Introduction to Unix: Fundamental Commands

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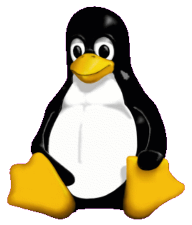
Based on slides from Turgut Yilmaz – Istanbul Teknik University

What We Will Learn

- The fundamental commands of the Unix operating system.
- Everything here is also applicable to the **Linux operating system**.



• What Is UNIX?

- UNIX is a computer operating system, a control program that works with users to
  - run programs,
  - manage resources, and
  - communicate with other computer systems.
- Several people can use a UNIX computer at the same time; hence UNIX is called a multiuser system. Any of these users can also run multiple programs at the same time; hence UNIX is called multitasking.

Shell Commands of UNIX

Unix Commands

- When you first log into a unix system, you are presented with something that looks like the following:

```
/home/ricky#        meander:>
```

- That "something" is called a **prompt.** As its name would suggest, it is prompting you to enter a command.
- Every unix command is a sequence of **letters**, **numbers** and **characters.** But there are no spaces.

- Unix is also case-sensitive. This means that *cat* and *Cat* are different commands.

- The prompt is displayed by a special program called the **shell**.

- **Shells accept** commands, and **run** those commands.

- They can also be programmed in their own language. These programs are called "**shell scripts**". Shell scripts are extremely powerful, but beyond the scope of this introduction.

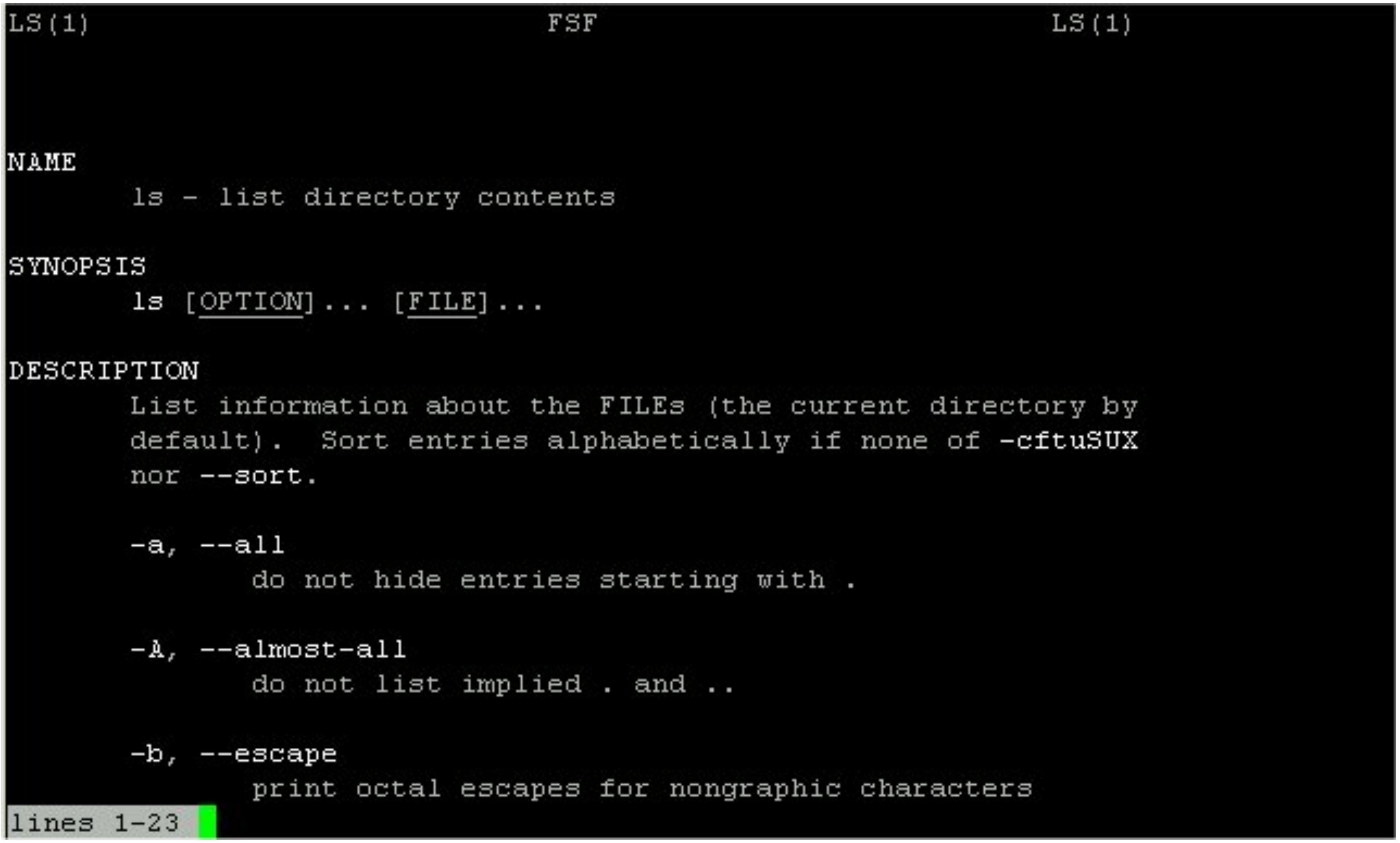
- When you first login, the prompt is displayed by bash, and you are running your first unix program, the bash shell.
- As long as you are logged in, the *bash shell* will constantly be running.
- Other shells are available, including csh, tcsh, and ksh.

