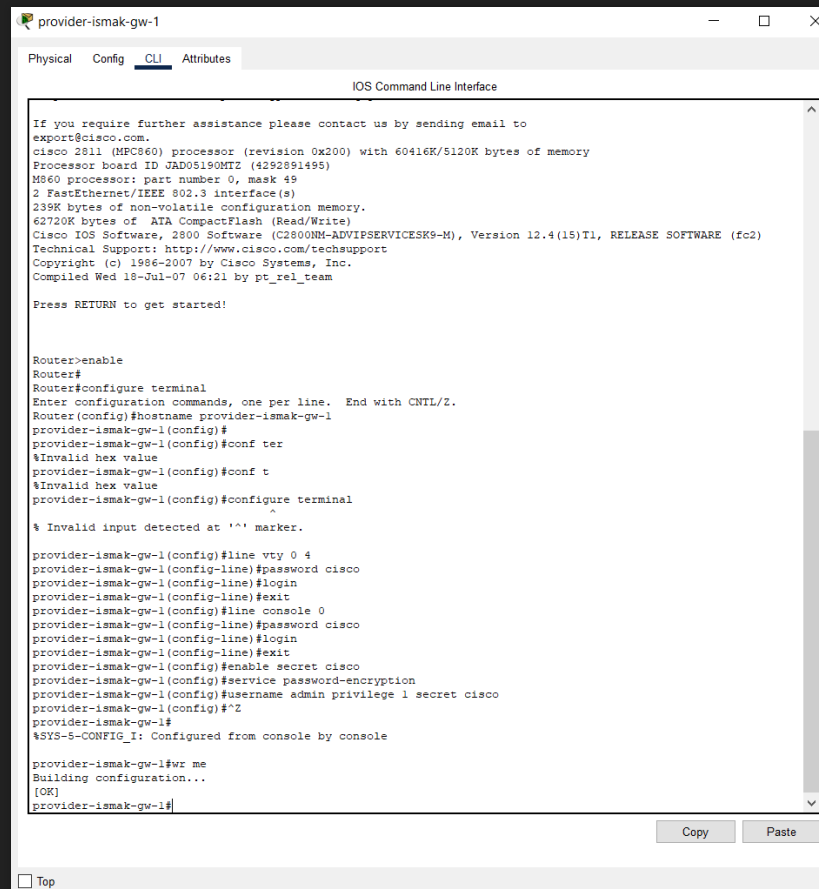


Рис. 1.1. Открытие проекта lab\_PT-12.pkt.

# Первоначальная настройка



```
provider-ismak-gw-1
Physical Config CLI Attributes
IOS Command Line Interface

If you require further assistance please contact us by sending email to
export@cisco.com.
cisco 2811 (MPC860) processor (revision 0x200) with 60416K/5120K bytes of memory
Processor board ID JAD05190MTZ (4292891495)
M860 processor: part number 0, mask 49
2 FastEthernet/IEEE 802.3 interface(s)
239K bytes of non-volatile configuration memory.
62720K bytes of ATA CompactFlash (Read/Write)
Cisco IOS Software, 2800 Software (C28000M-ADVIPSERVICESK9-M), Version 12.4(15)T1, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 18-Jul-07 06:21 by pt_rel_team

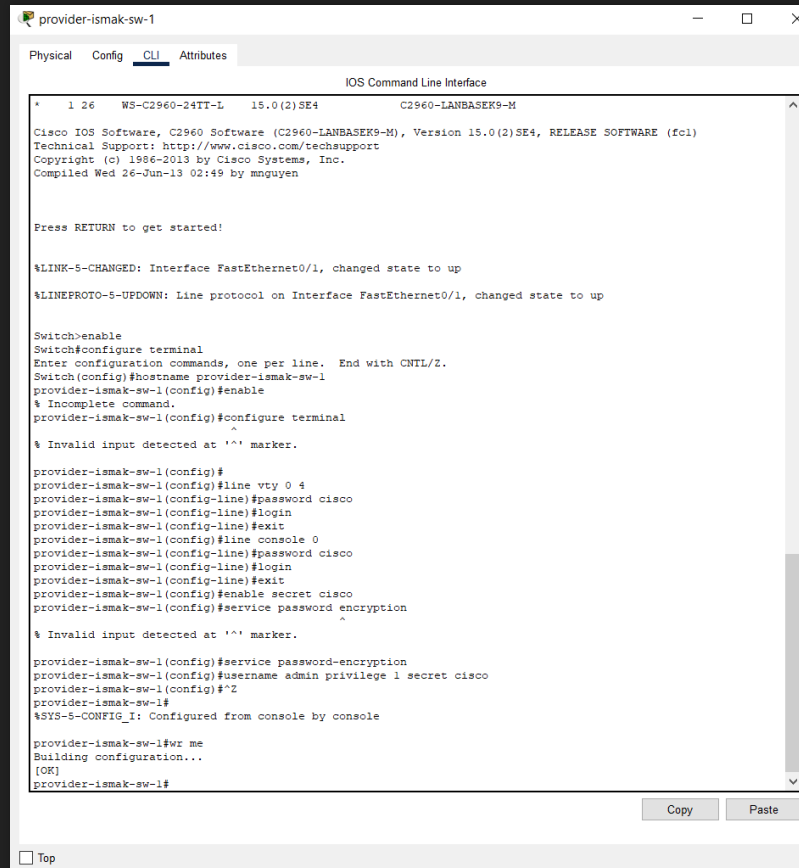
Press RETURN to get started!

Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname provider-ismak-gw-1
provider-ismak-gw-1(config)#
provider-ismak-gw-1(config)#conf ter
%Invalid hex value
provider-ismak-gw-1(config)#conf t
%Invalid hex value
provider-ismak-gw-1(config)#configure terminal
% Invalid input detected at '^' marker.
^
provider-ismak-gw-1(config)#line vty 0 4
provider-ismak-gw-1(config-line)#password cisco
provider-ismak-gw-1(config-line)#login
provider-ismak-gw-1(config-line)#exit
provider-ismak-gw-1(config)#line console 0
provider-ismak-gw-1(config-line)#password cisco
provider-ismak-gw-1(config-line)#login
provider-ismak-gw-1(config-line)#exit
provider-ismak-gw-1(config)#enable secret cisco
provider-ismak-gw-1(config)#service password-encryption
provider-ismak-gw-1(config)#username admin privilege 1 secret cisco
provider-ismak-gw-1(config)#^Z
provider-ismak-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

provider-ismak-gw-1#wr me
Building configuration...
[OK]
provider-ismak-gw-1#
```

