

CNEE 208

Linux Network Administration



Lab Manual

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Introduction

This lab manual is intended to be a user-friendly guide to networking and configuring Linux servers. We will be using Ubuntu, though much of what you learn in this course can be applied to other Linux distributions as well.

After installing VirtualBox and Ubuntu, you will learn how to install and configure DHCP, DNS, FTP, SSH, e-mail, a webserver, and a WordPress blog.



Tips & Tricks

Running Commands

When we say to run `sudo apt-get install apache2`, for instance, we mean to type the above command into a command prompt, also known as a terminal or CLI (command line interface). To open a new terminal, to go to Applications > Accessories > Terminal.

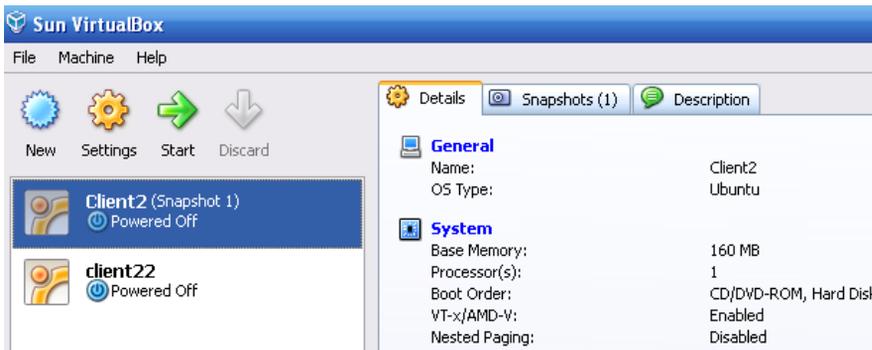


For convenience, you may want to add Terminal to your panel (the bar at the top of the screen) so you can access it with one click – by clicking on the icon – instead of finding it in the Applications menu every time you need to enter a command.



Lab 1

VirtualBox Installation

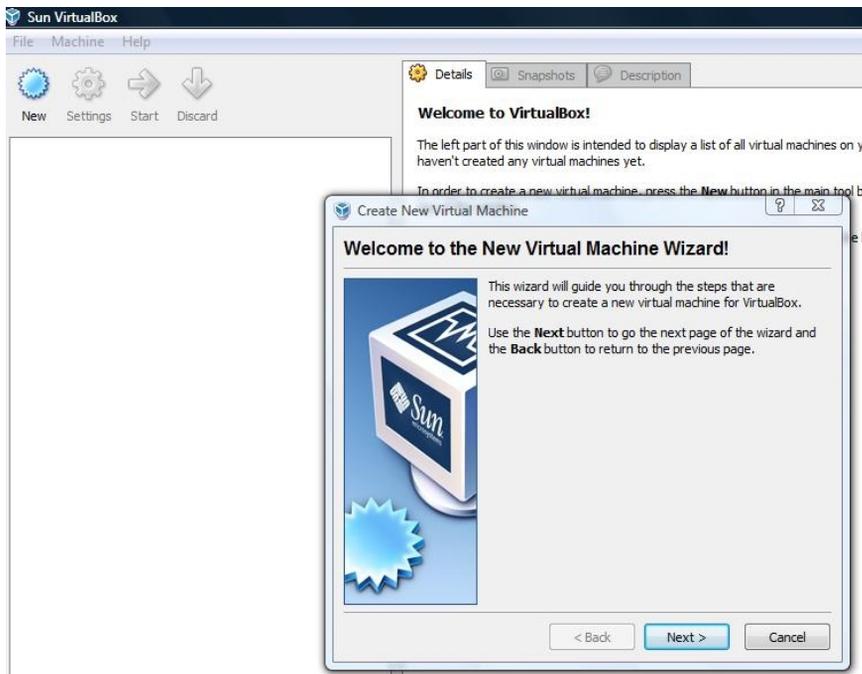


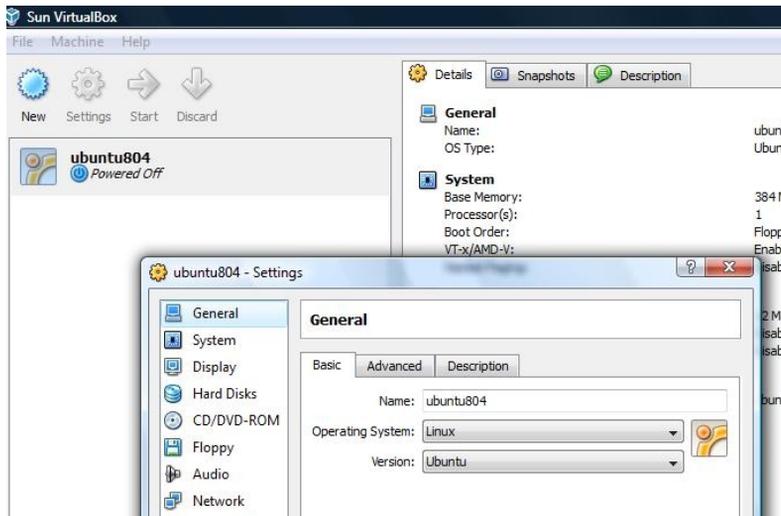
Objective

Virtualization uses software to emulate the functions of a computer. The main or "host" computer runs the virtualization software, which in turn runs a "guest" operating system. Think of it as a computer within a computer. This technique is useful for running multiple operating systems (a Windows host with a Linux guest) as well as for development, since the host PC is protected from OS crashes on the guest. In this lab, you will install Sun's virtualization product called Virtual Box.

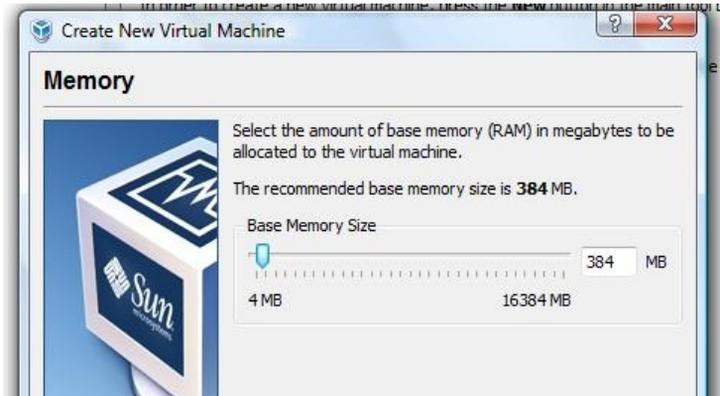
Procedure

- (1) Download the Windows version of Sun Virtual Box from the Sun or CNEE website as directed and install it on your PC.
- (2) Create a virtual machine to be used as a server for your labs, referring to the details in the following screen shots as required.

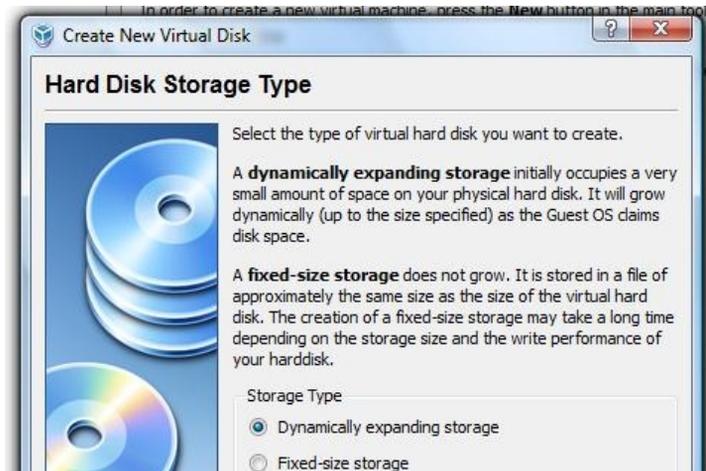




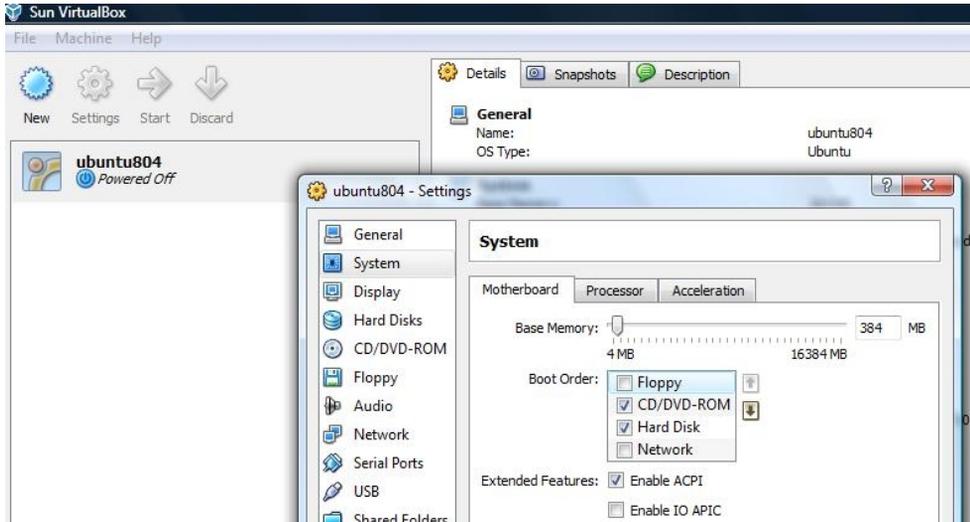
Linux operating system



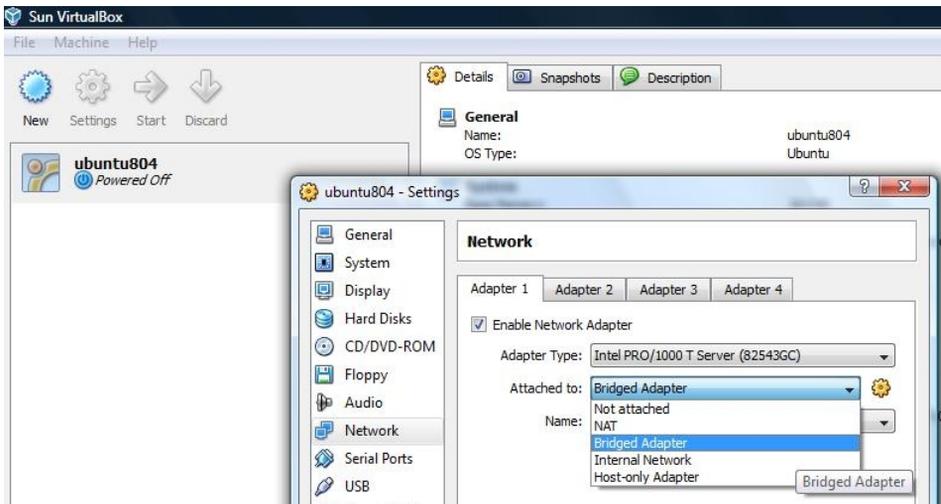
384 M memory



Dynamic hard drive

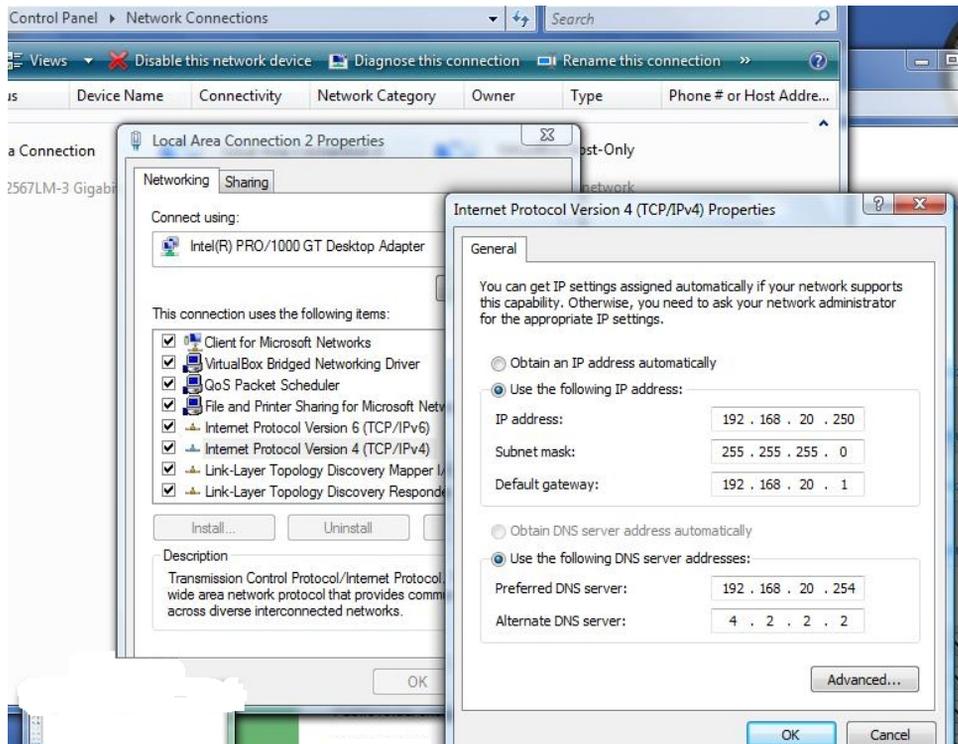


Boot from CD or hard drive



Network adapter in bridged mode

(3) After you've finished creating your virtual machine, you need to set up the network card on your Windows host PC.



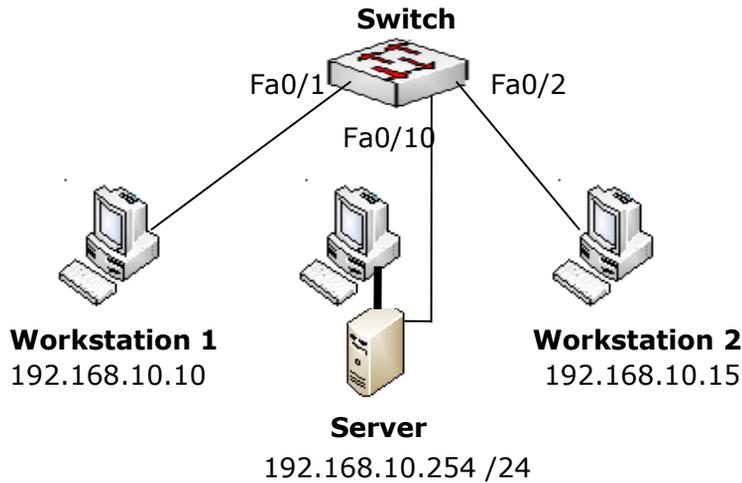
(a) Select the network connection associated with the CNEE Lab (not Internet).

(b) Choose a fixed network address which will be part of your workgroup's network but will not conflict with your DHCP range or other addresses. For example, if you group's network will be 192.168.20.0 /24, you might

- Assign 192.168.20.250 to the network card
- Assign 192.168.20.254 as a fixed address for your virtual server
- Assign 192.168.20.20 - 192.168.20.30 as a DHCP pool on your server

Lab 2

Installing Ubuntu

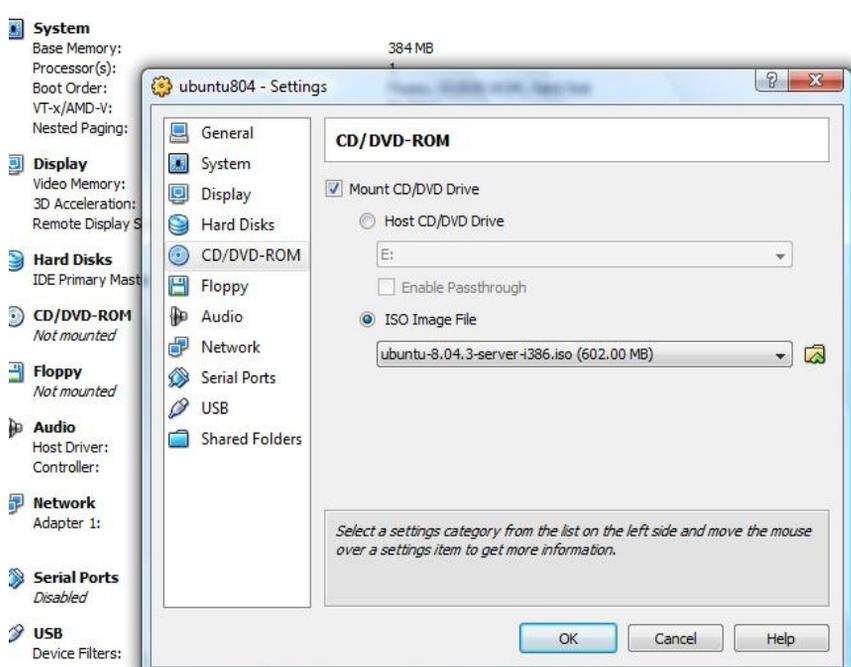


Objective

- (1) Install Ubuntu Server in Virtual Box on one of your work group's PCs.
- (2) Install Ubuntu Workstation in Virtual Box on one or more of your work group's PCs.

