

# Project 1: Network Services Setup

January 29, 2014

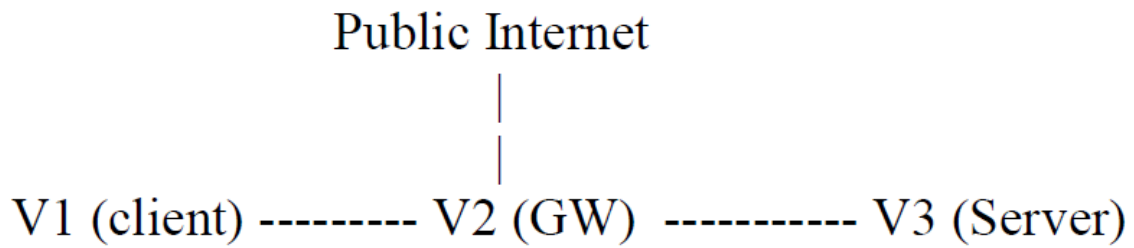
Bing Hao

## Project description

The goal of this project is to setup the network of three servers. The server student27vmg is supposed be configured as the gateway. The open source DNS server bind 9 is installed on the gateway. Web server apache is installed on the server student27vms. Web server must be accessible from server student27vmc.

## Network set up of the project

Servers are interconnected as follows:



At beginning, only the GW can access to the public Internet. The client and server needs to configure properly (set up the default gateway) to access to Internet.

### For the client:

The client's IP address is 172.24.27.6 and its DNS is configured to 172.24.27.133.

### For the Server:

The server's IP address is 172.24.27.134 and its DNS is configured to 8.8.8.8.

For the GW:

```
eth0    Link encap:Ethernet  HWaddr fa:16:3e:b6:bd:57
        inet addr:172.24.27.197  Bcast:172.24.27.207  Mask:255.255.255.240
        inet6 addr: fe80::f816:3eff:feb6:bd57/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:75664 errors:0 dropped:0 overruns:0 frame:0
        TX packets:49276 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:76827049 (76.8 MB)  TX bytes:5978729 (5.9 MB)

eth1    Link encap:Ethernet  HWaddr fa:16:3e:59:41:f7
        inet addr:172.24.27.5   Bcast:172.24.27.15  Mask:255.255.255.240
        inet6 addr: fe80::f816:3eff:fe59:41f7/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:60246 errors:0 dropped:0 overruns:0 frame:0
        TX packets:35256 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:5515111 (5.5 MB)  TX bytes:25314342 (25.3 MB)

eth2    Link encap:Ethernet  HWaddr fa:16:3e:99:72:a2
        inet addr:172.24.27.133 Bcast:172.24.27.143 Mask:255.255.255.240
        inet6 addr: fe80::f816:3eff:fe99:72a2/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:90060 errors:0 dropped:0 overruns:0 frame:0
        TX packets:34212 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:6708065 (6.7 MB)  TX bytes:27100898 (27.1 MB)
```

GW has 3 network cards, 172.24.27.133 will be used as the DNS server and the Gateway for other 2 machines.

### Software packages used in the project

- Apache web server
- Bind9 DNS server
- VIM
- iptables

### Step-by-step project description

1. Install VIM on the server student27vmg  
sudo apt-get update  
sudo apt-get install vim
2. Allow ip forward on student27vmg

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Adding following line to the /etc/rc.local  
sudo su - c "echo 1 > /proc/sys/net/ipv4/ip\_forward"

3. Setting up student27vmg as the gateway, executing following commands on student27vmg  
sudo iptables --table nat --append POSTROUTING --out-interface eth0 -j MASQUERADE  
sudo iptables --append FORWARD --in-interface eth2 -j ACCEPT
4. Configure the Wired connection 1 on student27vms as following:

**Editing Wired connection 1**

Connection name: **Wired connection 1**

Connect automatically

Wired | 802.1x Security | IPv4 Settings | IPv6 Settings

Method: Manual

**Addresses**

Address	Netmask	Gateway	
172.24.27.134	255.255.255.240	172.24.27.133	Add
			Delete

DNS servers: 8.8.8.8

Search domains: 172.24.27.133

DHCP client ID:

Require IPv4 addressing for this connection to complete

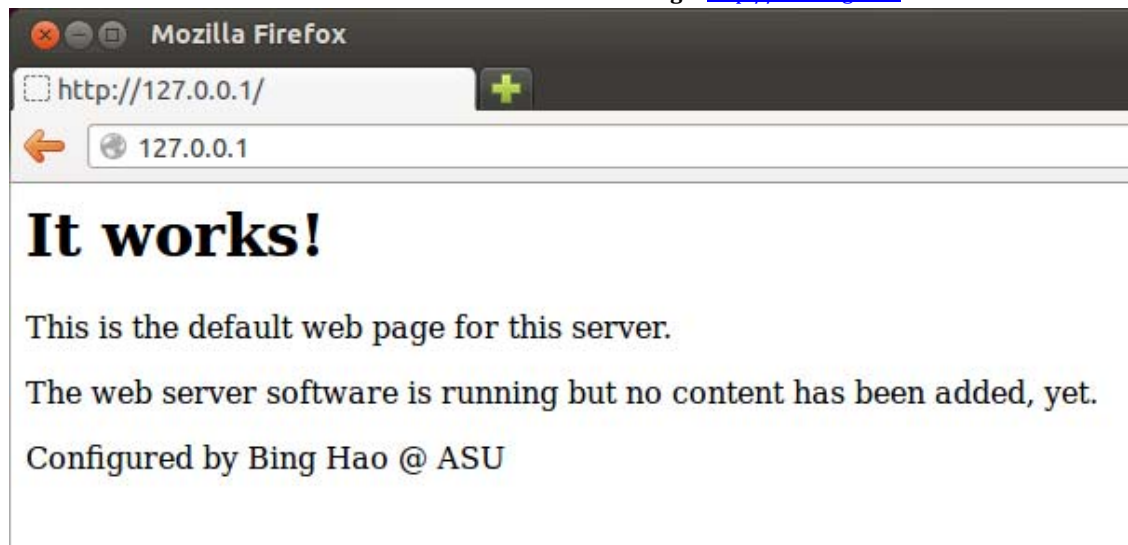
Routes...

Available to all users

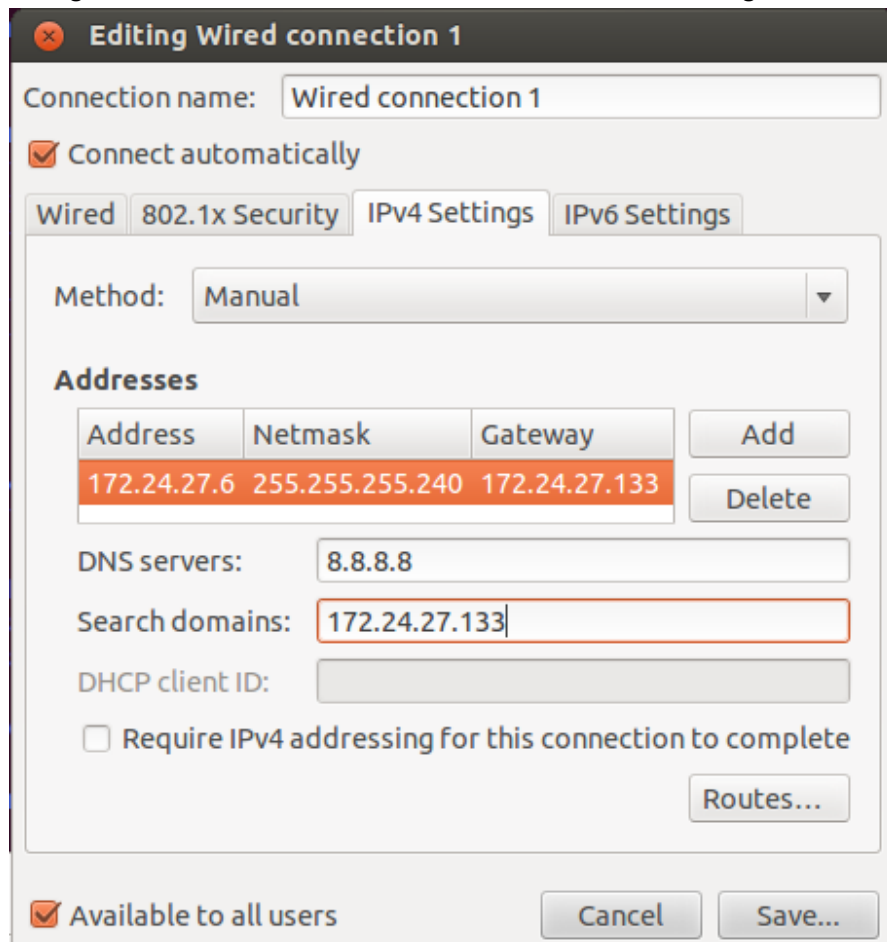
Cancel Save...

