O13

Linux Tour

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IBM @server xSeries
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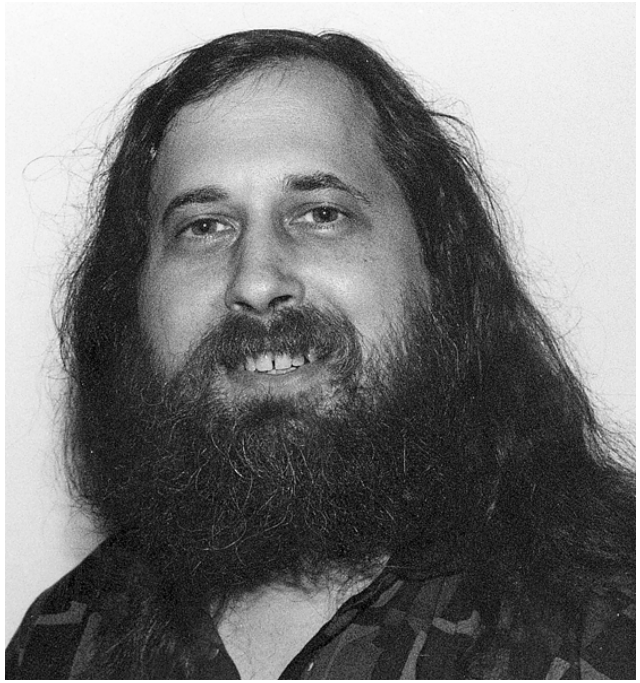
Notes:

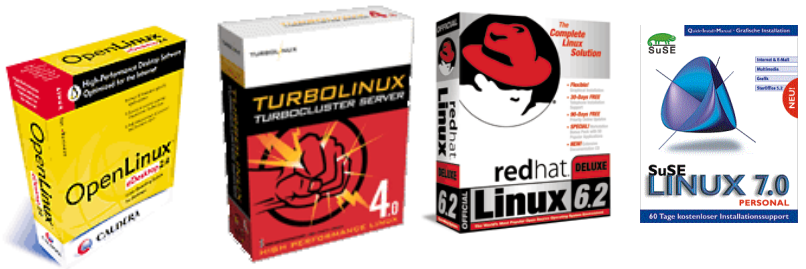
A Short History of Linux (1)



- 1984: Richard Stallman starts GNU project
  - GNU's Not Unix
  - http://www.gnu.org
- Purpose: Free UNIX
  - "Free as in Free Speech, not Free Beer"
- First step: re-implementation of UNIX Utilities
  - C compiler, C library
  - emacs
  - bash
- To fund the GNU project, the Free Software Foundation is founded
  - http://www.fsf.org

A Short History of Linux (2)

- 1991: Linus Torvalds writes 1st version of Linux kernel
  - Initially a research project about the 386 protected mode
  - Linus' UNIX -> Linux
  - Combined with the GNU and other tools forms a complete UNIX system
- 1992: First distributions emerge
  - Linux kernel
  - GNU and other tools
  - Installation procedure
- The rest is history...



What's So Special About Linux?

- Most software (including the Linux kernel) is **GPL**'ed (GNU General Public License)
  - http://www.gnu.org/copyleft/gpl.html

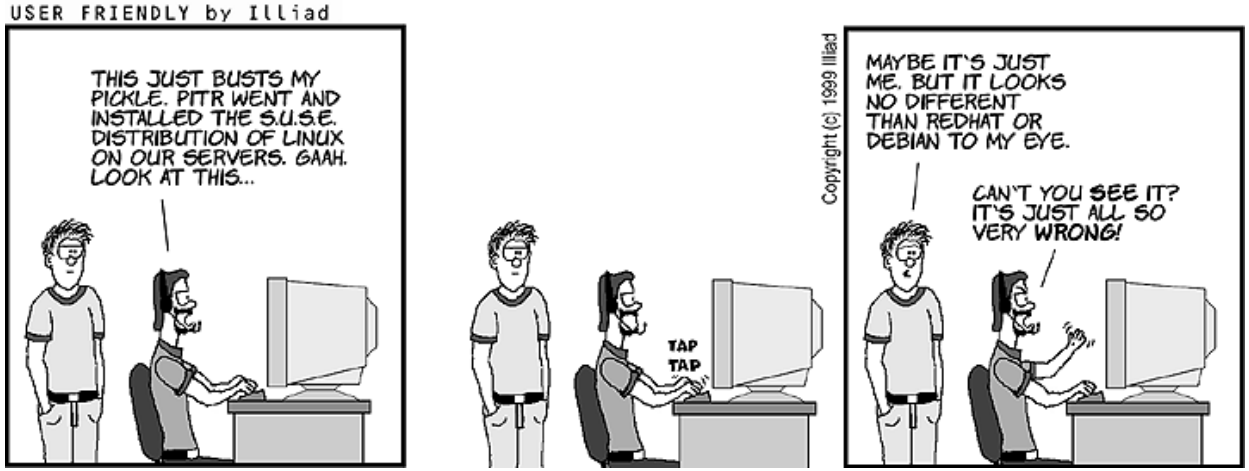
- Is called "copyleft" (instead of "copyright")
  - You may copy the software
  - You get the source code
  - You may alter the source code and recompile it
  - You may distribute the altered source and binaries
  - You may charge money for all this
- You only may not change the license
  - So all your customers have the same rights as you
  - So you really cannot make money from selling the software alone
- Other Open Source licenses (e.g. BSD) are also used

Effects of the License Model

- Everybody has access to the source
  - Volunteer software development on the Internet, with central coordination
  - Linus Torvalds coordinates kernel development
  - Others coordinate other pieces of the OS
- Peer reviews possible
  - Security
  - Performance
- License cannot change
  - So your changes (and name) will stay in forever

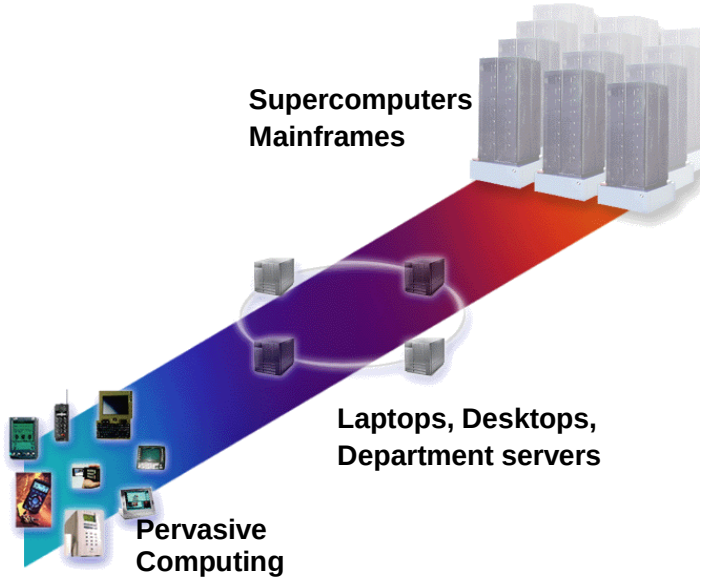
Linux has become a Way of Life

- Culture
- Celebrities
  - Linus Torvalds
  - Richard Stallman
  - Eric Raymond
- Humor
  - Userfriendly
  - Segfault
- Mascot
  - Tux