Procedure

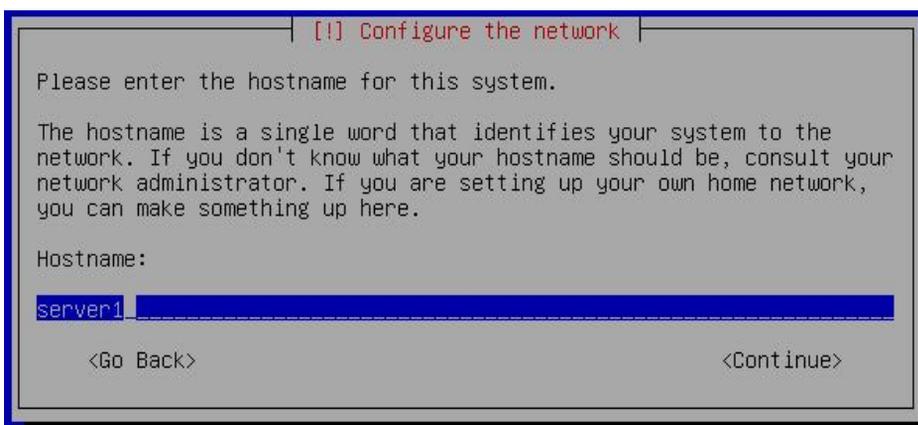
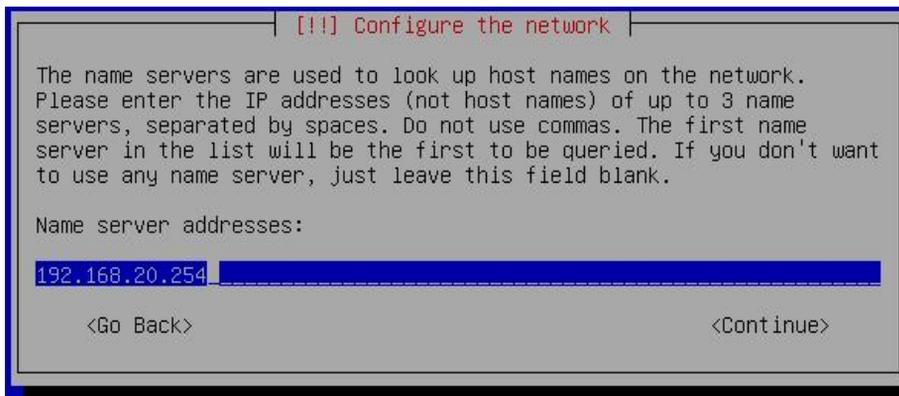
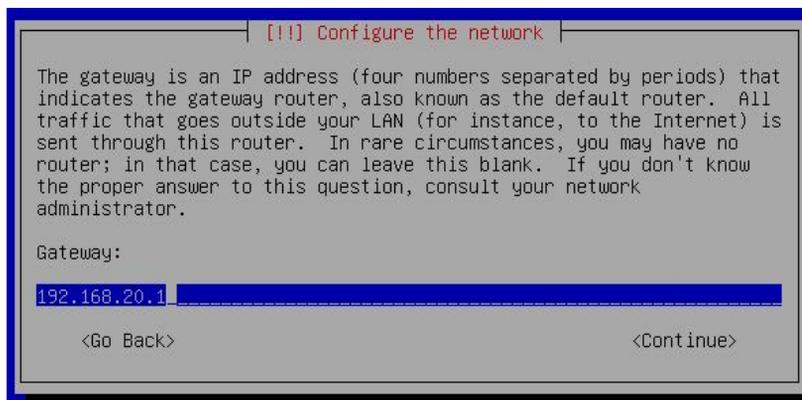
- (1) Open the Virtual Box machine on the PC designated as your work group's server.
- (2) Mount the CD and select either a drive or an ISO image containing the Ubuntu Server installation file as shown below.
- (3) During the installation, enable the network on your host PC which has Internet access and disable access to the CNEE Lab network.

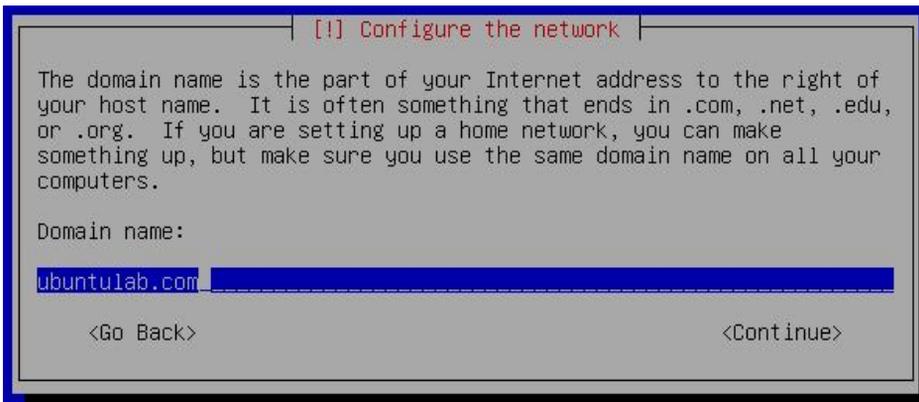


(3) After making sure that it is set up to boot from the location containing the Ubuntu installation file, start the virtual machine. Proceed with the server installation, referring to the screenshots below as required.

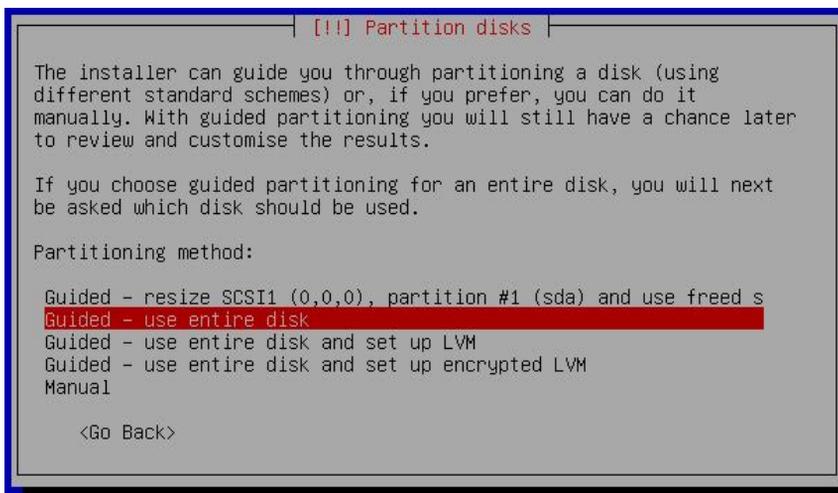


Enter addresses and names within your group's assigned network.





Partition your virtual drive



User accounts and passwords



Internet access can provide automatic updates

```
[!] Select and install software

Applying updates on a frequent basis is an important part of keeping
your system secure.

By default, updates need to be applied manually using package
management tools. Alternatively, you can choose to have this system
automatically download and install security updates, or you can
choose to manage this system over the web as part of a group of
systems using Canonical's Landscape service.

How do you want to manage upgrades on this system?

No automatic updates
Install security updates automatically
Manage system with Landscape
```

Use the up and down arrows on your keyboard to navigate to the various options. Press <spacebar> to select the highlighted option, and <tab> to move to the next section.

Select these packages for installation

```
[!] Software selection

At the moment, only the core of the system is installed. To tune the
system to your needs, you can choose to install one or more of the
following predefined collections of software.

Choose software to install:

[*] DNS server
[*] LAMP server
[*] Mail server
[*] OpenSSH server
[ ] PostgreSQL database
[ ] Print server
[*] Samba file server
[ ] Tomcat Java server
[ ] Virtual Machine host
[*] Manual package selection

<Continue>
```

Mail server configuration

```
[!] Postfix Configuration

Please select the mail server configuration type that best meets your
needs.

No configuration:
Should be chosen to leave the current configuration unchanged.
Internet site:
Mail is sent and received directly using SMTP.
Internet with smarthost:
Mail is received directly using SMTP or by running a utility such
as fetchmail. Outgoing mail is sent using a smarthost.
Satellite system:
All mail is sent to another machine, called a 'smarthost', for
delivery.
Local only:
The only delivered mail is the mail for local users. There is no
network.

General type of mail configuration:

No configuration      ↑
Internet Site        █
```

```
[!] Postfix Configuration

The "mail name" is the domain name used to "qualify" _ALL_ mail
addresses without a domain name. This includes mail to and from
<root>: please do not make your machine send out mail from
root@example.org unless root@example.org has told you to.

This name will also be used by other programs. It should be the
single, fully qualified domain name (FQDN).

Thus, if a mail address on the local host is foo@example.org, the
correct value for this option would be example.org.

System mail name:

server1.ubuntulab.com
-----
<Continue>
```

Proceed with the remainder of the installation and reboot as directed.

Installing the Ubuntu Desktop GUI

- a. Reboot your virtual server and log in.
- b. Confirm that your server has Internet access by pinging a known site, such as the Verizon server at 4.2.2.2.
- c. Enter
`sudo apt-get install ubuntu-desktop`
as shown below.

```
Ubuntu 9.04 server1 tty1

server1 login: server1
Password:
Added user server1.

Linux server1 2.6.28-11-generic #42-Ubuntu SMP Fri Apr 17 01:57:59 UTC 2009

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To access official Ubuntu documentation, please visit:
http://help.ubuntu.com/
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

server1@server1:~$ sudo apt-get install ubuntu-desktop_
```

- d. Once the GUI has finished installing enter
`startx`
to start Ubuntu Desktop.

```
Setting up totem (2.26.1-0ubuntu5) ...
Setting up totem-mozilla (2.26.1-0ubuntu5) ...
Setting up tsclient (0.150-1ubuntu6) ...

Setting up update-notifier (0.76.7) ...

Setting up ubuntu-desktop (1.140) ...
Setting up vinagre (2.26.1-0ubuntu1) ...

Setting up vino (2.26.1-0ubuntu1) ...

Setting up evolution-documentation-en (2.26.1-0ubuntu2) ...

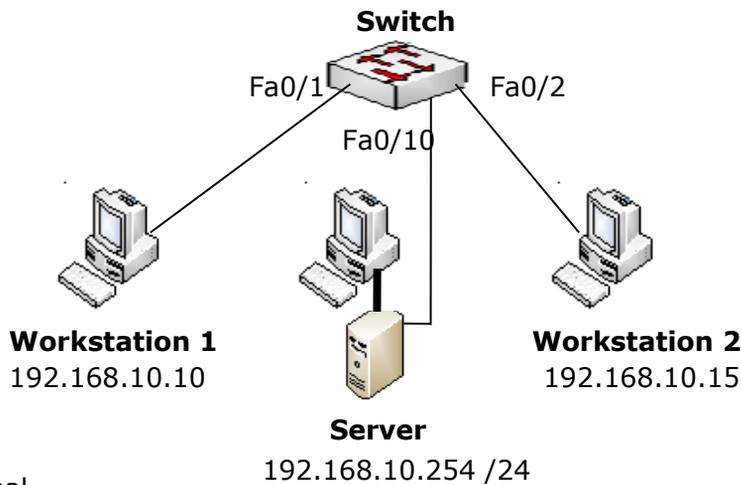
Setting up evolution-indicator (0.1.13-0ubuntu1) ...

Setting up gnome-pilot (2.0.17-0ubuntu1) ...

Setting up gnome-pilot-conduits (2.0.15-1.2) ...
Processing triggers for libc6 ...
ldconfig deferred processing now taking place
Processing triggers for python-support ...
Processing triggers for initramfs-tools ...
update-initramfs: Generating /boot/initrd.img-2.6.28-11-generic
server1@server1:~$ startx_
```

- e. Once you've successfully installed Ubuntu Desktop, your server will automatically boot into the GUI from now on.

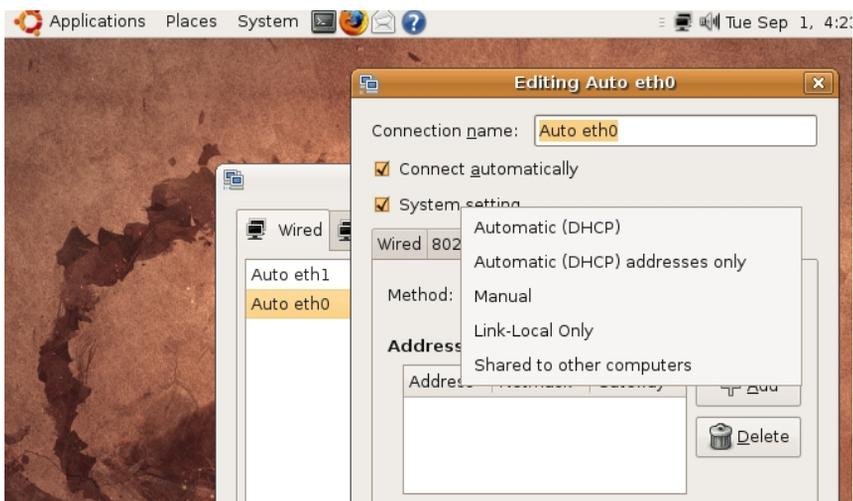
(4) Following the same procedure you used to install Ubuntu Server, install Ubuntu Workstation in Virtual Box on one or more of your other work group's PCs as directed. (You won't see the menus for installation of DNS, DHCP, or other services, but otherwise the Workstation installation will be very similar to that of the Server.)



Optional

- (5) After installing Ubuntu Server and Workstation on your group's PCs
 - a. On each PC, disable the network associated with Internet access and enable the CNEE Lab network.
 - b. Make sure that the Virtual Box network adapter for each machine is in the Bridged mode.
 - c. Use the Ubuntu GUI menu to assign fixed IP network addresses within your assigned network as shown in the screen shots below.

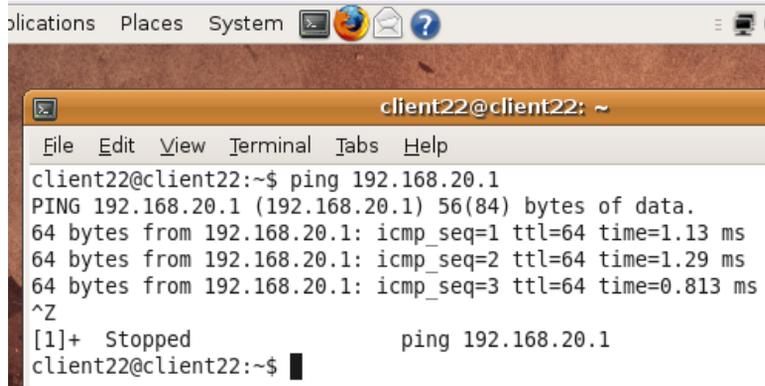




d. Select "Manual", followed by "+Add".

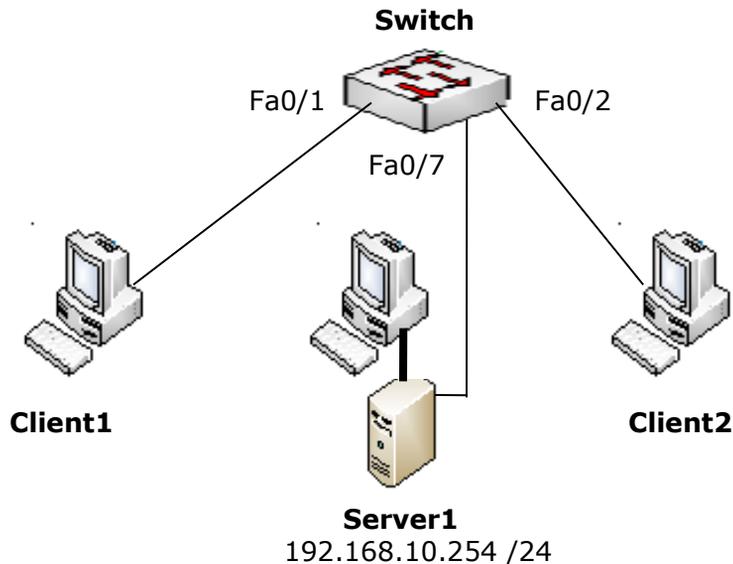


e. Enter your IP address, netmask, and gateway.



f. Use ping to verify connectivity among network members. To do so, open a terminal window and ping one of the other virtual machines on your network. (Unlike Windows, Linux pings continuously once started. You can stop the ping process by pressing Control Z).

Lab 3 DHCP Server



Objective

Learn how to configure dhcp3, a DHCP server.

What is DHCP?

Dynamic Host Control Protocol, or DHCP, allows IP addresses on the local network to be assigned dynamically, which means that a computer's IP can change over time (as opposed to being static, or fixed). The amount of time a host computer retains its IP address is determined by the duration of its *lease*, which is set by a DHCP server. DHCP is extremely popular largely because it provides a way to automatically assign IP addresses to hosts. If you can access the internet as soon as your computer starts without ever having to manually specify your IP address, chances are you're using DHCP. Many home "routers", such as those made by Linksys, Netgear, and D-Link, act as DHCP servers for added convenience. Sometimes we want Linux computers to act as DHCP servers, which is just what we'll be configuring today.

Procedure

- (1) Connect the network as shown in the above diagram.
- (2) Configure Server1 by running

```
sudo nano /etc/network/interfaces
```

and editing the file till it matches the following:

```
auto lo
iface lo inet loopback

auto eth0
iface eth0 inet static
    address 192.168.10.254
    netmask 255.255.255.0
    network 192.168.10.0
    broadcast 192.168.10.255
    gateway 192.168.10.1
```

Explanation:

auto eth0	Ensures that eth0 will be initialized at system startup
iface eth0 inet static	Says we're giving interface eth0 a static IP
address 192.168.10.254	Sets local IP
netmask 255.255.255.0	Sets network mask
network 192.168.10.0	Sets local network
broadcast 192.168.10.255	Specifies broadcast address
gateway 192.168.10.1	Specifies gateway to internet

Now run

```
sudo /etc/init.d/networking restart
```

to restart and reconfigure Server1's network interfaces using the information provided by the files we have just modified. To ensure your IP is 192.168.10.254, run

```
ifconfig eth0
```

(3) Now that the interfaces are set up properly, let's configure dhcp3, the DHCP server. (Make sure it's installed by running `sudo apt-get install dhcp3-server`.) dhcp3's configuration file is located at `/etc/dhcp3/dhcpd.conf`. Configure dhcp3 on Server1 by running

```
sudo nano /etc/dhcp3/dhcpd.conf
```

and adding the following text to the end of the file:

```
subnet 192.168.10.0 netmask 255.255.255.0 {
    range 192.168.10.20 192.168.10.30;
    option routers 192.168.10.1;
    option domain-name-servers 192.168.10.254;
}
```

Explanation:

subnet 192.168.10.0 netmask 255.255.255.0 Specifies local subnet and network mask

range 192.168.10.20 192.168.10.30; Specifies DHCP IP pool

option routers 192.168.10.1; Specifies IP of network router,
which is often also your gateway

option domain-name-servers 192.168.10.254; Specifies local IP of DNS server

(4) After saving the file with your additions, reload DHCP by entering

```
sudo service dhcp3-server restart
```

You should see the service stop and then restart with no error messages. If errors occur, check the files just edited for typos.