Unix Commands

obtaining help

- The man command displays reference pages for the command you specify.
- The UNIX man pages (man is short for manual) cover every command available.
- To search for a man page, enter man followed by the name of the command to find .
- For example:

```
ricky@meander:~>man ls
```



```
LS(1)                          FSF                          LS(1)



NAME
       ls - list directory contents

SYNOPSIS
       ls [OPTION]... [FILE]...

DESCRIPTION
       List information about the FILEs (the current directory by
       default).  Sort entries alphabetically if none of -cftuSUX
       nor --sort.

       -a, --all
              do not hide entries starting with .

       -A, --almost-all
              do not list implied . and ..

       -b, --escape
              print octal escapes for nongraphic characters
lines 1-23
```

To exit
Press "q"

• man (*obtaining help*)

- There is also a keyword function in man.
- For example;
  - If you are interested in any commands that deal with Postscript, the printer control language for Adobe
  - Type **man -k ps** or **man -k Postscript**,

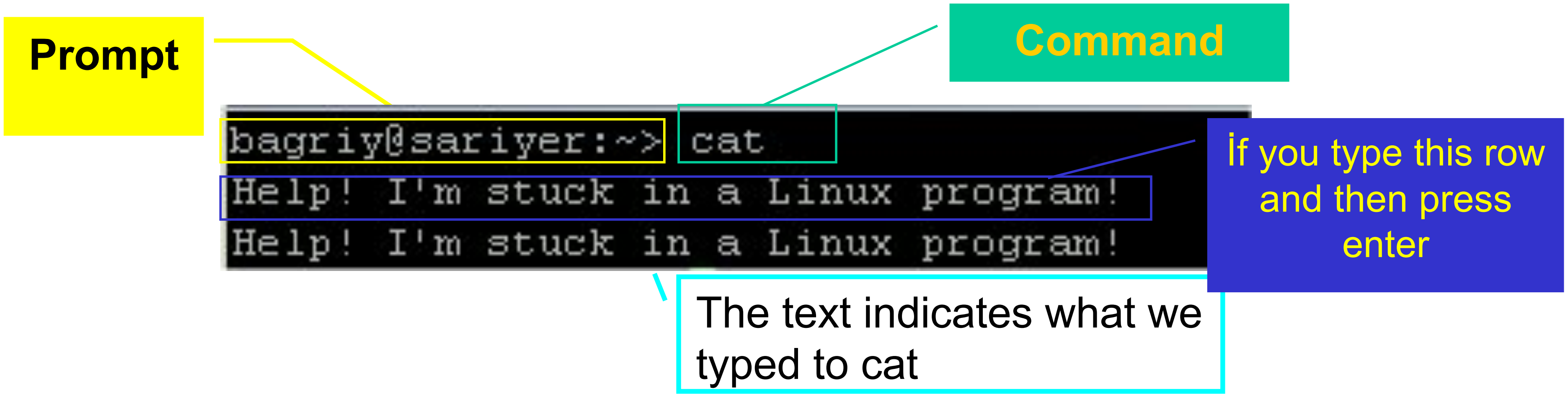
    you'll get a listing of all commands, system calls, and other documented parts of unix that have the word "ps" (or "Postscript") in their name or short description.
- This can be very useful when you're looking for a tool to do something, but you don't know it's name-or if it even exists!

• cat

- cat command is used to concatenate or displays the contents of a file.
- To use it, type cat, and then press enter key:

```
/home/larry#  cat
```

- This produces the correct result and runs the cat program.



