

Лабораторная работа №12

Настройка NAT

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Приобрести практические навыки по настройке доступа локальной сети к внешней сети посредством NAT.

1. Сделать первоначальную настройку маршрутизатора provider-gw-1 и коммутатора provider-sw-1 провайдера: задать имя, настроить доступ по паролю и т.п.
2. Настроить интерфейсы маршрутизатора provider-gw-1 и коммутатора provider-sw-1 провайдера.
3. Настроить интерфейсы маршрутизатора сети «Донская» для доступа к сети провайдера.
4. Настроить на маршрутизаторе сети «Донская» NAT с правилами.
5. Настроить доступ из внешней сети в локальную сеть организации.
6. Проверить работоспособность заданных настроек.
7. При выполнении работы необходимо учитывать соглашение об именовании.

```
Router>en
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
      ^
% Invalid input detected at '^' marker.

Router(config)#username admin privilege 1 secret cisco
Router(config)#^Z
```

Рис. 1: Первоначальная настройка маршрутизатора provider-gw-1

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#line vty 0 4
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#exit
Switch(config)#line console 0
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#exit
Switch(config)#enable secret cisco
Switch(config)#service password-encryption
      ^
% Invalid input detected at '^' marker.

Switch(config)#service password-encryption
Switch(config)#username admin privilege 1 secret cisco
Switch(config)#^Z
```

Рис. 2: Первоначальная настройка коммутатора provider-sw-1

```
provider-dmbelicheva-gw-1(config)#int f0/0
provider-dmbelicheva-gw-1(config-if)#no shutdown

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

provider-dmbelicheva-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-dmbelicheva-gw-1(config-if)#ip address 192.0.2.1 255.255.255.0
provider-dmbelicheva-gw-1(config-if)#description internet
provider-dmbelicheva-gw-1(config-if)#exit
```

Рис. 3: Настройка интерфейсов маршрутизатора provider-gw-1


```
provider-dmbelicheva-sw-1(config)#int f0/1
provider-dmbelicheva-sw-1(config-if)#switchport mode trunk

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

provider-dmbelicheva-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-dmbelicheva-sw-1(config-if)#exit
provider-dmbelicheva-sw-1(config)#vlan 4
provider-dmbelicheva-sw-1(config-vlan)#name nat
provider-dmbelicheva-sw-1(config-vlan)#exit
provider-dmbelicheva-sw-1(config)#int vlan4
provider-dmbelicheva-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-dmbelicheva-sw-1(config-if)#no shutdown
^
% Invalid input detected at '^' marker.

provider-dmbelicheva-sw-1(config-if)#no shutdown
provider-dmbelicheva-sw-1(config-if)#exit
```

Рис. 4: Настройка интерфейсов коммутатора provider-sw-1

Выполнение лабораторной работы

```
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-gw-1(config)#int f0/1
msk-donskaya-dmbelicheva-gw-1(config-if)#no shutdown

msk-donskaya-dmbelicheva-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-dmbelicheva-gw-1(config-if)#exit
msk-donskaya-dmbelicheva-gw-1(config)#int f0/1.4
msk-donskaya-dmbelicheva-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-dmbelicheva-gw-1(config-subif)#encapsulation dot1Q 4
msk-donskaya-dmbelicheva-gw-1(config-subif)#ip address 198.51.100.2 255.255.255.240
msk-donskaya-dmbelicheva-gw-1(config-subif)#description internet
msk-donskaya-dmbelicheva-gw-1(config-subif)#exit
msk-donskaya-dmbelicheva-gw-1(config)#exit
msk-donskaya-dmbelicheva-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

Рис. 5: Настройка интерфейсов маршрутизатора msk-donskaya-gw-1

```
msk-donskaya-dmbelicheva-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 80 percent (4/5), round-trip min/avg/max = 0/0/2 ms
```

Рис. 6: Проверка доступности маршрутизатора

```
usk-donskaya-dmbelicheva-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
usk-donskaya-dmbelicheva-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.

usk-donskaya-dmbelicheva-gw-1(config)#ip nat pool main-pool 198.51.100.2 198.51.100.14 netmask 255.255.255.240
usk-donskaya-dmbelicheva-gw-1(config)#^Z
usk-donskaya-dmbelicheva-gw-1#
```

