Module 10: Dark Web Forensics

Lab Scenario

When forensic investigators come across cases of dark web crimes, they generally do not locate any traces of criminal activity on normal browsers meant for daily use such as Google Chrome Mozilla Firefox, Microsoft Edge/Internet Explorer, etc. For perpetrating dark web crimes, criminals prefer the Tor Browser as it provides them with a high level of anonymity. In such instances, investigators need to examine the suspect machine for Tor Browser artifacts to help them solve such cases.

Tor Browser artifacts can be retrieved by examining the RAM dump of the suspect machine. In case Tor Browser has been removed/uninstalled from a system after committing the crime,investigators can discover its related artifacts by analyzing its prefetch file on a Windows machine.

Lab Objectives

The objective of this lab is to help you understand dark web forensics techniques. The tasks include:

- Discovering Tor Browser activity on a Windows machine
- Examining RAM dumps to discover Tor Browser artifacts

Overview of Dark Web Forensics

Use of dark web forensics is necessary because of an increase in illegal activities such as drugs and weapons trafficking, selling credit card details and other private information related to individuals, child pornography, etc. that are facilitated through the internet. Dark web forensics helps investigators gather evidence against the perpetrators of such dark web crimes so that they can be prosecuted in a court of law.

Lab Tasks

Recommended labs to assist you in dark web forensics:

- Detecting TOR browser on a machine
- Analyzing RAM dumps to retrieve TOR browser artifacts

Lab 1: Detecting TOR Browser on a Machine

Lab Scenario

During a search and seize operation connected with a case of an internet-based fraud in which credit card information and bank details of several individuals were stolen and sold, law enforcement authorities got hold of a few computers belonging to the suspects. During the forensic investigation of the seized computers, the investigators discovered that the suspects had tried to cover their tracks by removing all the tools/applications they had used on the systems. The investigators decided to examine the prefetch files on the system to determine the application/program that might have been used by the suspects to commit crimes. While searching through the prefetch files, the investigators located a prefetch file for Tor Browser, which indicate that this might be a case of dark web crime. How should the investigators proceed to be able to analyze the Tor Browser artifacts in this case?

As a forensic investigator, you must know how to analyze prefetch files pertaining to Tor Browser using the right tool(s).

Lab Objectives

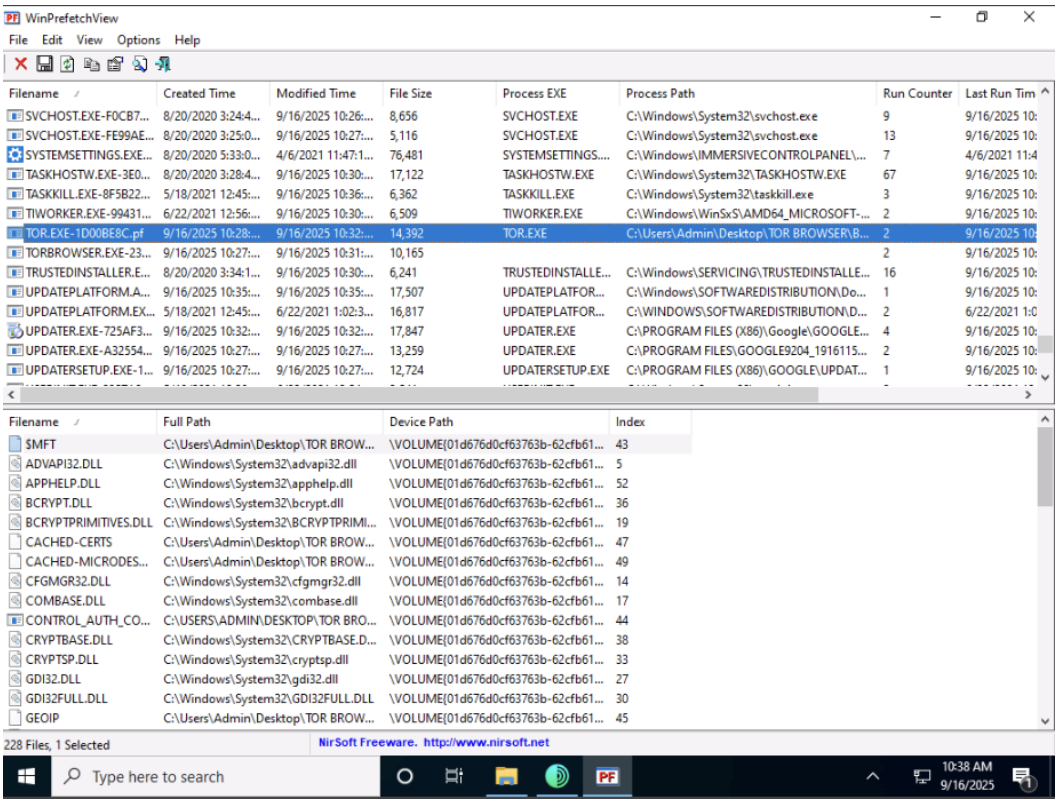
Tor Browser is based on a Mozilla Firefox browsing application that works on the concept of Onion Routing. It allows users to access the dark web and carry out criminal/illegal activities anonymously.