Linux Today

- Linux covers the whole spectrum of computing
  - Embedded devices
  - Laptops
  - Desktop systems
  - Development systems
  - Small and large servers
  - Megaclusters/supercomputers
- Linux is used throughout the world
  - ... and in space
- Linux is used by home users
  - ... and by some of the largest companies in the world
  - IBM
  - Boeing
  - NASA



Preparing a System for Installation

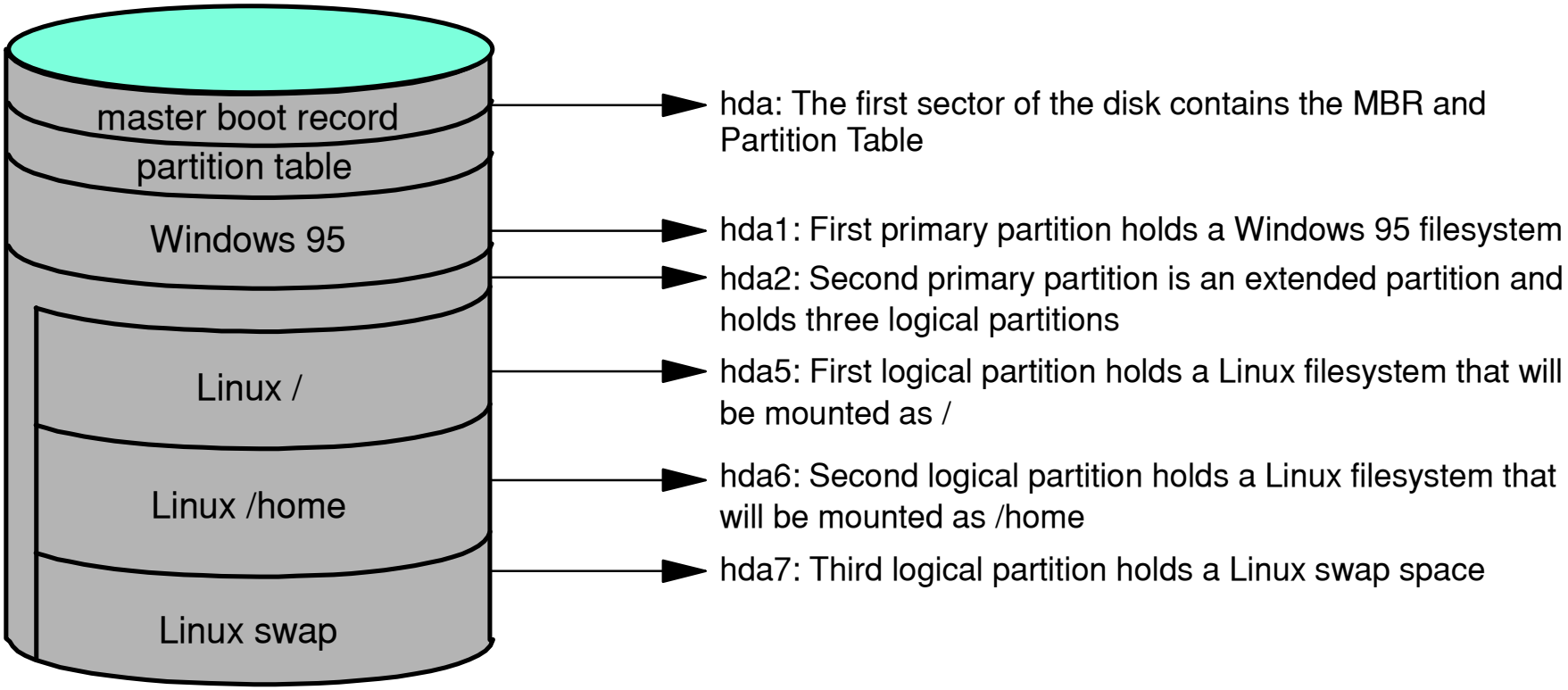
- Know your hardware
  - CPU, memory, keyboard, mouse
  - Hard disks, CD-ROM players
  - Graphical adapters, monitor capabilities
  - Network adapters, IP addresses
  - Printers
- Is all your hardware supported?
  - Linux Hardware-HOWTO
  - Distributors Hardware Compatibility List
  - Hardware manufacturer
  - If unsure, just try it!
- Make space for Linux partitions

Installation Steps

- All installation programs need to perform essentially the same steps:
    1. Choose language, keyboard type, mouse type
    2. Create partitions
    3. Set up a boot loader
    4. Configure network
    5. Configure users and authentication
    6. Select package groups
    7. Configure X
    8. Install Packages
    9. Create Boot Disk
- Order of steps may vary from distribution to distribution
- Other steps may also be included
    - e.g. firewall, printers, sound

Partitioning Theory

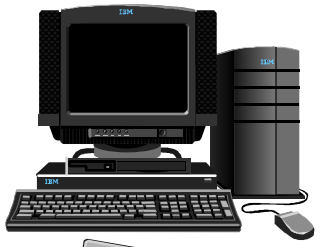
- Partitioning is necessary on Intel-based computers
- Maximum of four primary partitions
- One primary partition may be an extended partition
- An extended partition can hold an unlimited amount of logical partitions (Linux: max 59)



Notes:

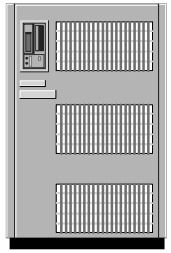
Install Class

- Most distributions have default installation "classes" for typical users
  - Workstation



  - Laptop

  - Server



  - ...
- A "custom" class allows you to make all decisions yourself
  - Packages to be installed
  - Various configuration options

Notes:

Space comparison for the different types of installations:

Personal Desktop:

A personal desktop installation includes a graphical desktop environment and requires at least 1.7GB of free space. If you choose both desktop environments, GNOME and KDE your total free disk requirement will be 1.8 GB.

Workstation:

If you decide to install a workstation and include a desktop environment and software development tools your installation will require at least 2.1GB of free space. If you choose both desktop environments GNOME and KDE you will need at least 2.2GB of free disk space.

Server:

For this type of installation you need at least 850MB of space. That doesn't include any support for a graphical environment. If you wish to install all package groups aside from the graphical components your installation will require 1.5GB of free space. You third option is to install support for both desktop environments, GNOME and KDE you will need 5.0GB of free space to install everything.

Custom:

A custom installation requires a minimum of 475MB and at least 5.0GB if every package is installed.

