

IT 360 Project Report

Bash Script Artifact Tool

By: Ethan Allgier, Jacob Kovar, Owen Reid

Digital Forensics Automation Script Project Report

Introduction

The purpose of our project was to build a simple tool that makes digital forensics work quicker and easier. In many investigations, examiners must run several different programs one at a time to check file integrity, find hidden information, and collect metadata. This can take a long time and increase the chance of making mistakes. Our project solves this problem by combining multiple forensic tools into one automated script. With this script, an investigator only must run one command to get hashes, extract artifacts, and read metadata. This makes the process much faster, more organized, and more consistent.

Technical Implementation

This project was created using bash, which is a scripting language commonly found on Linux forensic systems. Bash is lightweight, easy to use, and works well for automating command-line tools. The script first checks that the proper tools are installed and that the evidence file exists. After that, it creates a special output folder to store all results.

The script uses three different forensic programs:

- **hashdeep** – creates MD5 and SHA-256 hash values so investigators can confirm file integrity and see if files have been changed.
- **bulk_extractor** – scans the file for useful artifacts such as email addresses, URLs, domains, credit card numbers, and wordlists.
- **exifTool** – extracts metadata like timestamps, camera information, GPS locations, file types, and author information.

These tools were chosen because they cover different but important parts of forensic analysis: verifying data, finding hidden information, and reading metadata. They also work well together in a single automated workflow.

Results

When the script is finished running, it creates a folder called `script_output_IT360`. Inside this folder you see each run that has happened because the script will figure out the last time the tool has been run. So, when selecting which run you want you will see bulk directory where you see a bunch of different files. All the files that are shown are the default file that bulk can find information based on what you add as your data set. This means some of the files won't have anything in it. So, then we have the bulk metadata file which lets us know which bulk files have information on it. Then you can see the data set was hashed with hashdeep. Then the data set also has a metadata file, letting us get more information on that. Lastly, we have the `log.run` file just showing what happened when the tool was running.

- A text file from hashdeep with the SHA-256 and md5 hash values. (*See the picture below.*)

```
(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001]
└─$ ls
bulk  bulk_metadata.txt  file_hash.txt  file_metadata.txt  run.log

(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001]
└─$ cat file_hash.txt
%%%
HASHDEEP-1.0
%%% size,md5,sha256,filename
## Invoked from: /home/vmuser/IT360_Project
## $ hashdeep EPVME_1.zip
##
22669320,d93a934edc2c70a0765089f725868693,3e4e18371f2dc08a9668b1c0309c91e19a612a5068021e245cb6005e92958b97,/home/vmuser/IT360_Project/EPVME_1.zip
```

