

**TUGAS BESAR  
JARINGAN KOMPUTER  
MEMBANGUN SEBUAH JARINGAN SEDERHANA**



Disusun oleh:

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**Hash**                   =           **MUHYOP**

**Kode unik 1**           =           **17**

**Kode unik 2**           =           **8**

**Institut Teknologi Sumatera  
Jurusan Teknologi Produksi, Industri, Dan Informasi  
Program Studi Teknik Informatika  
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## **Kata Pengantar**

Segala puji bagi Tuhan Yang Maha Esa karena berkat rahmat dan hidayah-Nya kami masih diberikan nikmat sehat nikmat kesejahteraan serta nikmat keselamatan sehingga kami dapat menyelesaikan tugas besar Jaringan Komputer dengan lancar

Tugas besar ini disusun untuk memenuhi salah satu persyaratan untuk menyelesaikan mata kuliah Jaringan Komputer, selama mengerjakan tugas besar ini berbagai pihak telah membimbing kami, kami berterimakasih kepada asisten dosen angkatan 2016 yang juga sebagai asisten praktikum yang telah membimbing dalam pembuatan program tugas besar kali ini.

Kami menyadari, tugas besar ini masih banyak kelemahan dan kekurangan. Karena itu kritik dan saran yang membangun sangat diperlukan. Dengan adanya tugas besar ini kami berharap bisa memahami administrasi server

Lampung selatan, 05 Desember 2019

Tim Penulis

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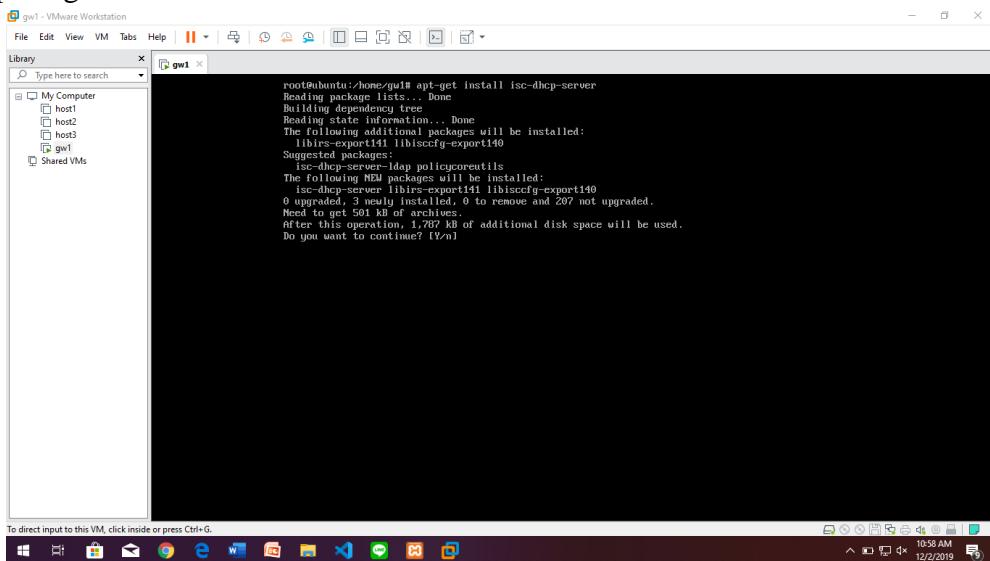
# Bab 1

## Tahap Pengembangan

### 1.1 Pengembangan jaringan 1

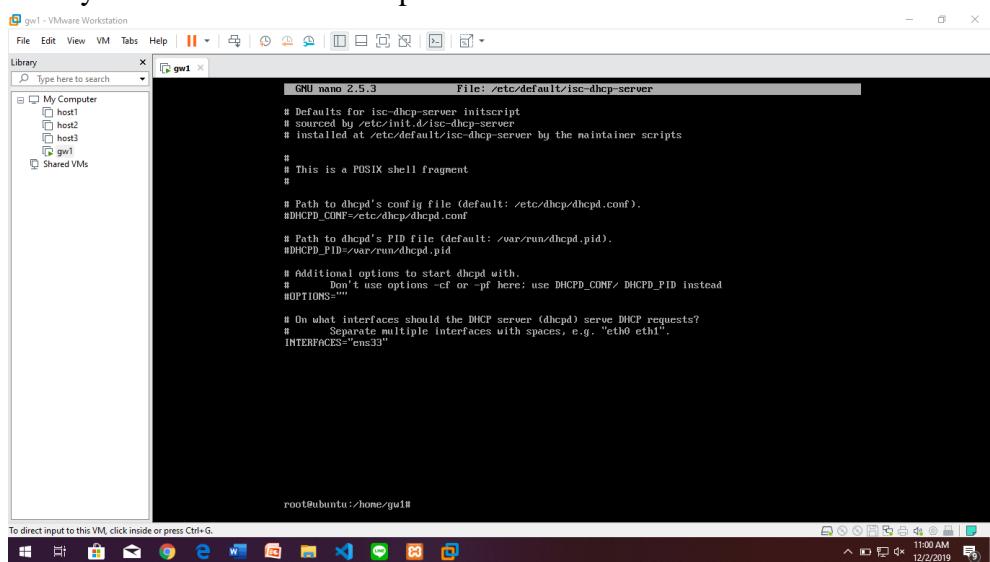
#### 1. GW1

Pada GW1 penulis menggunakan sistem operasi Ubuntu Server, pada GW1 terdapat service atau layanan yang dimiliki yaitu DHCP, NAT dan SSH. GW1 terhubung dengan host, dimana host akan merequest IP ke GW1 dan GW1 akan otomatis memberikan IP ke host menggunakan layanan DHCP. Untuk menggunakan layanan DHCP maka harus menginstall dan melakukan pengaturan konfigurasi DHCP. Langkah pertama harus menginstall dhcp dengan command “*apt-get install isc-dhcp server*”, tunggu hingga proses install selesai. Proses installasi DHCP seperti pada gambar dibawah ini.



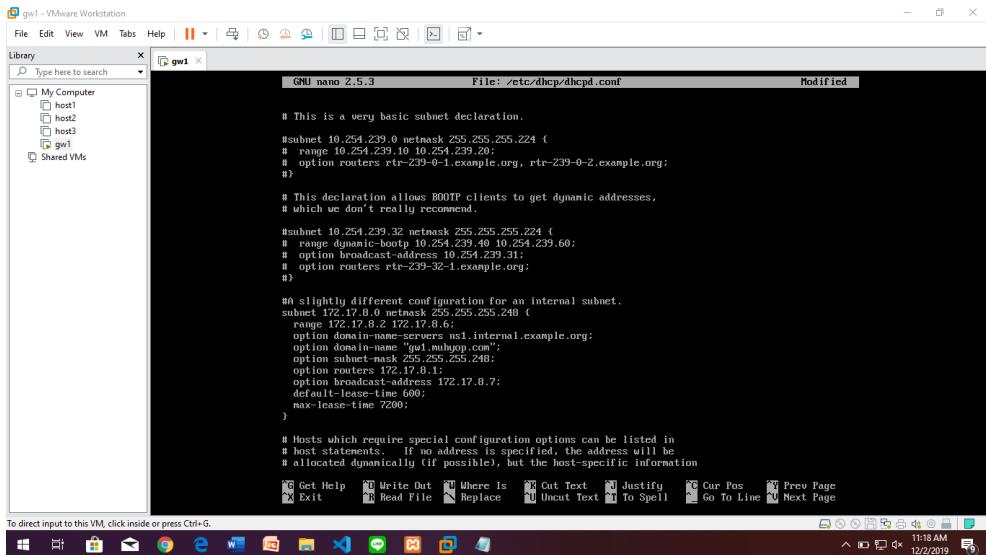
```
root@ubuntu:~# apt-get install isc-dhcp-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libisc-export141 libiscfg-export140
Suggested packages:
  isc-dhcp-server-ldap policycoreutils
The following NEW packages will be installed:
  isc-dhcp-server libirs-export141 libiscfg-export140
0 upgraded, 3 newly installed, 0 to remove and 207 not upgraded.
Need to get 501 kB of archives.
After this operation, 1,707 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

Kemudian lakukan konfigurasi interface yang digunakan dhcp, masukkan command “*nano /etc/default/isc-dhcp-server*”, ubah pada baris paling bawah terdapat code INTERFACES, kemudian masukkan interfaces yang digunakan untuk dhcp misalnya ens33. Setelah itu simpan file tersebut.



```
GNU nano 2.5.3          File: /etc/default/isc-dhcp-server
#
# Defaults for isc-dhcp-server initscript
# sourced by /etc/init.d/isc-dhcp-server
# installed at /etc/default/isc-dhcp-server by the maintainer scripts
#
# This is a POSIX shell fragment
#
# Path to dhcpcd's config file (default: /etc/dhcp/dhcpd.conf).
#DHCPD_CONF=/etc/dhcp/dhcpd.conf
#
# Path to dhcpcd's PID file (default: /var/run/dhcpcd.pid).
#DHCPD_PID=/var/run/dhcpcd.pid
#
# Additional options to start dhcpcd with.
# Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID instead
#OPTIONS=""
#
# On what interfaces should the DHCP server (dhcpcd) serve DHCP requests?
# Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACES="ens33"
```

Kemudian lakukan konfigurasi dhcp, masukkan command “*nano /etc/dhcp/dhcpd.conf*”, ubah pengaturan yang terdapat baris konfigurasi IP pada file tersebut. Penulis menggunakan IP 172.17.8.0 untuk DHCP pada GW1 yang didapat dari kode unik 1 dan kode unik 2, serta menggunakan netmask 255.255.255.248 karena menggunakan 3-5 host. Range yang digunakan adalah 172.17.8.2-172.17.8.6 karena IP 172.17.8.0 digunakan untuk network dan IP 172.17.8.7 digunakan untuk broadcast. Setelah itu simpan file tersebut dan lebih detailnya seperti pada gambar dibawah ini.



```

GNU nano 2.5.3           File: /etc/dhcp/dhcpd.conf          Modified

# This is a very basic subnet declaration.

#subnet 10.254.239.0 netmask 255.255.255.224 {
#  range 10.254.239.10 10.254.239.20;
#  option routers rtr-239-0-1.example.org, rtr-239-0-2.example.org;
#}

# This declaration allows BOOTP clients to get dynamic addresses,
# which don't really recommend.

#subnet 10.254.239.32 netmask 255.255.255.224 {
#  range dynamic-bootp 10.254.239.40 10.254.239.60;
#  option broadcast-address 10.254.239.31;
#  option routers rtr-239-32-1.example.org;
#}

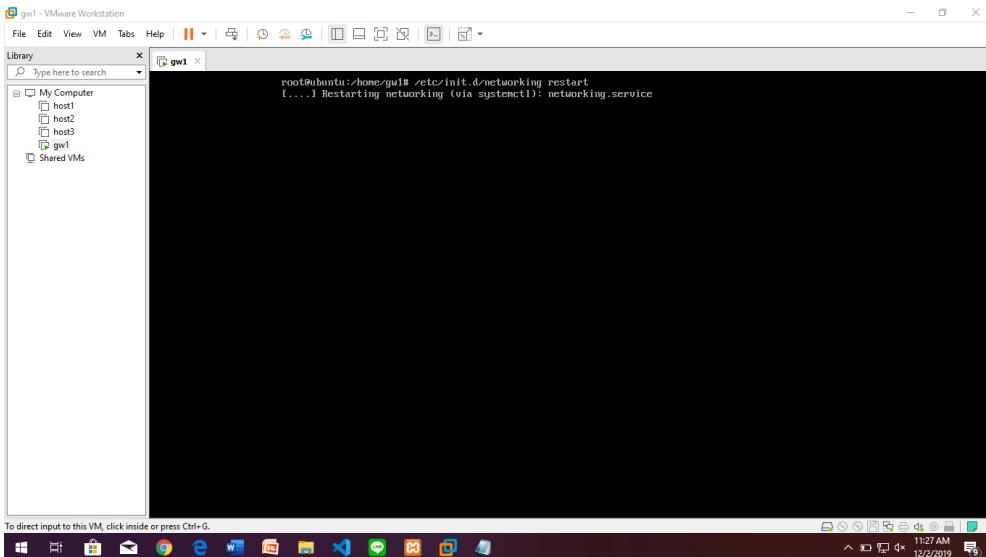
# A slightly different configuration for an internal subnet.
subnet 172.17.8.0 netmask 255.255.255.248 {
    range 172.17.8.2 172.17.8.6;
    option domain-name-servers ns1.internal.example.org;
    option domain-name 'gw1.dhcpip.com';
    option subnet-mask 255.255.255.248;
    option routers 172.17.8.1;
    option broadcast-address 172.17.8.7;
    default-lease-time 600;
    max-lease-time 7200;
}

# Hosts which require special configuration options can be listed in
# host statements. If no address is specified, the address will be
# allocated dynamically (if possible), but the host-specific information
# will be honored.

# Get Help   Write Out   Where Is   Cut Text   Justify   Our Pos   Prev Page
# Exit      Read File   Replace   Uncut Text   To Spell   Go To Line   Next Page

```

Setelah melakukan konfigurasi pada file */etc/dhcp/dhcpd.conf*, kemudian restart jaringan untuk memastikan pengaturan IP berhasil. Masukkan perintah “*/etc/init.d/networking restart*” seperti pada gambar dibawah ini. Jika konfigurasi benar dan tidak mengalami kesalahan, maka restart network akan berhasil. Jika gagal berarti terdapat kesalahan dalam konfigurasi DHCP.



```

root@ubuntu:~# /etc/init.d/networking restart
[....] Restarting networking (via systemctl): networking.service

```

Setelah berhasil direstart, cek IP yang sudah dikonfigurasi dengan command “*ifconfig*”, jika konfigurasi berhasil maka pada ens33 memiliki IP 172.17.8.1 seperti gambar dibawah ini.

