# [301] The Terminal

#### Tyler Caraza-Harter

	■ settern — -DdSH — OU×24	
st login: Wed Feb 24 10: v-host-6:~ settern\$	56:19 on ttys003	Windows PowerShell Vindows PowerShell Copyright (C) 2009 Microsoft Corporation. All rights reserved.
	<ul> <li>E:\Windows\system32\cmd.exe</li> <li>Microsoft Windows [Version 6.1.7100]</li> <li>Copyright (c) 2009 Microsoft Corporation. All rights</li> </ul>	TOPS C:Visera-NullHyte) get-help TOPG Get-Help S Peser SHORT DESCHIFTION Displays help about Vindows PowerShell endlets and concepts.
	E:\Users\ACK)shutdown /? Usage: shutdown L/i ! /l ! /s ! /r ! /g ! /a ! /p ! / [/n \\computer][/t xxx][/d [p!u:]xx:yy [/c "comme	LONG DESCRIPTION /h : /efsyntax ent"]] get-help ((CndletNane) : (TopicNane)) /help ((CndletNane) - ? (CndletNane) - ?
	No args Display help. This is the same as typ; /? Display the graphical user interface ( This must be the first option. /1 Log off. This cannot be used with /m of /2 Shutdown and restart the computer. /7 Shutdown and restart the computer. /9 Shutdown and restart any registered appl: /a Abort a system shutdown. This can only be used during the time- /p Turn off the local computer with no ti 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	<pre>ing /. typing CUID. Examples: get-help adout signal belp and get-help about signal belp ad get-help about signal belp ad help belp topics matches, for you can use vildcard characters in the help if multiple help topics matches, for you can use vildcard characters in the help if only one help topics matches, for get-help about signal help topics get-help about signal belp topics with "c get-help about signal topics with "c get-help about sildcards, type: shutdo For information about vildcards, type: </pre>
	<pre>/n \computer Specify the target computer. /t xxx Set the time-out period before shuddo The valid range is 0-315360000 (10 yea If the timeout period is greater than implied. /c "comment" Comment on the reason for the restan Maximum of 512 characters allowed. /f Force running applications to close with </pre>	get-help about_wildcard get-help about_wildcard ArS), w REMARS B, the roles to be the properties and ne where-object : Filters object properties. about_plains the use of object about_plains the use of object about_plains the use of object about_pencte : Tells how to run commands
	The /f parameter is implied when a value of the specified for the /t parameter. /d [p!u:]xx:yy Provide the reason for the restar p indicates that the restart or shutdd u indicates that the reason is user dd If neither p nor u is specified the re unplanned. xx is the major reason number (positiv	tue greater than 0 15 et or shutdown. awn is planned. efined. estart or shutdown is ve integer less than 256).

# **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



#### Mainframe (powerful computer)

### History: the original terminals



How to share it?

Mainframe (powerful computer)

### History: the original terminals





	•			
		_		
ty-mac:var	S ls -la			
total 0				
drwxr-xr-x	26 root	wheel	832 Dec 26 20	17 .
drwxr-xr-x	6 root	wheel	192 Dec 26 20	17
drwx	2 root	wheel	64 Jul 15 20	17 agentx
drwxr-xr-x	8 daemon	wheel	256 Dec 1 20	17 at
drwx	77 root	wheel	2464 Jul 30 09:	48 audit
drwx	2 root	wheel	64 Oct 2 20	17 backups
drwxr-xr-x	91 root	wheel	2912 Aug 15 23:	40 db
drwxr-xr-x	2 root	sys	64 Oct 2 20	17 empty
drwxr-xr-x	4 root	wheel	128 Apr 27 20	16 folders
drwx	2 root	wheel	64 Jul 28 23:	19 install
drwxr-x	2 _jabber	_jabber	64 Jul 15 20	17 jabberd
drwxr-xr-x	3 root	wheel	96 Jul 25 20	17 lib
drwxr-xr-x	46 root	wheel	1472 Aug 17 14:	41 log
drwxr-x	2 _mobileasset	_mobileasset	64 Oct 2 20	17 ma
drwxr-xr-x	3 root	wheel	96 Oct 2 20	17 msgs
drwxr-xr-x	2 root	wheel	64 Oct 2 20	17 netboot
drwxr-xr-x	6 _networkd	_networkd	192 Dec 26 20	17 networkd
drwxr-x	7 root	wheel	224 May 9 20	16 root
drwxr-xr-x	4 root	wheel	128 Jul 15 20	17 rpc
drwxrwxr-x	30 root	daemon	960 Aug 16 15:	07 run
drwxr-xr-x	2 daemon	wheel	64 Oct 2 20	17 rwho
drwxr-xr-x	6 root	wheel	192 Dec 1 20	17 spool
drwxrwxrwt	5 root	wheel	160 Jul 30 10:	40 tmp
drwxr-xr-x	4 root	wheel	128 Aug 16 09:	51 vm
druwn wr w	4 root	wheel	128 Dec 26 20	17 vn