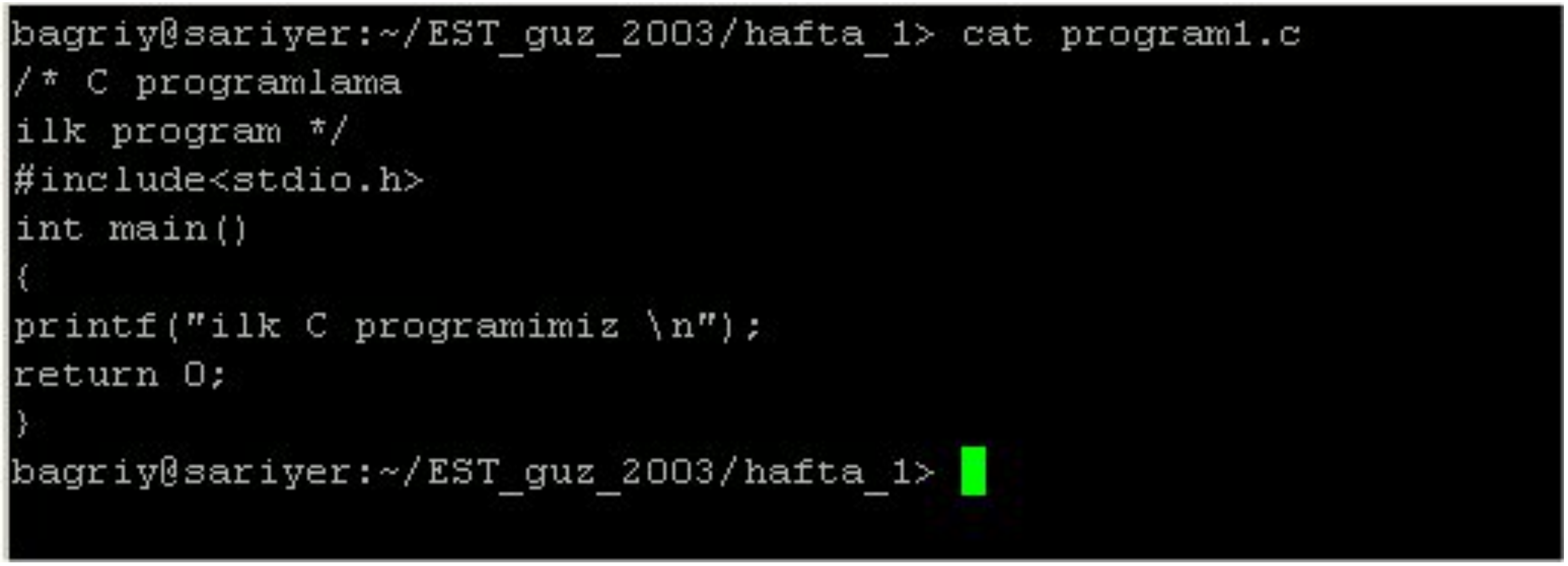
```
bagriy@sariyer:~> cat
Help! I'm stuck in a Linux program!
Help! I'm stuck in a Linux program!
```

Prompt
Command
If you type this row and then press enter
The text indicates what we typed to cat

- To end many unix command, type end-of-file command (EOF) [*hold down the key labeled* "Ctrl" *and press* "d" (**Ctrl+d**)]

- To display the contents of a file, type

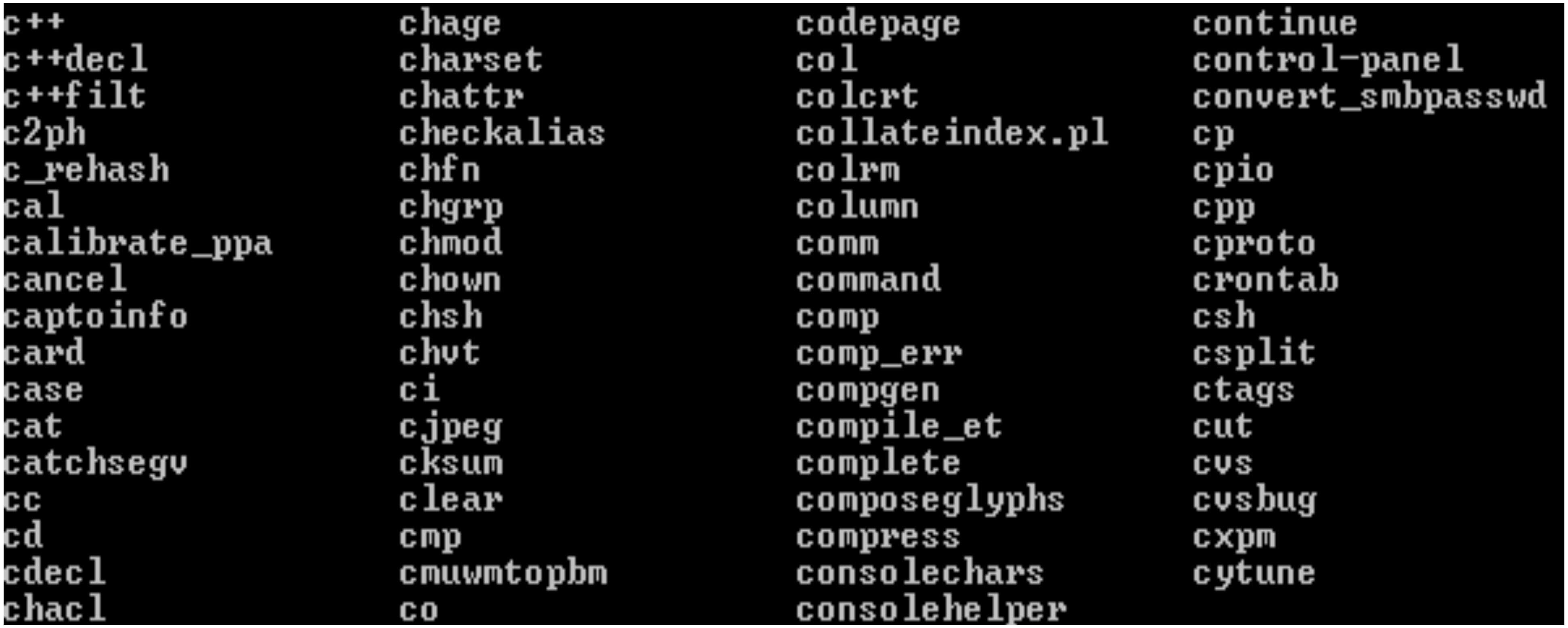
  cat *filename*



```
bagriy@sariyer:~/EST_guz_2003/hafta_1> cat program1.c
/* C programlama
ilk program */
#include<stdio.h>
int main()
{
printf("ilk C programimiz \n");
return 0;
}
bagriy@sariyer:~/EST_guz_2003/hafta_1> 
```

