РОССИЙСКИЙ УНИВЕРСИТЕТ ДРУЖБЫ НАРОДОВ

Факультет физико-математических и естественных наук

Кафедра прикладной информатики и теории вероятностей

ОТЧЕТ
ПО ЛАБОРАТОРНОЙ РАБОТЕ № 12

Настройка NAT

дисциплина: Администрирование локальных сетей

Студент: Саргсян Арам Грачьяевич

Группа: НПИбд 02-20

МОСКВА

2023 г.

ЦЕЛЬ РАБОТЫ

Приобретение практических навыков по настройке доступа локальной сети к внешней сети посредством NAT.

ХОД РАБОТЫ

1. Сделал первоначальную настройку provider-gw-1 (Рис. 1).

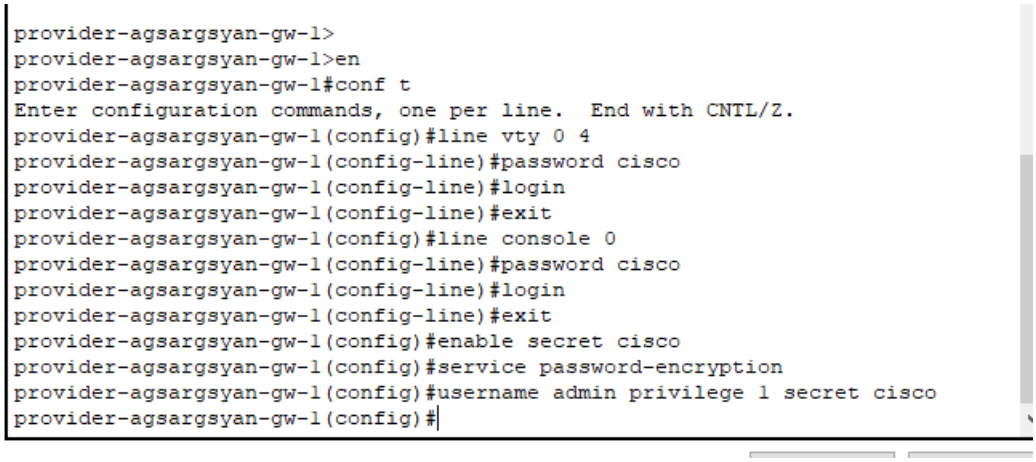

Рис. 1

2. Сделал первоначальную настройку provider-sw-1 (Рис. 2).

