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Лабораторная работа №3

Администрирование сетевых сервисов

Дисциплина: Администрирование компьютерных сетей

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“___” _____ 2021 г.

Санкт – Петербург
2021

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1. Цели работы

- Изучение технологий сетевых сервисов.
- Реализация технологий сетевых сервисов в виртуальной сети.

2. Ход работы

2.1 Параметры сети

В ходе лабораторной работы №1 в системе VMware была создана сеть виртуальных машин. Схема сети представлена на рисунке ниже:

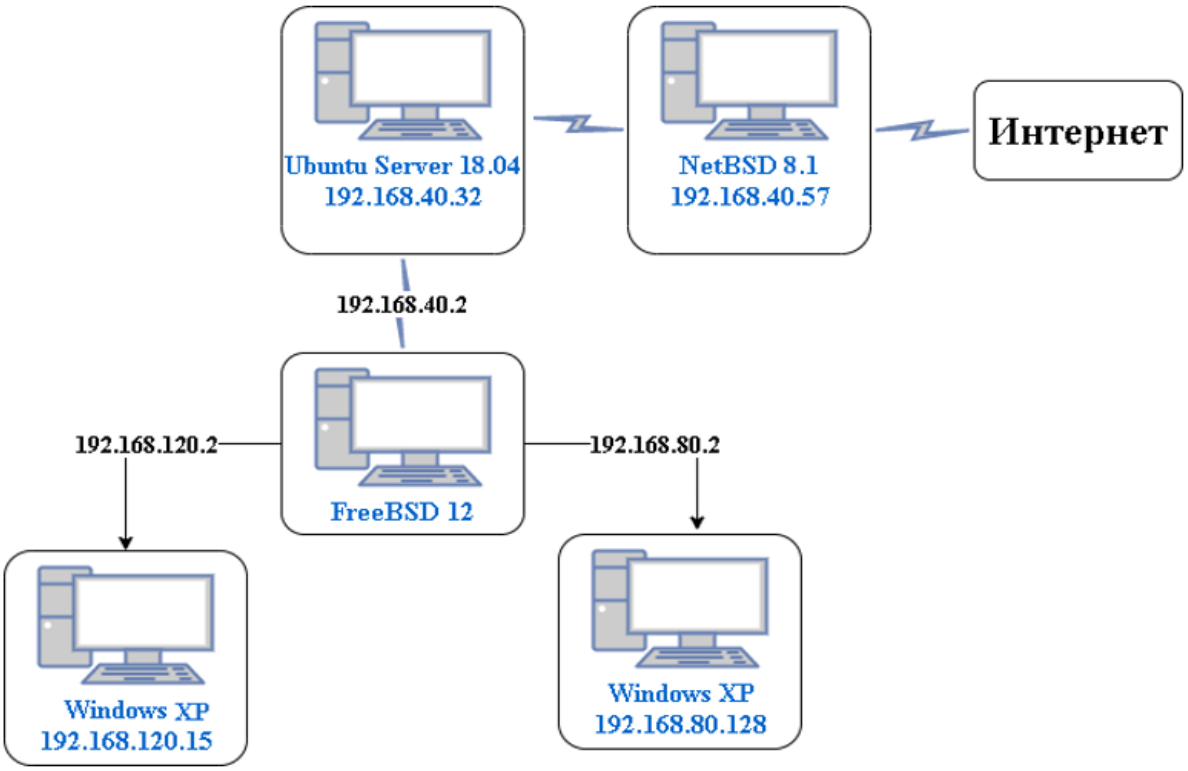

Рисунок 1 - Схема сети

2.2 Создание DHCP-серверов

2.2.1 Создание DHCP-сервера FreeBSD

В системе FreeBSD был создан и запущен DHCP-сервер.

```
root@:~ # pkg search "isc-dhcp.*-server"
The package management tool is not yet installed on your system.
Do you want to fetch and install it now? [y/N]: y
Bootstrapping pkg from pkg+http://pkg.FreeBSD.org/FreeBSD:12:amd64/quarterly, pl
ease wait...
Verifying signature with trusted certificate pkg.freebsd.org.2013102301... done
Installing pkg-1.16.3...
Extracting pkg-1.16.3: 100%
pkg: Repository FreeBSD missing. 'pkg update' required
isc-dhcp44-server-4.4.2_1      ISC Dynamic Host Configuration Protocol server
```

