SINGAPORE INSTITUTE OF TECHNOLOGY

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ICT 2202 Digital Forensics Assignment 1

Arcana User Manual

Team Spectre	
Name	**Student ID**
Muhamad Afiq Busari	**2000476**
Jeremy Jevon Chow Zi You	**2001558**
Tse Kin Ping, Matthew	**2001568**
Lee Zhi Yang Aloysius	**2001348**

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Installation

```
git clone https://github.com/afiqbusari7/Arcana
cd Arcana
pip install -r requirements.txt
```

Required Libraries

- libewf-python
- lxml
- pandas
- pytsk3
- python-evtx
- requests
- tabulate
- validators
- virustotal-python

Arcana Setup

1. Disk Image

For this application, we will be using the following test disk image.

nps-2009-domexusers — This is a disk image of a Windows XP SP3 system that has two users, domexuser1 and domexuser2, who communicate with a third user (domexuser3) via IM and email.

The one with the full system, distributed as an encrypted disk image, is used.

Download URL: https://digitalcorpora.s3.amazonaws.com/corpora/drives/nps-2009-domexusers/nps-2009-domexusers.E01

2. Virus Total API Key

To make use of the VirusTotal API, you will need to first sign up an account on VirusTotal with the following link: https://www.virustotal.com/gui/join-us

You will then need to copy the API key found in the VirusTotal account user menu.

The user will then need to paste the API key into the following string found in virusTotalAPI.py

3. PyCharm IDE

Users are encouraged to download the latest version of PyCharm from the following link: https://www.jetbrains.com/pycharm/download/

To ensure that all functions of Arcana are working as intended, please run PyCharm as administrator before adding and using Arcana.

Arcana Functions

1. Scan Raw Image
2. Scan File
3. Scan URL
4. Analyse Logs (LIVE)

Raw Image Functions

1. Display Files
2. Keyword Search
3. Select File to Extract from Image
4. Process and Display Web History
5. Scan for Virus

Virus Scan Functions

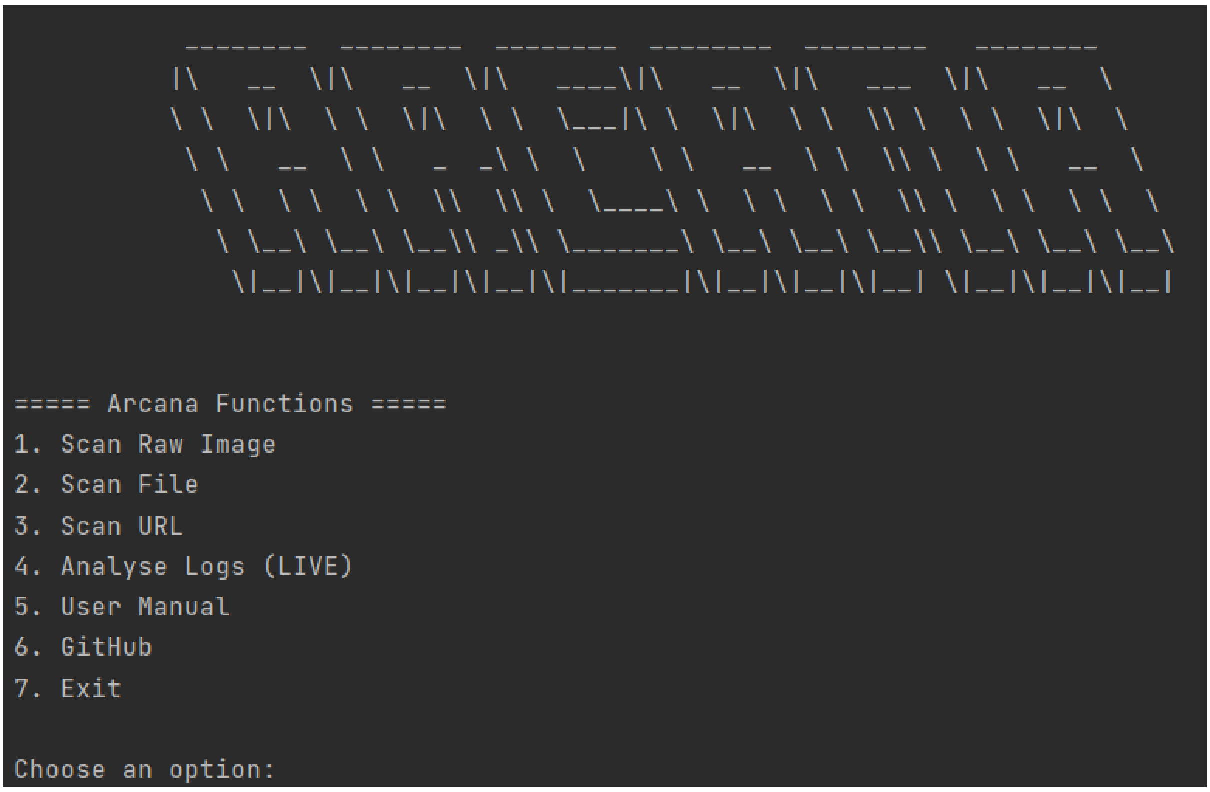
1. Full Scan (All Files and URLs)
2. Scan Files by Keyword
3. Scan URLs by Keyword

When the application prompts the user for input, the user can use the following commands:

Commands	**Description**
break	To return to the previous menu
exit	To stop the application

1. Scan Raw Image

On launch, the application will display the Arcana main menu.