local computer (e.g., personal)

drwxr-x2mobileasset64 Oct 22017 madrwxr-xr-x3rootwheel96 Oct 22017 msgsdrwxr-xr-x2rootwheel64 Oct 22017 networkddrwxr-xr-x6networkd192 Dec 262017 networkddrwxr-xr-x6networkd192 Dec 262017 networkddrwxr-xr-x4rootwheel224 May 92016 rootdrwxr-xr-x4rootwheel128 Jul 152017 rpcdrwxr-xr-x30 rootdaemon960 Aug 1615:07 rundrwxr-xr-x2daemon960 Aug 1615:07 rundrwxr-xr-x6rootwheel129 Dec 22017 spooldrwxr-xr-x6rootwheel12017 spooldrwxr-xr-x-x4rootwheel10:40 tmpdrwxr-xr-x4rootwheel128 Dec 26drwxr-xr-x4rootwheel128 Dec 26	ty-mac:var\$ ls -la total 0 drwxr-xr-x 26 root wheel drwxr-xr-x 6 root wheel drwxr-xr-x 8 daemon wheel drwxr-xr-x 8 daemon wheel drwxr-xr-x 91 root wheel drwxr-xr-x 2 root wheel drwxr-xr-x 4 root wheel drwxr-xr-x 3 root wheel drwxr-xr-x 4 root wheel	832 Dec 26 2017 . 192 Dec 26 2017 . 64 Jul 15 2017 agentx 256 Dec 1 2017 at 2464 Jul 30 09:48 audit 64 Oct 2 2017 backups 2912 Aug 15 23:40 db 64 Oct 2 2017 empty 128 Apr 27 2016 folders 64 Jul 28 23:19 install 64 Jul 25 2017 jabberd 96 Jul 25 2017 lib 1472 Aug 17 14:41 log		
	drwxr-x2 _mobileasset_mobileadrwxr-xr-x3 rootwheeldrwxr-xr-x2 rootwheeldrwxr-xr-x6 _networkd_networkddrwxr-xr-x4 rootwheeldrwxr-xr-x4 rootwheeldrwxr-xr-x6 rootwheeldrwxr-xr-x6 rootwheeldrwxr-xr-x6 rootwheeldrwxr-xr-x7 rootwheeldrwxr-xr-x4 rootwheeldrwxr-xr-x4 rootwheeldrwxr-xr-x4 rootwheeldrwxr-xr-x4 rootwheel	sset 64 Oct 2 2017 ma 96 Oct 2 2017 msgs 64 Oct 2 2017 netboot 192 Dec 26 2017 netboot 224 May 9 2016 root 128 Jul 15 2017 rpc 960 Aug 16 15:07 run 64 Oct 2 2017 rwho 192 Dec 1 2017 spool 160 Jul 30 10:40 tmp 128 Aug 16 09:51 vm 128 Dec 26 2017 yp	a a a a a a a a a a a a a a a a a a a	why???

local computer (e.g., personal)

https://techcrunch.com/2015/08/16/ibm-teams-with-canonical-on-linux-mainframe/ https://en.wikipedia.org/wiki/Computer\_terminal#Dumb\_terminals

 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	254	JUL	15	2017	agentx
 drwx	0 77	root	wheel	230	Jec	3 U T	09.48	audi+
 drwx	2	root	wheel	64	0ct	20	2017	hackups
 drwxr-xr-x	91	root	wheel	2912	Aug	15	23:40	db
 drwxr-xr-x	2	root	svs	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	0ct	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	/	root	wheel	120	May	15	2016	root
drwxr-xr-x	20	root	wnee1 doomon	128	Jui	15	201/	rpc
drwxr_xr_x	30	daemon	wheel	500	Aug	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	qv

fast



local computer (e.g., personal)

slow

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

Practice using good tools that are unfamiliar

Investment is more important than working hard



 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	254	JUL	15	2017	agentx
 drwx	0 77	root	wheel	230	Jec	3 U T	09.48	audi+
 drwx	2	root	wheel	64	0ct	20	2017	hackups
 drwxr-xr-x	91	root	wheel	2912	Aug	15	23:40	db
 drwxr-xr-x	2	root	svs	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	0ct	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	/	root	wheel	120	May	15	2016	root
drwxr-xr-x	20	root	wnee1 doomon	128	Jui	15	201/	rpc
drwxr_xr_x	20	daemon	wheel	500	Aug	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	qv

