

# Introduction to Basic Networking

Starting out with a network of just two computers so that we can transfer files between them.

Assumptions:

TCP/IP network

UTP connectors – Unshielded Twisted Pair – leads with RJ45 plugs

10BaseT/100BaseT ethernet

Key definitions:

**TCP/IP** – shorthand for Transmission Control Protocol / Internet Protocol. A set of protocols used by the Internet and more advanced networks. More complex than the simpler protocols like NetBEUI, but also more capable.

**IP address** – a unique identifying number assigned to a node in a TCP/IP network. An IP address consists of four numbers, each from 0 to 255 and separated by a full stop. Often referred to as a “*dotted quad*”.

for example - **192.168.0.10**

# Introduction to Basic Networking

To set up a basic TCP/IP network for each computer, we need to

- set up a means of identifying each computer on the network.
- set up the connection to the network.
- start up the network connection.

## **Identifying each computer on the network – assigning IP addresses**

We need to :

decide the network IP address range

decide how we will assign the IP address to each computer

determine the IP address and host name of each computer

# Introduction to Basic Networking

## Network IP address range

If you have a totally private tcp/ip network that is not connected in any way to any other network, you can use any IP address you like. However, if you want to connect your LAN to the internet, you will need to use a block of IP addresses which are not used on the internet, for example **192.168.x.y**. Here, the value of **x** should be the same for all computers on the LAN, but **y** is a different (unique) value for every computer on the LAN.

**Assigning an IP address** to each computer. We can do this in three ways

- an IP address is assigned by another computer. This is typically the case for a dialup internet connection. The resulting address is often referred to as a *dynamic* address.
- an IP address is set by the node computer generating a random IP address. This is rarely used.
- an IP address is assigned by setting it manually. This is often used for a small LAN using TCP/IP, and is what we will use here. The resulting address is often referred to as a *static* address.

# Introduction to Basic Networking

**Decide on the IP address and host name** of each computer in the LAN.

As we are using static IP addresses, it's best to decide these in advance. Here, we will use IP addresses in the range 192.168.0.1 to 192.168.0.254

Drawing up a table of hostnames and addresses we can have:

<b>hostname</b>	<b>IP Address</b>
seagull	192.168.0.2
parakeet	192.168.0.4
magpie	192.168.0.6
rosella	192.168.0.12
finch	192.168.0.13

We can also assign the domain name to be - **homenet.prv**

so that the full address of (eg/.) rosella will be - **rosella.homenet.prv**

# Introduction to Basic Networking

**Setting up a TCP/IP network connection between two computers.**

## **Cabling.**

This setup is done by using a “crossover” cable. Crossover cables are generally restricted to direct connection between two computers. If two computers are connected using a hub or a switch, then “straight through” cables are used between the computers and the hub.

The two computers we wish to connect will both need to have an ethernet connection.

Laptops generally have one built in, older laptops may need a PCMCIA card. Desktops often need the installation of a network card – usually very straightforward and cheap (~\$15 - \$25)