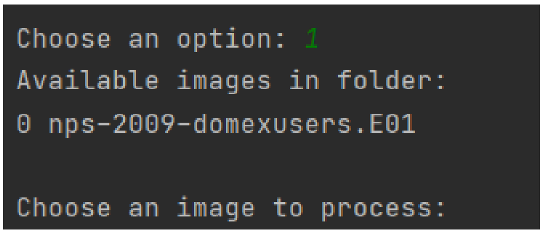


```
           ________  ________  ________  ________  ________   ________
          |\   __  \|\   __  \|\   ____\|\   __  \|\   ___  \|\   __  \
          \ \  \|\  \ \  \|\  \ \  \___|\ \  \|\  \ \  \\ \  \ \  \|\  \
           \ \   __  \ \   _  _\ \  \    \ \   __  \ \  \\ \  \ \   __  \
            \ \  \ \  \ \  \\  \\ \  \____\ \  \ \  \ \  \\ \  \ \  \ \  \
             \ \__\ \__\ \__\\ _\\ \_______\ \__\ \__\ \__\\ \__\ \__\ \__\
              \|__|\|__|\|__|\|__|\|_______|\|__|\|__|\|__| \|__|\|__|\|__|


===== Arcana Functions =====
1. Scan Raw Image
2. Scan File
3. Scan URL
4. Analyse Logs (LIVE)
5. User Manual
6. GitHub
7. Exit

Choose an option:
```

Disk Image Data Pre-processing

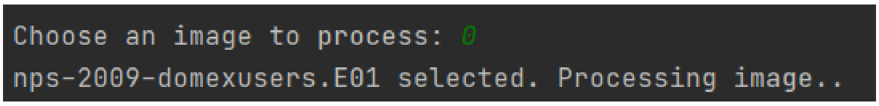


```
Choose an option: 1
Available images in folder:
0 nps-2009-domexusers.E01

Choose an image to process:
```

The application checks for available images of the E01 type in the folder and displays them all, if any. The user will then be prompted to select the disk image to use for the analysis.

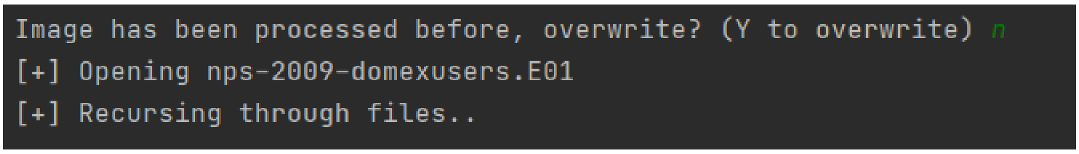
Upon selecting the disk image to use, the image volume is then loaded.



```
Choose an image to process: 0
nps-2009-domexusers.E01 selected. Processing image..
```

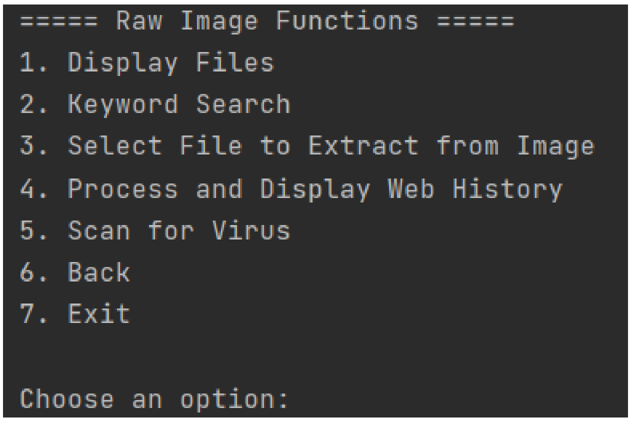
The application will also check if the disk image has been processed before. If so, there will be an option to overwrite the existing processed file.

The disk image is crawled recursively, with all files timestamped and hashed.



```
Image has been processed before, overwrite? (Y to overwrite) n
[+] Opening nps-2009-domexusers.E01
[+] Recursing through files..
```

After processing the disk image and producing the CSV output files, the Raw Image Function menu will be shown. The programme prompts the user for an input.



