Malware Traffic Analysis – Incident Report

The University Of

TAMPA

By

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Executive Summary:

On March 21st 2022, at 20:58:11 UTC, A user named Patrick Zimmerman was the victim of a malware attack. By doing an analysis on the captured network traffic using tools like Wireshark & Brim (Zui), there are few evidences of network compromise. It was identified that the user infected with IcedID malware. IcedID is a generally banking trojan that is popular to steal sensitive information like financial data from infected systems. The malware was likely infected by the attacker through a malicious website oceriesfornot.top (this is the IP 188.166.154.118, user visited this site). The network trojan was detected from this website and downloaded a suspicious zip file.

The attacker started using Patrick's network right after the malware infection, On the victim's machine (10.0.19.14 & 00:60:52:b7:33:0f), the host (10.0.19.9) was using Patrick's network. By using smb_mapping, the attacker enumerated and gained access to the domain controller.

The attacker visited many malicious sites through gaining access to domain controller which include file sharing websites (filebin.net & situla.bitbit.net) and remaining sites mentioned in IOCs. I found a domain 'bupdater.com' in my analysis, this domain and IP address are also identified as malicious, and have been identified as a cobalt strike C2 server by the community (Virus Total). Then I was able to conclude that the attacker utilized the initial access granted by the IcedID infection to establish cobalt strike C2 (23.227.198.203:757 - bupdater.com) on the victim machine.

Details:

Client MAC address: PERIPHER_b7:33:0f (00:60:52:b7:33:0f)

Requested IP Address: 10.0.19.14

Host Name: DESKTOP-5QS3D5D

Client name: DESKTOP-5QS3D5D.burnincandle.com

Username: patrick.zimmerman (found through Kerberos)

Attacker: 188.166.154.118:80 - oceriesfornot.top (malware), Cobalt strike: 23.227.198.203:757 - bupdater.com

I started my analysis with Wireshark, and my goal was to identify the malware that infected Patrick's machine. So I went through statistics to find information like the IP address, DNS, Host name, and MAC address of the host. By doing this process, I figured out that '10.0.19.14' was the most common IP address in the captured packets. If this is the most common IP, then I can say this is most likely the target for attackers. By analyzing 'dhcp' packets, I got all the user details. And next, I analyzed 'Kerberos' for finding the owner of the system (PC user).

Next, I started filtering the 'http' traffic using Wireshark to get more details of the network traffic. I came across an http GET request from Patrick (user - 10.0.19.14) to 188.166.154.118 (http://oceriesfornot.top). This domain and its extension look weird to me, so I went to Google and did an advanced search about this 'oceriesfornot.top' domain and found that this is a malicious site related to Quantum Ransomware. Then I opened my Brim (Zui) to figure out what happened when the user visited this site. I quickly filtered the 'dns' traffic and analyzed this domain and found, 'oceriesfornot.top' was accessed by the user and downloaded a zip file, and got infected by a network trojan.

Continuing my search for more details about this trojan, I searched on VirusTotal about this domain and confirmed this is malicious malware. But both the ‘MD5’ (792ec837418da54679ac01a9b8c9f257) & ‘sha1’(d5134cd34207addf6b483bdb39a24fbf847b1623) hash values found on Brim are not malware. Also, I checked for the TCP stream of this request and found an interesting cookie, and decoded it using ‘Cyberchef’ tools. I found the cookie is utilized for storing encoded information regarding the victim's host, which includes details such as the hostname, username, and Windows version. As a result, I had proof that the attacker was able to gather certain information regarding the victim's host.

I found more sites through ‘dns’ filter in both Brim & Wireshark. I saw our victim IP ‘10.0.19.14’ is making unusual TLS requests with ‘suncoastpinball.com’ domain (160.153.32.99) on port 443, I saw some weird responses like ‘Client Hello’ & ‘Server Hello’. This site is not self-signed but was issued by the Godaddy domain provider.

This DNS traffic disclosed the malicious operations of the attacker, I found another activity that within a fraction of seconds (like within 5-7 seconds) our victim tried to access ‘antnosience.com’ (157.245.142.66) ‘filebin.net’(185.47.40.36) ‘situla.bitbit.net’(87.238.33.8) ‘bupdater.com’(23.227.198.203) sites. This is a nice pattern that I observed, all the sites mentioned are related to malicious malware (found through VirusTotal) some are related to ‘Criminal IPs from different countries according to virus total. So basically the attacker used Patrick’s network and accessed these malicious sites.

While going through the ‘DNS’ traffic I encountered another site ‘bupdater.com’ with the 23.227.198.203 . So I filtered the traffic with that Ip address ‘ip.addr == 23.227.198.203’ and found, It made a pattern that our victim host was sending multiple requests every minute on port 757. Again, I searched this site on VirusTotal and confirmed this as a ‘Cobalt strike - Command and Control C2 server’ by the community discussion about it.

Now, I can say that the attacker utilized the initial access he got through the IceID malware infection and used that access to start the cobalt strike attack on Patrick (our user).

To keep Patrick Zimmerman's system safe, it's a good idea to install anti-virus and implement firewall security. This will help scan all downloaded files for any dangerous viruses. We should use multiple layers of protection to stop attackers from harming any users on our network.

Appendices- Indicators of Compromise:

The Initial network trafiic after the IcedID infection:

HTTP GET request - 188.166.154.118:80 - oceriesfornot.top (malware)

HTTPS traffic - 91.193.16.181:443 - seaskysafe.com and dilimoretast.com

HTTPS traffic - 157.245.142.66:443 - antnosience.com and otectagain.top

HTTPS traffic - 160.153.32.99:443 - suncoastpinball.com

The traffic to the file sharing websites:

HTTPS traffic - 185.47.40.36:443 - filebin.net

HTTPS traffic - 87.238.33.7:443 and 87.238.33.8:443 - situla.bitbit.net

The traffic to the cobalt strike command and control (C2):

HTTPS traffic - 23.227.198.203:757 - bupdater.com

* Detailed proofs with screenshots are in the next pages

This is first thing I did, Analyzing the protocol hierarchy. Statistics -> Hierarchy.

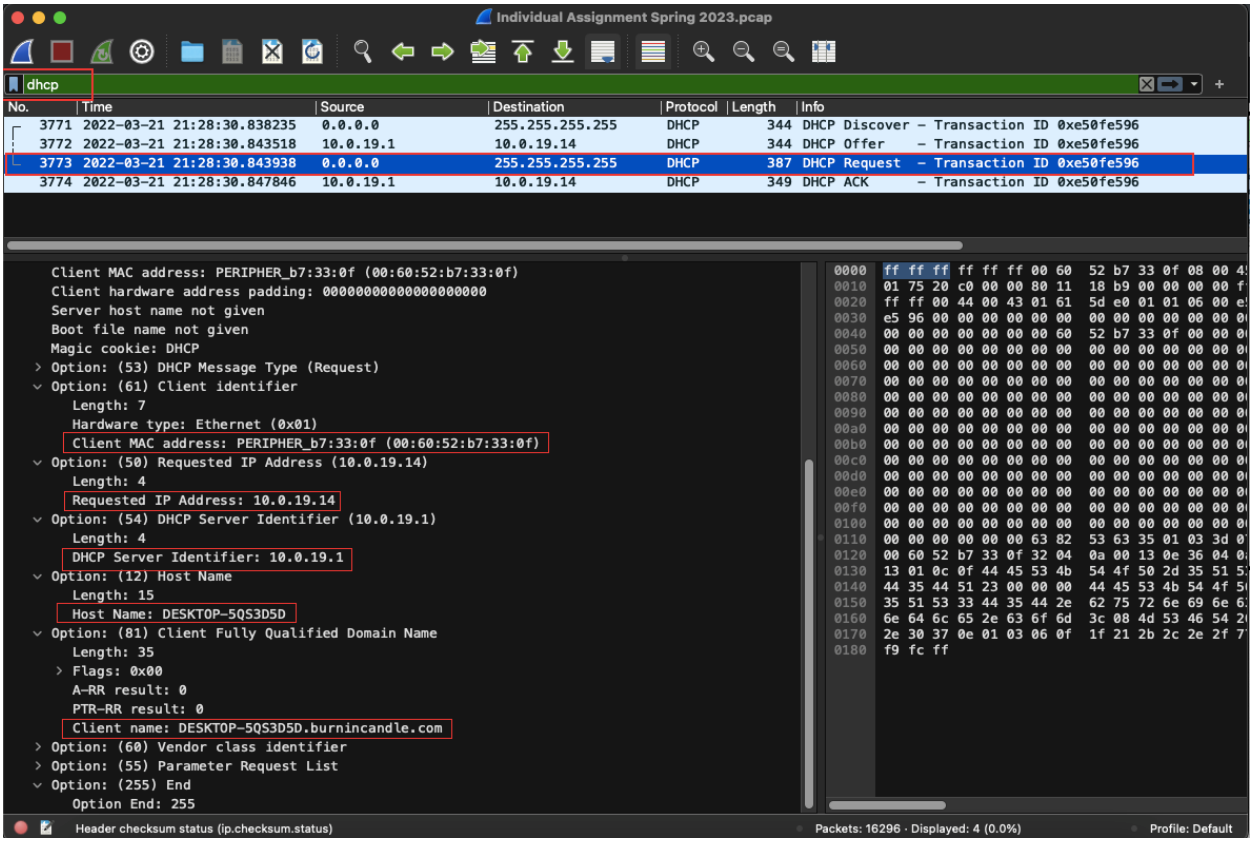
Wireshark · Protocol Hierarchy Statistics · Individual Assignment Spring 2023.pcap

Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End B
Frame	100.0	16296	100.0	6591621	2318	0	0	0
Ethernet	100.0	16296	4.2	273818	96	0	0	0
Internet Protocol Version 4	94.5	15406	4.7	308204	108	0	0	0
User Datagram Protocol	5.7	928	0.1	7424	2	0	0	0
Simple Service Discovery Protocol	0.1	20	0.0	2704	0	20	2704	0
Network Time Protocol	0.2	34	0.1	4080	1	34	4080	1
NetBIOS Name Service	0.4	65	0.1	4198	1	65	4198	1
NetBIOS Datagram Service	0.4	67	0.2	12978	4	0	0	0
SMB (Server Message Block Protocol)	0.4	67	0.1	7484	2	0	0	0
SMB MailSlot Protocol	0.4	67	0.0	1675	0	0	0	0
Microsoft Windows Browser Protocol	0.4	67	0.0	1722	0	67	1722	0
Multicast Domain Name System	0.0	8	0.0	320	0	8	320	0
Link-local Multicast Name Resolution	0.1	9	0.0	371	0	9	371	0
Dynamic Host Configuration Protocol	0.0	4	0.0	1256	0	4	1256	0
Domain Name System	3.9	640	0.6	39696	13	640	39696	13
Data	0.1	13	0.2	10206	3	13	10206	3
Connectionless Lightweight Directory Access Protocol	0.4	68	0.2	14838	5	68	14838	5
Transmission Control Protocol	88.7	14455	89.3	5886160	2070	8711	3125249	1099
Transport Layer Security	21.3	3463	55.6	3661765	1287	3462	2825160	993
NetBIOS Session Service	7.4	1205	5.1	338534	119	6	228	0
SMB2 (Server Message Block Protocol version 2)	6.8	1116	5.0	330866	116	990	271271	95
SMB (Server Message Block Protocol)	0.5	83	0.2	11337	3	67	9889	3
SMB Pipe Protocol	0.1	16	0.0	232	0	0	0	0
Microsoft Windows Lanman Remote API Protocol	0.1	16	0.0	264	0	16	264	0
Lightweight Directory Access Protocol	2.0	328	8.1	535176	188	328	482185	169
Kerberos	0.3	44	0.8	54279	19	44	54279	19
Hypertext Transfer Protocol	0.2	35	0.2	10357	3	34	8760	3
PKIX CERT File Format	0.0	1	0.0	1306	0	1	1306	0
Distributed Computing Environment / Remote Procedure Call (DCE/RPC)	3.1	508	2.1	135544	47	146	61196	21
Server Service	0.0	2	0.0	940	0	1	164	0
Malformed Packet	0.0	1	0.0	0	0	1	0	0
SAMR (pidl)	0.6	102	0.1	6980	2	102	6980	2
Microsoft Network Logon	0.1	16	0.2	10052	3	16	10052	3
Local Security Authority	0.1	10	0.0	1232	0	10	1232	0
DRSUAPI	1.0	164	0.3	20864	7	164	20864	7

No display filter.

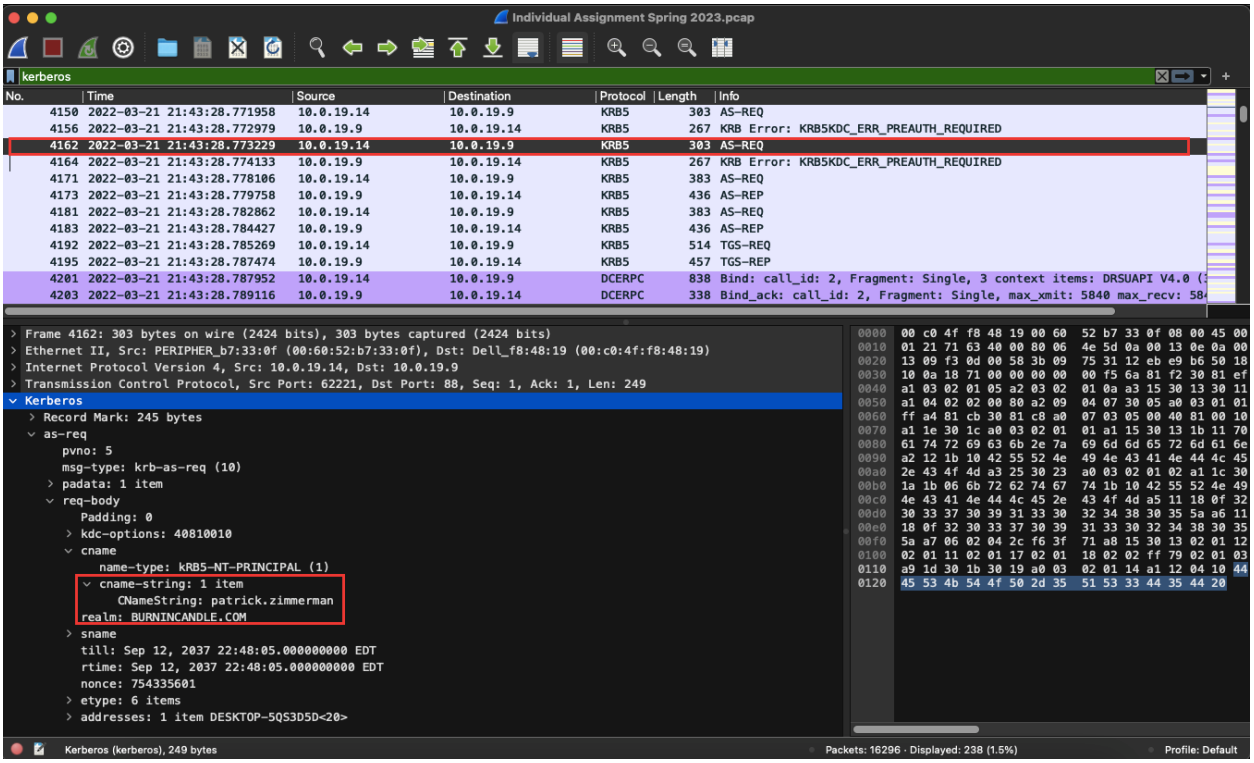
Help Copy Close

I filtered ‘dhcp’ traffic to gather the information of the user and found the Mac address, IP address, Host name.

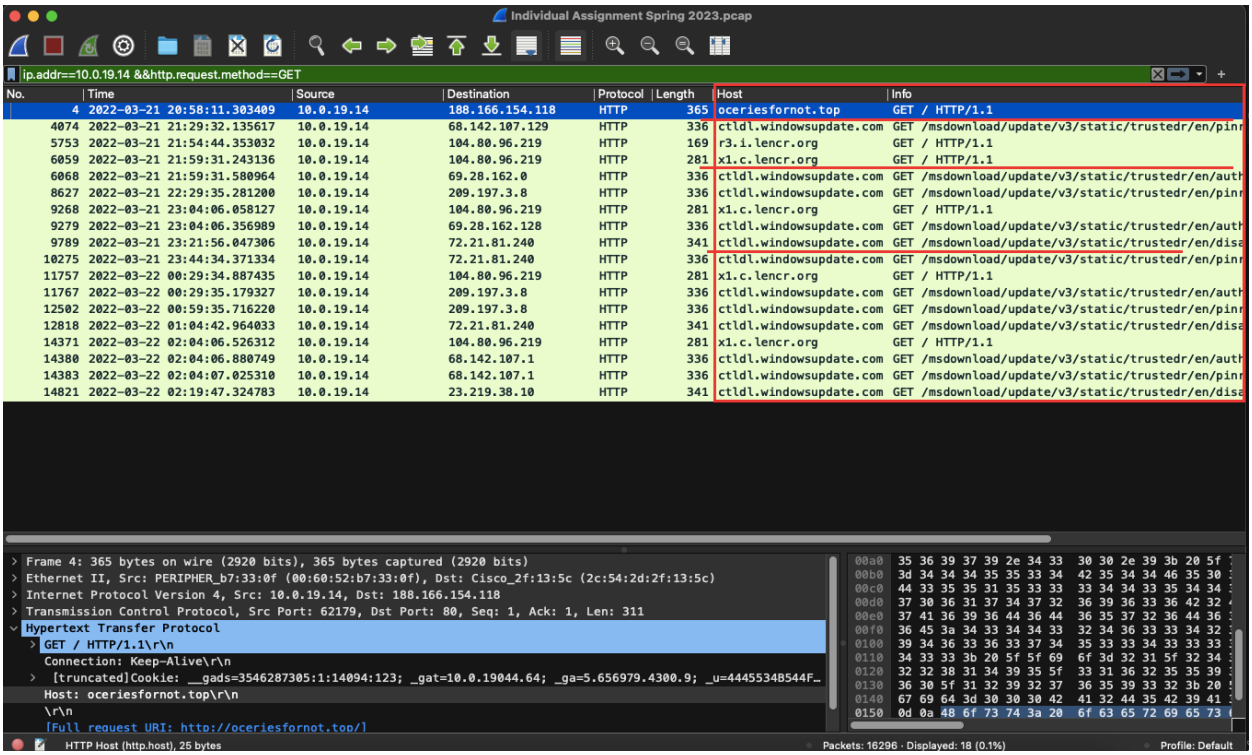


And to find out the username of the user, I filtered ‘kerberos’ traffic.

