DIGITAL FORENSICS LAB

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EXPERIMENT – 1

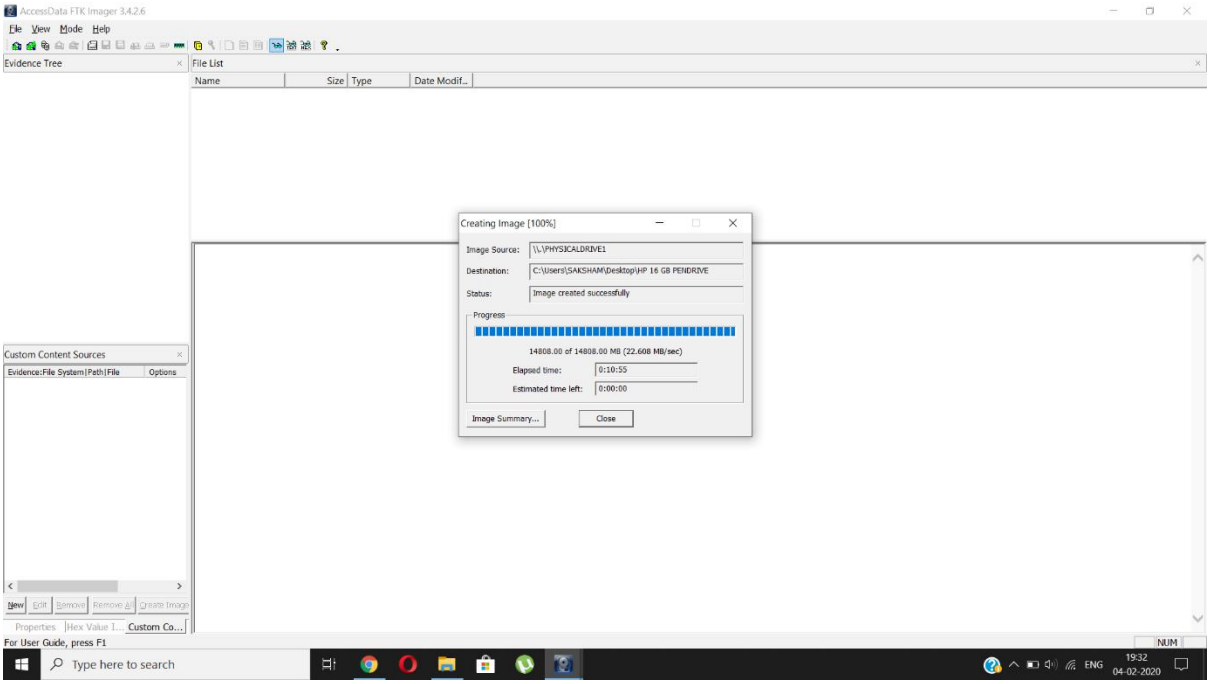
Creating a Forensics Image using FTK IMAGER

FTK Imager is a Windows acquisition tool and it can be download directly from Access Data website (http://accessdata.com/) for free of cost. FTK Imager is available in two types "FTK Imager" and "FTK Imager Lite". Both the softwares have same features and functions. Only difference is lite version can be run from a Pendrive or External Source, so Setup is not required for this version. The version used for Second task is FTK Imager liteversion 3.4.2.2. Note: The hash values(in both tasks) have to be saved or noted down some where for further analysis to check the integrity of the image before Forensic analysis and after Forensics analysis.

TASK I: Imaging

1. To run the application, select the application , right click on it and run as an "Administrator".

2. The application will be opened as shown below.



3. After clicking on the icon, the page will be opened

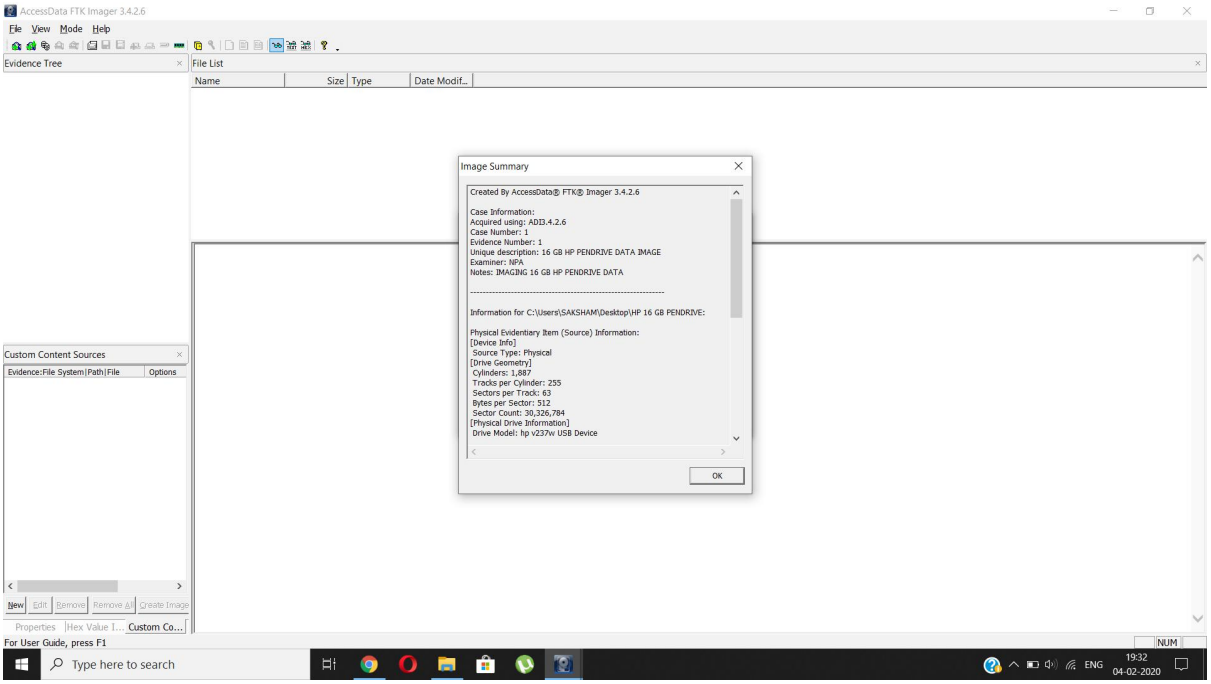
4. After selecting the device type, click on "Next" button to proceed, the page will be opened

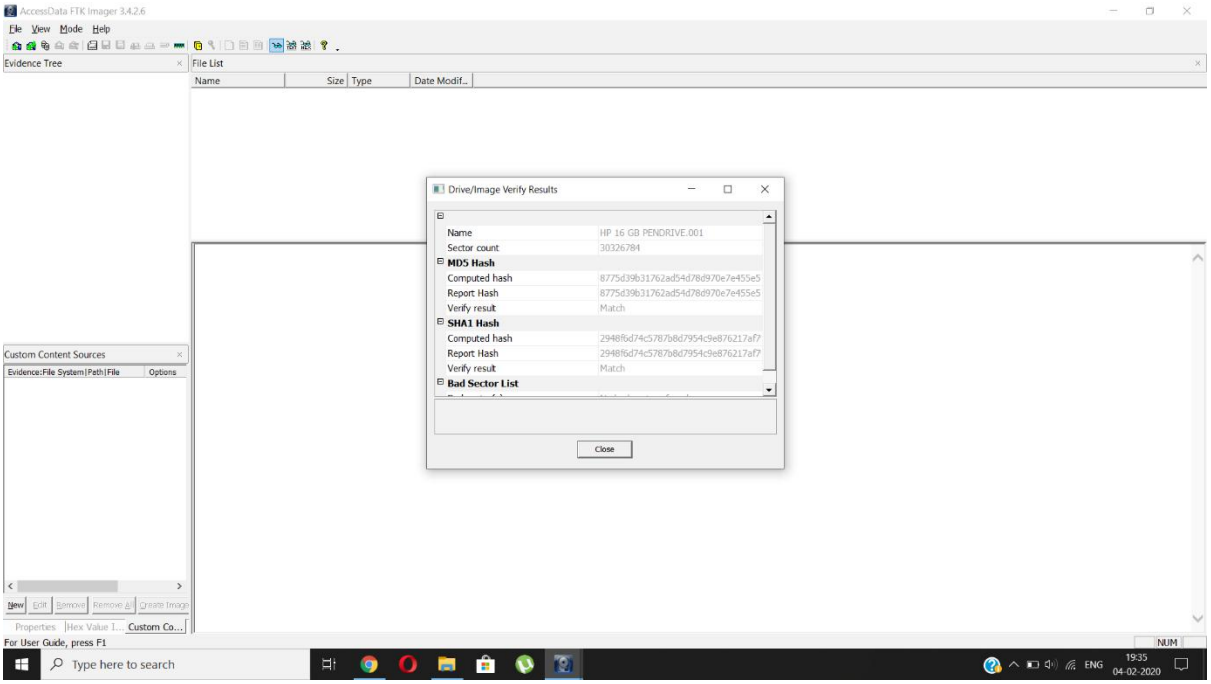
5. Click on "Add" button as shown above to add the destination location to save the image

6. After clicking on Add button, the page will be opened as shown above. Select the image type you want to create and click on "Next" button

7. After clicking on "Next" button, the page will be displayed

8.After completion of imaging, the hash value of the image will be calculated using MD5 and SHA1 algorithm and will be displayed as shown below.



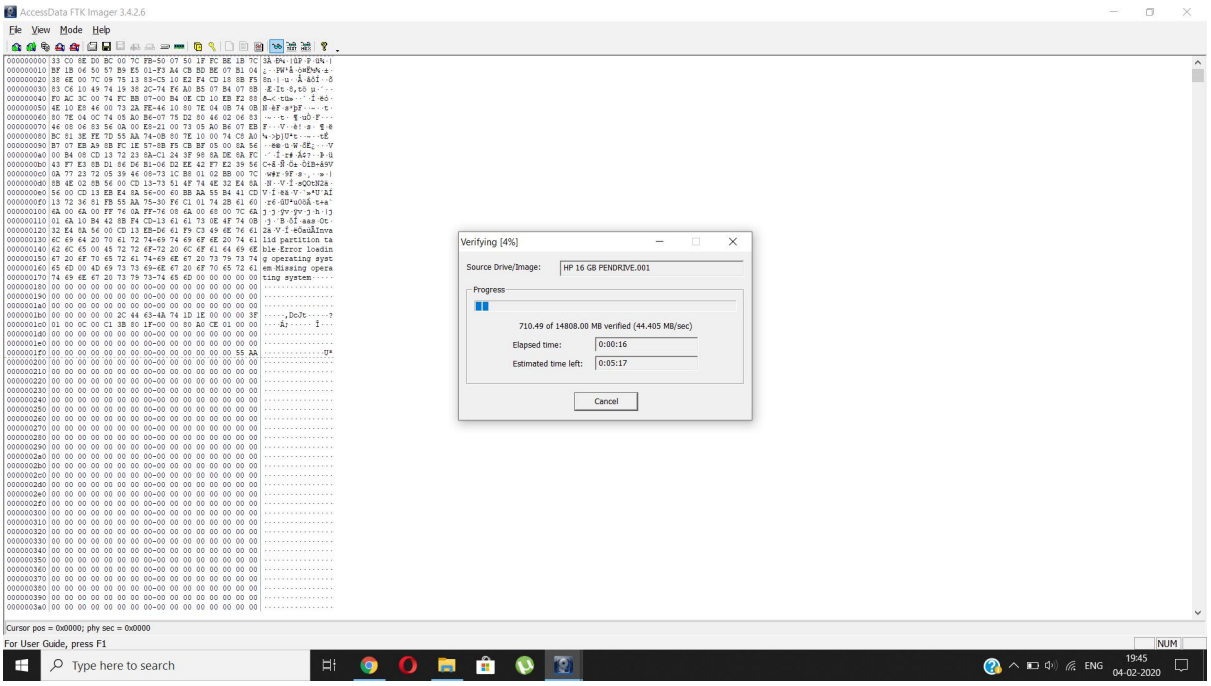


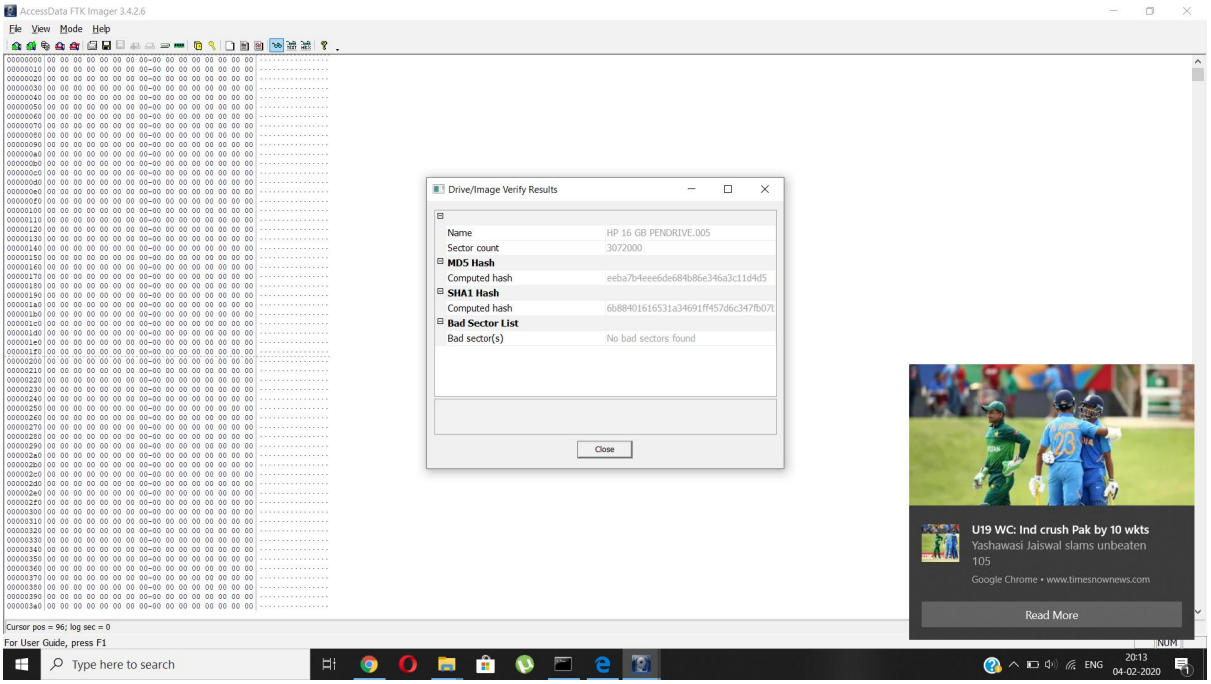
TASK II: Hashing

Download and Install FTK Imager 3.4.2 for this task

Verify the MD5 SHA1 hash value of an image Using FTK Imager version 3.4

1. Launch FTK Imager
2. Select File > Add Evidence Item
3. Select "Image File" and proceed to add the image
4. Under the "Evidence Tree", right click your image and select Verify Drive/Image
5. Compare the hash value calculated to the known hash value





EXPERIMENT – 2

VOLATALITY

Forensics case study-Stuxnet

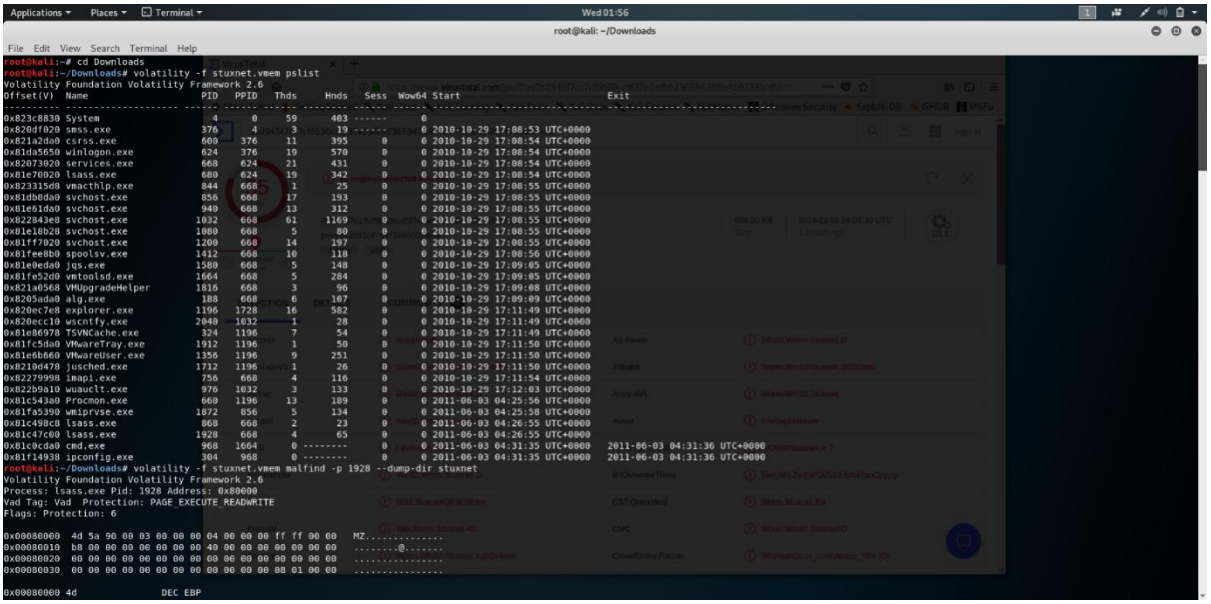
Volatility is one of the best open source software programs for analyzing RAM in 32 bit/64 bit systems. It supports analysis for Linux, Windows, Mac, and Android systems. It is based on Python and can be run on Windows, Linux, and Mac systems. It can analyze raw dumps, crash dumps, VMware dumps.

In this experiment, we analyse a image of a file called stuxnet.vmem.

In this , we first find all the process in that file and their ID'S.

Stuxnet is a malicious computer worm, first uncovered in 2010, thought to have been in development since at least 2005. Stuxnet targets supervisory control and data acquisition systems and is believed to be responsible for causing substantial damage to the nuclear program of Iran.

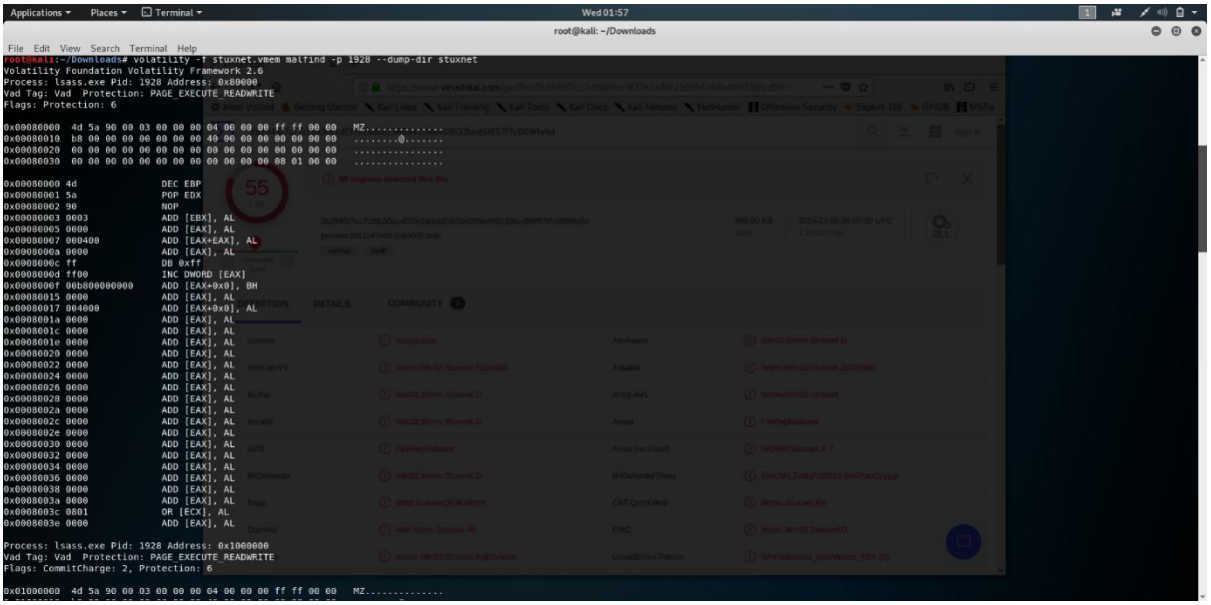
COMMAND USED : volatility -f stuxnet.vmem pslist

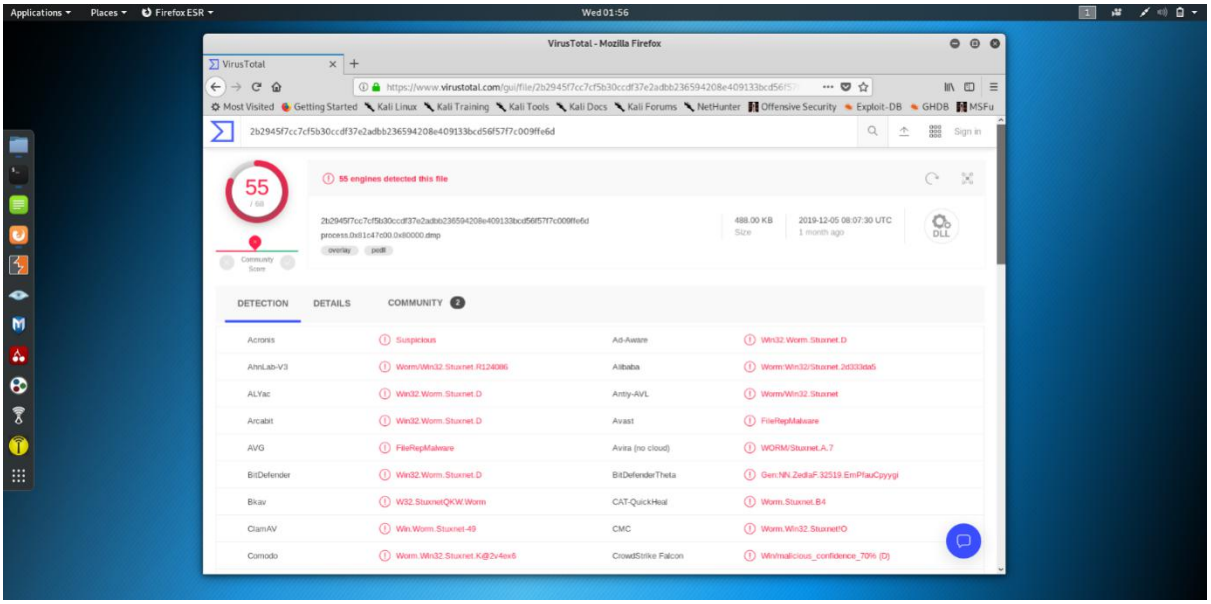


Then , we find connections and then we find any process in which we can find any malware.

COMMAND USED : volatility -f Stuxnet.vmem malfind -p 1928 –dump-dir Stuxnet

"**lsass**.**exe**" is the Local Security Authentication Server. It verifies the validity of user logons to your PC or server. **Lsass** generates the **process** responsible for authenticating users for the Winlogon service. This is performed by using authentication packages such as the default, Msgina.





Then we upload files created on virustotal.com where we can find some malwares.

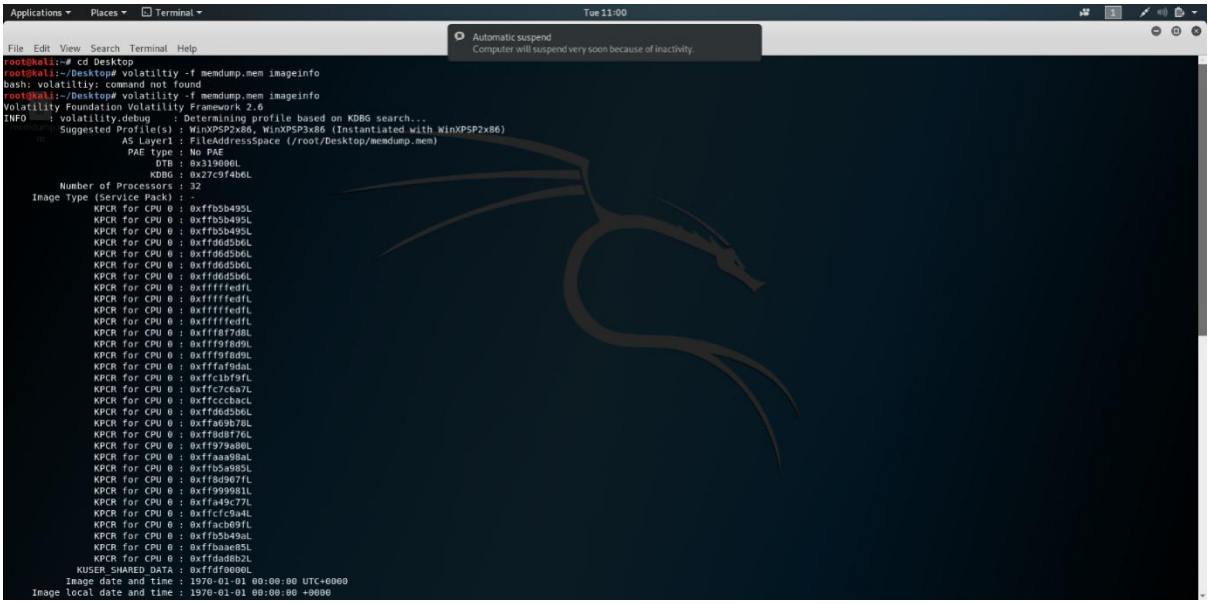
EXPERIMENT – 3

Creating Ram Dump using FTK and VOLATILITY

HERE WE CREATE IMAGE OF OUR RAM DUMP AND CREATE A RAM DUMP.

