**Unit 11 Submission File: Network Security Homework**

**Part 1: Review Questions**

**Security Control Types**

The concept of defense in depth can be broken down into three different security control types. Identify the security control type of each set of defense tactics.

1. Walls, bollards, fences, guard dogs, cameras, and lighting are what type of security control?

Answer: **Physical Security**

1. Security awareness programs, BYOD policies, and ethical hiring practices are what type of security control?

Answer: **Management security**

1. Encryption, biometric fingerprint readers, firewalls, endpoint security, and intrusion detection systems are what type of security control?

Answer: **Operational Security**

**Intrusion Detection and Attack indicators**

1. What's the difference between an IDS and an IPS?

Answer: **An IDS is a stateless, passive network management tool that logs and notifies specified individuals about network traffic. An IPS is an active, stateful control system that is capable of initializing security protocols such as blocking traffic from a specified port.**

1. What's the difference between an Indicator of Attack and an Indicator of Compromise?

Answer: **The IOA can indicate attacks happening in real time, can tell if an attack is currently happening but a full breach isn’t determined yet and focuses on the intent of the attacker**

**The IOC can indicate an attack has occurred resulting in a breach, exposes vulnerabilities in an attack allowing the defense ample time to increase defense and can indicated previous malicious activity.**

**The Cyber Kill Chain**

Name each of the seven stages for the Cyber Kill chain and provide a brief example of each.

1. **Stage 1: Reconnaissance: The attacker chooses a target and does research on the targets vulnerabilities so the attacker can expose them.**
2. **Stage 2: Weaponization: The attacker creates a weapon to infiltrate the target such as a virus to exploit the vulnerabilities of the target. This can result in a zero-day attack if they only target one vulnerability or it can result in multiple attacks against multiple vulnerabilities.**
3. **Stage 3: Delivery: In this step the attacker delivers the malicious materials to the target through means such as an email with an attachment.**
4. **Stage 4: Exploitation: In this step the malicious means from stage 3 are promoted and triggered to exploit the targets vulnerabilities(s).**
5. **Stage 5: Installation: The malware inserts an access point such as a back door so the attacker can fully access the targets network.**
6. **Stage 6: Command and Control: The backdoor gives the attacker full access to the network.**
7. **Stage 7: Actions on objective: The attacker has gained full access to the network and now can fulfill their objective weather it’s to receive money, data or anything else.**

**Snort Rule Analysis**

Use the Snort rule to answer the following questions:

Snort Rule #1

alert tcp $EXTERNAL\_NET any -> $HOME\_NET 5800:5820 (msg:"ET SCAN Potential VNC Scan 5800-5820"; flags:S,12; threshold: type both, track by\_src, count 5, seconds 60; reference:url,doc.emergingthreats.net/2002910; classtype:attempted-recon; sid:2002910; rev:5; metadata:created\_at 2010\_07\_30, updated\_at 2010\_07\_30;)

1. Break down the Sort Rule header and explain what is happening.

Answer: **This snort rule alerts the specified person of any TCP/IP traffic between the ports of 5800-5820**

1. What stage of the Cyber Kill Chain does this alert violate?

Answer: **Reconnaissance**

1. What kind of attack is indicated?

Answer: **Port Mapping /VNC**

Snort Rule #2

alert tcp $EXTERNAL\_NET $HTTP\_PORTS -> $HOME\_NET any (msg:"ET POLICY PE EXE or DLL Windows file download HTTP"; flow:established,to\_client; flowbits:isnotset,ET.http.binary; flowbits:isnotset,ET.INFO.WindowsUpdate; file\_data; content:"MZ"; within:2; byte\_jump:4,58,relative,little; content:"PE|00 00|"; distance:-64; within:4; flowbits:set,ET.http.binary; metadata: former\_category POLICY; reference:url,doc.emergingthreats.net/bin/view/Main/2018959; classtype:policy-violation; sid:2018959; rev:4; metadata:created\_at 2014\_08\_19, updated\_at 2017\_02\_01;)

1. Break down the Sort Rule header and explain what is happening.

Answer: **This TCP alert displays that there was a windows file download attempted by HTTP on port 80**

1. What layer of the Defense in Depth model does this alert violate?

Answer: **Network**

1. What kind of attack is indicated?

Answer: **ET POLICY PE EXE or DLL Windows file download HTTP**

**Cross scripting**

Snort Rule #3

* Your turn! Write a Snort rule that alerts when traffic is detected inbound on port 4444 to the local network on any port. Be sure to include the msg in the Rule Option.

