INTERNATIONAL CYBERSECURITY AND DIGITAL FORENSICS ACADEMY

Assignment Title: Cryptocurrency, Chrome history investigations and understand user web activity

Course Code: CI901 Cybercrime Investigations Case Studies

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Programme: Advance Cybercrime Investigations

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Contents

1. Introduction

This investigation analyzes user web activity and browser history artifacts to reconstruct suspected illegal online behavior. By examining URL structures, browser interactions, and stored history records, the investigation aims to interpret user intent and establish a reliable activity timeline.

2. Investigation Objectives

The objective of this investigation was to understand how user actions are reflected in browser history and to reconstruct illegal activities by correlating URLs, visit records, user interactions, and timestamps.

3. Understanding URLs in Digital Investigations

This step explains how URLs function as identifiers for web resources and how they act as forensic artifacts representing communication between a browser and a web server.

4. URL Structure and Resource Identification

The structure of URLs was examined to understand how domains, paths, parameters, and queries reveal user intent and accessed resources during browsing sessions.

5. User-Agent Interaction with Web Resources

This step focuses on how browsers act as user agents, sending requests to servers and receiving responses that are reflected in browser history records.

6. Creation and Hosting of Web Resources

This phase demonstrates how web resources are created, stored on a server, and accessed via URLs, establishing foundational knowledge for interpreting server-side and client-side artifacts.

7. URL Redirection and Its Forensic Significance

URL redirection behavior was analyzed to understand how browsers automatically navigate users between resources and how redirects are recorded in browser history databases.

8. Differentiating URL Rewriting and Redirecting

This step distinguishes between URL rewriting and URL redirecting, explaining how both mechanisms can affect visible URLs and recorded browser history.

9. User Web Activity and Browser Interaction Types

Different types of user interactions were examined, including typing URLs, clicking links, submitting forms, and interacting with web elements, all of which influence recorded browsing behavior.

10. How User Actions Modify URLs

This step explains how form submissions, searches, selections, and uploads dynamically change URLs, providing insight into user intent and behavior.

11. Browser History as a Forensic Artifact

Browser history was identified as a comprehensive record of user web activity, containing direct requests, redirects, and navigation sequences useful in forensic analysis.

12. Location of Browser History Files

This phase identifies standard storage locations of browser history files across operating systems, ensuring proper acquisition of relevant forensic artifacts.

13. Identification and Verification of the History Database

The Chrome History database was identified and verified as a valid SQLite file, confirming its suitability for forensic examination.

14. Examination of Browser History Database Structure

The internal structure of the History database was examined to identify key tables that record URLs, visits, downloads, and search activity.

15. Analysis of the URLs Table

The URLs table was analyzed to identify visited websites, page titles, visit counts, and timestamps, providing a high-level overview of browsing behavior.

16. Analysis of the Visits Table

The visits table was examined to reconstruct navigation paths, visit sequences, visit duration, and how web pages were accessed.

17. Interpretation of Visit Transition Types

Transition values were interpreted to determine whether pages were accessed via direct typing, link clicking, redirects, or form submissions.

18. Timestamp Normalization and Conversion

Browser timestamps stored in WebKit format were converted into human-readable date and time values to accurately reconstruct the browsing timeline.

19. Identification of Online Marketplace Activity

Browser history revealed user interaction with an online classified platform, indicating advertisement creation, navigation, and post management activities.

20. Email-Based Communication Analysis

Webmail access patterns were analyzed to identify communication between the suspect and a buyer, including opened messages and replies.

21. Cryptocurrency Transaction Verification Activity

Web activity related to blockchain explorers and cryptocurrency platforms was analyzed to identify payment verification behavior.

22. Analysis of Downloaded Evidence

Downloaded files recorded in browser history were examined to identify artifacts related to transaction confirmation and record keeping.

23. Correlation of Web Activity Across Platforms

Activities from classified advertisements, email communication, cryptocurrency verification, and downloads were correlated to establish a consistent sequence of events.

24. Timeline Reconstruction of Illegal Activities

A structured timeline was reconstructed to show the progression from advertisement posting to communication, payment verification, and transaction confirmation.

25. Findings and Interpretation

The combined analysis of URLs, user actions, timestamps, and navigation behavior provided strong evidence supporting the investigation hypothesis.

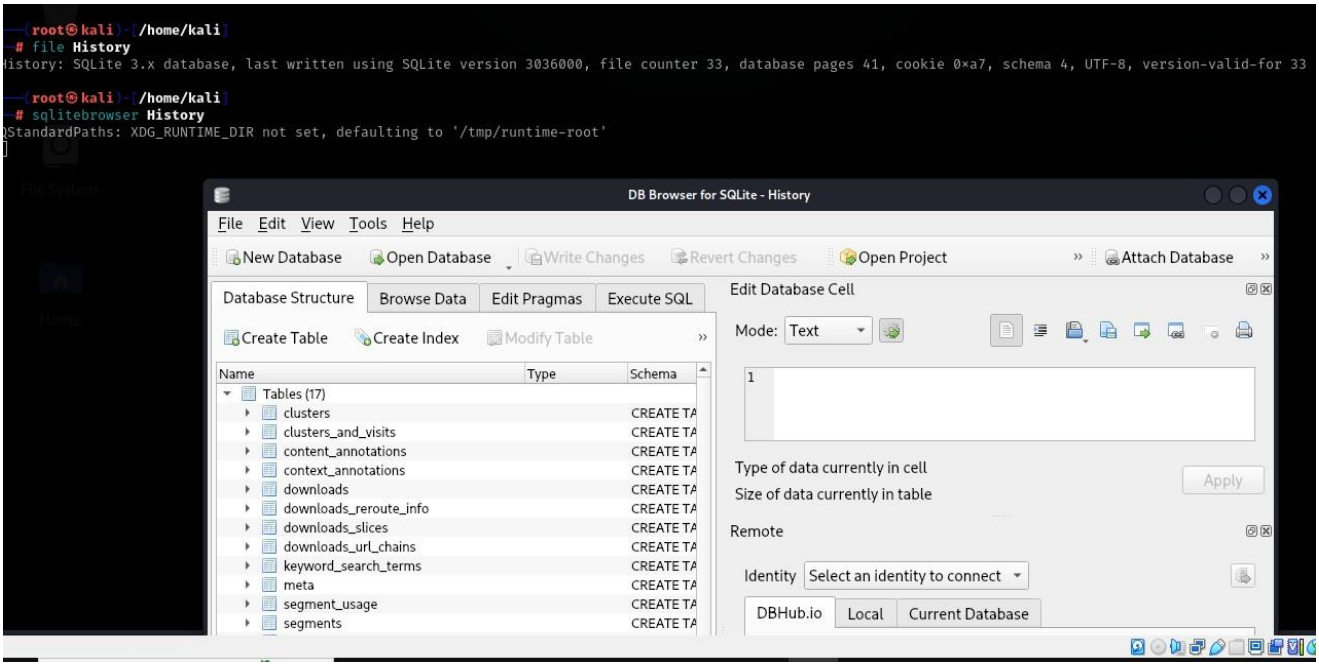
26. Conclusion and Summary

This investigation demonstrates how user web activity and browser history artifacts can be effectively used to reconstruct illegal online behavior. The findings highlight the forensic value of URLs, browser interactions, and history databases in establishing timelines and supporting digital evidence.