- To see linux commands press **Tab** key,
- If you want to learn commands beginning with c you can write c then press Tab key

/home/larry# c

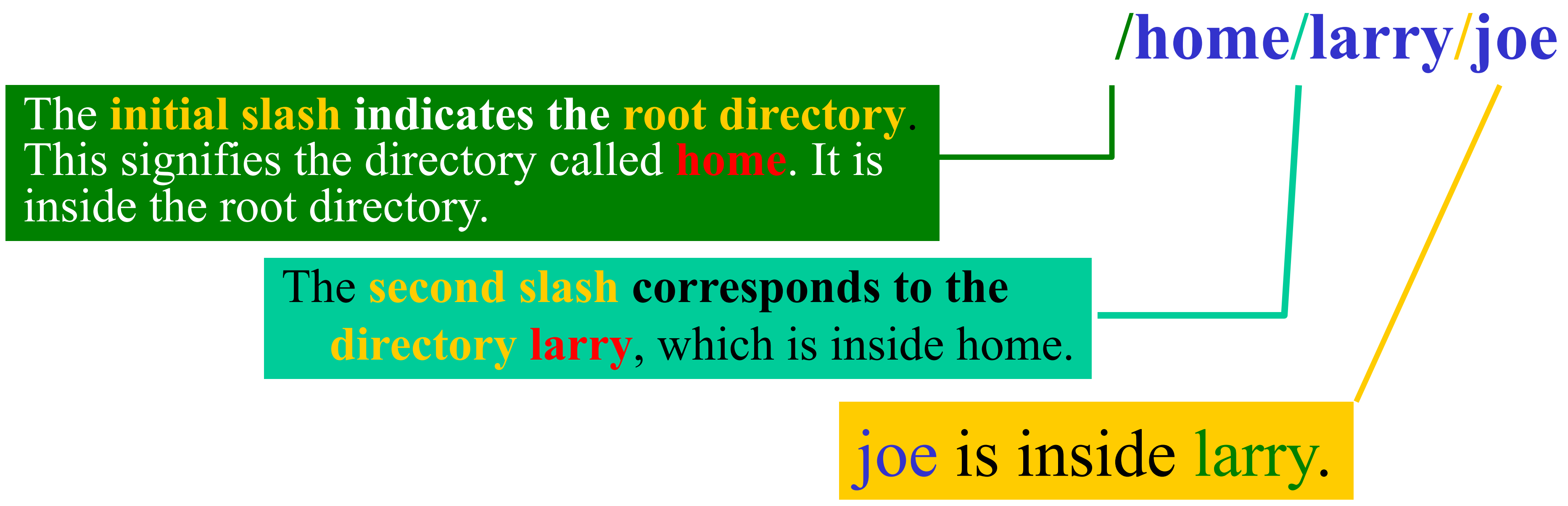


```
c++                 chage               codepage            continue
c++decl             charset             col                 control-panel
c++filt             chattr              colcrt              convert_smbpasswd
c2ph                checkalias          collateindex.pl     cp
c_rehash            chfn                colrm               cpio
cal                 chgrp               column              cpp
calibrate_ppa       chmod               comm                cproto
cancel              chown               command             crontab
captoinfo           chsh                comp                csh
card                chvt                comp_err            csplit
case                ci                  compgen             ctags
cat                 cjpeg               compile_et          cut
catchsegv           cksum               complete            cvs
cc                  clear               composeglyphs       cvsbug
cd                  cmp                 compress            cxpm
cdecl               cmuwmtopbm          consolechars        cytune
chacl               co                  consolehelper
```

• Storing information

- Unix provides files and directories.
- A directory is like a folder: it contains pieces of paper, or files.
- A large folder can even hold other folders-*directories can be inside directories*.
- In unix, the collection of directories and files is called the file system. Initially, the file system consists of one directory, called the “**root**” directory
- Inside the “root” directory, there are more directories, and inside those directories are files and yet more directories.

