



# Everything You Didn't Want to Know About CVE

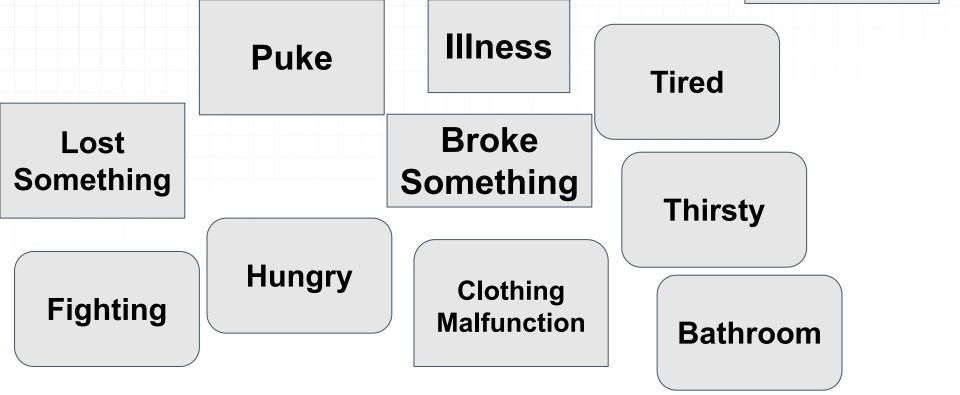
Paul Asadoorian, Principal Security Evangelist, Eclypsium

https://eclypsium.comm / https://securitypodcaster.com

© 2023 Eclypsium 1

# Scale 1-10 Rank All The Things That Could Go Wrong On Vacation With Kids

Lost Child!



#### **Outline**

1. Problems

2. Solutions







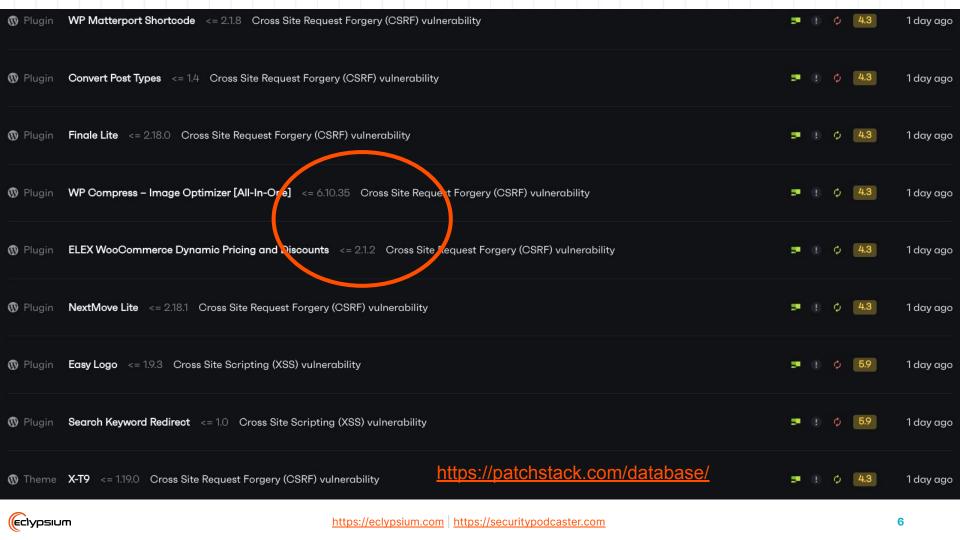
# Problem: CVE Lists The Wrong Versions As Vulnerable

#### Problem: CVE Lists The Wrong Versions As Vulnerable

- CVEs are created and state which versions are vulnerable. This is an important piece of information!
- The "all versions up to, and including x.x" statements are not always accurate!
- In some cases, people get this wrong, which could lead to false positives and false negatives when you are checking to see if you are vulnerable!
- This is common amongst CNAs that deal with Wordpress plugins...

