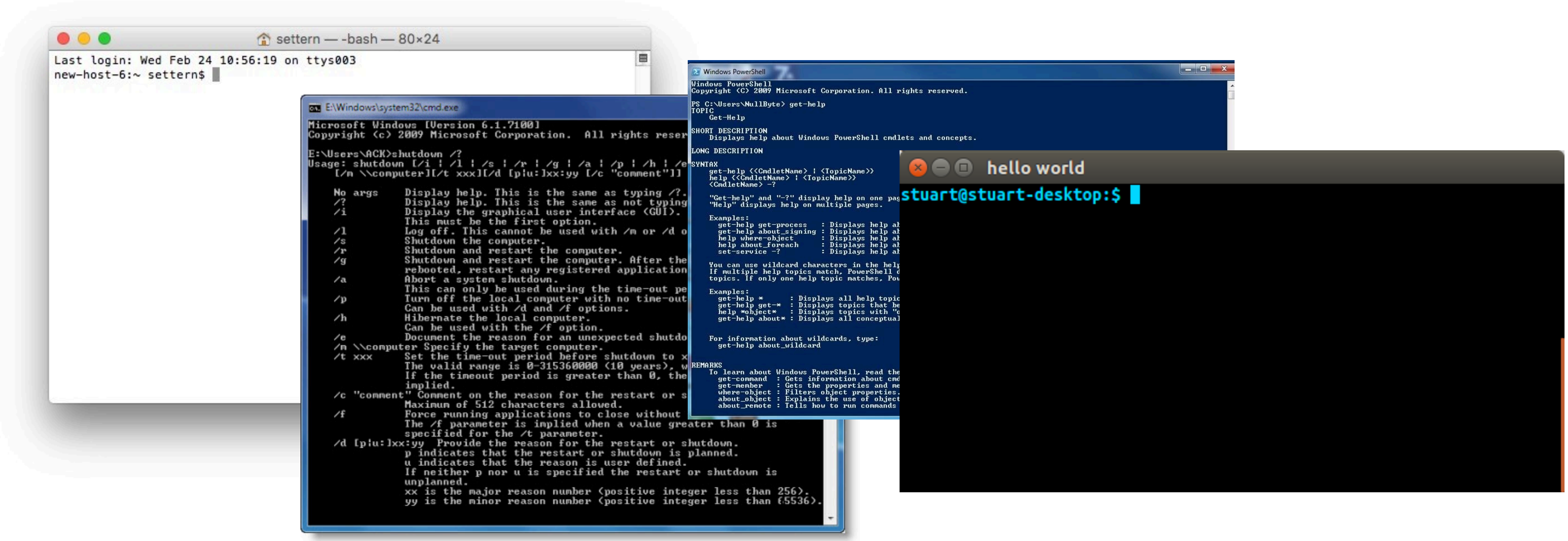
[220 / 319] The Terminal

Meena Syamkumar
Andy Kuemmel



```
Last login: Wed Feb 24 10:56:19 on ttys003
new-host-6:~ settern$
```

```
Microsoft Windows [Version 6.1.7100]
Copyright (c) 2009 Microsoft Corporation.  All rights reser

E:\Users\ACK>shutdown /?
Usage: shutdown [/i | /l | /s | /r | /g | /a | /p | /h | /e
    [/m \\computer][/t xxx][/d [p|u:]xx:yy [/c "comment"]]

    No args    Display help. This is the same as typing /?.
    /?         Display help. This is the same as not typing
    /i         Display the graphical user interface (GUI).
               This must be the first option.
    /l         Log off. This cannot be used with /m or /d o
    /s         Shutdown the computer.
    /r         Shutdown and restart the computer.
    /g         Shutdown and restart the computer. After the
               rebooted, restart any registered application
    /a         Abort a system shutdown.
               This can only be used during the time-out pe
    /p         Turn off the local computer with no time-out
               Can be used with /d and /f options.
    /h         Hibernate the local computer.
               Can be used with the /f option.
    /e         Document the reason for an unexpected shutdo
    /m \\computer Specify the target computer.
    /t xxx     Set the time-out period before shutdown to x
               The valid range is 0-315360000 (10 years), w
               If the timeout period is greater than 0, the
               implied.
    /c "comment" Comment on the reason for the restart or s
               Maximum of 512 characters allowed.
    /f         Force running applications to close without
               The /f parameter is implied when a value greater than 0 is
               specified for the /t parameter.
    /d [p|u:]xx:yy  Provide the reason for the restart or shutdown.
               p indicates that the restart or shutdown is planned.
               u indicates that the reason is user defined.
               If neither p nor u is specified the restart or shutdown is
               unplanned.
               xx is the major reason number (positive integer less than 256).
               yy is the minor reason number (positive integer less than 65536).
```

```
Windows PowerShell
Copyright (C) 2009 Microsoft Corporation. All rights reserved.

PS C:\Users\NullByte> get-help
TOPIC
    Get-Help

SHORT DESCRIPTION
    Displays help about Windows PowerShell cmdlets and concepts.

LONG DESCRIPTION

SYNTAX
    get-help {<CmdletName> | <TopicName>}
    help {<CmdletName> | <TopicName>}
    <CmdletName> -?

    "Get-help" and "-?" display help on one pag
    "Help" displays help on multiple pages.

    Examples:
      get-help get-process    : Displays help ab
      get-help about_signing : Displays help ab
      help where-object       : Displays help ab
      help about_foreach      : Displays help ab
      set-service -?          : Displays help ab

    You can use wildcard characters in the help
    If multiple help topics match, PowerShell d
    topics. If only one help topic matches, Pow

    Examples:
      get-help *       : Displays all help topic
      get-help get-*   : Displays topics that be
      help *object*    : Displays topics with "o
      get-help about* : Displays all conceptual


    For information about wildcards, type:
      get-help about_wildcard


REMARKS
    To learn about Windows PowerShell, read the
      get-command  : Gets information about cmd
      get-member   : Gets the properties and me
      where-object : Filters object properties.
      about_object : Explains the use of object
      about_remote : Tells how to run commands
```

```
stuart@stuart-desktop:$
```

Today's Topics

Terminal Emulators and Shells

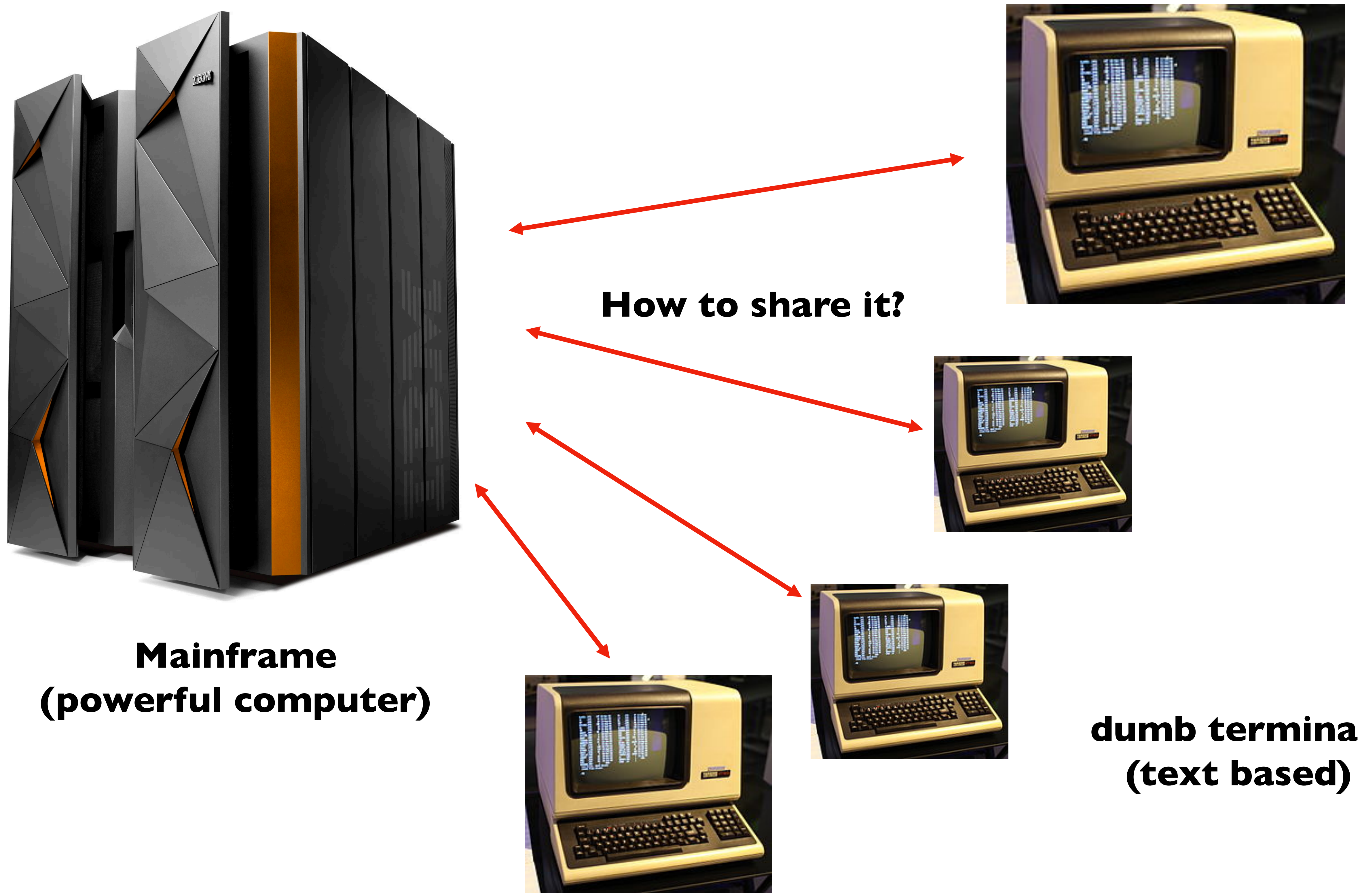
- Terminal history
- Shells
- Running programs from a shell

Navigation

Running Programs and Commands

Demos

History: the original terminals



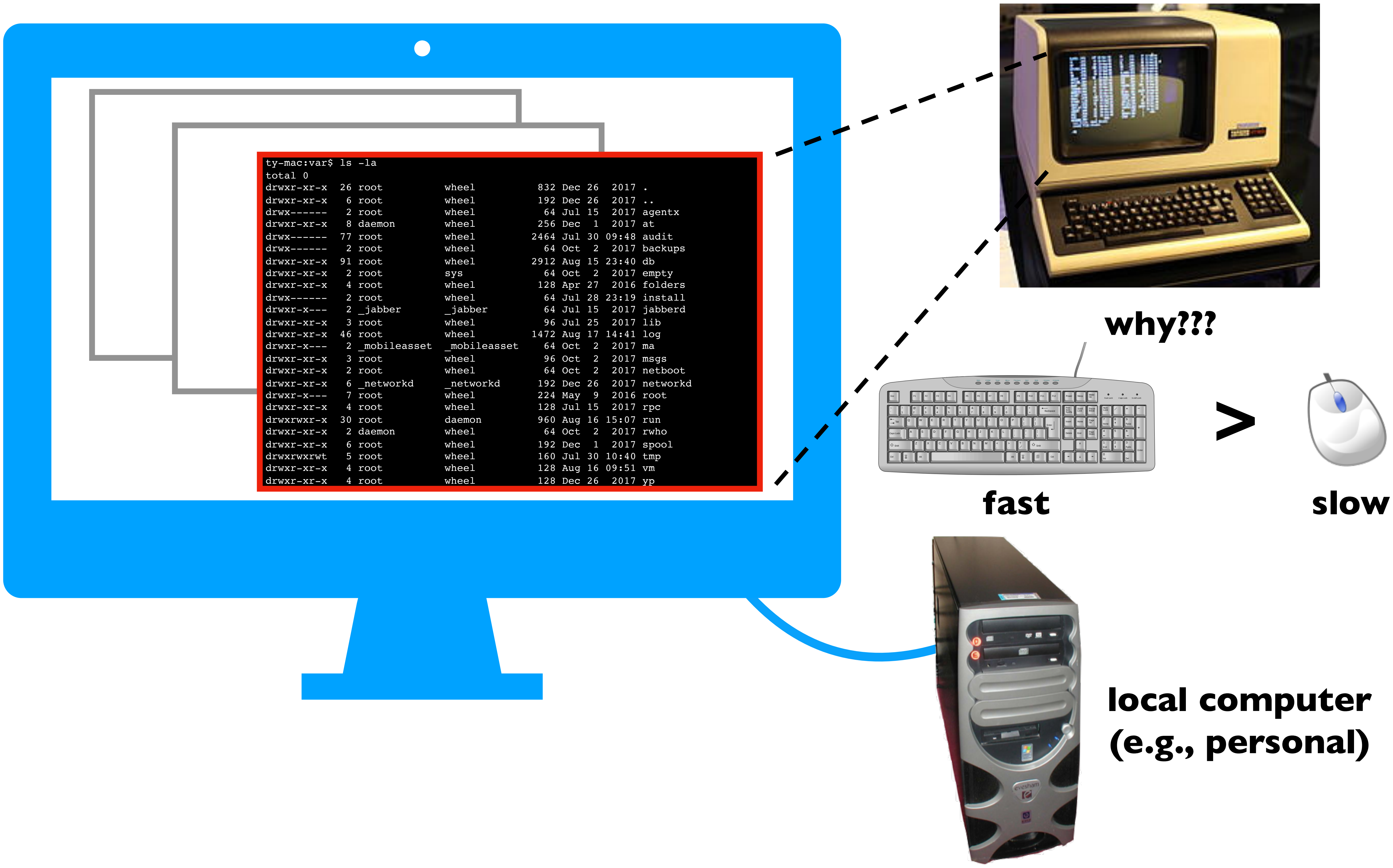
How to share it?

