

Southern California Linux Expo 2024

Secure Consumption of Open Source Software: Evaluating, Utilizing, and Contributing Safely

Katherine Druckman

Open Source Security Evangelist

Why are we here?

Today we'll cover

 Security challenges in consuming open source software

 Evaluating open source projects through a security lens

 Project health, governance, management, and community

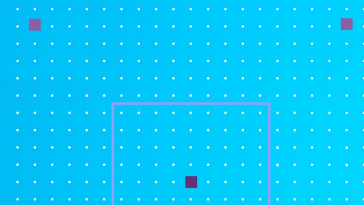
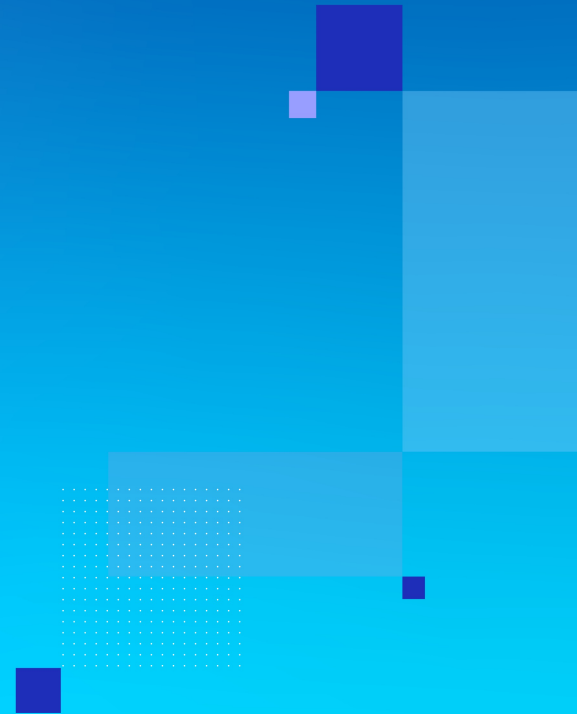
 Tools for securing open source software

 Open source community security efforts: OpenSSF

 How we can contribute to a safer ecosystem

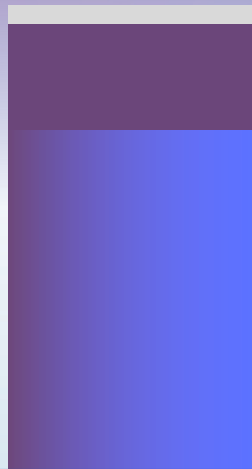
Security challenges

Why is open source security so challenging?



Open source is *everywhere*

96%
of codebases



77%
of code within

70–90%
of all software



Source: Synopsis

Source: Linux Foundation

<https://www.synopsys.com/software-integrity/resources/analyst-reports/open-source-security-risk-analysis.html>

<https://www.linuxfoundation.org/blog/blog/a-summary-of-census-ii-open-source-software-application-libraries-the-world-depends-on>

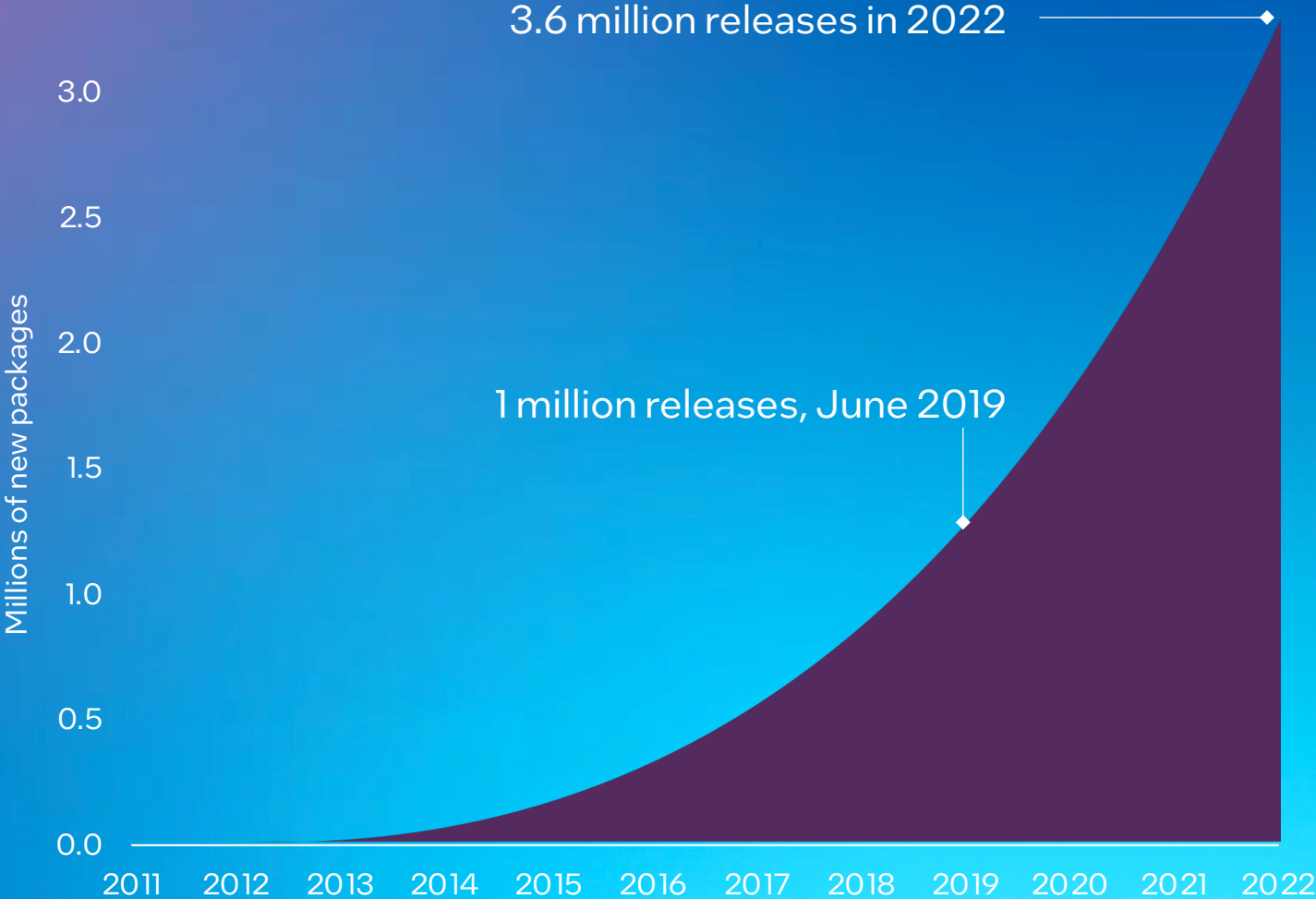
Open source is *everywhere*



Yay! We won!

Node Package Manager (NPM) | New project releases over time

Millions of packages ...