THEN IN IT WE APPLY SAME PROCESS WHICH WE DID FOR STUXNET.VMEM.

AND WE WILL FIND MALWARES IN IT.



25 engines detected this file

SHA-256	5b136147911b041f0126ce82dfd24c4e2c79553b65d3240ecea2dcab4452dcb5
File name	AcroSpeedLaunch.exe
File size	28.5 KB
Last analysis	2018-03-21 06:29:58 UTC

25 / 63

Detection | Details | Behavior | Community

Ad-Aware	Trojan.GenericKD.30403828	AegisLab	Uds.Dangerousobject.Multi!c
ALYac	Trojan.GenericKD.30403828	Arcabit	Trojan.Generic.D1CFECF4
Avira	TR/Drop.Decay.izv	AVware	Trojan.Win32.Generic!BT
BitDefender	Trojan.GenericKD.30403828	CAT-QuickHeal	Trojan.Multi
Comodo	UnclassifiedMalware	Cylance	Unsafe
Emsisoft	Trojan.GenericKD.30403828 (B)	eScan	Trojan.GenericKD.30403828
F-Secure	Trojan.GenericKD.30403828	Fortinet	PossibleThreat
GData	Trojan.GenericKD.30403828	Ikarus	Trojan.Dropper.Decay
Kaspersky	UDS:DangerousObject.Multi.Generic	MAX	malware (ai score=99)
McAfee	Artemis!12CF6583F5A9	McAfee-GW-Edition	Artemis
Qihoo-360	Win32/Trojan.Multi.daf	Sophos AV	Mal/Generic-S
Symantec	Trojan.Gen.2	VIPRE	Trojan.Win32.Generic!BT
ZoneAlarm	UDS:DangerousObject.Multi.Generic	AhnLab-V3	Clean
Antiy-AVL	Clean	Avast	Clean
Avast Mobile Security	Clean	AVG	Clean

EXPERIMENT – 4

Recovering abd Inspecting deleted files

In this experiment, what we do is we recover deleted files from pen drive .

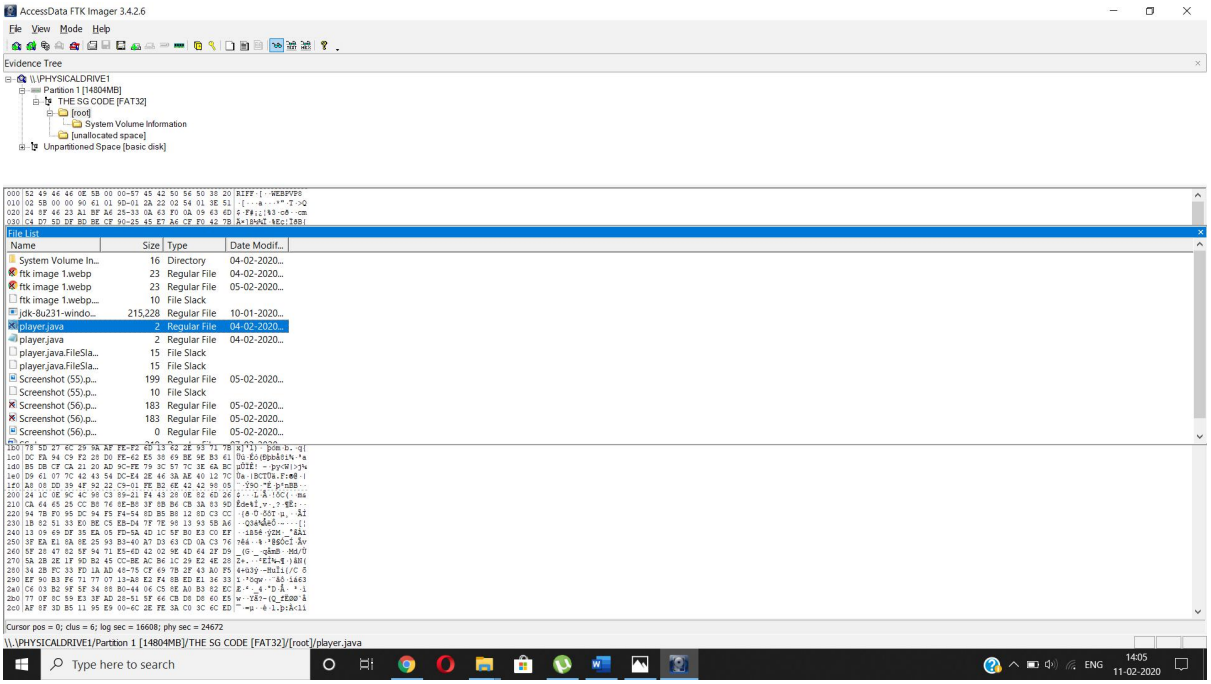
We achieve this by using FTK imager tool by deleting some files from the pen drive and then finding the deleted items on it.

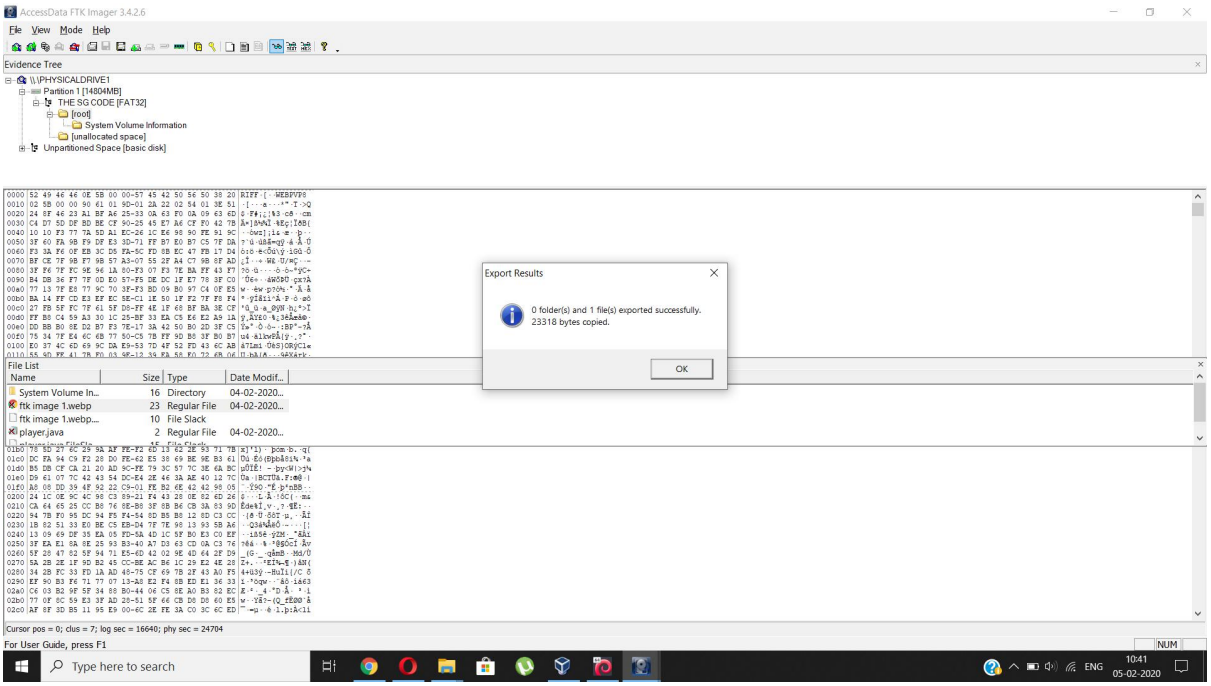
We do this for both linux and Windows.

In this we first add evidence item on the tool ADD EVIDENCE ITEM.

1. Launch FTK Imager
2. Select File > Add Evidence Item
3. Select "physical drive" which is pen drive here and proceed to add the file
4. Under the "Evidence Tree", right click your file and select Verify Drive.
5. Then here we right click and click on root option.
6. Then we find for the folder from we have deleted some files.
7. Here in front of the files where we have a cross mark it means it has been deleted from the pen drive very previously and we have to recover it.
8. For recovering it, we can right click on that picture of text file and can select the option of exporting it .
9. After this we can choose destination as of where to recover those deleted files or pic.

Snapshot :





EXPERIMENT – 5

GEORGE AND MARTHA CASE

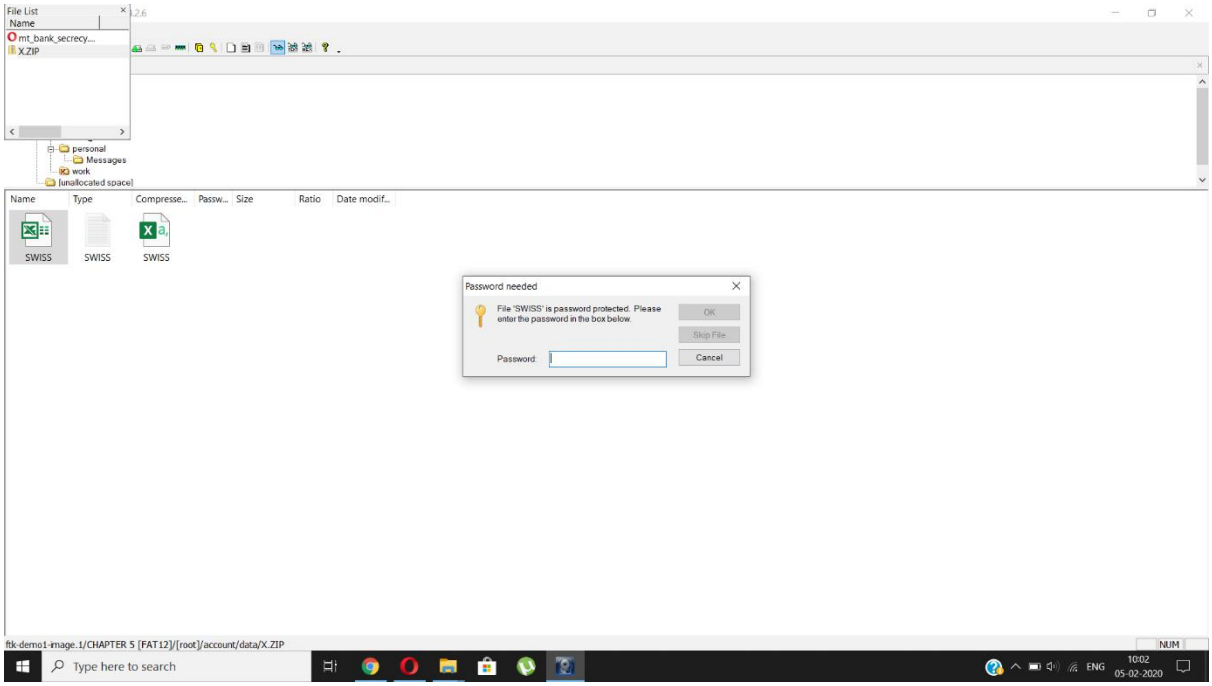
We have given a case of 2 people working in a company George and Martha.

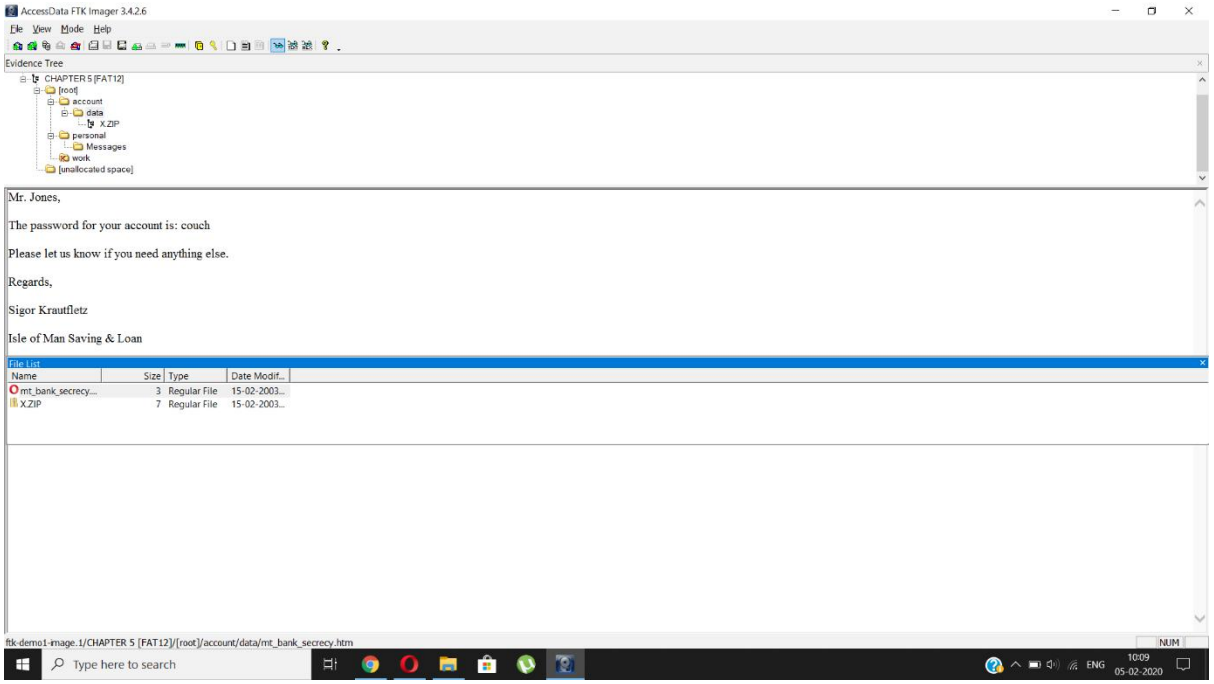
George Montgomery has worked at a firm for several years and is now missing. Another employee, Martha, is also missing. No one knows where they are or has seen them in over a week, so Steve (George's supervisor) asks the IT Department to confiscate George's hard drive and all storage media in his work area.

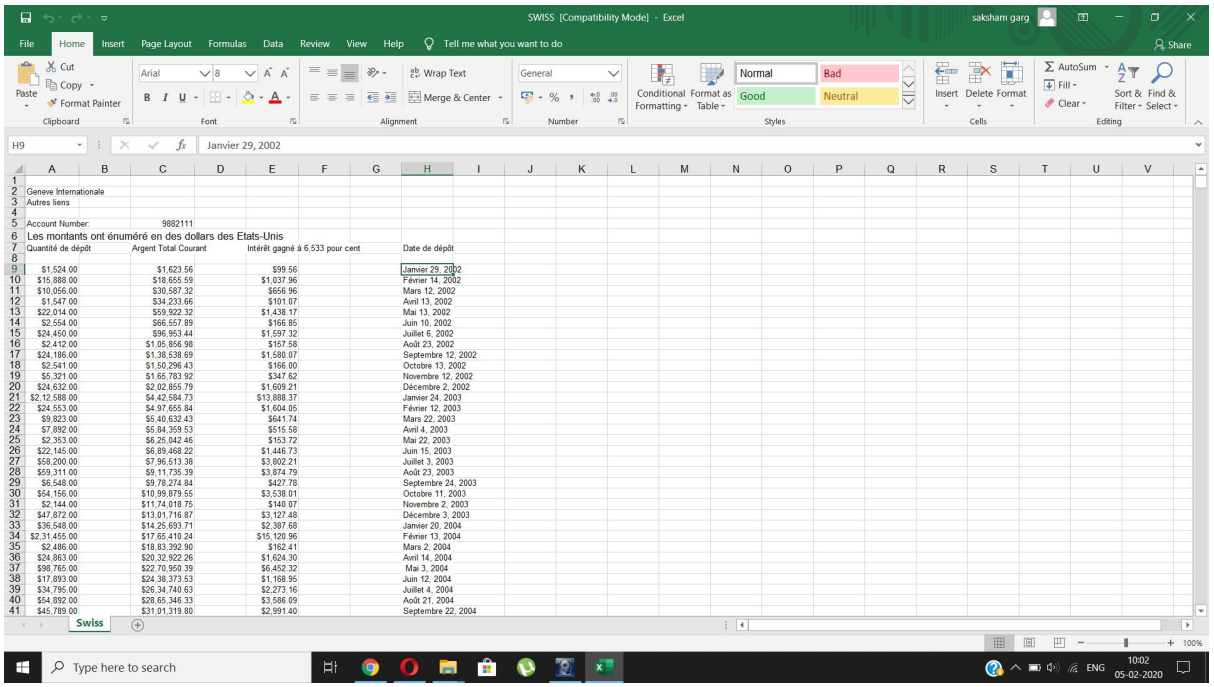
Investigate their scenario of what policies they broke and how they performed a theft of large amount of money.

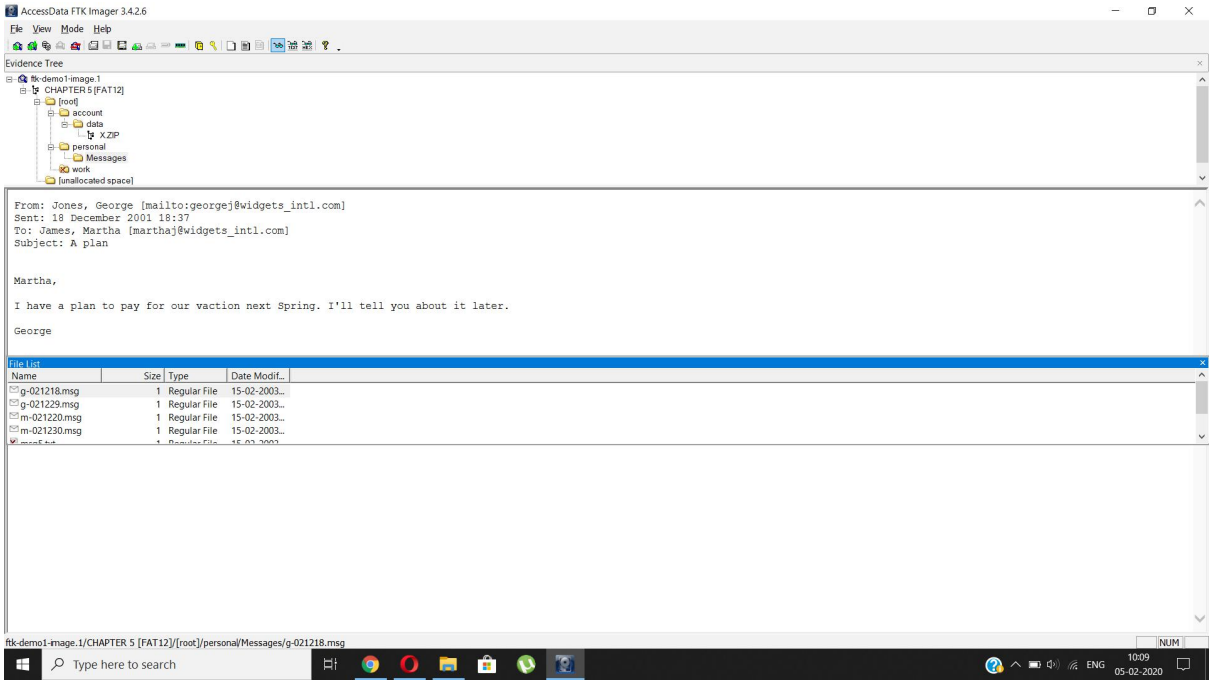
For this we use FTK imager tool to recover deleted files and to investigate their case so as to find out how they did this crime.

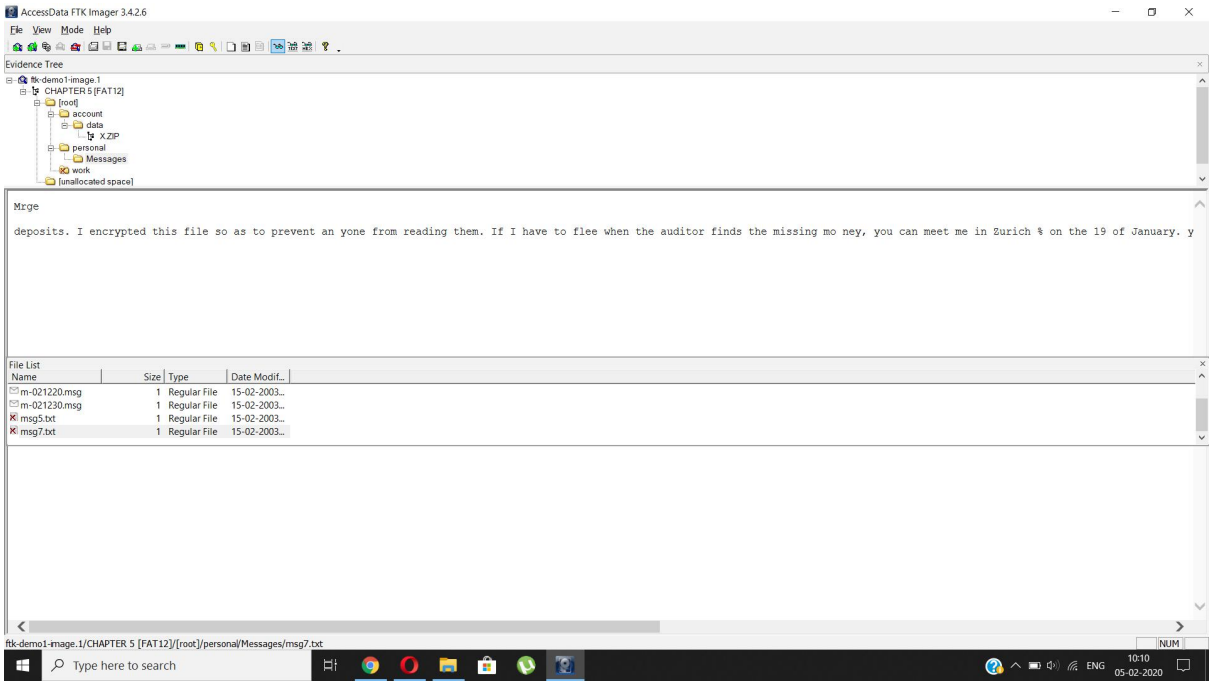
1. Launch FTK Imager
2. Select File > Add Evidence Item
3. Select "image file" and proceed to add the file
4. Under the "Evidence Tree", right click your file and select Verify Drive/Image

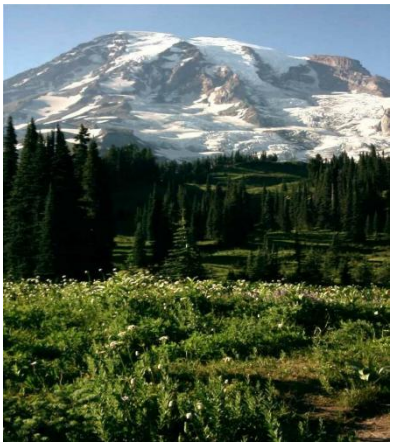



AccessData FTK Imager 3.4.2.6
File View Mode Help
Evidence Tree
CHAPTER 5 [FAT12]
[root]
account
data
X.ZIP
personal
Messages
work
[unallocated space]
Mr. Jones,
The password for your account is: couch
Please let us know if you need anything else.
Regards,
Sigor Krautfletz
Isle of Man Saving & Loan
File List
Name
Size
Type
Date Modif...
mt_bank_secrecy....
3
Regular File
15-02-2003...
X.ZIP
7
Regular File
15-02-2003...
ftk-demo1-image.1/CHAPTER 5 [FAT12]/[root]/account/data/mt_bank_secrecy.htm
NUM
Type here to search
ENG
10:09
05-02-2020