Mainframe
(powerful computer)

dumb terminals
(text based)

https://techcrunch.com/2015/08/16/ibm-teams-with-canonical-on-linux-mainframe/
https://en.wikipedia.org/wiki/Computer_terminal#Dumb_terminals

Terminal emulators



```
ty-mac:var$ ls -la
total 0
drwxr-xr-x  26 root          wheel          832 Dec 26  2017 .
drwxr-xr-x   6 root          wheel          192 Dec 26  2017 ..
drwx------   2 root          wheel           64 Jul 15  2017 agentx
drwxr-xr-x   8 daemon        wheel          256 Dec  1  2017 at
drwx------  77 root          wheel         2464 Jul 30 09:48 audit
drwx------   2 root          wheel           64 Oct  2  2017 backups
drwxr-xr-x  91 root          wheel         2912 Aug 15 23:40 db
drwxr-xr-x   2 root          sys             64 Oct  2  2017 empty
drwxr-xr-x   4 root          wheel          128 Apr 27  2016 folders
drwx------   2 root          wheel           64 Jul 28 23:19 install
drwxr-x---   2 _jabber       _jabber         64 Jul 15  2017 jabberd
drwxr-xr-x   3 root          wheel           96 Jul 25  2017 lib
drwxr-xr-x  46 root          wheel         1472 Aug 17 14:41 log
drwxr-x---   2 _mobileasset  _mobileasset    64 Oct  2  2017 ma
drwxr-xr-x   3 root          wheel           96 Oct  2  2017 msgs
drwxr-xr-x   2 root          wheel           64 Oct  2  2017 netboot
drwxr-xr-x   6 _networkd     _networkd      192 Dec 26  2017 networkd
drwxr-x---   7 root          wheel          224 May  9  2016 root
drwxr-xr-x   4 root          wheel          128 Jul 15  2017 rpc
drwxrwxr-x  30 root          daemon         960 Aug 16 15:07 run
drwxr-xr-x   2 daemon        wheel           64 Oct  2  2017 rwho
drwxr-xr-x   6 root          wheel          192 Dec  1  2017 spool
drwxrwxrwt   5 root          wheel          160 Jul 30 10:40 tmp
drwxr-xr-x   4 root          wheel          128 Aug 16 09:51 vm
drwxr-xr-x   4 root          wheel          128 Dec 26  2017 yp
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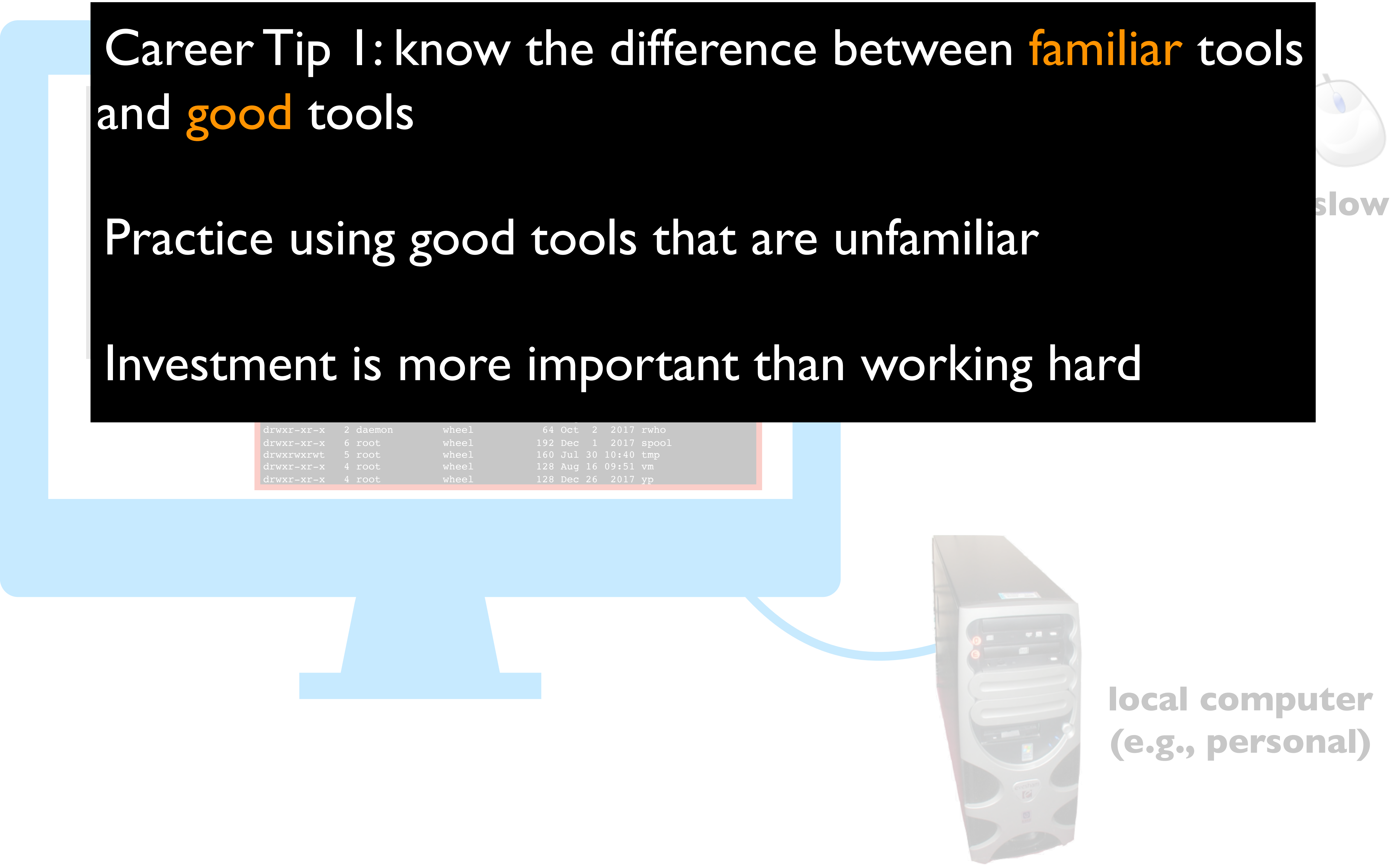
Terminal emulators

Career Tip 1: know the difference between familiar tools and good tools

Practice using good tools that are unfamiliar

Investment is more important than working hard



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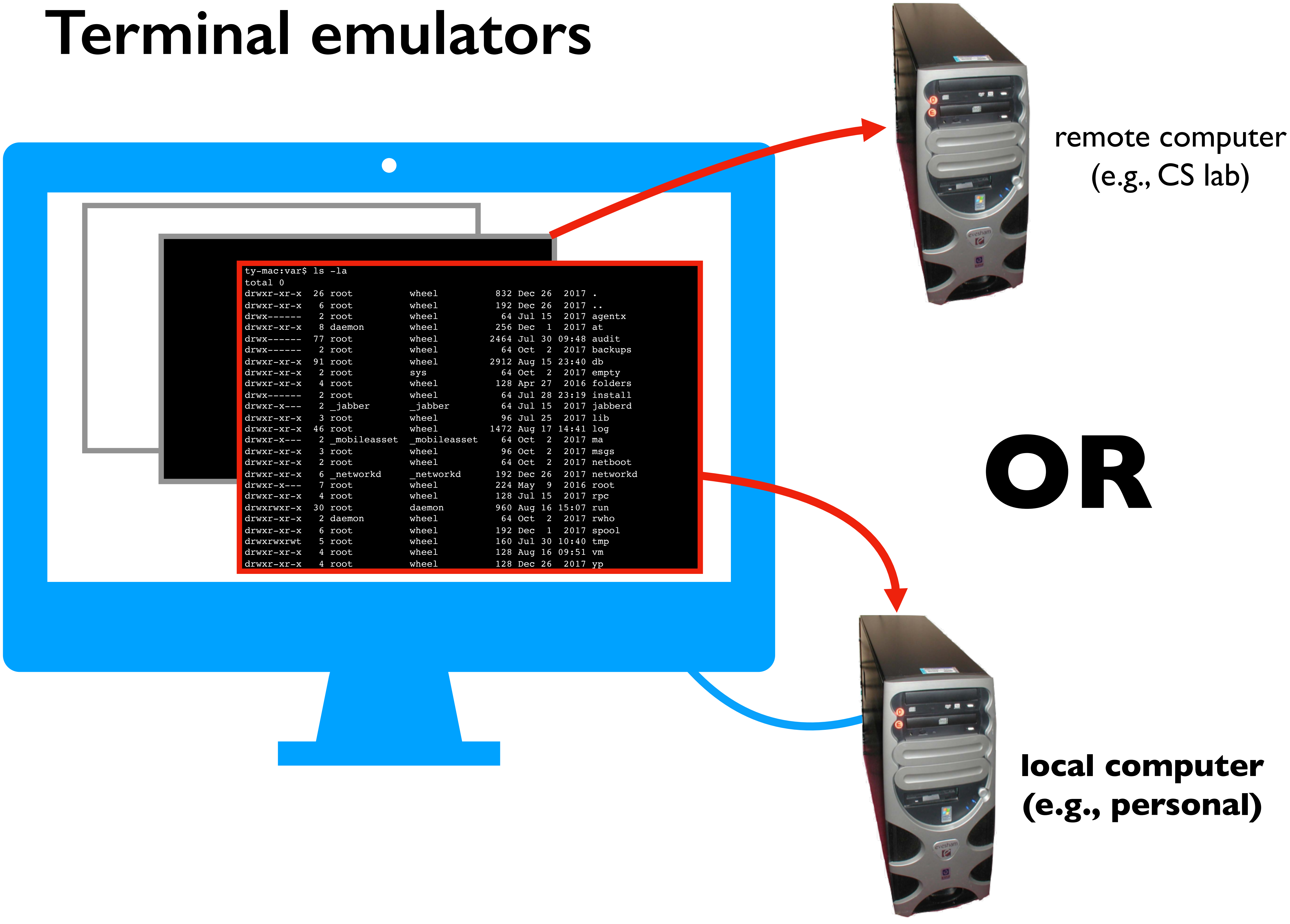
Terminal emulators



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drwxr-xr-x   4 root          wheel          128 Dec 26  2017 yp
```

remote computer
(e.g., CS lab)

OR

local computer
(e.g., personal)

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Terminal emulators

puter
ab)

Career Tip 2: master the tools that let you work from anywhere

Work for the highest-paying place from the most enjoyable place (home? beach?)

https://www.cnn.com/travel/article/australia-best-beaches/index.html

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nal)

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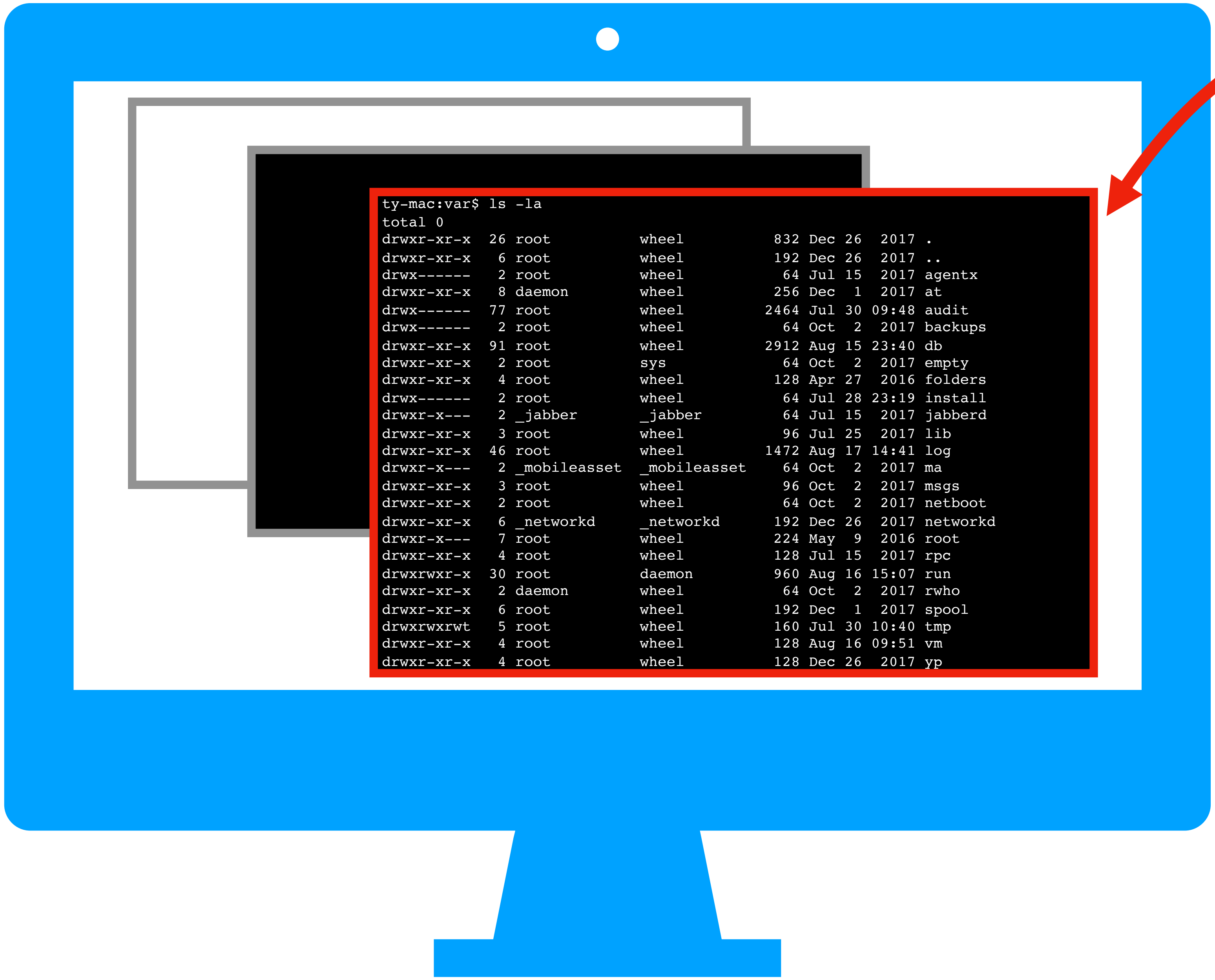
Terminal emulators