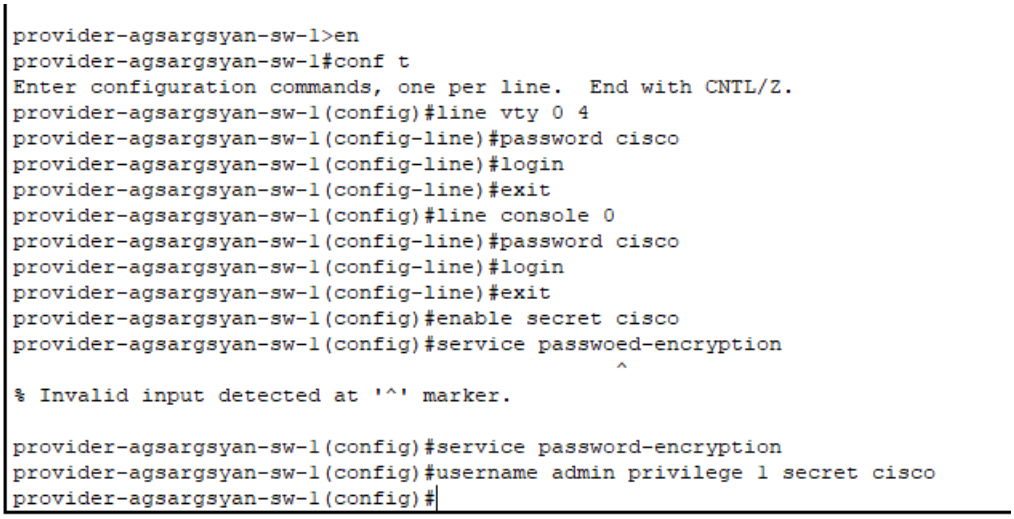

Рис. 2

3. Настроил интерфейсы provider-gw-1 (Рис. 3).

```
provider-agsargsyan-gw-1>
provider-agsargsyan-gw-1>en
provider-agsargsyan-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
provider-agsargsyan-gw-1(config)#line vty 0 4
provider-agsargsyan-gw-1(config-line)#password cisco
provider-agsargsyan-gw-1(config-line)#login
provider-agsargsyan-gw-1(config-line)#exit
provider-agsargsyan-gw-1(config)#line console 0
provider-agsargsyan-gw-1(config-line)#password cisco
provider-agsargsyan-gw-1(config-line)#login
provider-agsargsyan-gw-1(config-line)#exit
provider-agsargsyan-gw-1(config)#enable secret cisco
provider-agsargsyan-gw-1(config)#service password-encryption
provider-agsargsyan-gw-1(config)#username admin privilege 1 secret cisco
provider-agsargsyan-gw-1(config)#
provider-agsargsyan-gw-1(config)#
provider-agsargsyan-gw-1(config)#int f0/0
provider-agsargsyan-gw-1(config-if)#no shutdown

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

provider-agsargsyan-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-agsargsyan-gw-1(config-if)#ip address 192.0.2.1 255.255.255.0
% 192.0.2.0 overlaps with FastEthernet0/0
provider-agsargsyan-gw-1(config-if)#description internet
provider-agsargsyan-gw-1(config-if)#exit
provider-agsargsyan-gw-1(config)#exit
provider-agsargsyan-gw-1#
```

Рис. 3

4. Настроил интерфейсы provider-sw-1 (Рис. 4).

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

provider-agsargsyan-sw-1(config)#en
% Ambiguous command: "en"
provider-agsargsyan-sw-1(config)#int f0/1
provider-agsargsyan-sw-1(config-if)#switchport mode trunk

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

provider-agsargsyan-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-agsargsyan-sw-1(config-if)#exit
provider-agsargsyan-sw-1(config)#vlan 4
provider-agsargsyan-sw-1(config-vlan)#name nat
provider-agsargsyan-sw-1(config-vlan)#exit
provider-agsargsyan-sw-1(config)#interface vlan 4
provider-agsargsyan-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-agsargsyan-sw-1(config-if)#no shutdown
provider-agsargsyan-sw-1(config-if)#exit
provider-agsargsyan-sw-1(config)#
provider-agsargsyan-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

provider-agsargsyan-sw-1#wr mem
Building configuration...
[OK]
provider-agsargsyan-sw-1#
```

Рис. 4

5. Настроил интерфейсы msk-donskaya-agsargsyan-gw-1 (Рис. 5).

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

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

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

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

Рис. 5

6. Настроил пул адресов для NAT и список доступа для NAT (Рис. 6).

```
Building configuration...
[OK]
msk-donskaya-agsargsyan-gw-1#en
msk-donskaya-agsargsyan-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-gw-1(config)#ip nat pool main-pool  198.51.100.2 198.51.100.14 netmask 255.255.255.240
msk-donskaya-agsargsyan-gw-1(config)#ip access-list extended nat-inet
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#remark dk
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.11 eq 80
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.12 eq 80
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#remark departments
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit tcp 10.128.4.0 0.0.0.255 host 192.0.2.13 eq 80
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#remark adm
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq 80
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#remark admin
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit ip 10.128.6.200 any
                                                      ^
% Invalid input detected at '^' marker.

msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit ip host 10.128.6.200 any
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#permit ip host 10.128.6.201 any
msk-donskaya-agsargsyan-gw-1(config-ext-nacl)#
msk-donskaya-agsargsyan-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-agsargsyan-gw-1#wr mem
Building configuration...
[OK]
msk-donskaya-agsargsyan-gw-1#
```

Рис. 6

7. Настроид NAT (Рис. 7).

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

msk-donskaya-agsargsyan-gw-1#wr mem
Building configuration...
[OK]
msk-donskaya-agsargsyan-gw-1#
```

