Sri Lanka Institute of Information Technology

Applied Information Assurance - IE3022

Network Scanning and Reconnaissance Test

Lab sheet 04

IT22560094

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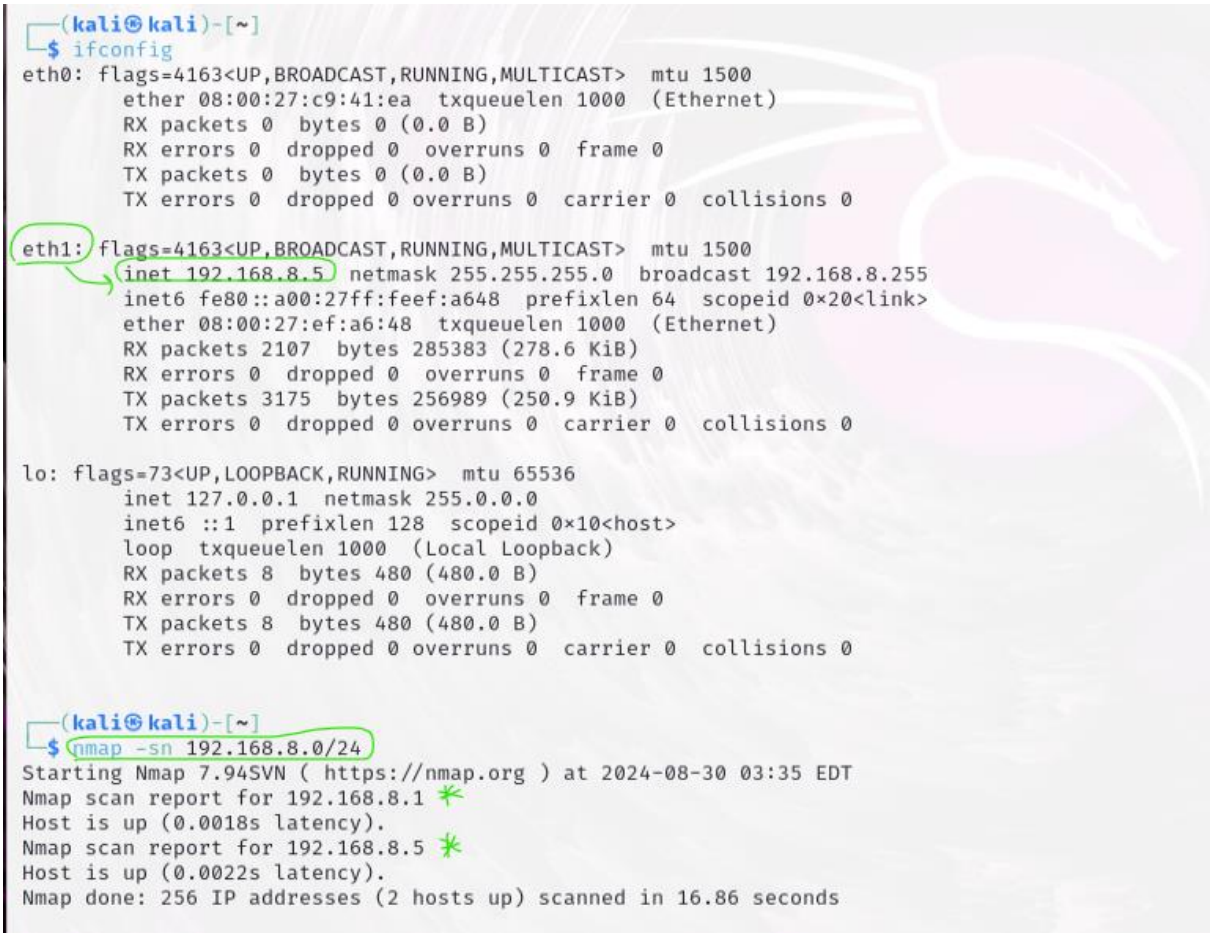
Nmap - Network Scanning and Reconnaissance

Nmap is an open-source network scanning tool which has a GNU General public license.

