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· SOFLO DEVCON 2024

Miami JVM Group

Software Composition Analysis

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INTRODUCTION

- Market forces are driving companies to accelerate the development of secure software to gain a competitive advantage and avoid costly security breaches.
- The software development community has found that Software Component Analysis tooling can improve the competitive need for increased security and speed.
- Software Composition Analysis tooling provides an efficient way to reduce security threats from open-source software components.

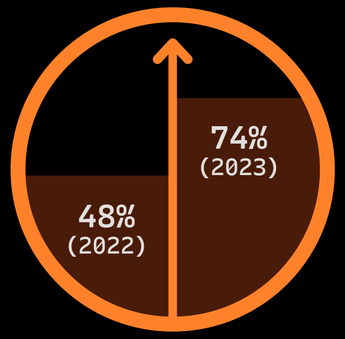
WE WILL DISCUSS

- The need for SCA to manage open source.
- How do CVEs and SBOMs relate to SCA?
- SCA tooling as part of a secure coding practice.
- The Cybersecurity landscape that is requiring SCA.
- The need for software license management with SCA.
- Third-party risk management (TPRM) and SCA.

OPEN SOURCE EXPOSURE

96%

of the total codebases **contained** open source



54% increase in codebases containing **high-risk vulnerabilities** in the past year

84%

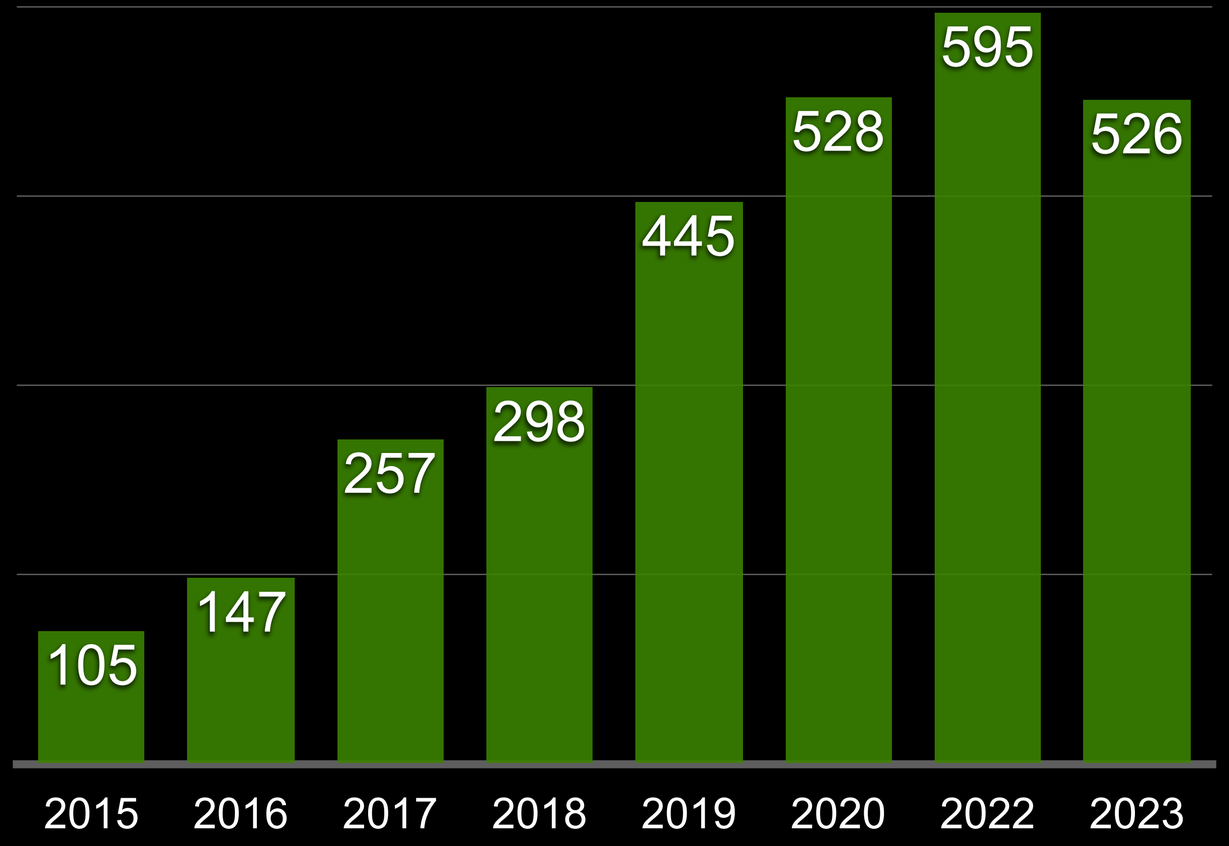
of codebases assessed for risk contained vulnerabilities

74%

of codebases assessed for risk contained high-risk vulnerabilities

Source: Synopsys Open Source Security and Risk Report 2024

OPEN SOURCE COMPONENTS
PER APPLICATION (2016-2024)



Source: Meta-analysis from Synopsys BlackDuck Open Source Security and Risk Reports 2016-2024

WHY SO MANY OPEN SOURCE COMPONENTS

AVERAGE OF 526

Source: Synopsys BlackDuck Open Source Security and Risk Reports 2024

AVERAGE OF 148
FOR JAVA APPLICATIONS

(EST. 90% OF THAT IS OPEN SOURCE)

