Course: Cloud and Network Security - C3 – 2025

Student Name: Johnmark Gichuki

Student No: CS-CNS10-25101

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Week 2 Assignment 2:

Class Exercise: Assignment 2 HTB Academy Introduction to Network Traffic Analysis

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Introduction

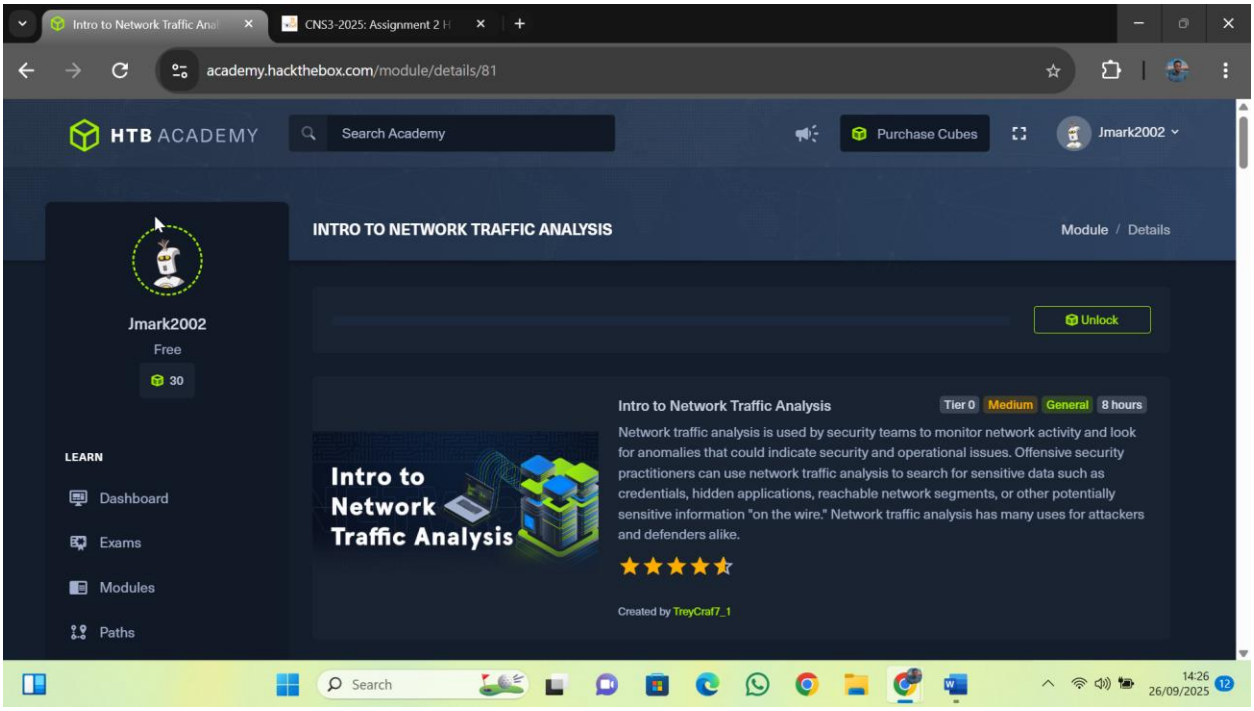
The "Intro to Network Traffic Analysis (Tier 0)" module introduced me to the fundamental concepts of network traffic analysis, which is essential for both offensive and defensive cybersecurity practices. Network traffic analysis involves the collection and examination of real-time and historical data to understand network activities. For defenders, this skill helps in detecting suspicious activities, identifying vulnerabilities, and improving incident response. For offensive security practitioners, traffic analysis is useful for identifying weak points in protocols and configurations.

This module covered network traffic analysis principles, tcpdump fundamentals, working with Wireshark, and Wireshark filtering techniques. It also included hands-on exercises and labs to reinforce learning.

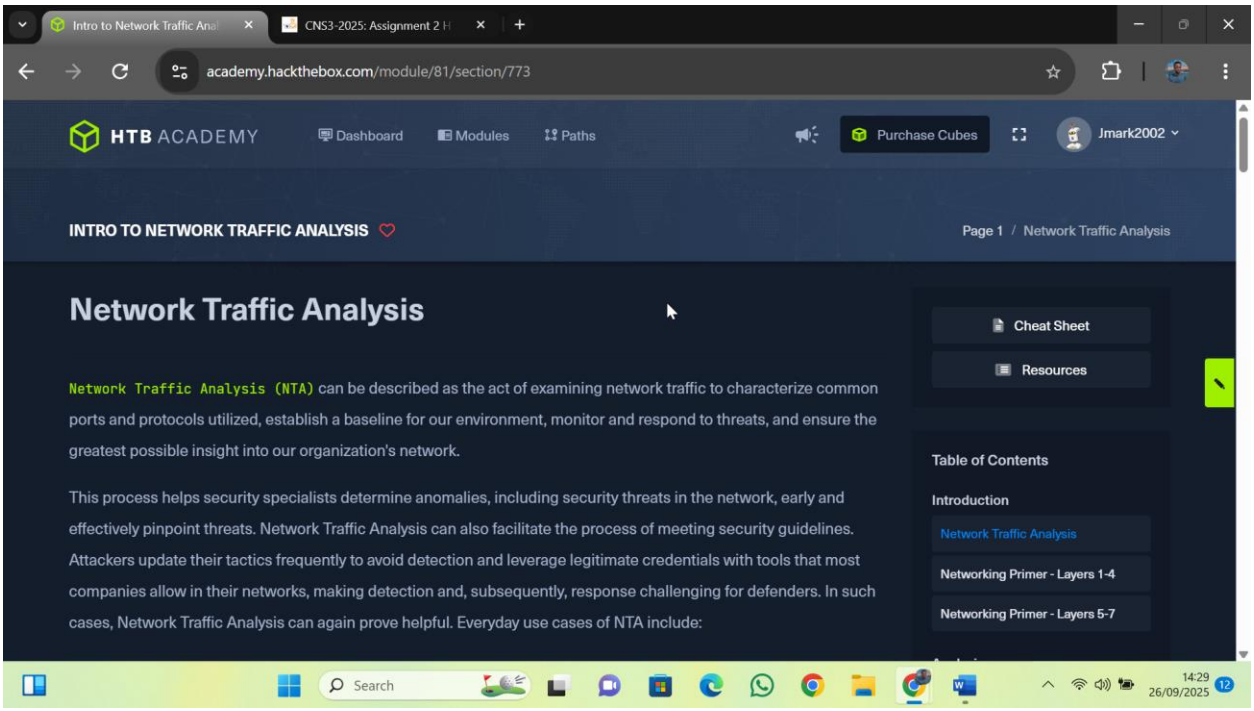
The primary tools explored were Wireshark, a graphical packet analysis tool, and tcpdump, a command-line tool for capturing and inspecting network traffic. These tools are commonly used to diagnose network issues, monitor suspicious activity, and perform penetration testing.

To successfully complete this module, a solid foundation in Linux fundamentals, basic networking, and web requests was necessary. By the end of this module, I developed practical skills in capturing, filtering, and analyzing network packets, which are critical for real-world cybersecurity roles such as SOC analysts, penetration testers, and network engineers.

Step 1: Accessing the Module



Part 1: Network Traffic Analysis

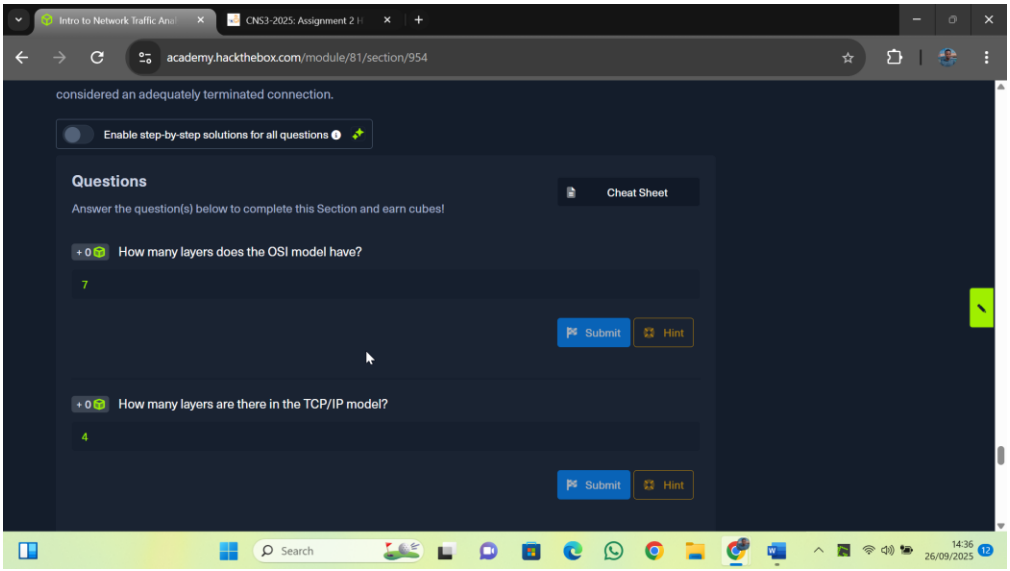


Part 2: Networking Primer - Layers 1-4

This section provided a refresher on fundamental networking concepts, focusing on the first four layers of the OSI (Open Systems Interconnection) model. Understanding these layers is essential for accurately capturing and analyzing network traffic, as each layer plays a unique role in data communication.