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

# Первоначальная настройка



```
provider-ismak-sw-1
Physical Config CLI Attributes
IOS Command Line Interface
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnnguyen

Press RETURN to get started!

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

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname provider-ismak-sw-1
provider-ismak-sw-1(config)#enable
% Incomplete command.
provider-ismak-sw-1(config)#configure terminal
^
% Invalid input detected at '^' marker.

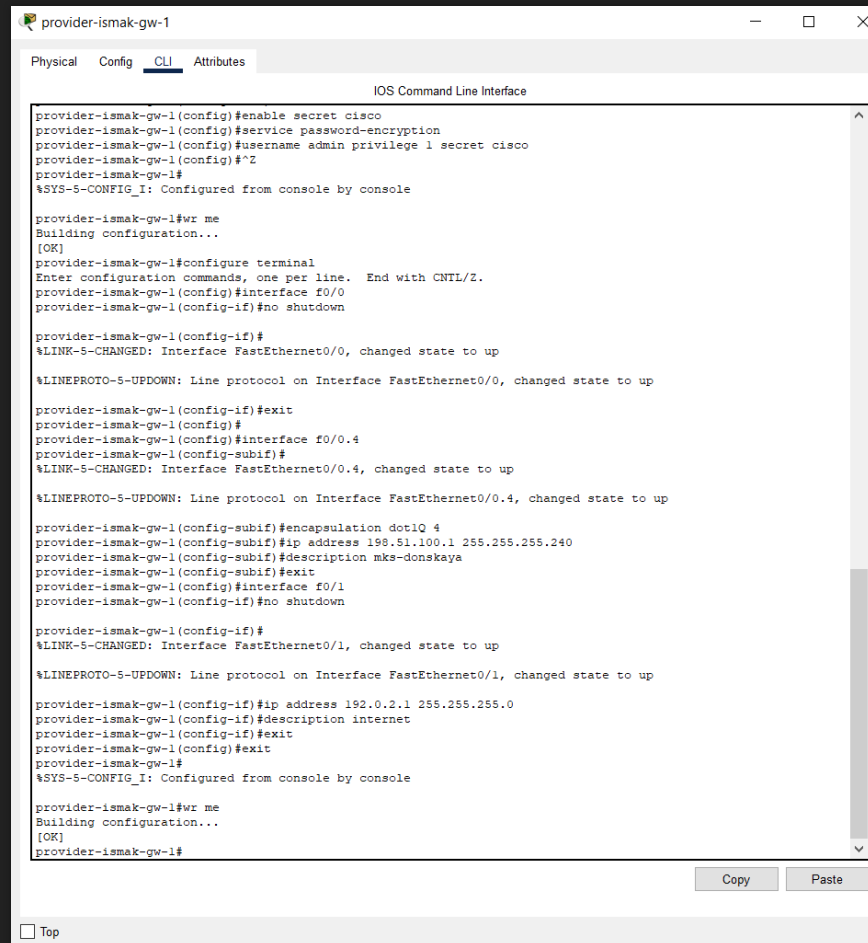
provider-ismak-sw-1(config)#
provider-ismak-sw-1(config)#line vty 0 4
provider-ismak-sw-1(config-line)#password cisco
provider-ismak-sw-1(config-line)#login
provider-ismak-sw-1(config-line)#exit
provider-ismak-sw-1(config)#line console 0
provider-ismak-sw-1(config-line)#password cisco
provider-ismak-sw-1(config-line)#login
provider-ismak-sw-1(config-line)#exit
provider-ismak-sw-1(config)#enable secret cisco
provider-ismak-sw-1(config)#service password encryption
^
% Invalid input detected at '^' marker.

provider-ismak-sw-1(config)#service password-encryption
provider-ismak-sw-1(config)#username admin privilege 1 secret cisco
provider-ismak-sw-1(config)#^Z
%SYS-5-CONFIG_I: Configured from console by console

provider-ismak-sw-1#wr me
Building configuration...
[OK]
provider-ismak-sw-1#
```

Рис. 1.3. Первоначальная настройка коммутатора provider-ismak-sw-1 (присвоение имени, настройка доступа по паролю и др.).

