Extracting the payload from a pcap file using Python

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(I am working on mac Sierra, Python 2.7.12, and the Pycharm IDE).

I am in the process of making a sniffing app to pull redundant copies of submission forms or other Ethernet traffic. It is part of Unhackable Server Project.

I have already started the project with pyshark but I could only get the http headers, not the payloads so I had to switch tactics.

One of my earlier posts was about executing terminal commands through python. The reason I had need of this was because I switched from using

Pyshark to sniff my network to going straight to the source; tshark. I just wanted to make it a but more elegant while getting as much information as possible.

```
import os


os.system("tshark  -T fields -e  data.data -e frame.time -w
Eavesdrop_Data.pcap > Eavesdrop_Data.txt -F pcap -c 1000")
```

I need to capture the packets being posted to the server.

> *n.b.: You can get in trouble if you use this to capture information that is not yours*

When you run this, it saves two files in the directory, a Pcap file and a text file after it captures 1000 packets. The output is a time stamp and whatever data is captured.

My goal now is to follow to TCP stream and extract the files in the packets.

> *To check the packets you saved while writing this code, I recommend you download Wireshark and give it root access by running this:* /Applications/Wireshark.app/Contents/MacOS/Wireshark *in your terminal.*

I am using this article from Codingsec.net as my guide but my needs are a bit simpler and more straight forward. I also have to be careful because the code I am referencing is written in Python 3 and I am using Python 2.

I downloaded scapy using the terminal. I had to restart PyCharm to get it to reload the interpreter and get it to import into the code.

I started to look over the reference code and adopt some of it.

```
import os
import pcapy as p
from scapy.all import *
a = " "
os.system("tshark  -T fields  -e frame.time -e  data.data -w
Eavesdrop_Data.pcap > Eavesdrop_Data.txt -F pcap -c 1000")

data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
```

So, this is gleaned form the afore mentioned code. This was just to dip my toe and see exactly what the different modules were doing.

Firstly, I had to re-download scapy for some reason it didn't properly download earlier so I uninstalled it and reinstalled it using the terminal. Then I had to download Pcapy which could not run without dumbnet. Ugh! I spent the whole day just finding and installing packages. But soon, I got this to work. The output looked like this:

Woot! No errors!

> *N.B. I installed dumbnet with my terminal from git.*

Now, I moved to the next few lines of the refference code:

```
from scapy.all import *
a = " "
os.system("tshark  -T fields  -e frame.time -e  data.data -w
Eavesdrop_Data.pcap > Eavesdrop_Data.txt -F pcap -c 1000")


data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
sessions = a.sessions()
print sessions
```

and the output is:

The dict keeps going all the way

Woot! Still no error. I like to use the print command just to check what is happening and that the data remains intact.

Code:

```
from scapy.all import *
a = " "
os.system("tshark  -T fields  -e frame.time -e  data.data -w
Eavesdrop_Data.pcap > Eavesdrop_Data.txt -F pcap -c 1000")

data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
sessions = a.sessions()
for session in sessions:
    print sessions
```

output:

Input:

```
from scapy.all import *
a = " "
#os.system("tshark  -T fields  -e frame.time -e  data.data -w
Eavesdrop_Data.pcap > Eavesdrop_Data.txt -F pcap -c 1000")


#I commented out the t-shark so i could just reuse the same data

data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
sessions = a.sessions()
for session in sessions:
    http_payload = ""
    for packet in sessions[session]:
        print packet
```

Now, at this point I'm thinking how can I make sure that I am getting the payload from all the http requests (not https) I am getting? So I changed the

command line file and added another underneath it to parse out the http packets from the file captured in the first command line. I then printed out the result.

Code:

```
from scapy.all import *
data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
os.system("tshark  -T fields -e _ws.col.Info -e http -e frame.time -e
"
          "data.data -w Eavesdrop_Data.pcap > Eavesdrop_Data.txt -c
1000")
os.system("tshark -r Eavesdrop_Data.pcap -Y http -w
Eavesdrop_Data_http.pcap")
sessions = a.sessions()
i = 1
for session in sessions:
    http_payload = ""
    for packet in sessions[session]:
        print packet
```

At this point, we are still only using scapy.

Output:

I did get some plain text which is what I am after!

So, now I must figure out how to isolate text/plain content types. I first put in a try and accept function inside my for loop to test if the http packets have a TCP. Then I matched source ports (sports) and destination ports (dports) to port 80. Port 80 is the default listening port for http.