SWISS [Compatibility Mode] - Excel
saksham garg
File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do
Share
Cut
Copy
Format Painter
Paste
Clipboard
Arial
8
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Normal
Bad
Good
Neutral
Styles
Insert
Delete
Format
Cells
AutoSum
Fill
Clear
Sort & Filter
Find & Select
Editing
H9
Janvier 29, 2002
Geneve Internationale
Autres liens
Account Number: 9882111
Les montants ont énuméré en des dollars des Etats-Unis
Quantité de dépôt
Argent Total Courant
Intérêt gagné à 6,533 pour cent
Date de dépôt
$1,524.00 $1,623.56 $99.56 Janvier 29, 2002
$15,888.00 $18,655.59 $1,037.96 Février 14, 2002
$10,056.00 $30,587.32 $656.96 Mars 12, 2002
$1,547.00 $34,233.66 $101.07 Avril 13, 2002
$22,014.00 $59,922.32 $1,438.17 Mai 13, 2002
$2,554.00 $66,557.89 $166.85 Juin 10, 2002
$24,450.00 $96,953.44 $1,597.32 Juillet 6, 2002
$2,412.00 $1,05,856.98 $157.58 Août 23, 2002
$24,186.00 $1,38,538.69 $1,580.07 Septembre 12, 2002
$2,541.00 $1,50,296.43 $166.00 Octobre 13, 2002
$5,321.00 $1,65,783.92 $347.62 Novembre 12, 2002
$24,632.00 $2,02,855.79 $1,609.21 Décembre 2, 2002
$2,12,588.00 $4,42,584.73 $13,888.37 Janvier 24, 2003
$24,553.00 $4,97,655.84 $1,604.05 Février 12, 2003
$9,823.00 $5,40,632.43 $641.74 Mars 22, 2003
$7,892.00 $5,84,359.53 $515.58 Avril 4, 2003
$2,353.00 $6,26,042.46 $153.72 Mai 22, 2003
$22,145.00 $6,89,468.22 $1,446.73 Juin 15, 2003
$58,200.00 $7,96,513.38 $3,802.21 Juillet 3, 2003
$59,311.00 $9,11,735.39 $3,874.79 Août 23, 2003
$6,548.00 $9,78,274.84 $427.78 Septembre 24, 2003
$54,156.00 $10,99,879.55 $3,538.01 Octobre 11, 2003
$2,144.00 $11,74,018.75 $140.07 Novembre 2, 2003
$47,872.00 $13,01,716.87 $3,127.48 Décembre 3, 2003
$36,548.00 $14,25,693.71 $2,387.68 Janvier 20, 2004
$2,31,455.00 $17,65,410.24 $15,120.96 Février 13, 2004
$2,486.00 $18,83,392.90 $162.41 Mars 2, 2004
$24,863.00 $20,32,922.26 $1,624.30 Avril 14, 2004
$98,765.00 $22,70,950.39 $6,452.32 Mai 3, 2004
$17,893.00 $24,38,373.53 $1,168.95 Juin 12, 2004
$34,795.00 $26,34,740.63 $2,273.16 Juillet 4, 2004
$54,892.00 $28,65,346.33 $3,586.09 Août 21, 2004
$45,789.00 $31,01,319.80 $2,991.40 Septembre 22, 2004
Swiss
100%
Type here to search
ENG
10:02
05-02-2020


AccessData FTK Imager 3.4.2.6
File View Mode Help
Evidence Tree
ftk-demo1-image.1
CHAPTER 5 [FAT12]
[root]
account
data
X.ZIP
personal
Messages
work
[unallocated space]
From: Jones, George [mailto:georgej@widgets_intl.com]
Sent: 18 December 2001 18:37
To: James, Martha [marthaj@widgets_intl.com]
Subject: A plan
Martha,
I have a plan to pay for our vaction next Spring. I'll tell you about it later.
George
File List
Name
Size
Type
Date Modif...
g-021218.msg 1 Regular File 15-02-2003...
g-021229.msg 1 Regular File 15-02-2003...
m-021220.msg 1 Regular File 15-02-2003...
m-021230.msg 1 Regular File 15-02-2003...
ftk-demo1-image.1/CHAPTER 5 [FAT12]/[root]/personal/Messages/g-021218.msg
NUM
Type here to search
ENG
10:09
05-02-2020


AccessData FTK Imager 3.4.2.6
File View Mode Help
Evidence Tree
ftk-demo1-image.1
CHAPTER 5 [FAT12]
[root]
account
data
X.ZIP
personal
Messages
work
[unallocated space]
Mrge
deposits. I encrypted this file so as to prevent an yone from reading them. If I have to flee when the auditor finds the missing mo ney, you can meet me in Zurich % on the 19 of January. y
File List
Name
Size
Type
Date Modif...
m-021220.msg 1 Regular File 15-02-2003...
m-021230.msg 1 Regular File 15-02-2003...
msg5.txt 1 Regular File 15-02-2003...
msg7.txt 1 Regular File 15-02-2003...
ftk-demo1-image.1/CHAPTER 5 [FAT12]/[root]/personal/Messages/msg7.txt
NUM
Type here to search
ENG
10:10
05-02-2020



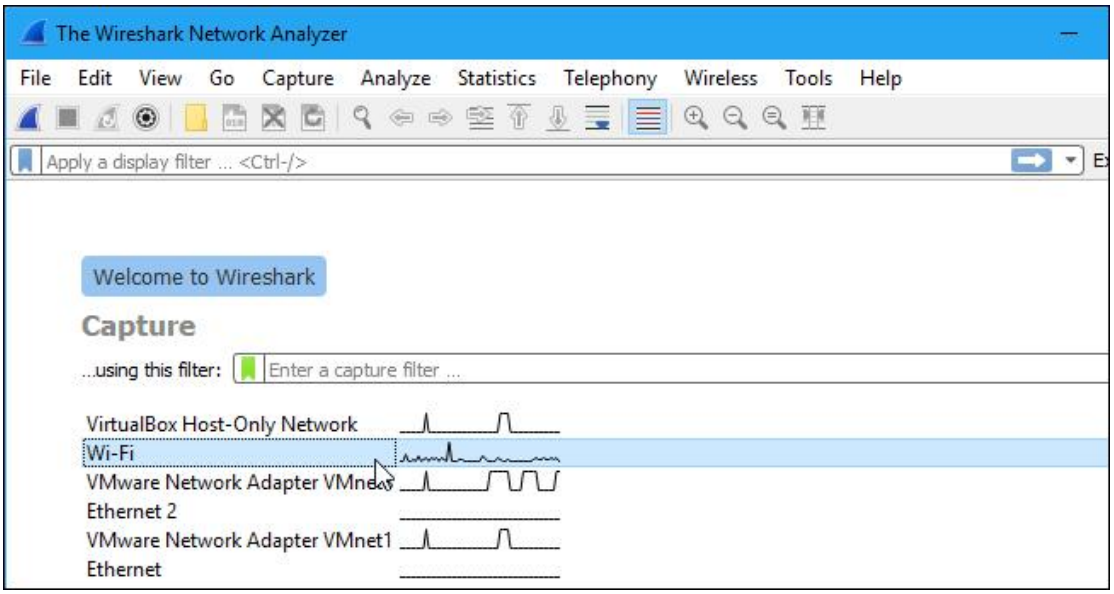
EXPERIMENT-6

Capturing and Analysis of Network Packets using WIRESHARK(Fundamentals)

Wireshark, a network analysis tool formerly known as Ethereal, captures packets in real time and display them in human-readable format. Wireshark includes filters, color coding, and other features that let you dig deep into network traffic and inspect individual packets.

Capturing Packets

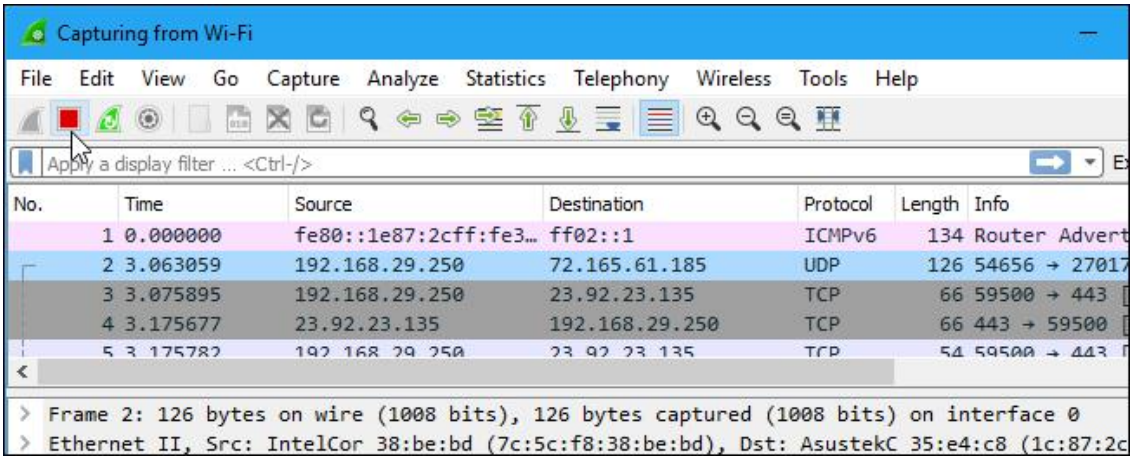
After downloading and installing Wireshark, you can launch it and double-click the name of a network interface under Capture to start capturing packets on that interface. For example, if you want to capture traffic on your wireless network, click your wireless interface. You can configure advanced features by clicking Capture > Options, but this isn't necessary for now.



As soon as you click the interface's name, you'll see the packets start to appear in real time. Wireshark captures each packet sent to or from your system.

If you have promiscuous mode enabled—it's enabled by default—you'll also see all the other packets on the network instead of only packets addressed to your network adapter. To check if promiscuous mode is enabled, click Capture > Options and verify the "Enable promiscuous mode on all interfaces" checkbox is activated at the bottom of this window.

Click the red "Stop" button near the top left corner of the window when you want to stop capturing traffic.

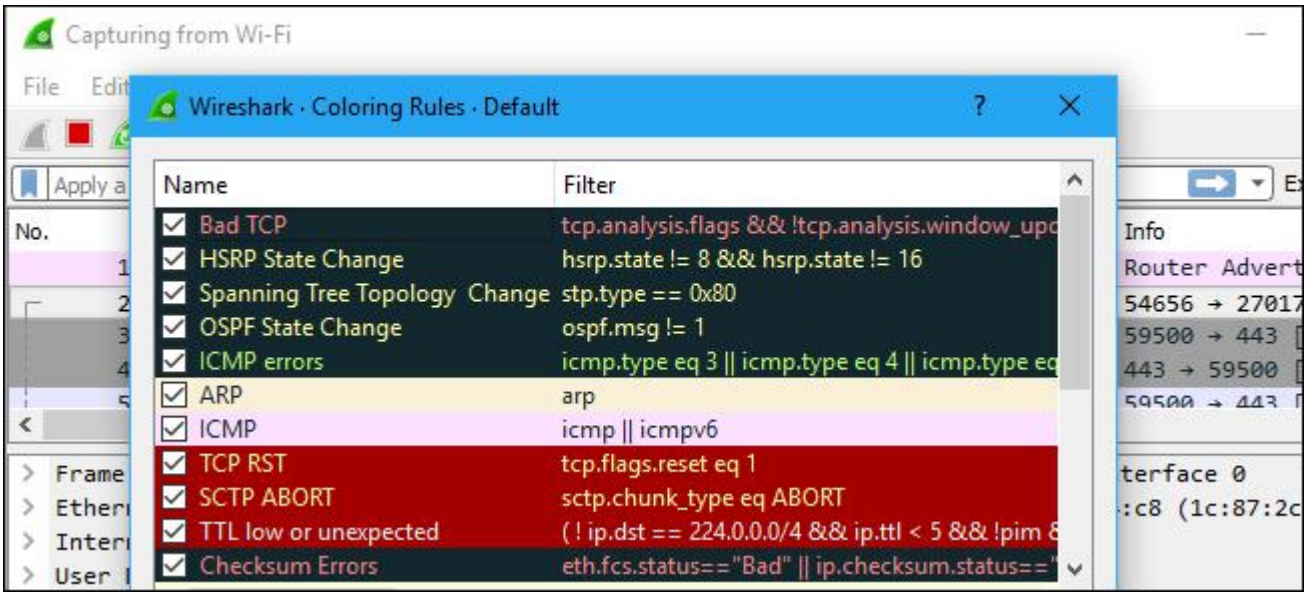


Color Coding

You'll probably see packets highlighted in a variety of different colors. Wireshark uses colors to help you identify the types of traffic at a glance. By default, light purple is TCP traffic, light blue is UDP traffic, and black identifies packets with errors—for example, they could have been delivered out of order.

To view exactly what the color codes mean, click View > Coloring Rules. You can also customize and modify the coloring rules from here, if you

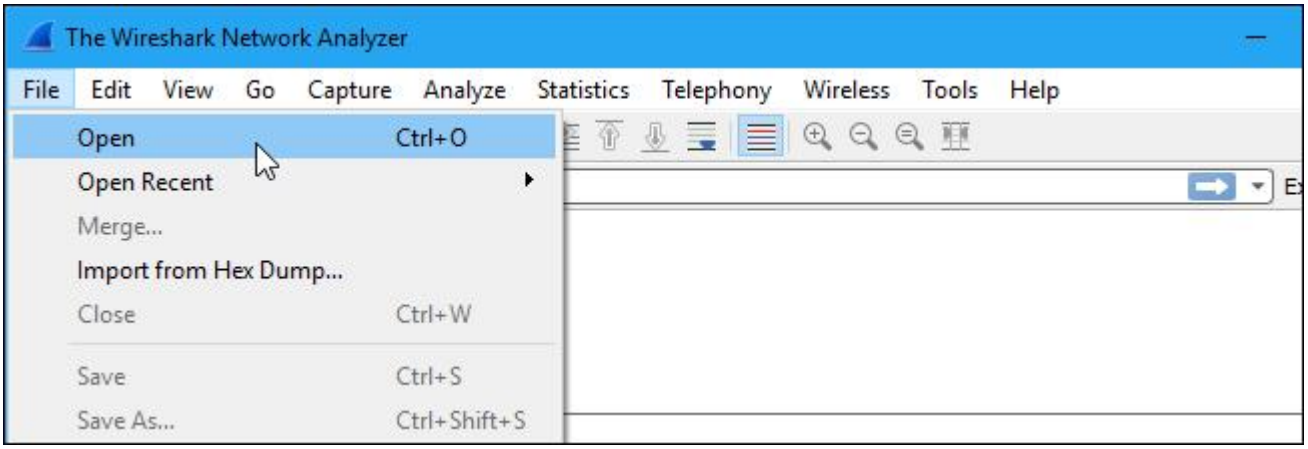
like.



Sample Captures

If there's nothing interesting on your own network to inspect, Wireshark's wiki has you covered. The wiki contains a page of sample capture files that you can load and inspect. Click File > Open in Wireshark and browse for your downloaded file to open one.

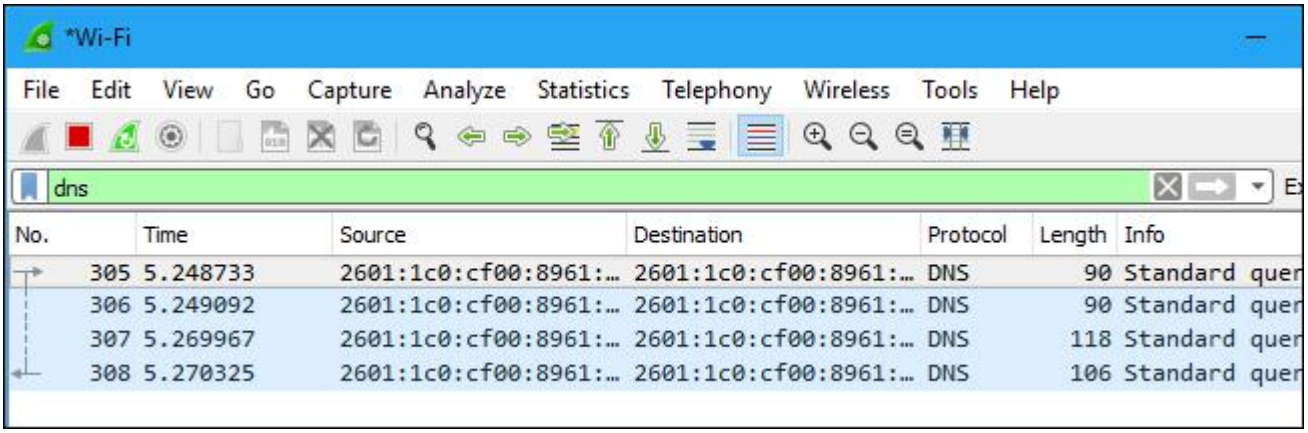
You can also save your own captures in Wireshark and open them later. Click File > Save to save your captured packets.



Filtering Packets

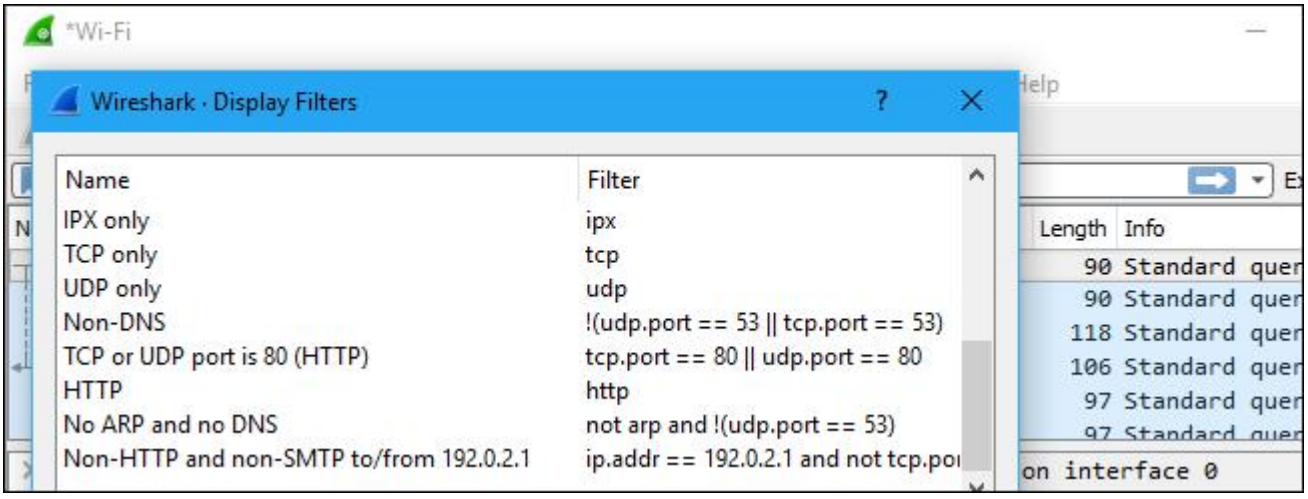
If you're trying to inspect something specific, such as the traffic a program sends when phoning home, it helps to close down all other applications using the network so you can narrow down the traffic. Still, you'll likely have a large amount of packets to sift through. That's where Wireshark's filters come in.

The most basic way to apply a filter is by typing it into the filter box at the top of the window and clicking Apply (or pressing Enter). For example, type "dns" and you'll see only DNS packets. When you start typing, Wireshark will help you autocomplete your filter.



You can also click Analyze > Display Filters to choose a filter from among the default filters included in Wireshark. From here, you can add your own custom filters and save them to easily access them in the future.

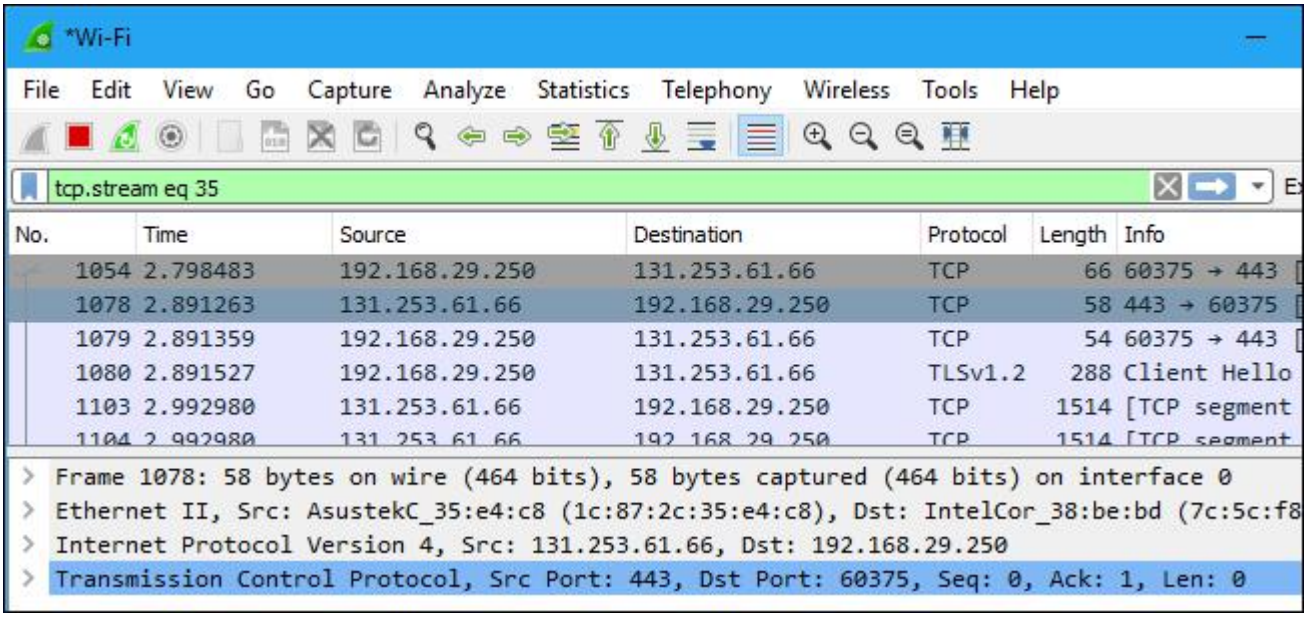
For more information on Wireshark's display filtering language, read the Building display filter expressions page in the official Wireshark documentation.



Another interesting thing you can do is right-click a packet and select Follow > TCP Stream.

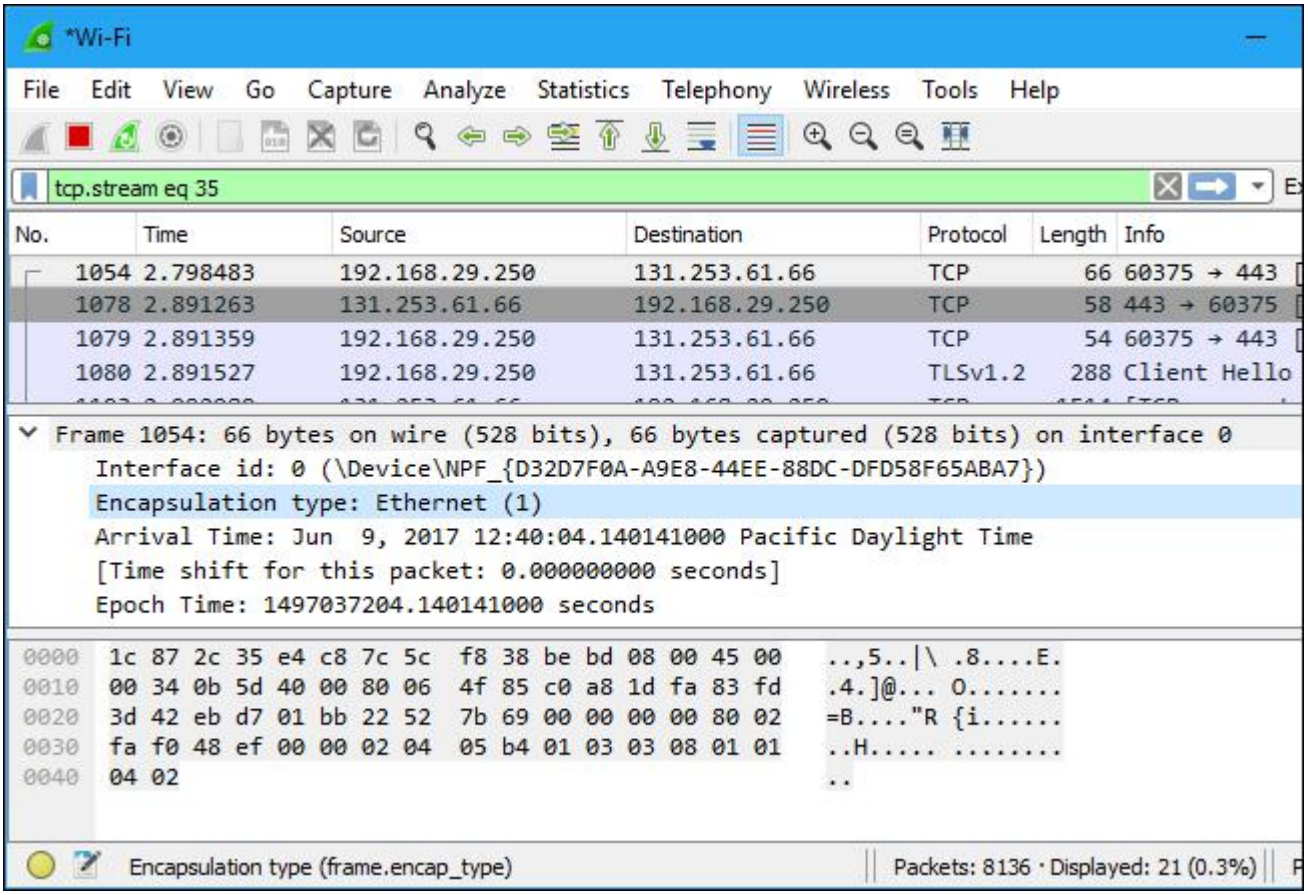
You'll see the full TCP conversation between the client and the server. You can also click other protocols in the Follow menu to see the full conversations for other protocols, if applicable.

Close the window and you'll find a filter has been applied automatically. Wireshark is showing you the packets that make up the conversation.