In this lab, you will learn how to retrieve Tor Browser activity from a Windows machine by:

- Examining Windows prefetch files
- Monitoring network connections using netstat command

Overview of the Lab

This lab familiarizes you with the process of determining whether **Tor Browser** has been used on a suspect system with the help of **WinPrefetchView**, an application that helps you find the prefetch files pertaining to various programs that have been installed on a system. Even if a program is deleted/uninstalled from a system, the prefetch file related to it is still likely to remain on the system, which provides the evidence for that program's execution on the system.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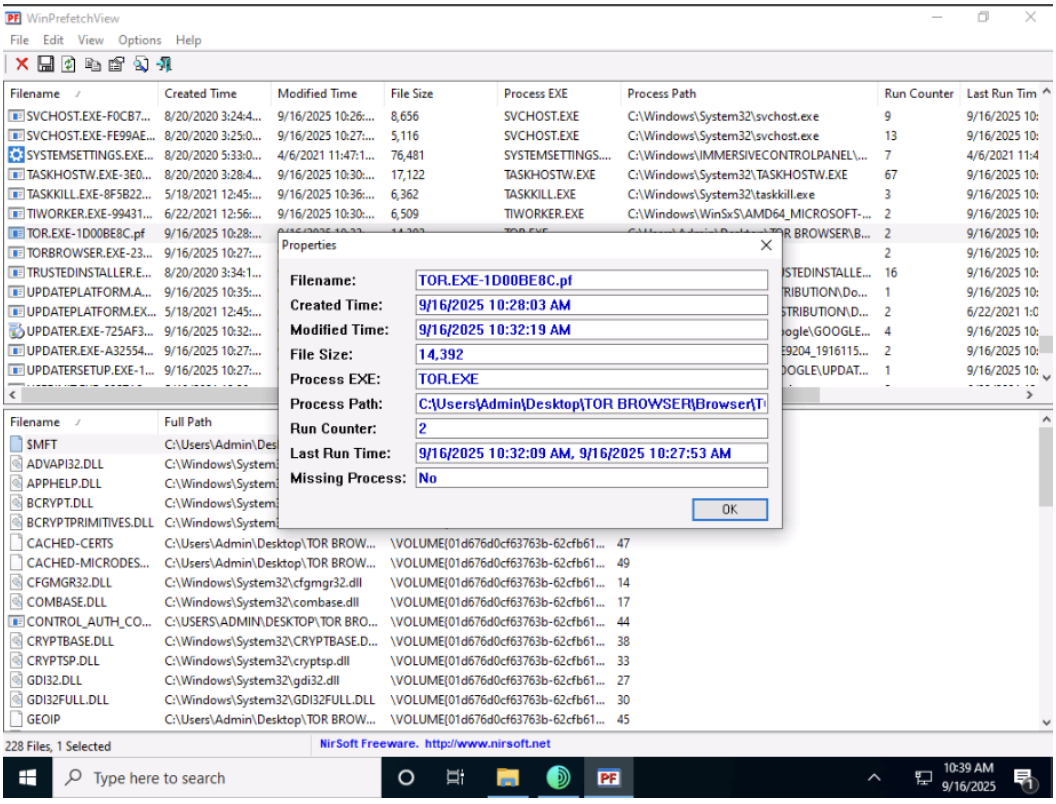
9/16/2025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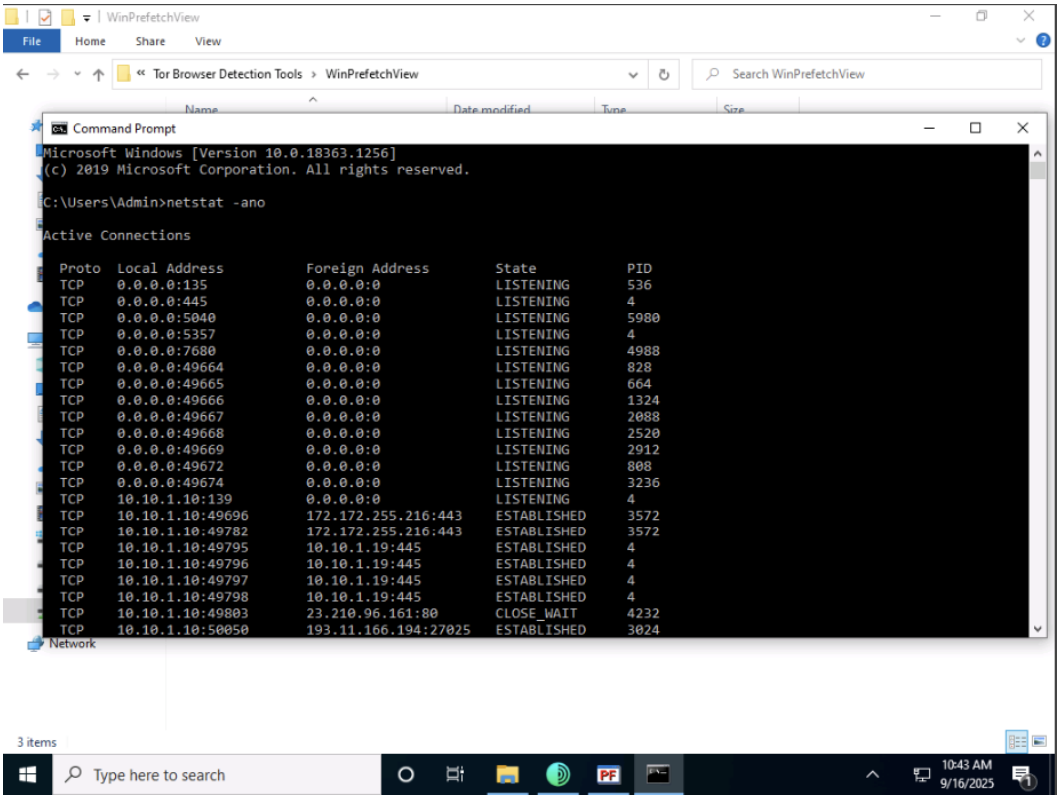
9/16/2025