Nmap was developed by Gordon "Fyodor" Lyon and continues to be actively maintained by a community of volunteers.

My current Nmap version is Nmap version 7.94SVN.

Exercise 1: Host Discovery



Questions:

1. What command did you use for host discovery?
   - Nmap –sn 192.168.8.0/24
   - After running the command, Nmap will output a list of active IP addresses on your network

2. List the IP addresses of the discovered hosts.
   - 192.168.8.1
   - 192.168.8.5

3. What are the possible reasons if a host is not detected in the scan?

Reason	Explanation
Firewalls	If the host is using a firewall which blocks ICMP (Internet control Message Protocol) echo requests which commonly known as ping requests.
Host is offline	If the host is powered off or disconnected to the network Nmap cannot detect them.
Different subnet	If the host is in a different subnet that will not be included in my scan range.
Network configurations	If the host has misconfigured network settings, the host will prevent responding to the network requests.
Stealth mode	If the hosts use stealth mode to intentionally avoid responding ping requests.

Exercise 2: Port Scanning

Perform a TCP SYN scan on one of the discovered hosts. Document the command used and the results.

nmap -sS [target-ip]

Questions:

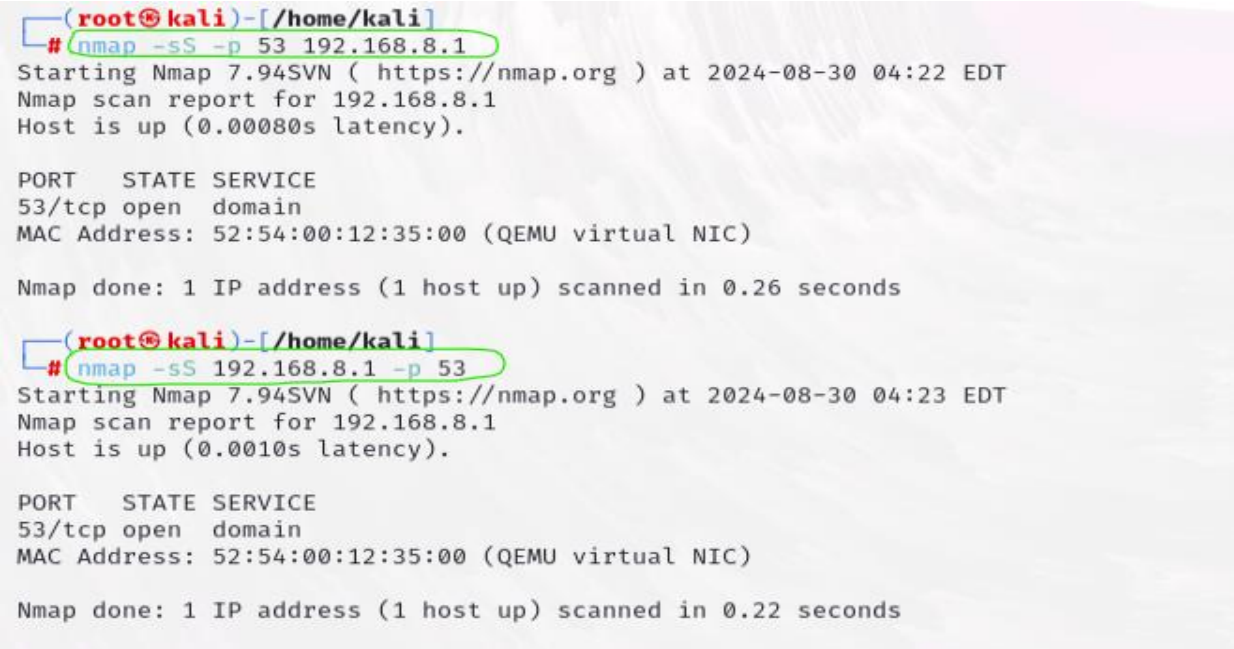
1. What command did you use for port scanning?
   - nmap -sS 192.168.8.1
2. List the open ports and services found on the target host.

```
┌──(kali㉿kali)-[~]