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drwxr-xr-x   4 root          wheel          128 Dec 26  2017 yp
```

programming running in the terminal emulator is called a "shell"

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Today's Topics

Terminal Emulators and Shells

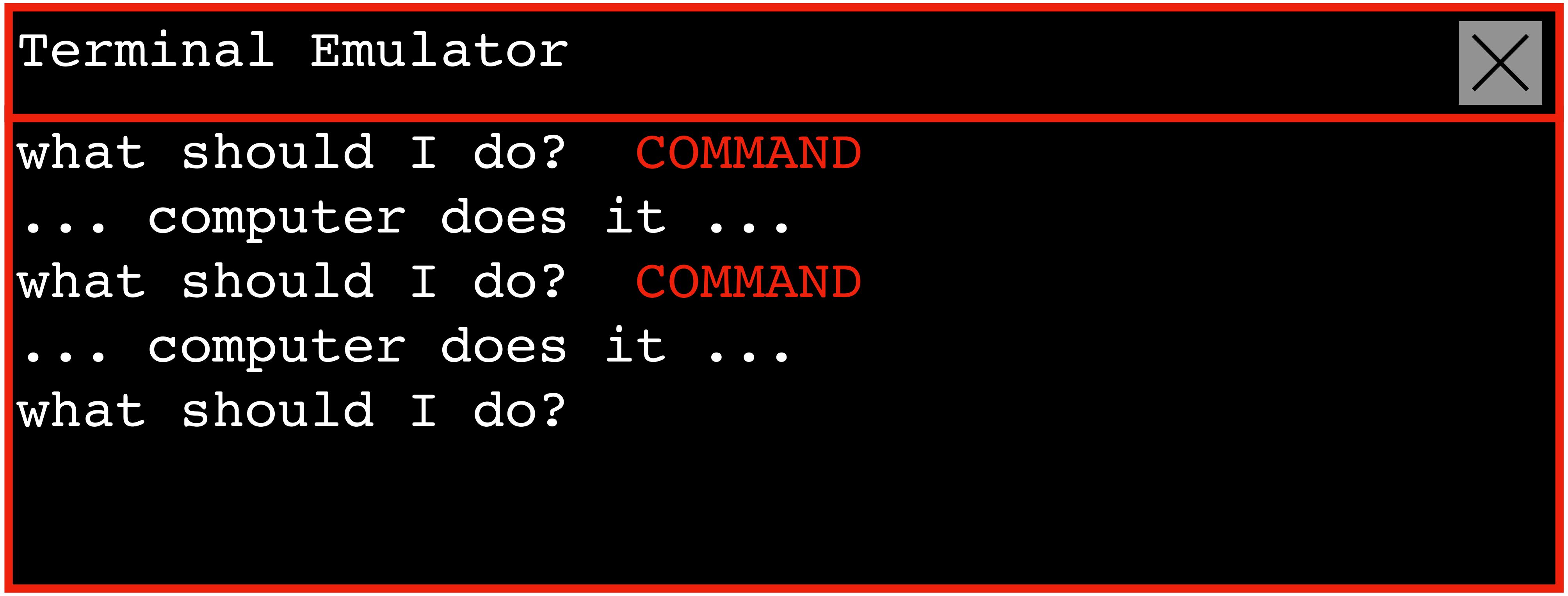
- Terminal history
- Shells
- Running programs from a shell

Navigation

Running Programs and Commands

Demos

Shell: the most helpful program



```
what should I do?  COMMAND
... computer does it ...
what should I do?  COMMAND
... computer does it ...
what should I do?
```

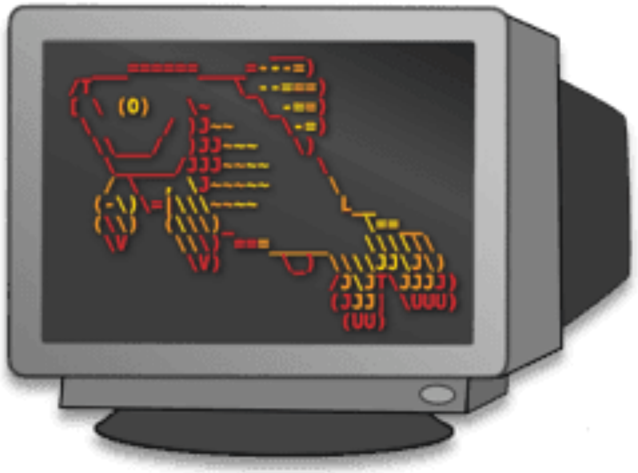
1. **navigate:** dig through ~~folders~~ directories and files
2. **run programs**

You have a few options when it comes to shells...

C:_

cmd

PowerShell



fish

today

>_

KornShell

ksh

zsh

csh

Stephen Bourne

/bin/sh

Bourne Shell

1979

BASH

THE BOURNE-AGAIN SHELL

Today's Topics

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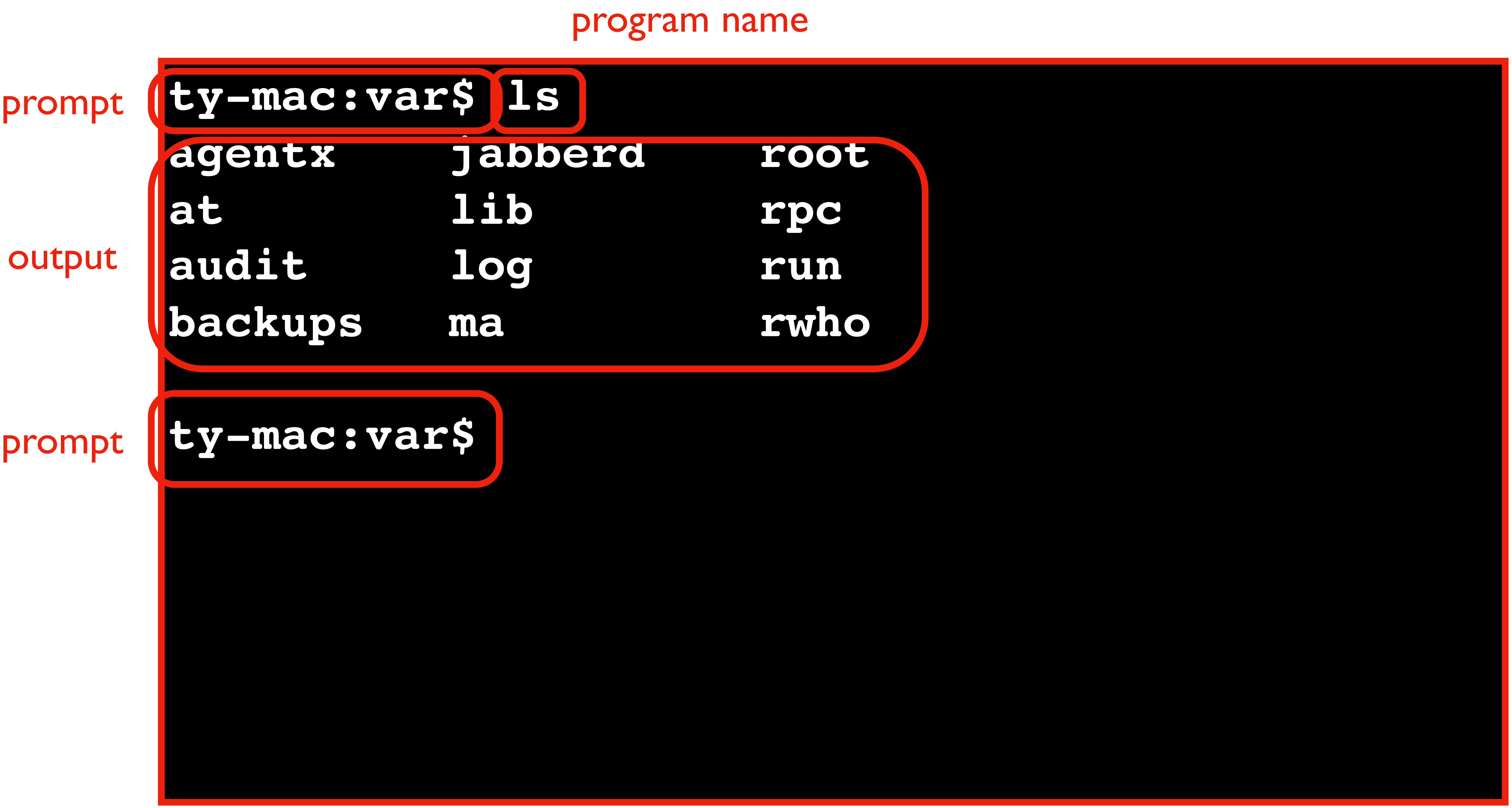
Running Programs

Running programs is easy, just type name of the program and hit enter:



```
ty-mac:var$ ls
agentx      jabberd     root
at          lib         rpc
audit       log         run
backups     ma          rwho