- Each file and each directory has a name.
- A short name for a file could be **joe**,
- while it's "full name" would be **/home/larry/joe**. The <u>full name</u> is usually called the **path**.
- The path can be divide into a sequence of directories.
- For example, here is how **/home/larry/joe** is read:



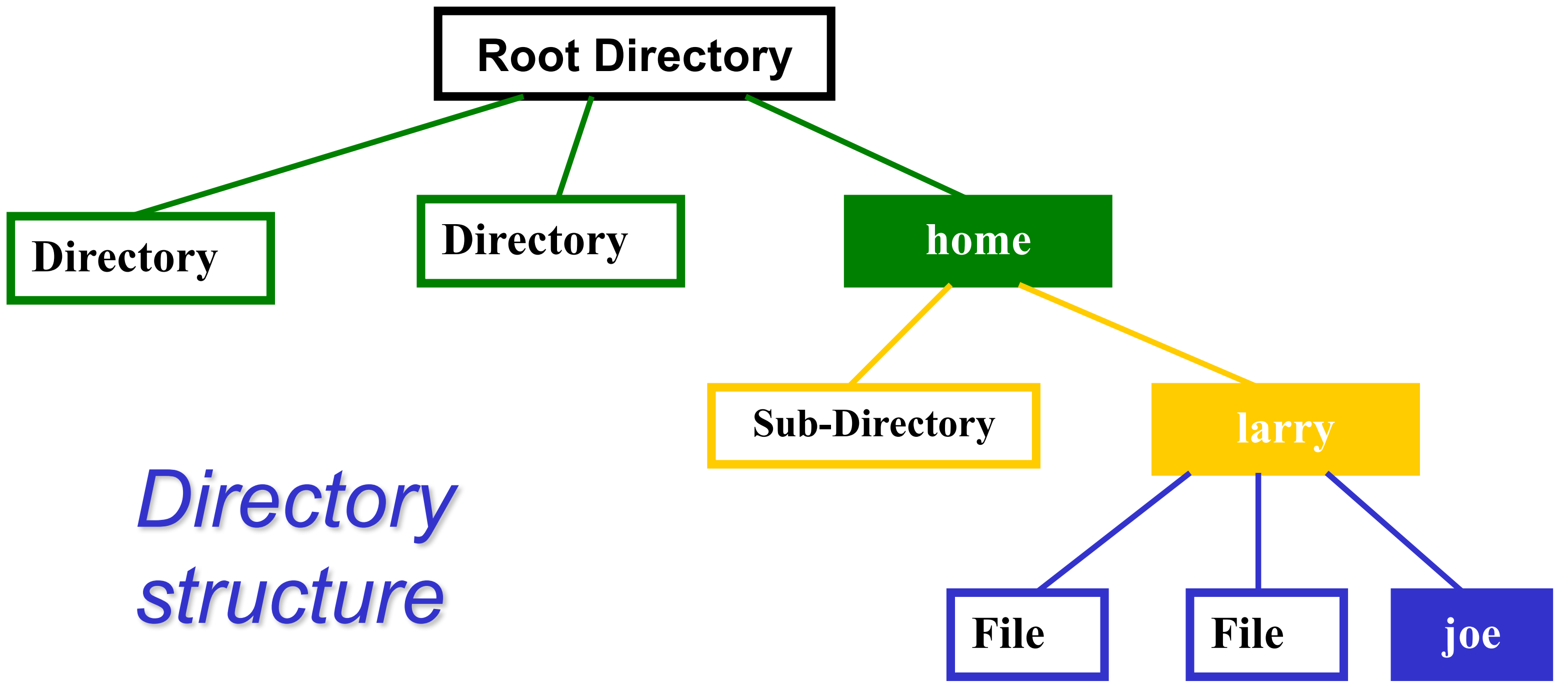
/home/larry/joe

The **initial slash indicates the root directory**. This signifies the directory called **home**. It is inside the root directory.

The **second slash corresponds to the directory larry**, which is inside home.

joe is inside larry.

- A path could refer to either a directory or a filename, so joe could be either.
- All the items before the short name must be directories.

