

Lab Exercises Report

Assignment 2

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1. Network configuration

a. Output from the command ip address.

Router:

```
yhtserver@yhtserver:~$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:d5:46:02 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.100/24 brd 10.0.2.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fed5:4602/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:af:51:75 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.1/24 brd 192.168.1.255 scope global enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:feaf:5175/64 scope link
        valid_lft forever preferred_lft forever
4: enp0s9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:09:c0:05 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.1/24 brd 192.168.2.255 scope global enp0s9
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe09:c005/64 scope link
        valid_lft forever preferred_lft forever
yhtserver@yhtserver:~$
```

Web:

```
web@web:~$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:3f:4c:1b brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.2/24 brd 192.168.1.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe3f:4c1b/64 scope link
        valid_lft forever preferred_lft forever
web@web:~$
```

Files:

```
files@files:~$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:8f:16:d3 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.2/24 brd 192.168.2.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe8f:16d3/64 scope link
        valid_lft forever preferred_lft forever
files@files:~$
```

Desktop:

```
yhtdesk@yhtdesk-VirtualBox:/share/fronfile$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:d9:ee:aa brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.3/24 brd 192.168.1.255 scope global noprefixroute enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::feed:d70f:52c9:a771/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
yhtdesk@yhtdesk-VirtualBox:/share/fronfile$
```

2. Routing configuration

a. cat /etc/iptables/rules.v4 on the router machine.

```
yhtserver@yhtserver:~$ sudo cat /etc/iptables/rules.v4
[sudo] password for yhtserver:
# Generated by iptables-save v1.8.4 on Fri Dec  4 10:18:45 2020
*nat
:PREROUTING ACCEPT [57:4488]
:INPUT ACCEPT [44:3548]
:OUTPUT ACCEPT [129:10129]
:POSTROUTING ACCEPT [36:2708]
-A POSTROUTING -o enp0s3 -j MASQUERADE
-A POSTROUTING -o enp0s3 -j MASQUERADE
COMMIT
# Completed on Fri Dec  4 10:18:45 2020
# Generated by iptables-save v1.8.4 on Fri Dec  4 10:18:45 2020
*filter
:INPUT ACCEPT [504:241392]
:FORWARD ACCEPT [84:6198]
:OUTPUT ACCEPT [555:50524]
COMMIT
# Completed on Fri Dec  4 10:18:45 2020
yhtserver@yhtserver:~$
```

b. ping 192.168.1.2 on files machine and ping 192.168.2.2 on the web machine.

```
files@files:~$ ping 192.168.1.2
PING 192.168.1.2 (192.168.1.2) 56(84) bytes of data.
64 bytes from 192.168.1.2: icmp_seq=1 ttl=63 time=0.643 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=63 time=0.690 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=63 time=0.601 ms
64 bytes from 192.168.1.2: icmp_seq=4 ttl=63 time=0.689 ms
^C
--- 192.168.1.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 0.601/0.655/0.690/0.036 ms
files@files:~$
```

```
web@web:~$ ping 192.168.2.2
PING 192.168.2.2 (192.168.2.2) 56(84) bytes of data.
64 bytes from 192.168.2.2: icmp_seq=1 ttl=63 time=0.581 ms
64 bytes from 192.168.2.2: icmp_seq=2 ttl=63 time=0.697 ms
64 bytes from 192.168.2.2: icmp_seq=3 ttl=63 time=0.787 ms
64 bytes from 192.168.2.2: icmp_seq=4 ttl=63 time=0.782 ms
^C
--- 192.168.2.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3011ms
rtt min/avg/max/mdev = 0.581/0.711/0.787/0.083 ms
web@web:~$
```

3. DNS service configuration

a. Content of file /etc/bind/named.conf.local and all forward and reverse zone files.