Рис. 7

8. Настройка доступа из Интернета (Рис. 8).

```
msk-donskaya-agsargsyan-gw-1#wr mem
Building configuration...
[OK]
msk-donskaya-agsargsyan-gw-1#en
msk-donskaya-agsargsyan-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.0.2 80 198.51.100.2 80
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.0.3 20 198.51.100.3 20
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.0.3 21 198.51.100.3 21
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.0.4 25 198.51.100.4 25
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.0.4 110 198.51.100.4 110
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.6.200 3389 198.51.100.10 3389
msk-donskaya-agsargsyan-gw-1(config)#ip nat inside source static tcp 10.128.6.201 3389 198.51.100.10 3389
msk-donskaya-agsargsyan-gw-1(config)#
```

Рис. 8

9. Проверил работоспособность настроек, доступы настроены правильно (Рис. 9-12).

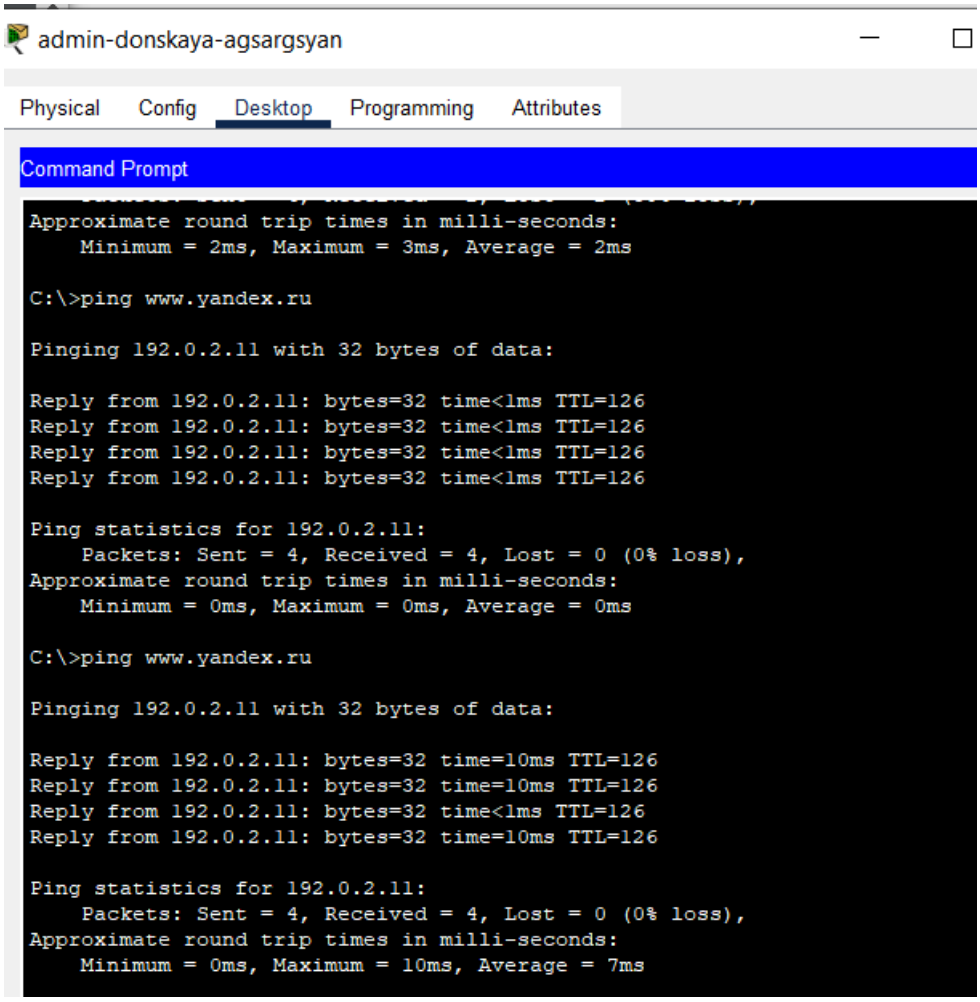

Рис. 9

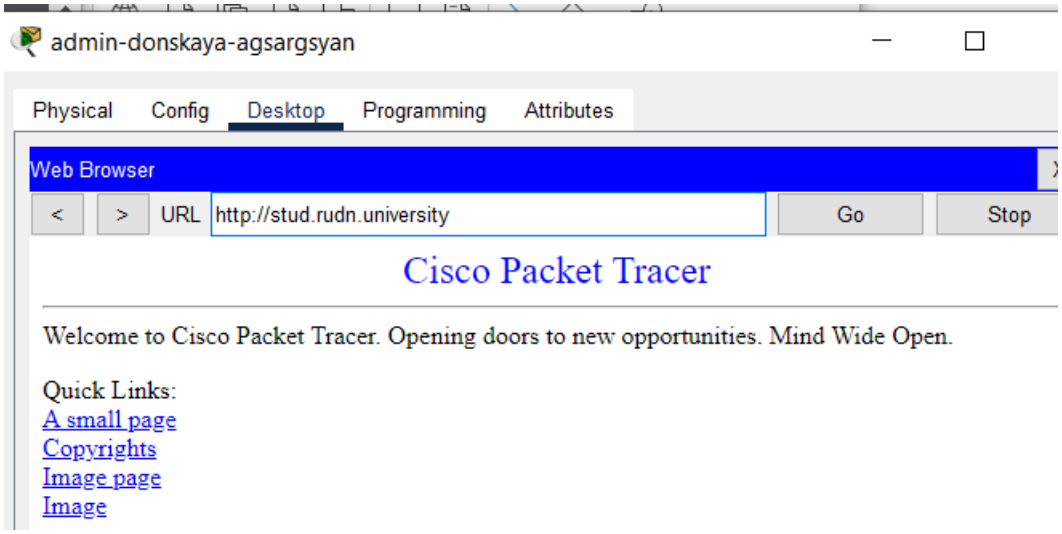

Рис. 10

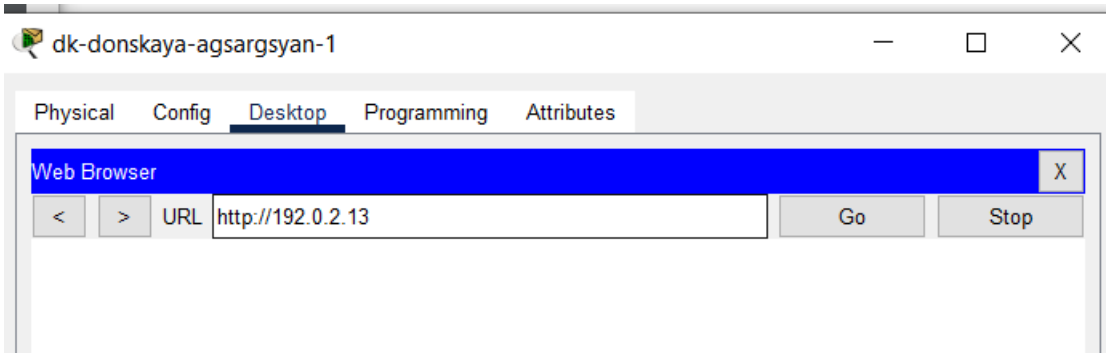

Рис. 11

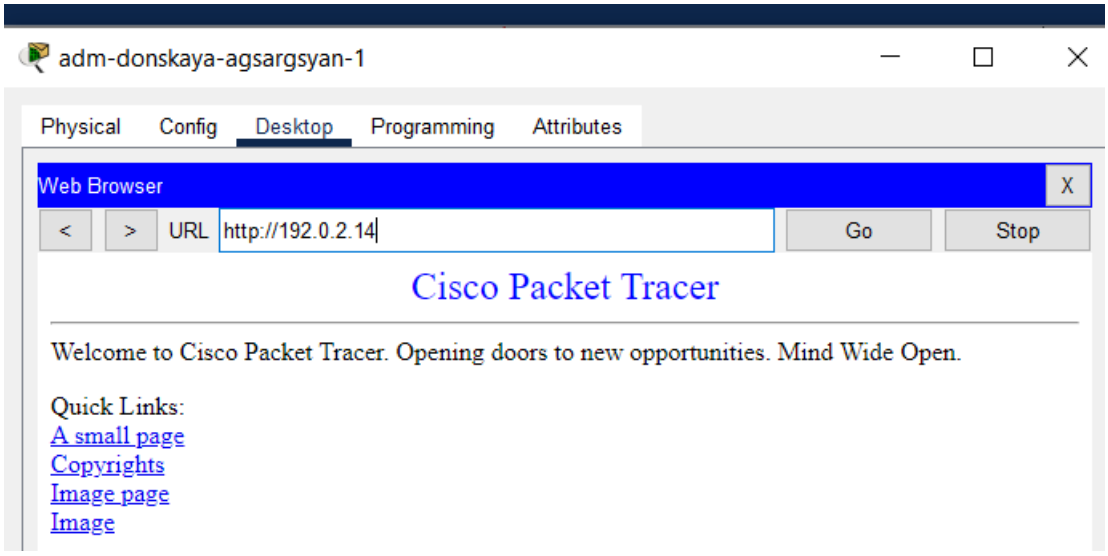

Рис. 12

ИТОГОВЫЕ КОНФИГУРАЦИИ

1. **msk-donskaya-agsargsyan-gw-1**

   !

   version 12.4

```
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname msk-donskaya-agsargsyan-gw-1
!
!
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
ip dhcp excluded-address 10.128.3.1 10.128.3.29
ip dhcp excluded-address 10.128.3.200 10.128.3.254
ip dhcp excluded-address 10.128.4.1 10.128.4.29
ip dhcp excluded-address 10.128.4.200 10.128.4.254
ip dhcp excluded-address 10.128.5.1 10.128.5.29
ip dhcp excluded-address 10.128.5.200 10.128.5.254
ip dhcp excluded-address 10.128.6.1 10.128.6.29
ip dhcp excluded-address 10.128.6.200 10.128.6.254
!
ip dhcp pool dk
 network 10.128.3.0 255.255.255.0
 default-router 10.128.3.1
 dns-server 10.128.0.5
ip dhcp pool departments
 network 10.128.4.0 255.255.255.0