5. Install apache2 on student27vms  
Sudo apt-get install apache2

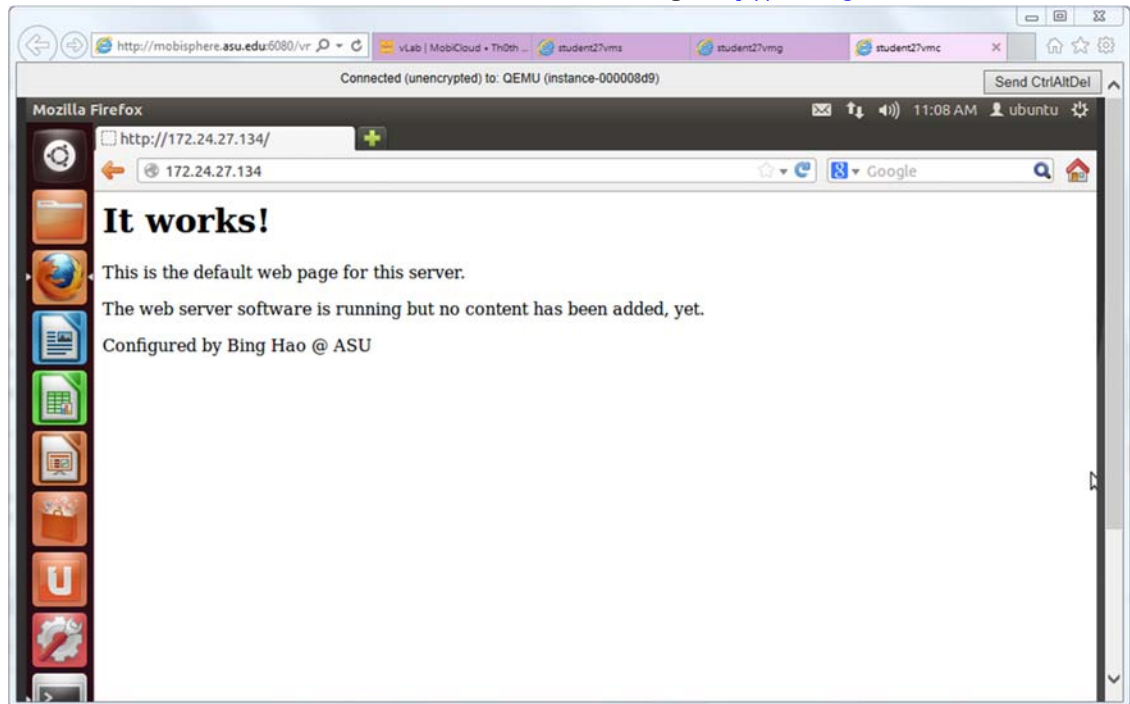
Accessing <http://127.0.0.1> in the firefox:

Home Page: <http://uniteng.com>

6. Configure the Wired connection 1 on student27vmc as following:



7. Accessing the Apache server from student27vmc  
Accessing 172.24.27.134(student27vms) on student27vmc using firefox:

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8. Installing bind9 DNS server on student27vmg  
sudo apt-get install bind9
9. Editing the file /etc/bind/named.conf.local on student27vmg as following:

```
ubuntu@ubuntu-virtual-machine: /etc/bind
//
// 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 "27.24.172.in-addr.arpa"{
    type master;
    notify no;
    file "/etc/bind/db.172";
};

zone "hao.com"{
    type master;
    file "/etc/bind/db.hao.com";
};
~
~
~
~
"named.conf.local" 18L, 315C                               1,1           All
```

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10. Creating a file db.hao.com under /etc/bind/ on student27vmg as following:

```
ubuntu@ubuntu-virtual-machine: /etc/bind
; BIND data file for local loopback interface
;
$TTL      604800
@         IN      SOA    www.hao.com. root.hao.com. (
                        2          ; Serial
                        604800     ; Refresh
                        86400      ; Retry
                        2419200    ; Expire
                        604800 )   ; Negative Cache TTL
;
@         IN      NS     www.hao.com.
www       IN      A      172.24.27.134

;also list other computers
dns       IN      A      172.24.27.133
vmc       IN      A      172.24.27.6
vms       IN      A      172.24.27.134
vmg       IN      A      172.24.27.133
```