└─$ sudo su
┌──(root㉿kali)-[/home/kali]
└─# nmap -sS 192.168.8.1
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-08-30 03:57 EDT
Nmap scan report for 192.168.8.1
Host is up (0.00018s latency).
Not shown: 999 closed tcp ports (reset)
PORT   STATE SERVICE
53/tcp open  domain
MAC Address: 52:54:00:12:35:00 (QEMU virtual NIC)

Nmap done: 1 IP address (1 host up) scanned in 0.48 seconds

┌──(root㉿kali)-[/home/kali]
└─# nmap -sT 192.168.8.1
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-08-30 03:58 EDT
Nmap scan report for 192.168.8.1
Host is up (0.00082s latency).
Not shown: 999 closed tcp ports (conn-refused)
PORT   STATE SERVICE
53/tcp open  domain
MAC Address: 52:54:00:12:35:00 (QEMU virtual NIC)

Nmap done: 1 IP address (1 host up) scanned in 0.34 seconds

┌──(root㉿kali)-[/home/kali]
└─# nmap -sT 192.168.8.5
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-08-30 03:58 EDT
Nmap scan report for 192.168.8.5
Host is up (0.00025s latency).
All 1000 scanned ports on 192.168.8.5 are in ignored states.
Not shown: 1000 closed tcp ports (conn-refused)

Nmap done: 1 IP address (1 host up) scanned in 0.06 seconds

┌──(root㉿kali)-[/home/kali]
└─# nmap -sS 192.168.8.5
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-08-30 03:58 EDT
Nmap scan report for 192.168.8.5
Host is up (0.0000060s latency).
All 1000 scanned ports on 192.168.8.5 are in ignored states.
Not shown: 1000 closed tcp ports (reset)

Nmap done: 1 IP address (1 host up) scanned in 0.14 seconds
```