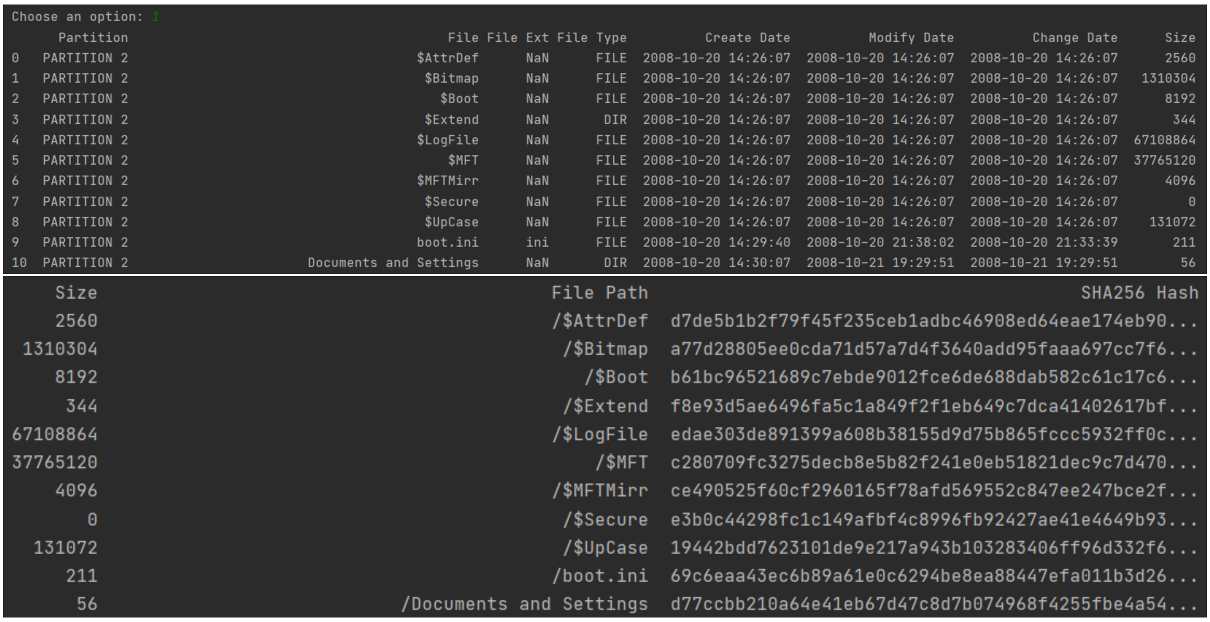
```
===== Raw Image Functions =====
1. Display Files
2. Keyword Search
3. Select File to Extract from Image
4. Process and Display Web History
5. Scan for Virus
6. Back
7. Exit

Choose an option:
```

1.1. Display Files

The display files option shows file data for all the files in the disk image. The following attributes are displayed:

- Partition
- File
- File Ext
- File Type
- Create Date
- Modify Date
- Change Date
- Size
- File Path
- SHA256 Hash

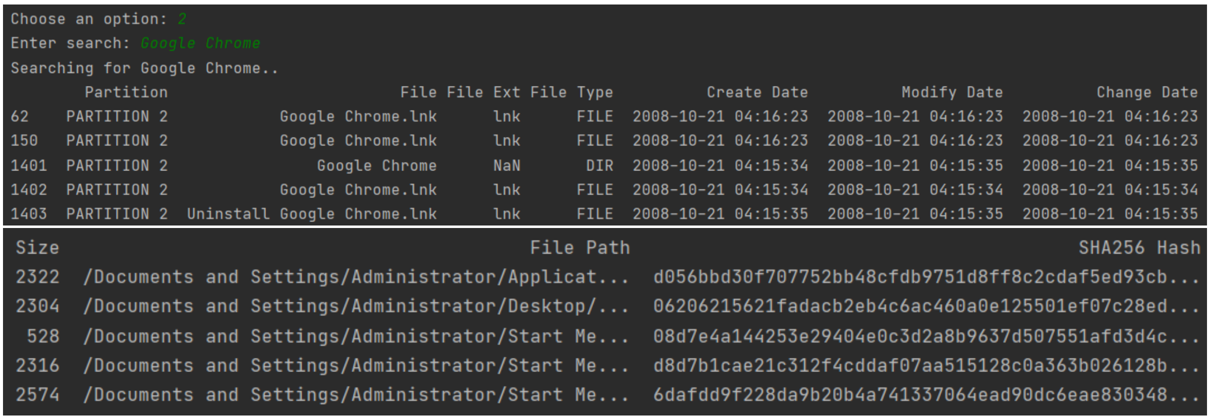


```
Choose an option: 1
      Partition                                         File File Ext File Type          Create Date          Modify Date          Change Date      Size
0   PARTITION 2                                     $AttrDef      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07      2560
1   PARTITION 2                                      $Bitmap      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07   1310304
2   PARTITION 2                                        $Boot      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07      8192
3   PARTITION 2                                      $Extend      NaN       DIR  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07       344
4   PARTITION 2                                     $LogFile      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07  67108864
5   PARTITION 2                                         $MFT      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07  37765120
6   PARTITION 2                                     $MFTMirr      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07      4096
7   PARTITION 2                                      $Secure      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07         0
8   PARTITION 2                                      $UpCase      NaN      FILE  2008-10-20 14:26:07  2008-10-20 14:26:07  2008-10-20 14:26:07    131072
9   PARTITION 2                                     boot.ini      ini      FILE  2008-10-20 14:29:40  2008-10-20 21:38:02  2008-10-20 21:33:39       211
10  PARTITION 2                       Documents and Settings      NaN       DIR  2008-10-20 14:30:07  2008-10-21 19:29:51  2008-10-21 19:29:51        56
```

```
    Size                               File Path                                         SHA256 Hash
    2560                               /$AttrDef  d7de5b1b2f79f45f235ceb1adbc46908ed64eae174eb90...
 1310304                                /$Bitmap  a77d28805ee0cda71d57a7d4f3640add95faaa697cc7f6...
    8192                                  /$Boot  b61bc96521689c7ebde9012fce6de688dab582c61c17c6...
     344                                /$Extend  f8e93d5ae6496fa5c1a849f2f1eb649c7dca41402617bf...
67108864                               /$LogFile  edae303de891399a608b38155d9d75b865fccc5932ff0c...
37765120                                   /$MFT  c280709fc3275decb8e5b82f241e0eb51821dec9c7d470...
    4096                               /$MFTMirr  ce490525f60cf2960165f78afd569552c847ee247bce2f...
       0                                /$Secure  e3b0c44298fc1c149afbf4c8996fb92427ae41e4649b93...
  131072                                /$UpCase  19442bdd7623101de9e217a943b103283406ff96d332f6...
     211                               /boot.ini  69c6eaa43ec6b89a61e0c6294be8ea88447efa011b3d26...
      56                  /Documents and Settings  d77ccbb210a64e41eb67d47c8d7b074968f4255fbe4a54...
```