Lab 2: Analyzing RAM Dumps to Retrieve TOR Browser Artifacts

Lab Scenario

Forensic investigators have seized a computer belonging to a drug trafficker who is suspected of expanding his drug smuggling network through the dark web. During investigation, it was found that the suspect had been using Tor Browser on his system to engage in drug trafficking and its expansion. To extract more information on the suspect's activities related to drug trafficking, investigators need to analyze the RAM dump of his system so that it reveals all his activities on Tor Browser. The artifacts obtained from the RAM dump can help the investigators extract evidence that can be used to prosecute the suspect.

As a forensic investigator, you must know how to analyze the RAM dump of a suspect machine and retrieve Tor Browser artifacts.

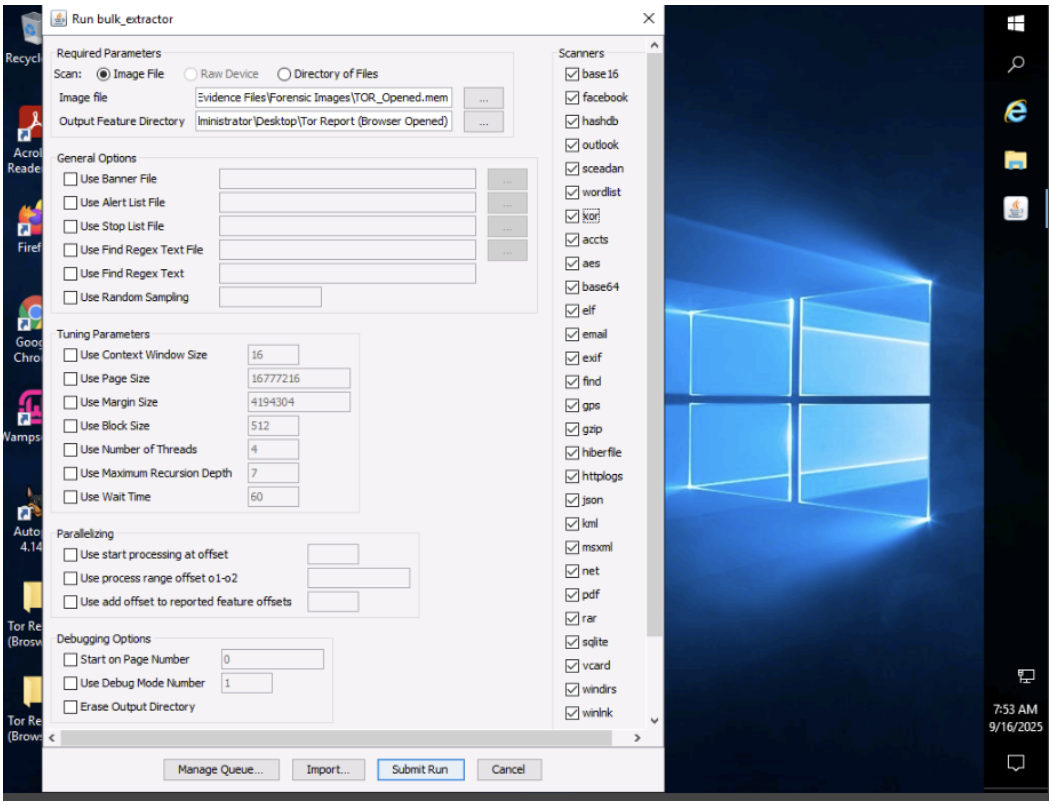
Lab Objectives

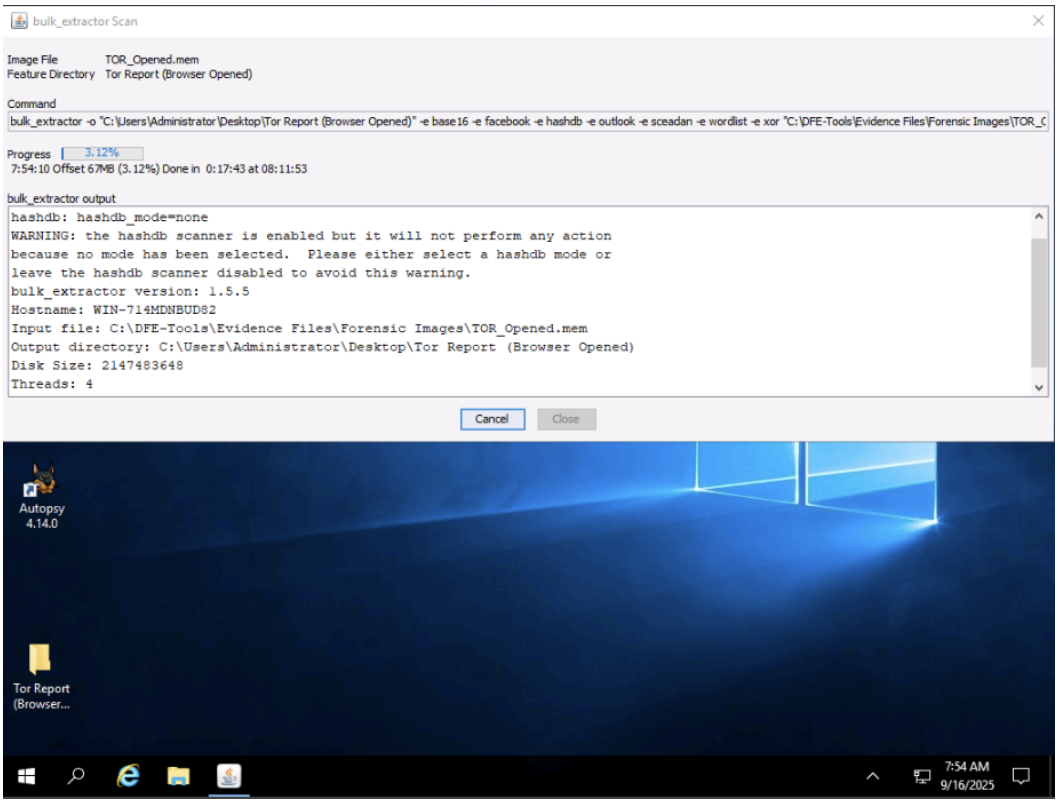
The memory dump collected from a suspect machine not only contains artifacts related to the browser, but also all the activities that occurred on it. Analyzing RAM dump can help investigators find all details pertaining to the activities that an attacker has performed on the system using Tor Browser.

The objective of this lab is to help you learn how to examine a RAM dump and recover potential artifacts pertaining to Tor Browser using the Bulk Extractor tool.

Overview of the Lab

This lab familiarizes you with the process of analyzing a RAM dump containing **Tor Browser** artifacts with the help of **Bulk Extractor**.