3. Explain the difference between a SYN scan and a CONNECT scan.

Aspect	SYN Scan (-sS)	CONNECT Scan (-sT)
Scan Type	Half-open scan	Full connection scan
TCP Handshake	Does not complete the TCP handshake (only sends SYN, receives SYN-ACK, and then sends RST)	Completes the full TCP handshake (SYN, SYN-ACK, ACK)
Stealth	Stealthier (less likely to be detected or logged)	Less stealthy (more likely to be detected and logged)
Speed	Faster	Slower
Resource Usage	Uses fewer resources on the target system	Uses more resources on the target system
Detection	Harder Don't complete the full TCP handshake they don't send the final ACK packet. So less likely to trigger alarms in Intrusion Detection System (IDS)/Intrusion Prevention System (IPS) systems.	Easier Because a CONNECT scan completes the full three-way TCP handshake, it generates more network activity and triggers the Intrusion Detection System (IDS)/Intrusion Prevention System (IPS).
Use Case	Preferred when you want to avoid detection	Used when SYN scan is not possible (e.g., due to restrictions)
Operating System	Typically requires root/administrator privileges	Can be run by regular users without special privileges

4. How can you use Nmap to scan for specific ports or service types?



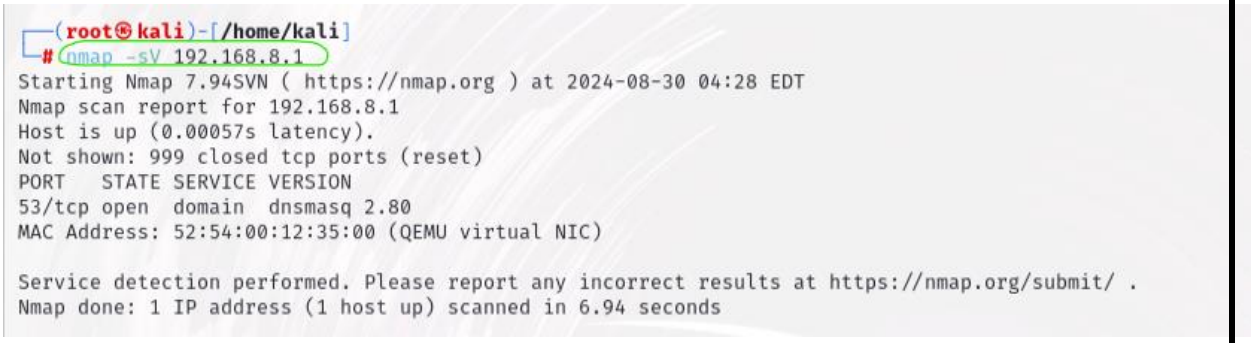
- Scan ports we can use '-p' before or after the ip address.
- Scan specific service type we can use '--service'

Exercise 3: Service and Version Detection

Run a service and version detection scan on the same host. Document the command used and the output.
nmap -sV [target-ip]

Questions:

1. What command did you use for service and version detection?
   - Nmap –sV 192.168.8.1
2. Provide details about the services and versions detected on the target host.



3. Why is it important to detect service versions during a network scan?
   - Knowing the version helps to find specific vulnerabilities linked to that version.
   - It helps to check if the service is up to date with security patches, which helps to keep the system secure.

4. How can version information be useful in identifying potential vulnerabilities?

- Known Issues: By knowing the version of the service (e.g., dnsmasq 2.80), we can check if that specific version has known security issues.
- Exploit Databases: Version information allows us to look up the version in exploit databases to see if there are any known exploits targeting that version.
- Update Recommendations: It helps determine if the service is outdated and needs to be updated or patched to fix security problems.

Nikto - Network Scanning and Reconnaissance

Exercise 1: Web Server Scanning

Scan a web server using Nikto. Document the command used and the findings.

Nikto commands can be used for scanning web applications.

Command	Description
nikto -h http://foo.com	Scans the specified host
nikto -h http://foo.com -Tuning 6	Uses a specific Nikto scan tuning level
nikto -h http://foo.com -port 8000	Scans the specified port
nikto -h http://foo.com -ssl	Scans for SSL vulnerabilities