Рисунок 2 – Установка сервера

```
root:~ # cat /etc/rc.conf
hostname="mister7"
dhcpd_enable="YES"
dhcpd_flags="-q"
dhcpd_ifaces="em2"
dhcpd_conf="/usr/local/etc/dhcpd.conf"
ifconfig_em0="inet 192.168.40.2 netmask 255.255.255.0"
ifconfig_em1="inet 192.168.80.2 netmask 255.255.255.0"
ifconfig_em2="inet 192.168.120.2 netmask 255.255.255.0"
ifconfig_em3="DHCP"
sshd_enable="YES"
gateway_enable="YES"
defaultrouter="192.168.40.57"
# Set dumpdev to "AUTO" to enable crash dumps, "NO" to disable
dumpdev="AUTO"
```

Рисунок 3 – Редактирование конфигурационного файла

```
# Sample configuration file for ISC dhcpd
# option definitions common to all supported networks...
option domain-name "example.org";
option domain-name-servers ns1.example.org, ns2.example.org;

default-lease-time 600;
max-lease-time 3600;

subnet 192.168.80.0 netmask 255.255.255.0{
interface em2;
range 192.168.80.127 192.168.80.224;
option domain-name-servers 192.168.32.2;
option domain-name "example.com";
option routers 192.168.80.2;
option broadcast-address 192.168.80.255;
}
# Use this to enble / disable dynamic dns updates globally.
#ddns-update-style none;

# If this DHCP server is the official DHCP server for the local
# network, the authoritative directive should be uncommented.
#authoritative;

/usr/local/etc/dhcpd.conf: 109 lines, 3503 characters.
root@:~ # vi /usr/local/etc/dhcpd.conf_
```

Рисунок 4 - Редактирование конфигурационного файла DHCP

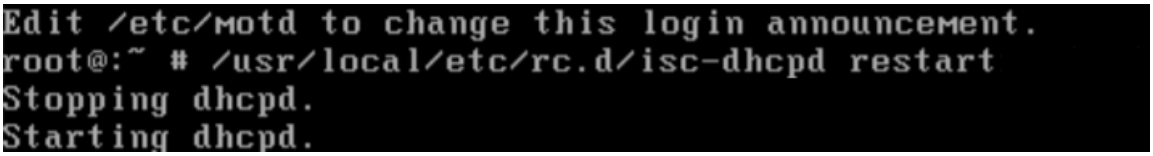

Рисунок 5 - Запсук сервера

2.2.2 Создание DHCP-сервера Ubuntu

В системе Ubuntu был создан DHCP-сервер, схожий с сервером в системе FreeBSD.

