

Novice to Know-How Module Text

Course 5: Ingesting Digital Content

Module 6: Using the Command Line

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1. Introduction.

In this module we are going to look at how to use a command line interpreter. We will be focusing on the Windows version, which is called the Command Prompt. There are similar facilities in other operating systems, for example in Apple's Mac OS it is known as Terminal. The principles of how to use the different versions are the same, but the commands (instructions) used differ.

The Command Prompt is a useful facility to be familiar with as it offers functionality that can be used in digital preservation processes, as well as being the interface for operating some key digital preservation tools, such as the characterization tool FITS.

We will start by looking at what a command line interpreter is, before taking you through some of the basic commands. Finally, we will look at two useful command line functions for digital preservation: creating a directory listing, and robocopy.

2. How We Interact with Computers.

To help explain exactly what a Command Line Interpreter is, we will start by looking at the basics of how we interact with computers. Human interaction with computers is a two-way information exchange: we provide information to the computer, which it then processes and provides the results back to us. Any object that facilitates this interaction is known as a user interface.

A user interface can be comprised of a physical object such as a keyboard, screen, or joystick, and/or a piece of software such as a word processor or an email app. We are now most familiar with software user interfaces that allow us to interact with graphics such as menus and buttons, these are known as graphical user interfaces (GUIs). This training is displaying in a GUI.

There are also user interfaces that allow instructions to be input as text rather than through clicks on graphics. Command Line Interpreters such as the Command Prompt fall into this category of user interface.

3. What is a Command Line Interpreter?

Command Line Interpreters (CLIs) have been in use since the 1960s, when they were introduced as an alternative to inputting information and commands to computers using punch cards or similar physical sources.

A CLI is the software program that accepts the input of a text command, and any accompanying information, and processes it through a Command Line Interface into a form that can be used by the computer. Each CLI has a series of standard commands that users must know to instigate the related computer processes.

The Command Prompt is the default Command Line Interpreter of the Windows Operating System. It is also often referred to as `cmd.exe`, which is the name of its program file.

4. Pros and Cons of Using the Command Prompt.

GUIs have become the most popular type of software interface as their graphical input makes them more intuitive and easier to master. There are, however, still some advantages to using a CLI such as the Command Prompt. The following is a quick summary of some pros and cons:

Pros.

- No graphics means running a CLI requires fewer computer resources, therefore freeing up processing power for the task at hand.
- Some operations require only inputting a command of a few characters, which can be much quicker than clicking through a GUI's menus.
- Multiple commands can be scripted to run automatically.
- A command history can be kept to document actions.

Cons.

- Users must learn the syntax of the language used and relevant commands, so a higher level of user skills are required.
- Outputs are text based and can be harder to interpret than those presented in a graphical format.
- There is limited access to formatting options such as fonts.

5. Working with the Command Prompt.

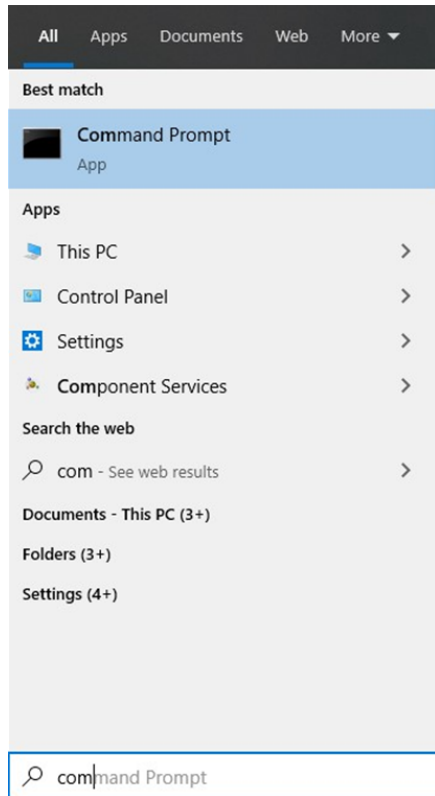
Now that we have established what the Command Prompt is and some reasons why it is a useful tool, we will have a look at some basics of how to use it.