Millions of packages ...
dozens of maintainers

Packages by number of maintainers



It's not just NPM

npmjs.org



3,639,251 packages
41,815,290 versions
822,231 maintainers
222,295 namespaces
742,169 keywords
237,045,471,901 downloads

proxy.golang.org



1,105,378 packages
9,970,233 versions
449,953 namespaces
70,056 keywords

hub.docker.com



1,001,771 packages
10,844,967 versions
411,451 namespaces
1,713 keywords
334,237,037,105 downloads

nuget.org



624,254 packages
7,566,455 versions
85,940 maintainers
129,237 keywords
514,134,790,590 downloads

pypi.org



542,396 packages
5,603,074 versions
229,691 maintainers
193,748 keywords
29,768,771,520 downloads

repo1.maven.org



499,556 packages
11,361,001 versions
66,310 namespaces
31,287 keywords

Statistics

Registries: 59
Packages: 8,840,726

Versions: 97,334,410
Namespaces: 1,328,127

Maintainers: 1,440,484
Downloads: 1,811,443,044,372

Keywords: 1,521,288

Common Vulnerabilities and Exposures (CVE)

CVE is a dictionary of common names for publicly known cybersecurity vulnerabilities, each of which receives a CVE Identifier.

CVE Identifiers make it easy to share data across separate network security databases and tools. Plus, they provide a baseline for evaluating the coverage of an organization's security tools.

- CVE = Common Vulnerabilities and Exposures
- List of "all" publicly known software security vulnerabilities starting in 1999
- MITRE Corporation manages and maintains CVE on behalf of the US National Cybersecurity Division



CVEs: True or false?

A project with no CVEs is more secure than a project with many CVEs.

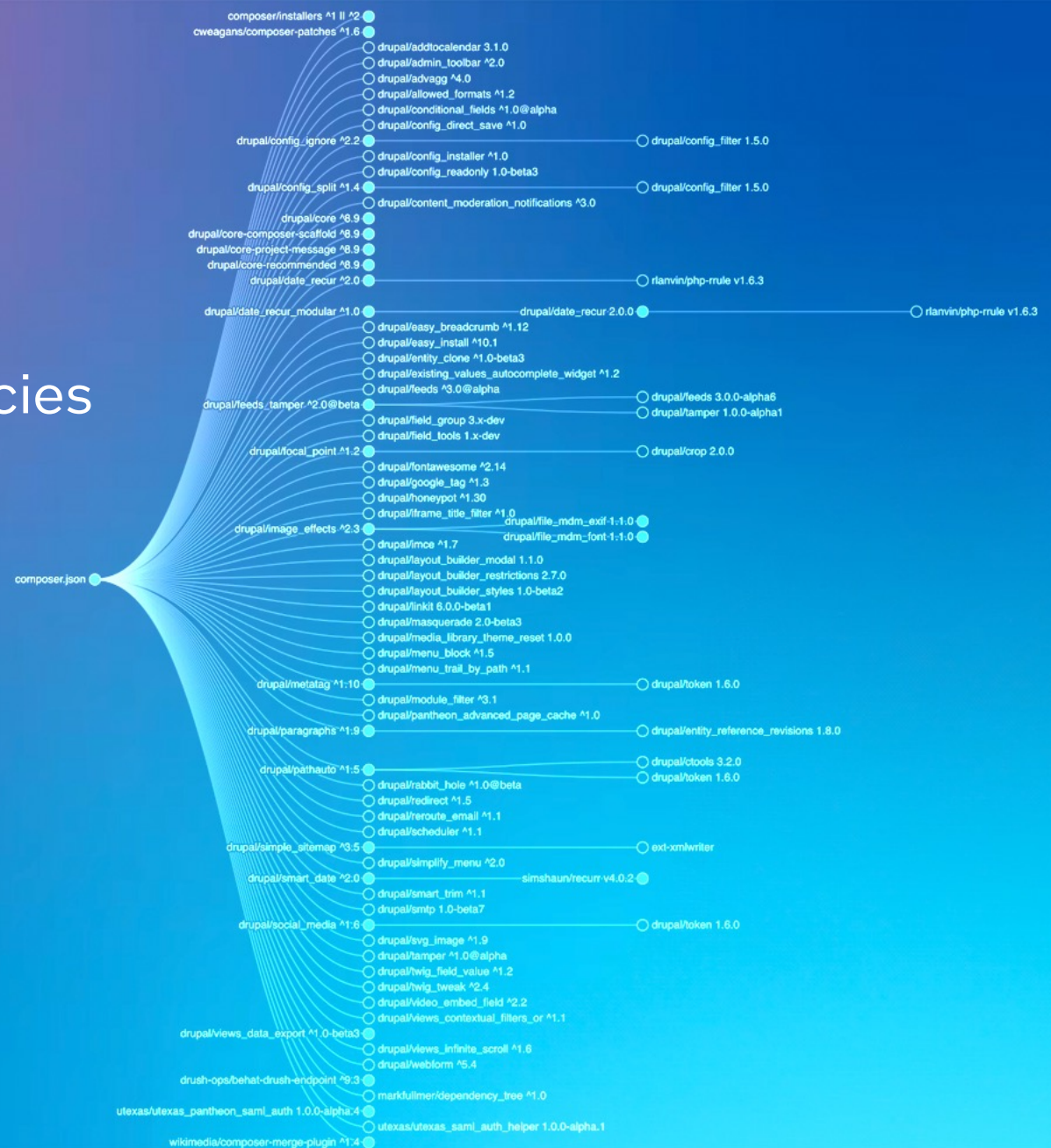


CVEs per year



So many dependencies

- Secondary and tertiary dependencies can get well into the 100s...
- Especially with web applications



New contributors!

From GitHub:

- 2023 had the largest number of first-time contributors
- 420 million total projects (27% growth YOY)
- 4.5 billion contributions in 2023




Evaluating projects

What does it mean to consume open source software securely?