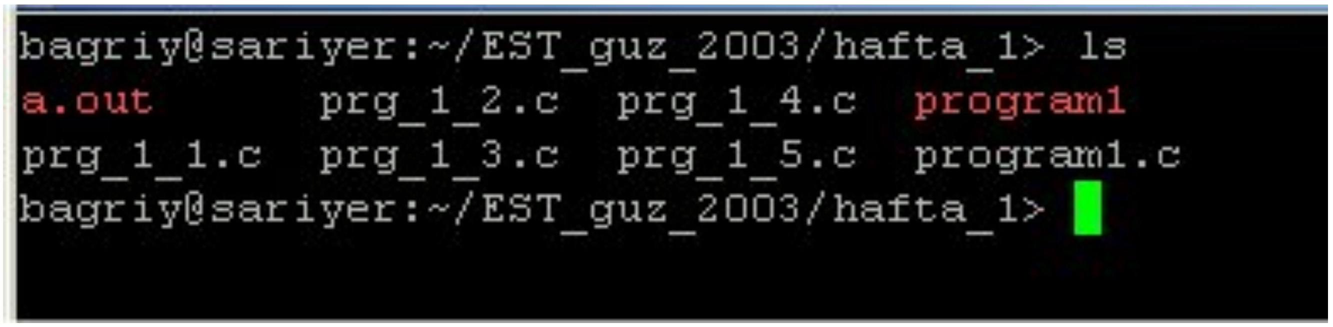


Directory structure

• Looking at directories with ls

• The command ls lists files.

• If you try ls as a command, it will list the files (and directories) contained in the current directory.



```
bagriy@sariyer:~/EST_guz_2003/hafta_1> ls
a.out       prg_1_2.c  prg_1_4.c  program1
prg_1_1.c   prg_1_3.c  prg_1_5.c  program1.c
bagriy@sariyer:~/EST_guz_2003/hafta_1>
```

If you have files, ls lists the names of files in the directory

- If you want a list of files of a more active directory, try the root directory.

```
/home/larry# ls /
   bin   etc      install  mnt   root user var
   dev  home  lib       proc  tmp  usr   vmlinux
```

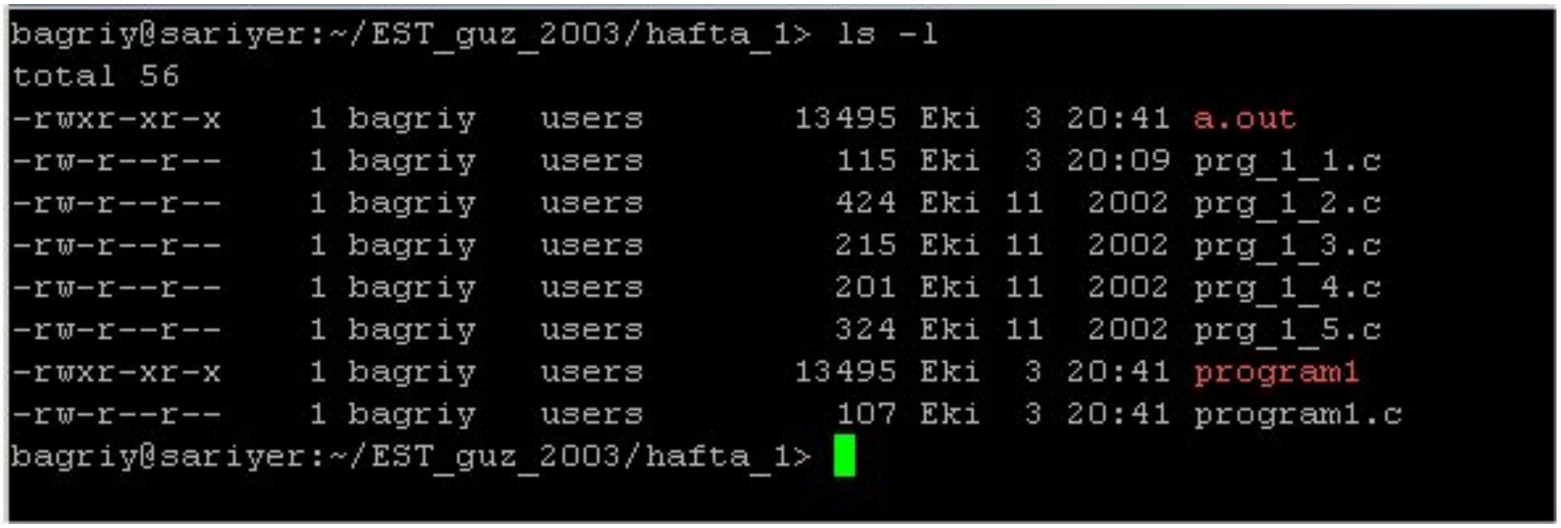
"/" is a parameter saying what directory you want a list for. In this case, it is the top level directory "/"

Some commands have special parameters called options or switches. To see this try:

```
/home/larry# ls –F /
   bin    etc/      install/ mnt/   root/  user/ var/
   dev/  home/  lib/       proc/  tmp/  usr/   vmlinux/
```

The **-F is an option**. It displays file types.

