Shell Basics

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CSI 402 – Systems Programming

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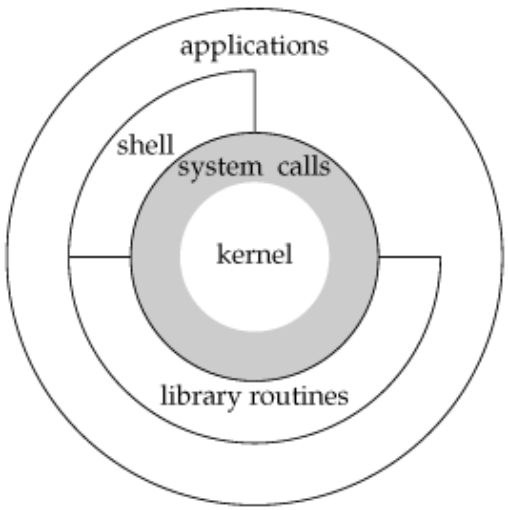
Administrivia

- Homework 1
  - due 11:59pm today
  - carefully follow instructions to avoid deductions
    - `answers.txt` must be pure text file. Open it with nano/vim/emacs to make sure
    - Task 2: should be done in your own Linux environment, not itsunix!
    - not sure? Please ask, don't make assumptions
  - questions?
- GitHub usernames
  - you won't receive a grade if we can't match your profile
- last in-class activity

Linux architecture

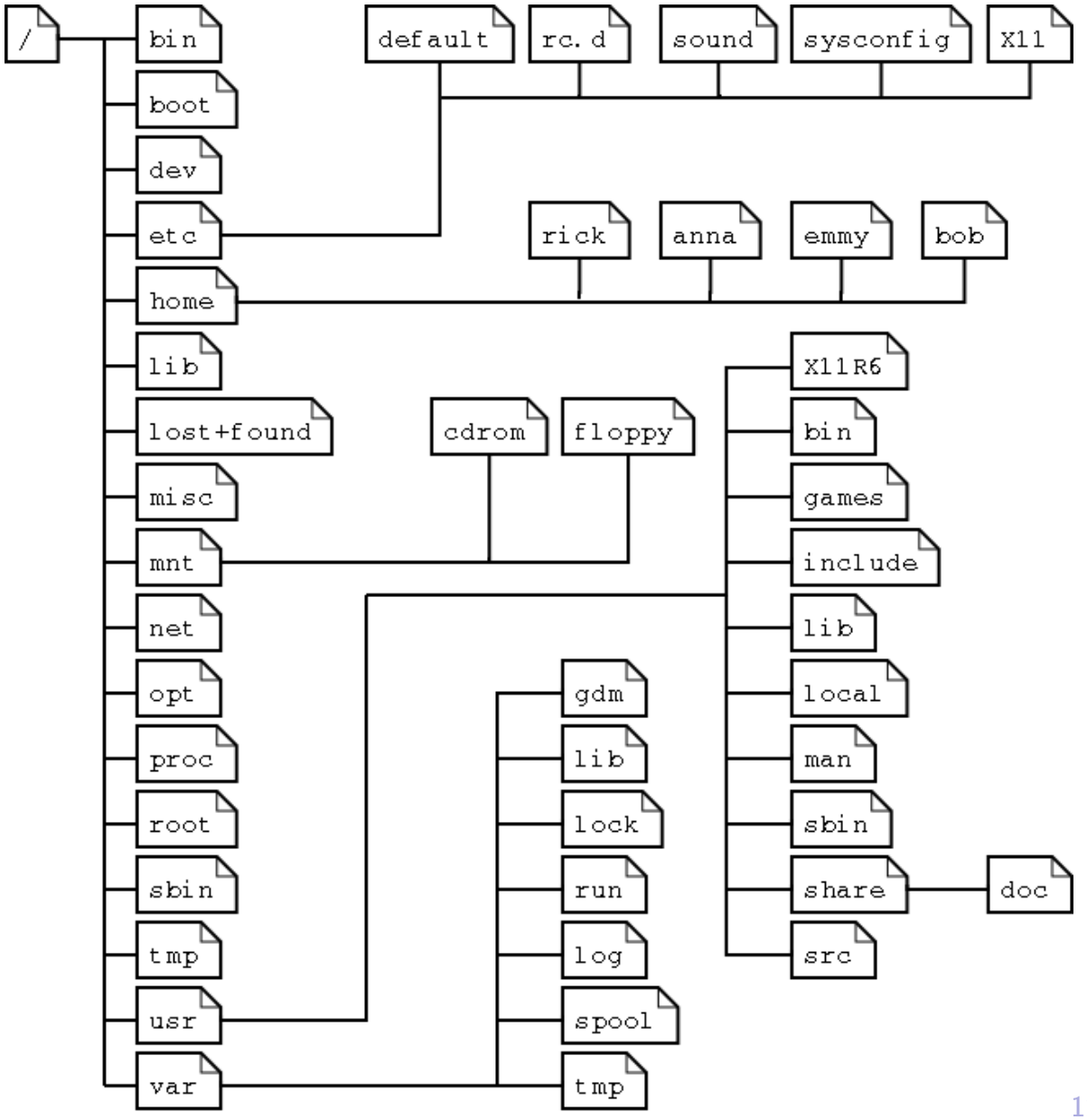


Shell

- shell: Unix command interpreter
  - direct user input
  - from a file (shell script/program)
- sh, csh, tcsh, ksh, bash
- bash (Bourne Again SHell)
  - improvements over sh: cmd line editing, cmd history, aliases, ...
  - default shell on most distros

