

# **Final Engagement**

## **Attack, Defense & Analysis of a Vulnerable Network**

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Mehrdad Bashiri, and Steven Bauer

# Table of Contents

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This document contains the following resources:



**Red & Blue Team**



**Network Topology & Critical Vulnerabilities**



**Traffic Profile**



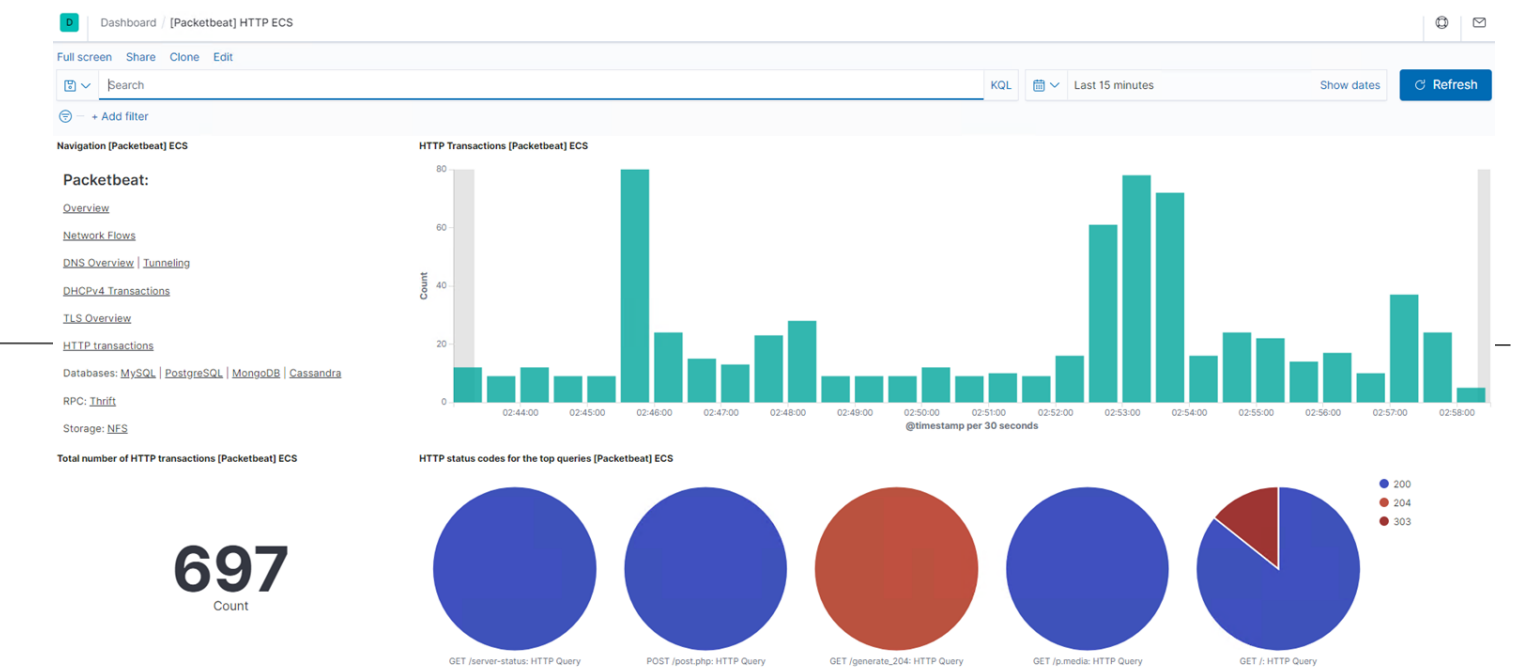
**Normal Activity**



**Malicious Activity**



# Blue Team



## Summary of Defensive Operations

- Prior to beginning our engagement, we Licensed our Elastic Stack - ELK Linux server with Beats (If you have an active license, do not revert to basic)
- We Configured three main threshold alerts using the Elasticsearch Watcher functionality.
  - CPU Usage Monitor
  - HTTP Request Size Monitor
  - Excessive HTTP Error Monitor
- Three main mitigation focuses: Configuration changes, OS and Application Updates, Monitoring changes
  - Patching of outdated Linux Versions and Wordpress installation
  - Configuration changes including Account lockout policies for each application as well as complex password requirements. (ex. “# steven ALL=(ALL)NOPASSWD: /usr/bin/python” in Target1 sudoers file.)
  - Instituting a continual improvement plan to evaluate and change alert thresholds

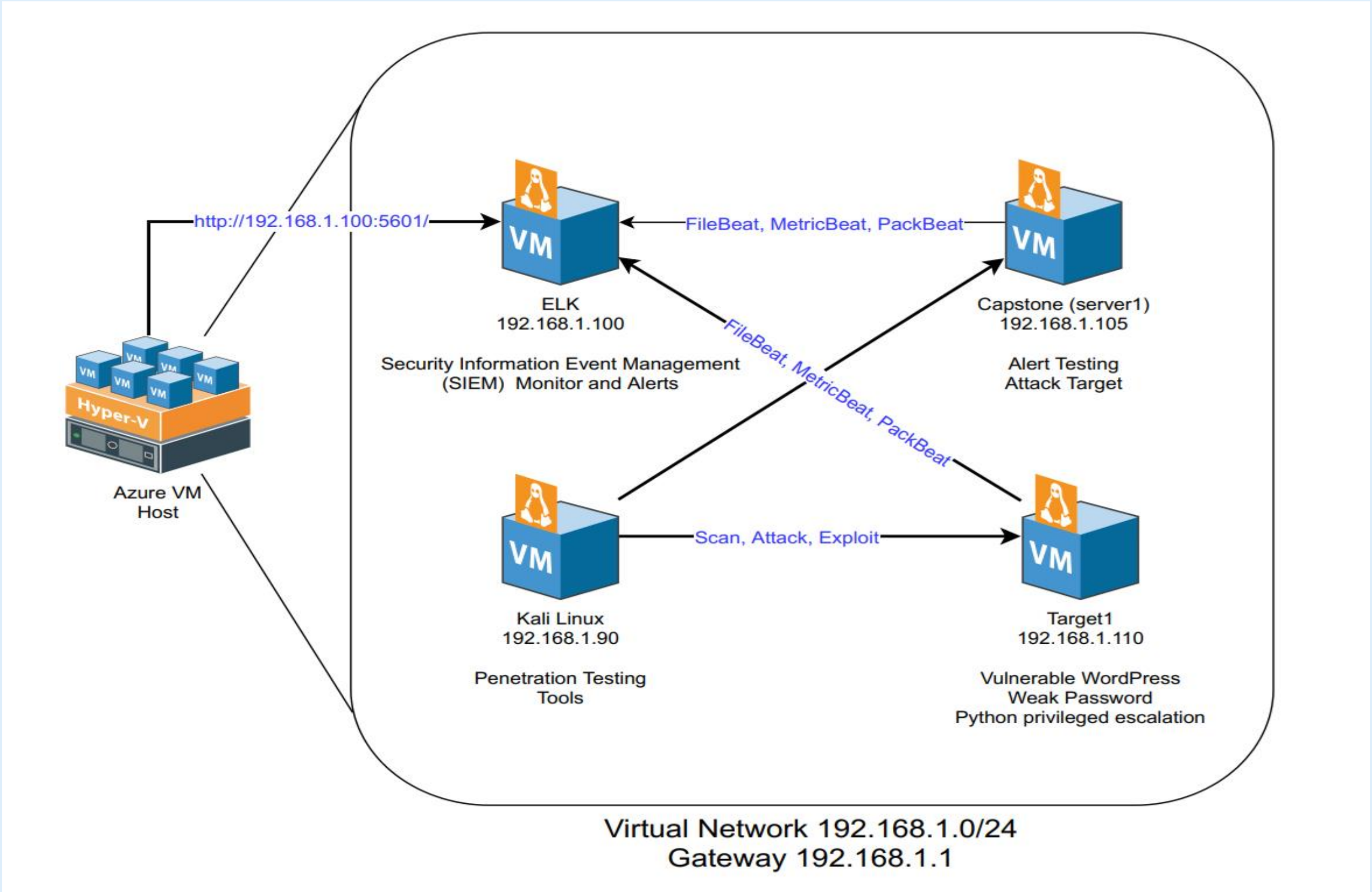
***These strategies will help keep X-CORP off the cover of USA Today in the future***