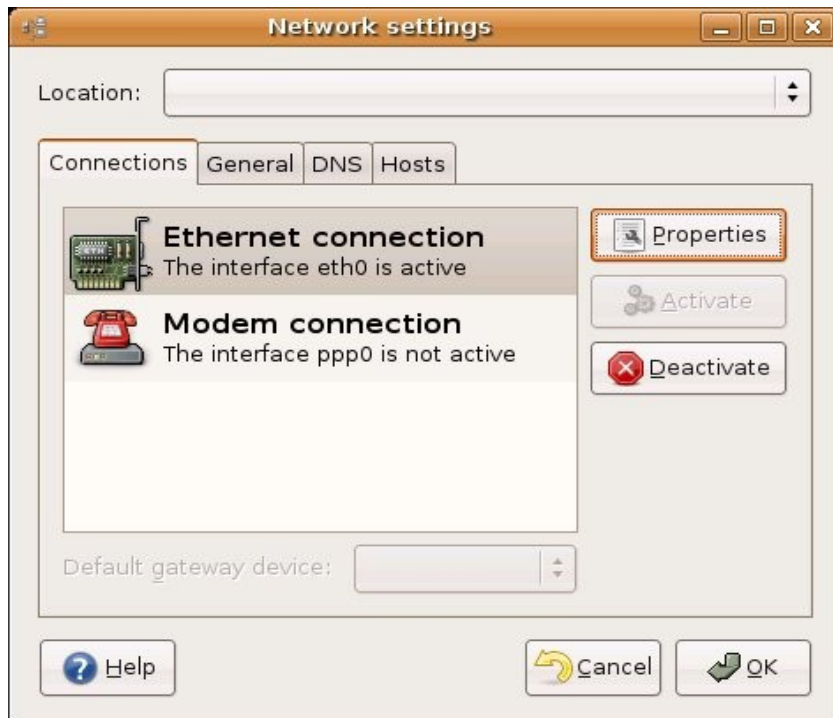
# Introduction to Basic Networking

## Setting up the ethernet connection – via a GUI

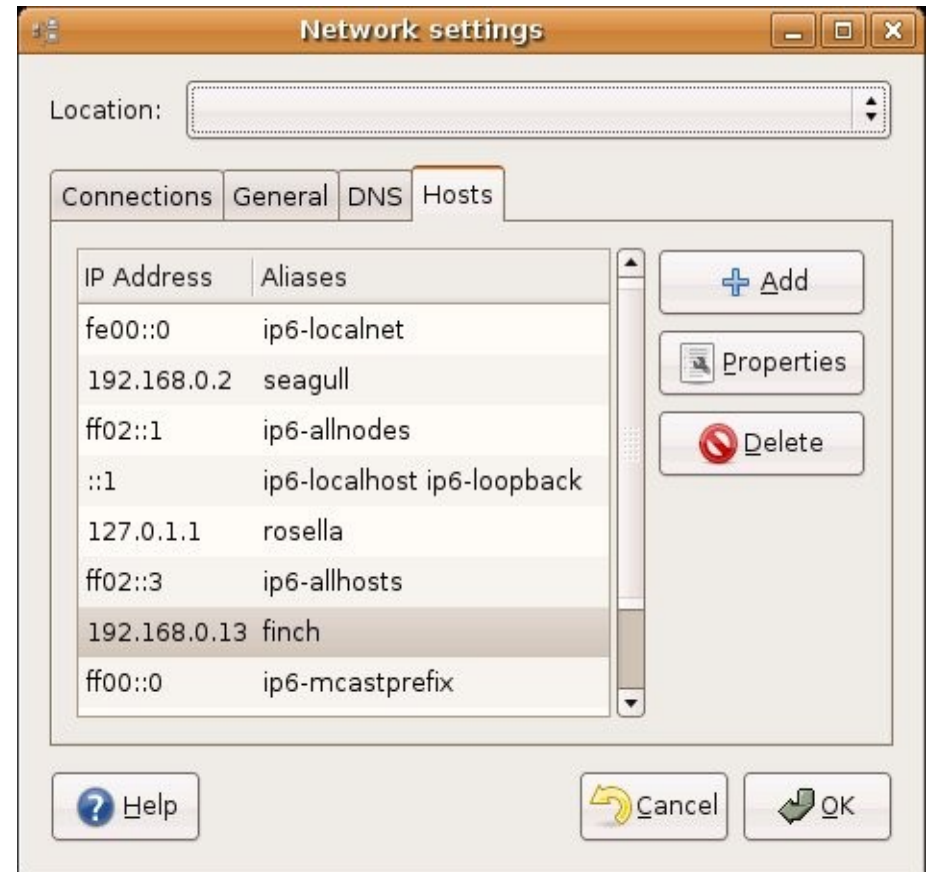
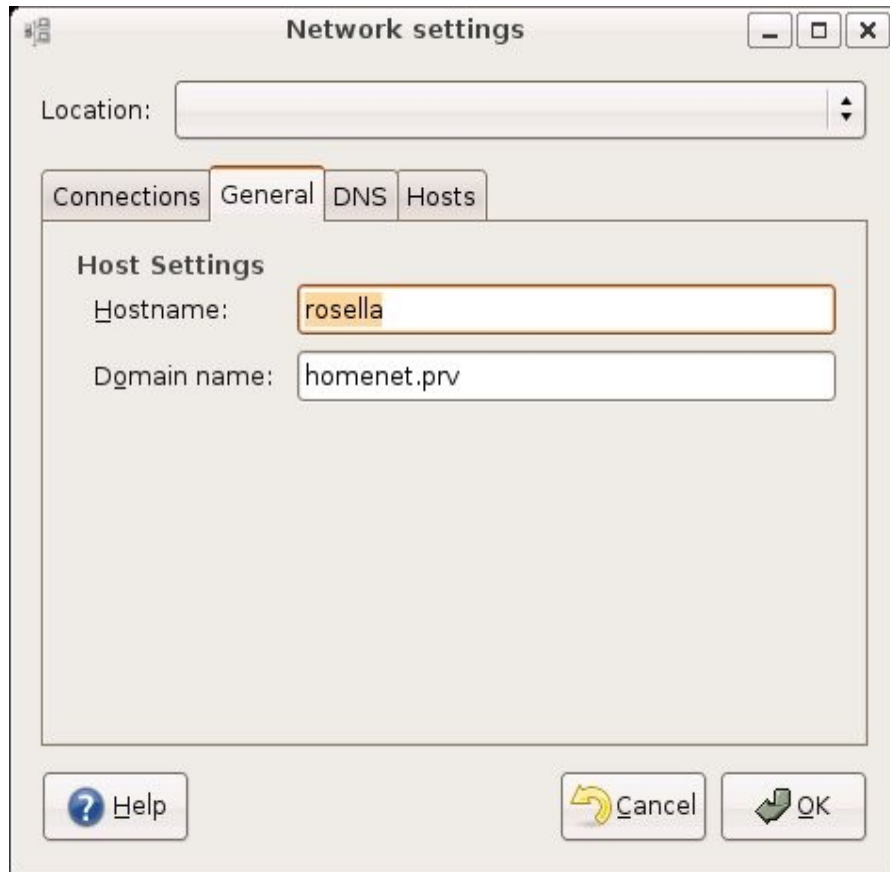
The exact layout of the setup GUI varies with the distribution. For example, Ubuntu has a network settings GUI activated by the menu item.

