**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: IDS = Passive IPS = Active. An IDS is a monitoring system that can create detailed logs and also send alerts or notifications but makes no changes to the data passing through a network. An IPS plays a more active role and can block network traffic, but most likely just the IP address from which it detected problems.

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

Answer: IOC = evidence of a breach IOA = evidence of attempted breach

**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
2. Stage 2: Weaponization
3. Stage 3: Delivery
4. Stage 4: Exploitation
5. Stage 5: Installation
6. Stage 6: Command and control
7. Stage 7: Actions on objectives

**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 rule sends an alert for activity detected coming in from external\_net to local\_net on ports 5800 to 5820, using TCP protocol. These ports are commonly used for VNC, or remote desktop.

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

Answer: Reconnaissance

1. What kind of attack is indicated?

Answer: Port Mapping

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 rule will send an alert when activity is detected originating from external\_net -> home\_net, this is further filtered by looking specifically for any downloaded EXE or DLL file on the TCP protocol and on HTTP ports 80 or 443

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

Answer: Delivery

1. What kind of attack is indicated?

Answer: Cross site 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 any -> $HOME\_NET 4444 (msg:"Activity on port 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 disable && systemctl disable ufw && sudo killall ufw

E**nable 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.service
* $ sudo /etc/init.d/firewalld start

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.

$ systemctl status firewalld.service

**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 --get-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
* $ sudo firewall-cmd --reload

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

* Run the command that sets your eth0 interface to your zones.
* $ sudo firewall-cmd --zone=public --change-interface=eth0
* $ sudo firewall-cmd --zone=web --change-interface=eth0
* $ sudo firewall-cmd --zone=sales --change-interface=eth0
* $ sudo firewall-cmd --zone=mail --change-interface=eth0

**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=smtp

$ sudo firewall-cmd --zone=public --add-service=pop3

* 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.

$ sudo 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=web --list-all
* $ sudo firewall-cmd --zone=sales --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: Host detection, monitoring a system

Answer 2: Network detection, monitoring network traffic

1. Describe how an IPS connects to a network.

Answer: It would be ideal for an IPS to be connected to an interface that would allow it to see all traffic

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

Answer: A stateless IDS or 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: A stateful 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: Administrative Policy

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

Answer: Technical Software

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

Answer: Technical Network

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

Answer: Technical Software

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

Answer: Technical Network

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

Answer: Administrative Procedures

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

Answer: Administrative Network

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

Answer: Encryption with bitlocker or similar

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

Answer: Encryption

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

Answer: Some newer devices have the option of find my device

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

Answer: Appropriate BIOS settings limiting boot options and a passwords on the BIOS

**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: Stateless 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: Stateful firewall

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: 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: Data link 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: A Trojan has been detected in an exe file with t raffic originating from 188.124.9.56 port 80 to local address 192.168.3.35 port 1035

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

Answer: To gain unauthorized access to a device on the local network with the Trojan.

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** | Collection of data, eg email address or through social media |  |
| **Weaponization** | An Trojan in exe format disguised as something legitimate |  |
| **Delivery** | Email attachment |  |
| **Exploitation** | Infect the system once executed |  |
| **Installation** | Installs itself once execute |  |
| **Command & Control (C2)** | Allows the attackers backdoor access once the Trojan has installed |  |
| **Actions on Objectives** | Record passwords or other sensitive information and encrypt data |  |

Answer:

1. What are your recommended mitigation strategies?

Answer: Training or education on the risks in opening email attachments or in general any files if their source cannot be verified as legitimate.

1. List your third-party references.

Answer:

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