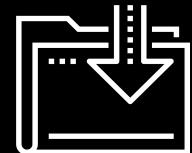




{ How Sweet Is the Terminal?

Cybersecurity
Terminal 101 Day 1



Class Objectives

By the end of today's class, you will be able to:



Explain why the command line is important for IT and security professionals.



Use commands like `ls`, `cd`, `mkdir`, `touch`, `cp`, `mv`, `rm`, `rmdir`, and `cat` for basic file navigation.



Navigate deeply nested folder structures using relative and absolute file paths.



Use commands like `head`, `tail`, `more`, and `less` to preview files in the command line.



Combine the preceding commands in sequence to accomplish relevant IT tasks.

Why the Terminal Matters

Graphical User Interfaces

We are used to Graphical User Interfaces (**GUIs**), with their familiar icons, windows, buttons, and mouse pointers.

Mac



PC



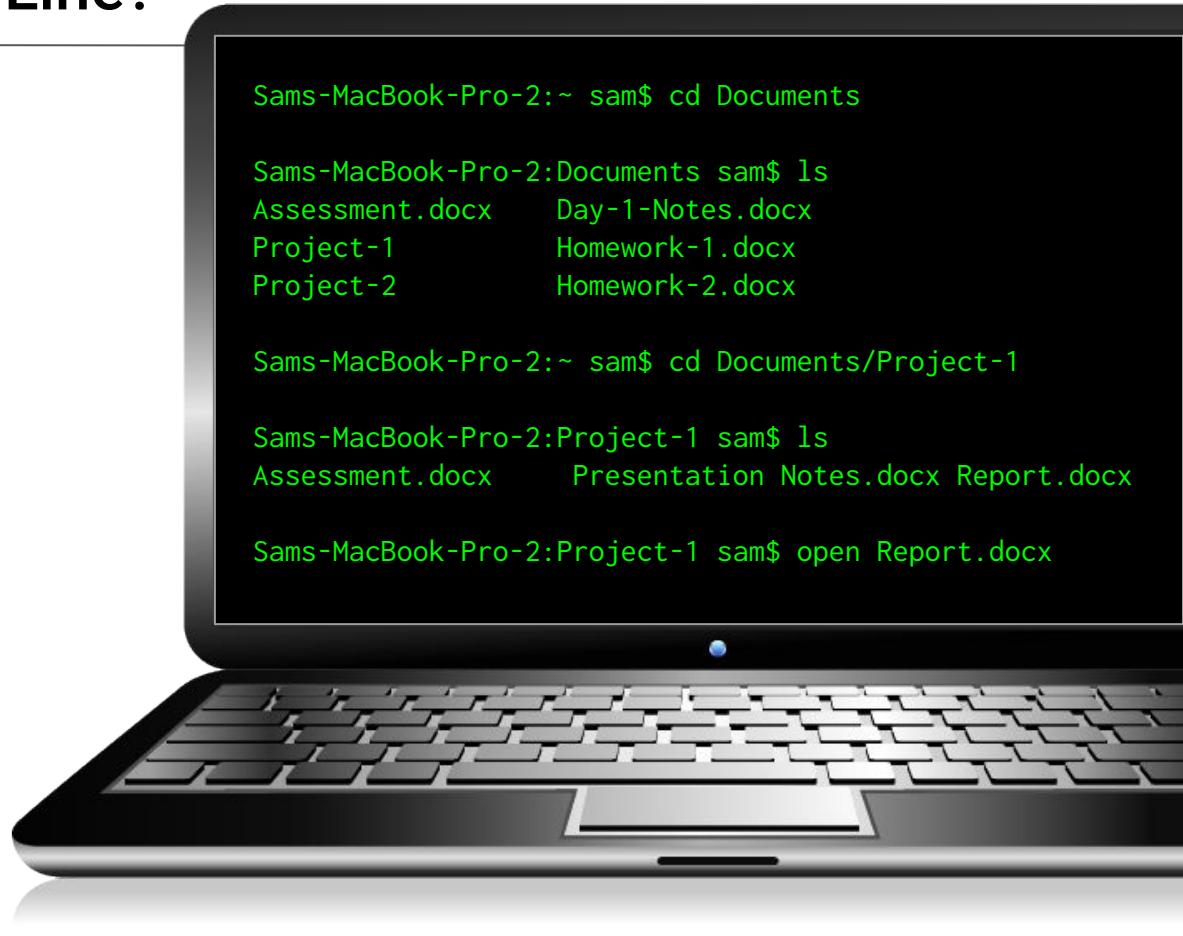
What is the Command Line?

Command line users don't directly interact with icons and buttons on the screen.

Users complete tasks on their computer by issuing commands with a line or lines of text in the terminal.

For example:

Rather than clicking on a file to open it, we can type a command to open it.



A photograph of a person's hands typing on a laptop keyboard. The laptop screen displays several lines of code in a dark-themed code editor. The person is wearing a blue and white horizontally striped shirt. A yellow circle is overlaid on the left side of the image, containing the text.