```
gw1@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet HWaddr 00:0c:29:f5:c9:bd
           inet addr: 172.17.8.1  Bcast:172.17.8.1  Mask:255.255.255.254
           inet6 addr: fe80::20c:29ff:fe5fc9b:bd Scope:Link
             UP BROADCAST RUNNING MULTICAST  MTU:1500 Metric:1
             RX packets:0 errors:0 dropped:0 overruns:0 frame:0
             TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
             collisions:0 txqueuelen:1000
             RX bytes:0 (0.0 B)  TX bytes:640 (640.0 B)
             Interrupt:19 Base address:0x2800

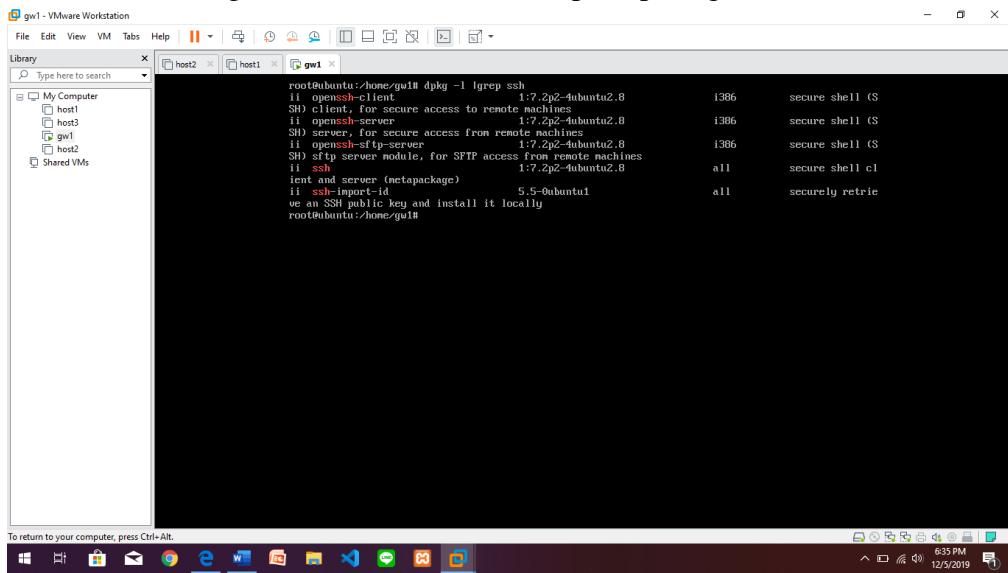
lo        Link encap:Local Loopback
          inet addr: 127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
            UP LOOPBACK RUNNING  MTU:65536 Metric:1
            RX packets:321 errors:0 dropped:0 overruns:0 frame:0
            TX packets:321 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1
            RX bytes:23729 (23.7 KB)  TX bytes:23729 (23.7 KB)

gw1@ubuntu:~$
```

Setelah itu install ssh dengan menggunakan command “*apt-get install ssh*”, tunggu hingga proses instalasi selesai.

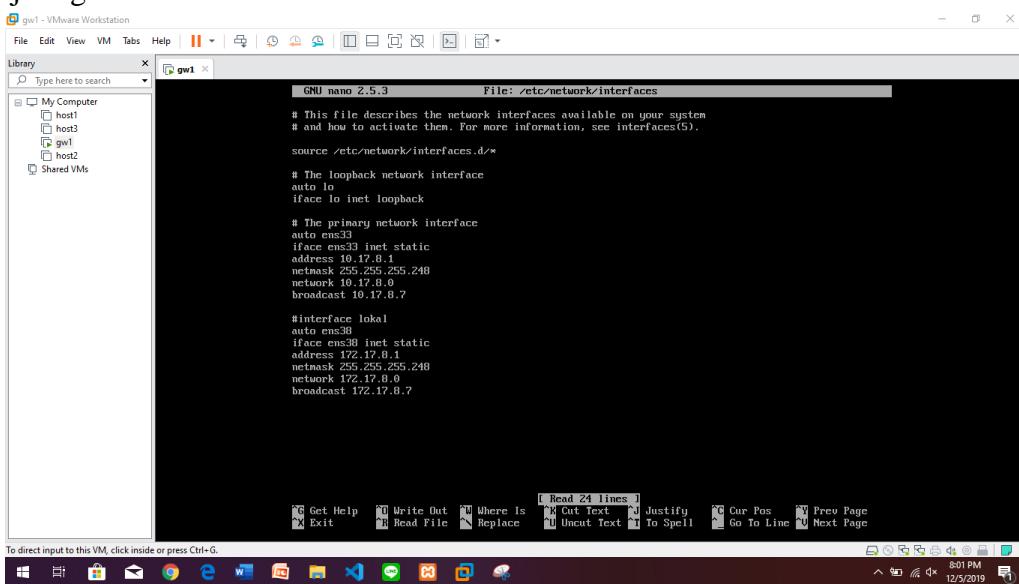
```
gw1@ubuntu:~$ sudo apt-get install ssh
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  liblber0  libnss-ldap  libkeychain  monkeysphere  rssh  nolly-guard  python3-chardet
  python3-pkg-resources  python3-requests  python3-six  python3-urllib3  ssh-import-id  tcpd
Suggested packages:
  ssh-askpass  libopen-ssh  libkeychain  monkeysphere  rssh  nolly-guard  python3-setuptools
  python3-nig-httplibclient  python3-openssl  python3-pyasn1
The following NEW packages will be installed:
  liblber0  libnss-ldap  libkeychain  monkeysphere  rssh  nolly-guard  python3-chardet  python3-pkg-resources
  python3-requests  python3-six  python3-urllib3  ssh  ssh-import-id  tcpd
The following packages will be upgraded:
  open-ssl  python3-setuptools
1 upgraded, 12 newly installed, 0 to remove and 206 not upgraded.
Need to get 1,719 kB of archives.
After this operation, 7,162 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

Untuk melakukan pengecekan ssh, masukkan command “`dpkg -l |grep ssh`”. Jika berhasil menginstall ssh maka akan tampil seperti gambar dibawah ini.



```
root@kudu:~# dpkg -l |grep ssh
ii  openssh-client          1:7.2p2-4ubuntu2.8      i386    secure shell (S
ii  openssh-server           1:7.2p2-4ubuntu2.8      i386    secure shell (S
ii  openssh-sshd              1:7.2p2-4ubuntu2.8      i386    secure shell (S
ii  openssh-sftp-server       1:7.2p2-4ubuntu2.8      i386    secure shell (S
SH) sftp server module, for SFTP access from remote machines
ii  ssh                        1:7.2p2-4ubuntu2.8      all     secure shell cl
ii  ssh-import-id             5.5-0ubuntu1          all     securely retrie
ve an SSH public key and install it locally
root@kudu:~#
```

Setelah itu menambahkan 1 interface lagi pada GW1, karena GW1 memiliki 2 IP yang terhubung ke host dan GW2 serta GW3. Untuk menambahkan interface kedua, buka file dengan command “`nano /etc/network/interfaces`” dan masukkan konfigurasi ens33 dan ens38 seperti gambar dibawah ini. Dimana ens33 memiliki IP 10.17.8.1 digunakan untuk LAN 0 yang terhubung ke GW2 dan GW3, sedangkan ens38 memiliki IP 172.17.8.1 digunakan untuk LAN 1 yang terhubung ke host. Kemudian save pengaturan IP seperti gambar dibawah ini dan lakukan restart jaringan.



```
root@kudu:~# nano /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).
source /etc/network/interfaces.d/*
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
    address 10.17.8.1
    netmask 255.255.255.248
    network 10.17.8.0
    broadcast 10.17.8.7

#interface lokal
auto ens38
iface ens38 inet static
    address 172.17.8.1
    netmask 255.255.255.248
    network 172.17.8.0
    broadcast 172.17.8.7

root@kudu:~#
```

Setelah berhasil direstart, cek IP yang sudah dikonfigurasi dengan command “*ifconfig*” , jika konfigurasi berhasil makan pada ens33 memiliki IP 10.17.8.1 dan ens38 memiliki IP 172.17.8.1 seperti gambar dibawah ini.

```

root@ubuntu:/home/gw1# ifconfig
ens33    Link encap:Ethernet HWaddr 00:0c:29:f5:cc:bd
          inet addr:10.17.8.1 Bcast:172.17.8.255 Mask:255.255.255.254
          inet6 addr: fe80::20c:29ff:fe5:cc%ens33 Scope:Link
            UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
            RX packets:0 errors:0 dropped:0 overruns:0 frame:0
            TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:0 (0.0 B) TX bytes:648 (648.0 B)
            Interrupt:19 Base address:0x2000

ens38    Link encap:Ethernet HWaddr 00:0c:29:f5:cc:c7
          inet addr:172.17.8.1 Bcast:172.17.8.255 Mask:255.255.255.254
          inet6 addr: fe80::20c:29ff:fe5:cc%ens38 Scope:Link
            UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
            RX packets:636 errors:0 dropped:0 overruns:0 frame:0
            TX packets:188 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:16248 (16.2 KB) TX bytes:8688 (8.6 KB)
            Interrupt:16 Base address:0x2080

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:16536 Metric:1
            RX packets:29457 errors:0 dropped:0 overruns:0 frame:0
            TX packets:29457 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1
            RX bytes:2179905 (2.1 MB) TX bytes:2179905 (2.1 MB)

root@ubuntu:/home/gw1#

```

Kemudian konfigurasi NAT, pertama buka file dengan command “*sudo /etc/sysctl.conf*” kemudian hilangkan tanda “#” pada kode “*net.ipv4.ip\_forward=1*”. Setelah itu save file.

```

# /etc/sysctl.conf - Configuration file for setting system variables
# See /etc/sysctl.d/ for additional system variables.
# See sysctl.conf (5) for information.
#
#kernel.domainname = example.com
#
# Uncomment the following to stop low-level messages on console
#kernel.printk = 3 4 1 3
#####
# Functions previously found in netbase
#
#
# Uncomment the next two lines to enable Spoof protection (reverse-path filter)
# Turn on Source Address Verification in all interfaces to
# prevent some spoofing attacks
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1
#
# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1
#
# Uncomment the next line to enable packet forwarding for IPv4
net.ipv4.ip_forward=1
#
# Uncomment the next line to enable packet forwarding for IPv6
# Enabling this option disables Stateless Address Autoconfiguration
# based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1

```

Kemudian masukkan command “`iptables -t nat -A POSTROUTING -o ens33 -j MASQUERADE`”, dan lakukan command yang sama untuk ens38. Setelah itu masukkan command “`iptables -t nat -L`” untuk melihat konfigurasi NAT yang sudah dibuat seperti gambar dibawah ini.

```

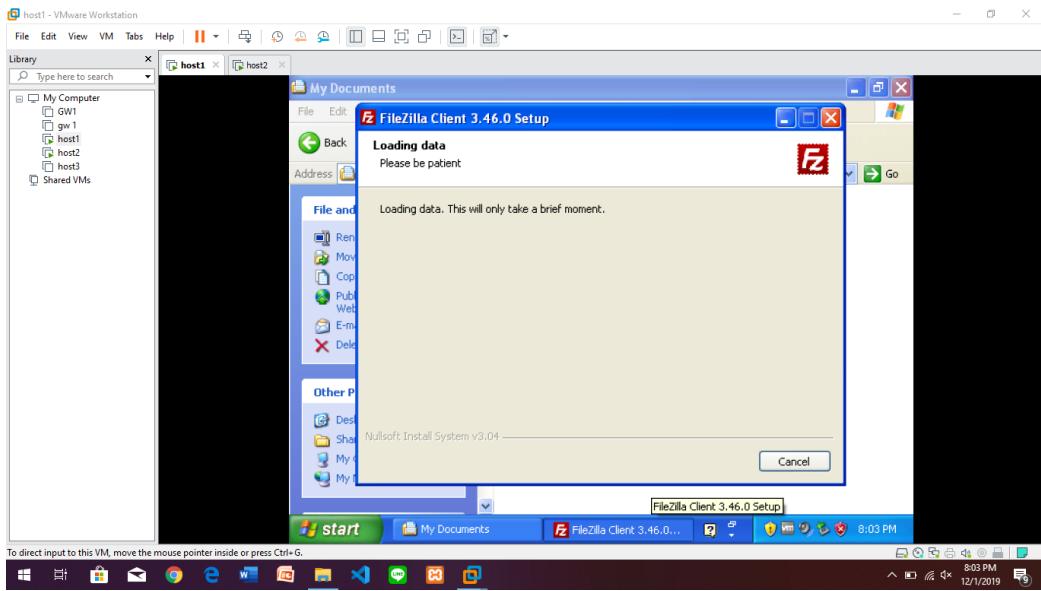
guil@ubuntu:~$ sudo su
[sudo] password for guil:
root@ubuntu:/home/guil# iptables -t nat -L
root@ubuntu:/home/guil# iptables -t nat -A POSTROUTING -o ens33 -j MASQUERADE
root@ubuntu:/home/guil# iptables -t nat -A POSTROUTING -o ens38 -j MASQUERADE
root@ubuntu:/home/guil# iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target     prot opt source               destination
Chain INPUT (policy ACCEPT)
target     prot opt source               destination
Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
Chain POSTROUTING (policy ACCEPT)
target     prot opt source               destination
MASQUERADE all  --  anywhere            anywhere
root@ubuntu:/home/guil# 

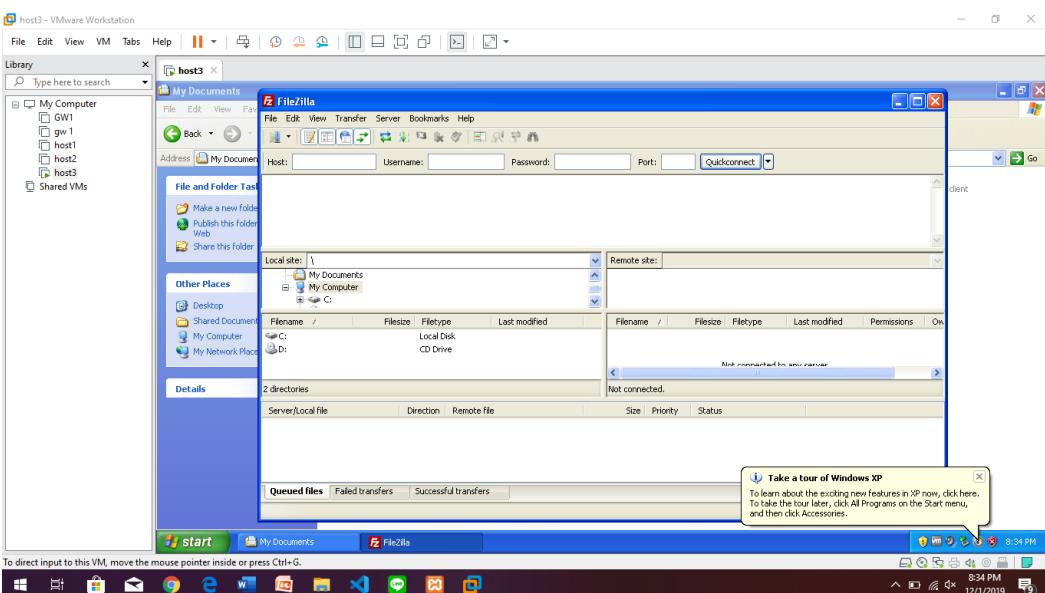
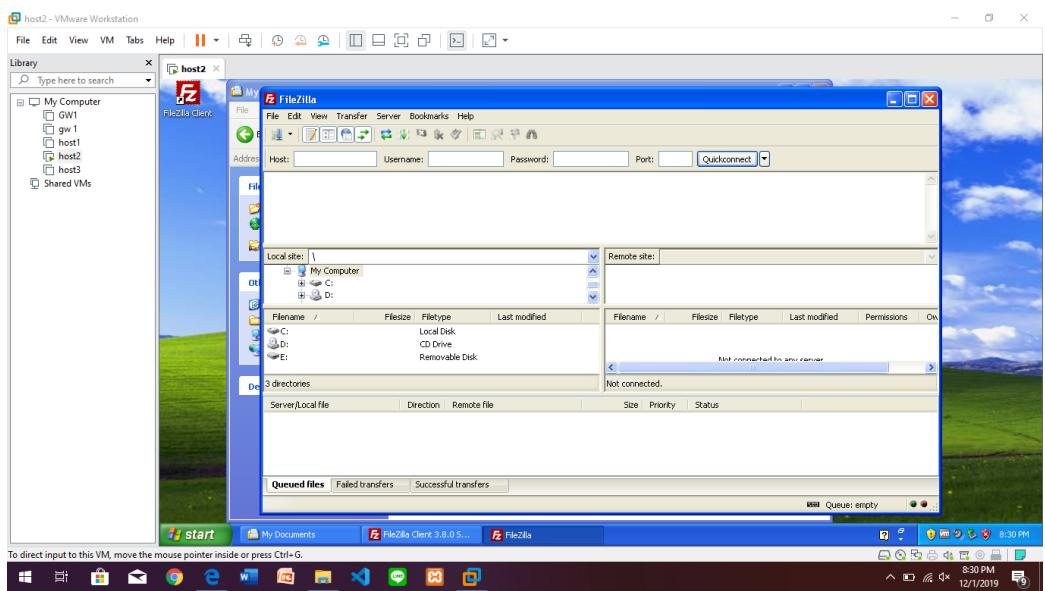
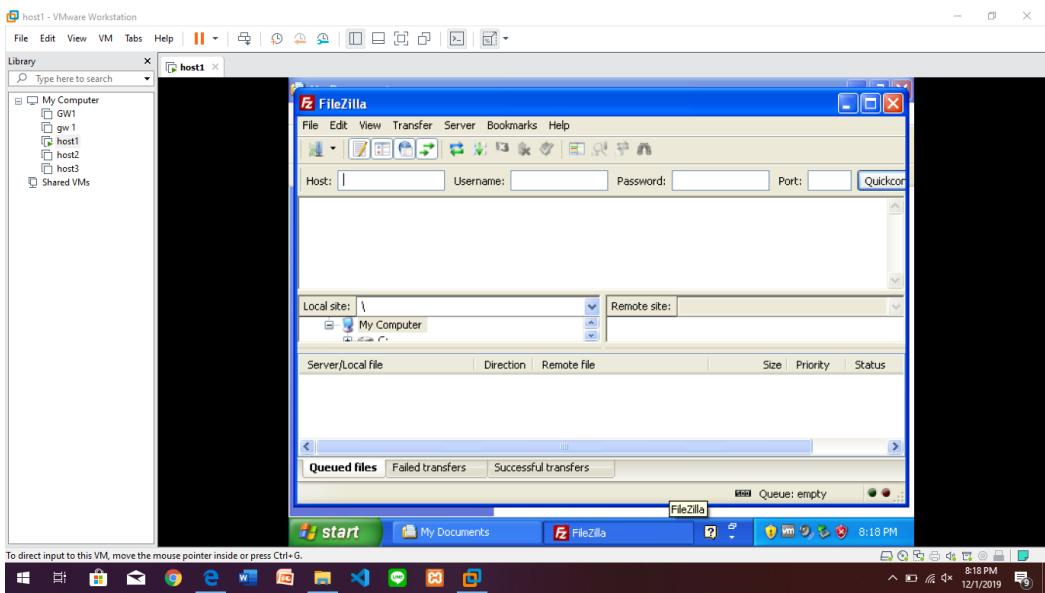
```