- A bulk_extractor output directory containing files such as email.txt, url.txt, domain.txt, and other lists of artifacts. (*See the picture below.*)

```
(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001]
└─$ cd bulk
(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001/bulk]
└─$ ls
aes_keys.txt          ether_histogram_1.txt  jpgs          rfc822.txt      url_searches.txt
alerts.txt            ether_histogram.txt   jpeg.txt      sin.txt        url_services.txt
ccn_histogram.txt    ethernet.txt         json.txt      soleil_carved.txt  url.txt
ccn_track2_histogram.txt  ethtx_carved.txt  kml_carved.txt  soleil_carved.txt  utmp_carved.txt
ccn_track2.txt       exif.txt           nftsidx_carved.txt  tcp_histogram.txt  utmpd_carved.txt
ccn.txt              facebook.txt        ntfsmft_carved.txt  tcp.txt        usercard.txt
domain_histogram.txt find_histogram.txt  ntfsmft_carved.txt  telephone_histgram.txt  windirs.txt
domain.txt           find.txt           ntfsmusn_carved.txt  telephone_histgram.txt  winlnk.txt
elf.txt              gos.txt            pii_teamviewer.txt  unrar_carved.txt  winpe_carved.txt
email_domain_histogram.txt httplogs.txt  pii.txt        url_facebook-address.txt  winpex.txt
email_histogram.txt  ip_histogram.txt   rar.txt       url_facebook-id.txt  winprefetch.txt
email.txt            ip.txt             report.xml    url_histogram.txt  zip
                           ipm.txt

(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001/bulk]
└─$ cat email.txt
# BANNER FILE NOT PROVIDED (-b option)
# BULK_EXTRACTOR-Version: 2.1.1
# Feature-Recorder: email
# Filename: EPVME_1.zip
# Feature-File-Version: 1.1
64-ZIP-6           sywi@pge.com  From: sywi@pge.com\012To: "joseph powell" <joseph.powell@bbsrc.ac.uk>\012Subject: XSS T
64-ZIP-45          joseph.powell@bbsrc.ac.uk  h powell (RI) <joseph.powell@bbsrc.ac.uk>\012Subject: XSS T
553-ZIP-21          ursus250list.ru  "Bianca West" <ursus250list.ru>\012To: <victim@i
852-ZIP-14          test@attack.com  Return-Path: <test@attack.com>\012From: admin@se
852-ZIP-37          admin@security.enron.com  tack.com\012From: admin@security.enron.com\012To: vanaya_vito
852-ZIP-66          vanaya_vito@vito@yahoo.com  y.enron.com\012To: vanaya_vito@vito@yahoo.com\012Subject: Go out
852-ZIP-1285         ktwarlic@speedy.uwaterloo.ca  formatte.branch.\012ktwarlic@speedy.uwaterloo.ca.\012\012\012\012——9747_hz
1770-ZIP-22          Wilcox7@prime-spec.net  "Wilcox, Hugo" <Wilcox7@prime-spec.net>\012To: rosalee.fl
1770-ZIP-51          rosalee.Fleming@enron.com  e-spec.net\012To: rosalee.Fleming@enron.com, elizabeth.iver
1770-ZIP-78          elizabeth.ivers@enron.com  ming@enron.com, elizabeth.ivers@enron.com, \012Subject: 6#39
2119-ZIP-15          ffreyb@xploronet.com  From\012: Larry <ffreyb@xploronet.com>\012Sender: jennif
2119-ZIP-45          jennifer.stewart@enron.com  et.com\012To: jennifer.stewart@enron.com\012To: p.connolly@en
2119-ZIP-76          p.connolly@nortresearch.co.nz  t@enron.com\012To: p.connolly@nortresearch.co.nz\012Subject: Now wi
3468-ZIP-6           kelly_p_davis@yahoo.com  From<kelly_p_davis@yahoo.com\000attack.com>\012To:
3468-ZIP-46          steven.kean@enron.com  attack.com\012To: steven.kean@enron.com, karen.denne@en
```

- An exifTool metadata report summarizing file properties and important details. (*See the picture below.*)

```

File Actions Edit View Help
└─$ cat bulk_metadata.txt
=====
script_output_IT360/run_001/bulk/utmp_carved.txt
ExifTool Version Number : 13.25
File Name : utmp_carved.txt
Directory : script_output_IT360/run_001/bulk
File Size : 0 bytes
File Modification Date/Time : 2025:11:30 16:42:30-06:00
File Access Date/Time : 2025:11:30 16:42:30-06:00
File Inode Change Date/Time : 2025:11:30 16:42:30-06:00
File Permissions : -rw-rw-r--
Error : File is empty
=====
script_output_IT360/run_001/bulk/winpe_carved.txt
ExifTool Version Number : 13.25
File Name : winpe_carved.txt
Directory : script_output_IT360/run_001/bulk
File Size : 0 bytes
File Modification Date/Time : 2025:11:30 16:42:30-06:00
File Access Date/Time : 2025:11:30 16:42:30-06:00
File Inode Change Date/Time : 2025:11:30 16:42:30-06:00
File Permissions : -rw-rw-r--
Error : File is empty
=====
script_output_IT360/run_001/bulk/email_histogram.txt
ExifTool Version Number : 13.25
File Name : email_histogram.txt
Directory : script_output_IT360/run_001/bulk
File Size : 397 kB
File Modification Date/Time : 2025:11:30 16:42:44-06:00
File Access Date/Time : 2025:11:30 16:42:44-06:00
File Inode Change Date/Time : 2025:11:30 16:42:44-06:00
File Permissions : -rw-rw-r--
File Type : TXT
File Type Extension : txt
MIME Type : text/plain
MIME Encoding : us-ascii
Newlines : Unix LF
Line Count : 14040
Word Count : 28090
=====
script_output_IT360/run_001/bulk/gps.txt
ExifTool Version Number : 13.25
File Name : gps.txt
Directory : script_output_IT360/run_001/bulk