Today, we will complete common computer tasks.

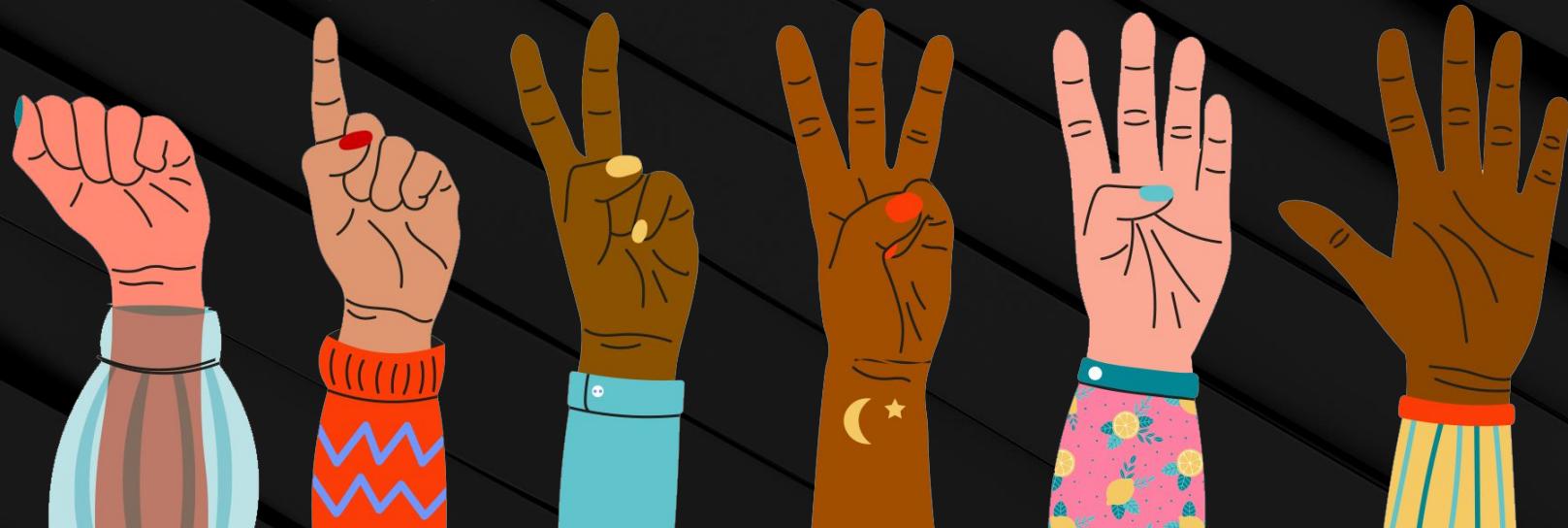
But rather than using our computer's GUI, we will use the command line.

FIST TO FIVE:

Raise a Fist: If you've never worked with the command line and barely know what it is.

Raise a Five: If you work with the command line on a daily basis.

Raise One, Two, Three or Four: If you fall somewhere in between.





For those who have used the
command line: where have you
used it and what for?

Why the Command Line?

Using the command line is a critical skill. At different times, it may be:

01

The only way
to achieve a
desired outcome.

02

The fastest way
to achieve a
desired outcome.

03

The most flexible
way to achieve a
desired outcome.

Why the Command Line?

Using the command line is a critical skill. At different times, it may be:

01

The only way
to achieve a
desired outcome.

You may have to work with systems and tools that have no GUI interface.

For example:

You need to configure a system that does not have a GUI. The command line is your only mode for configuration.

Why the Command Line?

Using the command line is a critical skill. At different times, it may be:

02

The fastest way
to achieve a
desired outcome.

The command line has tools that can speed
up a task.

For example:

You can develop a script on the command
line to automate and repeat a task.

Why the Command Line?

Using the command line is a critical skill. At different times, it may be:

03

The most flexible way to achieve a desired outcome.

Working with a GUI may be the most familiar, but working directly with the command line provides greater control.

For example:

You can output logs to specific locations, combine files in unique ways, and string together commands with more flexibility.

Words to the Wise

A few things to remember.



The best way to learn the command line is to use it.



This week will be heavily focused on practical activities.



Take notes during each demo and try your best on activities.



