Linux File System

Embedded Linux Primer Ch 6

1) What is available in the Linux file system?
2) How can you get info about the system?

File System Access

- Many things available via the file system:
  - Files: /usr, /etc, /home, ...
  - Devices: /dev
  - Processes info: /proc
- Access most resources via file interfaces:
  - fopen(), fread(), fwrite(), fclose().
- Demo:
  - Target: cat /dev/kmesg
  - Host: cat /dev/ttyUSB0, reboot target.

Minimal File System

```
.
|-- bin/
|   |-- busybox
|   '-- sh -> busybox
|-- dev/
|   '-- console
|-- etc/
|   '-- init.d/
|       '-- rcS
'-- lib/
    |-- ld-2.3.2.so
    |-- ld-linux.so.2 -> ld-2.3.2.so
    |-- libc-2.3.2.so
    '-- libc.so.6 -> libc-2.3.2.so
```

BusyBox Demo:

Create link:

```
# ln -s /bin/busybox ls
```

Run:

```
# ./ls
# ./ls --help
# ls --help
```

(see different options)

File System Hierarchy Standard:

Directory	Description
/	Root directory
bin	Essential command binaries (all users)
etc	..
home	User home directories (optional)
lib	..
mnt	Mount point for temporarily mounting file systems
opt	Add-on application software packages
root	Home directory for the root user (optional)
sbin	Essential system binaries (root)
usr	User programs
var	Variable data (log files, ...)

Virtual File System

Directory	Description
dev	Device files / nodes
proc	..
sys	Linux sysfs (machine-usable device nodes)
tmp	Temporary files

```
$ mount
rootfs      on /         type rootfs (rw)
/dev/root   on /         type yaffs (rw,relatime)
proc        on /proc     type proc (rw,relatime)
tmpfs       on /tmp      type tmpfs (rw,relatime)
sysfs       on /sys      type sysfs (rw,relatime)
tmpfs       on /dev      type tmpfs (rw,relatime)
var         on /dev      type tmpfs (rw,relatime)
devpts      on /dev/pts type devpts (rw,relatime,mode=600)
192.168.0.188:/home/brian/cmpt433/public on /mnt/remote type nfs ....
```

/proc

- Get information using:
  (host)$..

- Some "files" of interest:
  - /proc/cpuinfo — Processor info
  - /proc/cmdline — Kernel command line
  - /proc/meminfo — Memory info
  - /proc/uptime — Seconds running, and seconds in idle task

/proc/<pid>

- Information about the a specific process:
  - /proc/self/...
  - /proc/<pid>/status Human readable information.
  - /proc/<pid>/maps Memory map regions.
  - /proc/<pid>/stat All info shown in ps: name, id, ...
  - /proc/<pid>/fd All open files.
    Can echo something into stdout.

Linux Commands

- Some more useful Linux commands
  - Ctrl+z: Pause/interrupt current process.
  - bg: Runs paused program in background (like &)
  - fg: Runs paused program in foreground
  - ps -A: List all process
  - top: Show resource usage (updates 1s)
  - kill <pid>: end process:
    kill -9 <pid>: Force kill
  - df -h: Disk free (-h="human" readable: 3.2k)
  - du -sh *: Disk used