

Linux Hardware Management

Linux System Administration
COMP2018 Summer 2017

Hardware Resources

- CPU refers to the primary computing resource and is measured in processor cores
- RAM refers to the volatile on-board high speed memory used to store all programs and working data
- Storage refers to all devices used to hold data, typically formatted and attached as filesystems
- Network Interface refers to the devices that provide a means of transmitting data to/from other hosts on a network using TCP/IP protocols
- `lshw -short`, `lshw -businfo` are commands used to get summaries of recognized devices

CPU

- **lscpu** gives detailed processor information
- **arch** identifies the processor type
- **uptime** displays load averages, showing the processor demand trend
- **mpstat** gives detailed per-core processor activity details
- There are user vs. nice vs. system vs. wait processor activity types

RAM

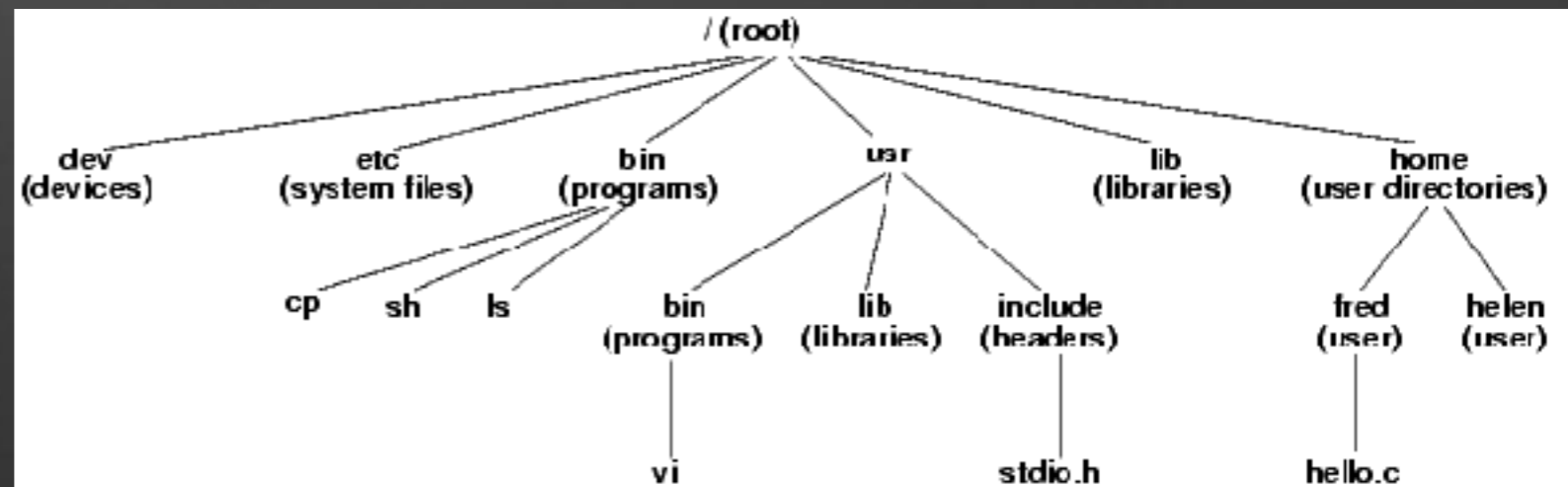
- `lshw -class memory` displays recognized memory hardware
- `vmstat` displays summary data on processor, ram, vm activity
- `free` displays allocated memory statistics, see <http://www.linuxatemyram.com> for a simple explanation
- `/proc/sys/vm/swappiness` specifies how the kernel will choose whether to send program data to swap or steal from the file cache when memory is low
- See <https://unix.stackexchange.com/questions/88693/why-is-swappiness-set-to-60-by-default> for a full discussion of when and if you might want to adjust this parameter either by changing its boot-time value in `/etc/sysctl.conf` or using the `sysctl` command

Storage

- **lshw -class storage**, **lshw -class disk**, **lsblk** display storage bus and device information
- **df** displays total and available space on mounted filesystems
- **iostat** displays device activity for storage devices

Filesystems in Linux

- A filesystem is a data structure on a storage device, created using the **mkfs** command
- It stores user data using file types, names, directories, and attributes
- The file names are used to uniquely identify containers for data, directories, or mechanisms for accessing data stored elsewhere (i.e. links or devices)
- The names are hierarchically structured using directories in a tree structure with one root directory and all other files contained either in that directory, or in a subdirectory one or more levels below that