1.2. Keyword Search

The application includes keyword search functionality whereby the file names within the processed document can be searched and all results displayed.

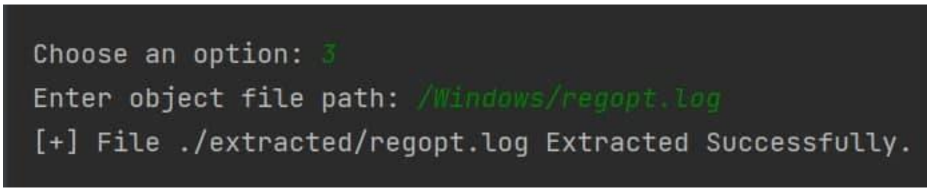


```
Choose an option: 2
Enter search: Google Chrome
Searching for Google Chrome..
        Partition                        File File Ext File Type          Create Date          Modify Date          Change Date
62    PARTITION 2           Google Chrome.lnk      lnk      FILE  2008-10-21 04:16:23  2008-10-21 04:16:23  2008-10-21 04:16:23
150   PARTITION 2           Google Chrome.lnk      lnk      FILE  2008-10-21 04:16:23  2008-10-21 04:16:23  2008-10-21 04:16:23
1401  PARTITION 2               Google Chrome      NaN       DIR  2008-10-21 04:15:34  2008-10-21 04:15:35  2008-10-21 04:15:35
1402  PARTITION 2           Google Chrome.lnk      lnk      FILE  2008-10-21 04:15:34  2008-10-21 04:15:34  2008-10-21 04:15:34
1403  PARTITION 2 Uninstall Google Chrome.lnk      lnk      FILE  2008-10-21 04:15:35  2008-10-21 04:15:35  2008-10-21 04:15:35
```

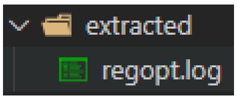
```
Size                                      File Path                                         SHA256 Hash
2322  /Documents and Settings/Administrator/Applicat...  d056bbd30f707752bb48cfdb9751d8ff8c2cdaf5ed93cb...
2304  /Documents and Settings/Administrator/Desktop/...  06206215621fadacb2eb4c6ac460a0e125501ef07c28ed...
 528  /Documents and Settings/Administrator/Start Me...  08d7e4a144253e29404e0c3d2a8b9637d507551afd3d4c...
2316  /Documents and Settings/Administrator/Start Me...  d8d7b1cae21c312f4cddaf07aa515128c0a363b026128b...
2574  /Documents and Settings/Administrator/Start Me...  6dafdd9f228da9b20b4a741337064ead90dc6eae830348...
```

1.3. Select File to Extract from Image

The application allows for the export of files from the disk image. The file is identified using its file path and then copied to an extracted folder for future use.