- An option is a special kind of parameter that starts with a **dash** "-"
- An option modifies how the program **runs**, but not what the program runs on.
- For **ls**, **-F** is an **option** that lets you see which things are **directories**, which ones are special **files**, which are **programs**, and which are normal files.
- Anything with a trailing **slash "/"** is a **directory**.
- ls -l file* displays files starting with "file"
- ls –l displays all details



```
bagriy@sariyer:~/EST_guz_2003/hafta_1> ls -l
total 56
-rwxr-xr-x    1 bagriy   users       13495 Eki  3 20:41 a.out
-rw-r--r--    1 bagriy   users         115 Eki  3 20:09 prg_1_1.c
-rw-r--r--    1 bagriy   users         424 Eki 11  2002 prg_1_2.c
-rw-r--r--    1 bagriy   users         215 Eki 11  2002 prg_1_3.c
-rw-r--r--    1 bagriy   users         201 Eki 11  2002 prg_1_4.c
-rw-r--r--    1 bagriy   users         324 Eki 11  2002 prg_1_5.c
-rwxr-xr-x    1 bagriy   users       13495 Eki  3 20:41 program1
-rw-r--r--    1 bagriy   users         107 Eki  3 20:41 program1.c
bagriy@sariyer:~/EST_guz_2003/hafta_1> 
```

- Many unix commands are like ls.
- They have **options**, which are generally one character after a dash, and they have **parameters**.
- Unlike ls, some commands *require* certain parameters and/or options. You have to learn these commands.

pwd

- **pwd** (**p**resent **w**orking **d**irectory) tells you your current directory.
  - *Most commands act, by default, on the current directory. For instance, ls without any parameters displays the contents of the current directory.*

cd

- **cd** is used to **c**hange **d**irectories.
- The format of this command :

  cd new-directory (where new-directory is the name of the new directory you want).

- For instance, try:

```
/home/larry#  cd /home

/home#
```

- If you **omit the optional parameter** *directory*, you're **returned to your home**, or original directory (the same as typing cd ~). Otherwise, cd will change you to the specified directory.

- There are two directories used only for relative pathnames:
  - The directory "." refers to the current directory
  - The directory ".." refers to the parent directory of the current directory
- The directory ".." is most useful moving back up a directory:

```
cd ..
```

- The command "**cd –**" will return you to the most recent directory visited.

- mkdir

mkdir (**ma**ke **dir**ectory) is used to create a new directory,

- It can take more than one parameter, interpreting each parameter as another directory to create.
- By default, it will create the new directory as a subdirectory of the current directory

- rmdir

rmdir (**re**move **dir**ectory) is used to remove a directory,

- rmdir will refuse to remove a non-existant directory, as well as a **directory that has anything in it**.

Moving Information

- The primary commands for manipulating files under unix are cp, mv, and rm. They stand for **co**py, **m**o**v**e, and **re**move, respectively.

cp

- cp is used to copy contents of file1 to file2

  cp file1 file2 (*contents of file1 is copied to file2 in the same directory*)

  cp folder1/file1 folder2 (*contents of file1 is copied to file1 in the inside of folder2 directory*)

rm

- rm is used to remove a file.
  - `rm` *`filename`* `--->` removes a file named *filename*

mv

- mv is used to move a file.
  - `mv` *`filename /path/newname`* `--->` moves a file named *filename* to a new location, with a new name
- looks like cp, except that it deletes the original file after copying it.
- mv will rename a file if the second parameter is a file. If the second parameter is a directory, mv will move the file to the new directory, keeping it's shortname the same.

• Some Other UNIX Commands

• The Power of Unix

- The power of unix is hidden in small commands that don’t seem too useful when used alone, but when combined with other commands produce a system that’s much more powerful, and flexible than most other operating systems.
- The commands include sort, grep, more, cat, wc, spell, diff, head, and tail.

Operating on Files

- In addition to the commands like cd, mv, and rm, you learned in shell section, there are other commands that just operate on files, but not the data in them.

- These include touch, chmod, du, and df.
- All of these commands don’t care what is in the file.

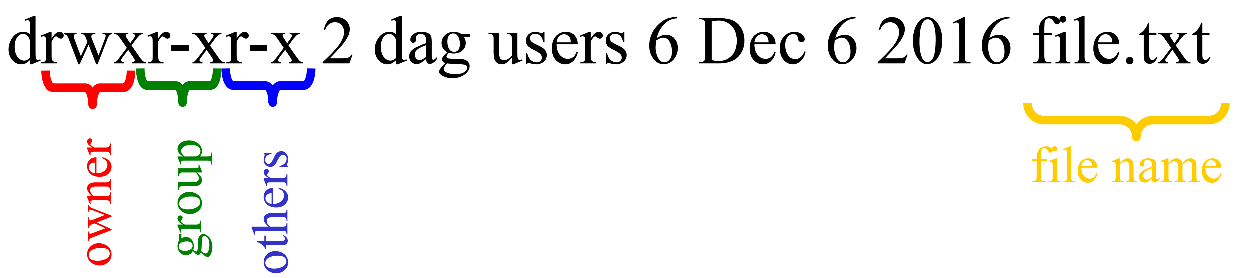
Some of the things these commands manipulate:

- The time stamp: Each file has three dates associated with it. These are creation time, last modification time and last access time.