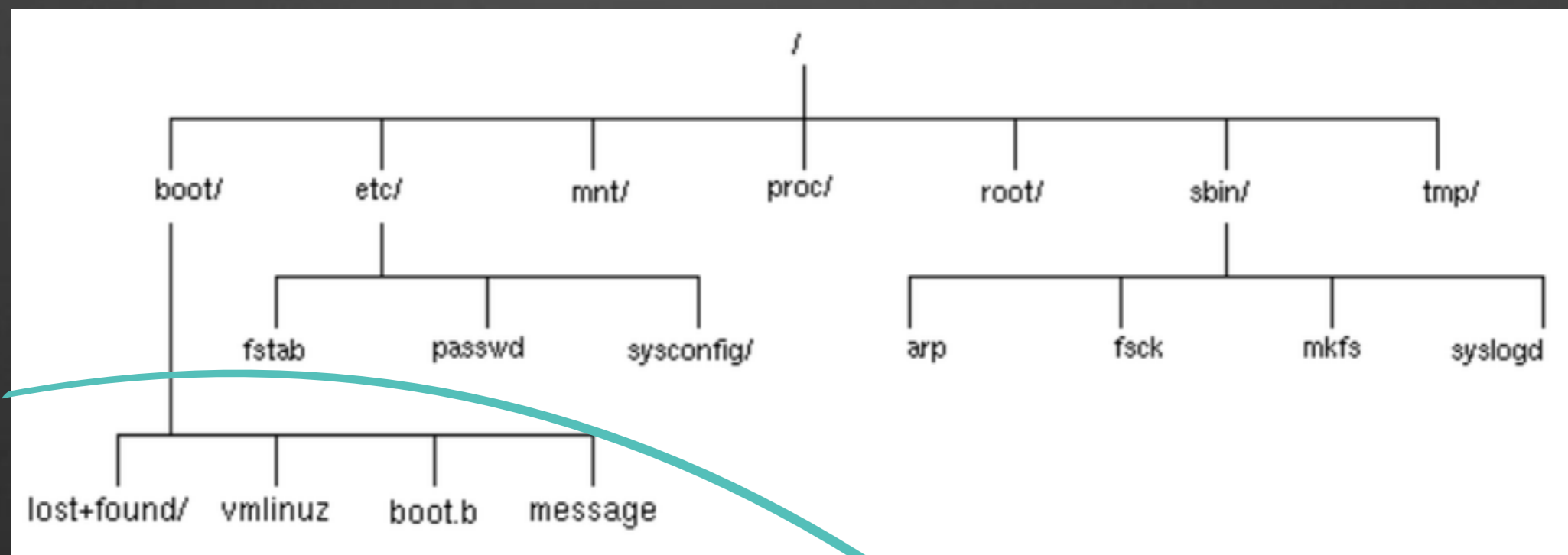


Storage Devices

- Storage devices in Linux have corresponding files in the `/dev` directory
- Each partition or slice of a storage device can hold a filesystem, and each gets a unique name in `/dev`
- The name in `/dev` is constructed using a device type name followed by a unit identifier, optionally followed by a partition identifier
e.g. `/dev/sda1`, `/dev/md0`, `/dev/disk/sdb2`
- The `lsblk` and `fdisk -l` commands can be used to show your attached block storage devices and their partitions with names

Multiple Filesystems

- At powerup, the boot program creates the root mount point in memory and mounts the root filesystem onto it
- The boot filesystem is then mounted onto the `/boot` directory if necessary
- The kernel can access the files it needs using normal filesystem semantics
- The `/etc/fstab` file specifies the disk devices containing filesystems to be mounted along with their attributes such as filesystem type and options
- Filesystems may be manually connected and disconnected using the `mount` and `umount` commands, use `eject` for removable media drives such as USB drives, optical media, etc.



Storage Devices Summary

- partitions/slices vs. filesystems
- **fdisk** can display, create, modify, or delete partition information on storage devices
- **mkfs** formats partitions as filesystems
- **mount/umount** attach/detach filesystems on storage devices to existing directories in the live filesystem
- Mount persistence is gained by adding entries to **/etc/fstab**

Network

- **lshw -class network** displays recognized network interface devices
- **netstat** displays a wide variety of networking information
- **nethogs** displays the top bandwidth users on a systems
- **iftop** displays a continuously updating list of processes using the network interfaces

Components And Naming

- Logical names for devices are used as filenames in the `/dev` directory
- Commands can then use these filenames to access the devices they represent
- `lshw` can show logical device names
- `dmesg` displays the kernel log, which may show devices being probed during boot, and any errors encountered - check `/var/log/kern.log` or `/var/log/dmesg` for older data than what is currently in kernel memory

Removable Devices

- `lshw -class disk` can be used to identify recognized storage devices that are classified as disk devices
- `lspci`, `lsusb` can be used to identify devices and their names for devices which may be used as storage devices but may not be formatted, or currently installed
- Use `eject` for removable media devices vs. `umount` for fixed media devices