```

```

└─(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001]
└─$ cat file_metadata.txt
ExifTool Version Number : 13.25
File Name : EPVME_1.zip
Directory : .
File Size : 23 MB
File Modification Date/Time : 2025:11:25 21:02:41-06:00
File Access Date/Time : 2025:11:30 16:42:28-06:00
File Inode Change Date/Time : 2025:11:30 16:37:39-06:00
File Permissions : -rw-rw-r--
File Type : ZIP
File Type Extension : zip
MIME Type : application/zip
Zip Required Version : 20
Zip Bit Flag : 0
Zip Compression : None
Zip Modify Date : 2022:12:01 00:04:56
Zip CRC : 0x00000000
Zip Compressed Size : 0
Zip Uncompressed Size : 0
Zip File Name : 1/

```

- The folder that contains the script output.(*See the picture below.*)

```
(vmuser㉿kali)-[~/IT360_Project]
└─$ cd script_output_IT360

(vmuser㉿kali)-[~/IT360_Project/script_output_IT360]
└─$ ls
run_001  run_002

(vmuser㉿kali)-[~/IT360_Project/script_output_IT360]
└─$ cd run_001

(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001]
└─$ ls
bulk  bulk_metadata.txt  file_hash.txt  file_metadata.txt  run.log
```

- The run log. (*See the picture below.*)

```
(vmuser㉿kali)-[~/IT360_Project/script_output_IT360/run_001]
└─$ cat run.log

=====
Evidence Processing Script
Run #: 1
Date : Sun Nov 30 04:42:28 PM CST 2025
File : EPVME_1.zip
=====

[1/5] Hashing evidence file using hashdeep
[+] Hash saved to: file_hash.txt

[2/5] Collecting metadata with exiftool
[+] Metadata saved to: file_metadata.txt

[3/5] Extracting artifacts/files with bulk extractor
bulk_extractor version: 2.1.1
Input file: "EPVME_1.zip"
```

Conclusion

While working on this project, we learned how valuable automation is in digital forensics. Running one script saved a lot of time compared to running three separate tools. Bash was easy to use for basic automation, but it limited how advanced the interface could be. One challenge we noticed was that bulk extractors sometimes created very large files, which made them hard to sort through without extra filtering. Running the script on large evidence images also took a long time, which showed us the importance of adding progress messages and logging.

One thing we planned at first was to use a tool called ripMIME to extract email attachments from the evidence file. Our goal was to have the script automatically pull out attachments along with emails and other artifacts. However, we could not get ripMIME to work correctly. The attachments did not show up in our tests, even after troubleshooting. Because of this, we decided to remove ripMIME from the project and use exiftool instead. Exiftool worked much more reliably and still gave us useful information. It gives especially metadata like timestamps, file details, and metadata from bulk extractor files to find out exactly which files contain information. In the future, we would like to come back to ripMIME and get it working, because attachment extraction would make the tool even more complete.

If we were to improve this project in the future, we would add features like a summary report, options to choose which tools to run, and stronger error handling. We would also try to include automatic filtering and keyword searching, so investigators do not have to scroll through huge output files. Overall, this project helped us understand how automation can speed up forensic analysis while keeping results organized and reliable.