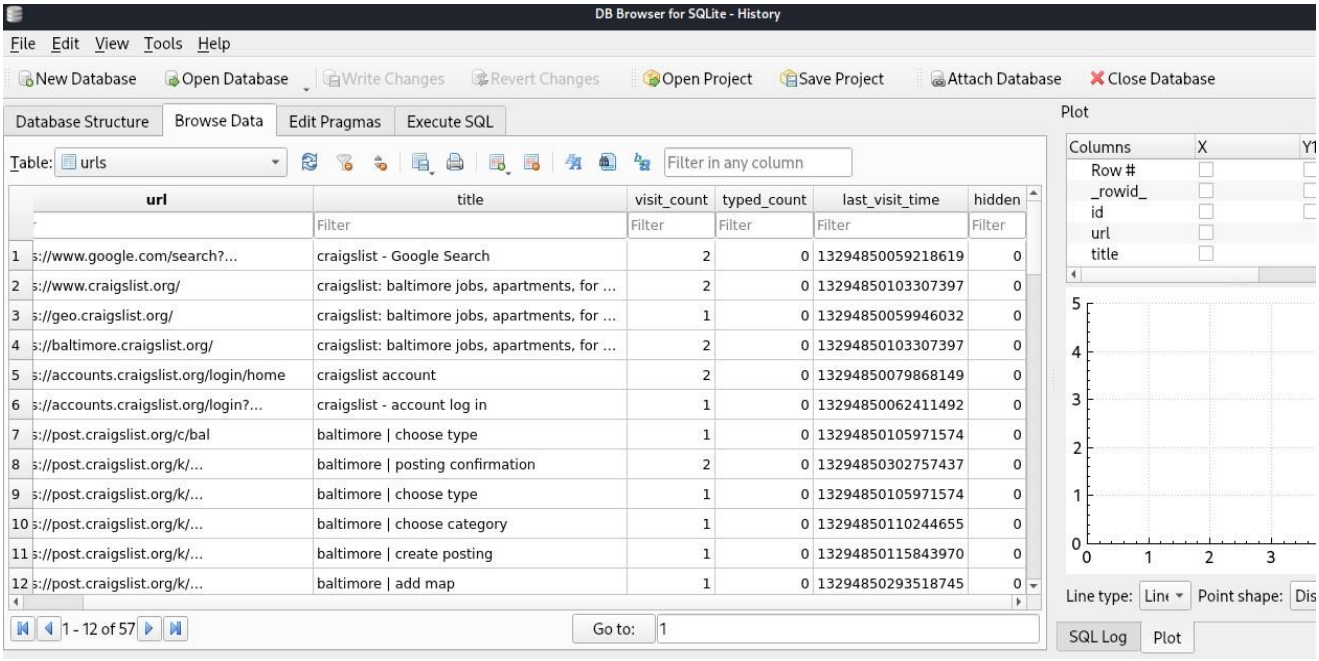
Practical: Cryptocurrency investigations

Download History:

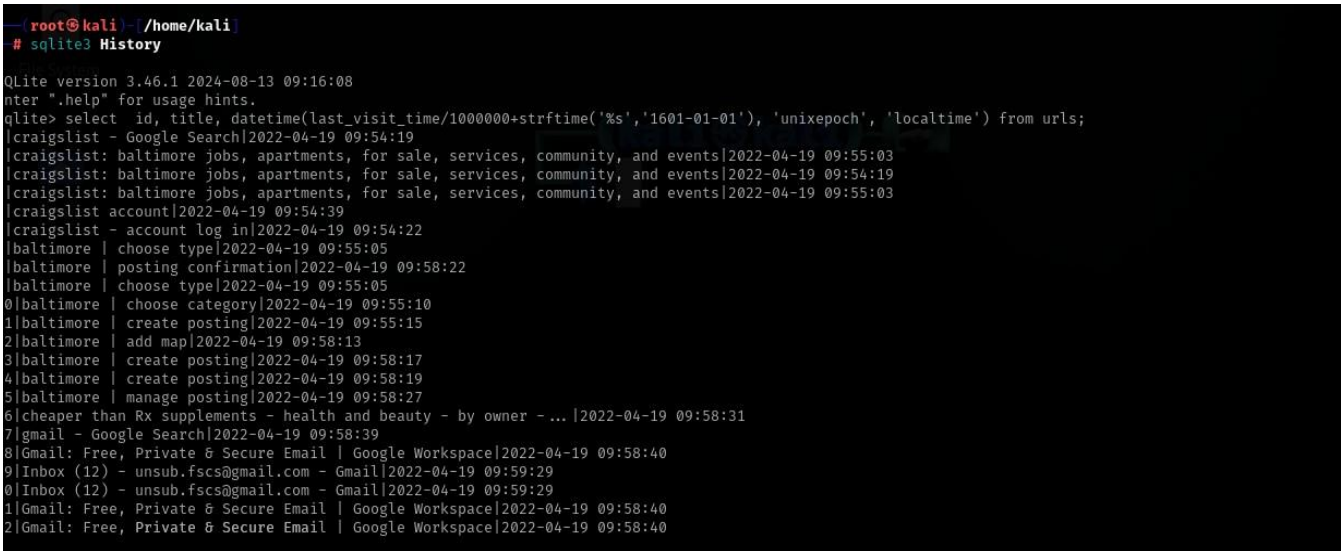
Examine main tables of History:



Tables View:



Show example records of urls:



```
┌──(root㉿kali)-[/home/kali]
└─# sqlite3 History

QLite version 3.46.1 2024-08-13 09:16:08
nter ".help" for usage hints.
qlite> select  id, title, datetime(last_visit_time/1000000+strftime('%s','1601-01-01'), 'unixepoch', 'localtime') from urls;
|craigslist - Google Search|2022-04-19 09:54:19
|craigslist: baltimore jobs, apartments, for sale, services, community, and events|2022-04-19 09:55:03
|craigslist: baltimore jobs, apartments, for sale, services, community, and events|2022-04-19 09:54:19
|craigslist: baltimore jobs, apartments, for sale, services, community, and events|2022-04-19 09:55:03
|craigslist account|2022-04-19 09:54:39
|craigslist - account log in|2022-04-19 09:54:22
|baltimore | choose type|2022-04-19 09:55:05
|baltimore | posting confirmation|2022-04-19 09:58:22
|baltimore | choose type|2022-04-19 09:55:05
0|baltimore | choose category|2022-04-19 09:55:10
1|baltimore | create posting|2022-04-19 09:55:15
2|baltimore | add map|2022-04-19 09:58:13
3|baltimore | create posting|2022-04-19 09:58:17
4|baltimore | create posting|2022-04-19 09:58:19
5|baltimore | manage posting|2022-04-19 09:58:27
6|cheaper than Rx supplements - health and beauty - by owner - ... |2022-04-19 09:58:31
7|gmail - Google Search|2022-04-19 09:58:39
8|Gmail: Free, Private & Secure Email | Google Workspace|2022-04-19 09:58:40
9|Inbox (12) - unsub.fscs@gmail.com - Gmail|2022-04-19 09:59:29
0|Inbox (12) - unsub.fscs@gmail.com - Gmail|2022-04-19 09:59:29
1|Gmail: Free, Private & Secure Email | Google Workspace|2022-04-19 09:58:40
2|Gmail: Free, Private & Secure Email | Google Workspace|2022-04-19 09:58:40
```

Convert timestamps in visits table to a readable format using sql statement

```
┌──(root㉿kali)-[/home/kali]
└─# sqlitebrowser History
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'

┌──(root㉿kali)-[/home/kali]
└─# sqlite3 History

SQLite version 3.46.1 2024-08-13 09:16:08
Enter ".help" for usage hints.
sqlite> select url, datetime(visit_time/1000000+strftime('%s','1601-01-01'), 'unixepoch', 'localtime'), from_visit, transition, visit_duration/1000 from visits order b
y visit_time;
1|2022-04-19 09:54:18|0|805306373|0
1|2022-04-19 09:54:19|0|805306368|727
2|2022-04-19 09:54:19|2|268435456|0
3|2022-04-19 09:54:19|3|-2147483648|0
4|2022-04-19 09:54:19|4|-1610612736|2465
5|2022-04-19 09:54:22|5|268435456|0
6|2022-04-19 09:54:22|6|-1610612736|17456
5|2022-04-19 09:54:39|7|805306375|23439
2|2022-04-19 09:55:03|8|268435456|0
4|2022-04-19 09:55:03|9|-1610612736|2664
7|2022-04-19 09:55:05|10|268435456|0
8|2022-04-19 09:55:05|11|-2147483648|0
9|2022-04-19 09:55:05|12|-1610612736|4273
10|2022-04-19 09:55:10|13|805306375|5599
11|2022-04-19 09:55:15|14|805306375|177674
12|2022-04-19 09:58:13|15|805306375|4389
13|2022-04-19 09:58:17|16|805306375|1649
14|2022-04-19 09:58:19|17|805306375|3199
8|2022-04-19 09:58:22|18|805306375|4989
15|2022-04-19 09:58:27|19|805306368|5597
16|2022-04-19 09:58:31|0|805306368|0
17|2022-04-19 09:58:38|0|838860805|0
17|2022-04-19 09:58:39|0|805306368|842
18|2022-04-19 09:58:40|23|268435456|0
```

