SPARKFABRIK

WHAT IS THE **SECURE SOFTWARE SUPPLY CHAIN** AND THE CURRENT STATE OF THE **PHP ECOSYSTEM**

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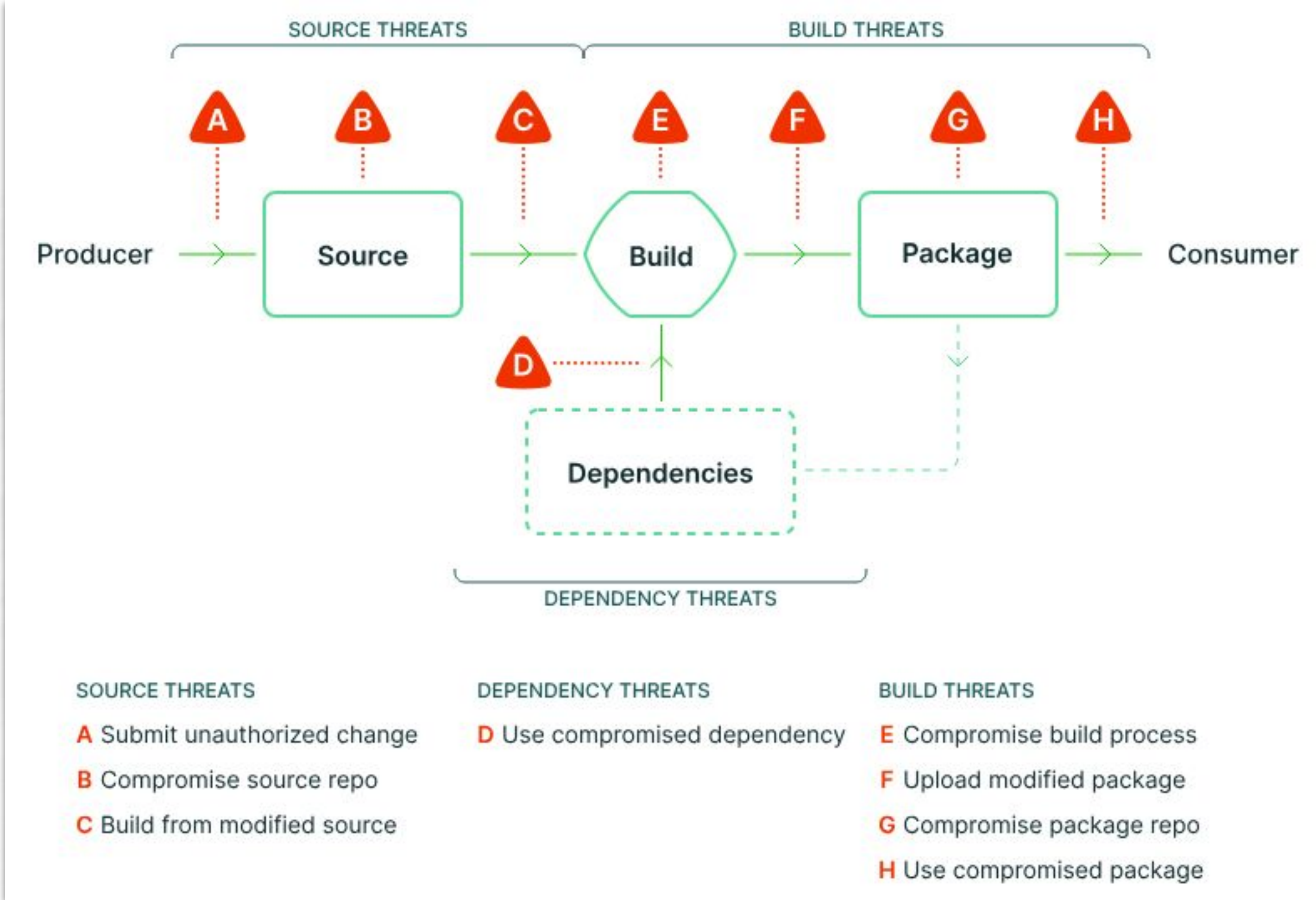
THE SESSION

→ What is a **Software Supply Chain**

→ State of the **PHP** ecosystem

→ What are **the threats** and how can be challenged with:
Sigstore - SBOM - OSV - Scorecard

A **supply chain** is a network of individuals and companies
who are involved in creating a product
and delivering it to the consumer