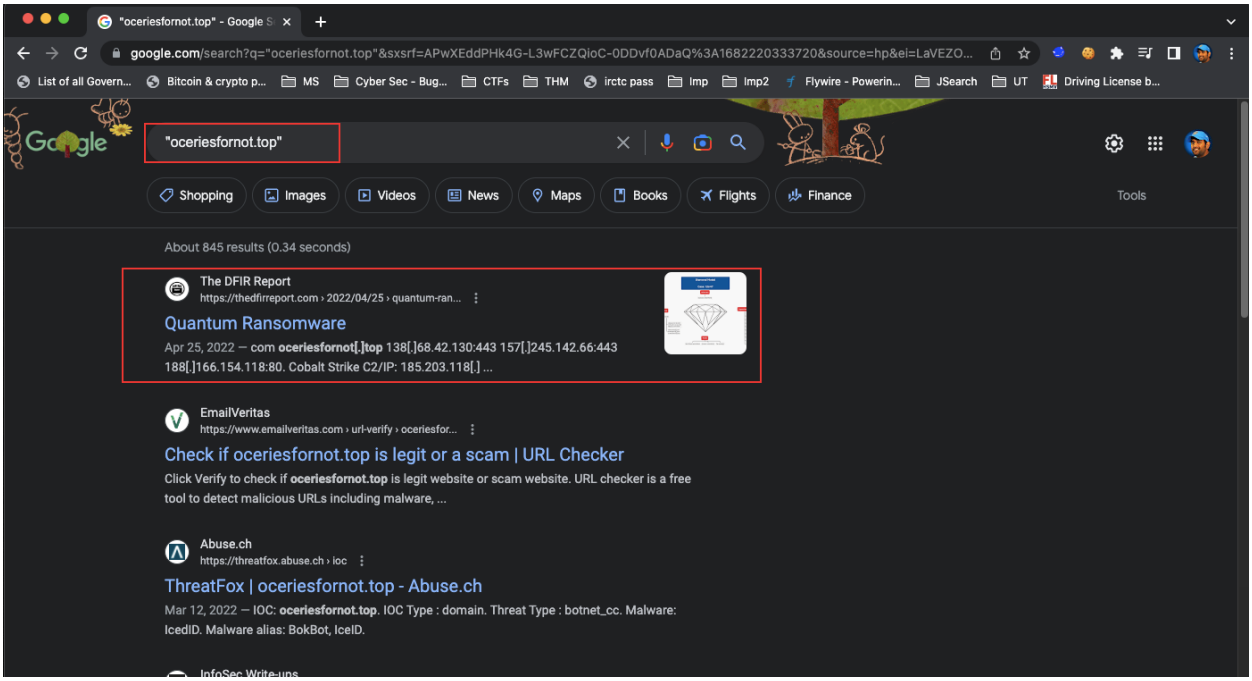
Kerberos:



“ ip.addr==10.0.19.14 &&http.request.method==GET ”. This filter gave me all the http GET request method, I found three main sites and analyzed them.



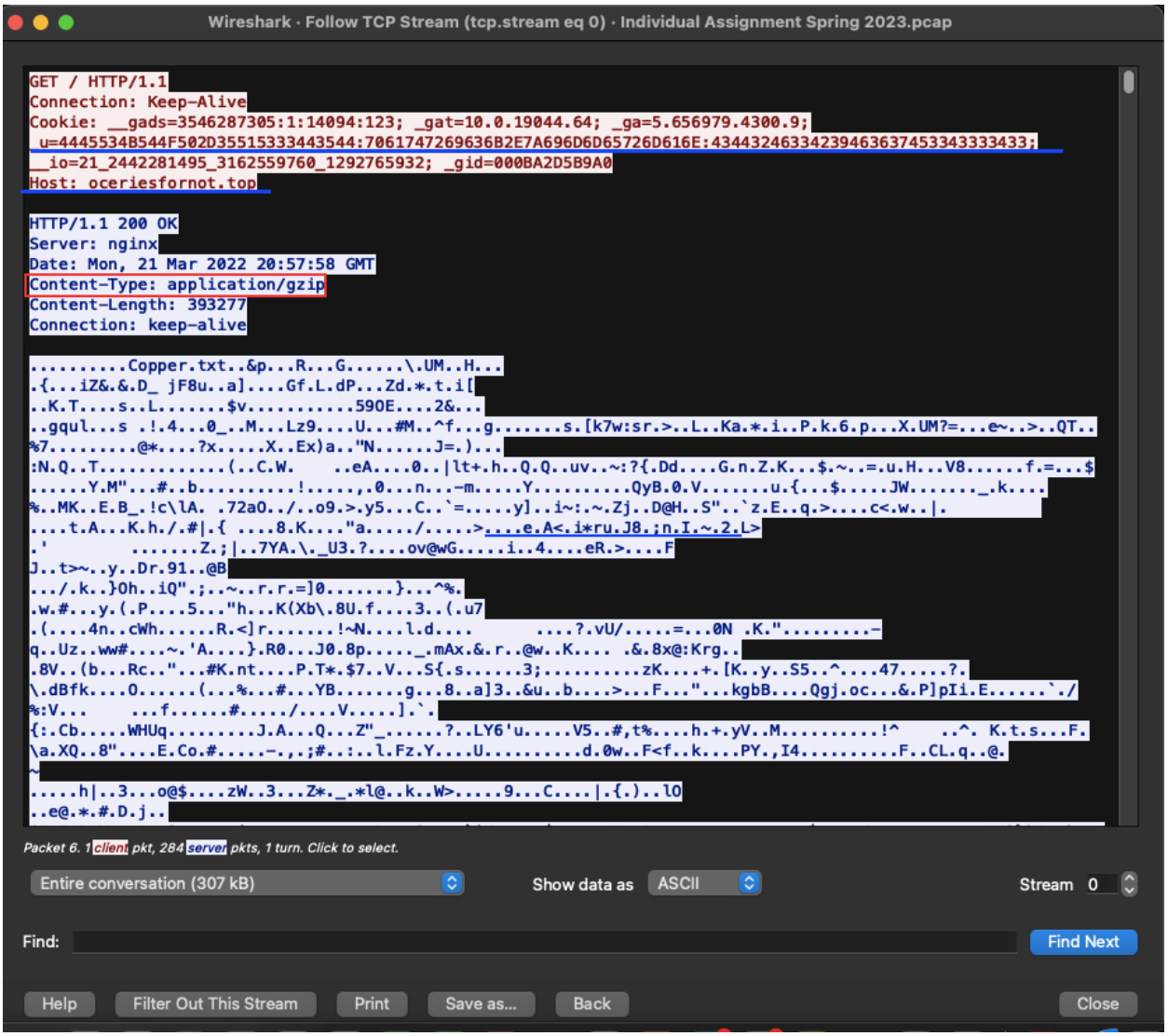
I looked up the two hosts, x1.c.lencr.org and ctldl.windowsupdate.com, and they appear to be genuinely owned by LetsEncrypt and Microsoft. However, oceriesfornot.top (188.166.154.118) appears to be linked to the Quantum Ransomware. See the google result below.



I find an unusual cookie after selecting the frame and following the TCP stream of “oceriesfornot.top” HTTP request:

(right click on frame -> Follow -> TCP Stream)

It will automatically download a zip file if we try to access the the site “oceriesfornot.top”



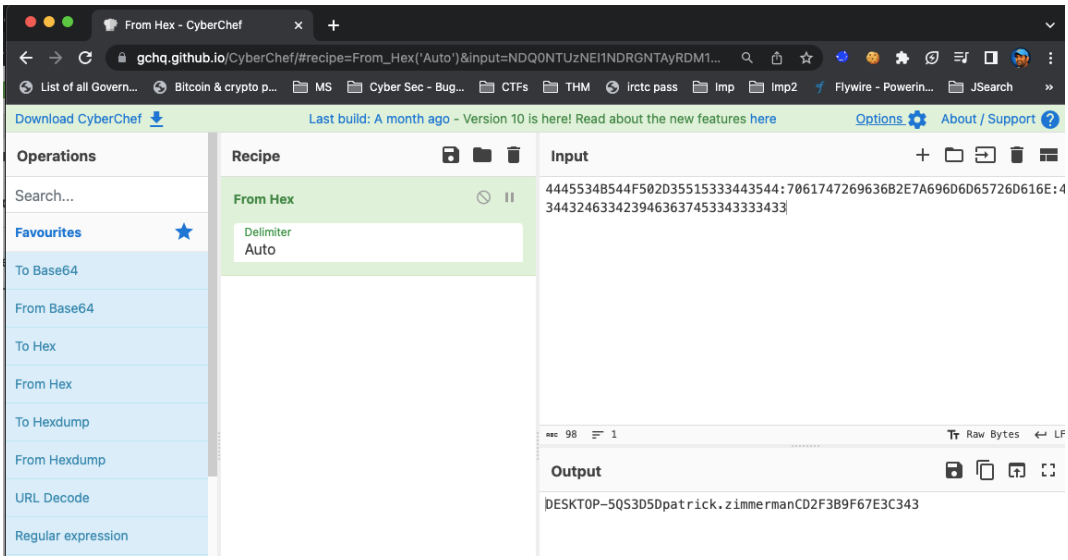
Upon discovering a gzip file, I did research on IcedID and gzip files. It became apparent to me that the extent of the infection went beyond what I initially assumed. The string "Copper.txt" acted as a simple facade. In reality, the data was encrypted IcedID configuration and not an actual file.