Segment visit records:

```
┌──(root㉿kali)-[/home/kali]
└─# sqlite3 History

SQLite version 3.46.1 2024-08-13 09:16:08
Enter ".help" for usage hints.
sqlite> select id, "url_ref_ID: " || url, datetime(visit_time/1000000+strftime('%s','1601-01-01'), 'unixepoch', 'localtime'), "From_visit: " || from_visit, 'Tran:' ||
transition , "Duration: " || (visit_duration/1000) from visits order by visit_time;
1|url_ref_ID: 1|2022-04-19 09:54:18|From_visit: 0|Tran:805306373|Duration: 0
2|url_ref_ID: 1|2022-04-19 09:54:19|From_visit: 0|Tran:805306368|Duration: 727
3|url_ref_ID: 2|2022-04-19 09:54:19|From_visit: 2|Tran:268435456|Duration: 0
4|url_ref_ID: 3|2022-04-19 09:54:19|From_visit: 3|Tran:-2147483648|Duration: 0
5|url_ref_ID: 4|2022-04-19 09:54:19|From_visit: 4|Tran:-1610612736|Duration: 2465
6|url_ref_ID: 5|2022-04-19 09:54:22|From_visit: 5|Tran:268435456|Duration: 0
7|url_ref_ID: 6|2022-04-19 09:54:22|From_visit: 6|Tran:-1610612736|Duration: 17456
8|url_ref_ID: 5|2022-04-19 09:54:39|From_visit: 7|Tran:805306375|Duration: 23439
9|url_ref_ID: 2|2022-04-19 09:55:03|From_visit: 8|Tran:268435456|Duration: 0
10|url_ref_ID: 4|2022-04-19 09:55:03|From_visit: 9|Tran:-1610612736|Duration: 2664
11|url_ref_ID: 7|2022-04-19 09:55:05|From_visit: 10|Tran:268435456|Duration: 0
12|url_ref_ID: 8|2022-04-19 09:55:05|From_visit: 11|Tran:-2147483648|Duration: 0
13|url_ref_ID: 9|2022-04-19 09:55:05|From_visit: 12|Tran:-1610612736|Duration: 4273
14|url_ref_ID: 10|2022-04-19 09:55:10|From_visit: 13|Tran:805306375|Duration: 5599
15|url_ref_ID: 11|2022-04-19 09:55:15|From_visit: 14|Tran:805306375|Duration: 177674
16|url_ref_ID: 12|2022-04-19 09:58:13|From_visit: 15|Tran:805306375|Duration: 4389
17|url_ref_ID: 13|2022-04-19 09:58:17|From_visit: 16|Tran:805306375|Duration: 1649
18|url_ref_ID: 14|2022-04-19 09:58:19|From_visit: 17|Tran:805306375|Duration: 3199
19|url_ref_ID: 8|2022-04-19 09:58:22|From_visit: 18|Tran:805306375|Duration: 4989
20|url_ref_ID: 15|2022-04-19 09:58:27|From_visit: 19|Tran:805306368|Duration: 5597
21|url_ref_ID: 16|2022-04-19 09:58:31|From_visit: 0|Tran:805306368|Duration: 0
22|url_ref_ID: 17|2022-04-19 09:58:38|From_visit: 0|Tran:838860805|Duration: 0
23|url_ref_ID: 17|2022-04-19 09:58:39|From_visit: 0|Tran:805306368|Duration: 842
24|url_ref_ID: 18|2022-04-19 09:58:40|From_visit: 23|Tran:268435456|Duration: 0
25|url_ref_ID: 19|2022-04-19 09:58:40|From_visit: 24|Tran:-2147483648|Duration: 0
26|url_ref_ID: 20|2022-04-19 09:58:40|From_visit: 25|Tran:-2147483648|Duration: 0
27|url_ref_ID: 21|2022-04-19 09:58:40|From_visit: 26|Tran:-2147483648|Duration: 0
28|url_ref_ID: 22|2022-04-19 09:58:40|From_visit: 27|Tran:-2147483648|Duration: 0
```

Seg1: Search “craiglist” (visit id=1-2):

```
sqlite> select  "url_id: " || id, url, title from urls where id=1;
url_id: 1|https://www.google.com/search?q=craigslist&rlz=1C1ONGR_enUS989US989&oq=craigslist&aqs=chrome..69i57j46i131i199i433i465i512j0i402l2j0i512l3j0i131i433l2j0i512.2595j0j15&sourceid=chrome&ie=UTF-8|craigslist - Google Search
sqlite>
```

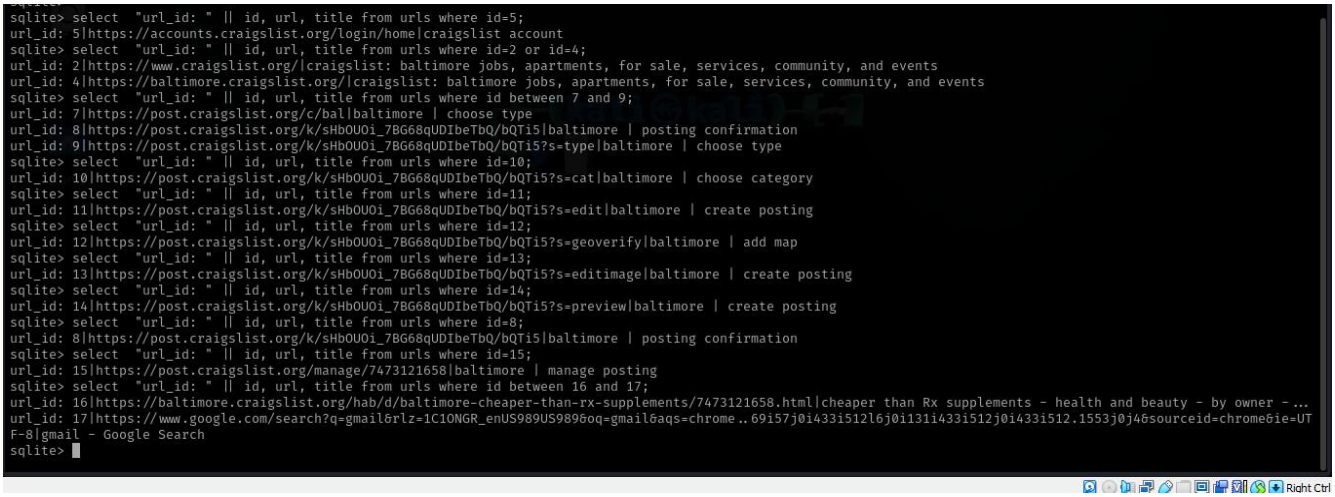
Seg2: Jump to https://www.craigslist.org/ (visits id=3-5)”

```
┌──(root㉿kali)-[/home/kali]
└─# sqlite3 History

SQLite version 3.46.1 2024-08-13 09:16:08
Enter ".help" for usage hints.
sqlite> select  "url_id: " || id, url, title from urls where id=2 or id=3 or id=4;
url_id: 2|https://www.craigslist.org/|craigslist: baltimore jobs, apartments, for sale, services, community, and events
url_id: 3|https://geo.craigslist.org/|craigslist: baltimore jobs, apartments, for sale, services, community, and events
url_id: 4|https://baltimore.craigslist.org/|craigslist: baltimore jobs, apartments, for sale, services, community, and events
sqlite>
```