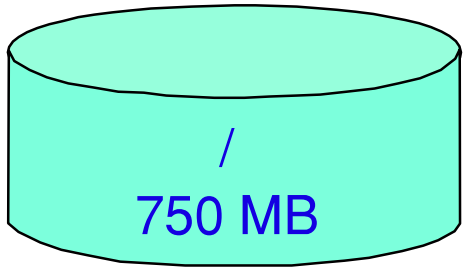
Configure a Boot Loader

- A Boot Loader loads and starts the Linux kernel

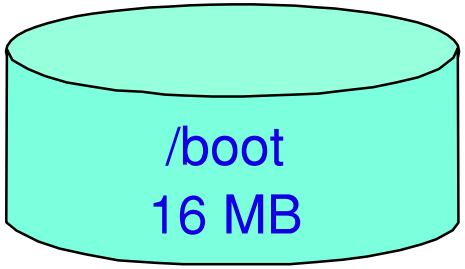
- Can boot other operating systems as well
  - OS/2, Windows, BeOS, ...
  - Give each OS a unique label!
- Can be password protected
  - Prevents users from passing boot parameters to Linux or booting any OS
- Should generally be configured in the MBR, unless another boot loader is used
- Common Boot Loaders:
  - LILO: Linux Loader
  - GRUB: GRand Unified Boot Loader

Disk Partitioning

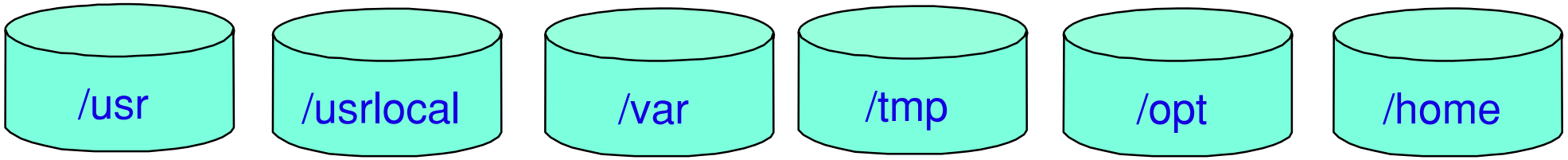
- Linux installation requires you to create Linux partitions
- At a minimum, create:



- Recommended:



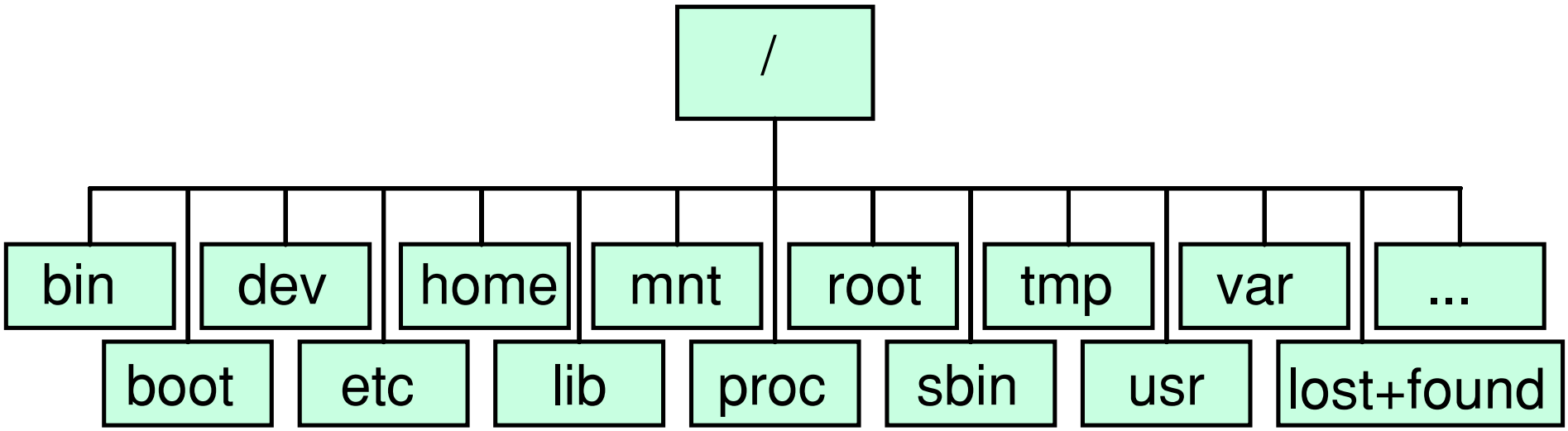
- May need/want to create other partitions:



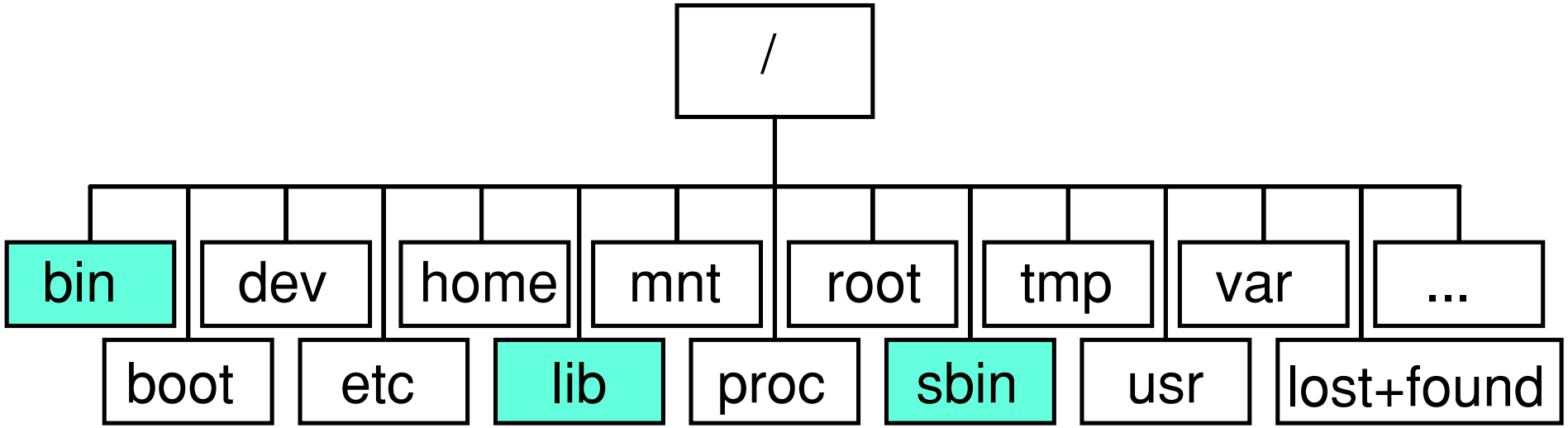
- Default partitioning program under Linux is **fdisk**
  - Distributions may add their own partitioning programs

Directory Structure

- All Linux directories are contained in one, virtual, "unified filesystem"
- Physical devices are mounted on mount points
  - Floppy disks
  - Hard disk partitions
  - CD-ROM drives
- No drive letters like A:, C:, ...