# Настройка интерфейсов



```
provider-ismak-gw-1
Physical Config CLI Attributes
IOS Command Line Interface

provider-ismak-gw-1(config)#enable secret cisco
provider-ismak-gw-1(config)#service password-encryption
provider-ismak-gw-1(config)#username admin privilege 1 secret cisco
provider-ismak-gw-1(config)#^Z
provider-ismak-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

provider-ismak-gw-1#wr me
Building configuration...
[OK]
provider-ismak-gw-1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
provider-ismak-gw-1(config)#interface f0/0
provider-ismak-gw-1(config-if)#no shutdown

provider-ismak-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-ismak-gw-1(config-if)#exit
provider-ismak-gw-1(config)#
provider-ismak-gw-1(config)#interface f0/0.4
provider-ismak-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-ismak-gw-1(config-subif)#encapsulation dot1Q 4
provider-ismak-gw-1(config-subif)#ip address 198.51.100.1 255.255.255.240
provider-ismak-gw-1(config-subif)#description mks-donskaya
provider-ismak-gw-1(config-subif)#exit
provider-ismak-gw-1(config)#interface f0/1
provider-ismak-gw-1(config-if)#no shutdown

provider-ismak-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-ismak-gw-1(config-if)#ip address 192.0.2.1 255.255.255.0
provider-ismak-gw-1(config-if)#description internet
provider-ismak-gw-1(config-if)#exit
provider-ismak-gw-1(config)#exit
provider-ismak-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

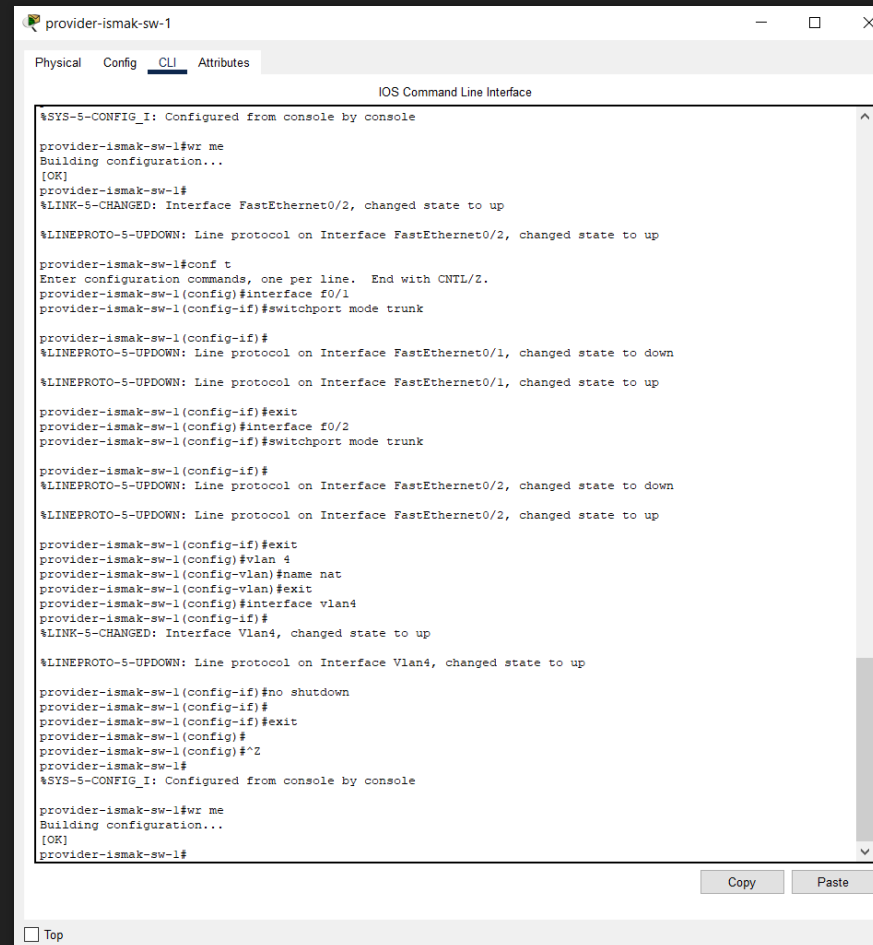
provider-ismak-gw-1#wr me
Building configuration...
[OK]
provider-ismak-gw-1#
```

