# Homework #6 Solution

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## Network Administration

**1.**

Omitted

**2.**

Omitted

**3.**

This can be done by Dynamic DNS. That is, the name server updates the domain name-IP mapping automatically. In this problem, we can sign up a domain name in some Dynamic DNS servers and configure the Dynamic DNS setting in our server. On the other hand, since the home server is behind NAT, static DHCP ip address and proper port forwarding, depending on the service of your home server which you want to access, should be configured on Wi-Fi router. (10%)

**4.**

On your HTTP server:

```
ssh -f -N -T -R [available port on public accessible machine]:localhost:[HTTP port] \
[public accessible machine in the same network]
```

Make sure the command runs automatically, for example, adding it to crobtab. (5%)

**5.**

1. (5%)

   ```
   C -{src: 8.8.8.8, dst: 1.2.3.4, vpn: {src: 10.2.0.2, dst: 10.2.0.1}}-> G
   G -{src: 10.2.0.2, dst: 10.2.0.1}-> B
   B -{src: 10.2.0.1, dst: 10.2.0.2}-> G
   G -{src: 1.2.3.4, dst: 8.8.8.8, vpn: {src: 10.2.0.1, dst: 10.2.0.2}}-> C
   ```

2. (5%)

   ```
   A -{src: 10.1.0.1, dst:1.2.3.4, vpn: {src: 10.2.0.3, dst: 10.2.0.1}}-> G
   G -{src: 10.2.0.3, dst: 10.2.0.1}-> B
   B -{src: 10.2.0.1, dst: 10.2.0.3}-> G
   G -{src:10.1.0.0, dst:10.1.0.1, vpn: {src: 10.2.0.1, dst: 10.2.0.3}}-> A
   ```

## System Administration

### FHS (15%)

/usr is usually where softwares installed by the system package manager are placed. When an administrator manually install a third-party software, it is a good practice to install it to /usr/local for the following reasons:

1. Prevent conflicting with files managed by the system package manager.

2. Mark a clear distinction between system softwares and softwares that are not part of the system.

### 1.

When packages are built, they are usually also configured with the Autoconf script configure. For example, here is Fedora's build file for iperf. Notice the following section:

```
%build
%{__autoconf}
%configure
%{__make} %{?_smp_mflags}
```

It is very similar to the ./configure; make; sudo make install thing you might do, except that these macros will be expanded to match the environment of the building machine. You can try the command: rpm --eval '%configure' on CentOS or Fedora to see what it expands to. Also try rpm --eval '%_prefix' to verify that RPM's default installation path is /usr instead of /usr/local.

### 2.

An extreme example of this can be found in FreeBSD (the BSD family alike). In Linux, the essential base software is just the kernel itself, other softwares are considered additions on top of kernel and are managed by various third-party organizations. In FreeBSD, kernel and other selected essential softwares are managed in the same repository. You can read the source code of this repository at /usr/src on the bsd1 workstation. As an example, /bin/ls is usually installed by the coreutil package on Linux, while on FreeBSD it is included with the kernel itself, the source code of which can be found at /usr/src/bin/ls.

### Doge's doom day (35%)

The web server, managed by the Systemd unit web.service, is run as the q.dog user, instead of root. That's why the permission (750) of the directory /var/www/q.dog/ prevents the web server from accessing it. This is something that you should realize when the web server tells you No permission to list directory.

Another thing you might notice is that you cannot access the Internet. By poking around /etc/sysconfig/network-scripts or using commands like ip route or ifconfig, you should realize that the default gateway is different from the one specified in the QEMU user-networking documentation. Fixing this will bring you back the Internet connection, and thus you can visit Q.Dog's favorite website on this VM.