Put Student Name(s) ↓	Put Student IDs ↓	Due Date	Grade Weight
Ishan Aakash Patel	146151238	As Posted	6%

Name	Lab 6: Analyze Network Traffic
Instructions	• It is an Individual assignment. Put your name + Student ID in the empty spaces above. • Show your genuine signs of your work is done on your machine. This includes: ○ Screenshots that show your desktop background with Date/Time. ○ Show a pop-up bx that shows "your name + IP". ○ Show your logged account when applicable. Optional: Your photo. • Submit your report name: CYT215-Lab6-Student Name & ID
Challenge Scenario	You are a network forensic analyst at a medium-sized enterprise. The network team has detected unusual network activities and generated a PCAP file from one of the internal segments during a suspected attack window. Your task is to analyze the PCAP file to identify potential malicious activities, verify if any data was exfiltrated, and assess any command-and-control communications.
Prior Knowledge	**Benign Traffic** Benign traffic refers to legitimate network data that does not pose any threat to security. It includes all normal communications that occur in a network under regular operations. Understanding benign traffic is essential for network analysts because it helps establish a baseline of normal activity, making it easier to spot anomalies or malicious activities. Common examples of benign traffic include: • **Web Browsing**: Requests and responses over HTTP/HTTPS that are part of typical user activity. • **Email Communications**: SMTP, POP3, and IMAP traffic used for sending and receiving emails. • **FTP Transfers**: Normal file transfers using FTP, which might be routine backups or scheduled data transfers. • **DNS Queries**: Regular DNS requests that resolve domain names to IP addresses, facilitating everyday internet usage. Benign traffic patterns can vary widely between different networks, depending on the nature of the business and the typical activities of users. Analysts use tools like Wireshark to capture and review this traffic to understand what is typical and thereby more easily identify what is not. **Command and Control (C&C) Communications** Command and Control (C&C) communications refer to the signals and data passed between compromised systems and an attacker's server. These communications are a hallmark of network breaches involving malware, especially in cases of botnets or

	ransomware. C&C servers issue commands to compromised systems (bots) and receive stolen data or status updates in return. Key aspects include: • **Control Mechanisms**: C&C can be conducted over various protocols, including IRC, HTTP, HTTPS, or custom protocols designed to evade detection. • **Purpose**: These communications allow attackers to remotely manage malware, perform data exfiltration, deploy additional payloads, update configurations, or initiate denial-of-service attacks. • **Detection Challenges**: C&C traffic is often designed to mimic benign traffic to avoid detection by traditional security tools. For instance, using HTTPS or intermittently connecting to blend in with normal HTTPS traffic. C&C communications are critical for the operational success of many malware campaigns. Detecting them involves looking for unusual outbound connections, irregular data flows, or connections to known malicious domains. Network analysts use deep packet inspection, behavior analysis, and signature-based detection to identify such communications.

Steps	**Open the PCAP File**:
	
	Open the provided `network_traffic.pcap` file in Wireshark or Network Miner. The guide below is for WireShark.
	
	Identify Malware Download:
	
	• **Task**: Locate the HTTP GET request for `malware.exe`.
	• **Instructions**:
	    o Use the filter `http.request.method == "GET" && http.request.uri contains "malware.exe"`.
	    o Identify the source and destination IP addresses and note the HTTP host header.
	    o Discuss the implications of malware being downloaded over HTTP.
	
	Investigate Command and Control Communication:
	
	• **Task**: Find the TCP handshake followed by data suggesting C&C communication.
	• **Instructions**:
	    o Use the filter `tcp.flags.syn == 1 && tcp.port == 4444` to find the initial connection establishment.

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Follow the TCP stream to view the communication. Discuss the potential signs that indicate C&C activity.

Analyze Data Exfiltration:

Task: Detect and analyze suspicious large data transfers.
Instructions:

Use the filter <code>tcp.port == 8888</code>.
Observe the payload size and pattern. Discuss how consistent, large payloads might indicate data exfiltration.
Analyze the timestamps to check if the data transfer occurred at an unusual time, suggesting malicious intent.

Differentiate Benign Traffic:

Task: Separate and identify benign DNS and HTTP traffic.
Instructions:

For DNS: Use the filter <code>udp.port == 53</code>.
For HTTP: Use the filter <code>http.request.method == "GET" && http.host == "www.example.com"</code>.
Discuss the characteristics of benign traffic and how it differs from the malicious traffic observed.

Reporting:

Task: Prepare a forensic report detailing the findings.
Instructions:

Summarize the identified malicious and benign activities.
Provide detailed evidence for each activity (screenshots, Wireshark filters used, etc.).
Recommend actions based on the findings.

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<td>Grading Alerts</td>
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If you do NOT use this template or delete any part of it or use any other template, you will be degraded.
If you do NOT follow the fie naming convention, you will be degraded.
If you do NOT submit your file in PDF; you will be degraded.
If you do NOT show your account real name (when applicable); you will be degraded.
If you do NOT show your machine desktop background (with date & time) and IP, you will be degraded.
If you do NOT write (in your own words) your learning experience for the activity practices, you will be degraded.

