System Administration

Startup Process

Why Care?

- Every process on your system comes about by following a specific chain of events from the machine startup
- You may want to disable processes
- You may want to enable processes

BIOS

- Has control of the machine when power is turned on
- Does some basic checks, and then looks for bootable devices
- Finds a bootable device, and then transfers control of the system to the bootloader stored in the first sector of the bootable device

Boot Loader

- Finds the kernel, loads it into memory and starts running it

GRUB

Configuration File: /boot/grub/grub.conf

```
default=0
timeout=10
splashimage=(hd0,0)/boot/grub/splash.xpm.gz
ttitle Red Hat Enterprise Linux Client (2.6.18-53.1.13.el5)
        root (hd0,0)
        kernel /vmlinuz-2.6.18-53.1.13.el5 ro root=LABEL=/1 rhgb quiet
        initrd /initrd-2.6.18-53.1.13.el5.img
```

Kernel

- Core of the operating system
- Manages processes, memory and access to devices
- Provides a common interface to system services
- Initializes itself
- Loads device drivers
- Runs init as first process

Init

- Ultimate parent of all other processes
- 7 different runlevels: 0 - 6
  - By convention: 0 is for halting machine, 6 is for rebooting the machine
  - Other levels have no set definition between distributions. RHEL uses:
    - 1: single user mode
    - 3: Multiuser
    - 5: Multiuser with X11 automatically started

/etc/inittab

- Format of inittab

```
x:5:respawn:/etc/X11/prefdm -nodaemon
```

  - A label
  - Runlevels in which line runs
  - Action
  - Command

/etc/inittab actions

- respawn: restart whenever process exits
- wait: start when entering runlevel, wait until process ends
- sysinit: run process during system boot, ignores runlevels
- ctrlaltdel: run when Cntl-Alt-Delete typed, ignores runlevels

/etc/inttab actions

- powerfail: run when init gets SIGPWR signal and /etc/powerstatus contains F(AIL)
- powerwaitok: run when init gets SIGPWR signal and /etc/powerstatus contains O(K)
- initdefault: signals default run level

```
id:5:initdefault:
```

/sbin/telinit

- `telinit` allows you to give commands to the `init` process
- tell init to switch to a different runmode

  `telinit <runlevel>`

  - This is only temporary --- the next time you restart init will come back to the default runlevel

Getting init to re-read inittab

- init only reads inittab when it starts up, when a process it monitors quits, or when you tell it to re-read inittab
- To tell it to re-read inittab, use the telinit command as root:
  `/sbin/telinit q`

Boot Sequence

BIOS

boot loader

kernel

`init`

all other processes

Exercises

- Examine /etc/inittab and determine the default runlevel of your system
- What does the line

  `6:2345:respawn:/sbin/mingetty tty6`

  in /etc/inittab do?
- What happens when "/sbin/mingetty tty6" exits?

/etc/rc.d/rc.sysinit

- Does basic startup activity:
  - Configures kernel parameters
  - Sets system clock from computer's hardware clock
  - Loads keyboard map
  - checks all disk partitions, mounts them
  - Starts swapping
  - Load modules

/etc/rc.d/init.d/

- For each service that is started through inittab, there is a script in this directory that starts and stops the service
- The script must be run with a command argument:
  - "start" to start the service
  - "stop" to stop the service
  - "restart" to restart the service
- Scripts may define other commands as well

/etc/rc.d/rc*N*.d/

- For each runlevel N, there is a /etc/rc.d/rc*N*.d/ directory
- This directory contains symlinks to /etc/rc.d/init.d/ scripts

/etc/rc.d/rc*N*.d/ scripts

- K*NN*service
  - If service is running, stop it when entering this runlevel (i.e., run script with "stop" argument)
- S*NN*service
  - If service is not running, start it when entering this runlevel (i.e., run script with "start" argument)
- "*NN*" is an "ordering" number from 0 to 99

Why have numbers in the script names?

- Allows services to have dependencies
- Lower numbers run first
- So, for example, `S10network` can start up networking before `S55sshd` starts up sshd, because sshd needs networking before it can start.

Enabling and Disabling Scripts: chkconfig

- command line program
- allows editing of all levels, as well as services started through xinetd 'super-daemon'

`/sbin/chkconfig --list`

Lists all services, all runlevels

`/sbin/chkconfig [ --level <levels> ]` *`name`* `<on|off|reset>`

Configures a service to be on, to be off, or to reset to defaults. Optionally specify levels to modify, if you don't want to modify all levels.

Enabling and Disabling Scripts: ntsysv

- text based interactive command
- allows editing of all levels, as well as services started through xinetd 'super-daemon'

```
/usr/sbin/ntsysv
```

Edit current runlevel

```
/usr/sbin/ntsysv --level <level>
```

Edit specific runlevel

Enabling and Disabling Scripts: system-config-services

- Graphical configuration client
- Actually removes /etc/rc.d/rc*N*.d/{S|K}*NN*name symlinks, instead of just renaming them

Enabling and Disabling Scripts: renaming them

- Simply renaming symlinks
- Not recommended unless you have a compelling reason to do so

Exercise

- To become root, run the command 'su -' and enter the root password
- Check that sshd is running in your default runlevel.
- Use chkconfig to disable it in runlevel 5.
- Is sshd still running?
  - Run: `ps ax | grep sshd`

/sbin/service

- None of the preceeding options for configuring which services run actually turns on or off a service.
- To immediately turn on or off a service, use service:

```
/sbin/service servicename start
/sbin/service servicename stop
```

/sbin/service

- To see the status of a process, run

  `/sbin/service` *`servicename`* `status`

/sbin/service

- /sbin/service may have other options depending on the service's startup script
- `/sbin/service` *`servicename`* simply calls the appropriate `/etc/rc.d/init.d/`*`servicename`* script.

Exercises

- Shut off sshd
- Check sshd's status to verify that it is not running
- Turn sshd back on
- Verify that it is running

Getting a login prompt

- Text login through getty and friends
- Graphical login through XDM and friends
- More details in sections on terminals and X

/sbin/shutdown

- `/sbin/shutdown [-r|-h] time message`
- Runs shutdown to reboot (-r) or halt the machine (-h) at a certain time, and displays the message as a note to logged in users and to various log files

Shutdown options

- time can be an absolute time

`HH:MM`

- where HH is in 24 hour time (i.e. 1 pm is 13:00)

or

- Time can be an offset `+m` where +m is m minutes from now

or

- `now`, which is the same as +0

What shutdown does

- Prevents users from logging in
- Prints advisory message
- Switches init to runlevel 0 (shutdown) or 6 (reboot)

Exercise

- How would you configure your machine to start up without X running?