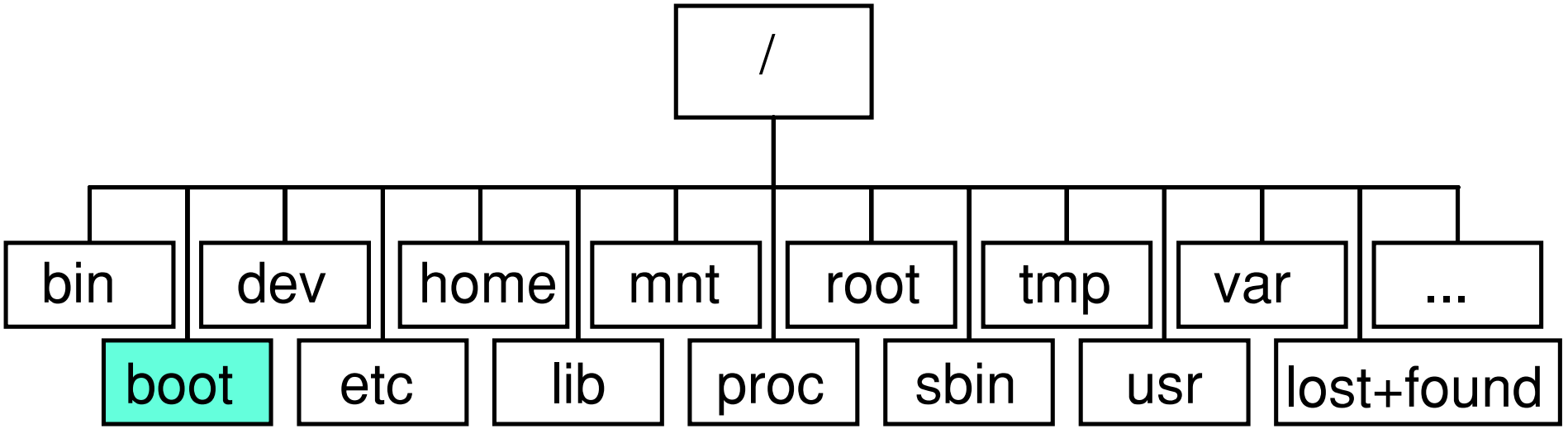


/bin, /lib, /sbin



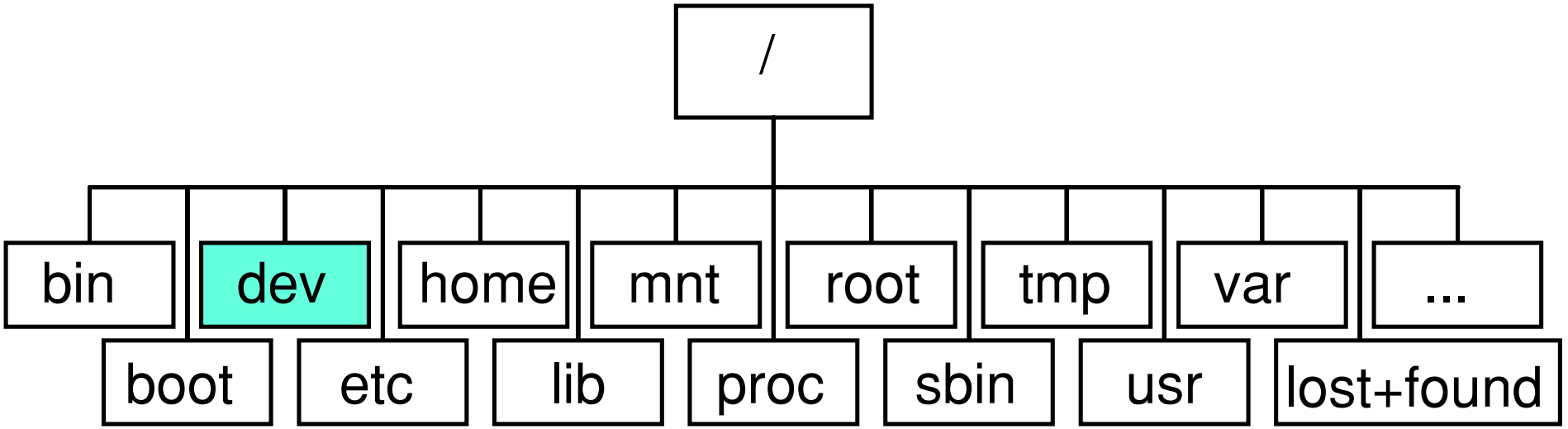
- /bin contains executables for every user
- /sbin contains system administration executables
- /lib contains libraries
- Should always be available
  - At system boot
  - In single user mode
  - When booting from rescue disk
- Can not be in separate filesystems

/boot



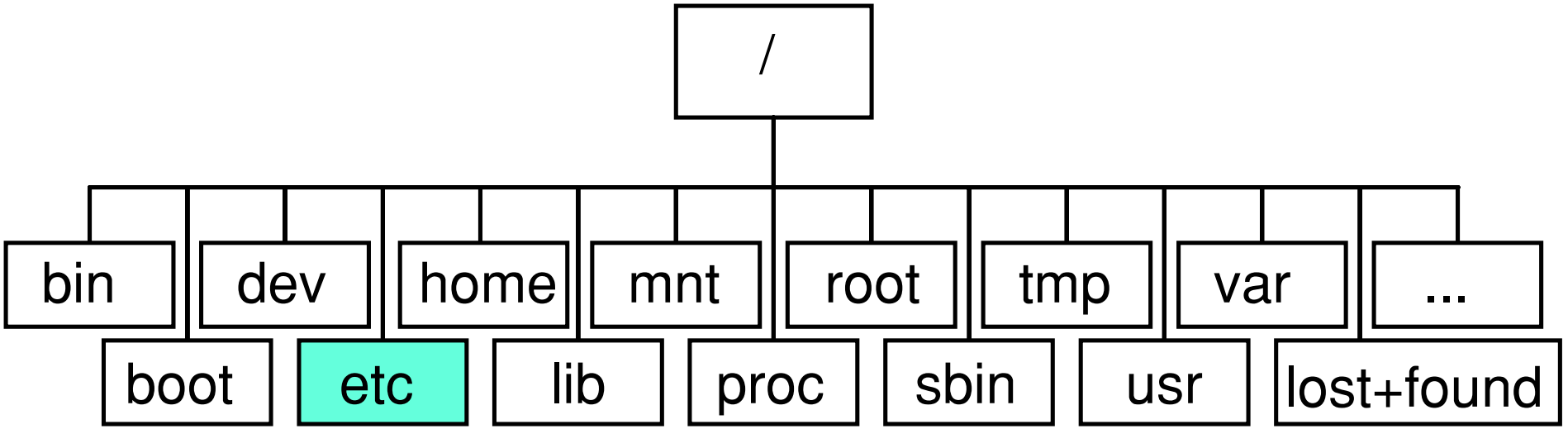
- Contains kernel image and some other goodies
- Should be located below cylinder 1023 and/or 8 Gb
  - Good habit to always make it a separate filesystem