Source: Sonatype 9th Annual State of the Software Supply Chain Report, Nov 2023

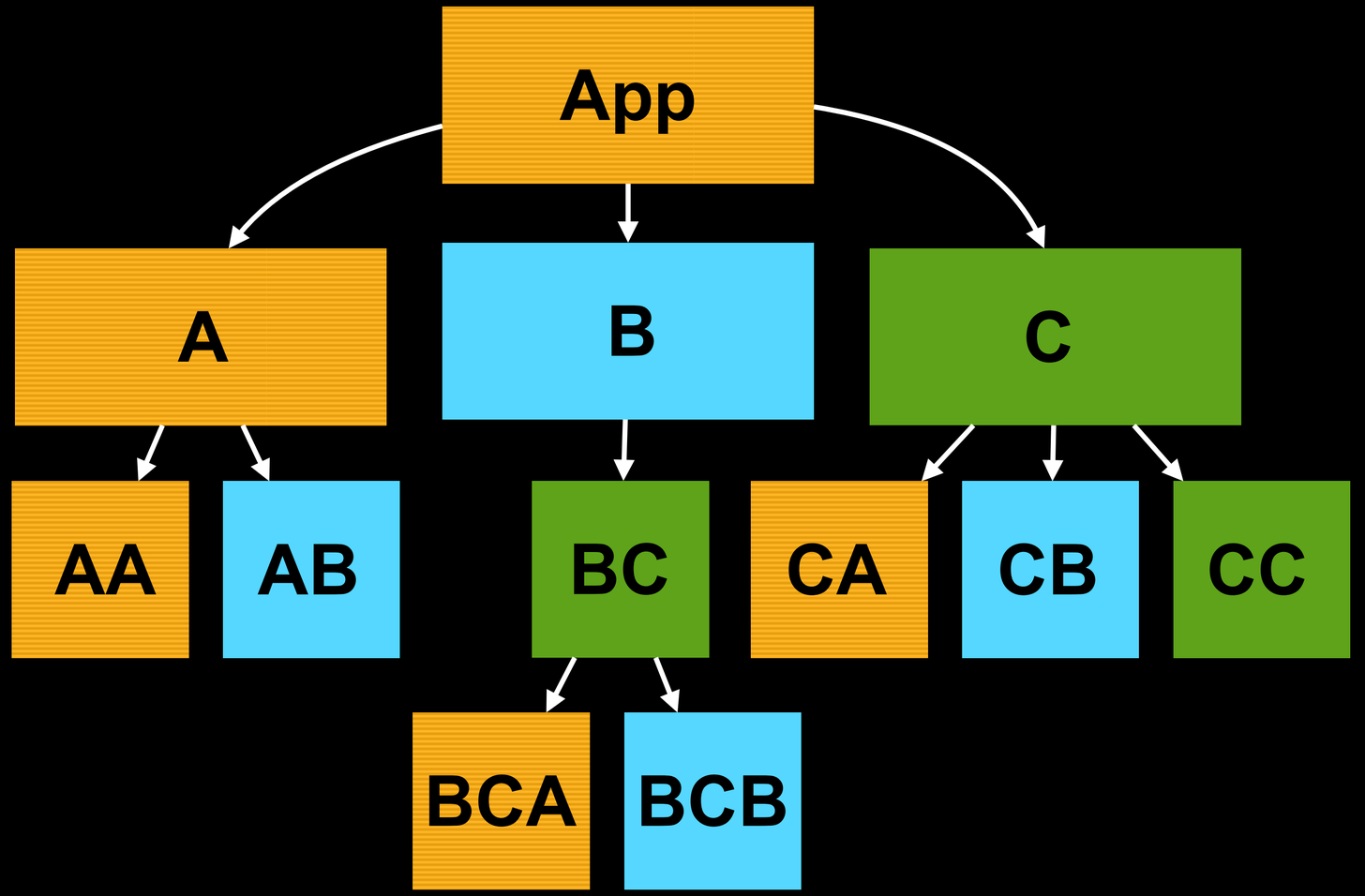
MEDIAN OF 683
FOR JAVASCRIPT APPLICATIONS

(FROM A MEDIAN OF 10 DIRECT)

Source: GitHub Octoverse Report, Dec 2020

TRANSITIVE DEPENDENCIES

“Do you realize how many dependencies?”



“INVINCIBILITY LIES IN THE DEFENCE”

TZU, SUN. *THE ART OF WAR*

“THUS, WHAT IS OF SUPREME IMPORTANCE IN WAR IS TO ATTACK THE ENEMY’S STRATEGY.”

TZU, SUN. *THE ART OF WAR*

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SECURE CODING DOJO

- SAST: Static Application Security Testing
- DAST: Dynamic Application Security Testing
- SCA: Software Composition Analysis

SCA TOOLS IN ACTION

- Identify open-source components
- Identify security issues in open-source components
- Identify license issues in open-source components
- Notify and mitigate open-source issues
- Manage open-source quality

SOFTWARE COMPOSITION ANALYSIS COMBINED WITH STATIC APPLICATION SCAN

- Some SCA tools use SAST to confirm that code is vulnerable
- Be careful with false negatives
- Dynamic code can only be detected with runtime analysis

JUST A SIMPLE UPDATE?