(5) Next, open a terminal in one of your client workstations and enter

```
sudo dhclient eth0
```

You should see something like the following as the workstation requests and obtains an IP address from the DHCP server.

```
client1@client1:~$ sudo dhclient eth0
[sudo] password for client1:
...
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 8
DHCPOFFER of 192.168.10.20 from 192.168.10.254
DHCPREQUEST of 192.168.10.20 on eth0 to 255.255.255.255 port 67
DHCPACK of 192.168.10.20 from 192.168.10.254
bound to 192.168.10.20 -- renewal in 281 seconds.
```

(6) Now open a terminal in your next client workstation and again enter

```
sudo dhclient
```

You should see the DHCP process assign the next available pool address to this workstation.

(7) The DHCP server stores its lease information in the file in `/var/lib/dhcp3/dhcpd.leases`. Run

```
cat /var/lib/dhcp3/dhcpd.leases
```

to observe the leases which have been issued to your workstations. You should see something similar to the example below.

Example

```
server1@server1:/var/lib/dhcp3$ cat dhcpd.leases
```

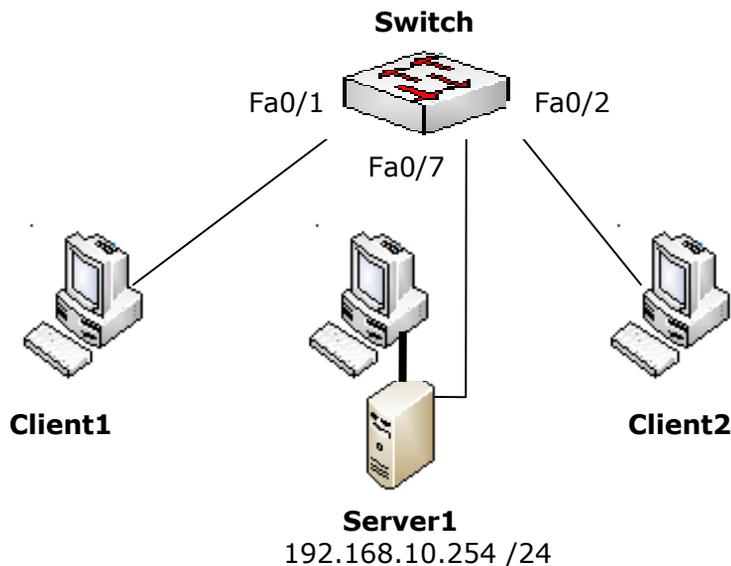
```
# The format of this file is documented in the dhcpd.leases(5) manual page.  
# This lease file was written by isc-dhcp-V3.1.1
```

```
lease 192.168.10.21 {  
  starts 4 2009/08/27 17:02:06;  
  ends 4 2009/08/27 17:12:06;  
  tstp 4 2009/08/27 17:12:06;  
  cltt 4 2009/08/27 17:02:06;  
  binding state active;  
  next binding state free;  
  hardware ethernet 08:00:27:c1:39:69;  
  client-hostname "client2";  
}
```

```
lease 192.168.10.20 {  
  starts 4 2009/08/27 17:02:43;  
  ends 4 2009/08/27 17:12:43;  
  tstp 4 2009/08/27 17:12:43;  
  cltt 4 2009/08/27 17:02:43;  
  binding state active;  
  next binding state free;  
  hardware ethernet 08:00:27:d0:0a:84;  
  client-hostname "client1";
```

Lab 4

DNS Server



Objective

Learn how to configure a DNS server.

What is DNS ?

Domain Name Service, or DNS, allows IP addresses in the familiar alphanumeric form such as `http://www.ubuntulab.com` to be converted or "resolved" to a routable numeric address like `192.168.10.254`. A DNS server with first hand knowledge of a given network's names and addresses is said to be "authoritative" over its "zone". In this lab you will configure the Linux DNS service, known as `bind9`, to create an authoritative server for the computers in your work group.

Procedure

- (1) Connect the network as shown in the above diagram.
- (2) Ensure that Clients 1 and 2 have received DHCP addresses and that all computers in your workgroup can ping each other by numeric IP address.
- (3) If you haven't already done so, install the `bind9` and DNS utilities on the server by entering

```
sudo apt-get install bind9 dnsutils
```

- (4) Next, configure the server's host name:

```
echo "server1.ubuntulab.com" > /etc/hostname
```

(5) Now edit `/etc/hosts` as follows:

```
127.0.0.1 localhost.localdomain localhost
192.168.10.254 server1.ubuntulab.com server1

# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
ff02::3 ip6-allhosts
```

(6) and `/etc/resolv.conf`

```
search ubuntulab.com
nameserver 192.168.10.254
```

(7) Next edit `/etc/bind/named.conf.local` to include your forward and reverse lookup information:

```
//
// 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 "ubuntulab.com" {
type master;
file "db.ubuntulab.com";
};

zone "10.168.192.in-addr.arpa" {
type master;
file "db.192.168.10";
};
```

(8) Now create the forward zone file `/var/cache/bind/db.ubuntulab.com` and edit it as follows. (Remember to increment the serial number each time you update this file.)

```
$TTL 604800
@ IN SOA server1.ubuntulab.com. root.ubuntulab.com. (
6 ;serial
04800 ;refresh
86400 ;retry
2419200 ;expire
604800 ;negative cache TTL
)
@ IN NS server.ubuntulab.com.
@ IN A 192.168.10.254
server1 IN A 192.168.10.254
www IN CNAME server1
```

(9) Then create the reverse zone lookup file `/var/cache/bind/db.192.168.10`

```
$TTL 604800
@ IN SOA server1.ubuntulab.com. root.ubuntulab.com. (
6          ;serial
604800    ;refresh
86400     ;retry
2419200   ;expire
604800    ;negative cache TTL
)
@ IN NS   server1.ubuntulab.com.
@ IN A    192.168.10.254
254 IN PTR server1.ubuntulab.com.
```

Comments:

*(a) The 254 in the last line is the last octet of your DNS server's IP address (192.168.10.**254** in this example).*

(b) Remember to increment the serial number each time you update this file and all other configuration files that contain the word "serial".

(10) Next make sure that your DHCP server is including the address of the DNS server(s) each time it hands out an address. For this example, `/etc/dhcp3/dhcpd.conf` would include:

```
subnet 192.168.10.0 netmask 255.255.255.0 {
    range 192.168.10.25 192.168.10.35;
    option routers 192.168.10.1;
    option domain-name-servers 192.168.10.254;
    option domain-name "ubuntulab.com";
}
```

(11) Now, for those clients and servers which have static IP addresses and don't interact with DHCP, edit their `/etc/resolv.conf` file as follows:

```
# Generated by NetworkManager

search ubuntulab.com
nameserver 127.0.0.1
nameserver 192.168.20.254
```

Comment: In this case, use the word "nameserver" as shown. Don't replace it with your server's info.

(12) Now restart the DHCP and DNS servers:

```
sudo service dhcp3-server restart
sudo service bind9 restart
```

On those clients using DHCP, restart this function by entering

```
sudo dhclient
```

and confirming that an address has been received from the server.

(13) You should now be able to use the nslookup function from one of your network clients to confirm that DNS is working:

```
client2@client2:~$ nslookup ubuntulab.com

Server:                192.168.10.254
Address:               192.168.10.254#53
Name:                 ubuntulab.com
Address:              192.168.10.254
client22@client22:~$ nslookup 192.168.10.254
Server:                192.168.10.254
Address:               192.168.10.254#53
```

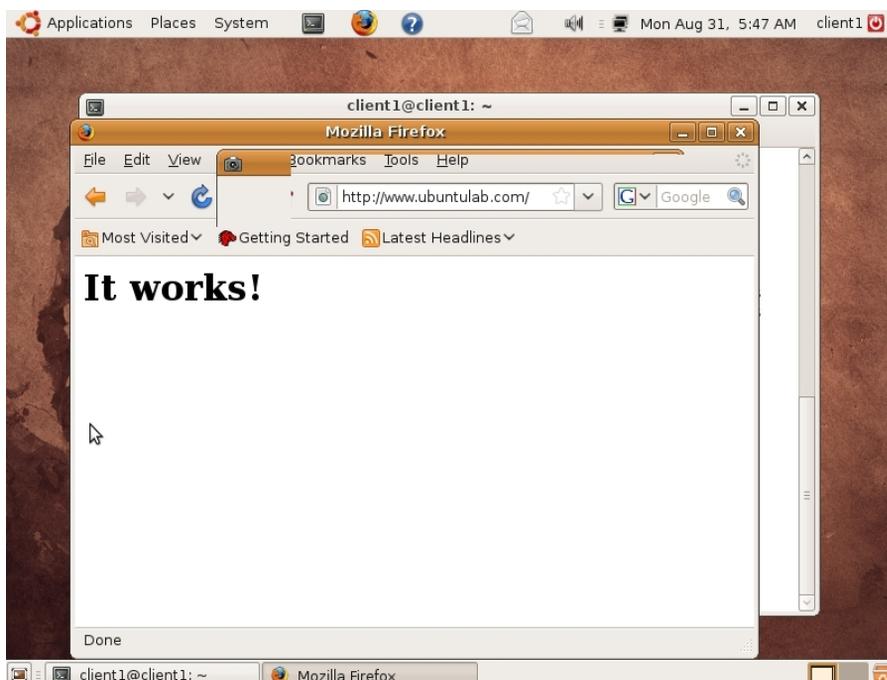
```
254.10.168.192.in-addr.arpa name = server.ubuntulab.com.
```

and check the resolv.conf file on the DHCP clients to make sure that they have received the correct information:

```
client2@client2:/etc$ cat resolv.conf
domain ubuntulab.com
search ubuntulab.com
nameserver 192.168.10.254

nameserver 192.168.20.254
```

(14) The server should now respond when pinged by name (server1.ubuntu**lab.com**). If you have installed the Apache package on the web server, open Mozilla web browser in one of the clients and enter [http://www.ubuntu**lab.com**](http://www.ubuntulab.com). You should see a display similar to the one below.



(15) Although you can now ping your server by name, you won't be able to ping by name those clients which have received their address via DHCP. You can fix this problem by installing dynamic dns.

(16) Begin by changing the owner of `/var/cache/bind` to `user:bind` and `group:bind`.

```
chown bind. /var/cache/bind
```

(17) Next edit the file `/etc/bind/named.conf.local` as shown:

```
//
// Do any local configuration here
//
// Consider adding the 1918 zones here, if they are not used in your
// organization
// include "/etc/bind/zones.rfc1918";

include "/etc/dhcp3/rndc.key";
controls {
inet 127.0.0.1 allow { localhost; } keys { "rndc-key"; };
};

zone "ubuntulab.com" {
type master;
file "db.ubuntulab.com";
allow-update { key "rndc-key"; };
};

zone "10.168.192.in-addr.arpa" {
type master;
file "db.192.168.10";
allow-update { key "rndc-key"; };
};
```

(18) Assuming your server's interface is `"eth0"`, edit the file `/etc/default/dhcp3-server` as follows:

```
# Defaults for dhcp initscript
# sourced by /etc/init.d/dhcp
# installed at /etc/default/dhcp3-server by the maintainer scripts
#
# This is a POSIX shell fragment
#
# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
# Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACES="eth0"
```

(19) Now edit `/etc/dhcp3/dhcpd.conf`

```
ddns-update-style interim;
ignore client-updates;

include "/etc/bind/rndc.key";

zone ubuntulab.com. {
    primary 127.0.0.1;
    key "rndc-key";
}
authoritative;

subnet 192.168.10.0 netmask 255.255.255.0 {
    range 192.168.10.25 192.168.10.35;
    option domain-name-servers 192.168.10.254;
    option domain-name "ubuntulab.com";
    option routers 192.168.10.1;
    default-lease-time 600;
    max-lease-time 7200;

    zone server1.ubuntulab.com. {
        primary 192.168.10.254;
        key "rndc-key";
    }

    zone 10.168.192.in-addr.arpa. {
        primary 192.168.10.254;
        key "rndc-key";
    }
}
```

(20) Make a copy of the `rndc` file and place it in the `dhcp3` folder:

```
sudo cp /etc/bind/rndc.key /etc/dhcp3/rndc.key
```

(21) Now restart both the DNS and DHCP servers:

```
sudo service bind9 restart
sudo service dhcp3-server restart
```

You should see both services stop and then restart with no error messages.

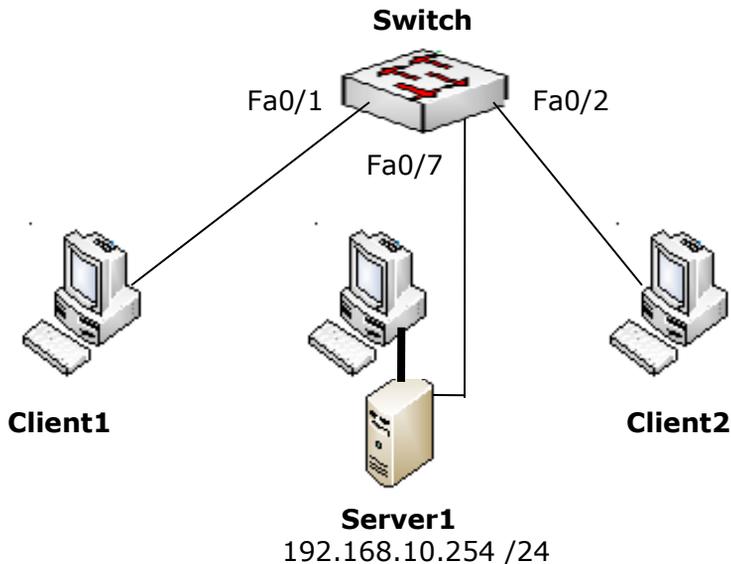
(22) Have your client request a new DHCP address by entering

```
sudo dhclient
```

from the client.

(23) Once the new address has been obtained, you will be able to ping the client by FQDN.

Lab 5 FTP Server



Objective

Learn how to configure ProFTPD, an FTP server.

What is FTP?

File Transfer Protocol, or FTP, allows computers to exchange files. This can be done via HTTP, but FTP server software is particularly suited for this task. FTP servers can be either public, in which case they allow users to log in anonymously (or don't require them to log in at all), or they can be private, which means a user name and password are required for use.

Procedure

- (1) Connect the network as shown in the above diagram.
- (2) Once you've installed ProFTPD via the

```
sudo apt-get install proftpd
```

command, configure Server1 by running

```
sudo nano /etc/proftpd/proftpd.conf
```

and editing the config file as follows:

If you want to limit user access to their individual home directories, uncomment

```
# DefaultRoot ~
```

Set ServerName to "Server1".

To allow anonymous access, uncomment the last 40 lines or so till they read as:

```
<Anonymous ~ftp>
User ftp
Group nogroup
# We want clients to be able to login with "anonymous" as well as "ftp"
UserAlias anonymous ftp
# Cosmetic changes, all files belongs to ftp user
DirFakeUser on ftp
DirFakeGroup on ftp

RequireValidShell off

# Limit the maximum number of anonymous logins
MaxClients 10

# We want 'welcome.msg' displayed at login, and '.message' displayed
# in each newly chdired directory.
DisplayLogin welcome.msg
DisplayChdir .message

# Limit WRITE everywhere in the anonymous chroot
<Directory *>
  <Limit WRITE>
    DenyAll
  </Limit>
</Directory>

</Anonymous>
```

This configuration works best when your goal is to distribute files to others but do not want them to be able to upload files to your server.

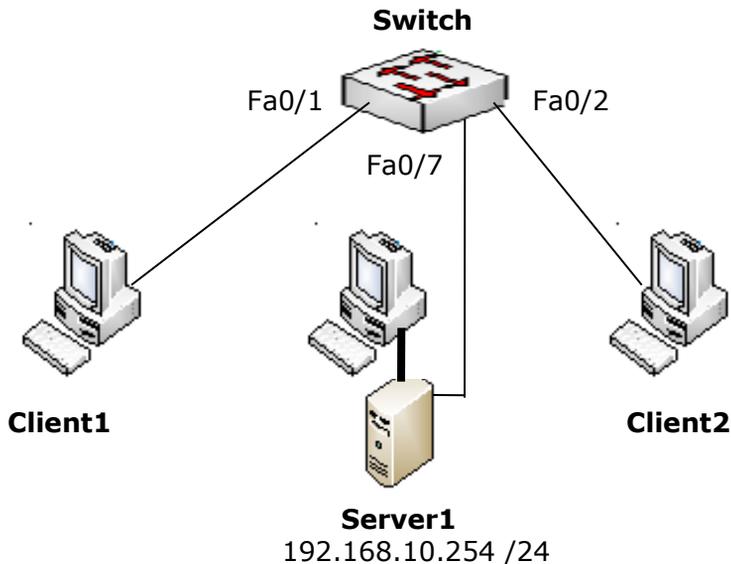
To create a new user account for FTP login, run

```
sudo adduser ftpuser
```

where "ftpuser" should be the name of the new username.

A word of caution: by today's standards, FTP is extremely insecure because user passwords are sent in plain text; no encryption is used. To securely transfer files from one computer to another, consider using scp (secure copy), which is built into the SSH client and server.

Lab 6 SSH Server



Objective

Learn how to configure SSHD, an SSH server.

What is SSH?

Secure Shell, or SSH, allows users to securely log into a remote computer. It may help to think of SSH as an encrypted version of telnet since, once logged in, the user experience is exactly what it would be if she were logged into a local machine, but without the GUI – it's just like using a computer but with only command line access. SSH can also be used to transfer files via the scp command. Today you will learn how to configure an SSH server so you can allow yourself or others to log into it remotely.

Procedure

(1) Connect the network as shown in the above diagram.