I spent some time researching more and came across sysopfb's blog where he did some research on “IcedID” malware that contains a similar cookie:

Link: https://sysopfb.github.io/malware,/icedid/2020/04/28/IcedIDs-updated-photoloader.html

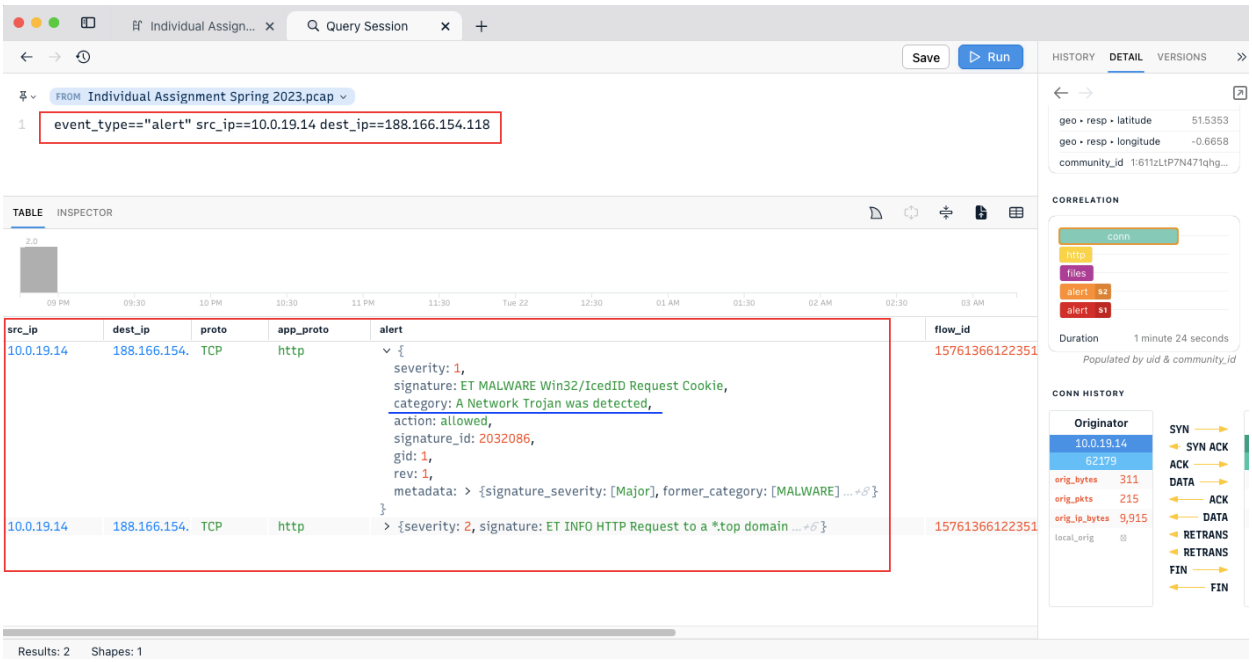
Cookie	Value
_gid	Based on physical address of NIC
_io	Domain identifier from SID
_u	Username and Computername
_gat	Windows version info
_ga	Processor info via CPUID including hypervisor brand if available
_gads	First DWORD from decoded config data, flag from inspecting server certificate, a random DWORD or number passed as parameter with -id=, number of processes

He explains that the “_u” cookie value contains the victim's hexa-decimalized username and computer-name. Therefore, I utilized cyberchef to validate this, and indeed I got this outcome from the cookie value:



The cookie is utilized for storing encoded information regarding the victim's host, which includes details such as the hostname, username, and Windows version. As a result, I had substantial proof that the attacker was able to gather certain information regarding the victim's host.

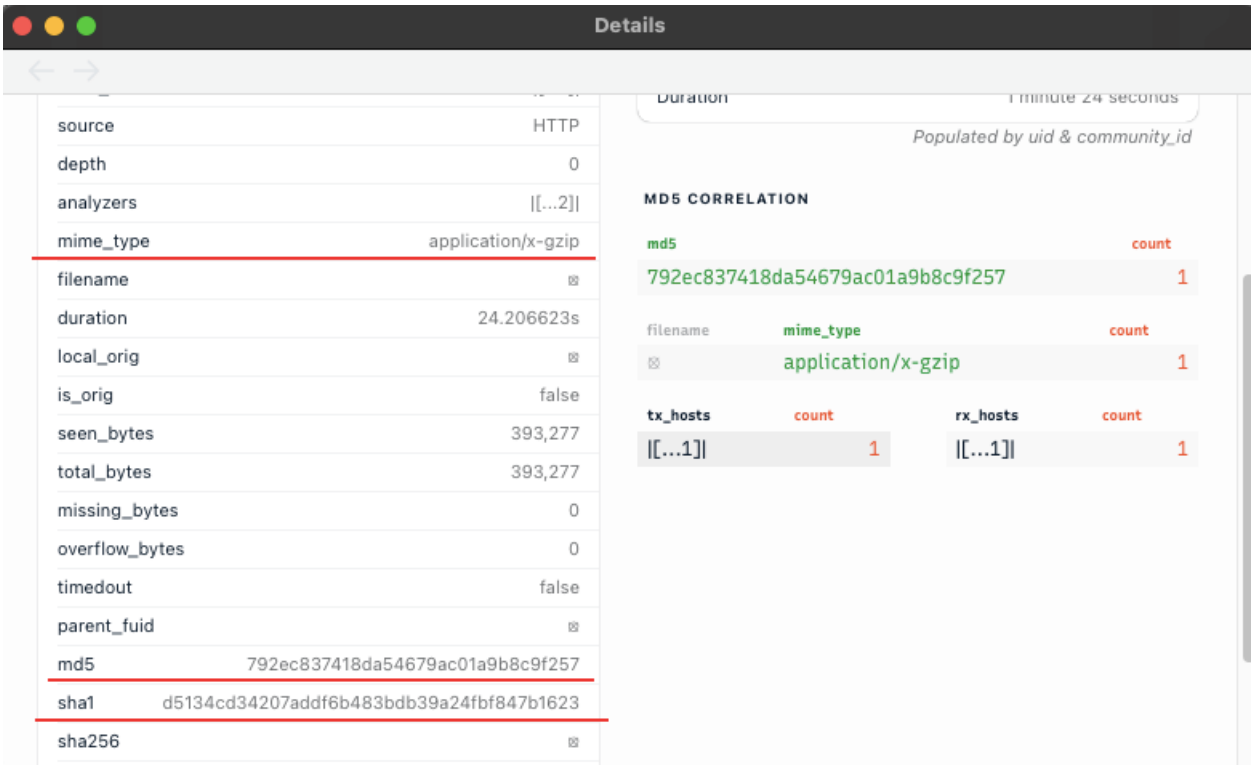
Using Zui software, I found and confirmed that ‘188.166.154.118’ IP as malicious and a ‘Network Trojan’ was detected. Take a look at the below screenshot.