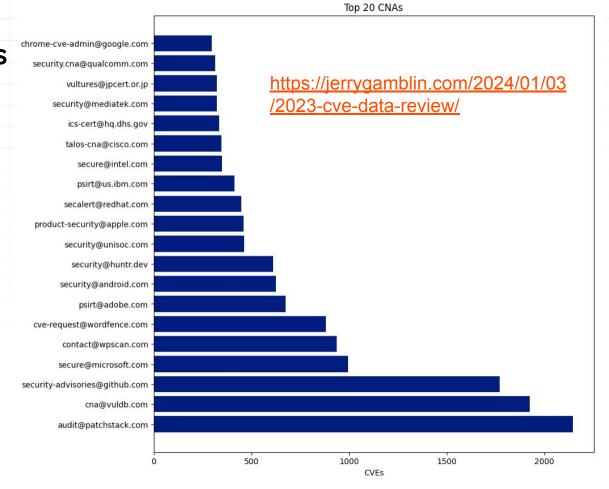
https://www.pluginvulnerabilities.com/2024/01/22/many-cve-records-are-listing-the-wrong-versions-of-software-as-being-affected/





#### 2023 Top CVE Reporters

Remember: Just because a CVE was reported does not mean the data is accurate or up-to-date!





# Problem: Dates Are Confusing



#### Problem: Dates Can Be Confusing

- Assigned vs Published vs Updated
- The CVE number itself is not reliable to determine when a vulnerability was made public
  - Sometimes the year is from the previous year
  - This could be a pre-allocated CVE number
  - It could also indicate that disclosure took a long time
- We can rely on updated date, but you end up sifting through older CVEs



# Problem: **Anyone Can** Score Using **CVSS**

In STAR WARS
anyone can hop in
any spaceship and
knows how to fly it.

I just spent 20 minutes trying to find the headlights in a rental car.

#### Problem: Anyone Can Score Using CVSS - LogoFAIL Fail

BRLY-8.2 Acer, Dell, Gigabyte, HP, Intel, CWE-122. DXE Memory LOGOFAIL-(High AMI Lenovo, MSI, Samsung, CWE-190 Corruption 2023-018 Supermicro

https://www.binarly.io/blog/finding-logofail-the-dangers-of-image-parsing-during-system-boot

Severity

CVSS Version 3.x

CVSS Version 2.0

CVSS 3.x Severity and Metrics:



NIST: NVD

Base Score: 7.8 HIGH

Vector: CVSS:3.1/AV:L/AC:L/PR:L/UI:N/S:U/C:H/I:H/A:H

CNA: AMI

Base Score: 7.5 HIGH

Vector: CVSS:3.1/AV:L/AC:H/PR:H/UI:N/S:C/C:H/I:H/A:H

https://nvd.nist.gov/vuln/detail/CVE-2023-39539



# Problem: Not All Vulnerabilities Get A CVE



#### **Squid Proxy**

The majority of these vulnerabilities have not been fixed. All vulnerabilities were discovered in squid-5.0.5. Tests were done in nearly every component possible: forward proxying, reverse proxying, all protocols supports (http, https, https intercept, urn, whois, gopher, ftp), responses, requests, "helpers", DNS, ICAP, ESI, and caching. Every conceivable possible user and build configuration was used.

https://www.securityweek.com/dozens-of-squid-proxy-vulnerabilities-remain-unpatched--2-years-after-disclosure/



#### FreeRDP

In this blog post we will present the technical details of the attempt to provide a **complete** fix to the root cause of the software vulnerabilities found in FreeRDP, and the timeline of this process. Our case study will be a patch I submitted to the project on **October 2021** and that just recently (Mid-December 2023) was announced as part of the latest release (3.0.0) of the project. Yup, you read it right. The fix was merged **two years ago**, was available on the development branch, and yet it was officially launched only the past few days.

https://eyalitkin.wordpress.com/2024/01/01/lessons-from-securing-freerdp/



#### Zyxel

These vulnerabilities are not present in the most recent version of Zyxel firmware (5.37), released last year. Of note, Zyxel has disabled ZTP altogether as of V5.37 patch 1. Eclypsium notified Zyxel of the vulnerabilities but they declined to issue an advisory as the vulnerabilities are not present in the latest version of the firmware. However, since CVEs have not been issued for these vulnerabilities, organizations may not know that they need to update the firmware on their devices. As such, we encourage teams to update their firmware to the latest available version.

https://eclypsium.com/blog/dont-play-with-fire-prioritize-zyxel-firewall-update-to-fix-unreported-vulnerability/