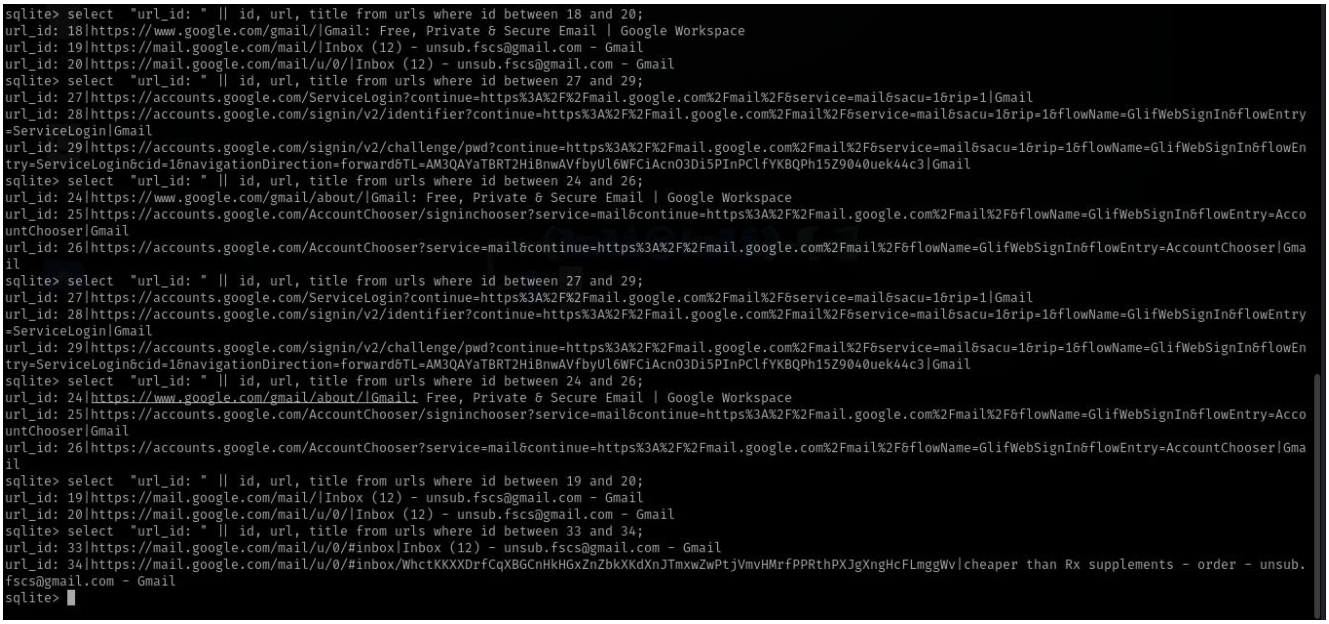
Analyze segment 3 (visits id=6-7):

```
sqlite>  select  "url_id: " || id, url, title from urls where id=5 or id=6;
url_id: 5|https://accounts.craigslist.org/login/home|craigslist account
url_id: 6|https://accounts.craigslist.org/login?rp=%2Flogin%2Fhome&rt=L|craigslist - account log in
sqlite>
```

Analyze segment 4 (visits id=8), Analyze segment 5 (visits id=9-10), Analyze segment 6 (visits id=11-13), Analyze segment 7 (visits id=14), Analyze segment 8 (visits id=15), Analyze segment 9 (visits id=16), Analyze segment 10 (visits id=17), Analyze segment 11 (visits id=18), Analyze segment 12 (visits id=19), Analyze segment 13 (visits id=20), Analyze segment 14 (visits id=21-23)



Analyze segment 15 (visits id=24-26), Analyze segment 15 part 2 (visits id=27-29), Analyze segment 15 part 3 (visits id=30-32), Analyze segment 15 part 4 (visits id=33-36), Analyze segment 16 (visits id=37-39), Analyze segment 17 part 1(visits id=40-41), Analyze segment 17 part 2 (visits id=42-43)



Analyze segment 19 (visits id=44-45), Analyze segment 20 (visits id=46-48), Analyze segment 21 (visits id=49-50)

```
sqlite>
sqlite> select  "url_id: " || id, url, title from urls where id between 35 and 36;
url_id: 35|https://mail.google.com/mail/u/0/#inbox/WhctKKXXDrfCqXBGCnHkHGxZnZbkXKdXnJTmxwZwPtjVmvHMrfPPRthPXJgXngHcFLmggWv?compose=JHrtffdgkFjdrvzMfJPRMHgQmSZBjzPlcXtW
PRlXfSGwhzrQgskTqNxQLFWSmhvscKrDpXcPbHKpCDnqPgtmpWSJWbLlCLcpRBwKDFNRmPLzKkvkC|cheaper than Rx supplements - order - unsub.fscs@gmail.com - Gmail
url_id: 36|https://mail.google.com/mail/u/0/#inbox/WhctKKXXDrfCqXBGCnHkHGxZnZbkXKdXnJTmxwZwPtjVmvHMrfPPRthPXJgXngHcFLmggWv?compose=DXDwSWwxqgzWzDRtRJhRTXQgRWQdlXLDsZNV
CgswmTqsxJBwBsdXxSKvPCxdbcBxxgBdwWDSvwScdmrjTqtTPCDbWhdHHQqGsTtBblLnfbhKchZLqdPKdpwL|cheaper than Rx supplements - order - unsub.fscs@gmail.com - Gmail
sqlite>
select  "url_id: " || id, url, title from urls where id between 33 and 34;
select  "url_id: " || id, url, title from urls where id=37;
url_id: 33|https://mail.google.com/mail/u/0/#inbox|Inbox (12) - unsub.fscs@gmail.com - Gmail
url_id: 34|https://mail.google.com/mail/u/0/#inbox/WhctKKXXDrfCqXBGCnHkHGxZnZbkXKdXnJTmxwZwPtjVmvHMrfPPRthPXJgXngHcFLmggWv|cheaper than Rx supplements - order - unsub.
fscs@gmail.com - Gmail
url_id: 37|https://mail.google.com/mail/u/0/#inbox/WhctKKXXDrfCqvtRjhGdkMBqVNFnwtCnJjRvqlXsZNkFbrkGDZwdVPkdDvjBPxRxDLqKDSv|cheaper than Rx supplements -- txid: 517b215
6914944339a96137ad8978408ea52b2fc144c98d3b0b16b21888afdc5 - unsub.fscs@gmail.com - Gmail
sqlite> select  "url_id: " || id, url, title from urls where id between 38 and 39;
url_id: 38|https://www.google.com/url?q=https://imgur.com/dTgrkP7&source=gmail&ust=1650466604648000&usg=AOvVaw0058wuJx6Jub4I72ZRaQpM|Imgur: The magic of the Internet
url_id: 39|https://imgur.com/dTgrkP7|Imgur: The magic of the Internet
sqlite>
```

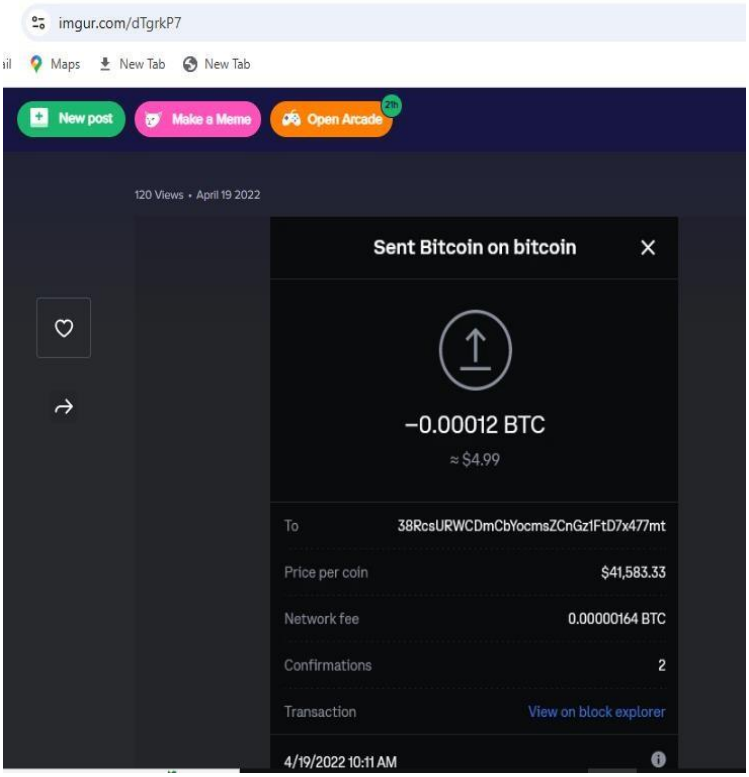
Imgur:

Imgur is an online image sharing and hosting service. Images can be uploaded anonymously and shared.