SOURCE THREATS

A Submit unauthorized change

B Compromise source repo

C Build from modified source

DEPENDENCY THREATS

D Use compromised dependency

BUILD THREATS

E Compromise build process

F Upload modified package

G Compromise package repo

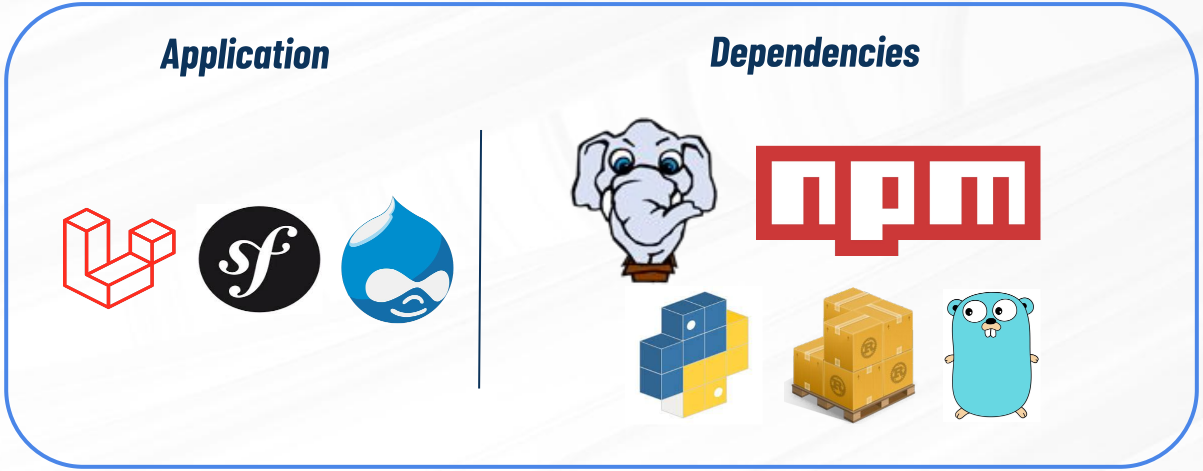
H Use compromised package

https://slsa.dev/spec/v0.1/#supply-chain-threats

A MODERN PHP APPLICATION

Application

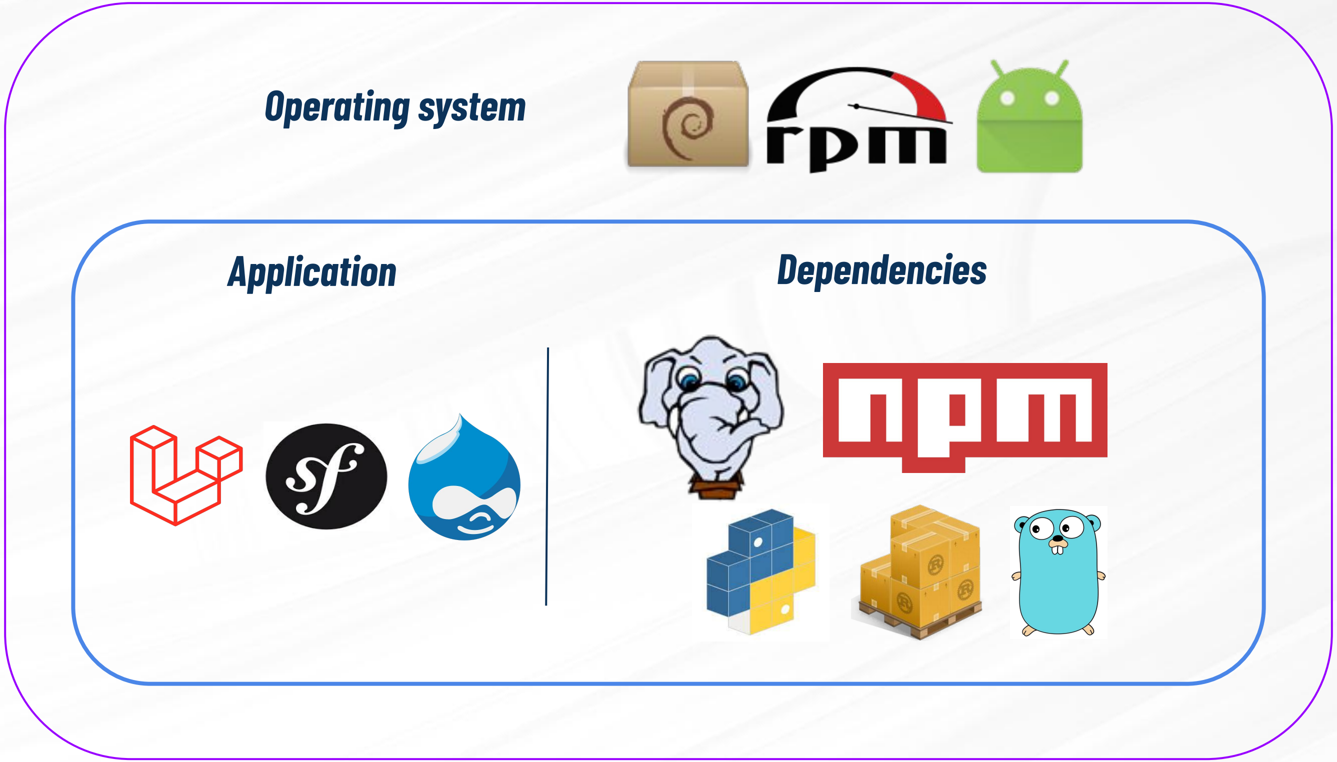
A MODERN PHP APPLICATION



Application

Dependencies

A MODERN PHP APPLICATION

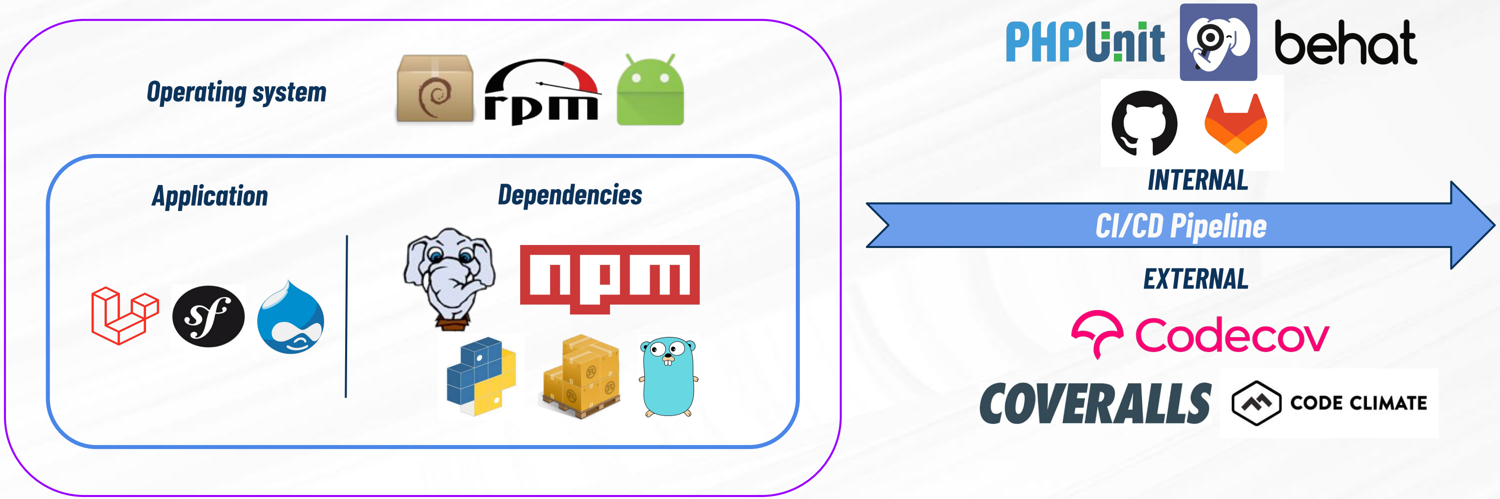


Operating system

Application

Dependencies

A MODERN PHP APPLICATION



Operating system

Application

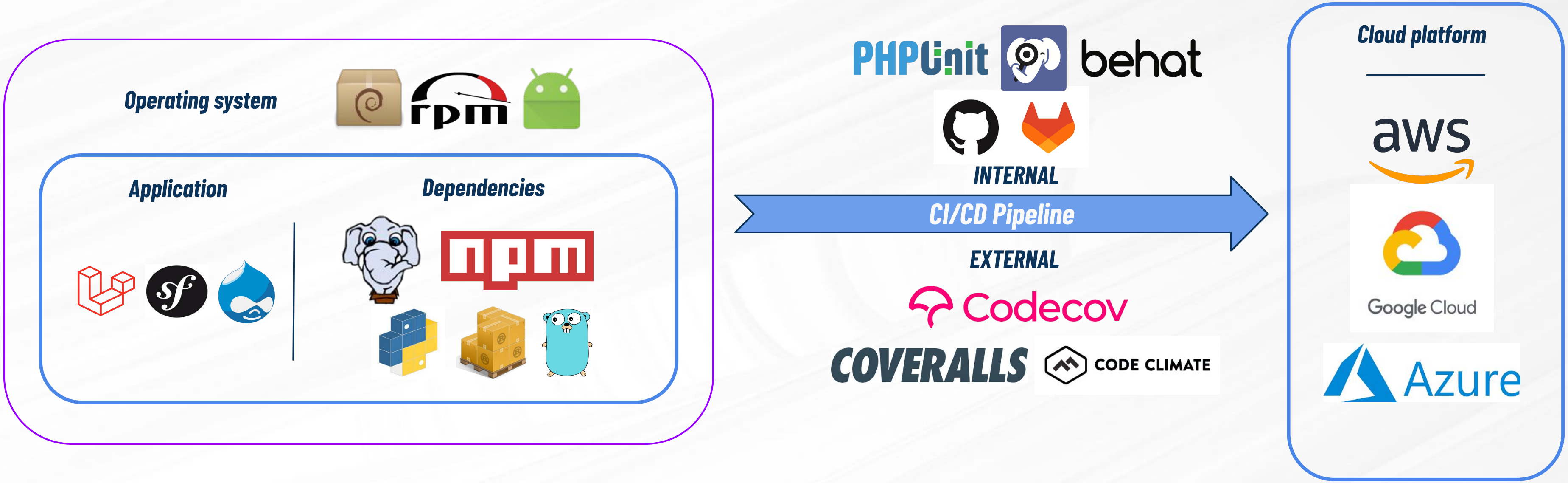
Dependencies

INTERNAL

CI/CD Pipeline

EXTERNAL

A MODERN PHP APPLICATION



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Dependencies

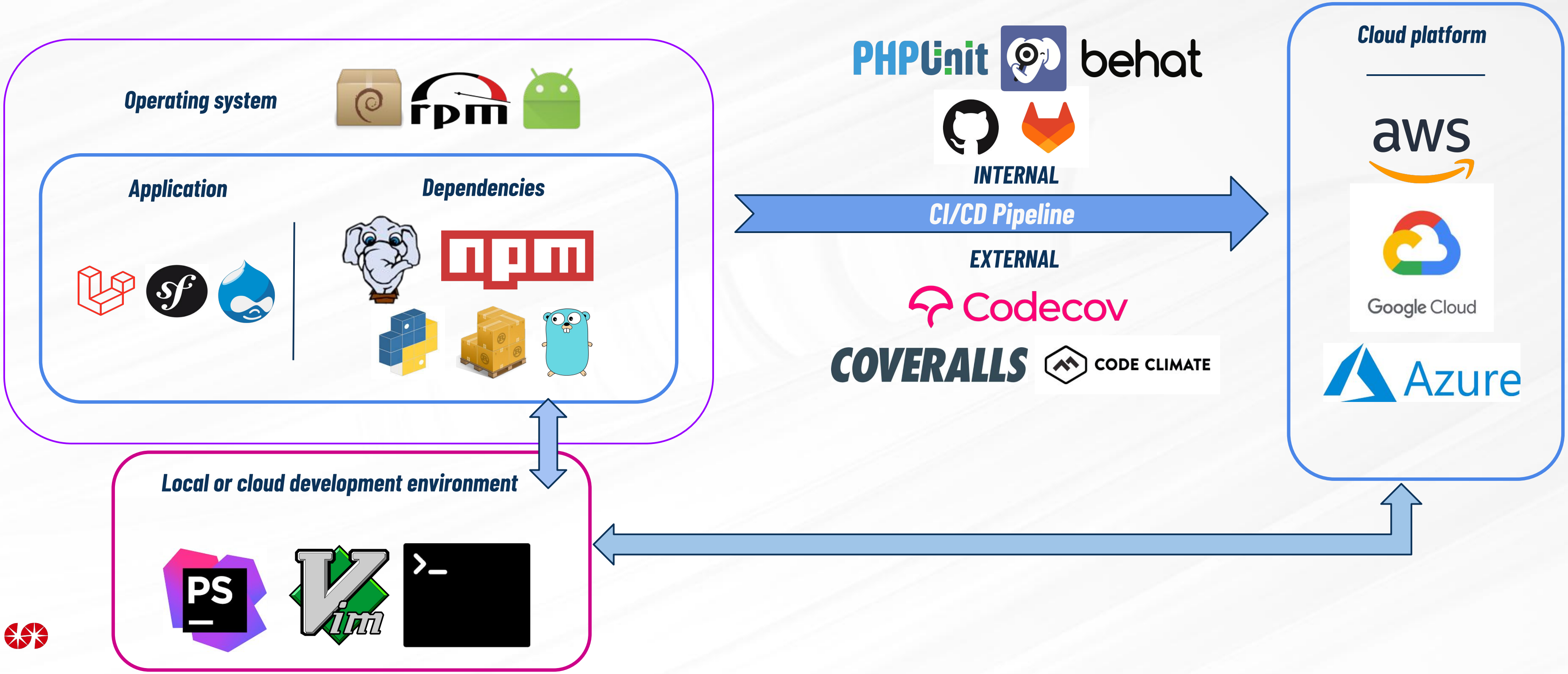
INTERNAL

CI/CD Pipeline