In this section we will be walking you through how to open the Command Prompt and some of the basic commands you can use. This will help you become familiar with using the interface. Whenever a command is shown it will be written in *italics*.

To get the most from the rest of this module, we recommend opening and working along with the slides using the Command Prompt on your own computer. For each command we will give you clear instructions and information on what is happening.

6. Opening with the Command Prompt.

The Command Prompt is easily accessible through the main Windows menu available at the bottom left of the screen. There are two methods for locating and opening it:

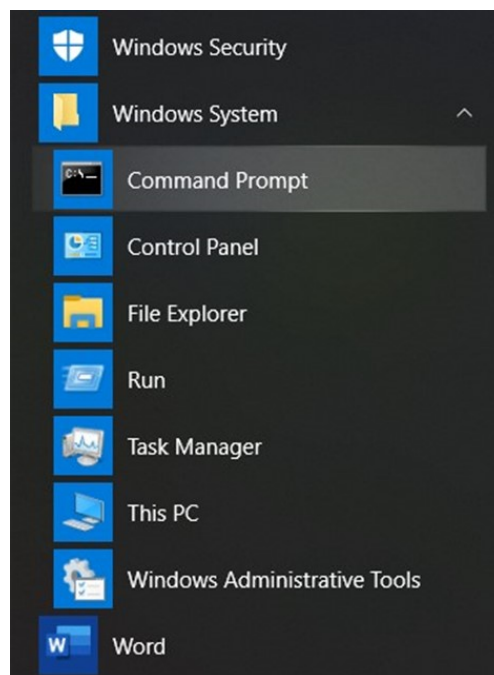


First, Finding via a Search

1. Click the Windows Menu icon
2. Start typing "Command Prompt"
3. Click on the App listing that appears

Second, Navigating Through the Menu

1. Click the Windows Menu icon
2. Scroll down and click on "Windows System" Folder
3. Click on "Command Prompt" listing



7. First View of the Command Prompt.



```
Command Prompt
Microsoft Windows [Version 10.0.18363.1016]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\sharo>
```

When the Command Prompt first opens there are only a few lines of text on screen. They are the computer's operating system (Microsoft Windows), the version (Version 10.0.18363.1016 in the above example), and a copyright declaration.

The next line is the command line where we can input our commands. The default is to start in the main folder for the user profile we are using. In the example above we are in the C: Drive in the sharo folder, which is a sub-folder of the Users folder. The current folder location will always be followed by a ">" symbol, this is where our commands will be entered.

As we begin to enter commands there are two important things to remember:

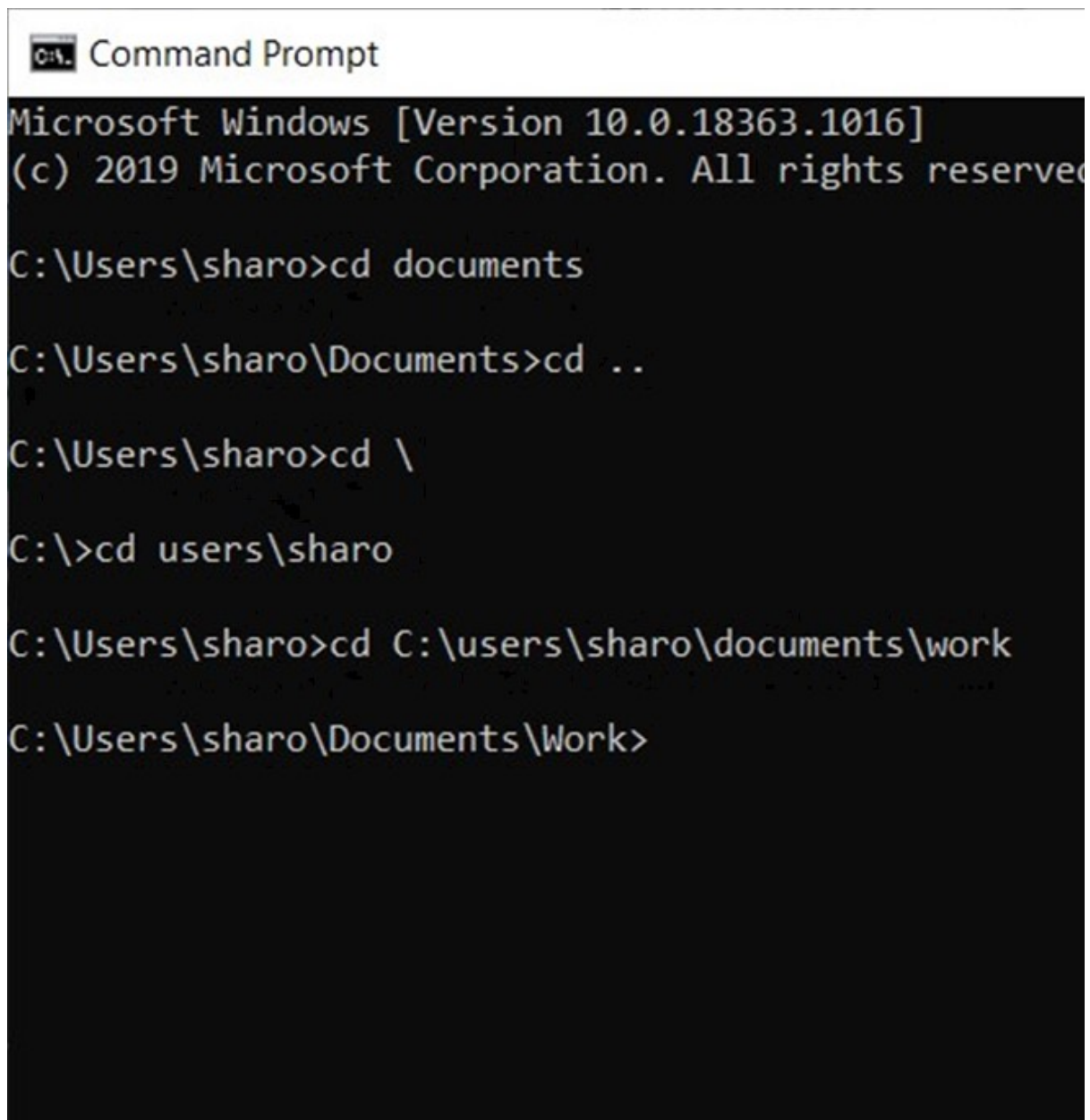
- Commands are not case sensitive
- We need to use a backward slash (\) for file locations and not a forward slash as we would with website addresses (/)

8. Moving Between Folders.

The first useful basic command we will use is for moving between different folders. The command to do this is "**cd**" (change directory). The image below shows five examples of the syntax that can be used for this command to make different moves. In each case the following line shows the file path for our new location in the folder structure. The five examples are:

1. **cd folder name** – to move to a sub-folder of the current folder e.g. **cd documents**
2. **cd ..** – moves to the folder above the current folder
3. **cd ** – jumps to the top level of the current drive
4. **cd folder name\sub-folder name** – moves two levels down in the structure to the named sub-folder e.g. **cd users\sharo**
5. **cd file path** – you can also type the full file path for the folder you wish to move to e.g. **cd C:\users\sharo\documents\work**

Using the Command Prompt you opened earlier try out each of these commands to move around the computer's folder structure.



```
C:\> Command Prompt

Microsoft Windows [Version 10.0.18363.1016]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\sharo>cd documents

C:\Users\sharo\Documents>cd ..

C:\Users\sharo>cd \

C:\>cd users\sharo

C:\Users\sharo>cd C:\users\sharo\documents\work

C:\Users\sharo\Documents\Work>
```

9. Viewing the Folder Structure.

When navigating the folder structure in the Command Prompt it would obviously be useful to be able to view that structure. The examples here show two options using the ***dir*** and ***tree*** commands.

```
Command Prompt

C:\Users\sharo\Documents\ExampleFolder>dir /a
Volume in drive C is Windows
Volume Serial Number is FABF-6346

Directory of C:\Users\sharo\Documents\ExampleFolder

16/07/2020  13:34    <DIR>          .
16/07/2020  13:34    <DIR>          ..
16/07/2020  13:34    <DIR>          Archive_School_Collection
16/07/2020  14:56    <DIR>          CourseContent
17/02/2020  11:12                7,614 DROIDMetadata.csv
17/02/2020  14:45           420,721 DROIDProfile.droid
16/07/2020  13:34                470 ExampleFolder.hash
28/02/2020  16:16           2,904 FileCountReport.pdf
16/07/2020  14:56    <DIR>          N2N_FullTextAndResources
               4 File(s)          431,709 bytes
               5 Dir(s)  299,977,420,800 bytes free
```