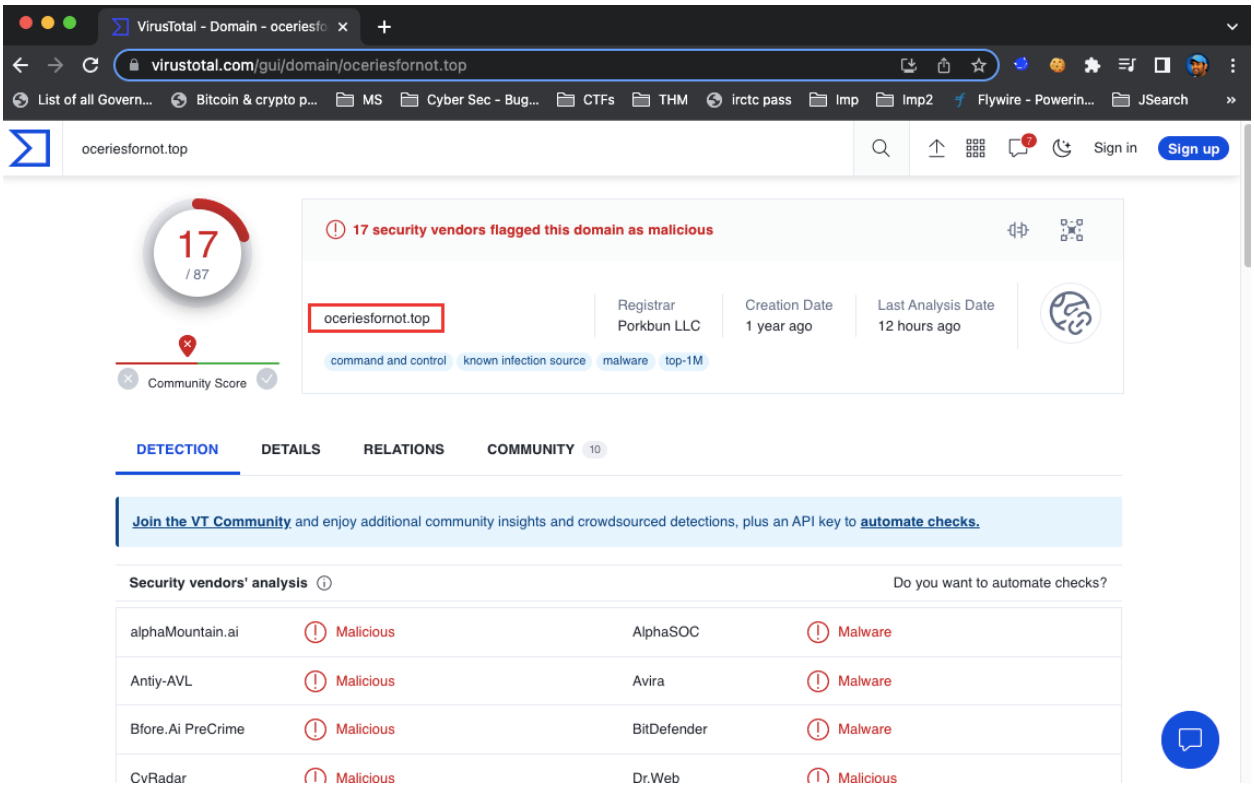
Downloading a zip file from 188.166.154.118 to the victims machine (10.0.19.14)

MD5: 792ec837418da54679ac01a9b8c9f257

Sha1: d5134cd34207addf6b483bdb39a24fbf847b1623

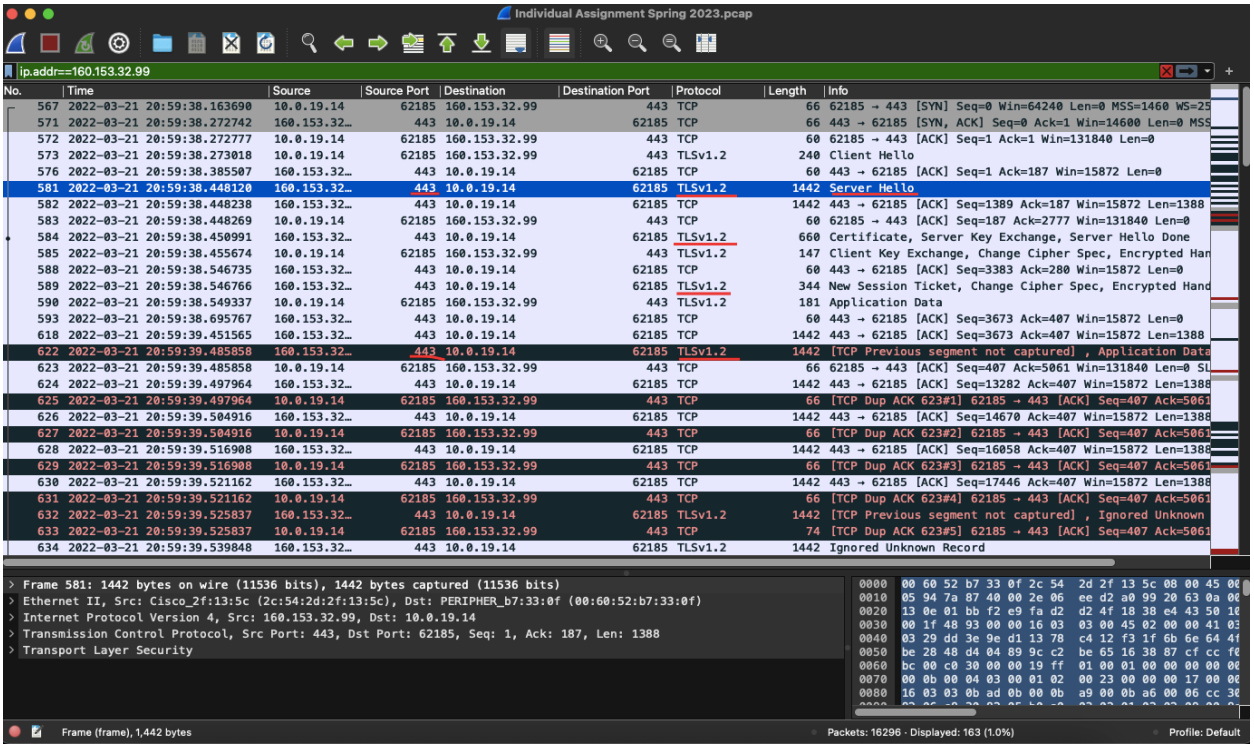


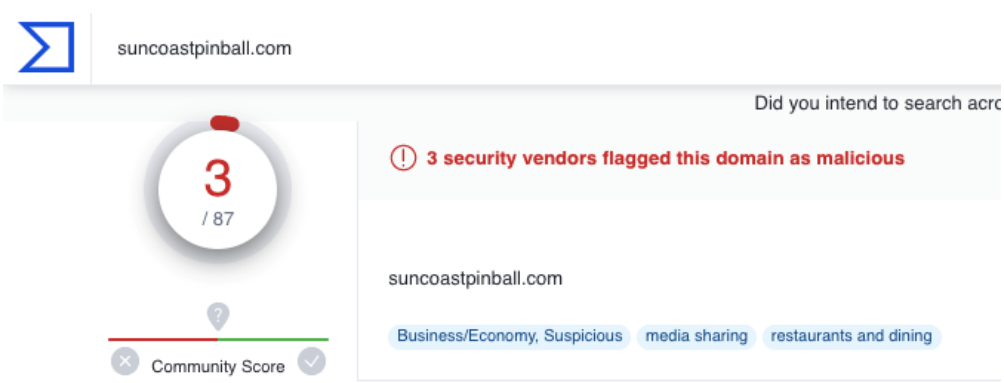
Another confirmation on VirusTotal:



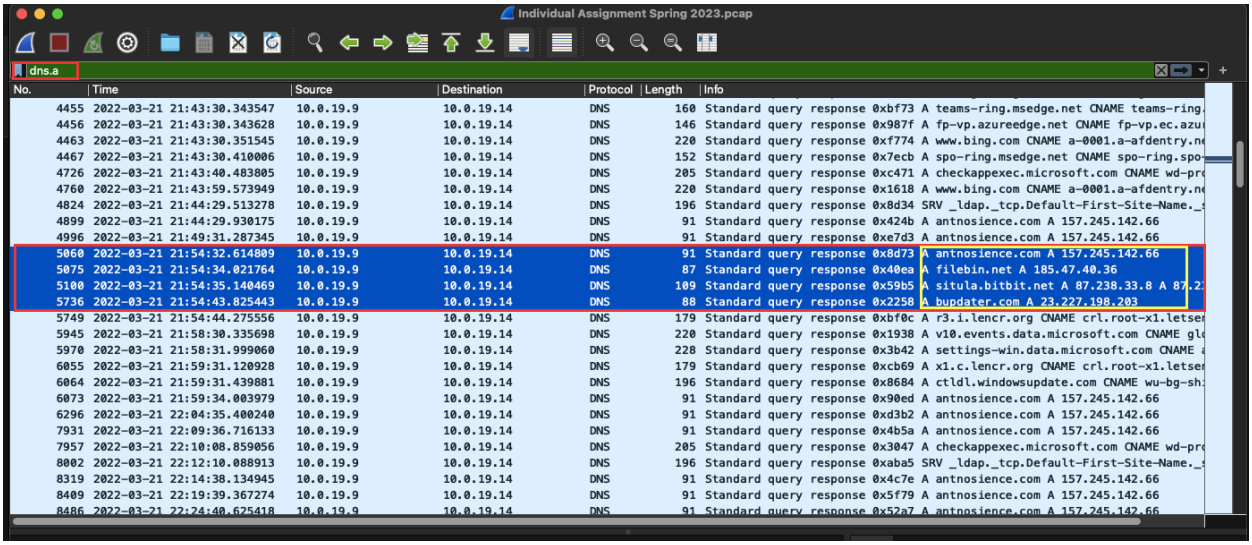
I came across the initial IOC and determined that the domain and IP address of "oceriesfornot.top" were identified as malicious through VirusTotal as well.

I noticed that the victim IP address established multiple unusual TLS connections with the suncoastpinball.com domain located at 160.153.32.99:443 (port 443), which provided me with another indicator of compromise (IOC). Despite not being self-signed, the domain's SSL certificate was issued by GoDaddy (SSL info found on Follow->TCP Stream). And people reported it as a virus site.