11. Creating a file db.172 under /etc/bind/ on student27vmg as following:

```
ubuntu@ubuntu-virtual-machine: /etc/bind
;
; BIND reverse data file for local loopback interface
;
$TTL      604800
@         IN      SOA    ns.example.com. root.example.com. (
                        3          ; Serial
                        604800     ; Refresh
                        86400      ; Retry
                        2419200    ; Expire
                        604800 )   ; Negative Cache TTL
;
@         IN      NS     www.
134      IN      PTR    www.hao.com.

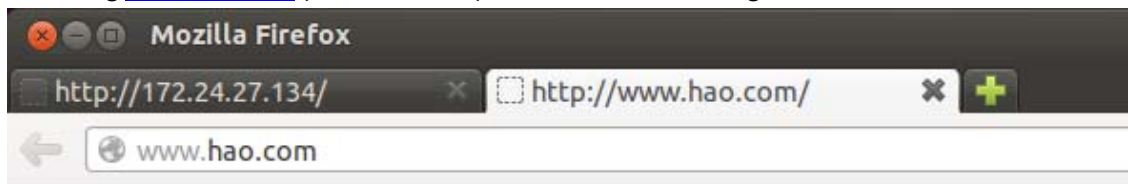
; also list other computers
133      IN      PTR    dns.hao.com.
6        IN      PTR    vmc.hao.com.
134      IN      PTR    vms.hao.com.
133      IN      PTR    vmg.hao.com.
```

12. Configuring the file /etc/resolv.conf on student27vmc as following:

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```
ubuntu@ubuntu-virtual-machine: ~
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
#     DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
# nameserver 127.0.0.1
# search 172.24.27.133
nameserver 172.24.27.133
search hao.com
```

13. Accessing the Apache server from student27vmc using the domain name hao.com  
Accessing [www.hao.com](http://www.hao.com) (student27vms) on student27vmc using firefox:



## It works!

This is the default web page for this server.

The web server software is running but no content has been added, yet.

Configured by Bing Hao @ ASU

14. Nslookup testing and verification on student27vmc

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```
ubuntu@ubuntu-virtual-machine:~$ ./test_DNS.sh
Server:          172.24.27.133
Address:         172.24.27.133#53

Name:   www.hao.com
Address: 172.24.27.134

Server:          172.24.27.133
Address:         172.24.27.133#53

Name:   dns.hao.com
Address: 172.24.27.133

Server:          172.24.27.133
Address:         172.24.27.133#53

Name:   vmc.hao.com
Address: 172.24.27.6

Server:          172.24.27.133
Address:         172.24.27.133#53

Name:   vms.hao.com
Address: 172.24.27.134

Server:          172.24.27.133
Address:         172.24.27.133#53

Name:   vmg.hao.com
Address: 172.24.27.133
```

```
ubuntu@ubuntu-virtual-machine:~$ ./test_DNS_reverse.sh
Server:          172.24.27.133
Address:         172.24.27.133#53

134.27.24.172.in-addr.arpa   name = www.hao.com.
134.27.24.172.in-addr.arpa   name = vms.hao.com.

Server:          172.24.27.133
Address:         172.24.27.133#53

133.27.24.172.in-addr.arpa   name = vmg.hao.com.
133.27.24.172.in-addr.arpa   name = dns.hao.com.

Server:          172.24.27.133
Address:         172.24.27.133#53

6.27.24.172.in-addr.arpa     name = vmc.hao.com.
```



**Conclusion**

The project have been finished successfully. The client and server have been configured properly to access to Internet. The DNS server bind9 was set up on the gateway and the client was configured to use the DNS server on the gateway. The DNS entries were also created successfully for the web server.

**Attached files**

File name: test\_DNS.sh

```
ubuntu@ubuntu-virtual-machine:~$ cat test_DNS.sh
#!/bin/bash
nslookup www.hao.com
nslookup dns.hao.com
nslookup vmc.hao.com
nslookup vms.hao.com
nslookup vmg.hao.com
```

File name: test\_DNS\_reverse.sh

```
ubuntu@ubuntu-virtual-machine:~$ cat test_DNS_r*
#!/bin/bash
nslookup 172.24.27.134
nslookup 172.24.27.133
nslookup 172.24.27.6
```