(2) Once you've installed sshd by running the

```
sudo apt-get install openssh-server
```

command, configure Server1 by running

```
sudo nano /etc/ssh/sshd_config
```

and editing the config file as follows:

For security purposes, set

PermitRootLogin no

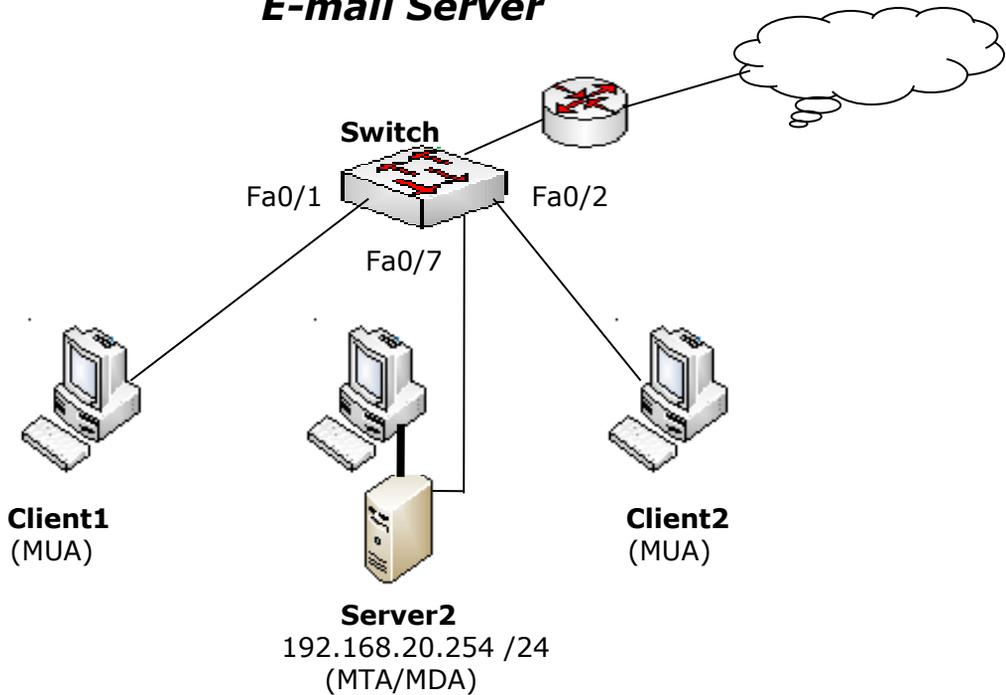
If you ever need to remotely run a command as root, ssh to the server you need to connect to using regular user credentials (and not as root), then use "sudo" as necessary.

If you need to change the default port that sshd runs on, which is sometimes helpful when your server is behind a firewall you'd like to avoid the restrictions of,

Port 2222

should do the trick.

Lab 7 E-mail Server



Objective

Learn how to configure a basic e-mail server and e-mail client.

E-mail Building Blocks

MUA - Mail User Agent software is used to download and generate e-mail for a given user account. In this lab, we'll use Evolution as the MUA. Other popular MUAs include Mozilla Thunderbird and Microsoft Outlook.

MDA - The Mail Delivery Agent on the server interacts with individual user accounts to upload and download e-mail. Dovecot will be the MDA for this lab.

MTA - The Mail Transfer Agent routes e-mail to/from other networks and the MDA. We'll use Postfix as the MTA for this lab.

Procedure

(1) During our explanation, we'll use `server2.ubuntulab2.com` at a fixed IP address of `192.168.20.254` as the mail server. Substitute the assigned server name, domain, and IP address for your workgroup during the actual installation.

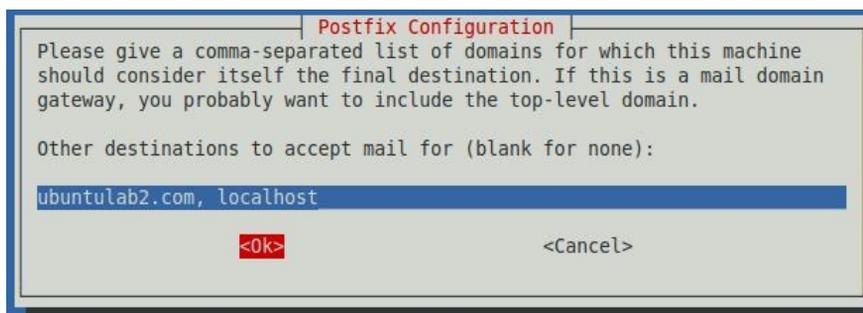
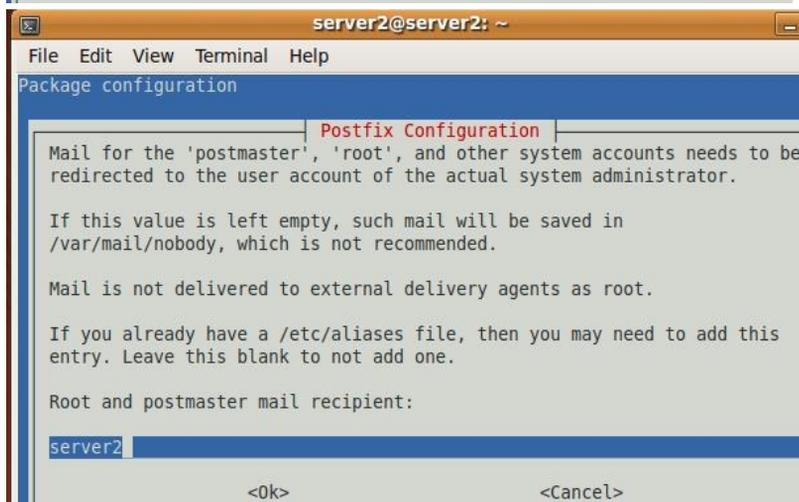
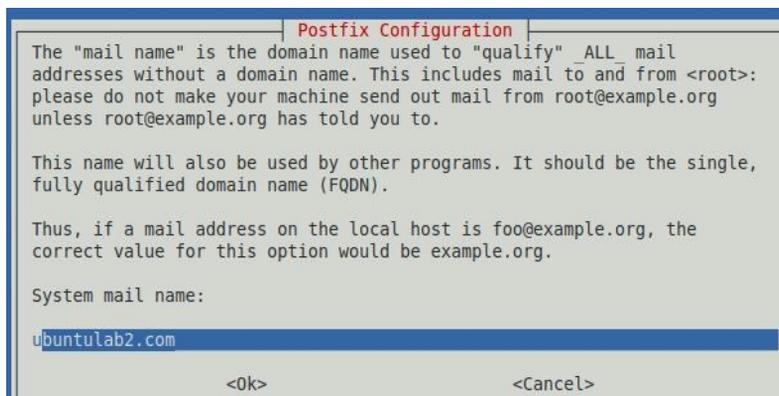
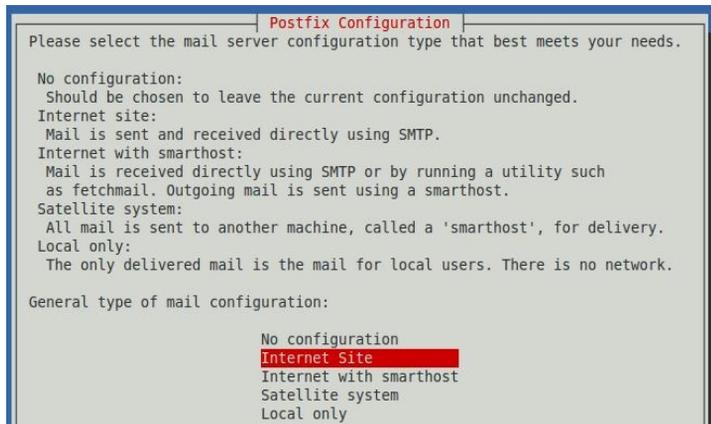
(2) Begin by making sure that Postfix is installed on your server. If not, run

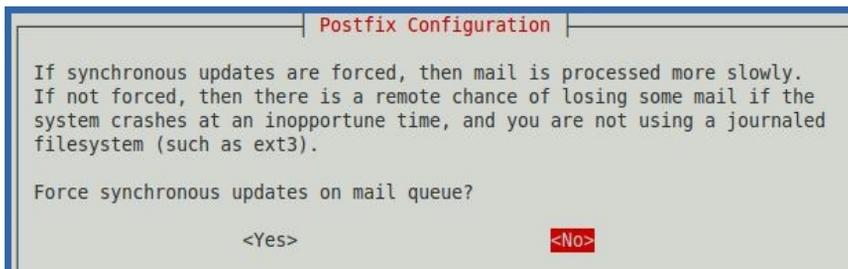
```
sudo apt-get install postfix
```

(3) If Postfix is already installed, it must be reconfigured by entering

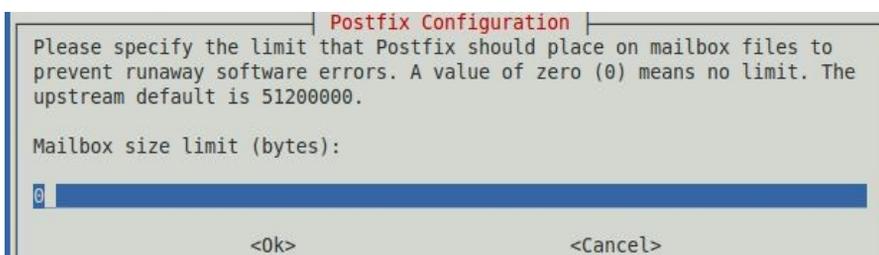
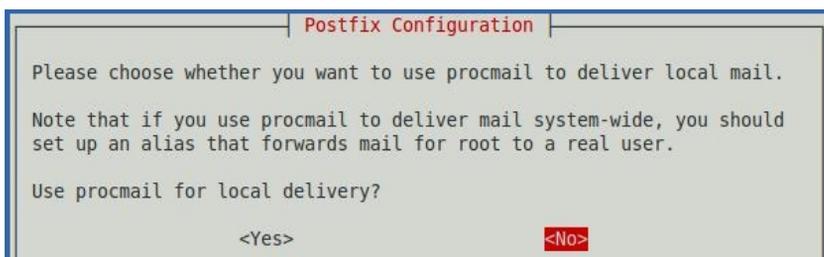
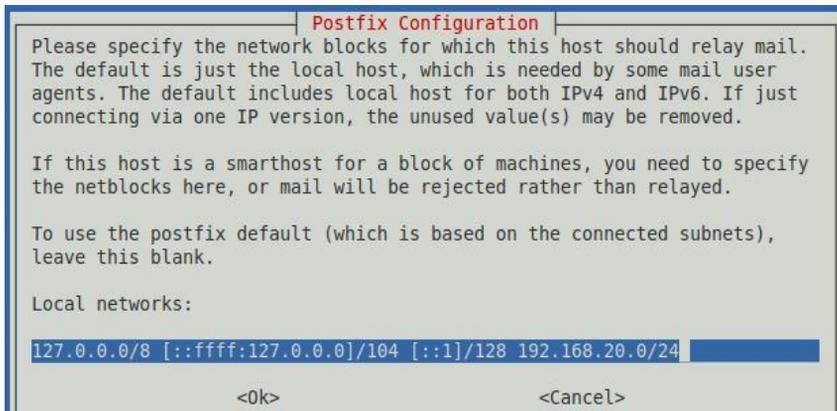
```
sudo dpkg-reconfigure postfix
```

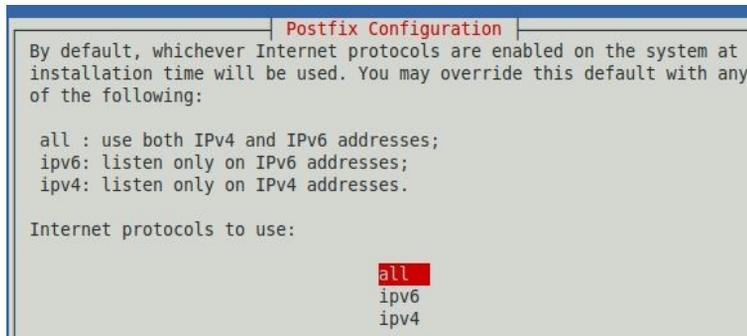
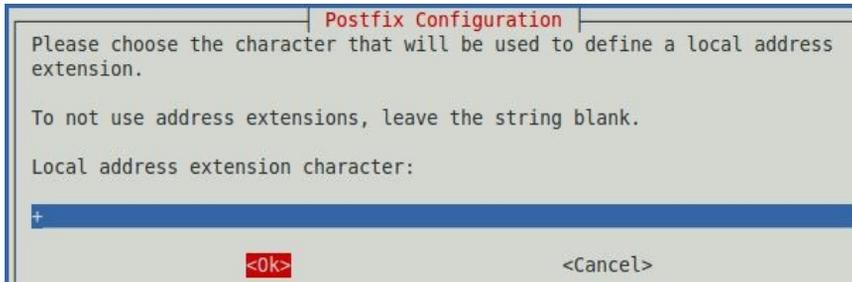
(4) The screen shots below follow the configuration process detailed in the Ubuntu 9.04 Server Guide.



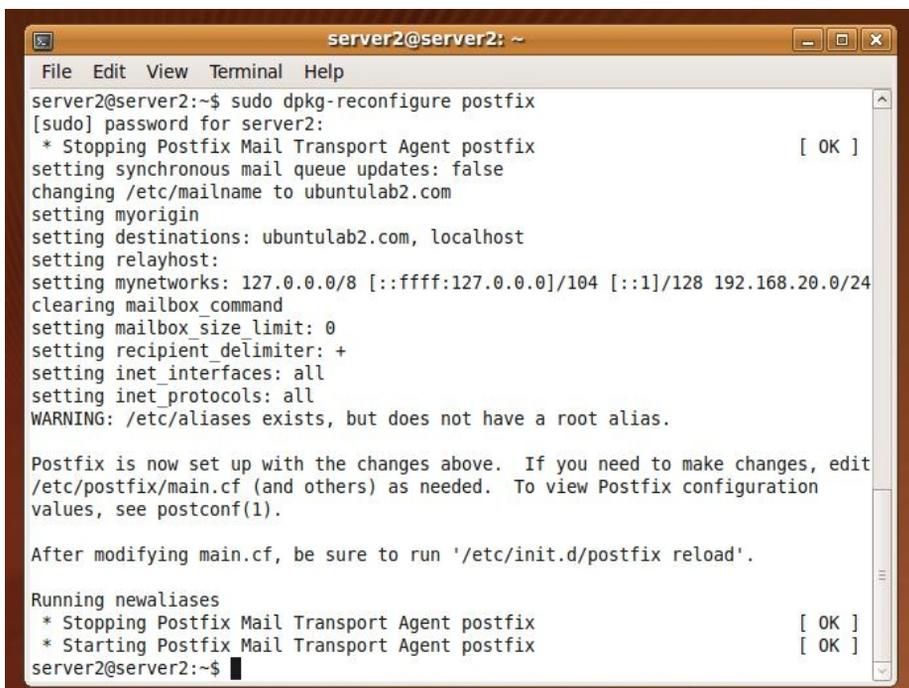


Enter your network's address last (192.168.20.0) , followed by the mask length (/24):



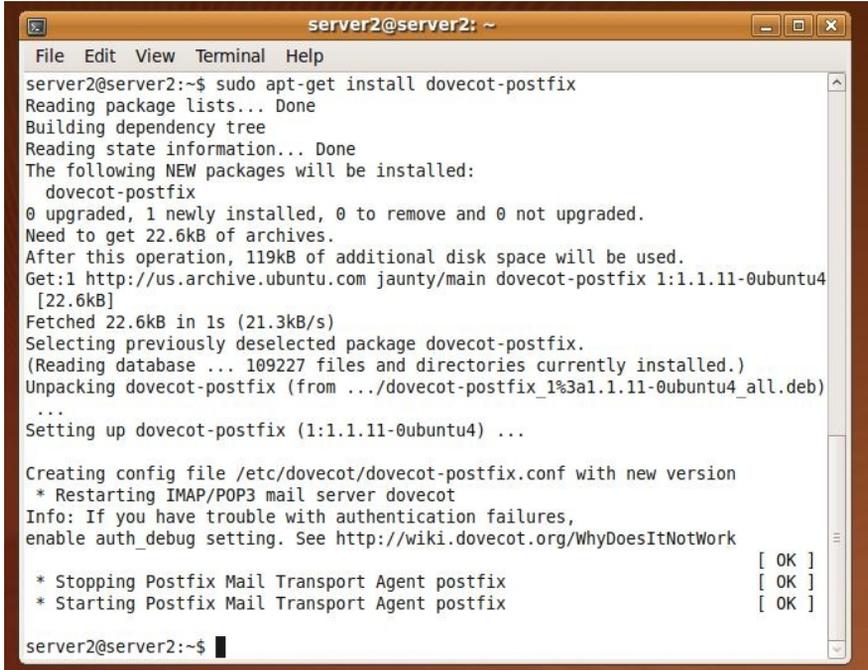


When the Postfix installer exits, your terminal window should appear similar to this one:



- (5) Now install the Dovecot MDA interface with Postfix.

```
sudo apt-get install dovecot-postfix
```

A terminal window titled 'server2@server2: ~' showing the output of the command 'sudo apt-get install dovecot-postfix'. The output includes package list reading, dependency tree building, and the installation of dovecot-postfix. It shows that 22.6kB of archives are needed and 119kB of additional disk space will be used. The package is fetched and unpacked, and the configuration file is created. The terminal also shows the stopping and starting of the Postfix Mail Transport Agent.

```
server2@server2:~$ sudo apt-get install dovecot-postfix
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
 dovecot-postfix
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 22.6kB of archives.
After this operation, 119kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com jaunty/main dovecot-postfix 1:1.1.11-0ubuntu4
 [22.6kB]
Fetched 22.6kB in 1s (21.3kB/s)
Selecting previously deselected package dovecot-postfix.
(Reading database ... 109227 files and directories currently installed.)
Unpacking dovecot-postfix (from ../dovecot-postfix_1%3a1.1.11-0ubuntu4_all.deb)
...
Setting up dovecot-postfix (1:1.1.11-0ubuntu4) ...

Creating config file /etc/dovecot/dovecot-postfix.conf with new version
* Restarting IMAP/POP3 mail server dovecot
Info: If you have trouble with authentication failures,
enable auth_debug setting. See http://wiki.dovecot.org/WhyDoesItNotWork

* Stopping Postfix Mail Transport Agent postfix      [ OK ]
* Starting Postfix Mail Transport Agent postfix      [ OK ]

server2@server2:~$
```

- (6) Once the installation is complete, restart Postfix

```
sudo /etc/init.d/postfix restart
```

and use telnet to test the server as shown below.