EXTERNAL

Cloud platform

A MODERN PHP APPLICATION



Operating system

Application

Dependencies

Local or cloud development environment

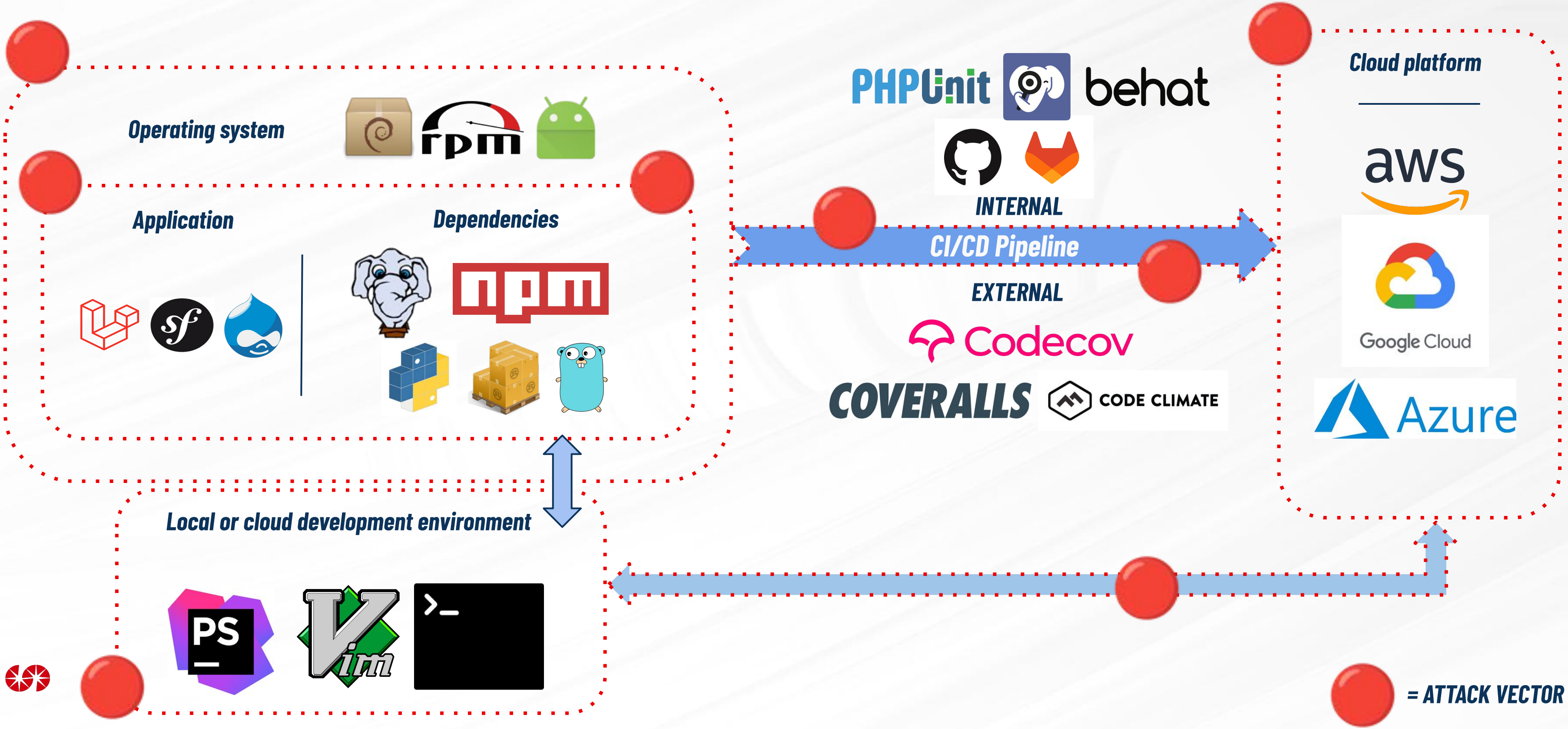
INTERNAL

CI/CD Pipeline

EXTERNAL

Cloud platform

A MODERN PHP APPLICATION



Operating system

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Local or cloud development environment

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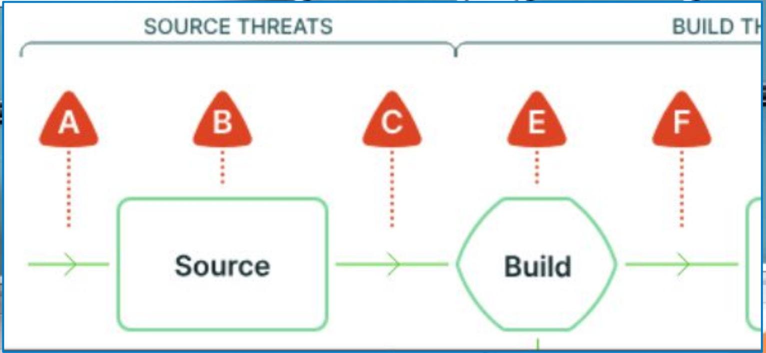
EXTERNAL

Cloud platform

= ATTACK VECTOR



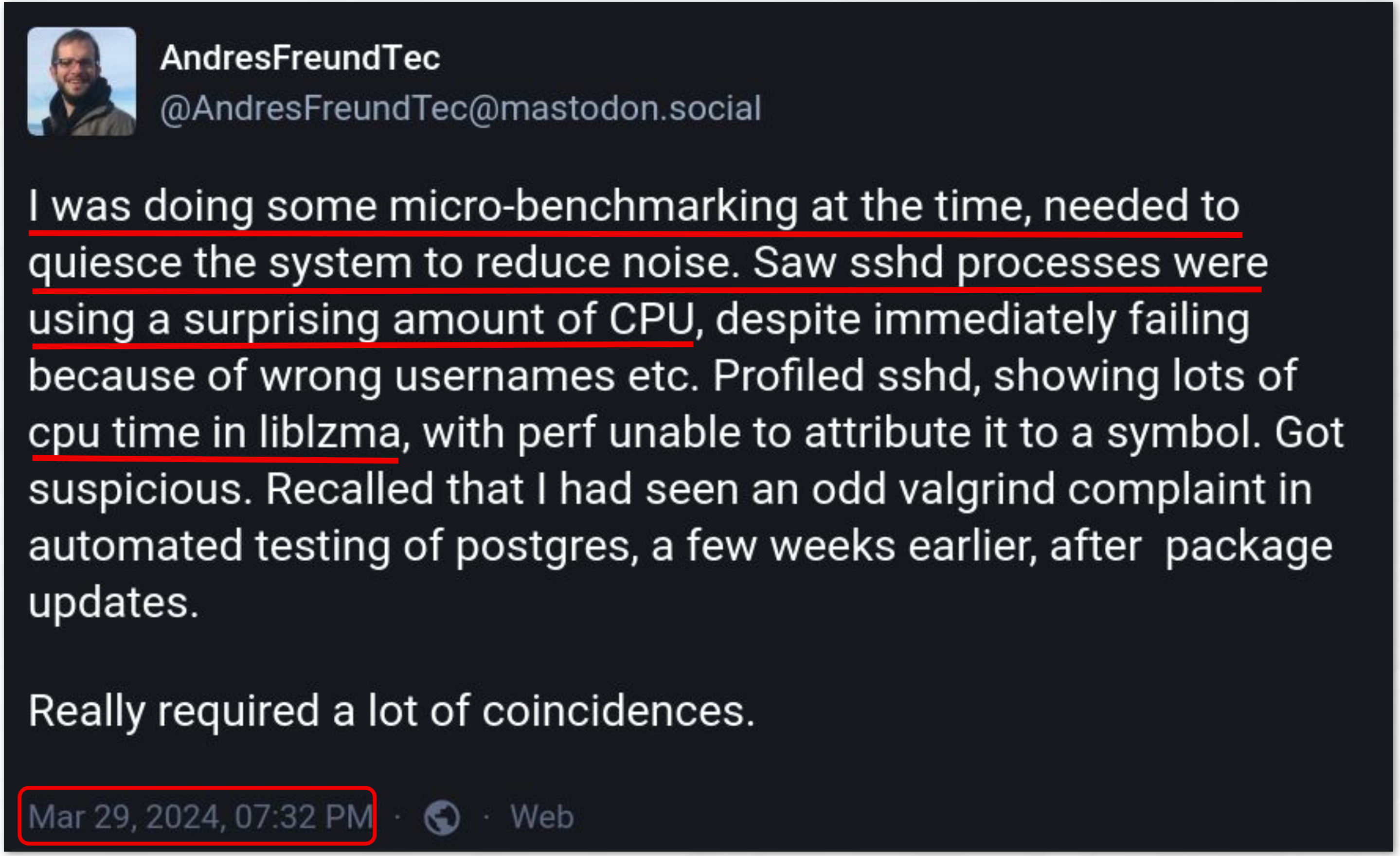
2020

About 18,000 customers of SolarWinds installed the infected updates,
including firms like Microsoft (Cisco, Intel, Deloitte) and top government US agencies
like Pentagon, Homeland security, National Nuclear Security etc.

April 2024

SSH BACKDOOR VIA LIBLZMA

The story of the XZ failed *(by chance)* attack https://mastodon.social/@AndresFreundTec/112180083704606941