Imgur link received in Gmail and opened in above screenshot at url_id=39.

In database, you can see the imgur link from message has parameter source=gmail

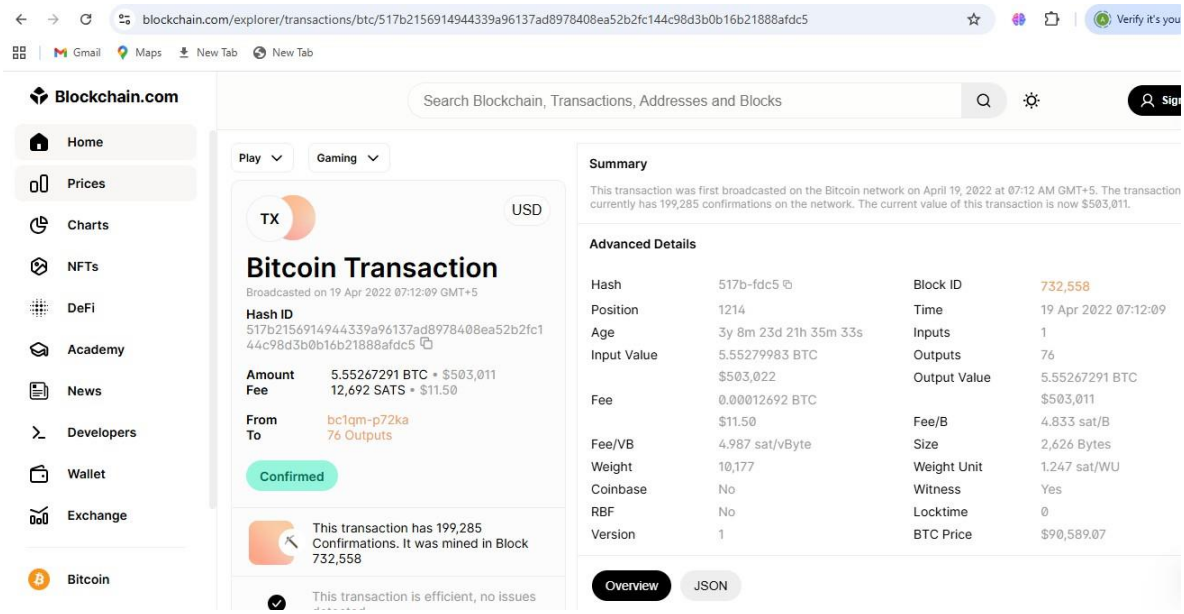
Look at the imgur post – URL does not have enough information about the image post.



Block chain Explorer:

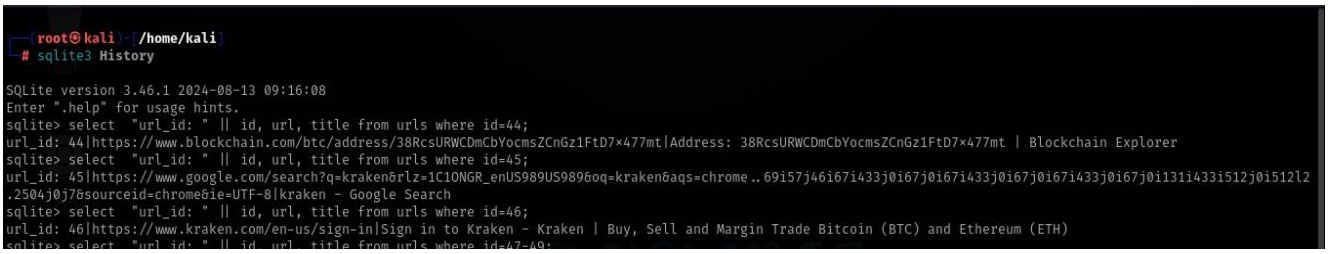
Block chain Explorer is a block and crypto transaction search engine – queries can include wallet addresses and transaction IDs.

visits id=50 Using the TXID from the Gmail message we can search it on a Blockchain Explorer to verify authenticity.



This segment is a transition from the transaction to a wallet address:

Analyze segment 25 (visits id=58), Analyze segment 26 (visits id=59-60)



Kraken:

Kraken is a cryptocurrency exchange and banking platform.

This segment is a transition from Google search results to www.kraken.com. Analyze segment 27 (visits id=61-62)

This segment is the transition from the mempool.space page to Kraken History Ledger page. Analyze segment 31 (visits id=71).

This segment are the transitions back to suspect's Gmail inbox and another two replies being composed to one message. Analyze segment 32 (visits id=72-73).

Materials of Interest:

Matieral	Description/Value	Value
Possible Suspect Location	Baltimore Region	Narrows search area
Suspect/Dealer-Buyer TXID	517b2156914944339a96137ad8978408ea52b2fc144c98d3b0b16b21888afdc5	Allows us to create a paper trail for transaction
Suspect BTC Wallet Address	38RcsURWCDmCbYocmsZCnGz1FtD7x477mt	Can monitor BTC address
Suspect Email Address	unsub.fscs@gmail.com	Can monitor email address
Downloaded File	proof_of_payment.png	Connects receipt of transaction to suspect
Downloads File Location	C:\Users\FSCS_User\Desktop\	Gives us an idea of suspect's device file structure
Chrome History File Location	C:\Users\FSCS_User\Local\Google\Chrome\User Data\Default\	

Confirming Hypothesis with Timeline

1. Suspected drug dealer posted ad on a website listing sale of illegal drugs

Visit ID	Date	Description	Duration (in second)
1	Tue Apr 19 09:54:18 AM EDT 2022	User typed "**craiglist**" into Chrome address bar and generate a URL	0 (indicate a redirect)
2	Tue Apr 19 09:54:19 AM EDT 2022	Without any delay (duration =0), Chrome sends the URL to Google and google returns results in web page with the title "**craigslist - Google Search**"	User stayed in the page for 0.727 second
3-5	Tue Apr 19 09:54:19 AM EDT 2022	User clicked a the link (from **visits**.id=2) and visited **https://www.craigslist.org/**. However, it was redirected to **|https://geo.craigslist.org/** and **https://baltimore.craigslist.org/**	User stayed in the page **https://baltimore.craigslist.org/** for 2.465 second
6-7	Tue Apr 19 09:54:22 AM EDT 2022	User click an account link **https://accounts.craigslist.org/login/home** in order to log in. User was redirected to another link **https://accounts.craigslist.org/login?rp=%2Flogin%2Fhome&rt=L**	User stayed in the page **|https://post.craigslist.org/c/bal** for 17 second
8	Tue Apr 19 09:54:39 AM EDT 2022	User filled out the form and submit	User stayed in the page for 23 second

1. Suspected drug dealer posted ad on a website listing sale of illegal drugs

Visit ID	Date	Description	Duration (in second)
9-10	Tue Apr 19 09:55:03 AM EDT 2022	User clicked a link **https://www.craigslist.org/** and was redirected to **https://baltimore.craigslist.org/**	User stayed in the page for 24 second
11-13	Tue Apr 19 09:55:05 AM EDT 2022	User clicked a link (create a posting) **https://post.craigslist.org/c/bal** User was redirect to **url_id** 8 and then **url_id** 9	User stayed in the page **url_id 9** for 4 second
14	Tue Apr 19 09:55:10 AM EDT 2022	User filled out the form (chosen types) and submit it User needs to choose category	User stayed in the page for 5 second
15	Tue Apr 19 09:55:15 AM EDT 2022	User filled out the form (select category) and submit it User needs to add information (description, title, price, delivery, etc.)	User stayed in the page for 17 second
16	Tue Apr 19 09:58:13 AM EDT 2022	User filled out the form (description title, price, delivery, etc.) User needs to choose their location	User stayed in the page for 4 second
17	Tue Apr 19 09:58:17 AM EDT 2022	User filled out the form (chose location) User needs to choose to upload image or not	User stayed in the page for 1 second
18	Tue Apr 19 09:58:19 AM EDT 2022	User filled the form (chose image option), URL doesn't show if they uploaded an image or not but we can always check the post itself User can edit post, edit location, edit images or publish post	User stayed in the page for 3 second
19	Tue Apr 19 09:58:22AM EDT 2022	User filled the form (selected publish) User can share, view, or manage post or return to account page	User stayed in the page for 4 second