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

# Настройка интерфейсов



```
%SYS-5-CONFIG_I: Configured from console by console
provider-ismak-sw-1#wr me
Building configuration...
[OK]
provider-ismak-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-ismak-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
provider-ismak-sw-1(config)#interface f0/1
provider-ismak-sw-1(config-if)#switchport mode trunk

provider-ismak-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-ismak-sw-1(config-if)#exit
provider-ismak-sw-1(config)#interface f0/2
provider-ismak-sw-1(config-if)#switchport mode trunk

provider-ismak-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-ismak-sw-1(config-if)#exit
provider-ismak-sw-1(config)#vlan 4
provider-ismak-sw-1(config-vlan)#name nat
provider-ismak-sw-1(config-vlan)#exit
provider-ismak-sw-1(config)#interface vlan4
provider-ismak-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-ismak-sw-1(config-if)#no shutdown
provider-ismak-sw-1(config-if)#
provider-ismak-sw-1(config-if)#exit
provider-ismak-sw-1(config)#
provider-ismak-sw-1(config)#^Z
provider-ismak-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
provider-ismak-sw-1#wr me
Building configuration...
[OK]
provider-ismak-sw-1#
```

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

# Проверка

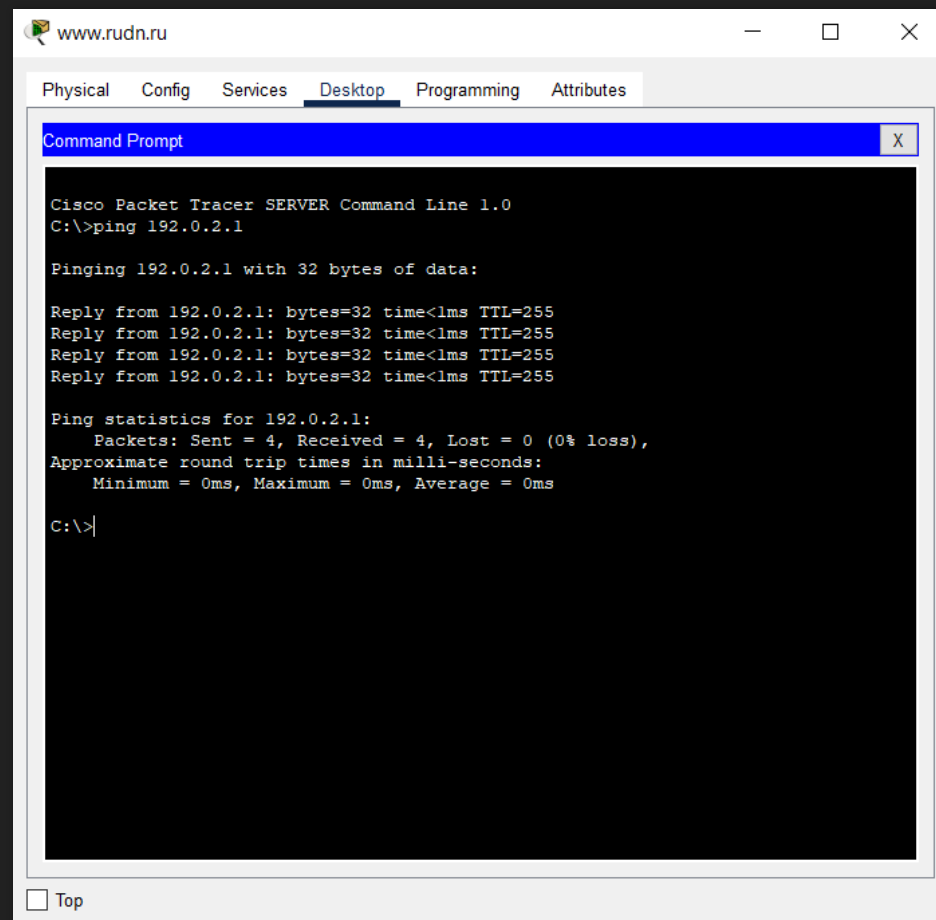
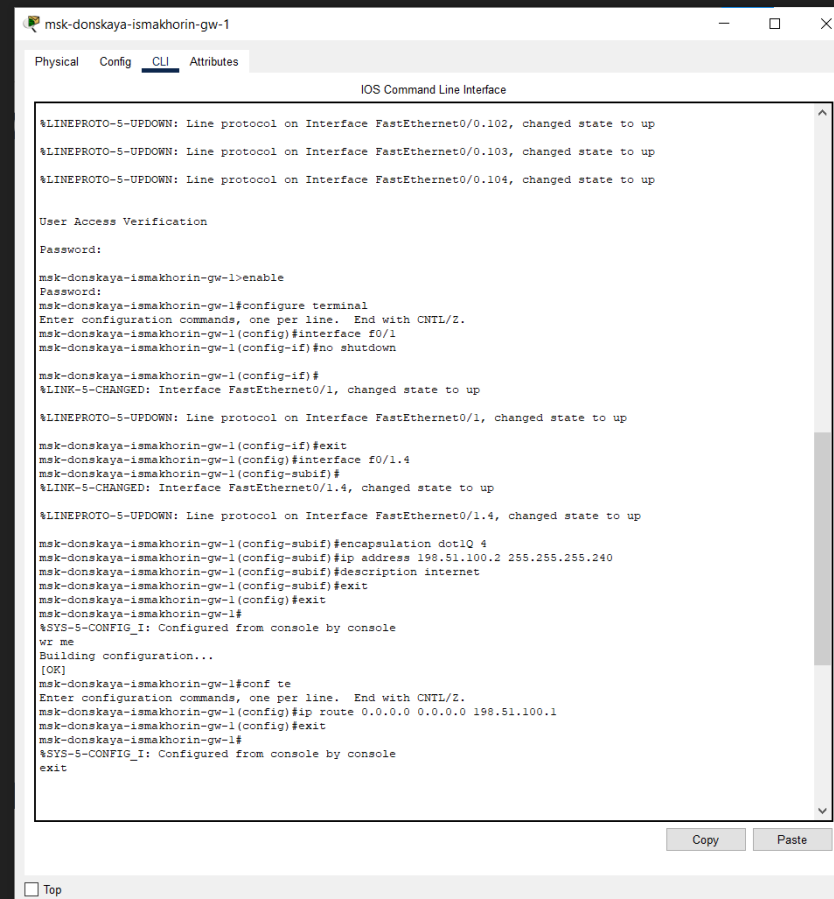