Answer:  **alert tcp $EXTERNAL\_NET 4444 -> $HOME\_NET any 4444 (msg: “inbound on 4444”)**

**Part 2: "Drop Zone" Lab**

**Log into the Azure firewalld machine**

Log in using the following credentials:

* Username: sysadmin
* Password: cybersecurity

**Uninstall ufw**

Before getting started, you should verify that you do not have any instances of ufw running. This will avoid conflicts with your firewalld service. This also ensures that firewalld will be your default firewall.

* Run the command that removes any running instance of ufw.

**[Sudo ufw reset]**

**Sudo apt -y remove ufw**

**Enable and start firewalld**

By default, these service should be running. If not, then run the following commands:

* Run the commands that enable and start firewalld upon boots and reboots.
* **$ <sudo systemctl enable firewalld > or <** **sudo /etc/init.d/firewalld start>**

**$ <sudo systemctl start firewalld >**

Note: This will ensure that firewalld remains active after each reboot.

**Confirm that the service is running.**

* Run the command that checks whether or not the firewalld service is up and running.

$ <**sudo systemctl status firewalld** >

**List all firewall rules currently configured.**

Next, lists all currently configured firewall rules. This will give you a good idea of what's currently configured and save you time in the long run by not doing double work.

* Run the command that lists all currently configured firewall rules:

$ <**sudo firewall-cmd --list-all** >

* Take note of what Zones and settings are configured. You many need to remove unneeded services and settings.

**List all supported service types that can be enabled.**

* Run the command that lists all currently supported services to see if the service you need is available

$ <**sudo firewall-cmd -–get-services** >

* We can see that the Home and Drop Zones are created by default.

**Zone Views**

* Run the command that lists all currently configured zones.

$ <**sudo firewall-cmd -–list-all-zones** >

* We can see that the Public and Drop Zones are created by default. Therefore, we will need to create Zones for Web, Sales, and Mail.

**Create Zones for Web, Sales and Mail.**

* Run the commands that creates Web, Sales and Mail zones.
* $ <**sudo firewall-cmd -– permanent -–new-zone=web >**
* **$ < sudo firewall-cmd -– permanent -–new-zone=sales >**

**$ < sudo firewall-cmd -– permanent -–new-zone=mail** >

**Set the zones to their designated interfaces:**

* Run the commands that sets your eth interfaces to your zones.

**$ <sudo firewall-cmd --zone=public --change-interface=eth0>**

**$ <sudo firewall-cmd --zone=web --change-interface=eth1>**

**$ <sudo firewall-cmd --zone=sales --change-interface=eth2>**

**$ <sudo firewall-cmd --zone=mail --change-interface=eth3>**

* **Add services to the active zones:**
* Run the commands that add services to the **public** zone, the **web** zone, the **sales** zone, and the **mail** zone.
* Public:
* $ **<sudo firewall-cmd -–zone=public -–add-service=http>**
* **$ <sudo firewall-cmd -–zone=public -–add-service=https >**
* **$ <sudo firewall-cmd -–zone=public -–add-service=pop3 >**

**$ <sudo firewall-cmd -–zone=public -–add-service=smtp** >

* Web:

$ <**sudo firewall-cmd -–zone=web -–add-service=http** >

* Sales

$ <**sudo firewall-cmd -–zone=sales -–add-service=https** >

* Mail
* $ <**sudo firewall-cmd -–zone=mail -–add-service=smtp >**

**$ <sudo firewall-cmd -–zone=mail -–add-service=pop3** >

* What is the status of http, https, smtp and pop3?