1. Suspected drug dealer posted ad on a website listing sale of illegal drugs

Visit ID	Date	Description	Duration (in second)
20	Tue Apr 19 09:58:27 AM EDT 2022	User clicked a link (**https://post.craigslist.org/manage/7473121658|baltimore**) to manage the post User can edit post, update images, edit location, delete post or visit post	User stayed in the page for 5 second
21-23	Tue Apr 19 09:58:31 AM tp 09:58:31 AM to 09:58:39 AM EDT 2022	User clicked a link (**https://baltimore.craigslist.org/hab/d/baltimore-cheaper-than-rx-supplements/7473121658.html**) to view post Then user typed "**gmail**" in Chrome address bar and URL was generated to **Google Search** results	User stayed in the page 17 for .8 second

2. Interested buyer messaged dealer

Visit ID	Date	Description	Duration (in second)
24-26	Tue Apr 19 09:58:40 AM AM EDT 2022	User clicked a link (**https://www.google.com/gmail**) to Gmail Then user was redirected to **unsub.fscs@gmail.com** inbox Then user was redirected to URL containing path **/u/0/** indicating user is logged into account **0**	User stayed in the page for 0 second
27-29	Tue Apr 19 09:58:40 AM AM EDT 2022	User was redirected to **accounts.google.com** with the URL to their inbox as a parameter to **ServiceLogin?service=** User was then directed to about page **/help/about.html** on **mail.google.com** User was then redirected again to another about page **/help.about.html** on **google.com**	User stayed in the page for 0 second
30-32	Tue Apr 19 09:58:40 AM AM to 09:58:43 AM EDT 2022	User clicked a link (**https://www.google.com/gmail/About/**) to Google Workspace Then user clicked a link (**https://accounts.google.com/AccountChooser/**) with query **/siginchooser?service=mail** to a login page Then user was redirected to accounts.google.com with query **AccountChooser?service=mail** to choose an account	User stayed in the page for 0 second

2. Interested buyer messaged dealer

Visit ID	Date	Description	Duration (in second)
33-36	Tue Apr 19 09:58:43 AM AM to 09:58:44 AM EDT 2022	User clicked a link (**https://accounts.google.com/**) to Gmail with query **ServiceLogin?continue=** to a login page Then user clicked a link (**https://accounts.google.com/**) to Gmail with same query (**https://accounts.google.com/**) to Gmail with path **/signin/** with query **identifier?continue** to a login page prompting identifier email address/username Then user clicked a link **(https://accounts.google.com/)** with path **/signin/challenge/** and query **pwd?continue=** to a login page prompting challenge password	User stayed in the page 29 for 2 second
37-39	Tue Apr 19 09:59:29 AM EDT 2022	User clicked a link (**https://accounts.google.com/**) with query **CheckCookie?continue=** and parameter value **loginDoneHtml** to **unsub.fscs@gmail.com's** inbox Then user was redirected (**https://mail.google.com/**) with path **/accounts/** and query **SetOSID?authuser** to **unsub.fscs@gmail.com's** inbox Then user was redirected (**https://accounts.youtube.com/**) with path **/accounts/** and query **SetSID?** To **unsub.fscs@gmail.com's** inbox	User stayed in the page for 0 second

2. Interested buyer messaged dealer

Visit ID	Date	Description	Duration (in second)
40-41	Tue Apr 19 09:59:29 AM EDT 2022	User clicked a link (**https://mail.google.com/**) with path **/mail/** to unsub.fscs@gmail.com's inbox User clicked a link (**https://mail.google.com/**) with path **/u/0/** to unsub.fscs@gmail.com's inbox	User stayed in the page for 0 second
42-43	Tue Apr 19 09:59:31 AM AM to 10:04:12 EDT 2022	User clicked a link (**https://mail.google.com/**) with path **/mail/u/0/#inbox** to unsub.fscs@gmail.com's inbox User clicked a link (**https://mail.google.com/**) with string **WhctKKXXDrfCq...** indicating ID for opened email with subject header **cheaper than Rx supplements - order**	User stayed in the page for 0 second

3. Dealer replied with transaction details (Bitcoin wallet)

Visit ID	Date	Description	Duration (in second)
44-45	Tue Apr 19 10:04:35 AM AM to 10:04:46 EDT 2022	User clicked a link (**https://mail.google.com/**) with query **?compose=JHrtff** referring to open message **WhctKKXX** with subject header **"order"** User then clicked a link **(https://mail.google.com)** with query **?compose=DXDWs** referring to same message **WhctKKXX** indicating two replies were made for the same message	User stayed in the page for 0 second

4. Buyer sent payment

Visit ID	Date	Description	Duration (in second)
46-48	Tue Apr 19 10:04:52 AM AM to 10:04:59 EDT 2022	User clicked a link (**https://mail.google.com/mail/u/0/#inbox**) to **unsub.fscs@gmail.com's** inbox User clicked a link (**https://mail.google.com/mail/u/0/#inbox**) with string **WhctKKXXDrFCqXBGC "order"** message open User clicked a lick (**https://mail.google.com/mail/u/0/#inbox**) with string **WhctKKXXDrfCqvtRj**, another new message with subject header **"txid: 517b2159..."**	User stayed in the page for 0 second

5. Dealer confirmed payment

Visit ID	Date	Description	Duration (in second)
49-50	Tue Apr 19 10:56:52 AM EDT 2022	User clicked a link (**https://www.google.com/**) with query **url?=https://imgur.com/dTgrkp7** and parameter **source=gmail** indicating the imgur link originated from a Gmail message User clicked a link (**https://imgur.com/dTgrkP7**) to imgur post	User stayed in the page 39 for 18 second
51-52	Tue Apr 19 10:58:59 AM to 10:59:00 EDT 2022	User typed "**blockchain explorer**" into Chrome address bar and generated a URL to **Google Search** results	User stayed in the page for 1 second
53-54	Tue Apr 19 10:59:01 AM to 10:59:02 EDT 2022	User clicked a link (**https://www.blockchain.com/explorer**) to **Blockchain Explorer**	User stayed in the page for 18 second

5. Dealer confirmed payment

Visit ID	Date	Description	Duration (in second)
55-57	Tue Apr 19 10:59:06 AM EDT 2022	User clicked a link (**https://www.blockchain.com/**) with query **?search=** value **517b215**... then a URL was generated User then clicked a link (**https://blockchain.com/**) with path **/btc/tx** and string matching **517b215** transaction to view the transaction	User stayed in the page for 0 second
58	Tue Apr 19 10:59:21 AM EDT 2022	User clicked a link (**https://www.blockchain.com**) with path **/btc/address/** and string **38RcsURW**... to the suspect's address	User stayed in the page for 0 second
59-60	Tue Apr 19 10:59:38 AM to 10:59:39 AM EDT 2022	User typed "**kraken**" into Chrome address bar and generated a URL to **Google Search** results	User stayed in the page for 7 second
61-62	Tue Apr 19 10:59:47 AM EDT 2022	User clicked link **(https://kraken.com/)** with path /en-us/sign in to **Kraken Sign in** page	User stayed in the page for 0 second
63-65	Tue Apr 19 11:00:21 AM to 11:01:12 AM EDT 2022	User clicked a link (**https://www.kraken.com**) with path **/en-us/device-approval** to approve signing in from new device User then clicked a link (**https://www.kraken.com**) with path **/u/** and query **trade?i=true** after successfully signing in User then clicked a link (**https://www.kraken.com**) with path **/u/instant**	User stayed in the page for 104 seconds or 1.7 minutes