/dev



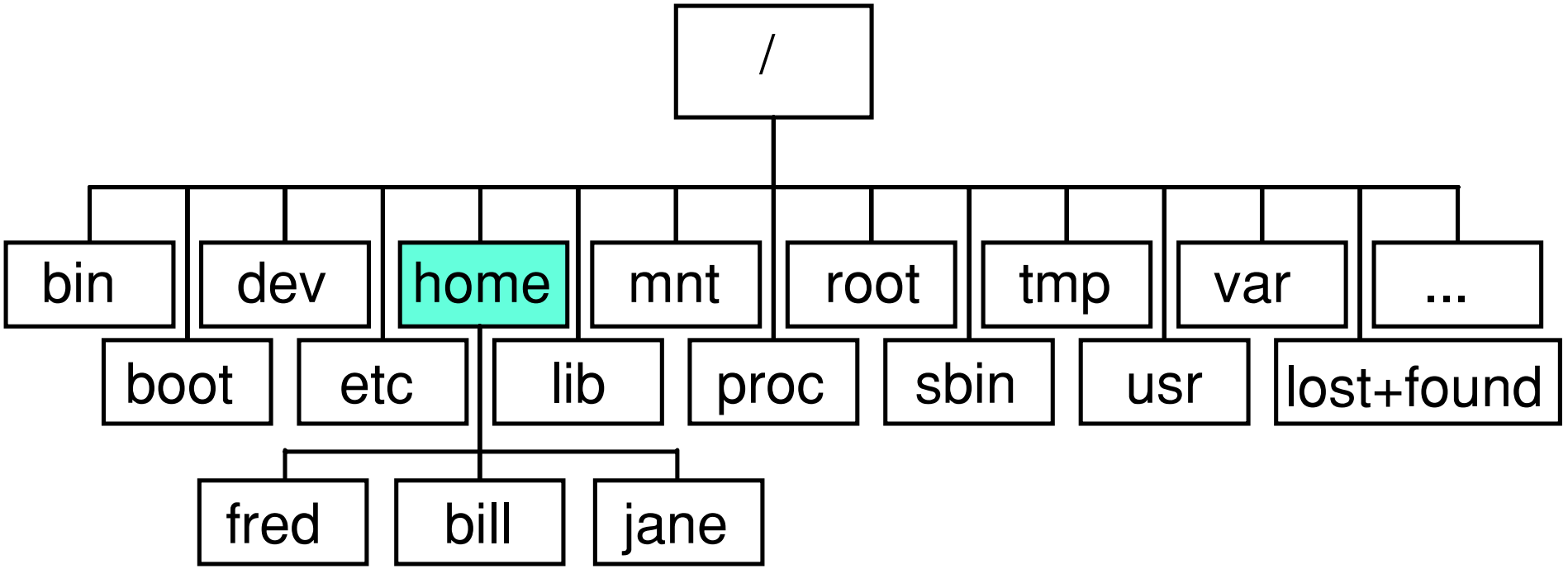
- Contains special files that represent hardware devices
  - Block special device, for example, a hard disk
  - Character special device, for example, mouse and keyboard
- Each device has a major and minor number
  - Identification within the kernel
- Can not be a separate filesystem

/etc



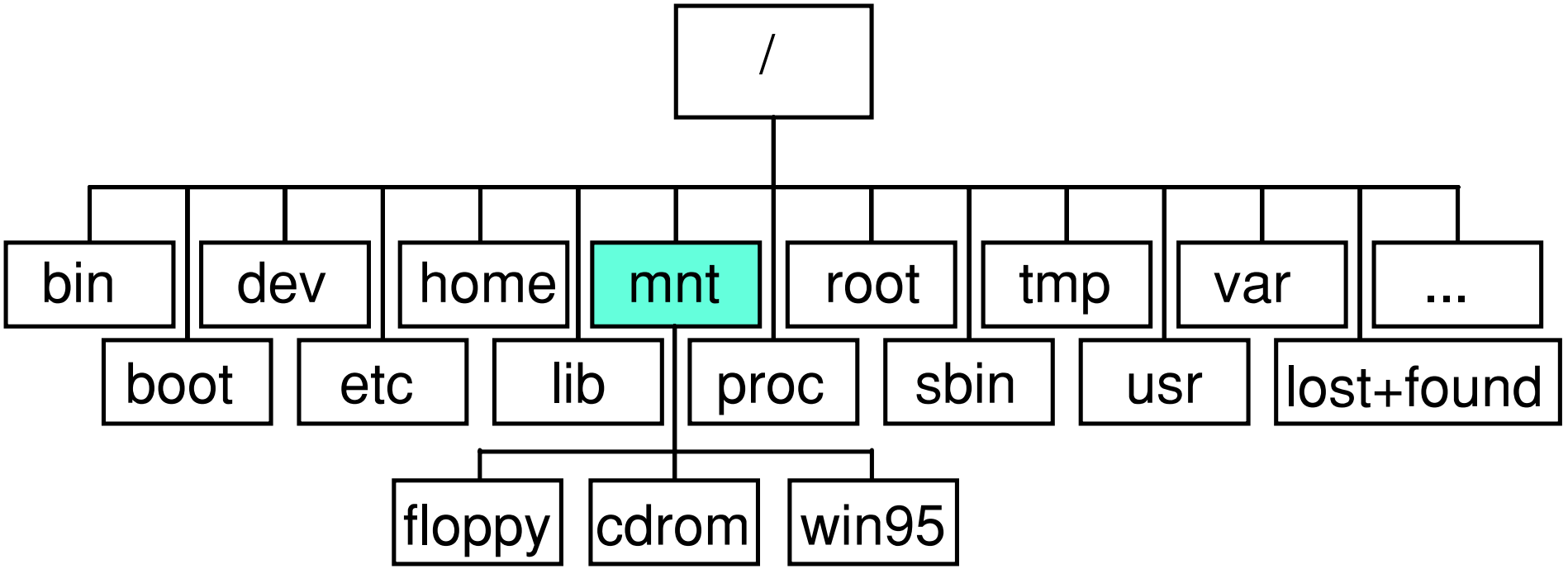
- Contains system-wide configuration files
- Some subsystems have multiple files and therefore use a separate directory
  - /etc/X11 contains X Window System configuration
  - /etc/skel contains default user configuration files
  - /etc/sysconfig contains system configuration
- Can not be a separate filesystem

/home



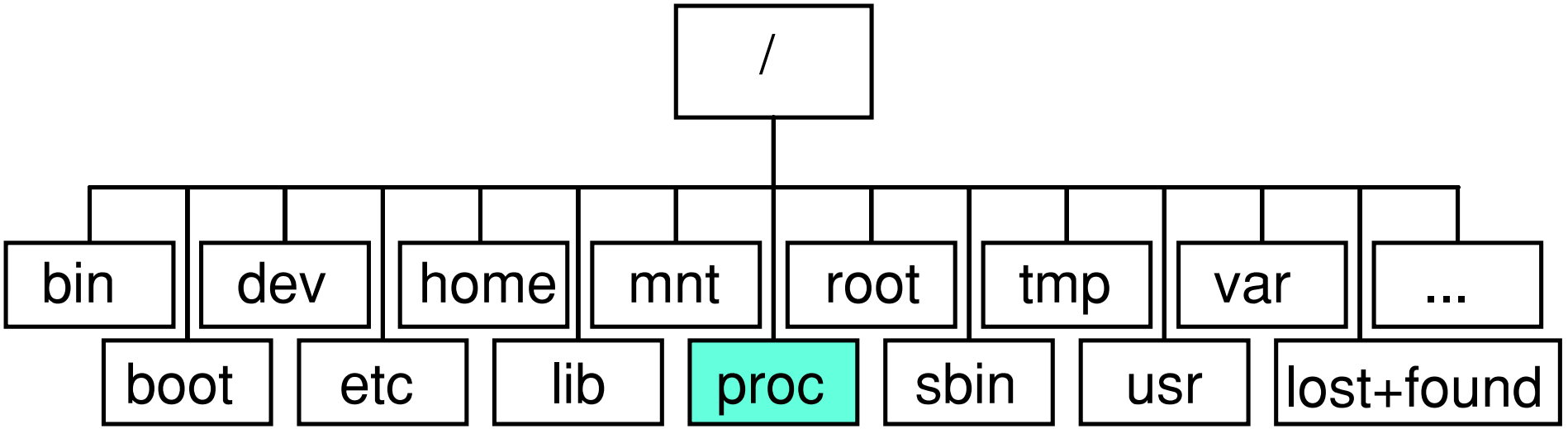
- Home directories of users
- Can be a separate filesystem