**Add your adversaries to the Drop Zone.**

* Run the command that will add all current and any future blacklisted IPs to the Drop Zone.
* **$ <sudo firewall-cmd -–zone=drop -–add-source=10.208.56.23 >**
* **$ <sudo firewall-cmd -–zone=drop -–add-source=135.95.103.76 >**

**$ <sudo firewall-cmd –zone=drop -–add-source=76.34.169.118 >**

**Make rules permanent then reload them:**

It's good practice to ensure that your firewalld installation remains nailed up and retains its services across reboots. This ensure that the network remains secured after unplanned outages such as power failures.

* Run the command that reloads the firewalld configurations and writes it to memory

$ <**sudo firewall-cmd--reload** >

**View active Zones**

Now, we'll want to provide truncated listings of all currently **active** zones. This a good time to verify your zone settings.

* Run the command that displays all zone services.

$ < **sudo firewall-cmd -–list-all-zones** >

**Block an IP address**

* Use a rich-rule that blocks the IP address 138.138.0.3.

**$ <sudo firewall-cmd -–permanent -–add-rich-rule=”rule family=’ipv4’ source address=’138.138.0.3’ reject”** >

**Block Ping/ICMP Requests**

Harden your network against ping scans by blocking icmp ehco replies.

* Run the command that blocks pings and icmp requests in your public zone.

$ <**audo firewall-cmd -–zone=public -–add-icmp-block=echo-reply** >

**Rule Check**

Now that you've set up your brand new firewalld installation, it's time to verify that all of the settings have taken effect.

* Run the command that lists all of the rule settings. Do one command at a time for each zone.
* $ <**sudo firewall-cmd -–zone=public -–list-all** >
* $ <**sudo firewall-cmd -–zone=sales -–list-all** >
* $ <**sudo firewall-cmd -–zone=web -–list-all** >
* $ <**sudo firewall-cmd -–zone=mail -–list-all** >

$ <**sudo firewall-cmd -–zone=drop -–list-all** >

* Are all of our rules in place? If not, then go back and make the necessary modifications before checking again.

Congratulations! You have successfully configured and deployed a fully comprehensive firewalld installation.

**Part 3: IDS, IPS, DiD and Firewalls**

Now, we will work on another lab. Before you start, complete the following review questions.

**IDS vs. IPS Systems**

1. Name and define two ways an IDS connects to a network.

Answer 1: **Network Intrusion Detection System (NIDS): this filters subnets on the network.**

Answer 2: **Host-based Intrusion Detection System (HIDS):Can be run locally on systems weather it’s on a host based system, user server or user workstation.**

1. Describe how an IPS connects to a network.

Answer: **IPS connects inline with the data flow and is typically between the firewall and the network switch.**

1. What type of IDS compares patterns of traffic to predefined signatures and is unable to detect Zero-Day attacks?

Answer: **Signature-based IDS**

1. Which type of IDS is beneficial for detecting all suspicious traffic that deviates from the well-known baseline and is excellent at detecting when an attacker probes or sweeps a network?

Answer: **Anomaly-based IDS**

**Defense in Depth**

1. For each of the following scenarios, provide the layer of Defense in Depth that applies:
   1. A criminal hacker tailgates an employee through an exterior door into a secured facility, explaining that they forgot their badge at home.

Answer: **Physical**

* 1. A zero-day goes undetected by antivirus software.

Answer: **Application**

* 1. A criminal successfully gains access to HR’s database.

Answer: **Data**

* 1. A criminal hacker exploits a vulnerability within an operating system.

Answer: **Host**

* 1. A hacktivist organization successfully performs a DDoS attack, taking down a government website.

Answer: **Network**

* 1. Data is classified at the wrong classification level.

Answer: **Policies & Procedures**

* 1. A state sponsored hacker group successfully firewalked an organization to produce a list of active services on an email server.

Answer: **Perimeter**

1. Name one method of protecting data-at-rest from being readable on hard drive.

Answer: **Drive Encryption**

1. Name one method to protect data-in-transit.

Answer: **Data Encryption**

1. What technology could provide law enforcement with the ability to track and recover a stolen laptop.

Answer: **GPS tracking chips or monitoring software**

1. How could you prevent an attacker from booting a stolen laptop using an external hard drive?

Answer: **Disk encryption, locking computer from settings, hard drive encryption**

**Firewall Architectures and Methodologies**

1. Which type of firewall verifies the three-way TCP handshake? TCP handshake checks are designed to ensure that session packets are from legitimate sources.