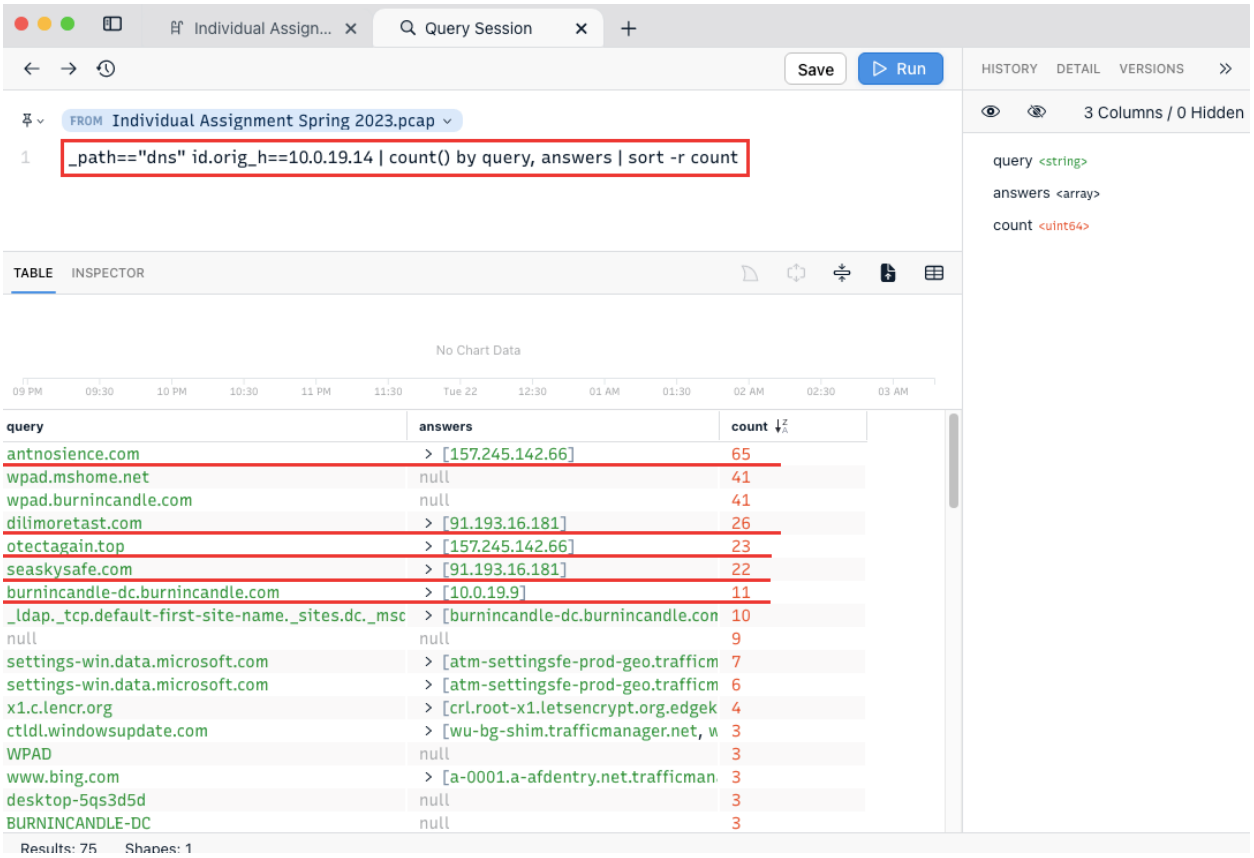
As I proceeded to examine Wireshark further, I decided to narrow my focus by filtering for DNS traffic. This particular type of traffic can disclose the domains and IP addresses employed by attackers to execute their malicious operations. After applying this filter, I observed that the victim's IP address made few DNS requests for domains, all within a brief interval of time (5 seconds difference like that).



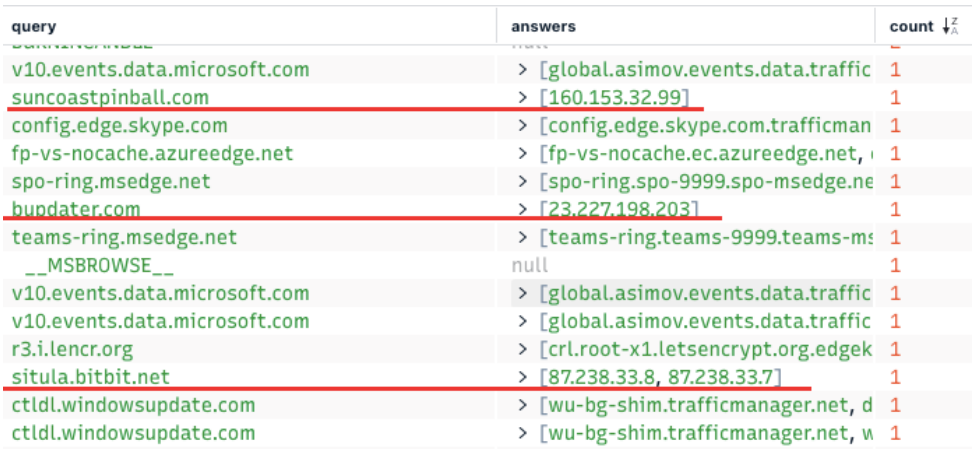
No.	Time	Source	Destination	Protocol	Length	Info
4455	2022-03-21 21:43:30.343547	10.0.19.9	10.0.19.14	DNS	160	Standard query response 0xbf73 A teams-ring.msedge.net CNAME teams-ring.
4456	2022-03-21 21:43:30.343628	10.0.19.9	10.0.19.14	DNS	146	Standard query response 0x987f A fp-vp.azureedge.net CNAME fp-vp.ec.azu
4463	2022-03-21 21:43:30.351545	10.0.19.9	10.0.19.14	DNS	220	Standard query response 0xf774 A www.bing.com CNAME a-0001.a-afdentry.n
4467	2022-03-21 21:43:30.410006	10.0.19.9	10.0.19.14	DNS	152	Standard query response 0x7ecb A spo-ring.msedge.net CNAME spo-ring.spo
4726	2022-03-21 21:43:40.483805	10.0.19.9	10.0.19.14	DNS	205	Standard query response 0xc471 A checkappexec.microsoft.com CNAME wd-pr
4760	2022-03-21 21:43:59.573949	10.0.19.9	10.0.19.14	DNS	220	Standard query response 0x1618 A www.bing.com CNAME a-0001.a-afdentry.n
4824	2022-03-21 21:44:29.513278	10.0.19.9	10.0.19.14	DNS	196	Standard query response 0x8d34 SRV _ldap._tcp.Default-First-Site-Name._
4899	2022-03-21 21:44:29.930175	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x424b A antnosience.com A 157.245.142.66
4996	2022-03-21 21:49:31.287345	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0xe7d3 A antnosience.com A 157.245.142.66
5060	2022-03-21 21:54:32.614809	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x8d73 A antnosience.com A 157.245.142.66
5075	2022-03-21 21:54:34.021764	10.0.19.9	10.0.19.14	DNS	87	Standard query response 0x40ea A filebin.net A 185.47.40.36
5100	2022-03-21 21:54:35.140469	10.0.19.9	10.0.19.14	DNS	109	Standard query response 0x59b5 A situla.bitbit.net A 87.238.33.8 A 87.2
5736	2022-03-21 21:54:43.825443	10.0.19.9	10.0.19.14	DNS	88	Standard query response 0x2258 A bupdater.com A 23.227.198.203
5749	2022-03-21 21:54:44.275556	10.0.19.9	10.0.19.14	DNS	179	Standard query response 0xbf0c A r3.i.lencr.org CNAME crl.root-x1.letse
5945	2022-03-21 21:58:30.335698	10.0.19.9	10.0.19.14	DNS	220	Standard query response 0x1938 A v10.events.data.microsoft.com CNAME gl
5970	2022-03-21 21:58:31.999060	10.0.19.9	10.0.19.14	DNS	228	Standard query response 0x3b42 A settings-win.data.microsoft.com CNAME
6055	2022-03-21 21:59:31.120928	10.0.19.9	10.0.19.14	DNS	179	Standard query response 0xcb69 A x1.c.lencr.org CNAME crl.root-x1.letse
6064	2022-03-21 21:59:31.439881	10.0.19.9	10.0.19.14	DNS	196	Standard query response 0x8684 A ctldl.windowsupdate.com CNAME wu-bg-sh
6073	2022-03-21 21:59:34.003979	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x90ed A antnosience.com A 157.245.142.66
6296	2022-03-21 22:04:35.400240	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0xd3b2 A antnosience.com A 157.245.142.66
7931	2022-03-21 22:09:36.716133	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x4b5a A antnosience.com A 157.245.142.66
7957	2022-03-21 22:10:08.859056	10.0.19.9	10.0.19.14	DNS	205	Standard query response 0x3047 A checkappexec.microsoft.com CNAME wd-pr
8002	2022-03-21 22:12:10.088913	10.0.19.9	10.0.19.14	DNS	196	Standard query response 0xaba5 SRV _ldap._tcp.Default-First-Site-Name._
8319	2022-03-21 22:14:38.134945	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x4c7e A antnosience.com A 157.245.142.66
8409	2022-03-21 22:19:39.367274	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x5f79 A antnosience.com A 157.245.142.66
8486	2022-03-21 22:24:40.625418	10.0.19.9	10.0.19.14	DNS	91	Standard query response 0x52a7 A antnosience.com A 157.245.142.66

The domains “filebin.net” and “situla.bitbit.net” are file sharing platforms (malicious). Connections to both domains were established, with each connection lasting for less than 10 seconds. At this point, it remains unclear whether this indicates that data was being exfiltrated, or if the malware was attempting to retrieve additional resources to be deployed on the victim's device.