Questions

1. How many layers does the OSI model have? 7 Layers
2. How many layers are there in the TCP/IP model? 4 layers



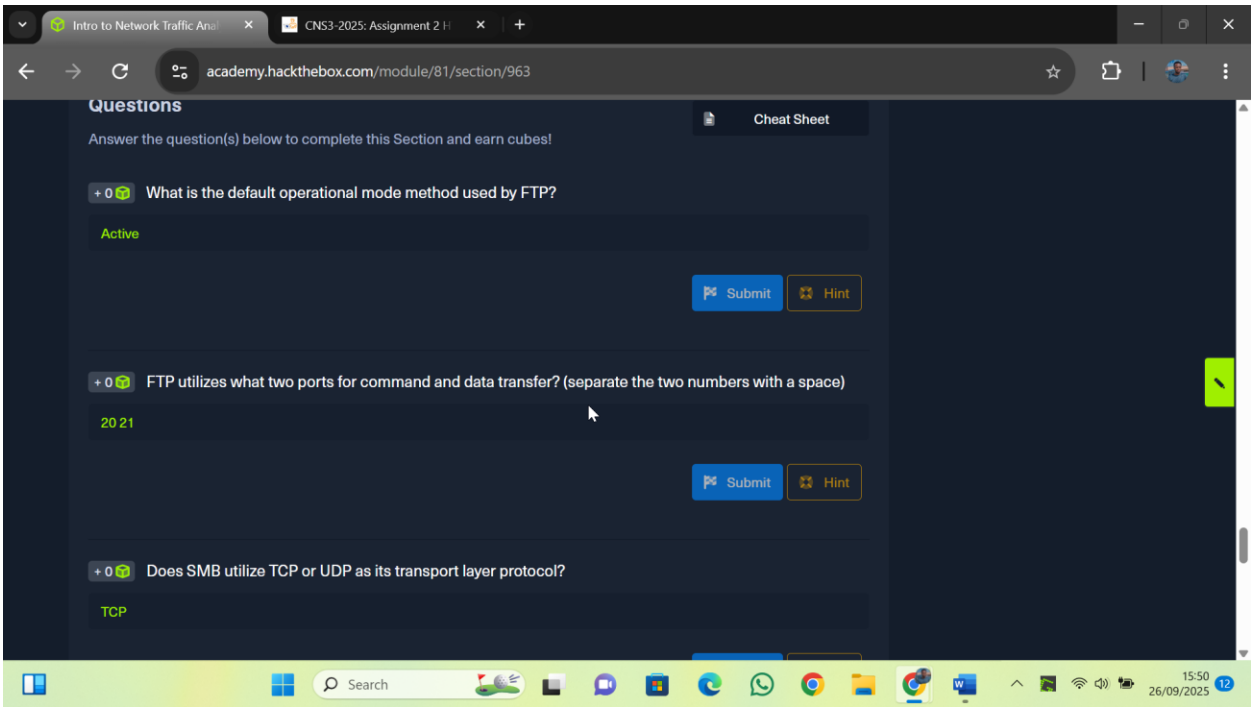
3. True or False: Routers operate at layer 2 of the OSI model? False
4. What addressing mechanism is used at the Link Layer of the TCP/IP model? MAC-Address
5. At what layer of the OSI model is a PDU encapsulated into a packet? (the number) 3
6. What addressing mechanism utilizes a 32-bit address? IPv4
7. What Transport layer protocol is connection oriented? TCP
8. What Transport Layer protocol is considered unreliable? UDP
9. TCP's three-way handshake consists of 3 packets: 1.Syn, 2.Syn & ACK, 3. _? What is the final packet of the handshake? ACK

Part 3: Networking Primer - Layers 5-7

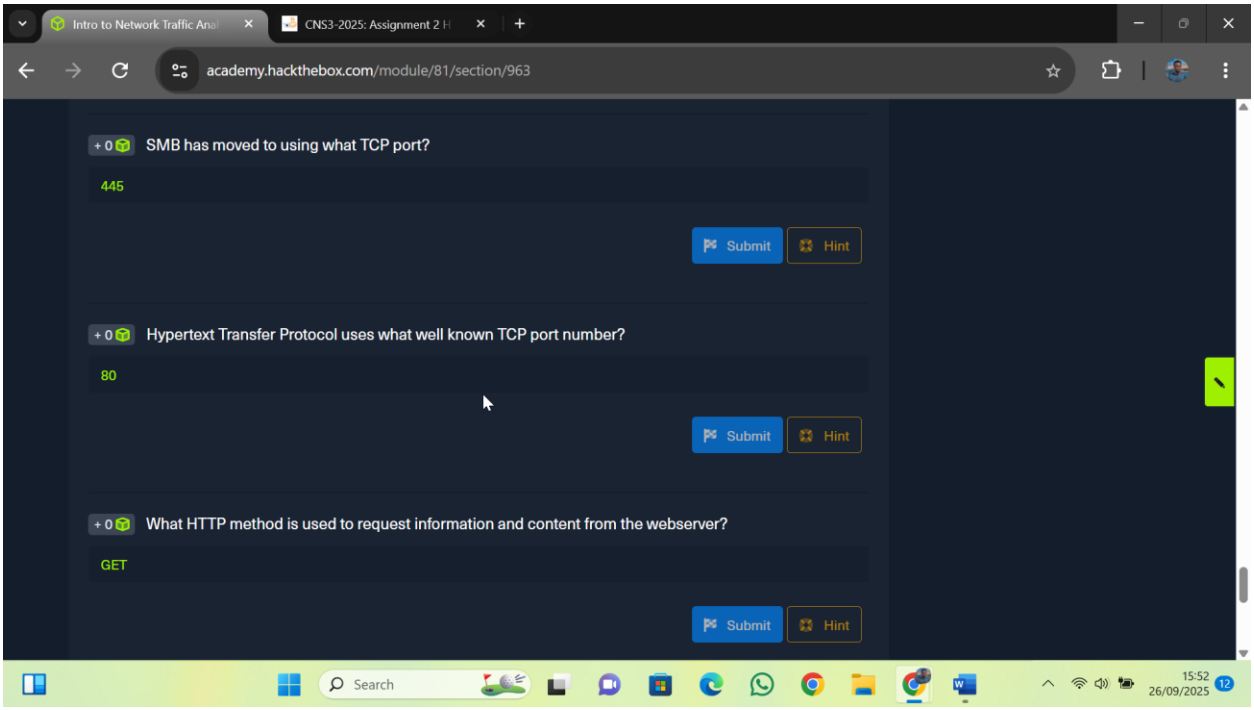
In this section, we move beyond the lower layers of the OSI model, which focus on how data is physically transmitted, routed, and delivered, to explore the upper layers (Layers 5–7). These layers are responsible for how applications interact across a network, ensuring that communication between devices is smooth, secure, and meaningful for end users. While there are many protocols and services at these layers, this section focused on a few key protocols that are critical for maintaining and managing network connections.