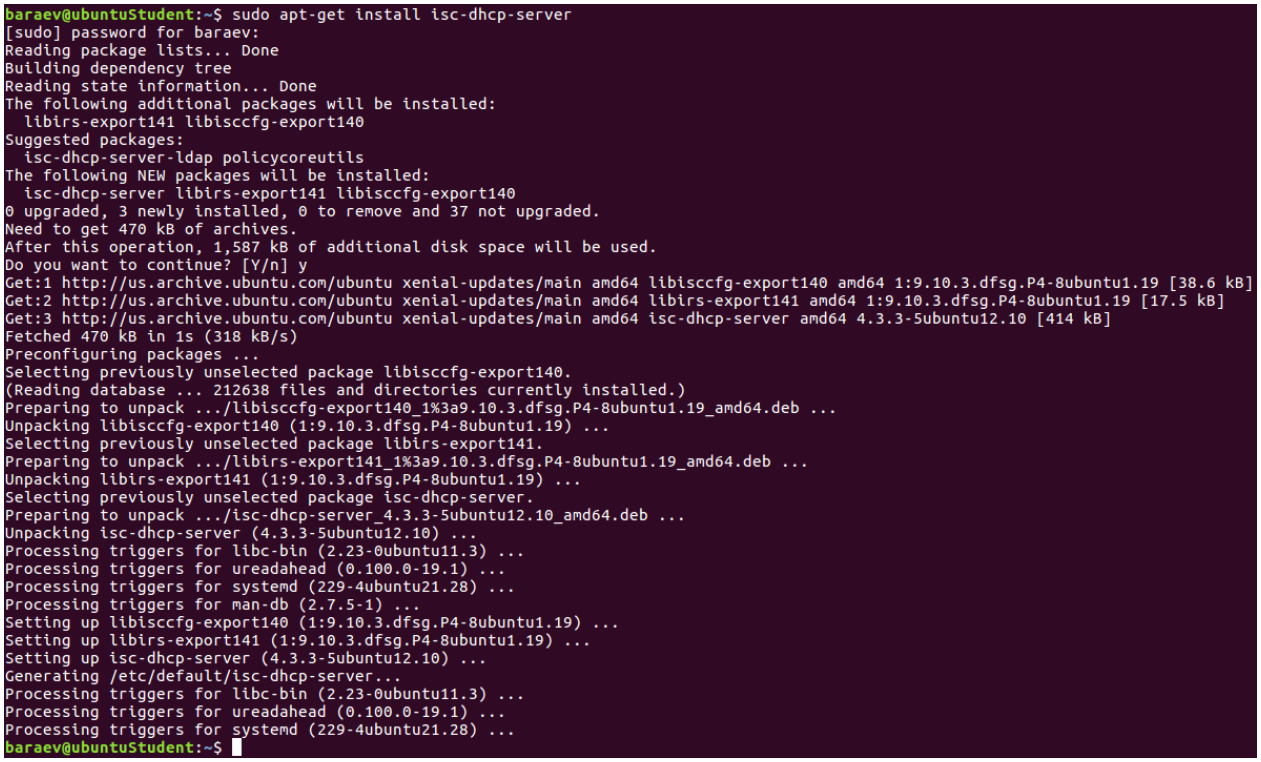

Рисунок 6 – Установка сервера

```
baraev@ubuntuStudent:~$ cat /etc/dhcp/dhcpd.conf
#
# Sample configuration file for ISC dhcpd for Debian
#
# Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
# configuration file instead of this file.
#
#

# The ddns-updates-style parameter controls whether or not the server will
# attempt to do a DNS update when a lease is confirmed. We default to the
# behavior of the version 2 packages ('none', since DHCP v2 didn't
# have support for DDNS.)
#ddns-update-style none;

# option definitions common to all supported networks...
option domain-name "example.org";
option domain-name-servers ns1.example.org, ns2.example.org;

default-lease-time 600;
max-lease-time 3600;

subnet 192.168.120.0 netmask 255.255.255.0{
range 192.168.120.100 192.168.120.200;
option domain-name-servers 192.168.32.2;
option domain-name "example.com";
option routers 192.168.120.2;
option broadcast-address 192.168.120.255;
}
```

Рисунок 7 - Редактирование конфигурационного файла DHCP

```
baraev@ubuntuStudent:~$ systemctl start isc-dhcp-server
baraev@ubuntuStudent:~$ sudo systemctl enable isc-dhcp-server
Synchronizing state of isc-dhcp-server.service with SysV init with /lib/systemd/systemd-sysv-install...
Executing /lib/systemd/systemd-sysv-install enable isc-dhcp-server
```

Рисунок 8 - Запуск сервера

2.3 Создание TFTP -сервера

2.3.1 Создание TFTP-сервера Ubuntu

Был создан и настроен TFTP-сервер.

```
baraev@ubuntuStudent:~$ sudo apt install tftpd-hpa
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  pxelinux
The following NEW packages will be installed:
  tftpd-hpa
0 upgraded, 1 newly installed, 0 to remove and 37 not upgraded.
Need to get 39.1 kB of archives.
After this operation, 115 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 tftpd-hpa amd64 5.2+20150808-1ubuntu1.16.04.1 [39.1 kB]
Fetched 39.1 kB in 0s (65.0 kB/s)
Preconfiguring packages ...
Selecting previously unselected package tftpd-hpa.
(Reading database ... 212673 files and directories currently installed.)
Preparing to unpack .../tftpd-hpa_5.2+20150808-1ubuntu1.16.04.1_amd64.deb ...
Unpacking tftpd-hpa (5.2+20150808-1ubuntu1.16.04.1) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for systemd (229-4ubuntu21.28) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up tftpd-hpa (5.2+20150808-1ubuntu1.16.04.1) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for systemd (229-4ubuntu21.28) ...
```