#### Other Examples

- Weak/Default Passwords
  - Common in IoT and appliances
- Backdoors (sometimes)
  - Backdoors are not secrets?
- Mis-Configurations
  - Introduced by the user
- Unsupported Hardware and Software
  - Again, common in IoT and appliances





Problem: Open-Source Patches Are Public



#### Half Days And More!

Open-source vulnerability disclosure is hard:

- O-day A vulnerability that is unknown to the maintainer of the project.
- **1-day** A vulnerability that is known to the maintainer. Typically, the CVE is published. There is (typically) an available patch.
- Half-Day Known to the maintainer, information is publicly available (GitHub Commit/PR/Issue), fixes may be in the works, CVE may not be assigned
- 0.75-Day Known to the maintainer, patch is available, CVE not assigned or available

Project: <a href="https://github.com/Aqua-Nautilus/CVE-Half-Day-Watcher">https://github.com/Aqua-Nautilus/CVE-Half-Day-Watcher</a>

Blog Post: <a href="https://blog.aquasec.com/50-shades-of-vulnerabilities-uncovering-flaws-in-open-source-vulnerability-disclosures">https://blog.aquasec.com/50-shades-of-vulnerabilities-uncovering-flaws-in-open-source-vulnerability-disclosures</a>



## Problem: Tracking Supply Chain Vulnerabilities Is Hard



#### CVEs Are For Vulnerabilities - Mostly...

- Who should issue a CVE and for what? E.g. a vulnerability in a library such as Webp:
  - https://readme.synack.com/the-problems-with-vulnerability-reporting
  - https://www.postgresgl.org/about/news/cve-2020-21469-is-not-a-security-vulnerability-2701/
- Except we got one for XZ: <a href="https://nvd.nist.gov/vuln/detail/CVE-2024-3094">https://nvd.nist.gov/vuln/detail/CVE-2024-3094</a>
   (CWE-506 Embedded Malicious Code)

If we do it for one backdoor, shouldn't we now issue them for all?





Problem: How Do We Track Severity and Impact Changes?

#### This one was a "hoot";)

- https://www.securityweek.com/cisa-says-owl-labs-vulnerabilitiesrequiring-close-physical-range-exploited-in-attacks/ and exploited in the wild! Oh, never mind, it's really not.
- https://www.shielder.com/blog/2024/01/hunting-for-~~un~~authenticated-n-days-in-asus-routers/ Unauthenticated remote was only true when running in emulation, actual devices were not as vulnerable.







#### The Original Severity Changed With:

- EternalBlue (MS17-010): Originally no public exploit for this. The Shadow Brokers group later leaked an exploit developed by the NSA, then WannaCry and NotPetya.
- BlueKeep (CVE-2019-0708): Initially no public exploit for this RDP vulnerability, but later, several researchers and malicious actors developed exploits.
- Heartbleed (CVE-2014-0160): Disclosed in April 2014, but at the time no exploits were
  publicly known. However, later on researchers and attackers quickly developed exploits that
  could steal sensitive data from vulnerable servers.
- Apache Struts CVE-2017-5638: Disclosed in March 2017. Initially, there was no exploit in the wild, but shortly after the disclosure, attackers began exploiting it to compromise web servers. This vulnerability was notably exploited in the Equifax data breach.
- Spectre (CVE-2017-5753 and CVE-2017-5715) and Meltdown (CVE-2017-5754): These vulnerabilities affect modern microprocessors and were disclosed in January 2018. Initially, there were no known exploits in the wild. However, the disclosure led to a flurry of research and subsequent development of various exploits taking advantage of these hardware vulnerabilities.





# Problem: The State of NIST's NVD Program

#### NIST's NVD Program Needs Love

Summary of what people are saying: We need the enriched CVE data for CVSS and CPE, NIST needs more resources to do this, don't let it fall in the wrong hands.