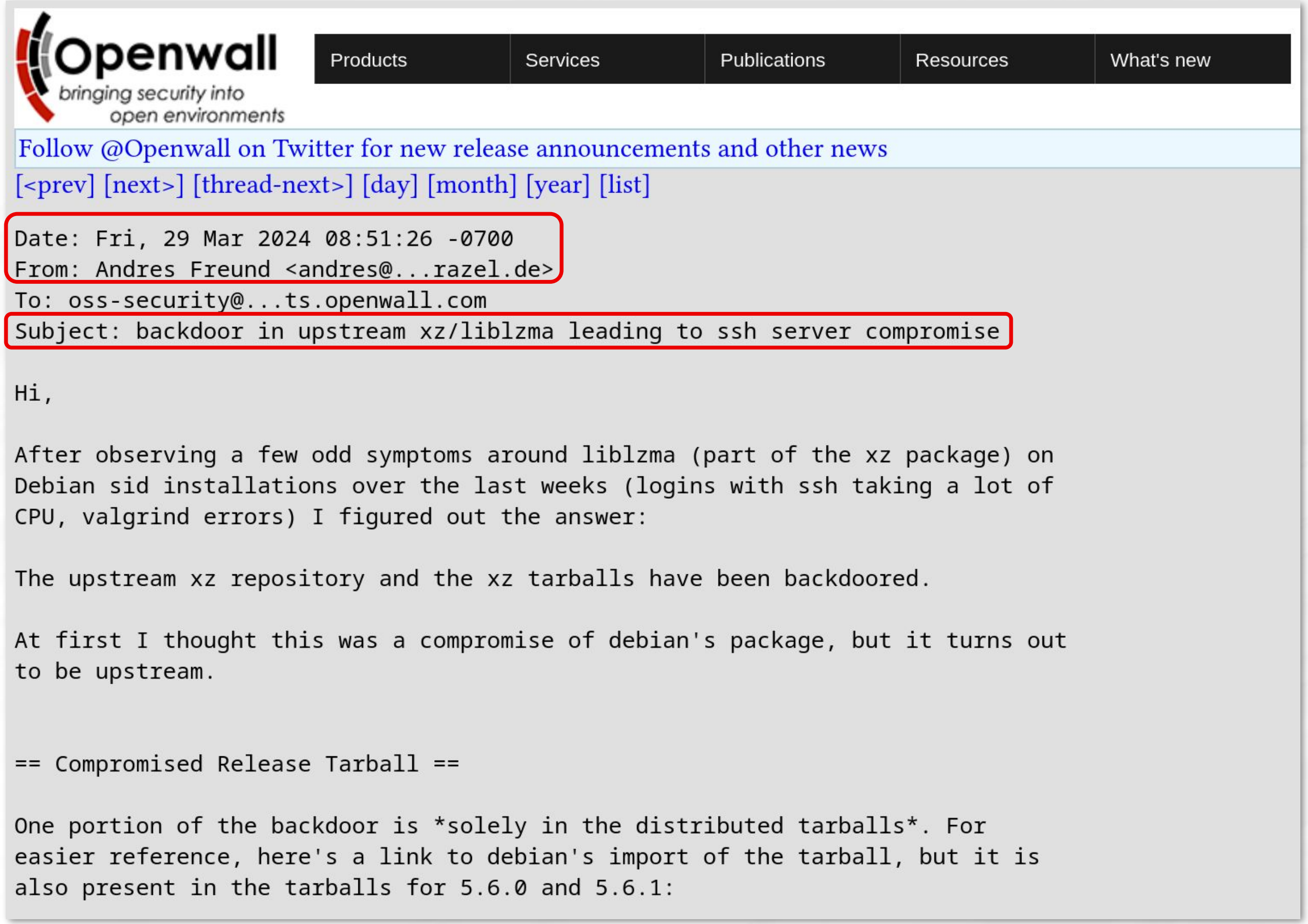
AndresFreundTec
@AndresFreundTec@mastodon.social

I was doing some micro-benchmarking at the time, needed to quiesce the system to reduce noise. Saw sshd processes were using a surprising amount of CPU, despite immediately failing because of wrong usernames etc. Profiled sshd, showing lots of cpu time in liblzma, with perf unable to attribute it to a symbol. Got suspicious. Recalled that I had seen an odd valgrind complaint in automated testing of postgres, a few weeks earlier, after package updates.

Really required a lot of coincidences.

Mar 29, 2024, 07:32 PM · · Web

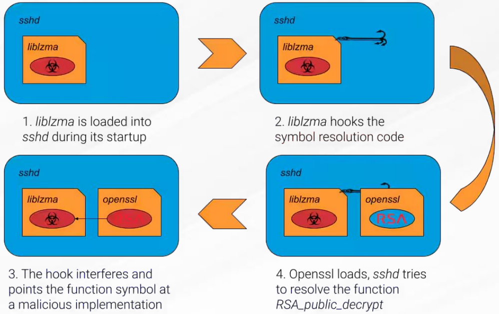
https://www.openwall.com/lists/oss-security/2024/03/29/4



Follow @Openwall on Twitter for new release announcements and other news

[<prev] [next>] [thread-next>] [day] [month] [year] [list]

```
Date: Fri, 29 Mar 2024 08:51:26 -0700
From: Andres Freund <andres@...razel.de>
To: oss-security@...ts.openwall.com
Subject: backdoor in upstream xz/liblzma leading to ssh server compromise

Hi,

After observing a few odd symptoms around liblzma (part of the xz package) on
Debian sid installations over the last weeks (logins with ssh taking a lot of
CPU, valgrind errors) I figured out the answer:

The upstream xz repository and the xz tarballs have been backdoored.

At first I thought this was a compromise of debian's package, but it turns out
to be upstream.


== Compromised Release Tarball ==

One portion of the backdoor is *solely in the distributed tarballs*. For
easier reference, here's a link to debian's import of the tarball, but it is
also present in the tarballs for 5.6.0 and 5.6.1:
```



1. *liblzma* is loaded into *sshd* during its startup

2. *liblzma* hooks the symbol resolution code

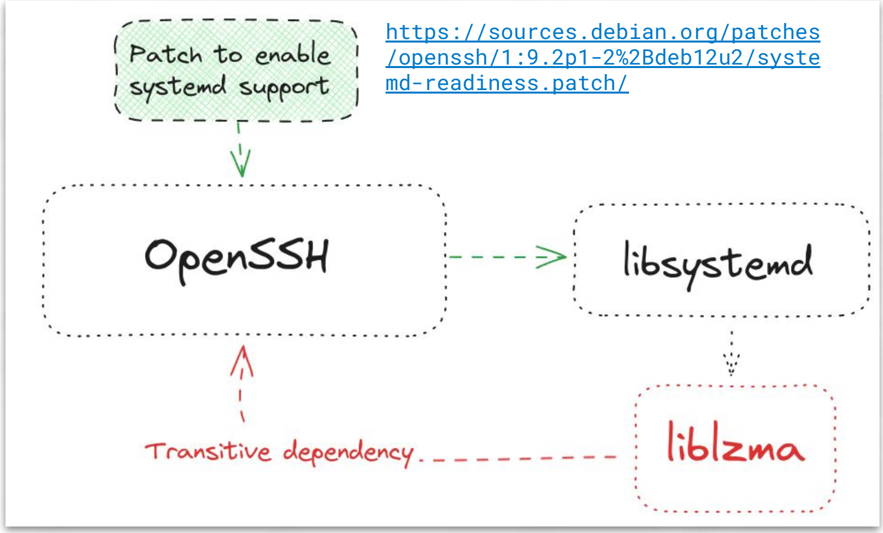
3. The hook interferes and points the function symbol at a malicious implementation

4. Openssl loads, *sshd* tries to resolve the function *RSA_public_decrypt*

What is XZ and why SSH has been impacted ?

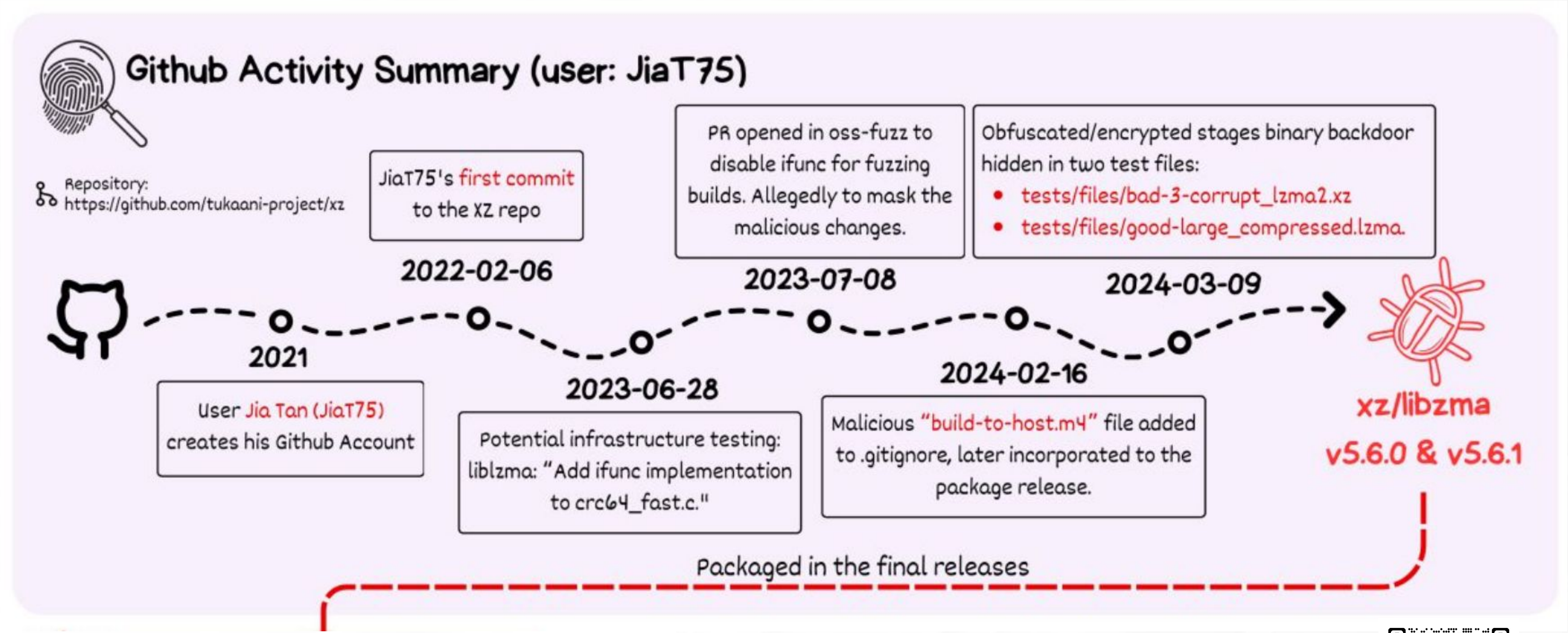
XZ Utils and its underlying library, liblzma, are **open-source projects that implement LZMA compression** and decompression. They are **included in many Linux distributions** out of the box.

OpenSSH does not depend on XZ, however Debian and several other distributions - patch it to support systemd notification, and eventually, **libsystemd does depend on liblzma**.



https://sources.debian.org/patches/openssh/1:9.2p1-2%2Bdeb12u2/systemd-readiness.patch/

XZ attack timeline



Github Activity Summary (user: JiaT75)

Repository: https://github.com/tukaani-project/xz

2021

User Jia Tan (JiaT75) creates his Github Account

2022-02-06

JiaT75's first commit to the XZ repo

2023-06-28

Potential infrastructure testing: liblzma: "Add ifunc implementation to crc64_fast.c."

2023-07-08

PR opened in oss-fuzz to disable ifunc for fuzzing builds. Allegedly to mask the malicious changes.