Evaluating open source projects

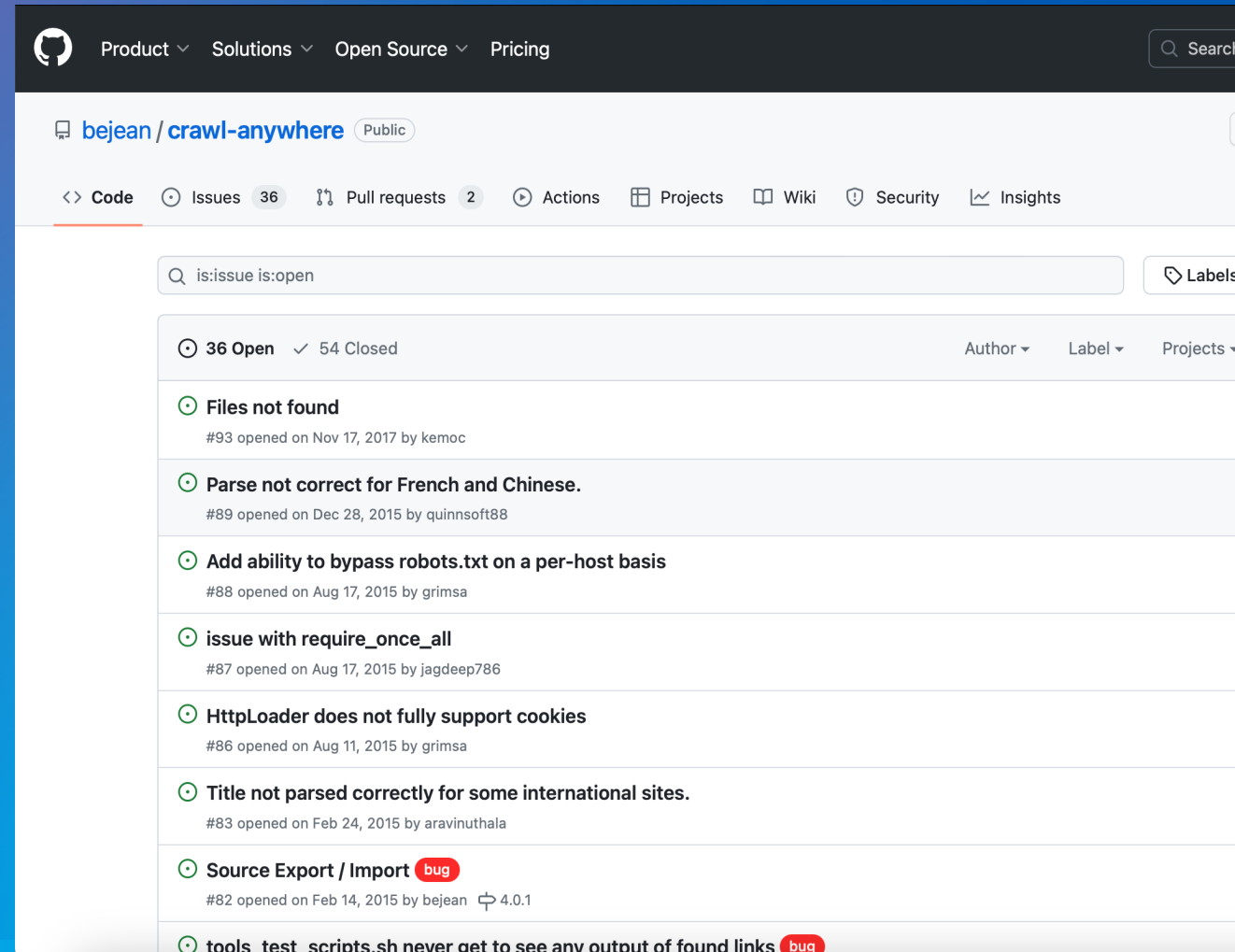
1. Review basic health—Is it active?
2. Check governance—Is it defined?
3. Review maintenance & releases—Is there a cadence?
4. Explore the community—Are people engaged?
5. Bug reporting—Is there a documented process?

What's the first thing you would look at when evaluating an open source project to use or include as a dependency?



1. Evaluating software: Basic health

- Does the project even have a maintainer anymore?
- When was the last commit?
- Look at the issue queue
 - How active is it?
 - When was the last post?
 - When was the last response to an issue?

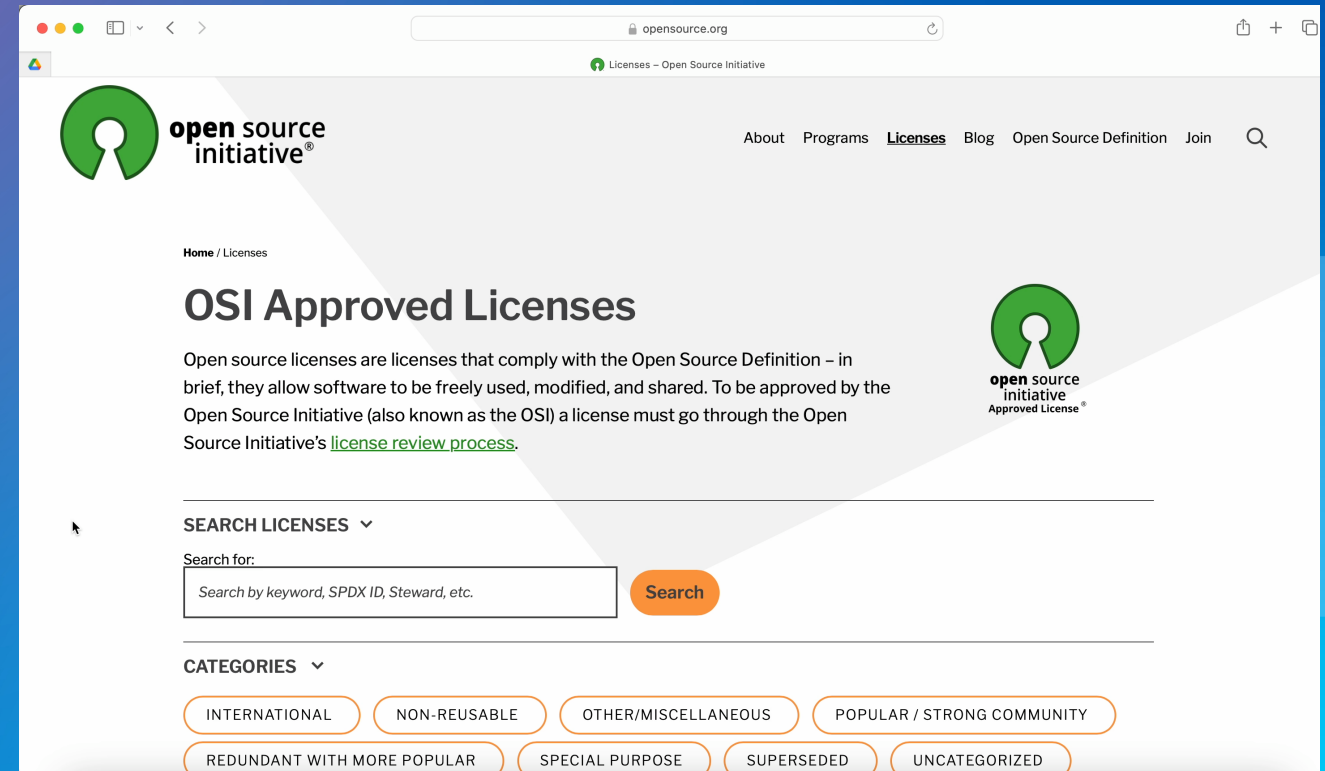


The screenshot shows the GitHub interface for the repository 'bejean/crawl-anywhere'. The navigation bar includes 'Product', 'Solutions', 'Open Source', and 'Pricing'. The repository name is 'bejean/crawl-anywhere' (Public). The issue queue is displayed with a search bar containing 'is:issue is:open'. The queue shows 36 Open issues and 54 Closed issues. The issues listed are:

- Files not found (#93 opened on Nov 17, 2017 by kemoc)
- Parse not correct for French and Chinese. (#89 opened on Dec 28, 2015 by quinnsoft88)
- Add ability to bypass robots.txt on a per-host basis (#88 opened on Aug 17, 2015 by grimsa)
- issue with require_once_all (#87 opened on Aug 17, 2015 by jagdeep786)
- HttpLoader does not fully support cookies (#86 opened on Aug 11, 2015 by grimsa)
- Title not parsed correctly for some international sites. (#83 opened on Feb 24, 2015 by aravinuthala)
- Source Export / Import bug (#82 opened on Feb 14, 2015 by bejean 4.0.1)
- tools test scripts.sh never get to see any output of found links bug

2. Evaluating software: Governance

- Clearly defined governance?
 - Clearly stated license? (Hopefully OSI approved)
 - More than one maintainer
 - Maintainers from more than one company or organization
 - How are decisions made?