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Feature Directory Tor Report (Browser Opened)
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Progress 3.12%
7:54:10 Offset 67MB (3.12%) Done in 0:17:43 at 08:11:53
bulk_extractor output
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because no mode has been selected. Please either select a hashdb mode or
leave the hashdb scanner disabled to avoid this warning.
bulk_extractor version: 1.5.5
Hostname: WIN-714MDNBUD82
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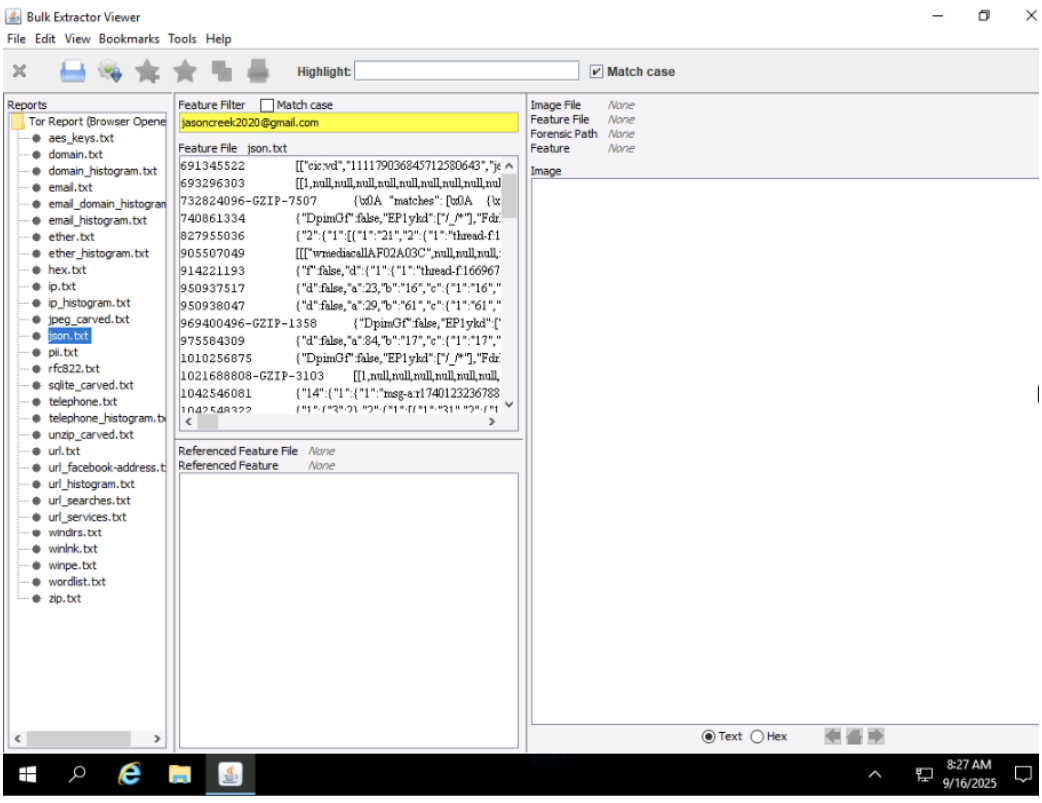
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File Edit View Bookmarks Tools Help
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domain.txt
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rfc822.txt
sqlite_carved.txt
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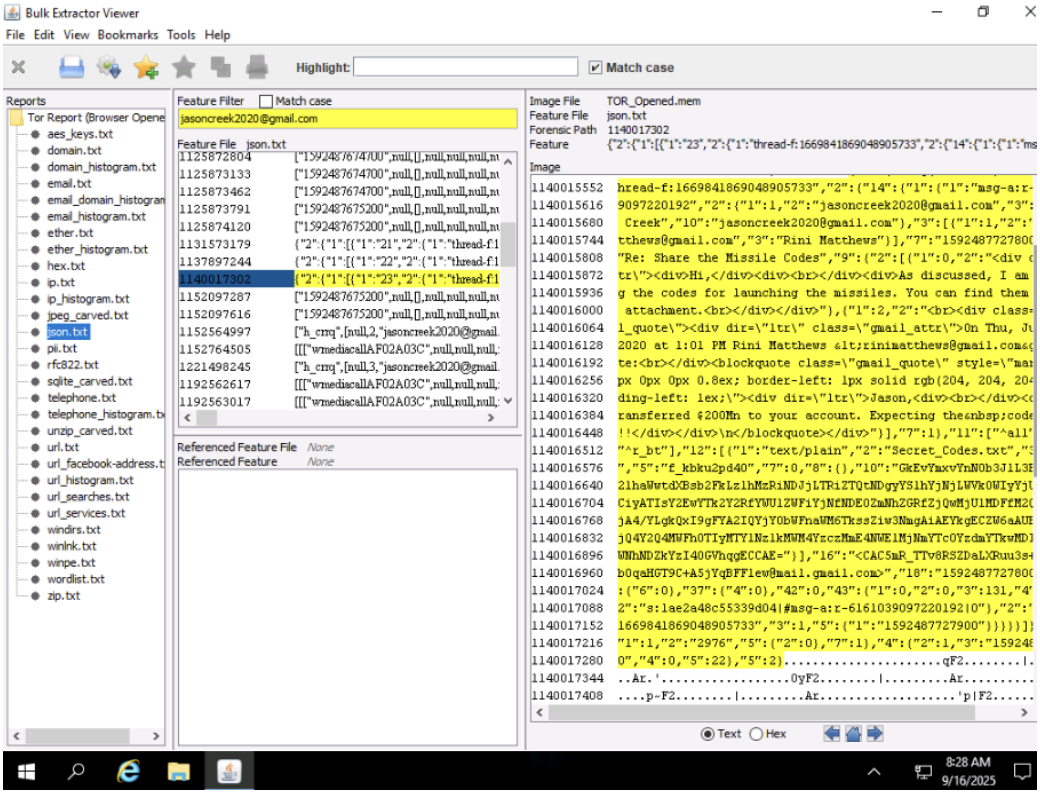
Bulk Extractor Viewer
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jpeg_carved.txt