File system

- (almost) everything is a file
  - no difference between a file and a directory
- partitions & mount points



File system: inodes

- name/inode reference is stored in directory files
- inode stores:
  - owner/group
  - type
  - permissions
  - creation date/time
  - update date/time
  - number of links to the file
  - file size
  - address of data location

Navigation & file manipulation

- paths
  - absolute vs. relative
  - `PATH` shell variable
- related commands: `ls`, `cp`, `mv`, `rm`, `mkdir`, `ln`, ...
  - also, check out `touch`, `cat`

```
1: -rw-r--r-- 1 root root     17 Aug 14  2016 /etc/locale.conf
2: -rw-r--r-- 1 root root   9612 Aug 26  2016 /etc/locale.gen
3: lrwxrwxrwx 1 root root     38 Jan 17  2017 /etc/localtime -> ../usr/share/zo
4: -rw-r--r-- 1 root root   5645 Dec 16 11:03 /etc/login.defs
5: -rw-r--r-- 1 root root    686 Dec  9 07:23 /etc/logrotate.conf
6: drwxr-xr-x 2 root root   4096 Nov 10 10:31 /etc/logrotate.d
7: -rw-r--r-- 1 root root     89 Nov 26  2013 /etc/lsb-release
8: drwxr-xr-x 5 root root   4096 Dec 24 23:35 /etc/lvm
```

Wildcards

- types
  - `*`
  - `?`
  - `[chars]`
  - `[!chars]`
  - `[[:class:]]`
- wildcard expansion
  - shell can use wildcard patterns to match with filenames and provide them as parameters to a program
  - program does not see the wildcards

Exercise

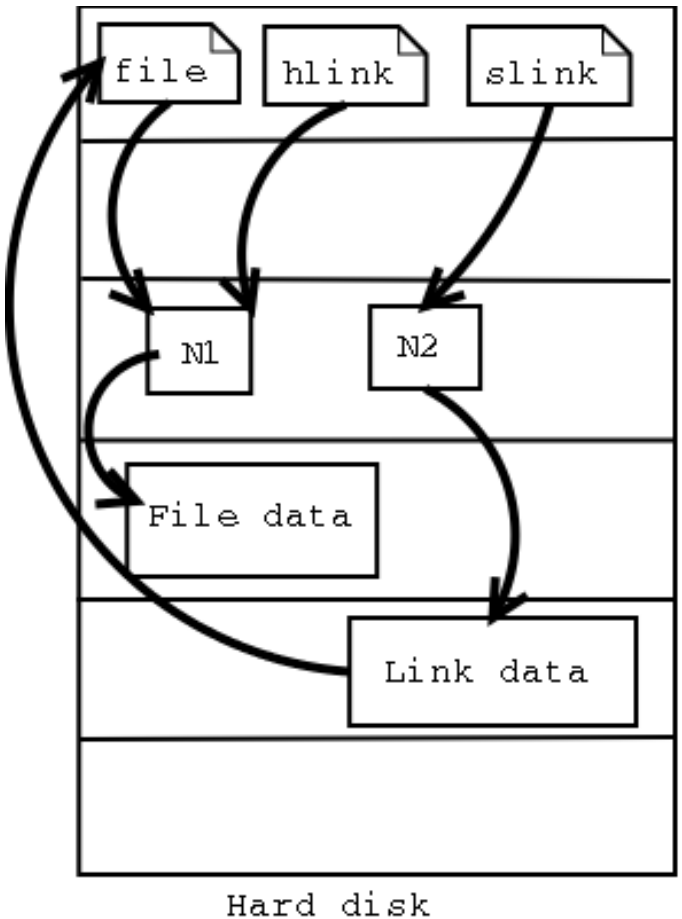
Write wildcard patterns for selecting filenames in each case:

1. start with a digit between 1 and 9, and end with ".txt"
2. contain the following two words in the same order: "csi", "lecture"

Make sure to use `touch` to test your patterns before submission

Soft/Hard links

- hard link
- soft link (symbolic link; symlink)



Exercise

1. create a text file `1.txt` containing "a simple text"
2. create hard link `h1.txt` to `1.txt`
3. create hard link `h2.txt` to `1.txt`
4. create hard link `s1.txt` to `1.txt`
5. rename `1.txt` to `2.txt`
6. delete `2.txt`

- How many ways can we access text file contents immediately after step 5?
- How about after step 6?

Commands

- executable
- shell builtin
  - contained within the shell itself
  - shell executes them directly; without creating a process
- shell function
  - group of commands; executed directly
- alias
  - abbreviation
  - new functionality
  - ensure some default options for a command