- https://resilientcyber.substack.com/p/death-knell-of-the-nvd
- https://anchore.com/blog/national-vulnerability-database-opaque-changes-and-un answered-questions/
- https://www.linkedin.com/posts/jgamblin\_vulnerabilitymanagement-cve-nvd-activit y-7172701454816669696-nw00/
- https://www.linkedin.com/posts/netriseinc\_cve-vulnerabilitymanagement-cybersecu rity-activity-7172030138476388353-mTif/
- https://www.linkedin.com/posts/danlorenc\_nvd-nist-fedramp-activity-71727095910 91245057-x0lp/





### Solutions?



#### Potential Solutions That Help You With These Problems:

- Do not trust the version number
- Ignore the dates
- Generate your own scores
- Find non-CVE vulnerabilities through intelligence and testing
- Assume there are 0-Days
- Generate your own SBOMs
- Prove something is exploitable (KEV and pen testing)
- Work together to improve CVE, CVSS, EPSS, KEV, etc...



#### Affected versions and publication dates

cve-maker \> critical

[+] Looking for the latest critical CVEs: /

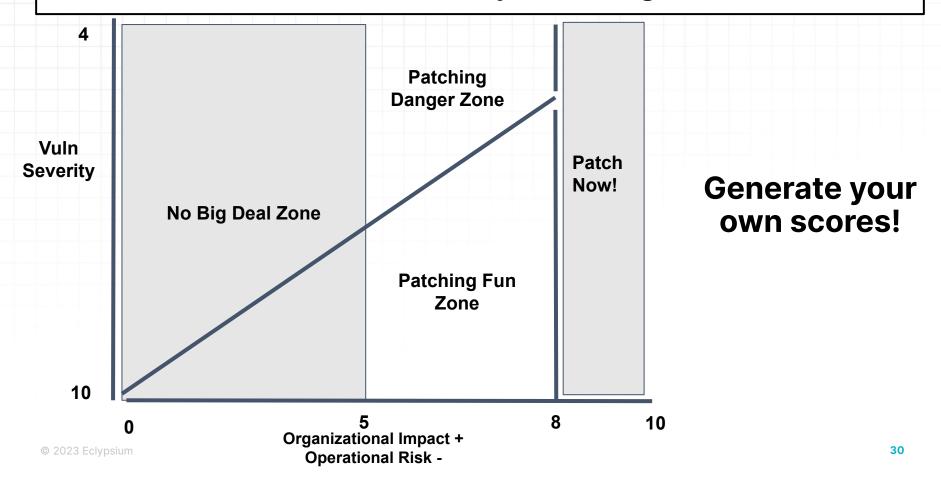
CVE	CVSS	Vendor	Product	Description	Update
   CVE-2024-3400	10.0			A command injection vulnerability in the GlobalProtect feature of Palo Alto Networks PAN-OS software	
CVE-2023-33045	9.8	QUALCOMM	ar8035	Memory corruption in WLAN Firmware while parsing a NAN management frame carrying a S3 attribute. <td>  2024-04-12</td>	2024-04-12
CVE-2023-33028	9.8	QUALCOMM	ar8035	Memory corruption in WLAN Firmware while doing a memory copy of pmk cache.	2024-04-12
CVE-2023-28581	9.8	QUALCOMM	fastconnect_6800	Memory corruption in WLAN Firmware while parsing receieved GTK Keys in GTK KDE.	2024-04-12
CVE-2023-28562	9.8	QUALCOMM	aqt1000	Memory corruption while handling payloads from remote ESL.	2024-04-12
CVE-2023-28561	9.8	QUALCOMM	qcn7606	Memory corruption in QESL while processing payload from external ESL device to firmware.	2024-04-12
CVE-2023-28543	9.8	QUALCOMM	qcs405	A malformed DLC can trigger Memory Corruption in SNPE library due to out of bounds read, such as by	2024-04-12
CVE-2023-24855	9.8	QUALCOMM	ar8035	Memory corruption in Modem while processing security related configuration before AS Security Exchan	2024-04-12
CVE-2023-22388	9.8	QUALCOMM	315_5g_iot_modem	Memory Corruption in Multi-mode Call Processor while processing bit mask API.	2024-04-12
CVE-2023-22385	9.8	QUALCOMM	315_5g_iot_modem	Memory Corruption in Data Modem while making a MO call or MT VOLTE call.	2024-04-12
CVE-2023-21631	9.8	QUALCOMM	205	Weak Configuration due to improper input validation in Modem while processing LTE security mode comm	2024-04-12
CVE-2022-40537	9.8	QUALCOMM	apq8009	Memory corruption in Bluetooth HOST while processing the AVRC_PDU_GET_PLAYER_APP_VALUE_TEXT AVRCP re	2024-04-12
CVE-2022-40515	9.8	QUALCOMM	apq8009	Memory corruption in Video due to double free while playing 3gp clip with invalid metadata atoms. <td>  2024-04-12</td>	2024-04-12
CVE-2022-40514	9.8	QUALCOMM	aqt1000	Memory corruption due to buffer copy without checking the size of input in WLAN Firmware while proce	2024-04-12
CVE-2022-40510	9.8	QUALCOMM	apq8009	Memory corruption due to buffer copy without checking size of input in Audio while voice call with E	2024-04-12
CVE-2022-33279	9.8	QUALCOMM	ar9380	Memory corruption due to stack based buffer overflow in WLAN having invalid WNM frame length.	2024-04-12
CVE-2022-33259	9.8	QUALCOMM	mdm8207	Memory corruption due to buffer copy without checking the size of input in modem while decoding raw	2024-04-12
CVE-2022-33256	9.8	QUALCOMM	ar8035	Memory corruption due to improper validation of array index in Multi-mode call processor.	2024-04-12
CVE-2022-33211	9.8	QUALCOMM	mdm8207	memory corruption in modem due to improper check while calculating size of serialized CoAP message </td <td>  2024-04-12</td>	2024-04-12
CVE-2022-25745	9.8	QUALCOMM	mdm9205	Memory corruption in modem due to improper input validation while handling the incoming CoAP message	2024-04-12



```
-s critical -f kev,poc
cvemap
projectdiscovery.io
[INF] Current cvemap version v0.0.6 (latest)
                   CVSS
                          SEVERITY
                                     EPSS