- H2 database
- JUnit4 vs JUnit5
- Spring Framework
- Angular JS
- Apache Struts

MAYBE OR MAYBE NOT

CVE
(COMMON VULNERABILITIES AND EXPOSURES)

- Publicly released list of known cybersecurity vulnerabilities
  - Issued by vendors and researchers
  - Each CVE has an identification number “identifier”
  - A CVE does not include technical data
  - Databases of public disclosed CVEs (multiple)
    - NVD (National Vulnerabilities Database) USA

Source: https://www.cve.org/

SBOM FORMATS (SOFTWARE BILL OF MATERIALS)

CycloneDX

Open source machine-readable by OWASP

SPDX® (Software Package Data Exchange)

Open standard ISO/IEC 5692:2021 by Linux Foundation

Source: https://cyclonedx.org/
Source: https://spdx.dev/

EXAMPLE SBOM?

SPDX Example of an SBOM

```
SPDXVersion: SPDX-2.1
DataLicense: CC0-1.0
DocumentNamespace: http://www.spdx.org/spdxdocs/8f141b09-1138-4fc5-aecb-
fc10d9ac1eed
DocumentName: SpdxDoc for GNU Time
SPDXID: SPDXRef-DOCUMENT

## Creation Information
Creator: Person: Gary O'Neall
Creator: Tool: Source Auditor Open Source Scanner
Created: 2018-08-17T11:29:46Z
## Relationships
Relationship: SPDXRef-DOCUMENT DESCRIBES SPDXRef-1

## Package Information
PackageName: GNU Time
PackageVersion: 1.9
PackageSupplier: Organization: GNU
PackageOriginator: Organization: GNU
PackageDownloadLocation: https://ftp.gnu.org/gnu/time/t
PackageChecksum: SHA1: 75868c26abbed3ad3980685bae21d7202d288317
PackageHomePage: https://www.gnu.org/software/time/
PackageLicenseConcluded: (GFDL-1.3 AND GPL-3.0-or-later AND LicenseRef-1)
## License information from files
PackageLicenseInfoFromFiles: X11
PackageLicenseInfoFromFiles: GPL-2.0-or-later WITH Libtool-exception
PackageLicenseInfoFromFiles: GPL-3.0-or-later
PackageLicenseInfoFromFiles: LicenseRef-1
PackageLicenseInfoFromFiles: GFDL-1.3
PackageLicenseDeclared: GPL-3.0-or-later
PackageLicenseComments: <text>Several files contained a GPL 2.0 or later
license.  Since they were linked to a GPL 3.0
text>
PackageCopyrightText: <text>Copyright (C) 19
Inc.</text>
PackageSummary: <text>The 'time' command runs another program, then displays
information about the resources used by that program.</text>
PackageDescription: <text>The 'time' command runs another program, then
displays information about the resources used by that program.</text>

## File Information
FileName: ./tests/help-version.sh
SPDXID: SPDXRef-164
FileType: SOURCE
FileChecksum: SHA1: 30b3973b22ddbcd9e8982a06c5a2440fcb315013
LicenseConcluded: GPL-3.0-or-later
LicenseInfoInFile: GPL-3.0
LicenseComments: Seen licenses generated by Source Auditor Scanner.  Results
should be manually verified.
FileCopyrightText: <text>Copyright Free Software Foundation, Inc</text>
FileNotice: <text>NOASSERTION</text>
```