ty-mac:var$
```

a "prompt" is the question, *what should I do?*

Today's Topics

Terminal Emulators and Shells

Navigation

- Storage Drives (Windows)
- Files
- Directories (aka Folders)
- Windows vs. Mac

Running Programs and Commands

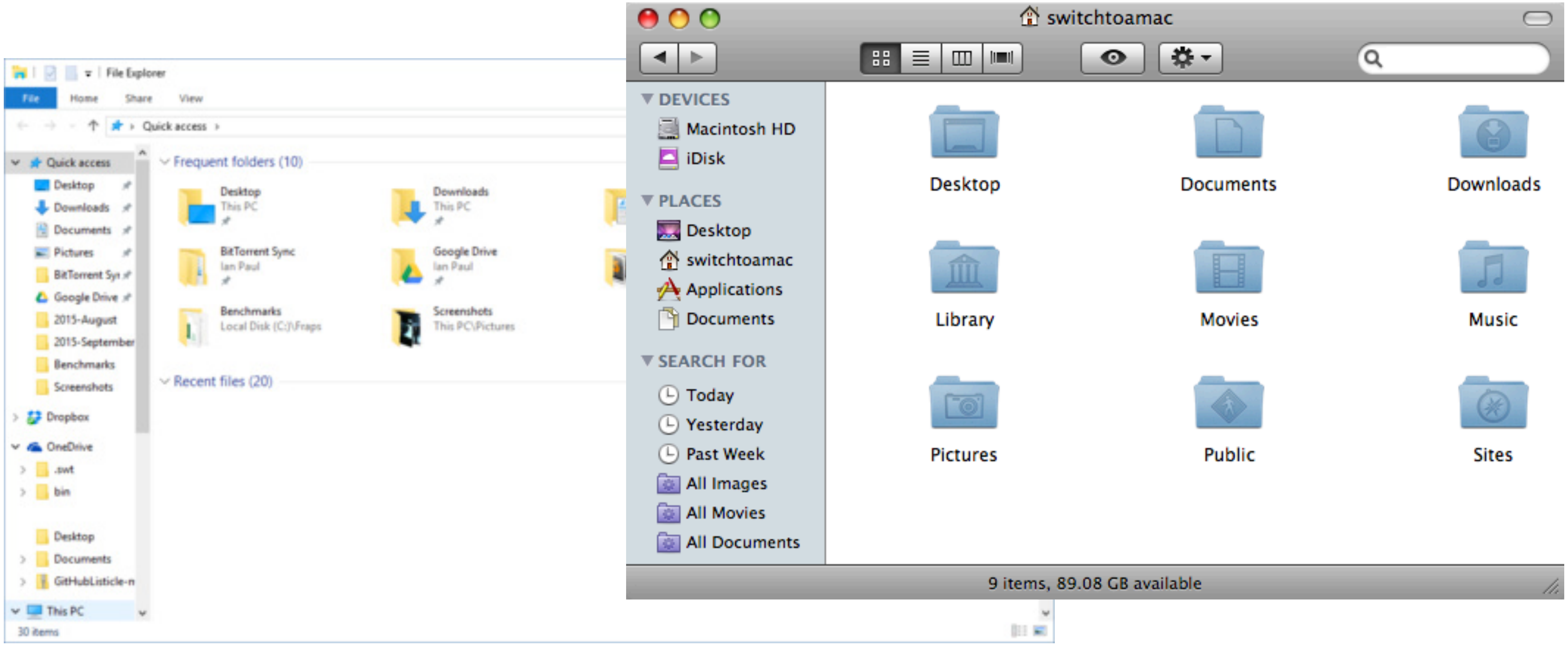
Demos

What is navigation?

Navigation is looking around for files/folders you want

Navigation programs

- File Explorer (Windows)
- Finder (Mac)



What is navigation?

Navigation is looking around for files/folders you want

Navigation programs

- File Explorer (Windows)
- Finder (Mac)

With shell, navigate w/ various commands...

`pwd` `cat` `...`

`ls` `cd` `mkdir`

Today's Topics

Terminal Emulators and Shells

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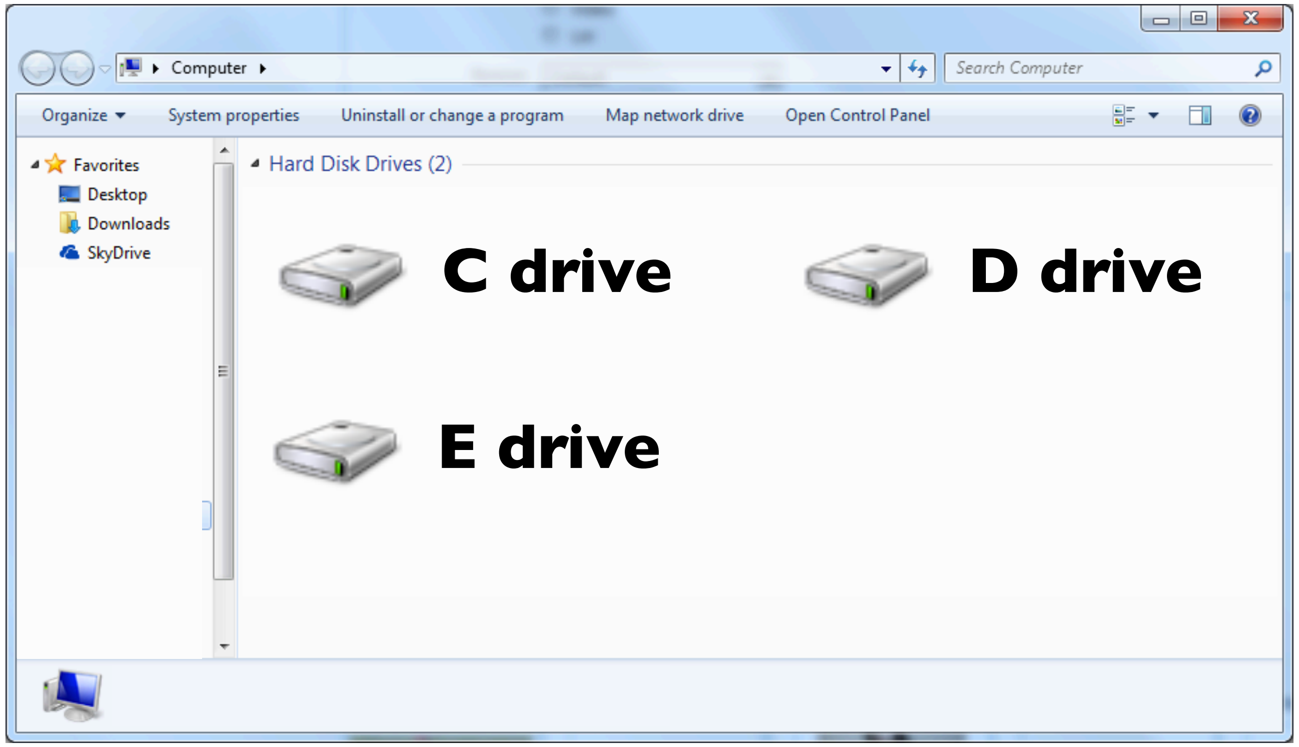
Running Programs and Commands

Demos

Windows Storage Drives



Each added drive is given its own drive letter

Today's Topics

Terminal Emulators and Shells

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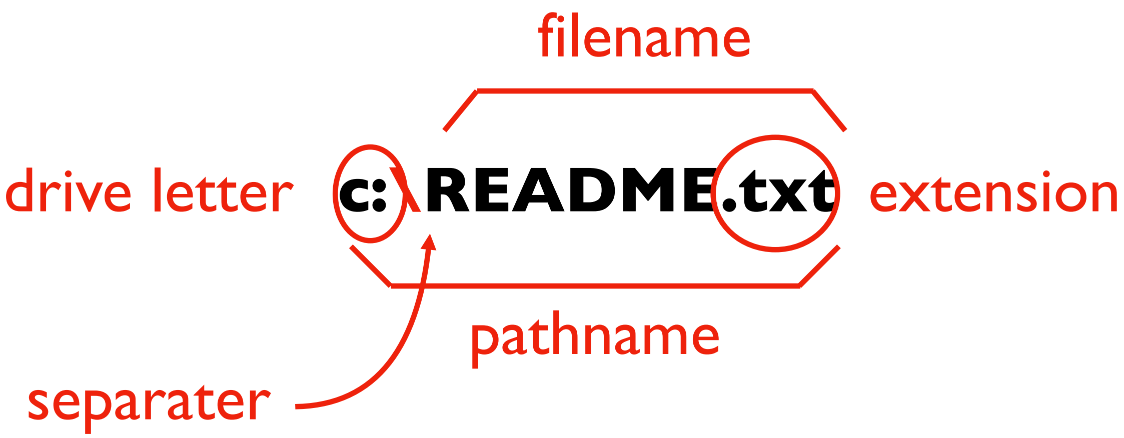
Files

Each file has a name, called a “path name”



filename

drive letter **c:\README.txt** extension

pathname

separater

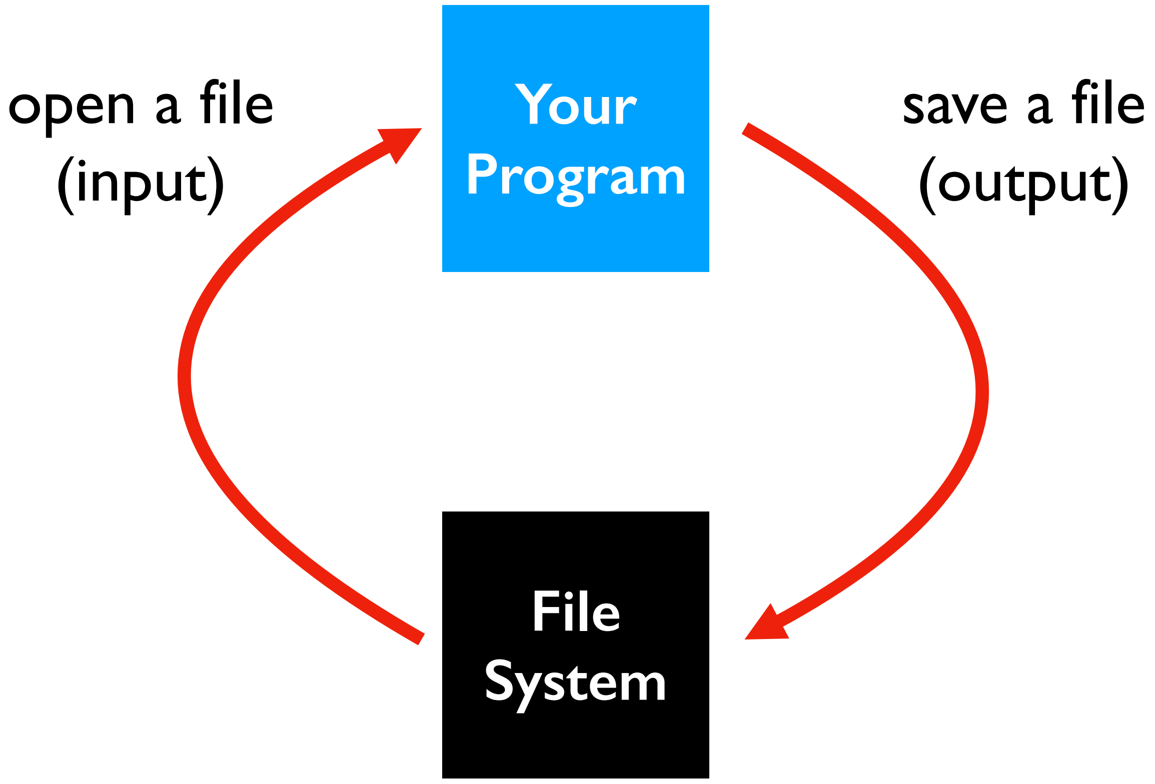
c:\hw.docx

d:\page.html

e:\main.py

Files

Files might be either input or output for your programs



Today's Topics

Terminal Emulators and Shells

Navigation

- Storage Drives (Windows)
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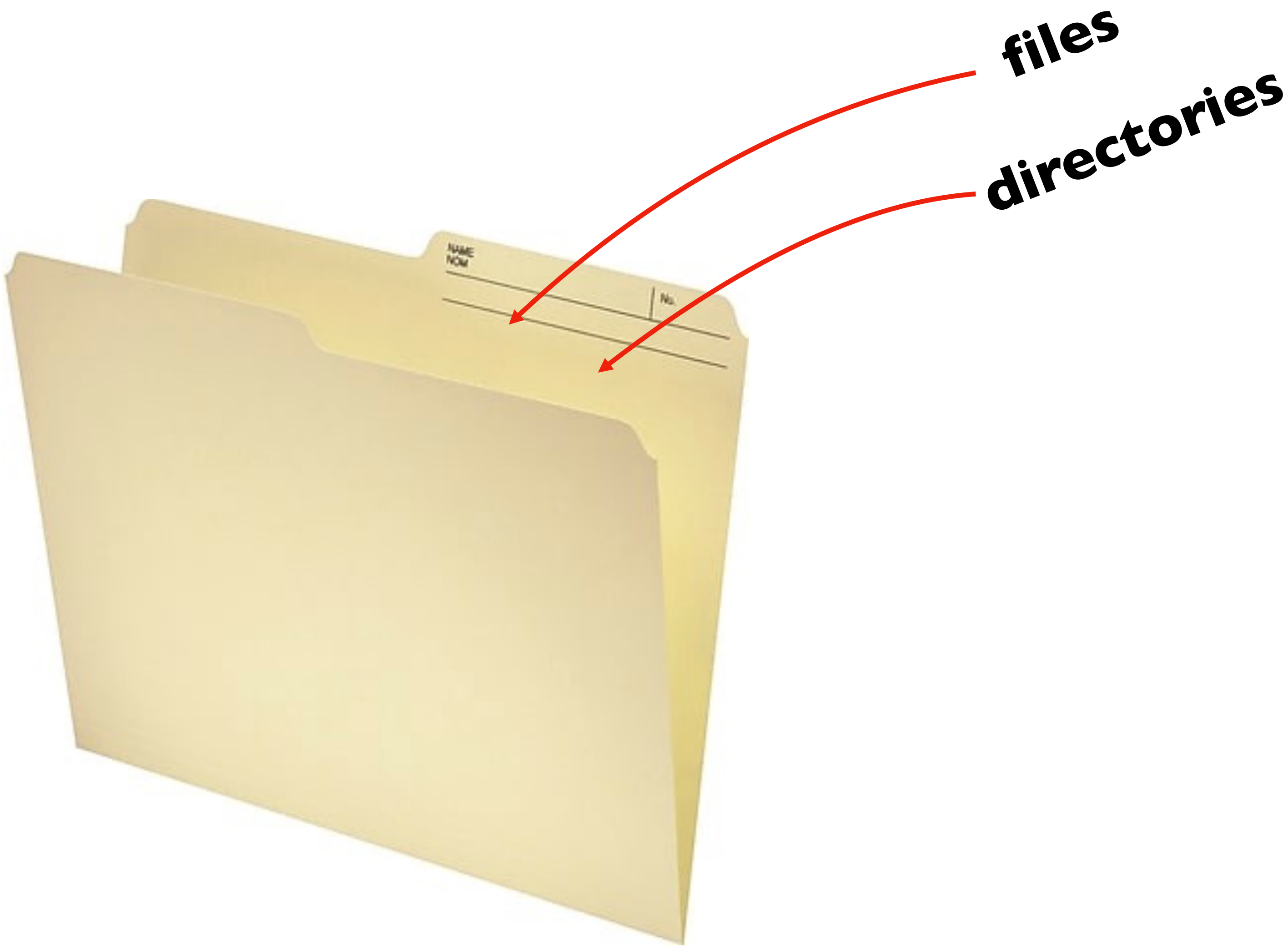
Running Programs and Commands

Demos

Directories

Directories are used to organize files and sub directories

- Also called “folders”
- A directory also has pathname



https://www.staples.ca/en/Staples-Recycled-File-Folder-1-2-Cut-Letter-Size-11-pt-Manila-100-Pack/product_13579_1-CA_1_20001

Directories

Directories are used to organize files and sub directories

- Also called “folders”
- A directory also has pathname

Example paths:

- c:\my-directory\file1.docx
- c:\my-directory\file2.docx
- c:\my-directory\file3.docx
- c:\directory1\directory2\file1.docx
- c:\same-dir\same-dir\readme.txt

two types of paths: relative or absolute

Relative Paths

Where is the Computer Science building?

- Answer 1: 1210 W Dayton St, Madison, WI 53706
- Answer 2: on the other side of Johnson street

When is Answer 2 appropriate?

- When you're in the psychology building
- It may be more convenient

Pathnames are absolute (answer 1) or relative (answer 2)

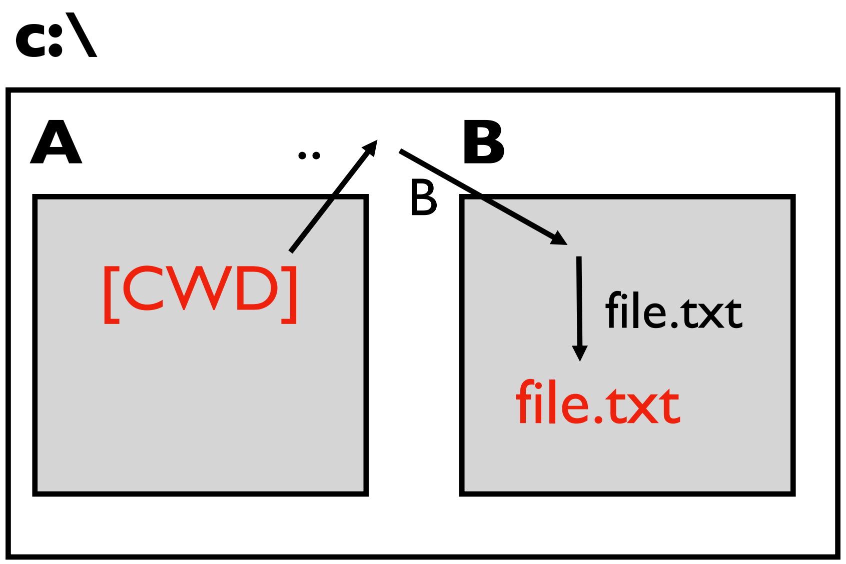
- Absolute paths: always possible
- Relative paths: if current location is known
- Working Directory (our current location)

Absolute vs. Relative

Absolute Path	Working Directory	Relative Path
c:\test.txt	c:\	test.txt
c:\x\y\z\my.docx	c:\x\y\z	my.docx
c:\x\y\z\my.docx	c:\x\y	z\my.docx
c:\x\y\z	c:\x	y\z
c:\test.txt	c:\	.\test.txt
c:\x\y\z	c:\x	.\y\z
c\x	c:\x\y\z	..\..
c:\B\file.txt	c:\A	..\B\file.txt

Two special directory names

- “..” means up a directory
- “.” means current directory



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Multiple Drives in Mac

Windows

- Absolute paths start with c:\ or d:\
- Indicates which drive

Mac

- Absolute paths start with /
- Example: /Users/tyler/my-file.docx
- Don't know which drive

How can we use multiple drives if every file paths starts the same???
/.....

Answer: different drives feel like different directories

Comparison

on a Mac, a path doesn't tell you what drive you're on

Windows	Mac	Drives
c:\Users\tyler\file.txt c:\Program Files c:\Windows\…\Logs	/Users/tyler/file.txt /usr/local/bin /var/log	
d:\ d:\A	/Volumes/backup /Volumes/backup/A	
e:\movies e:\movies\demo1.mov	/Volumes/movies /Volumes/movies/demo1.mov	

Today's Topics

Terminal Emulators and Shells

Navigation

Running Programs and Commands

- Navigational commands
- Arguments
- Saving output

Demos

We'll cover a few simple examples for reference in the slides, then go into more detail in the demo…

Most of these examples work in both PowerShell (Windows) and bash (Mac)

Today's Topics

Terminal Emulators and Shells

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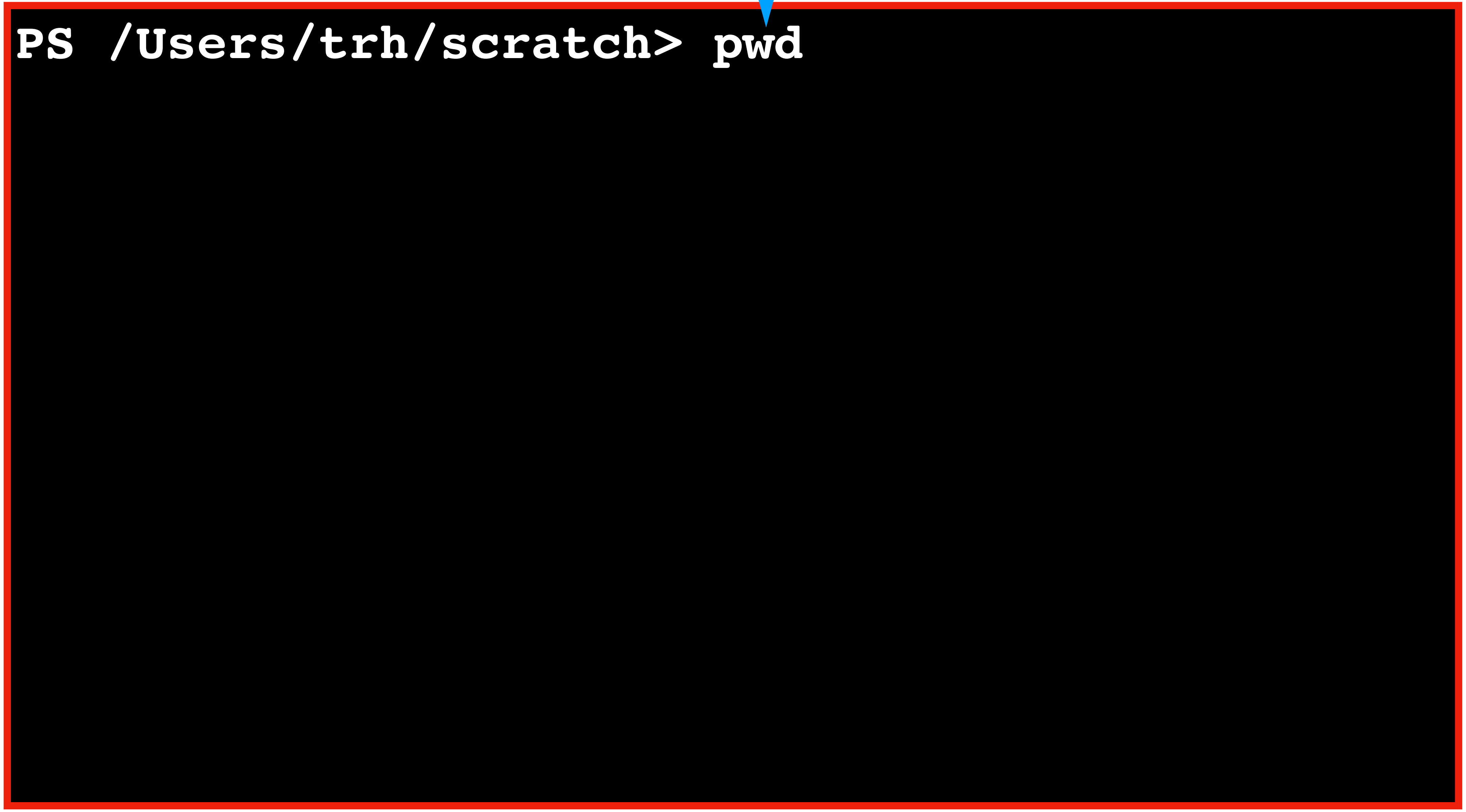
Demos

Where am I? (What directory am I in?)

Command: **pwd**

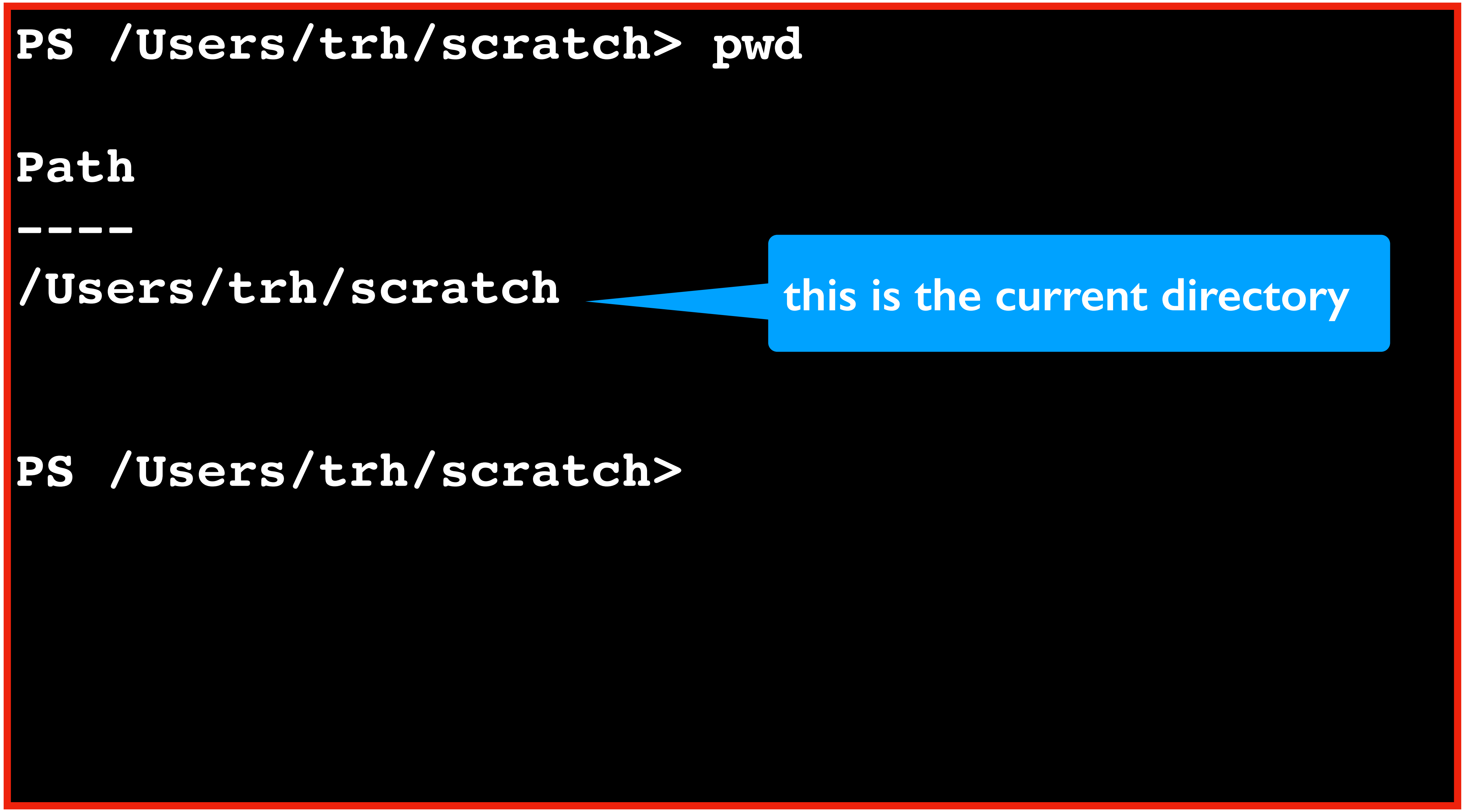
“print working directory”