***dir* Command,**

Using just the dir command will show information about the current directory and the files and sub-folders it contains one level down. Folders are indicated in the list by <DIR>.

```
Command Prompt

C:\Users\sharo\Documents\ExampleFolder>tree
Folder PATH listing for volume Windows
Volume serial number is FABF-6346
C:.
|_ Archive_School_Collection
|   |_ MyFolder
|   |_ CourseContent
|       |_ Course1_IntroToDP
|           |_ FinalProducts
|               |_ OldVersions
|           |_ Module3_Images
|           |_ PreviousVersions
|               |_ Old Versions
|           |_ What is Digital Preservation - Storyline output
|               |_ html5
|                   |_ data
|                       |_ css
|                       |_ js
|                   |_ lib
|                   |_ img
```

***tree* Command ,**

The tree command will display a tree diagram of all of the sub-folders contained below the current folder. As this includes all levels below this tree can lengthy for large/complex folders. Now use your open Command Prompt window to try out the dir and tree commands and examine the results.

10. Renaming a File or Folder,

The rename command will allow you to rename files and folders. When renaming objects in the current folder the structure of the command is as follows:

A File: ***rename [current file name] [new file name]*** – the file extension must be included
e.g. ***rename example.txt examplefile.txt***

A Sub-Folder: ***rename [current folder name] [new folder name]*** - e.g. ***rename examplefolder newexamplefolder***

If any of the names contain spaces they must be enclosed in quotation marks, e.g.: ***rename "example file.txt" "new example.txt"***

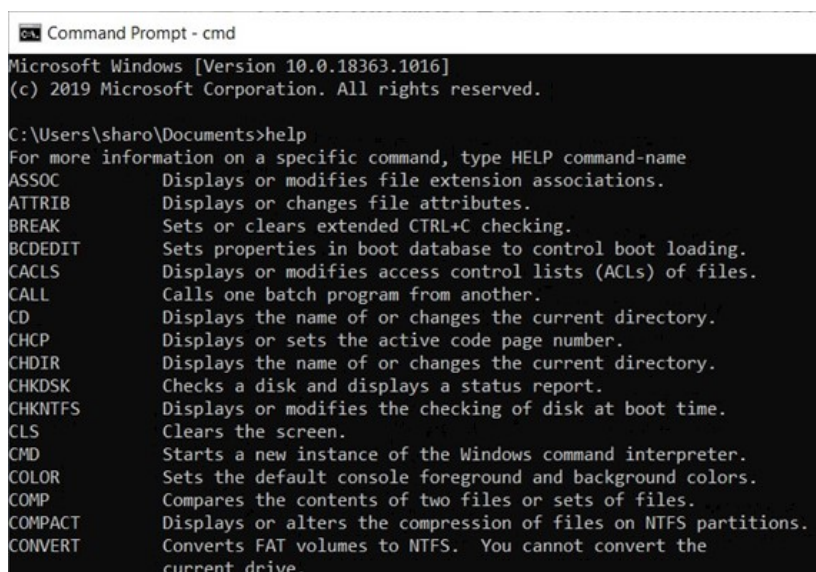
Also, it is possible to rename a file or folder not in the current folder by including the full file path with the current name, e.g.:

rename C:\Users\sharo\Documents\Work WorkFiles .

Now try these out yourself, but avoid using important files or folders in case of mistakes! The image on the right shows the examples listed above, note that a result is only shown if there is an error.