SBOM Data Author

Timestamp Info

Depend. Relationship

Component Name

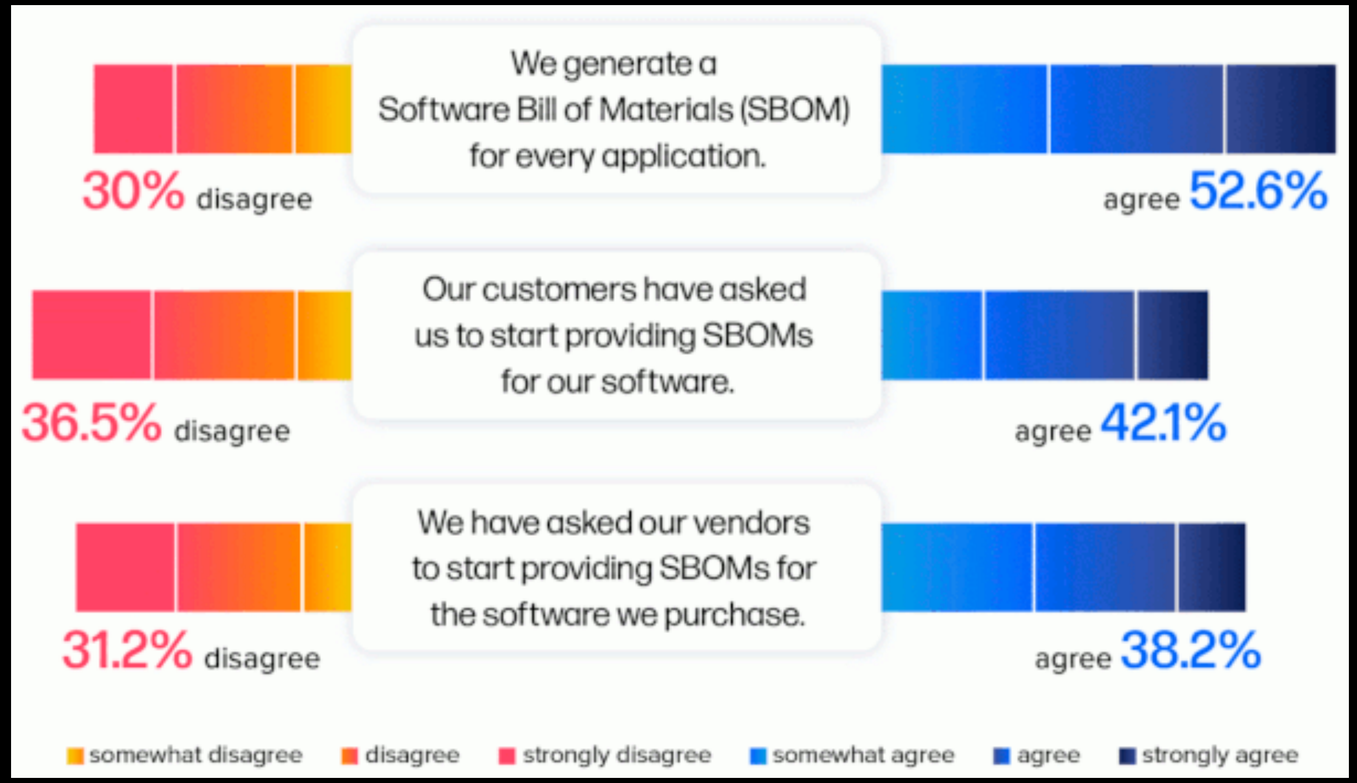
Component Version

Component Supplier

Unique Identifying Information

Source: https://www.thesslstore.com/blog/sbom-an-up-close-look-at-a-software-bill-of-materials/

SBOM USAGE SURVEY SAYS



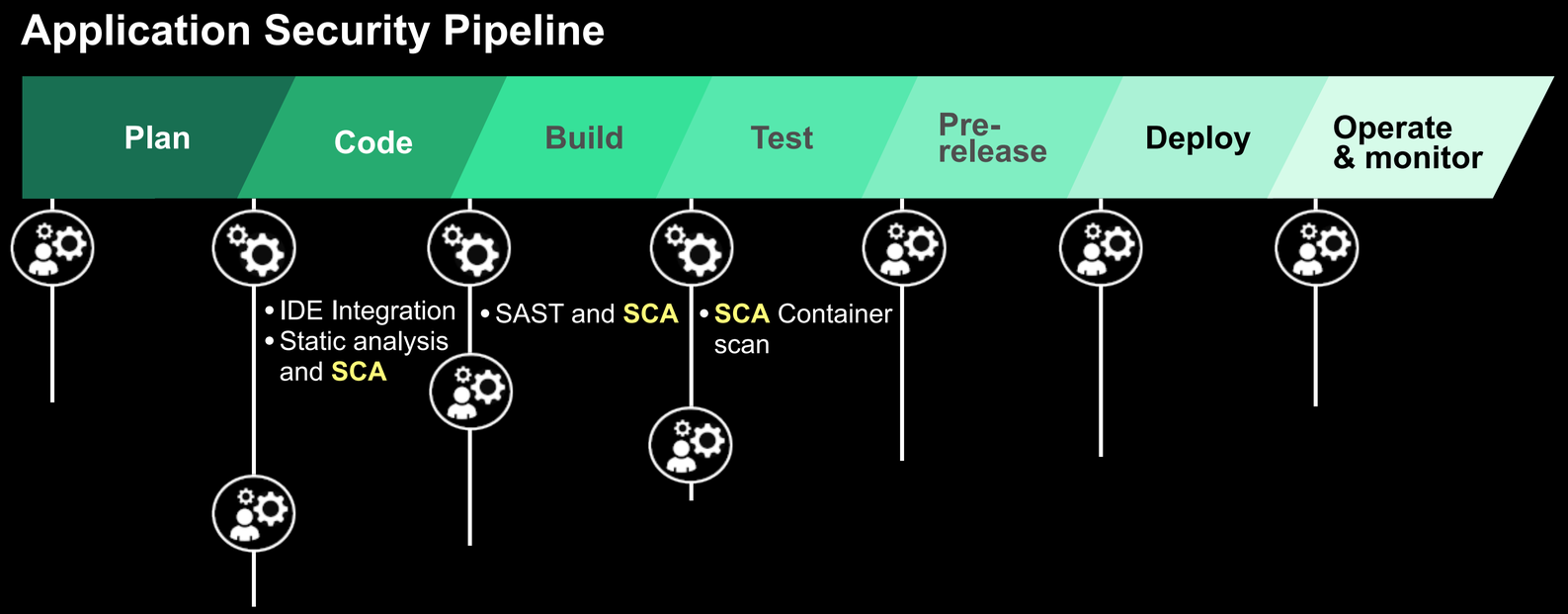
Source: Sonatype 9th Annual State of the Software Supply Chain Report, Nov 2023

SBOM ADOPTION DRIVERS

- Presidential Executive order 14028 (Cybersecurity)
  - An SBOM as part of Secure Development
- Regulatory Compliance
- Risk management via CI/CD supply chain monitoring
- Customer Assurance

Source: https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/12/executive-order-on-improving-the-nations-cybersecurity/

WHERE IS SCA IN BUILD PIPELINE



Source: https://vulcan.io/blog/ci-cd-security-5-best-practices/

OPEN SOURCE LICENSE IDENTIFICATION AND MANAGEMENT

- MIT License
- Apache License 2.0
- BSD License variants
- Mozilla Public License 2.0
- Public Domain
- GNU Lesser (As long as the code is unmodified)

- GNU GPL (License conflict)