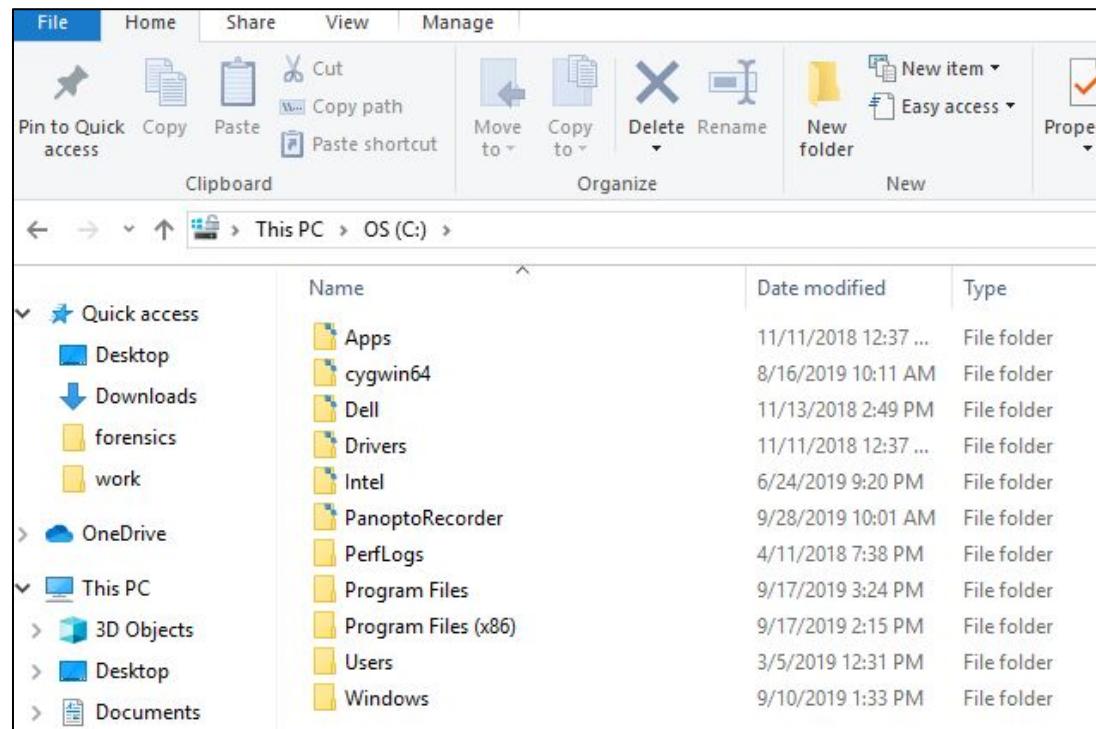
Remember: Practice makes perfect!

Working on the Command Line

Within this Windows Explorer, we can complete the following tasks:

- View current directory location.
- Navigate through directories and files.
- Create new folders.

In the next demo, we'll complete these tasks on the command line.



Basic Terminal Commands

Basic Commands

In the next demo, we'll cover the following commands:

pwd	Display the current working directory (<i>print working directory</i>).
ls	List directories and files in the current directory.
cd	Navigate into a directory (<i>change directory</i>).
mkdir	Make a directory.
rmdir	Remove a directory.
touch	Create an empty file.
rm	Remove a file.
clear	Clear the terminal history of a page.

Demonstration Scenario

We are security analysts at ACME Corp. Our manager assigned us several investigations and gave us a computer in the evidence room. We are asked to:

01

Create several directories to organize our investigations:
Case1 and **Case2**.

02

Put our directories in the already existing folder
security_evidence.

03

Put an empty file in the **Case1** folder titled
case1_evidence.



Instructor Demonstration

Terminal Basics

Demonstration Review

What does each of the commands do?

pwd	
ls	
cd	
mkdir	
rmdir	
touch	
rm	
clear	

Demonstration Review

What does each of the commands do?

pwd	Display the current working directory (<i>print working directory</i>).
ls	List directories and files in the current directory.
cd	Navigate into a directory (<i>change directory</i>).
mkdir	Make a directory.
rmdir	Remove a directory.
touch	Create an empty file.
rm	Remove a file.
clear	Clear the terminal history of a page.



Activity: Take Five and Practice the Command Line

In this activity, you are a security analyst at Wonka Corp.

- Wonka Corp believes an employee is selling secret recipes.
- You must create evidence directories for email, logs, and web_access to organize your investigation of the rogue employee.

Suggested Time:

20 Minutes



Time's Up! Let's Review.

Questions?



Relative vs. Absolute Paths

File Paths

A file path is a unique location in the file system where a file is located.

The `cat.jpg` image file is located in the `my_images` directory, which is in the `desktop` directory, in the `Sally` directory, in the `home` directory.

/home/Sally/Desktop/my_images/cat.jpg

The directory path is:
`/home/Sally/Desktop/my_images/`

The file is an image called:
`cat.jpg`

File Paths in IT

You are a security administrator and need to access a network log for an investigation.