fast



local computer (e.g., personal)

slow

Terminal emulators	remote computer
ty-mac:var\$ 1s -1a         total 0         drwxr-xr-x 26 root       wheel       832 Dec 26 2017 .         drwxr-xr-x 26 root       wheel       192 Dec 26 2017         drwxr-xr-x 2 root       wheel       64 Jul 15 2017 agentx         drwxr-xr-x 8 daemon       wheel       256 Dec 1 2017 at         drwxr-xr-x 91 root       wheel       64 Oct 2 2017 backups         drwxr-xr-x 4 root       wheel       2912 Aug 15 23:40 db	(e.g., CS lab)
drwxr-xr 2 root wheel 64 Jul 28 23:19 install drwxr-xr 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-xr-x 2 _mobileasset _mobileasset 64 Oct 2 2017 ma drwxr-xr-x 2 root wheel 96 Jul 22 2017 netboot drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 7 root wheel 124 May 9 2016 root drwxr-xr-x 4 root wheel 140 ct 2 2017 run drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 7 root wheel 124 May 9 2016 root drwxr-xr-x 6 root wheel 196 Oct 2 2017 rpc drwxrwxr-x 30 root daemon 960 Aug 16 15:07 run drwxr-xr-x 4 root wheel 192 Dec 1 2017 rpc drwxrwxrwt 5 root wheel 192 Dec 2 1017 rwho drwxr-xr-x 4 root wheel 100 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	
	Iocal computer (e.g., personal)



iputei 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?)





Terminal emulators	remote computer
ty-mac:var\$ 1s -1a         total 0         drwxr-xr-x 26 root       wheel       832 Dec 26 2017 .         drwxr-xr-x 26 root       wheel       192 Dec 26 2017         drwxr-xr-x 2 root       wheel       64 Jul 15 2017 agentx         drwxr-xr-x 8 daemon       wheel       256 Dec 1 2017 at         drwxr-xr-x 91 root       wheel       64 Oct 2 2017 backups         drwxr-xr-x 4 root       wheel       2912 Aug 15 23:40 db	(e.g., CS lab)
drwxr-xr 2 root wheel 64 Jul 28 23:19 install drwxr-xr 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-xr-x 2 _mobileasset _mobileasset 64 Oct 2 2017 ma drwxr-xr-x 2 root wheel 96 Jul 22 2017 netboot drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 7 root wheel 124 May 9 2016 root drwxr-xr-x 4 root wheel 140 ct 2 2017 run drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 6 _networkd 192 Dec 26 2017 networkd drwxr-xr-x 7 root wheel 124 May 9 2016 root drwxr-xr-x 6 root wheel 196 Oct 2 2017 rpc drwxrwxr-x 30 root daemon 960 Aug 16 15:07 run drwxr-xr-x 4 root wheel 192 Dec 1 2017 rpc drwxrwxrwt 5 root wheel 192 Dec 2 1017 rwho drwxr-xr-x 4 root wheel 100 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	
	Iocal computer (e.g., personal)

		_			
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

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

# **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



navigate: dig through folders and files



# Shell: the most helpful program



navigate: dig through folders directories and files



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



https://en.wikipedia.org/wiki/Seashell

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



# **Today's Topics**

**Terminal Emulators and Shells** 

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- Shells
- Running programs from a shell

Navigation

Running Programs and Commands

Demos

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



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



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:va	r\$						

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



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...



# **Today's Topics**

**Terminal Emulators and Shells** 

Navigation

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

Running Programs and Commands

Demos

# Windows Storage Drives



Each added drive is given

its own drive letter



### Windows Storage Drives





#### Each added drive is given its own drive letter

# Windows Storage Drives





#### Each added drive is given its own drive letter

# **Today's Topics**

**Terminal Emulators and Shells** 

Navigation

- Storage Drives (Windows)
- Files
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- Windows vs. Mac

Running Programs and Commands

Demos

#### **Files**

Each file has a name, called a "path name"

#### c:\README.txt

c:\hw.docx

d:\page.html

e:\main.py

#### **Files**

Each file has a name, called a "path name"

filename c:\README.txt

c:\hw.docx

d:\page.html

e:\main.py

**Files** 

Each file has a name, called a "path name"



c:\hw.docx

d:\page.html

e:\main.py
Each file has a name, called a "path name"



c:\hw.docx

d:\page.html

e:\main.py

Each file has a name, called a "path name"



c:\hw.docx

d:\page.html

e:\main.py

Each file has a name, called a "path name"





e:\main.py

Files might be either input or output for your programs



# **Today's Topics**

**Terminal Emulators and Shells** 

Navigation

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

Running Programs and Commands

Demos

Directories are used to organize files and sub directories

• Also called "folders"



https://www.staples.ca/en/Staples-Recycled-File-Folder-I-2-Cut-Letter-Size-II-pt-Manila-I00-Pack/product\_I3579\_I-CA\_I\_2000I

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-I-2-Cut-Letter-Size-II-pt-Manila-100-Pack/product\_13579\_I-CA\_I\_20001

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



in my-directory

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

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

Where is the Computer Science building?