Рисунок 9 - Загрузка сервера

В конфигурационный файл /etc/rc.conf были добавлены строки:
tftpd_enable = “YES”
tftpd_flags = “-p -s /usr/tftpboot -B 1024 -ipv4”

```
baraev@ubuntuStudent:~$ sudo apt install -y syslinux pxelinux
Reading package lists... Done
Building dependency tree
Reading state information... Done
syslinux is already the newest version (3:6.03+dfsg-11ubuntu1).
The following NEW packages will be installed:
  pxelinux
0 upgraded, 1 newly installed, 0 to remove and 37 not upgraded.
Need to get 183 kB of archives.
After this operation, 307 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu xenial/main amd64 pxelinux all 3:6.03+dfsg-11ubuntu1 [183 kB]
Fetched 183 kB in 0s (232 kB/s)
Selecting previously unselected package pxelinux.
(Reading database ... 212686 files and directories currently installed.)
Preparing to unpack .../pxelinux_3%3a6.03+dfsg-11ubuntu1_all.deb ...
Unpacking pxelinux (3:6.03+dfsg-11ubuntu1) ...
Setting up pxelinux (3:6.03+dfsg-11ubuntu1) ...
```

Рисунок 10 - Установка SysLinux

```
baraev@ubuntuStudent:~$ ifconfig
ens33     Link encap:Ethernet  HWaddr 00:0c:29:11:d9:47
          inet addr:192.168.40.32  Bcast:192.168.40.255  Mask:255.255.255.0
          inet6 addr: fe80::859d:e61:125e:9463/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:188570 errors:0 dropped:0 overruns:0 frame:0
          TX packets:88328 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:284554251 (284.5 MB)  TX bytes:5363637 (5.3 MB)

ens38     Link encap:Ethernet  HWaddr 00:0c:29:11:d9:51
          inet addr:192.168.32.129  Bcast:192.168.32.255  Mask:255.255.255.0
          inet6 addr: fe80::831a:c0e8:3051:67cd/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:313 errors:0 dropped:0 overruns:0 frame:0
          TX packets:208 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:34219 (34.2 KB)  TX bytes:22372 (22.3 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:397 errors:0 dropped:0 overruns:0 frame:0
          TX packets:397 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:35043 (35.0 KB)  TX bytes:35043 (35.0 KB)
```

Рисунок 11 - Проверка состояния сети

2.4 Создание DNS -сервера

В системе Ubuntu был создан, настроен и проверен кэширующий DNS-сервер.

```
baraev@ubuntuStudent:~$ sudo apt install bind9
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  bind9utils libirs141
Suggested packages:
  bind9-doc
The following NEW packages will be installed:
  bind9 bind9utils libirs141
0 upgraded, 3 newly installed, 0 to remove and 37 not upgraded.
Need to get 591 kB of archives.
After this operation, 2,960 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libirs141 amd64 1:9.10.3.dfsg.P4-8ubuntu1.19 [17.9 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 bind9utils amd64 1:9.10.3.dfsg.P4-8ubuntu1.19 [200 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 bind9 amd64 1:9.10.3.dfsg.P4-8ubuntu1.19 [373 kB]
Fetched 591 kB in 1s (341 kB/s)
Preconfiguring packages ...
Selecting previously unselected package libirs141:amd64.
(Reading database ... 212694 files and directories currently installed.)
Preparing to unpack .../libirs141_1%3a9.10.3.dfsg.P4-8ubuntu1.19_amd64.deb ...
Unpacking libirs141:amd64 (1:9.10.3.dfsg.P4-8ubuntu1.19) ...
Selecting previously unselected package bind9utils.
Preparing to unpack .../bind9utils_1%3a9.10.3.dfsg.P4-8ubuntu1.19_amd64.deb ...
Unpacking bind9utils (1:9.10.3.dfsg.P4-8ubuntu1.19) ...
Selecting previously unselected package bind9.
Preparing to unpack .../bind9_1%3a9.10.3.dfsg.P4-8ubuntu1.19_amd64.deb ...
Unpacking bind9 (1:9.10.3.dfsg.P4-8ubuntu1.19) ...
Processing triggers for libc-bin (2.23-0ubuntu11.3) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for ufw (0.35-0ubuntu2) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for systemd (229-4ubuntu21.28) ...
Setting up libirs141:amd64 (1:9.10.3.dfsg.P4-8ubuntu1.19) ...
Setting up bind9utils (1:9.10.3.dfsg.P4-8ubuntu1.19) ...
Setting up bind9 (1:9.10.3.dfsg.P4-8ubuntu1.19) ...
Adding group `bind' (GID 131) ...
Done.
Adding system user `bind' (UID 123) ...
Adding new user `bind' (UID 123) with group `bind' ...
Not creating home directory `/var/cache/bind'.
wrote key file "/etc/bind/rndc.key"
```