## 2. Host

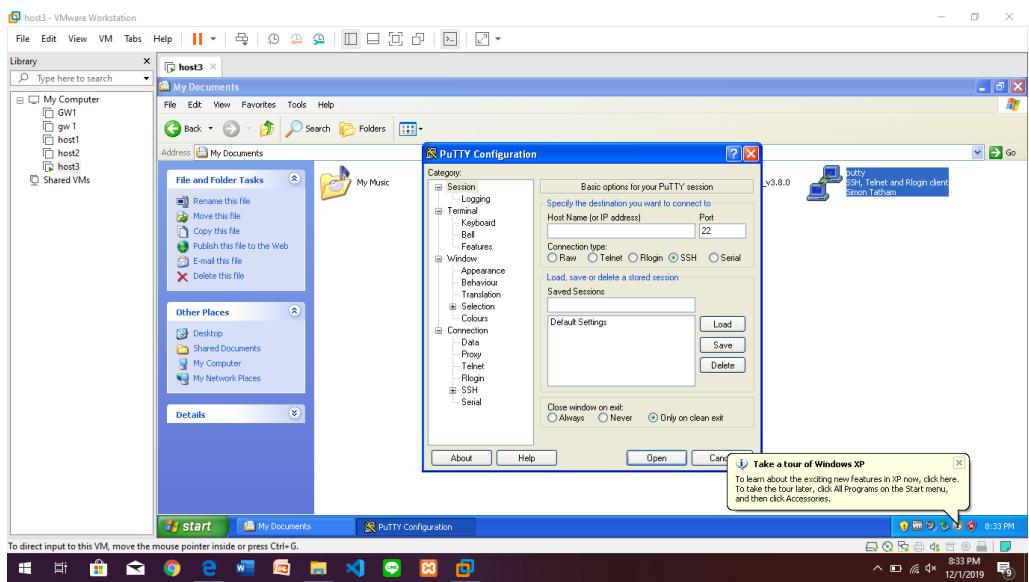
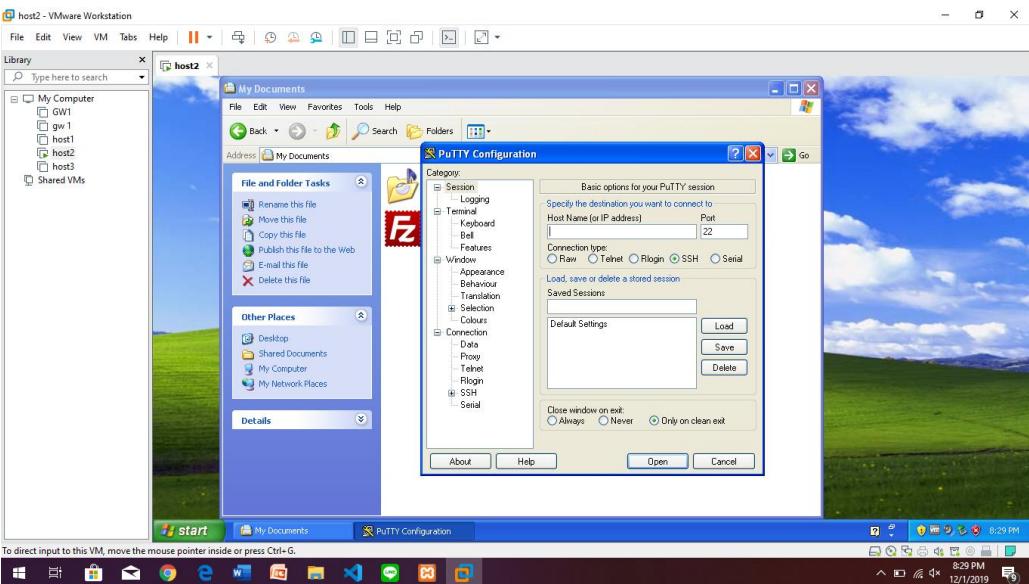
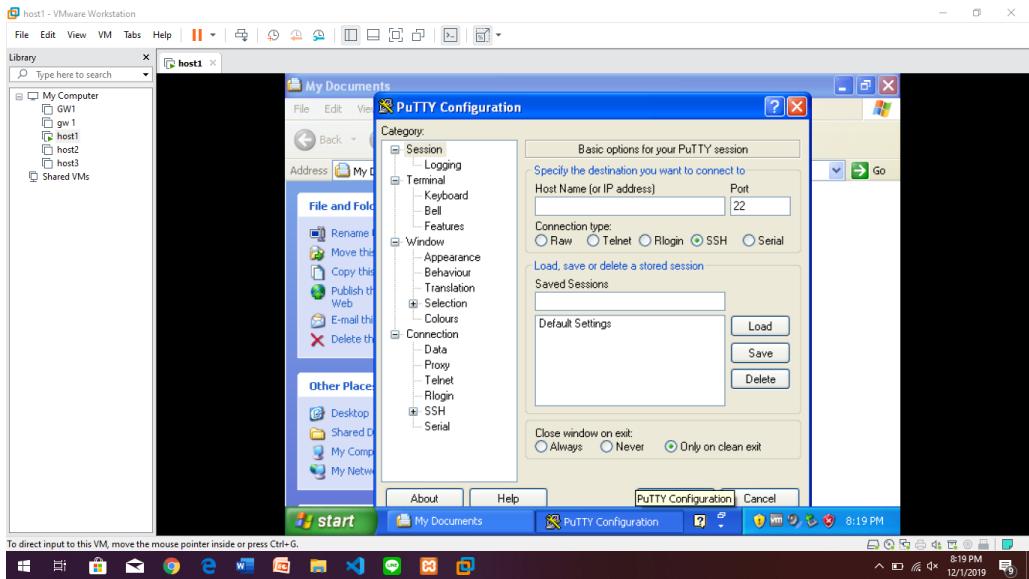
Pada host penulis menggunakan sistem operasi Windows, pada host terdapat software yaitu web browser, Filezilla dan putty. Pada host akan otomatis mendapatkan IP dari GW1.

Pada host 1-3 lakukan instalasi filezilla seperti pada gambar dibawah ini.





Pada host 1-3 juga lakukan instalasi putty seperti pada gambar dibawah ini.



## 1.2.Pengembangan jaringan 2

### 1.GW2

Pada GW2 penulis menggunakan sistem operasi Ubuntu Server, pada GW2 terdapat service atau layanan yang dimiliki yaitu Firewall, NAT dan SSH. GW2 terhubung dengan DBserver dan webserver.

Seting IP address, IP network, netmask, broadcast dan gateway. Dapat dilihat terdapat IP yang sudah disetting pada GW2, yaitu pada ens33 kelasnya akan sama dengan Web server dan Database server, yang artinya mereka akan berada pada satu LAN yang sama yaitu 192.17.8.X lalu IP pada ens38 adalah 10.17.8.2 ini nantinya akan terhubung pada setiap GW1 dan GW2, mereka berada pada LAN yang sama yaitu LAN 0. Untuk mengkonfigurasi IP menggunakan command “*nano /etc/network/interfaces*”.

```
GNU nano 2.5.3          File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
    address 192.17.8.1
    netmask 255.255.255.248
    network 192.17.8.0
    broadcast 192.17.8.7

auto ens38
iface ens38 inet static
    address 10.17.8.2
    netmask 255.255.255.248
    gateway 10.17.8.1
    network 10.17.8.0
    broadcast 10.17.8.7

up route add -net 200.17.8.0/29 gw 10.17.8.3 dev ens38
```

Cek IP yang sudah di konfigurasi dengan menggunakan command “*ifconfig*”. Dapat dilihat ens33 dan ens38 sudah tersetting pada GW2.

```
gw2@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet HWaddr 00:0c:29:2e:c0:19
           inet addr:192.17.8.1 Bcast:192.17.8.7 Mask:255.255.255.248
             inet6 addr: fe80::20c:29ff:fe2e:c019/64 Scope:Link
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:236 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:24183 (24.1 KB) TX bytes:2300 (2.3 KB)
                  Interrupt:19 Base address:0x2000

ens38      Link encap:Ethernet HWaddr 00:0c:29:2e:c0:23
           inet addr:10.17.8.2 Bcast:10.17.8.7 Mask:255.255.255.248
             inet6 addr: fe80::20c:29ff:fe2e:c023/64 Scope:Link
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:194 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:22295 (22.2 KB) TX bytes:648 (648.0 B)
                  Interrupt:16 Base address:0x2000

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:10256 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:10256 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1
                  RX bytes:759056 (759.0 KB) TX bytes:759056 (759.0 KB)
```

Instalasi dan routing NAT sudah berhasil dilakukan, dapat dilihat dari gambar dimana MASQUERADE all –anywhere ada 2 yaitu untuk ens33 dan ens38.

```
gw2@ubuntu:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target    prot opt source               destination
Chain INPUT (policy ACCEPT)
target    prot opt source               destination
Chain OUTPUT (policy ACCEPT)
target    prot opt source               destination
Chain POSTROUTING (policy ACCEPT)
target    prot opt source               destination
MASQUERADE  all  --  anywhere             anywhere
MASQUERADE  all  --  anywhere             anywhere
gw2@ubuntu:~$
```

Instalasi SSH sudah berhasil dilakukan, kita dapat mengeceknya dengan perintah “*dpkg -l |grep SSH*” yaitu command untuk mengecek apakah ssh sudah terinstall atau belum.

```
gw2@ubuntu:~$ dpkg -l |grep SSH
ii  openssh-client           1:7.2p2-4ubuntu2.8          i386   secur
e shell (SSH) client, for secure access to remote machines
ii  openssh-server            1:7.2p2-4ubuntu2.8          i386   secur
e shell (SSH) server, for secure access from remote machines
ii  openssh-sftp-server       1:7.2p2-4ubuntu2.8          i386   secur
e shell (SSH) sftp server module, for SFTP access from remote machines
ii  ssh-import-id              5.5-0ubuntu1                  all    secur
ely retrieve an SSH public key and install it locally
gw2@ubuntu:~$
```