# Network Topology & Critical Vulnerabilities



# Network Topology



## Network

Address Range:  
192.168.1.0/24  
Netmask: 255.255.255.0  
Gateway: 192.168.1.1

## Machines

IPv4: 192.168.1.90  
OS: Kali Linux  
Hostname: Kali

IPv4: 192.168.1.100  
OS: Ubuntu Linux  
Hostname: ELK

IPv4: 192.168.1.105  
OS: Ubuntu Linux  
Hostname: Server1  
(Capstone)

IPv4: 192.168.1.110  
OS: Debian Linux  
Hostname: Target1

# Critical Vulnerabilities: Target 1

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Our assessment uncovered the following critical vulnerabilities in **Target 1**.

Vulnerability	Description	Impact
Wordpress user enumeration	WP scan returned sensitive information	Easily located usernames
Weak password requirements	Users with same user/password	Easily guessed/cracked passwords
Unsalted password hashes	Minimal encryption makes for easily cracked passwords	Access to user privileges
Python privilege escalation	Steven had the ability to invoke Python commands with sudo privileges	Allowed root level access through Python script

# Traffic Profile



# Traffic Profile

Our analysis identified the following characteristics of the traffic on the network:

Feature	Value	Description
Top Talkers (IP Addresses)	172.16.4.205 (51,364 packets) 185.243.115.84 (30,344 packets) 10.0.0.201 (19,503 packets)	Top three devices which generated the most network traffic (packets).
Most Common Protocols	Internet Protocol Version 4 (IPv4) TCP (88.5%) UDP (11.2%)	Protocols are a set of rules regarding how the network operates. TCP is a connection-oriented protocol, whereas UDP is a connectionless protocol.
# of Unique IP Addresses	808	Unique IPv4 IP addresses and 30 MAC address captured.
Subnets	10.0.0.0/24, 10.6.12.0/24, 10.11.11.0/24,172.16.4.0/24, 192.168.1.0/24	Observed subnet ranges.
Malware Species	● Trojan - june11.dll ● Fake Browser Update Pop-Up Remote Access Trojan (RAT)	Malware binaries identified in traffic.

# Behavioral Analysis

## Purpose of Traffic on the Network

Users were observed engaging in the following kinds of activity.

### “Normal” Activity

- Online shopping After Hours
- Web Browsing Hospital Information
- WordPress Blog Browsing

### Suspicious Activity

- Web browsing for iPhone hacks and Jailbreaking.
- Torrent traffic used to download a movie typically against company policies.
- Trojan Malware Downloaded
- Fake Browser Update Pop-Up (RAT)



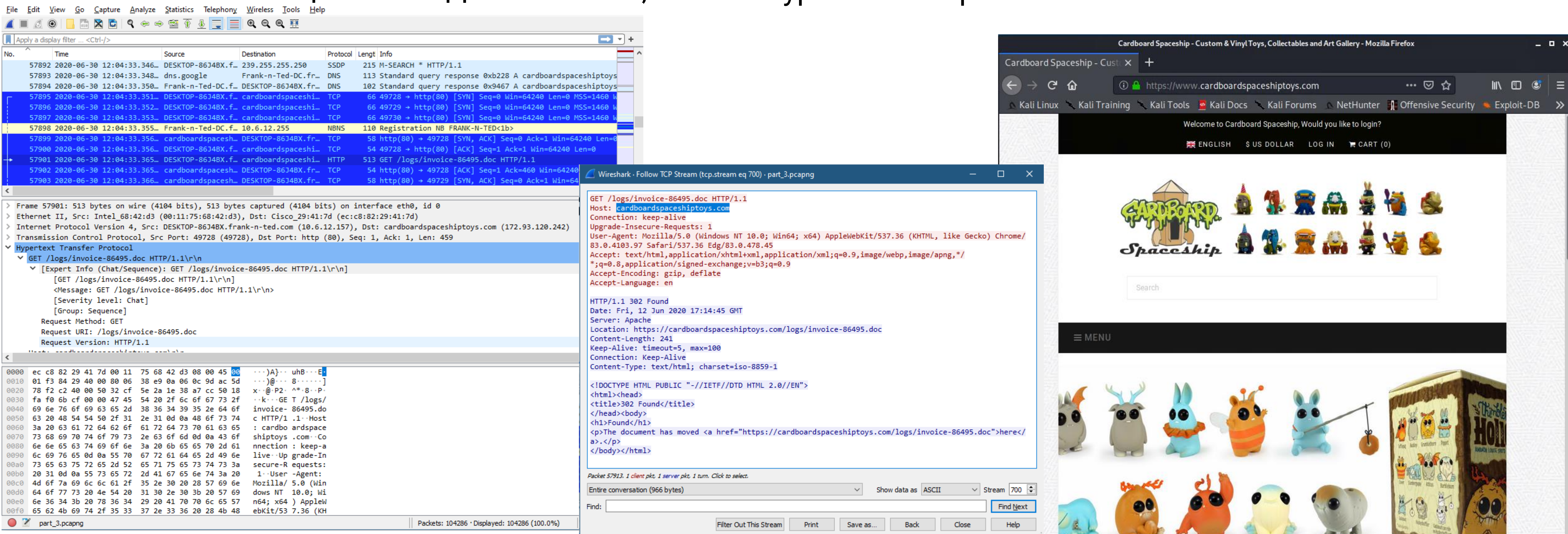


Normal Activity



# Online Shopping After Hours

- HTTP web browsing traffic from 10.6.12.157 to 172.91.120.242  
<http://www.cardboardspacehiptoys.com>
- The user (ted.brokowski) browsing from DESKTOP-86J4BX.frank-n-ted.com was toy shopping and made a purchase at the website as an invoice file was captured.
- There is TLS1.3 protocol application data, which encrypts the TCP protocol session of HTTPS traffic from