Questions

1. What is the default operational mode method used by FTP? Active
2. FTP utilizes what two ports for command and data transfer? (separate the two numbers with a space) 20 21
3. Does SMB utilize TCP or UDP as its transport layer protocol? TCP

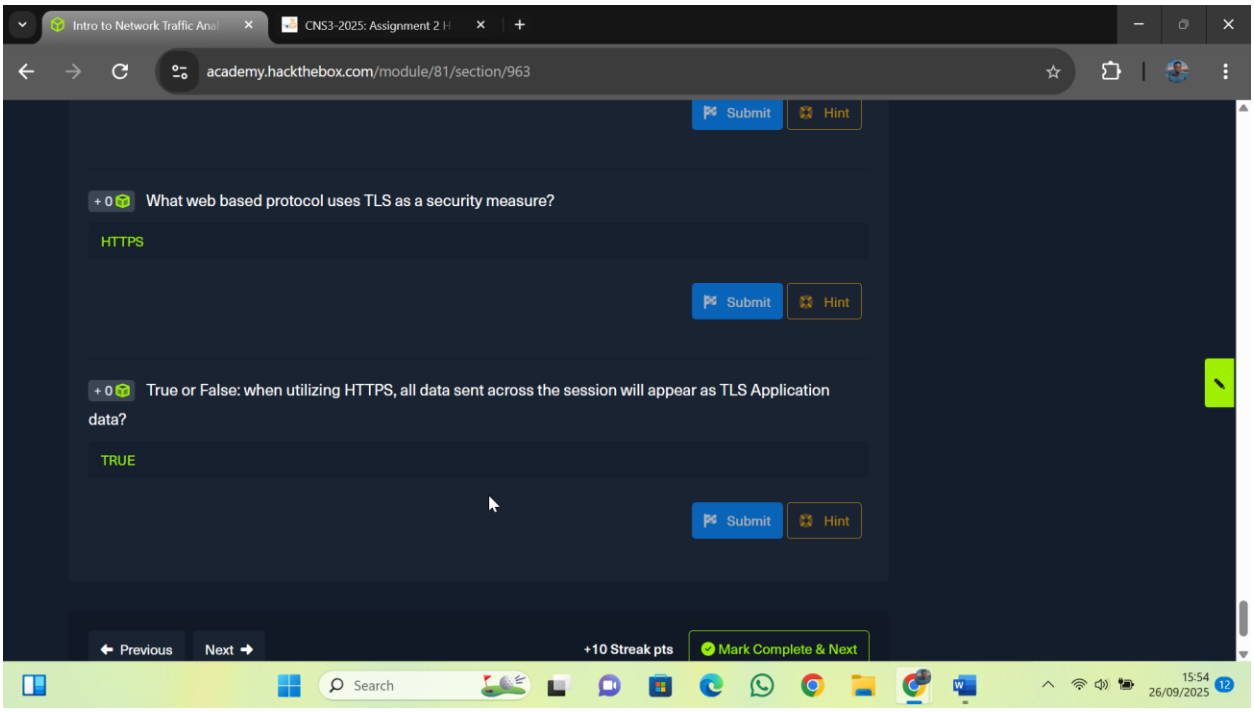


4. SMB has moved to using what TCP port? 445
5. Hypertext Transfer Protocol uses what well known TCP port number? 80
6. What HTTP method is used to request information and content from the webserver? GET



7. What web-based protocol uses TLS as a security measure? HTTPS

8. True or False: when utilizing HTTPS, all data sent across the session will appear as TLS Application data? TRUE



Part 4: The Analysis Process

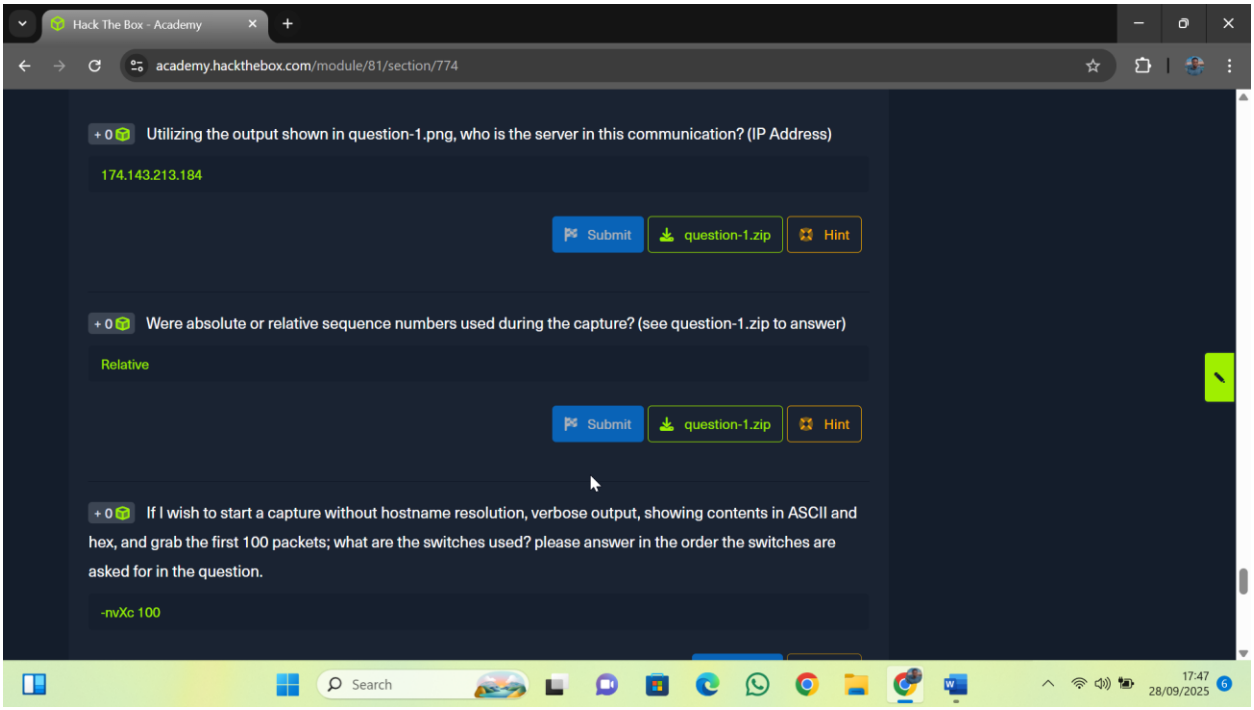
Network Traffic Analysis (NTA) is an essential process in cybersecurity that involves monitoring, capturing, and analyzing network data to identify irregularities, troubleshoot problems, and prevent potential attacks. It provides visibility into network operations, allowing administrators to establish a baseline of normal activity and quickly detect suspicious behavior. This visibility is vital for both defensive security and daily operations, helping organizations identify malicious traffic, such as unauthorized remote access attempts, and fix issues like connectivity problems. By combining NTA with advanced tools like firewalls, intrusion detection systems (IDS/IPS), and platforms like Splunk or ELK Stack, analysts can quickly detect and respond to threats, making network monitoring a proactive defense measure.

There are two main approaches to traffic analysis: **passive** and **active**. Passive capture involves copying traffic without interfering with it, often through mirrored ports, while active capture, also known as in-line capturing, requires inserting devices like network taps directly into the traffic flow. Each method has unique dependencies, such as permissions, specialized hardware, storage space, and processing power. Establishing a network baseline is crucial to filter out normal traffic and quickly identify anomalies. For example, noticing two user computers communicating over unusual ports could indicate a breach. Overall, NTA is a dynamic skill that requires both automated tools and human expertise to effectively secure networks and ensure smooth daily operations.