System -> Administration -> Networking

Here, we need to highlight the Ethernet connection, and use the Properties tab to set the Configuration, IP address, and Subnet mask for the node.



# Introduction to Basic Networking



Here, we see the settings for the host and domain names in the General tab, and the settings for other network hosts in the Hosts tab.

# Introduction to Basic Networking

## Command line setup :

- start a console (Xterm) and use `su` to gain root privileges.
- use `cp` to make a copy of `/etc/hosts` and call it something like `/etc/hosts.original`

```
# cp /etc/hosts /etc/hosts.original
```

- start up your favourite editor, and add the hostnames and matching IP addresses shown above to the `/etc/hosts` file. The file should then include something like the following ...

```
192.168.0.2      seagull.homenet.prv    seagull
192.168.0.4      parakeet.homenet.prv   parakeet
192.168.0.6      magpie.homenet.prv     magpie
192.168.0.12     rosella.homenet.prv    rosella
192.168.0.13     finch.homenet.prv      finch
```

# Introduction to Basic Networking

use the **ifconfig** command to set up the node address and related info

```
# ifconfig eth0 192.168.0.12 netmask 255.255.255.0 broadcast 192.168.0.255
```

use the **ifconfig** command to check that the eth0 interface is “up”

```
# ifconfig
```

```
eth0      Link encap:Ethernet  HWaddr 00:03:47:B7:4B:E2
          inet addr:192.168.0.12  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST 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:0 (0.0 b)
```

```
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:16436  Metric:1
          RX packets:23 errors:0 dropped:0 overruns:0 frame:0
          TX packets:23 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1652 (1.6 KiB)  TX bytes:1652 (1.6 KiB)
```

# Introduction to Basic Networking

Sometimes, the eth0 interface may not start up when configured with ifconfig. In this case, use the command

```
# ifconfig eth0 up
```