# Web Browsing Hospital Information

- User of DESKTOP-B49J3FD.local (10.11.11.195) was browsing the www.sabethahospital.com (12.133.50.21) webpage, specifically researching the function of the appendix organ.
- There are several different pages that were loaded, several java
- and php content files, the appendix info was most interesting.
- All of the traffic was TCP protocol, HTTP traffic from Port 80
- 10.11.11.195:50137-50150 <> 12.133.50.21:80

HTTP

DESKTOP-B49J3FD.local

www.sabethahospital.com

50138 (50138) http (80)

GET /getpage.php?name=whatappendixdo

DNS

10.11.11.217

okay-boomer-dc.okay-boomer.info

Standard query 0x0c84 A

TCP

www.sabethahospital.com

DESKTOP-B49J3FD.local

http (80)

50138 (50138) http (80) > 50138 [ACK]

User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/70.0.3538.102 Safari/537.36

Accept-Encoding: gzip, deflate\r\n

Host: www.sabethahospital.com\r\n

Connection: Keep-Alive\r\n

\r\n

[Full request URI: http://www.sabethahospital.com/getpage.php?name=whatappendixdo]

[HTTP request 1/1]

0030 04 00 38 e2 00 00 47 45 54 20 2f 67 65 74 70 61 ..8...GE T /getpa

0040 67 65 2e 70 68 70 3f 6e 61 6d 65 3d 77 68 61 74 ge.php?name=what

0050 61 70 70 65 6e 64 69 78 64 6f 20 48 54 54 50 2f appendix do HTTP/

0060 31 2e 31 0d 0a 41 63 63 65 70 74 3a 20 74 65 78 1.1..Acc ept: tex

0070 74 2f 68 74 6d 6c 2c 61 70 70 6c 69 63 61 74 69 t/html,a pplicati

0080 6f 6e 2f 78 68 74 6d 6c 2b 78 6d 6c 2c 61 70 70 on/xhtml+xml,app

0090 6c 69 63 61 74 69 6f 6e 2f 78 6d 6c 3b 71 3d 30 lication /xml;q=0

00a0 2e 39 2c 2a 2f 2a 3b 71 3d 30 2e 38 0d 0a 41 63 .9,\*/;q =0.8..Ac

00b0 63 65 70 74 2d 4c 61 6e 67 75 61 67 65 3a 20 65 cept-Lan guage: e

00c0 6e 2d 55 53 0d 0a 55 70 67 72 61 64 65 2d 49 6e n-US..Up grade-In

00d0 73 65 63 75 72 65 2d 52 65 71 75 65 73 74 73 3a secure-R equests:

P

R

M

C

Permian Regional

Medical Center

GET /common\_js/polyfills.js HTTP/1.1

Referer: http://www.sabethahospital.com/getpage.php?name=whatappendixdo

Accept: \*/\*

Accept-Language: en-US

Accept-Encoding: gzip, deflate

User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/70.0.3538.102 Safari/537.36 Edge/18.18362

Host: www.sabethahospital.com

Connection: Keep-Alive

HTTP/1.1 200 OK

Date: Mon, 11 Nov 2019 22:22:20 GMT

Server: Apache

Last-Modified: Fri, 15 Mar 2019 16:36:36 GMT

ETag: "d9c05b-1a66b-58424a46f4d00"

Accept-Ranges: bytes

Vary: Accept-Encoding

Content-Encoding: gzip

Content-Length: 32943

Connection: close

Content-Type: application/x-javascript

Content-Language: UTF-8

.....b.H.(.<.

I" \ \ H E R TK h h 5 / 0 A h W I 0 1 M \ "##### m2vn E R \ 0 iv

Your Appendix - What Does it Really Do? - Mozilla Firefox

wp-config\_final - Google x Final notes - Google Doc x Network Presentation - x Your Appendix - What D x

https://www.sabethahospital.com/getpage.php?name=whatappendixdo

Kali Linux Kali Training Kali Tools Kali Docs Kali Forums NetHunter Offensive Security Exploit-DB GHDB MSFU

Sabetha Community Hospital

14th & Oregon Street | Sabetha, KS 66534 | (785) 284-2121

Employee E-mail Login

Home About Us Hospital Family Practice Home Health & Hospice Monthly Health Topics Calendars

Providers Services Visitor Information SCH Volunteer

Quick Links

Community Health Needs

Employee Area

Employment

Financial Assistance


Golf Tournament Results

Pricing Transparency

Pay My Bill

Your Appendix - What Does it Really Do?