                                                                  AGE
                                                                        TEMPLATE
                                                                                    KEV
                                                                                            POC
 ID
                                                PRODUCT
                          CRITICAL
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-3400
                   9.8
                                     0.00043
 CVE-2024-3272
                   9.8
                          CRITICAL
                                     0.00177
                                                                  8
                                                                                    TRUE
                                                                                            TRUE
 CVE-2024-31997
                   9.9
                          CRITICAL
                                     0.00045
                                                                                    FALSE
                                                                                            FALSE
                          CRITICAL
 CVE-2024-31996
                   10
                                     0.00044
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31988
                   9.6
                          CRITICAL
                                     0.00044
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31987
                   9.9
                          CRITICAL
                                     0.00045
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31986
                          CRITICAL
                                                                                    FALSE
                                                                                            FALSE
                                     0.00045
                          CRITICAL
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31984
                   9.9
                                     0.00044
 CVE-2024-31983
                   9.9
                          CRITICAL
                                     0.00045
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31982
                          CRITICAL
                                     0.00045
                                                                                    FALSE
                                                                                            FALSE
                   10
 CVE-2024-31981
                   9.9
                          CRITICAL
                                     0.00045
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31849
                   9.8
                          CRITICAL
                                     0.00043
                                                                  6
                                                                                    FALSE
                                                                                            TRUE
 CVE-2024-31848
                   9.8
                          CRITICAL
                                     0.00043
                                                                  6
                                                                                    FALSE
                                                                                            TRUE
 CVE-2024-31465
                   9.9
                          CRITICAL
                                                                                    FALSE
                                     0.00044
                                                                                            FALSE
                          CRITICAL
                                                                                    FALSE
                                                                                            FALSE
 CVE-2024-31461
                   9.1
                                     0.00045
```