5. Dealer confirmed payment

Visit ID	Date	Description	Duration (in second)
66	Tue Apr 19 11:00:21 AM EDT 2022	User clicked a link (**https://www.kraken.com**) with path **/u/funding** to **Funding** page	User stayed in the page for 0 seconds
67-70	Tue Apr 19 11:01:31 AM to 11:01:33 AM EDT 2022	User clicked a link (**https://www.kraken.com**) with query **redirect?url=** pointing to **https://mempool.space/tx/517b21...** Then page is refreshed by server Then refresh page is redirected to link (**https://www.kraken.com**) with query **redirect?** and title **Transaction: 517b21..** Then redirected to link **(https://mempool.space)** with path **/tx/517b21...**	User stayed in the page for 0 seconds
71	Tue Apr 19 11:02:05 AM EDT 2022	User clicked a link (**https://www.kraken.com**) with path **/u/history/ledger** to **Kraken History Ledger** page	User stayed in the page for 0 seconds

6-7. Dealer shipped drugs and buyer received drugs

Visit ID	Date	Description	Duration (in second)
72-73	Tue Apr 19 11:02:05 AM to 11:02:44 AM EDT 2022	User clicked a link (**https://mail.google.com**) with path **/u/0/#inbox** with string pointing to **WhctKKXXdrfC**... message with subject "**order**" and query **?compose=Jhrtffdgkf**... as one reply to the message User then clicked a link (**https://mail.google.com**) with same path pointing to same **WhctKKXXdrfC**... message but with another reply **xQTrpQHKf**...	User stayed in the page for 0 seconds
74	Tue Apr 19 11:02:05 AM EDT 2022	User clicked a link (**https://mail.google.com**) with path **/mail/u/0/#inbox/** with string **WhctKKXXDRf** message with subject header **txid** from earlier visit **id=48**	User stayed in the page for 0 seconds

Practical: User_web_activity

Define recourse on a web server

HTML files and images

Save resource to a specific location on web server

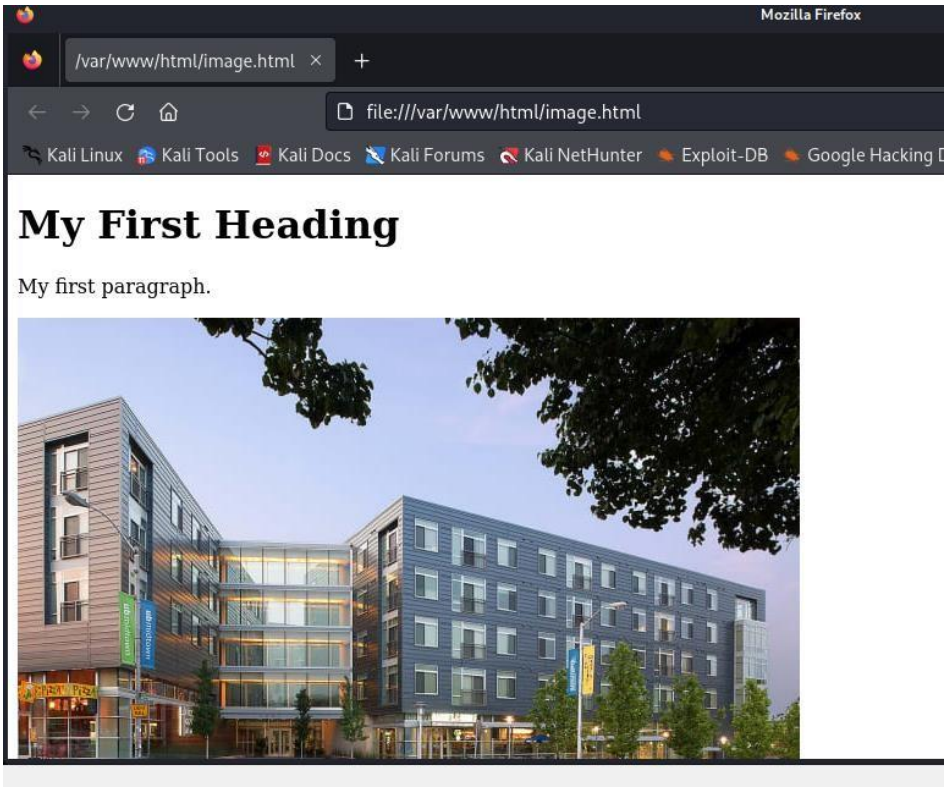
/var/www/html/

Find the domain name/IP

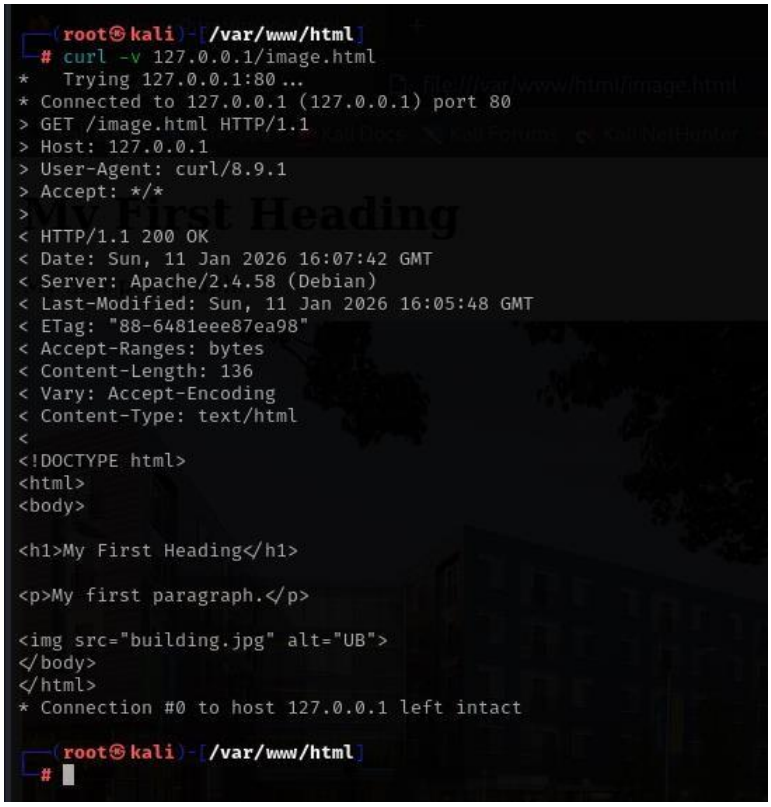
URL in a browser

- Download an image building.jpg
  - Save it to /var/www/html
- Add building.jpg in a webpage image.html
  - Show the webpage with the image