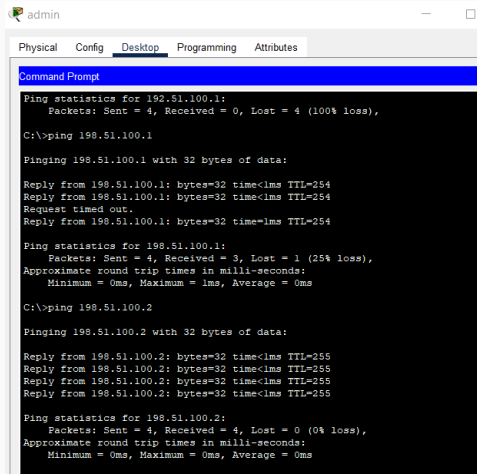
Рис. 7: Настройка пула адресов для NAT

```
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-gw-1(config)#ip access-list extended nat-inet
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#remark dk
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.11 eq 80
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.12 eq 80
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#remark departments
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#permit tcp 10.128.4.0 0.0.0.255 host 192.0.2.13 eq 80
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#remark adm
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq 80
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#remark admin
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#permit ip host 10.128.6.200 any
msk-donskaya-dmbelicheva-gw-1(config-ext-nacl)#^Z
msk-donskaya-dmbelicheva-gw-1#
```

Рис. 8: Настройка списка доступа для NAT

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

Рис. 9: Настройка NAT



The screenshot shows a Windows Command Prompt window titled "admin". The window has tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes", with "Desktop" currently selected. The Command Prompt displays the following text:

```
Command Prompt

Ping statistics for 192.51.100.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

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
Request timed out.
Reply from 198.51.100.1: bytes=32 time=1ms TTL=254

Ping statistics for 198.51.100.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

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
```

Рис. 10: Проверка доступности маршрутизаторов

```
msk-donskaya-dmbelicheva-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.0.2 80 198.51.100.2 80
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.0.3 80 198.51.100.3 80
msk-donskaya-dmbelicheva-gw-1(config)#no ip nat inside source static tcp 10.128.0.3 80 198.51.100.3 80
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.0.3 20 198.51.100.3 20
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.0.3 21 198.51.100.3 21
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.0.4 25 198.51.100.4 25
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.0.4 110 198.51.100.4 110
msk-donskaya-dmbelicheva-gw-1(config)#ip nat inside source static tcp 10.128.6.200 3389 198.51.100.10 3389
msk-donskaya-dmbelicheva-gw-1(config)#exit
msk-donskaya-dmbelicheva-gw-1#
SYS-5-CONFIG: 1: Configured from console by console
```

Рис. 11: Настройка доступа из Интернета

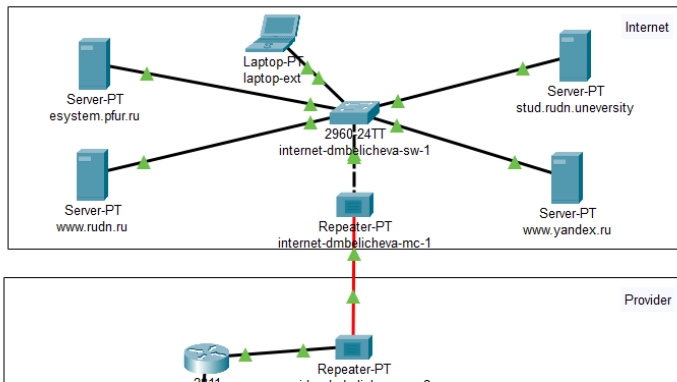
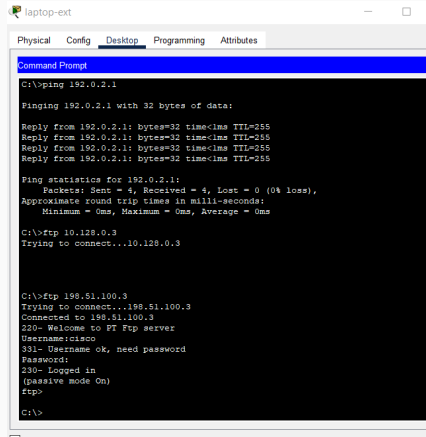


Рис. 12: Добавление ноутбука на территорию Интернет

Выполнение лабораторной работы



```
laptop-ext
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.0.2.1

Pinging 192.0.2.1 with 32 bytes of data:

Reply from 192.0.2.1: bytes=32 time<1ms TTL=255
Reply from 192.0.2.1: bytes=32 time<1ms TTL=255
Reply from 192.0.2.1: bytes=32 time<1ms TTL=255
Reply from 192.0.2.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.0.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ftp 10.128.0.3
Trying to connect...10.128.0.3

C:\>ftp 198.51.100.3
Trying to connect...198.51.100.3
Connected to 198.51.100.3
220- Welcome to FT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>

C:\>
```