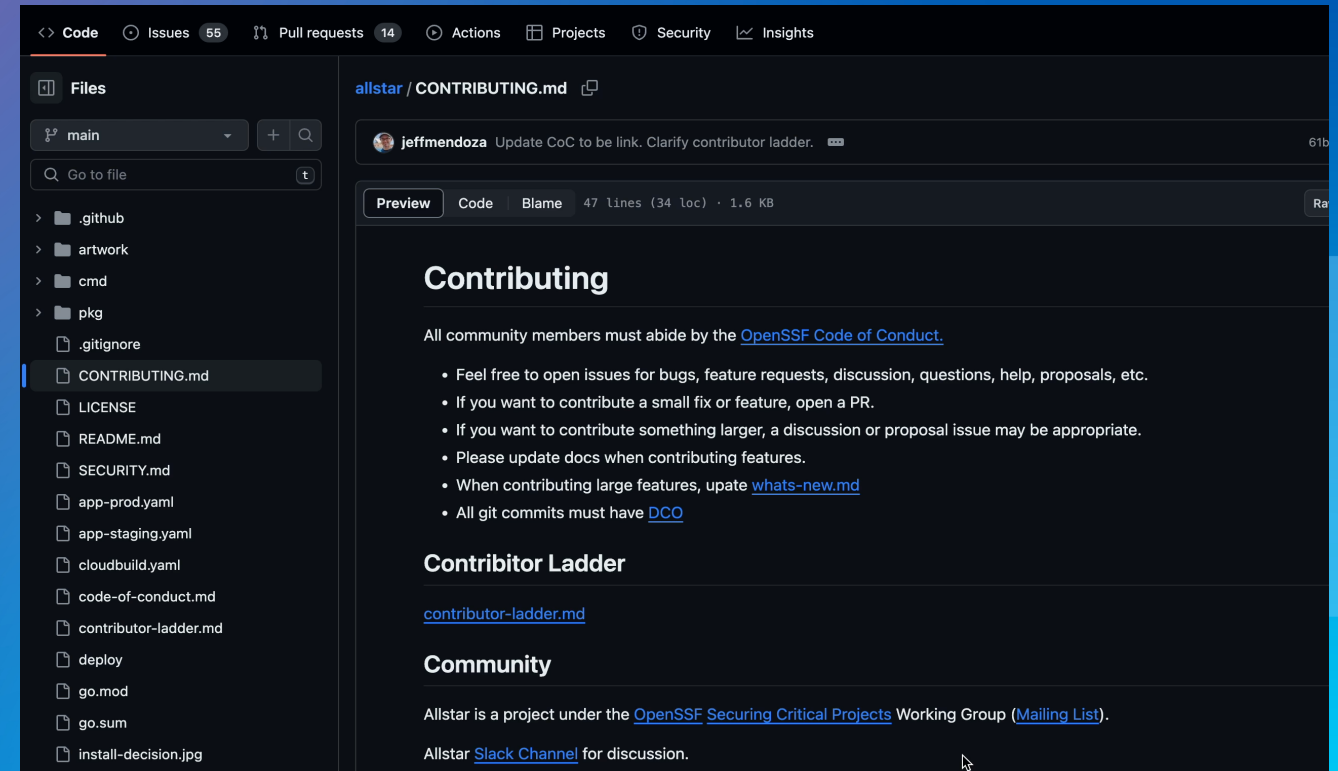
3. Evaluating software: Maintenance and release management

- Has there been substantial activity in the last year?
- Look at the release cadence
 - Is it documented?
 - Regularly occurring?
 - Prompt patch releases to address bugs and security issues?
- Does the project communicate announcements regularly?
Does it have a blog?
- Is the latest release a “-alpha” or “-beta,” or does it indicate that it is not yet production-ready?



4. Evaluating software: Community engagement

- Contributor guide?
- Extensively used?
- Is the community working toward security best practices?
 - Automated tests
 - Up-to-date dependencies





Community



Early Bird Registration for DrupalCon Portland 2024 is open! Register by 23:59 UTC on 18 March 2024, to get \$100 off your ticket.

[Register now](#)

[Contributor guide](#)

Contribution areas

This guide is always evolving. If you'd like to help improve it, the best starting point is the [Contribute to the Contributor Guide](#) page.

The Drupal project has many areas that you can contribute to improving -- it's not

Help improve this page

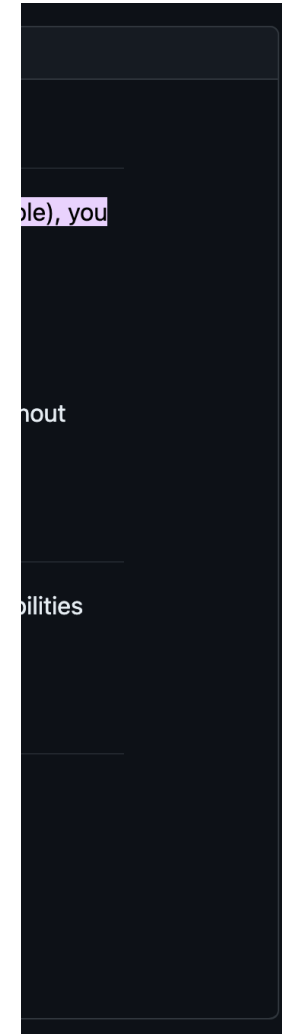
[Create an issue](#) describing the problem.

5. Evaluating software: Secure bug reporting

🔗 Where do I report security issues?

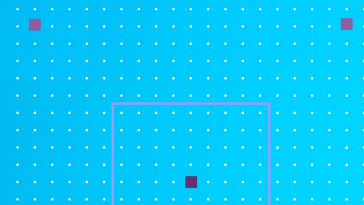
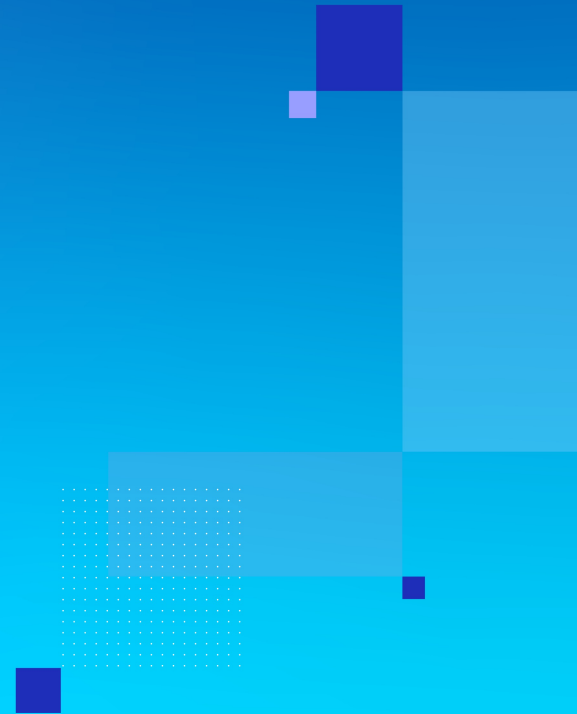
- If you are here to report any sort of security issue with [a site hosted on WordPress.com](#), then please [submit a report at the Automattic HackerOne page](#). If the issue you're trying to report is on [WordPress.com](#) and is **not** a security issue, then please use their [support forums](#) instead.
- If you're having an issue with your own self-hosted [WordPress.org](#) site that is **not** a security issue, then please use the [WordPress.org support forums](#).
- For security issues with WordPress plugins, follow the information on [Reporting Plugin Security Issues](#).
- For security issues with the self-hosted version of WordPress, submit a report at the [WordPress HackerOne page](#). Include as much detail as you can. Please **always use HackerOne instead of Core Trac**, even if the vulnerability is only in `trunk`, or a `beta/RC` release, because there are some sites that run those in production.