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url_searches.txt
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winlnk.txt
winpe.txt
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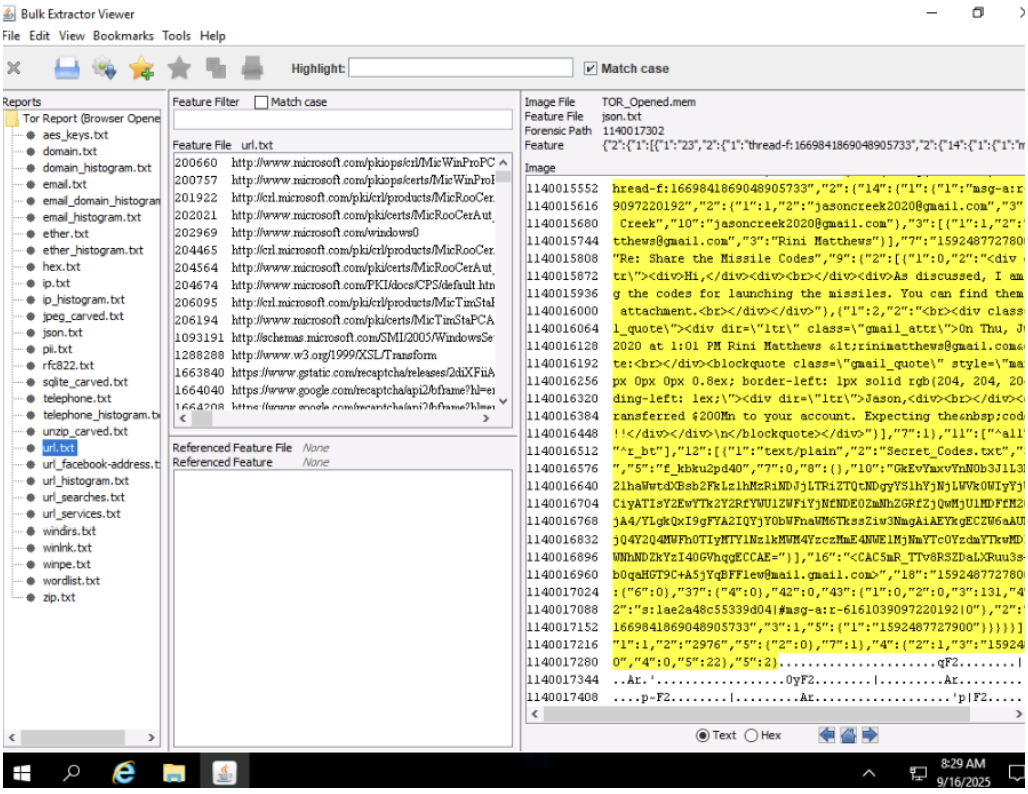
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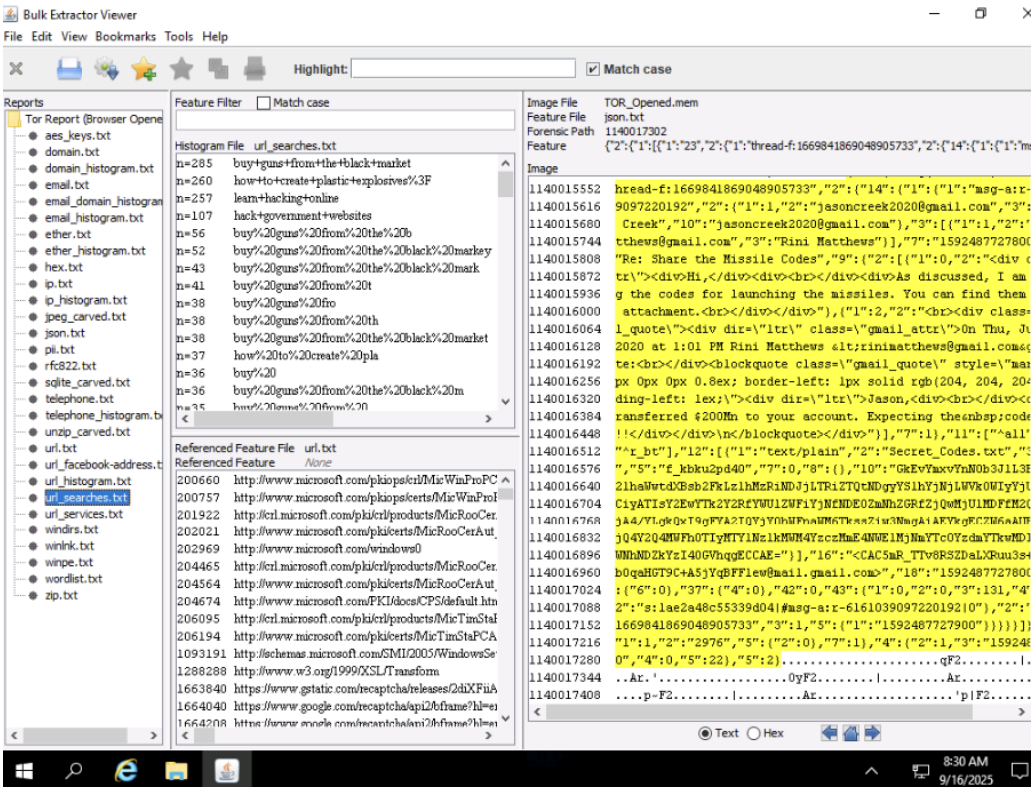
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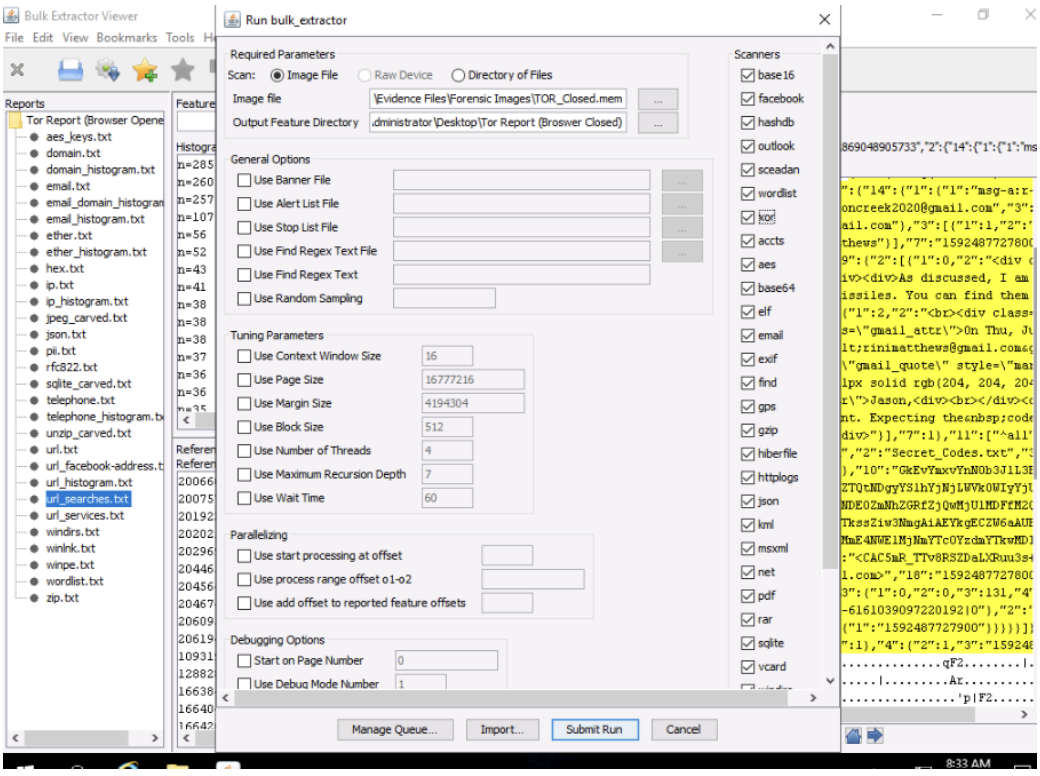
1140017344 ..Ar.'.....0yF2.....|.....Ar.....
1140017408 ....p-F2.....|.....Ar.....'p|F2.....
Text Hex
8:30 AM
9/16/2025