## 2. Web Server

Setting IP pada Web Server, dapat dilihat pada gambar IP Address, netmask, gateway, broadcast sudah di setting di interface dengan menggunakan perintah nano /etc/network/interface, setelah itu simpan dengan menekan tombol ctrl + x lalu ketik y dan enter. Maka IP address sudah tersetting pada Web Server yaitu 192.17.8.3.

```
GNU nano 2.5.3                                     File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
address 192.17.8.3
netmask 255.255.255.248
gateway 192.17.8.1
network 192.17.8.0
broadcast 192.17.8.7

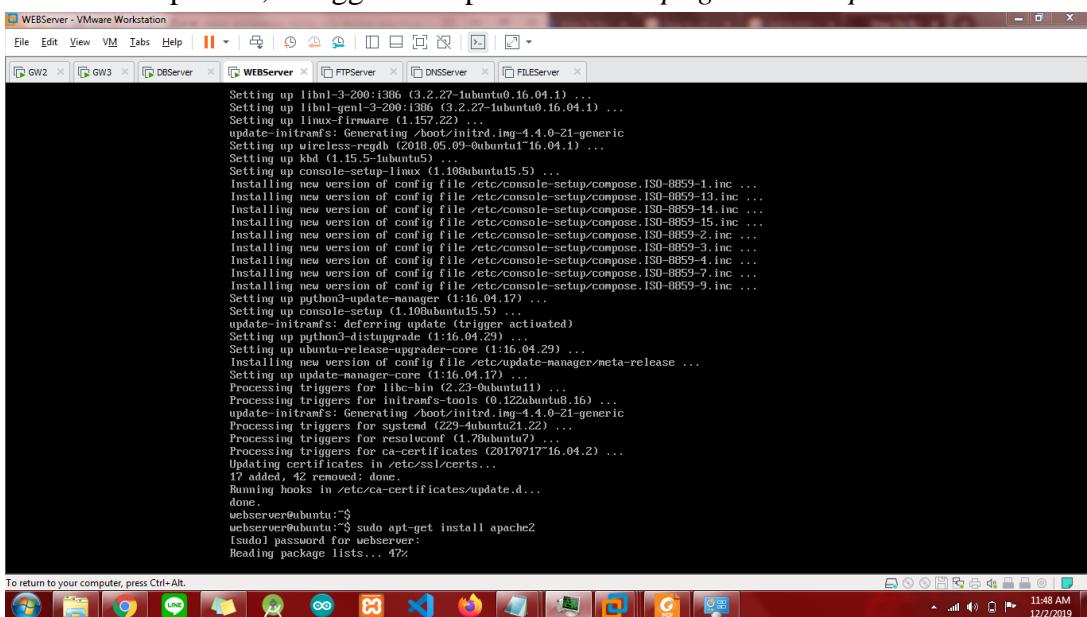
up route add -net 10.17.8.0/29 gw 192.17.8.1 dev ens33
```

Untuk mengecek apakah ip sudah tersetting pada web server atau tidak, kita dapat menggunakan perintah *ifconfig*. Dapat dilihat pada gambar IP sudah tersetting di ens33 dengan IP address 172.17.8.3

```
webserver@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet HWaddr 00:0c:29:c2:57:ba
            inet addr:192.17.8.3  Bcast:192.17.8.255 Mask:255.255.255.2548
            inet6 addr: fe80::20c:29ff:fec2:57ba/64 Scope:Link
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:540 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:128 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:53927 (53.9 KB) TX bytes:12016 (12.0 KB)
                  Interrupt:19 Base address:0x2000

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:32176 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:32176 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1
                  RX bytes:2381136 (2.3 MB) TX bytes:2381136 (2.3 MB)
```

Instalasi apache2, menggunakan perintah *sudo apt-get install apache2*



## Proses instalasi Apache2

The screenshot shows a terminal window titled 'WEBServer' in a VMware Workstation interface. The command entered is 'sudo apt-get install phpmyadmin'. The output shows the package manager reading lists, building a dependency tree, and listing packages to be installed, including various MySQL and PHP components. It also lists suggested packages like mariadb-server and mysql-server. The terminal indicates 0 upgraded, 35 newly installed, and 754 not upgraded. A download progress bar for 'dbconfig-common\_2.0.4ubuntu1 [582 kB]' is shown at the bottom.

```
webserver@ubuntu:~$ sudo apt-get install phpmyadmin
Reading package lists... Done
Building dependency tree...
Reading state information... Done
The following additional packages will be installed:
  dbconfig-common libconfig-mysql javascript-common liblai0
  libapache2-mod-php libapache2-mod-php7.0 libjs-jquery
  libjs-sphinxdoc libjs-underscore libmcrypt4 mysql-client
  mysql-client-5.7 mysql-client-core-5.7 mysql-common
  php-common php-gd php-gettext php-mbstring php-mcrypt
  php-mysql php-pear php-pearlib php-tcpdf php-xml
  php7.0-clients php7.0-common php7.0-gd php7.0-json
  php7.0-mbstring php7.0-mcrypt php7.0-mysql php7.0-opcache
  php7.0-readline php7.0-xml
Suggested packages:
  mysql-server | mariadb-server libmcrypt-dev mcrypt
  php-lbsodium php-gmp php-imapck mysql-server
  | mariadb-server | virtual-mysql-server
The following NEW packages will be installed:
  dbconfig-common libconfig-mysql javascript-common liblai0
  libapache2-mod-php libapache2-mod-php7.0 libjs-jquery
  libjs-sphinxdoc libjs-underscore libmcrypt4 mysql-client
  mysql-client-5.7 mysql-client-core-5.7 mysql-common
  php-common php-gd php-gettext php-mbstring php-mcrypt
  php-mysql php-pear php-pearlib php-tcpdf php-xml
  php7.0-clients php7.0-common php7.0-gd php7.0-json
  php7.0-mbstring php7.0-mcrypt php7.0-mysql php7.0-opcache
  php7.0-readline php7.0-xml phpmyadmin
0 upgraded, 35 newly installed, 0 to remove and 754 not upgraded.
Need to get 25.5 MB of additional disk space will be used.
Do you want to continue? [Y/n]
Get:1 http://us.archive.ubuntu.com/ubuntu xenial/main amd64 dbconfig-common all 2.0.4ubuntu1 [582 kB]
  0% [1 dbconfig-common 152 kB/582 kB 26%]
```

Jika sudah selesai instalasi apache2, maka dapat di cek dengan menggunakan perintah “`dpkg -l |grep apache2`”, dapat terlihat apache2 sudah terinstall pada Web Server

The screenshot shows a terminal window displaying the output of the command 'dpkg -l |grep apache2'. The output lists several packages related to Apache2, including apache2, apache2-bin, apache2-data, apache2-utils, libapache2-mod-php, and libapache2-mod-php7.0. All packages are marked as installed ('ii') and are listed under the 'Apache' category.

Package	Version	Architecture	Category
apache2	2.4.18-2ubuntu3.14	i386	Apache
apache2-bin	2.4.18-2ubuntu3.14	i386	Apache
apache2-data	2.4.18-2ubuntu3.14	all	Apache
apache2-utils	2.4.18-2ubuntu3.14	i386	Apache
libapache2-mod-php	1:7.0+35ubuntu6.1	all	serve
libapache2-mod-php7.0	7.0.33-0ubuntu0.16.04.7	i386	serve

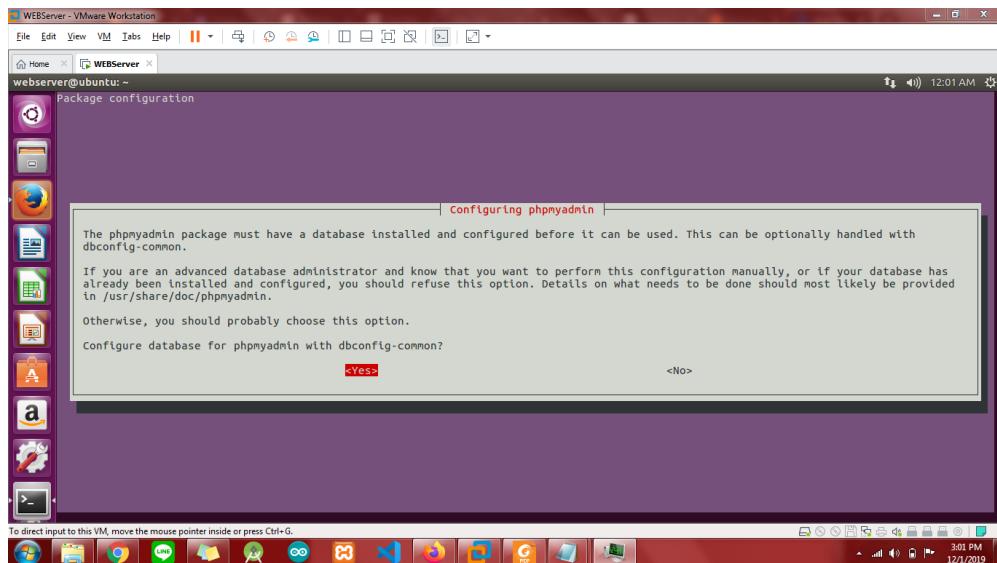
Instalasi PHP, untuk mengecek apakah PHP sudah terinstal dapat menggunakan perintah “`dpkg -l |grep php`”

<code>ii php-mcrypt</code>	1:7.0+35ubuntu6.1	all	libmcrypt
<code>ii php-mysql</code>	1:7.0+35ubuntu6.1	all	MySQL
<code>ii php-pear</code>	1:1.10.1+submodules+notgz-6ubuntu0.1	all	PEAR
<code>ii php-xml</code>	1:7.0+35ubuntu6.1	all	DOM, SimpleXML, WDDX, XML, and XSL module for PHP [default]
<code>ii php7.0</code>	7.0.33-0ubuntu0.16.04.7	all	server-side, HTML-embedded scripting language (metapackage)
<code>ii php7.0-cli</code>	7.0.33-0ubuntu0.16.04.7	i386	command-line interpreter for the PHP scripting language
<code>ii php7.0-common</code>	7.0.33-0ubuntu0.16.04.7	i386	documentation, examples and common module for PHP
<code>ii php7.0-gd</code>	7.0.33-0ubuntu0.16.04.7	i386	GD module for PHP
<code>ii php7.0-json</code>	7.0.33-0ubuntu0.16.04.7	i386	JSON module for PHP
<code>ii php7.0-mbstring</code>	7.0.33-0ubuntu0.16.04.7	i386	MBSTR module for PHP
<code>ii php7.0-mcrypt</code>	7.0.33-0ubuntu0.16.04.7	i386	libmcrypt
<code>ii php7.0-mysql</code>	7.0.33-0ubuntu0.16.04.7	i386	MySQL module for PHP
<code>ii php7.0-opcache</code>	7.0.33-0ubuntu0.16.04.7	i386	Zend OpCache module for PHP
<code>ii php7.0-readline</code>	7.0.33-0ubuntu0.16.04.7	i386	readline module for PHP
<code>ii php7.0-xml</code>	7.0.33-0ubuntu0.16.04.7	i386	SimpleXML, WDDX, XML, and XSL module for PHP
<code>ii phpmyadmin</code>	4:4.5.4.1-2ubuntu2.1	all	MySQL web administration tool

Instalasi PHPMYADMIN, masukkan command “`apt-get install phpMyAdmin`”.

```

Creating config file /etc/dbconfig-common/phpmyadmin.conf with new version
Creating config file /etc/phpmyadmin/config-db.php with new version
mysql: [Warning] mysql: Empty value for 'port' specified. Will throw an error in future versions
ERROR 2002 (HY000): Can't connect to local MySQL server through socket '/var/run/mysqld/mysqld.sock' (2).
unable to connect to mysql server.
error: encountered creation error.
mysql: [Warning] mysql: Empty value for 'port' specified. Will throw an error in future versions
ERROR 2002 (HY000): Can't connect to local MySQL server through socket '/var/run/mysqld/mysqld.sock' (2).
dbconfig-common: phpmyadmin configure: trying again (skip questions).
dbconfig-common: writing config to /etc/dbconfig-common/phpmyadmin.conf
Replacing config file /etc/dbconfig-common/phpmyadmin.conf with new version
mysql: [Warning] mysql: Empty value for 'port' specified. Will throw an error in future versions
ERROR 2002 (HY000): Can't connect to local MySQL server through socket '/var/run/mysqld/mysqld.sock' (2).
unable to connect to mysql server.
error: encountered creation error.
mysql: [Warning] mysql: Empty value for 'port' specified. Will throw an error in future versions
ERROR 2002 (HY000): Can't connect to local MySQL server through socket '/var/run/mysqld/mysqld.sock' (2).
dbconfig-common: phpmyadmin configure: trying again.
dbconfig-common: writing config to /etc/dbconfig-common/phpmyadmin.conf
Replacing config file /etc/dbconfig-common/phpmyadmin.conf with new version
dbconfig-common: flushing administrative password
Processing triggers for libapache2-mod-php7.0 (7.0.33-0ubuntu0.16.04.7) ...
Processing triggers for libapache2-mod-php7.0 (7.0.33-0ubuntu0.16.04.7) ...
webserver@ubuntu:~$ sudo apt-get install phpmyadmin
[sudo] password for webserver:
Sorry, try again.
[sudo] password for webserver:
Reading package lists... Done
Building dependency tree
Reading state information... Done
phpmyadmin is already the newest version (4:4.5.4.1-2ubuntu2.1).
0 upgraded, 0 newly installed, 0 to remove and 754 not upgraded.
webserver@ubuntu:~$ 
```



Cara mengecek apakah PHPMYADMIN sudah terinstal di WEB SERVER adalah dengan menggunakan perintah `dpkg -l |grep phpmyadmin`

```
webserver@ubuntu:~$ dpkg -l |grep phpmyadmin
ii  phpmyadmin                               4:4.5.4.1-2ubuntu2.1          all      MySQL
  web administration tool
webserver@ubuntu:~$
```

### 3. Database Server

Setting IP pada Database Server, dapat dilihat pada gambar IP Address, netmask, gateway, broadcast sudah di setting di interface dengan menggunakan perintah “`nano /etc/network/interfaces`”, setelah itu simpan dengan menekan tombol `ctrl + x` lalu ketik `y` dan enter. Maka IP address sudah tersetting pada Database Server 192.17.8.2.

```
GNU nano 2.5.3                                     File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
  address 192.17.8.2
  netmask 255.255.255.248
  gateway 192.17.8.1
  network 192.17.8.0
  broadcast 192.17.8.7
```