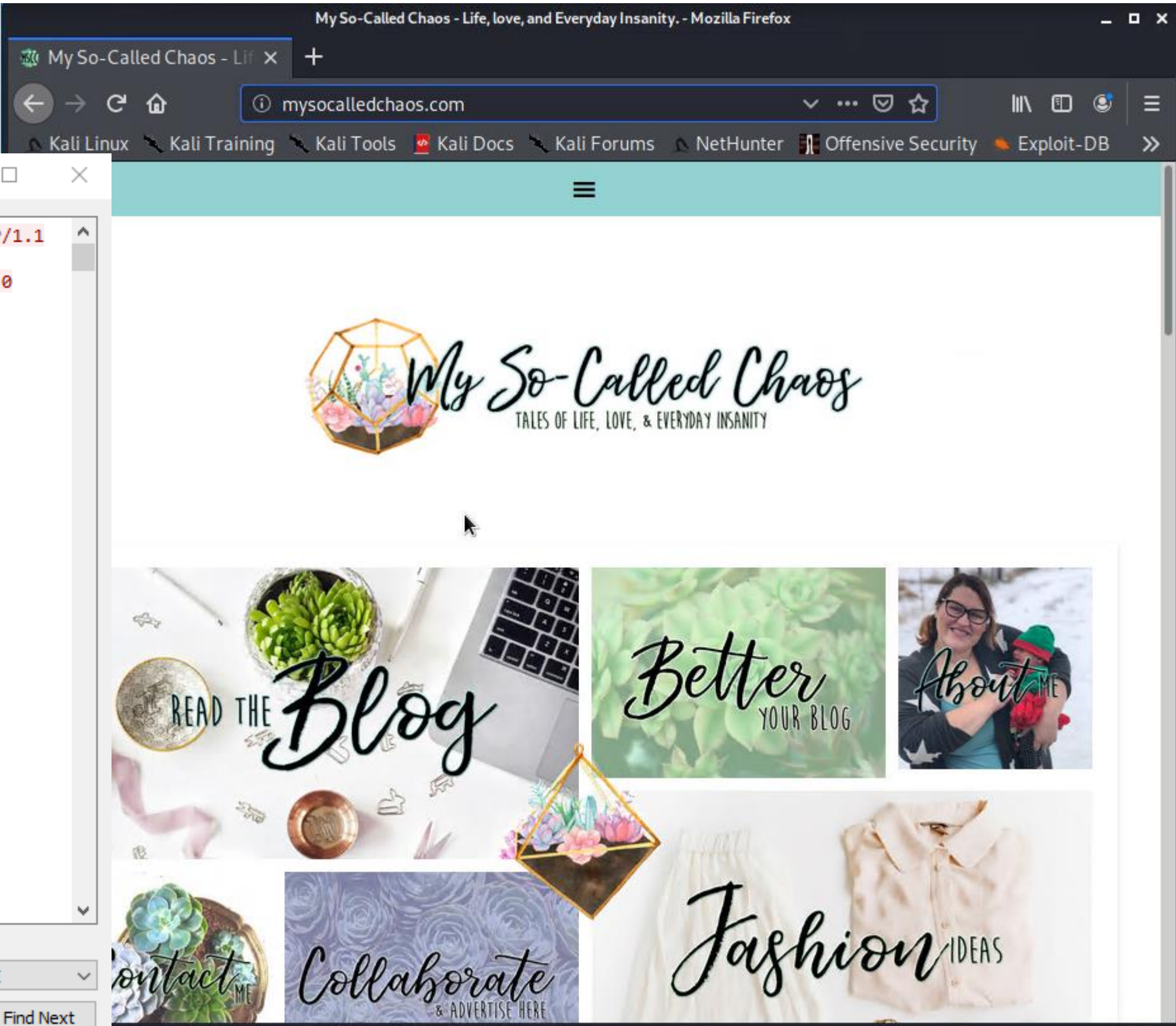
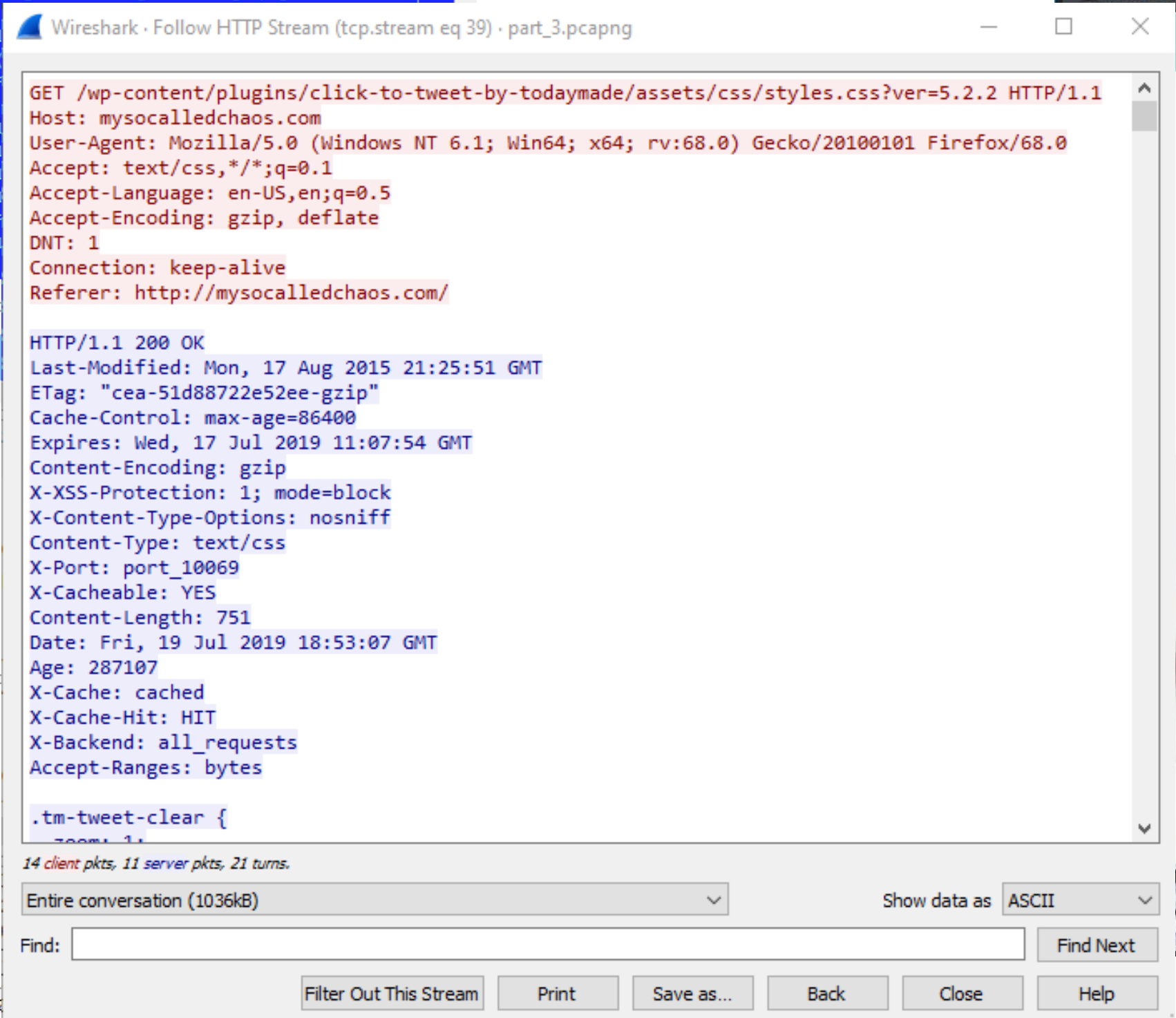
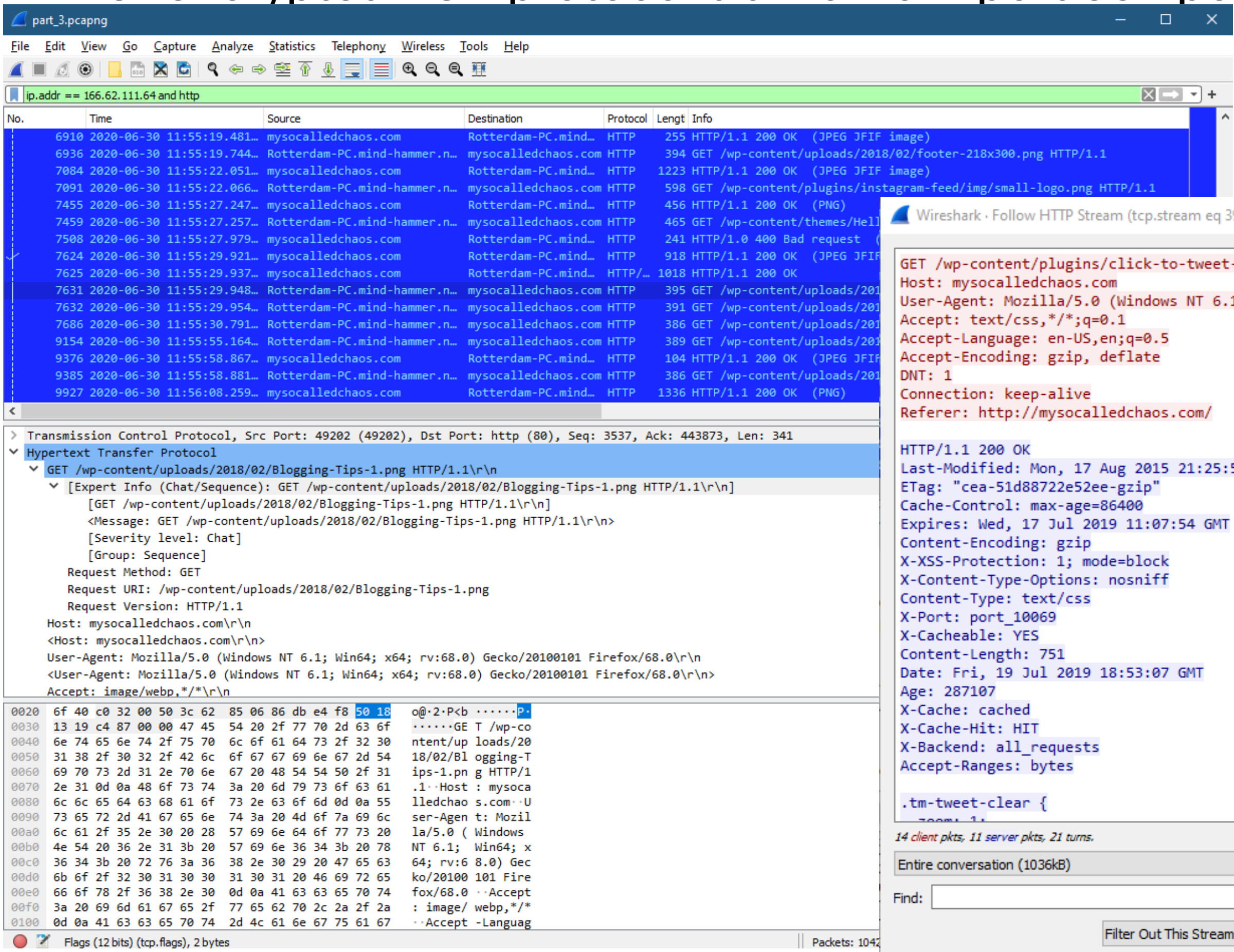
Your appendix is a thin 4 inch tube that is connected to your large intestine. Normally it sits in your lower right abdomen. The function of the appendix is basically unknown. One theory is that the appendix





