

РОССИЙСКИЙ УНИВЕРСИТЕТ ДРУЖБЫ НАРОДОВ

Факультет физико-математических и естественных наук
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ОТЧЕТ **ПО ЛАБОРАТОРНОЙ РАБОТЕ № 12**

Настройка NAT

дисциплина: Администрирование локальных сетей

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МОСКВА

2022 г.

Цель работы

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

Выполнение работы

1. Сделала первоначальную настройку маршрутизатора provider-kim-gw-1 (рис. 1)

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

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

Рисунок 1

2. Сделала первоначальную настройку коммутатора provider-kim-sw-1 (рис. 2)

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

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

Рисунок 2

3. Настроить интерфейсы маршрутизатора provider-kim-gw-1 (рис. 3)

```

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

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

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

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

```

Рисунок 3

4. Настроить интерфейсы коммутатора provider-kim-sw-1 (рис. 4)

```

provider-kim-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
provider-kim-sw-1(config)#int f0/1
provider-kim-sw-1(config-if)#switchport mode trunk

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

provider-kim-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-kim-sw-1(config-if)#exit
provider-kim-sw-1(config)#vlan 4
provider-kim-sw-1(config-vlan)#name nat
provider-kim-sw-1(config-vlan)#exit
provider-kim-sw-1(config)#int vlan4
provider-kim-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-kim-sw-1(config-if)#no shutdown
provider-kim-sw-1(config-if)#exit
provider-kim-sw-1(config)#exit
provider-kim-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

provider-kim-sw-1#wr m
Building configuration...

```

Рисунок 4

5. Настроить интерфейсы маршрутизатора msk-donskaya-kim-gw-1 (рис. 5)

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

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

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

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

Рисунок 5

6. Настроить пула адресов для NAT и списка доступа для NAT (рис. 6)

```
msk-donskaya-kim-gw-1>en
Password:
msk-donskaya-kim-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-kim-gw-1(config)#ip nat pool main-pool 198.51.100.2 198.51.100.14 netmask 255.255.255.240
msk-donskaya-kim-gw-1(config)#ip access-list extended nat-inet
msk-donskaya-kim-gw-1(config-ext-nacl)#remark dk
msk-donskaya-kim-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.11 eq 80
msk-donskaya-kim-gw-1(config-ext-nacl)#permit tcp 10.128.3.0 0.0.0.255 host 192.0.2.12 eq 80
msk-donskaya-kim-gw-1(config-ext-nacl)#remark departments
msk-donskaya-kim-gw-1(config-ext-nacl)#permit tcp 10.128.4.0 0.0.0.255 host 192.0.2.13 eq 80
msk-donskaya-kim-gw-1(config-ext-nacl)#remark adm
msk-donskaya-kim-gw-1(config-ext-nacl)#permit tcp 10.128.5.0 0.0.0.255 host 192.0.2.14 eq 80
msk-donskaya-kim-gw-1(config-ext-nacl)#remark admin
msk-donskaya-kim-gw-1(config-ext-nacl)#permit ip host 10.128.6.200 any
msk-donskaya-kim-gw-1(config-ext-nacl)#^Z
msk-donskaya-kim-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

Рисунок 6

7. Настройка NAT (рис. 7)

```

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

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

```

Рисунок 7

8. Настройка доступа из Интернета (рис. 8)

```

msk-donskaya-kim-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-kim-gw-1(config)#ip nat inside source static tcp 10.128.0.2 80 198.51.100.2 80
msk-donskaya-kim-gw-1(config)#ip nat inside source static tcp 10.128.0.3 20 198.51.100.3 20
msk-donskaya-kim-gw-1(config)#ip nat inside source static tcp 10.128.0.3 21 198.51.100.3 21
msk-donskaya-kim-gw-1(config)#ip nat inside source static tcp 10.128.0.4 25 198.51.100.4 25
msk-donskaya-kim-gw-1(config)#ip nat inside source static tcp 10.128.0.4 110 198.51.100.4 110
msk-donskaya-kim-gw-1(config)#ip nat inside source static tcp 10.128.6.200 3389 198.51.100.10 3389
msk-donskaya-kim-gw-1(config)#^Z
msk-donskaya-kim-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