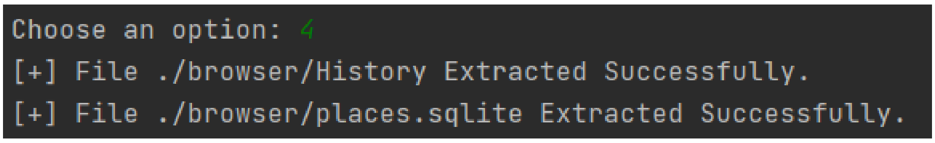
```
Choose an option: 3
Enter object file path: /Windows/regopt.log
[+] File ./extracted/regopt.log Extracted Successfully.
```



```
extracted
  regopt.log
```

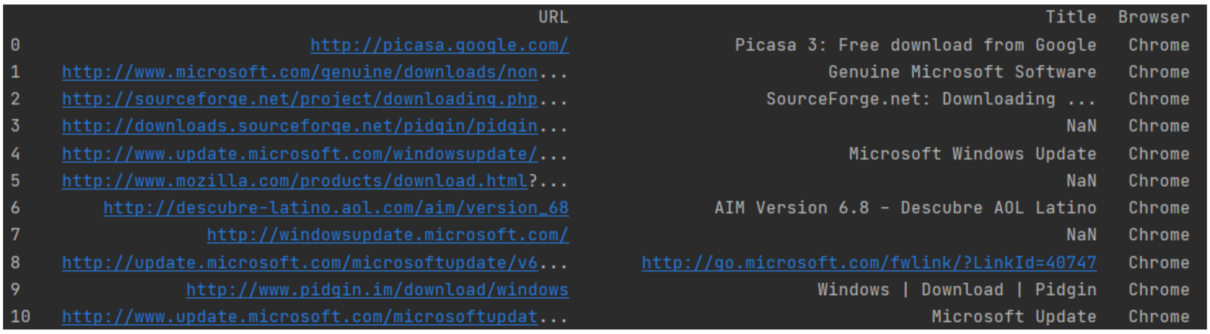
1.4. Process and Display Web History

For analysing Web History from the disk image. The history log files from both the Chrome and Firefox browsers are located using regex and then parsed and saved in a browser folder.



```
Choose an option: 4
[+] File ./browser/History Extracted Successfully.
[+] File ./browser/places.sqlite Extracted Successfully.
```

The data is then concatenated with an additional variable name to denote which browser is used for each URL.

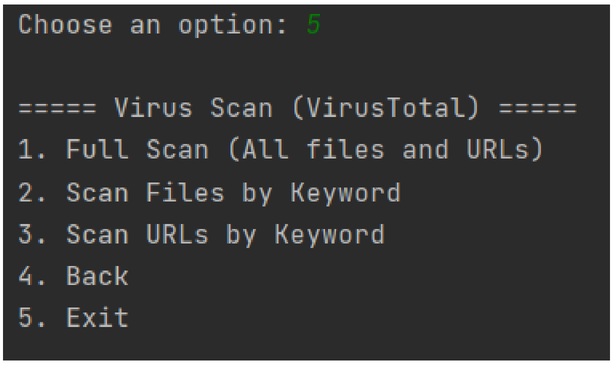


```
                                                  URL                                         Title  Browser
0                            http://picasa.google.com/           Picasa 3: Free download from Google   Chrome
1   http://www.microsoft.com/genuine/downloads/non...                    Genuine Microsoft Software   Chrome
2   http://sourceforge.net/project/downloading.php...              SourceForge.net: Downloading ...   Chrome
3   http://downloads.sourceforge.net/pidgin/pidgin...                                           NaN   Chrome
4   http://www.update.microsoft.com/windowsupdate/...                      Microsoft Windows Update   Chrome
5   http://www.mozilla.com/products/download.html?...                                           NaN   Chrome
6       http://descubre-latino.aol.com/aim/version_68         AIM Version 6.8 - Descubre AOL Latino   Chrome
7                 http://windowsupdate.microsoft.com/                                           NaN   Chrome
8   http://update.microsoft.com/microsoftupdate/v6...  http://go.microsoft.com/fwlink/?LinkId=40747   Chrome
9               http://www.pidgin.im/download/windows                   Windows | Download | Pidgin   Chrome
10  http://www.update.microsoft.com/microsoftupdat...                              Microsoft Update   Chrome
```

1.5. Scan for Virus

The virus scan component of this application allows for full or selective scans. The Virus Total API is used whereby a valid API_KEY is required.

Full scans process both files and URLs while selective scan performs the scan using a search string for the files or URLs.



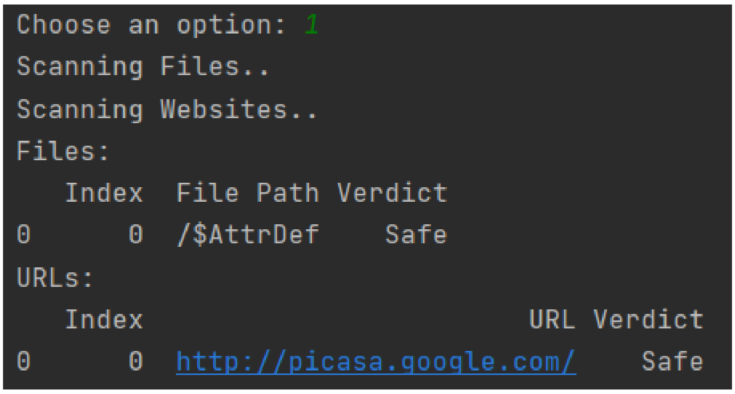
```
Choose an option: 5

===== Virus Scan (VirusTotal) =====
1. Full Scan (All files and URLs)
2. Scan Files by Keyword
3. Scan URLs by Keyword
4. Back
5. Exit
```

1.5.1 Full Scan (All files and URLs)

A full scan processed both files and URLs. However, how this application this scan is limited to a single scan due to API limitation on a public API_KEY.