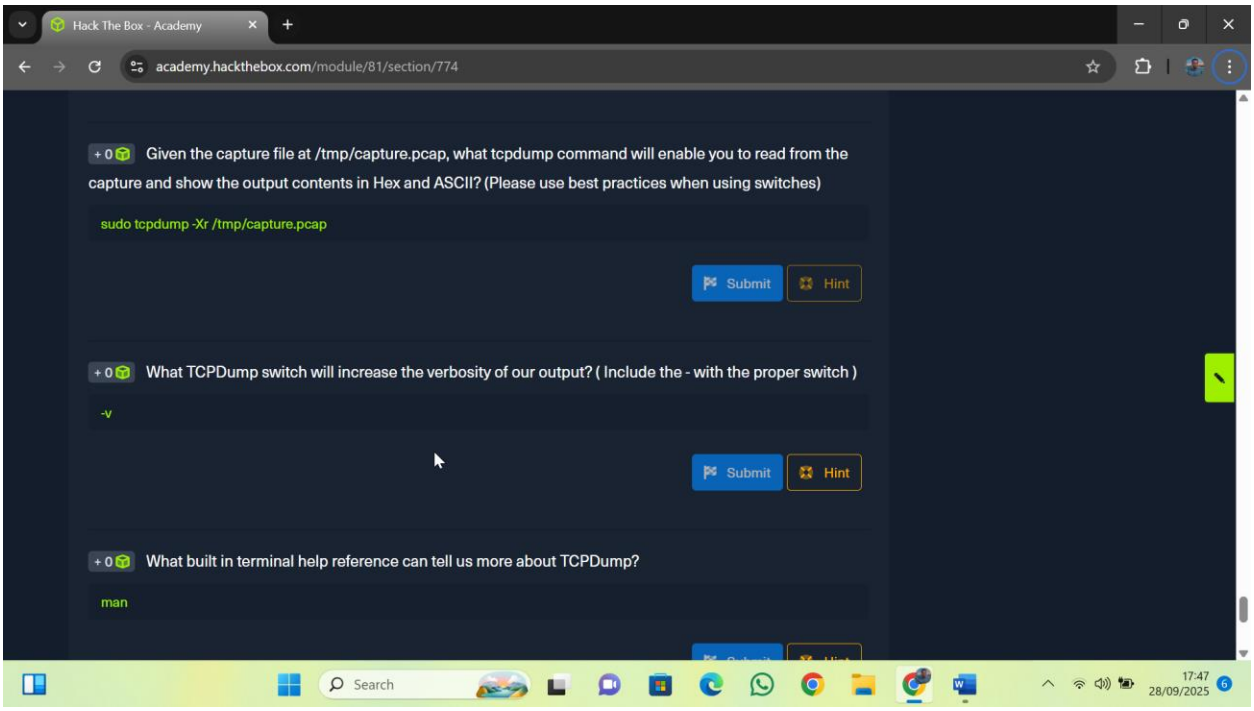
Part 5: Tcpdump Fundamentals

Questions

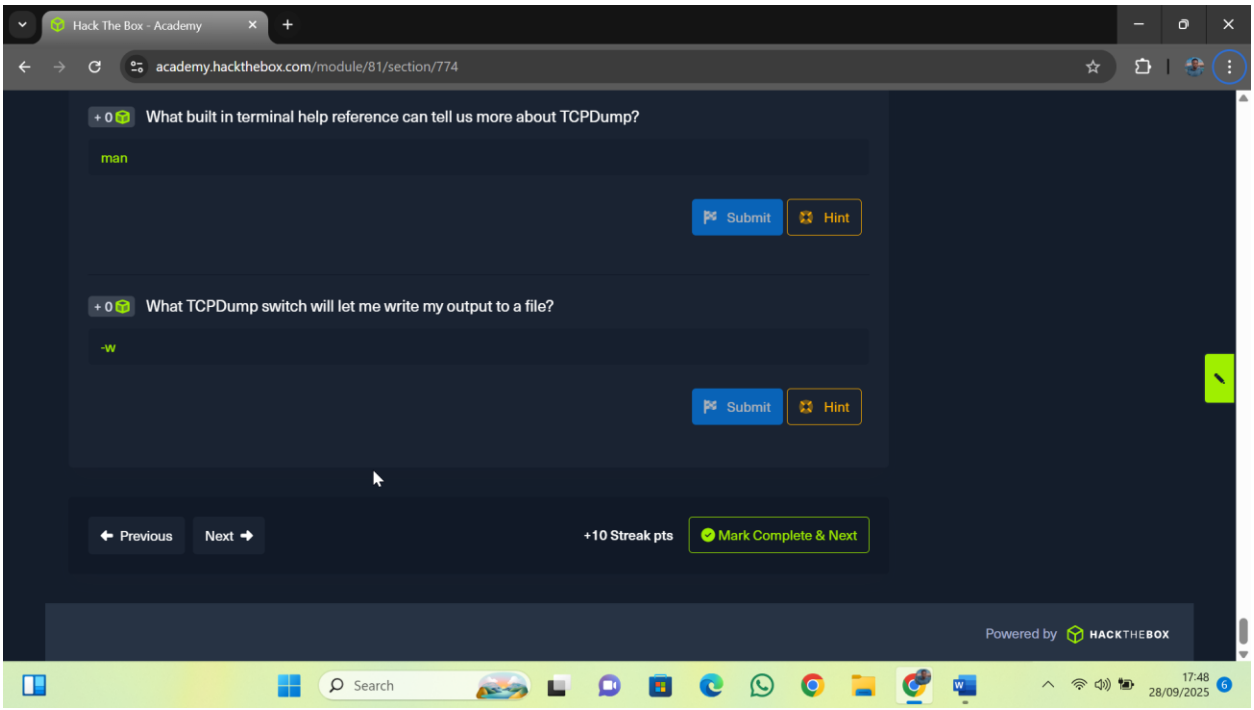
1. Utilizing the output shown in question-1.png, who is the server in this communication? (IP Address) 174.143.213.184
2. Were absolute or relative sequence numbers used during the capture? (see question-1.zip to answer) Relative
3. If I wish to start a capture without hostname resolution, verbose output, showing contents in ASCII and hex, and grab the first 100 packets; what are the switches used? please answer in the order the switches are asked for in the question. -nvXc 100



4. Given the capture file at /tmp/capture.pcap, what tcpdump command will enable you to read from the capture and show the output contents in Hex and ASCII? (Please use best practices when using switches) sudo tcpdump -Xr /tmp/capture.pcap
5. What TCPDump switch will increase the verbosity of our output? (Include the - with the proper switch) -v
6. What built in terminal help reference can tell us more about TCPDump? Man



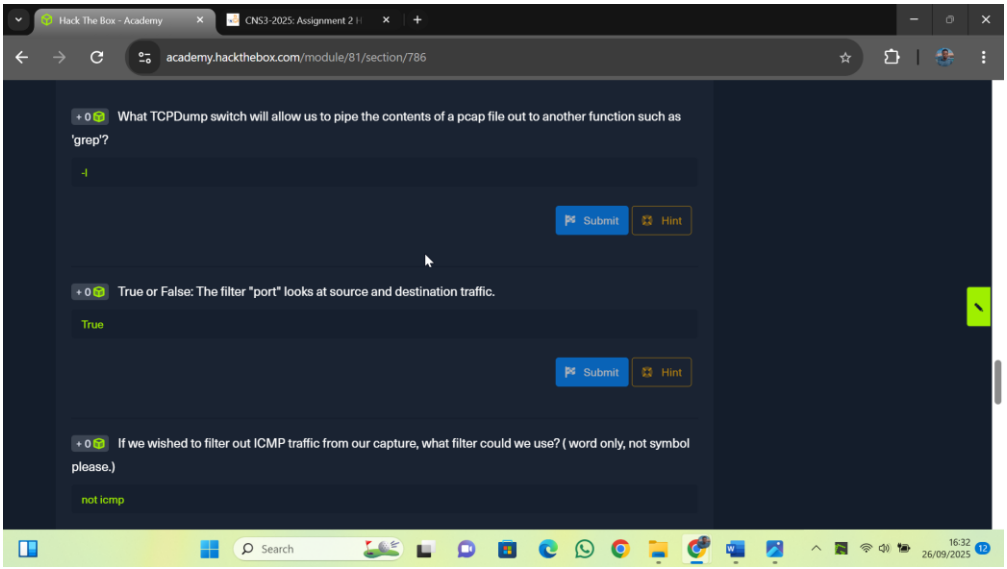
7. What TCPDump switch will let me write my output to a file? -w