Рисунок 12 - Загрузка Bind9

```
baraev@ubuntuStudent:~$ cat /etc/bind/named.conf.options
options {
        directory "/var/cache/bind";

        // If there is a firewall between you and nameservers you want
        // to talk to, you may need to fix the firewall to allow multiple
        // ports to talk.  See http://www.kb.cert.org/vuls/id/800113

        // If your ISP provided one or more IP addresses for stable
        // nameservers, you probably want to use them as forwarders.
        // Uncomment the following block, and insert the addresses replacing
        // the all-0's placeholder.

         forwarders {
                8.8.8.8;
         };

        //========================================================================
        // If BIND logs error messages about the root key being expired,
        // you will need to update your keys.  See https://www.isc.org/bind-keys
        //========================================================================
        dnssec-validation auto;

        listen-on-v6 { any; };
};
```

Рисунок 13 - Добавление forwarders в конфигурационный файл

```
baraev@ubuntuStudent:~$ cd /etc/bind
baraev@ubuntuStudent:/etc/bind$ nslookup wikipedia.org
Server:         127.0.1.1
Address:        127.0.1.1#53

Non-authoritative answer:
Name:   wikipedia.org
Address: 91.198.174.192

baraev@ubuntuStudent:/etc/bind$ nslookup vk.com
Server:         127.0.1.1
Address:        127.0.1.1#53

Non-authoritative answer:
Name:   vk.com
Address: 87.240.190.72
Name:   vk.com
Address: 87.240.190.78
Name:   vk.com
Address: 93.186.225.208
Name:   vk.com
Address: 87.240.139.194
Name:   vk.com
Address: 87.240.137.158
Name:   vk.com
Address: 87.240.190.67
```

Рисунок 14 - Результат запроса

```
baraev@ubuntuStudent:/etc/bind$ cat named.conf.local
//
// Do any local configuration here
//

// Consider adding the 1918 zones here, if they are not used in your
// organization
//include "/etc/bind/zones.rfc1918";
zone "example.com"{
        type master;
        file "/etc/bind/db.example.com";
};

zone "0.0.127.in-addr.arpa"{
        type master;
        file "/etc/bind/db.127";
};
```

Рисунок 15 - Добавление новых зон

```
baraev@ubuntuStudent:/etc/bind$ cat db.127
;
; BIND reverse data file for local loopback interface
;
$TTL    604800
@       IN      SOA     localhost. root.localhost. (
                              1         ; Serial
                         604800         ; Refresh
                          86400         ; Retry
                        2419200         ; Expire
                         604800 )       ; Negative Cache TTL
;
@       IN      NS      localhost.
1.0.0   IN      PTR     localhost.
```

Рисунок 16 - Просмотр файла зоны

```
 GNU nano 2.5.3                                        File: db.127

;
; BIND reverse data file for local loopback interface
;
$TTL    604800
@       IN      SOA     localhost. root.localhost. (
                              1         ; Serial
                         604800         ; Refresh
                          86400         ; Retry
                        2419200         ; Expire
                         604800 )       ; Negative Cache TTL
;
@       IN      NS      localhost.
@       IN      A       127.0.0.1
@       IN      AAAA    ::1
```

Рисунок 17 - Редактирование файла зоны

3. Вывод

В ходе выполнения данной лабораторной работы были созданы DHCP-серверы в системах Ubuntu и FreeBSD. Также был создан TFTP-сервер и DNS-сервер в системе Ubuntu.