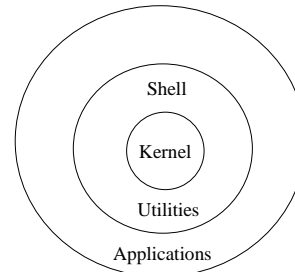


## Linux

- Kernel created by Linus Torvalds
- GNU utilities
- X Windows
- Other applications: OpenOffice, DBMS, ...
- common line interface
- text file based config
- stable, scalable
- Distributions: RedHat, Debian, Mandrake.

by hmlaw, Sep03 P.1

## Linux (cont.)



by hmlaw, Sep03 P.2

## Running Linux

- Runlevel
  - S: single user mode
  - 3: networked multi-user
  - 6: reboot
- Single user mode: for maintenance
  - to enter: pass 'single' to the kernel in boot loader
  - lilo: tab, 'linux single'
  - grub: press e, add 'single' to kernel line, press b
- shutdown
  - `shutdown`, `reboot`, `halt`, `poweroff`,  
`ctrl-alt-del`, `telinit 6`

by hmlaw, Sep03 P.3

## Running Linux (cont.)

- Getting help
  - `man` command
  - `info` (GNU info) command
- `uname`: print system info

by hmlaw, Sep03 P.4

## Process / Daemon / Service

- `ps` (process status) command
- `daemon`: background process
- `service`: set of daemons serve for same function
- `chkconfig`: manage service on startup
  - `chkconfig --list`
  - `chkconfig --del sendmail`
  - `chkconfig sendmail reset`
- `setup`, `ntsysv`

by hmlaw, Sep03 P.5

## Service (cont)

- `/sbin/service`
  - `service sendmail stop`;  
`service sendmail start`
  - `service sendmail restart`
  - `/etc/rc.d/init.d/sendmail restart`
- `/etc/rc.d`: store all startup scripts
  - `init.d`: master copy of startup scripts
  - `rcX.d`: startup scripts invoked in the runlevel
  - `rc3.d/s80sendmail -> init.d/sendmail`
- `/etc/rc.d/rc.local`: your own services
  - `rc3.d/s99local -> /etc/rc.d/rc.local`

by hmlaw, Sep03 P.6

## TCP/IP Networking

- **FQDN** `www.cuhk.edu.hk`  
IP Addr `137.189.8.146`  
MAC addr `08:00:20:FD:92:7F`
- **arp**: manage arp cache
- **ifconfig**: manage network interface
  - `ifconfig -a`, `ifconfig eth0`
  - `ifconfig eth0 10.2.3.1 netmask 255.255.255.0 \`  
`broadcast 10.2.3.255 up`
- **route**: manage IP routing table
  - `route add default gw 10.2.3.254`
  - `route add -net 10.1.1.0 netmask 255.255.255.0 \`  
`gw 10.2.3.250`

by hmlaw, Sep03 P.7

## TCP/IP Networking (cont)

- **Netstat**: network connection, route table, ...
  - `netstat`
  - `netstat -r, -rn`
- **ping**: test the network connectivity by ICMP
- **tcpdump**: dump the network traffic
- `/etc/resolv.conf`
  - `search ine.cuhk.edu.hk`
  - `nameserver 137.189.87.2`
- `/etc/hosts`
- `/etc/nsswitch.conf`
  - `hosts: files dns`
- **switch** ``-n'`: don't convert host addr to names
  - `netstat -rn, arp -an, tcpdump -n eth0`

by hmlaw, Sep03 P.8

## RedHat Network Scripts

- `/etc/sysconfig/network-scripts`
- **ifcfg-eth0**
  - `DEVICE=eth0`
  - `BOOTPROTO=static`
  - `IPADDR=10.2.3.1`
  - `NETMASK=255.255.255.0`
  - `ONBOOT=yes`
- `ifdown eth0; ifup eth0`
- `/etc/sysconfig/network`: other system info
  - `NETWORKING=yes`
  - `FORWARD_IPV4=true`
  - `HOSTNAME=gateway`
  - `GATEWAY=10.2.3.254`
- Ref: `/usr/share/doc/initscript-xxx/sysconfig.txt`

by hmlaw, Sep03 P.9

## Being a router

- config two interfaces: `eth0, eth1`
- check routing table: `netstat -r`
- allow packet forwarding
  - `echo '1' > /proc/sys/net/ipv4/ip_forward`
  - `/etc/sysctl.conf`
  - `/etc/sysconfig/network: FORWARD_IPV4`

by hmlaw, Sep03 P.10

## How to debug?

- A:e0 & R:e0 on same vlan
- R:e1 & B:e0 on same vlan
- A can ping R:e0
- B can ping R:e1
- A know how to reach B
- B know how to reach A
- route table of R is correct
  - | Dest | Int |
|------|-----|
| A    | e0  |
| B    | e1  |
- R is willing to forward packet



by hmlaw, Sep03 P.11

## Package Management

- **RPM**: RedHat Package Manager
  - Install `rpm -I foobar.rpm`
  - Upgrade `rpm -U foobar.rpm`
  - Freshen `rpm -F foobar.rpm`
  - Erase `rpm -e foobar`
  - Verify `rpm -V foobar`
  - Query `rpm -q foobar`
- Update kernel
  - `rpm -Fhv kernel-2.4.18.rpm`

by hmlaw, Sep03 P.12

## Package Management (cont)

### ■ Query

```
rpm -q nfs-utils // check if nfs-utils have been installed
rpm -qi nfs-utils // list package info
rpm -ql nfs-utils // list files installed for the package
rpm -qf /etc/rc.d/init.d/nfs // check package owning the file
rpm -qa // list all installed packages
rpm -qi -p foobar.rpm // query the rpm file
```

by hmlaw, Sep03 P.13

## Reference

- LINUX: Rute User's Tutorial and Exposition  
<http://www.icon.co.za/~psheer/book/>  
<http://www.cse.cuhk.edu.hk/~csc4130/ref/rute>
- SSU CS IT Lab Manual  
<http://www.cs.sonoma.edu/itl/manual/contents.html>
- Unix System Admin Handbook (3rd)  
Linux Admin Handbook  
<http://www.admin.com>
- Essential System Admin (3rd)  
<http://www.oreilly.com/catalog/esa3/>

by hmlaw, Sep03 P.14