In all cases, you should **not** share the details with anyone else until after the fix for the bug has been officially released to the public.



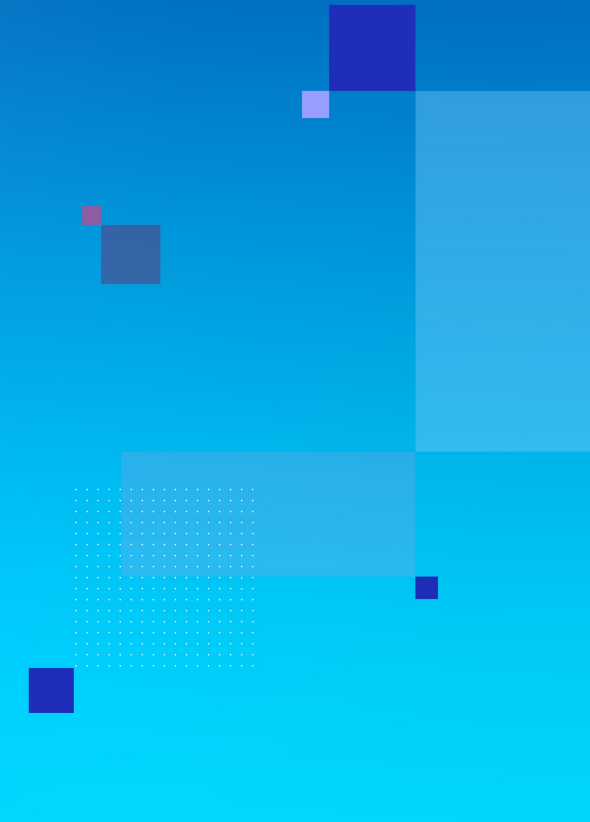
Tools for securing open source software

Beyond basic health



Security tools for open source software

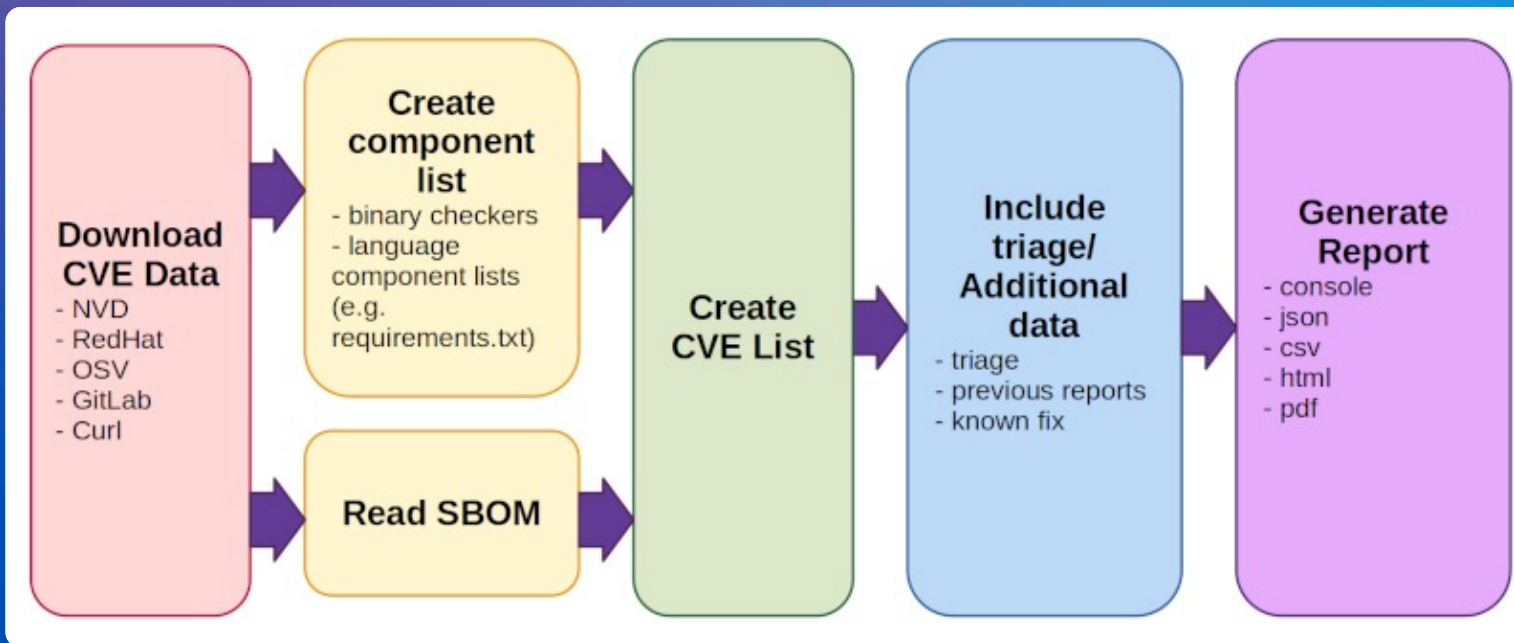
- Intel maintained CVE-bin-tool
- Open Source Security Foundation (OpenSSF):
 - OpenSSF Best Practices Badge
 - Secure Supply Chain Consumption Framework (S2C2F)
 - OpenSSF Scorecard



CVE-bin-tool

The CVE Binary Tool can help you find known vulnerabilities in software by using data from the [National Vulnerability Database \(NVD\)](#) list of [Common Vulnerabilities and Exposures \(CVEs\)](#) as well as known vulnerability data from [Redhat](#), [Open Source Vulnerability Database \(OSV\)](#), [Gitlab Advisory Database \(GAD\)](#), and [Curl](#).

1. A binary scanner—Helps you determine which packages may have been included as part of a piece of software.
2. Tools for scanning known component lists—Such as CSV files, SBOM formats, etc.



As simple as ...

```
pip install cve-bin-tool  
cve-bin-tool <directory/file>
```

Open Source Security Foundation (OpenSSF)

The Open Source Security Foundation (OpenSSF) seeks to make it easy to **develop, maintain, and consume** open source software safely and securely.

This includes fostering collaboration, establishing best practices, and developing innovative solutions for the open source software we all depend on.