Рис. 1.6. Проверка командой ping с сервера www.rudn.ru на роутер провайдера.

# Настройка интерфейсов



The screenshot shows a window titled "msk-donskaya-ismakhorin-gw-1" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The interface shows a series of configuration commands and their outputs. The commands are entered in a terminal-like environment, and the outputs show the status of the interfaces and the configuration process.

```
msk-donskaya-ismakhorin-gw-1>enable
msk-donskaya-ismakhorin-gw-1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-ismakhorin-gw-1(config)#interface f0/1
msk-donskaya-ismakhorin-gw-1(config-if)#no shutdown

msk-donskaya-ismakhorin-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

msk-donskaya-ismakhorin-gw-1(config-if)#exit
msk-donskaya-ismakhorin-gw-1(config)#interface f0/1.4
msk-donskaya-ismakhorin-gw-1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.4, changed state to up

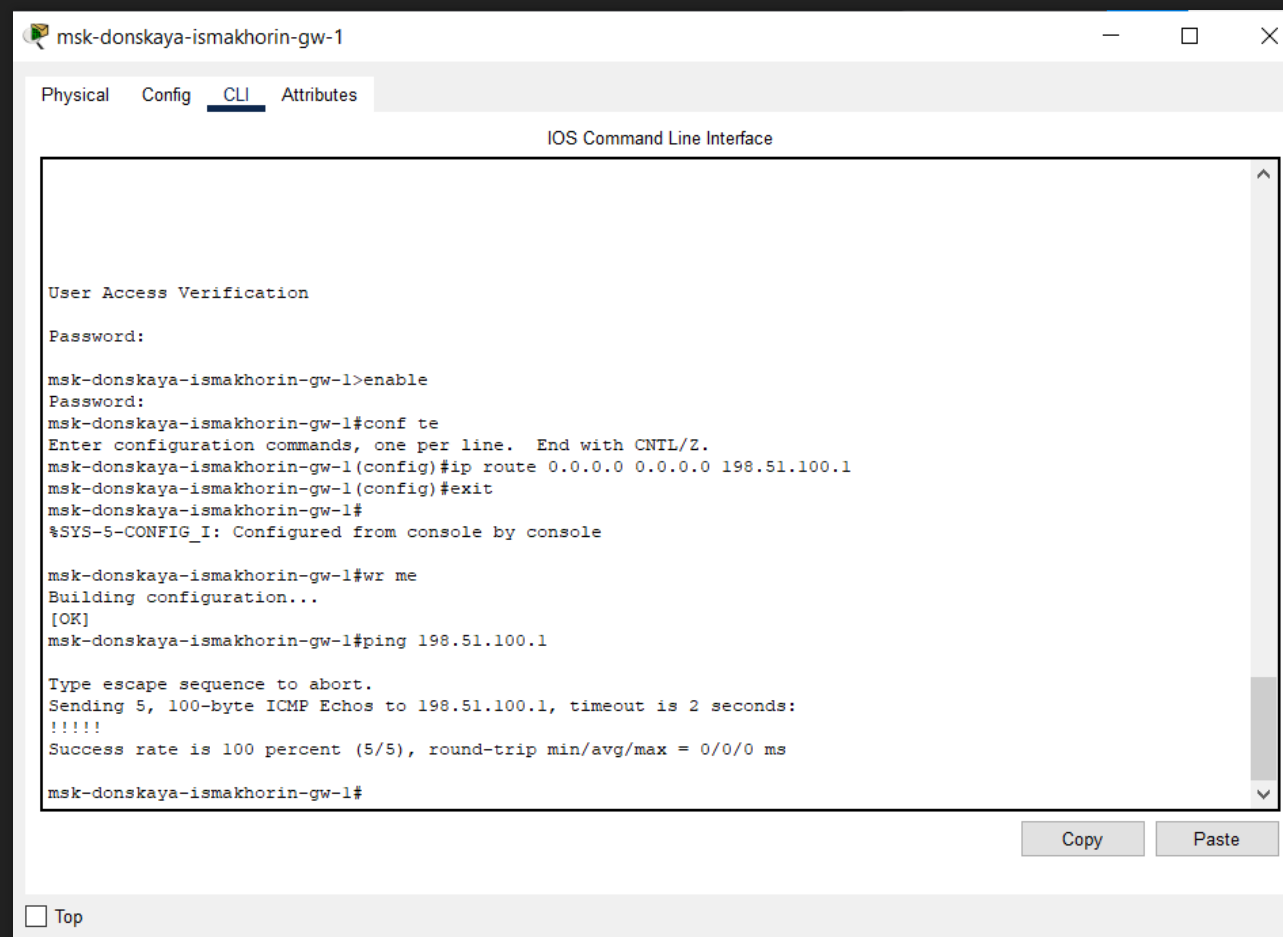
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.4, changed state to up

msk-donskaya-ismakhorin-gw-1(config-subif)#encapsulation dot1Q 4
msk-donskaya-ismakhorin-gw-1(config-subif)#ip address 198.51.100.2 255.255.255.240
msk-donskaya-ismakhorin-gw-1(config-subif)#description internet
msk-donskaya-ismakhorin-gw-1(config-subif)#exit
msk-donskaya-ismakhorin-gw-1(config)#exit
msk-donskaya-ismakhorin-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr me
Building configuration...
[OK]
msk-donskaya-ismakhorin-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-ismakhorin-gw-1(config)#ip route 0.0.0.0 0.0.0.0 198.51.100.1
msk-donskaya-ismakhorin-gw-1(config)#exit
msk-donskaya-ismakhorin-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
exit
```