A terminal window titled 'server2@server2: ~' showing the output of the command 'telnet ubuntu2.com 25'. The output shows the connection attempt, successful connection to ubuntu2.com, and the escape character being '^'. The server responds with '220 server2.ubuntu2.com ESMTP Postfix (Ubuntu)'.

```
server2@server2:~$ telnet ubuntu2.com 25
Trying 192.168.20.254...
Connected to ubuntu2.com.
Escape character is '^]'.
220 server2.ubuntu2.com ESMTP Postfix (Ubuntu)
```

- (7) Now restart Dovecot

```
sudo /etc/init.d/dovecot restart
```

(8) Next, create a user account and password on the server for each e-mail client. For example, `client2@ubuntulab2.com` would have a user account on `server2` with name `client2` and a password as shown below.



New user account

Account | User Privileges | Advanced

Basic Settings

Username:

Real name:

Profile:

Contact Information

Office location:

Work phone:

Home phone:

Password

Set password by hand



Users Settings

Name	Login name	Home directory
client22	client22	/home/client22
root	root	/root
server2	server2	/home/server2
client2	client2	/home/client2

+ Add User

Properties

Delete

Manage Groups

Help

Unlock

Close

The same task can be accomplished by running

```
sudo adduser client2
```

(9) Configure an Evolution e-mail account on each client (client1, client2, etc.) and on the server. The example below shows setup of an e-mail account for mail user "server2" on the server.

Evolution Setup Assistant

Identity

Please enter your name and email address below. The "optional" fields below do not need to be filled in, unless you wish to include this information in email you send.

Required Information

Full Name:

Email Address:

Optional Information

Make this my default account

Evolution Setup Assistant

Receiving Email

Please select among the following options

Server Type:

Description: For reading and storing mail on IMAP servers.

Configuration

Server:

Username:

Security

Use Secure Connection:

Authentication Type

Remember password

Evolution Setup Assistant

Receiving Options

Checking for New Mail

Check for new messages every minutes

Check for new messages in all folders

Check for new messages in subscribed folders

Connection to Server

Use custom command to connect to server

Command:

Folders

Show only subscribed folders

Override server-supplied folder namespace

Namespace:

Options

Apply filters to new messages in INBOX on this server

Check new messages for junk contents

Only check for junk messages in the INBOX folder

Automatically synchronize remote mail locally

Evolution Setup Assistant

Sending Email

Please enter information about the way you will send mail. If you are not sure, ask your system administrator or Internet Service Provider.

Server Type:

Description: For delivering mail by connecting to a remote mailhub using SMTP.

Server Configuration

Server:

Server requires authentication

Security

Use Secure Connection:

Authentication

Type:

Username:

Remember password

Evolution Setup Assistant

Account Management

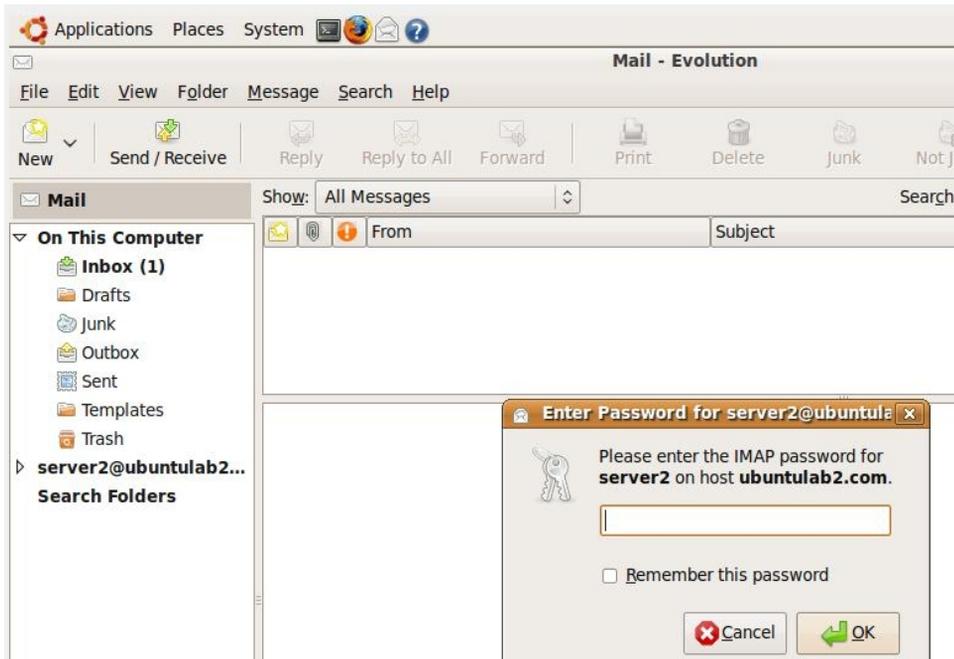
Please enter a descriptive name for this account in the space below. This name will be used for display purposes only.

Account Information

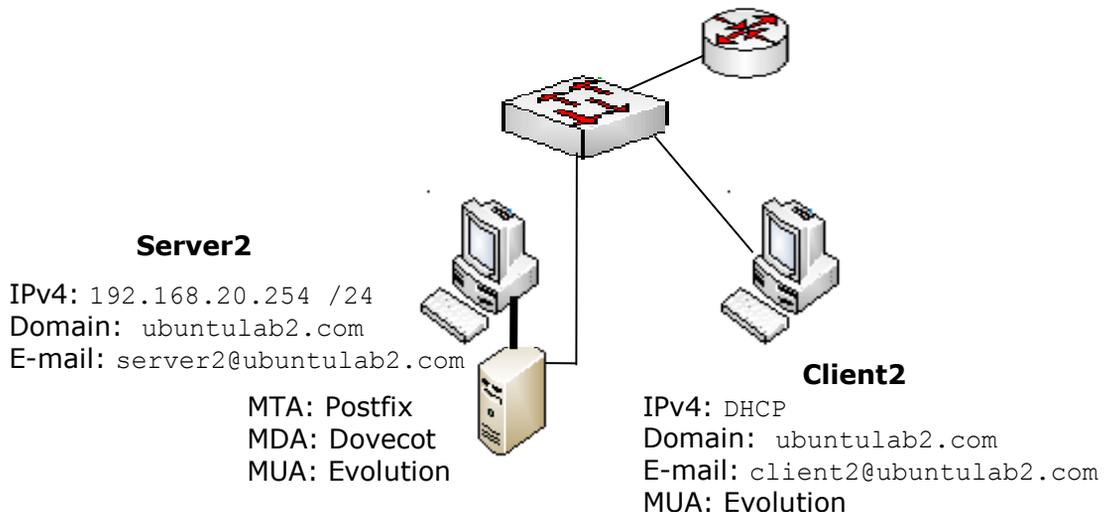
Type the name by which you would like to refer to this account. For example: "Work" or "Personal"

Name:

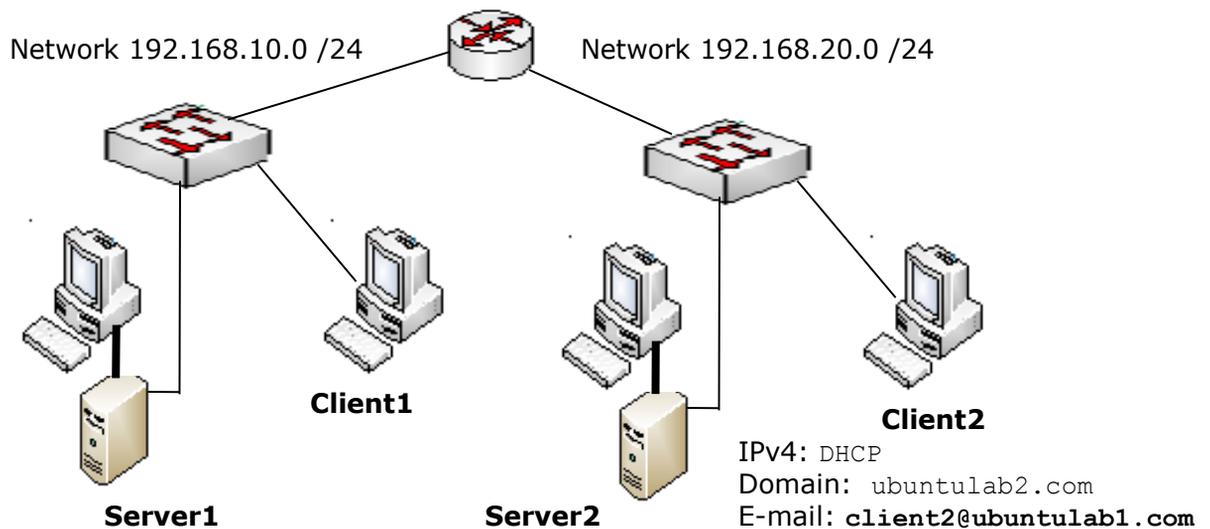
(10) Now test your newly created e-mail system by sending an e-mail from one user to another. (The password being requested in the screen shot below is the same one you created for this client's user account on the server.)



(11) Here's a summary of what we've assembled so far:



(12) What if the mail server and client are on different networks ?



Mail server

IPv4: 192.168.10.254 /24
Domain: ubuntuulab1.com
User account for client1

In this case, client2 on ubuntuulab2 needs an e-mail account. The account will be set up on the mail server, Server1 on ubuntuulab1, as follows:

- Set up a user account for client2 on mail server ubuntuulab1.com
- Set up the Evolution e-mail user account on client2 with e-mail address client2@ubuntuulab1.com as shown below:

Evolution Setup Assistant

Identity

Please enter your name and email address below. The "optional" fields below do not need to be filled in, unless you wish to include this information in email you send.

Required Information

Full Name: client2

Email Address: client2@ubuntuulab1.com

Optional Information

Make this my default account

Evolution Setup Assistant

Receiving Email

Please select among the following options

Server Type: IMAP

Description: For reading and storing mail on IMAP servers.

Configuration

Server: ubuntuulab1.com

Username: client2

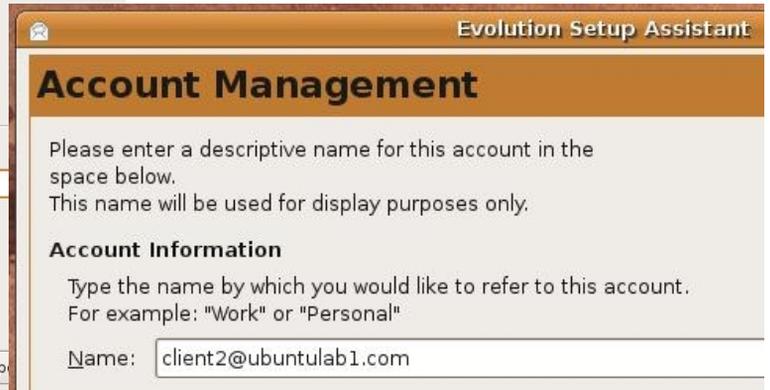
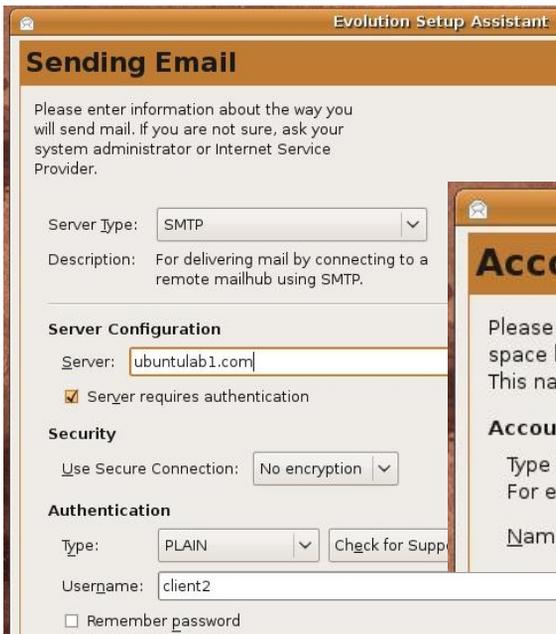
Security

Use Secure Connection: TLS encryption

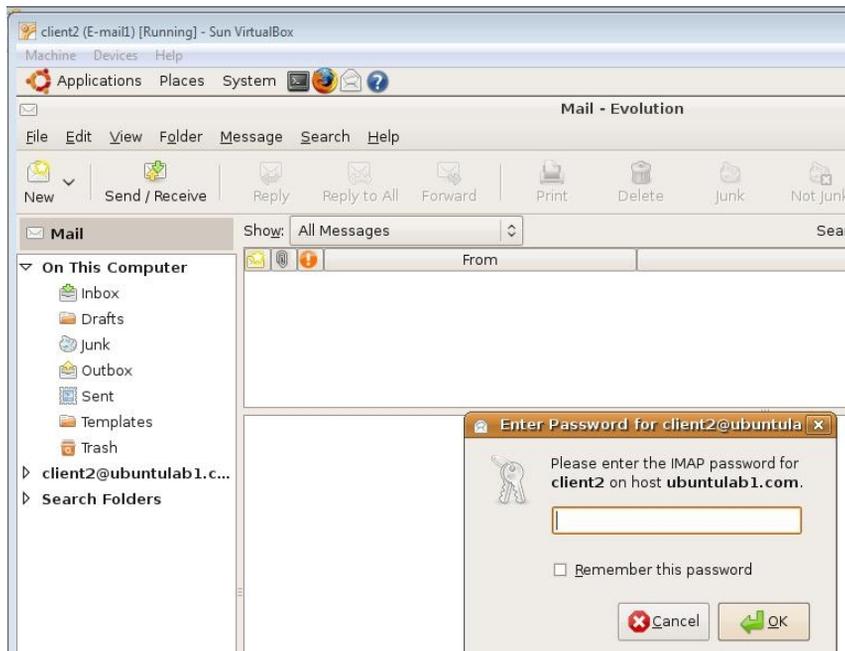
Authentication Type

Password Check for Supported Types

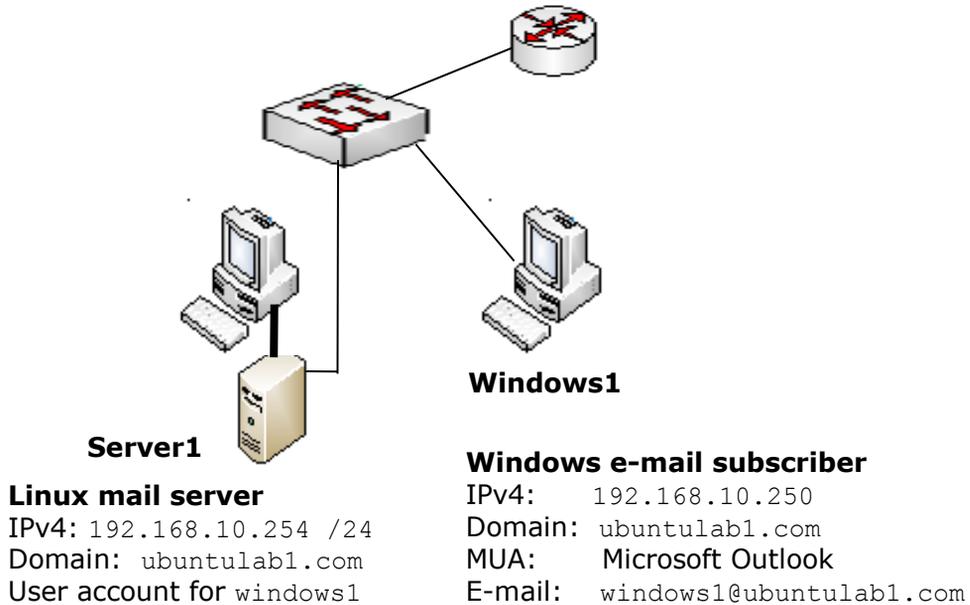
Remember password



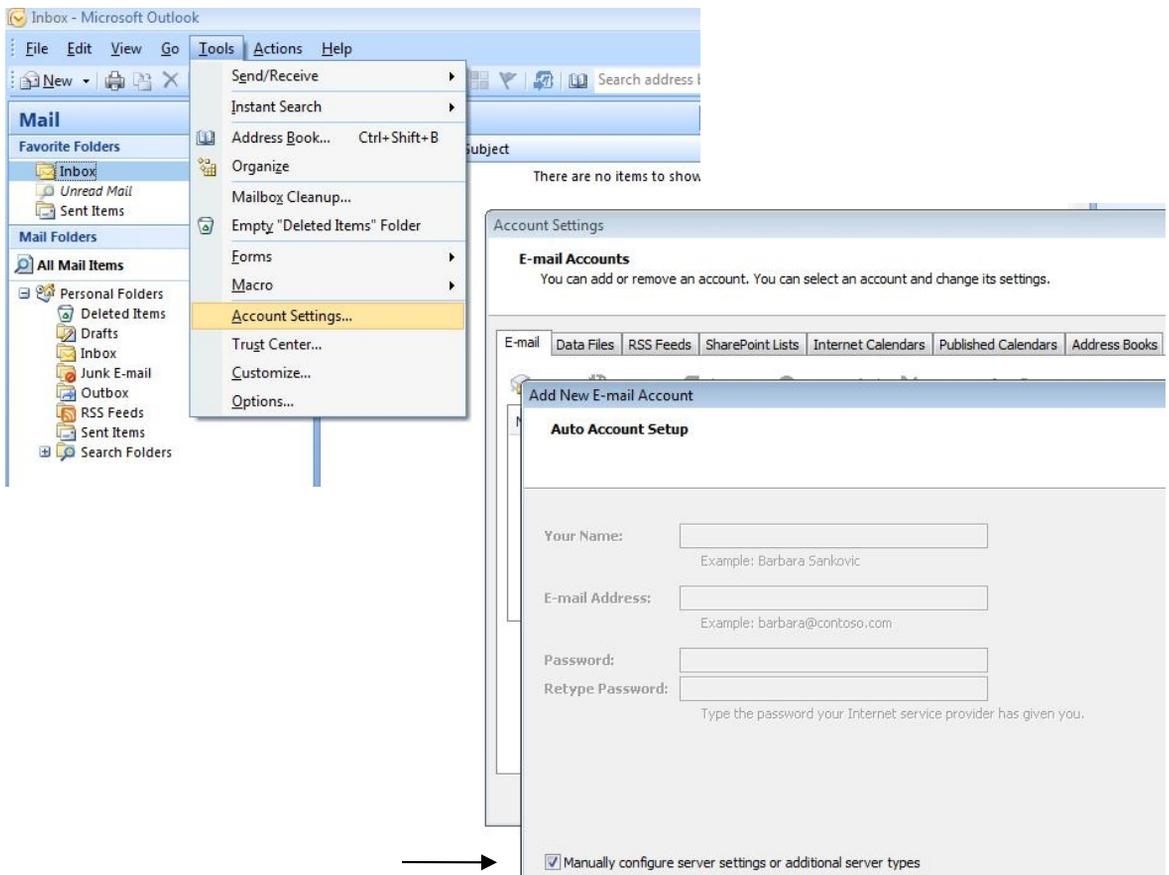
When client2 uses Evolution, the password requested is for the client2 user account on Server1 (ubuntu1.com).