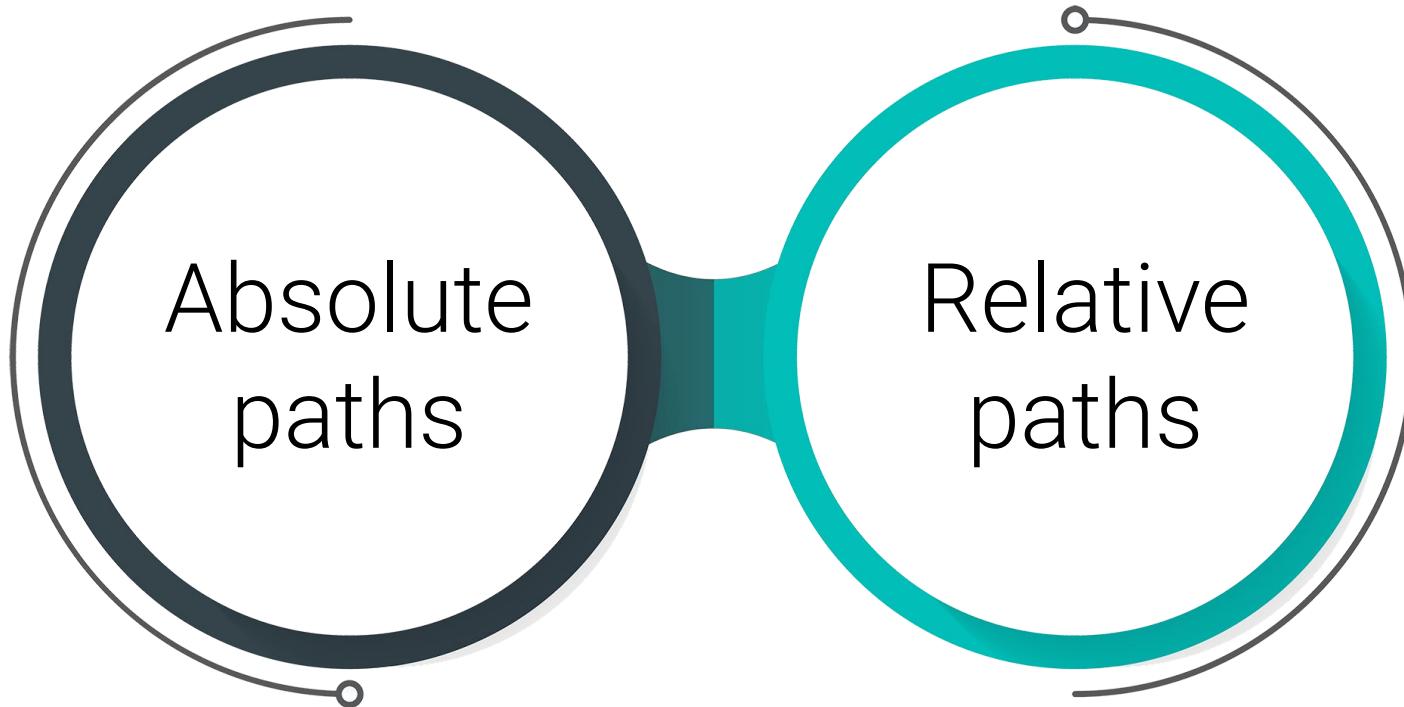
You might ask the network team for the location or path of the file.

The network team would provide you with a file path such as:

```
/var/log/logfile1.txt
```

File Paths

There are two types of file paths:



Absolute Paths



```
/home/Sally/Desktop/Sallysfiles/textfiles/Sallyfile.txt
```

An **absolute path** indicates the location of a file regardless of your current location in the file system.

If you're in the **Applications** directory and need to access a file in the **Desktop** directory, you can use an absolute path to get the file without navigating to the **Desktop** directory.

Absolute Paths

a file located at:

```
/home/Sally/Desktop/Sallysfiles/textfiles/Sallyfile.txt
```

If we are located in a different directory, such as,

```
/home/bob/file_logs/
```

We can use the absolute path,

```
/home/Sally/Desktop/Sallysfiles/textfiles/Sallyfile.txt
```

To access

```
Sallyfile.txt
```

Relative Paths



Sallysfiles/textfiles/Sallyfile.txt

A relative path starts at your current location in the file system and doesn't require using the root directory("/")�.

- If you need to access a file in the Desktop directory and are already in Desktop, create a path from your current point.
- In the above example, the user is in the Desktop directory, so /home/username/Desktop/ is assumed and not written.

File Paths on the Command Line

Relative and absolute paths function as helpful shortcuts on the command line.

```
cd Desktop  
cd Sallysfiles  
cd textfiles
```



```
cd Desktop/Sallysfiles/textfiles/
```

Demonstration Scenario

Our manager at ACME Corp. needs us to create several additional evidence files for our investigation. They provided the following instructions:

01

 Navigate to the directory

`/03-instructor/day1/pathnav_demonstration/security_evidence/Case2/.`

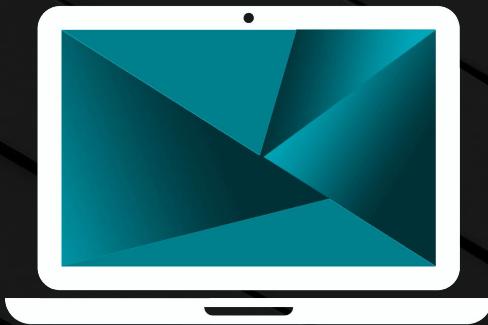
 Create an empty file called `case2_evidence`.