 default-router 10.128.4.1
 dns-server 10.128.0.5
ip dhcp pool adm
 network 10.128.5.0 255.255.255.0
 default-router 10.128.5.1
 dns-server 10.128.0.5
ip dhcp pool other
 network 10.128.6.0 255.255.255.0
 default-router 10.128.6.1
```

```
 dns-server 10.128.0.5
!
!
!
ip cef
no ipv6 cef
!
!
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
!
!
!
!
!
ip domain-name donskaya.rudn.edu
ip name-server 10.128.0.5
!
!
spanning-tree mode pvst
!
!
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
!
interface FastEthernet0/0.2
```

```
 description management
 encapsulation dot1Q 2
 ip address 10.128.1.1 255.255.255.0
 ip access-group management-out out
!
interface FastEthernet0/0.3
 description servers
 encapsulation dot1Q 3
 ip address 10.128.0.1 255.255.255.0
 ip access-group servers-out out
 ip nat inside
!
interface FastEthernet0/0.101
 description dk
 encapsulation dot1Q 101
 ip address 10.128.3.1 255.255.255.0
 ip nat inside
!
interface FastEthernet0/0.102
 description departments
 encapsulation dot1Q 102
 ip address 10.128.4.1 255.255.255.0
 ip nat inside
!
interface FastEthernet0/0.103
 description adm
 encapsulation dot1Q 103
 ip address 10.128.5.1 255.255.255.0
 ip nat inside
!
interface FastEthernet0/0.104
 description other
 encapsulation dot1Q 104
 ip address 10.128.6.1 255.255.255.0
 ip access-group other-in in
```

```
 ip nat inside
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
!
interface FastEthernet0/1.4
 description internet
 encapsulation dot1Q 4
 ip address 198.51.100.2 255.255.255.240
 ip nat outside
!
interface Vlan1
 no ip address
 shutdown
!
ip nat pool main-pool 198.51.100.2 198.51.100.14 netmask 255.255.255.240
ip nat inside source list nat-inet pool main-pool overload
ip nat inside source static tcp 10.128.0.2 80 198.51.100.2 80
ip nat inside source static tcp 10.128.0.3 20 198.51.100.3 20