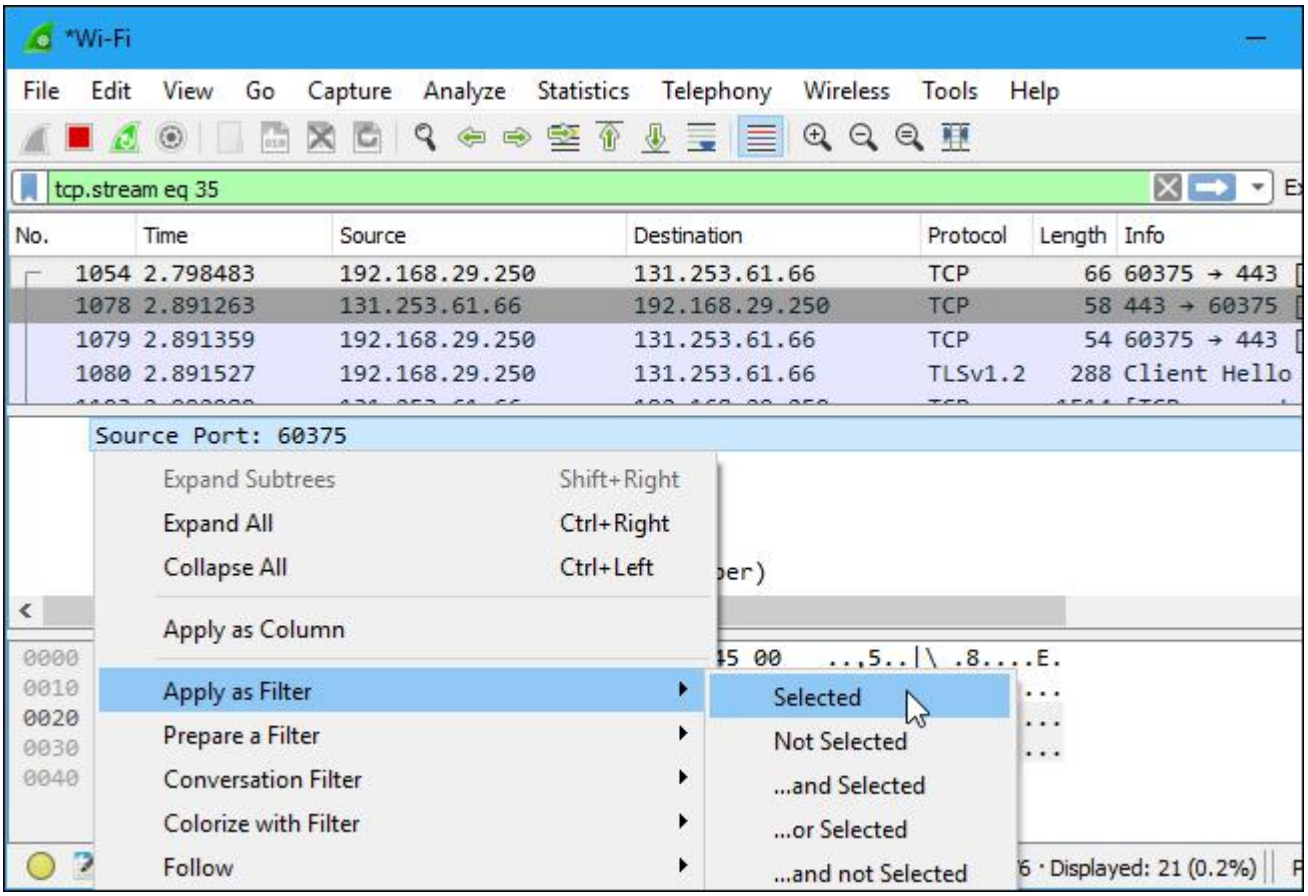


Inspecting Packets

Click a packet to select it and you can dig down to view its details.



You can also create filters from here — just right-click one of the details and use the Apply as Filter submenu to create a filter based on it.



Wireshark is an extremely powerful tool, and this tutorial is just scratching the surface of what you can do with it. Professionals use it to debug network protocol implementations, examine security problems and inspect network protocol internals.

EXPERIMENT-7

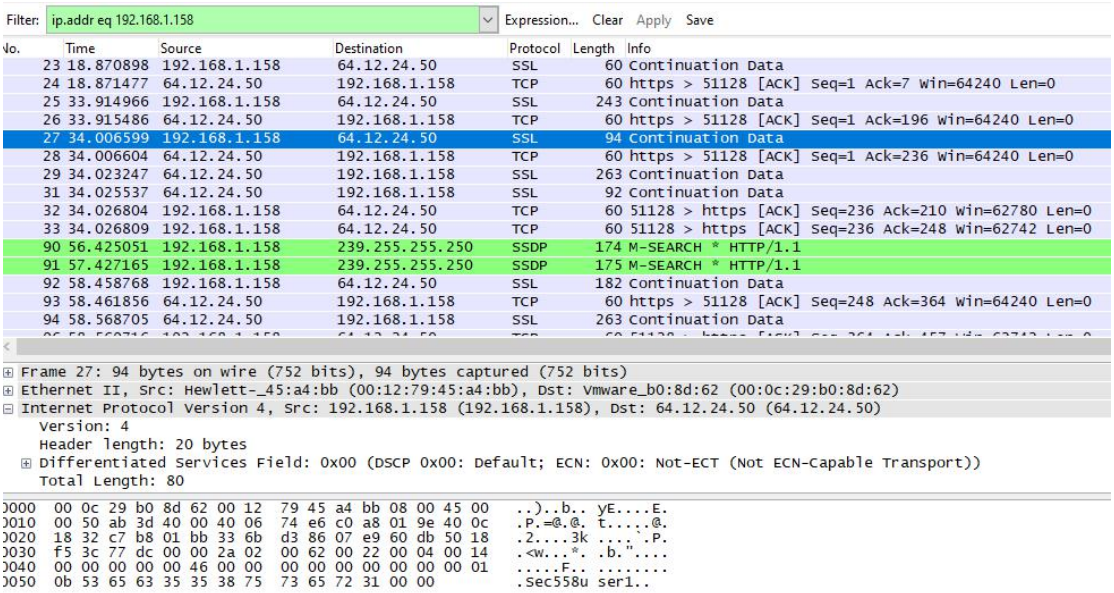
Analysis of 5 pcap files using WIRESHARK

All 5 Pcap file solutions are present

This was the only information found within all the pcap files

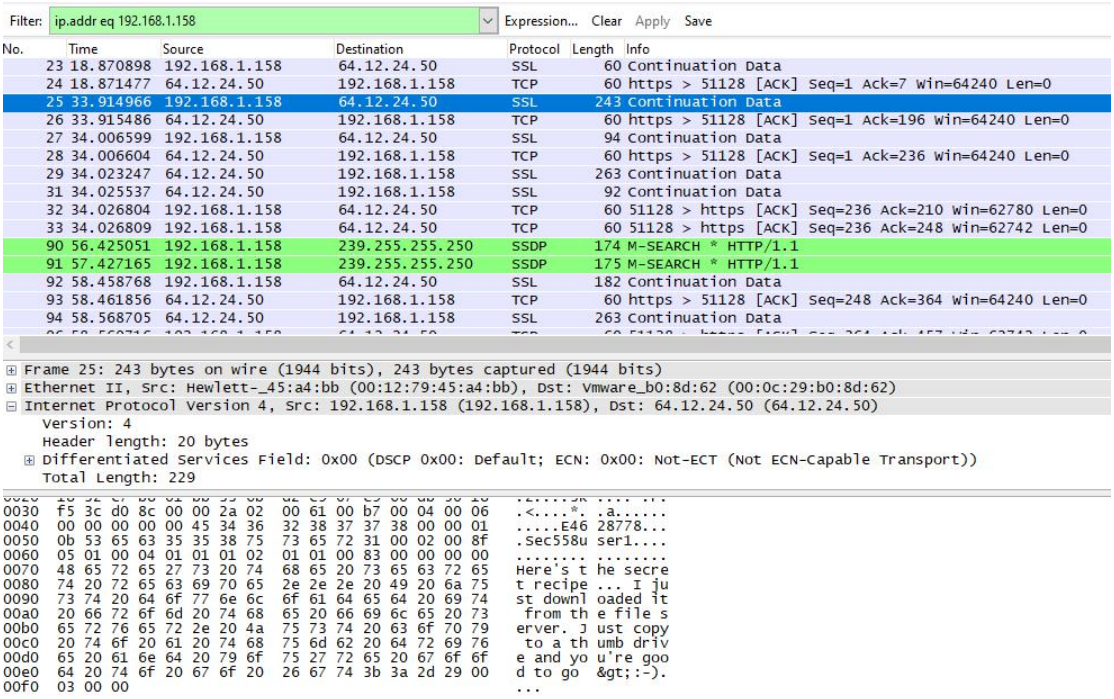
Ann Bed Pcap Solutions

1. The name of Ann's IM buddy is

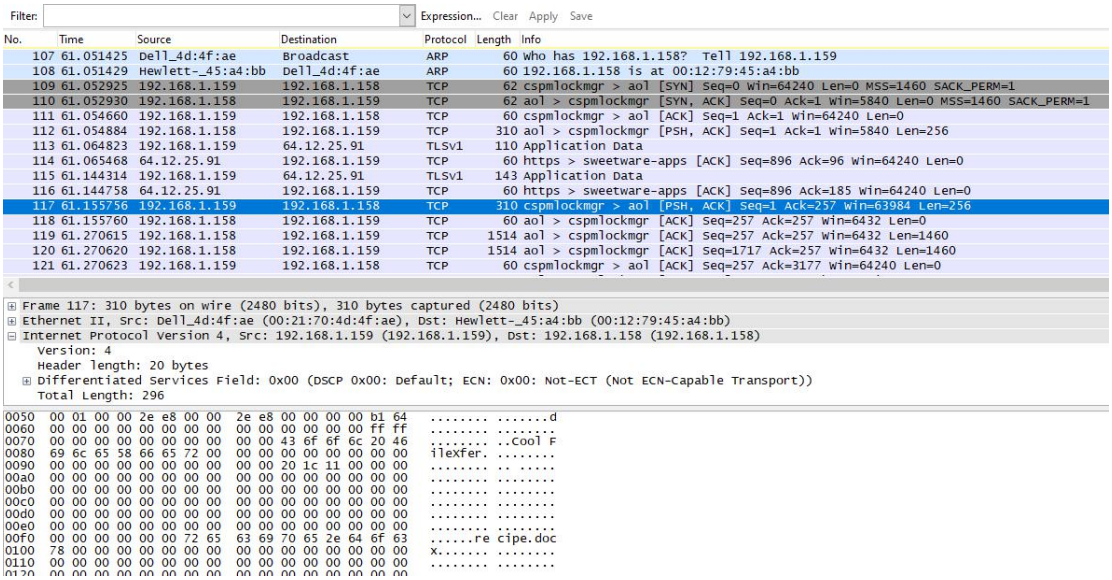


Sec558user1

2. The first comment in the captured IM conversation is

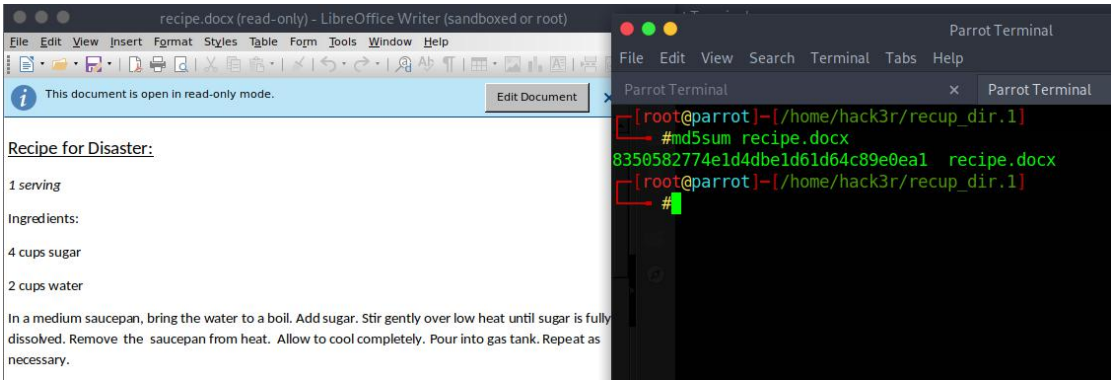


3. The name of the file that Ann transferred is



Recipe.doc

4.The MD5 sum of the file is



5. The secret recipe is

Recipe for Disaster:

1 serving

Ingredients:

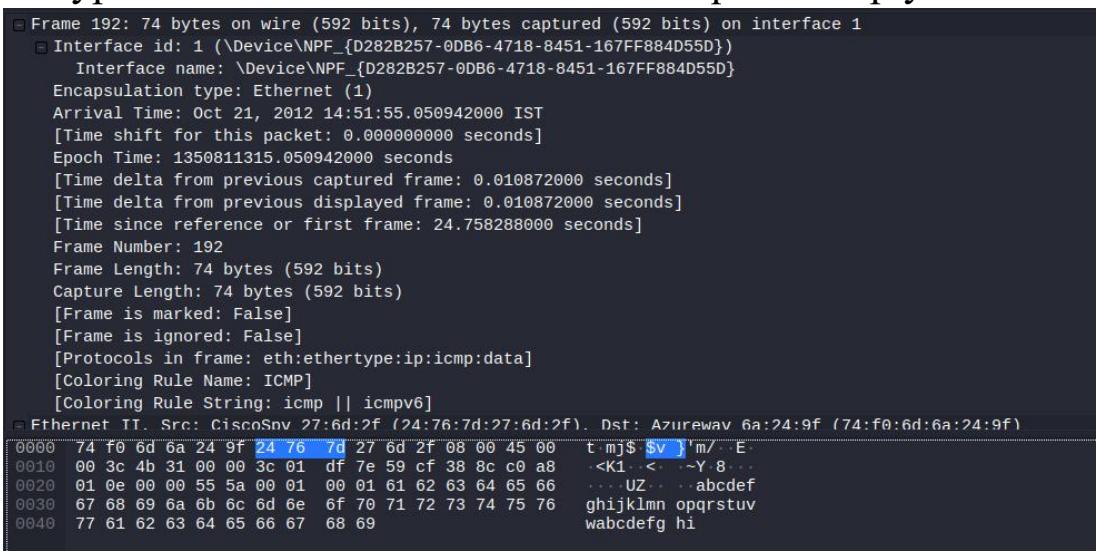
4 cups sugar

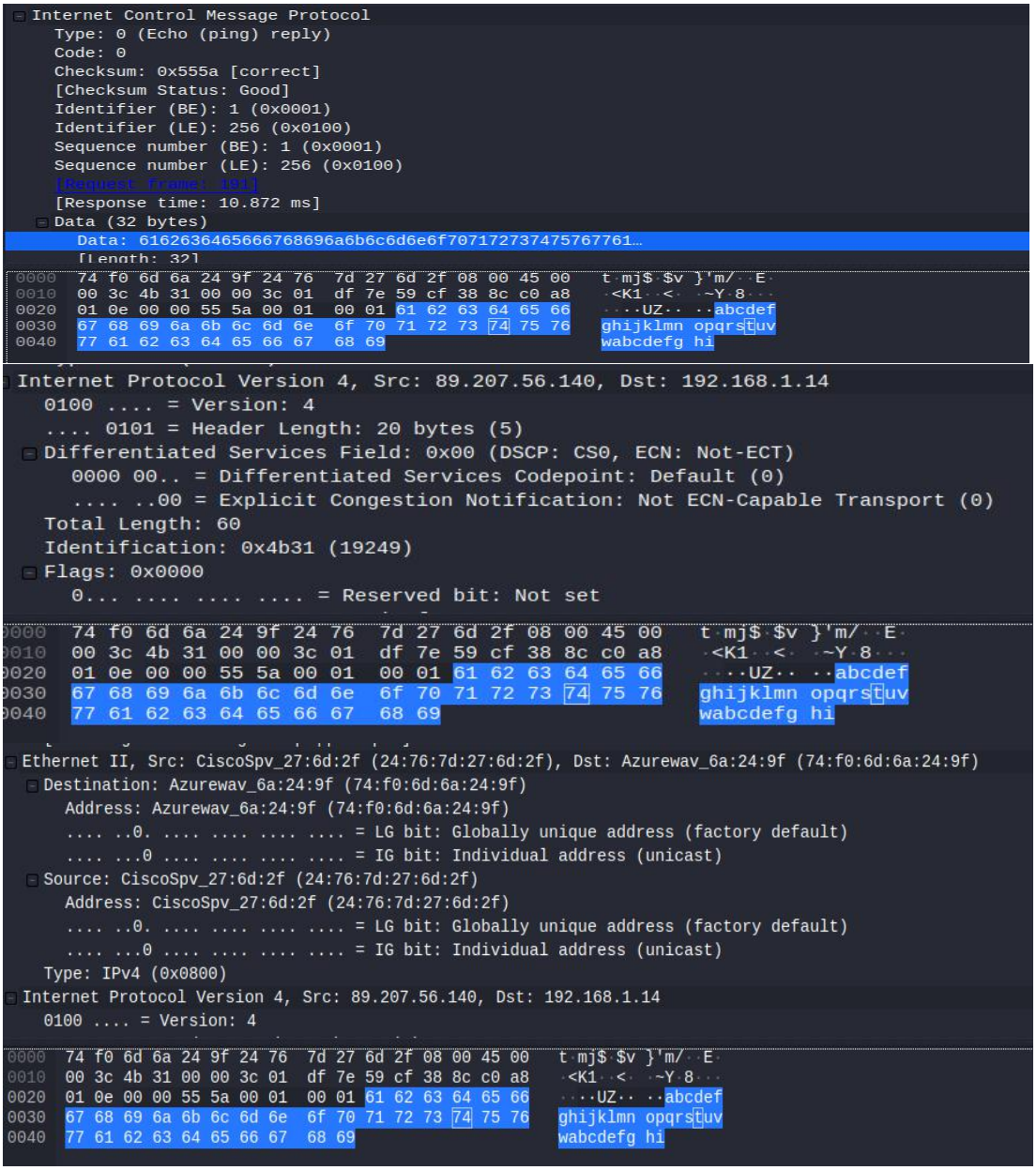
2 cups water

In a medium saucepan, bring the water to a boil. Add sugar. Stir gently over low heat until sugar is fully dissolved. Remove the saucepan from heat. Allow to cool completely. Pour into gas tank. Repeat as necessary.

Ping Pcap Solutions

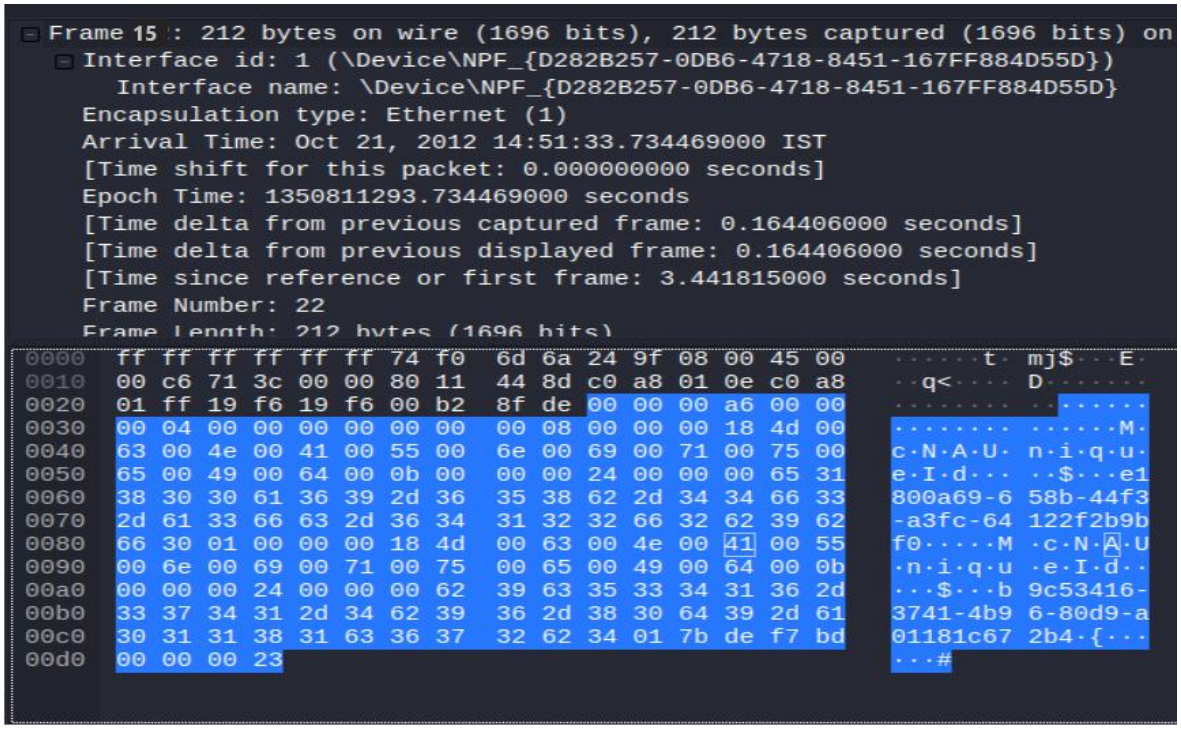
1. Type of ICMP traffic shown: Echo Request / Reply





2. Frame no. 15 Indicates something funny might be going on.

(Unprompted reply with suspicious content - SSH-2.0-OpenSSH_5.3p1 Debian-3ubuntu6...)

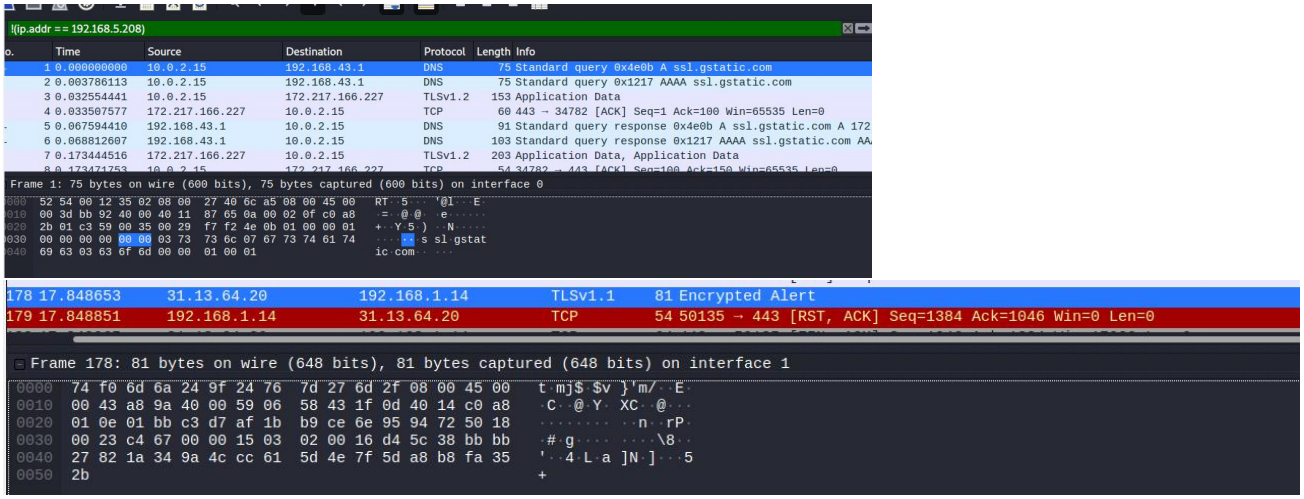


2. Application layer protocol hidden in icmp traffic ie. Payload is ssh

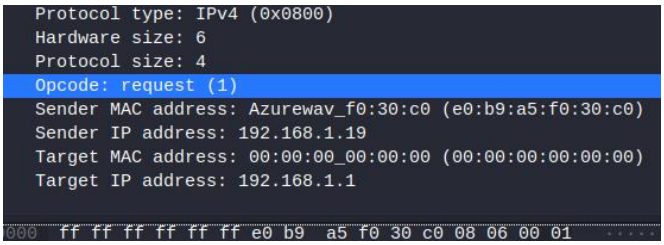
3. The tool most likely generated this traffic is ICMP Tunnel