2024-02-16

Malicious "build-to-host.m4" file added to .gitignore, later incorporated to the package release.

2024-03-09

Obfuscated/encrypted stages binary backdoor hidden in two test files:

- tests/files/bad-3-corrupt_lzma2.xz
- tests/files/good-large_compressed.lzma.

xz/libzma v5.6.0 & v5.6.1

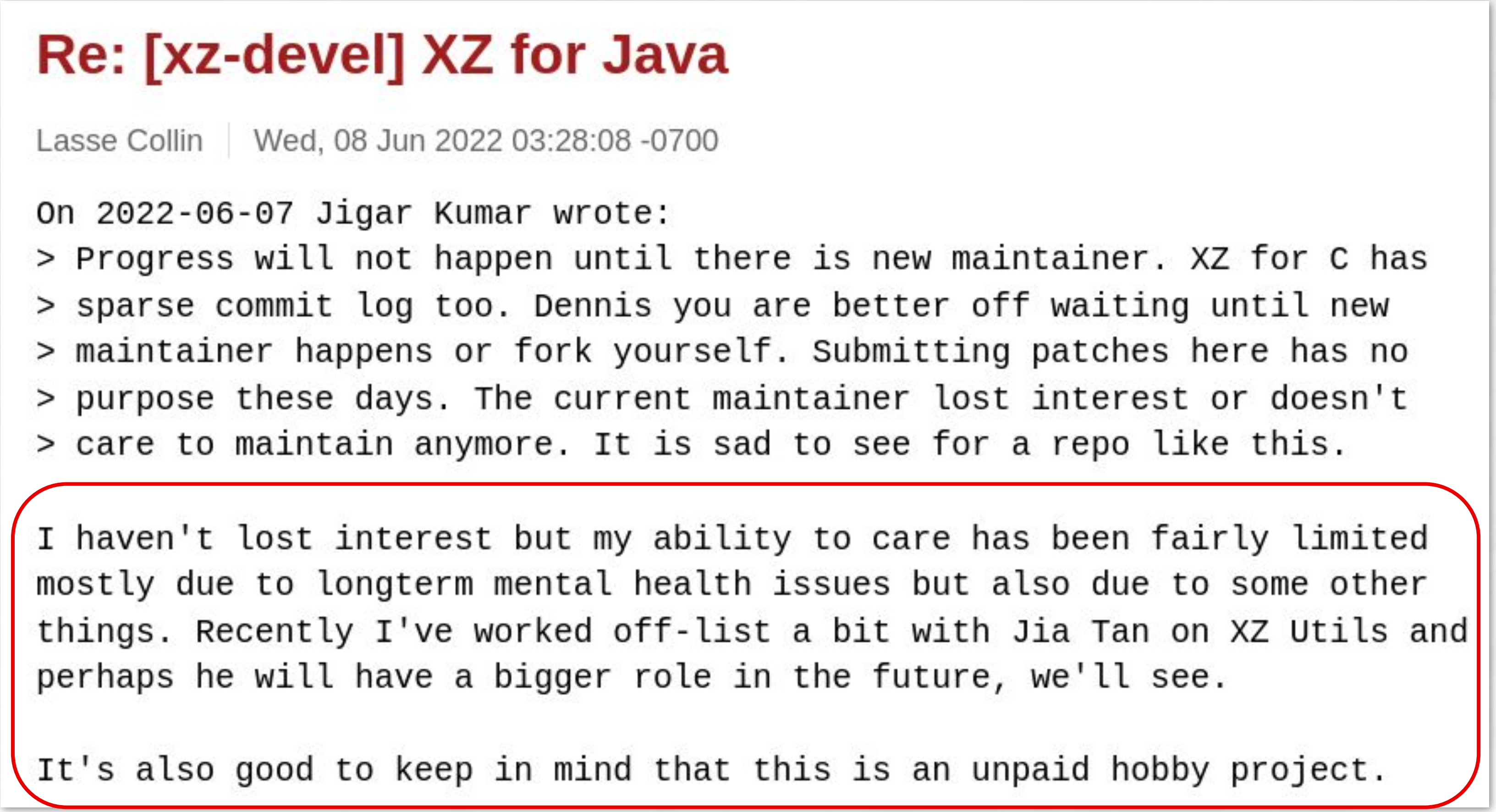
Packaged in the final releases

Source: https://www.linkedin.com/posts/thomas-roccia_infosec-xz-cybersecurity-activity-7180110597139697664-nzJL

Open source has won

Everyone needs to downgrade xz
My ssh runs 0.4 seconds slower
imgflip.com

It won yes, but is it still sustainable ?



Re: [xz-devel] XZ for Java

Lasse Collin | Wed, 08 Jun 2022 03:28:08 -0700

On 2022-06-07 Jigar Kumar wrote:

> Progress will not happen until there is new maintainer. XZ for C has
> sparse commit log too. Dennis you are better off waiting until new
> maintainer happens or fork yourself. Submitting patches here has no
> purpose these days. The current maintainer lost interest or doesn't
> care to maintain anymore. It is sad to see for a repo like this.

I haven't lost interest but my ability to care has been fairly limited mostly due to longterm mental health issues but also due to some other things. Recently I've worked off-list a bit with Jia Tan on XZ Utils and perhaps he will have a bigger role in the future, we'll see.

It's also good to keep in mind that this is an unpaid hobby project.

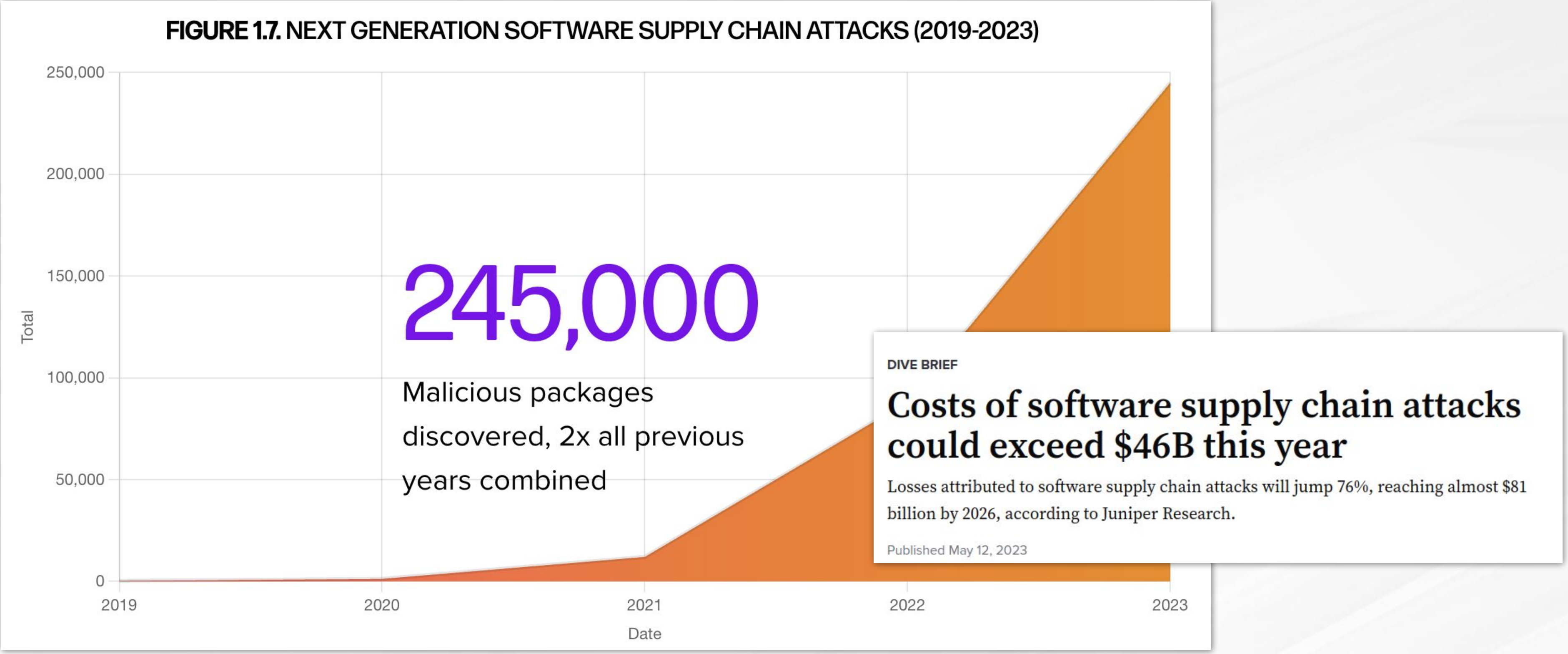


FIGURE 1.7. NEXT GENERATION SOFTWARE SUPPLY CHAIN ATTACKS (2019-2023)

245,000

Malicious packages discovered, 2x all previous years combined

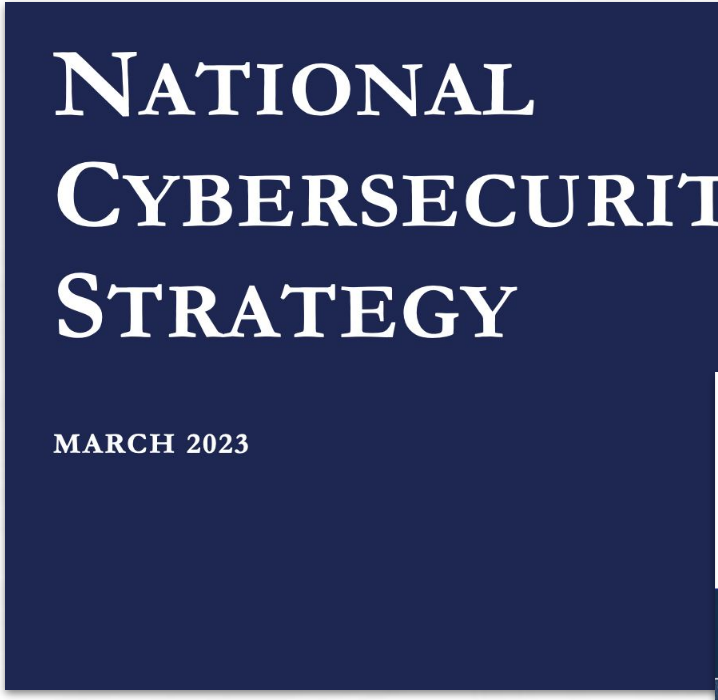
DIVE BRIEF

Costs of software supply chain attacks could exceed $46B this year

Losses attributed to software supply chain attacks will jump 76%, reaching almost $81 billion by 2026, according to Juniper Research.