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



# Проверка



The screenshot shows a web-based interface for a network device named 'msk-donskaya-ismakhorin-gw-1'. The 'CLI' tab is selected, displaying the 'IOS Command Line Interface'. The terminal output shows the following sequence of commands and responses:

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

msk-donskaya-ismakhorin-gw-1#wr me
Building configuration...
[OK]
msk-donskaya-ismakhorin-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 = 0/0/0 ms

msk-donskaya-ismakhorin-gw-1#
```

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

Рис. 1.8. Проверка.

# Настройка пула адресов

```
msk-donskaya-ismakhorin-gw-1#conf ter
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-ismakhorin-gw-1(config)#ip nat pool main pool 198.51.100.2
                                     ^
% Invalid input detected at '^' marker.

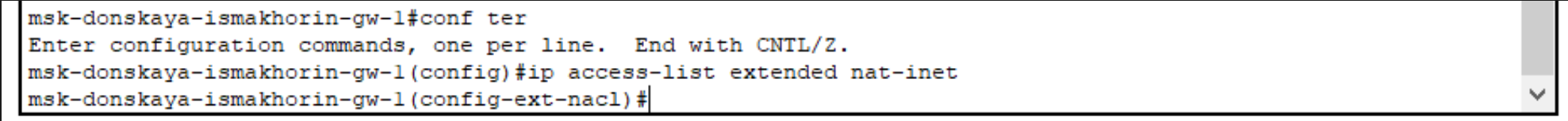
msk-donskaya-ismakhorin-gw-1(config)# 198.51.100.14 netmask 255.255.255.240
                                     ^
% Invalid input detected at '^' marker.

msk-donskaya-ismakhorin-gw-1(config)#ip nat pool main-pool 198.51.100.2 198.51.100.14 netmask 255.255.255.240
msk-donskaya-ismakhorin-gw-1(config)#^Z
msk-donskaya-ismakhorin-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-ismakhorin-gw-1#wr me
Building configuration...
[OK]
msk-donskaya-ismakhorin-gw-1#
```

Рис. 1.9. Настройка пула адресов для NAT.

# Настройка списка доступа



```
msk-donskaya-ismakhorin-gw-1#conf ter
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-ismakhorin-gw-1(config)#ip access-list extended nat-inet
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#
```

Рис. 1.10. Настройка списка доступа для NAT.

# Сеть

```
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#remark dk
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.11 eq 80
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.12 eq 80
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#
```

**Рис. 1.11.** 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))).

# Сеть

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

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

# Сеть