02

 Navigate to the directory `Case1` and create an empty file called `Web_logs`.

03

 Navigate back to the home folder.



Instructor Demonstration

File Paths

Copying and Moving Files



Security and IT professionals
often **copy** files from one
location to another.

Copying Files

For example:

You're asked to make a copy of a log file and put it in a separate evidence folder.



cp (copy) creates a copy
of the file and places it
in a specified location.



The original file stays
in its original location.

The original file remains.
A copy is created in the
new location, where it can
be edited as needed.



Security and IT professionals
often **move** files from one
location to another.

Copying Files

For example:

An image file is accidentally placed in the email directory. You have to move the file out of the email directory and into the correct image directory.



Unlike **cp**, the original file doesn't remain.



mv (move), relocates the file from its current location to a new, specified location.

The file is moved into the new location. (Similar to "cut and paste.")

Similar Syntax

`cp` and `mv` Have a Similar Syntax.

```
mv cat.jpg /dirA
```

This command moves the file `cat.jpg` into the directory `dirA`.

The `<file>` or `<location>` can be indicated with an absolute or relative path if the file is not in your current location.

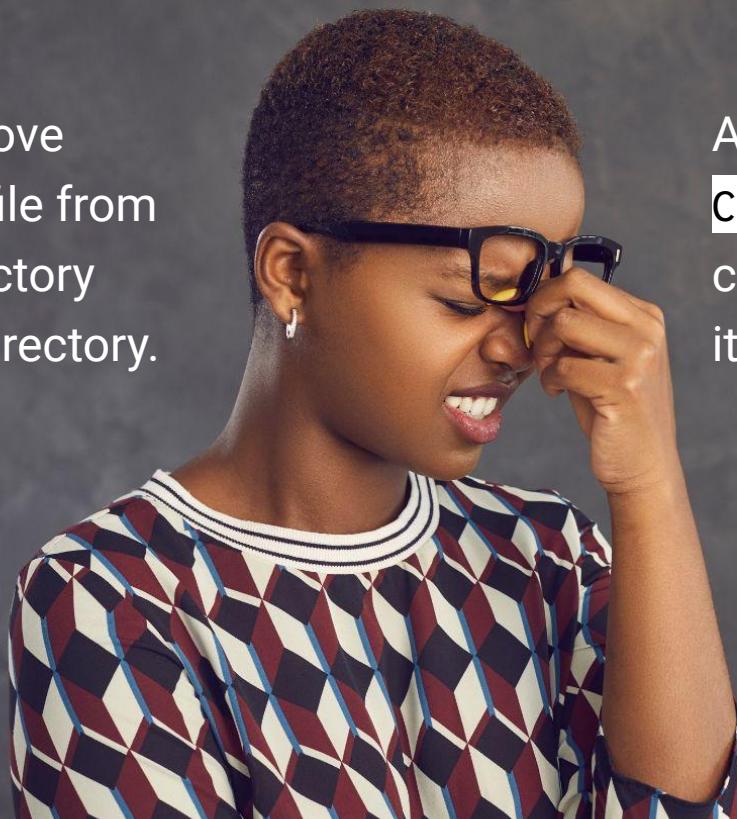
```
mv dirA/dirB/dirC/cat.jpg /dirA/dirB
```

This command moves the file `cat.jpg` from the `dirC` directory, over to the `dirB` directory.

Copy and Move Demo Scenario

Our manager made a mistake. They realize they only need web activity for Case 2.

We need to move
the `Web_logs` file from
the `Case1` directory
to the `Case2` directory.



After we move the file into the
`Case2` directory, we will make a
copy of the `Web_logs` file and place
it in the `security_evidence` folder.

Let's Review

Let's review the following concepts and commands:

file path

absolute path

relative path

cp

mv

Let's Review

Let's review the following concepts and commands:

file path	Identifies a unique location in a file system.
absolute path	
relative path	
cp	
mv	

Let's Review

Let's review the following concepts and commands:

file path	Identifies a unique location in a file system.
absolute path	Starts at the top directory of the file system.
relative path	
cp	
mv	

Let's Review

Let's review the following concepts and commands:

file path	Identifies a unique location in a file system.
absolute path	Starts at the top directory of the file system.
relative path	Begins from the current directory.
cp	
mv	

Let's Review

Let's review the following concepts and commands:

file path	Identifies a unique location in a file system.
absolute path	Starts at the top directory of the file system.
relative path	Begins from the current directory.
cp	Copies files.
mv	

Let's Review

Let's review the following concepts and commands:

file path	Identifies a unique location in a file system.
absolute path	Starts at the top directory of the file system.
relative path	Begins from the current directory.
cp	Copies files.
mv	Moves files.