nikto -h http://foo.com -Format html	Formats output in HTML
nikto -h http://foo.com -output out.txt	Saves the output to a file

nikto -h http://[target-ip]

```
┌──(kali㉿kali)-[~]
└─$ nikto --version
Unknown option: version

   Options:
       -ask+               Whether to ask about submitting updates
                               yes   Ask about each (default)
                               no    Don't ask, don't send
                               auto  Don't ask, just send
       -check6             Check if IPv6 is working (connects to ipv6.google.com or value set in nikto.conf)
       -Cgidirs+           Scan these CGI dirs: "none", "all", or values like "/cgi/ /cgi-a/"
       -config+            Use this config file
       -Display+           Turn on/off display outputs:
                               1     Show redirects
                               2     Show cookies received
                               3     Show all 200/OK responses
                               4     Show URLs which require authentication
                               D     Debug output
                               E     Display all HTTP errors
                               P     Print progress to STDOUT
                               S     Scrub output of IPs and hostnames
                               V     Verbose output
       -dbcheck            Check database and other key files for syntax errors
       -evasion+           Encoding technique:
                               1     Random URI encoding (non-UTF8)
                               2     Directory self-reference (/./)
                               3     Premature URL ending
                               4     Prepend long random string
                               5     Fake parameter
                               6     TAB as request spacer
                               7     Change the case of the URL
                               8     Use Windows directory separator (\)
                               A     Use a carriage return (0x0d) as a request spacer
                               B     Use binary value 0x0b as a request spacer
        -followredirects   Follow 3xx redirects to new location
        -Format+           Save file (-o) format:
                               csv   Comma-separated-value
                               json  JSON Format
                               htm   HTML Format
                               nbe   Nessus NBE format
                               sql   Generic SQL (see docs for schema)
                               txt   Plain text
                               xml   XML Format
                               (if not specified the format will be taken from the file extension passed to -output)
       -Help               This help information
       -host+              Target host/URL
       -id+                Host authentication to use, format is id:pass or id:pass:realm
       -ipv4                  IPv4 Only
       -ipv6                  IPv6 Only
```