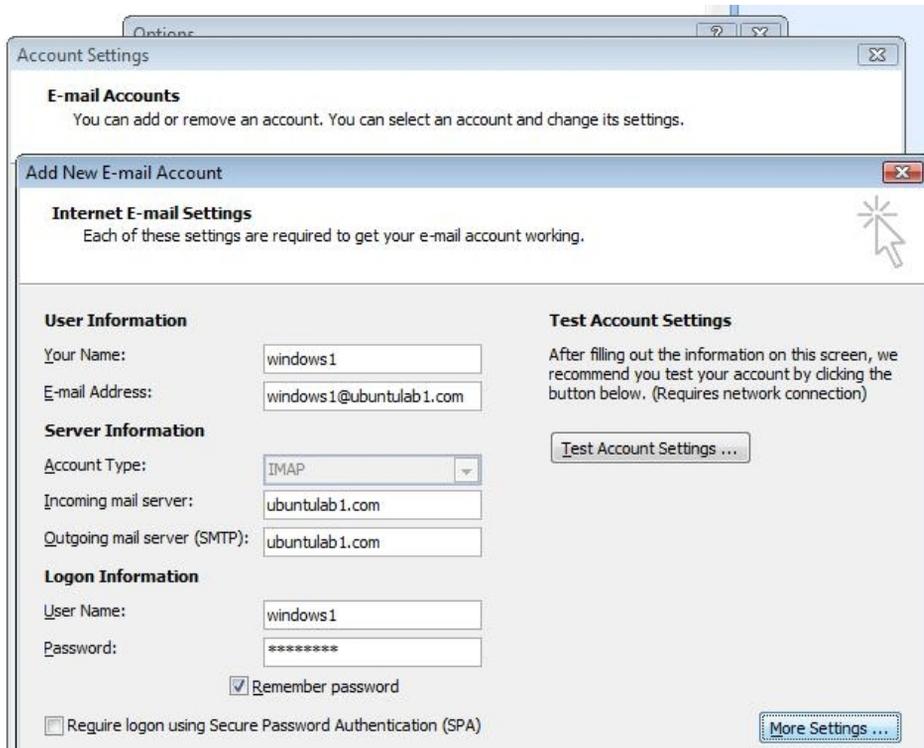
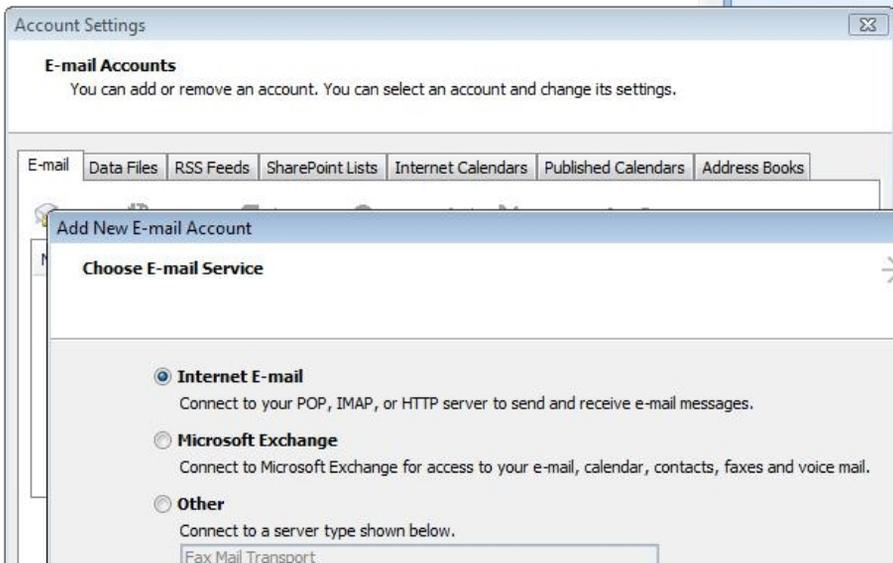


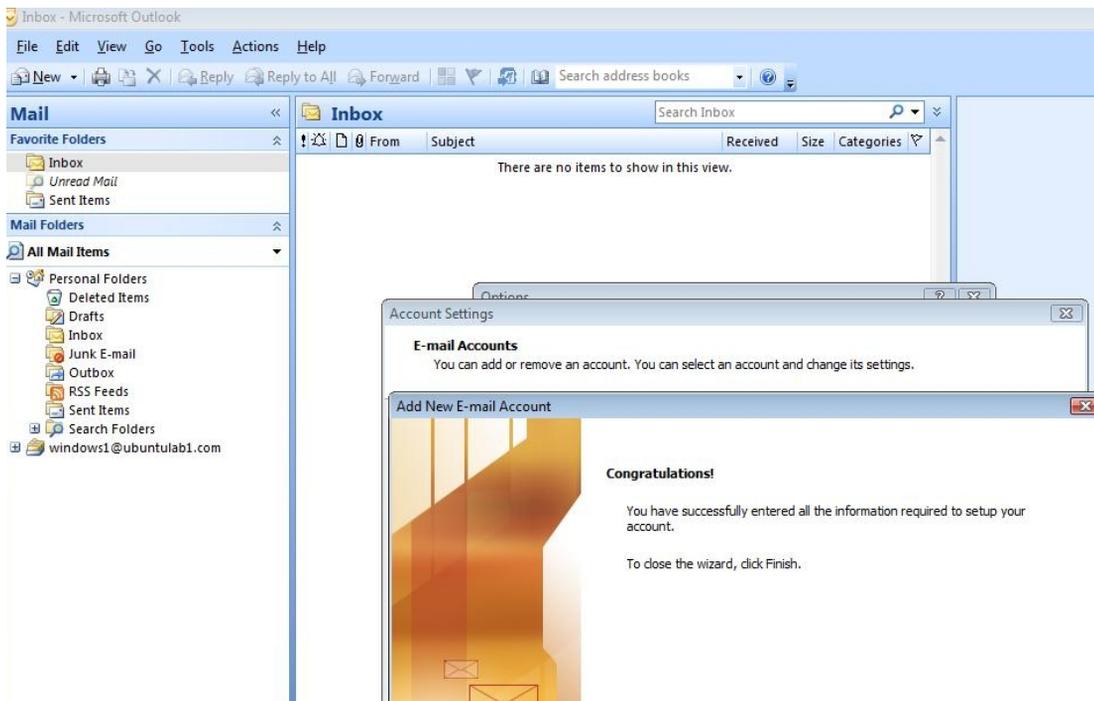
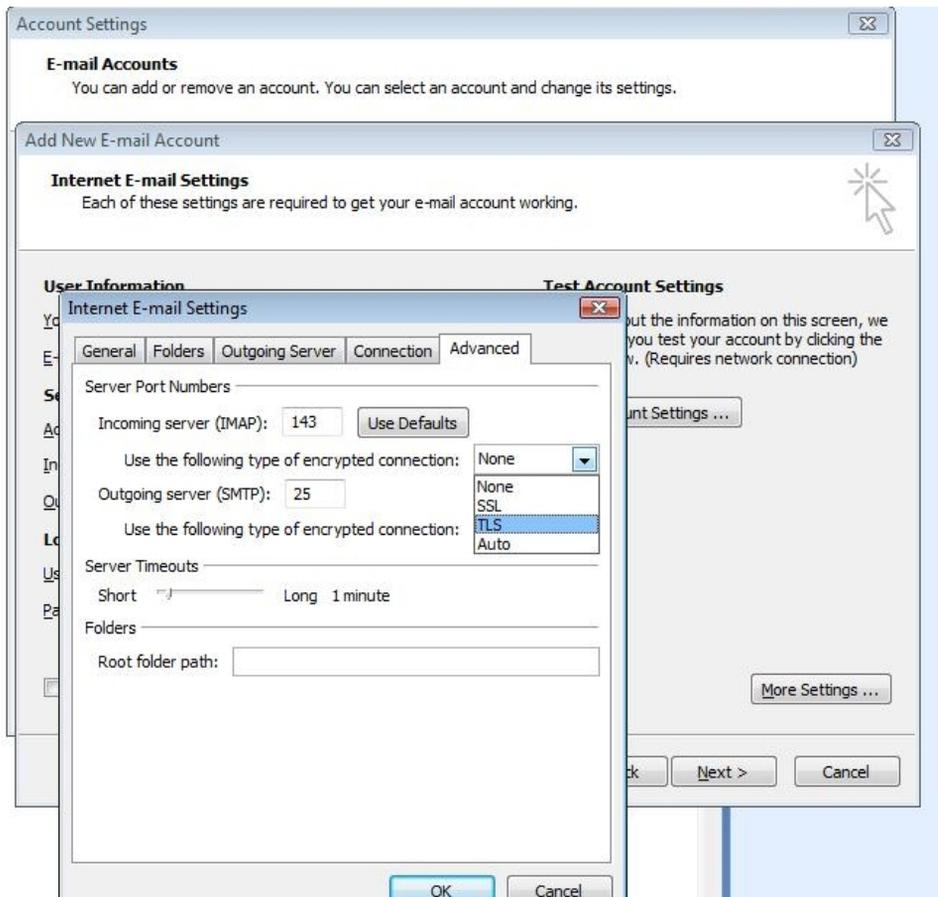
(13) Setting up an e-mail user account on a Windows PC with Outlook

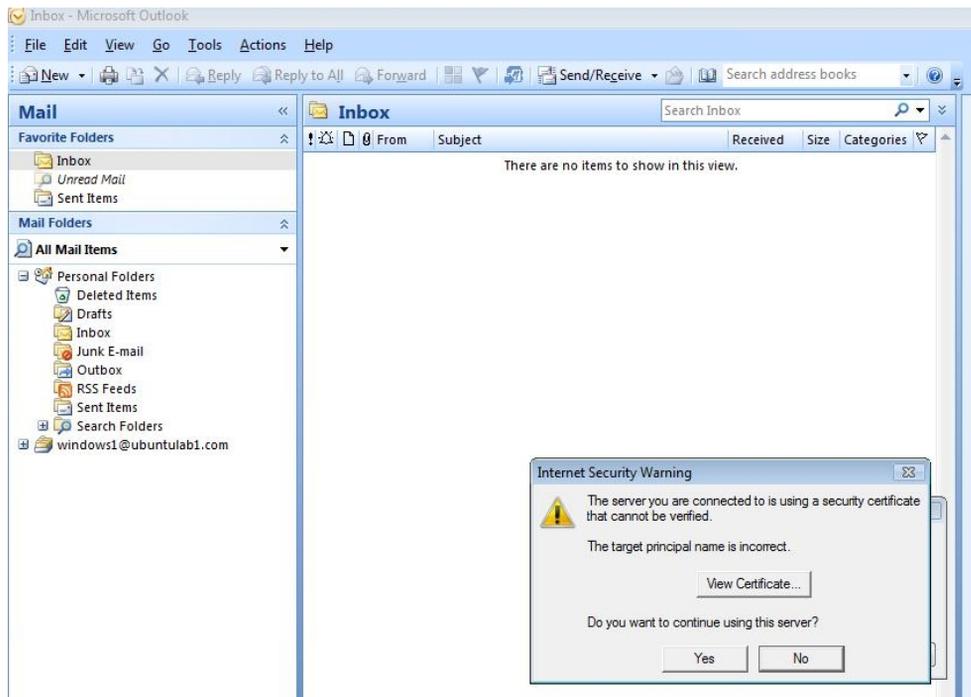


Begin by setting up a user account on the Linux mail server for the Windows PC (windows1 in this example). Then follow the screen shots below to set up the Outlook e-mail account on the Windows PC.

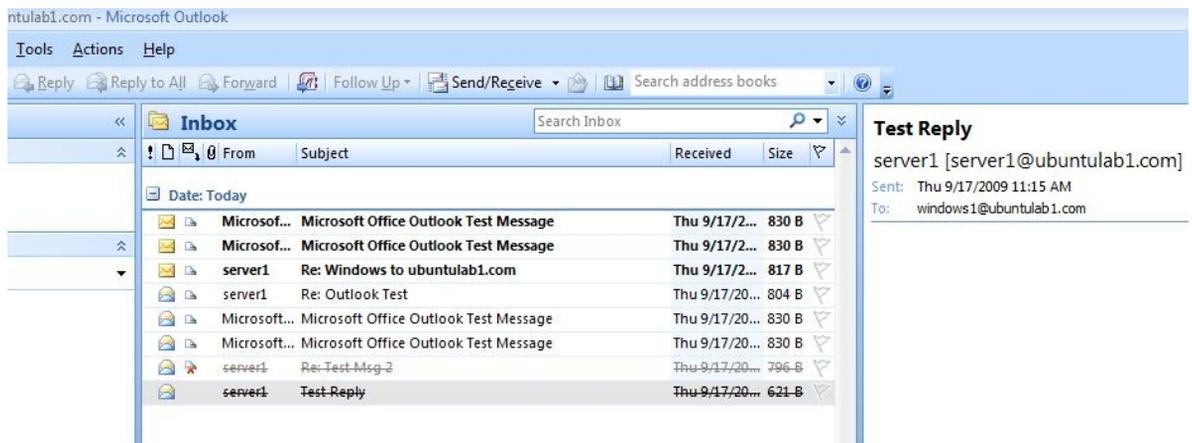








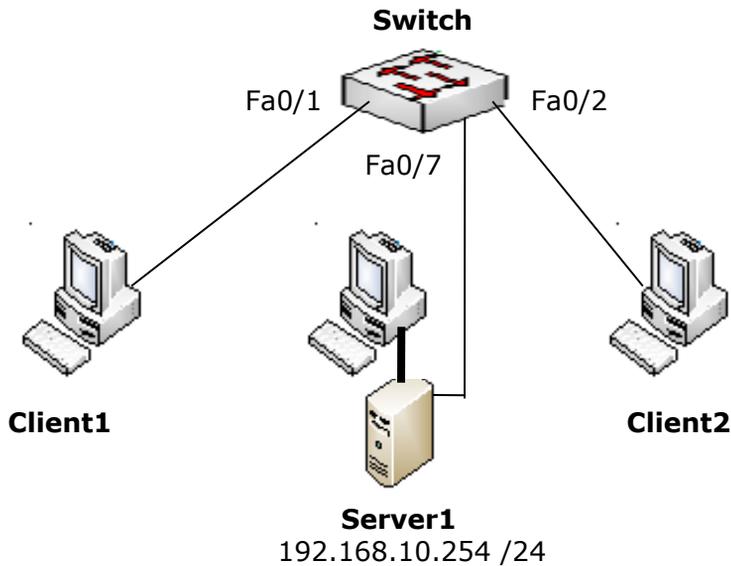
This message appears because the server is using a self-signed certificate. Choose Yes.



Sending a few e-mails back and forth across the network will confirm that your new e-mail client is working.

Lab 8

Webserver & Blog



Objective

Learn how to set up your very own blog using Linux, Apache, MySQL, and PHP – commonly called “LAMP” or “a LAMP stack” -- as well as WordPress, a content management system (CMS) with a built-in, user-friendly, pre-configured blog.

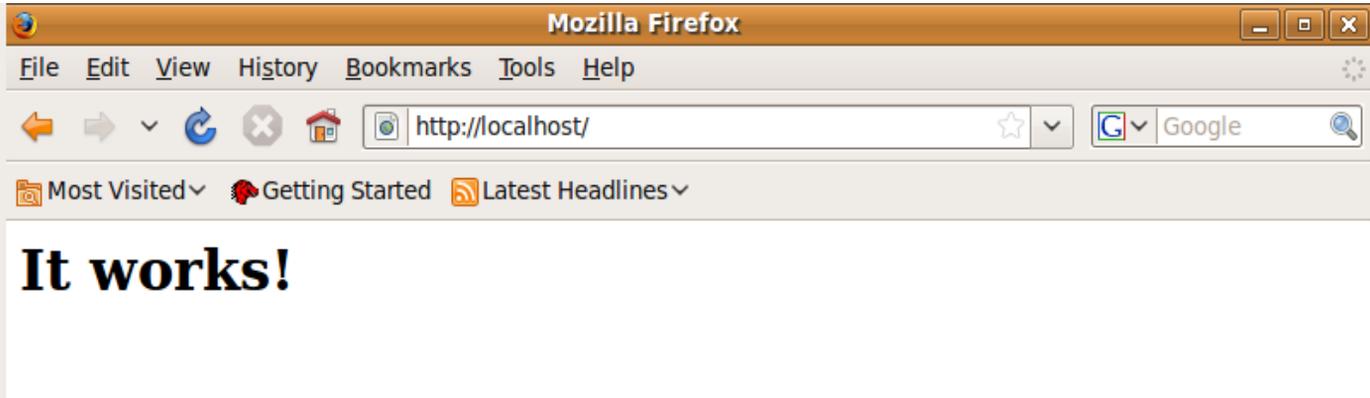
Procedure

- (1) Connect the network as shown in the above diagram.
- (2) Install Apache, MySQL, and PHP by running

```
sudo apt-get install apache2 mysql-server mysql-client php5 php5-mysql
```

A terminal window titled 'server1@server1: ~' with a menu bar (File, Edit, View, Terminal, Help). The command 'sudo apt-get install apache2 mysql-client mysql-server php5 php5-mysql' is entered and executed.