```
PS /Users/trh/scratch> pwd
```

Where am I? (What directory am I in?)

Command: **pwd**



```
PS /Users/trh/scratch> pwd

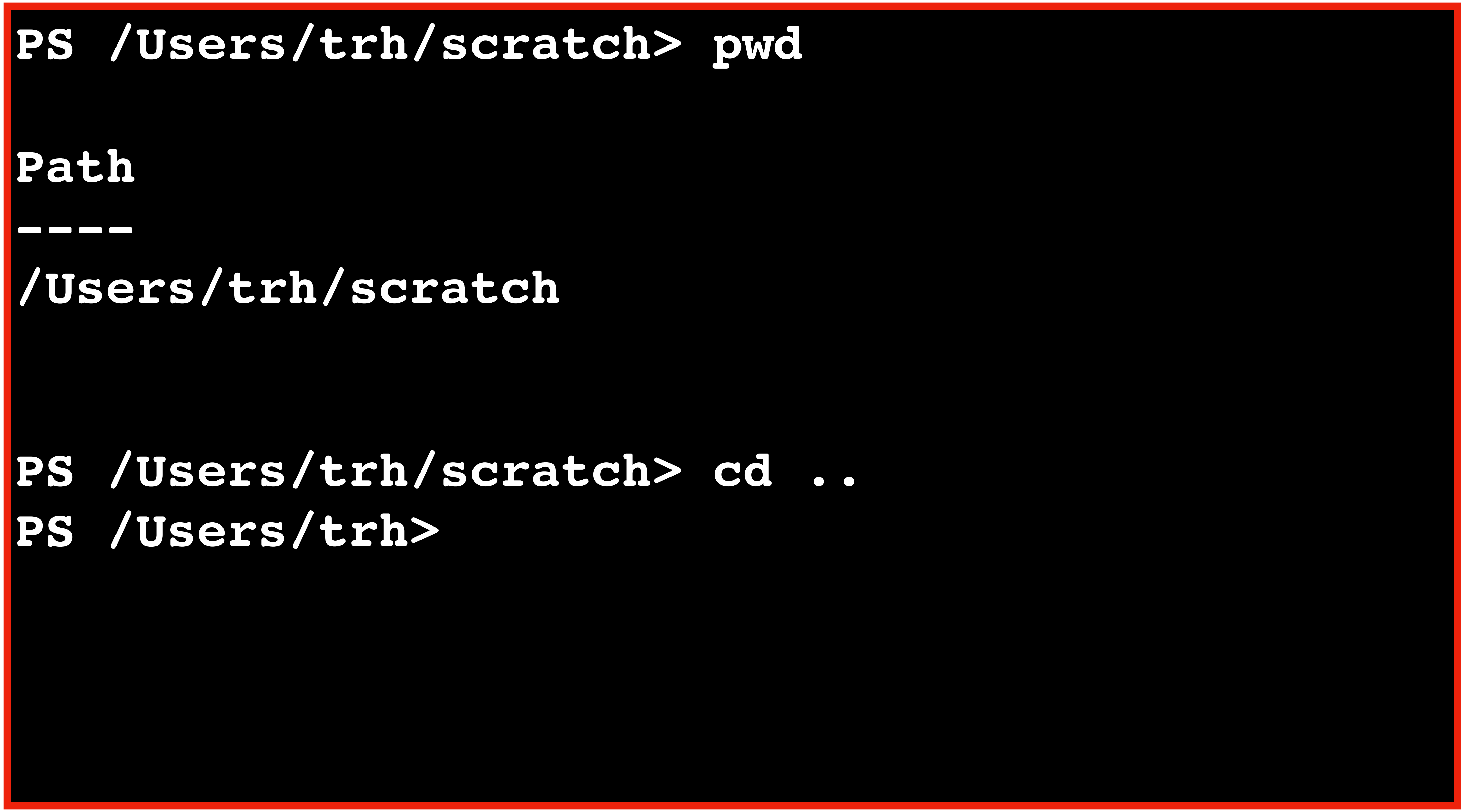
Path
----
/Users/trh/scratch


PS /Users/trh/scratch>
```

this is the current directory

Go up a directory

Command: **`cd ..`**



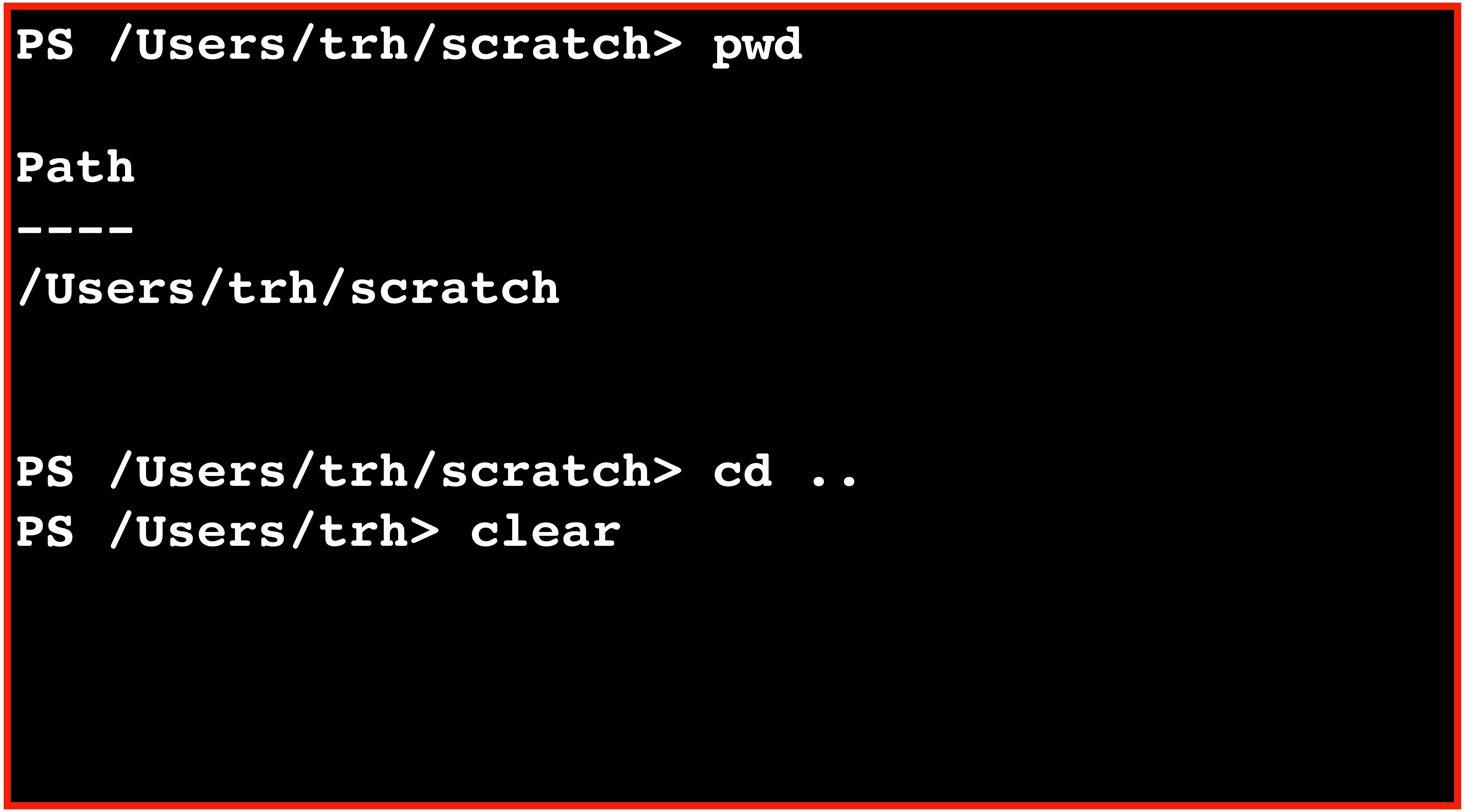
```
PS /Users/trh/scratch> pwd