# WordPress Blog Browsing

- The user (matthijs.devries) Rotterdam-PC.mind-hammer.net host was browsing Angie’s WordPress Blog.
- HTTP WordPress traffic from 172.16.4.205 to 166.62.111.64 <http://mysocalledchaos.com/>
- Unencrypted TCP protocol traffic from port 80 - port 49190





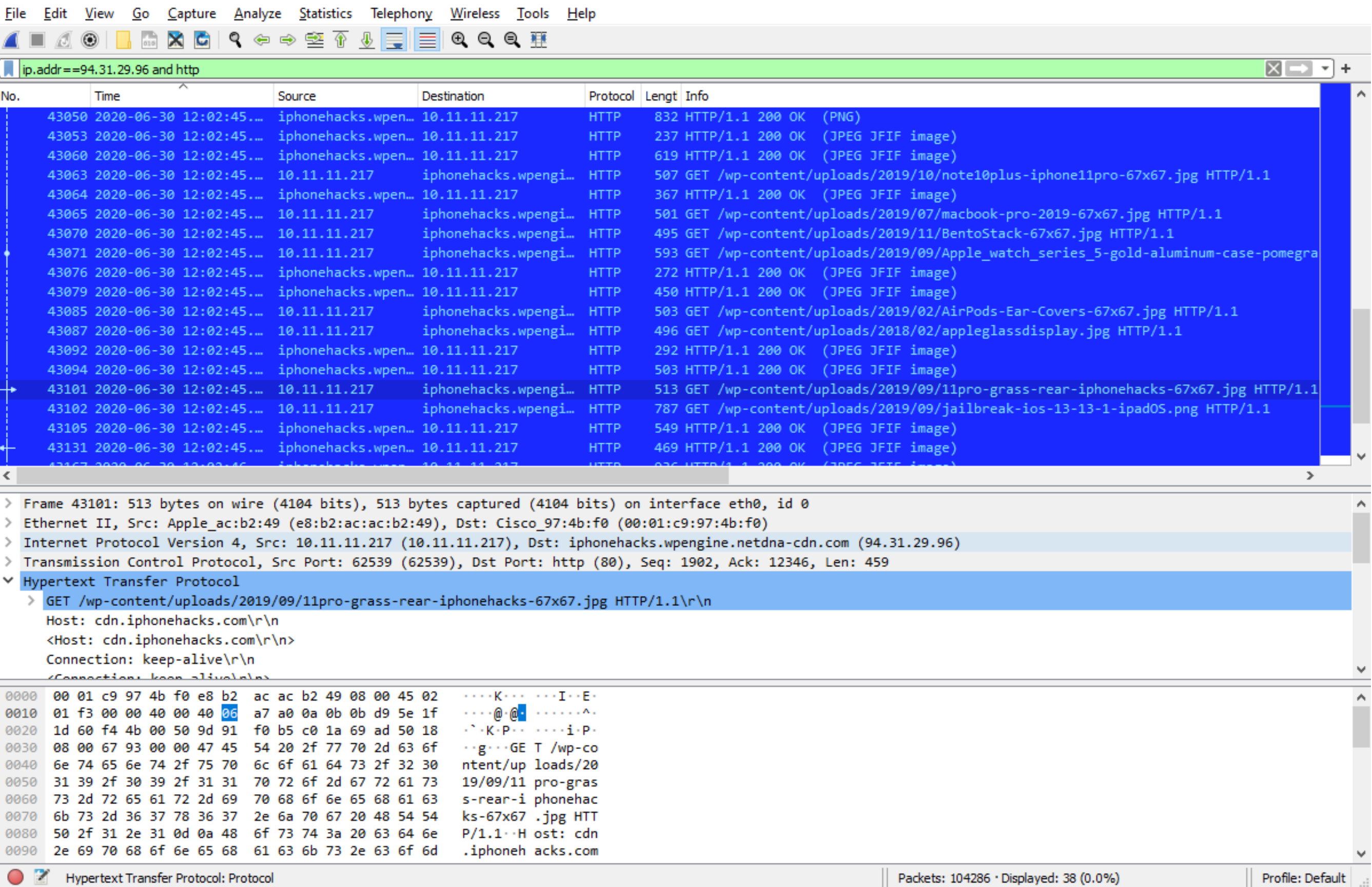
# Malicious Activity

# Instructions to Jailbreak iOS Devices



Summarize the following:

- HTTP traffic to iPhone Hacks website at 94.31.29.96
- The user was researching how to Jailbreak iPhone iOS 13.