- The owner: the owner of files

- The group: the group of users

- The permissions: read, write, execute permissions of files. The permissions tell unix who can access what file, or change it, or, in the case of programs, execute it. Each of these permissions can be toggled separately for the owner, the group, and all the other users.



```
drwxr-xr-x 2 dag users 6 Dec 6 2016 file.txt
```

read, write, execute permissions of files

- touch

- touch will update the time stamps of the files listed on the command line to the current time.
- If a file doesn’t exist, touch will create it.

chmod

- chmod (**ch**ange **mod**e) is used to change the permissions on a file.

```
                  (owner)  (group)  (others)
chmod [number][number][number] file1
```

Number = (read)4 + (write)2 + (execute)1

- Example: chmod 754 file1

  for owner: *read*, *write* and *execute* permissions (4+2+1)

  for group: *read* and *execute* permissions (4+0+1)

  for others: only *read* permission (4+0+0)

chmod

- chmod can also be set in alpha mode (non-octal)

(owner) (group) (others)

chmod [**u**ser/**g**roup/**o**thers/**a**ll]operator[permission] [file(s)]

operator can be +, -, or =

- Example: chmod u+rwx,g+rx,o+r file1

<u>for owner</u>: *read*, *write* and *execute* permissions (u+rwx)

<u>for group</u>: *read* and *execute* permissions (g+rx)

<u>for others</u>: only *read* permission (o+r)

System Statistics

- Commands in this section will display statistics about the operating system, or a part of the operating system.

du

du (**d**isk **u**sage) will count the amount of disk space for a given directory, and all its subdirectories take up on the disk.

df

df (**d**isk **f**illing) summarizes the amount of disk space in use. For each file system, it shows the total amount of disk space, the amount used, the amount available, and the total capacity of the file system that's used.

What's in the File?

- There are two major commands used in unix for listing files, cat, and more.

cat

- **cat** shows the contents of the file.

```
cat [-nA] [file1 file2 . . . fileN]
```

- cat is not a user friendly command-it doesn't wait for you to read the file, and is mostly used in conjuction with pipes.
- However, cat does have some useful command-line options. For instance, n will number all the lines in the file, and A will show control characters.

• more

- more is much more useful, and is the command that you’ll want to use when browsing ASCII text files

  more [-l] [+*linenumber*}] [*file1 file2 ... fileN*]

- The only interesting option is l, which will tell more that you aren't interested in treating the character Ctrl-L} as a ``new page'' character. more will start on a specified linenumber.

• head

head will display the first ten lines in the listed files.

head [- *lines*}] [l *file1 file2 ... fileN*]

- Any numeric option will be taken as the number of lines to print, so head -15 frog will print the first fifteen lines of the file frog

- tail

  - Like head, tail display only a fraction of the file.
  - tail also accepts an option specifying the number of lines.

    tail [-*lines*] [1 *file1 file2 … fileN*]

- file

  - file command attempts to identify what format a particular file is written in.

    file [*file1 file2 … fileN*]

  - Since not all files have extentions or other easy to identify marks, the file command performs some rudimentary checks to try and figure out exactly what it contains.

Information Commands

- The commands that will alter a file, perform a certain operation on the file, or display statistics on the file.

grep

- grep is the **g**eneralized **r**egular **e**xpression **p**arser.
- This is a fancy name for a utility which can only search a text file.

grep [-nvwx] [-number] { *expression*} [*file1 file2 … fileN*]

• wc

• wc (**w**ord **c**ount) simply counts the number of words, lines, and characters in the file(s).

```
wc [-clw] [file1 file2 ... fileN]
```

• The three parameters, clw, stand for **c**haracter, **l**ine, and **w**ord respectively, and tell wc which of the three to count.

• spell

- spell is very simple unix spelling program, usually for American English. spell is a filter, like most of the other programs we've talked about.

```
spell [file1 file2 ... fileN]
```

• diff

- The GNU version of diff has over twenty command line options. It shows you what the differences are between two files
- diff *file1 file2*

```
gzip [-v#] [file1 file2 ... fileN]
gunzip [-v] [file1 file2 ... fileN]
zcat [{file1 file2 ... fileN]
```

• These three programs are used to compress and decompress data.

• gzip, or GNU Zip, is the program that reads in the original file(s) and outputs files that are compressed, and therefore smaller.

• gzip deletes the files specified on the command line and replaces them with files that have an identical name except that they have ".gz" appended to them.

More help

- Lynda.com course:
  - “UNIX for Mac OS X Users” (most applies to all flavors of UNIX)
  - Be sure to access it using via the Library’s Research Portal to take advantage of the UVa subscription: http://www.library.virginia.edu/research/
  - Then click on Lynda.com link
- Lots of online resources
  - http://www.doc.ic.ac.uk/~wjk/UnixIntro/