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

When is Answer 2 appropriate?

Where is the Computer Science building?

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



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

Where is the Computer Science building?

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When is Answer 2 appropriate?

- When you're in the psychology building
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Pathnames are absolute (answer I) or relative (answer 2)

- Absolute paths: always possible
- Relative paths: if current location is known

Where is the Computer Science building?

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When is Answer 2 appropriate?

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

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

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

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

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	
c:\x\y\z	c:\x	

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	

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

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

- ".." means up a directory
- "." means current directory

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:\test.txt	c:\	
c:\x\y\z	c:\x	
c:\x	c:\x\y\z	

- ".." means up a directory
- "." means current directory

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:\test.txt	c:\	.\.\test.txt
c:\x\y\z	c:\x	
c:\x	c:\x\y\z	

- ".." means up a directory
- "." means current directory

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:\test.txt	c:\	.\.\test.txt
c:\x\y\z	c:\x	.\y\z
c:\x	c:\x\y\z	

- ".." means up a directory
- "." means current directory

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:\test.txt	c:\	.\.\test.txt
c:\x\y\z	c:\x	.\y\z
c:\x	c:\x\y\z	\

- ".." means up a directory
- "." means current directory

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:\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	

- ".." means up a directory
- "." means current directory

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:\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

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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:\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

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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:\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

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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:\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

- ".." means up a directory
- "." means current directory





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:\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

- ".." means up a directory
- "." means current directory





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:\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

more examples in demo later...

# **Today's Topics**

**Terminal Emulators and Shells** 

Navigation

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

#### Running Programs and Commands

#### Demos

## 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???

## 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

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\demol.mov	/Volumes/movies /Volumes/movies/demo1.mov	

## 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\demol.mov	/Volumes/movies /Volumes/movies/demol.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** 

Navigation

#### Running Programs and Commands

- Navigational commands
- Arguments
- Saving output

Demos

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

Command: **pwd** 



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



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

Command: **pwd** 



## Go up a directory

Command: cd ..

PS /Users/trh/scratch> pwd Path /Users/trh/scratch **PS** /Users/trh/scratch>

## Go up a directory

Command: cd ..

PS /Users/trh/scratch> pwd Path /Users/trh/scratch PS /Users/trh/scratch> cd ..

## Go up a directory

Command: cd ..

PS	/Users/trh/scratch>	pwd
Pat	:h	
/បទ	sers/trh/scratch	
PS PS	/Users/trh/scratch> /Users/trh>	cd

#### **Clear the screen**

Command: **clear** 

<b>PS</b> /Users/trh/scrat	ch> pwd	
Path		
/Users/trh/scratch		
PS /Users/trh/scrat PS /Users/trh> clea	ch> cd ar	

#### **Clear the screen**

Command: **clear** 

PS /Users/trh>

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## Go inside a directory

Command: cd directory-name



## Go inside a directory

Command: cd directory-name

name of directory we started in



### Go inside a directory

Command: cd directory-name

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 /

## Go to top directory

Command: cd /

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

### View contents of current directory

Command: **1s** 

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

#### View contents of current directory

Command: **1s** 

PS /Users/trh> cd scratch
PS /Users/trh/scratch> cd /
PS /> ls

#### View contents of current directory

Command: **1s** 

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 />				

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 />				

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				

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

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! < data saved in README.txt				
PS />				

# **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			
System	net			
Users	README.txt			
PS /> cat README.tx	t			
The file says Hello!				
PS />				

## Arguments (program input)



#### PS /Users/trh>

#### PS /Users/trh> echo hello



PS /Users/trh> echo hello
hello
PS /Users/trh>



# **Today's Topics**

**Terminal Emulators and Shells** 

Navigation

Running Programs and Commands

- Navigational commands
- Arguments
- Saving output

#### Demos

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



Format: program > file-name



Format: program > file-name

PS /Users/trh> echo hello
hello
PS /Users/trh>

Format: program > file-name



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

PS /Users/trh> echo hello
hello
PS /Users/trh> echo hello > output.txt
PS /Users/trh>
Format: program > file-name



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

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

Format: program > file-name

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

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**

**Terminal Emulators and Shells** 

Navigation

Running Programs and Commands

Demos

#### 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