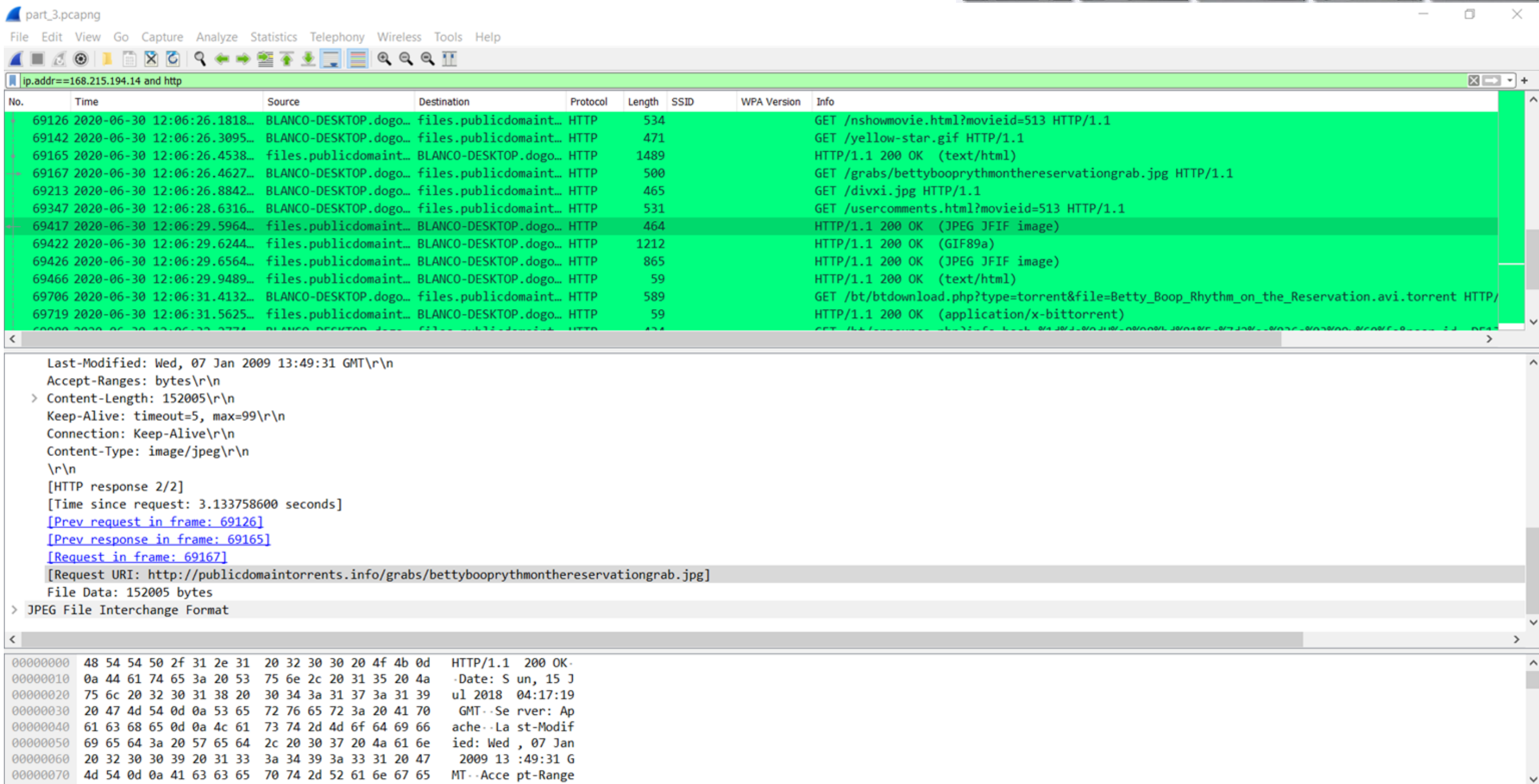
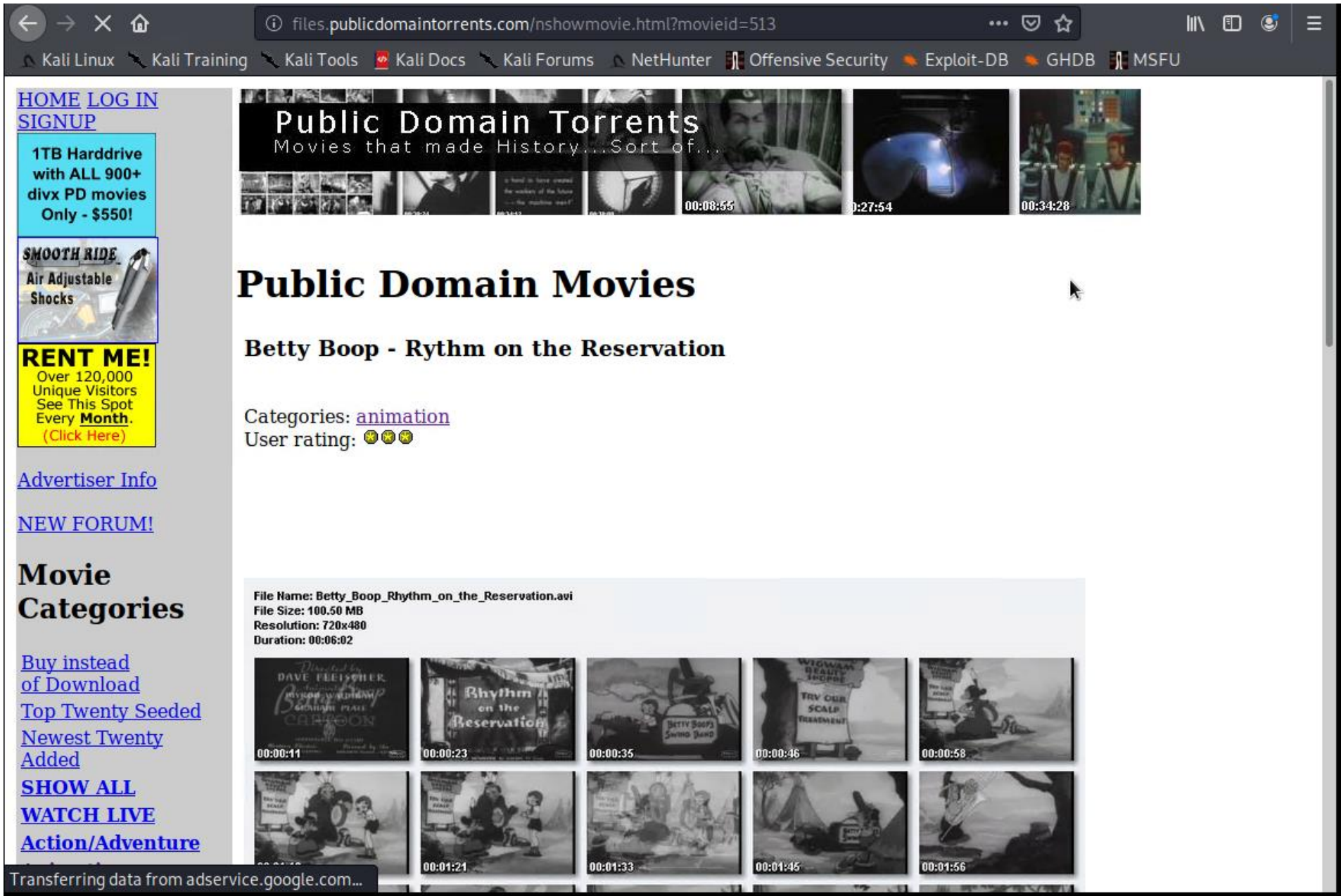