Cek apakah IP address sudah berhasil dikonfigurasi di database server dengan menggunakan perintah “*ifconfig*”. Dapat dilihat pada gambar ip sudah berhasil dikonfigurasi pada ens33 database server

```
databaseserver@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet HWaddr 00:0c:29:00:a0:a6
            inet addr:192.17.8.2 Bcast:192.17.8.7 Mask:255.255.255.248
            inet6 addr: fe80::20c:29ff:fe00:a0a6/64 Scope:Link
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:556 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:86 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:55807 (55.8 KB) TX bytes:7956 (7.9 KB)
                  Interrupt:19 Base address:0x2000

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:40656 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:40656 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1
                  RX bytes:3008656 (3.0 MB) TX bytes:3008656 (3.0 MB)

databaseserver@ubuntu:~$
```

Instalasi mysql, mengecek MYSQL sudah terinstal pada database server adalah dengan menggunakan perintah “*dpkg -l |grep phpMyAdmin*”

```
databaseserver@ubuntu:~$ dpkg -l |grep mysql
ii  dbconfig-mysql                               2.0.4ubuntu1          all    dbconfig-co
mon MySQL/MariaDB support
ii  mysql-client                                5.7.28-0ubuntu0.16.04.2      all    MySQL datab
ase client (metapackage depending on the latest version)
ii  mysql-client-5.7                            5.7.28-0ubuntu0.16.04.2      i386   MySQL datab
ase client binaries
ii  mysql-client-core-5.7                        5.7.28-0ubuntu0.16.04.2      i386   MySQL datab
ase core client binaries
ii  mysql-common                                5.7.28-0ubuntu0.16.04.2      all    MySQL datab
ase common files, e.g. /etc/mysql/my.cnf
ii  mysql-server                                5.7.28-0ubuntu0.16.04.2      all    MySQL datab
ase server (metapackage depending on the latest version)
ii  mysql-server-5.7                            5.7.28-0ubuntu0.16.04.2      i386   MySQL datab
ase server binaries and system database setup
ii  mysql-server-core-5.7                        5.7.28-0ubuntu0.16.04.2      i386   MySQL datab
ase server binaries
ii  php-mysql                                    1:7.0+35ubuntu6.1          all    MySQL modul
e for PHP [default]
ii  php7.0-mysql                                 7.0.33-0ubuntu0.16.04.7      i386   MySQL modul
e for PHP
databaseserver@ubuntu:~$ _
```

Setelah menginstall Mysql, masuk ke mysql -u root untuk masuk ke mysql.

```
databaseserver@ubuntu:~$ mysql -u root -p_
```

Dapat dilihat database yang ada dengan memasukkan perintah show database, disini penulis sudah membuat database mahasiswa. Masukkan command “use mahasiswa”, untuk menggunakan database mahasiswa dan “select \*from mahasiswa” untuk menampilkan isi table pada database.

```
mysql> show databases
-> ;
+-----+
| Database      |
+-----+
| information_schema |
| mahasiswa      |
| mysql          |
| performance_schema |
| sys            |
+-----+
5 rows in set (0.26 sec)

mysql> use mahasiswa;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> select *from mahasiswa;
```

### 1.3.Pengembangan jaringan 3

#### 1. GW3

Pada GW3 penulis menggunakan sistem operasi Ubuntu Server, pada GW3 terdapat service atau layanan yang dimiliki yaitu Firewall, NAT dan SSH. GW3 terhubung dengan Fileserver, DNSserver dan FTPserver.

Seting IP address, IP network, netmask, broadcast dan gateway. Dapat dilihat terdapat IP yang sudah disetting pada GW2, yaitu pada ens33 kelasnya akan sama dengan Web server dan Database server, yang artinya mereka akan berada pada satu LAN yang sama yaitu 200.17.8.X lalu IP pada ens38 adalah 10.17.8.3 ini nantinya akan terhubung pada setiap GW1 dan GW2, mereka berada pada LAN yang sama yaitu LAN 0. Untuk mengkonfigurasi IP menggunakan command “nano /etc/network/interfaces”.

```
GNU nano 2.5.3           File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
address 200.17.8.1
netmask 255.255.255.248
network 200.17.8.0
broadcast 200.17.8.7

auto ens38
iface ens38 inet static
address 10.17.8.3
netmask 255.255.255.248
network 10.17.8.0
gateway 10.17.8.1
broadcast 10.17.8.7

up route add -net 192.17.8.0/29 gw 10.17.8.2 dev ens38
```

Untuk melihat apakah ip sudah terkonfigurasi atau tidak masukkan perintah “`ifconfig`”, dapat dilihat IP sudah terkonfigurasi.

```
gw3@ubuntu:~$ ifconfig
ens33    Link encap:Ethernet HWaddr 00:0c:29:a3:55:bc
          inet addr:200.17.8.1  Bcast:200.17.8.255 Mask:255.255.255.248
          inet6 addr: fe80::20c:29ff:fea3:55bc/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
            RX packets:2197 errors:0 dropped:0 overruns:0 frame:0
            TX packets:328 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:187037 (187.0 KB) TX bytes:31548 (31.5 KB)
            Interrupt:19 Base address:0x2000

ens38    Link encap:Ethernet HWaddr 00:0c:29:a3:55:c6
          inet addr:10.17.8.3  Bcast:10.17.8.255 Mask:255.255.255.248
          inet6 addr: fe80::20c:29ff:fea3:55c6/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
            RX packets:1117 errors:0 dropped:0 overruns:0 frame:0
            TX packets:1972 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:109876 (109.8 KB) TX bytes:157637 (157.6 KB)
            Interrupt:16 Base address:0x2000

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:46256 errors:0 dropped:0 overruns:0 frame:0
            TX packets:46256 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1
            RX bytes:3423056 (3.4 MB) TX bytes:3423056 (3.4 MB)

gw3@ubuntu:~$
```

Instalasi NAT, dapat dilihat dari gambar NAT sudah terinstal pada GW 3 yang ditandai dengan adanya “MASQUERADE ALL – ANYWHERE”, terdapat 2 karena ada 2 ip yaitu pada ens33 dan ens38. Untuk melihat table routing NAT tuliskan perintah “`iptables -t nat -L`”.

```
gw3@ubuntu:~$ sudo iptables -t nat -L
[sudo] password for gw3:
Chain PREROUTING (policy ACCEPT)
target    prot opt source               destination

Chain INPUT (policy ACCEPT)
target    prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target    prot opt source               destination

Chain POSTROUTING (policy ACCEPT)
target    prot opt source               destination
MASQUERADE  all  --  anywhere             anywhere
MASQUERADE  all  --  anywhere             anywhere
gw3@ubuntu:~$
```

Cek apakah SSH sudah terinstal apa belum. Dengan memasukkan perintah “`dpkg -l |grep ssh`”. Dapat dilihat keterangan pada gambar bahwa ssh sudah terinstal.

```
gw3@ubuntu:~$ dpkg -l |grep ssh
ii  openssh-client           1:7.2p2-4ubuntu2.8          i386      secur
e shell (SSH) client, for secure access to remote machines
ii  openssh-server            1:7.2p2-4ubuntu2.8          i386      secur
e shell (SSH) server, for secure access from remote machines
ii  openssh-sftp-server       1:7.2p2-4ubuntu2.8          i386      secur
e shell (SSH) sftp server module, for SFTP access from remote machines
ii  ssh                         1:7.2p2-4ubuntu2.8          all      secur
e shell client and server (metapackage)
ii  ssh-import-id              5.5-0ubuntu1                  all      secur
ely retrieve an SSH public key and install it locally
gw3@ubuntu:~$
```

## 2. FTP Server

Setting IP pada FTP Server, dapat dilihat pada gambar IP Address, netmask, gateway, broadcast sudah di setting di interface dengan menggunakan perintah “`nano /etc/network/interface`”, setelah itu simpan dengan menekan tombol `ctrl + x` lalu ketik `y` dan enter. Maka IP address sudah tersetting pada FTP Server yaitu 200.17.8.2.

```
GNU nano 2.5.3                               File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
    address 200.17.8.2
    netmask 255.255.255.248
    gateway 200.17.8.1
    network 200.17.8.0
    broadcast 200.17.8.7
```

Untuk melihat apakah ip sudah terkonfigurasi atau tidak masukkan perintah “`ifconfig`”, dapat dilihat IP sudah terkonfigurasi.

```
ftpserver@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet HWaddr 00:0c:29:35:9b:d8
           inet addr:200.17.8.2 Bcast:200.17.8.7 Mask:255.255.255.248
           inet6 addr: fe80::20c:29ff:fe35:9bd8/64 Scope:Link
             UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
             RX packets:34 errors:0 dropped:0 overruns:0 frame:0
             TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
             collisions:0 txqueuelen:1000
             RX bytes:3578 (3.5 KB) TX bytes:2244 (2.2 KB)
             Interrupt:19 Base address:0x2000

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:3684 errors:0 dropped:0 overruns:0 frame:0
             TX packets:3684 errors:0 dropped:0 overruns:0 carrier:0
             collisions:0 txqueuelen:1
             RX bytes:272584 (272.5 KB) TX bytes:272584 (272.5 KB)

ftpserver@ubuntu:~$ _
```

## Instalasi PROFTPD.

Dapat dilihat pada gambar bahwa proftpd sudah berhasil diinstal, dari keterangan pada gambar di jelaskan bahwa proftpd-basic is already the newest version

```
ftpserver@ubuntu:~$ sudo apt-get install proftpd
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'proftpd-basic' instead of 'proftpd'
proftpd-basic is already the newest version (1.3.5a-1ubuntu0.1).
0 upgraded, 0 newly installed, 0 to remove and 214 not upgraded.
ftpserver@ubuntu:~$
```

## 3. DNS Server

Setting IP pada DNS Server, dapat dilihat pada gambar IP Address, netmask, gateway, broadcast sudah di setting di interface dengan menggunakan perintah “*nano /etc/network/interface*”, setelah itu simpan dengan menekan tombol *ctrl + x* lalu ketik *y* dan enter. Maka IP address sudah tersetting pada DNS Server yaitu 200.17.8.3.

```
GNU nano 2.5.3                               File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
address 200.17.8.3
netmask 255.255.255.248
network 200.17.8.0
broadcast 200.17.8.7
gateway 200.17.8.1
```

## CEK apakah IP sudah terkonfigurasi pada DNS SERVER

```
dnsserver@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet HWaddr 00:0c:29:84:05:72
           inet addr:200.17.8.3 Bcast:200.17.8.7 Mask:255.255.255.248
           inet6 addr: fe80::20c:29ff:fe84:572/64 Scope:Link
             UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
             RX packets:1034 errors:0 dropped:0 overruns:0 frame:0
             TX packets:4786 errors:0 dropped:0 overruns:0 carrier:0
             collisions:0 txqueuelen:1000
             RX bytes:106317 (106.3 KB) TX bytes:372338 (372.3 KB)
             Interrupt:19 Base address:0x2000

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:2346 errors:0 dropped:0 overruns:0 frame:0
             TX packets:2346 errors:0 dropped:0 overruns:0 carrier:0
             collisions:0 txqueuelen:1
             RX bytes:152197 (152.1 KB) TX bytes:152197 (152.1 KB)

dnsserver@ubuntu:~$ _
```

## Instalasi BIND9

Untuk mengecek apakah bind9 sudah terinstal atau belum dapat dicek dengan memasukkan perintah “`dpkg -l |grep bind9`”

```
dnsserver@ubuntu:~$ dpkg -l |grep bind9
ii  bind9                           1:9.10.3.dfsg.P4-8ubuntu1.15   i386      Internet Domain
ii  bind9-host                       1:9.10.3.dfsg.P4-8ubuntu1.15   i386      Version of 'host
ii  bind9utils                       1:9.10.3.dfsg.P4-8ubuntu1.15   i386      Utilities for BI
ii  libbind9-140:i386                1:9.10.3.dfsg.P4-8ubuntu1.15   i386      BIND9 Shared Lib
dnsserver@ubuntu:~$
```

## 4. File Server

Setting IP pada File Server, dapat dilihat pada gambar IP Address, netmask, gateway, broadcast sudah di setting di interface dengan menggunakan perintah “`nano /etc/network/interfaces`”, setelah itu simpan dengan menekan tombol `ctrl + x` lalu ketik `y` dan enter. Maka IP address sudah tersetting pada File Server yaitu 200.17.8.4.

```
GNU nano 2.5.3                               File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto ens33
iface ens33 inet static
    address 200.17.8.4
    netmask 255.255.255.248
    gateway 200.17.8.1
    network 200.17.8.0
    broadcast 200.17.8.7
```

Cek IP yang sudah di konfigurasi dengan menggunakan command “`ifconfig`”. Dapat dilihat ens33 sudah tersetting pada File server.

```
fileserver@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet  HWaddr 00:0c:29:57:8a:7f
            inet addr:200.17.8.4  Bcast:200.17.8.7  Mask:255.255.255.248
            inet6 addr: fe80::20c:29ff:fe57:8a7f/64 Scope:Link
                      UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
                      RX packets:155 errors:0 dropped:0 overruns:0 frame:0
                      TX packets:127 errors:0 dropped:0 overruns:0 carrier:0
                      collisions:0 txqueuelen:1000
                      RX bytes:15205 (15.2 KB)  TX bytes:16440 (16.4 KB)
                      Interrupt:19 Base address:0x2000

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:19076 errors:0 dropped:0 overruns:0 frame:0
                      TX packets:19076 errors:0 dropped:0 overruns:0 carrier:0
                      collisions:0 txqueuelen:1
                      RX bytes:1411456 (1.4 MB)  TX bytes:1411456 (1.4 MB)
```

Instalasi SAMBA. Untuk mengecek apakah SAMBA sudah berhasil di install atau belum, kita dapat memasukkan perintah sudo apt-get install samba, jika belum terinstal maka akan meminta persetujuan apakah ingin melanjutkan instalasi samba atau tidak. Jika sudah terinstal maka tampilannya sama seperti gambar di bawah ini yang menerangkan samba is already newest version.

```
fileserver@ubuntu:~$ sudo apt-get install samba
Reading package lists... Done
Building dependency tree
Reading state information... Done
samba is already the newest version (2:4.3.11+dfsg-0ubuntu0.16.04.23).
0 upgraded, 0 newly installed, 0 to remove and 213 not upgraded.
```