11. Accessing Information on Available Commands .

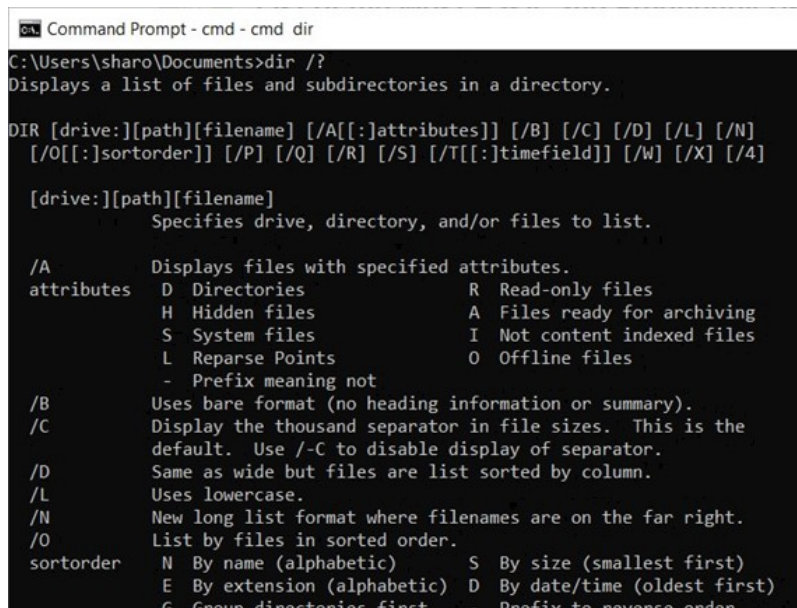
We have now practiced a few of the basic commands that can be used in the Command Prompt. If you would like to try others you can access a full list of default commands on the Command Prompt itself. You can also get information about the syntax that should be used for each command.



```
Command Prompt - cmd
Microsoft Windows [Version 10.0.18363.1016]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\sharo\Documents>help
For more information on a specific command, type HELP command-name
ASSOC          Displays or modifies file extension associations.
ATTRIB         Displays or changes file attributes.
BREAK          Sets or clears extended CTRL+C checking.
BCDEDIT        Sets properties in boot database to control boot loading.
CACLS          Displays or modifies access control lists (ACLs) of files.
CALL           Calls one batch program from another.
CD             Displays the name of or changes the current directory.
CHCP           Displays or sets the active code page number.
CHDIR          Displays the name of or changes the current directory.
CHKDSK         Checks a disk and displays a status report.
CHKNTFS        Displays or modifies the checking of disk at boot time.
CLS           Clears the screen.
CMD            Starts a new instance of the Windows command interpreter.
COLOR          Sets the default console foreground and background colors.
COMP           Compares the contents of two files or sets of files.
COMPACT        Displays or alters the compression of files on NTFS partitions.
CONVERT        Converts FAT volumes to NTFS. You cannot convert the
               current drive.
```

List of Default
Commands:
help



```
Command Prompt - cmd - cmd dir
C:\Users\sharo\Documents>dir /?
Displays a list of files and subdirectories in a directory.

DIR [drive:][path][filename] [/A[:]attributes] [/B] [/C] [/D] [/L] [/N]
  [/O[:]sortorder] [/P] [/Q] [/R] [/S] [/T[:]timefield] [/W] [/X] [/4]

  [drive:][path][filename]
    Specifies drive, directory, and/or files to list.

  /A      Displays files with specified attributes.
attributes  D Directories          R Read-only files
             H Hidden files        A Files ready for archiving
             S System files        I Not content indexed files
             L Reparse Points      O Offline files
             - Prefix meaning not

  /B      Uses bare format (no heading information or summary).
  /C      Display the thousand separator in file sizes. This is the
           default. Use /-C to disable display of separator.
  /D      Same as wide but files are list sorted by column.
  /L      Uses lowercase.
  /N      New long list format where filenames are on the far right.
  /O      List by files in sorted order.
sortorder  N By name (alphabetic)    S By size (smallest first)
           E By extension (alphabetic) D By date/time (oldest first)
           G Group directories first - Prefix to reverse order
```

Information on a
Command:
help [command], e.g.
help dir

Now we have worked through some basic examples, we will examine how to use the Command Prompt for two tasks that can help with Digital Preservation work.

12. Why Create a Directory Listing?

In the last section we looked at a command to help us examine the contents of a folder: `dir`. This is a particularly useful command for digital preservation as it can allow us to quickly generate a complete list of files and folders within a collection or area of our storage. Knowing what we have and where it is stored is essential for managing digital content.