Published May 12, 2023

https://www.sonatype.com/state-of-the-software-supply-chain/introduction



NATIONAL CYBERSECURITY STRATEGY

MARCH 2023

https://linuxfoundation.eu/cyber-resilience-act

CYBER RESILIENCE ACT

New EU cybersecurity rules ensure more secure hardware and software products

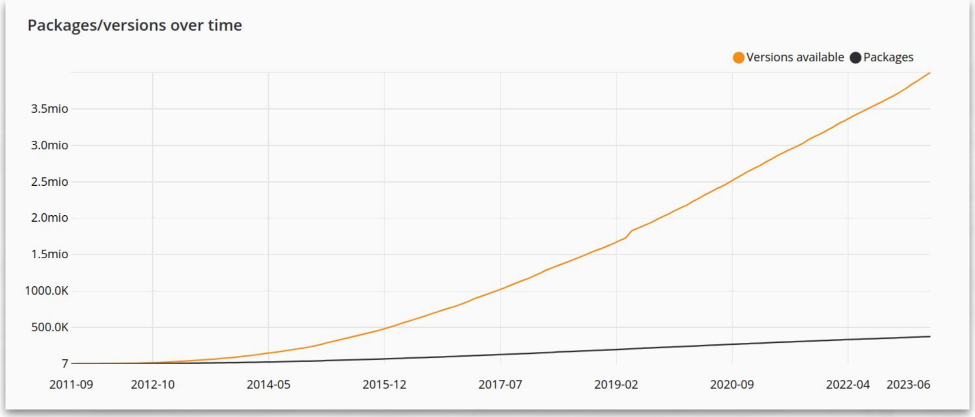
#DigitalEU #SecurityUnion #Cybersecurity

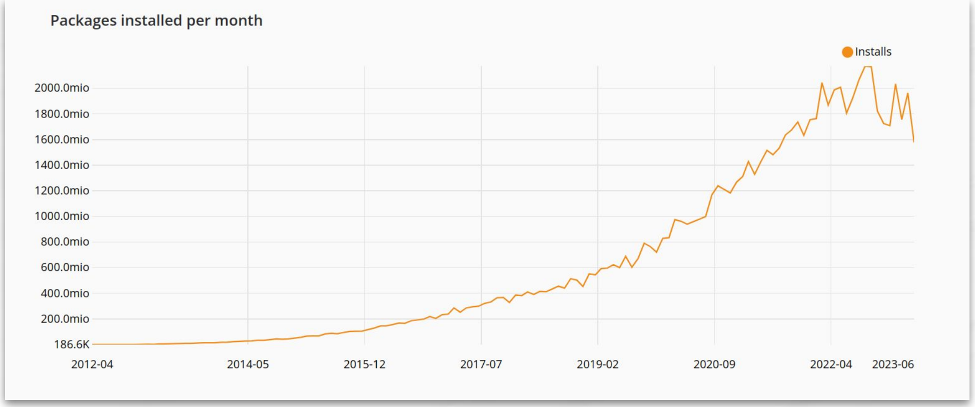
#SOTEU

SEPTEMBER 2022 – UPDATED **DECEMBER 2023**

STATE OF THE PHP ECOSYSTEM

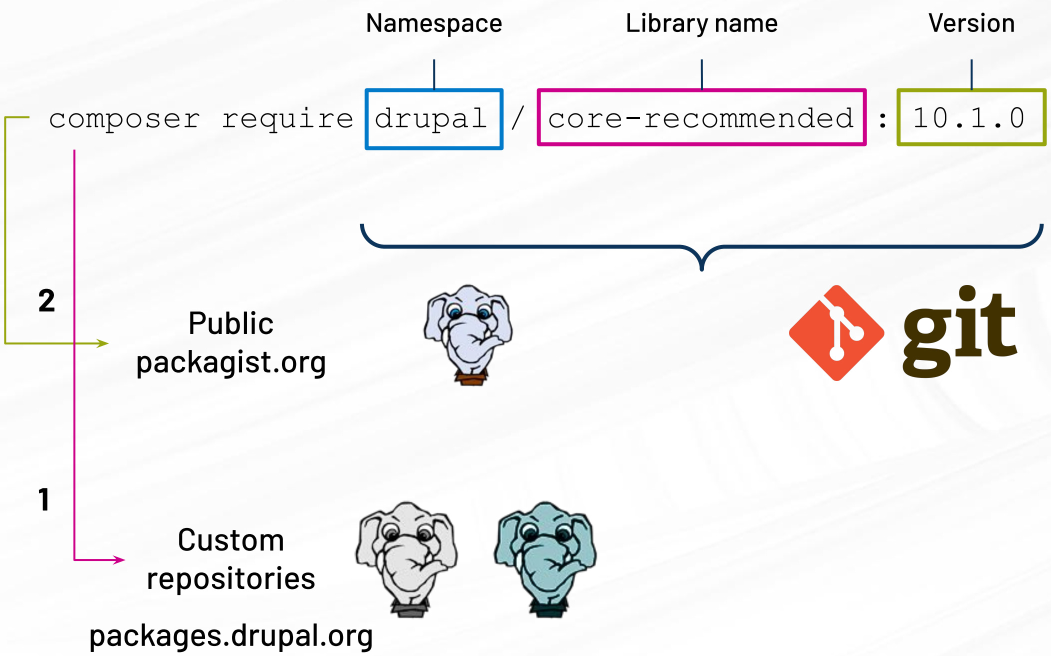
COMPOSER: THE PHP PACKAGE MANAGER





- Invented in 2012 by **Nils Adermann** and **Jordi Boggiano**.
- **Standard de-facto** for the PHP package management.
- packagist.org hosts more than 300k packages and 2.5M revisions.

COMPOSER BUILT-IN SECURITY PROTECTIONS



Namespace

Library name

Version

```
composer require drupal / core-recommended : 10.1.0
```

2

Public
packagist.org

1

Custom
repositories

packages.drupal.org

Only vendor-namespaced packages allowed
(eg: NPM allows root packages)

Code is always hosted on a git repository, only metadata goes on packagist.org
(eg: NPM hosts the code)

Composer Repositories are Canonical by default.
(no dependency confusion)

https://blog.packagist.com/preventing-dependency-hijacking

THE LATEST SUPPLY CHAIN ATTACKS ON PHP

April 29, 2021

PHP Supply Chain Attack on Composer

"A critical vulnerability in the source code of Composer which is used by Packagist. It allowed us to execute arbitrary system commands on the Packagist.org server"

October 4, 2022

Securing Developer Tools: A New Supply Chain Attack on PHP

"A new critical vulnerability in similar components. It allowed taking control of the server distributing information about existing PHP software packages, and ultimately compromising every organization that uses them"

March 29, 2022

PHP Supply Chain Attack on PEAR

"In this article we present two bugs, both exploitable for more than 15 years. An attacker exploiting the first one could take over any developer account and publish malicious releases, while the second bug would allow the attacker to gain persistent access to the central PEAR server."

May 3, 2023

Packagist.org maintainer account takeover

"An attacker accessed an inactive account on Packagist.org for a period of time but still had access to a total of 14 packages. The attacker forked each of the packages and replaced the package description in composer.json with their own message but did not otherwise make any malicious changes"

And counting

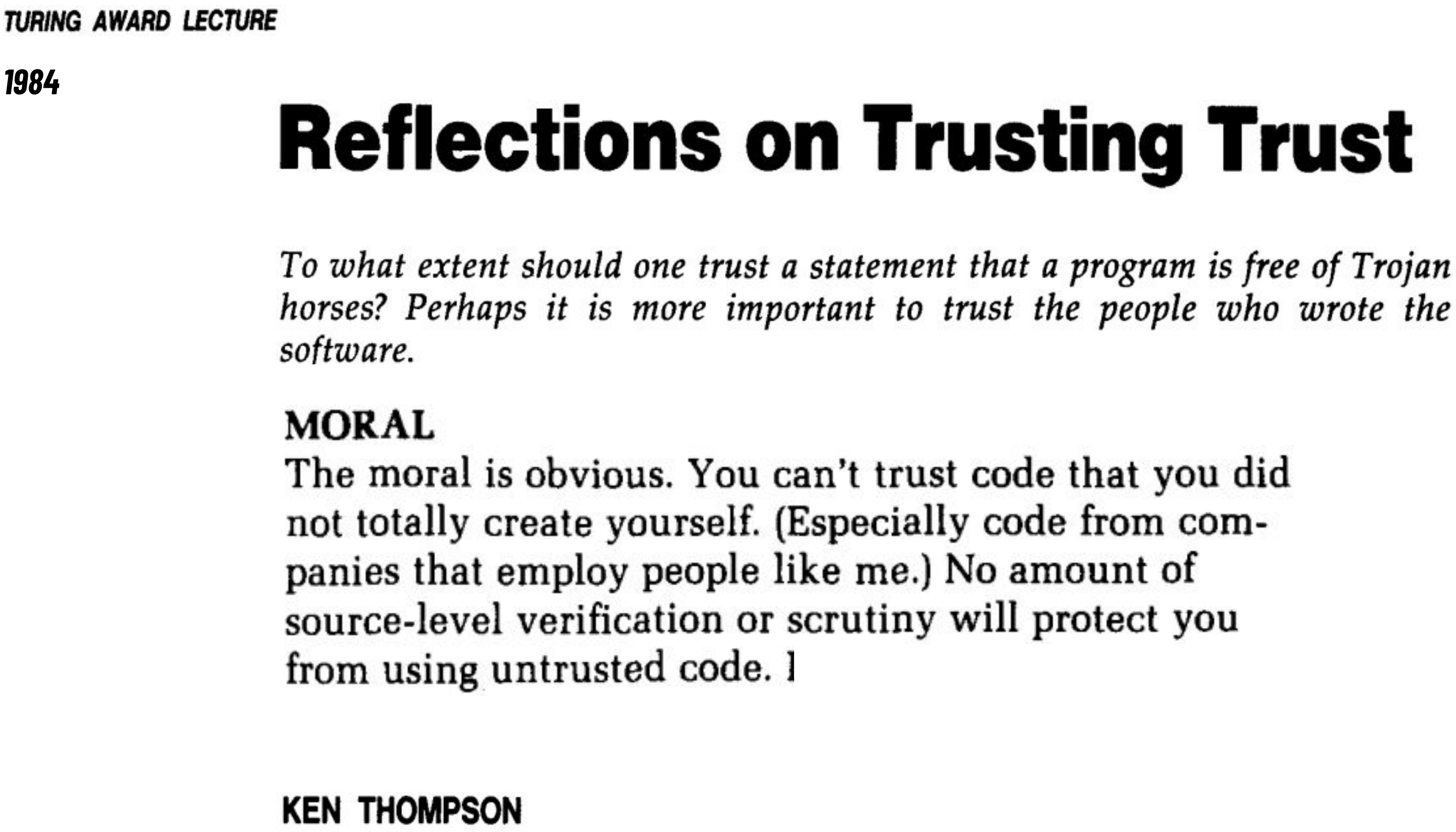
https://www.sonatype.com/resources/vulnerability-timeline