(eclypsium



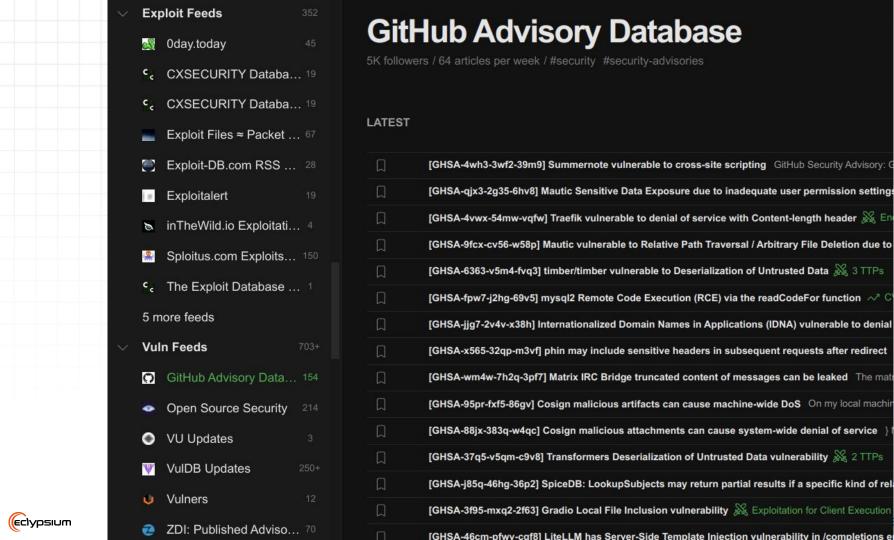


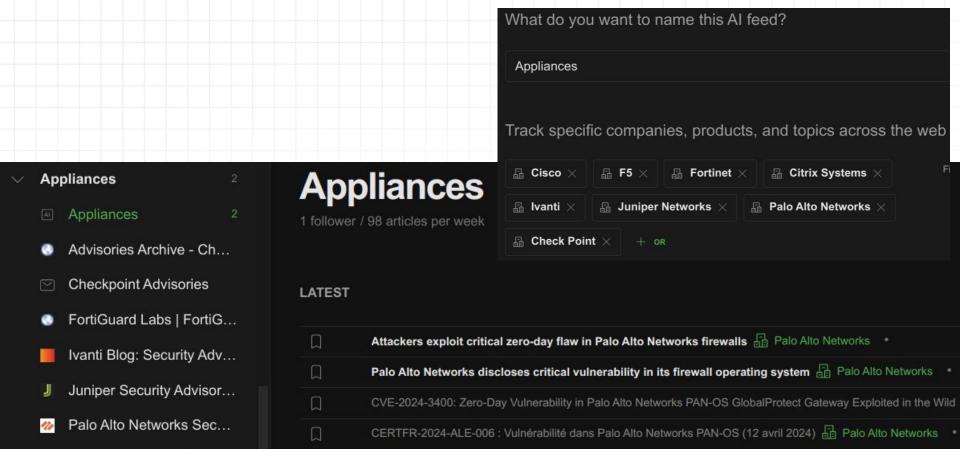
## Find non-CVE vulnerabilities through intelligence and testing

- Use threat and vulnerability feeds (open-source and commercial options exist)
- Subscribe to PTAS (Pen Testing As A Service) and ASM (Attack Surface Management) services

Monitor feeds on your own (I have tips for you!)







#### Looking For Half-Day Vulnerabilities

```
$ python scan nvd.py --github token `cat token.txt` \
 -days 10 \
--min stars 500
https://services.nvd.nist.gov/rest/json/cves/2.0/?pubStartDate=2024-04-02T1
8:17:56&pubEndDate=2024-04-13T18:17:56&resultsPerPage=2000
found a possible half day on CVE-2023-29483 with the reference:
https://github.com/rthalley/dnspython/issues/1045
```



- 1. Use an RSS Reader Download my OPML file here:
  - a. PaulsFeeds.opml

**Cheet Sheet Time!** 

- 2. Use cve-maker (<a href="https://github.com/msd0pe-1/cve-maker">https://github.com/msd0pe-1/cve-maker</a>)
  - a. python3 -m cve-maker
  - b. critical To get the latest critical CVEs
  - c. search <keyword> Searches the CVE database for keyword
  - d. get <CVE-ID> Gets info about the CVE and lists any exploits
- 3. Use cvemap (<a href="https://github.com/projectdiscovery/cvemap">https://github.com/projectdiscovery/cvemap</a>):
  - a. go install <a href="mailto:github.com/projectdiscovery/cvemap/cmd/cvemap@latest">github.com/projectdiscovery/cvemap/cmd/cvemap@latest</a>
  - b. cvemap -age 20 -s critical -f kev,poc Get the last 20 days of CVEs, only those that are 9.0 CVSS or above, indicate if its in the CISA KEV and if there is a PoC exploit available
- 4. Use CVE Half Day Watcher (<a href="https://github.com/Aqua-Nautilus/CVE-Half-Day-Watcher">https://github.com/Aqua-Nautilus/CVE-Half-Day-Watcher</a>):
  - a. Create a Github API token
  - b. python scan\_nvd.py --github\_token `cat token.txt` --days 10 --min\_stars 500 Scan Github for "Half Day" vulnerabilities in the past 10 days, filtering only Github projects with more than 500 stars