ip nat inside source static tcp 10.128.0.3 21 198.51.100.3 21
ip nat inside source static tcp 10.128.0.4 25 198.51.100.4 25
ip nat inside source static tcp 10.128.0.4 110 198.51.100.4 110
ip nat inside source static tcp 10.128.6.200 3389 198.51.100.10 3389
ip nat inside source static tcp 10.128.6.201 3389 198.51.100.10 3389
ip classless
ip route 0.0.0.0 0.0.0.0 198.51.100.1
!
ip flow-export version 9
!
!
ip access-list extended servers-out
 remark web
 permit icmp any any
```

```
 permit tcp any host 10.128.0.2 eq www
 permit tcp host 10.128.6.200 host 10.128.0.2 range 20 ftp
 permit tcp host 10.128.6.200 host 10.128.0.2 eq telnet
 remark file
 permit tcp 10.128.0.0 0.0.255.255 host 10.128.0.3 eq 445
 permit tcp any host 10.128.0.3 range 20 ftp
 remark mail
 permit tcp any host 10.128.0.4 eq smtp
 permit tcp any host 10.128.0.4 eq pop3
 remark dns
 permit udp 10.128.0.0 0.0.255.255 host 10.128.0.5 eq domain
 permit tcp host 10.128.6.201 host 10.128.0.2 range 20 ftp
 permit tcp host 10.128.6.201 host 10.128.0.2 eq telnet
ip access-list extended other-in
 remark admin
 permit ip host 10.128.6.200 any
 permit ip host 10.128.6.201 any
ip access-list extended management-out
 remark admin
 permit ip host 10.128.6.200 10.128.1.0 0.0.0.255
 permit ip host 10.128.6.201 10.128.1.0 0.0.0.255
ip access-list extended nat-inet
 remark dk
 permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.11 eq www
 permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.12 eq www
 remark departments
 permit tcp 10.128.4.0 0.0.0.255 host 192.0.2.13 eq www
 remark adm
 permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq www
 remark admin
 permit ip host 10.128.6.200 any
 permit ip host 10.128.6.201 any
!
!
!
```

```
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line aux 0
!
line vty 0 4
 password 7 0822455D0A16
 login
 transport input ssh
!
!
!
end
```