Questions:

1. What command did you use for the web server scan?
   Nikto –h courseweb.sliit.lk

2. List any vulnerabilities or issues detected by Nikto.
   - The anti-clickjacking X-Frame-Options header is not present
   - The X-Content-Type-Options header is not set

3. Explain how Nikto's scan results can be used to improve web server security.
   - Nikto can find web server softwares that is outdated and needs updating.
   - It can detect known security vulnerabilities on the web server.
   - It can finds default or leftover files that could be exploited by attackers.
   - By using those results legitimate owners can reduce attack surfaces.

4. What are some limitations of Nikto in web vulnerability assessments?

False Positives	Nikto might show a directory as potentially dangerous because it contains certain files, but those files might be harmless or created for a legitimate purpose. It could report an outdated software version as a vulnerability even if security patches have been applied but if they forgot to update the version number.
Limited Coverage	Nikto scanning's can leads to cause some missing vulnerabilities because it primarily looks for known issues in common web servers
No Exploitation	It might find a potential SQL injection point but won't test if it's exploitable, leaving you uncertain of the real risk.
Basic Scanning	Advanced threats like zero-day vulnerabilities, which have no known fix or public knowledge, are likely to be missed by Nikto's scanning methods.

The Harvester - Network Scanning and Reconnaissance

Exercise 1: Information Gathering

Use TheHarvester to gather information about a domain. Document the command used and summarize the results.

theharvester -d [domain] -l 500 -b google

Command	Description
theHarvester -d example.com -l 500	Gathers the first 500 results for the domain example.com.
theHarvester -d example.com -b google	Uses Google as the search engine to gather information on example.com
theHarvester -d example.com -b all	Uses all available search engines for information gathering on example.com
theHarvester -d example.com -f report.html	Saves the results in an HTML report named report.html
theHarvester -d example.com -v	Enables verbose mode, showing more detailed output during the scan
theHarvester -d example.com -c	Checks the validity of found emails
theHarvester -d example.com -s 0	Starts searching from the first result (useful for large queries)
theHarvester -d example.com -b bing -l 200 -f results.xml	Uses Bing, limits results to 200, and saves the output in XML format.

Questions

1. What command did you use for harvesting information?
    - theHarvester -d hackthissite.org -l 500

2. List the email addresses, subdomains, and any other information collected.

```
┌──(kali㉿kali)-[~]
└─$ theHarvester -d vulnhub.com -l 500
Read proxies.yaml from /home/kali/.theHarvester/proxies.yaml
*******************************************************************
*  _   _                                             _            *
* | |_| |__   ___    ^  /\__ _ _ ____   _____  ___| |_ ___ _ __  *
* | __|  _ \ / _ \  / /_/ / _` | '__\ \ / / _ \ __| __/ _ \ '__| *
* | |_| | | |  __/ / __  / (_| | |   \ V /  __/\__ \ ||  __/ |    *
*  \__|_| |_|\___| \/ /_/ \__,_|_|    \_/ \___||___/\__\___|_|    *
*                                                                 *
* theHarvester 4.6.0                                              *
* Coded by Christian Martorella                                   *
* Edge-Security Research                                          *
* cmartorella@edge-security.com                                   *
*                                                                 *
*******************************************************************

[*] No IPs found.

[*] No emails found.

[*] No hosts found.


┌──(kali㉿kali)-[~]
└─$ theHarvester -d gov.lk -l 500
Read proxies.yaml from /home/kali/.theHarvester/proxies.yaml
*******************************************************************
*  _   _                                             _            *
* | |_| |__   ___    ^  /\__ _ _ ____   _____  ___| |_ ___ _ __  *
* | __|  _ \ / _ \  / /_/ / _` | '__\ \ / / _ \ __| __/ _ \ '__| *
* | |_| | | |  __/ / __  / (_| | |   \ V /  __/\__ \ ||  __/ |    *
*  \__|_| |_|\___| \/ /_/ \__,_|_|    \_/ \___||___/\__\___|_|    *
*                                                                 *
* theHarvester 4.6.0                                              *
* Coded by Christian Martorella                                   *
* Edge-Security Research                                          *
* cmartorella@edge-security.com                                   *
*                                                                 *
*******************************************************************

[*] No IPs found.

[*] No emails found.

[*] No hosts found.
```