```
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#remark adm
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#permit tcp 10.128.5.0 0.0.0.255 host
% Incomplete command.
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq 80
msk-donskaya-ismakhorin-gw-1(config-ext-nacl)#
```

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

# Сеть

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

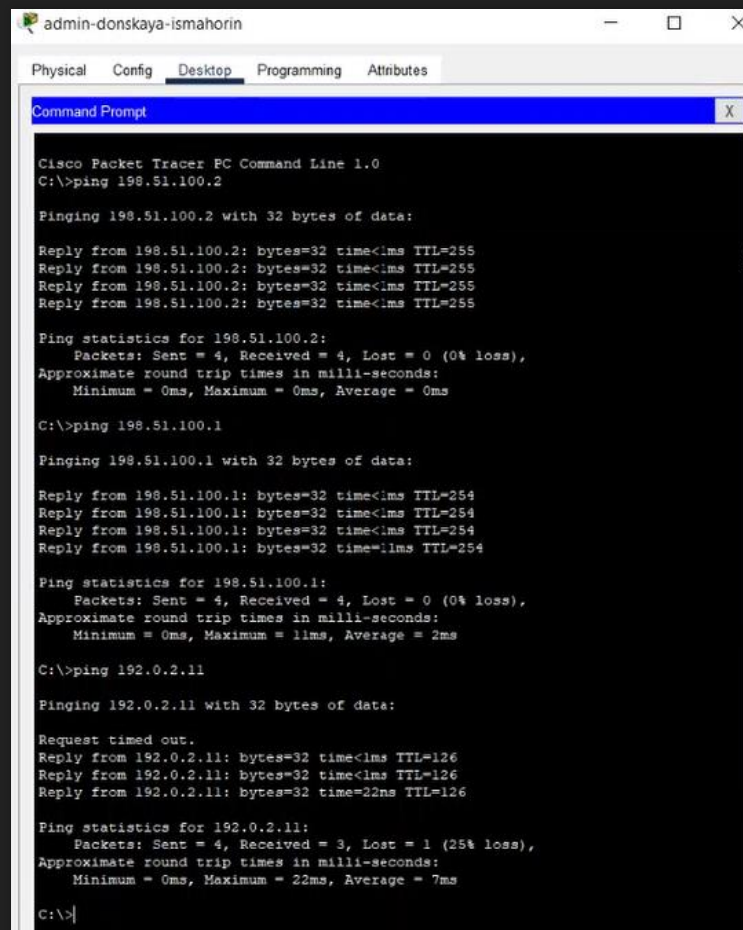
```
msk-donskaya-ismakhorin-gw-1#conf te
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-ismakhorin-gw-1(config)#ip nat inside source list natinet pool mainpool overload
msk-donskaya-ismakhorin-gw-1(config)#ip nat inside source list nat-inet pool main-pool overload
msk-donskaya-ismakhorin-gw-1(config)#int f0/0.3
msk-donskaya-ismakhorin-gw-1(config-subif)#ip nat inside
msk-donskaya-ismakhorin-gw-1(config-subif)#interface f0/0.101
msk-donskaya-ismakhorin-gw-1(config-subif)#ip nat inside
msk-donskaya-ismakhorin-gw-1(config-subif)#exit
msk-donskaya-ismakhorin-gw-1(config)#interface f0/0.102
msk-donskaya-ismakhorin-gw-1(config-subif)#ip nat inside
msk-donskaya-ismakhorin-gw-1(config-subif)#exit
msk-donskaya-ismakhorin-gw-1(config)#interface f0/0.103
msk-donskaya-ismakhorin-gw-1(config-subif)#ip nat inside
msk-donskaya-ismakhorin-gw-1(config-subif)#exit
msk-donskaya-ismakhorin-gw-1(config)#interface f0/0.104
msk-donskaya-ismakhorin-gw-1(config-subif)#ip nat inside
msk-donskaya-ismakhorin-gw-1(config-subif)#exit
msk-donskaya-ismakhorin-gw-1(config)#interface f0/1.4
msk-donskaya-ismakhorin-gw-1(config-subif)#ip nat outside
msk-donskaya-ismakhorin-gw-1(config-subif)#exit
msk-donskaya-ismakhorin-gw-1(config)#^Z
msk-donskaya-ismakhorin-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-ismakhorin-gw-1#wr me
Building configuration...
[OK]
msk-donskaya-ismakhorin-gw-1#
```

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



# Проверка



```
admin-donskaya-ismahorin
Physical Config Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
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=11ms 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 = 11ms, Average = 2ms

C:\>ping 192.0.2.11

Pinging 192.0.2.11 with 32 bytes of data:

Request timed out.
Reply from 192.0.2.11: bytes=32 time<1ms TTL=126
Reply from 192.0.2.11: bytes=32 time<1ms TTL=126
Reply from 192.0.2.11: bytes=32 time=22ms TTL=126

Ping statistics for 192.0.2.11:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 22ms, Average = 7ms

C:\>|
```

Рис. 1.16. Проверка.

# Проверка

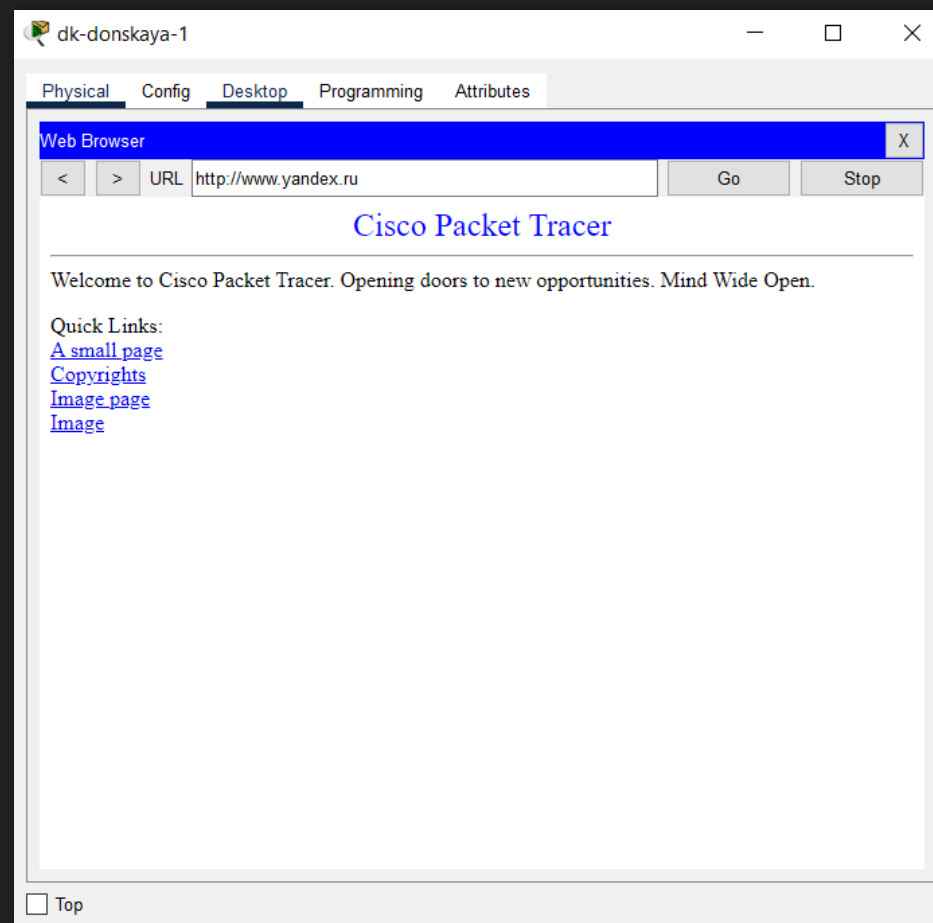


Рис. 1.17. Проверка.

# Настройка доступа из Интернета