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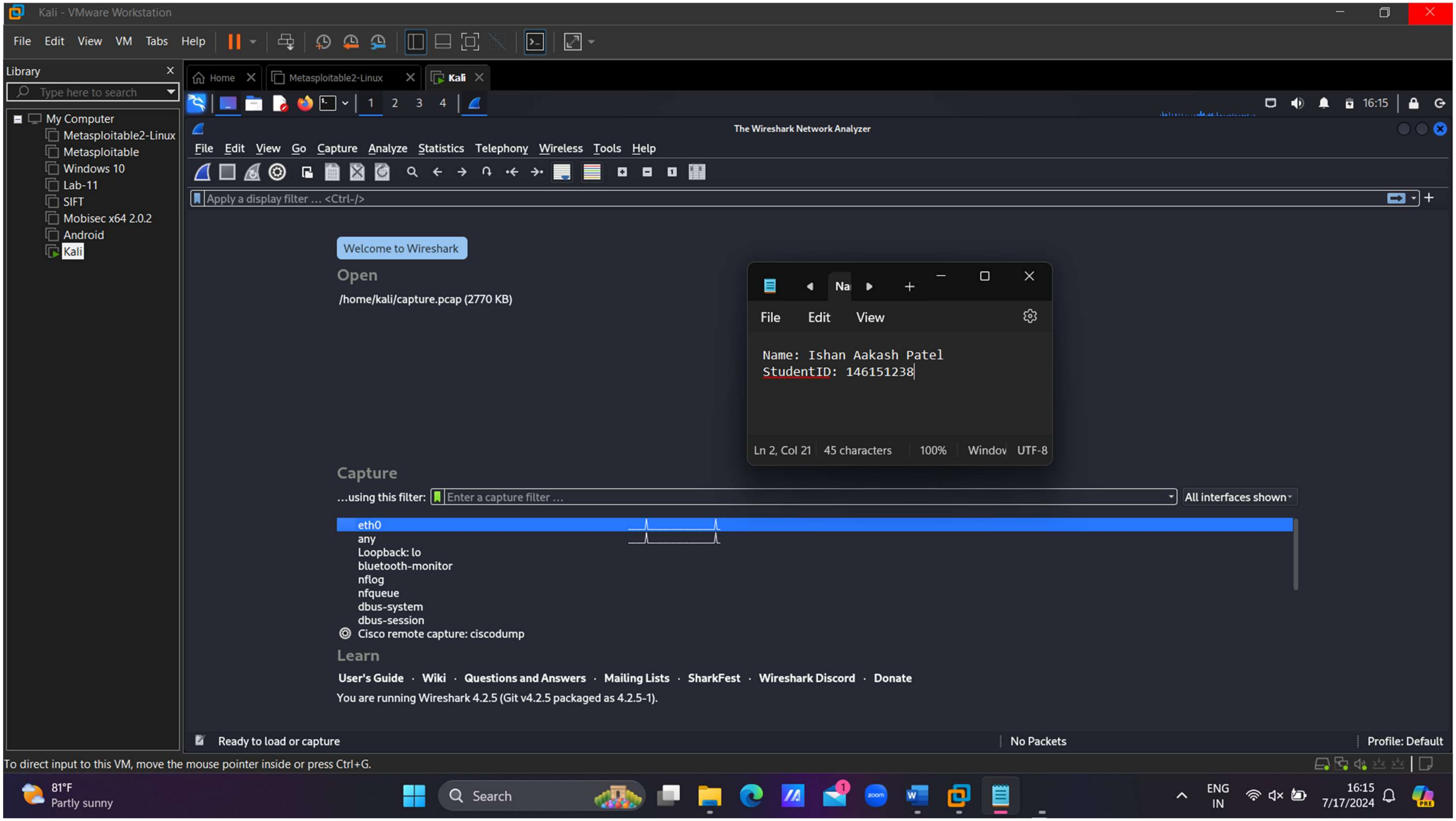
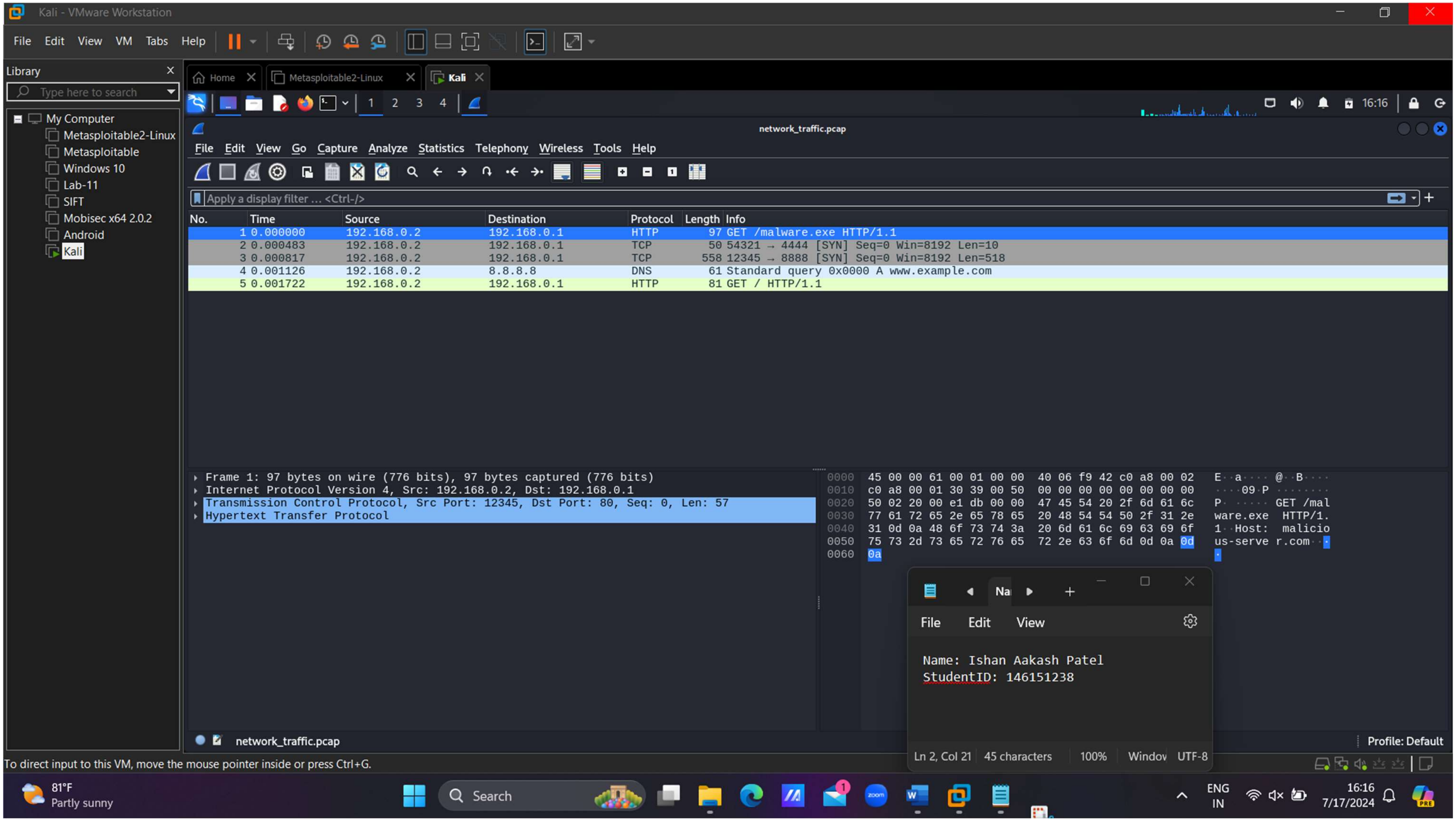
Wireshark

