# Exemplar: Create hash values

Lab instructions and tasks



## Activity overview

As a security analyst, you'll need to implement security controls to protect organizations against a range of threats.

That's where hashing comes in. Previously, you learned that a hash function is an algorithm that produces a code that can't be decrypted. Hash functions are used to uniquely identify the contents of a file so that you can check whether it has been modified. This code provides a unique identifier known as a hash value or digest.

For example, a malicious program may mimic an original program. If one code line is different from the original program, it produces a different hash value. Security teams can then identify the malicious program and work to mitigate the risk.

Many tools are available to compare hashes for various scenarios. But for a security analyst it's important to know how to manually compare hashes.

In this lab activity, we'll create hash values for two files and use Linux commands to manually examine the differences.

## Scenario

In this scenario, you need to investigate whether two files are identical or different.

Here's how you'll do this task: **First**, you'll display the contents of two files and create hashes for each file. **Next**, you'll examine the hashes and compare them.

Let's hash some files!

***Note:*** *The lab starts with your user account, called* `analyst`*, already logged in to the Bash shell. This means you can start the tasks as soon as you click the* ***Start Lab*** *button.*
**Disclaimer:** For optimal performance and compatibility, it is recommended to use either **Google Chrome** or **Mozilla Firefox** browsers while accessing the labs.

# Start your lab

Before you begin, you can review the instructions for using the Qwiklabs platform under the **Resources** tab in Coursera.

If you haven't already done so, click **Start Lab**. This brings up the terminal so that you can begin completing the tasks!

When you have completed all the tasks, refer to the **End your Lab** section that follows the tasks for information on how to end your lab.

# Task 1. Generate hashes for files

The lab starts in your home directory, `/home/analyst`, as the current working directory. This directory contains two files `file1.txt` and `file2.txt`, which contain different data.

In this task, you need to display the contents of each of these files. You'll then generate a hash value for each of these files and send the values to new files, which you'll use to examine the differences in these values later.

1. Use the `ls` command to list the contents of the directory.

The command to complete this step:

ls

Two files, `file1.txt` and `file2.txt`, are listed.

2. Use the `cat` command to display the contents of the `file1.txt` file:

cat file1.txt ***Note:*** *If you enter a command incorrectly and it fails to return to the command-line prompt, you can press* ***CTRL+C*** *to stop the process and force the shell to return to the command-line prompt.*

3. Use the `cat` command to display the contents of the `file2.txt` file:

cat file2.txt

4. Review the output of the two file contents: analyst@4fb6d613b6b0:-$ cat file1.txt X5O!P%@AP[4\PZX54(P^)7CC)7}$EICAR-STANDARD-ANTIVIRUS-TEST-FILE!$H+H* analyst@4fb6d613b6b0:-$ cat file2.txt X5O!P%@AP[4\PZX54(P^)7CC)7}$EICAR-STANDARD-ANTIVIRUS-TEST-FILE!$H+H*

**Answer**: Yes. The contents of the two files appear identical when you use the `cat` command to display the file contents.

Although the contents of both files appear identical when you use the `cat` command, you need to generate the hash for each file to determine if the files are actually different.

5. Use the `sha256sum` command to generate the hash of the `file1.txt` file:

sha256sum file1.txt

You now need to follow the same step for the `file2.txt` file.

6. Use the `sha256sum` command to generate the hash of the `file2.txt` file:

sha256sum file2.txt

7. Review the generated hashes of the contents of the two files:
   analyst@4fb6d613b6b0:-$ sha256sum file1.txt
   131f95c51cc819465fa1797f6ccacf9d494aaaff46fa3eac73ae63ffbdfd8267 file1.txt
   analyst@4fb6d613b6b0:-$ sha256sum file2.txt
   2558ba9a4cad1e69804ce03aa2a029526179a91a5e38cb723320e83af9ca017b file2.txt

**Answer**: No. The generated hash value for `file1.txt` is different from the generated hash value for `file2.txt`, which indicates that the file contents are not identical.

Click **Check my progress** to verify that you have completed this task correctly.

Generate hashes for files

# Task 2. Compare hashes

In this task, you'll write the hashes to two separate files and then compare them to find the difference.

1. Use the `sha256sum` command to generate the hash of the `file1.txt` file, and send the output to a new file called `file1hash`:

sha256sum file1.txt >> file1hash

You now need to complete the same step for the `file2.txt` file.

2. Use the `sha256sum` command to generate the hash of the `file2.txt` file, and send the output to a new file called `file2hash`:

sha256sum file2.txt >> file2hash

Now, you should have two hashes written to separate files. The first hash was written to the `file1hash` file, and the second hash was written to the `file2hash` file.

You can manually display and compare the differences.

3. Use the `cat` command to display the hash values in the `file1hash` and `file2hash` files.

The command to complete this step:

cat file1hash cat file2hash

4. Inspect the output and note the difference in the hash values.

***Note:** Although the content in `file1.txt` and `file2.txt` previously appeared identical, the hashes written to the `file1hash` and `file2hash` files are **completely** different.*

Now, you can use the `cmp` command to compare the two files byte by byte. If a difference is found, the command reports the byte and line number where the first difference is found.

5. Use the `cmp` command to highlight the differences in the `file1hash` and `file2hash` files:

cmp file1hash file2hash

6. Review the output, which reports the first difference between the two files:

analyst@4fb6d613b6b0:-$ cmp file1hash file2hash file1hash file2hash differ: char1, line 1
***Note:** The output of the `cmp` command indicates that the hashes differ at the first character in the first line.*

**Answer**: Yes, the contents of the two files are different because the hash values of each file are different.

Click **Check my progress** to verify that you have completed this task correctly.

Compare hashes

# Conclusion

Great work!

You practiced how to

- compute hashes using `sha256sum`,
- display hashes using the `cat` command, and
- compare hashes using the `cmp` command.

These are valuable tools you can use to validate data integrity as you contribute to the control of your organization’s security.

# End your lab

Before you end the lab, make sure you’re satisfied that you’ve completed all the tasks, and follow these steps:

1. Click **End Lab**. A pop-up box will appear. Click **Submit** to confirm that you're done. Ending the lab will remove your access to the Bash shell. You won’t be able to access the work you've completed in it again.

2. Another pop-up box will ask you to rate the lab and provide feedback comments. You can complete this if you choose to.
3. Close the browser tab containing the lab to return to your course.
4. Refresh the browser tab for the course to mark the lab as complete.