3. How can harvested email addresses be used in social engineering attacks?

Social engineering attack type	Description
Phishing Attacks	Attackers can send tricky emails that appear legitimate, tricking recipients into providing sensitive information, such as passwords or credit card details.
Spear Phishing	Targeted phishing where attackers customize emails to specific individuals using personal information, related topics which make the attack more convincing and harder to detect.
Credential Stuffing	Using harvested email addresses, attackers may attempt to log in to various accounts with commonly used or previously leaked passwords and try to brute force attacks.
Impersonation	Attackers can impersonate a trusted colleague, boss, or company using the email address, if attackers able to gain access to those mails.

4. What steps can be taken to mitigate the risk associated with the information gathered by TheHarvester?
   - Give Awareness Training related to these phishing, spear phishing, and other email-based threats.
   - Use email authentication protocols like SPF, DKIM, and DMARC.
   - Encourage the use of strong, unique passwords for all accounts and implement MFA (Multi factor authentication).
   - Continuously monitor network traffic and update security protocols and firewalls.

Maltego - Network Scanning and Reconnaissance

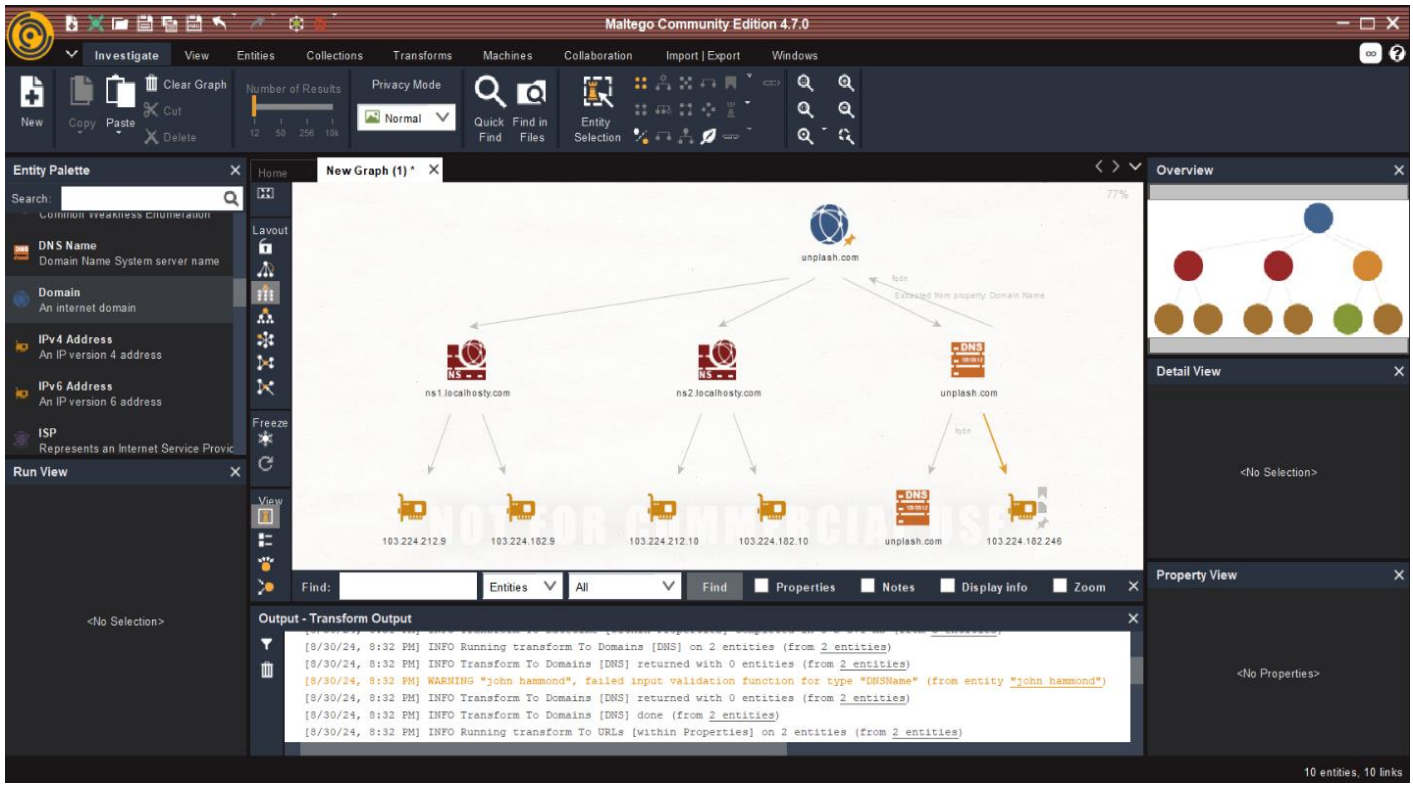
Exercise 1: Visual Link Analysis

Set up Maltego and create a new graph with an entity (e.g., domain or IP address). Perform a transformation to gather additional data. Document the process and your findings.

Questions:

1. Describe the entity you used and the transformation performed.
    - Entity: Domain – unplash.com
    - Transformation: DNS name

2. Provide a screenshot of the graph created and summarize any key relationships or data points.



3. How does Maltego's graphical representation assist in understanding network relationships?
    - Maltego creates visual graphs that map out the relationships between domains, Ip addresses, email addresses and people which helps to quickly identify how those different components are connected.

4. What are some practical applications of Maltego in a penetration testing scenario?
    - Reconnaissance and Information Gathering
    - Mapping Organizational Structure
    - Social Engineering Attacks
    - Identifying Vulnerabilities in a network
    - Tracking Digital Footprints