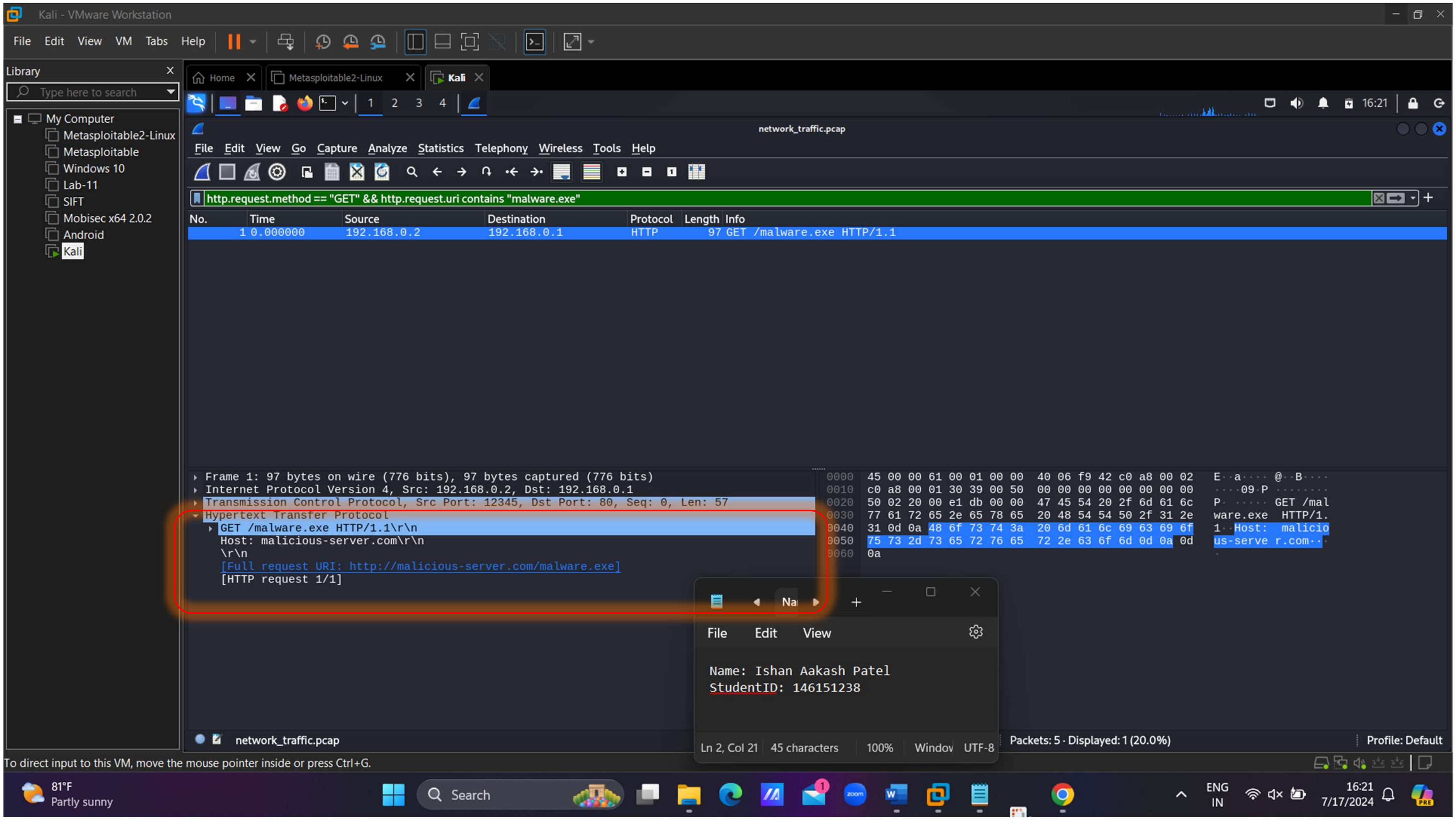


Kali - VMware Workstation
File Edit View VM Tabs Help
Library
Type here to search
My Computer
Metasploitable2-Linux
Metasploitable
Windows 10
Lab-11
SIFT
Mobisec x64 2.0.2
Android
Kali
Home
Metasploitable2-Linux
Kali
The Wireshark Network Analyzer
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter … <Ctrl-/>
Welcome to Wireshark
Open
/home/kali/capture.pcap (2770 KB)
Name: Ishan Aakash Patel
StudentID: 146151238
Ln 2, Col 21
45 characters
100%
UTF-8
Capture
…using this filter:
Enter a capture filter …
All interfaces shown
eth0
any
Loopback: lo
bluetooth-monitor
nflog
nfqueue
dbus-system