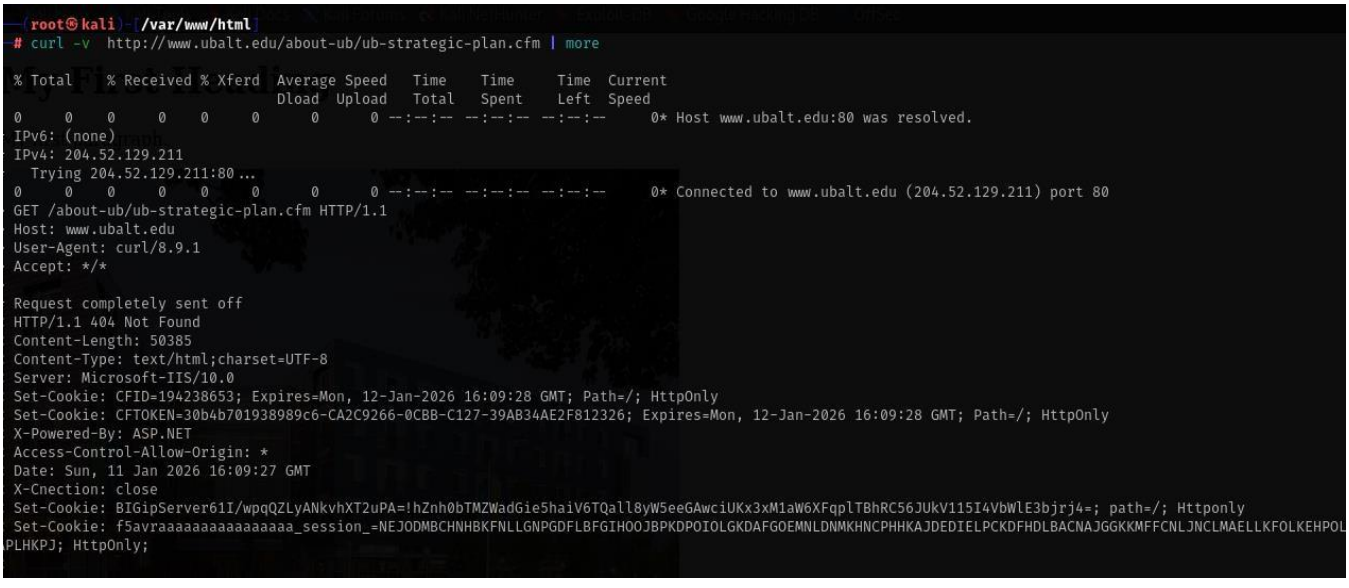
```
┌──(root㉿kali)-[/home/kali]
└─# cd /var/www/html/

┌──(root㉿kali)-[/var/www/html]
└─# ls
dvwa

┌──(root㉿kali)-[/var/www/html]
└─# ls -l /var/www/html
total 4
drwxr-xr-x 12 www-data www-data 4096 Jul 13 14:58 dvwa

┌──(root㉿kali)-[/var/www/html]
└─# chmod 777 /var/www/html

┌──(root㉿kali)-[/var/www/html]
└─# ls -l /var/www/html
total 4
drwxr-xr-x 12 www-data www-data 4096 Jul 13 14:58 dvwa

┌──(root㉿kali)-[/var/www/html]
└─# wget -q https://www.dropbox.com/s/jiq17tgi8u1xls3/building.jpg

┌──(root㉿kali)-[/var/www/html]
└─# ls
building.jpg  dvwa

┌──(root㉿kali)-[/var/www/html]
└─# ls -l /var/www/html
total 72
-rw-r--r--  1 root     root     68661 Jan 11 10:54 building.jpg
drwxr-xr-x 12 www-data www-data  4096 Jul 13 14:58 dvwa

┌──(root㉿kali)-[/var/www/html]
└─#
```



How an agent requests resource using a URL?

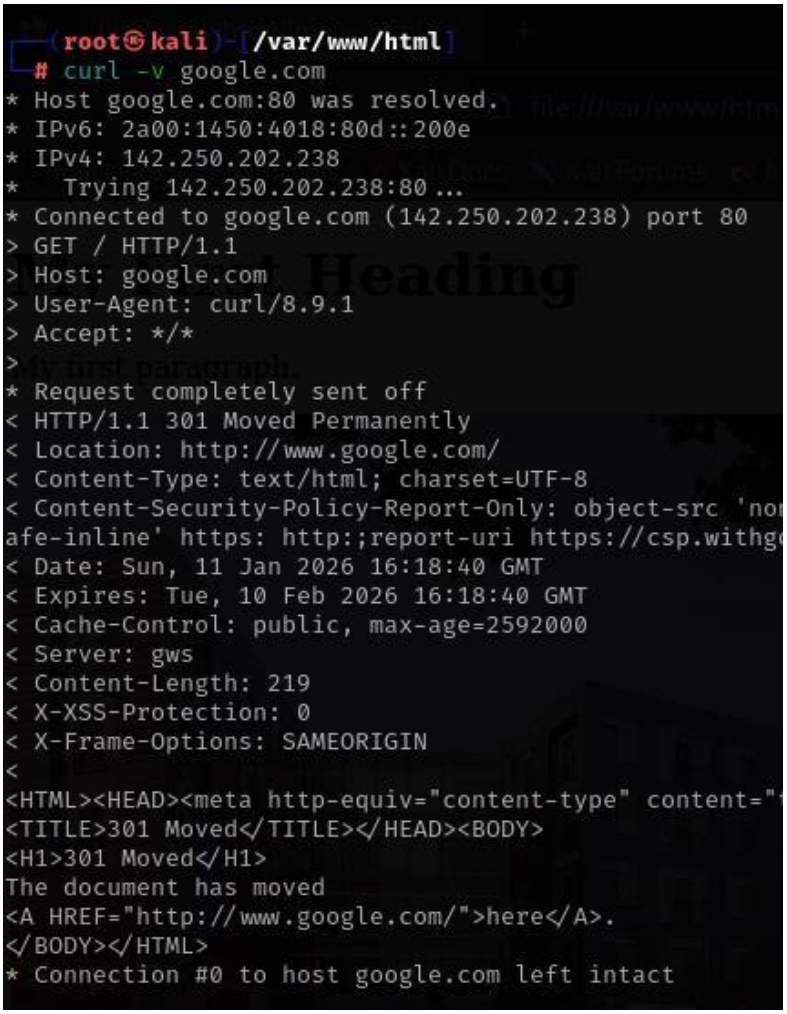


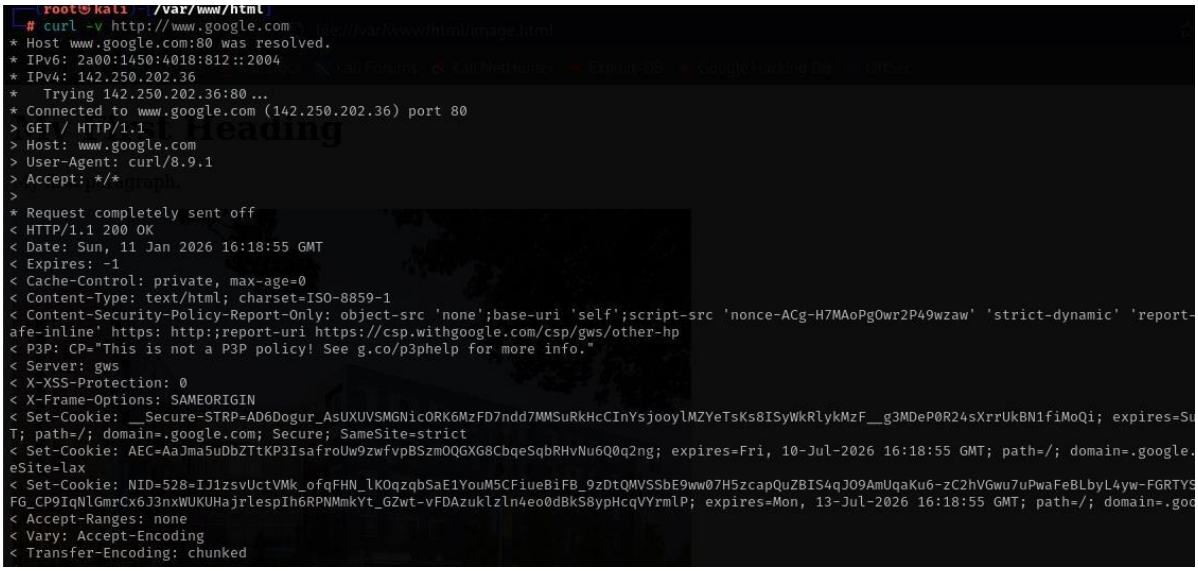
Curl a live page of University of Baltimore at /var/www/html/about/ub-strategic-plan.cfm



What is URL redirecting?

- “This thing is no longer here. Go over here."
- Browser may redirect URLs for various reasons:
    - Site moved to new domain
    - Several different URLs for one site
    - Merging sites together
    - Page removed
- Redirect reasons are not recorded by browsers
    - Must guess what reason for redirect might be





Location of Google Chrome history

- Windows XP
  - **C:\Documents and Settings\<username>\Local Settings\Application Data\Google\Chrome\User Data\Default**
  - **C:\Documents and Settings\<username>\Local Settings\Application Data\Google\Chrome\User Data\Default\Cache**
- Windows Vista, 7, 8, 10
  - **C:\Users\<username>\AppData\Local\Google\Chrome\User Data\Default**
  - **C:\Users\<username>\AppData\Local\Google\Chrome\User Data\Default\Cache**
- Mac OS X
  - **/Users/<username>/Library/Application Support/Google/Chrome/Default**
  - **/Users/<username>/Library/Caches/Google/Chrome/Default/Cache**
- Linux/Unix
  - **/home/<username>/.config/google-chrome/Default**
  - **/home/<username>/.cache/google-chrome/Default/Cache**