Activity: Finding Your Milky Way

You continue in your role as security analyst at Wonka Corp.

- Your manager now believes there is a second employee working with Slugworth Corp.
- To continue the investigation, you've been asked to create an additional directory, and copy and move several of the evidence files.

Suggested Time:

20 Minutes



Time's Up! Let's Review.

Questions?



15:00

Break



Preview Commands

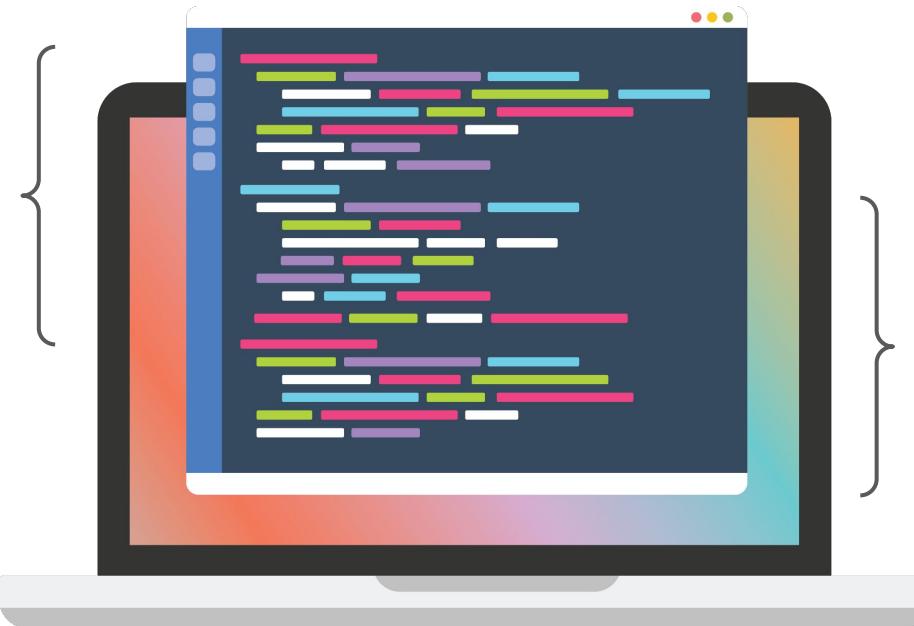


Security and IT professionals often
preview the contents of a files.

Previewing Files Example

A **security administrator**

needs to preview the top 10 lines of an email file to figure out who it was sent to.



A **network administrator**

needs to preview the bottom of a log file to see the last timestamp captured.

More Less Head and Tail

To preview and scroll through a whole file, use the **more** or **less** commands.

more	View a file one page at a time. Space bar moves you to the next page.
less	Similar to more , but it allows more flexibility. You can scroll forward and backward one line at a time, and it supports horizontal scrolling.

To preview a file by a certain number of lines, use the **head** or **tail** commands.

head	Displays the top 10 lines of a file.
tail	Displays the bottom 10 lines of a file.

Modifying the Preview

`head` and `tail` preview 10 lines by default. This number can be changed easily.

The syntax for `head` is:

```
head -number file
```

For example:

```
head -50 logfile.txt
```

shows the top 50 lines in `logfile.txt`.

The same syntax applies for the `tail` command.

Demo Scenario

At ACME Corp, we've been asked to examine several potential evidence files.



Our manager provided a directory, `evidence_directory`, containing four files:
`File1`, `File2`, `File3`, `File4`.



These files were pulled from a secret computer at Wonka. They should be access logs showing who has logged in to that computer.



We'll use the preview commands to determine which files are actually access logs.



Once we determine which are access logs, we'll document the last timestamp in the file.

Let's Review

What does each command do?

more	
less	
head	
tail	
-number	

Let's Review

What does each command do?

more	Display a file page-by-page. Space bar moves you to the next page.
less	Similar to more, but allows you to scroll up and down a file.
head	Previews the top 10 lines of a file.
tail	Previews the bottom 10 lines of a file.
-number	Added after head or tail to change the number of lines previewed.



Activity: Oh Henry, What Did You Do?

You continue in your role as security analyst at Wonka Corp.

- Your manager identified two employees who may be working with Slugworth—Henry and Ruth—and quickly pulled some files from their computers.
- You must preview the files to determine which have readable text data that can be used for analysis.

Suggested Time:

15 Minutes



Time's Up! Let's Review.

Questions?



Data Streams and the `cat` Command

The cat Command

Security and IT professionals often have to combine files.

For example:

A security professional needs to combine several of the same type of log file into a single log file.

We can use the cat command to complete this task.

The cat Command

cat (*concatenate*): combines files and displays the results.

- To combine `1.txt` and `2.txt`, run `cat 1.txt 2.txt`.
- This displays the combined results of `1.txt` and `2.txt` — but doesn't save the results beyond the command line.