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

```

Рисунок 8

9. Проверить работоспособность заданных настроек (рис. 9-10)

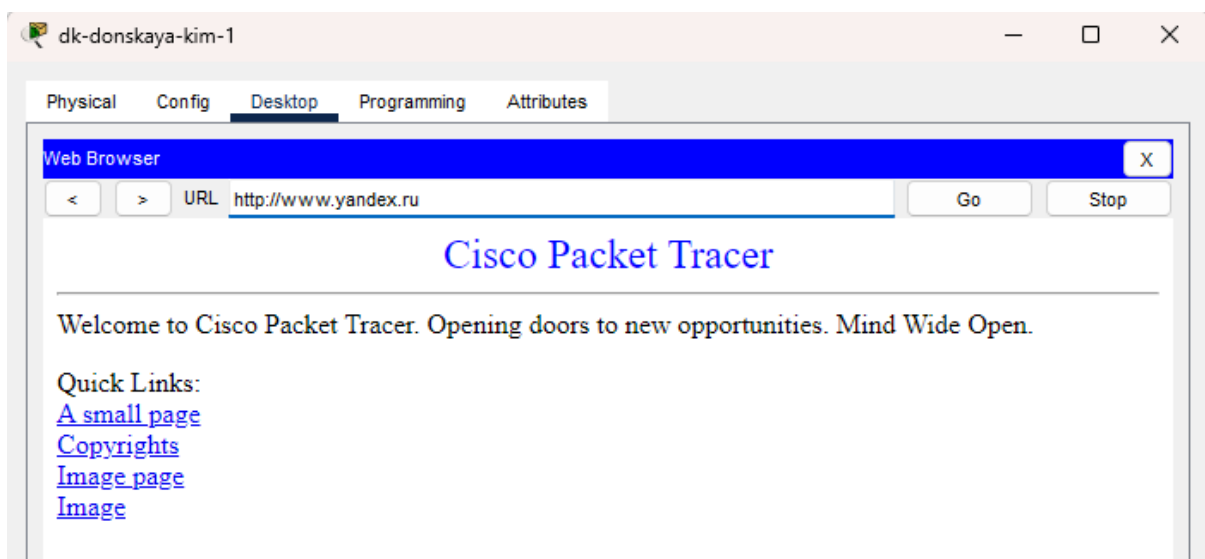


Рисунок 9

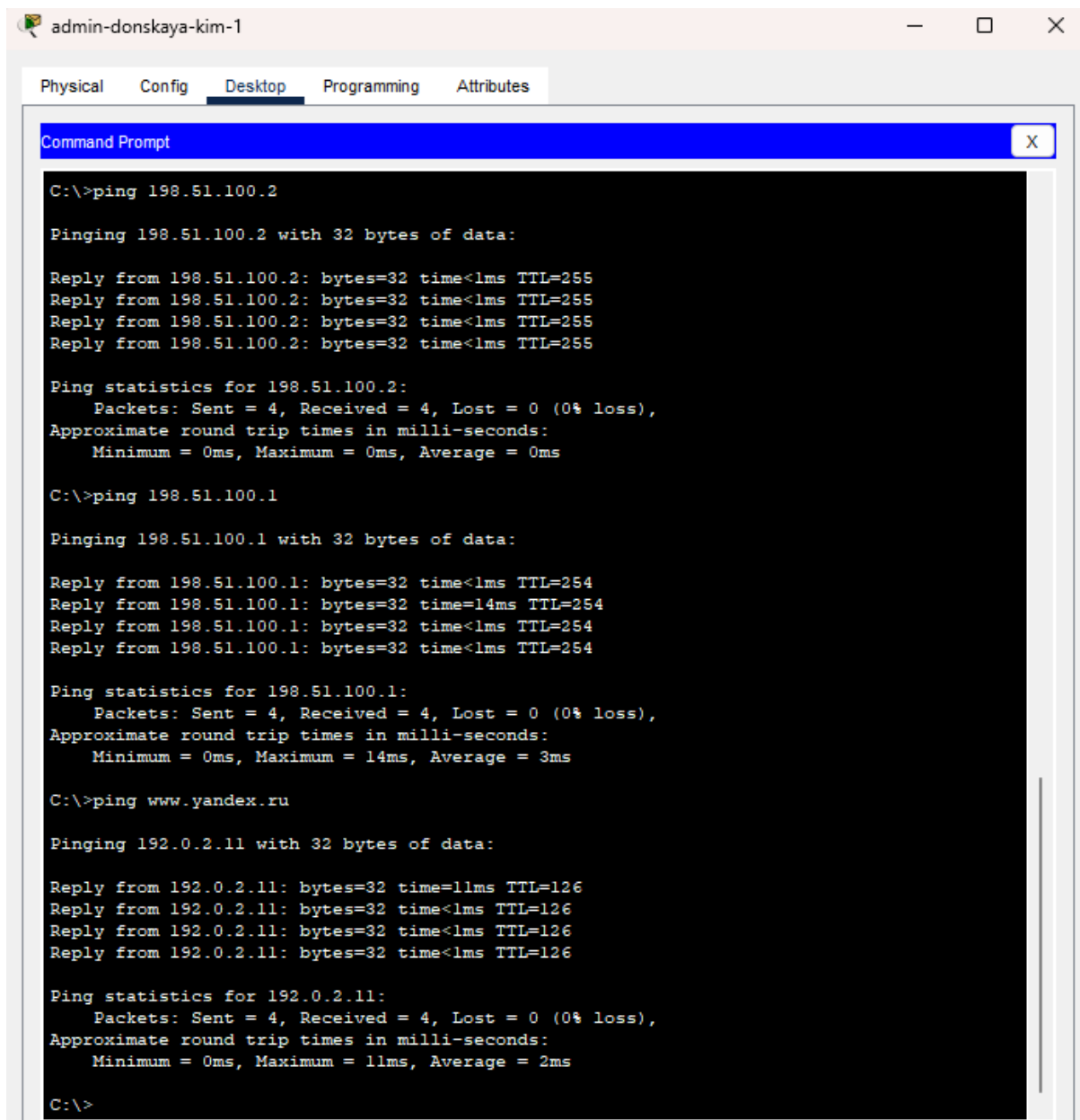


Рисунок 10

Конфигурации оборудования

- msk-donskaya-kim-gw-1

!

version 15.1

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname msk-donskaya-kim-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

!

!

license udi pid CISCO2811/K9 sn FTX1017LG55-

!

!

!

!

!

!

!

!

!

ip domain-name donskeya.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 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
ip access-list extended other-in
remark admin
permit ip host 10.128.6.200 any
ip access-list extended management-out
remark admin
permit ip host 10.128.6.200 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
!
!
!
!
!
line con 0
```

```
password 7 0822455D0A16
```

```
login
```

```
!
```

```
line aux 0
```

```
!
```

```
line vty 0 4
```

```
password 7 0822455D0A16
```

```
login
```

```
transport input ssh
```

```
!
```

```
!
```

```
!
```

```
end
```

- **provider-kim-gw-1**

```
!
```

```
version 15.1
```

```
no service timestamps log datetime msec
```

```
no service timestamps debug datetime msec
```

```
service password-encryption
```

```
!
```

```
hostname provider-kim-gw-1
```

```
!
```

```
!
```

```
!
```

```
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
```

```
!
```

```
!
```

```
!
```

```
!
```

```
!
```

```
!
```

```
ip cef
```

```
no ipv6 cef
```

```
!  
!  
!  
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0  
!  
!  
license udi pid CISCO2811/K9 sn FTX10176UI2-  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
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
```

- **provider-kim-sw-1**

!

version 15.0

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname provider-kim-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

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