# Torrents of Material Against Policy



Summarize the following:

- HTTP traffic from 168.215.194.14 (files.publicdomaintorrents.com) to 10.0.0.24
- The user was downloading torrents going against policy, specifically a movie called “Betty\_Boop\_rythym\_on\_the\_reservation”





# Trojan Malware Downloaded

Summarize the following:

- Initial HTTP traffic from the user's computer 10.6.12.203 to IP Address 205.185.125.104.
- Trojan Malware “june11.dll” was downloaded and the computer became infected.

part\_3.pcapng

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

ip.addr==205.185.125.104 and http

No.	Time	Source	Destination	Protocol	Length	Info
58748	2020-06-30 12:04:39...	LAPTOP-SWKHX9YG...	205.185.125.104	HTTP	275	GET /pQ8twj HTTP/1.1
58750	2020-06-30 12:04:39...	205.185.125.104	LAPTOP-SWKHX9YG.fr...	HTTP	542	HTTP/1.1 302 Found
58752	2020-06-30 12:04:39...	LAPTOP-SWKHX9YG...	205.185.125.104	HTTP	312	GET /files/june11.dll HTTP/1.1
59388	2020-06-30 12:04:49...	205.185.125.104	LAPTOP-SWKHX9YG.fr...	HTTP	946	HTTP/1.1 200 OK

> Ethernet II, Src: IntelCor\_6d:fc:e2 (84:3a:4b:6d:fc:e2), Dst: Cisco\_29:41:7d (ec:c8:82:29:41:7d)

> Internet Protocol Version 4, Src: LAPTOP-SWKHX9YG.frank-n-ted.com (10.6.12.203), Dst: 205.185.125.104 (205.185.125.104)

> Transmission Control Protocol, Src Port: 49739 (49739), Dst Port: http (80), Seq: 222, Ack: 489, Len: 258

> Hypertext Transfer Protocol

GET /files/june11.dll HTTP/1.1\r\n

[Expert Info (Chat/Sequence): GET /files/june11.dll HTTP/1.1\r\n]

Request Method: GET

Request URI: /files/june11.dll

Request Version: HTTP/1.1

Accept: \*/\*\r\n

<Accept: \*/\*\r\n>

Accept-Encoding: gzip, deflate\r\n

<Accept-Encoding: gzip, deflate\r\n>

User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 10.0; WOW64; Trident/7.0; .NET4.0C; .NET4.0E)\r\n

<User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 10.0; WOW64; Trident/7.0; .NET4.0C; .NET4.0E)\r\n>

00a0 61 74 69 62 6c 65 3b 20 4d 53 49 45 20 37 2e 30 atible; MSIE 7.0

00b0 3b 20 57 69 6e 64 6f 77 73 20 4e 54 20 31 30 2e ; Window s NT 10.

00c0 30 3b 20 57 4f 57 36 34 3b 20 54 72 69 64 65 6e 0; WOW64 ; Triden

00d0 74 2f 37 2e 30 3b 20 2e 4e 45 54 34 2e 30 43 3b t/7.0; . NET4.0C;

00e0 20 2e 4e 45 54 34 2e 30 45 29 0d 0a 48 6f 73 74 .NET4.0 E)\r\n

00f0 3a 20 32 30 35 2e 31 38 35 2e 31 32 35 2e 31 30 : 205.18 5.125.10

0100 34 0d 0a 43 6f 6e 6e 65 63 74 69 6f 6e 3a 20 4b 4; Conne ction: K

0110 65 65 70 2d 41 6c 69 76 65 0d 0a 43 6f 6f 6b 69 eep-Aliv e-Cooki

0120 65 3a 20 5f 73 75 62 69 64 3d 33 6d 6d 68 66 6e e; \_subi d=3mmhfn

0130 64 38 6a 70 0d 0a 0d 0a d8jp....

Request line (http.request.line), 23 bytes

Packets: 104286 · Displayed: 4 (0.0%)

Profile

Wireshark · Follow HTTP Stream (tcp.stream eq 724) · part\_3.pcapng

GET /pQ8twj HTTP/1.1

Accept: \*/\*

Accept-Encoding: gzip, deflate

User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 10.0; WOW64; Trident/7.0; .NET4.0C; .NET4.0E)

Host: 205.185.125.104

Connection: Keep-Alive

GET /files/june11.dll HTTP/1.1

Accept: \*/\*

Accept-Encoding: gzip, deflate

User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 10.0; WOW64; Trident/7.0; .NET4.0C; .NET4.0E)

Host: 205.185.125.104

Connection: Keep-Alive

Cookie: \_subid=3mmhfn8jdp

Wireshark · Follow HTTP Stream (tcp.stream eq 724) · part\_3.pcapng

HTTP/1.1 302 Found

Server: nginx

Date: Fri, 12 Jun 2020 17:15:19 GMT

Content-Type: text/html; charset=UTF-8

Content-Length: 0

Connection: keep-alive

Cache-Control: no-cache, no-store, must-revalidate,post-check=0,pre-check=0

Expires: 0

Last-Modified: Fri, 12 Jun 2020 17:15:19 GMT

Location: http://205.185.125.104/files/june11.dll

Pragma: no-cache

Set-Cookie: \_subid=3mmhfn8jdp;Expires=Monday, 13-Jul-2020 17:15:19 GMT;Max-Age=2678400;Path=/

Access-Control-Allow-Origin: \*

HTTP/1.1 200 OK

Server: nginx

Date: Fri, 12 Jun 2020 17:15:19 GMT

Content-Type: application/octet-stream

Content-Length: 563032

Last-Modified: Thu, 11 Jun 2020 22:34:56 GMT

Connection: keep-alive

Etag: "5ee2b190-89758"

X-Content-Type-Options: nosniff

Accept-Ranges: bytes

MZ.....@.....!..L!This program cannot be run in DOS mode.