You can also shut down the eth0 interface by using

```
# ifconfig eth0 down
```

Now, with the cables connected, the hosts file updated, and the ethernet interfaces configured we should be able to check the connection by using the **ping** command. For example ..

```
# ping finch
```

```
PING finch (192.168.0.13) 56(84) bytes of data.  
64 bytes from finch (192.168.0.13): icmp_seq=1 ttl=64 time=2.96 ms  
64 bytes from finch (192.168.0.13): icmp_seq=2 ttl=64 time=0.663 ms  
64 bytes from finch (192.168.0.13): icmp_seq=3 ttl=64 time=0.669 ms  
64 bytes from finch (192.168.0.13): icmp_seq=4 ttl=64 time=0.735 ms  
64 bytes from finch (192.168.0.13): icmp_seq=5 ttl=64 time=0.667 ms  
64 bytes from finch (192.168.0.13): icmp_seq=6 ttl=64 time=0.617 ms
```

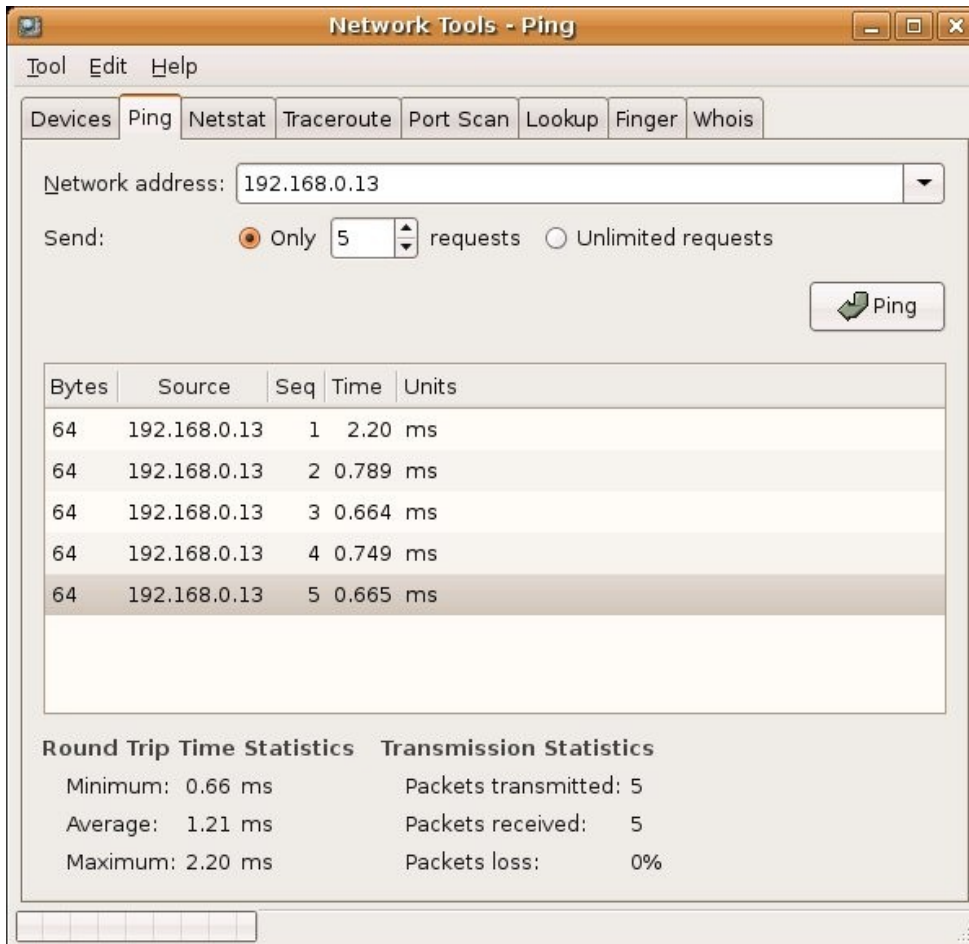
```
--- finch ping statistics ---
```

```
6 packets transmitted, 6 received, 0% packet loss, time 5018ms  
rtt min/avg/max/mdev = 0.617/1.051/2.960/0.855 ms
```

# Introduction to Basic Networking

Some distros have a GUI interface to ping – for example in Ubuntu ...

System -> Administration -> Network Tools



# Introduction to Basic Networking

We have now set up the basic network between our two computers. To do useful things with this link, we need to have a server set up on one of the networked computers. For example, to be able to transfer files we could use an ftp server.

When an ftp server is running, you can use ftp file transfer programs to copy files between the two computers in a manner identical to using ftp over the internet.