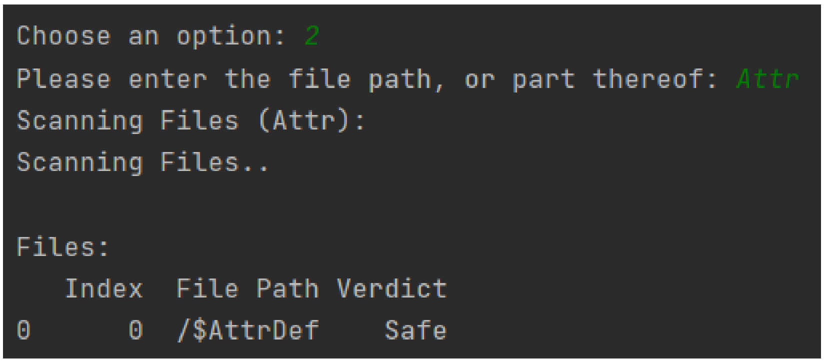
The file hashes or URLs are passed through the API and the results are processed to determine whether any of the various sources deem it to be malicious. Just a single malicious verdict will result in an overall malicious verdict.



```
Choose an option: 1
Scanning Files..
Scanning Websites..
Files:
   Index  File Path Verdict
0      0  /$AttrDef     Safe
URLs:
   Index                        URL  Verdict
0      0  http://picasa.google.com/     Safe
```

1.5.2 Scan Files by Keyword

Scan files by Keyword allow the user to enter a search keyword, which will be used to find matching files and then process them through the Virus Total API.

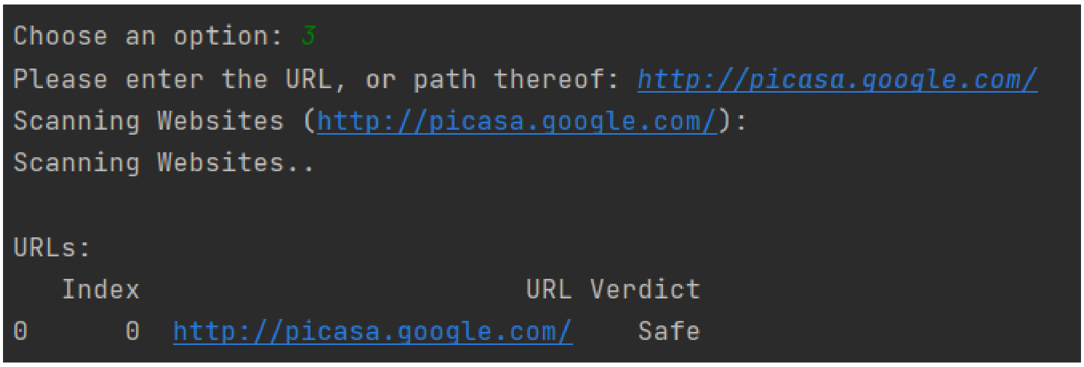


```
Choose an option: 2
Please enter the file path, or part thereof: Attr
Scanning Files (Attr):
Scanning Files..

Files:
   Index  File Path Verdict
0      0  /$AttrDef     Safe
```

1.5.3 Scan URLs by Keyword

Likewise, Scan URLs by Keyword allows the user to enter a search keyword to find matching URLs in the web history and process them through the Virus Total API.

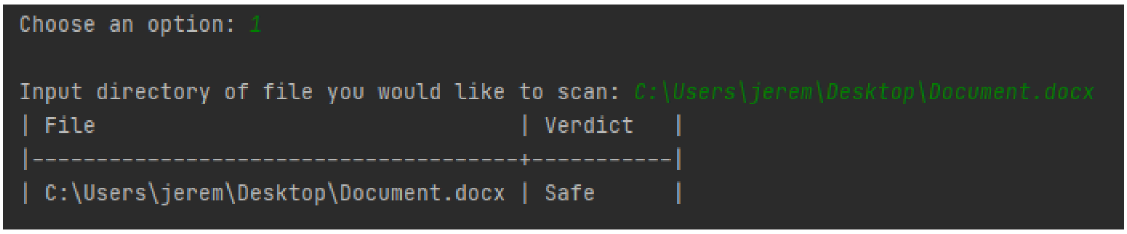


```
Choose an option: 3
Please enter the URL, or path thereof: http://picasa.google.com/
Scanning Websites (http://picasa.google.com/):
Scanning Websites..

URLs:
   Index                        URL  Verdict
0      0  http://picasa.google.com/     Safe
```

2. Scan File

This function performs a VirusTotal scan on a file in the user's local directory to check for malware.