All the these domains are malicious according to the Virus Total (people reported these websites as virus). I have all the screenshots in the next page.



query	answers	count
antnosience.com	[157.245.142.66]	65
wpad.mshome.net	null	41
wpad.burnincandle.com	null	41
dilimoretast.com	[91.193.16.181]	26
otectagain.top	[157.245.142.66]	23
seaskysafe.com	[91.193.16.181]	22
burnincandle-dc.burnincandle.com	[10.0.19.9]	11
_ldap._tcp.default-first-site-name._sites.dc._msc	[burnincandle-dc.burnincandle.con	10
null	null	9
settings-win.data.microsoft.com	[atm-settingsfe-prod-geo.trafficm	7
settings-win.data.microsoft.com	[atm-settingsfe-prod-geo.trafficm	6
x1.c.lencr.org	[crl.root-x1.letsencrypt.org.edgek	4
ctldl.windowsupdate.com	[wu-bg-shim.trafficmanager.net, w	3
WPAD	null	3
www.bing.com	[a-0001.a-afdentry.net.trafficman	3
desktop-5qs3d5d	null	3
BURNINCANDLE-DC	null	3



query	answers	count
v10.events.data.microsoft.com	[global.asimov.events.data.traffic	1
suncoastpinball.com	[160.153.32.99]	1
config.edge.skype.com	[config.edge.skype.com.trafficman	1
fp-vs-nocache.azureedge.net	[fp-vs-nocache.ec.azureedge.net,	1
spo-ring.msedge.net	[spo-ring.spo-9999.spo-msedge.ne	1
bupdater.com	[23.227.198.203]	1
teams-ring.msedge.net	[teams-ring.teams-9999.teams-ms	1
__MSBROWSE__	null	1
v10.events.data.microsoft.com	[global.asimov.events.data.traffic	1
v10.events.data.microsoft.com	[global.asimov.events.data.traffic	1
r3.i.lencr.org	[crl.root-x1.letsencrypt.org.edgek	1
situla.bitbit.net	[87.238.33.8, 87.238.33.7]	1
ctldl.windowsupdate.com	[wu-bg-shim.trafficmanager.net, d	1
ctldl.windowsupdate.com	[wu-bg-shim.trafficmanager.net, w	1

filebin.net	> [185.47.40.36]	1

situla.bitbit.net

1 / 87

1 security vendor flagged this domain as malicious

situla.bitbit.net

bitbit.net

filebin.net

Did you intend to searc

5 / 87

5 security vendors flagged this domain as malicious

filebin.net

known infection source | media sharing | personal network storage and ba

Community Score

seaskysafe.com

Did you intend to searc

12 / 87

12 security vendors flagged this domain as malicious

seaskysafe.com

Malicious | bot networks | spyware and malware

Community Score

dilimoretast.com

Did you intend to se

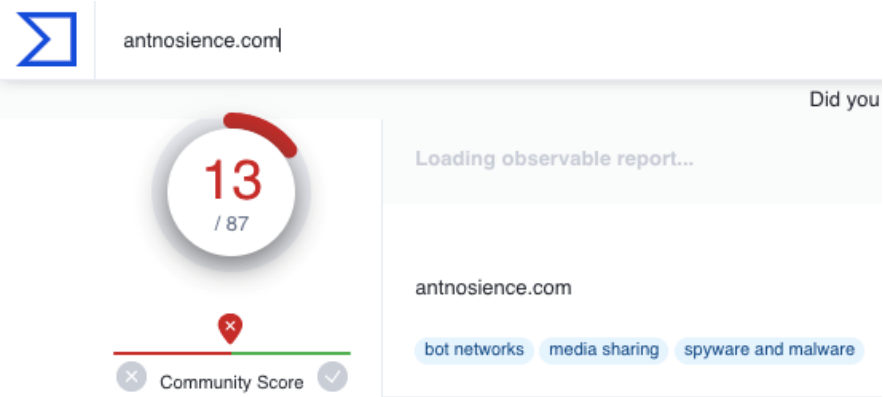
15 / 87

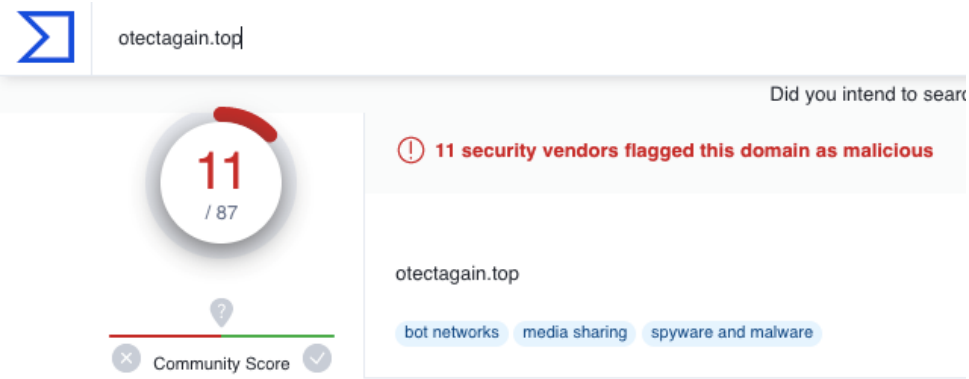
15 security vendors flagged this domain as malicious

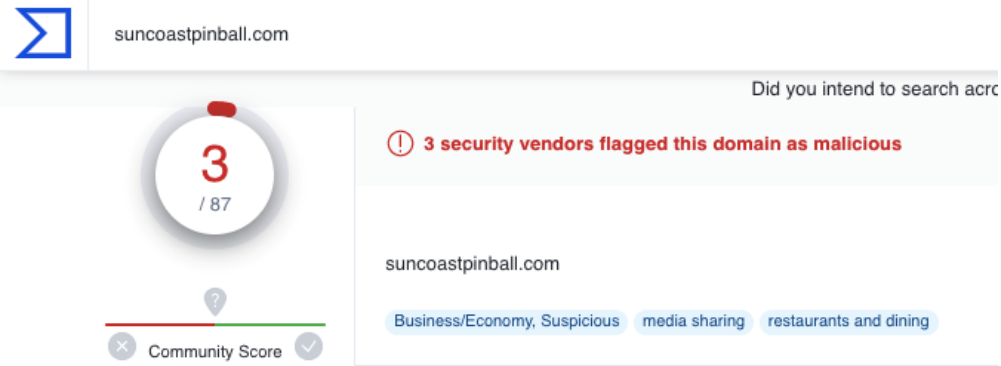
dilimoretast.com

bot networks | spyware and malware | unknown

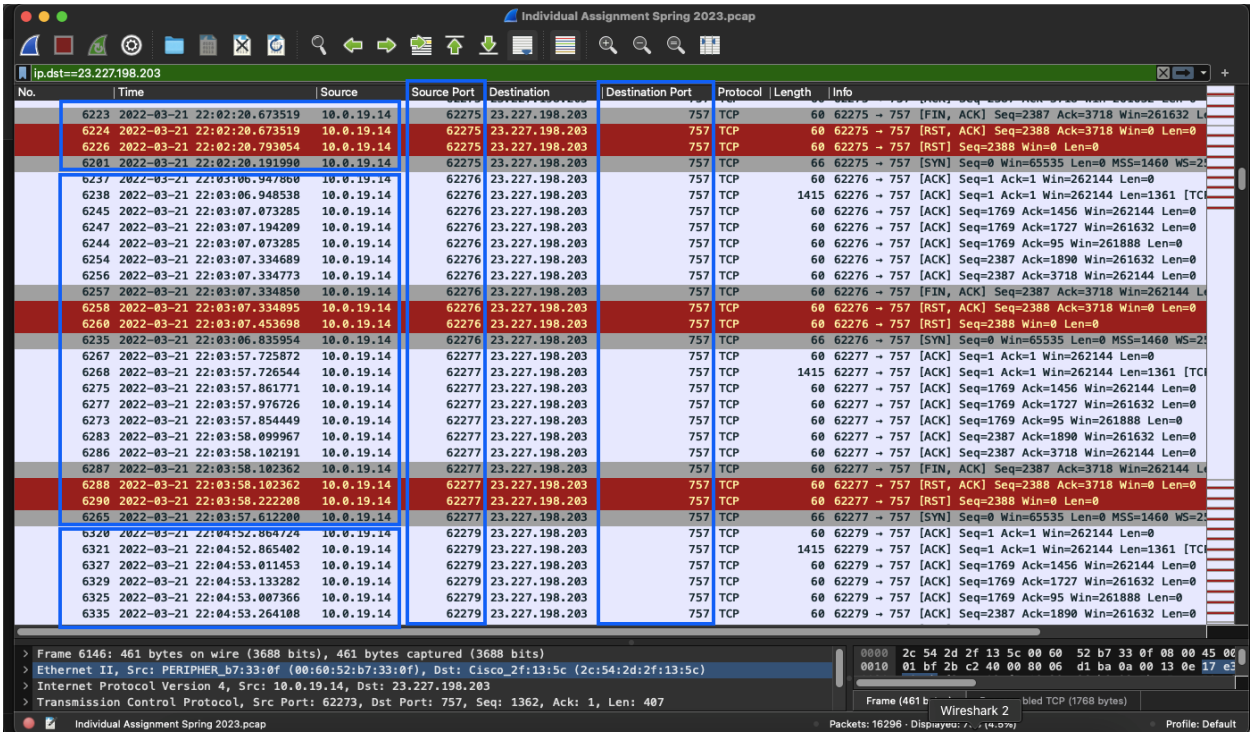
Community Score


antnosience.com
Did you
13
/ 87
Loading observable report...
antnosience.com
bot networks
media sharing
spyware and malware
Community Score