4. True Destination IP is: 192.168.5.217

An external host accessible through 192.168.5.217



5. Session Identifier for each packet in format of 1111

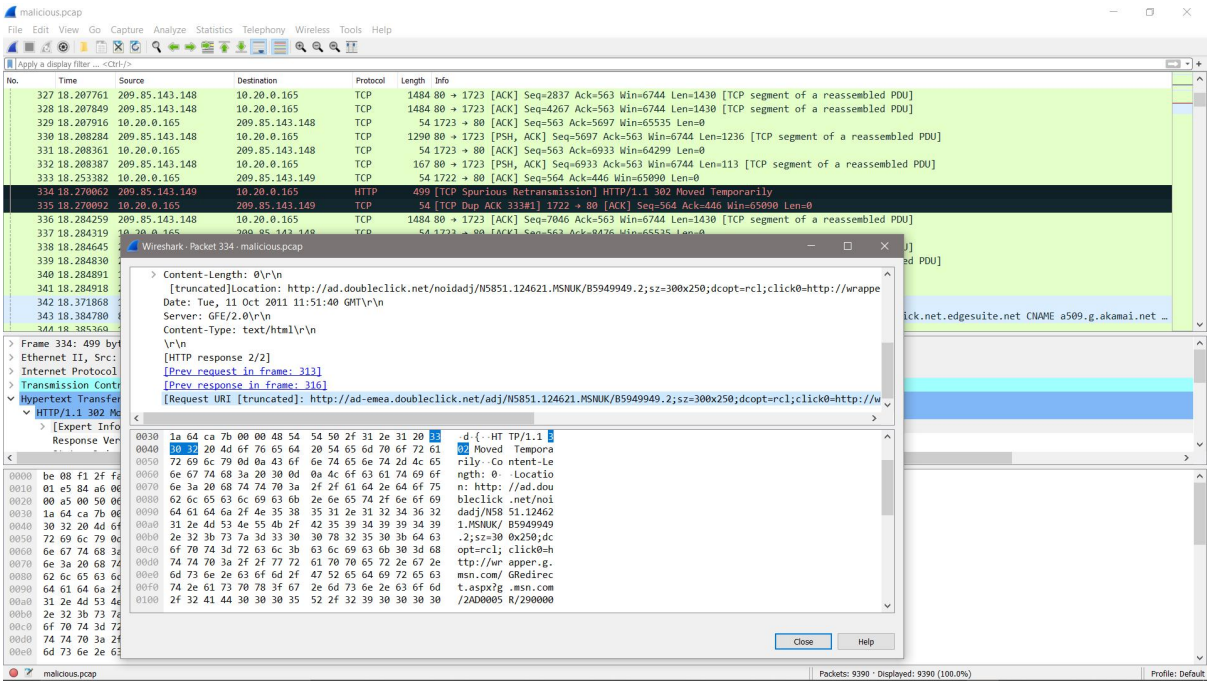


Malicious Pcap Solutions

1. The complete URI of the original web request that led to the client being compromised is,

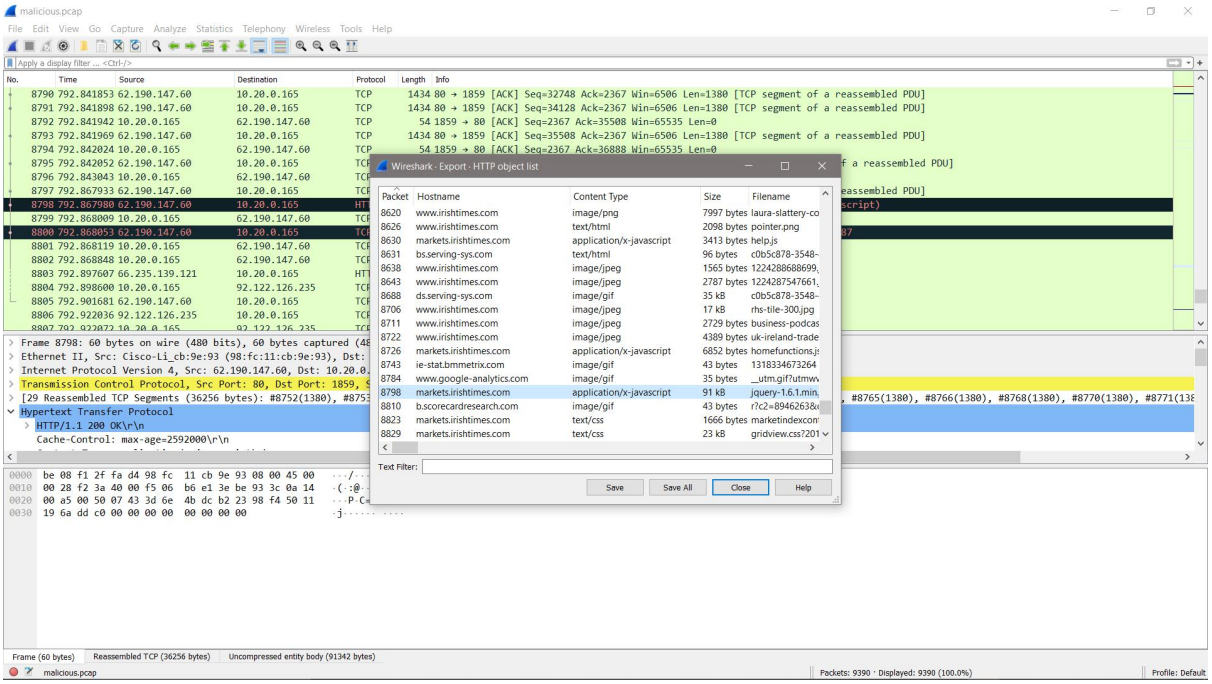
http://ad-emea.doubleclick.net/adj/N5851.124621.MSNUK/B5949949.2;sz=300x250;dcopt=rcl;click0=http://wrapper.g.msn.com/GRedirect.aspx?g.msn.com/2AD0005R/290000000000099086.1?!&&PID=9240833&UIT=G&TargetID=100008621&A]

http://10.20.0.111:8080/banking.htm



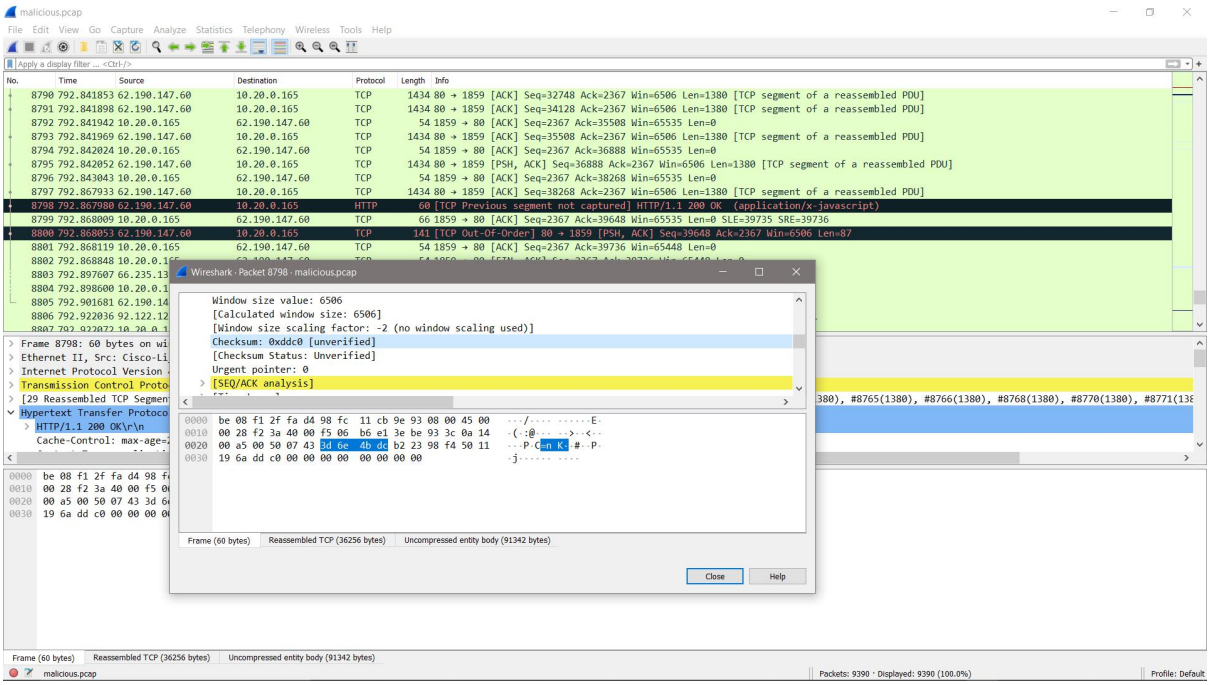
This can be found when we examine the first suspicious packet that uses Hyper Text Transfer Protocol under Hypertext Transfer Protocol tab in the Packet details pane.

2. The file type requested in the final web request from the malicious server was a gif file as we can see below,



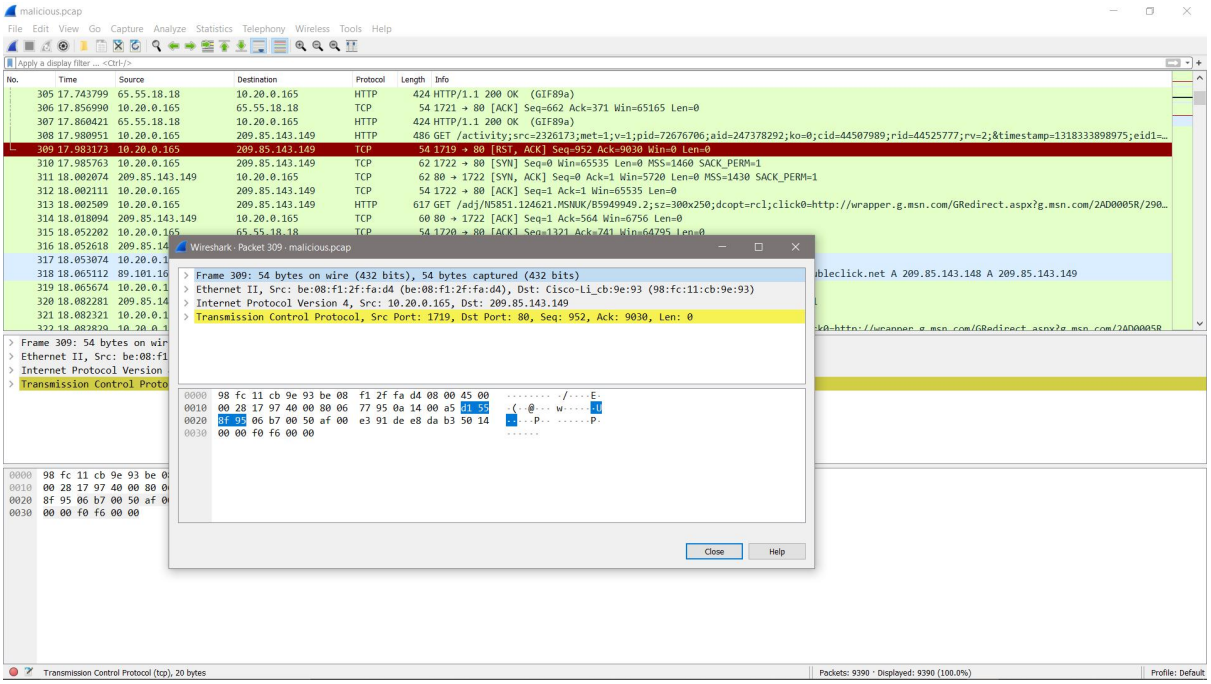
This can be found by finding out the file requested by the last frame under the HTTP object list which shows the name of the file along with the extension and other details.

3.The SHA1 Hash of the requested file to the malicious server is 0xddc0.



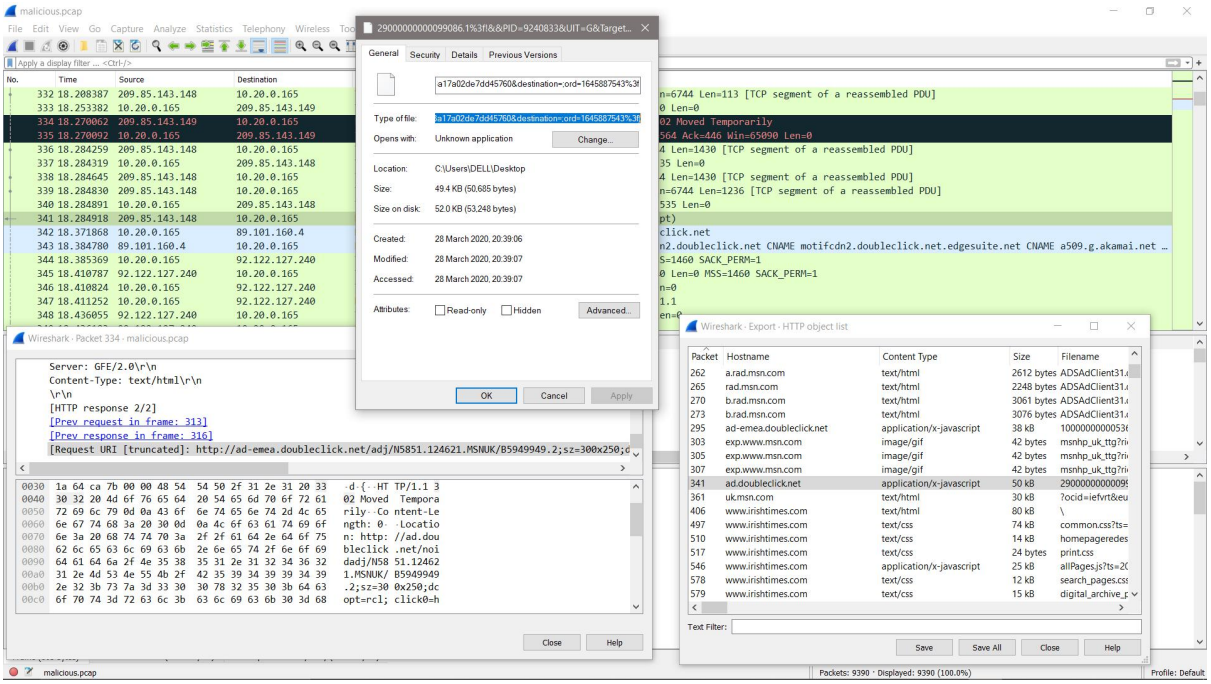
Can be found by going in the Packet details pane of the 8790th frame and checking it's checksum value.

4. The number of the first frame that indicates that the client has been attacked is 4722.



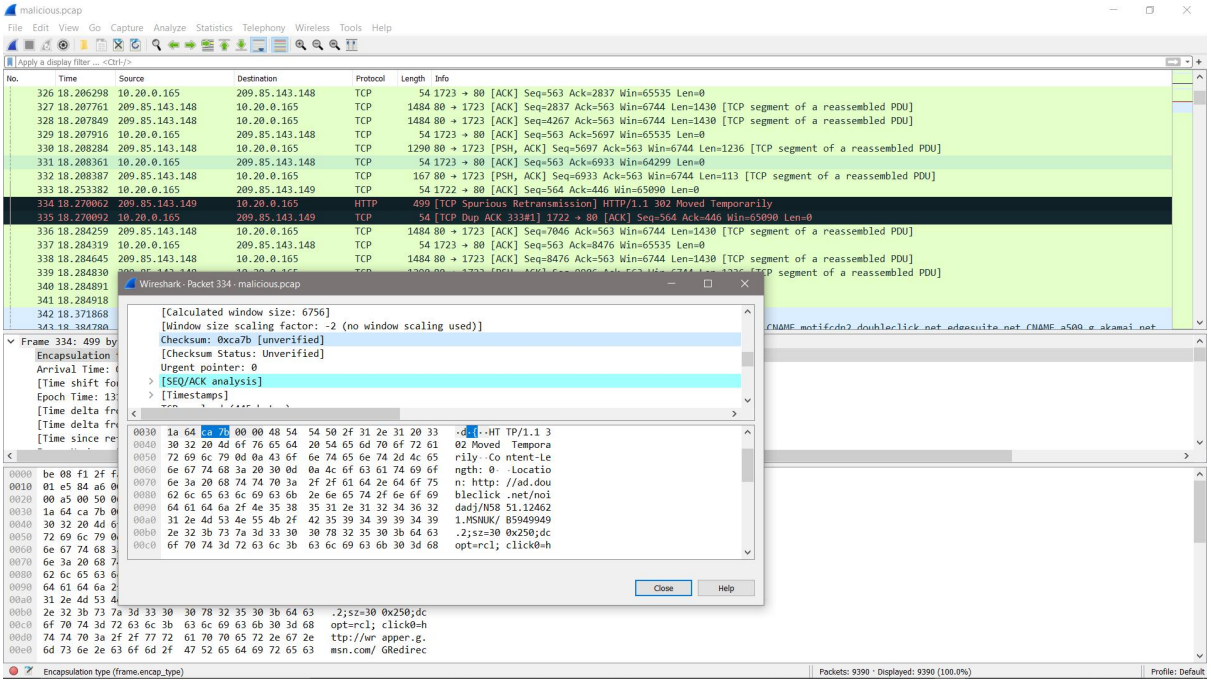
5. The file that the malicious server sends the client is a type of windows executable file.

1%3F!&&PID=9240833&UIT=G&TARGETID=100008621&AN=1645887543&PG=UK9REN&ASID=85E54A since it's extension is .1%3f!&&PID=9240833&UIT=G&TargetID=100008621&AN=1645887543&PG=UK9REN&ASID=85e54a8ea63a43e8a17a02de7dd45760&destination=;ord=1645887543%3f.



Here we can see the extension of the file as well as how it was discovered.

6. The SHA1 hash of the malicious file which we found out in the previous question is 7afc1f67e627abb4786e5596843f9d790be81a34



We can find this out by checking the checksum of the frame we received the file from.

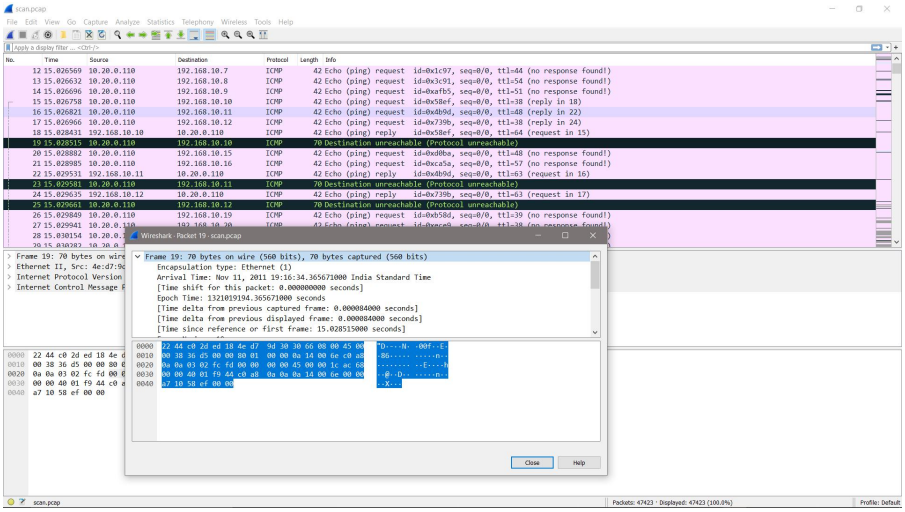
7. The Vulnerable Software here clearly was the browser application IE6 used by the client since the malicious file entered the system exploiting the vulnerability of the application.

8. This is a “Gain Privileges” vulnerability. To get the corresponding CVE security bulletin, we check what kind of vulnerability this is. Since we have established that the type of vulnerability exploited is a “Gain Privileges” vulnerability, we check the database of CVE and match the columns with the file we are analysing. Doing this, the CVE security bulletin can be CVE-2005-1790.

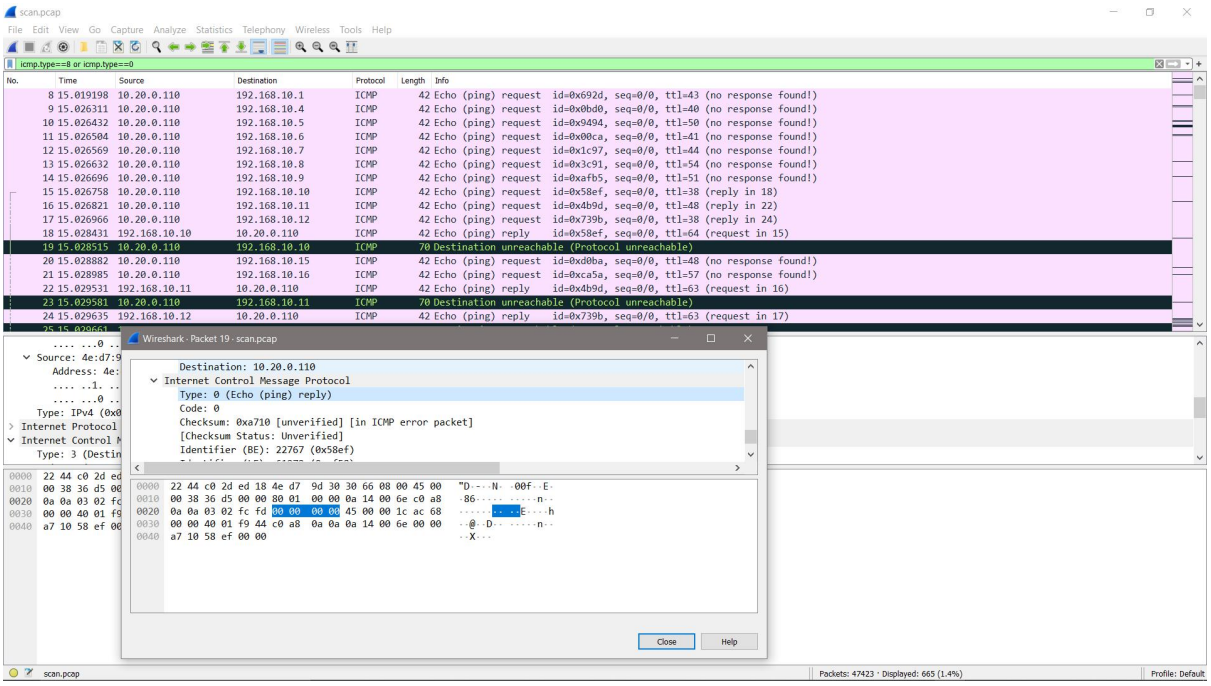
Scan Pcap Solutions

1. The tool used to generate this traffic is the “ping”.

2. The Frame which first shows unusual behaviour is Frame number 8.



3. This Frame constitutes the beginning of an ICMP Ping Sweep Attack.

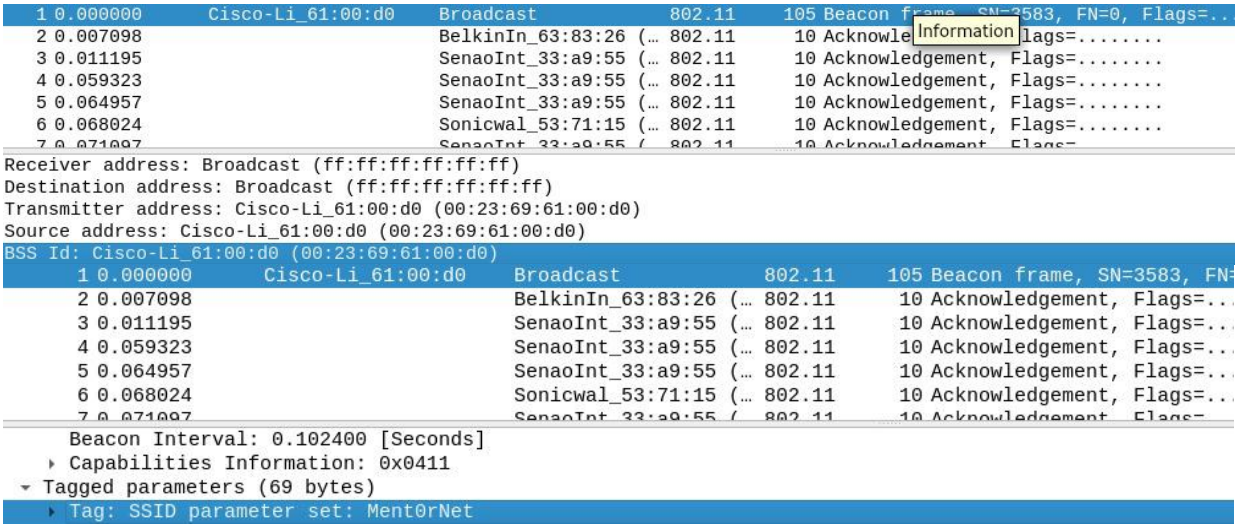


4. sU switch was removed from the command to improve the speed.

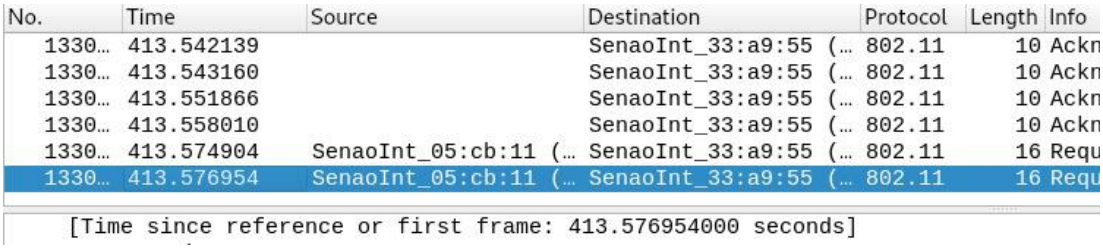
5. sS was the switch added to final scan.