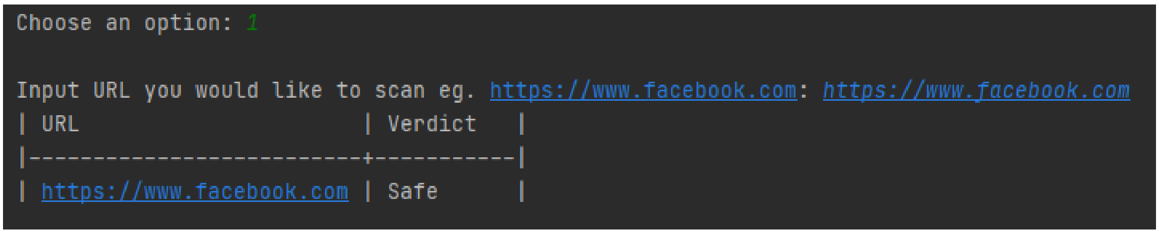


```
Choose an option: 1

Input directory of file you would like to scan: C:\Users\jerem\Desktop\Document.docx
| File                                 | Verdict    |
|--------------------------------------+-----------|
| C:\Users\jerem\Desktop\Document.docx | Safe       |
```

3. Scan URL

This function performs a VirusTotal scan on any website URL entered by the user.



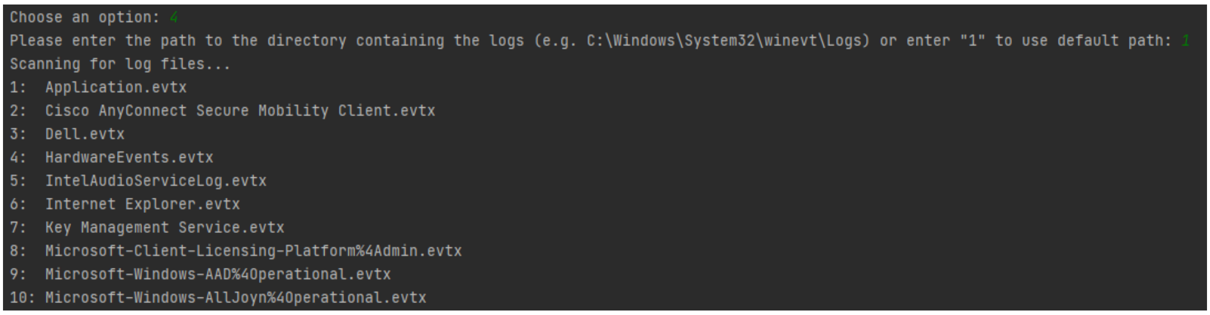
```
Choose an option: 1

Input URL you would like to scan eg. https://www.facebook.com: https://www.facebook.com
| URL                         | Verdict    |
|-----------------------------+------------|
| https://www.facebook.com | Safe       |
```

4. Analyse Logs (LIVE)

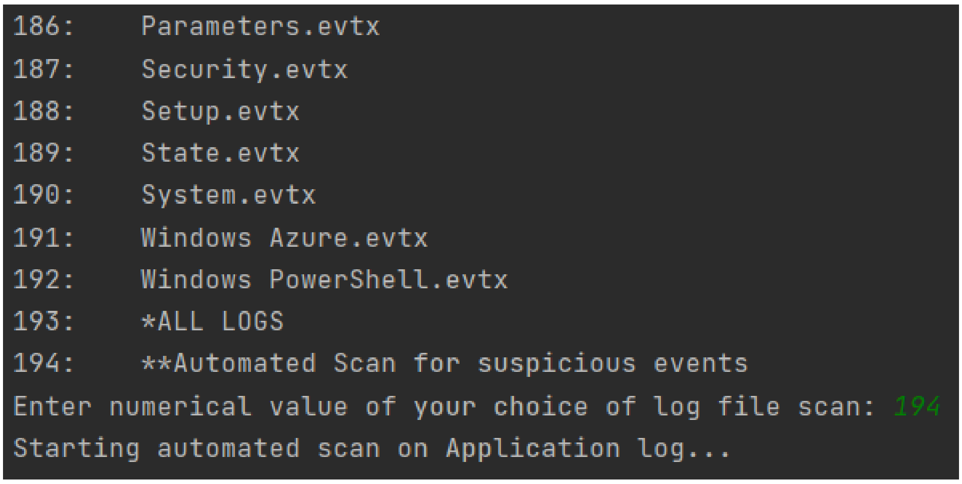
This function allows the user to analyse logs in their local directory to identify any suspicious events that have transpired based on the event IDs that were predefined.

The user will first be prompted to enter the directory which contains the logs file or enter “1” for the default path.