2. **provider-agsrgsyan-gw-1**

```
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname provider-agsargsyan-gw-1
!
!
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
!
!
!
```

```
ip cef
no ipv6 cef
!
!
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
!
interface FastEthernet0/0.4
 description msk-donskaya
 encapsulation dot1Q 4
 ip address 198.51.100.1 255.255.255.240
!
interface FastEthernet0/1
 description internet
```

```
 ip address 192.0.2.1 255.255.255.0
 duplex auto
 speed auto
!
interface Vlan1
 no ip address
 shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line aux 0
!
line vty 0 4
 password 7 0822455D0A16
 login
!
!
!
end
```

3. **provider-agsrgsyan-sw-1**

```
!
version 15.0
```

```
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname provider-agsargsyan-sw-1
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport mode trunk
!
interface FastEthernet0/2
 switchport mode trunk
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
```

!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!

```
interface GigabitEthernet0/2
!
interface Vlan1
 no ip address
 shutdown
!
interface Vlan4
 no ip address
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line vty 0 4
 password 7 0822455D0A16
 login
line vty 5 15
 login
!
!
!
!
end
```

ОТВЕТЫ НА КОНТРОЛЬНЫЕ ВОПРОСЫ

1. В чём состоит основной принцип работы NAT (что даёт наличие NAT в сети организации)?

NAT на устройстве позволяет ему соединять публичные и частные сети между собой с помощью только одного IP-адреса для группы.

2. В чём состоит принцип настройки NAT (на каком оборудовании и что нужно

настроить для из локальной сети во внешнюю сеть через NAT)?

В Настройке интерфейсов на внутренних и внешних маршрутизаторах, наборов правил для преобразования IP.

3. Можно ли применить Cisco IOS NAT к субинтерфейсам?

Да, так как они существуют в энергонезависимой памяти.

4. Что такое пулы IP NAT?

Пулы IP NAT — это выделяемые для трансляции NAT IP.

5. Что такое статические преобразования NAT?

Взаимно однозначное преобразование внутренних IP во внешние.

ВЫВОД

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