Bulk Extractor Viewer
Run bulk_extractor
Required Parameters
Scan: Image File Raw Device Directory of Files
Image file \Evidence Files\Forensic Images\TOR_Closed.mem
Output Feature Directory dministrator\Desktop\Tor Report (Broswer Closed)
General Options
Use Banner File
Use Alert List File
Use Stop List File
Use Find Regex Text File
Use Find Regex Text
Use Random Sampling
Tuning Parameters
Use Context Window Size 16
Use Page Size 16777216
Use Margin Size 4194304
Use Block Size 512
Use Number of Threads 4
Use Maximum Recursion Depth 7
Use Wait Time 60
Parallelizing
Use start processing at offset
Use process range offset o1-o2
Use add offset to reported feature offsets
Debugging Options
Start on Page Number 0
Use Debug Mode Number 1
Scanners
base16
facebook
hashdb
outlook
sceadan
wordlist
kor
accts
aes
base64
elf
email
exif
find
gps
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httplogs
json
kml
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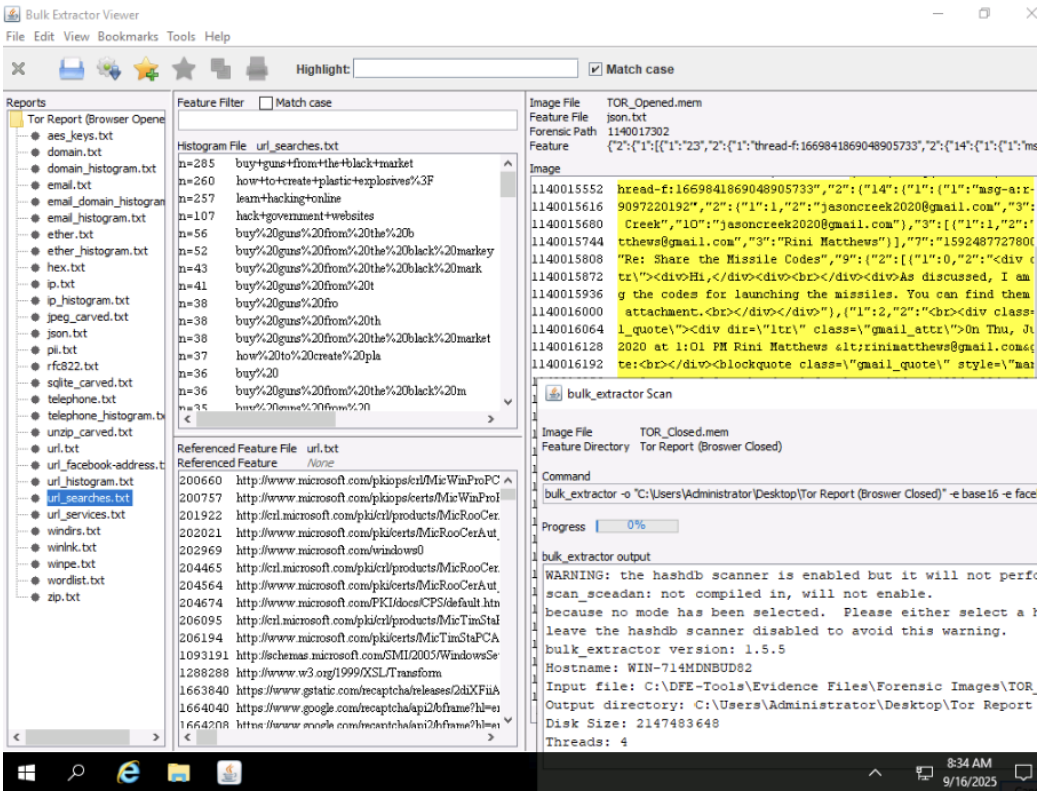
pdf
rar
sqlite
vcard
Manage Queue...
Import...
Submit Run
Cancel