1.txt:

A B C D

2.txt:

E F G H

`cat 1.txt 2.txt`

A B C D
E F G H

The `cat` Command

cat is also used to simply view the contents of a single file:

Readme.txt:

hello!

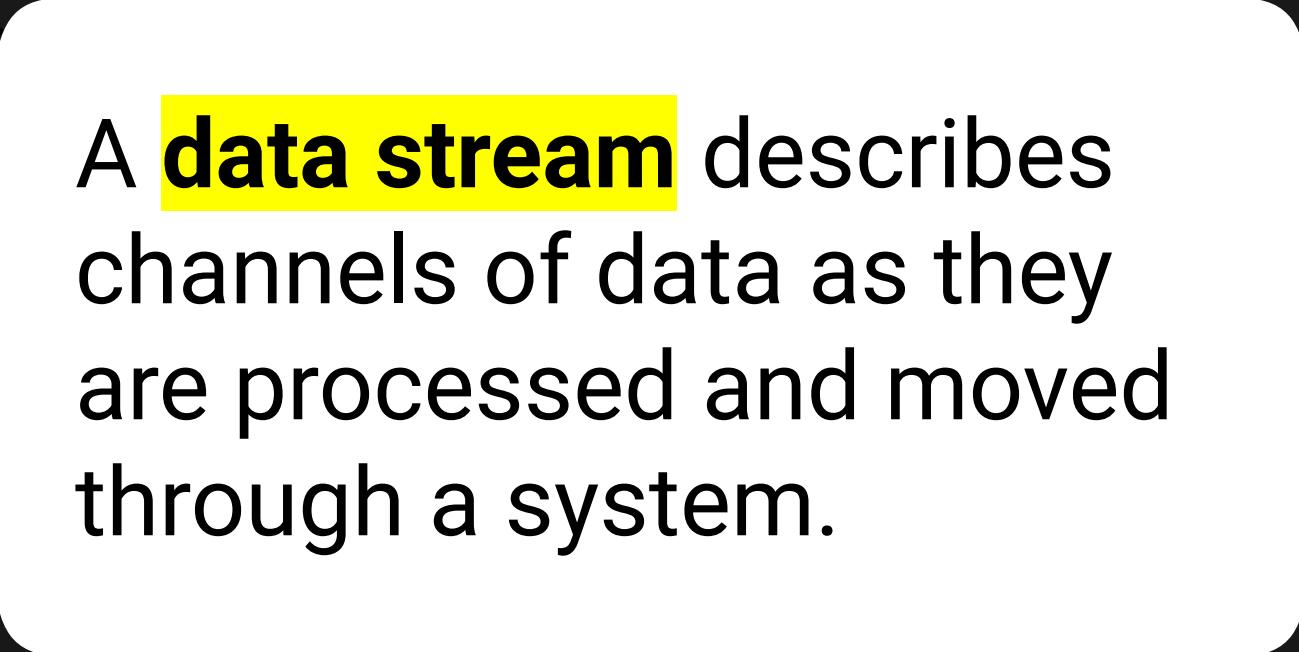
`cat ReadMe.txt`

hello!



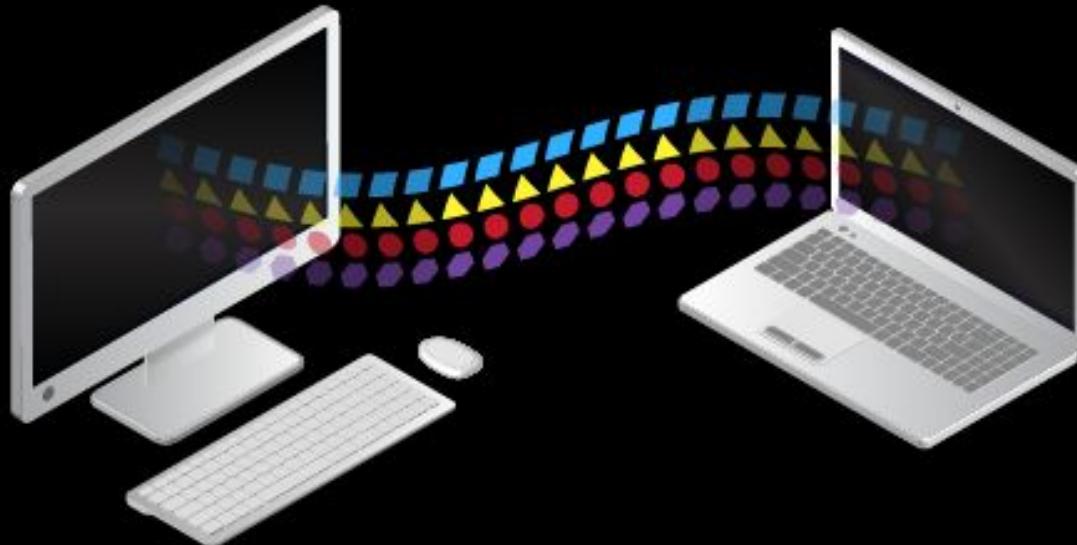
This command **does not** save
the results.