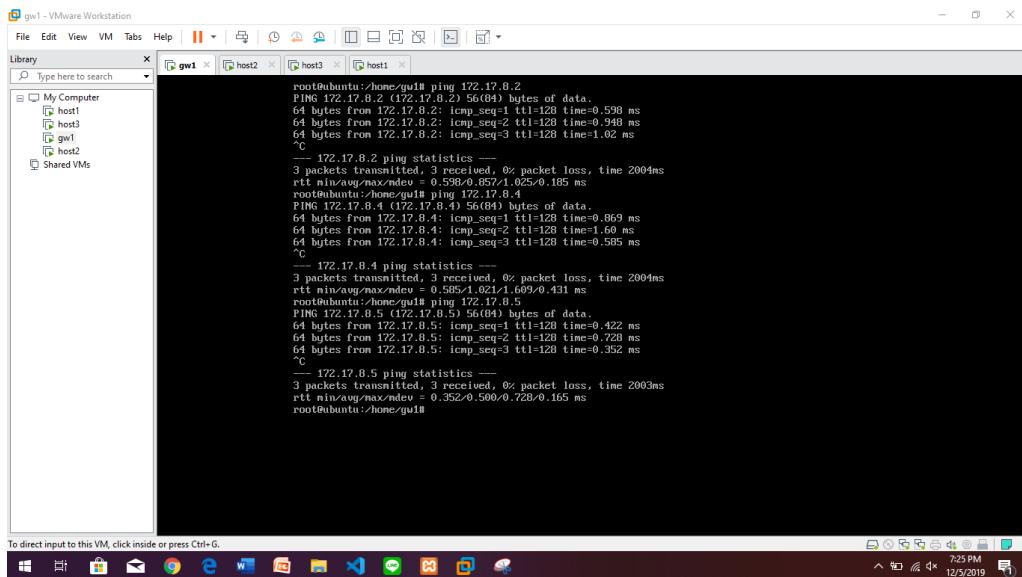
## Bab II

### Tahap Pengujian

#### 2.1 Pengujian jaringan 1

##### 1.GW1

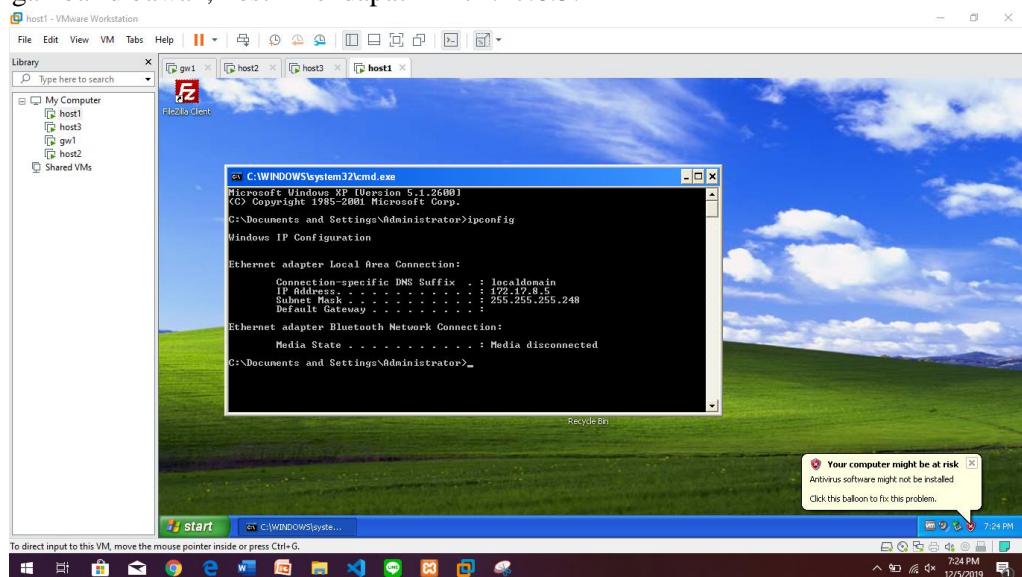
Menguji GW1 untuk memastikan bahwa setiap host sudah terhubung ke GW1 dan mendapat IP dengan otomatis menggunakan DHCP, penulis mengirim ping ke setiap host yang ada. GW1 berhasil mengirim ping ke host 1 (172.17.8.5), host 2 (172.17.8.2) dan host 3 (172.17.8.4) seperti pada gambar dibawah ini.



```
root@ubuntu:/home/gw1# ping 172.17.8.2
PING 172.17.8.2 (172.17.8.2) 56(84) bytes of data.
64 bytes from 172.17.8.2: icmp_seq=1 ttl=128 time=0.598 ms
64 bytes from 172.17.8.2: icmp_seq=2 ttl=128 time=0.948 ms
64 bytes from 172.17.8.2: icmp_seq=3 ttl=128 time=1.02 ms
^C
--- 172.17.8.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 0.598/0.857/1.025/0.185 ms
root@ubuntu:/home/gw1# ping 172.17.8.4
PING 172.17.8.4 (172.17.8.4) 56(84) bytes of data.
64 bytes from 172.17.8.4: icmp_seq=1 ttl=128 time=0.869 ms
64 bytes from 172.17.8.4: icmp_seq=2 ttl=128 time=1.68 ms
64 bytes from 172.17.8.4: icmp_seq=3 ttl=128 time=0.595 ms
^C
--- 172.17.8.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 0.595/1.021/1.609/0.431 ms
root@ubuntu:/home/gw1# ping 172.17.8.5
PING 172.17.8.5 (172.17.8.5) 56(84) bytes of data.
64 bytes from 172.17.8.5: icmp_seq=1 ttl=128 time=0.422 ms
64 bytes from 172.17.8.5: icmp_seq=2 ttl=128 time=0.728 ms
64 bytes from 172.17.8.5: icmp_seq=3 ttl=128 time=0.352 ms
^C
--- 172.17.8.5 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 0.352/0.500/0.728/0.165 ms
root@ubuntu:/home/gw1#
```

#### 2. Host 1

Menguji host1 untuk memastikan bahwa host 1 mendapat IP dengan otomatis menggunakan DHCP dari GW1, penulis mengecek IP dengan command “ipconfig”. Pada gambar dibawah, host1 mendapat IP 172.17.8.5.

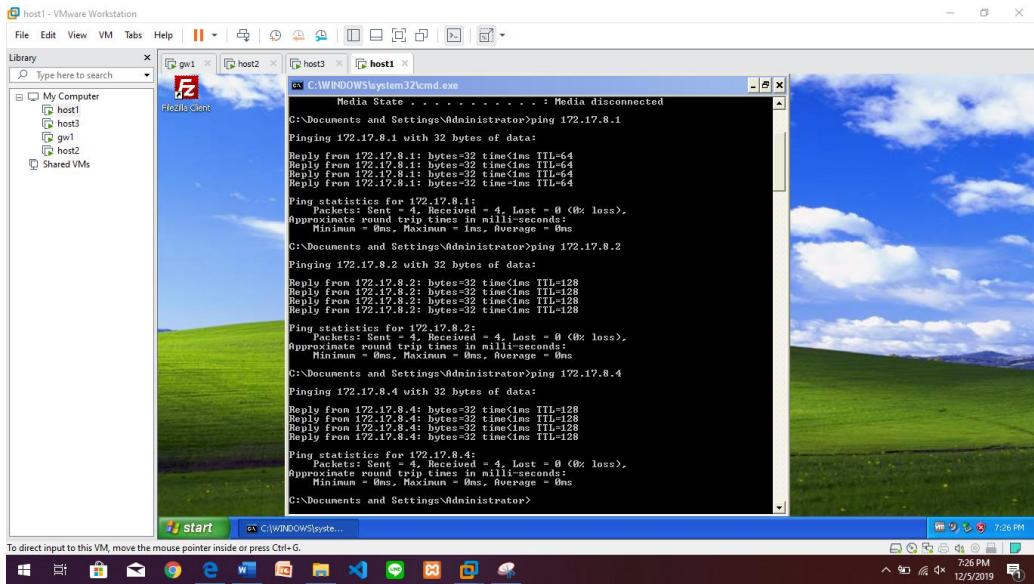


```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\>Documents and Settings\Administrator>ipconfig
Windows IP Configuration

Ethernet adapter Local Area Connection:
  Connection-specific DNS Suffix . : localdomain
  IP Address . . . . . : 172.17.8.5
  Subnet Mask . . . . . : 255.255.255.248
  Default Gateway . . . . . :
  Ethernet adapter Bluetooth Network Connection:
    Media State . . . . . : Media disconnected
C:\>Documents and Settings\Administrator>
```

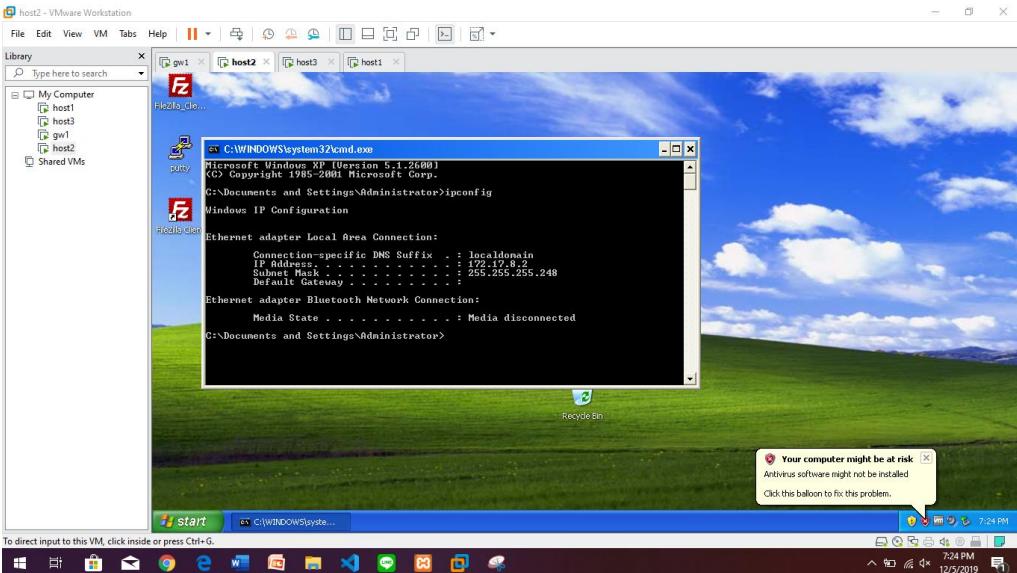
Your computer might be at risk
Antivirus software might not be installed
Click the balloon to fix this problem.

Kemudian untuk memastikan host1 terhubung dengan host lain, penulis mengirim ping ke setiap host yang ada dan GW1. Host1 berhasil mengirim ping ke GW1 (172.17.8.1), host 2 (172.17.8.2) dan host 3 (172.17.8.4) seperti pada gambar dibawah ini.

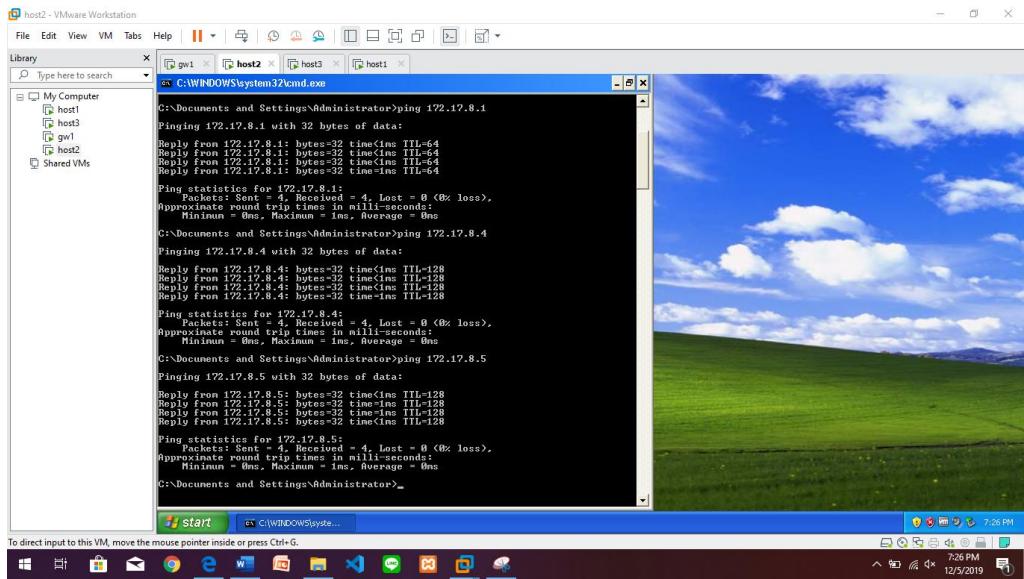


### 3.Host 2

Menguji host2 untuk memastikan bahwa host 2 mendapat IP dengan otomatis menggunakan DHCP dari GW1, penulis mengecek IP dengan command “ipconfig”. Pada gambar dibawah, host1 mendapat IP 172.17.8.2.

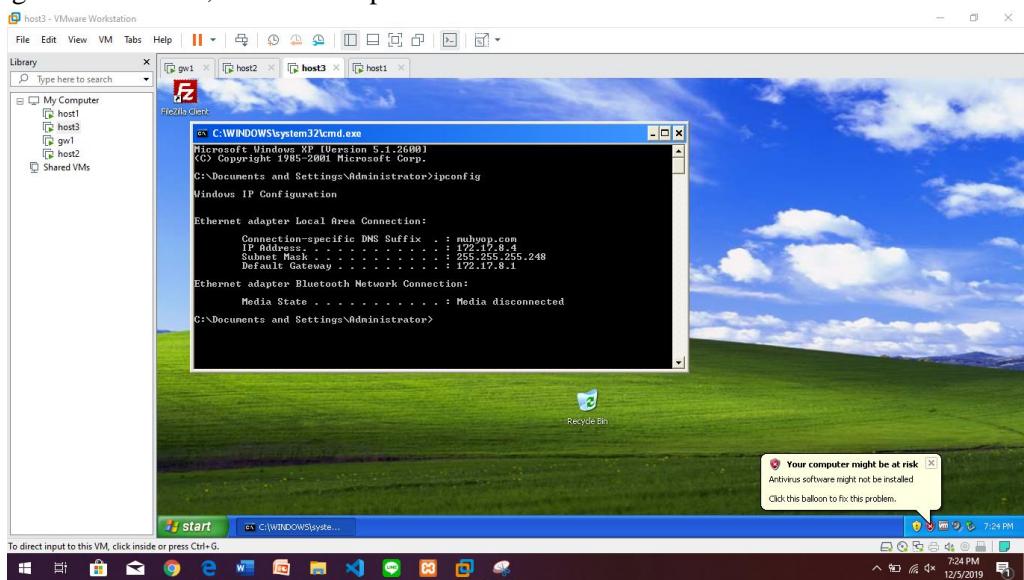


Kemudian untuk memastikan host2 terhubung dengan host lain, penulis mengirim ping ke setiap host yang ada dan GW1. Host2 berhasil mengirim ping ke GW1 (172.17.8.1), host 1 (172.17.8.5) dan host 3 (172.17.8.4) seperti pada gambar dibawah ini.