3. Make sure that Apache is up and running by visiting “<http://localhost/>” in Firefox.

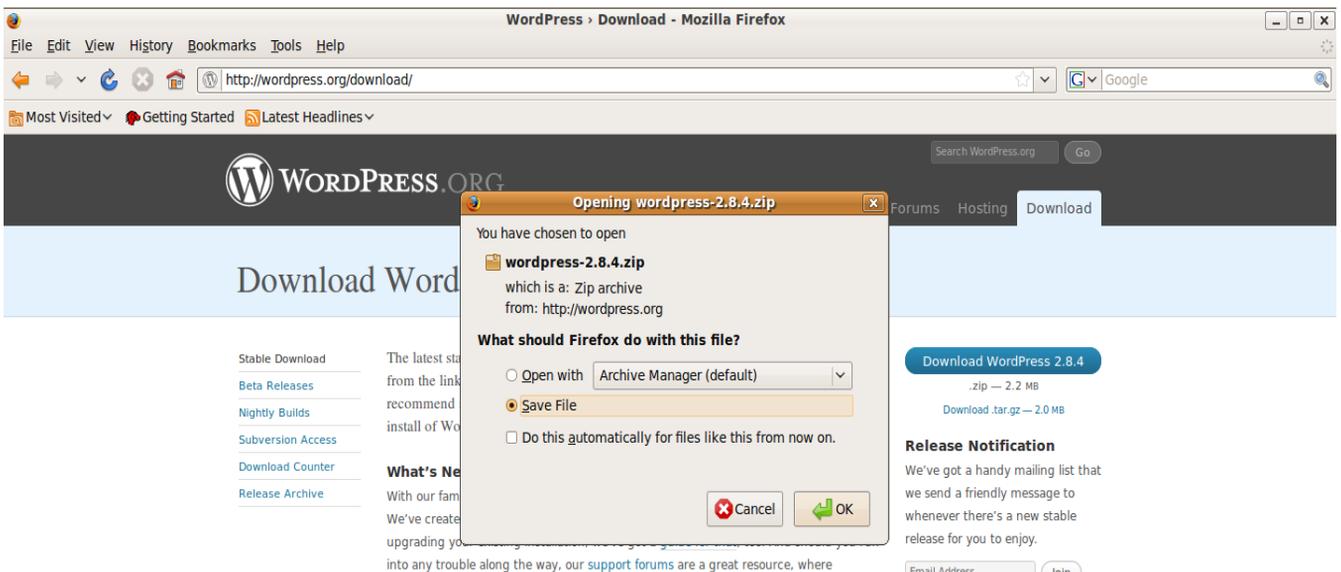


If Apache is not running, type

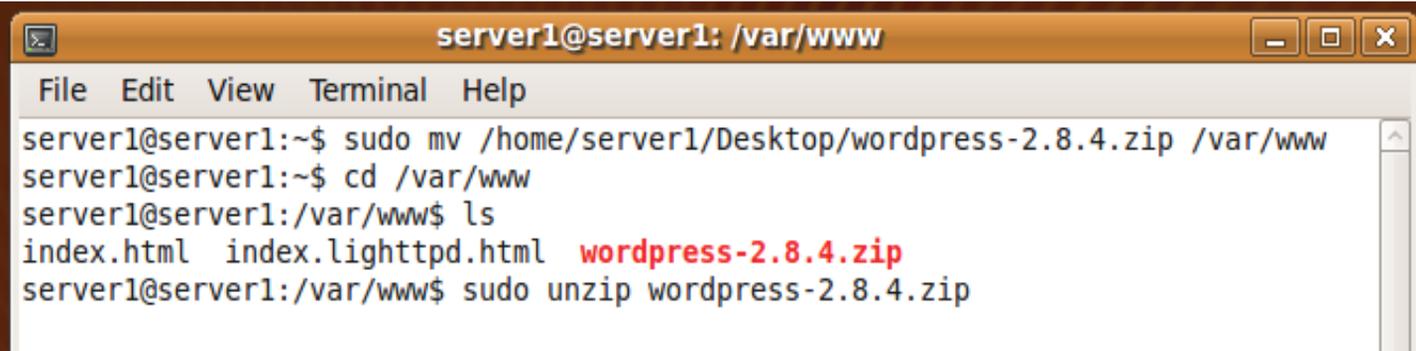
```
sudo /etc/init.d/apache2 start
```

to start it.

(4). Go to wordpress.org/download in Firefox, then click the “Download WordPress” button on the right side of the screen. Tell Firefox to save the file.

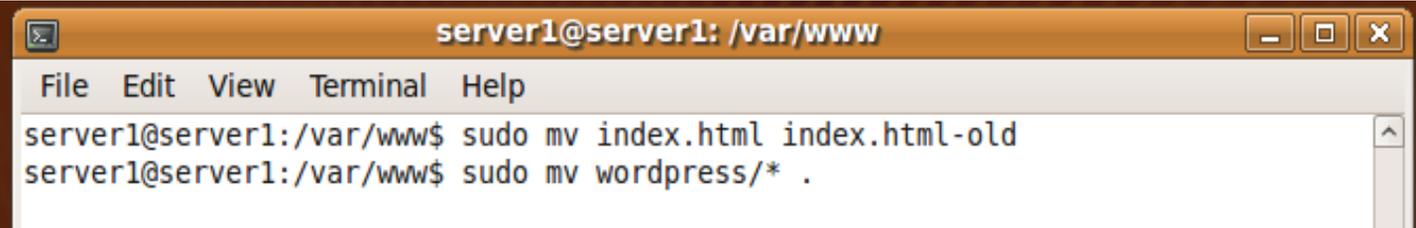


(5) Move the .zip file you've just downloaded from the location Firefox saved it to (usually ~/Desktop or the home directory) to /var/www, then unzip the file, like so. This will create the /var/www/wordpress directory.



```
server1@server1: /var/www
File Edit View Terminal Help
server1@server1:~$ sudo mv /home/server1/Desktop/wordpress-2.8.4.zip /var/www
server1@server1:~$ cd /var/www
server1@server1:/var/www$ ls
index.html  index.lighttpd.html  wordpress-2.8.4.zip
server1@server1:/var/www$ sudo unzip wordpress-2.8.4.zip
```

(6) Change the name of Apache's default index.html file; we chose index.html-old. Then, move everything in the wordpress/ directory to /var/www as shown below.

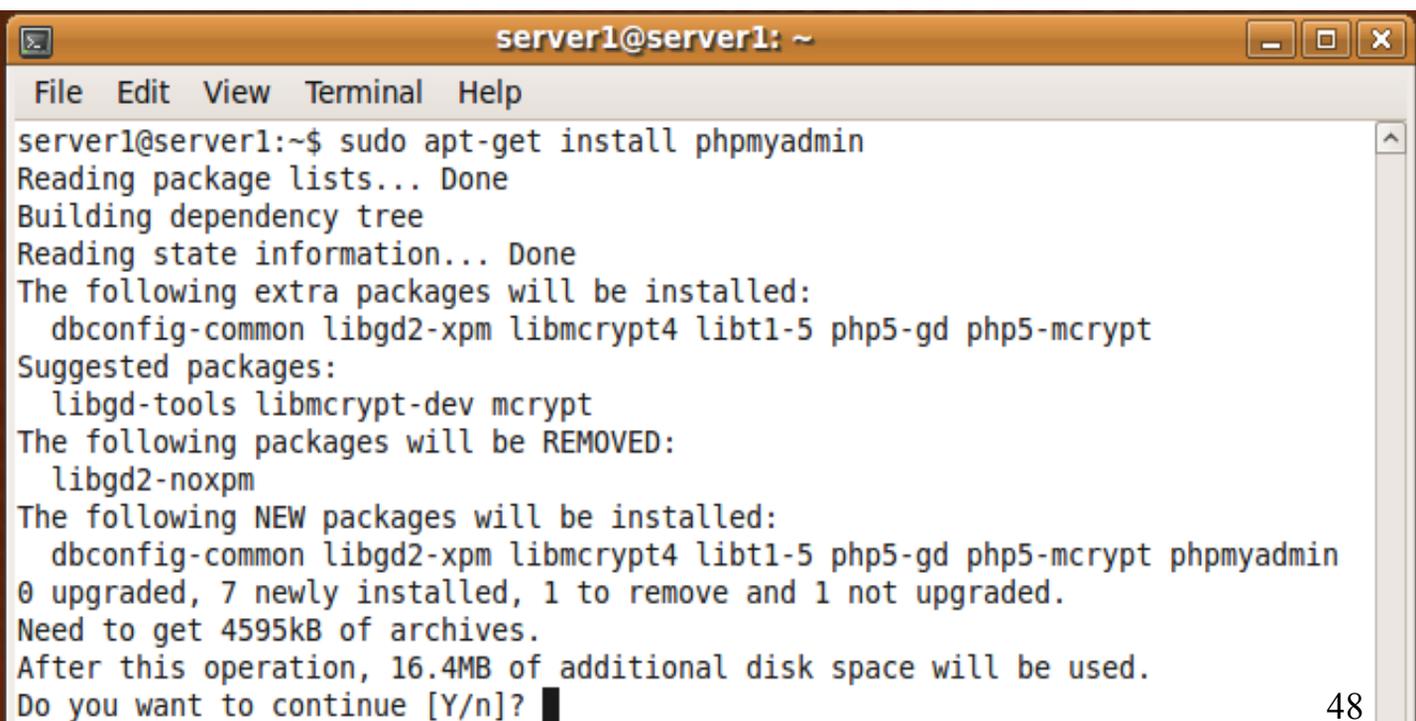


```
server1@server1: /var/www
File Edit View Terminal Help
server1@server1:/var/www$ sudo mv index.html index.html-old
server1@server1:/var/www$ sudo mv wordpress/* .
```

(7) Install phpmyadmin by running

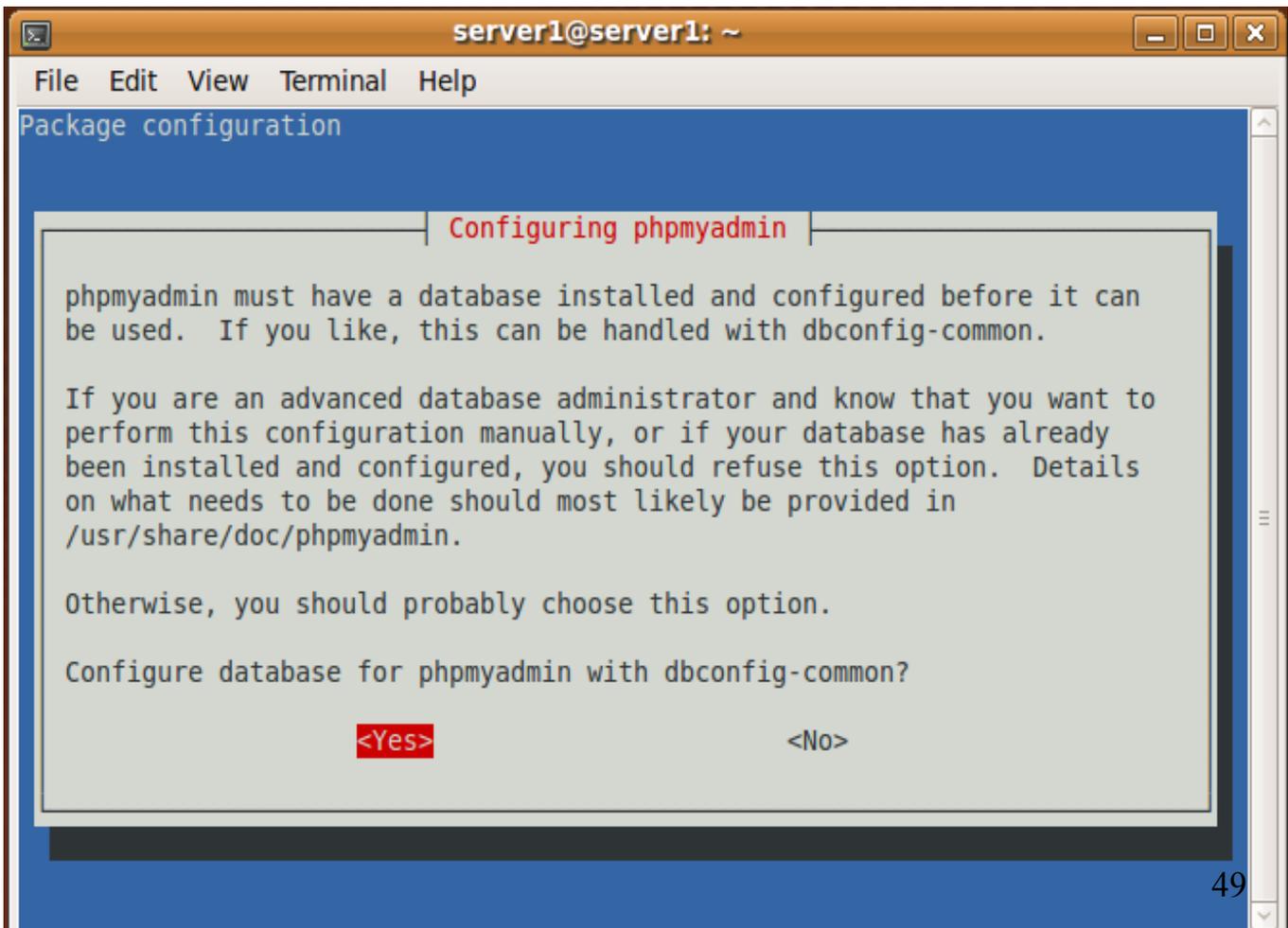
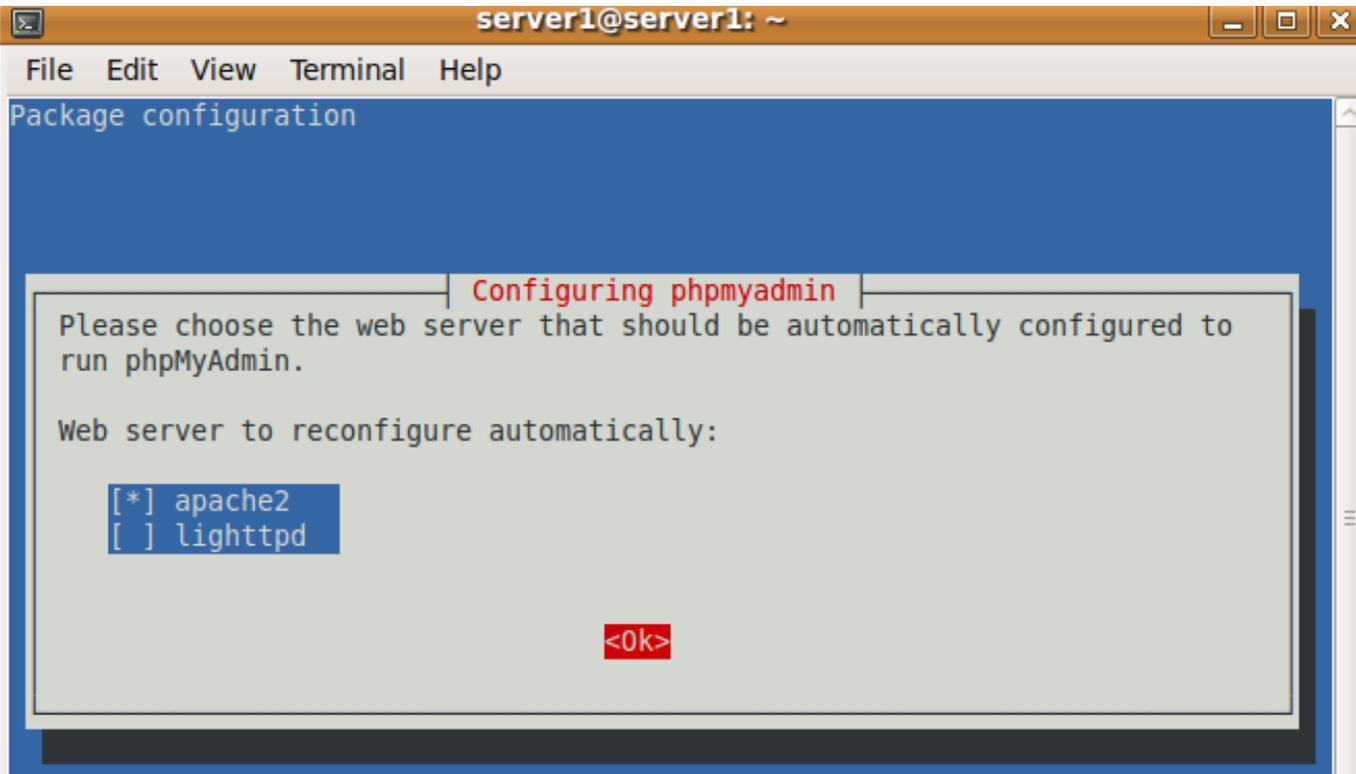
```
sudo apt-get install phpmyadmin
```

This will allow us to configure MySQL with a point-and-click GUI.

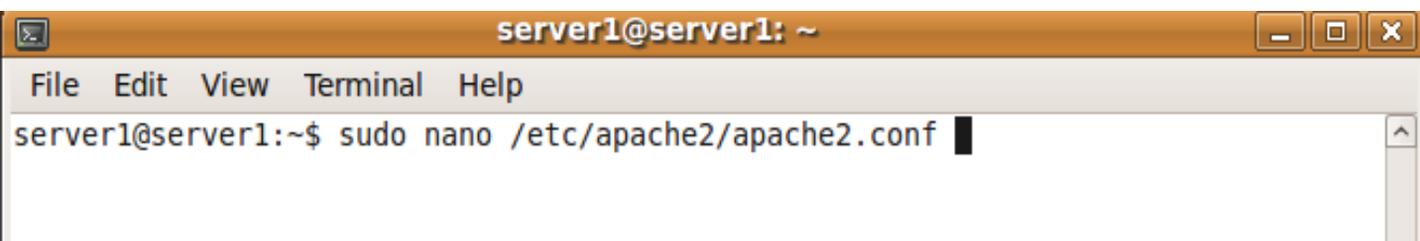


```
server1@server1: ~
File Edit View Terminal Help
server1@server1:~$ sudo apt-get install phpmyadmin
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  dbconfig-common libgd2-xpm libmcrypt4 libt1-5 php5-gd php5-mcrypt
Suggested packages:
  libgd-tools libmcrypt-dev mcrypt
The following packages will be REMOVED:
  libgd2-noxpm
The following NEW packages will be installed:
  dbconfig-common libgd2-xpm libmcrypt4 libt1-5 php5-gd php5-mcrypt phpmyadmin
0 upgraded, 7 newly installed, 1 to remove and 1 not upgraded.
Need to get 4595kB of archives.
After this operation, 16.4MB of additional disk space will be used.
Do you want to continue [Y/n]? █
```

(7) Choose the indicated options when prompted by using <spacebar> to check "apache2" followed by <enter>.