Path
----
/Users/trh/scratch


PS /Users/trh/scratch> cd ..
PS /Users/trh>
```

Clear the screen

Command: **`clear`**



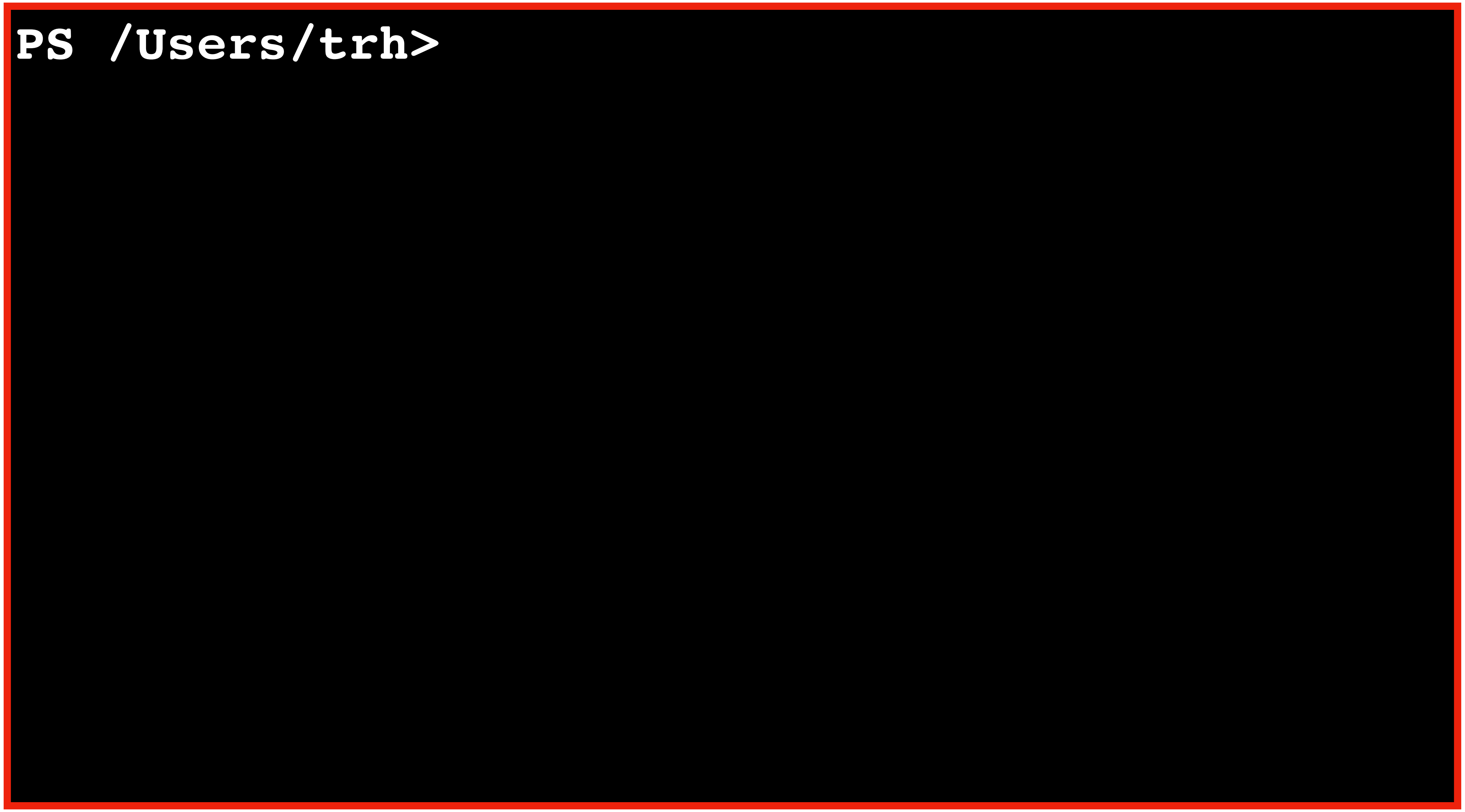
```
PS /Users/trh/scratch> pwd

Path
----
/Users/trh/scratch


PS /Users/trh/scratch> cd ..
PS /Users/trh> clear
```

Clear the screen

Command: **`clear`**

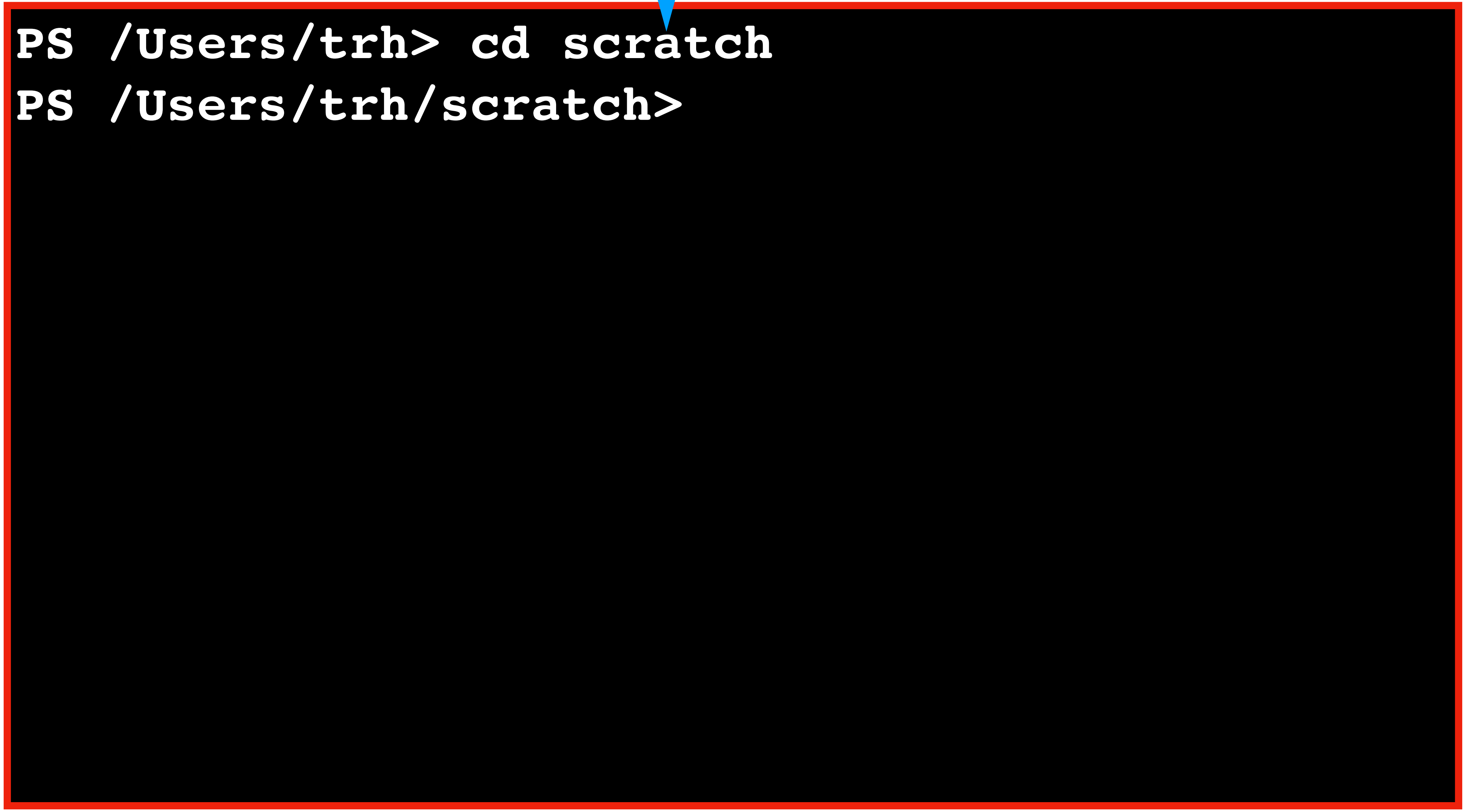


```
PS /Users/trh>
```

Go inside a directory

Command: **`cd directory-name`**

name of directory we started in

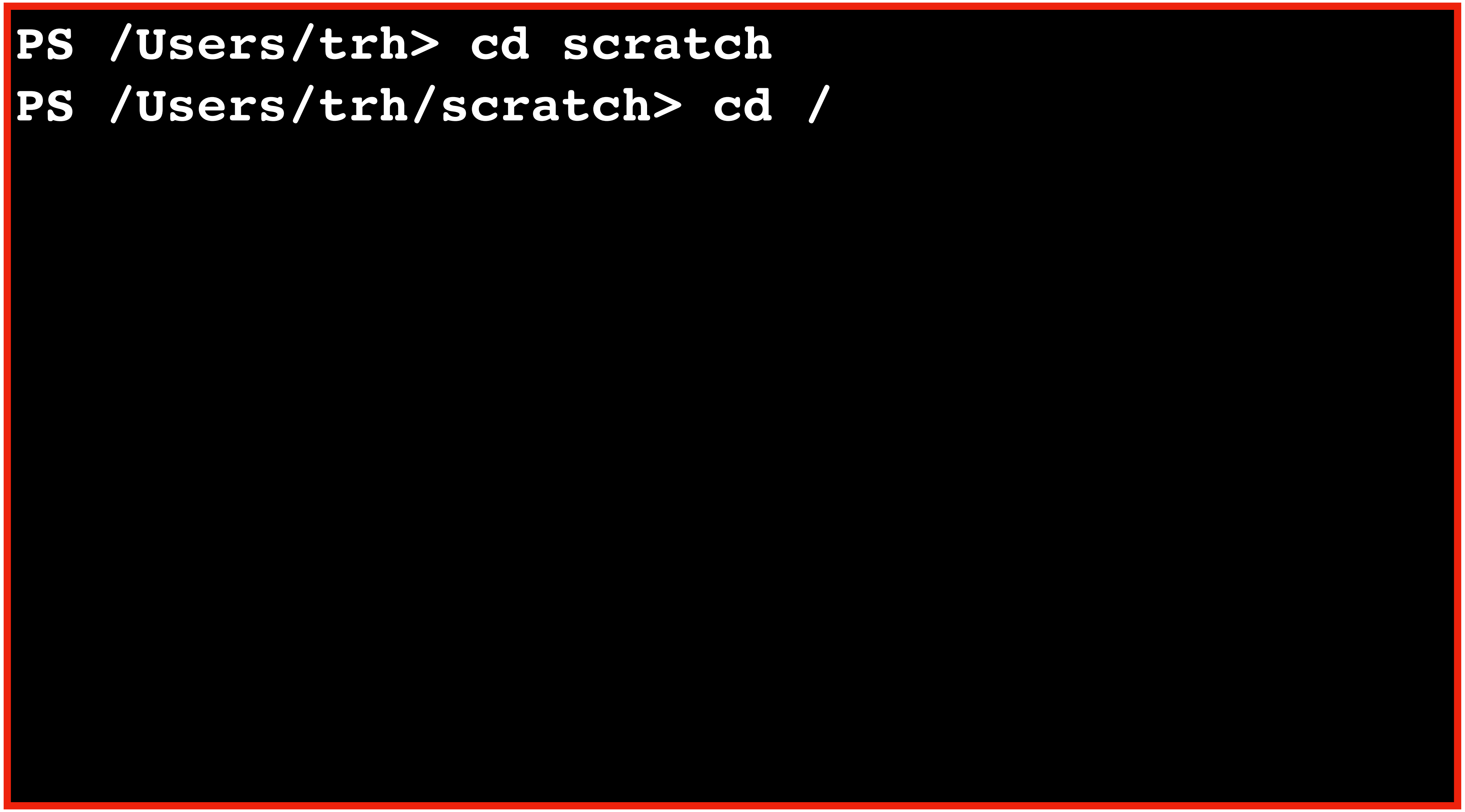


```
PS /Users/trh> cd scratch
PS /Users/trh/scratch>
```

Go to top directory

Command: **`cd /`**

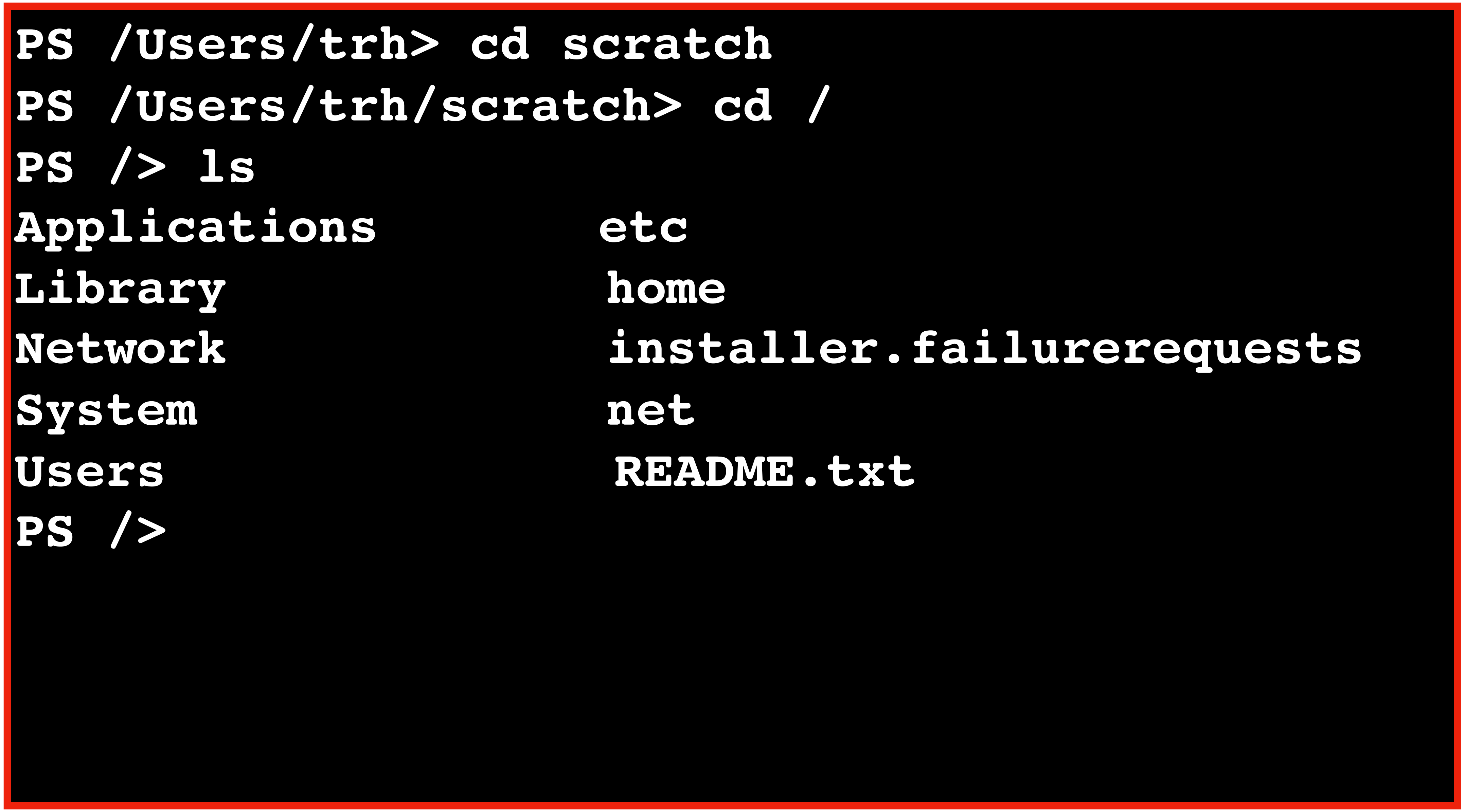
is this Windows or Mac?