Source: https://www.gnu.org/licenses/gpl-3.0.en.html

WHY GPL CAUSES A CONFLICT

- Copyleft Requirement: Any derivative work created from a GPL licensed code must be distributed under the GPL which includes the source code of the entire derivative work.
- Examples:
  - Linksys/Cisco WRT54G
  - Samsung Smart TVs

Source: https://www.fsf.org/news/2008-12-cisco-suit

OPEN SOURCE VERSION MANAGEMENT

of the codebases assessed for risk contained components that were
10 versions or more behind the most current version of the component

Source: Synopsys Open Source Security and Risk Report, Feb 2024

of the component downloads with known vulnerabilities could be avoided as a better, fixed version is already available

Source: Sonatype 9th Annual State of the Software Supply Chain Report, Nov 2023

- SCA Tools recommend the latest version

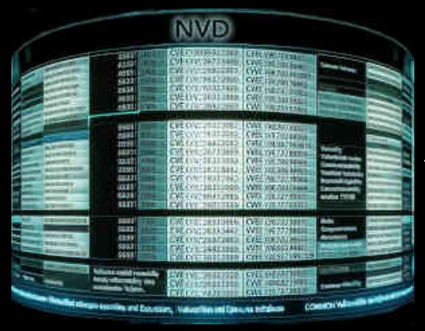
OPEN SOURCE QUALITY MANAGEMENT

“The fact that 18.6% of [open source] projects stopped being maintained in the last year highlights the need to not only choose good dependencies, but monitor those dependencies for changes in their quality.” *

Source: Sonatype 9th Annual State of the Software Supply Chain Report, Nov 2023

* maintained as defined by the OpenSSF (Open Source Security Foundation) scorecard

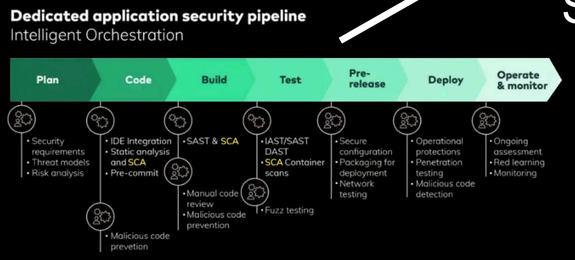
CONTINUOUS MONITORING AND NOTIFICATION



NVD et al.

24/7 Monitoring

SBOM



Pipeline

Email

Text

Microsoft Teams

SCA SCAN FOR VENDOR SOFTWARE

Source: DALL·E

SBOM FOR VENDOR SOFTWARE RECOMMENDED

THIRD-PARTY RISK MANAGEMENT (TPRM)

“98% of organizations have a relationship with a third party that has been breached.”

Source: SecurityScoreCard Global Third-Party Cybersecurity Breaches Report, Feb 2024

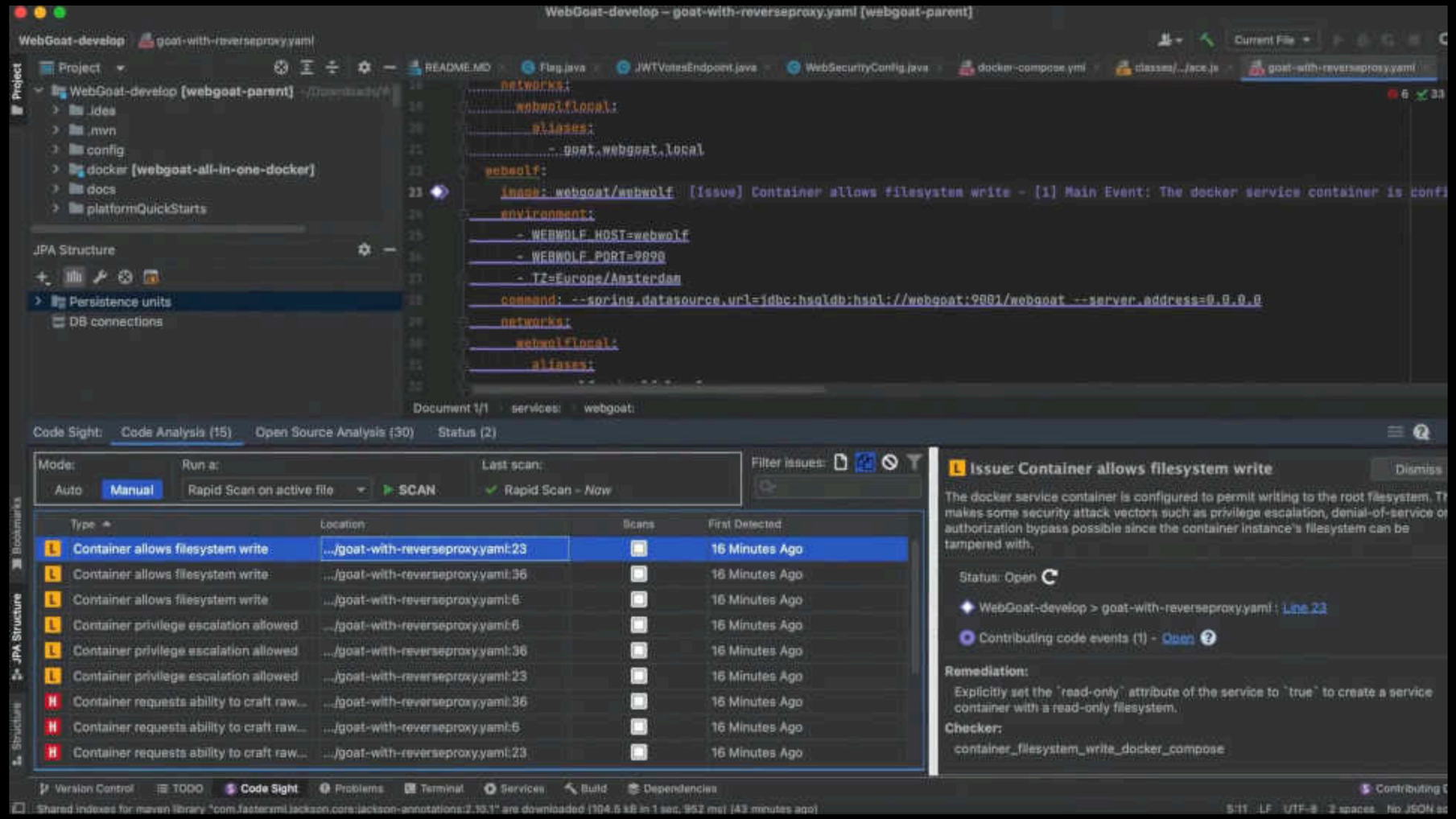
Third-party breaches by industry:
43% Technology & Telecommunications
30% Financial Services
29% Overall cross-industry rate