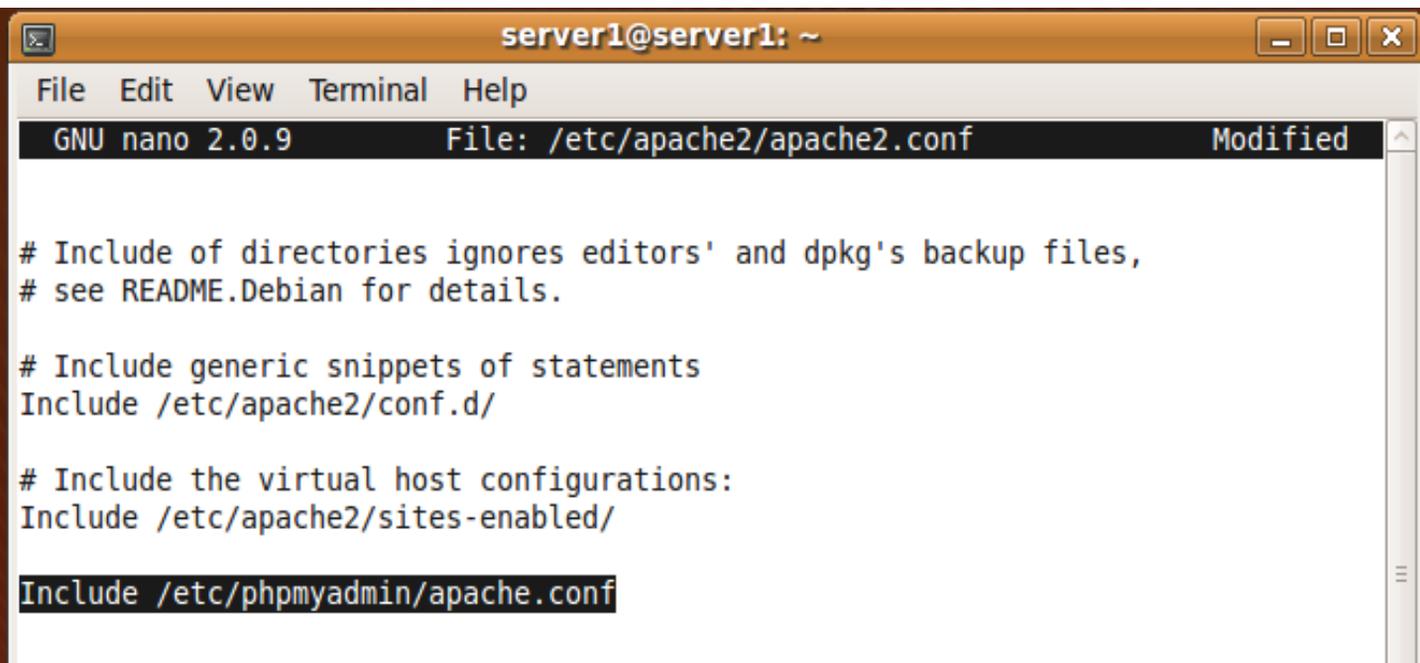


(8) Edit the /etc/apache2/apache2.conf file via nano



```
server1@server1: ~  
File Edit View Terminal Help  
server1@server1:~$ sudo nano /etc/apache2/apache2.conf
```

(9) Add "Include /etc/phpmyadmin/apache.conf" to the very end of the file as shown below. The added line is highlighted.

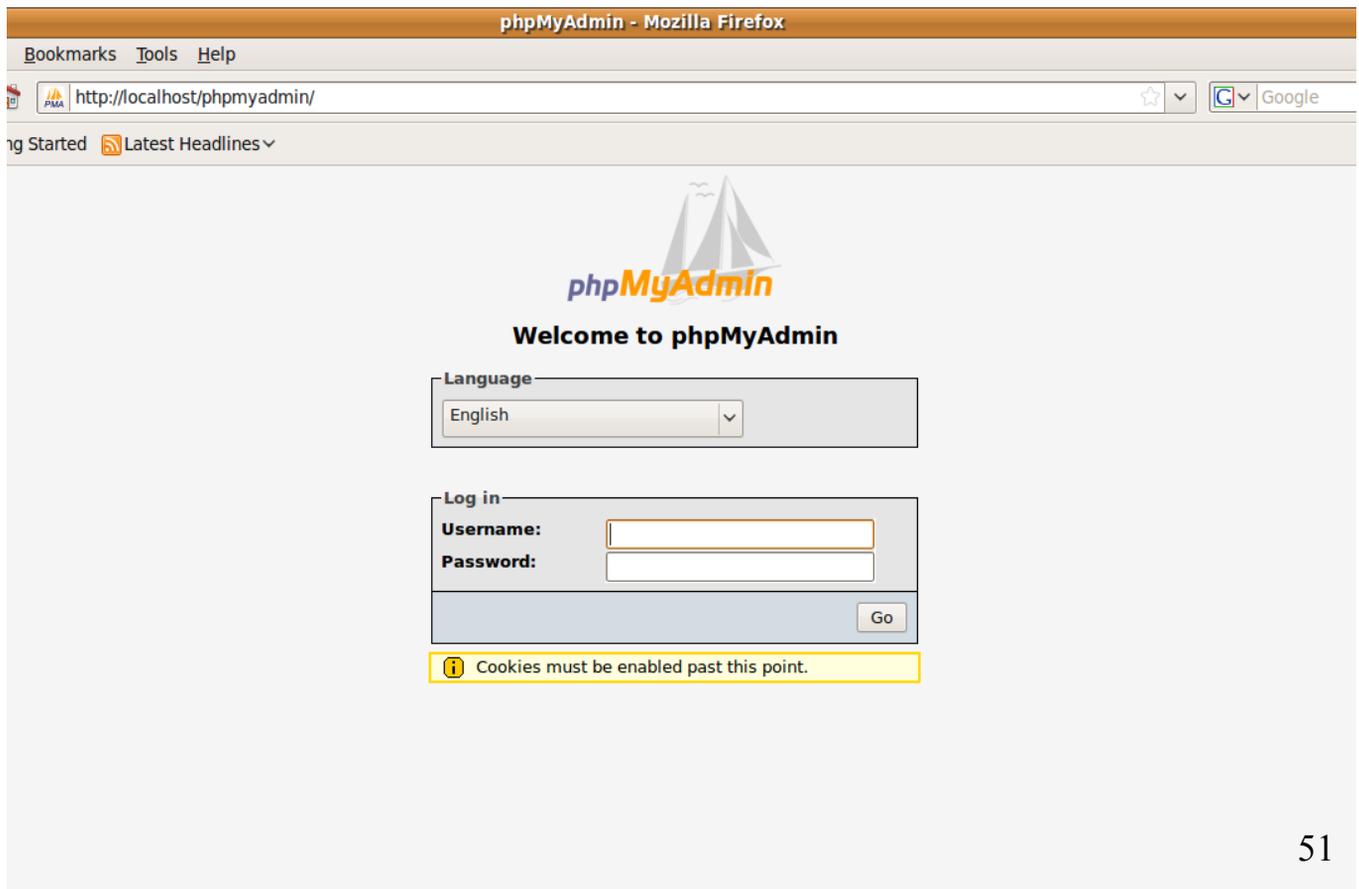


```
server1@server1: ~  
File Edit View Terminal Help  
GNU nano 2.0.9 File: /etc/apache2/apache2.conf Modified  
  
# Include of directories ignores editors' and dpkg's backup files,  
# see README.Debian for details.  
  
# Include generic snippets of statements  
Include /etc/apache2/conf.d/  
  
# Include the virtual host configurations:  
Include /etc/apache2/sites-enabled/  
  
Include /etc/phpmyadmin/apache.conf
```

(10) Restart apache

```
server1@server1: ~
File Edit View Terminal Help
server1@server1:~$ sudo nano /etc/apache2/apache2.conf
server1@server1:~$ sudo /etc/init.d/apache2 restart
 * Restarting web server apache2
[Wed Sep 16 23:29:24 2009] [warn] The Alias directive in /etc/phpmyadmin/apache.
conf at line 3 will probably never match because it overlaps an earlier Alias.
apache2: Could not reliably determine the server's fully qualified domain name,
using 127.0.1.1 for ServerName
... waiting [Wed Sep 16 23:29:25 2009] [warn] The Alias directive in /etc/phpmy
admin/apache.conf at line 3 will probably never match because it overlaps an ear
lier Alias.
apache2: Could not reliably determine the server's fully qualified domain name,
using 127.0.1.1 for ServerName
[ OK ]
server1@server1:~$
```

(11) Visit "<http://localhost/phpmyadmin/>" in Firefox. We will use these menus to configure MySQL. Now, log in using "root" as the username the password you specified when installing MySQL.



(12) Create a new database called "wp28" or something similar. (As of September 2009, the newest version of WordPress is 2.8, hence the name.) Type the database name in the text box, then press "Create".

The screenshot shows the phpMyAdmin 3.1.2deb1 interface in a browser. The address bar shows the URL: `http://localhost/phpmyadmin/index.php?token=182b621be8b812a045d6917e5a...`. The main content area is titled "MySQL localhost" and features a "Create new database" section. The "Name" field contains "wp28", the "Collation" dropdown is set to "utf8_general_ci", and the "Create" button is visible. Other sections include "Actions" with "Change password" and "Log out" links, and an "Interface" section with "Language" (English), "Theme / Style" (Original), "Custom color" (Reset), and "Font size" (82%).

You should receive verification that the database was successfully created.

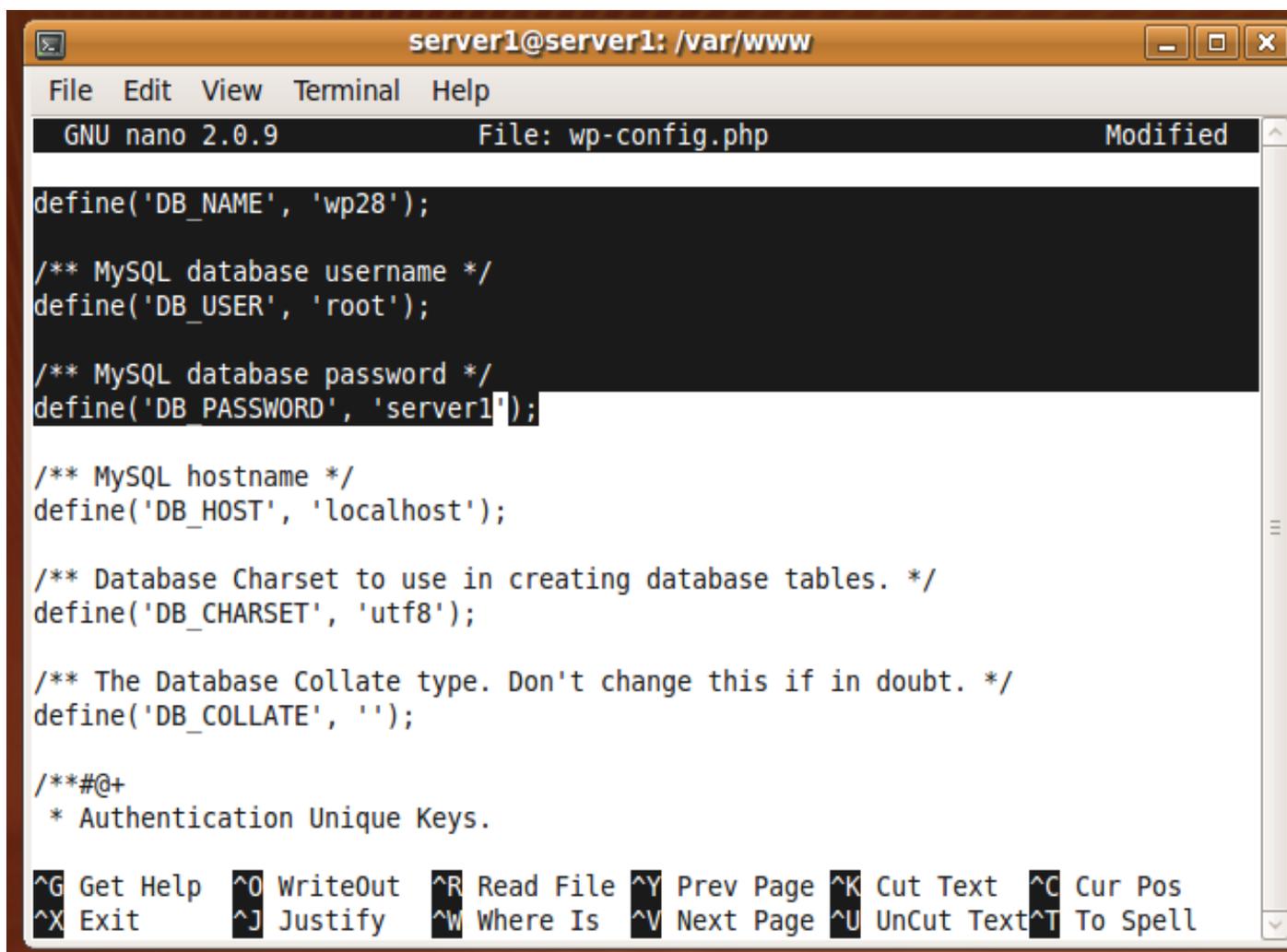
The screenshot shows the phpMyAdmin 3.1.2deb1ubuntu0.1 interface in Mozilla Firefox. The address bar shows the URL: `http://localhost/phpmyadmin/index.php?token=182b621be8b812a045d6917e5abed6ad`. The main content area shows a green confirmation message: "Database wp28 has been created." Below the message is the SQL command: `CREATE DATABASE `wp28` ;`. The interface also shows the "Database" dropdown set to "wp28" and various toolbars for "Structure", "SQL", "Search", "Query", "Export", "Import", "Designer", "Operations", "Privileges", and "Drop".

(13) It is now time to configure WordPress to use the database we've just created for it. Run the indicated commands.



```
server1@server1: /var/www
File Edit View Terminal Help
server1@server1:~$ cd /var/www/
server1@server1:/var/www$ sudo mv wp-config-sample.php wp-config.php
server1@server1:/var/www$ sudo nano wp-config.php
```

(14) Scroll down till you see a line that begins with "define('DB_NAME',...". Fill in the database name, username, and MySQL password.



```
server1@server1: /var/www
File Edit View Terminal Help
GNU nano 2.0.9 File: wp-config.php Modified
define('DB_NAME', 'wp28');

/** MySQL database username */
define('DB_USER', 'root');

/** MySQL database password */
define('DB_PASSWORD', 'server1');

/** MySQL hostname */
define('DB_HOST', 'localhost');

/** Database Charset to use in creating database tables. */
define('DB_CHARSET', 'utf8');

/** The Database Collate type. Don't change this if in doubt. */
define('DB_COLLATE', '');

/**#@+
 * Authentication Unique Keys.

^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
```

Save the file and exit nano.

(15) WordPress should now be installed and configured! Visit <http://localhost/wp-admin/install.php> in Firefox to make sure. Feel free to follow the WordPress instructions from this point on to customize your own personal blog.



The screenshot shows a Mozilla Firefox browser window with the address bar containing `http://localhost/wp-admin/install.php`. The browser's menu bar includes "Bookmarks", "Tools", and "Help". Below the address bar, there are tabs for "Started" and "Latest Headlines". The main content area displays the WordPress logo and the heading "WordPress". Below this is a "Welcome" section with a horizontal line, followed by a paragraph of introductory text. A section titled "Information needed" also has a horizontal line and contains a request for user information. There are three input fields: "Blog Title", "Your E-mail", and a checkbox for "Allow my blog to appear in search engines like Google and Technorati.". At the bottom of the form is a button labeled "Install WordPress".

WordPress > Installation - Mozilla Firefox

Bookmarks Tools Help

http://localhost/wp-admin/install.php

Started Latest Headlines

WordPress

Welcome

Welcome to the famous five minute WordPress installation process! You may want to browse the [ReadMe documentation](#) at your leisure. Otherwise, just fill in the information below and you'll be on your way to using the most extendable and powerful personal publishing platform in the world.

Information needed

Please provide the following information. Don't worry, you can always change these settings later.

Blog Title

Your E-mail
Double-check your email address before continuing.

Allow my blog to appear in search engines like Google and Technorati.

Install WordPress

Further Information

Popular Linux Geek Hangouts

- slashdot.org
- reddit.com (especially reddit.com/r/programming, aka "proggit")
- news.ycombinator.com
- The #linux IRC channel on freenode

Linux News

- distrowatch.com
- lxr.com
- linuxtoday.com
- lwn.net
- linuxjournal.com

Help

- <http://ubuntuforums.org/>
- Searching the internet for the exact error you receive is highly suggested

"Real" text editors*

- emacs
- vi and vim

* Hardcore Linux geeks make fun of nano, but we still recommend it to beginners

About the Authors

Steve Phillips has been using Linux since 2002 as a high school student in northern California. He attended UC Santa Barbara from 2004-2008 where he double-majored in Philosophy and Mathematics, but still found room for a few programming classes. He uses emacs for text editing and does almost all his programming in C or Python. When not using a computer, he writes Philosophy.

Feel free to send him feedback regarding this lab manual via email. His address is elimisteve@gmail.com.

Jeff Fuller is a returning student updating his computer skill set. His previous electronics experience includes work in both the wireless industry and the military.

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