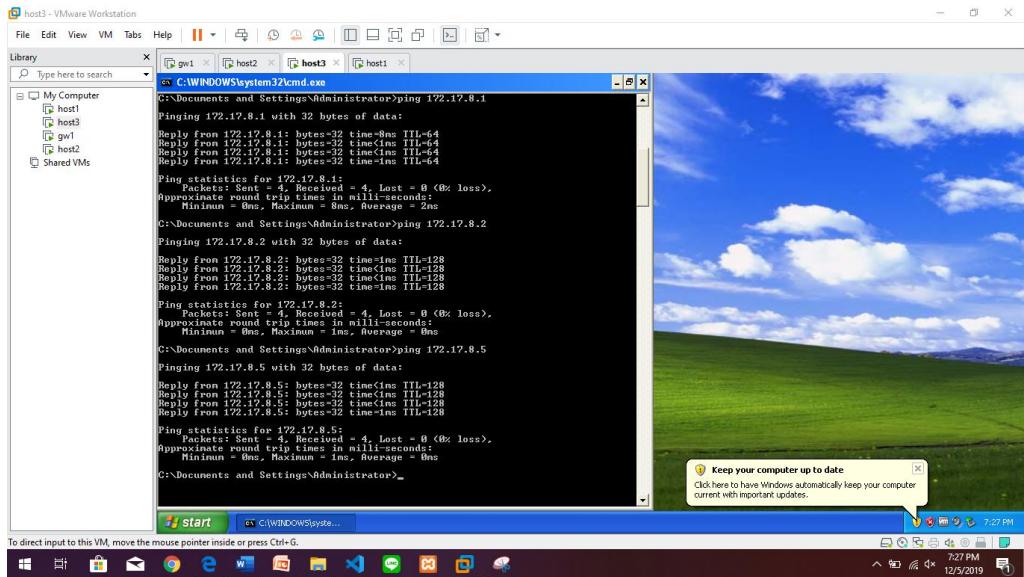


#### 4. Host 3

Menguji host3 untuk memastikan bahwa host 3 mendapat IP dengan otomatis menggunakan DHCP dari GW1, penulis mengecek IP dengan command “ipconfig”. Pada gambar dibawah, host1 mendapat IP 172.17.8.4.



Kemudian untuk memastikan host3 terhubung dengan host lain, penulis mengirim ping ke setiap host yang ada dan GW1. Host3 berhasil mengirim ping ke GW1 (172.17.8.1), host 1 (172.17.8.5) dan host 2 (172.17.8.2) seperti pada gambar dibawah ini.



## 2.2 Pengujian jaringan 2

### 1. GW2

Menguji GW2 untuk memastikan bahwa setiap PC pada jaringan 2 sudah terhubung ke GW2 dan dapat saling mengirim ping, penulis mengirim ping ke setiap PC yang ada. GW2 berhasil mengirim ping ke DBServer , Web server dan setiap GWseperti pada gambar dibawah ini.

#### Ping ke Database Server (192.17.8.2)

```
gw2@ubuntu:~$ ping 192.17.8.2
PING 192.17.8.2 (192.17.8.2) 56(84) bytes of data.
64 bytes from 192.17.8.2: icmp_seq=1 ttl=64 time=1.05 ms
64 bytes from 192.17.8.2: icmp_seq=2 ttl=64 time=0.980 ms
64 bytes from 192.17.8.2: icmp_seq=3 ttl=64 time=1.63 ms
64 bytes from 192.17.8.2: icmp_seq=4 ttl=64 time=1.15 ms
64 bytes from 192.17.8.2: icmp_seq=5 ttl=64 time=1.26 ms
64 bytes from 192.17.8.2: icmp_seq=6 ttl=64 time=2.17 ms
64 bytes from 192.17.8.2: icmp_seq=7 ttl=64 time=1.23 ms
64 bytes from 192.17.8.2: icmp_seq=8 ttl=64 time=1.61 ms
64 bytes from 192.17.8.2: icmp_seq=9 ttl=64 time=0.931 ms
64 bytes from 192.17.8.2: icmp_seq=10 ttl=64 time=1.01 ms
64 bytes from 192.17.8.2: icmp_seq=11 ttl=64 time=2.52 ms
64 bytes from 192.17.8.2: icmp_seq=12 ttl=64 time=0.948 ms
64 bytes from 192.17.8.2: icmp_seq=13 ttl=64 time=1.05 ms
64 bytes from 192.17.8.2: icmp_seq=14 ttl=64 time=3.21 ms
64 bytes from 192.17.8.2: icmp_seq=15 ttl=64 time=1.00 ms
64 bytes from 192.17.8.2: icmp_seq=16 ttl=64 time=3.26 ms
64 bytes from 192.17.8.2: icmp_seq=17 ttl=64 time=1.10 ms
64 bytes from 192.17.8.2: icmp_seq=18 ttl=64 time=1.60 ms
64 bytes from 192.17.8.2: icmp_seq=19 ttl=64 time=1.05 ms
64 bytes from 192.17.8.2: icmp_seq=20 ttl=64 time=0.845 ms
64 bytes from 192.17.8.2: icmp_seq=21 ttl=64 time=1.06 ms
64 bytes from 192.17.8.2: icmp_seq=22 ttl=64 time=2.24 ms
64 bytes from 192.17.8.2: icmp_seq=23 ttl=64 time=1.94 ms
```

### Ping ke Web Server (192.17.8.3)

```
PING 192.17.8.3 (192.17.8.3) 56(84) bytes of data.  
64 bytes from 192.17.8.3: icmp_seq=1 ttl=64 time=1.34 ms  
64 bytes from 192.17.8.3: icmp_seq=2 ttl=64 time=0.827 ms  
64 bytes from 192.17.8.3: icmp_seq=3 ttl=64 time=1.77 ms  
64 bytes from 192.17.8.3: icmp_seq=4 ttl=64 time=1.96 ms  
64 bytes from 192.17.8.3: icmp_seq=5 ttl=64 time=0.896 ms  
64 bytes from 192.17.8.3: icmp_seq=6 ttl=64 time=1.28 ms  
64 bytes from 192.17.8.3: icmp_seq=7 ttl=64 time=1.11 ms  
64 bytes from 192.17.8.3: icmp_seq=8 ttl=64 time=1.03 ms  
64 bytes from 192.17.8.3: icmp_seq=9 ttl=64 time=1.55 ms  
64 bytes from 192.17.8.3: icmp_seq=10 ttl=64 time=0.851 ms  
64 bytes from 192.17.8.3: icmp_seq=11 ttl=64 time=1.07 ms  
64 bytes from 192.17.8.3: icmp_seq=12 ttl=64 time=1.15 ms  
64 bytes from 192.17.8.3: icmp_seq=13 ttl=64 time=1.32 ms  
64 bytes from 192.17.8.3: icmp_seq=14 ttl=64 time=0.984 ms  
64 bytes from 192.17.8.3: icmp_seq=15 ttl=64 time=1.03 ms  
64 bytes from 192.17.8.3: icmp_seq=16 ttl=64 time=1.22 ms  
64 bytes from 192.17.8.3: icmp_seq=17 ttl=64 time=2.13 ms  
64 bytes from 192.17.8.3: icmp_seq=18 ttl=64 time=2.98 ms  
64 bytes from 192.17.8.3: icmp_seq=19 ttl=64 time=1.92 ms  
64 bytes from 192.17.8.3: icmp_seq=20 ttl=64 time=0.896 ms
```

### Ping GW1 (10.17.8.1)

```
gw2@ubuntu:~$ ping 10.17.8.1  
PING 10.17.8.1 (10.17.8.1) 56(84) bytes of data.  
64 bytes from 10.17.8.1: icmp_seq=1 ttl=64 time=2.35 ms  
64 bytes from 10.17.8.1: icmp_seq=2 ttl=64 time=1.19 ms  
64 bytes from 10.17.8.1: icmp_seq=3 ttl=64 time=1.26 ms  
64 bytes from 10.17.8.1: icmp_seq=4 ttl=64 time=1.17 ms  
64 bytes from 10.17.8.1: icmp_seq=5 ttl=64 time=1.49 ms  
64 bytes from 10.17.8.1: icmp_seq=6 ttl=64 time=1.05 ms  
64 bytes from 10.17.8.1: icmp_seq=7 ttl=64 time=1.06 ms  
64 bytes from 10.17.8.1: icmp_seq=8 ttl=64 time=0.944 ms  
64 bytes from 10.17.8.1: icmp_seq=9 ttl=64 time=0.922 ms  
64 bytes from 10.17.8.1: icmp_seq=10 ttl=64 time=1.06 ms  
64 bytes from 10.17.8.1: icmp_seq=11 ttl=64 time=1.12 ms  
64 bytes from 10.17.8.1: icmp_seq=12 ttl=64 time=1.03 ms  
64 bytes from 10.17.8.1: icmp_seq=13 ttl=64 time=0.979 ms  
64 bytes from 10.17.8.1: icmp_seq=14 ttl=64 time=3.97 ms  
64 bytes from 10.17.8.1: icmp_seq=15 ttl=64 time=0.909 ms  
64 bytes from 10.17.8.1: icmp_seq=16 ttl=64 time=1.02 ms  
64 bytes from 10.17.8.1: icmp_seq=17 ttl=64 time=1.12 ms  
64 bytes from 10.17.8.1: icmp_seq=18 ttl=64 time=0.935 ms  
64 bytes from 10.17.8.1: icmp_seq=19 ttl=64 time=1.07 ms
```

Ping GW3 (10.17.8.3)

```
gw2@ubuntu:~$ ping 10.17.8.3
PING 10.17.8.3 (10.17.8.3) 56(84) bytes of data.
64 bytes from 10.17.8.3: icmp_seq=1 ttl=64 time=2.02 ms
64 bytes from 10.17.8.3: icmp_seq=2 ttl=64 time=1.26 ms
64 bytes from 10.17.8.3: icmp_seq=3 ttl=64 time=1.15 ms
64 bytes from 10.17.8.3: icmp_seq=4 ttl=64 time=1.61 ms
64 bytes from 10.17.8.3: icmp_seq=5 ttl=64 time=1.01 ms
64 bytes from 10.17.8.3: icmp_seq=6 ttl=64 time=1.30 ms
64 bytes from 10.17.8.3: icmp_seq=7 ttl=64 time=1.10 ms
64 bytes from 10.17.8.3: icmp_seq=8 ttl=64 time=1.14 ms
64 bytes from 10.17.8.3: icmp_seq=9 ttl=64 time=1.12 ms
64 bytes from 10.17.8.3: icmp_seq=10 ttl=64 time=1.07 ms
64 bytes from 10.17.8.3: icmp_seq=11 ttl=64 time=1.09 ms
64 bytes from 10.17.8.3: icmp_seq=12 ttl=64 time=1.10 ms
64 bytes from 10.17.8.3: icmp_seq=13 ttl=64 time=1.11 ms
64 bytes from 10.17.8.3: icmp_seq=14 ttl=64 time=1.38 ms
64 bytes from 10.17.8.3: icmp_seq=15 ttl=64 time=1.18 ms
64 bytes from 10.17.8.3: icmp_seq=16 ttl=64 time=0.927 ms
64 bytes from 10.17.8.3: icmp_seq=17 ttl=64 time=1.07 ms
64 bytes from 10.17.8.3: icmp_seq=18 ttl=64 time=1.25 ms
-
```

## 2. Web Server

Ping GW2 (192.17.8.1)

```
PING 192.17.8.1 (192.17.8.1) 56(84) bytes of data.
64 bytes from 192.17.8.1: icmp_seq=1 ttl=64 time=1.15 ms
64 bytes from 192.17.8.1: icmp_seq=2 ttl=64 time=1.27 ms
64 bytes from 192.17.8.1: icmp_seq=3 ttl=64 time=1.11 ms
64 bytes from 192.17.8.1: icmp_seq=4 ttl=64 time=1.01 ms
64 bytes from 192.17.8.1: icmp_seq=5 ttl=64 time=0.975 ms
64 bytes from 192.17.8.1: icmp_seq=6 ttl=64 time=1.04 ms
64 bytes from 192.17.8.1: icmp_seq=7 ttl=64 time=1.14 ms
64 bytes from 192.17.8.1: icmp_seq=8 ttl=64 time=1.27 ms
64 bytes from 192.17.8.1: icmp_seq=9 ttl=64 time=1.06 ms
64 bytes from 192.17.8.1: icmp_seq=10 ttl=64 time=1.08 ms
64 bytes from 192.17.8.1: icmp_seq=11 ttl=64 time=1.14 ms
```

Ping DataBase Server (192.17.8.2)

```
PING 192.17.8.2 (192.17.8.2) 56(84) bytes of data.
64 bytes from 192.17.8.2: icmp_seq=1 ttl=64 time=1.82 ms
64 bytes from 192.17.8.2: icmp_seq=2 ttl=64 time=1.05 ms
64 bytes from 192.17.8.2: icmp_seq=3 ttl=64 time=0.919 ms
64 bytes from 192.17.8.2: icmp_seq=4 ttl=64 time=0.867 ms
64 bytes from 192.17.8.2: icmp_seq=5 ttl=64 time=1.01 ms
64 bytes from 192.17.8.2: icmp_seq=6 ttl=64 time=1.02 ms
64 bytes from 192.17.8.2: icmp_seq=7 ttl=64 time=1.01 ms
64 bytes from 192.17.8.2: icmp_seq=8 ttl=64 time=1.10 ms
64 bytes from 192.17.8.2: icmp_seq=9 ttl=64 time=1.04 ms
64 bytes from 192.17.8.2: icmp_seq=10 ttl=64 time=1.14 ms
```