/etc/bind/named.conf.local:

```
GNU nano 4.8 /etc/bind/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 "mycompany.com"{
    type master;
    file "/etc/bind/db.yhtserver.test";
};

zone "2.0.10.in-addr.arpa"{
    type master;
    notify no;
    file "/etc/bind/db.10";
};

zone "1.168.192.in-addr.arpa"{
    type master;
    notify no;
    file "/etc/bind/db.192";
};

zone "2.168.192.in-addr.arpa"{
    type master;
    notify no;
    file "/etc/bind/db.1922";
};

[ File '/etc/bind/named.conf.local' is unwritable ]
^G Get Help  ^O Write Out  ^W Where Is   ^K Cut Text   ^J Justify    ^C Cur Pos    M-U Undo
^X Exit       ^R Read File  ^E Replace    ^U Paste Text ^T To Spell   ^_ Go To Line  M-E Redo
```

/etc/bind/db.mycompany.com

```
GNU nano 4.8 db.mycompany.com
;
; This is the forward zone for mycompany.com internal domain ;
;
$TTL 604800
@      IN      SOA      server.mycompany.com. asl.seu.edu.cn. (
        2019112001    ; Serial
        604800        ; Refresh
        86400         ; Retry
        2419200       ; Expire
        604800        ) ; Negative Cache TTL
;
@      IN      NS       server.mycompany.com.
@      IN      A        127.0.0.1
@      IN      AAAA     ::1

gateway IN      A        10.0.2.1
server  IN      A        10.0.2.100
racktables IN   A        10.0.2.100
desktop IN      A        192.168.1.3
www     IN      A        192.168.1.2
home    IN      A        192.168.2.2
dns     IN      A        10.0.2.100
```

/etc/bind/db.10:

```

GNU nano 4.8                                db.10
;
; This is the reverse zone for mycompany.com internal domain;
;
$TTL      604800
@         IN      SOA      server.mycompany.com. asl.seu.edu.cn. (
                        2019112001          ; Serial
                        604800              ; Refresh
                        86400               ; Retry
                        2419200             ; Expire
                        604800 )           ; Negative Cache TTL
;
@         IN      NS       server.mycompany.com.
100       IN      PTR      gateway.mycompany.com.

```

/etc/bind/db.192:

```

GNU nano 4.8                                db.192
;
; This is the reverse zone for mycompany.com. internal domain;
;
$TTL      604800
@         IN      SOA      server.mycompany.com. asl.seu.edu.cn. (
                        2019112001          ; Serial
                        604800              ; Refresh
                        86400               ; Retry
                        2419200             ; Expire
                        604800 )           ; Negative Cache TTL
;
@         IN      NS       server.mycompany.com.
1         IN      PTR      dns.mycompany.com.
2         IN      PTR      www.mycompany.com.

```

/etc/bind/db.1922:

```

GNU nano 4.8                                db.1922
;
; This is the reverse zone for mycompany.com. internal domain;
;
$TTL      604800
@         IN      SOA      server.mycompany.com. asl.seu.edu.cn. (
                        2019112001          ; Serial
                        604800              ; Refresh
                        86400               ; Retry
                        2419200             ; Expire
                        604800 )           ; Negative Cache TTL
;
@         IN      NS       server.mycompany.com.
1         IN      PTR      dns.mycompany.com.
2         IN      PTR      home.mycompany.com.

```

- b. dig home.mycompany.com on the web machine and dig www.mycompany.com on the files machine.

```

min/avg/max/mdev = 0.581/0.711/0.787/0.083 ms
web@web:~$ dig home.mycompany.com

; <<>> DiG 9.16.1-Ubuntu <<>> home.mycompany.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 60058
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;home.mycompany.com.                IN      A

;; ANSWER SECTION:
home.mycompany.com.        604800  IN      A      192.168.2.2

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Thu Dec 17 11:03:51 UTC 2020
;; MSG SIZE rcvd: 63

web@web:~$

```

```

min/avg/max/mdev = 0.581/0.711/0.787/0.083 ms
files@files:~$ dig www.mycompany.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.mycompany.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50226
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;www.mycompany.com.                IN      A

;; ANSWER SECTION:
www.mycompany.com.        604800  IN      A      192.168.1.2

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Thu Dec 17 11:04:29 UTC 2020
;; MSG SIZE rcvd: 62

files@files:~$

```

- c. **dig -x 192.168.2.2 @dns.mycompany.com** on the web machine.

```

min/avg/max/mdev = 0.761/0.785/0.810/0.024 ms
web@web:~$ dig -x 192.168.2.2 @dns.mycompany.com

; <<>> DiG 9.16.1-Ubuntu <<>> -x 192.168.2.2 @dns.mycompany.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 57312
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 5e0b2a2f00f5de87010000005fdb3c134db0ad1e56401dcf (good)
;; QUESTION SECTION:
;2.2.168.192.in-addr.arpa.        IN      PTR

;; ANSWER SECTION:
2.2.168.192.in-addr.arpa. 604800  IN      PTR      home.mycompany.com.

;; Query time: 0 msec
;; SERVER: 10.0.2.100#53(10.0.2.100)
;; WHEN: Thu Dec 17 11:08:03 UTC 2020
;; MSG SIZE rcvd: 113

web@web:~$

```

4. File system configuration

- a. Zpool status on the web and files machines.