SO WHAT ? WHERE SHOULD WE START ?

INTEGRITY, TRUST AND DEPENDENCIES

What is the ***trusting model*** between ***us*** and ***digital artifacts***?

How can i be sure that ***what I’m running*** is coming from a ***trusted source***?



TURING AWARD LECTURE

1984

Reflections on Trusting Trust

To what extent should one trust a statement that a program is free of Trojan horses? Perhaps it is more important to trust the people who wrote the software.

MORAL

The moral is obvious. You can't trust code that you did not totally create yourself. (Especially code from companies that employ people like me.) No amount of source-level verification or scrutiny will protect you from using untrusted code. ■

KEN THOMPSON

SECURE SOFTWARE SUPPLY CHAIN CHECKLIST

✅ Who built it, when and how
(***Signatures*** and ***Provenance Attestations***)

✅ The list of things who made the artifact
(***SBOM - Software Bill of Material***)

DIGITAL SIGNATURES 101

Integrity

Ensure the data signed was not altered.

Authenticity

Attest that the data was sent by the signer.

Non-repudiation

Ensure that the signer cannot deny the authenticity of the signature.

Managing keys is hard

Distribution, Storage, Compromise

DIGITAL SIGNATURES - SIGSTORE

Sigstore is an OSS project under the umbrella of [***OpenSSF***](https://openssf.org) foundation.

Fast growing community and mainstream adopted

Used in ***Kubernetes*** and many other big vendors

(Github, Rubygems, Arch Linux etc..)

https://openssf.org/community/sigstore

sigstore

In collaboration with

OpenSSF Chainguard cisco Google Hewlett Packard Enterprise PURDUE UNIVERSITY Red Hat vmware

DIGITAL SIGNATURES - SIGSTORE

Keyless signing of any software artifact

Signatures metadata are stored in a ***public tamper-resistant log***

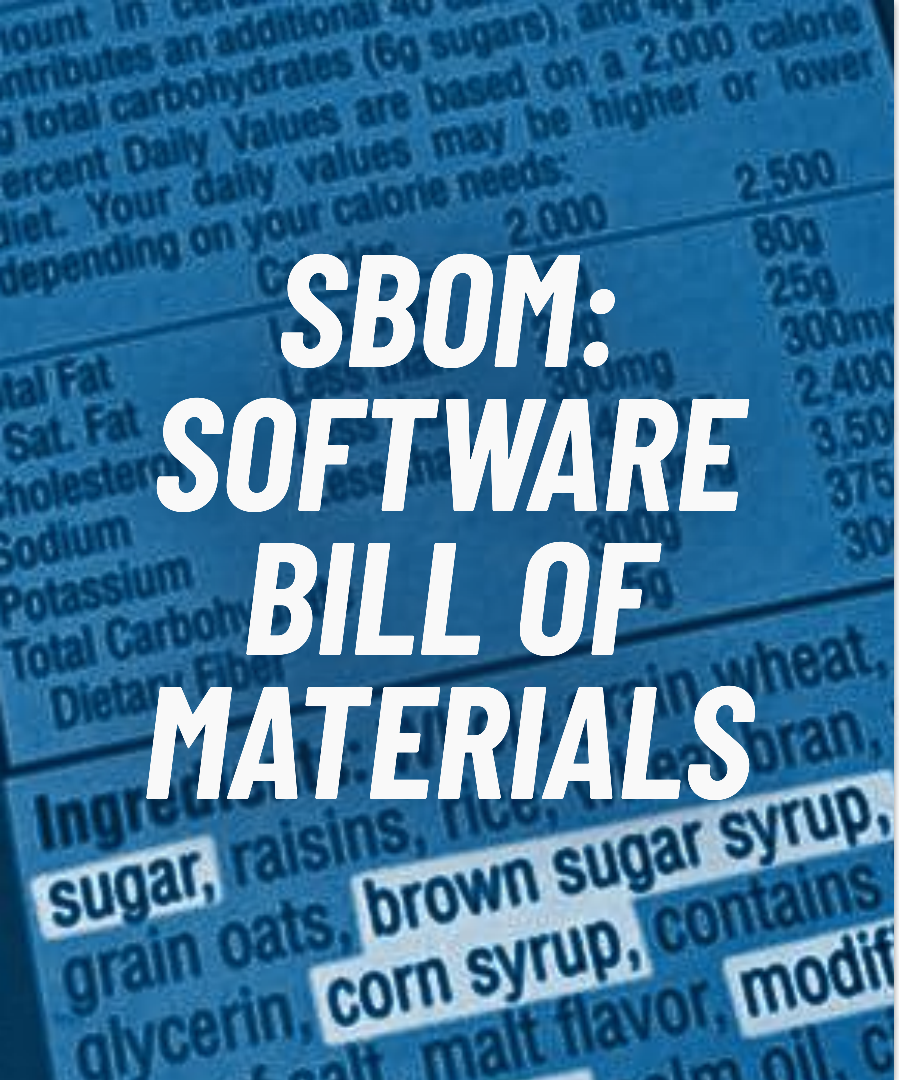
Not yet usable on the PHP packages.

Drupal-TUF

sigstore

In collaboration with

OpenSSF Chainguard cisco Google Hewlett Packard Enterprise PURDUE UNIVERSITY Red Hat vmware



ntributes an additional 40 ca
g total carbohydrates (6g sugars), and 4g
ercent Daily Values are based on a 2,000 calorie
diet. Your daily values may be higher or lower
depending on your calorie needs:
2,000
2,500
80g
25g
300mg
2,400
3,500
375
30
tal Fat
Sat. Fat
holesterol
Sodium
Potassium
Total Carbohy
Dietary Fiber
Less than
Less than
300mg
300g
25g
wheat,
bran,
Ingred
sugar, raisins, rice,
grain oats, brown sugar syrup,
glycerin, corn syrup, contains
malt flavor, modif
oil,

SBOM: SOFTWARE BILL OF MATERIALS

A list of “ingredients” for a software artifact

Can be used for:

- ➔ Vulnerability scanning
- ➔ Software transparency
- ➔ License policy
- ➔ Find abandoned dependencies