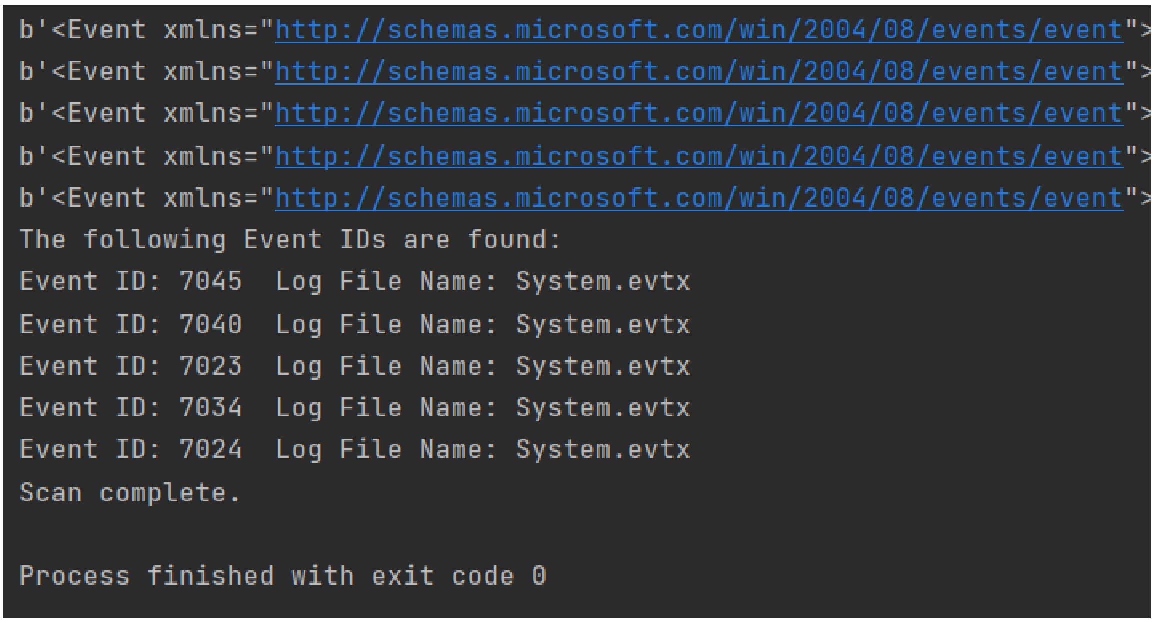
```
Choose an option: 4
Please enter the path to the directory containing the logs (e.g. C:\Windows\System32\winevt\Logs) or enter "1" to use default path: 1
Scanning for log files...
1:  Application.evtx
2:  Cisco AnyConnect Secure Mobility Client.evtx
3:  Dell.evtx
4:  HardwareEvents.evtx
5:  IntelAudioServiceLog.evtx
6:  Internet Explorer.evtx
7:  Key Management Service.evtx
8:  Microsoft-Client-Licensing-Platform%4Admin.evtx
9:  Microsoft-Windows-AAD%4Operational.evtx
10: Microsoft-Windows-AllJoyn%4Operational.evtx
```

Users will then be able to select a Windows Event Log that is available on their local directory and view the event information. Arcana provides users with an option to conduct a automated scan for any suspicious events.



```
186:    Parameters.evtx
187:    Security.evtx
188:    Setup.evtx
189:    State.evtx
190:    System.evtx
191:    Windows Azure.evtx
192:    Windows PowerShell.evtx
193:    *ALL LOGS
194:    **Automated Scan for suspicious events
Enter numerical value of your choice of log file scan: 194
Starting automated scan on Application log...
```

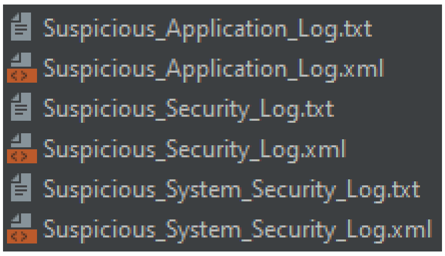
Once an option has been selected, Arcana will start running a automated scan on the application log and return the relative even IDs as shown in the image below.



```
b'<Event xmlns="http://schemas.microsoft.com/win/2004/08/events/event">
b'<Event xmlns="http://schemas.microsoft.com/win/2004/08/events/event">
b'<Event xmlns="http://schemas.microsoft.com/win/2004/08/events/event">
b'<Event xmlns="http://schemas.microsoft.com/win/2004/08/events/event">
b'<Event xmlns="http://schemas.microsoft.com/win/2004/08/events/event">
The following Event IDs are found:
Event ID: 7045  Log File Name: System.evtx
Event ID: 7040  Log File Name: System.evtx
Event ID: 7023  Log File Name: System.evtx
Event ID: 7034  Log File Name: System.evtx
Event ID: 7024  Log File Name: System.evtx
Scan complete.

Process finished with exit code 0
```

Once the automated scan has been completed, Arcana will output the event IDs in a text file and the event information in an xml file for further analysis.



Suspicious_Application_Log.txt
Suspicious_Application_Log.xml
Suspicious_Security_Log.txt
Suspicious_Security_Log.xml
Suspicious_System_Security_Log.txt
Suspicious_System_Security_Log.xml