Web:

```
web@web:~$ zpool status
pool: webpool
state: ONLINE
scan: none requested
config:

    NAME        STATE      READ  WRITE CKSUM
    webpool      ONLINE    0     0     0
      mirror-0   ONLINE    0     0     0
        sdb      ONLINE    0     0     0
        sdc      ONLINE    0     0     0

errors: No known data errors
web@web:~$
```

Files:

```
files@files:~$ zpool status
pool: datapool
state: ONLINE
scan: none requested
config:

    NAME        STATE      READ  WRITE CKSUM
    datapool     ONLINE    0     0     0
      raidz2-0   ONLINE    0     0     0
        sdb      ONLINE    0     0     0
        sdc      ONLINE    0     0     0
        sdd      ONLINE    0     0     0

errors: No known data errors
files@files:~$ _
```

- b. Zfs list on the web and files.

Web:

```
web@web:~$ zfs list
NAME                USED  AVAIL  REFER  MOUNTPOINT
webpool             150K  352M   24K    /webpool
webpool/doc         24.5K  352M   24.5K   /www
web@web:~$ _
```

Files:

```
files@files:~$ zfs list
NAME                USED  AVAIL  REFER  MOUNTPOINT
datapool            128K  339M   23.9K   /datapool
datapool/home       24.4K  339M   24.4K   /datapool/home
files@files:~$ _
```

- c. Showmount -e home.mycompany.com on the desktop machine.

```
yhtdesk@yhtdesk-VirtualBox:/share/fronfile$ showmount -e home.mycompany.com
Export list for home.mycompany.com:
/datapool/home *
yhtdesk@yhtdesk-VirtualBox:/share/fronfile$
```

- d. Cat /etc/fstab on the desktop machine.

```
yhtdesk@yhtdesk-VirtualBox:/share/fronfile$ cat /etc/fstab
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda5 during installation
UUID=6d100d6b-8a1a-45bf-9f4f-c000a1842d9f / ext4 errors=remount
-ro 0 1
# /boot/efi was on /dev/sda1 during installation
UUID=B117-6189 /boot/efi vfat umask=0077 0 1
/swapfile none swap sw
0 0
server.yhtserver.test:/mnt/md0 /share/md0 nfs defaults,user,exec 0 0
home.mycompany.com:/datapool/home /share/fronfile nfs defaults,user,exec 0 0
yhtdesk@yhtdesk-VirtualBox:/share/fronfile$
```

5. Web service configuration

- Cat /etc/apache2/sites-available/000-default.conf on the web machine.

```
<VirtualHost www.mycompany.com:80>
# The ServerName directive sets the request scheme, hostname and port that
# the server uses to identify itself. This is used when creating
# redirection URLs. In the context of virtual hosts, the ServerName
# specifies what hostname must appear in the request's Host: header to
# match this virtual host. For the default virtual host (this file) this
# value is not decisive as it is used as a last resort host regardless.
# However, you must set it for any further virtual host explicitly.
#ServerName www.example.com

ServerAdmin web
DocumentRoot /www
    <Directory /www>
        Options FollowSymLinks
        AllowOverride None
        Require all granted
    </Directory>

# Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
# error, crit, alert, emerg.
# It is also possible to configure the loglevel for particular
# modules, e.g.
#LogLevel info ssl:warn

ErrorLog ${APACHE_LOG_DIR}/error.log
CustomLog ${APACHE_LOG_DIR}/access.log combined

# For most configuration files from conf-available/, which are
# enabled or disabled at a global level, it is possible to
# include a line for only one particular virtual host. For example the
# following line enables the CGI configuration for this host only
# after it has been globally disabled with "a2disconf".
#Include conf-available/serve-cgi-bin.conf
</VirtualHost>

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
web@web:~$
```

- On browser pointing to www.mycompany.com on desktop machine.