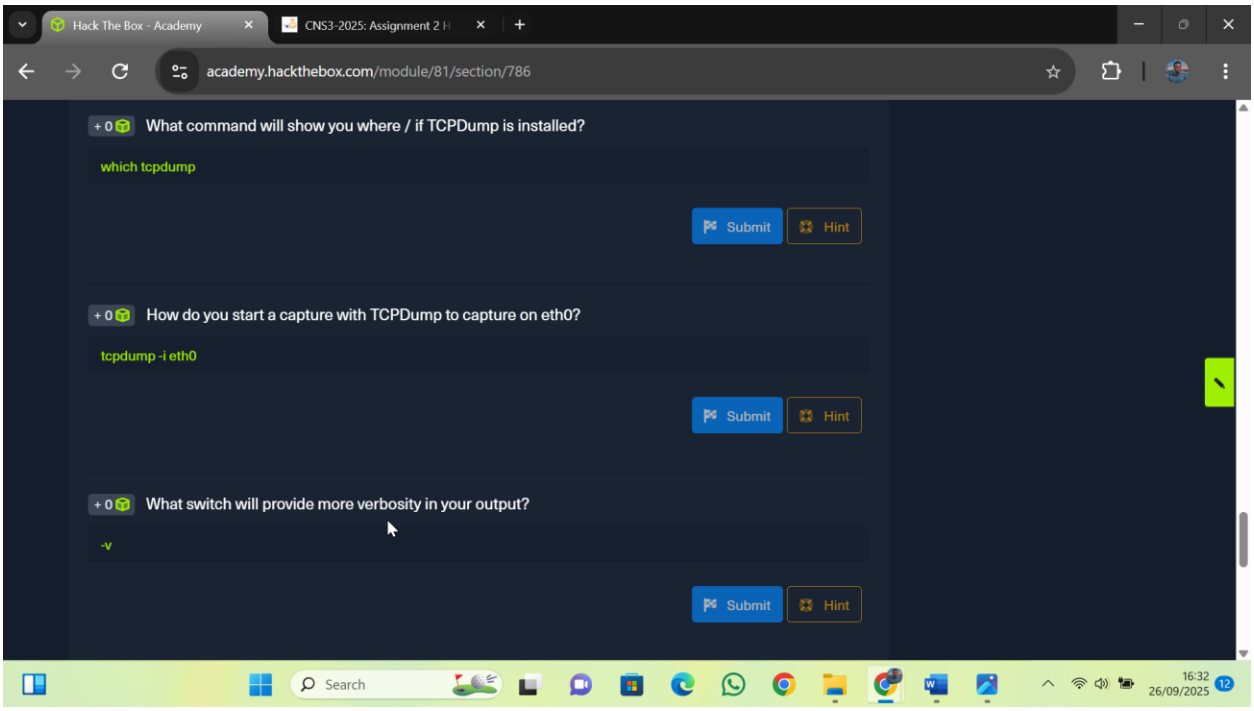
Part 6: Fundamentals Lab

Questions

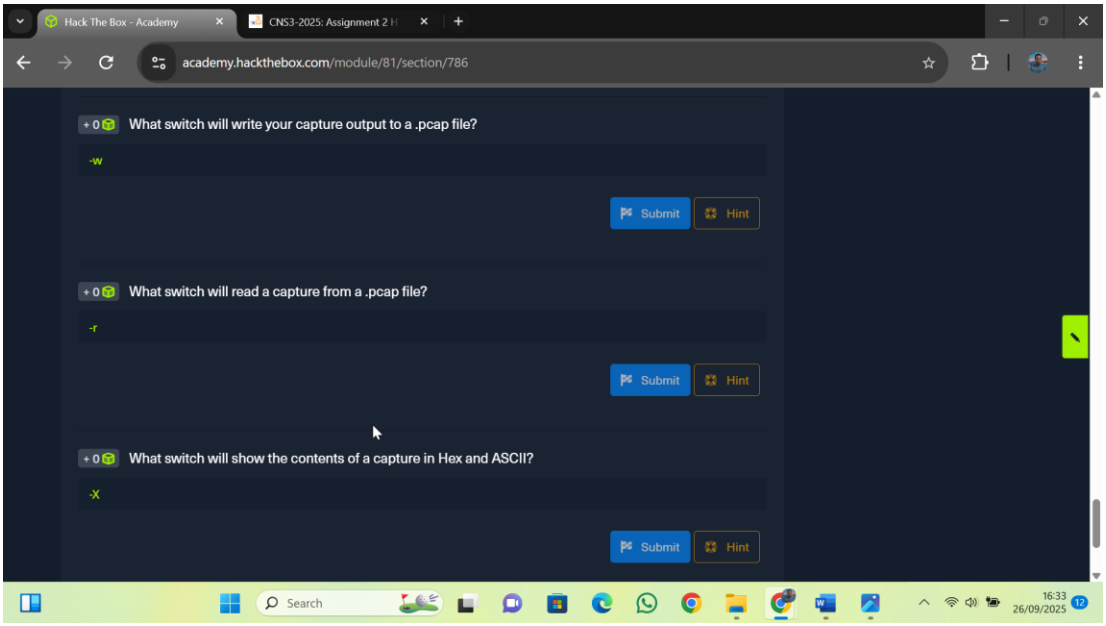
1. What TCPDump switch will allow us to pipe the contents of a pcap file out to another function such as 'grep'? -l
2. True or False: The filter "port" looks at source and destination traffic. True
3. If we wished to filter out ICMP traffic from our capture, what filter could we use? (word only, not symbol please.) not icmp



4. What command will show you where / if TCPDump is installed? which tcpdump
5. How do you start a capture with TCPDump to capture on eth0? tcpdump -i eth0
6. What switch will provide more verbosity in your output? -v



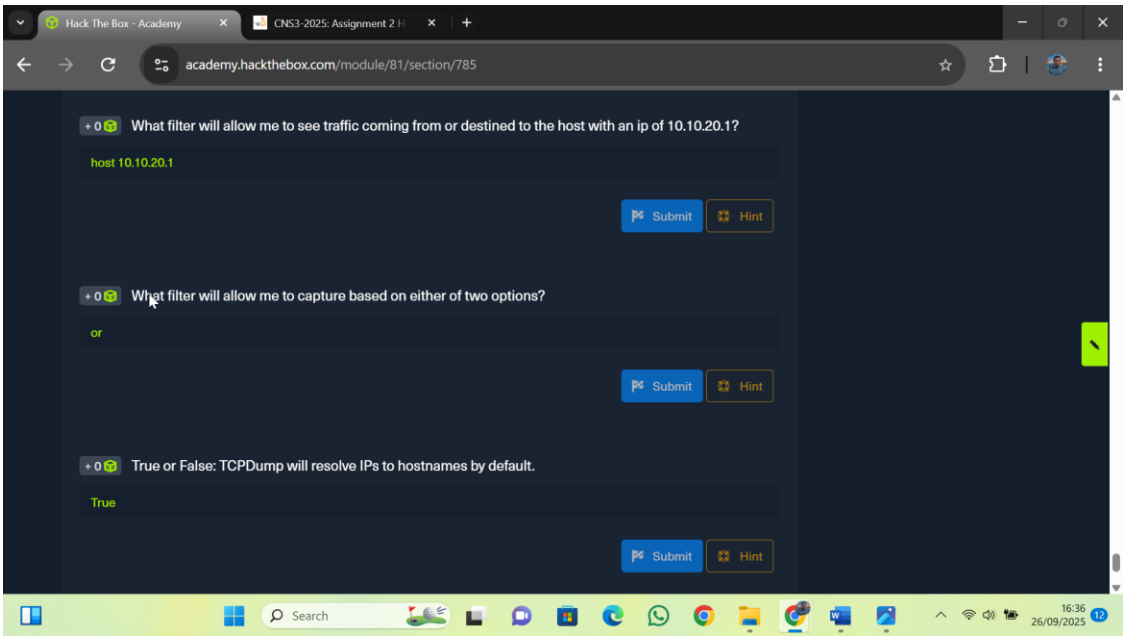
7. What switch will write your capture output to a .pcap file? -w
8. What switch will read a capture from a .pcap file? -r
9. What switch will show the contents of a capture in Hex and ASCII? -X



Part 7: Tcpdump Packet Filtering

Questions

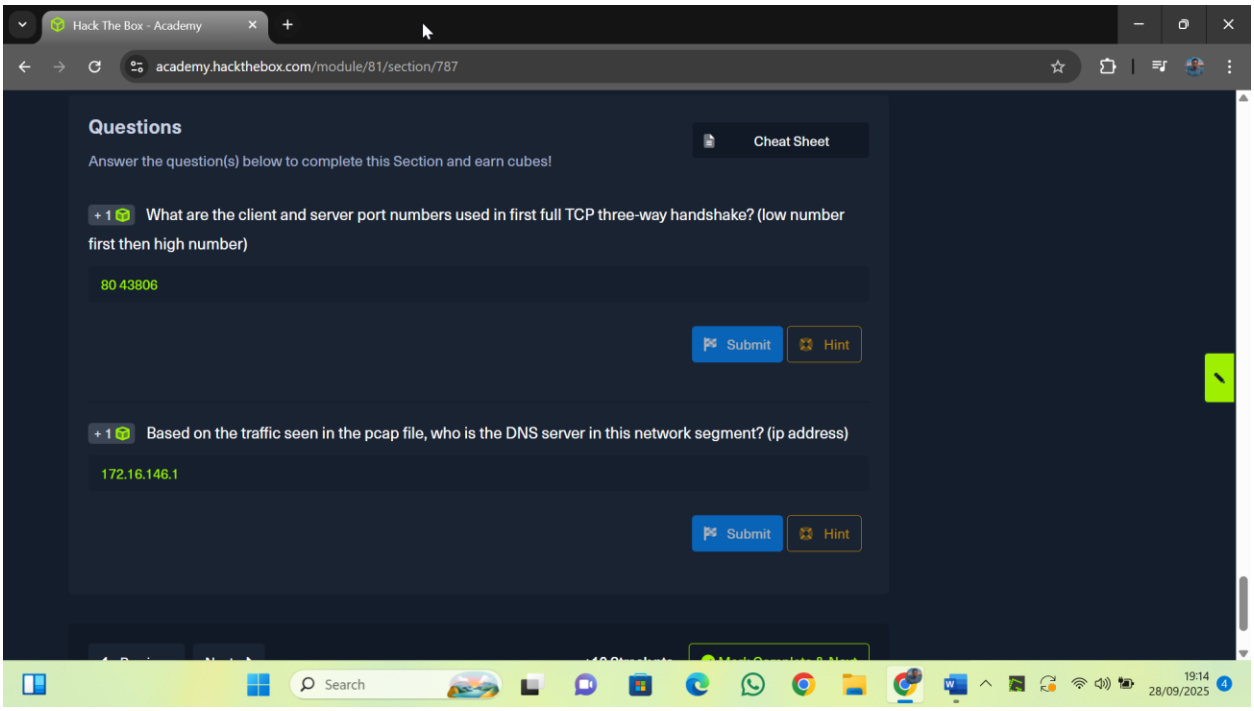
1. What filter will allow me to see traffic coming from or destined to the host with an ip of 10.10.20.1? host 10.10.20.1
2. What filter will allow me to capture based on either of two options? Or
3. True or False: TCPDump will resolve IPs to hostnames by default. True