SBOM - Tools

SBOM + Vulnerabilities

`$ docker sbom`

CycloneDX

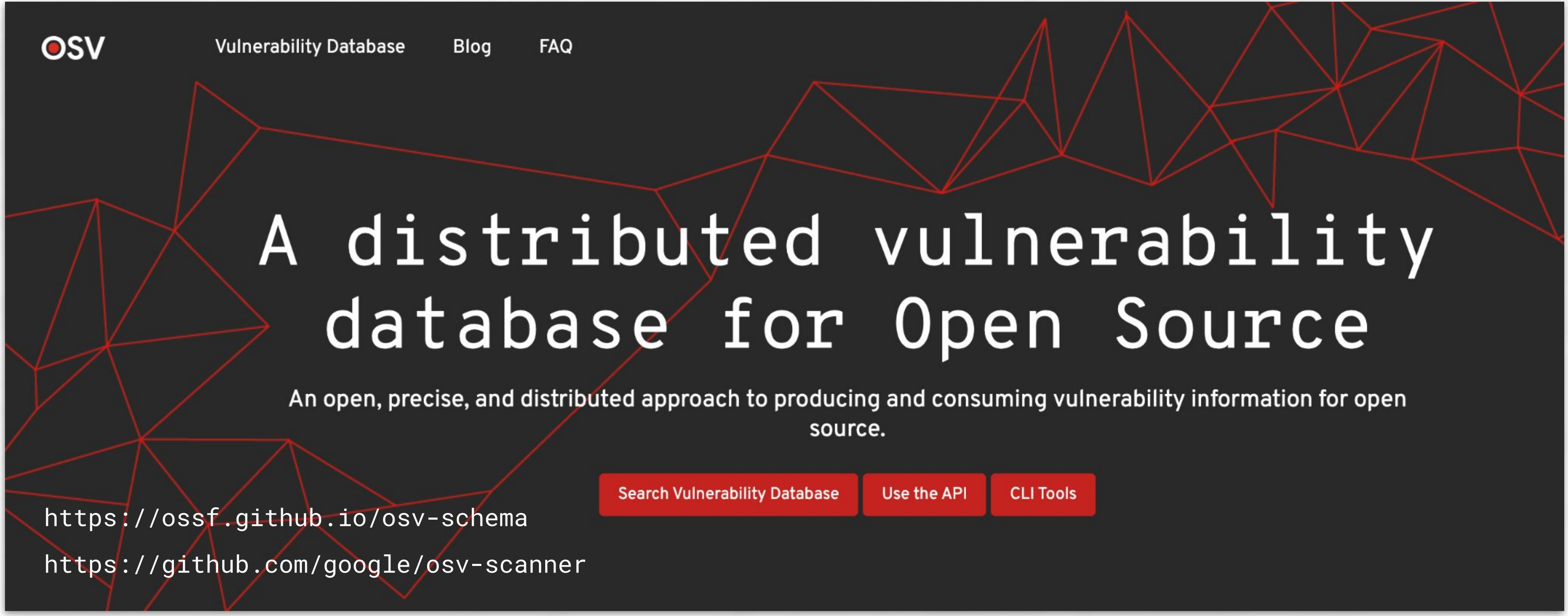
PHP Composer

https://github.com/CycloneDX/cyclonedx-php-composer

KNOW YOUR DEPENDENCIES

OSV

https://osv.dev



A distributed vulnerability database for Open Source

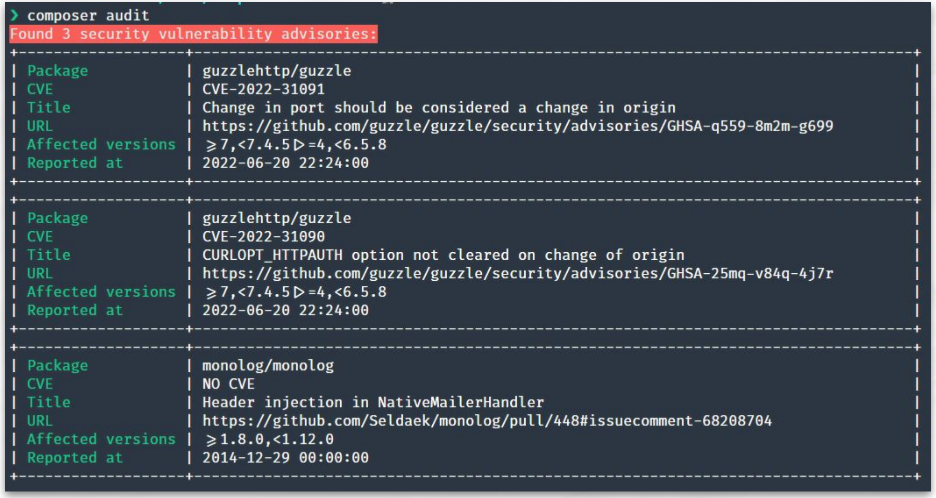
An open, precise, and distributed approach to producing and consuming vulnerability information for open source.

https://ossf.github.io/osv-schema

https://github.com/google/osv-scanner

Composer audit

https://packagist.org/api/security-advisories/



```
❯ composer audit
Found 3 security vulnerability advisories:
+-------------------+----------------------------------------------------------------------------------+
| Package           | guzzlehttp/guzzle                                                                |
| CVE               | CVE-2022-31091                                                                   |
| Title             | Change in port should be considered a change in origin                           |
| URL               | https://github.com/guzzle/guzzle/security/advisories/GHSA-q559-8m2m-g699         |
| Affected versions | ⩾7,<7.4.5▷=4,<6.5.8                                                              |
| Reported at       | 2022-06-20 22:24:00                                                              |
+-------------------+----------------------------------------------------------------------------------+
+-------------------+----------------------------------------------------------------------------------+
| Package           | guzzlehttp/guzzle                                                                |
| CVE               | CVE-2022-31090                                                                   |
| Title             | CURLOPT_HTTPAUTH option not cleared on change of origin                          |
| URL               | https://github.com/guzzle/guzzle/security/advisories/GHSA-25mq-v84q-4j7r         |
| Affected versions | ⩾7,<7.4.5▷=4,<6.5.8                                                              |
| Reported at       | 2022-06-20 22:24:00                                                              |
+-------------------+----------------------------------------------------------------------------------+
+-------------------+----------------------------------------------------------------------------------+
| Package           | monolog/monolog                                                                  |
| CVE               | NO CVE                                                                           |
| Title             | Header injection in NativeMailerHandler                                          |
| URL               | https://github.com/Seldaek/monolog/pull/448#issuecomment-68208704                |
| Affected versions | ⩾1.8.0,<1.12.0                                                                   |
| Reported at       | 2014-12-29 00:00:00                                                              |
+-------------------+----------------------------------------------------------------------------------+
```

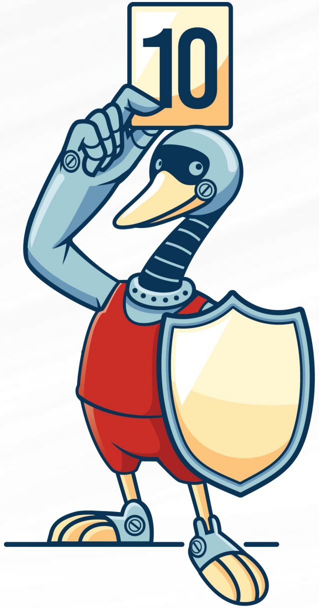
- Lists vulnerable versions in composer.lock

- Uses packagist.org vulnerability db API
  - GitHub advisory database
  - FriendsOfPHP/security-advisories

- Returns non-zero if vulnerabilities found -> can check in CI

OpenSSF Scorecard

https://scorecard.dev



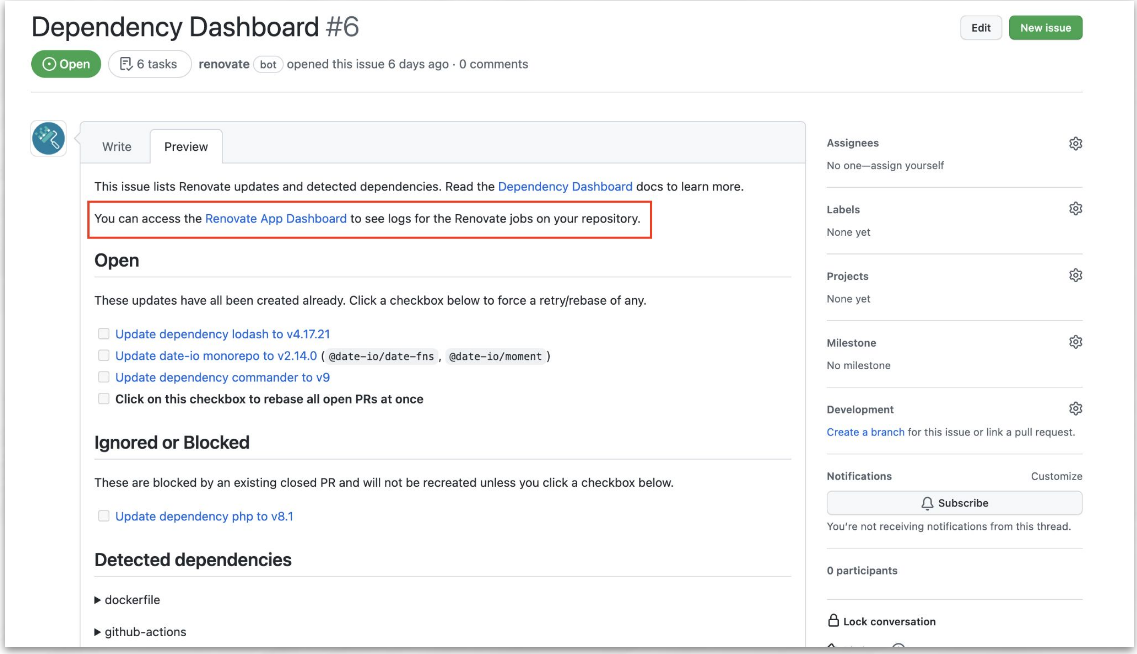
Checks: Code vulnerabilities, Maintenance, Continuous testing, Source risk assessment, Build risk assessment

Automated dependencies management

https://github.com/renovatebot/renovate - https://github.com/dependabot

Renovate

Dependabot



Dependency Dashboard #6

Open · 6 tasks · renovate bot opened this issue 6 days ago · 0 comments

This issue lists Renovate updates and detected dependencies. Read the Dependency Dashboard docs to learn more.

You can access the Renovate App Dashboard to see logs for the Renovate jobs on your repository.

Open

These updates have all been created already. Click a checkbox below to force a retry/rebase of any.

- □ Update dependency lodash to v4.17.21
- □ Update date-io monorepo to v2.14.0 (`@date-io/date-fns` , `@date-io/moment`)
- □ Update dependency commander to v9
- □ **Click on this checkbox to rebase all open PRs at once**

Ignored or Blocked

These are blocked by an existing closed PR and will not be recreated unless you click a checkbox below.

- □ Update dependency php to v8.1

Detected dependencies

▸ dockerfile

▸ github-actions

Assignees
No one—assign yourself

Labels
None yet

Projects
None yet

Milestone
No milestone

Development
Create a branch for this issue or link a pull request.

Notifications Customize
Subscribe
You're not receiving notifications from this thread.

0 participants

Lock conversation

Takeaways

➔ Digital Signatures with Sigstore and Software Bills of materials.

➔ More informed choice of external dependencies with OSV, OpenSSF Scorecard and deps.dev

➔ Automate your dependencies management with Github DependaBot or Renovate for all other platforms.

➔ Demo of Sigstore, Syft, Grype, Chainguard images: https://www.youtube.com/watch?v=8osHp_h9bYU

Demo

THANKS