\$.PE..L..A.^.....!..2.6...H.....@>.....P.....y

Packet 58750. 0 client pkts, 2 server pkts, 0 turns. Click to select.

205.185.125.104:http → LAPTOP-SWKHX9YG.frank-n-ted.com:49739 (563kB)

Show data as ASCII

Find:

Find Next

Filter Out This Stream

Print

Save as...

Back

Close

Help

VirusTotal - Mozilla Firefox

VirusTotal

https://www.virustotal.com/gui/file/d3636666b407fe5527b96696377ee7ba9b609c8ef4561fa76af218ddd764dec

Kali Linux Kali Training Kali Tools Kali Docs Kali Forums NetHunter Offensive Security Exploit-DB GHDB MSFU

d3636666b407fe5527b96696377ee7ba9b609c8ef4561fa76af218ddd764dec

Sign in Sign up

53 / 68

53 security vendors flagged this file as malicious

d3636666b407fe5527b96696377ee7ba9b609c8ef4561fa76af218ddd764dec

549.84 KB Size

2021-08-24 01:32:27 UTC 22 hours ago

DLL

GoogleUpdate.exe

invalid-signature overlay pedll signed

DETECTION

DETAILS

RELATIONS

BEHAVIOR

COMMUNITY 2

Ad-Aware

Trojan.Mint.Zamg.O

AhnLab-V3

Malware/Win32.RL\_Generic.R346613

Alibaba

TrojanSpy:Win32/Yakes.56555f48

ALYac

Trojan.Mint.Zamg.O

Antiy-AVL

Trojan/Generic.ASCCommon.1BE

SecureAge APEX

Malicious

Arcabit

Trojan.Mint.Zamg.O

Avast

Win32:DangerousSig [Trj]

AVG

Win32:DangerousSig [Trj]

Avira (no cloud)

TR/AD.ZLoader.ladbd

BitDefender

Trojan.Mint.Zamg.O

BitDefenderTheta

Gen:NN.ZedlaF.34088.lu9@aul7OQgi

CrowdStrike Falcon

Win/malicious\_confidence\_100% (W)

Cylance

Unsafe

Cynet

Malicious (score: 100)

Cyren

W32/Trojan.SIAQ-3008



# Fake Browser Update Pop-Up (RAT)

- The Rotterdam-PC.mindhammer.net was browsing on ball.dardavies.com and clicked a link which spurred a TCP stream to b5689023.green.mattingsolutions.co which is a known compromised URL which downloads empty.gif files which create a backdoor into the infected machine and links the machine to a command and control server.

12998	196.147300500	Rotterdam-PC.mind-h...	ball.dardavies.com	TCP
12999	196.148265300	Rotterdam-PC.mind-h...	ball.dardavies.com	TCP
13000	196.149227000	Rotterdam-PC.mind-h...	prod.disqus.map.fastlylb.net	TCP
13001	196.150276900	prod.disqus.map.fas...	Rotterdam-PC.mind-hammer.net	TCP
13002	196.151236300	Rotterdam-PC.mind-h...	d3ar2nimg19ie1.cloudfront.net	TCP
13003	196.152197700	Rotterdam-PC.mind-h...	d3ar2nimg19ie1.cloudfront.net	TCP
13004	196.153257400	d3ar2nimg19ie1.clou...	Rotterdam-PC.mind-hammer.net	TCP
13005	196.154314000	Rotterdam-PC.mind-h...	b5689023.green.mattingsolutions.co	TCP
13006	196.155364000	d3ar2nimg19ie1.clou...	Rotterdam-PC.mind-hammer.net	TCP
13007	196.156423300	b5689023.green.matt...	Rotterdam-PC.mind-hammer.net	TCP
13008	196.157386000	Rotterdam-PC.mind-h...	b5689023.green.mattingsolutions.co	TCP
13009	196.166120200	Rotterdam-PC.mind-h...	b5689023.green.mattingsolutions.co	TCP

Packet	Hostname	Content Type	Size	Filename
31721	b5689023.green.mattingsolutions.co		3,592 kB	empty.gif?ss&ss2img
27702	b5689023.green.mattingsolutions.co		3,592 kB	empty.gif?ss&ss1img
13010	b5689023.green.mattingsolutions.co	application/x-www-form-urlencoded	72 bytes	empty.gif
13039	b5689023.green.mattingsolutions.co	text/html	14 kB	empty.gif
13086	b5689023.green.mattingsolutions.co	application/x-www-form-urlencoded	19 kB	empty.gif
13131	b5689023.green.mattingsolutions.co		2,714 bytes	empty.gif
13134	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13137	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13139	b5689023.green.mattingsolutions.co		2,714 bytes	empty.gif
13142	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13145	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13148	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13151	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13154	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13159	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13164	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13168	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13176	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13180	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13188	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13193	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13196	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13198	b5689023.green.mattingsolutions.co		2,714 bytes	empty.gif
13201	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13208	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13211	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13215	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13218	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13221	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13224	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif
13230	b5689023.green.mattingsolutions.co		4,071 bytes	empty.gif



Always remember: “You do **NOT** want your company to end up on the front page of USA TODAY.”

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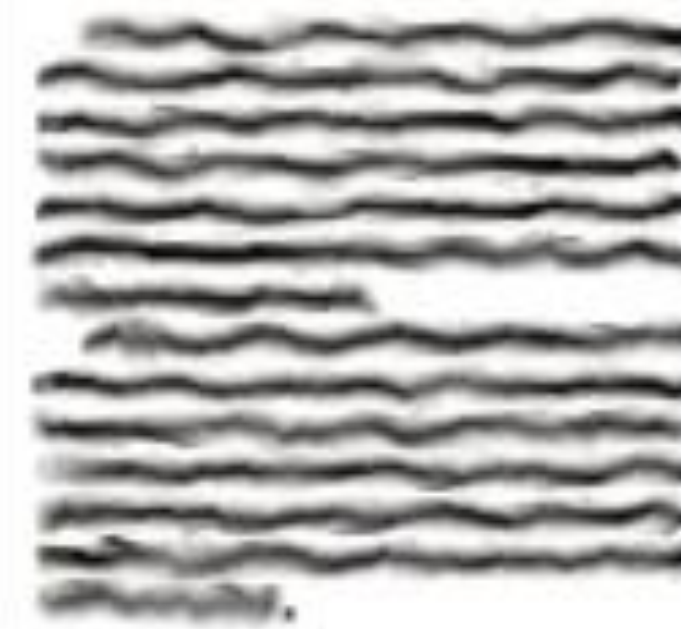
## X-CORP Hacked!



### Michael and Steven Cause Major Breach

Expert hackers take control of entire system

Lorenzo Reyes  
USA TODAY





# The End

Chase Carroll  
Dylan Nelson  
Lucas Martynec  
Matt Gaulke  
Mehrdad Bashiri  
Steven Bauer  
Thank you!

“Don’t cry because it’s over.  
Smile because it happened.”  
-Dr. Seuss