Angry IP Scanner-Network Scanning and Reconnaissance

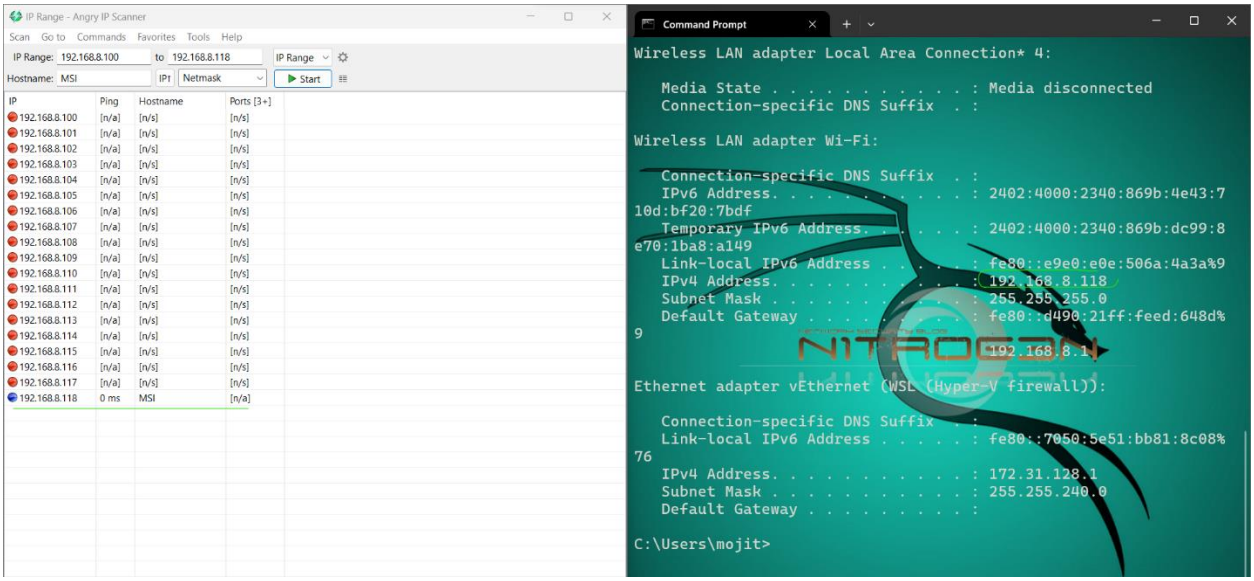
Exercise 1: Quick Network Scanning

Scan your network range using Angry IP Scanner. Document the IP range scanned and the results.

Questions:

1. What IP range did you scan?
    - 192.168.8.100 -> 192.168.8.118

2. List the IP addresses, open ports, and any other information gathered.



3. How does Angry IP Scanner compare to Nmap in terms of features and usability?

Feature/Aspect	Angry IP Scanner	Nmap
Ease of Use	User-friendly interface, suitable for beginners.	Command-line based, requires some IT knowledge.
Speed	Generally faster for basic scans due to simplicity.	Can be slower, especially with complex or deep scans.
Customization	Limited customization, primarily IP scanning.	Highly customizable with extensive options and code scripts.
Network Discovery	Effective for quick discovery of live hosts.	Can perform detailed network discovery and mapping.
Community Support	Smaller community, fewer resources.	Large community with bigger support.

4. What are the benefits and drawbacks of using Angry IP Scanner for network reconnaissance?
    - Benefits- ease of use and higher speed.
    - Drawbacks-Limited features for network scanning and basic output as a report.

Conclusion Questions

1. Compare the functionalities and use cases of Nmap, Nikto, TheHarvester, Maltego, and Angry IP Scanner.

Tool	Functionality	Use case
Nmap	Scan networks. Service detection. OS fingerprinting.	Comprehensive network mapping. Vulnerability detection.
Nikto	Web server vulnerability scan.	Know vulnerability detection.
TheHarvester	Information gathering.	Open-source intelligence (OSINT)
Maltego	Visual mapping between digital entities.	Analyse and understand complex networks.
Angry IP Scanner	Quick Ip and port scanning.	Basic network scanning.

2. Discuss how combining the results from these tools can provide a more comprehensive understanding of network security.

    - Enhance coverage by using Nmap for identifying open ports and services and while Nikto can uncover web server vulnerabilities. TheHarvester gathers external information that could be used in attacks, and Maltego visualizes the relationships between entities.
    - Using multiple tools like that allows for cross-validation of results not only that, but it also increases the accuracy of the security assessment.

3. Reflect on any ethical considerations when using these tools in real-world scenarios.
   - Always get permission from websites and network owners before conducting these scans.
   - Avoid collecting, storing or sharing those collected scan results without permission from legitimate owners.
   - Once we find vulnerabilities inform those issues to affected parties.

4. Based on the tools used, what are some best practices for conducting a thorough network and web application assessment?

Use Multiple Tools	Combine these scanning tools and cover different aspects of security like network scanning, vulnerability detection and information gathering.
Conduct regular scans	Regularly using these tools helps to maintain ongoing network changes.
Validate and Cross-Check Findings	Once gather information using these tools need to validate those results and make sure those are not false positive values.
Follow Ethical Guidelines	Always take permissions before doing scanning and avoid potential legal issues.