Part 8: Interrogating Network Traffic with Capture and Display Filters

Questions

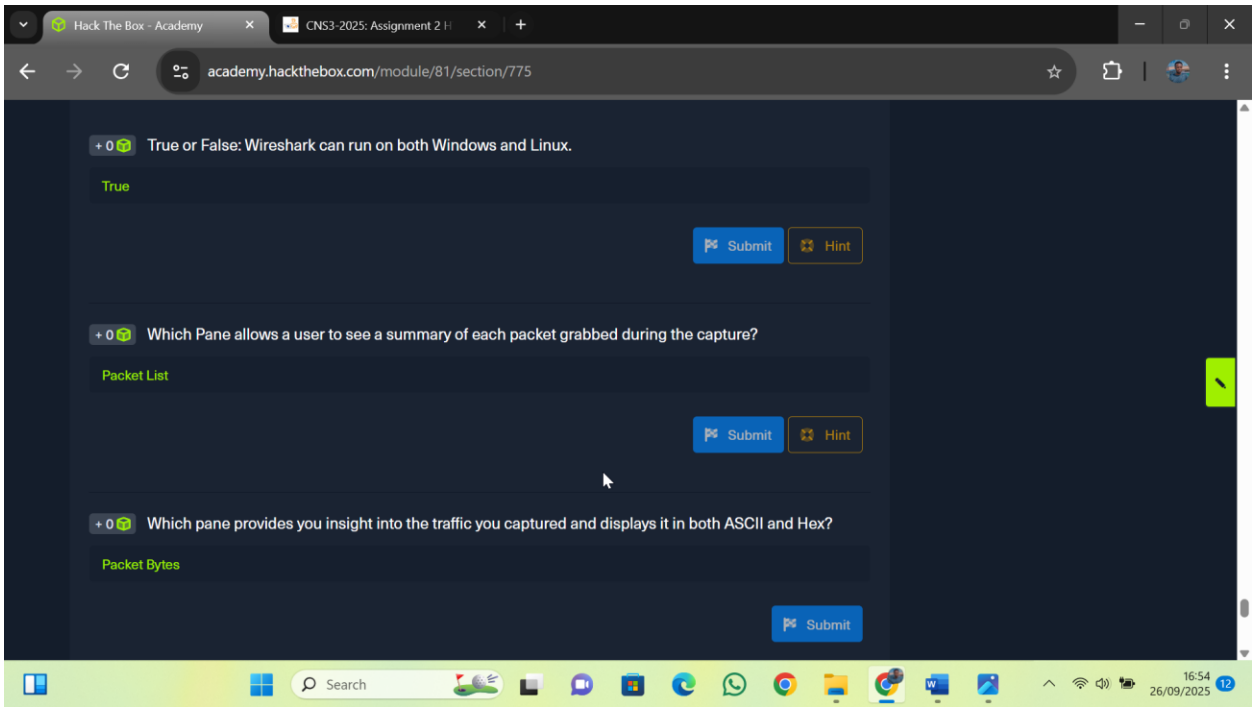
1. What are the client and server port numbers used in first full TCP three-way handshake? (low number first then high number) 80 43806
2. Based on the traffic seen in the pcap file, who is the DNS server in this network segment? (ip address) 172.16.146.1



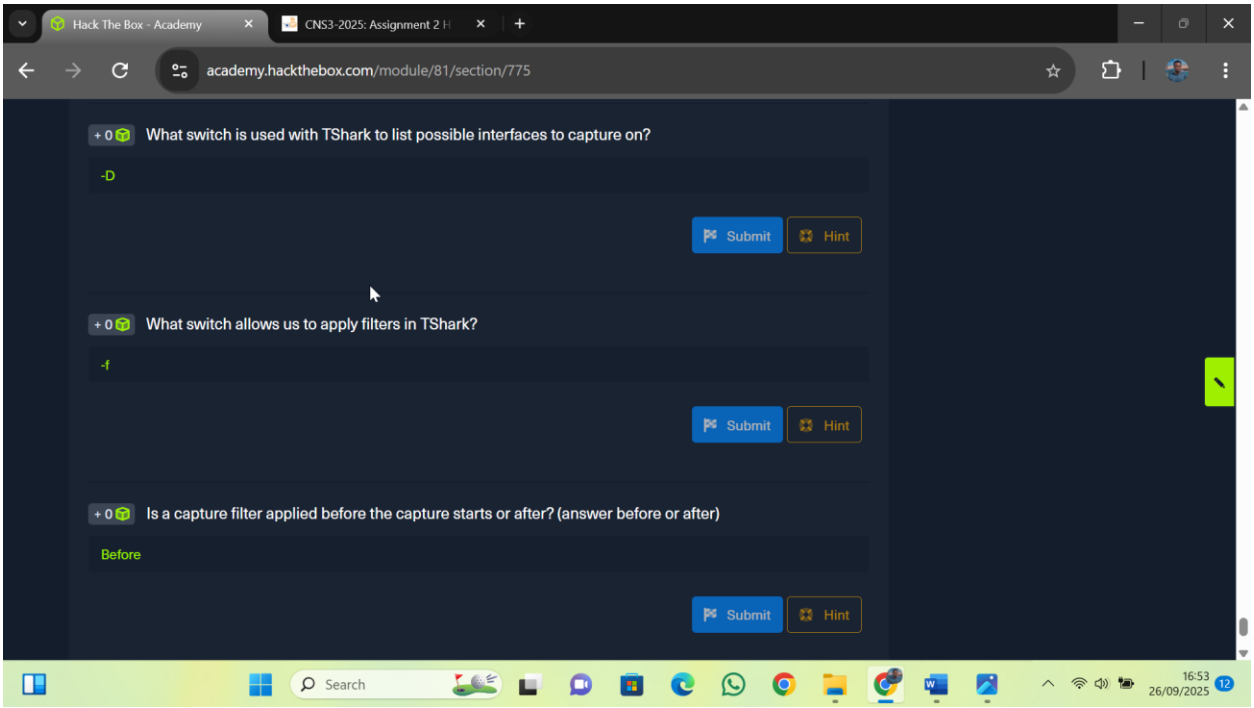
Part 9: Analysis with Wireshark

Questions

1. True or False: Wireshark can run on both Windows and Linux. True
2. Which Pane allows a user to see a summary of each packet grabbed during the capture? Packet List
3. Which pane provides you insight into the traffic you captured and displays it in both ASCII and Hex? Packet Bytes