#### Assume there are 0-Days

Go out and get the latest, next generation, Al enhanced, multi-layered, cutting-edge, 0-Day threat protection solution on the market...

Then, throw it away

Then, implement a solid infosec strategy and plan (different talk)

Don't mind me, just taking out the trash





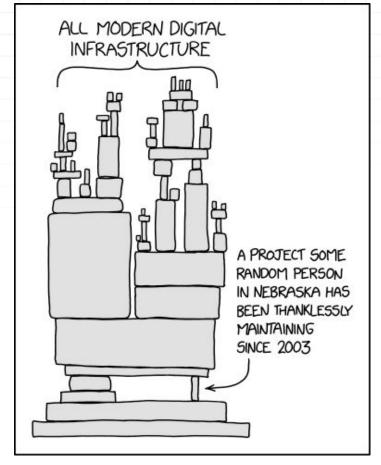
#### Generate your own SBOMs

- Firmware: <a href="https://github.com/e-m-b-a/emba">https://github.com/e-m-b-a/emba</a>
- Containers: <u>https://anchore.com/sbom/how-to-generate-an-sbom-with-free-open-source-tools/</u>
- Java: <a href="https://github.com/CycloneDX/cyclonedx-maven-plugin">https://github.com/CycloneDX/cyclonedx-maven-plugin</a>
- General: <a href="https://github.com/microsoft/sbom-tool">https://github.com/microsoft/sbom-tool</a>



#### Use Google's OSV

- https://blog.hartwork.org/posts/expat-2-6-2-released/
- https://osv.dev/vulnerability/CVE-2024-28757
- https://google.github.io/osv.dev/faq/
- Discover open-source dependencies and related vulnerabilities



https://xkcd.com/2347/



#### Prove something is exploitable (KEV and pen testing)

```
[+] Looking for the latest firmware CVEs:
      CVE
                 CVSS I
                         Vendor
                                       Product
                                                                                                Description
                                                                                                                                                           Update
 CVE-2023-33061
                                                            Transient DOS in WLAN Firmware while parsing WLAN beacon or probe-response frame.
                                                                                                                                                         2024-04-12
                        QUALCOMM
                                        ar8035
CVE-2023-33056
                 7.5
                        QUALCOMM
                                        ar8035
                                                             Transient DOS in WLAN Firmware when firmware receives beacon including T2LM IE.
                                                                                                                                                         2024-04-12
CVE-2023-33048
                 7.5
                        OUALCOMM
                                        ar8035
                                                                       Transient DOS in WLAN Firmware while parsing t2lm buffers.
                                                                                                                                                         2024-04-12
CVE-2023-33047
                        QUALCOMM
                                        ar8035
                                                                      Transient DOS in WLAN Firmware while parsing no-inherit IES.
                                                                                                                                                         2024-04-12
                                                     Memory corruption in WLAN Firmware while parsing a NAN management frame carrying a S3 attribute.
                                                                                                                                                         2024-04-12
CVE-2023-33045
                        QUALCOMM
                                        ar8035
CVE-2023-33028
                        QUALCOMM
                                        ar8035
                                                               Memory corruption in WLAN Firmware while doing a memory copy of pmk cache.
                                                                                                                                                         2024-04-12
                                                                         Transient DOS in WLAN Firmware while parsing rsn ies.
CVE-2023-33027
                        QUALCOMM
                                                                                                                                                         2024-04-12
                 7.5
                                  315 5g iot modem
CVE-2023-33026
                                                                  Transient DOS in WLAN Firmware while parsing a NAN management frame.
                                                                                                                                                         2024-04-12
                 7.5
                        QUALCOMM
                                        ar8035
                                                                Transient DOS in WLAN firmware while parsing MLO (multi-link operation).
CVE-2023-33016
                 7.5
                        QUALCOMM
                                       csr8811
                                                                                                                                                         2024-04-12
CVE-2023-33015
                        QUALCOMM
                                        315 5g
                                                         Transient DOS in WLAN Firmware while interpreting MBSSID IE of a received beacon frame.
                                                                                                                                                         2024-04-12
                                                             Memory corruption in WLAN Firmware while parsing receiveed GTK Keys in GTK KDE.
CVE-2023-28581
                        OUALCOMM
                                  fastconnect 6800
                                                                                                                                                         2024-04-12
                                                                   Information disclosure in IOE Firmware while handling WMI command.
CVE-2023-28563
                        QUALCOMM
                                       aqt1000
                                                                                                                                                         2024-04-12
CVE-2023-28561
                        QUALCOMM
                                       qcn7606
                                                        Memory corruption in QESL while processing payload from external ESL device to firmware.
                                                                                                                                                         2024-04-12
CVE-2023-28539
                                        ar8035
                                                     Memory corruption in WLAN Host when the firmware invokes multiple WMI Service Available command.
                                                                                                                                                        2024-04-12
                        OUALCOMM
CVE-2023-24854
                        OLIAL COMM
                                         215
                                                            Memory Corruption in WLAN HOST while parsing OMI WLAN Firmware response message.
                                                                                                                                                         2024-04-12
```