1. INFORM

Vulnerability disclosures

Efficient vulnerability reporting and remediation

- I. CVD Guides SIGs
- J. OSS-SIRT SIG
- K. Open Source Vuln Schema (OSV) project
- L. OpenVEX SIG
- M. Vuln Autofix SIG



Metrics & metadata

Security metrics/reviews for open source projects

- N. Security Insights project
- O. Security-Metrics: Risk Dashboard project
- P. Security Reviews project
- AH. Security Insights Spec project

Securing critical projects

Identification of critical open source projects

- U. List of Critical OS Prj, Components & Frameworks SIG
- V. Criticality score project
- W. Harvard study SIG
- X. Package Analysis project
- Y. Allstar project



2. EQUIP

Best practices

Identification, awareness, and education of security best practices

- A. Secure Software Development Fundamentals courses SIG
- B. Security Knowledge Framework (SKF) project
- C. OpenSSF Best Practices Badge project
- D. OpenSSF Scorecard project
- E. Common Requirements Enumeration (CRE) project
- F. Concise & Best Practices Guides SIGs
- G. Education SIG
- H. Memory Safety SIG
- AG. The Security Toolbelt SIG



Security tooling

State of the art security tools

- Q. SBOM Everywhere SIG
- R. OSS Fuzzing SIG
- AI. SBOMit project
- Protobom project



Supply chain integrity

Ensuring the provenance of open source code

- S. Supply-chain Levels for Software Artifacts (SLSA) project
- T. Secure Supply Chain Consumpt Framework (S2C2F) project
- AI. Gituf project
- AK. GUAC project



Securing software repositories

Collaboration between repository operators

- AB. RSTUF project



AI/ML security

AI/ML security at the Intersection of Artificial Intelligence and Cybersecurity

DevRel

Develop Use Cases and help others learn about security

Diversity, equity & inclusion

Increase representation and strengthen the overall effectiveness of the cybersecurity workforce

Projects

Category-leading software initiatives

- AD. Alpha-Omega
- AE. Sigstore
- AF. Core Toolchain Infrastructure (CTI)



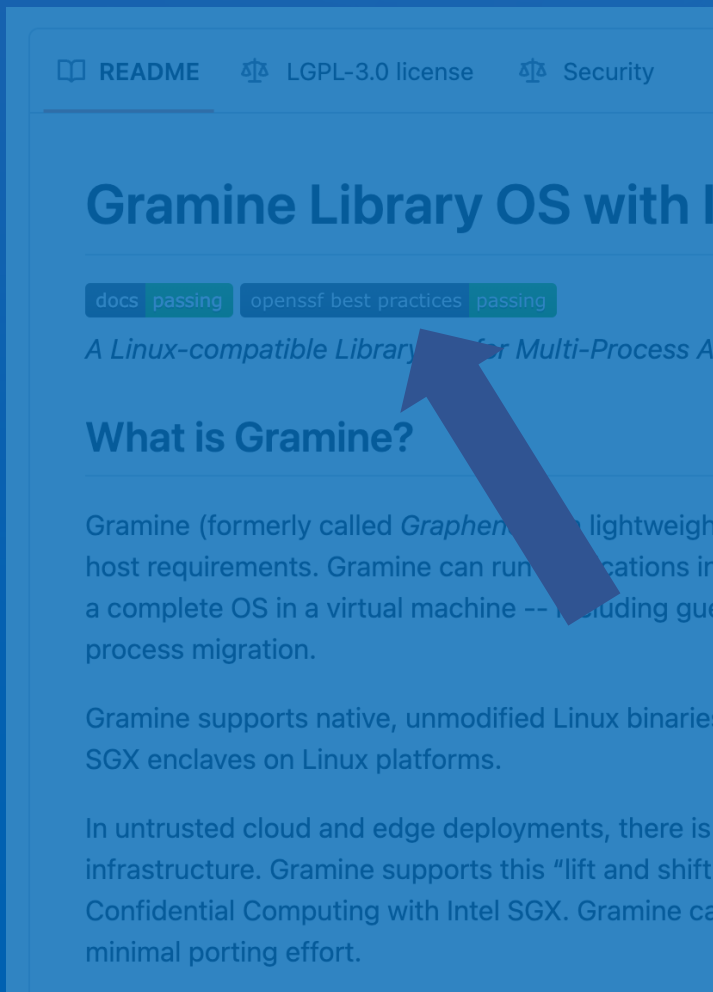
3. ENGAGE

End users

Voice of public & private sector organizations that primarily consume open source

- Z. Threat Modeling SIG

OpenSSF Best Practices Badge



Documentation



- Met
- Unmet
- ?

The project **MUST** have a documented roadmap that describes what the project intends to do and not do for at least the next year. (URL required) [documentation_roadmap] [Show details](#)



- Met
- Unmet
- N/A
- ?

The project **MUST** include documentation of the architecture (aka high-level design) of the software produced by the project. If the project does not produce software, select "not applicable" (N/A). (URL required) [documentation_architecture] [Show details](#)



- Met
- Unmet
- N/A
- ?

The project **MUST** document what the user can and cannot expect in terms of security from the software produced by the project (its "security requirements"). (URL required) [documentation_security] [Show details](#)



- Met
- Unmet
- N/A
- ?

The project **MUST** provide a "quick start" guide for new users to help them quickly do something with the software. (URL required) [documentation_quick_start] [Show details](#)

<https://www.libreoffice.org/get-help/documentation/>

OpenSSF Scorecard

- What is it?
 - Quick, easy project assessment via list of automated checks for best practices
- What does it help protect me from?
 - Malicious maintainers and packages
 - Poorly maintained projects
 - Compromised build systems and/or code
- How do I use it?
 - Command line interface (CLI)
 - GitHub Action

OpenSSF Scorecard

openssf scorecard 9.6 openssf best practices passing build passing CodeQL passing reference go report A+

codecov 75% SLSA level 3 slack openssf/scorecard

Overview

- [What Is Scorecard?](#)
- [Prominent Scorecard Users](#)
- [View a Project's Score](#)
- [Scorecard's Public Data](#)

Using Scorecard

- [Scorecard GitHub Action](#)
- [Scorecard REST API](#)
- [Scorecard Badges](#)
- [Scorecard Command Line Interface](#)
 - [Prerequisites](#)
 - [Installation](#)
 - [Authentication](#)
 - [Basic Usage](#)

OpenSSF Scorecard

Score in terminal ...

```
Finished [Pinned-Dependencies]
Finished [Fuzzing]
Finished [Packaging]
Finished [Signed-Releases]
Finished [Code-Review]
Finished [SAST]
Finished [Dangerous-Workflow]
Finished [License]
Finished [Token-Permissions]
Finished [Dependency-Update-Tool]
Finished [Branch-Protection]
Finished [CI-Tests]
Finished [Maintained]
RESULTS
Aggregate score: 5.1 / 10

Check scores:
```

SCORE	NAME	REASON	DOCUMENTATION/REMEDIATION
10 / 10	Binary-Artifacts	no binaries found in the repo	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#binary-artifacts
0 / 10	Branch-Protection	branch protection not enabled on development/release branches	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#branch-protection
8 / 10	CI-Tests	2 out of 29 merged PRs checked by a CI test -- score normalized to 8	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#ci-tests
9 / 10	CI-Best-Practices	no effort to earn an OpenSSF best practices badge detected	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#cii-best-practices
6 / 10	Code-Review	found 12 unreviewed changsets out of 38 -- score normalized to 6	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#code-review
10 / 10	Contributors	3 different organizations found -- score normalized to 10	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#contributors
10 / 10	Dangerous-Workflow	no dangerous workflow patterns detected	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#dangerous-workflow
0 / 10	Dependency-Update-Tool	no update tool detected	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#dependency-update-tool
0 / 10	Fuzzing	project is not fuzzed	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#fuzzing
9 / 10	License	license file detected	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#license
10 / 10	Maintained	3 commit(s) out of 30 and 13 issue activity out of 30 found in the last 90 days -- score normalized to 10	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#maintained
7	Packaging	no published package detected	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#packaging
0 / 10	Pinned-Dependencies	dependency not pinned by hash detected -- score normalized	https://github.com/ossf/scorecard/blob/49c8eed3a423f90c872b5c3c9f1bbca9e8aae799/docs/checks.md#pinned-dependencies