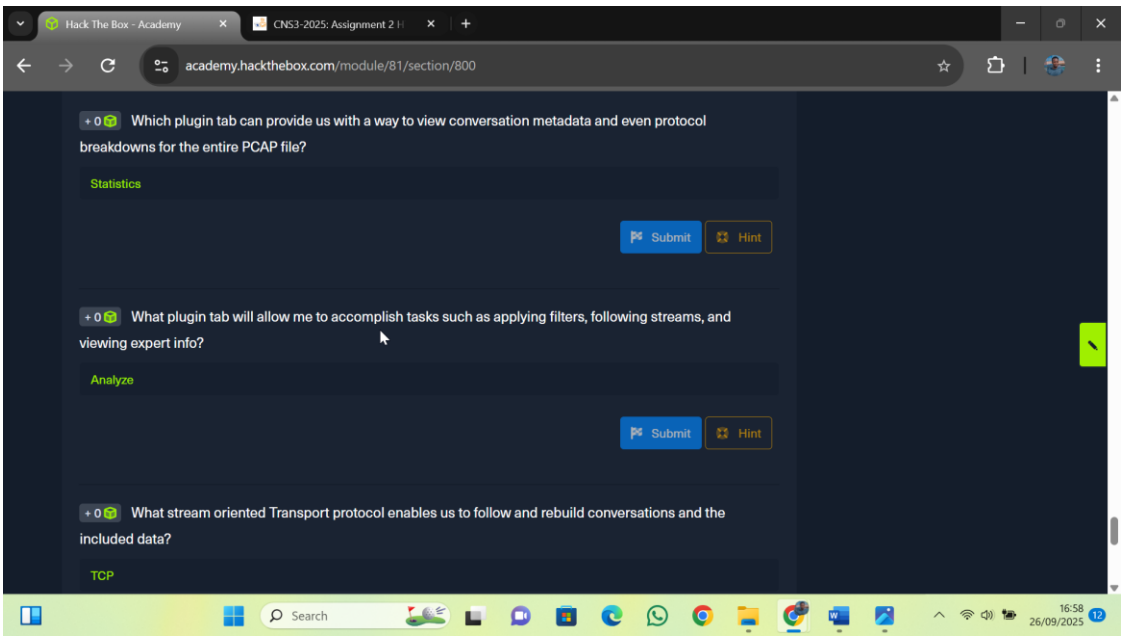
4. What switch is used with TShark to list possible interfaces to capture on? -D
5. What switch allows us to apply filters in TShark? -f
6. Is a capture filter applied before the capture starts or after? (answer before or after) Before



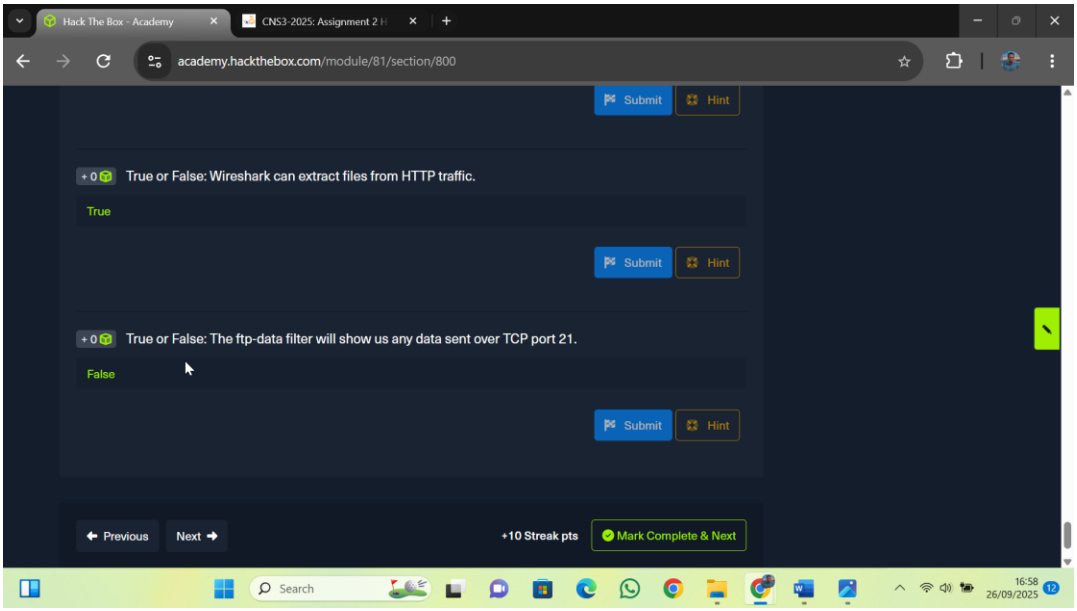
Part 10: Wireshark Advanced Usage

Questions

1. Which plugin tab can provide us with a way to view conversation metadata and even protocol breakdowns for the entire PCAP file? Statistics
2. What plugin tab will allow me to accomplish tasks such as applying filters, following streams, and viewing expert info? Analyze
3. What stream oriented Transport protocol enables us to follow and rebuild conversations and the included data? TCP



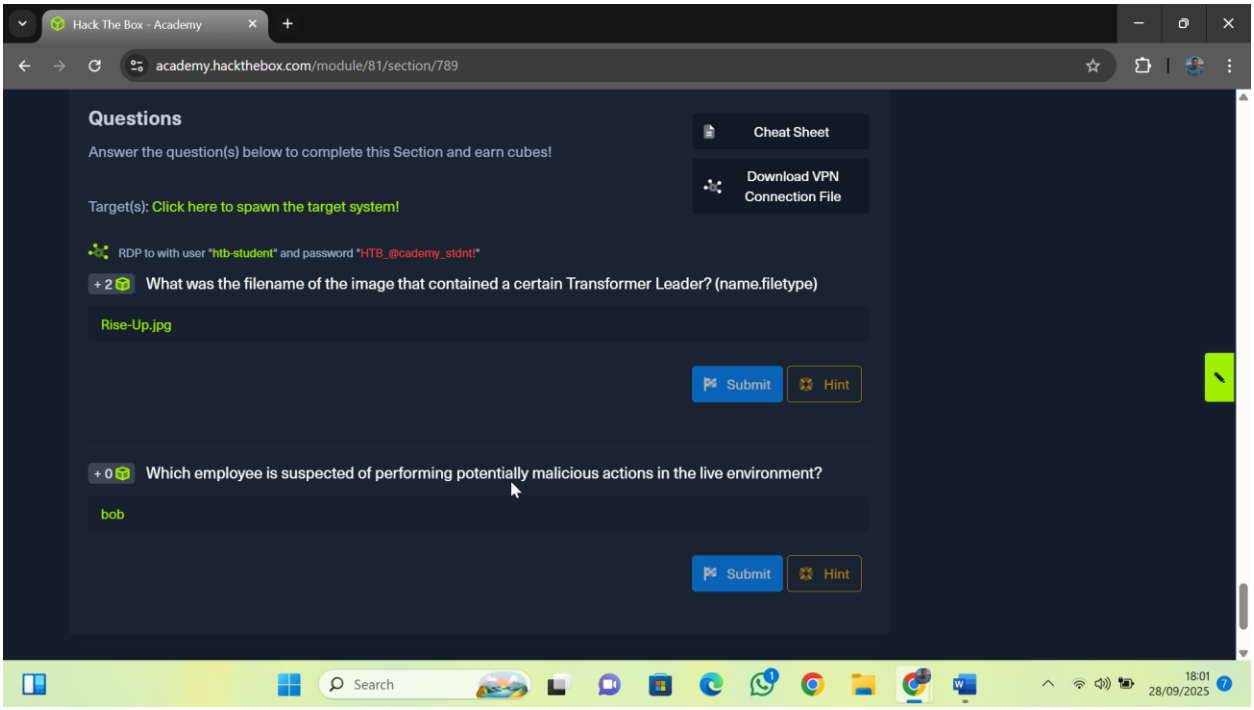
4. True or False: Wireshark can extract files from HTTP traffic. True
5. True or False: The ftp-data filter will show us any data sent over TCP port 21. False