My code now looks like this:

```
from scapy.all import *
data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
#os.system("tshark  -T fields -e _ws.col.Info -e http -e frame.time -
e  "
#          "data.data -w Eavesdrop_Data.pcap > Eavesdrop_Data.txt -c
1000")
os.system("tshark -r Eavesdrop_Data.pcap -Y http -w
Eavesdrop_Data_http.pcap")
sessions = a.sessions()
i = 1
for session in sessions:
    http_payload = ""
    for packet in sessions[session]:
        try:
            if packet[TCP].dport == 80 or packet[TCP].sport == 80:
                print packet[TCP].payload
        except:
            pass
```

and I get this in my terminal:

It looks a lot less scary that before and as you can see, the plain text is still there.

I have to figure out how to get the http header so I can sift through the content types. If you scroll down in out example code, you will see that the author has created a class to handle this. His class is geared towards images.

I started by copying and pasting his function and adapting it to work for text (everywhere it says image, change it to text). This is what it looks like:

```
import re


def HTTPHeaders(http_payload):
        try:
            #isolate headers
            headers_raw =
http_payload[:http_payload.index("\r\n\r\n") + 2]
            regex = r"(?P&lt;'name&gt;.*?): (?
P&lt;value&gt;.*?)\r\n'"
            headers =  dict(re.findall(regex, headers_raw))
        except:
            return None
        if 'Content-Type' not in headers:
            return None
        return headers

def extractText(headers, http_payload):
        text = None
        text_type = None
        if 'text' in headers['Content-Type']:
            text_type = headers['Content-Type'].split("/")[1]
            text = http_payload[http_payload.index("\r\n\r\n")+4:]
            return text,text_type
```

This is my output:

None
None
None
None
None
None
None
None
None
None
None
…

…

all the way down.

As we have seen before, there should be headers in the output. I isolated the problem to the regular expression in the try function. Time to learn something new… again. What is the best way?

After scouring the internet, I found the most amazing api! I was able to test the regex given in the sample code with the “headers_raw”. In the meantime, I leaned out the code and just kept all the code I needed (got rid of the text_type functions).

Afterwards, I set out to find what was happening. I tested with print statements. I followed the data, printing it out in each step, each loop, each function and found the the problem was the headers_raw line. The error was that the substring could not be found. With this, I removed it and used part of a code generated from https://regex101.com/ (translated to python 2.7).

Now it looks like:

```
import re
import zlib

def HTTPHeaders(http_payload):
    try:
        # isolate headers
        matches = re.finditer(r'\r\n\r\n', http_payload)

        for matchNum, match in enumerate(matches):
            matchNum = matchNum + 1
```

```
            headers_raw = http_payload[:match.end()]
            print headers_raw
        regex = ur"/?P&lt;'name&gt;.*?/: /?P&lt;value&gt;.*?/\n"
        headers = dict(re.findall(regex, headers_raw, re.UNICODE))
        return headers
    except:
        return None
    if 'Content-Type' not in headers:
        return None
    return headers

def extractText(headers, http_payload):
        text = None
        try:
            if 'text/html' in headers['Content-Type']:
                text = http_payload[http_payload.index("\n\n")+4:]
                try:
                    if "Content-Encoding" in headers.keys():
                        if headers['Content-Encoding'] == "gzip":
                            text = zlib.decompress(text)
                    elif headers['Content-Encoding'] == "deflate":
                        text = zlib.decompress(text)
                except: pass
        except:
            return None
        return text
```

The output looks like:

The match worked perfectly but I soon found out that even though I solved my header_raw problem, something was up with the regex that parses the headers into dictionaries.

Again, I shed a tear because I have no clue about regexes. I rolled up my sleeves and got to work.

This was going to be a lot more complicated than just finding the headers. I did more research, googled and searched Stackoverflow as well as

Regex101 looking for a solution. Regex101 has a library of regexes users have created. Searching for json , I found this: (?:[\n]{0,1})(\w+)(?:\ *=\ *)([^\n]*)(?:[\n]{0,1})

When I put it in my code, as-is, it gave me this:

Ooops! It's supposed to be a dictionary form of :

If you look carefully at the output, you can see that there are some rogue \r values in there on top of that, the regex has cut out a lot of the information. If we add \r to our \n in the regex like this: **“(?:[\r\n]{0,1})(\w+)(?:\ *=\ *)([^\r\n]*)(?:[\r\n]{0,1})”**

and our output looks like this:

It's getting there....

Another adjustment I needed to make was to change the equals sign to a colon to adapt the regex to the format of my input (the original had = to signify key value pairs).