... or via browser





OpenSSF Scorecard Report

github.com/google/python-fire
COMMIT: 343e6b6cec2d174d511e99dec7e5a24849121c2e
GENERATED AT: 2024-03-04
SORT: Risk level (desc)

Score	Check Name	Risk Level	Description
5.5	Overall Score		
10	Dangerous-Workflow	CRITICAL	Determines if the project's GitHub Action workflows avoid dangerous patterns.
0	Branch-Protection	HIGH	Determines if the default and release branches are protected with GitHub's branch protection settings.
0	Token-Permissions	HIGH	Determines if the project's workflows follow the principle of least privilege.
7	Code-Review	HIGH	

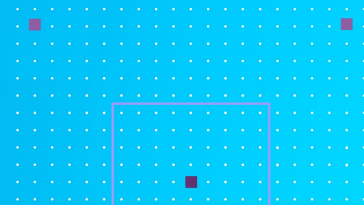
Secure Supply Chain Consumption Framework (S2C2F)

The S2C2F project works to further develop and improve the S2C2F guide, which outlines how to securely consume open source software (OSS) dependencies.

Level 1	Level 2	Level 3	Level 4
 Minimum OSS Governance Program <ul style="list-style-type: none">• Use package managers• Local copy of artifact• Scan with known vulns• Scan for software licenses• Inventory OSS• Manual OSS updates	 Secure Consumption and Improved MTTR <ul style="list-style-type: none">• Scan for end life• Have an incident response plan• Auto OSS updates• Alert on vulns at PR time• Audit that consumption is through the approved ingestion method• Validate integrity of OSS• Secure package source file configuration	 Malware Defense and Zero-Day Detection <ul style="list-style-type: none">• Deny list capability• Clone OSS source• Scan for malware• Proactive security reviews• Enforce OSS provenance• Enforce consumption from curated feed	 Advanced Threat Defense <ul style="list-style-type: none">• Validate the SBOMs of OSS consumed• Rebuild OSS on trusted infrastructure• Digitally sign rebuilt OSS• Generate SBOM for rebuilt OSS• Digitally sign protected SBOMs• Implement fixes

Putting the tools to work

Let's evaluate some software




Evaluating open source projects

1. Review basic health—Is it active?
2. Check governance—Is it defined?
3. Review maintenance & releases—Is there a cadence?
4. Explore the community—Are people engaged?
5. Bug reporting—Is there a documented process?
6. Run OpenSSF Scorecard

OpenSSF projects and tools

Grab a random repo




You can apply some optional filters:

Language


Topic

Next

 **google/python-fire**
Python Fire is a library for automatically generating command line interfaces (CLIs) from absolutely any Python object.

★ 25936 🍏 1505 👁 25936 Python

Save ✓



git -random

Picks a random public GitHub repository across all languages and topics. Create a shortlist of repos to view them all at once or save them for later viewing

Download List of Selected Repos

Open All

© 2020 DigitalBunker

intel. SCALE 21x 2024

<https://gitrandom.digitalbunker.dev/> 34

Basic health check: Looks promising!

Python Fire python 2.7 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9

Python Fire is a library for automatically generating command line interfaces for any Python object.

- Python Fire is a simple way to create a CLI in Python. [1]
- Python Fire is a helpful tool for developing and debugging Python code. [2]
- Python Fire helps with exploring existing code or turning other people's code into a CLI. [3]
- Python Fire makes transitioning between Bash and Python easier. [4]
- Python Fire makes using a Python REPL easier by setting up the REPL with the modules and variables you'll need already imported and created. [5]

Installation

To install Python Fire with pip, run: `pip install fire`

To install Python Fire with conda, run: `conda install fire -c conda-forge`

To install Python Fire from source, first clone the repository and then run: `python setup.py install`

Used by 28k

+ 28,004

Contributors 62

+ 48 contributors

Languages

● Python 100.0%

No OpenSSF Best Practices Badge?

Issue queue

google / python-fire Public

Notifications Fork 1.5k Star 25.9k

<> Code Issues 122 Pull requests 26 Actions Projects Security Insights

is:issue is:open Labels 9 Milestones 0 New issue

122 Open ✓ 181 Closed Author Label Projects Milestones Assignee Sort

- Cannot parse list of strings containing `is`
#481 opened 2 weeks ago by `renruewang`
- Remove test requirement on `mock`
#469 opened on Nov 1, 2023 by `dvzrv`
- Version flag alongside other commands 3
#468 opened on Oct 11, 2023 by `amin-nejad`
- [feature request] Exclude function (kw)args from synopsis, arguments and flags in help output enhancement
#465 opened on Sep 29, 2023 by `eelkevdbos`
- [feature request] support multiple dialects for boolean parameters 3
#461 opened on Aug 31, 2023 by `iRyoka`
- Warning Deprecation: Legacy `'setup.py'`
#460 opened on Aug 17, 2023 by `nitipit`
- Strings args do not need to be parsed. 3
#459 opened on Jul 11, 2023 by `hxse`
- Fire needs to include features like in `ArgParse` enhancement
#457 opened on Jul 3, 2023 by `vihaanmody1`
- [Question] Even if no type hints is supplied, would `python-fire` accept stub files? question
#456 opened on May 16, 2023 by `Diogo-Rossi`
- Add Docker Image for easier setup
#455 opened on May 12, 2023 by `Faizan-Alam-1`

Pull requests


The screenshot shows the GitHub interface for the repository 'google/python-fire'. At the top, it indicates the repository is 'Public' and has 1.5k forks and 25.9k stars. The navigation bar includes 'Code', 'Issues (122)', 'Pull requests (26)', 'Actions', 'Projects', 'Security', and 'Insights'. A search bar contains the query 'is:open is:pr'. Below the search bar, there are filters for 'Labels (9)' and 'Milestones (0)', and a 'New pull request' button. The main content is a list of pull requests with columns for 'Author', 'Label', 'Projects', 'Milestones', 'Reviews', 'Assignee', and 'Sort'. The list includes:



- Docstring description multiline parsing** ✓ (22 comments, 1 review)
- added venv doc link in readme** ✓ (2 comments)
- #444: Removed pipes dependency** ✓ (6 comments)
- Fix pandas.DataFrame support in core._PrintResult** ✓ (2 comments)
- ci: watcher for automerge** ✗ (20 comments)
- adding GH dependabot** ✗ (17 comments)
- Support case-insensitive usage** (no comments)
- Detect the program name when `python -m` was executed** (4 comments, 1 review)
- Support SkipParse decorator** ✓ (7 comments)

OpenSSF Scorecard: Manual CLI scan—Terminal








```
scorecard --repo github.com/google/python-fire
```











OpenSSF Scorecard: Manual CLI scan—Browser

 **OpenSSF Scorecard Report**

 **5.5**  **github.com/google/python-fire**
COMMIT: 343e6b6cec2d174d511e99dec7e5a24849121c2e
GENERATED AT: 2024-03-04

SORT: Risk level (desc) ▼

-  **10** **Dangerous-Workflow** **CRITICAL**
Determines if the project's GitHub Action workflows avoid dangerous patterns.
-  **0** **Branch-Protection** **HIGH**
Determines if the default and release branches are protected with GitHub's branch protection settings.
-  **0** **Token-Permissions** **HIGH**
Determines if the project's workflows follow the principle of least privilege.
-  **6** **Code-Review** **HIGH**
Determines if the project requires human code review before pull requests (aka merge requests) are merged.
-  **10** **Maintained** **HIGH**
Determines if the project is "actively maintained".
-  **10** **Binary-Artifacts** **HIGH**
Determines if the project has generated executable (binary) artifacts in the source repository.
-  **10** **Vulnerabilities** **HIGH**
Determines if the project has open, known unfixed vulnerabilities.