```
PS /Users/trh> cd scratch
PS /Users/trh/scratch> cd /
```

View contents of current directory

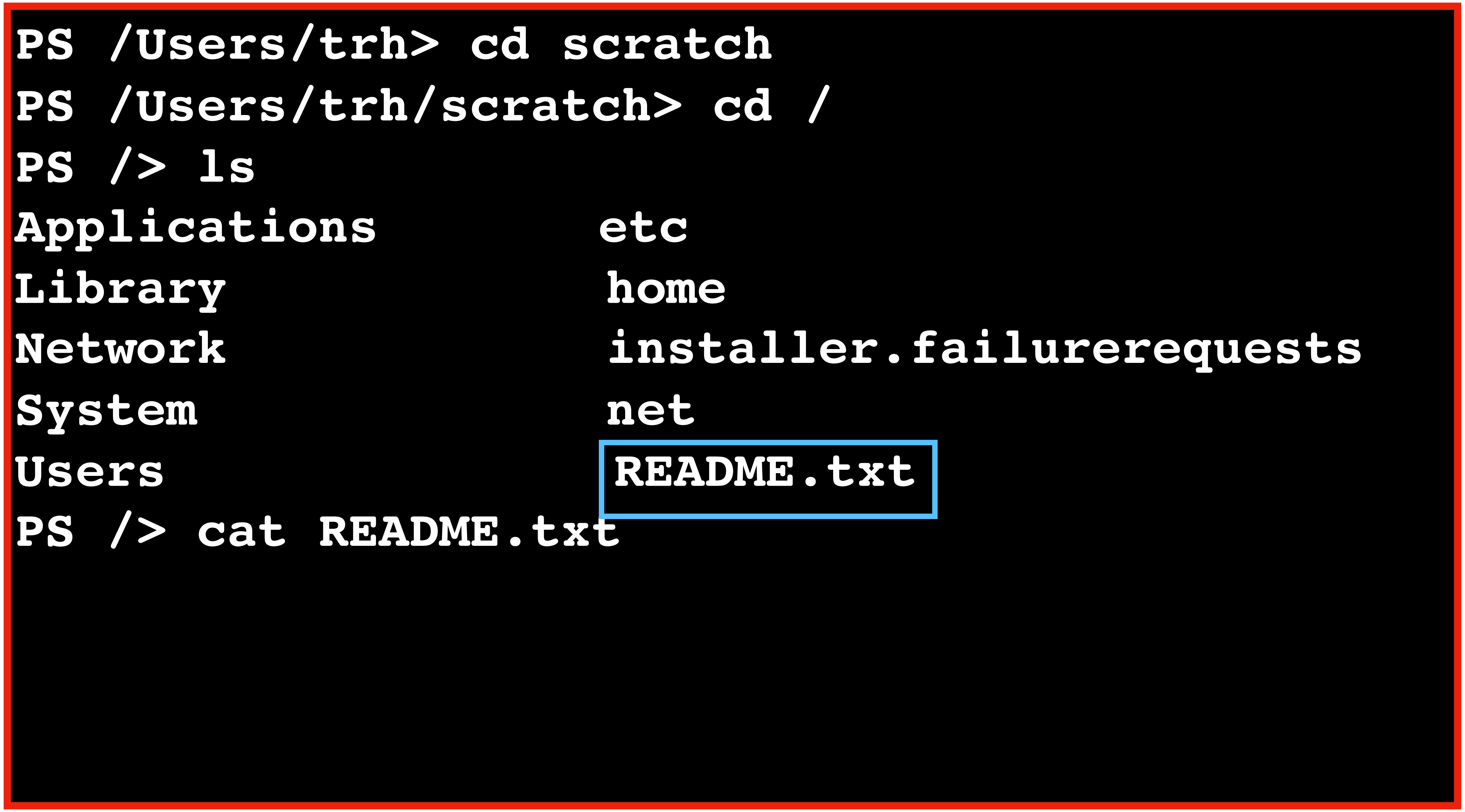
Command: `ls`



```
PS /Users/trh> cd scratch
PS /Users/trh/scratch> cd /
PS /> ls
Applications        etc
Library             home
Network             installer.failurerequests
System              net
Users               README.txt
PS />
```

View contents of a file

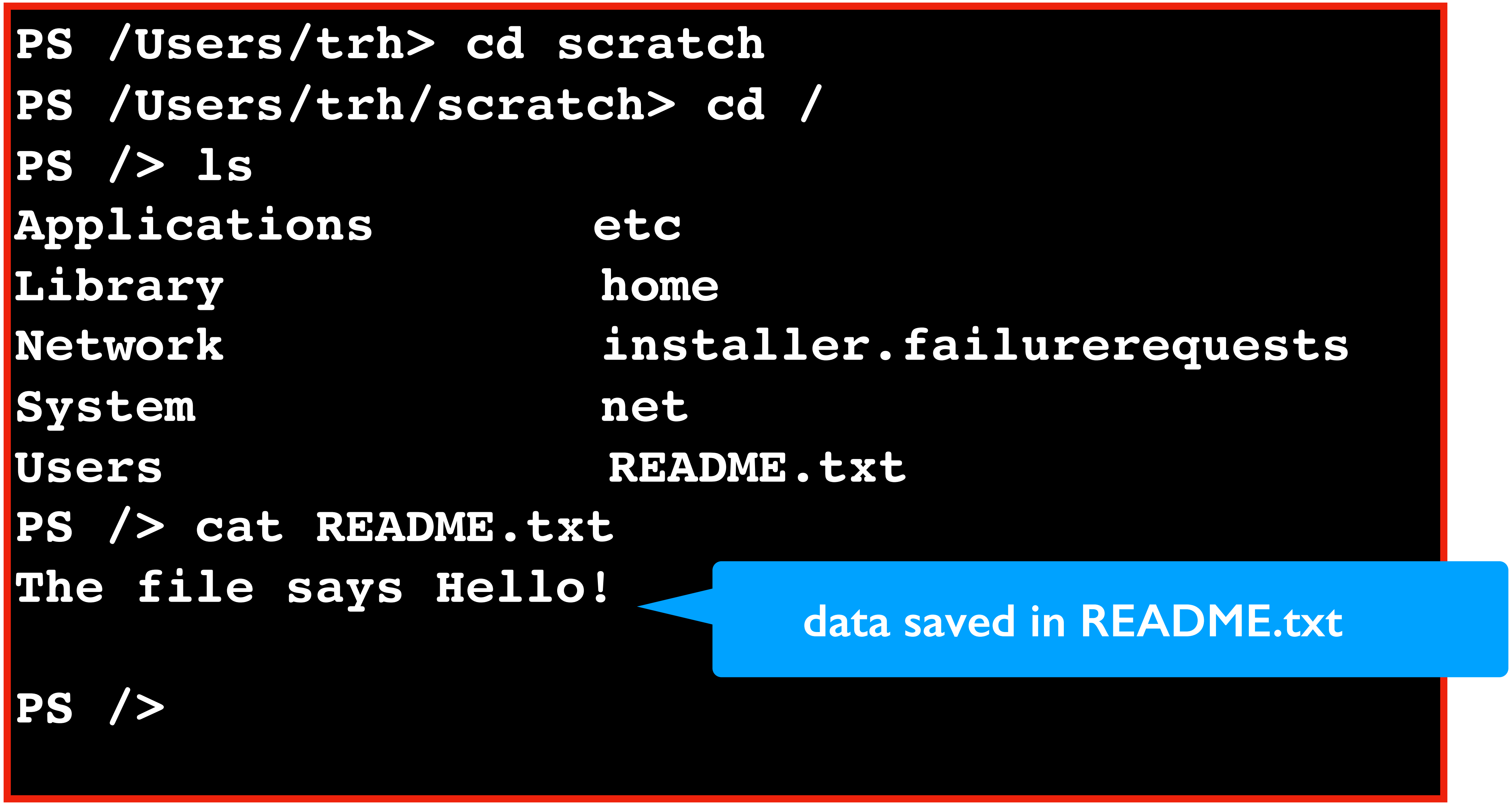
Command: **`cat file-name`**



```
PS /Users/trh> cd scratch
PS /Users/trh/scratch> cd /
PS /> ls
Applications       etc
Library            home
Network            installer.failurerequests
System             net
Users              README.txt
PS /> cat README.txt
```

View contents of a file

Command: **`cat file-name`**



```
PS /Users/trh> cd scratch
PS /Users/trh/scratch> cd /
PS /> ls
Applications        etc
Library             home
Network             installer.failurerequests
System              net
Users               README.txt
PS /> cat README.txt
The file says Hello!

PS />
```

data saved in README.txt

Today's Topics

Terminal Emulators and Shells

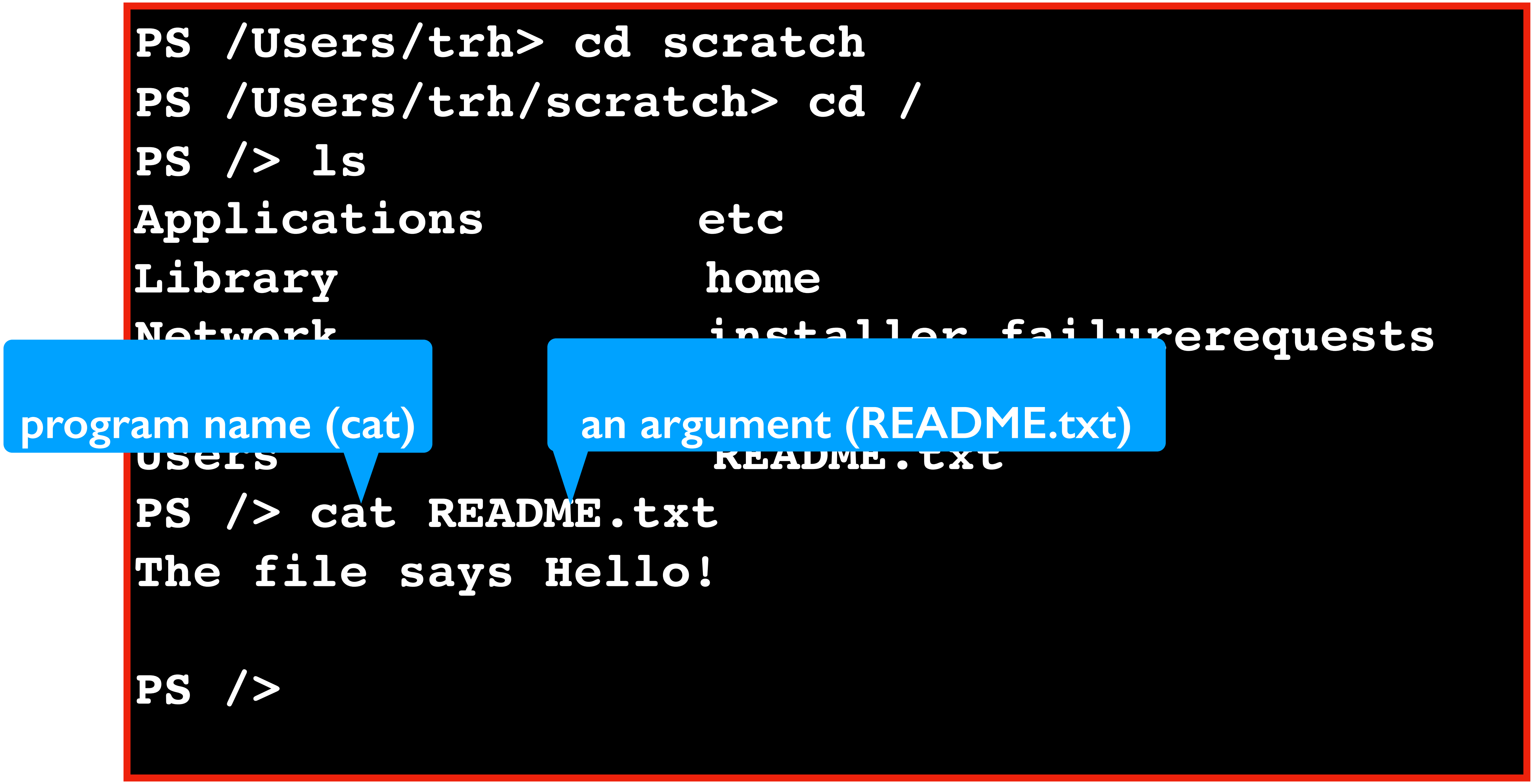
Navigation

Running Programs and Commands

- Navigational commands
- Arguments
- Saving output

Demos

Arguments (program input)



```
PS /Users/trh> cd scratch
PS /Users/trh/scratch> cd /
PS /> ls
Applications           etc
Library                home
Network                installer.failurerequests