/mnt



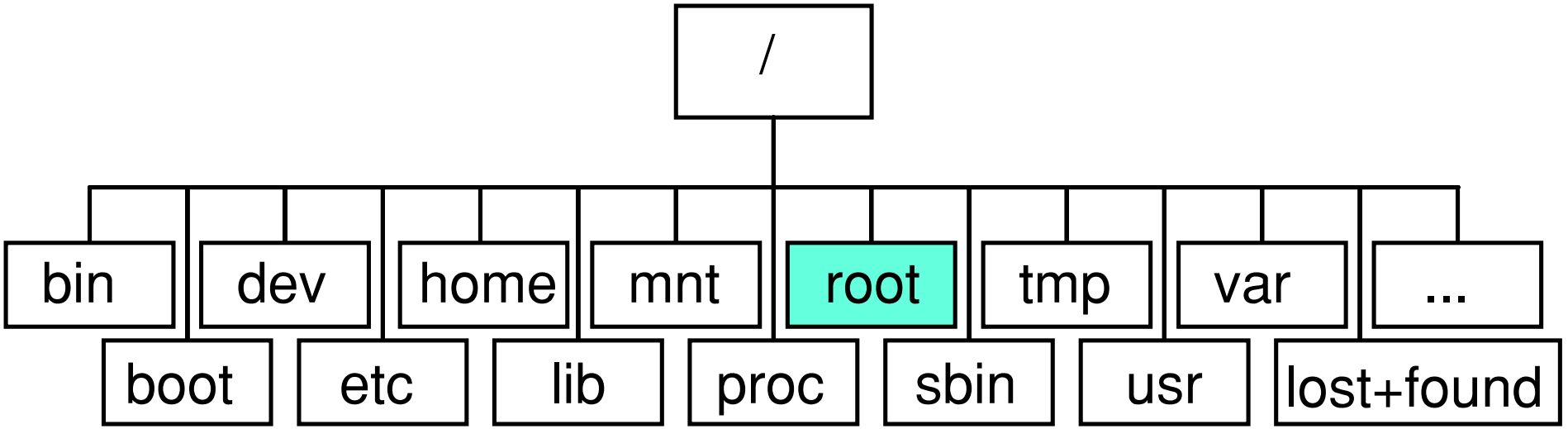
- Mount points for other filesystems
- Can be a separate filesystem
- Note: SuSE uses /media instead of /mnt for floppy and cdrom mountpoints

/proc



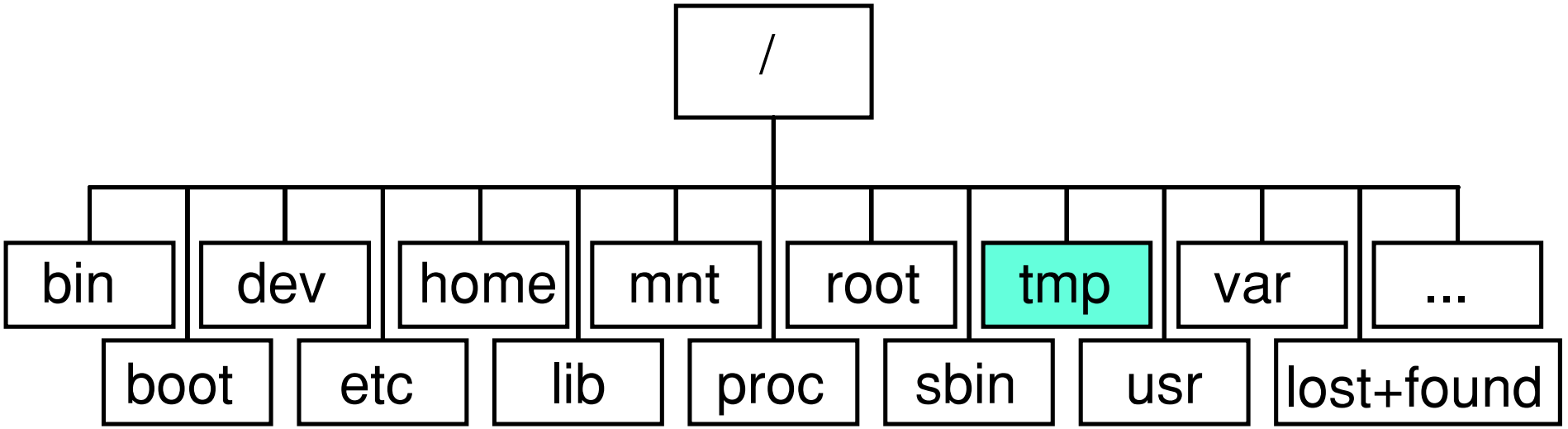
- Virtual filesystem
- Represents kernel and process information

/root



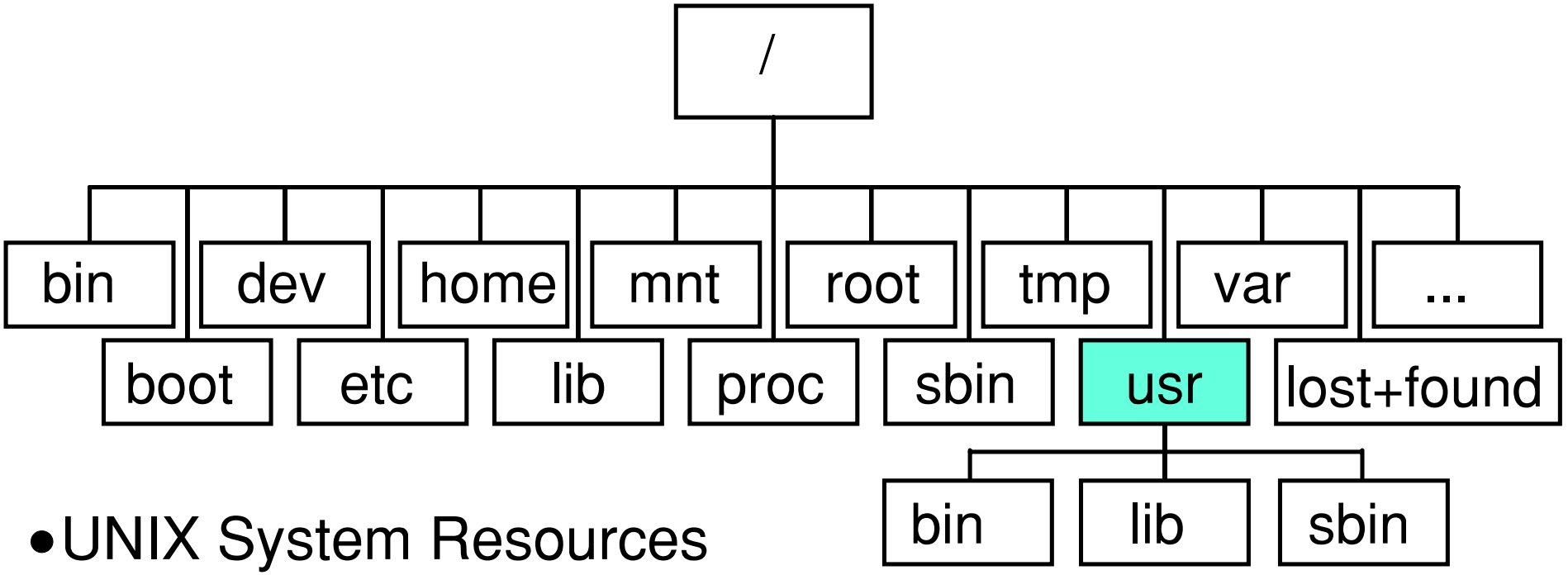
- Home directory of the root user
- Should not be a separate filesystem