dbus-session
Cisco remote capture: ciscodump
Learn
User's Guide · Wiki · Questions and Answers · Mailing Lists · SharkFest · Wireshark Discord · Donate
You are running Wireshark 4.2.5 (Git v4.2.5 packaged as 4.2.5-1).
Ready to load or capture
No Packets
Profile: Default
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
81°F
Partly sunny
Search
ENG
IN
16:15
7/17/2024

Opening the pcap file in wireshark



Task 1 : Identify Malware Download

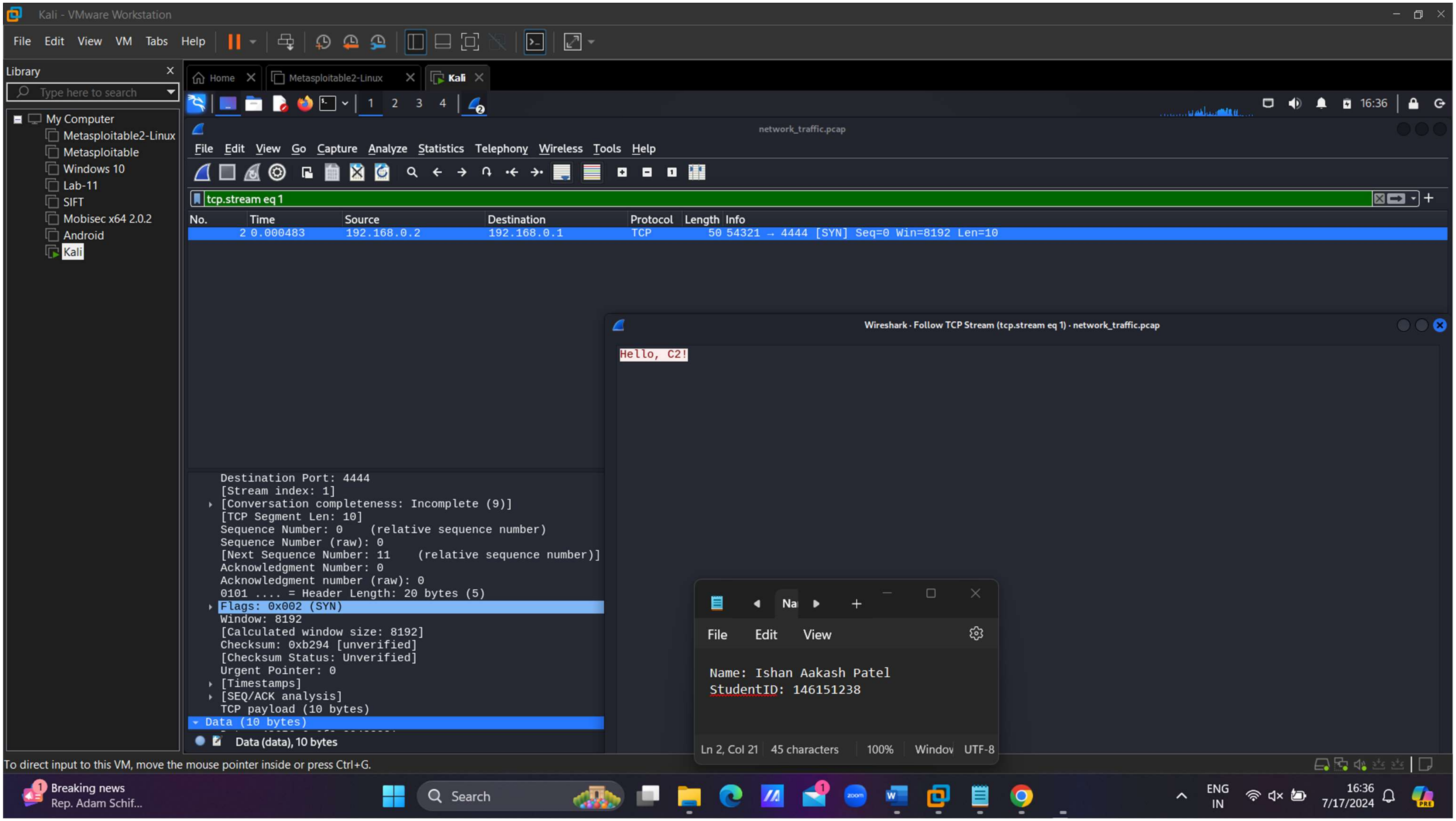


Source IP: 192.168.0.2 Destination IP: 192.168.0.1 HTTP Host header: malicious-server.com

Implications of malware being downloaded over HTTP:

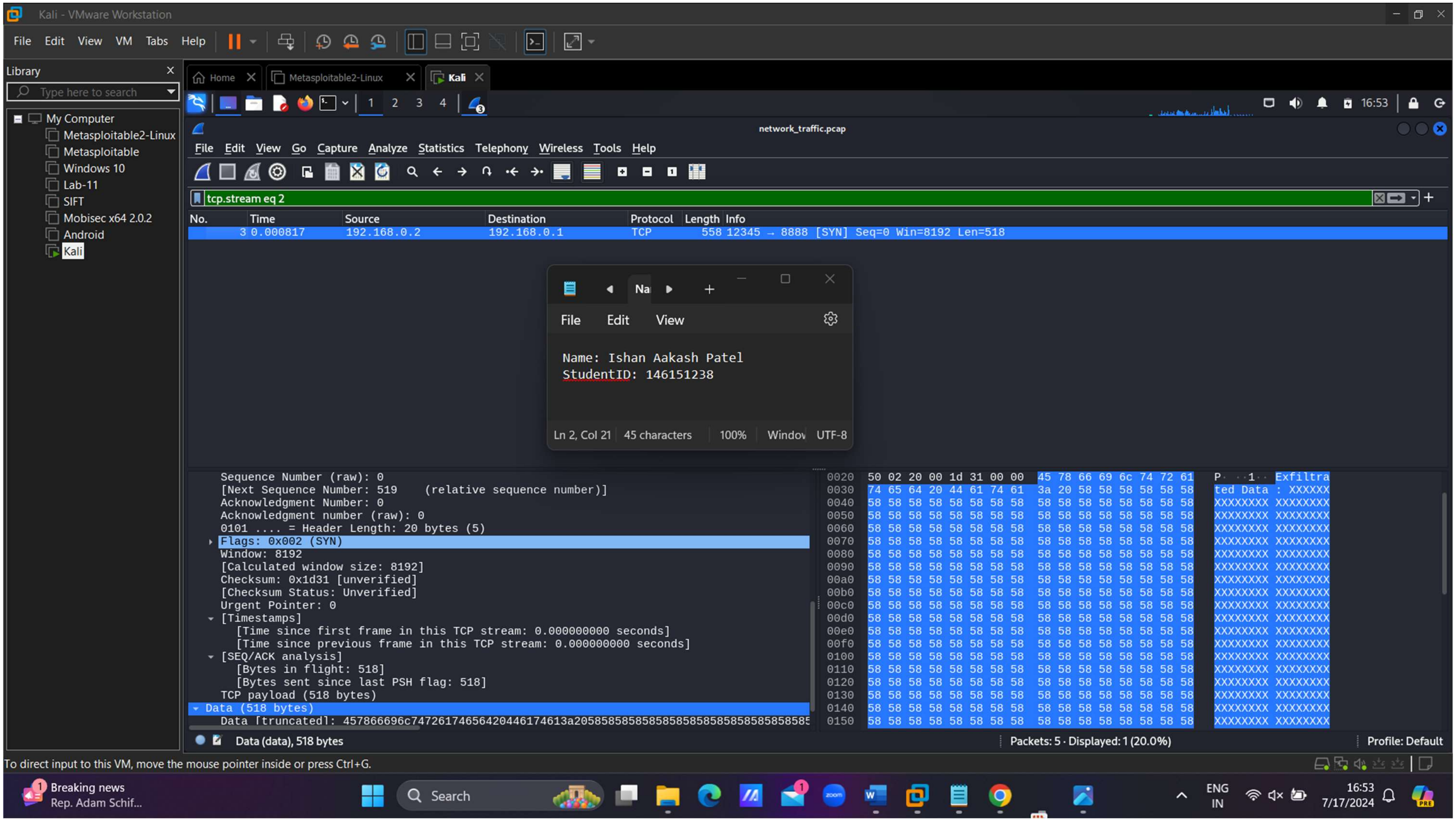
1. Lack of encryption: HTTP transfers data in plaintext, allowing potential attackers to intercept and view the content, including sensitive information like usernames, passwords, or in this case, malicious code.
2. No data integrity: Without HTTPS, there's no way to verify if the content has been tampered with in transit, potentially allowing man-in-the-middle attacks.
3. Easier detection: Network administrators and security tools can more easily detect and block suspicious HTTP traffic compared to encrypted HTTPS traffic.
4. Vulnerability to DNS hijacking: Attackers could potentially redirect HTTP requests to their own servers more easily than with HTTPS.
5. Lack of server authentication: There's no way to verify if the server is actually the intended one, increasing the risk of connecting to malicious servers.
6. Potential for network-level attacks: Unencrypted traffic is more susceptible to various network-level attacks and manipulations.
7. Non-compliance: Many security standards and regulations require the use of encryption for data transfer, making HTTP downloads of sensitive content non-compliant.