Source: SecurityScoreCard Global Third-Party Cybersecurity Breaches Report, Feb 2024

- Stop depending on a questionnaires for TPRM
- Vendor SBOMs can be monitored 24/7 by SCA Tooling

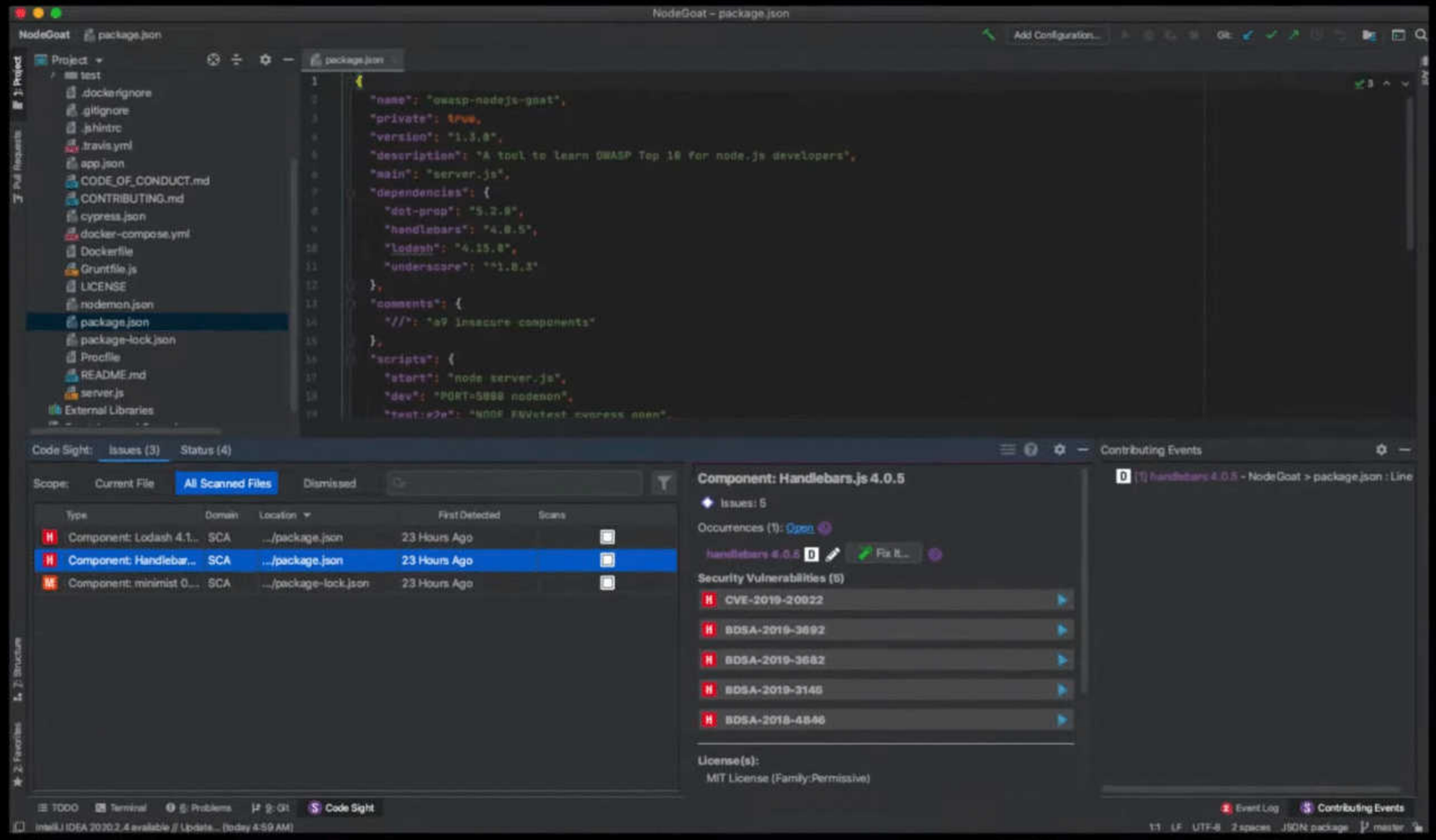
SCA TOOLS

SCA IDE PLUGINS



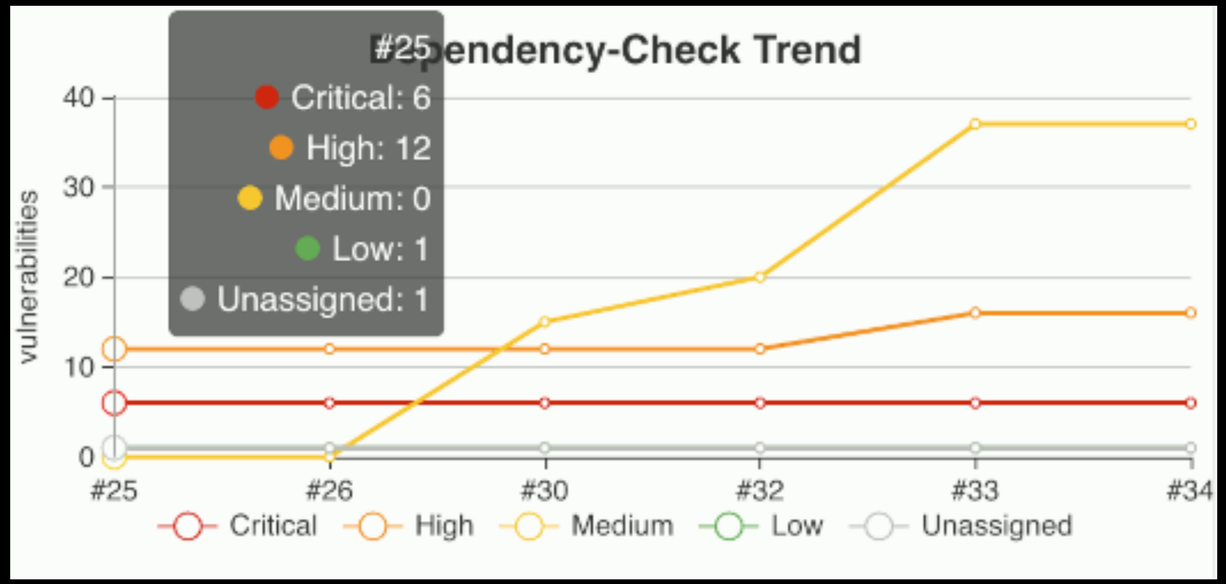
Source: https://youtu.be/6cxi96CJB14

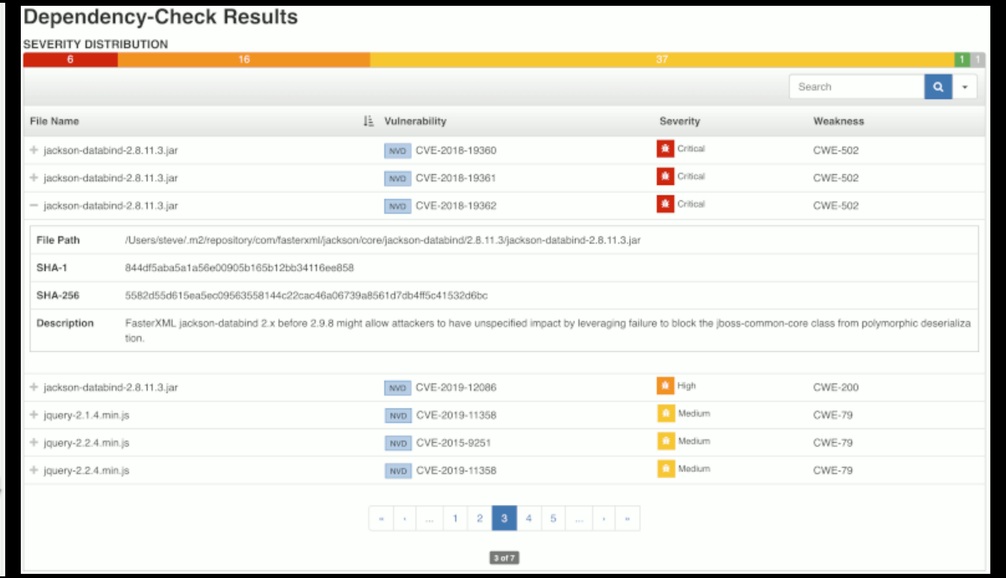
SCA IDE PLUGINS



Source: https://youtu.be/W9BHyXYw3vQ

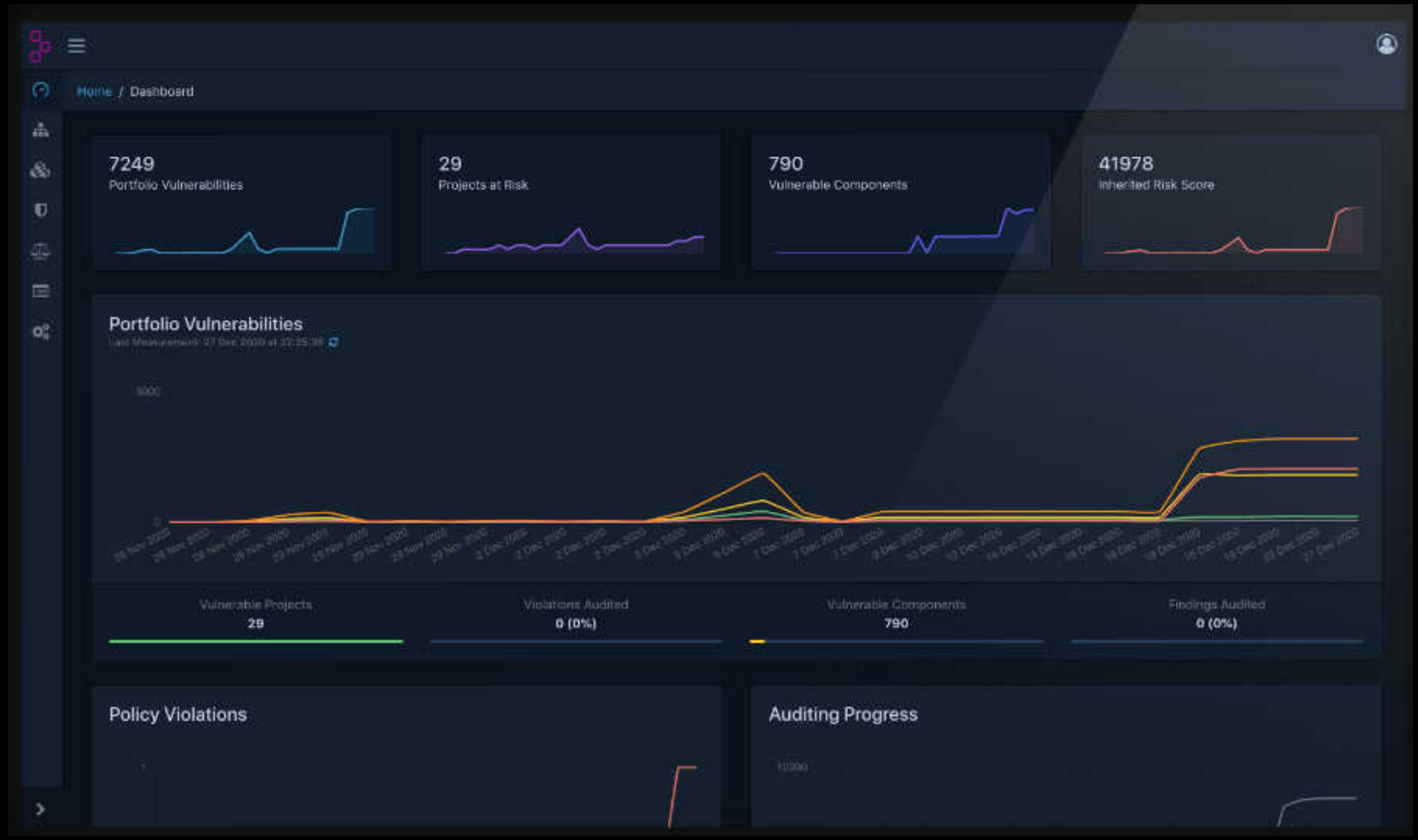
DEPENDENCY CHECK





Source: https://plugins.jenkins.io/dependency-check-jenkins-plugin/

DEPENDENCY TRACK



Source: https://www.dependencytrack.org/

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Thank You

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REFERENCES

- Synopsys 2024 Open Source Security and Risk Analysis Report (OSSRA)
- https://www.synopsys.com/content/dam/synopsys/sig-assets/reports/rep-ossra-2024.pdf