Analyzing RAM Dumps to Retrieve TOR Browser Artifacts

Lab Scenario:

During an investigation of internet-based fraud and dark web criminal activity, law enforcement seized computers from suspects involved in illegal activities, including drug trafficking. Tor Browser usage was suspected, and forensic investigators needed to extract evidence from the suspect machines. RAM dumps of the systems were acquired to retrieve artifacts related to Tor Browser, even in cases where the browser had been uninstalled or removed.

Lab Objectives:

- Discover Tor Browser activity on a Windows machine using prefetch files and the netstat command.
- Analyze RAM dumps to retrieve Tor Browser artifacts, including websites visited, email access, and other user activity.
- Understand dark web forensics techniques for investigating criminal activity facilitated through Tor Browser.

Overview of the Lab:
This lab focused on using **Bulk Extractor** to analyze RAM dumps and extract Tor Browser artifacts. The process included:

- Locating Tor Browser prefetch files using **WinPrefetchView** to confirm prior usage.
- Running **Bulk Extractor** to scan memory dumps and generate reports for "Browser Opened" and "Browser Closed" states.
- Examining specific output files such as domain.txt to identify visited domains, including multiple Gmail accesses.
- Interpreting artifacts to construct a timeline of user activity on Tor Browser.

Lab Challenges:
Due to lab time restrictions and limits on extended session allowances, the RAM dump extraction could not be fully completed. Download times for the tools and the progress time for bulk extraction exceeded the maximum allowed lab time. As a result, the lab could not be fully finalized, but key steps were executed to demonstrate the methodology for recovering Tor Browser activity from RAM dumps.