Over the next couple of slides we will look at how to add criteria to a directory command (such as sorting the results in a particular order) and how to save the information to a separate file that can be accessed again later.

13. Adding Criteria to the *dir* Command.

As mentioned on the previous slide, it is possible to add criteria to the `dir` command to customize the information it will provide. The full list of possible choices by typing `help dir` into the Command Prompt. The example command below shows some of the most useful criteria and explains what they are.

Example command: `dir /s /b /o:N`

dir – the command to create a directory listing

/s – the directory listing should list the contents of the folder and all subfolders

/b – the directory listing should be 'bare' of heading information, i.e. it will contain the file path and file name only

/o – the directory listing should be sorted on a particular criteria.

:N – the order should be alphabetically by name

Other options include:

:S – by size (smallest first)

:E – by file extension (alphabetically)

:D – by date (oldest first)

14. Saving the Directory Listing.

To save the directory list that will be generated we need to add instructions on where to create the file, what to call it, and what file format it should be. This information is added to the end of the command after a `'>'` symbol.

To save the file in the current folder we just need to specify the name of the file we want to create: **`dir /s /b /o:N > directorylist.txt`**

To save the file in a different folder we can specify this using a file path:

dir /s /b /o:N > C:\Archive\DirectoryLists\directorylist.txt

Saving the directory list as a text file (.txt) is a good option in the first instance. This can then potentially be loaded into a spreadsheet or database.

Now try this task for yourself by using the Command Prompt to navigate to a folder and creating a directory list for it. Consider trying it a few times with different criteria and comparing the outcomes.

15. Introducing Robocopy.

Robocopy, or “Robust File Copy”, is a file copying command that provides more resilient and reliable copying functionality than the standard Windows copying functions using the Windows Explorer GUI. Some of the reasons it is a superior option include that it:

- Can tolerate network interruptions and resume copying
- Is more reliable when copying the file data and its attributes
- Can copy files and folders with file paths longer than 256 characters
- Has lots of customization options for how to carry out the copying
- Provides a report at the end of the copying process

The customization options include choices about the file attributes to copy, whether to copy empty folders or not, and the ability to schedule copying for a particular time. This is particularly useful if copying a large amount of data as it can be scheduled for times your network is quieter (e.g. at night). As with other commands, the full list of options is available by typing help robocopy into the Command Prompt.

16. The *robocopy* Command.

As mentioned on the previous slide, there are lots of ways to customize the robocopy command, but we are going to concentrate on a relatively simple version of the command. The structure for this is as follows:

robocopy [source folder] [destination folder] [options]

Below is an example of a full command. Here we have written the command to tell the computer to copy the contents of the “ExampleFolder” to the folder “CopyExample” (if the folder we want to copy to does not already exist, the computer will create it). We have also included an instruction, “/e”, that we want all of the sub-folders copied, including those that are empty (so we copy the folder structure exactly).

***robocopy “C:\users\sharo\documents\examplefolder”
“C:\users\sharo\documents\copyexample” /e***

Note that here we have included the full folder file path in inverted commas. Supplying the source and destination folders in this form ensures accuracy when the computer executes the command.