### 3. Database Server

Ping GW2 (192.17.8.1)

```
PING 192.17.8.1 (192.17.8.1) 56(84) bytes of data.  
64 bytes from 192.17.8.1: icmp_seq=1 ttl=64 time=0.983 ms  
64 bytes from 192.17.8.1: icmp_seq=2 ttl=64 time=0.862 ms  
64 bytes from 192.17.8.1: icmp_seq=3 ttl=64 time=1.06 ms  
64 bytes from 192.17.8.1: icmp_seq=4 ttl=64 time=0.865 ms  
64 bytes from 192.17.8.1: icmp_seq=5 ttl=64 time=0.935 ms  
64 bytes from 192.17.8.1: icmp_seq=6 ttl=64 time=1.13 ms  
64 bytes from 192.17.8.1: icmp_seq=7 ttl=64 time=1.06 ms  
64 bytes from 192.17.8.1: icmp_seq=8 ttl=64 time=0.957 ms  
64 bytes from 192.17.8.1: icmp_seq=9 ttl=64 time=1.04 ms  
64 bytes from 192.17.8.1: icmp_seq=10 ttl=64 time=0.925 ms  
64 bytes from 192.17.8.1: icmp_seq=11 ttl=64 time=1.44 ms  
64 bytes from 192.17.8.1: icmp_seq=12 ttl=64 time=1.01 ms  
64 bytes from 192.17.8.1: icmp_seq=13 ttl=64 time=0.991 ms  
64 bytes from 192.17.8.1: icmp_seq=14 ttl=64 time=1.01 ms
```

Ping WEB SERVER (192.17.8.3)

```
PING 192.17.8.3 (192.17.8.3) 56(84) bytes of data.  
64 bytes from 192.17.8.3: icmp_seq=1 ttl=64 time=0.062 ms  
64 bytes from 192.17.8.3: icmp_seq=2 ttl=64 time=0.078 ms  
64 bytes from 192.17.8.3: icmp_seq=3 ttl=64 time=0.073 ms  
64 bytes from 192.17.8.3: icmp_seq=4 ttl=64 time=0.078 ms  
64 bytes from 192.17.8.3: icmp_seq=5 ttl=64 time=0.080 ms  
64 bytes from 192.17.8.3: icmp_seq=6 ttl=64 time=0.079 ms  
64 bytes from 192.17.8.3: icmp_seq=7 ttl=64 time=0.078 ms  
64 bytes from 192.17.8.3: icmp_seq=8 ttl=64 time=0.093 ms  
64 bytes from 192.17.8.3: icmp_seq=9 ttl=64 time=0.079 ms  
64 bytes from 192.17.8.3: icmp_seq=10 ttl=64 time=0.073 ms  
64 bytes from 192.17.8.3: icmp_seq=11 ttl=64 time=0.079 ms  
64 bytes from 192.17.8.3: icmp_seq=12 ttl=64 time=0.079 ms  
64 bytes from 192.17.8.3: icmp_seq=13 ttl=64 time=0.078 ms  
^C
```

## 2.3 Pengujian jaringan 3

### 1. GW3

Menguji GW3 untuk memastikan bahwa setiap PC pada jaringan 3 sudah terhubung ke GW3 dan dapat saling mengirim ping, penulis mengirim ping ke setiap PC yang ada. G32 berhasil mengirim ping ke FTPserver , DNS server, File server dan setiap GW seperti pada gambar dibawah ini.

Ping FTP SERVER (200.17.8.2)

```
gw3@ubuntu:~$ ping 200.17.8.2
PING 200.17.8.2 (200.17.8.2) 56(84) bytes of data.
64 bytes from 200.17.8.2: icmp_seq=1 ttl=64 time=3.86 ms
64 bytes from 200.17.8.2: icmp_seq=2 ttl=64 time=0.870 ms
64 bytes from 200.17.8.2: icmp_seq=3 ttl=64 time=0.886 ms
64 bytes from 200.17.8.2: icmp_seq=4 ttl=64 time=0.847 ms
64 bytes from 200.17.8.2: icmp_seq=5 ttl=64 time=0.831 ms
64 bytes from 200.17.8.2: icmp_seq=6 ttl=64 time=0.935 ms
64 bytes from 200.17.8.2: icmp_seq=7 ttl=64 time=0.872 ms
64 bytes from 200.17.8.2: icmp_seq=8 ttl=64 time=0.884 ms
64 bytes from 200.17.8.2: icmp_seq=9 ttl=64 time=0.948 ms
64 bytes from 200.17.8.2: icmp_seq=10 ttl=64 time=0.873 ms
64 bytes from 200.17.8.2: icmp_seq=11 ttl=64 time=1.09 ms
64 bytes from 200.17.8.2: icmp_seq=12 ttl=64 time=1.18 ms
64 bytes from 200.17.8.2: icmp_seq=13 ttl=64 time=1.02 ms
^C
```

Ping DNS SERVER (200.17.8.3)

```
gw3@ubuntu:~$ ping 200.17.8.3
PING 200.17.8.3 (200.17.8.3) 56(84) bytes of data.
64 bytes from 200.17.8.3: icmp_seq=1 ttl=64 time=0.868 ms
64 bytes from 200.17.8.3: icmp_seq=2 ttl=64 time=0.847 ms
64 bytes from 200.17.8.3: icmp_seq=3 ttl=64 time=1.10 ms
64 bytes from 200.17.8.3: icmp_seq=4 ttl=64 time=0.977 ms
64 bytes from 200.17.8.3: icmp_seq=5 ttl=64 time=0.982 ms
64 bytes from 200.17.8.3: icmp_seq=6 ttl=64 time=0.849 ms
64 bytes from 200.17.8.3: icmp_seq=7 ttl=64 time=1.06 ms
64 bytes from 200.17.8.3: icmp_seq=8 ttl=64 time=0.984 ms
64 bytes from 200.17.8.3: icmp_seq=9 ttl=64 time=0.723 ms
64 bytes from 200.17.8.3: icmp_seq=10 ttl=64 time=0.927 ms
64 bytes from 200.17.8.3: icmp_seq=11 ttl=64 time=1.01 ms
^C
```

Ping FILESERVER (200.17.8.4)

```
PING 200.17.8.4 (200.17.8.4) 56(84) bytes of data.
64 bytes from 200.17.8.4: icmp_seq=1 ttl=64 time=1.01 ms
64 bytes from 200.17.8.4: icmp_seq=2 ttl=64 time=1.31 ms
64 bytes from 200.17.8.4: icmp_seq=3 ttl=64 time=0.890 ms
64 bytes from 200.17.8.4: icmp_seq=4 ttl=64 time=0.981 ms
64 bytes from 200.17.8.4: icmp_seq=5 ttl=64 time=0.864 ms
64 bytes from 200.17.8.4: icmp_seq=6 ttl=64 time=0.872 ms
64 bytes from 200.17.8.4: icmp_seq=7 ttl=64 time=0.943 ms
64 bytes from 200.17.8.4: icmp_seq=8 ttl=64 time=1.37 ms
^C
```

## 2. FTP Server

Ping GW3 (200.17.8.1)

```
PING 200.17.8.1 (200.17.8.1) 56(84) bytes of data.
64 bytes from 200.17.8.1: icmp_seq=1 ttl=64 time=1.03 ms
64 bytes from 200.17.8.1: icmp_seq=2 ttl=64 time=0.837 ms
64 bytes from 200.17.8.1: icmp_seq=3 ttl=64 time=0.940 ms
64 bytes from 200.17.8.1: icmp_seq=4 ttl=64 time=1.43 ms
64 bytes from 200.17.8.1: icmp_seq=5 ttl=64 time=0.893 ms
64 bytes from 200.17.8.1: icmp_seq=6 ttl=64 time=1.47 ms
64 bytes from 200.17.8.1: icmp_seq=7 ttl=64 time=0.851 ms
64 bytes from 200.17.8.1: icmp_seq=8 ttl=64 time=1.11 ms
^C
```

Ping DNS SERVER(200.17.8.3)

```
PING 200.17.8.3 (200.17.8.3) 56(84) bytes of data.  
64 bytes from 200.17.8.3: icmp_seq=1 ttl=64 time=37.2 ms  
64 bytes from 200.17.8.3: icmp_seq=2 ttl=64 time=76.1 ms  
64 bytes from 200.17.8.3: icmp_seq=3 ttl=64 time=3.54 ms  
64 bytes from 200.17.8.3: icmp_seq=4 ttl=64 time=52.0 ms  
64 bytes from 200.17.8.3: icmp_seq=5 ttl=64 time=0.827 ms  
^C
```

Ping FILE SERVER (200.17.8.4)

```
PING 200.17.8.4 (200.17.8.4) 56(84) bytes of data.  
64 bytes from 200.17.8.4: icmp_seq=1 ttl=64 time=2.19 ms  
64 bytes from 200.17.8.4: icmp_seq=2 ttl=64 time=1.27 ms  
64 bytes from 200.17.8.4: icmp_seq=3 ttl=64 time=0.870 ms  
64 bytes from 200.17.8.4: icmp_seq=4 ttl=64 time=0.978 ms  
64 bytes from 200.17.8.4: icmp_seq=5 ttl=64 time=0.966 ms  
64 bytes from 200.17.8.4: icmp_seq=6 ttl=64 time=1.84 ms  
^C
```

### 3. DNS Server

Ping GW3 (200.17.8.1)

```
PING 200.17.8.1 (200.17.8.1) 56(84) bytes of data.  
64 bytes from 200.17.8.1: icmp_seq=1 ttl=64 time=1.06 ms  
64 bytes from 200.17.8.1: icmp_seq=2 ttl=64 time=0.972 ms  
64 bytes from 200.17.8.1: icmp_seq=3 ttl=64 time=1.28 ms  
64 bytes from 200.17.8.1: icmp_seq=4 ttl=64 time=1.32 ms  
64 bytes from 200.17.8.1: icmp_seq=5 ttl=64 time=1.91 ms  
64 bytes from 200.17.8.1: icmp_seq=6 ttl=64 time=2.85 ms  
64 bytes from 200.17.8.1: icmp_seq=7 ttl=64 time=1.65 ms  
^C
```

Ping FTP SERVER(200.17.8.2)

```
PING 200.17.8.2 (200.17.8.2) 56(84) bytes of data.  
64 bytes from 200.17.8.2: icmp_seq=1 ttl=64 time=3.94 ms  
64 bytes from 200.17.8.2: icmp_seq=2 ttl=64 time=0.993 ms  
64 bytes from 200.17.8.2: icmp_seq=3 ttl=64 time=0.898 ms  
64 bytes from 200.17.8.2: icmp_seq=4 ttl=64 time=0.801 ms  
64 bytes from 200.17.8.2: icmp_seq=5 ttl=64 time=0.976 ms  
64 bytes from 200.17.8.2: icmp_seq=6 ttl=64 time=1.03 ms  
64 bytes from 200.17.8.2: icmp_seq=7 ttl=64 time=0.827 ms  
^C
```

Ping FILE SERVER (200.17.8.4)

```
PING 200.17.8.4 (200.17.8.4) 56(84) bytes of data.  
64 bytes from 200.17.8.4: icmp_seq=1 ttl=64 time=3.24 ms  
64 bytes from 200.17.8.4: icmp_seq=2 ttl=64 time=0.885 ms  
64 bytes from 200.17.8.4: icmp_seq=3 ttl=64 time=0.871 ms  
64 bytes from 200.17.8.4: icmp_seq=4 ttl=64 time=0.997 ms  
64 bytes from 200.17.8.4: icmp_seq=5 ttl=64 time=0.999 ms  
64 bytes from 200.17.8.4: icmp_seq=6 ttl=64 time=0.988 ms  
^C
```

#### 4. File Server

Ping GW3 (200.17.8.1)

```
PING 200.17.8.1 (200.17.8.1) 56(84) bytes of data.  
64 bytes from 200.17.8.1: icmp_seq=1 ttl=64 time=1.17 ms  
64 bytes from 200.17.8.1: icmp_seq=2 ttl=64 time=1.14 ms  
64 bytes from 200.17.8.1: icmp_seq=3 ttl=64 time=1.01 ms  
64 bytes from 200.17.8.1: icmp_seq=4 ttl=64 time=0.911 ms  
64 bytes from 200.17.8.1: icmp_seq=5 ttl=64 time=1.59 ms  
64 bytes from 200.17.8.1: icmp_seq=6 ttl=64 time=0.966 ms
```

Ping FTP SERVER (200.17.8.2)

```
PING 200.17.8.2 (200.17.8.2) 56(84) bytes of data.  
64 bytes from 200.17.8.2: icmp_seq=1 ttl=64 time=1.18 ms  
64 bytes from 200.17.8.2: icmp_seq=2 ttl=64 time=1.02 ms  
64 bytes from 200.17.8.2: icmp_seq=3 ttl=64 time=0.987 ms  
64 bytes from 200.17.8.2: icmp_seq=4 ttl=64 time=0.874 ms  
64 bytes from 200.17.8.2: icmp_seq=5 ttl=64 time=0.900 ms  
64 bytes from 200.17.8.2: icmp_seq=6 ttl=64 time=0.945 ms  
64 bytes from 200.17.8.2: icmp_seq=7 ttl=64 time=0.920 ms  
^C
```

Ping DNS SERVER (200.17.8.3)

```
PING 200.17.8.3 (200.17.8.3) 56(84) bytes of data.  
64 bytes from 200.17.8.3: icmp_seq=1 ttl=64 time=1.48 ms  
64 bytes from 200.17.8.3: icmp_seq=2 ttl=64 time=0.934 ms  
64 bytes from 200.17.8.3: icmp_seq=3 ttl=64 time=0.827 ms  
64 bytes from 200.17.8.3: icmp_seq=4 ttl=64 time=1.24 ms  
64 bytes from 200.17.8.3: icmp_seq=5 ttl=64 time=0.845 ms  
64 bytes from 200.17.8.3: icmp_seq=6 ttl=64 time=0.730 ms  
^C
```

### **BAB III**

### **Kesimpulan**

1. Jaringan pada GW1 berjalan baik dan dapat saling berkomunikasi setiap PC. Setiap host dapat memiliki IP secara otomatis dengan request DHCP dari GW1.
2. Jaringan pada GW2 berjalan baik dan dapat saling berkomunikasi setiap PC. Database server dan Web server dapat mengirim IP dengan GW2.
3. Jaringan pada GW3 berjalan baik dan dapat saling berkomunikasi setiap PC. FTP server, File server dan DNS server dapat mengirim IP dengan GW3.
4. Setiap PC yang berbeda jaringan belum dapat mengirim ping ke PC di jaringan lain.

## **Daftar Pustaka**

Admin. (2016, Agustus 4). *Install DHCP Server in Ubuntu 16.04*. Retrieved from  
<https://www.ostechnix.com/install-dhcp-server-in-ubuntu-16-04/>

Jim. (2016, Agustus 22). *How to Enable SSH in Ubuntu 16.04 LTS*. Retrieved from  
<http://ubuntuhandbook.org/index.php/2016/04/enable-ssh-ubuntu-16-04-lts/>