/tmp



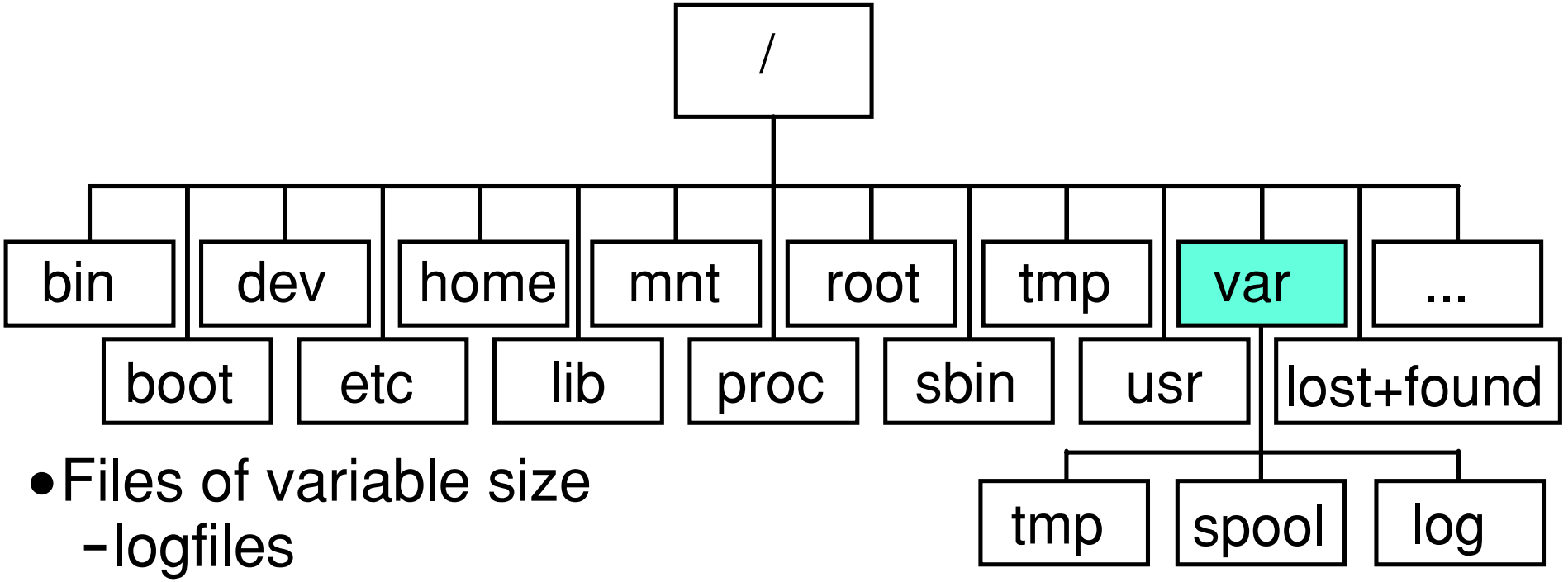
- Temporary storage space for programs, users
- Can be a separate filesystem
- Sometimes automatic cleanup mechanism active

/usr



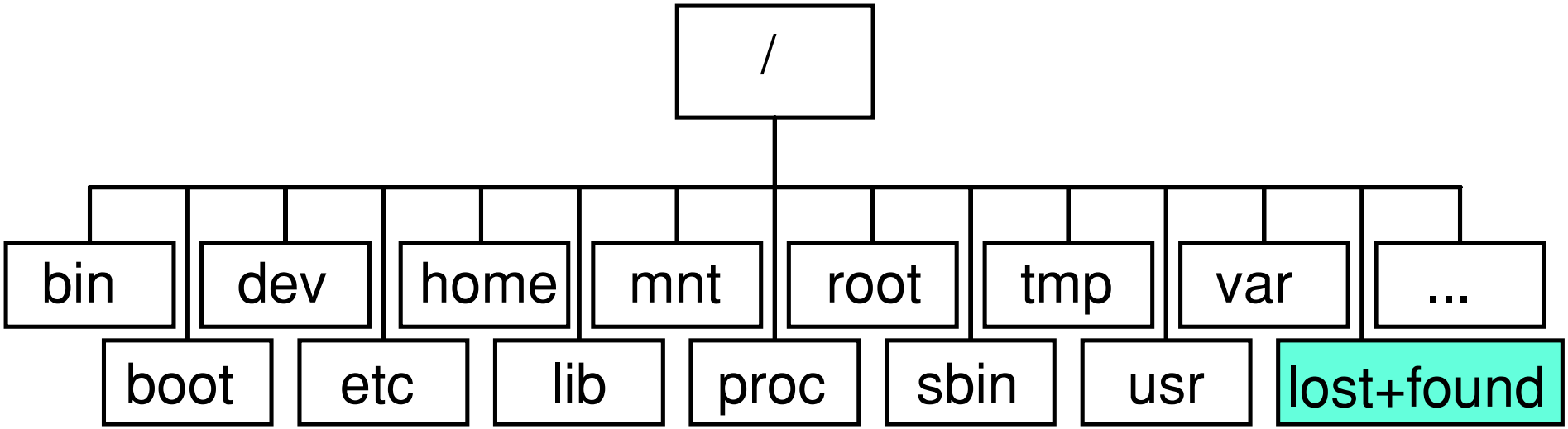
- UNIX System Resources
- Contains all programs, libraries and so on which are not essential for system boot and emergency operations
- Can be a separate filesystem
  - Can be mounted over NFS
  - Can be read-only
- /usr/local intended for programs not in the distribution
  - May be a separate filesystem too

/var



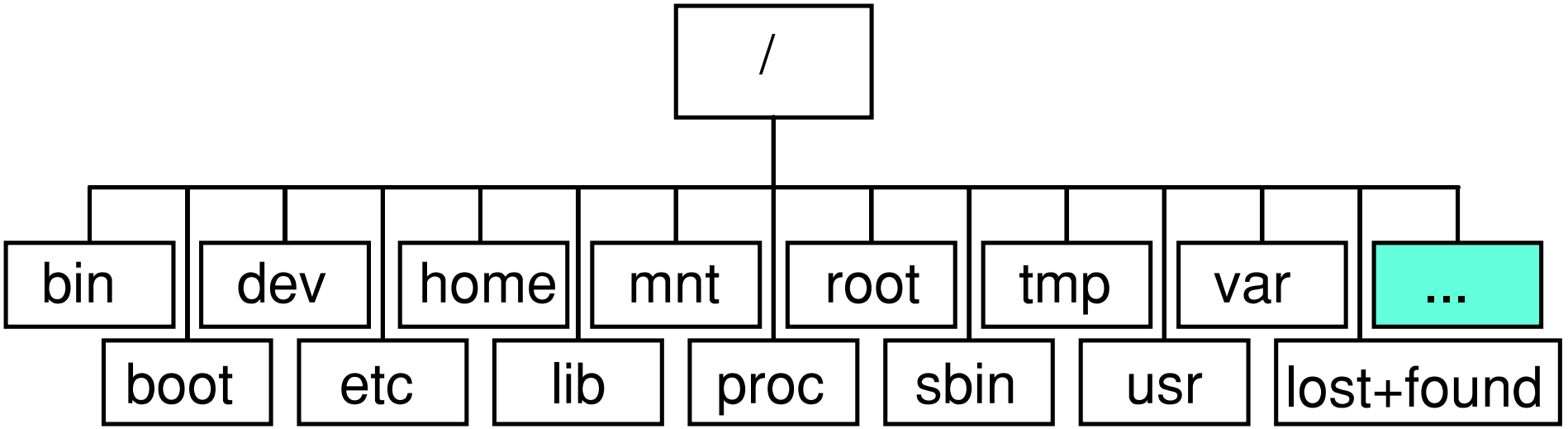
- Files of variable size
  - logfiles
  - lockfiles
- Directories with variable content
  - mail
  - scheduling
  - printing
- Temporary storage space, longer than /tmp
- Can be a separate filesystem

/lost+found



- Exists in every filesystem
- Place where lost+found files are stored after a crash recovery by fsck.