```
msk-donskaya-ismakhorin-gw-1#conf te
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-ismakhorin-gw-1(config)#ip nat inside source static tcp 10.128.0.2 80 198.51.100.2 80
msk-donskaya-ismakhorin-gw-1(config)#
```

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

# Настройка доступа из Интернета

```
msk-donskaya-ismakhorin-gw-1(config)#ip nat inside source static tcp 10.128.0.3 20 198.51.100.3 20  
msk-donskaya-ismakhorin-gw-1(config)#ip nat inside source static tcp 10.128.0.3 21 198.51.100.3 21  
msk-donskaya-ismakhorin-gw-1(config)#
```

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

# Настройка доступа из Интернета

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

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

# Настройка доступа из Интернета

```
msk-donskaya-ismakhorin-gw-1(config)#ip nat inside source static tcp 10.128.6.200 3389 198.51.100.10 3389
msk-donskaya-ismakhorin-gw-1(config)#^Z
msk-donskaya-ismakhorin-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-ismakhorin-gw-1#wr me
Building configuration...
[OK]
msk-donskaya-ismakhorin-gw-1#
```

Copy

Paste

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

# Проверка

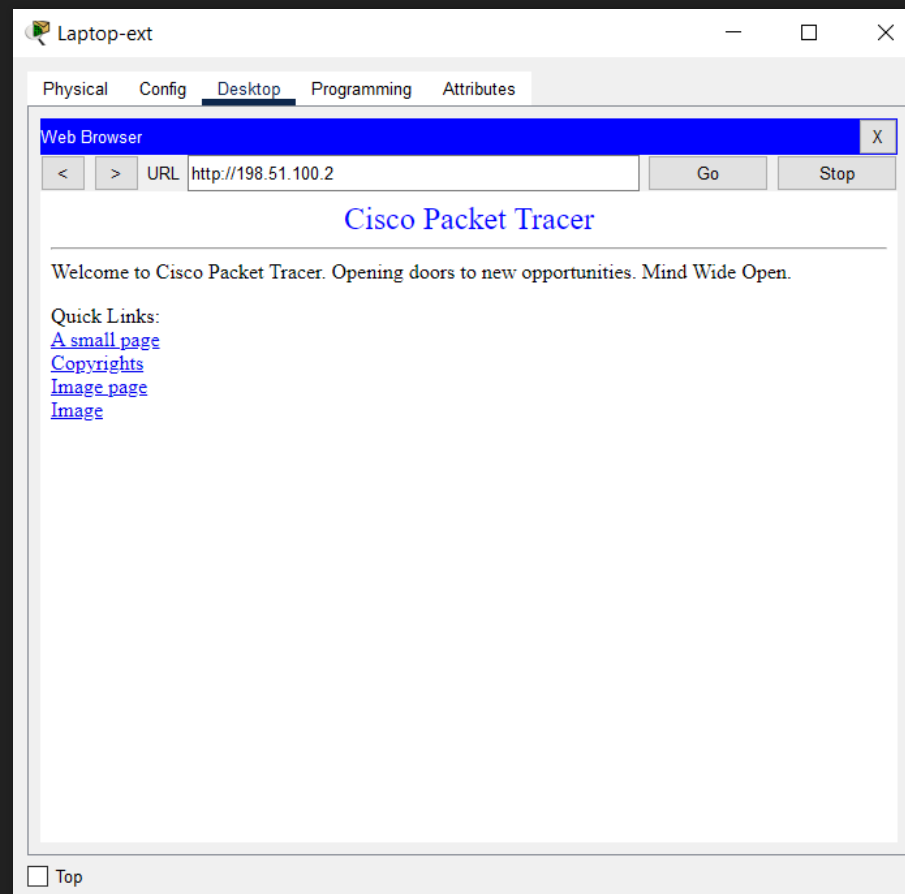


Рис. 1.22. Проверка.

# ВЫВОД

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



Спасибо за внимание!