Рис. 13: Проверка доступа из Интернета по ftp

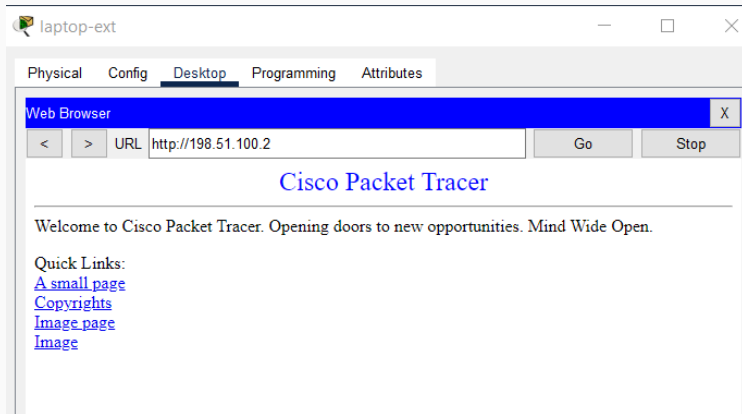


Рис. 14: Проверка доступа из Интернета к web-серверу

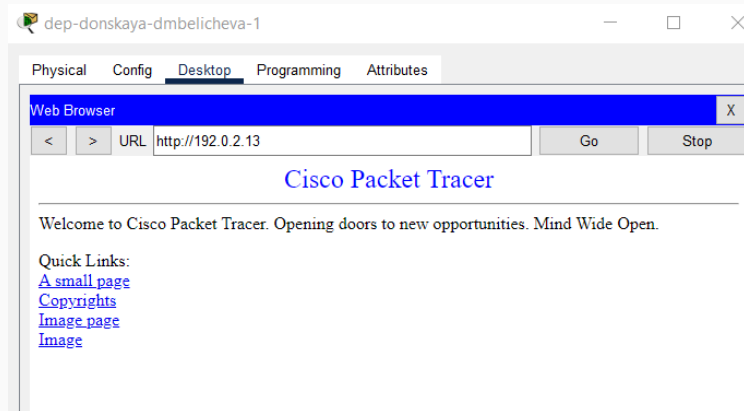


Рис. 15: Доступ dep-donskaya-1 к 192.0.2.13



Рис. 16: Доступ dk-donskaya-1 к www.yandex.ru

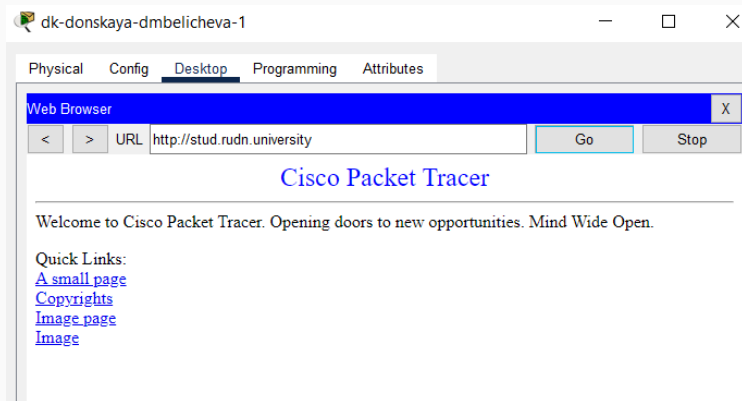


Рис. 17: Доступ dk-donskaya-1 к stud.rudn.university

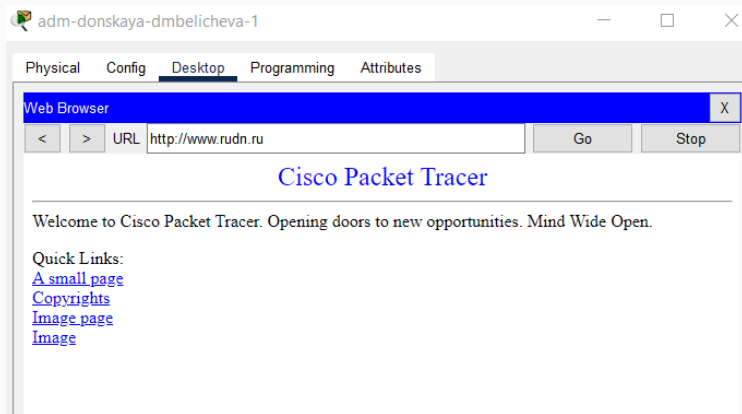


Рис. 18: Доступ adm-donskaya-1 к www.rudn.ru

В результате выполнения данной лабораторной работы я приобрела практические навыки по настройке доступа локальной сети к внешней сети посредством NAT.