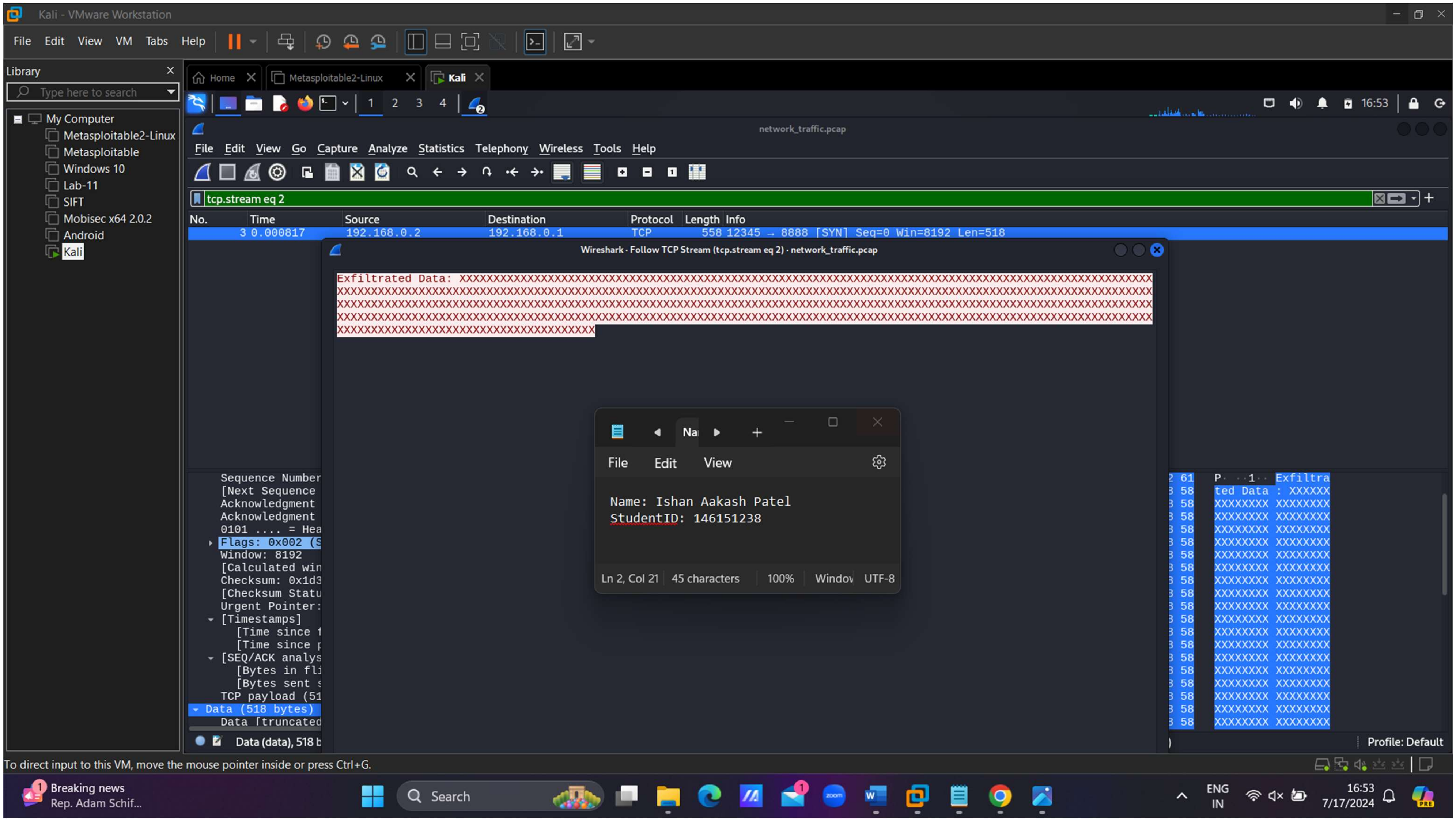
Task 2 : Investigation Command and Control Communication



1. Use of port 4444: This is a non-standard port often associated with malware and backdoors.
2. Short, simple initial message: The payload "Hello, C2!" suggests a basic check-in or beacon to a command server.
3. TCP stream content: The presence of a simple greeting could be an initial handshake or identification message to the C&C server.
4. Unusual source/destination: The communication is between local IP addresses (192.168.0.2 to 192.168.0.1), which could indicate an infected internal machine contacting a compromised server or pivot point.
5. SYN flag: The TCP SYN flag indicates the start of a new connection, potentially for ongoing communication with the C&C server.
6. Small payload size: The 10-byte payload is consistent with a minimal beacon or command acknowledgment.
7. Lack of standard application data: There's no indication of normal application traffic, suggesting this could be malware communication.

Task 3 : Analyze Data Exfiltration




Kali - VMware Workstation
File Edit View VM Tabs Help
Library
My Computer
Metasploitable2-Linux
Metasploitable
Windows 10
Lab-11
SIFT
Mobisec x64 2.0.2
Android
Kali
Home
Metasploitable2-Linux
Kali
16:53
network_traffic.pcap
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
tcp.stream eq 2
No. Time Source Destination Protocol Length Info
3 0.000817 192.168.0.2 192.168.0.1 TCP 558 12345 → 8888 [SYN] Seq=0 Win=8192 Len=518
Wireshark · Follow TCP Stream (tcp.stream eq 2) · network_traffic.pcap
Exfiltrated Data: XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Name: Ishan Aakash Patel
StudentID: 146151238
File Edit View
Ln 2, Col 21 45 characters 100% UTF-8
Sequence Number
[Next Sequence
Acknowledgment
Acknowledgment
0101 .... = Hea
Flags: 0x002 (S
Window: 8192
[Calculated win
Checksum: 0x1d3
[Checksum Statu
Urgent Pointer:
[Timestamps]
[Time since f
[Time since p
[SEQ/ACK analys
[Bytes in fli
[Bytes sent s
TCP payload (51
Data (518 bytes)
Data [truncated
Data (data), 518 b
Exfiltra
ted Data : XXXXXX
Profile: Default
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
Breaking news
Rep. Adam Schif...
Search
ENG
IN
16:53
7/17/2024

Payload size and pattern:

- The TCP stream shows a large payload of 518 bytes.
- The data appears to be consistent and repetitive, with many "58" byte values visible in the hex dump.
- This pattern of large, consistent payloads could indicate data exfiltration. Attackers often compress or encode stolen data before transmission, which can result in uniform, seemingly random data patterns.
- The use of port 8888, which is non-standard, further raises suspicion.