This:

```
(?:[\r\n]{0,1})(\w+)(?:\ *:\ *)([^\r\n]*)(?:[\r\n]{0,1})
```

Gives me this:

By this time, I understand how regex works a little so when I realized that the code was dropping the first part of anything hyphenated, I knew I needed to escape the hyphen and add a \w+ to add the word before the hyphen.

```
regex = ur"(?:[\r\n]{0,1})(\w+\-\w+)(?:\ *:\ *)([^\r\n]*)(?:[\r\n]
{0,1})"
```

which got me this:

If you look at the output, you will notice that now, it is ignoring everything that isn't hyphenated. So I needed to add an "or" in order to grab the

missing key/value combinations(or is denoted with a |).

```
regex = ur"(?:[\r\n]{0,1})(\w+\-\w+|\w+)(?:\ *:\ *)([^\r\n]*)(?:
[\r\n]{0,1})"
```

Woooot! It is not in order, but that does not matter to me. At this point, I went back to see if the original parsing for the headers_raw would work because the for loop for the matching seemed a bit cumbersome. It worked!

In the end, my code was made of two python files. Here they are:

Eavesdrop.py

```
import os
from scapy.all import *

from getHTTPHeaders import HTTPHeaders, extractText
```

```
data = "Eavesdrop_Data.pcap"
a = rdpcap(data)
os.system("tshark  -T fields -e _ws.col.Info -e http -e frame.time -e
"
          "data.data -w Eavesdrop_Data.pcap > Eavesdrop_Data.txt -c
1000")


sessions = a.sessions()
carved_texts = 1
for session in sessions:
    http_payload = ""
    for packet in sessions[session]:
        try:
            if packet[TCP].dport == 80 or packet[TCP].sport == 80:
                http_payload += str(packet[TCP].payload)
        except:
            pass
        headers = HTTPHeaders(http_payload)
    if headers is None:
        continue
    text = extractText(headers,http_payload)
    if text is not None:
         print (text)
```

getHTTPHeaders.py

```
import re
import zlib

def HTTPHeaders(http_payload):
```

```
    try:
        # isolate headers
        headers_raw = http_payload[:http_payload.index("\r\n\r\n") +
2]
        regex = ur"(?:[\r\n]{0,1})(\w+\-\w+|\w+)(?:\ *:\ *)([^\r\n]*)
(?:[\r\n]{0,1})"
        headers = dict(re.findall(regex, headers_raw, re.UNICODE))
        print headers
        return headers
    except:
        return None
    if 'Content-Type' not in headers:
        return None
    return headers

def extractText(headers, http_payload):
        text = None
        try:
            if 'text/plain' in headers['Content-Type']:
                text =
http_payload[http_payload.index("\r\n\r\n")+4:]
                try:
                    if "Accept-Encoding" in headers.keys():
                        if headers['Accept-Encoding'] == "gzip":
                            text = zlib.decompress(text,
16+zlib.MAX_WBITS)
                    elif headers['Content-Encoding'] == "deflate":
                        text = zlib.decompress(text)
                except: pass
        except:
            return None
        return text
```

In the data, there is only one plain text payload…. and the code found it!

This was a test in patience and a labor of love . I have been trying to solve this problem for a few months. Keep in mind that when I started, I had no network programming experience. I hope this helps someone out there. If you have any suggestions, please comment down or find me on my Github

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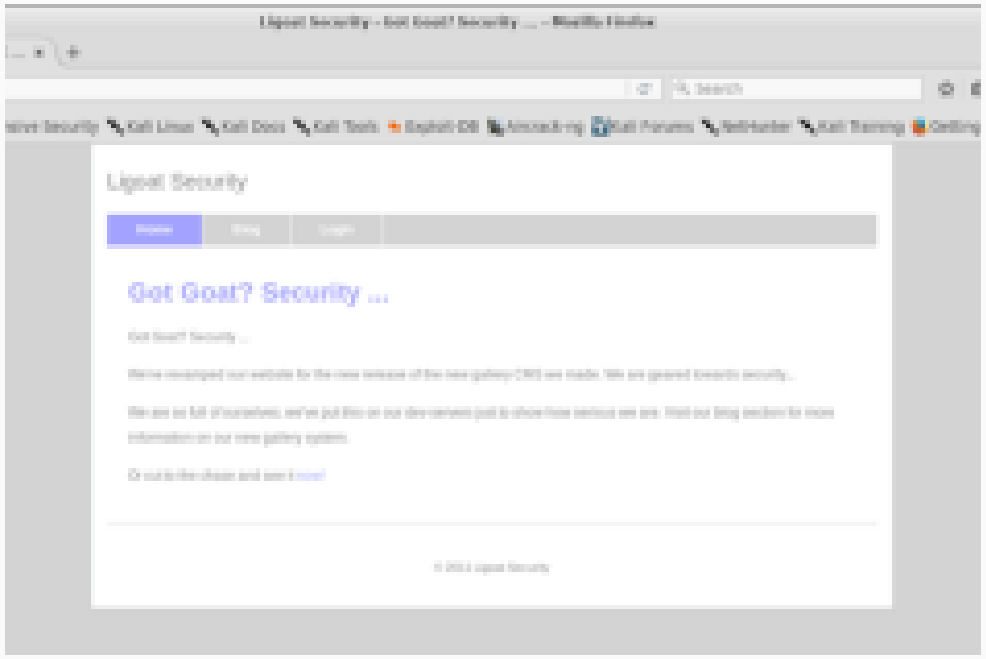