Other directories in /



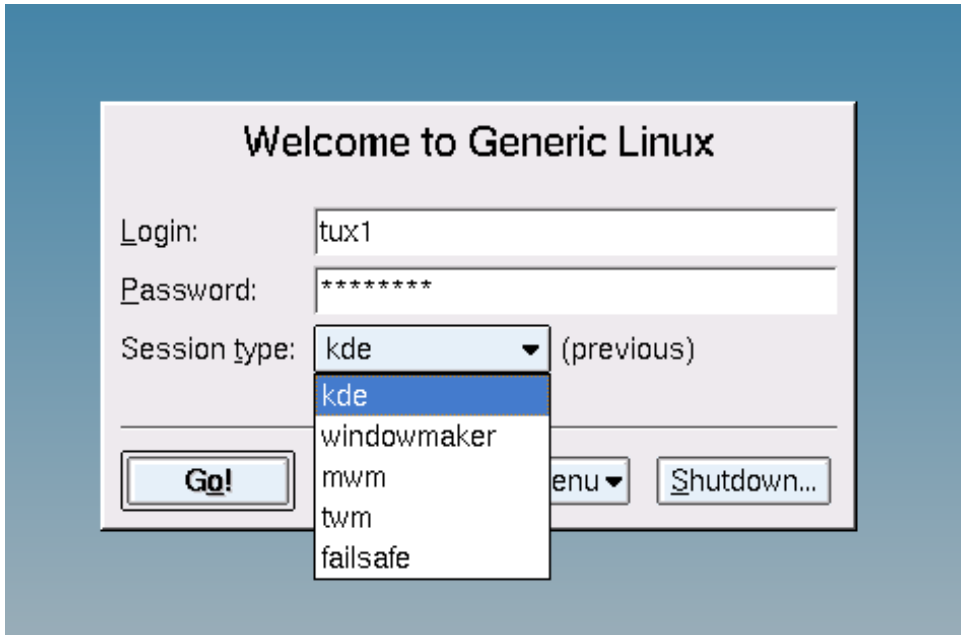
- /opt: used for some software from external providers
  - Separate filesystem advisable
- Whatever you create yourself.

Desktop Environments

- A Desktop Environment is:
  - A set of tools, libraries and standards that allows development of X clients
  - A set of X clients (including one or more window managers) that are developed with these tools, libraries and standards
- Examples:
  - GNOME (GNU Network Object Model Environment)
  - KDE (K Desktop Environment)
  - ...
- Advantages of Desktop Environments
  - Integration (cut & paste via clipboard, drag & drop)
  - Common look (themes)

Choosing your Desktop Environment

- Most distributions provide multiple desktop environments
- To choose between them, select from the Login prompt
- Every user can have his/her own preference



The K Desktop Environment (KDE)

The GNOME Desktop Environment

The man Command

- With the **man** command you can read the manual page of commands.
- Manual pages are stored in /usr/share/man
- The manual page consists of:

Name	The name of the command and a one-line description
Synopsis	The syntax of the command
Description	Explanation of how the command works and what it does
Files	The files used by the command
Bugs	Known bugs and errors
See also	Other commands related to this one

man Example

```
$ man finger
Formatting page, please wait...
NAME
   finger - user information lookup program

SYNOPSIS
   finger [-lmsp] [user ...] [user@host]

DESCRIPTION
   The finger command displays information
   about the system users.

   Options are:
   -s Finger displays the user's login name,
:
```

man Sections

- Manual pages are divided in 9 sections:
  1. **User commands**
  2. **System calls**
  3. **Libc calls**
  4. **Devices**
  5. **File formats and protocols**
  6. **Games**
  7. **Conventions, macro packages and so forth**
  8. **System administration**
  9. **Kernel**
- Certain subjects appear in multiple sections
- To select correct section, add section number:
  man 1 passwd (about the **passwd** command)
  man 5 passwd (about the **passwd** file)

The info Command

- Sometimes a replacement for manual pages
- Widely used by the GNU project
- Information for info is stored in **/usr/share/info**
- Some **info** commands:

```
space      next screen of text
delete        previous screen of text

n             next node
p             previous node

q             quit info
```

info Example

```
# info pwd
```

```
File: coreutils.info, Node: pwd invocation, Next: stty invocation, Up: \
Working context

`pwd': Print working directory
==============================

    `pwd' prints the fully resolved name of the current directory. That
is, all components of the printed name will be the actual directory
names--none will be symbolic links

    Because most shells have a built-in command by the same name, using
the unadorned command name in a script or interactively may get you
different functionality than that described here.

    The only options are a lone `--help' or `--version'.  *Note Common
options::.


--zz-Info: (coreutils.info.gz)pwd invocation, 17 lines --All------------
Welcome to Info version 4.2. Type C-h for help, m for menu item.
```

The --help Option

- Another way of getting help about a command
- Help is built in the command itself (if supported)

```
$ who --help
Usage: who [OPTION]... [ FILE | ARG1 ARG2 ]

 -h, --heading  print line of column headings
 -m             only hostname and user
                associated with stdin
 -q, --count    all login names and number of
                users logged in
     --help     display this help and exit
     --version  output version information and exit
```

HOWTO Documents

- Documents which describe in detail a certain aspect of configuring or using Linux.
- Detailed information about how to perform a given task
  - Install PCMCIA support
  - Kernel compilation
  - Dual boot with other operating systems
- HOWTO documents are text files in **/usr/share/doc/HOWTO**
  - Need to be installed manually
- On the Internet:
  `http://www.tldp.org/index.html`

HOWTO Example

```
$ less /usr/share/doc/HOWTO/XFree86-HOWTO
The Linux XFree86 HOWTO
by Eric S. Raymond
v5.8, 16 August 1998

This document describes how to obtain, install, and
configure
version 3.3 of the XFree86 version of the X Windows System
(X11R6) for Linux systems. It is a step-by-step guide to
configuring XFree86 on your system.

Table of Contents
/usr/share/doc/HOWTO/XFree86-HOWTO  lines 1-23/494 2%
```

Internet

- All Linux documentation is available on the Internet.
- For information look at:

```
http://www.tldp.org
http://www.linux.org
http://www.redhat.com
http://www.suse.com
http://www.xfree86.org
http://www.kernel.org
http://lwn.net
http://www.ugu.com
and many more
```

- Usenet news:

```
comp.os.linux.*
Country-specific groups
```

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