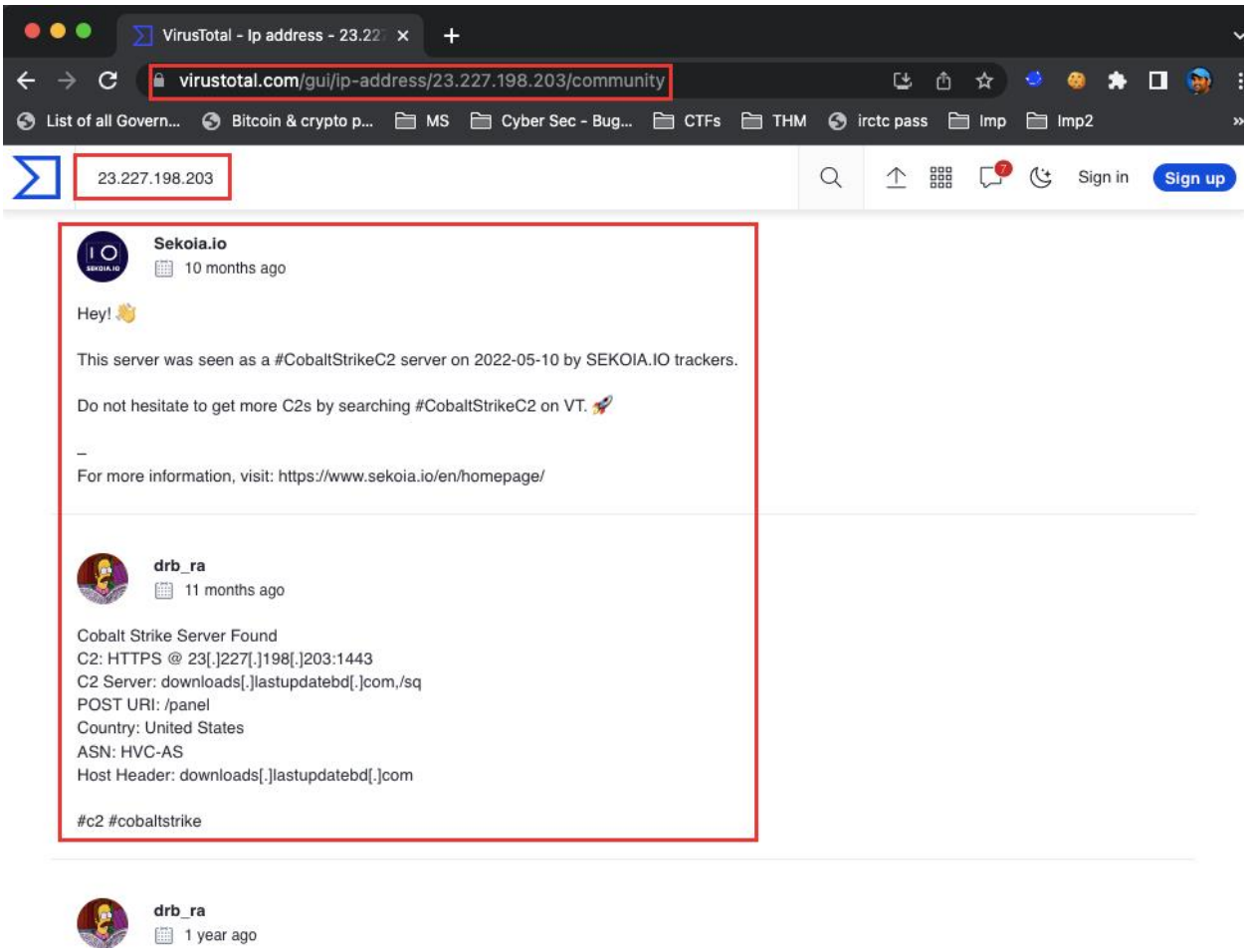

otectagain.top
Did you intend to searc
11
/ 87
11 security vendors flagged this domain as malicious
otectagain.top
bot networks
media sharing
spyware and malware
Community Score


suncoastpinball.com
Did you intend to search acro
3
/ 87
3 security vendors flagged this domain as malicious
suncoastpinball.com
Business/Economy, Suspicious
media sharing
restaurants and dining
Community Score

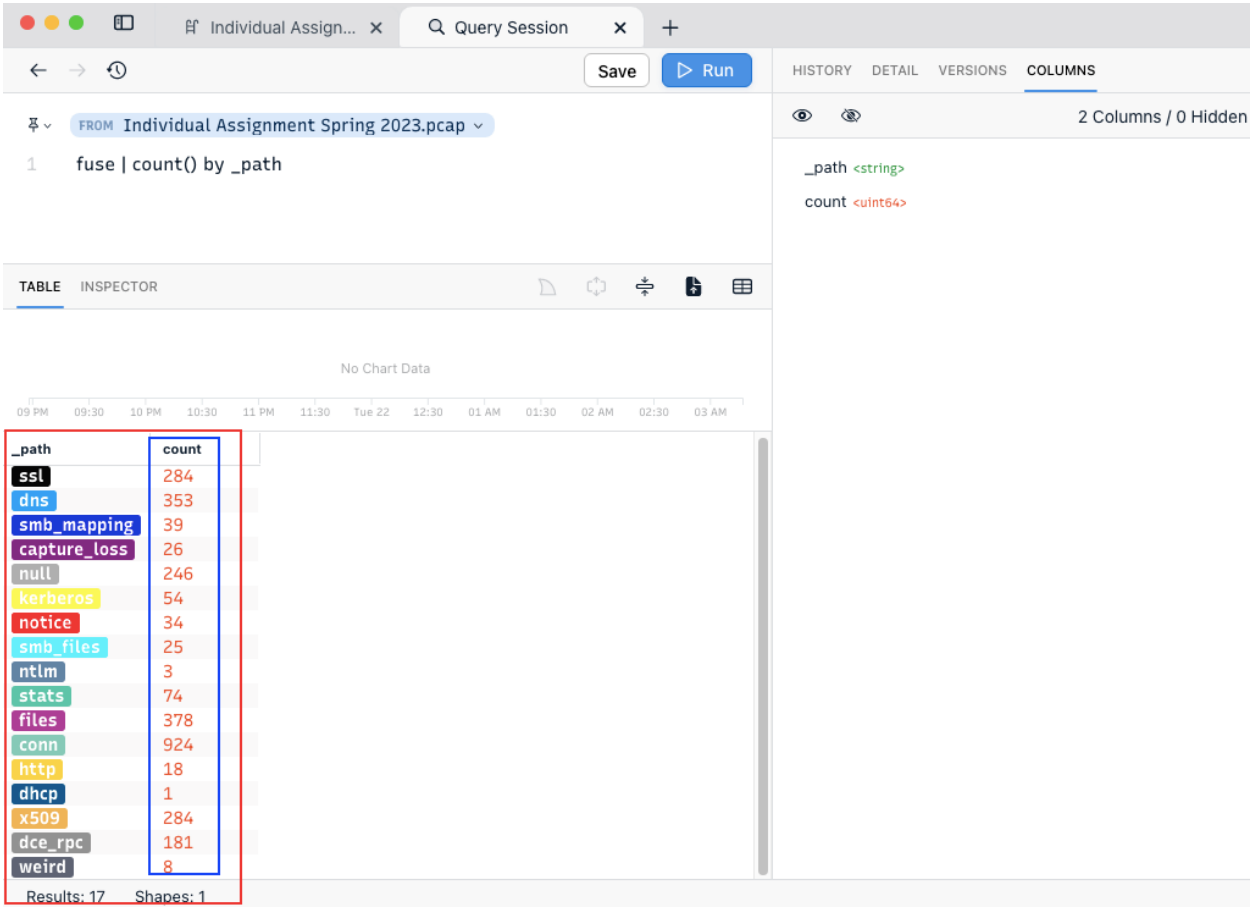
I noticed a pattern after configuring 23.227.198.203 (bupdater.com) as my destination address. Specifically, the host appeared to communicate with ‘bupdater.com’ every minute on port 757.



After performing a search on VirusTotal (23.227.198.203), I discovered that multiple individuals had previously reported it as a Cobalt Strike Command-and-Control (C2) server.



So I confirmed this as Cobalt Strike Command-and-Control (C2) server.



Above screenshot is for overall activity from Brim (Zui)

Finally, The user was affected by the IcedID malware from the ‘oceriesfornot.top’ domain and attacker gained access to domain controller, so attacker visited malicious sites or links and utilized the access to do Cobalt strike on the victim (bupdater.com).