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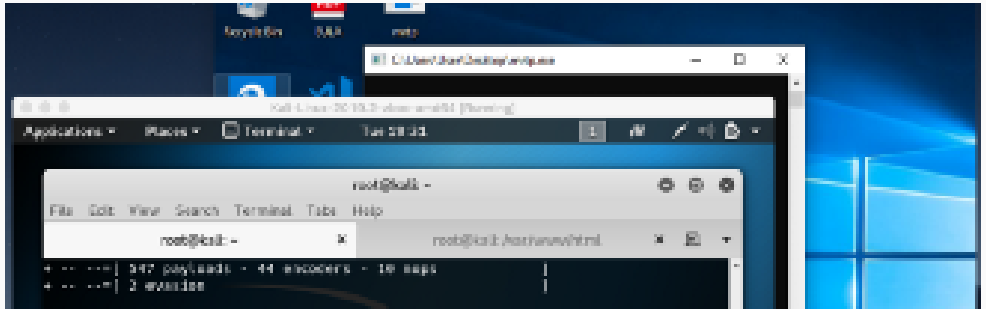

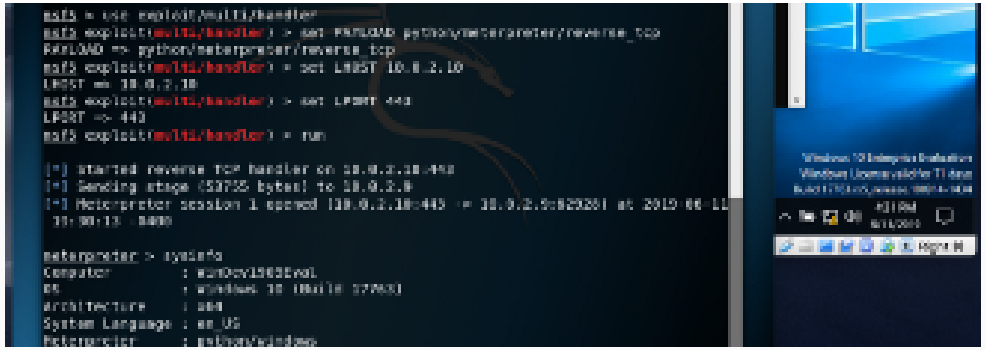

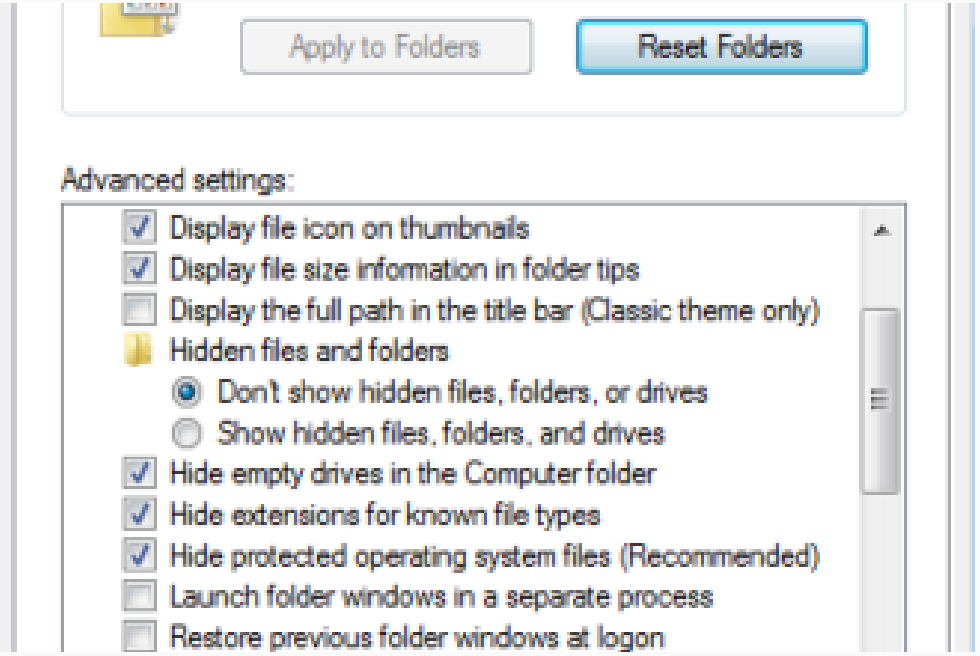

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