-  **10** **Vulnerabilities** **HIGH**
Determines if the project has open, known unfixed vulnerabilities.
-  **0** **Fuzzing** **MEDIUM**
Determines if the project uses fuzzing.
-  **0** **Pinned-Dependencies** **MEDIUM**
Determines if the project has declared and pinned the dependencies of its build process.
-  **0** **SAST** **MEDIUM**
Determines if the project uses static code analysis.
-  **10** **Security-Policy** **MEDIUM**
Determines if the project has published a security policy.
-  **0** **CII-Best-Practices** **LOW**
Determines if the project has an OpenSSF (formerly CII) Best Practices Badge.
-  **9** **License** **LOW**
Determines if the project has defined a license.
-  **?** **Packaging** **MEDIUM**
Determines if the project is published as a package that others can easily download, install, easily update, and uninstall.
-  **?** **Signed-Releases** **HIGH**
Determines if the project cryptographically signs release artifacts.

OpenSSF web report: Protocol buffers



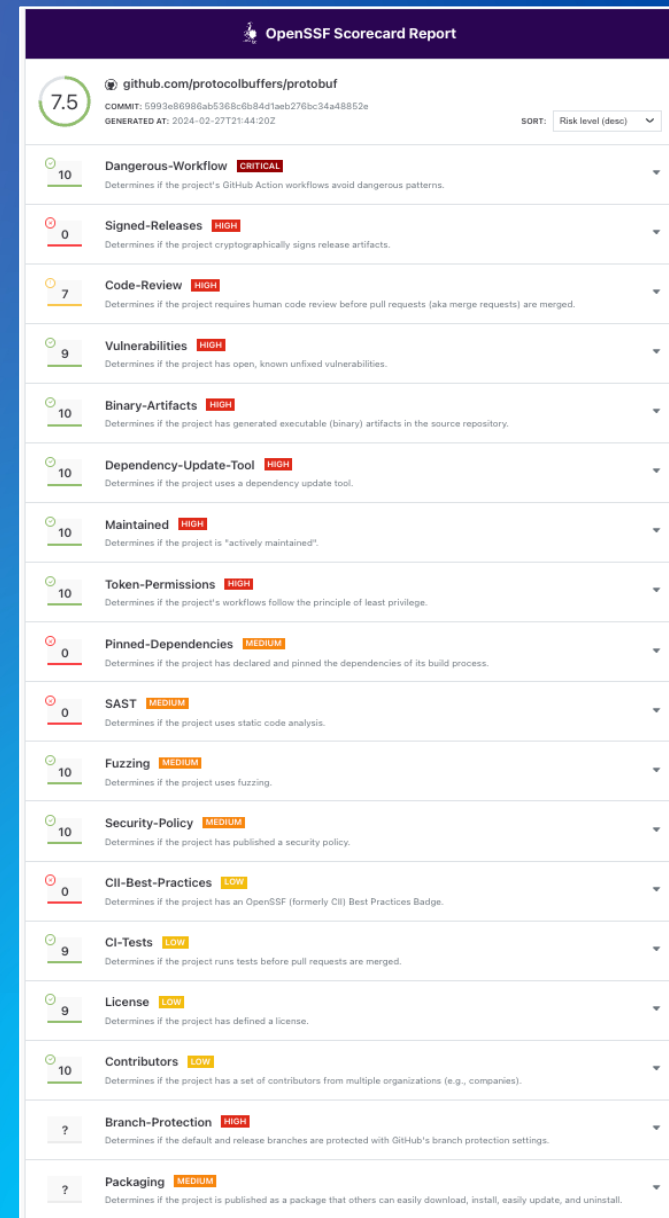
The good:

- No dangerous workflows!
- Maintained!
- Security policy!
- Even fuzzing!



The less good:

- No signed releases
- Static analysis
- Branch protection unknown

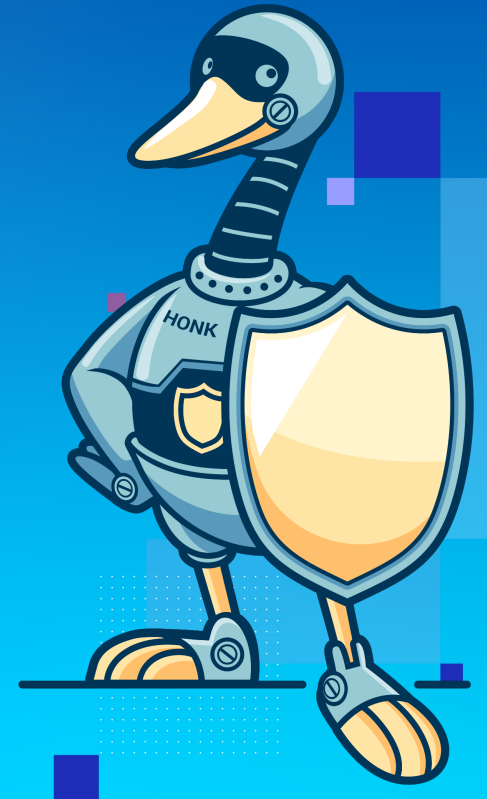


Get involved in the OpenSSF

Be your own hero!

openssf.org

The best way to influence an OSS project direction is to get involved.



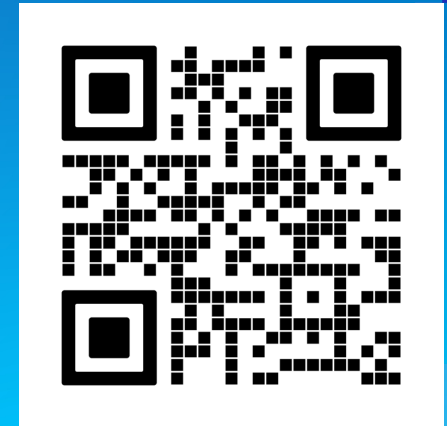
Taking ownership

Developers don't owe you anything

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Visit the presentation's GitHub page

- Intel and OpenSSF tools
- Guides and community resources
- Links to articles and source material
- A PDF of this presentation



Where to find me

- Twitter/X: @katherined
- Fediverse: @katherined@reality2.social
- LinkedIn: katherinedruckman





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