text

EDB-40081

EDB-20654

EDB-27942

EDB-51269

[+] Looking +   EDB	-+	+ Juage		firmware: ✓ 	Description   Author   Releas	 e Date	+   Update
[+] Looking	Explo:	+		firmware: / 			
	223 2		mlaita fan				
CVE-2023-2 +	21656	7.8	QUALCOMM -+	ar8035   +	Memory corruption in WLAN HOST while receiving an WMI event from firmware.	202	4-04-12   +
CVE-2023-2	21658	7.5	QUALCOMM	ar8035	Transient DOS in WLAN Firmware while processing the received beacon or probe response frame.	202	4-04-12
CVE-2023-2	21659	7.5	QUALCOMM	315_5g_iot_modem	Transient DOS in WLAN Firmware while processing frames with missing header fields.	202	4-04-12
CVE-2023-2	21660	7.5	QUALCOMM	csr8811	Transient DOS in WLAN Firmware while parsing FT Information Elements.	202	4-04-12
	T-TOJI	7.0	QUALCOMM	ar8035	Memory Corruption in WLAN HOST while parsing QMI response message from firmware.	202	4-04-12
CVE-2023-2	24851	7.8	I OHAL COMM	002F		1 202	4-04-12 i

Gregory Smiley

altomo

Core Security

Yerodin Richards

2016-07-11

2001-02-26

2013-08-29

2023-04-06

2016-07-11

2012-08-20

2013-08-29

2023-04-06

Belkin AC1200 Router Firmware 1.00.27 - Authentication Bypass

APC WEB/SNMP Management Card (9606) Firmware 3.0 - Telnet Administration Denial of Service

AVTECH DVR Firmware 1017-1003-1009-1003 - Multiple Vulnerabilities

Arris Router Firmware 9.1.103 - Remote Code Execution (RCE) (Authenticated)

cve-maker \> search firmware

#### Work together to improve CVE, CVSS, EPSS, KEV, etc...

- I believe these are all great programs
- I do not believe we want to see them replaced by commercial offerings or run by commercial companies 100%
- Much of the issues stem from lack of funding and resources
- We can help with the resources part!



#### Good News

- Microsoft adopts CWE
  - https://msrc.microsoft.com/blog/2024/04/toward-greater-transparency-adopting-the-cwestandard-for-microsoft-cves/
- What if there is no patch available for EOL products?
- I LOVE this: "Separate critical security fixes for customers and not bundle those patches with new product features or functionality changes."
  - https://www.centerforcybersecuritypolicy.org/insights-and-research/network-resilience-coa lition-offers-recommendations-for-improving-network-infrastructure-security-in-new-white -paper
- EPSS Improvements: <a href="https://www.cyentia.com/epss-report/">https://www.cyentia.com/epss-report/</a>



### Thank You!

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### Dear LOL,

Thank you for being there when I have nothing else to say.