Access Pcap Solutions

1. The SSID and BSSID of his access point are:
SSID: Ment0rNet
BSSID: 00:23:69:61:00:d0



2. Time for packet capture is 414s



3. 59274 WEP-encrypted data frames are there total in the packet capture
$ tshark -r evidence08.pcap -R '((wlan.fc.type_subtype == 0x20) && (wlan.fc.protected == 1)) && (wlan.bssid == 00:23:69:61:00:d0)'|wc -l

```
$ tshark -r evidence08.pcap -R 'wlan.fc.type_subtype==0x20 && wlan.fc.protected==1
&& wlan.bssid==00:23:69:61:00:d0' | wc -l
59274
```

4. 29719 unique WEP initialization vectors (IVs) are there total in the packet capture related to Joe's access point
$ tshark -r evidence08.pcap -R '(wlan.bssid == 00:23:69:61:00:d0) && wlan.wep.iv' -T fields -e wlan.wep.iv | sort -u | wc -l

5. The MAC address of the station executing the Layer 2 attacks
1c:4b:d6:69:cd:07

6. How many unique IVs were generated (relating to Joe's access point):
a) 14133 By the attacker station.
$ tshark -r evidence08.pcap -R '(wlan.bssid == 00:23:69:61:00:d0) && (wlan.sa

== 1c:4b:d6:69:cd:07) && wlan.wep.iv' -T fields -e wlan.wep.iv|sort -u|wc -l

b) 15587 By all other stations combined
$ tshark -r evidence08.pcap -R '(wlan.bssid == 00:23:69:61:00:d0) && (wlan.sa != 1c:4b:d6:69:cd:07) && wlan.wep.iv' -T fields -e wlan.wep.iv|sort -u|wc -l

7. D0:E5:9E:B9:04 was the WEP key of Joe's WAP
$ aircrack-ng -b 00:23:69:61:00:d0 evidence08.pcap

8. They administrative username and password of the targeted wireless access point
username: admin
passphrase: admin

9. The WAP administrative passphrase changed to :
passphrase: hahp0wnedJ00

EXPERIMENT-8

Email Forensics

8.A

- Mail Service Providers

A mailbox provider, mail service provider or, somewhat improperly, email service provider is a provider of email hosting. It implements email servers to send, receive, accept, and store email for other organizations or end users, on their behalf.

Some e-mail providers :

- Email protocols

POP3

POP3 stands for Post Office 3 protocol. POP simply reaches out to the mail server and brings back the mail contents. This is a simple yet standardized way which allows users to access mailboxes and quickly download messages to their device.

With POP3, users can configure the server settings. This can be used to allow mail copies to be left on the server or move all emails without leaving any copy on the server. This is usually configurable in most cases. The biggest advantage of POP3 is the low dependency over the Internet. Users can download all emails and read them at leisure even if they are accessing this offline.

The way these emails are stored in local depends on the email client. For instance, Outlook utilizes .pst, while Thunderbird uses .mbox. This is a good option in case you choose to read emails offline. Apart from this, this helps you reduce the server space by storing messages locally.

The default ports for POP3 are:

Port 110 – This is the default non-encrypted port.

Port 995 – This is the default port for secure connections.

IMAP

This stands for Internet Message Access Protocol. This again is a standard protocol for accessing emails and is a client/server protocol. Here the emails are received and held by the Internet server. Unlike POP, this does not move the emails. The biggest difference between POP3 and IMAP is the mail sync up. POP3 assumes that a user will be connected to a single device. However, IMAP is suitable for different devices simultaneously.

IMAP requires users to be constantly connected to the Internet. When a user accesses the mailbox, the user is actually connected to an external server. This is more beneficial when there are multiple users. IMAP can work over a relatively low internet connection since it only downloads email messages from the server when a user has requested to read a specific email.

The default ports for IMAP are:

Port 143 – This is the default non-encrypted port.

Port 993 – This is default port for secure connections.

SMTP

This stands for Simple Mail Transfer Protocol. This is a standard protocol for sending emails over the Internet. This is a protocol which is used by a Mail Transfer Agent to deliver emails to a recipient's email server. This is a protocol which defines mail sending and cannot be used for mail receiving.

SMTP is the most commonly used protocol for mail transfer between two servers. This requires no authentication to function, unlike POP3 and IMAP. Certain Internet Service Providers block the default port 25 of SMTP. In such cases, the mail server also provides an alternate secondary port.

The default port for SMTP are:

Port 25 – This is the default non-encrypted port.

Port 465/ 587 – This is default port for secure connections.

HTTP

This is a commonly known protocol and stands for HyperText Transfer Protocol. This is not an email specific protocol. However, HTTP is used for email access using web-based emails. Hotmail or Gmail are examples of using HTTP as an email protocol. This is used to compose and retrieve emails from a web-based account.

The default port for HTTP are:

Port 80 – This is default non-encrypted port.

Port 443 – This is default port for secure connections.

- Recovering emails

Limitations:

This will only work for emails that are removed from the "Deleted Items" folder.

Emails are only stored for 14 days after permanent deletion.

Windows: How to recover deleted mail in windows

Step 1- Open Outlook.

Step 2- Select the "Deleted Items" folder.

Step 3- Go to the "Tools >> Recover Deleted Items from server"

Step 4- Select the email(s) that you would like to recover.

Step 5- Click the "Recover Selected Items" button (the icon is an email message with an arrow).

Step 6- The email will go back to the "Deleted Items" folder it was in. (You may need to select another folder and then reselect this folder for it to appear.)

- Analyzing email header

An email consists of three vital components: the envelope, the header(s), and the body of the message. The envelope is something that an email user will never see since it is part of the internal process by which an email is routed. The body is the part that we always see as it is the actual content of the message contained in the email. The header(s), the third component of an email, is perhaps a little more difficult to explain, though it is arguably the most interesting part of an email.

Header

In an e-mail, the body (content text) is always preceded by header lines that identify particular routing information of the message, including the sender, recipient, date and subject. Some headers are mandatory, such as the FROM, TO and DATE headers. Others are optional, but very commonly used, such as SUBJECT and CC. Other headers include the sending time stamps and the receiving time stamps of all mail transfer agents that have received and sent the message. In other words, any time a message is transferred from one user to another (i.e. when it is sent or forwarded), the message is date/time stamped by a mail transfer agent (MTA) - a computer program or software agent that facilitates the transfer of email message from one computer to another. This date/time stamp, like FROM, TO, and SUBJECT, becomes one of the many headers that precede the body of an email.

To really understand what an email header is, you must see one. Here is an example of a full email header*:

Return-Path: <example_from@dc.edu>

X-SpamCatcher-Score: 1 [X]

Received: from [136.167.40.119] (HELO dc.edu)

by fe3.dc.edu (CommuniGate Pro SMTP 4.1.8)

with ESMTP-TLS id 61258719 for example_to@mail.dc.edu; Mon, 23 Aug 2004 11:40:10 -0400

Message-ID: <4129F3CA.2020509@dc.edu>

Date: Mon, 23 Aug 2005 11:40:36 -0400

From: Taylor Evans <example_from@dc.edu>

User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.1) Gecko/20020823 Netscape/7.0

X-Accept-Language: en-us, en

MIME-Version: 1.0

To: Jon Smith <example_to@mail.dc.edu>

Subject: Business Development Meeting

Content-Type: text/plain; charset=us-ascii; format=flowed

Content-Transfer-Encoding: 7bit

* email headers should always be read from bottom to top.

Fortunately, most of this information is hidden inside the email with only the most relevant or mandatory headers appearing to the user. Those headers that we most often see and recognize are bolded in the above example.

Header Characteristics

A single email header has some important characteristics, including perhaps the most important part of an email - this is the KEY:VALUE pairs contained in the header. Looking at the above, you can tell some of the KEY:VALUE pairs used. Here is a breakdown of the most commonly used and viewed headers, and their values:

- From: sender's name and email address (IP address here also, but hidden)
- To: recipient's name and email address
- Date: sent date/time of the email
- Subject: whatever text the sender entered in the Subject heading before sending

Headers Provide Routing Information

Besides the most common identifications (from, to, date, subject), email headers also provide information on the route an email takes as it is transferred from one computer to another. As mentioned earlier, mail transfer agents (MTA) facilitate email transfers. When an email is sent from one computer to another it travels through a MTA. Each time an email is sent or forwarded by the MTA, it is

stamped with a date, time and recipient. This is why some emails, if they have had several destinations, may have several RECEIVED headers: there have been multiple recipients since the origination of the email. In a way it is much like the same way the post office would route a letter: every time the letter passes through a post office on its route, or if it is forwarded on, it will receive a stamp. In this case the stamp is an email header.

When viewed in their entirety, these multiple recipient headers will look like this in an email:

Received: from tom.bath.dc.uk ([138.38.32.21] ident=yalrla9a1j69szla2ydr)

by steve.wrath.dc.uk with esmtp (Exim 3.36 #2)id 19OjC3-00064B-00

for example_to@imaps.bath.dc.uk; Sat, 07 Jun 2005 20:17:35 +0100

Received: from write.example.com ([205.206.231.26])

by tom.wrath.dc.uk with esmtp id 19OjBy-0001lb-3V

for example_to@bath.ac.uk; Sat, 07 Jun 2005 20:17:30 +0100

Received: from master.example.com (lists.example.com [205.206.231.19])

by write.example.com (Postfix) with QMQP

id F11418F2C1; Sat, 7 Jun 2005 12:34:34 -0600 (MDT)

In the example shown above, there are three Received: stamps. Reading from the bottom upwards, you can see who sent the message first, next and last, and you can see when it was done. This is because every MTA that processed the email message added a Received: line to the email's header. These Received: lines provide information on where the message originated and what stops it made (what computers) before reaching its final destination. As the example shows, these Received: lines provide the email and IP address of each sender and recipient. They also provide the date and time of each transfer. The lines also indicate if the email address was part of an email list. It is all this information that is valued by computer programmers and IT department associates when making efforts to track and stop SPAM email message. And it is this information that arguable makes headers the most important part of an email.

8.B

Case Study: Wes Mantooth Solution

1. Details regarding email categories

   Users->Wes Mantooth->AppData->Local->Microsoft->Outlook…
   Outlook.pst(converted it into pdf and got emails)

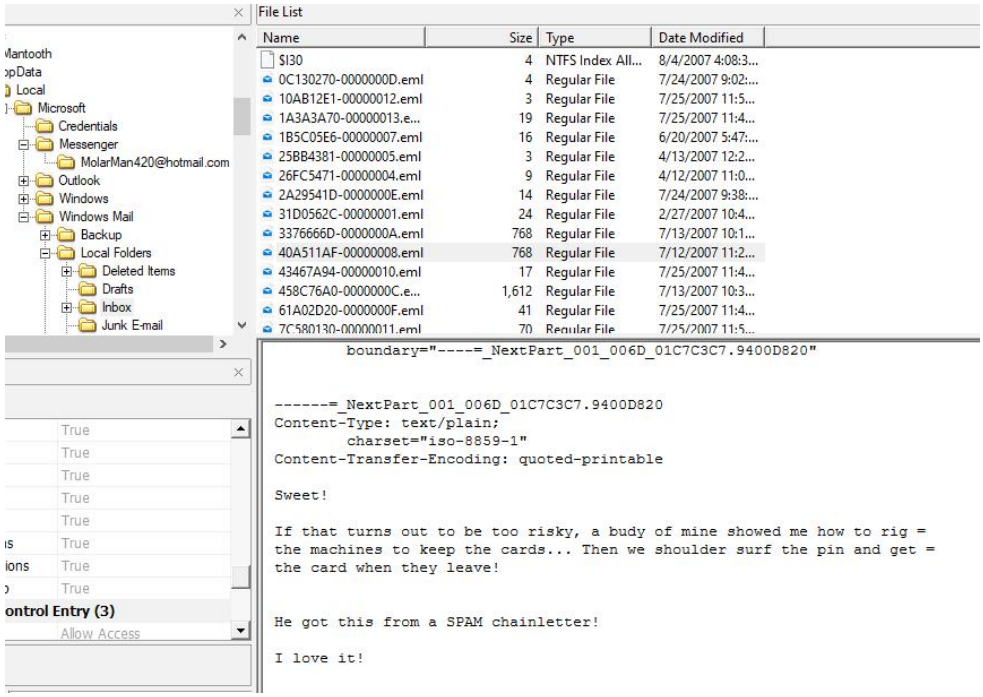
   A. John Washer and Mantooth emailed each other several times discussing about different ways to catch quick money (check washing project and selling drugs)

   B. Rasco Badguy emailed Wes Mantooth about Bujumbura Africa meeting.

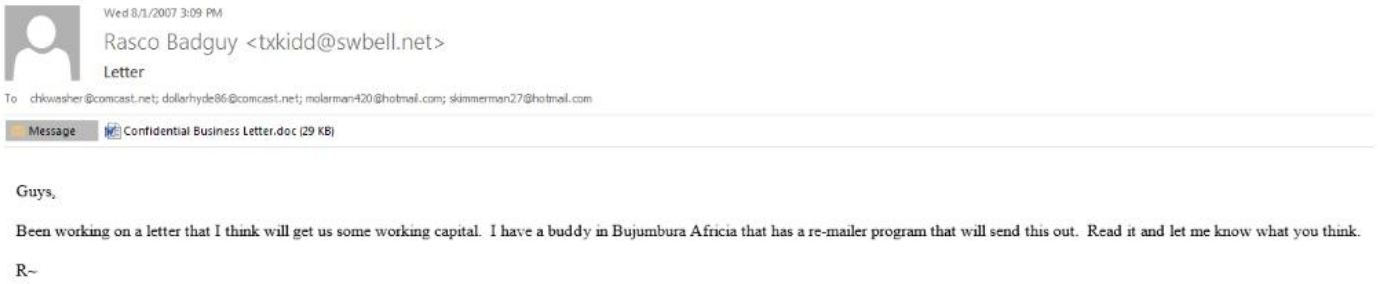
   C. Wes Mantooth also emailed about NZ's trade show.

2. Look and bookmark 10 email messages

These are the some messages found in inbox folder and to be bookmarked.



3. Email regarding Bujumbura, Africa



Wed 8/1/2007 3:09 PM
Rasco Badguy <txkidd@swbell.net>
Letter
To chkwasher@comcast.net; dollarhyde86@comcast.net; molarman420@hotmail.com; skimmerman27@hotmail.com
Message Confidential Business Letter.doc (29 KB)

Guys,

Been working on a letter that I think will get us some working capital. I have a buddy in Bujumbura Africia that has a re-mailer program that will send this out. Read it and let me know what you think.

R~

A. Email sent on Wednesday 8/1/2007 at 3.09pm

B. Parties associated with the mail were:

a. chkwasher@comcast.net - John Washer

b. Dollarhyde86@comcast.net - Wes Mantooth

c. Molarman420@hotmail.com -

d. Skimmerman27@hotmail.com - David Thomas

C. Yes, there was an attachment. It was a confidential business letter.

D. 66.196.96.95 Email server ip-address

E. Microsoft -- Outlook

4. Real names with the mail-ids associated are :

chkwasher@comcast.net - John Washer

Dollarhyde86@comcast.net - Wes Mantooth

Molarman420@hotmail.com -

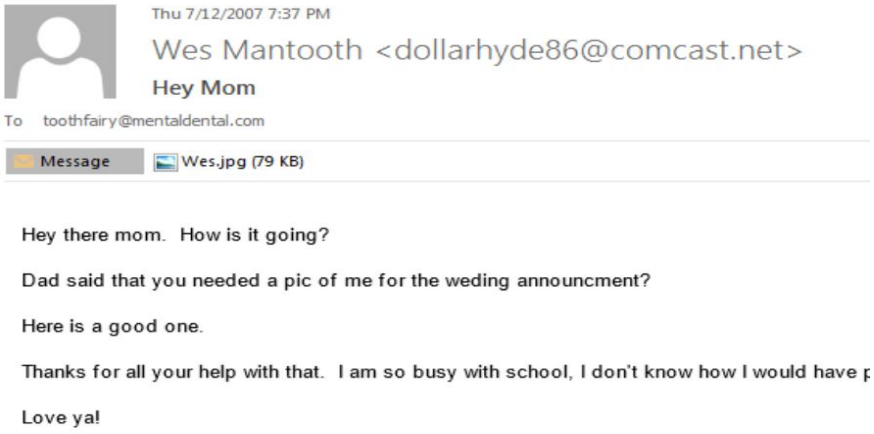
Skimmerman27@hotmail.com - David Thomas

toothfairy@mentaldental.com - Wes's Mom

txkidd@swbell.net - Rasco Badguy

Smee.rox@gmail.com - Mr Smee

5. Mom's mail sent by mantooth to his mom


Thu 7/12/2007 7:37 PM

Wes Mantooth <dollarhyde86@comcast.net>

Hey Mom

To toothfairy@mentaldental.com

Message Wes.jpg (79 KB)

Hey there mom. How is it going?

Dad said that you needed a pic of me for the weding announcment?

Here is a good one.

Thanks for all your help with that. I am so busy with school, I don't know how I would have p

Love ya!

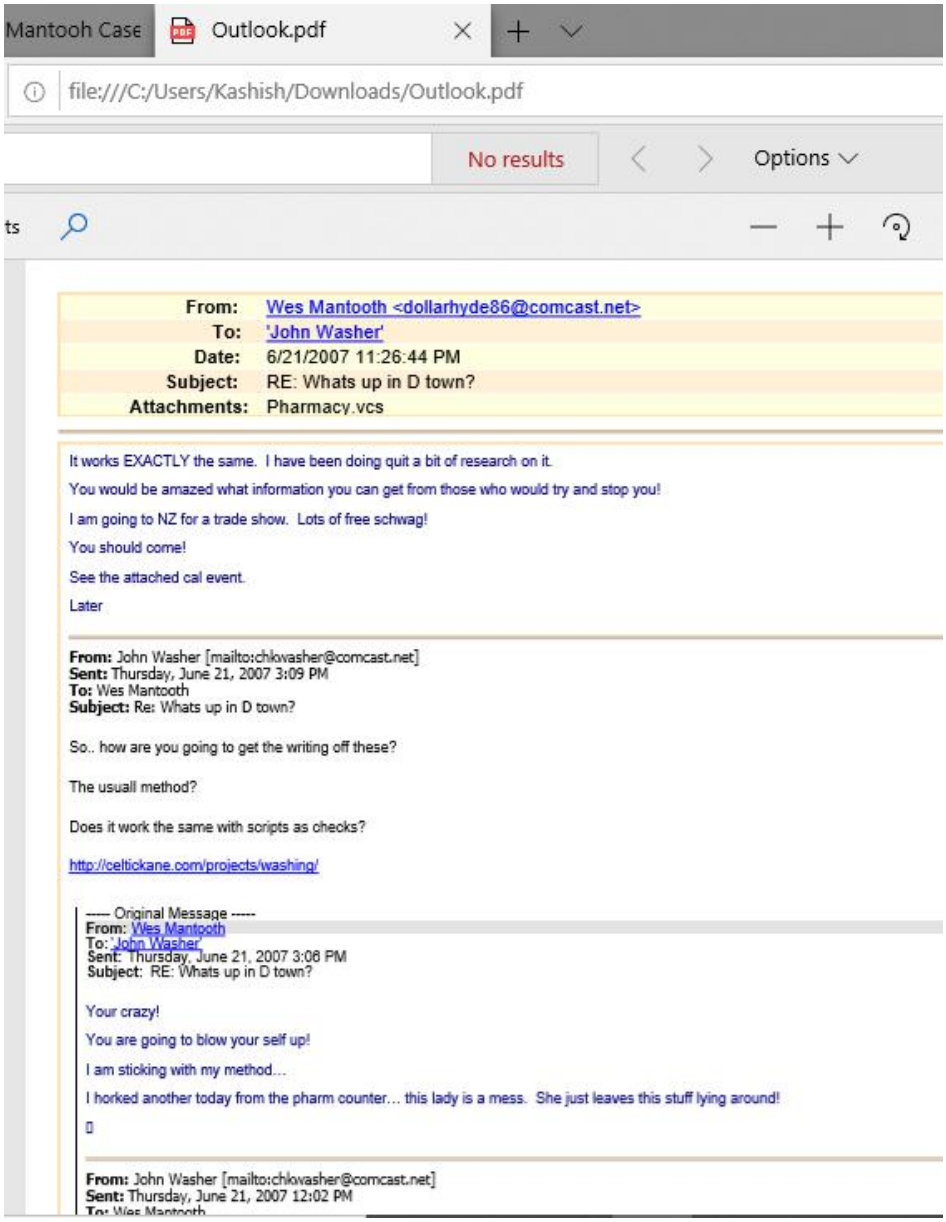
6. Regarding the wedding announcement his mother wanted to see him . A message was conveyed by his dad for sending a picture of his.

7. Joan is one of the contacts of Wes Mantooth. We can see his details in address book of Wes Mantooth. There are also his personal details of business,mobile number etc., It is mentioned that Joan is excellent source of for checks. He works in ARYBS Company.

8. Mantooth's dad was released from jail. Dear Sweetie.doc .

9. Users->Wes Mantooth->AppData->Local->Microsoft->Outlook…

Outlook.pst(converted it into pdf and got emails) one of the screenshots for example from pdf.



10. Yes,there is an email sent by David Thomas to Wes mantooth regarding ATM rigging. The name Rasco is also mentioned in the email.

11. Washer‘ s AIM username was: Washergonebad .

EXPERIMENT-9

Web Browser Forensics

9.A Browser Forensics Analysis is a separate, large area of expertise. Web browsers are used in mobile devices, tablets, netbooks, desktops, etc.

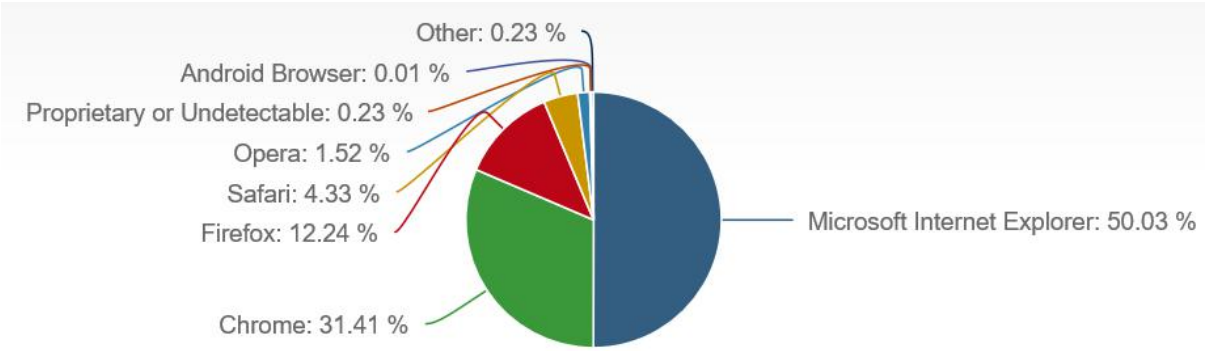
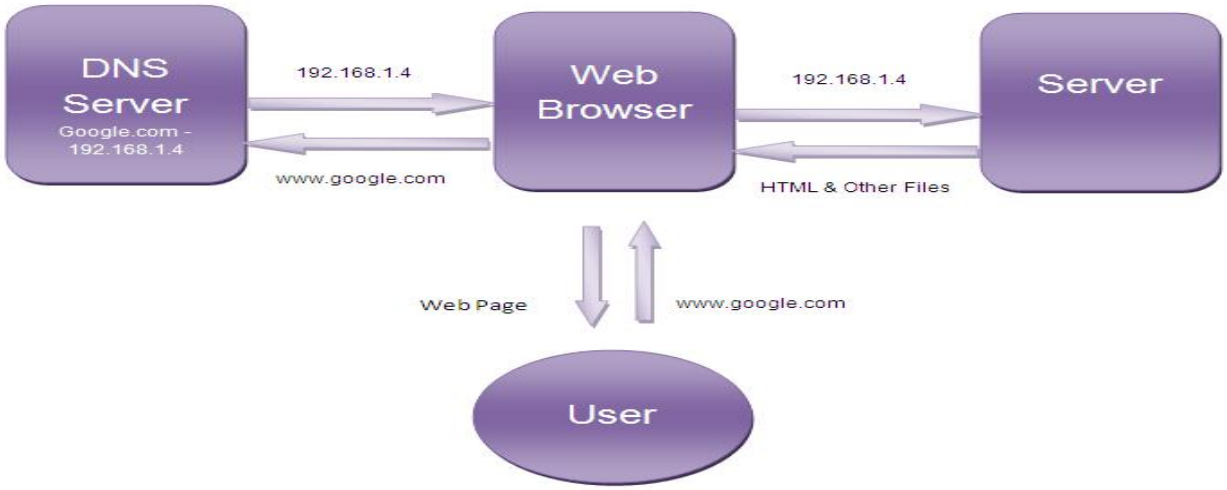


Table 2. File Location in the Web Browser Operating System

Web Browser	Operating System	File Path
Internet Explorer	Windows 95/98	C:\Temporary Internet Files\Content.ie5 C:\Cookies C:\History\History.ie5
	Windows 2000/XP	C:\Documents and Settings\%username%\Local Settings\Temporary Internet Files\Content.ie5 C:\Documents and Settings\%username%\Cookies C:\Documents and Settings\%username%\Local Settings\History\history.ie5
	Windows Vista, 7 and latest version	C:\Users\%username%\AppData\Local\Microsoft\Windows\Temporary Internet Files\ C:\Users\%username%\AppData\Local\Microsoft\Windows\Temporary Internet Files\Low\
Firefox	Linux	/home/$USER/.mozilla/firefox/$PROFILE.default/places.sqlite
	MacOS-X	/Users/$USER/Library/Application Support/Firefox/Profiles/$PROFILE.default/places.sqlite
	Windows XP	C:\Documents and Settings\%username%\Application Data\Mozilla\Firefox\Profiles\%PROFILE%.default\places.sqlite
	Windows Vista,7 and latest version	C:\Users\%USERNAME%\AppData\Roaming\Mozilla\Firefox\Profiles\%PROFILE%.default\places.sqlite
Safari	MacOS-X	/Users/$USER/Library/Safari/ /Users/$USER/Library/Caches/com.apple.Safari/
	Windows XP	C:\Documents and Settings\%username%\Application Data\Apple Computer\Safari\ C:\Documents and Settings\%username%\Local Settings\Application Data\Apple Computer\Safari\
	Windows 7	C:\Users\%username%\AppData\Roaming\Apple Computer\Safari\ C:\Users\%username%\AppData\Local\Apple Computer\Safari\
Opera	Linux	/home/$USER/.opera/
	MacOS-X	/Users/$USER/Library/Opera/
	Windows XP	C:\Documents and Settings\%username%\Application Data\Opera\Opera\
	Windows Vista, 7 and latest version	C:\Users\%username%\AppData\Roaming\Opera\Opera\
Google Chrome	Linux	/home/$USER/.config/google-chrome/Default/Preferences
	MacOS-X	/Users/$USER/Library/Application Support/Google/Chrome/Default/Preferences
	Windows XP	C:\Documents and Settings\%username%\Local Settings\Application Data\Google\Chrome\User Data\Default\Preferences
	Windows Vista, 7 and latest version	C:\Users\%username%\AppData\Local\Google\Chrome\User Data\Default\Preferences

- **Web Browser working**

A browser is a software application used to locate, retrieve and display content on the World Wide Web, including Web pages, images, video and other files. As a client/server model, the browser is the client run on a computer that contacts the Web server and requests information. The Web server sends the information back to the Web browser which displays the results on the computer or other Internet-enabled device that supports a browser.

