Perth Linux Users Group -- October 2003

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Presents

Introduction to IP[v4] networking.

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Why should I network?

Share Reources
- Files
- Printers
- Internet access
- Training

It's cool!

Why not

Security.

- If your Linux box (Internet gateway) get broken into then they can get to your "other" boxes.

You only have one machine :-)

Goals

When you leave here tonight I hope you'll be able to:

- Get some/all of your machines talking to each other
- Setup a DNS Server for your local network.

What I won't cover (hopefully it will be done in the next 2 months)

- Synchronising user data accross the network
- Windows (read SMB) networking
  - Samba
- Sharing your Internet connection/Firewalling
- Incorporating wireless devices
- Backup
- Interconnecting multiple networks

How

What do you need.

- 2 (or more) Computers
- Network Interface Cards (NIC)
- Cable(s)
- HUB/Switch (optional)

Network Interface Card

- Cost between $50 and $150
- Get one supported by Linux
- Some NICs come with the C source for the driver on the driver floppy
  - This'd be great if the kernel didn't keep changing!

- New Intel NICs
  - The new NICs need the new kernel driver (e100/e1000) this has been merged as of 2.4.19
  - It make getting things working slower, but its not an insurmountable problem

Cables, HUB/Switch

Cable types
- Straight through (MDI)
- Cross over (MDX) [Xvr]

Hub/Switch
- Dongle
- HUB
- Switch

Problems

You've plugged things in and no lights!

- Well you're NIC might not have LEDs
- Cable problems, you may have the wrong one.
  - Rule of thumb "When connecting like to like use a Xvr cable"
- Speed/Duplex mismatches
- Hardware fault :(

How ip addressing works

Disclaimer:

I'm going to ignore certain complicating factors, so while what I'm telling you is correct, it's not complete.

It is, however, enough to get you all networked at home and most probably the office.

How ip adrressing works

An IP address looks like:
- nnn.nnn.nnn.nnn (192.168.1.16)

Where
  - 0 <= nnn <= 255

Frequently you'll see them in the form:
- 192.168.1.16/mm or
- 192.168.1.16/MMM.MMM.MMM.MMM

Where
  - 0 <= mm <= 32
  - 0 <= MMM <= 255

This new part is called a network mask (or netmask)

Netmasks, demasked

Yes I do know that was bad

The netmask is used to determine the network address for the host

The 2 forms mean exatly the same thing
- 192.168.1.123/255.255.255.0 == 192.168.1.123/24

The latter is just shorthand for the former.

More specifically they both mean the 24 most significant bits are the network.

Netmasks/Network addresses

Somewhat obvisouly all hosts on the same network MUST have the same network address.

- With a netmask of /24 (255.255.255.0) the first 3 octets must match.
  - 192.168.1.123/24 is host 123 on network 192.168.1.0

It/they is/are used for routing.

All you need to know is; they exist and for home networking they are uncomplicated and can all but be ignored

Special IP Addresses

Network Address

- 10.0.0.0   -   10.255.255.255
- 172.16.0.0   -   172.31.255.255
- 192.168.0.0 -   192.168.255.255
- 169.254.0.0 -   169.254.255.255

See RFC's 1918 and 3330 for details

Host Address

- *.0 is the network address (the network as a whole)
- *.255 s the broadcast address (all hosts)
- *.1 is "usually" the gateway/DNS server

Getting an IP

Static IPs

- Visit every machine and give it an ip address and netmask valid for your network.
  - Pros
    - Very Simple
  - Cons
    - None really when you have less than 10 hosts

Getting an IP

DHCP (rarp/bootp)

- Dynamic Host Configuration Protocol
- Setup networking on one of your linux boxes, install and configure a DHCP
    - Pros
        - ‣ Adding a host to your network is simple
        - ‣ Changing your network is simple
        - ‣ Moving arround is quick
    - Cons
        - ‣ Slightly less simple (than static IPs)
        - ‣ Your DHCP server must be fully functional for any networking

Command line tools

ifconfig

- used for setting/viewing an (NIC) interface's an
  address

```
eth0        Link encap:Ethernet  HWaddr 08:00:46:72:0E:8B
            inet addr:192.168.1.123  Bcast:192.168.1.255  Mask:255.255.255.0
            inet6 addr: fe80::a00:46ff:fe72:e8b/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
            RX packets:3339 errors:0 dropped:0 overruns:0 frame:0
            TX packets:3094 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:2525546 (2.4 MiB)  TX bytes:334735 (326.8 KiB)
            Interrupt:9 Base address:0x3000 Memory:f4100000-f4100038
```

Command line tools

route

- used for setting/viewing the kernel route tables

```
Kernel IP routing table
Destination      Gateway              Genmask         Flags Metric Ref    Use Iface
192.168.1.0      0.0.0.0              255.255.255.0   U     0      0        0 eth0
```

Command line tools

ip

- **The next generation of tool.**
  - used for setting/viewing an (NIC) interface's an address

    ```
    2: eth0: <BROADCAST,MULTICAST,UP> mtu 1500 qdisc pfifo_fast qlen 1000
        link/ether 08:00:46:72:0e:8b brd ff:ff:ff:ff:ff:ff
        inet 192.168.1.123/24 brd 192.168.1.255 scope global eth0
        inet6 fe80::a00:46ff:fe72:e8b/64 scope link
    ```
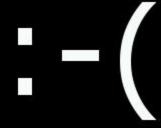
  - used for setting/viewing the kernel route tables

    ```
    192.168.1.0/24  proto kernel  scope link  src 192.168.1.123
    ```

Command line tools

ping
- used for testing basic connectivity

GUI Tools

:-(

Making it all stick

- **RedHat (and Mandrake)**
  - /etc/sysconfig/network-scripts/ifcfg-*
- **SuSe (version >= 8.0)**
  - /etc/sysconfig/network/ifcfg-*
- **SuSe (version <= 8.0)**
  - /etc/rc.config
- **Debian**
  - /etc/network/interfaces
- **Gentoo**
  - /etc/conf.d/net
- **Slackware**
  - /etc/rc.d/rc.inet1

Domain Name System/Server

You remember names better that IPs

- esp. as networks age.

Network applications expect it.

Key files for DNS

- **named.conf**
  - This file configures the DNS server
  - It's location varies from distro to distro :(
- **/etc/resolv.conf**
  - This file configures the DNS client

```
search yourdomainname.here
nameserver 127.0.0.1
```

will make connections quicker

Worked example

PLUG it all in

Setting the IP of this machine

Setting the IP of a second machine

ping/ssh to verify connectivity.

Setup a name to IP DNS Server

- ping/ssh to verify connectivity.

Setup an IP to name DNS Server
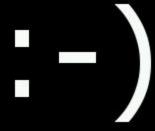
- ping/ssh to verify connectivity.

Setup a DHCP Server

- ping/ssh to verify connectivity.

Add a 3rd machine

- ping/ssh to verify connectivity.

Done

:-)

Questions?

?