Answer: **Circuit level Firewall**

1. Which type of firewall considers the connection as a whole? Meaning, instead of looking at only individual packets, these firewalls look at whole streams of packets at one time.

Answer: **Packet-Filtering Firewall (Stateful)**

1. Which type of firewall intercepts all traffic prior to being forwarded to its final destination. In a sense, these firewalls act on behalf of the recipient by ensuring the traffic is safe prior to forwarding it?

Answer: **Application Proxy Firewall**

1. Which type of firewall examines data within a packet as it progresses through a network interface by examining source and destination IP address, port number, and packet type- all without opening the packet to inspect its contents?

Answer: **Packet Filtering Firewall**

1. Which type of firewall filters based solely on source and destination MAC address?

Answer: **MAC Layer Firewall**

**Bonus Lab: "Green Eggs & SPAM"**

In this activity, you will target spam, uncover its whereabouts, and attempt to discover the intent of the attacker.

* You will assume the role of a Jr. Security administrator working for the Department of Technology for the State of California.
* As a junior administrator, your primary role is to perform the initial triage of alert data: the initial investigation and analysis followed by an escalation of high priority alerts to senior incident handlers for further review.
* You will work as part of a Computer and Incident Response Team (CIRT), responsible for compiling **Threat Intelligence** as part of your incident report.

**Threat Intelligence Card**

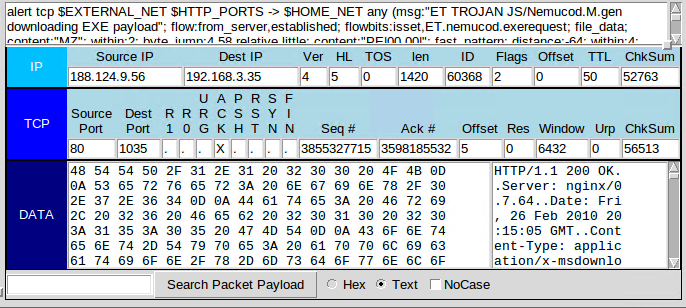
**Note**: Log into the Security Onion VM and use the following **Indicator of Attack** to complete this portion of the homework.

Locate the following Indicator of Attack in Sguil based off of the following:

* **Source IP/Port**: 188.124.9.56:80
* **Destination Address/Port**: 192.168.3.35:1035
* **Event Message**: ET TROJAN JS/Nemucod.M.gen downloading EXE payload

Answer the following:

1. What was the indicator of an attack?
   * Hint: What do the details of the reveal?

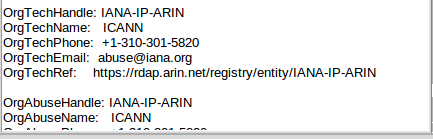


Answer: **There was an attempt to download “ET Trojan js” on port 80**

1. What was the adversarial motivation (purpose of attack)?

Answer: **Stage 3 of the cyber kill chain (delivery) meaning to download malicious trojan material**

1. Describe observations and indicators that may be related to the perpetrators of the intrusion. Categorize your insights according to the appropriate stage of the cyber kill chain, as structured in the following table.



| **TTP** | **Example** | **Findings** |
| --- | --- | --- |
| **Reconnaissance** | How did they attacker locate the victim? | **The internet website** |
| **Weaponization** | What was it that was downloaded? | **Java script DownloaderTrojan** |
| **Delivery** | How was it downloaded? | **Port 80** |
| **Exploitation** | What does the exploit do? | **Once the opens the zip file the trojan executes** |
| **Installation** | How is the exploit installed? | **email** |
| **Command & Control (C2)** | How does the attacker gain control of the remote machine? | **Once the java script is run they have access to the network** |
| **Actions on Objectives** | What does the software that the attacker sent do to complete it's tasks? | **It allows the attacker access to the network** |

Answer:

1. What are your recommended mitigation strategies?

Answer: **Educate employees on cyber threats, have an application installed to block malicious activity**, **firewalls on port 80**

1. List your third-party references.

Answer: **Mcafee**