To save results of the **cat** command,
you have to redirect the data stream.



A **data stream** describes channels of data as they are processed and moved through a system.

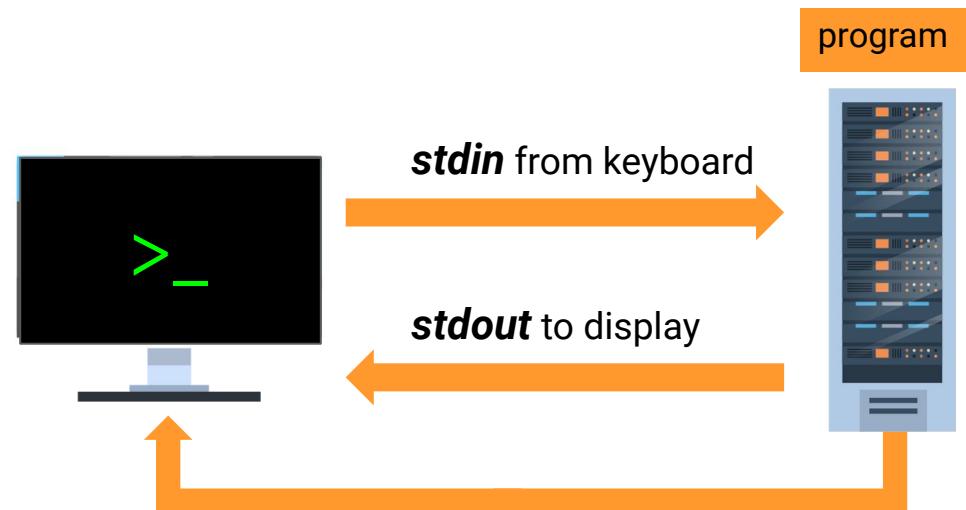
Data streams are used to move data from one process or program to another.



stdin* and *stdout

The most common data streams are ***stdin*** and ***stdout***, pronounced “standard in” and “standard out.”

- Input data is usually the *argument* given to the program. Output data is the information returned by the program when the command succeeds.
- Input data is streamed using the data stream ***stdin***.
- Output data is streamed using the data stream ***stdout***.



Back to Saving Results with cat

To save the results of `cat`, you have to use either `>` or `>>`.



or



cat with >

```
cat 1.txt 2.txt > combined_1_and_2.txt
```

The above command will combine two separate files, `1.txt` and `2.txt`, into a single file called `combined_1_and_2.txt`.

If `combined_1_and_2.txt` already exists, it will **overwrite** the file with the combined data from `1.txt` and `2.txt`.

cat with >

```
cat 3.txt 4.txt >> combined_3_and_4.txt
```

The preceding command will combine two separate files, `3.txt` and `4.txt`, into a single file called `combined_3_and_4.txt`.

If it already exists, it will **append** to the end of the file with the combined data from `3.txt` and `4.txt`.

cat and Data Streams:

```
cat 1.txt 2.txt > combined_1_and_2.txt
```

- `cat` takes data directly from ***stdin*** and directs it to ***stdout***.
- `1.txt` and `2.txt` is sent to ***stdin***.
- `cat` is taking ***stdin***, concatenating the data, and sending it to ***stdout***.
- The results of combining `1.txt` and `2.txt` is ***stdout***.
- ***stdout*** is redirected and written to a file called `combined_1_and_2.txt`.

Demonstration Set Up

At ACME Corp, we are asked to combine several evidence log files.

The manager provided:

A directory, called `LogFile_evidence_directory` containing four files: `LogFile1`, `LogFile2`, `LogFile3`, `LogFile4`.

Each file has logs from a different day.

The manager explained:

That your forensic team will be doing an analysis of these logs.

Their job will be easier if you can combine the log files into a single file.

We are tasked with:

Using the `cat` command to combine the logs into a single file called `rogue_employee_log_evidence`.



Instructor Demonstration

Data Streams and the `cat` Command



Activity: Internal Investigation: Finding the Kit cat Burglar

You continue in your role as security analyst at Wonka Corp

- Your manager believes Henry and Ruth are sharing secret recipes and collected some files from their computers to help you build your case.
- You must analyze this additional data and prepare a combined evidence file for the local authorities.

Suggested Time:

15 Minutes



Time's Up! Let's Review.

Questions?







Which command do we use to
retrieve a list of all files in a folder?



Which command do we use to
retrieve a list of files/directories?

ls



Which command do we use
to create a folder?



Which command do we use
to create a folder?

mkdir



Which command do we use to
combine multiple files?
How do we save the output?



Which command do we use to combine multiple files? **cat**

How do we save the output?

```
cat file1 file2 > output_file
```

Questions?



*The
End*