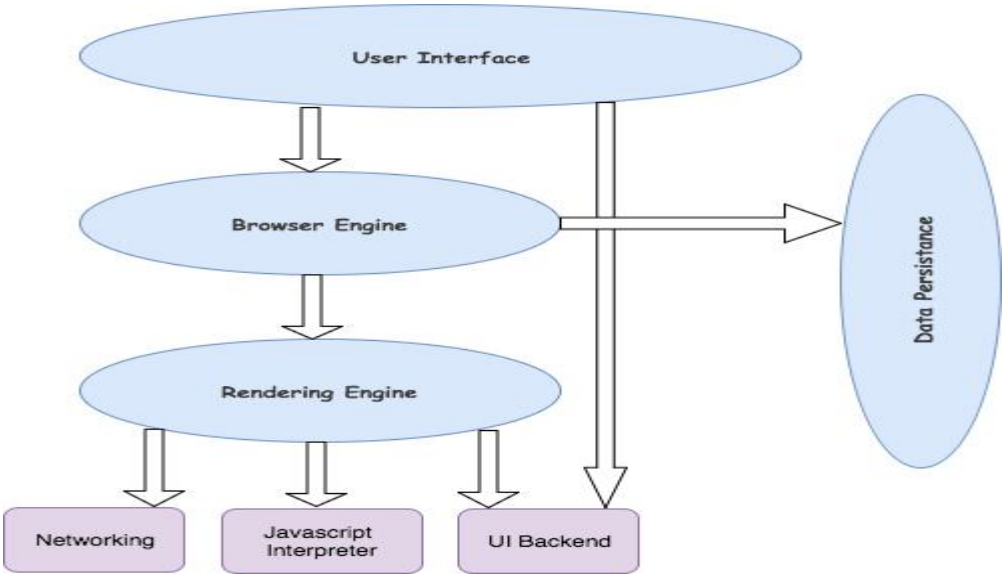


Today's browsers are fully-functional software suites that can interpret and display HTML Web pages, applications, JavaScript, AJAX and other content hosted on Web servers. Many browsers offer plug-ins which extend the capabilities of the software so it can display multimedia information (including sound and video), or the browser can be used to perform tasks such as videoconferencing, to design web pages or add anti-phishing filters and other security features to the browser.

A browser is a group of structured codes which together performs a series of tasks to display a web page on the screen. According to the tasks they perform, these codes are made as different components.

High-level architecture of browser

The below image shows the main components of a web browser:



Main components of the browser

1. **The User Interface**: The user interface is the space where User interacts with the browser. It includes the address bar, back and next buttons, home button, refresh and stop, bookmark option, etc. Every other part, except the window where requested web page is displayed, comes under it.

2. **The Browser Engine**: The browser engine works as a bridge between the User interface and the rendering engine. According to the inputs from various user interfaces, it queries and manipulates the rendering engine.

3. **The Rendering Engine**: The rendering engine, as the name suggests is responsible for rendering the requested web page on the browser screen. The rendering engine interprets the HTML, XML documents and images that are formatted using CSS and generates the layout that is displayed in the User Interface. However, using plugins or extensions, it can display other types data also. Different browsers user different rendering engines:
   * Internet Explorer: Trident
   * Firefox & other Mozilla browsers: Gecko
   * Chrome & Opera 15+: Blink
   * Chrome (iPhone) & Safari: Webkit

4. **Networking**: Component of the browser which retrieves the URLs using the common internet protocols of HTTP or FTP. The networking component

handles all aspects of Internet communication and security. The network component may implement a cache of retrieved documents in order to reduce network traffic.

5. **JavaScript Interpreter:** It is the component of the browser which interprets and executes the javascript code embedded in a website. The interpreted results are sent to the rendering engine for display. If the script is external then first the resource is fetched from the network. Parser keeps on hold until the script is executed.

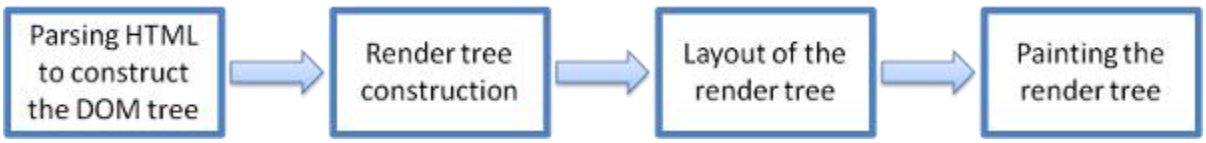
6. **UI Backend**: UI backend is used for drawing basic widgets like combo boxes and windows. This backend exposes a generic interface that is not platform specific. It underneath uses operating system user interface methods.

7. **Data Persistence/Storage:** This is a persistence layer. Browsers support storage mechanisms such as localStorage, IndexedDB, WebSQL and FileSystem. It is a small database created on the local drive of the computer where the browser is installed. It manages user data such as cache, cookies, bookmarks and preferences.

An important thing to note here is that in web browsers such as Google Chrome each tab runs in a separate process(multiple instances of rendering engine).

Rendering engine

The networking layer will start sending the contents of the requested documents to the rendering engine in chunks of 8KBs.



Rendering engine basic flow

The rendering engine parses the chunks of HTML document and convert the elements to DOM nodes in a tree called the "**content tree**" or the "**DOM tree**". It also parses both the external CSS files as well in style elements.

While the DOM tree is being constructed, the browser constructs another tree, the **render tree**. This tree is of visual elements in the order in which they will be

displayed. It is the visual representation of the document. The purpose of this tree is to enable painting the contents in their correct order. Firefox calls the elements in the render tree "frames". WebKit uses the term renderer or render object.

After the construction of the render tree, it goes through a "**layout process**" of the render tree. When the renderer is created and added to the tree, it does not have a position and size. The process of calculating these values is called layout or reflow. This means giving each node the exact coordinates where it should appear on the screen. The position of the root renderer is 0,0 and its dimensions are the viewport–the visible part of the browser window. All renderers have a "layout" or "reflow" method, each renderer invokes the layout method of its children that need layout.

The next stage is **painting**. In the painting stage, the render tree is traversed and the renderer's "paint()" method is called to display content on the screen. Painting uses the UI backend layer.

The rendering engine always tries to display the contents on the screen as soon as possible for better user experience. It does not wait for the HTML parsing to complete before starting to build and layout the render tree. It parses and displays the content it has received from the network, while rest of the contents stills keeps coming from the network.

- **Forensics activities on browser**

Encryption of data

Part of the data in web browsers is encrypted (for example, passwords to websites). Internet Explorer on Microsoft EDGE uses the Data Protection Application Programming Interface. The DPAPI mechanism appeared in Windows 2000 and is used to protect stored passwords and confidential information on the computer. This mechanism includes the functions of encryption and decryption of data and RAM.

You need a user password to decrypt the encrypted data. If the password is logged into your account using the login and the password, the operating system uses the hash of the password to decrypt the encrypted data.

As a rule, data encryption is carried out using the SHA1 algorithm, however, in some cases, the data is encrypted using a less crypto-resistant algorithm.

Difficulties of web browsers forensic analysis

An examiner can have the following difficulties when analyzing web browsers:

- Many browsers, lots of data
- Different data
- Encryption used to protect user data
- User's use of Private mode (or Incognito mode), in which the examined computer does not have web browser artifacts.

Web browser forensic artifacts

Of course, each web browser leaves its own individual artifacts in the operating system. Types of artifacts from the web browser can vary depending on the version of the web browser. Typically, when researching artifacts of web browsers, you can extract the following types of artifacts:

- History
- Cache
- Cookies
- Typed URLs
- Sessions
- Most visited sites
- Screenshots
- Financial info
- Form values (Searches, Autofill)
- Downloaded files (Downloads)
- Favorites

Tools for Analysis:

Commonly WEFA, NetAnalaysis, Browser History Examiner, FTK and Encase are software used for analyzing web browsers in digital forensics examinations. In this chapter features of specified web browser analyze tools are demonstrated [7].

1. IEF (Internet Evidence Finder)

IEF is a software with license fee produced by Magnet forensics company. Personal computers are used in the process of examinations of smart phones and tablets by experts. With its different models, it presents the characteristics like examining internet TV series, analysis of traces obtained from mobile applications. It is used on Windows and MacOs operating systems.

2. WEFA

WEFA is a free web browser analyze tool. It runs on Windows NT and later versions. Supports Internet Explorer(~11),Mozilla Firefox, Apple Safari, Opera, Chromium, Google Chrome, Google Chrome Canary, Comodo Dragon, CoolNovo(ChromePlus), Swing browsers. For these browsers WEFA offers various methods to perform analysis from an active system or an image disk. These methods include gathering the web browser's cache, cookies, internet history, download history, session data, temporary internet files, and the timesheet data information. The obtained data can be displayed in timeline view, HTML view or URL parameters view Searches can be made in obtained data by date, key word or regular expressions. Also deleted data can be recovered, index.dat file can be analyzing in detail and classification and analysis of user behaviors can be made. CSV formatted reports can be generated according to these data.

3. NetAnalysis

NetAnalysis is a licensed tool developed by Digital Detective company for digital examining of web browsers. And supports Microsoft Internet Explorer, Mozilla Firefox, Google Chrome, Apple Safari and Opera bowsers. It allows the examination of Internet history, cache, cookies and other components. And it has an effective reporting feature that allows quickly gathering evidence according to user behavior. Also this software has effective analytical tools for decoding and understanding data. At the same time, it has ability to use SQL queries to identify related evidence. Also it can be used to recover deleted web browser components

4. Browser History Examiner

Browser History Examiner is a licensed tool developed by Foxton Forensics Company and it extracts and analyzes web history It supports Chrome, Firefox, Internet Explorer and Edge web browsers. And it can analyze a lot of data type as downloads, cache data and visited URL files. Internet activities in a specific timeline can be traced with web site timeline feature. Data can be analyzed by using various filters like key word list and time-date range with advanced filtering feature. Image files saved in the browser cache can be easily shown in thumbnail galleries with cache image viewer feature. Web sites stored in browser cache can be reconstructed and analyzed with cache web page viewer feature. Different time zone conversions can be performed with Time Zone and DST Configuration feature. And all obtained data from these features are reported.

5. FTK

FTK is one of the tools developed to analyze systems entirely. It enables to analyze web browser data with its features. Web browser history is virtualized in detail. Internet Explorer, Firefox, Chrome, Safari and Opera browsers are supported. Also, deleted web browser data can be recovered by FTK. This software also has a feature to report analysis results.

6. Encase

Encase system is an analysis tool developed to examine systems entirely. It enables to examine web browser data with its features. With the help of a simple script, all browser history, cookies and cache files are copied into a file by using 3rd party software. Internet explorer, Firefox, Chrome / Chromium, Opera and Safari are supported in Windows, UNIX and Mac operating systems. Also it enables to recover deleted internet components. Obtained data can be analyzed by filtering according to key word and time parameters.

WEFA, NetAnalysis and History Examiner are developed especially for performing digital analysis of web browsers. But, FTK and EnCase applications are developed to examine files and systems. This software also has features as analyzing web history and holistic analysis.

4. Conclusion

Web browser analysis is one of the most important processes in digital forensics. Most of the crimes committed through computer systems is performed via a web browsers and a lot of crimes are revealed by this analysis. Digital forensics experts must know how web browsers save data in different operating systems to be able to collect evidence from web browsers. Obtaining search history of the suspect, search words, visited URLs, download history and cache data is very important for gathering evidence. Information which obtained from user files reveals whether the offense occurred or not. Therefore, experts must analyze browser data correctly.

In this paper it is shown how most commonly used web browsers store data, what information can be recover or analyze and how different operating systems store records. Besides, applications which can be used by experts who perform analysis in this field, are introduced. Thus, it is put forward which data will be obtained and analyzed by expert in this field.

- **Cache / Cookies analysis**

- ***Cookies***

Cookies are text files used to give feedback from the user to the server. When performing some actions with a web resource (viewing web links,

downloading files, etc.), these actions are registered in a cookie that is secretly sent by the server to the user's computer. With this web resource, the server has the ability to find out what actions the user has taken on previous visits to this web resource.
\Users\%userprofile%\AppData\Roaming\Mozilla\Firefox\Profiles\xxxxxxx x.default\cookies.sqlite (Firefox, Windows)
\Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Cookies.db (Google Chrome, Windows)

\Windows\Cookies\ (Windows 98) (Internet Explorer)
\Documents and Settings\Administrator\Cookies (Windows 2000, Windows XP) (Internet Explorer)
\Users\%userprofile%\AppData\Roaming\Microsoft\Windows\Cookies (Windows 7) (Internet Explorer)
\Users\Default\AppData\Roaming\Microsoft\Windows\Cookies (Windows 7) (Internet Explorer)

- ***Cache***

Users\%userprofile%\AppData\Roaming\Mozilla\Firefox\Profiles\xxxxxxx x.default\cache2\entries Firefox (Windows)
\Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Cache\ (Google Chrome, Windows)
\Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\GPUCache\ (Google Chrome, Windows)
\Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Media Cache\ (Google Chrome, Windows)
\Users\%userprofile%\AppData\Roaming\Opera Software\Opera Stable\ShaderCache\GPUCache\data_3 (Opera, Windows)

- **Last Internet activity**

Some important paths in internet activities :

- ***Searches***
  \Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Web Data (Google Chrome, Windows)
- ***Most Visited sites***
  \Users\%userprofile%\Library\Safari\TopSites.plist (Safari, MacOS)
- ***Last Session***
  \Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Last Session (Google Chrome, Windows)
  \Users\%userprofile%\AppData\Roaming\Opera Software\Opera Stable\Last Session (Opera, Windows)
  \Users\%userprofile%\Library\Safari\LastSession.plist (Safari, MacOS)

- ***Last Tabs***
  \Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Last Tabs (Google Chrome, Windows)
  \Users\%userprofile%\AppData\Roaming\Opera Software\Opera Stable\Last Tabs (Opera, Windows)
- ***Current Tabs***
  \Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Current Tabs (Google Chrome, Windows)
  \Users\%userprofile%\AppData\Roaming\Opera Software\Opera Stable\Current Tabs (Opera, Windows
- ***Current Session***
  \Users\%userprofile%\AppData\Local\Google\Chrome\User Data\Default\Current Session (Google Chrome, Windows)
- ***Session***

\Users\%userprofile%\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\MicrosoftEdge\User\Default\Recovery\Active\{07677C23-6987-4777- B133-5AC24BD039F5}.dat (Microsoft EDGE, Windows)

\Users\%userprofile%\AppData\Roaming\Opera Software\Opera Stable\Current Session (Opera, Windows)

- ***Session Recovery***

\Users\%userprofile%\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\MicrosoftEdge\User\Default\Recovery\Active\{A7D7A4FC-7458-11E6- 9BCD-000C29566E3E}.dat (Microsoft EDGE, Windows)

\Users\%userprofile%\AppData\Roaming\Mozilla\Firefox\Profiles\xxxxxxx x.defaul t\sessionstore.js

(Firefox, Windows)

9.B

Case Study : Granny Clampet Solution

1. All the registry files are exported from the evidence provided.

2.

url1	REG_SZ	http://www.google.com/
url2	REG_SZ	http://www.live.com/
url3	REG_SZ	http://www.yahoo.com/
url4	REG_SZ	http://www.dogpile.com/
url5	REG_SZ	http://www.microsoft.com/isapi/redir.dll?prd=ie&p...

NTUSER.DAT[3548].tmp\Software\Microsoft\Internet Explorer\TypedURLs

3. What was Granny's Internet Explorer home page?

http://www.dogpile.com/
NTUSER.DAT[3548].tmp\Software\Microsoft\Internet Explorer\Main

4.

A. What printer was Granny using?
SnagIt 7
NTUSER.DAT[3548].tmp\Printers

B. What was Buddy's default printer?
SnagIt 7
NTUSER.DAT[2269].tmp\Printers

C. What was Jethro's default printer?
Microsoft Office Document Image Writer
NTUSER.DAT[2242].tmp\Printers

5. What was the last location that Granny downloaded something from using Internet Explorer?

Save Directory	REG_SZ	C:\Documents and Settings\Granny\My Documents\

NTUSER.DAT[3548].tmp\Software\Microsoft\Internet Explorer\Main

6. Generate a report based on Granny's NTUSER.DAT file

Registry Information

Registry Viewer Report

Granny's NTUSER.DAT file

Software\Microsoft\Internet Explorer\TypedURLs

Last Written Time 7/3/2009 22:34:22 UTC

Name	Type	Data
url1	REG_SZ	http://www.google.com/
url2	REG_SZ	http://www.live.com/
url3	REG_SZ	http://www.yahoo.com/
url4	REG_SZ	http://www.dogpile.com/
url5	REG_SZ	http://www.microsoft.com/isapi/redir.dll?prd=ie&pver=6&ar=msnhome

Software\Microsoft\Windows\CurrentVersion\Explorer\RecentDocs

7. Jethro email account

   smurferator@gmail.com
   NTUSER.DAT[2242].tmp\Software\Microsoft\Protected Storage System Provider\S-1-5-21-1409082233-2049760794-839522115-1003\Internet Explorer\Internet Explorer\email:StringData

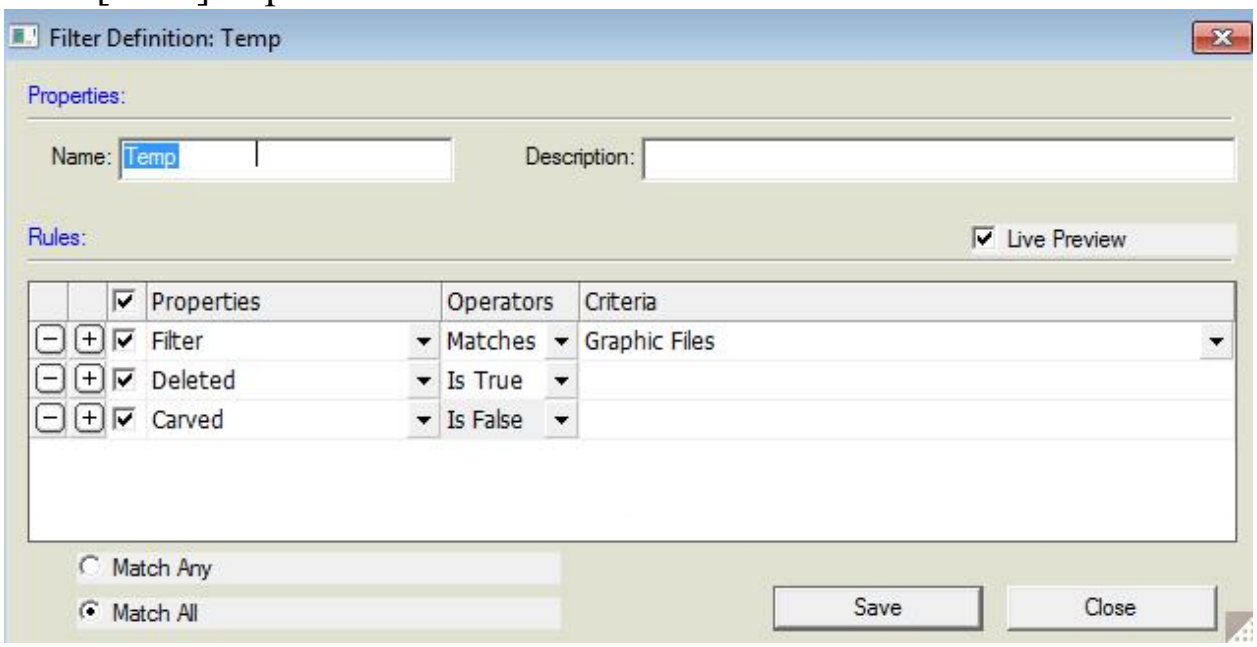
8. A. Who is the registered owner and what is the registered organization?

   Jed, Clampett Industries
   software[2314].tmp\Microsoft\Windows NT\CurrentVersion

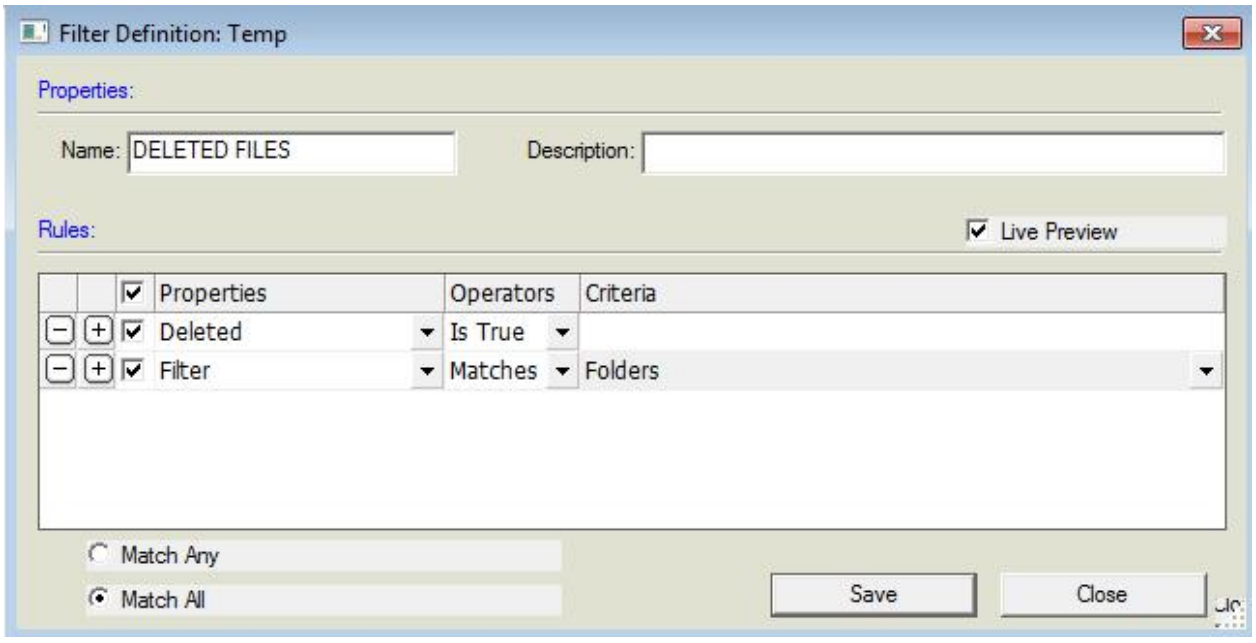
   B. Portable devices

system[2310].tmp\ControlSet001\Enum\USBSTOR

C. Document when Granny last logged on to this machine.
7/3/2009 23:10:23 UTC
SAM[2320].tmp\SAM\Domains\Account\Users\000003EE



9 folders



Four Folders

D. Generate a Report based on the System File.

Registry Viewer Report

Registry Information

Granny's NTUSER.DAT file

Software\Microsoft\Internet Explorer\TypedURLs

Last Written Time	7/3/2009 22:34:22 UTC

Name	Type	Data
url1	REG_SZ	http://www.google.com/
url2	REG_SZ	http://www.live.com/
url3	REG_SZ	http://www.yahoo.com/
url4	REG_SZ	http://www.dogpile.com/
url5	REG_SZ	http://www.microsoft.com/isapi/redir.dll?prd=ie&pver=6&ar=msnhome

Software\Microsoft\Windows\CurrentVersion\Explorer\RecentDocs

Last Written Time	7/3/2009 23:31:27 UTC

Name	Type	Data
MRUListEx	REG_BINARY	MRU ordered list : 27, 26, 25, 24, 0, 23, 22, 16, 17, 21, 20, 1, 2, 19, 18, 15, 10, 14, 13, 12, 11, 9, 8, 7, 6, 5, 4, 3
27	REG_BINARY	Shortcut Target Name : Customers.xls Shortcut Name (ASCII) : Customers.lnk Shortcut Name (Unicode) : Customers.lnk
26	REG_BINARY	Shortcut Target Name : New Microsoft Excel Worksheet.xls Shortcut Name (ASCII) : New Microsoft Excel Worksheet.lnk Shortcut Name (Unicode) : New Microsoft Excel Worksheet.lnk
25	REG_BINARY	Shortcut Target Name : Apology number 2.doc Shortcut Name (ASCII) : Apology number 2.lnk Shortcut Name (Unicode) : Apology number 2.lnk
24	REG_BINARY	Shortcut Target Name : Apology.doc Shortcut Name (ASCII) : Apology.lnk Shortcut Name (Unicode) : Apology.lnk
0	REG_BINARY	Shortcut Target Name : Thank You Letter.doc Shortcut Name (ASCII) : Thank You Letter.lnk Shortcut Name (Unicode) : Thank You Letter.lnk