- Sonatype 2023 9th Annual State of the Software Supply Chain Report
- https://www.sonatype.com/hubfs/2023 Sonatype- 9th Annual State of the Software Supply Chain- Update.pdf

- GitHub Octoverse Report 2020
- https://octoverse.github.com/2020/

- The Art of War: Sun Tzu
- https://www.amazon.com/Art-War-Sun-Tzu/dp/1599869772

- CVE (Common Vulnerabilities and Exposures)
- https://www.cve.org

- OWASP CycloneDX Software Bill of Materials (SBOM) Standard
- https://cyclonedx.org/

REFERENCES

- System Package Data Exchange (SPDX®) (SBOM) Standard
- https://spdx.dev/

- SBOM: An Up-Close Look at a Software Bill of Materials
- https://www.thesslstore.com/blog/sbom-an-up-close-look-at-a-software-bill-of-materials/

- Executive order 14028 (Cybersecurity)
- https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/12/executive-order-on-improving-the-nations-cybersecurity/

- CI/CD security - 5 best practices
- https://vulcan.io/blog/ci-cd-security-5-best-practices/

- GNU General Public License
- https://www.gnu.org/licenses/gpl-3.0.en.html

- GPL Violation law suit
- https://www.fsf.org/news/2008-12-cisco-suit

REFERENCES

- SecurityScoreCard Global Third-Party Cybersecurity Breaches Report, Feb 2024
- https://securityscorecard.com/wp-content/uploads/2024/02/Global-Third-Party-Cybersecurity-Breaches-Final-1.pdf

- Code Sight IDE Plugin for Application Security Testing | Synopsys
- https://youtu.be/6cxi96CJB14

- Secure and manage open source risks in applications and contains with Black Duck SCA
- https://youtu.be/W9BHyXYw3vQ

- OWASP Dependency Check
- https://owasp.org/www-project-dependency-check/
- https://plugins.jenkins.io/dependency-check-jenkins-plugin/

- OWASP Dependency Track
- https://owasp.org/www-project-dependency-track/
- https://www.dependencytrack.org/