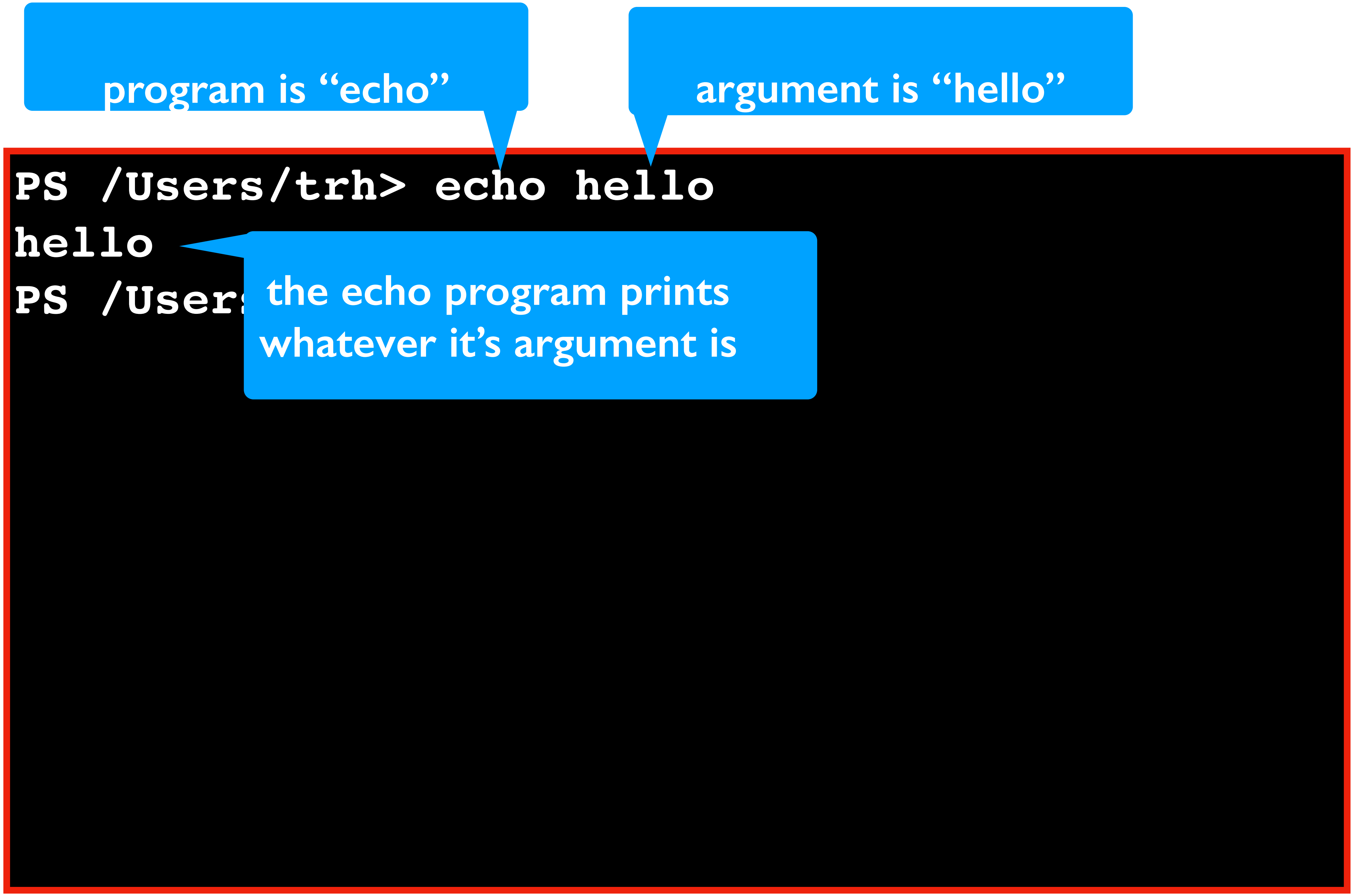
Users                  README.txt
PS /> cat README.txt
The file says Hello!

PS />
```

program name (cat)

an argument (README.txt)

echo Example



program is “echo”

argument is “hello”

```
PS /Users/trh> echo hello
hello
PS /User
```

the echo program prints whatever it’s argument is

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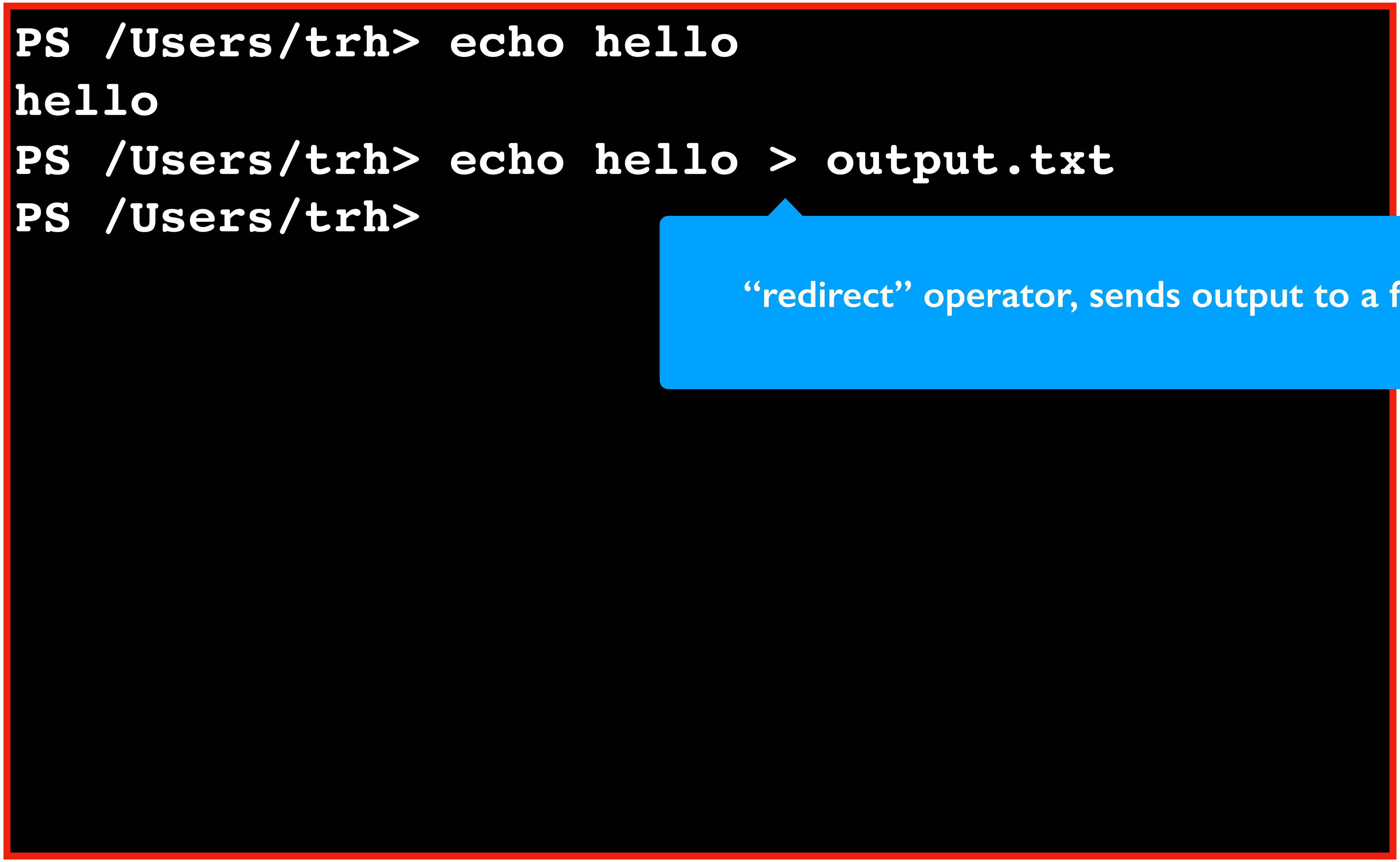
Saving output

Format: **`program > file-name`**

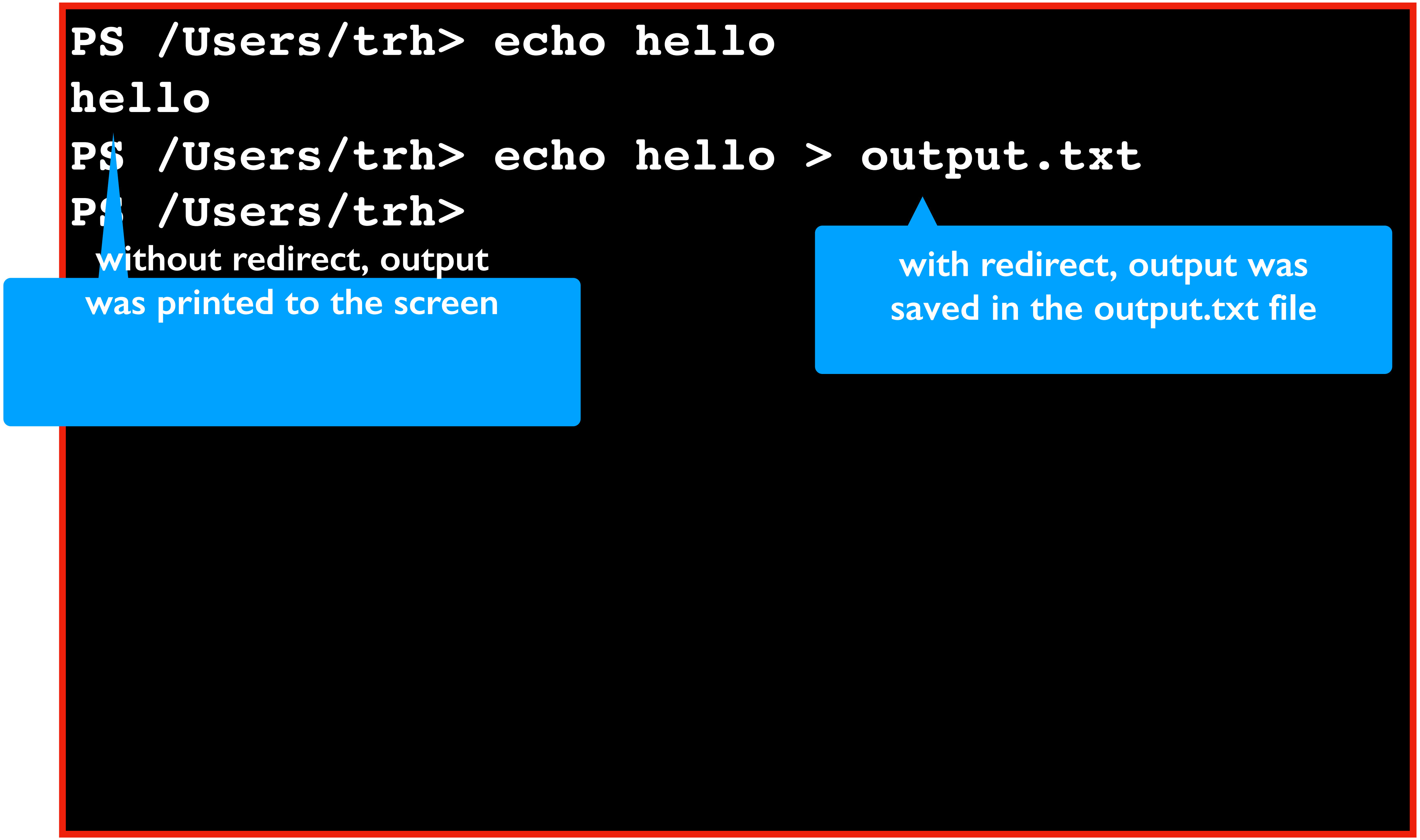


```
PS /Users/trh> echo hello
hello
PS /Users/trh> echo hello > output.txt
PS /Users/trh>
```

“redirect” operator, sends output to a file

Saving output

Format: **`program > file-name`**



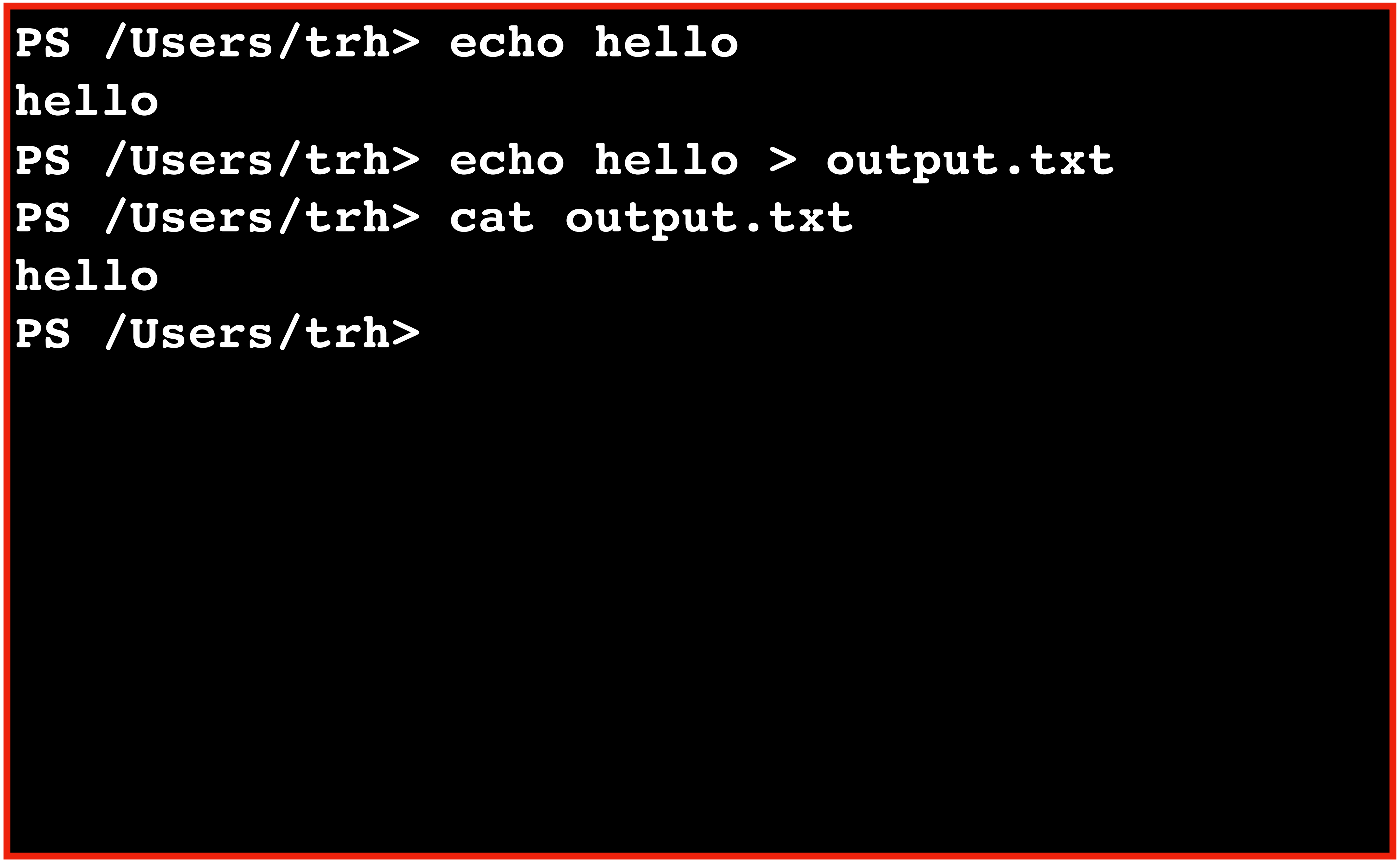
```
PS /Users/trh> echo hello
hello
PS /Users/trh> echo hello > output.txt
PS /Users/trh>
```

without redirect, output was printed to the screen

with redirect, output was saved in the output.txt file

Saving output

Format: **`program > file-name`**



```
PS /Users/trh> echo hello
hello
PS /Users/trh> echo hello > output.txt
PS /Users/trh> cat output.txt
hello
PS /Users/trh>
```

Today's Topics

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Conclusion

Today we covered

- What a terminal and shell is
- What it looks like to have multiple storage drives attached to your computer
- How to navigate between directories/folders
- How to run programs in the terminal