Timestamps and timing:

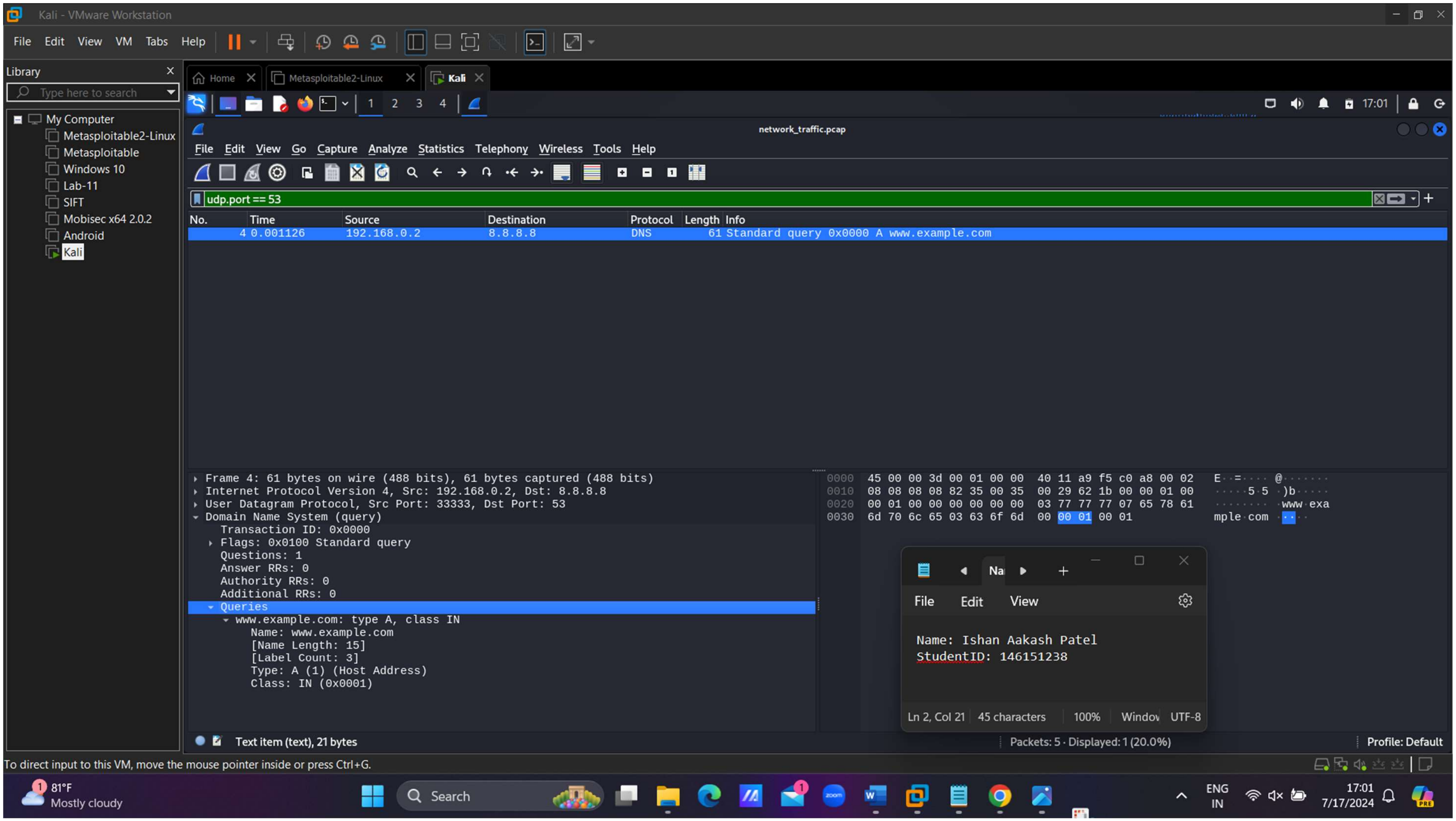
- The timestamp shown in the capture is 3.000817 seconds from the start of the capture.
- Without more context about the normal operating hours of the system or network, it's difficult to definitively state if this is an unusual time.
- However, data exfiltration often occurs during off-hours to avoid detection. The fact that this large data transfer is happening might be suspicious depending on the expected network behavior.

Additional observations:

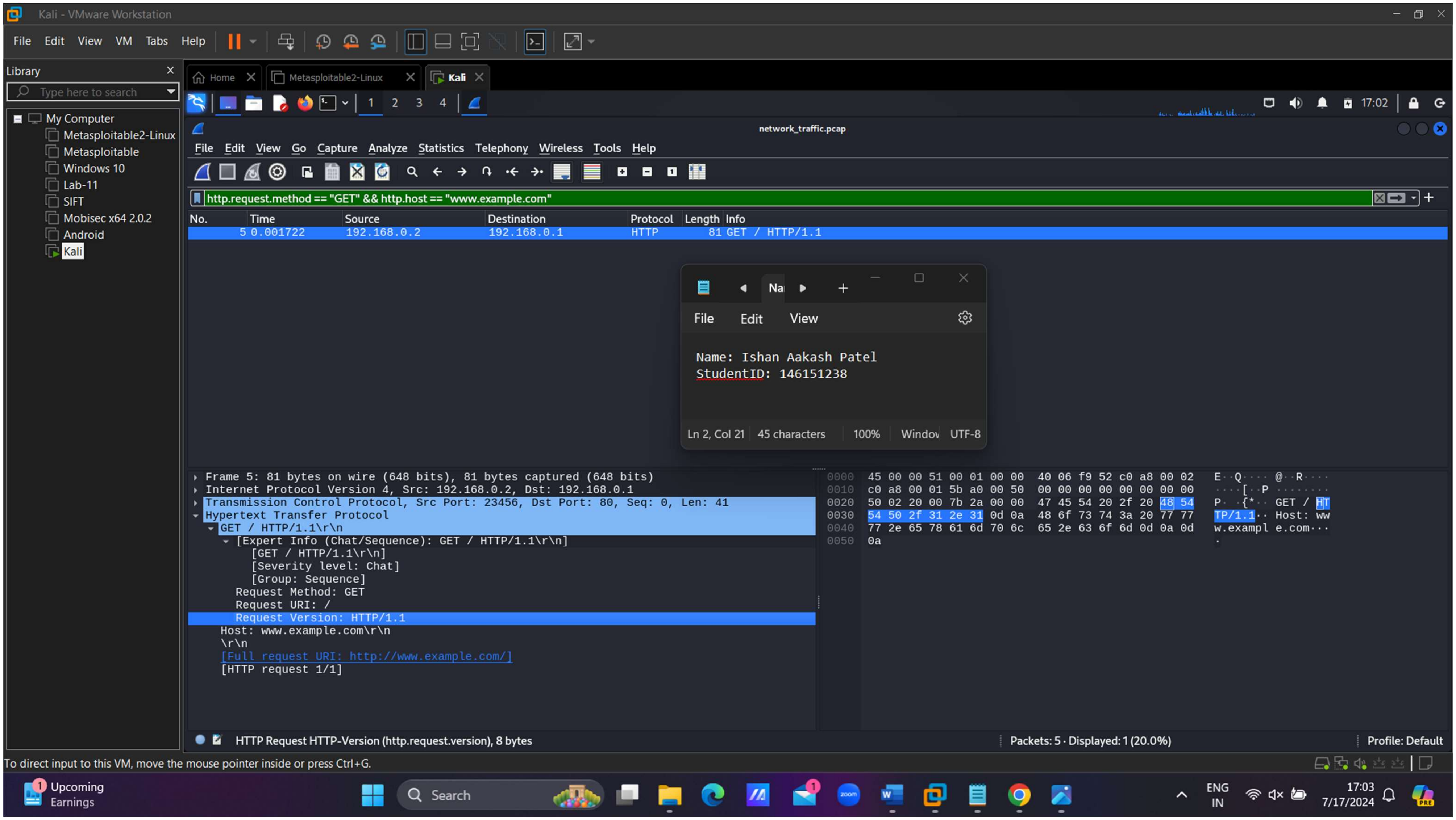
- The communication is between internal IP addresses (192.168.0.2 to 192.168.0.1), which could indicate an already compromised internal system acting as a staging point for data exfiltration.
- The SYN flag is set, suggesting the start of a new connection for this data transfer.

Task 4 : Differentiate Benign Traffic

For DNS



For HTTP



Kali - VMware Workstation
network_traffic.pcap
http.request.method == "GET" && http.host == "www.example.com"
No. Time Source Destination Protocol Length Info
5 0.001722 192.168.0.2 192.168.0.1 HTTP 81 GET / HTTP/1.1
Name: Ishan Aakash Patel
StudentID: 146151238
Frame 5: 81 bytes on wire (648 bits), 81 bytes captured (648 bits)
Internet Protocol Version 4, Src: 192.168.0.2, Dst: 192.168.0.1
Transmission Control Protocol, Src Port: 23456, Dst Port: 80, Seq: 0, Len: 41
Hypertext Transfer Protocol
GET / HTTP/1.1\r\n
[Expert Info (Chat/Sequence): GET / HTTP/1.1\r\n]
Request Method: GET
Request URI: /
Request Version: HTTP/1.1
Host: www.example.com\r\n
[Full request URI: http://www.example.com/]
[HTTP request 1/1]
HTTP Request HTTP-Version (http.request.version), 8 bytes
Packets: 5 · Displayed: 1 (20.0%)
Profile: Default

Characteristics of benign traffic:

1. Standard protocols and ports: The DNS query uses UDP port 53, which is the standard port for DNS.
2. Expected destinations: The DNS query is sent to 8.8.8.8, a well-known public DNS server (Google's).
3. Normal query content: The DNS request is for "www.example.com", a common placeholder domain often used in documentation and testing.
4. Appropriate packet size: The DNS query is 61 bytes, which is a typical size for a standard DNS request.
5. Clear, unobfuscated data: The domain being queried is visible in plaintext, not encoded or obfuscated.
6. Expected behavior: A single DNS query for a domain name is normal network behavior.
7. Standard flags: The packet shows a "Standard query" flag, which is expected for normal DNS traffic.

Differences from malicious traffic:

1. No suspicious ports: Unlike the earlier observed traffic on ports 4444 and 8888, this uses a standard port.
2. Public destination: The DNS query goes to a public IP, not an internal address like the suspicious traffic.
3. No large data transfers: This is a small DNS query, unlike the large, repetitive data seen in potential exfiltration.
4. Expected protocol behavior: This follows standard DNS protocol, unlike potential C2 communications seen earlier.
5. No encoded payloads: The earlier suspicious traffic had repetitive, possibly encoded data. This DNS query is clear and understandable.
6. Legitimate domain: "www.example.com" is a known, safe domain, unlike potential malicious domains or IP addresses seen in attack traffic.
7. No signs of evasion: There are no attempts to hide the nature of this traffic, unlike malware which often tries to blend in or obfuscate its communications.

Learning Experience

This lab was really eye-opening for me. I got to use Wireshark to look at real network traffic and figure out what was normal and what wasn't. It was like being a detective, searching for clues in all the data going back and forth. I learned how to spot things that didn't look right, like malware downloads and suspicious connections. It was surprising to see how attackers try to hide their activities by making them look like normal traffic.

The most interesting part was seeing how different types of traffic look in Wireshark. Normal stuff like DNS queries and web browsing has certain patterns. But when there's something fishy going on, like data being stolen or malware talking to its control server, it stands out if you know what to look for. This lab made me realize how important it is to understand normal network behavior so you can catch the bad stuff. I feel like I've gained some real-world skills that could be useful in a cybersecurity job.