Part 11: Packet Inception, Dissecting Network Traffic with Wireshark

Questions

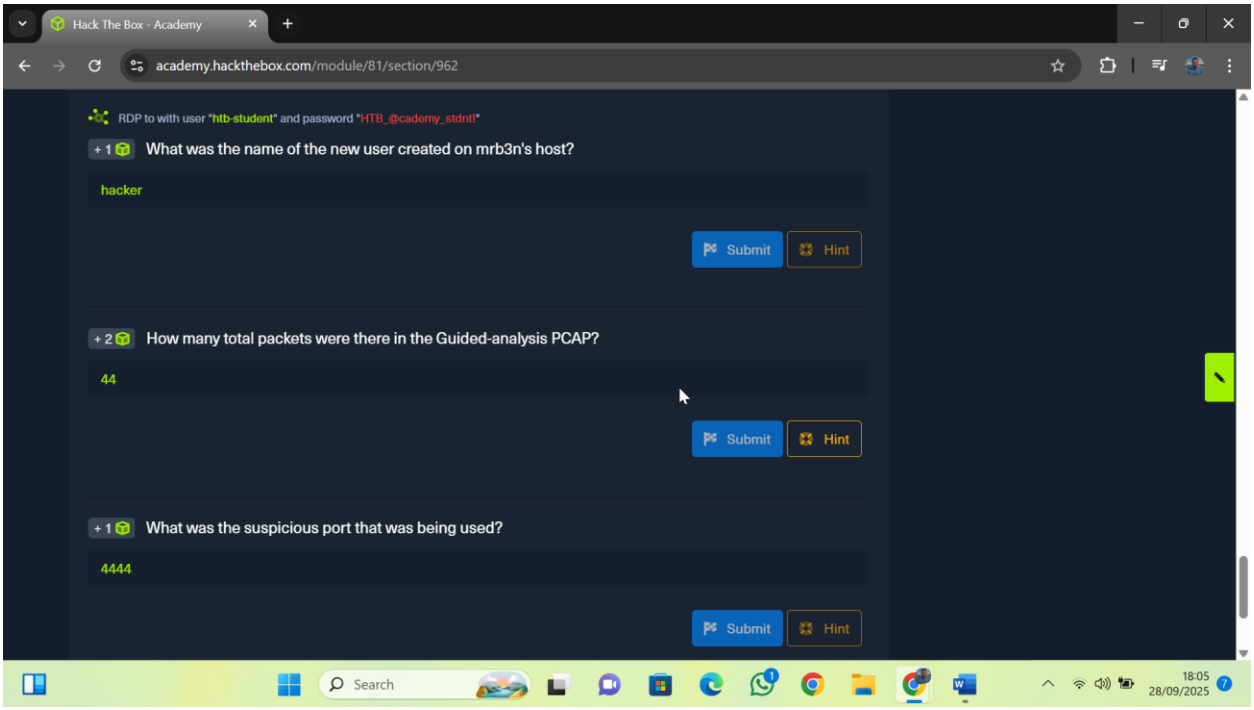
1. What was the filename of the image that contained a certain Transformer Leader? (name.filetype) Rise-Up.jpg
2. Which employee is suspected of performing potentially malicious actions in the live environment? Bob



Part 12: Guided Lab: Traffic Analysis Workflow

Questions

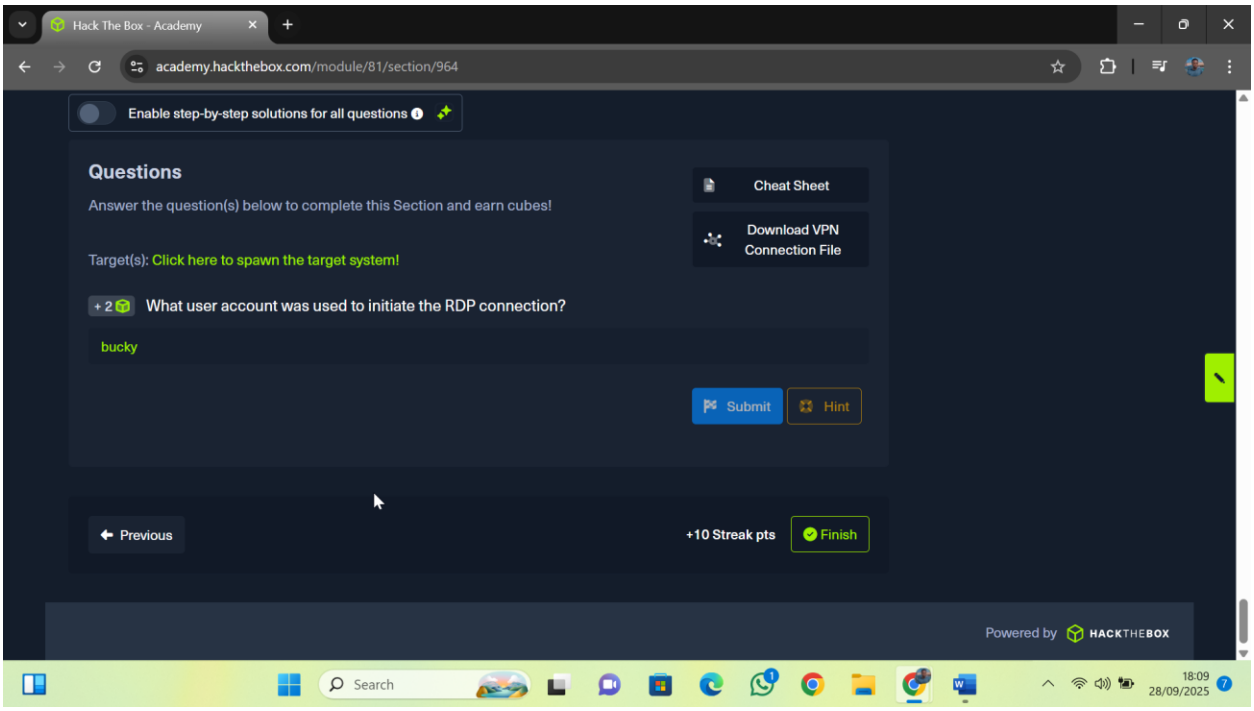
1. What was the name of the new user created on mrb3n's host? hacker
2. How many total packets were there in the Guided-analysis PCAP? 44
3. What was the suspicious port that was being used? 4444



Part 13: Decrypting RDP connections

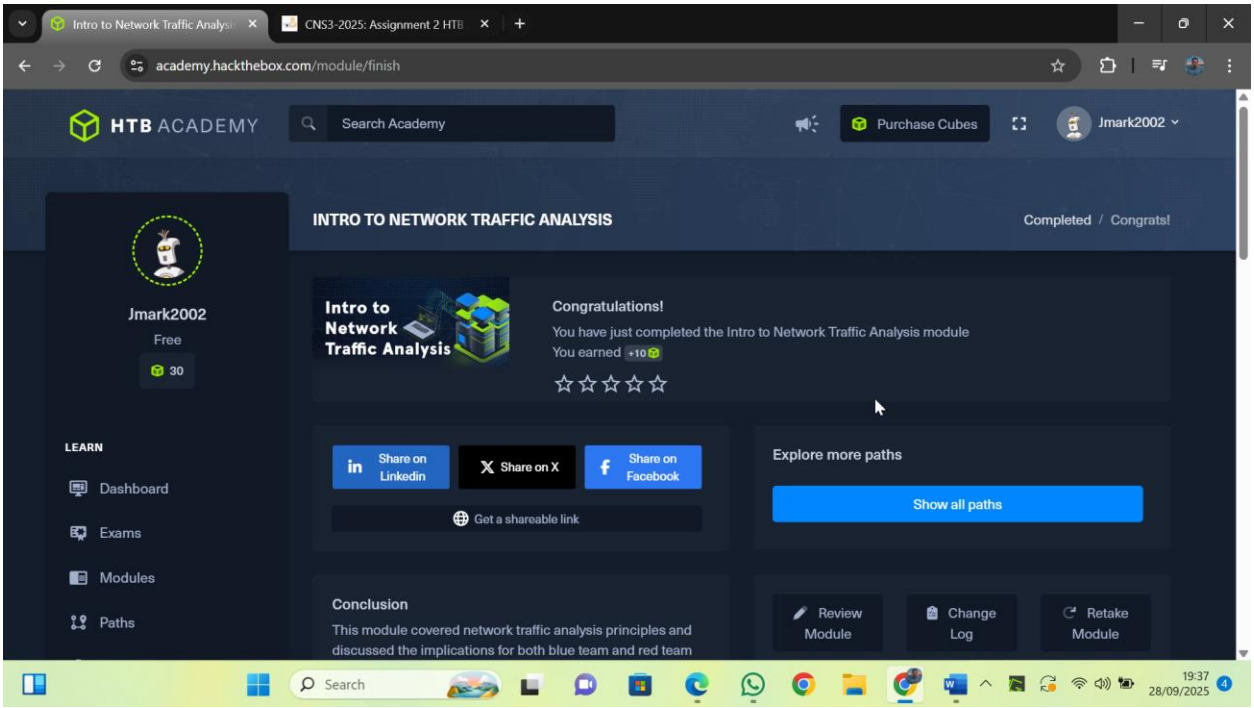
Questions

1. What user account was used to initiate the RDP connection? bucky



Module completion and Completion link:

https://academy.hackthebox.com/achievement/2178420/81



Conclusion

Through this assignment, I gained a deeper understanding of network traffic analysis and the important role it plays in both offensive and defensive cybersecurity. I learned how to identify, capture, and analyze network traffic using tools like Wireshark and tcpdump, as well as how to apply different filters to pinpoint suspicious or malicious activities. The module gave me a clear view of how network communication works, including how protocols such as TCP, HTTP, FTP, and SMB function within the OSI and TCP/IP models. This knowledge helped me better interpret packet data and understand the flow of information across a network.