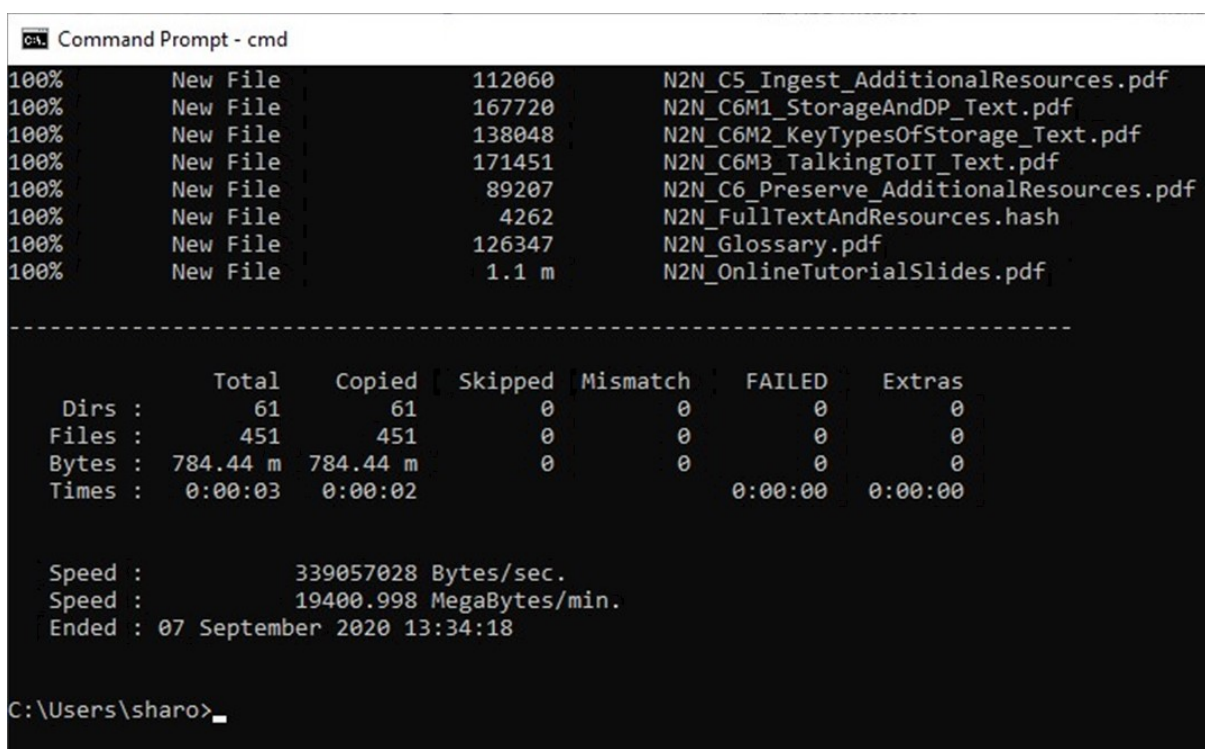
17. Report from *robocopy* Command.

On the first slide in this section we noted that after executing a robocopy command you will receive a report on the process. The image below shows an example report after executing the command from the previous slide.

It lists how many folders (directories) were copied, how many files, their total size, and if any were skipped or failed, along with other more detailed information. This provides clear confirmation of the success (or otherwise) of the copy action.

Now it is time to try the robocopy command yourself. Remember the structure for the command is:

robocopy [source folder] [destination folder] [options]



```

C:\> Command Prompt - cmd
100%      New File           112060      N2N_C5_Ingest_AdditionalResources.pdf
100%      New File           167720      N2N_C6M1_StorageAndDP_Text.pdf
100%      New File           138048      N2N_C6M2_KeyTypesOfStorage_Text.pdf
100%      New File           171451      N2N_C6M3_TalkingToIT_Text.pdf
100%      New File            89207      N2N_C6_Preserve_AdditionalResources.pdf
100%      New File            4262       N2N_FullTextAndResources.hash
100%      New File           126347      N2N_Glossary.pdf
100%      New File            1.1 m       N2N_OnlineTutorialSlides.pdf

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      Total      Copied      Skipped      Mismatch      FAILED      Extras
 Dirs  :         61         61           0           0           0           0
Files  :         451         451           0           0           0           0
Bytes  :    784.44 m    784.44 m           0           0           0           0
Times  :    0:00:03    0:00:02                0:00:00    0:00:00

Speed  :             339057028 Bytes/sec.
Speed  :             19400.998 MegaBytes/min.
Ended  : 07 September 2020 13:34:18

C:\Users\sharo>
```

18. Module Wrap-Up.

In this module we looked at some of the basics of the Windows Command Prompt, gaining familiarity with its use. The Command Prompt has inbuilt commands that can be useful for digital preservation. There are also some tools that are operated using the Command Prompt.

In this module we have introduced the following commands:

cd – ‘change directory’, which is used to navigate the folder structure

dir – which is used to display information on the folder structure

rename – which allows us to rename files or folders

help – which displays information about the available commands

robocopy – a robust and reliable way to copy files to a new location

We have also examined how to customize these commands by setting criteria. The Command Prompt can be a powerful tool, so it is worth continuing to practice!