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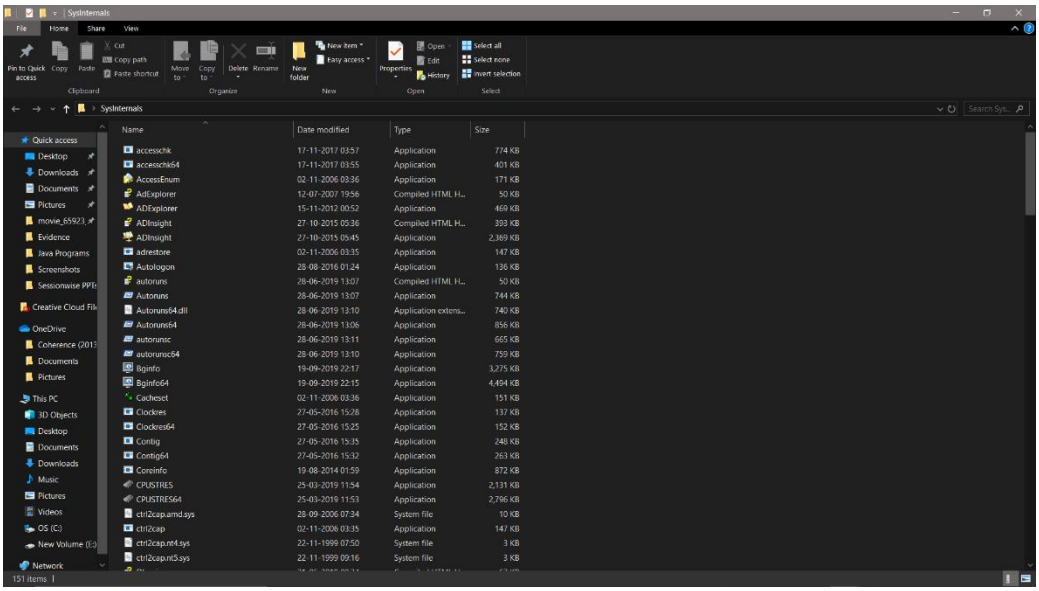
EXPERIMENT-10

Using Sisinternals tools for Network Tracking and Process Monitoring

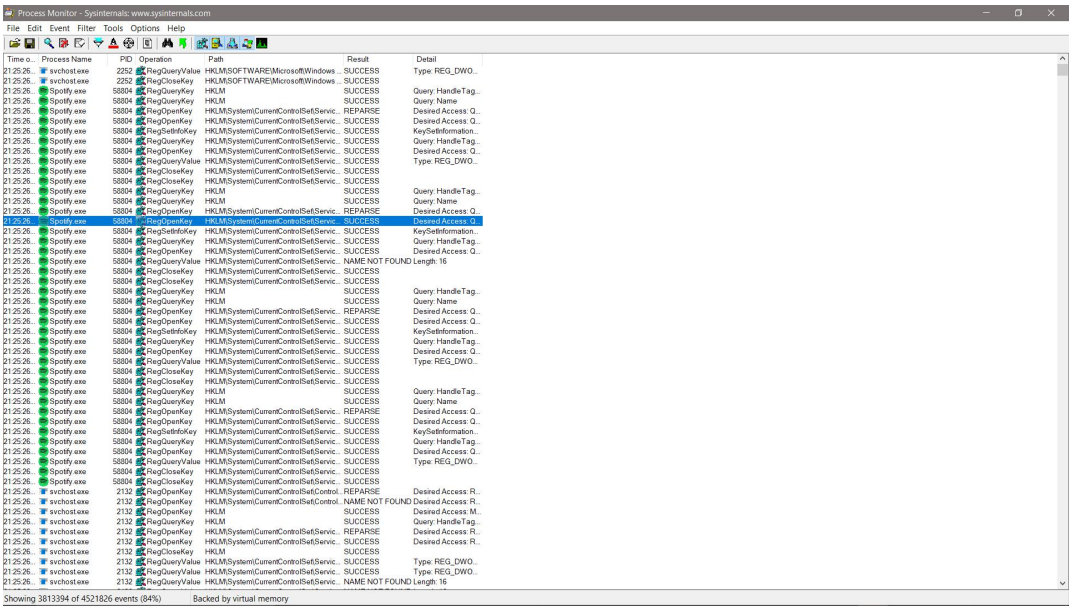
To download the SysInternals tools we can go to Microsoft's official site to download the SysInternals Suite package which contains all of the SysInternals tools.



In the above picture we can see some of the various variety of tools we are provided with in the SysInternals Suite package.

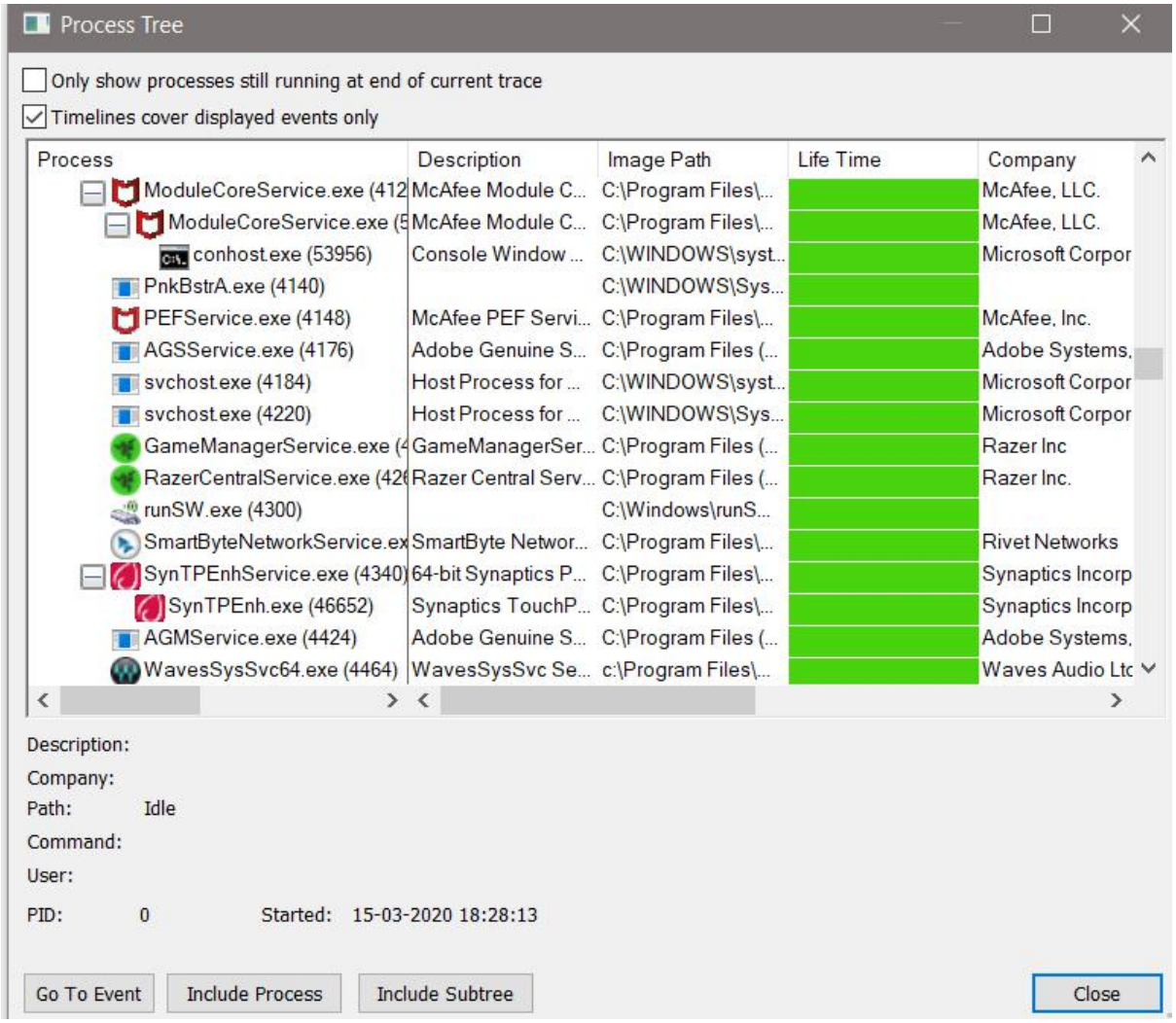
Capture Live Processes:

Now, to monitor live processes of the system we use the application 'Process Monitor' which can be found as Procmon64 in the package.



The above image shows the processes captured in this session in the Process Manager. These are all the live process running right now on the system.

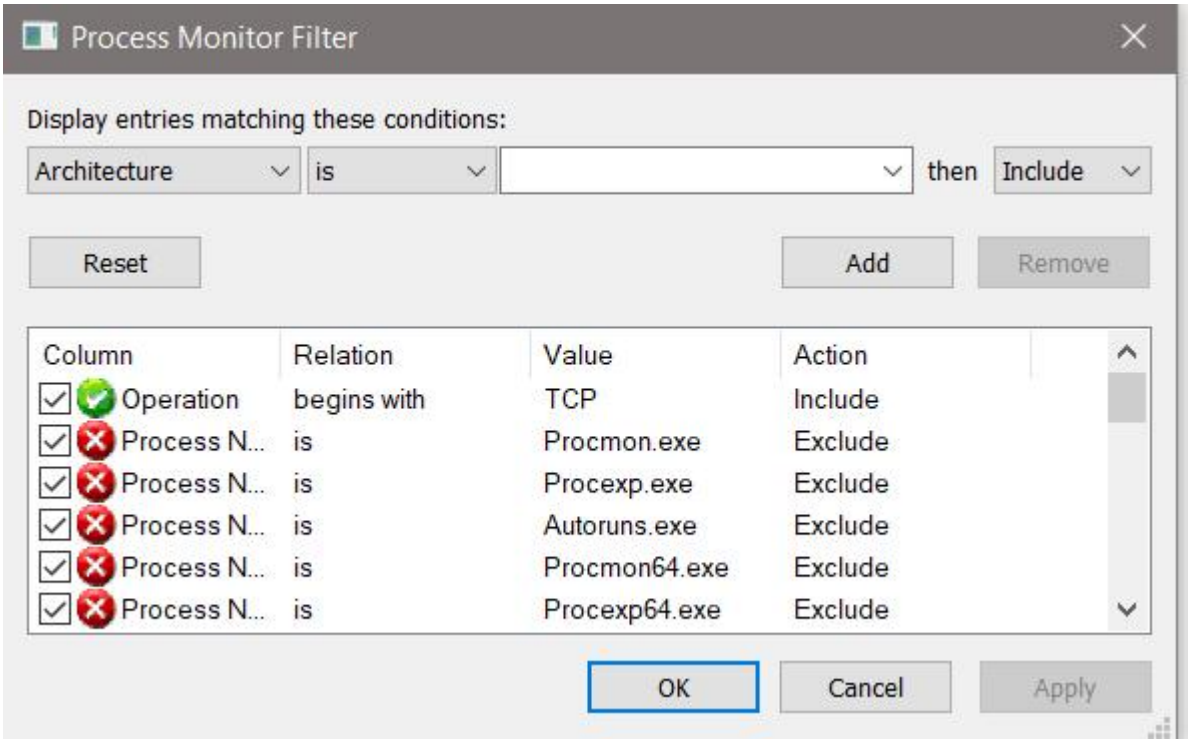
Now, to have a simplified view of the live processes running we can use the ‘Process Tree’. We can access it by going to the ‘Tools’ drop-down menu and click ‘Process Tree’ or pressing CTRL+ T.



The picture above shows the Process Tree of my system. These are some of the live processes.

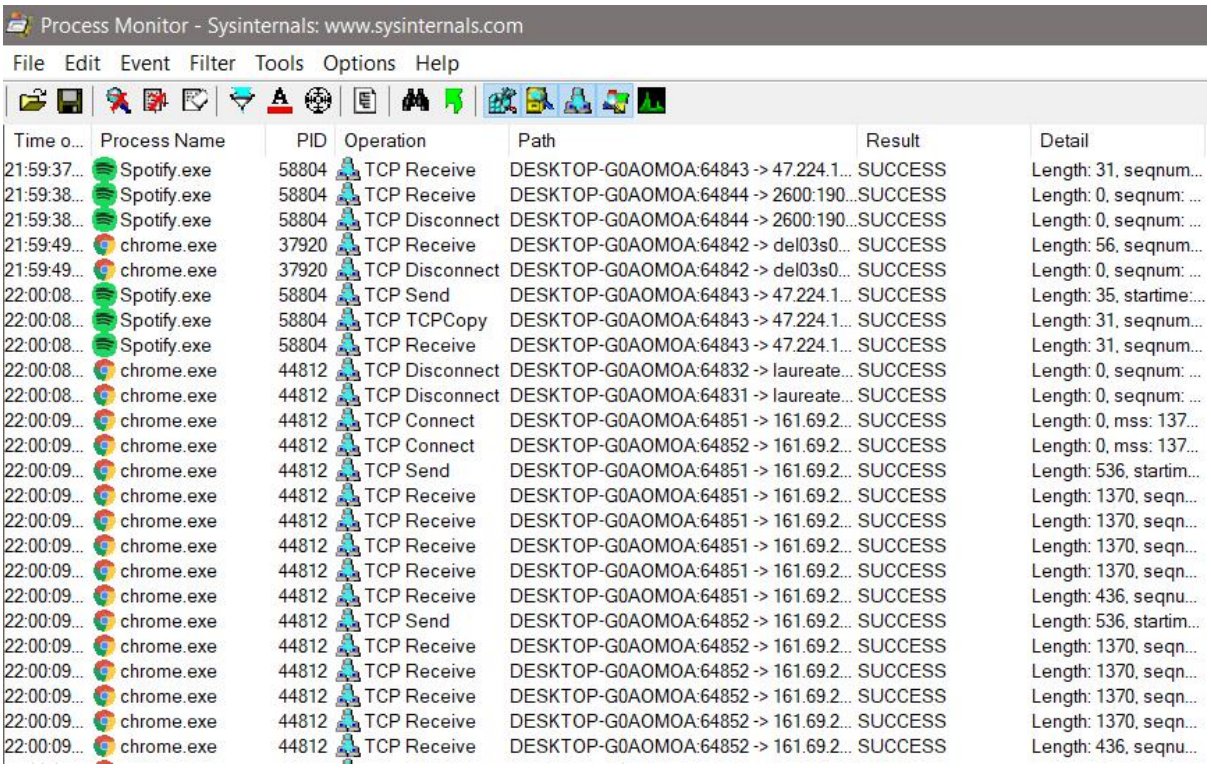
Capture TCP/UDP Packets:

Process Monitor can also be used to capture TCP Packets. To do this, first we need to apply the filter of including TCP packets in the capture and excluding lsass.exe and svchost.exe for better functioning and capture of our processes.



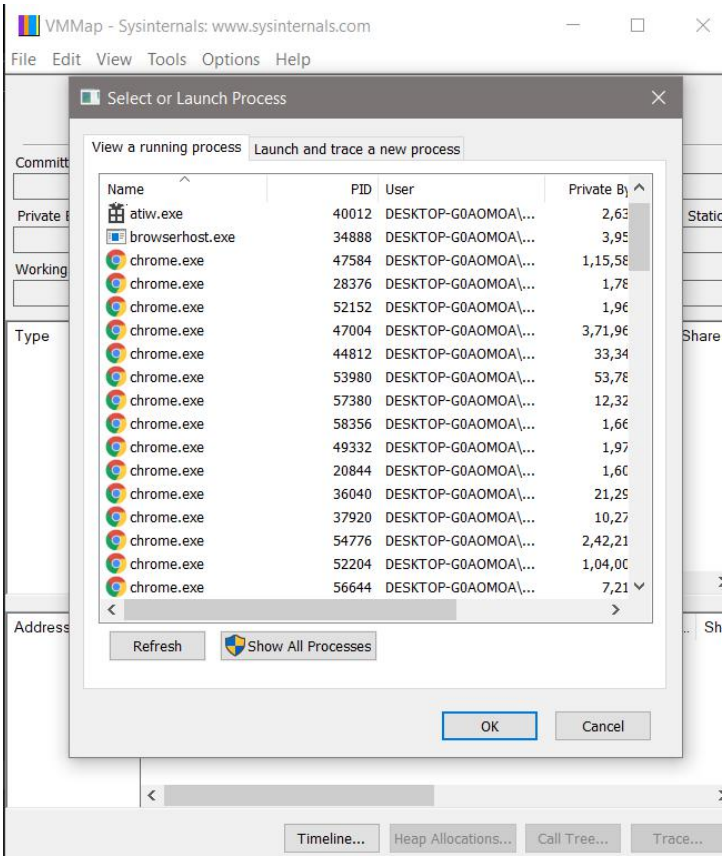
The above picture shows that the filters have been applied using the Process Monitor Filter.

So, now when we capture the packets it will only show the packets that follow the TCP protocol as we can see in the picture below.



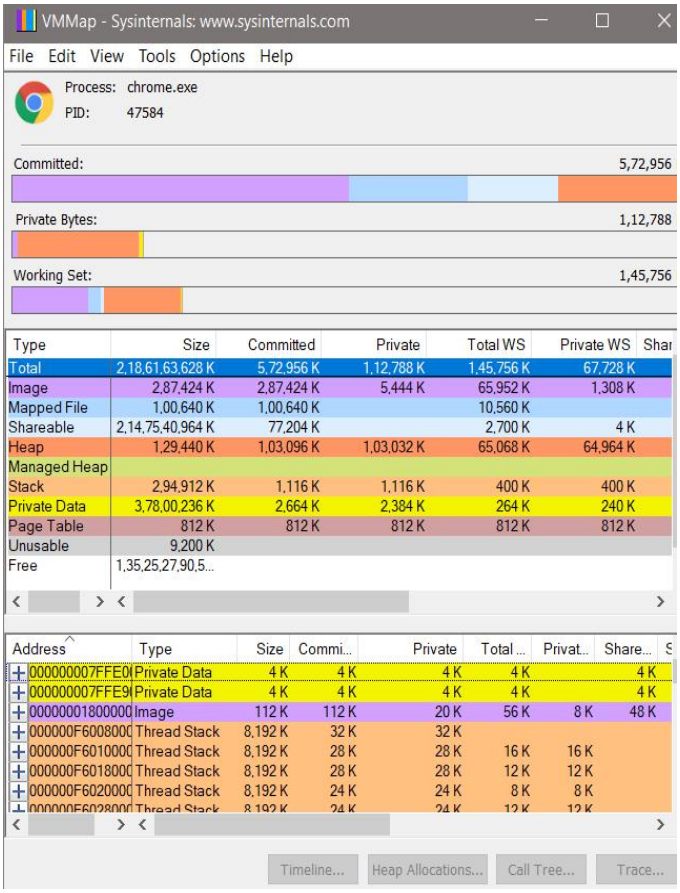
Monitor Virtual Memory:

To Monitor Virtual Memory using a SysInternals tool, we have to use VMMap. We can find this in the SysInternals Suite package.



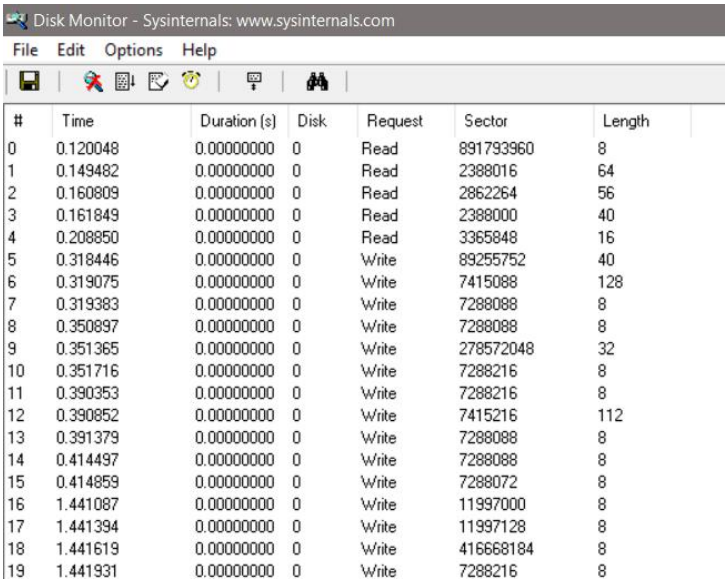
Once we double click on the application we will be greeted by the major live processes of the system as we can see in the picture above and to take a look about their memory, we need to select a process and click *'Okay'*.

Now once we click 'Okay' we will see the able to see the memory occupied by the process as shown in the picture below.



Monitor Hard Disk:

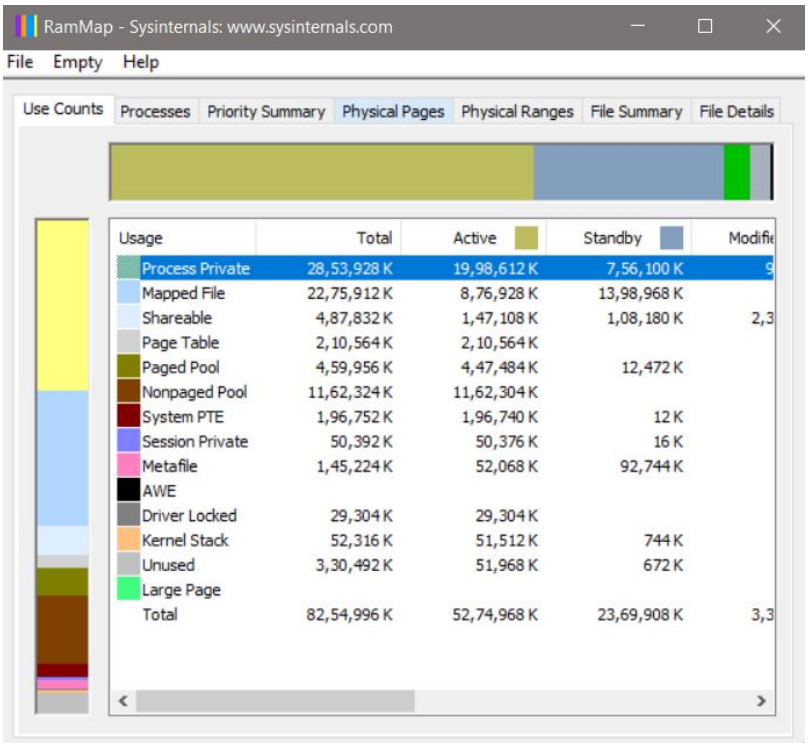
To monitor the activity inside the Hard Disk we need to use an application in SysInternals Suite package known as Disk Monitor. We can find it as Diskmon in the package. We need to open this application as an Administrator because a guest cannot access such sensitive information.



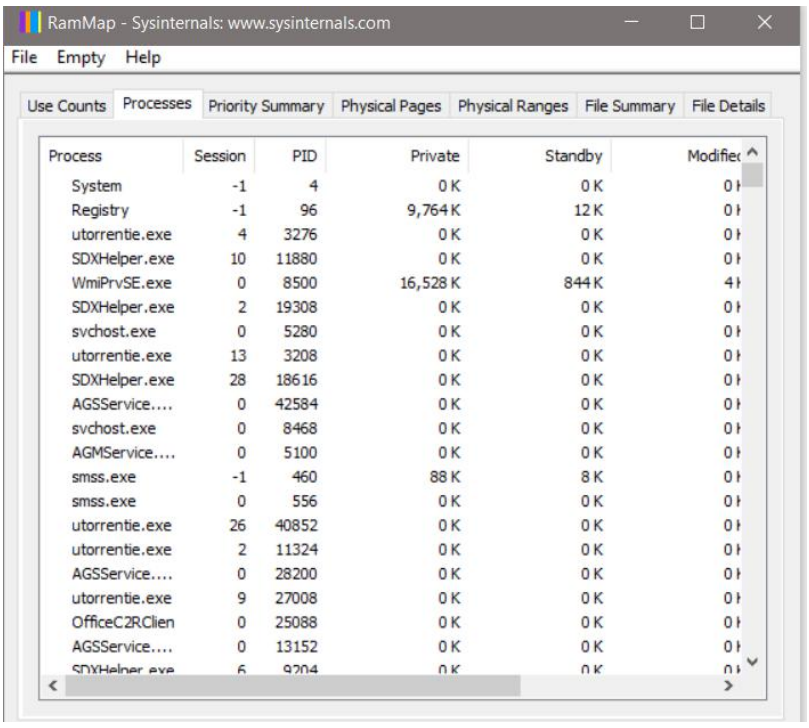
Therefore, as we can see in the image above these are some of the process that are running in the Hard Disk.

Monitor Cache Memory:

We know that cache memory is stored in RAM. Therefore, we need to use RAMMap to monitor Cache Memory. We can find this in the SysInternals Suite package.



The above image shows the different portions of the RAM. To access the Cache processes we need to select the ‘Processes’ tab.



The picture above shows the processes stored in the RAM.

THE END